

**ENERGY LABORATORY**  
IN ASSOCIATION WITH  
**CENTER FOR**  
**INTERNATIONAL STUDIES**

**MASSACHUSETTS INSTITUTE**  
**OF TECHNOLOGY**

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**INTERNATIONAL DIFFUSION**  
**OF ENERGY TECHNOLOGY**

Report of a Workshop held on  
June 2-3, 1976, at Dedham, Massachusetts



With the support of Grant #E(49-18)-2295,  
Task Order No. 2, from the Energy  
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## Summary and Conclusions

1. A Workshop on the International Diffusion of Energy Technology, held at the Massachusetts Institute of Technology on June 2-3, 1976, brought together corporate officers, government officials, and academic specialists to discuss problems in the international transfer of energy technology and international cooperation in energy R&D as seen from industry's perspective.
2. Industry participants expressed the view that transnational industry-to-industry cooperative arrangements are generally the most efficient and expeditious means for the United States to avail itself of the useful aspects of foreign technology. ERDA should therefore intervene in this process only when the private market fails to produce optimum results. It should then act with limited instruments in a circumscribed and well-defined manner.
3. ERDA should be aware of international arrangements undertaken by industry, the specific assistance industry needs and the activities of other countries that might provide opportunities for American firms.
4. Despite some impediments to industry's participation in government-sponsored international cooperative R&D programs, such programs can be useful when they are appropriately defined and when government action stimulates rather than substitutes for industry activities under way or in the planning stage.
5. Industry should have a greater role in planning and formulating the agreements for cooperative R&D and should be invited to participate in relevant international discussions at an early stage.
6. The establishment of an industry advisory committee to the Assistant ERDA Administrator for International Affairs was proposed

to facilitate communication and coordination between the government and the energy industry.

7. Industry participants felt that despite ERDA's information dissemination policy and the requirements of the Freedom of Information Act there was much useful commercial information to exchange with other countries. Such exchanges should be arranged, whenever possible, by industry.
8. While industry participants for the most part found ERDA's present patent policies quite acceptable, they encouraged wider publicity for the new regulations.
9. The regulation of exportation of energy technology and equipment was not seen as a major issue outside of the nuclear sector.
10. There was considerable sentiment that the United States Government should improve its capability to assist American firms' operations in the energy area in other countries.
11. The constraints of government safety, environment and other regulation and enforcement of anti-trust legislation were seen as impediments to industry's international activities that, in some cases, the government should act to offset.
12. Industry participants expressed the strong view that the government's role in stimulating the commercialization of energy technology should be focused on improving the climate for industry to carry out its own programs rather than on direct intervention in the private market.
13. Industry participants agreed that a relationship between government and industry that was appropriately designed to utilize fully the resources and competence of the private sector would offer considerable mutual benefits.

## 1. Introduction

On June 2-3, 1976, a Workshop on the International Diffusion of Energy Technology was held at the Endicott House of the Massachusetts Institute of Technology in Dedham, Massachusetts. It was organized by the Center for International Studies and the Energy Laboratory of the Massachusetts Institute of Technology (M.I.T.) under the sponsorship of the Office of the Assistant Administrator for International Affairs, Energy Research and Development Administration. The primary purpose of the workshop was to provide an informal setting in which corporate officers, government officials and academic specialists could think through and discuss critical problems in the international transfer of energy technology and international cooperation in energy research and development as seen from industry's perspective. A broad cross-section of the energy industry was represented, primarily through officers of large corporations active in R&D, marketing and construction of energy-related technology, equipment and facilities. A full list of participants is attached as an appendix to this report. A wide variety of views was expressed on many topics and no attempt was made to reach consensus on any subject. This report is a summary of the significant insights and suggestions made by workshop participants.

## 2. Government-Industry Relations in the International Context

Industry participants from other than the nuclear sector generally reflected little experience in dealing with the United States Government on energy technology issues in an international context. This may have been the result of the particular choice of participants but more likely reflected ERDA's bilateral and multilateral government-to-government cooperative agreements. In the nuclear area, of course, there is a long history of direct government involvement in the diffusion of technology. The embryonic nature of the government-industry relationship in non-nuclear areas provides an opportunity to begin with a clean slate and establish a productive partnership that would

fully utilize the resources and competence of the private sector in pursuit of American national objectives of an economic and political nature.

By contrast, the number of transnational industry-to-industry arrangements are generally the most efficient and expeditious means for the United States to avail itself of the useful aspects of foreign technological development. As a result they urged ERDA not to view its mandate or interpret its mission as providing a broad license to intervene in or to manage the operation of the free market. Rather, they felt ERDA should interpose itself only in specific instances. The following were suggested as circumstances requiring ERDA intervention: a particular technology has military or important political implications; the U.S. government, perhaps through the national laboratories, is the primary holder of the technology; American industry is in a relatively weak competitive position with respect to foreign firms; and a foreign government possesses or controls data or technology and a government-to-government agreement, perhaps involving a political quid pro quo, is required to gain access to it. Put differently, the industry participants felt the government should act only where the operation of the market fails to produce optimum results. It should then act with limited instruments in a circumscribed and well-defined manner.

In order to fill these needs effectively, ERDA must be aware of those international arrangements in which industry is already engaged, the specific assistance industry feels it needs and the activities of other countries that might provide opportunities for American firms.

In order to better facilitate communication and coordination between ERDA and the energy industry in all matters related to the international arena and to improve the likelihood that their activities in this area would constructively reinforce each other, some participants felt an industry advisory committee to the Assistant Administrator for International Affairs would be useful. This proposal was not explored in detail, but merits further study with due attention, among other things, to its possible anti-trust implications.

Many participants acknowledged that the close working relationship between government and industry in some countries sometimes puts American firms, operating apart from the government and without its explicit support, at a competitive disadvantage in international markets. Nevertheless, there was no support either for creating such a government-industry relationship in the United States or for the government's offering favored treatment to selected individual firms to act as a commercial agent for a particular technology.

### 3. Industry Participation in International R&D Cooperation

There was general recognition among industry participants that the establishment of the International Energy Agency and some bilateral technology exchange agreements were primarily motivated by international political considerations. There was also agreement that if real technical cooperation is to take place under these auspices, substantial and technically valid programs must be developed in ways that make participation by industry feasible and attractive. There was considerable sentiment that government activities in this area should take account and be reinforcing of industry activities already under way or in the planning stage and that industry should both be afforded a greater role in planning and formulating the agreements for cooperation and be invited to participate in international discussions at an early stage. Otherwise American industry can be put at a competitive disadvantage with respect to foreign firms that work closely with their governments. It was also felt that where industry already has active cooperative programs ERDA should not do more than provide enabling mechanisms.

Industry participants had little familiarity with the international agreements and cooperative programs that ERDA has established. When informed about them some participants expressed considerable interest in finding a way for their firms to participate. There was some expression of need for a mechanism for ERDA to communicate to industry more completely the range of international activities under way and



the opportunities for industry participation.

Several impediments to industry participation in international R&D cooperative arrangements were identified. Among these were difficulties industry has in dealing with the several parts of the government that have responsibility for or interest in the international aspects of American energy policy and the perceived lack of clarity, consistency over time and coordination between and within agencies, in the establishment and implementation of government policy. The uncertainties inherent in sharing of responsibility and authority between Congress and the Executive Branch compound the difficulties. While it was recognized that these problems are by no means unique to this particular area of policy and that they are to a considerable degree intrinsic to the American process of governance, any actions that would reduce their impact would improve the climate for industry cooperation with and participation in the government's cooperative R&D programs.

Little comment was elicited about the possible participation of foreign firms in ERDA-sponsored R&D programs. Their involvement was viewed with general equanimity so long as foreign companies were extended no privileges or advantages from American firms.

#### 4. Problems in Acquiring Foreign Technology Due to U.S. Regulations for Information Dissemination

The workshop discussed two possible difficulties in obtaining energy technology from other countries that might result from ERDA's information dissemination policies and procedures and the requirements of the Freedom of Information Act:

1. Because foreign governments have easy access to unclassified reports of ERDA-sponsored research and development they may see little need or inducement to enter into cooperative arrangements with the United States in which they must offer their own proprietary information.

2. Foreign governments fear that the information provided to ERDA could not be prevented from being made public in the United States and would therefore become available to both domestic publics and potential commercial competitors.

The significance of these problems was underlined by expressions of concern that participation in programs under the auspices of inter-governmental cooperative agreements and the requirements of the Freedom of Information Act would lead to information dissemination detrimental to the competitive positions of individual firms. As a direct consequence of this concern, there was an evident reluctance to participate in government-sponsored cooperative programs except, paradoxically, when a firm is in a weak technical and commercial position.

Despite this sentiment, most industry participants distinguished between information in published reports and the technological knowhow and engineering practice that is largely unavailable in such reports. They stressed the importance of the latter and concluded that, despite American information dissemination policies, there remained much useful commercial information to trade with other countries. However, since this know-how and engineering practice normally resided not in the government but in the private sector, industry itself could, and normally did, enter directly into whatever cooperative arrangements appeared potentially beneficial. Such arrangements between firms were thought to be the best means of transferring technology and operational experience.

There was little industrial experience that was relevant to the second potential problem. There was no objection raised to the proposal, suggested in the May 6, 1976, Report to the Joint Economic Committee, Congress of the United States by the Comptroller General of the United States, entitled, "Can the U.S. Breeder Reactor Development Program be Accelerated by Using Foreign Technology ?," that ERDA seek legislation "specifically exempting data acquired through international technology agreements from the disclosure provisions" of the Freedom of Information Act. Indeed there was some sentiment that the establishment of a broader category of government proprietary information, exempt from

Freedom of Information Act disclosure requirements, would facilitate the willingness of American industry as well as foreign industry to participate in ERDA-sponsored technology development programs. On the other side, some participants stressed the value of national and international competition that is fostered, among other ways, by a policy of open dissemination of information.

#### 5. ERDA Patent Policy

Industry participants were on the whole unaware of the substantial changes that ERDA has made in the patent policies inherited from the Atomic Energy Commission. When these were explained, with their greater emphasis on flexibility, uniformity and liberalness in granting rights to firms as a means of encouraging innovation, the industry participants were generally quite pleased. Nevertheless, there remained some residual apprehension about the uncertainties inherent in relying on a system based on the prerogative of the ERDA Administrator rather than legislative mandate. There was also concern that the new regulations had not received wide enough publicity and, in the experience of some, were apparently not fully familiar to or serving as guidelines for ERDA employees in field offices and at the lower levels more generally.

There was also some concern that international exchange of energy technology might be impeded by patent clauses in bilateral or international cooperative agreements that are more detrimental to private firms than the new ERDA regulations. There was, however, little relevant experience from which to draw conclusions.

#### 6. Export Controls

The United States Government does not require approval of most individual commercial export transactions of energy technology or equipment. There are however, two categories of exceptions. The export of nuclear materials, technology and equipment is licensed by the Nuclear

Regulatory Commission as part of American policy to discourage and inhibit nuclear weapons proliferation. In the non-nuclear area a small number of items (such as seismic equipment) appears on the Commodity Control List maintained by the Office of Export Administration of the Department of Commerce. These are regulated to prevent the export or re-export of equipment and technology with potential military applications to the Soviet Union and other communist countries unless adequate assurances against diversion are provided. Of course general export licenses are required for all commercial exports but these carry no requirement to inform the government concerning individual transactions.

Other than in the nuclear area export controls were not considered a major issue by industry participants and they had relatively little experience with the export control machinery. In those few instances where they had been inconvenienced, industry participants reported being for the most part well treated and understood the rationale behind the controls.

Several isolated experiences were related that led to expressions of concern in two areas. First, a few instances were reported in which government decisions were forthcoming only after very long delays or in which opinions expressed at lower levels were subsequently reversed by senior officials. The preference was expressed, as a result of these experiences for more consistent and timely determination of government policy. Second, instances were reported in which one government agency or another for political reasons exerted moral suasion of firms to prevent their exporting energy technology or equipment. Several participants felt that the ability of ERDA or, for some firms, of the Department of Defense, to exert such suasion was very considerable.

#### 7. Assistance Abroad from the U.S. Government

The industry participants had only limited knowledge of or experience in working with American officials in other countries. There were some instances reported in which useful assistance was received

in helping to establish company bona fides, to overcome the problem of cultural distance and in providing information about government policies and the practices and personalities of foreign government officials. But the record seemed to be very inconsistent from country to country over time. In general, however, there was a sense that the government, and ERDA in particular, could do more and that embassy staffs of other countries in fact were frequently more knowledgeable and helpful to their respective countries' firms than were American embassy officials. Indeed, instances were cited of American firms relying for assistance on the staffs of the embassies of other countries.

Since the activities abroad of American firms in the energy industry are likely to grow in coming years, there was considerable sentiment that a systematic effort should be undertaken to strengthen the ability of American embassy staffs to assist these firms. This could be done, for example, by expanding the number of American embassies and consulates with ERDA representatives or by working out other arrangements with the science attache program of the Department of State.

#### 8. The Significance of U.S. Government Regulation

The extent to which safety, environmental or other regulation in the United States acts to impose a competitive disadvantage on American firms operating abroad was not probed in detail. Nonetheless, there was a general consensus that the greater stringency of such regulations in the United States compared with some other industrialized countries did have some detrimental impact. The sentiment was expressed that where possible the United States should encourage and foster the development of international standards and those instances in which such standards exist or are being negotiated were noted with approval. The nuclear safety area was mentioned as a particularly fruitful area to explore. There was also recognition, however, that progress toward international standards would be slow and limited and that to reach agreement the standard must frequently be set at a level much more permissive than current U.S. practice.

Existing anti-trust legislation and its interpretation by the Justice Department were seen as serious impediments to the formation of international R&D consortia. Concern was voiced about the time

delays in obtaining waivers and the requirement for annual renewal. It was suggested that ERDA might act as an intermediary between private industry planning a cooperative energy development project in an area of priority interest and the Justice Department's Anti-Trust Division so as to expedite the process of evaluating applications for waivers.

#### 9. The Commercialization of Energy Technology

During the course of the Workshop the issue of ERDA's role in the commercialization of energy technology was raised repeatedly. While not directly applicable to the primary aims of the Workshop it is indirectly relevant because its implications for ERDA-industry relations and for ERDA's conception of its own role will apply in the international milieu no less than in the domestic arena.

Government support for basic research and development was thought to be proper and desirable. Government subsidization of technology commercialization, however, was seen in quite a different light. It was thought to be appropriate and constructive only in special circumstances. As in dealings with foreign firms, the independent decisions of private industry were seen normally to provide the most efficient and lowest risk mechanism for the commercialization of energy technology. The government's proper role was said to be in providing an appropriate climate for industry to carry out its programs.

Some participants were convinced that government subsidies would replace rather than supplement private capital and that the net result would be less rather than more investment for commercialization. The sentiment was widely shared that any government subsidies of energy technology commercialization should be limited in time and extent and that the instruments chosen to provide the subsidy should be designed to minimize direct government interference with prerogatives and decision-making of individual firms. Although the nuclear industry was recognized to be a special case without general applicability, its reputed lack of success was singled out as a lesson in the drawbacks of too extensive government involvement in industrial development.

In this area too there was a feeling that greater communication

was needed between ERDA and industry in order to maximize the likelihood of utilizing available resources to best advantage. The establishment of industry panels comprised of both designer-builders and user-operators was proposed to advise the ERDA program managers and serve as a link between industry and government. Again, the implications of this proposal, including the possible anti-trust implications, were not explored in depth.

#### 10. Conclusion

There seemed to be general agreement among industry participants that an appropriately designed relationship between private firms and ERDA would offer considerable mutual benefits. Outside the nuclear sector this relationship is just developing and will almost certainly broaden and become stronger with time. There is therefore an opportunity to build constructively for the long term.

APPENDIX

List of Workshop Participants

- Ben Ball  
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Gulf Oil Corporation
- Professor Francis Bator  
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- Dr. Michael Brenner  
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- Dr. Wayne G. Burwell  
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General Electric Company
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Dow Chemical Company
- Dr. David Douglas  
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Gould, Inc.
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