
Chapter 5

U.S. Policy: Tools for Controlling and Promoting Energy Technology Transfers

U.S. Policy: Tools for Controlling and Promoting Energy Technology Transfers

The U.S. Government has available both controls and promotional programs that can be used to affect the scope and nature of energy technology transfers to China, within the overall context of U.S. foreign policy.

Export controls have historically been by far the more extensively used of these two avenues. For 20 years all U.S. exports to China were embargoed. It was not until the early 1970s when U.S.-China relations began to thaw that U.S. non-strategic exports similar to those allowed for the Soviet Union were permitted. During the past 3 years, U.S. restrictions on exports to China have been significantly loosened in light of a dramatic shift toward encouraging Chinese economic modernization and U.S. trade. But controls remain central to U.S. policies affecting technology transfer to China.

The U.S. approach to policies governing technology transfer contrasts with those of other countries supplying technology to China such as Japan and some West European nations, not only in the more extensive use of controls but also because the United States has no aid program for China and does not use extensive official financing to promote energy-related development projects there. Science and technology exchanges are the major way the U.S. Government helps to develop China's science and technology infrastructure needed to absorb foreign technologies and innovate domestically. Many of these exchanges, however, contribute only rather indirectly to commercial technology transfers in energy fields.

U.S.-China relations have bloomed since the normalization of relations in 1979. Both the United States and China see technology transfer, particu-

larly in energy, as a key area of cooperation. But despite the great expectations, doubts remain about U.S. willingness to transfer the most advanced and sensitive technologies, particularly those with military as well as civilian applications. This has caused some to question whether the U.S. commitment to export liberalization is really genuine, while others fear that the United States may be moving too quickly to export dual-use technologies without developing a comprehensive strategy.

In the sections that follow, disputes surrounding U.S. policies (both controls and promotional programs) that affect energy technology transfers to China are discussed and possible improvements outlined. The analysis indicates that the rationale for controls on militarily sensitive technologies remains valid, but problems in U.S. and Cocom export administration have created a climate of uncertainty. Additional steps could be taken to improve these systems, better focusing efforts on restricting flows of militarily sensitive exports. Most of the energy technologies that China wants, however, are not sensitive dual-use technologies. The U.S. Government could play a more active role in promoting these kinds of energy technology transfers.

Many of the improvements in policy that could be considered are not easily susceptible to congressional action. Indeed, some of the long-term policy issues raised below cannot be effectively handled by the United States unilaterally. Nevertheless, the time is ripe for a review of U.S. policies affecting energy technology, because such a review could contribute to the integration of policies and programs into a more coherent strategy.

CONTROLS ON NONNUCLEAR ENERGY EXPORTS

The Rationale of U.S. Export Controls

The U.S. system of export control attempts to balance two sometimes conflicting goals. These are preserving national security (by restricting the export of items that could significantly augment the military capabilities of unfriendly countries) and ensuring the ability of U.S. firms to export. In more concrete terms, the system is designed to identify and restrict U.S. exports that have military significance to particular countries, without constraining trade in other commodities and to other parts of the world. Sensitive exports that require extensive review and a validated license are contained on the Commodity Control List which includes more than 300 entries.¹ The U.S. system of export controls also includes a country classification of export destinations which reflect U.S. foreign policy considerations. Both the military significance of the particular commodity or technology and U.S. relations with the country to which the export is destined are taken into consideration in reviews of applications for export.

The rationale for U.S. export policies to China was summarized by President Reagan in a 1981 directive on technology transfer. It states that the United States "supports a secure, friendly and modernized China."² Earlier, the Carter Administration decided to liberalize exports of high technology civilian goods with potential military applications.

In the past 4 years, U.S. controls on exports to China have been rapidly liberalized. Under the "two times rule" adopted in 1981, exports with technical levels twice those previously exported to the U.S.S.R. and China were approved. In an even more dramatic move, China was transferred in June 1983, to category V, a catchall which includes friendly countries such as Japan and West European allies as well as Yugoslavia and India.³

¹The entries are categorized by Export Commodity Control Numbers (ECCN) in the Department of Commerce Export Regulations.

²See Shelly Mumford, "U.S. Relaxes Restrictions on China Trade; Expects \$2 Billion in Export Revenues," *EDN*, May 17, 1984, p. 301.

³In announcing this change, the U.S. Government noted that "restrictions on certain products and technologies" would nevertheless be allowed. See U.S. Department of Commerce, *Export Administration Annual Report, 1983* (Washington, DC: 1984), p. 9.

The United States also permits exports to China of items on the U.S. Munitions Control List on a case-by-case basis. These steps signaled that official U.S. policy sees China as a friendly country and seeks to promote its modernization.⁴

U.S. export administrators took an unusual step in establishing a "zone" system to cover China exports. The goal was to restrict certain kinds of exports in the interest of national security while speeding the review of applications for nonsensitive exports by providing clear guidelines to license review officers.

The China zone guidelines enable the Department of Commerce to expedite applications from U.S. businesses for "green" zone technologies that are seen to pose no threat to U.S. national security if exported.⁵ Because of the time and technical effort required to formulate the zones, the Department of Commerce began by targeting seven areas for special attention in license reviews.⁶ These seven categories, which were said to make up about 75 percent of all license applications for China,⁷ were semiconductor production equipment; electronic instruments; microcircuits; computers; recording equipment; oscilloscopes; and computerized instruments. In the case of green zone items, the Department of Commerce can by itself approve exports.⁸ U.S. export regulations include references to green zone items.

⁴See, for example, Department of State, "The U.S.-China Relationship," *Current Policy*, No. 594, May 31, 1984, p. 2. President Reagan directed in 1983 that China be treated as a "friendly, non-allied country."

⁵For a statement of the guidelines for U.S. controls on exports to China, see testimony of William T. Archey before the Subcommittee on International Economic Policy and Trade, House Foreign Affairs Committee, Nov. 17, 1983.

⁶Today there are eight major categories. Two of the original categories have been merged, and two additional ones added (microwave, numerically controlled machine tools).

⁷One expert has estimated that today the green zone actually covers about 40 to 50 percent of license applications.

⁸Some types of U.S. exports to China, such as agricultural products, do not require licenses or export review. In 1984, for example, total U.S. exports to China were valued at \$3.0 billion (\$1.9 billion in manufactured goods; \$614 million for agricultural exports; \$443 million other), while the total value of U.S. licenses approved for exports to China was \$2.0 billion. This figure should, however, be used cautiously, since many export shipments may not actually occur or there may be delays between license approval and actual shipments. One expert in the U.S. Department of State estimates that only about 10 percent of all U.S. exports actually require extensive review.

The most advanced technologies that have direct applications to military systems are theoretically included in the "red" zone, although no list of red zone items has been published. Included are technologies with direct and significant military applications—nuclear weapons and delivery systems, technologies and equipment used in intelligence gathering, electronic warfare, antisubmarine warfare, power projection, and air superiority.⁹ Some of these technologies could provide more significant military applications than some kinds of less sophisticated weaponry. Since the export of red zone technologies may pose a threat to U.S. national security, these license applications are carefully reviewed. Exports to China have been greatly liberalized in light of growing friendly relations, but militarily sensitive exports may be denied.

In practice, license reviews for all items not on the green list are approved on a case-by-case basis and require reviews by the Department of Defense and other agencies as appropriate. Initially it was hoped that a three zone system (red-intermediate-green) would clearly categorize all exports and facilitate reviews, but in actuality decisions about cases depend on a number of specific factors about which various executive branch agencies may disagree. Non-green zone exports may be approved if the agencies determine that their export causes no threat to U.S. national security. This determination is based on a number of factors. These include, among others, the type of end-user in China and the control that the U.S. firm will retain over the technology. In some cases, the reviewing agencies set conditions on exports (for example, that the equipment must be operated solely by the U.S. firm or that it be leased but not sold to China).

The categorization of items and technologies has evolved over time. For example, the United States restricts the export to China of computers with very high processing data rates (with processing data rates above 155 Mbits/second) on the grounds that they have significant military applications. The ceiling level has changed over time. In late 1984, after months of consideration, the

U.S. Government approved the leasing of a high-powered Cyber computer to China. Both because U.S. policies toward China have changed and because technology is constantly being developed, the Commodity Control List and the zones must be periodically updated. (Technical Advisory Committees, which include industry representatives, help to identify the critical technical data in their fields.) At present, an interagency group is working on a review of the green zone (Green Zone II). This review has been underway for more than a year, much to the distress of exporters.

The total volume of trade with China has grown rapidly in the context of liberalization of export regulations. The dollar value of *all* approved licenses for export to China increased from \$523 million in 1982 to \$2 billion in 1984. According to one estimate, the "high-tech" exports (excluding commercial aircraft) exceeded \$300 million of this total by 1984.¹⁰ During 1984 of the 9,637 license applications processed, only 15 were denied. In addition, 1,810 were returned without action (often because forms were incomplete).

Because equipment used in energy development spans a number of Commodity Control List (CCL) categories, it is difficult to quantify the dollar value of these energy exports. In 1984 over \$1 million worth of geophysical and mineral prospecting equipment and about \$21,000 in nuclear related equipment was approved for export. The largest dollar value of approved exports (\$1.1 billion) during 1984 was for "electric and electronic equipment."¹¹

Under the current U.S. export system for China, there are very few nonnuclear energy-related exports considered to have direct military applications. Most energy-related commodities and technologies therefore are included in the green zone or require no license review.

The exceptions are high-powered computers and array transform processors used in oil and gas exploration, and certain kinds of calibration and measuring equipment. Because these kinds of equipment and technology are critical for some energy development projects such as offshore oil

⁹See US [Department of State, "U. S. Export Controls and China," *GIST*, March 1985.

¹⁰*Ibid.*

¹¹The Department of Commerce supplied these statistics to OTA in May 1985.

explorations, some U.S. energy technology transfers have been limited by these restrictions. Specifically, U.S. export controls do not permit sales of certain kinds of array processors used in evaluating seismic data in support of oil development.¹² U.S. export restrictions have been revised a number of times, with the result that U.S. firms such as Western Geophysical and Control Data Corp. have been forced to modify equipment. This is a costly process.¹³ In addition, regulations on the export of technical data have been said to limit U.S. firms in providing training in analysis of seismic data.

Problems With the System

U.S. controls on exports to China have been officially relaxed during recent years, but some uncertainty remains for exporters about what can and cannot be exported and how long the process of license review will take.¹⁴ This uncertainty has been reflected in delays in license reviews, turf battles within and between U.S. agencies involved in export administration, difficulties in coordinating U.S. export policies with those of Japan and Western Europe, and (until recently) congressional

stalemate over renewal of the Export Administration Act.

The number and dollar value of export applications for China more than doubled between 1983 and 1984 alone (see table 8). Not surprisingly, the U.S. export administration system has been unable to quickly respond to the surge in applications. Exporters have complained about delays associated with export licensing. Between June and October 1984, the licensing review process within the U.S. Government took an average of 117 days for green zone and 192 days for non-green zone case reviews. In addition, the required review by Cocom (discussed below) took about another 100 days in each case.¹⁵

Exporters and some U.S. Government officials claim that these delays have caused U.S. firms to lose sales. OTA has not been able to develop an estimate of lost sales, but U.S. firms probably have been disadvantaged in some cases because other supplier countries do not have such extensive export controls. Based on the information now available, however, it is not clear whether U.S. sales in energy-related fields would have been significantly higher had the delays been reduced since there are a number of other factors such as financing that come into play.

In addition to the backlog in license reviews, exporters complain about apparent inconsistencies in the system. For example, U.S. businessmen need approval to ship computers to their branches overseas; but they can often purchase the same computers abroad. U.S.-made advanced technology products such as computers are available throughout Asia and particularly in Hong Kong, China's second largest trading partner.

The Department of Commerce has taken a number of steps to streamline the review process.

¹²The current official green zone standard for array processors allows export of those that have a maximum rate of multiply operations less than or equal to 2 million per second or not less than 40 milliseconds for performing an FFT (fast fourier transformer) for 1,024 complex points. Industry officials note that there is no commercially available array transform processor that currently meets these specifications.

¹³According to one of the firms (Western Geophysical), the modifications (for eight array processors) cost \$180,000. The total selling price of one of the processors is approximately \$100,000. None of the eight units have yet been exported to China.

¹⁴In May and June 1985, OTA made a series of calls to Department of Commerce telephone numbers set up to provide exporters with information about the licensing system and the status of their application reviews. Out of 20 calls made to these numbers, the OTA call was answered only twice (and in both cases immediately put on hold). This admittedly limited experiment provides substantiation for claims that U.S. exporters find it extremely frustrating to obtain information about export administration.

¹⁵Data provided by DOC to OTA in May 1985.

Table 8.—Export Applications for the PRC (millions)

	Received	= Pending	+ Processed	= Approved	+ Returned	+ Denied	
1983	4,015	(\$1,300)	84	3,931	2,834	1,082	15
1984	9,637	(\$6,300)	3,366	6,271	4,443	1,810	15
1985 ^a	3,900	(\$2,500)	NA	NA	1,800	NA	10

^aFirst quarter 1985.

SOURCE U.S. Department of Commerce, May 1985.

ess. In May 1985 DOC officials stated that they were processing green zone cases within 30 days and that non-green zone case processing had probably been reduced to about 14.5 days. A Department of Defense official stated in June 1985 that they were processing cases in 18 to 20 days (average).

In addition to increasing the numbers of license reviewers, DOC officials point to specific steps taken to reduce the backlog in China applications. These include the elimination of end-user checks by other U.S. agencies for green zone applications; initiation of fast track processing by routing cases directly from the licensing division to the Cocom submission branch (eliminating review by the East-West trade office); using a form cover letter for submissions to Cocom; and automating some aspects of the licensing process.¹⁶ Other steps taken (using faster means of sending submissions to Paris) were also expected to reduce the time required for Cocom review of U.S. cases.

DOC officials indicate that much of the backlog in Washington has been reduced and the review time significantly shortened. Whether this will continue and whether U.S. exporters, who have heard such promises by the DOC for years, will be satisfied remain to be seen.

Another type of problem concerns the definition of the green, intermediate, and red zones. The thrust of changes in U.S. controls on exports to China in recent years has been to focus attention on the really sensitive items (in the intermediate and red zones), while speeding the review of non-sensitive green zone items.

One dimension of this problem is that the zone definitions must be constantly updated, in light of technological change, foreign availability of items, and developments in U.S.-China relations. At a more fundamental level, disagreements about the zones reflect uncertainty about the national security implications of transferring certain types of technology to China. Official U.S. policy characterizes China as a friendly, non-allied country and export policy is to approve much more advanced and sensitive technology exports to China than to the Soviet Union. There is, however, room

for disagreement among informed observers about what the proper threshold level should be and on what basis it should be determined.

Another question is whether sensitive (red zone) exports are slipping by U.S. license reviewers, either because of Chinese attempts to circumvent U.S. restrictions, or because license reviewers lack proper expertise and resources to evaluate export applications.

The first issue was raised in congressional hearings a few years ago. The Defense Intelligence Agency (DIA) in 1982 referred to an upsurge in Chinese attempts to obtain Western computers and other technologies restricted by Cocom through surreptitious efforts. The DIA Director, in congressional testimony, said that the Chinese Government did not appear to have a formal policy of illegal acquisition of restricted technologies, but it was "likely" using commercial channels and science and technology exchanges to supplement legitimate commercial purchases.¹⁷ Other observers have suggested that China may use investments in the U.S. and dummy firms to gain access to U.S. technology.¹⁸

Questions about the capabilities of U.S. license reviewers, the second issue, have also been raised. A 1984 congressional hearing on technology transfer highlighted a turf battle between the Defense Department's DRE (Defense Research and Engineering) and ISP (International Security Policy).¹⁹ More recently, Congress has debated the pros and cons of an expanded role for the Department of the Defense in Cocom.²⁰ The Department of Com-

¹⁶See Testimony of Lt. Gen. James A. Williams, DIA, before Subcommittee on International Trade, Finance, and Security Economics, Joint Economic Committee of the Congress, *Allocations of Resources in the Soviet Union and China*, June 29 and Dec. 1, 1982, p. 113. See also "U.S. to Ease Technology Controls, Change Country Group; August Announcement Seen," *[U.S. Export Weekly]*, June 28, 1983, pp. 463-464.

¹⁷Denis Fred Simon, "Technology for China: Too Much Too Fast?" *Technology Review*, October 1984, p. 48.

¹⁸Some Members of Congress questioned whether the more political ISI could effectively handle the technical review formerly led by DRE. This dispute was settled in favor of the ISP in the new Export Administration Act passed by both Houses in June 1985. See Senate Committee on Governmental Affairs, Subcommittee on Permanent Investigations *Transfer of Technology*, hearings (Apr. 2, 3, 11, and 12, 1984) and report (September 1984), pp. 15 and 26. DOD officials in the Strategic Trade Directorate say that they call on the resources of DRE where needed in license reviews and have available technical expertise throughout the Defense Department.

²⁰See *Congressional Record* May 9, 1985, H 3061.

¹⁹Department of Commerce officials also referred to the institution of simultaneous review by DOC and DOD of non-green zone cases. DOD officials stated that this had not been instituted.

merce and the Customs Service have, moreover, feuded over which has primary responsibility for export enforcement. Bureaucratic struggles within U.S. export control agencies and between them revolve around who is best equipped to make technical judgments required in license review and whether reviewers have adequate resources to do a good job.

Critics believe that the licensing bureaucracy was established to control exports and is not really committed to export liberalization. In addition, high-level policy makers have openly disagreed about U.S. export controls, thereby sending license examiners and exporters alike mixed signals. In this sense, the delays in the review process reflect underlying turf battles and differences in perspective among the relevant agencies. Congressional stalemate over renewal of the Export Administration Act reflected and contributed to these disputes. After 2 years of delay, Congress renewed the Export Administration Act on June 27, 1985, thereby sending a clearer signal to the executive branch on export controls which could help to moderate disputes among agencies over jurisdiction.

From one perspective, however, delays in license reviews may be a reasonable price to pay for ensuring that really sensitive technologies are not exported. On the other hand, delays may stem from negligence on the part of reviewers. The question is whether the process of export administration can be streamlined and, more importantly, whether a coherent strategy can be built to guide policy implementation.

Problems with export administration may be as serious (or perhaps more so) in Paris as in Washington. Paris is the headquarters of the Coordinating Committee for Multilateral Export Controls (Cocom), an informal organization involving the United States, Japan, and West European countries with the purpose of coordinating export policies toward Communist countries. A voluntary organization formed in 1950, Cocom operates on the basis of unanimous approval for decisions but has no formal sanctions against violations of its informal guidelines.

Cocom maintains three lists of items that exporters cannot sell to Soviet bloc countries (in-

cluding China, Albania and Southeast Asian Communist countries) without its permission. These lists cover military, nuclear, and dual-use items. Despite its limited resources, Cocom remains one joint Western institution that keeps export controls on the multilateral agenda.

Because of U.S. membership in Cocom, U.S. export applications for sales of items on the Cocom list must pass Cocom review as well as U.S. review. Especially since U.S. controls on exports to China were loosened in 1983, the number of U.S. submissions (requests for approval by Cocom) has grown dramatically. In 1984 more than 2,200 U.S. license applications were sent to Cocom, while a total of more than 6,200 were processed in the United States.²¹ The current Cocom system sets a voluntary framework that makes it difficult (but not "illegal") to make certain changes in U.S. export administration for China. Eliminating review of green zone exports to China altogether, for example, would not be likely so long as some of these items are covered by Cocom review. Nor is the United States likely under the current Cocom system to institute distribution licenses, which permit U.S. sellers to make repeated sales (unlimited quantities to unspecified end-users) during a specified time period.

While the details of Cocom decisionmaking are confidential, general problems have been much publicized. The major enduring dilemma is to maintain an operating consensus among Cocom members who often disagree about the details of export policy for specific Communist bloc countries. With regard to China specifically, the United States has found itself in the unusual position in recent years in its support of a liberalized Cocom review for China exports, while at the same time advocating tighter controls on exports to the Soviet Union. Countries such as France and West Germany have reportedly resisted these efforts in light of the fact that Washington has refused to loosen up on exports to countries such as Bulgaria where they do more business.²²

Member countries have accused each other of playing "games" in Cocom designed to further the

²¹Some of the license applications sent to Cocom cover two or more U.S. applications.

²²See report by Stuart Auerbach, "Cocom Feuds Over Trade to East Bloc," *Wall Street Journal*, July 17, 1984, p. 27.

commercial fortunes of domestic firms. U.S. firms have complained that they have lost sales because of red tape and delays in Cocom review.²³ But firms from other countries have also complained that the United States uses Cocom to its own advantage.

What is clear is that China applications make up by far the bulk of U.S. submissions to Cocom (90 percent),²⁴ and there have been many more U.S. submissions to Cocom than those by other Cocom members. According to one report, in early 1985 the United States had submitted 70 percent of all cases before Cocom; 807 of 877 pending cases were for products destined for China.²⁵ In May 1985 there was still a large backlog in Cocom cases, according to State and Commerce Department officials. Of the 454 U.S. cases pending in Cocom, 418 were for exports to China. In addition, more than 200 submissions had not been made because of a limitation that no more than 20 U.S. cases can be submitted weekly.²⁶ While data are not available on numbers of submissions by other Cocom countries, it appears that U.S. cases for China are still the great majority of cases now pending in Cocom, despite the fact that the value of U.S. exports is lower than that of Japan, for example.²⁷

These problems have become points of contention in Cocom, and they have also been noted by the Chinese. The Chinese Vice Minister of the Ministry of Electronic Industry told a group of Seattle businessmen in April 1984 that Cocom approval was still a problem, despite the fact that the United States had relaxed its export regulations.²⁸ The Japanese *Mainichi Daily News* reported in March 1985 that Minister Ding Min of the Chinese Embassy in Tokyo called for Japa-

nese efforts to remove China from the Cocom list.²⁹

U.S. officials have disagreed among themselves about Cocom, and one high ranking trade official resigned in 1983 to protest what he called a "counterproductive" U.S. strategy in Cocom, specifically vis-a-vis controls on exports to the U.S.S.R. and Eastern Europe.³⁰ China-related exports are thus one facet of a larger Cocom consensus-building dilemma, but the surge in U.S. applications for China exports has certainly overwhelmed the organization.

Possible Improvements in U.S. Export Controls

The problems discussed above suggest a number of possible approaches to improving the U.S. system of export controls. Congress has, first of all, helped to clarify overall U.S. policy by passing an Export Administration Act. Failure to pass the act allowed export controls to be the product of bureaucratic rivalries within the executive branch. The recent passage of export control legislation holds at least the potential for reducing U.S. exporters' uncertainty about the system.

Nor does the U.S. Government possess extensive information about certain aspects of technology transfer to China, or to other parts of the world for that matter. More information and systematic review of alleged problems such as violations of U.S. export controls in third countries, and (if they occur) patent infringements and illegal acquisitions of technology by China could help to clarify where the real national security problems lie. Perhaps even more importantly, various agencies could cooperate better in exchanging relevant information.

There are a number of other possible steps which the executive branch might consider to improve the management of export administration, including concluding the Green Zone II review. The Department of Commerce has already added a number of people to its licensing review staff,

²³See Stuart Auerbach, Red Tape Snarls Seattle Exporter's Sale to China, *Washington Post*, July 22, 1984, p. F8.

²⁴Data provided by DOC to OTA in May 1985.

²⁵See Daniel Southerland and Stuart Auerbach, "High Tech Sales to China Delayed," *Washington Post*, Mar. 5, 1985, p. D1.

²⁶Information provided to OTA by DOC, State, May 1985.

²⁷It may be that other countries submit cases to Cocom only when a military end-user is involved or the item is clearly militarily sensitive. Cocom does not make public data that would make it possible to substantiate the hypothesis, but it seems unlikely that the United States is selling so many more items on the Cocom list than other countries.

²⁸Stuart Auerbach, "China Hits Slowness of High Tech Imports," *Washington Post*, Apr. 24, 1984, p. D9.

²⁹"Envoy Urges Removing PRC From Cocom List," *Mainichi Daily News* (English), Mar. 20, 1985, p. 1.

³⁰See William A. Root, "Export Control That Work," *Foreign Policy*, No. 56, fall 1984.

but managerial improvements could also be made. License reviewers normally handle cases dealing with exports worldwide. It might be useful to assign a few individuals to concentrate on review of China cases, while preserving non-area expertise at higher decisionmaking levels. Measures to further automate the system of license review so that documents and information can be quickly exchanged among executive branch agencies could also help to streamline the U.S. export control process. In order to ensure that the really sensitive items are restricted, efforts could be made to further develop the technical expertise of license reviewers. For nonsensitive energy related exports, the ceiling on service supply licenses could be raised above the existing \$8,000 limitation so as to facilitate exports.

Efforts are now underway to streamline the Cocom process of China export reviews. Neither ending Cocom review of exports to China nor an aggressive unilateral U.S. push on Cocom partners to tighten controls is likely to be feasible or promising at this juncture. Instead, more constructive efforts are now being made to adopt a "notification" system for nonsensitive items. Cocom, with all its problems, is an organization that plays a key role in harmonizing Western approaches to East-West trade. It appears that changes can be made to streamline China review without jeopardizing the carefully built Cocom consensus on trade with other countries. In light of the informal nature of the Cocom organization, these steps can best be pursued in low-key negotiations among the member countries.

CONGRESSIONAL REVIEW OF NUCLEAR COOPERATION AGREEMENT

The primary focus of policy debate on nuclear-related matters will be on the proposed cooperation agreement with China. Issues of nuclear trade, proliferation, and strategic security are subsumed under this rubric. The specific issues are discussed in chapter 4. Additional information is in the Congressional Research Service Issue Brief included with the background papers.

Before a nuclear cooperation agreement becomes valid, it is submitted to Congress by the President for a period of 90 working days (30 days of consultation with the Foreign Affairs and Foreign Relations Committees, and 60 days of congressional review). If, as in this case, the President determines the agreement does not require an exemption from the relevant sections of the Atomic Energy Act as revised, the signed agreement comes into force at the end of the 90-day period, unless Congress adopts a joint resolution of disapproval. Congress would need a two-thirds majority to override a Presidential veto. Under the recently renewed Export Administration Act which was signed into law by the President on July 12, 1985, a nuclear agreement requiring an exemption because it significantly deviates from usual terms

and conditions of the Atomic Energy Act would not be valid unless Congress passes a joint resolution approving it. The situation is less clear in the event that the President sends to Congress an agreement without exemption, but where one of the two lead committees believes an exemption is required. According to the conference committee that developed the legislation, in such a case Congress "expects that the President will submit an exemption."³¹ There is, however, no specific requirement in the law to this effect.

When the U.S.-China agreement was submitted to Congress on July 24, 1985, it was accompanied by the President's written determination, approval and authorization for the agreement, a memorandum prepared jointly by the Departments of State and Energy stating that the agreement meets the requirements of U.S. law and that it serves U.S. foreign policy and nonproliferation interests, a memorandum from the Director of the Arms Control and Disarmament Agency (ACDA) assessing the "adequacy of the safeguards and other control mechanisms, and peaceful use assurances" of the proposed agreement, and a Nuclear Nonproliferation Assessment Statement prepared by ACDA.

³¹congressional Record, HR4919, June 25, 1985.

These documents are included at the back of this technical memorandum.

As Congress reviews the signed agreement, the language of these documents (particularly Article 5 on retransfers and consent rights) will be carefully scrutinized. Concerns over possible improvements to submarine technology are more difficult to address via these documents, since the most

likely route to enhanced capability would be through the upgrading of China's nuclear industry generally. Close monitoring as required by law of nuclear exports as part of the export control procedures handled by the Nuclear Regulatory Commission (NRC) and perhaps improved intelligence could also help to serve U.S. nuclear non-proliferation policy aims.

PROMOTING ENERGY TECHNOLOGY TRANSFERS

Limited Scope of U.S. Promotional Programs

The United States has few programs explicitly designed to promote commercial technology transfers to China. Official U.S. programs are focused much more on science and technical exchange than those of other countries like Japan where aid and official financing have been used extensively to support involvement in commercial energy development projects. In the United States, controls rather than promotional programs have been the central focus of policy debate.

There are a number of possible explanations for the comparative lack of attention to promotional measures. There may be a sense that U.S. promotional programs have not been especially effective in the past, or that these are best left to the firms themselves. In a period of budgetary austerity, it is unlikely that some of these programs will be expanded. Since U.S. controls are seen by many to directly inhibit trade, many proponents of expanded trade and technology transfer to China look to changes in export administration, rather than promotional programs, as the prime avenue for policy change.

The few U.S. Government programs that even indirectly affect commercial energy technology transfer to China include science and technology cooperation, U.S. official representation in China, and insurance and financing support for U.S. firms doing business there. The United States and China have established a Joint Commission on Commerce and Trade (JCCT), but current programs do not include activities in energy technology transfers.

Table 9 provides a listing of the energy-related science and technology accords. The fossil energy protocol was recently negotiated.³²

The United States has assisted China's petroleum geologists by providing Landsat remote sensing data. The United States and China have also agreed to cooperate in environmental protection, but little has yet been done in the area of pollution control technologies. Studies on the health effects of coal combustion (at least one underway and others planned by the U.S. Department of Health and Human Services) could lay the foundation for exploring and documenting some very serious problems associated with energy use in China.³³

³² Among the 24 active protocols are agreements on cooperation in high energy physics, nuclear safety. See Department of State, U.S.-China Science and Technology Exchanges *GIST*, April 1985.

³³ See House Committee on Energy and Commerce, Special Subcommittee on U.S. Trade with China, *China's Economic Development and U.S. Trade Interests*, May 1985, pp. 49-52.

Table 9.—Energy-Related Science and Technology Agreements With China

1. Nuclear Safety (NRC)
2. Nuclear Physics and Magnetic Fusion (DOE)
3. Fossil Energy (DOE)
(Hydropower—expired)

NOTE These agreements support basic science and exchange of information between scientists and technicians. The programs contribute, but rather indirectly, to commercial technology transfers in energy-related fields.

The hydropower protocol was probably the most controversial U.S. private sector firms criticized the role of the U.S. Government, and there was some misunderstanding with the Chinese on the role of the private sector. See, for example, Robert A. Delfs, Jr. "Hydropower Agreement Update" *China Business Review* May-June 1981, p. 52.

The U.S. Department of the Interior is continuing to provide technical assistance for Chinese hydropower development on a reimbursable basis. In other words, the Chinese are funding these studies, some of which have been subcontracted to U.S. firms. The Department of the Interior is leading discussions to explore the possibility of an expanded U.S. role in the Three Gorges Project with U.S. private sector participation.

The U.S. Embassy in Beijing has a staff of 124 U.S. citizens, and another 50 are stationed in U.S. consulates in other cities. In order to represent U.S. business, the Foreign Commercial Service has six U.S. officers stationed in China.³⁴ In addition, there are four³⁵ official U.S. representatives in Beijing involved in science and technology exchange activities.

U.S. Government financing and insurance programs supporting energy development in China have been fairly limited. The primary mechanisms for providing this support are loans and credits from the Export-Import Bank, insurance by the Overseas Private Investment Corporation (OPIC), and financing of feasibility studies by the Trade and Development Program. OPIC insures U.S. firms investing overseas; it covered three energy projects in China by September 1984.³⁷ U.S. direct investment in China is very limited.³⁷ OPIC insures against political risk, an important concern for U.S. firms participating in offshore oil and gas development. But limitations on OPIC's resources have been criticized by U.S. energy firms who believe that the ceiling on OPIC country coverage should be raised to support additional U.S. investments in Chinese energy development.³⁸ The Chinese have found financing (some at aid-related concessional rates) from Japanese and other sources at interest rates lower than those offered by the U.S. Export-Import Bank. U.S. Export-Import Bank loans have been granted

to only two U.S. firms involved in work in China. The two are Combustion Engineering and Westinghouse, involved in energy-related projects. Table 10 provides a list of the U.S. Government supported energy-related projects in China.

Subsidized supplier government financing has been a key factor in some of China's energy projects, particularly those in the hydroelectricity field. A number of these projects involve the use of "mixed credits," which combine official (Export-Import Bank) and aid-type concessional financing. The United States, because it does not have an aid program in China,³⁹ has not been in a position to match the soft financing offered elsewhere. The United States has used the Trade and Development Program, however, to provide financing for feasibility studies for one Chinese hydropower project (see table 10).

Japan, in contrast, negotiated with China a package of construction projects valued at \$1.5 billion, one involving hydroelectricity development. The loans for these projects were provided by the Japanese Government, through the Overseas Economic Cooperation Fund which provides aid-type concessional financing at a rate of 3 percent annual interest over a 30-year repayment period. The Wuqiangxi hydroelectric powerplant supported by these loans is expected to power the refining of nonferrous metals, whose export should help finance Chinese purchases of Japanese products.⁴⁰ Japan's Export-Import Bank has also provided credits for seven coal development projects, and in 1983 it was said to have committed over \$500 million to Chinese offshore oil development.⁴¹ Table 11 shows that the Japanese Export-Import Bank has provided more than \$2 billion for energy projects in China. Japan has

³⁴The total number of U.S. citizens officially posted to China is 178, including Foreign Commercial Service, State Department, United States Information Service, and other agency representation. These figures were provided by the U.S. State Department, May 1985, and the FCS, August 1985.

³⁵In June 1985 there were three representatives, with an additional one authorized.

³⁶See Henry R. Berghoef, "OPIC in China," *The China Business Review*, October 1984, p. 44.

³⁷The most recent official U.S. Department of Commerce data show a negative U.S. foreign direct investment position of \$9 million as of 1983. This statistic reflects the fact that the value of the debt owed by U.S. parent companies to their Chinese affiliates was greater than the debt owed by those affiliates to them. This is not uncommon in a situation where there is little or no direct investment by the parent firms.

New data will be released near the end of 1985. The U.S.-China Trade Council has drawn up a list of U.S.-PRC joint ventures (as of Mar. 31, 1985) that includes 17 in energy-related fields.

³⁸See House Committee on Energy and Commerce, Special Subcommittee on U.S. Trade with China, *China Offshore Oil Development and the Energy Security of the Pacific Rim*, Feb. 28, 1984, p. 56.

³⁹Chapter 3, Section 620-F of the Foreign Assistance Act of 1961 prohibits the provision of funds (for aid) to Communist countries and stipulates that the President shall not waive this prohibition unless he can show that this is necessary for national security or that the country is no longer controlled by the international Communist conspiracy, or that assistance will promote its independence from such. The People's Republic of China is specifically mentioned. In recent years, the U.S. Government has provided some assistance through the TDP (Trade and Development Program) and through exchange programs, neither of which involve direct payments to China.

⁴⁰See Chae-Jin Lee, *China and Japan* (Stanford, CA: Hoover Press, 1984), ch. 4.

⁴¹See Martin Weil, "Coal's Promises and Problems," *China Business Review*, March-April 1984.

Table 10.—U.S. Government-Supported Energy Department Projects in China

Project		
1. Dresser Ind., Inc.	oil/gas services	\$ 4,950,000 ^a
2. Pennzoil Co.,	oil/gas exploration	\$100,000,000 ^a
3. Texaco Inc.	oil/gas exploration	\$ 50,000,000 ^a
4. Combustion Eng.	thermal power generation	\$ 23,000,000 ^b
5. Westinghouse	thermal power generation	\$ 28,000,000 ^b
6. Harza Eng.	Tiengshengqiao hydropower	\$ 440,000 ^c
7. Not yet contracted	Hualing coal mine	\$ 550,000 ^a
8. Kaiser Engineers.	Yuxian coal gas	\$ 750,000 ^c
9. SAIC	ShanJiasi heavy oil	\$ 280,000 ^c

^aTotal insured Investment by OPIC.

^bTotal loans by Export-import Bank

^cFunds provided by the Trade and Development Program for feasibility studies

NOTE TDP supported pre-feasibility study exchanges between the Army Corps of Engineers and the Bureau of Reclamation on hydropower projects in China (1980-84)

SOURCE Office of Technology Assessment

Table 11.—U.S. and Japanese Trade, Aid, and Investment in China, 1983

	United States	Japan
Trade		
Exports to PRC	\$2,173 million	\$4,914 million
Imports from PRC	\$2,243 million	\$4,843 million
Investment ^a		
Aid (ODA loans net).	0	\$ 299 million ^b
Exlm loans for energy projects (1980-84)	\$ 51 million ^c	\$2,132 million ^a

^aOfficial DOC data show a -\$9 million U S direct Investment position in China during 1983 See footnote 42 for additional explanation Additional data are now being prepared which may show a positive investment position for the United States in the hundreds of millions of dollars The U S Department of State estimates that U S direct Investment totaled more than \$100 million by late 1984 See Office of Chinese Affairs, USDOS, "U.S. and Other Foreign Investment in China," October 1984

JETRO data indicate that Japan's direct Investment position was \$29 million in 1983, and that by 1985 Japanese Investments in China had risen to \$187 million

^bTotal ODA received by China during 1983 was \$500 million See OECD Geographical Distribution of *Financial Flows to Developing Countries*, 1980.83 (Paris 1984), p 74

^cSee table 3 for U.S. data. Japanese data from JETRO data file 1984, provided to OTA Japanese data Includes only coal and oil development projects

signed long-term agreements to import some of the coal and oil it is helping China develop, and has granted China trade preferences under the Generalized System of Preferences.

Japanese firms and the government work together to negotiate large development projects in China, which combine trade and aid concerns. While Japanese foreign direct investments in China are apparently very limited,⁴² Japanese firms are well represented in China, including remote areas of the countryside, by trading com-

⁴²As indicated in the notes to table 11, investment data for China should be treated with great caution. Current official U.S. data is not available, and the U, S., Chinese, and Japanese governments include different elements in their foreign direct investment data.

panies as well as government organizations such as JETRO (the Japan External Trade Organization). In 1983, more than 1,200 Japanese experts were sent to China by JICA (the Japan International Cooperation Agency) to work on technical cooperation projects.⁴³ European firms are also pursuing innovative approaches to the China market. The establishment of a special West European financing consortium for China trade was recently announced.

Japan and the United States have developed quite different types of economic interactions with China. Table 11 shows the comparative strength of Japanese Government financing and aid as well as the strong overall lead Japanese firms enjoy in trade.

It is unlikely that the U.S. Government will provide subsidized financing for China trade equivalent to Japan's. Nor is it clear that this would be desirable from a national perspective, since the interest rate subsidies could be costly. The United States has furthermore gone on record advocating the elimination of mixed credits (which combine concessional aid and official trade financing) as examples of predatory financing.

On the other hand, the United States is well positioned to do much more in the area of promotion. Such steps could involve expansion of established programs, particularly support for feasibility studies and insurance programs. In addition, technical exchanges in areas such as reduc-

⁴³MITI, *Keizai Kyoryoku no Genjoto Mondai* (The Current Status of Economic Cooperation)

ing coal-related environmental pollution could be promoted under the science and technology protocols. This could be carried out by allocating funds directly to the projects rather than relying on the Environmental Protection Agency or some other government agency to provide funding. It should be noted that promotional programs could be expanded without adopting predatory financing approaches that weaken international trade agreements. The expansion of technical exchanges, Ex-Im financing and OPIC insurance and feasibility studies could all be carried out in a way consistent with international trade norms.

Selection of Energy Development Projects

Among the many energy development projects that China undertakes, some will undoubtedly be more successful than others. If there are negative side effects (such as adverse environmental consequences) associated with technology transfers, ill will might be created between the United States and China.

But while energy technology transfers to China could involve negative, unexpected consequences for both countries, the U.S. Government has not and probably cannot establish regulations that eliminate such risks. The one important exception to this rule is national security-related risks, where the U.S. export control system is designed to prohibit certain types of transfers with potential military applications. In particular, nuclear-related exports must undergo an extensive review by the Department of Energy and related agencies.

With regard to the other nonsensitive energy technologies, the ability of the U.S. Government to try to tell China how to develop its energy resources is quite limited. The U.S. Government officially supports few energy-related projects in China, as table 10 indicates. In addition, given the availability of energy technologies from other suppliers it generally would be futile for the United States to try to tell China what to purchase. The basic assumption of U.S. policies affecting technology transfers worldwide is that the firms themselves are in a position to make responsible choices about what kinds of technology transfers they should make, unless these choices impinge on na-

tional security. In addition, since the United States does not have an aid program for China, a mechanism for encouraging certain types of projects in developing countries is not available for China.

In the few instances where U.S. Government financing is used (Ex-Im Bank loans and credits), the Ex-Im Bank considers the creditworthiness of the host country. Today China is ranked high in terms of creditworthiness by the Bank.⁴⁴ Project selection by the Bank normally involves an evaluation of the financial soundness of the proposed project. The Bank prefers projects that will expand U.S. exports and employment. The Bank, however, does not have a rigid set of criteria used in evaluating projects, and in practice decisions have often been influenced by political factors.⁴⁵

Since 1977, Congress has reviewed nuclear technology exports involving financing by the Bank. The level of loans and credits for nuclear-related exports has fallen in recent years to 2.4 percent (\$4 million to support management services) of the Bank's authorizations in energy-related products and services in 1983.⁴⁶ The Bank has changed its position in recent years on support of nuclear exports to countries such as Egypt, reflecting controversy within the United States over whether or not subsidized financing should be provided to such projects. In practice, however, Ex-Im Bank financing for nuclear projects has fallen to a very small part of Bank-supported projects. For China, Ex-Im financing of nuclear exports will be moot until the agreement on nuclear cooperation becomes effective.

The Overseas Private Investment Corporation, which provides investment insurance, contractor guarantees, and other support to U.S. investments overseas has a detailed and extensive list of criteria it considers when supporting a project.⁴⁷

⁴⁴Information provided to OTA by U.S. Export-Import Bank in May 1985.

⁴⁵See, for example, "The Selection and Distribution of Loans," in Richard E. Feinberg, *Subsidizing Success: The Export-Import Bank in the U.S. Economy* (Cambridge, MA: Cambridge University Press, 1982), p. 65.

⁴⁶Export-Import Bank, *Report to the Congress on Export Credit Competition and the Export-Import Bank of the United States*, for Jan. 1, 1983 to Dec. 31, 1983 (Washington, DC: 1984).

⁴⁷For a discussion of OPIC's role in technology transfer, see U.S. Congress, Office of Technology Assessment, *Technology Transfer to the Middle East* (Washington, DC: U.S. Government Printing Office, September 1984), OTA-ISC-173, p. 538ff.

Congress requires that OPIC carry out a developmental impact statement of projects, in order to ensure that economic and social effects are taken into account. Other criteria considered include U.S. employment, technology transfer, productivity, multiplier effects on other industries, contribution to host country revenues, and environmental and safety effects.

It does not appear likely that the U.S. Government could effectively extend its review of energy projects beyond what is already built into these reviews and into export administration review (on grounds of U.S. national security).

On the other hand, more could be done to provide China with information on the health and safety effects of energy technologies. There are protocols with China in environmental protection and nuclear safety. But science and technology exchanges in these and other areas (legal issues surrounding contract obligations, and project management) could be enlarged to augment China's own expanding efforts in the area of environmental protection.⁴⁸

Possible Improvements in U.S. Promotional Programs

While controls remain the major focus of U.S. Government policies affecting technology transfers to China, there are steps that could be taken to promote energy technology transfers in addition to streamlining the license review process.

At the most general level, Congress could take the lead in promoting a new view of the United States as a country whose economic health depends on our ability to promote exports worldwide. This would involve a significant change in thinking in light of recent preoccupation with im-

port penetration. It is unlikely that promotional programs will be expanded unless Congress develops a new approach to U.S. exports. More extensive export promotion programs could be designed that support rather than endanger multilateral agreements on trade and export financing.

There is no one program that if changed or enlarged would provide a "quick fix" for export promotion, but there are a number of possibilities for incremental improvements, particularly in information flows. U.S. representation through the Foreign Commercial Service could be expanded in China, and efforts could be better linked to trade development in the United States. Such efforts could, in some cases, augment the science and technology protocol activities. The U.S. Government could support expanded technical training in energy-related fields in China and in the United States. Were the United States to establish an aid program, more extensive programs could be considered, but the above-mentioned steps could be taken regardless.

In the absence of an aid program, science and technology exchanges are a major avenue for U.S. Government support. Protocols in fossil energy and nuclear safety provide a framework for cooperation in energy-related fields. Programs of the Committee on Scholarly Communication with the People's Republic of China (CSCPRC) under the National Academy of Sciences and the National Academy of Engineering, funded by U.S. Government agencies, support exchanges of scholars between the United States and China in the engineering and social science fields relevant to energy technology transfer. The joint study on coal conversion in China supported by the CSCPRC is an example of a useful exchange of information that should assist both Chinese and U.S. firms in this field of energy development. Further studies and exchanges in energy-related fields could be considered, but their relevance and utility will also depend on the support given these efforts by China's leaders.

⁴⁸See "Chinese Environmental Protection: The Regulatory Climate," *China Business and Trade*, vol. vi, issue 22, May 23, 1985.

BALANCING CONTROL AND PROMOTION

U.S. Government policies and programs affecting energy technology transfers to China include a mix of controls and promotional programs that has shifted over time in response to changes in overall U.S. China policy and other contextual factors. While export controls retain a central place in U.S. policies, today agreements for co-operation in science and technology as well as limited financial and insurance support provide only modest encouragement for technology transfer in energy fields.

Despite the problems identified above, the fundamental rationale for export controls remains valid. U.S. export controls play a critical role in restricting the flow of militarily sensitive technologies while at the same time allowing exports in other areas. A U.S.-led push to remove exports to China from Cocom review is not at present a feasible or promising alternative, since this would greatly reduce the ability of Western countries to control exports in the event that China dramatically changes its foreign policy, and since removing China from Cocom could disturb the voluntary consensus that undergirds the organization.

Nevertheless, much could be done to streamline and improve the system. In addition, as technology is further developed and U.S.-China relations evolve, it will be important to review periodically the overall balance of control and promotion programs to ensure a proper fit with overall U.S. China policy. This type of systematic review is especially needed at this point, since U.S.-China economic relations have developed rapidly during the past few years.

Many of the areas where improvements could be made in U.S. policies are not easily susceptible to congressional action, and many require multilateral coordination with other countries. The following types of changes could be considered:

- measures to improve the efficiency of the U.S. export control system (upgrading the technical expertise of license examiners, expanding their numbers, better management of license review, better coordination among

executive branch agencies involved in the review);

- measures to speed the Cocom review process (adoption of a "notification" system for non-sensitive exports so that Cocom review can focus on the really sensitive cases while at the same time keeping a record of other types of exports that can be periodically reviewed); and
- maintain and expand promotional measures (use science and technology exchanges to assist China in understanding the long-term environmental effects of energy technology transfers; maintain financing and other supports for energy projects such as measures to improve the flow of information about China's technology needs and U.S. expertise).

Congress has an immediate role in reviewing the nuclear cooperation agreement. Although it does not specifically promote exports, an agreement is a necessary step for expanding nuclear trade. However, there are other factors that Congress will consider in this review: nonproliferation policy, the adequacy of the consent rights provisions, the level of concern over potential improvements to China's nuclear submarines, the appropriateness of nuclear power for China, the role of other supplier countries, and overall U. S.-China relations. As discussed in chapter 4, different evaluations of these factors can lead to arguments favoring or rejecting the agreement.

China's energy technology requirements present a tremendous opportunity for U.S. firms and organizations. U.S. technologies could, in particular, contribute to improving the efficient use of energy, environmental protection, and the development of large-scale electrical systems in China. While there are significant risks associated with energy technology transfers, the potential gains outweigh the dangers and it should be possible to effectively manage the risks.

U.S. policies affecting energy technology transfers, however, have been rather inconsistently implemented to date. Despite high-level decisions to liberalize exports, uncertainty and delays have

continued within U.S. export administration. U.S. Government policy makers must maintain the proper balance between controls and promotional policies, one consistent with the overall U. S.-China relationship. In the current context, the major challenges are to further focus attention of ex-

port examiners on assessing, limiting, and monitoring the militarily sensitive exports, while expanding efforts to promote the many other types of energy technology transfers China needs to develop its energy resources.