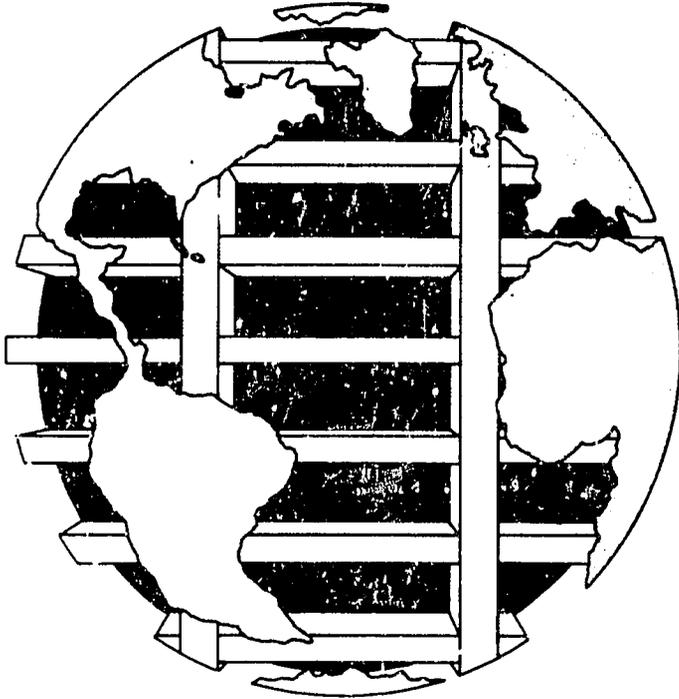


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**Proceedings of the
U.S. DEPARTMENT
OF ENERGY**

**PHOTOVOLTAIC
EXPORT
ASSISTANCE
SEMINAR**

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Prepared by:

**MERIDIAN CORPORATION
5113 LEESBURG PIKE, SUITE 700
FALLS CHURCH, VA 22041**

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EXECUTIVE SUMMARY

PURPOSE OF SEMINAR

The "Photovoltaic Export Assistance Seminar" held on September 12, 1984, in Washington, DC, was sponsored by the Department of Energy's (DOE) Photovoltaic Energy Technology Division. The purpose of the Seminar was to stimulate a dialogue between government export assistance agencies and the U.S. photovoltaic (PV) industry on ways to increase PV exports. In attendance were over 100 invited officials from the photovoltaic industry, key federal export assistance agencies, and other organizations involved in PV research, development, marketing and sales. The Seminar had three main objectives:

- (1) to increase government awareness of the role that PV can play in serving energy needs worldwide;
- (2) to improve industry's understanding of government programs that can assist in overseas marketing; and
- (3) to promote government interagency cooperation in PV export assistance in accordance with the recently enacted Renewable Energy Industry Development Act of 1983 (P.L. 98-370).

Speakers included senior level officials from the U.S. photovoltaic industry and key federal agencies.

NEED FOR SEMINAR

Photovoltaics, the direct conversion of sunlight to electricity, is making its entry into the international marketplace at a rapid pace. With over a decade of operating experience gained from 3,000 federal projects and tens of thousands of commercial systems, the reliability, simplicity, modularity and low maintenance of this high technology option have been firmly established.

For a number of reasons, the export market is key to sustaining the photovoltaic industry until the technology matures for U.S. bulk power generation. First, due to low U.S. energy prices relative to those in other nations, photovoltaic products are more price competitive in international markets than domestically, particularly in less developed countries (LDCs). Second, the export market provides the economies of scale needed to bring PV system prices to levels which are competitive with conventional energy supplies. Third, the export market provides the experience which allows U.S. manufacturers to refine their products for domestic consumption.

Currently, the U.S. is the world leader in photovoltaics, with sales of over \$100 million in 1983. However, this leadership position is seriously threatened as a result of increased competition from foreign firms, many of which receive significant market development and financial assistance from their governments. Both the PV industry and the U.S. Department of Energy believe that action needs to be taken now to maintain a strong U.S. presence in the growing and intensely competitive international marketplace, with the first step being an enhanced partnership between U.S. industry and federal export assistance agencies. The Photovoltaic Export Assistance Seminar provided the mechanism to bring together government and industry in this important mission.

PV INDUSTRY HIGHLIGHTS

The PV industry was represented by senior officials from Arco Solar, Incorporated (Woodland Hills, CA), Hughes Aircraft Company (Long Beach, CA), Mobil Solar Energy Corporation (Waltham, MA), Solarex Corporation (Rockville, MD), Solavolt International (Phoenix, AZ), Spire Corporation (Bedford, MA), and Strategies Unlimited (Mountain View, CA), each of whom provided information on the difficulties encountered in exporting.

The industry speakers emphasized that photovoltaics is a ready and commercially viable technology for export today. It is particularly appropriate in areas of the developing world that traditionally have been without power for basic human needs like water pumping, refrigeration, telecommunications, lighting, education, village power and other electrical needs. Furthermore, in many of these applications, photovoltaics provide power at lower costs than competing alternatives such as diesel- and kerosene-powered generators.

Industry presentations focused on four major problems that are most common to PV exporting:

1. Education. U.S. government officials, both domestically and abroad, as well as foreign government officials, are not aware of the commercial status, economics and applications of today's photovoltaic systems overseas. Additionally, the PV industry is not always familiar with the range of federal programs that can assist them in exporting.
2. Financing. Foreign customers who have the most need for photovoltaics frequently lack the hard currency required to purchase these systems. Furthermore, U.S. industry has difficulty in obtaining financing from U.S. government agencies and private financial institutions in the relatively small dollar increments (e.g., \$100,000-\$500,000) required for system sales.
3. Foreign Competition. U.S. PV firms have difficulty competing against foreign firms which receive substantial support from their governments. This support includes fielding strong government/industry teams for overseas marketing; providing extensive technical consulting, feasibility studies, royalty-free licenses, and equipment donations; offering attractive financing packages; and imposing trade barriers and regulations against photovoltaic imports.
4. U.S. Government Programs. Federal export assistance programs are frequently complex, uncoordinated, slow in processing and geared towards the needs of large system and equipment sales. Moreover, they do not give proper recognition to photovoltaics for overseas use.

Industry called for government assistance in working to resolve these problems. The speakers did not seek additional federal funding or new programs, but asked that current services be applied more effectively and aggressively to promote U.S. PV exports.

GOVERNMENT EXPORT ASSISTANCE PROGRAM HIGHLIGHTS

Representatives from the Agency for International Development (AID), the

Department of Commerce (DOC), the Export-Import Bank (Eximbank), the Overseas Private Investment Corporation (OPIC), the Small Business Administration (SBA), and the Trade and Development Program (TDP), summarized the types of export assistance available from their respective agencies. Some of the key highlights presented by these individuals are discussed below.

- o In 1985, the AID Office of Energy is conducting a study to assess PV systems experience in less developed countries.
- o The AID Bureau for Private Enterprise provides grants and investment funds to stimulate local business development in the developing world; the U.S. PV industry could benefit through joint ventures.
- o The DOC, through the International Trade Administration, offers assistance to exporting businesses through the sponsoring of trade missions and trade shows, and the provision of market assessment support. Through a Memorandum of Understanding, DOC and DOE can sponsor individual company participation in DOC trade events on a cost-shared basis.
- o The Eximbank offers a number of services to assist PV exporters, including providing insurance and guarantees against commercial and political risk to project lenders, offering fixed rate medium-term financing, making competitive bids when faced with foreign government competition, furnishing working capital loan guarantees, advising on economic conditions in foreign markets, and combating foreign subsidies and mixed credit offerings.
- o The TDP promotes U.S. exports through financing, planning services, feasibility studies and some technical workshops and orientation missions. The TDP also funds project studies through direct grants to the host country government and provides incentives for a foreign government to contract work from U.S. firms.
- o OPIC promotes business investment in the developing world through two major programs: (1) insuring U.S. investments against political risk; and (2) providing financing through loan guarantees and small business direct loans. OPIC also provides assistance in obtaining letters of credit, sponsoring investment missions, financing reconnaissance trips, conducting feasibility studies, and providing training grants.

Overall, there are more than 75,000 federal employees and 100 programs available to assist in foreign and domestic commerce. Agency representatives encouraged the PV industry to take full advantage of these services.

PV EXPORT ASSISTANCE EFFORTS TO CONTINUE

Both PV industry and government attendees pledged to increase efforts at finding ways to accelerate exports of PV products and services. Initially, efforts will be made by an interagency working group, called the Committee on Renewable Energy Commerce and Trade (CORECT), which is mandated by the Renewable Energy Industry Development Act of 1983. The goal of the CORECT is to increase the efficiency of the federal government in providing trade assistance in order to ensure that the U.S. renewable energy industry maintains or strengthens its world leadership position. The first meeting of the CORECT, planned for early 1985, will focus on the four key exporting problems identified by indus-

try representatives in their presentations -- education, financing, foreign competition and government programs. CORECT membership will include cabinet level and other senior officials from the Agency for International Development, the Export-Import Bank, the Office of the U.S Trade Representative, the Overseas Private Investment Corporation, the Small Business Administration, the Trade and Development Program, and the Departments of Commerce, Defense, Energy, State and Treasury.

Seminar attendees were provided two documents that will assist in ongoing efforts to promote U.S. PV exports. The first, a report on Federal Export Assistance Programs Applicable to the U.S. Photovoltaic Industry, provides a comprehensive review of key government agency programs, services and contacts relevant to PV firms. The second, a brochure entitled Photovoltaics: Electricity from Sunlight, was developed to update foreign officials and U.S. government personnel overseas on the current status, economics and applications for PV throughout the developing world. Both documents, as well as the Seminar, were sponsored by DOE under the supervision of Robert Annan, Director of the Photovoltaic Energy Technology Division.

I. KEYNOTE ADDRESS

PAT COLLINS, UNDER SECRETARY

U.S. DEPARTMENT OF ENERGY

Good morning, I want to extend a warm welcome to my colleagues from government and to our friends from industry. It is my pleasure to be with you today, and also an honor to serve as the chairman for today's Photovoltaic (PV) Export Assistance Seminar.

We are here today for several reasons.

First, we are here today for both government and industry to determine how a small and new, yet promising industry can better market its products and services overseas.

We hope a two-way dialogue will start here today between government and industry on this subject. Government agencies involved in export assistance will learn about why photovoltaics need their attention, while industry will learn about the many ways government export assistance programs can help them with exporting.

Second, today's seminar marks a first step in the implementation of the "Renewable Energy Industry Development Act of 1983," which was signed into law by President Reagan in July of 1984. The Act calls on federal agencies to better coordinate their export assistance efforts on behalf of the renewable energy industry. We will be hearing more about the Act from our luncheon speaker, Secretary of Energy Donald Hodel.

There are two key themes I would like to present to you this morning. The first major theme is that photovoltaic products are now commercially viable in the export marketplace. Tremendous progress has occurred over the past ten years to allow me to make that statement. Ten years ago, photovoltaics was considered an exotic and expensive energy idea. Photovoltaics was only considered economic for use as a source of power for satellites. No industry of any size existed then, nor did any form of market infrastructure.

Since then, a brand-new high tech industry has sprung up to offer the hope of a potentially large source of domestic power, as well as a dynamic export market for our nation.

We at the Department of Energy have helped private industry to bring photovoltaics from the laboratory to commercial product status -- a status that allows us to meet today to discuss how we can help industry sell PV overseas.

Since the creation of the Department of Energy, over \$700 million has been spent by the federal government on PV research and development. Industry has invested a similar amount, so we are proud of the partnership between the federal government and private industry. Cooperation with industry has been a consistent part of the DOE PV program.

The partnership has produced many technological advances, in terms of performance, reliability and economics. PV module costs have decreased tenfold in the last decade. Module reliability has increased tenfold, with module lifetime projected to reach 20 or 30 years shortly. These and other achievements signify the world leadership position that the United States has in PV.

Part of the forecasted growth in the PV market will be overseas. In foreign markets there exist many applications for PV that are economical today. These markets are mainly for remote power supplies for purposes such as village power, water pumping, education, sanitation facilities, communications, navigational aids, lighting and refrigeration. Many of these applications currently are powered by diesel generators. Remote diesel systems are expensive to operate and do nothing to free the world from reliance upon petroleum.

There are a wide variety of ways PV power can be used to improve living standards around the world. At present, there are countless villages worldwide anxiously awaiting the many benefits that energy systems powered by PV can provide. Photovoltaics can play a major role in helping countries move forward.

In the future, photovoltaics will become competitive for many additional worldwide applications as traditional energy sources rise in cost, while photovoltaic costs continue to decline.

However, the U.S. is not the only country that recognizes the potential of photovoltaics. Foreign recognition of photovoltaics has given rise to intense international competition that has resulted in a loss of U.S. market share for worldwide PV sales from about 72 percent in 1980 to 60 percent in 1983. Furthermore, in the last two years PV exports have leveled off at about 15 percent of the annual sales volume of American companies.

I view the market share slippage as only temporary. Though our PV industry faces stiff competition overseas, we often neglect what we have going for us. Our industry is still the world leader in technology. We have the best laboratories, the best universities, and the advantage of having many firms, large and small, involved in some aspect of photovoltaics. We also have a variety of government programs that are available today to help the PV industry export its products in the foreign marketplace.

It is for this last point that we are here today; and I am now ready to discuss my second major theme.

The second theme I want to leave with you this morning is a challenge to those in government agencies to find imaginative ways to support this growing business as it competes in a very tough international marketplace.

The photovoltaic industry represents a new industrial opportunity for our country. However, being a new industry can be somewhat of a disadvantage in terms of exports. Because PV is new, it is not well known to those agencies and people involved with export assistance. As a result, the particular needs of photovoltaic companies as they try to export may not be appreciated. Today's seminar is one way that those involved in export assistance can become more familiar with photovoltaics.

Besides selling a relatively unknown technology, the PV industry also is handicapped in exporting by being comprised primarily of small businesses. As small businesses, PV firms often are not able to afford the staff, time, and patience needed to operate or compete effectively overseas. A sales trip to visit a potential overseas client can be a major expense. We understand that foreign firms, subsidized by their governments, offer PV demonstration systems and even PV production lines as sales incentives. U.S. firms are not often in a position to offer such "free samples" to prospective clients. Small size may preclude a PV firm from having an employee to keep track of the many export assistance programs available.

Ideally, a PV company should have all the necessary export assistance mechanisms lined up before an export sale occurs. A PV firm today all too often begins the long process of trying to match client needs with export assistance programs only after the sale. The result is frustration, delays and the possible loss of future sales. The increased cooperation and knowledge gained from today's seminar will go far toward making export sales easier for PV firms.

Part of DOE's role is to make agencies involved with export assistance aware of the many small business related problems that the PV industry faces and to be understanding and helpful when a PV company approaches an agency for help. The new interagency working group will be an important organizational step.

As we will find out today, there are many existing export assistance programs applicable to the photovoltaic industry. Some PV firms already have begun to avail themselves of export assistance programs. I salute both the federal agencies who have already provided export assistance and the firms themselves for initiating these contacts.

The federal government offers over 100 programs that can assist photovoltaic firms in exporting. However, PV firms are not always familiar with the specific services available to them, how they can be accessed, and what agreement terms will be involved. Furthermore, within the government itself, we need to continue to improve coordination among the assistance programs we offer, in an effort to leverage and maximize the effect gained from our individual program offerings.

We have the resources to provide a substantive export assistance program for the U.S. PV industry. I am able to say this because:

- o DOE works with industry to sponsor R&D of new PV technology options, which are then brought to market by PV firms;
- o the Agency for International Development demonstrates the suitability of proven PV products in developing world applications;
- o the Department of Commerce conducts trade missions and trade shows overseas to introduce U.S. PV products and firms to foreign countries;
- o the Trade and Development Program finances reconnaissance missions and feasibility studies for specific overseas marketing opportunities;
- o the Small Business Administration and the Export-Import Bank provide loans and loan guarantees for project financing; and,

o the Overseas Private Investment Corporation insures sales against political risk.

We in the government need to work together more closely to coordinate these programs, and look for ways to reduce the burden on PV and other renewable energy firms in trying to tap the wealth of resources available.

To the many PV firms in the audience today, I urge you to avail yourselves of the export assistance your government can provide. Take some time to find out about the resources that are available. I would also urge you to offer any guidance or advice that could improve the government's ability to assist you in your efforts to prosper in the international marketplace.

II. PV POLICY FORUM

- A. Introduction to Government Policy
- B. Photovoltaic Opportunities
- C. Government/Industry Panel Discussion

A. Introduction to Government Policy

1. AGENCY FOR INTERNATIONAL DEVELOPMENT

JACK VANDERRYN, AGENCY DIRECTOR FOR
ENERGY AND NATURAL RESOURCES
BUREAU FOR SCIENCE AND TECHNOLOGY

I am very pleased to be here to talk with members of the PV industry and the broader renewable energy industry. Let me start out by discussing AID's broad role in energy, and then more specifically, to indicate the agency's view on photovoltaics.

Our job as the foreign assistance agency of the United States, is to help developing countries meet their energy needs so that they can move more expeditiously toward economic development.

We work with countries in the lower half of the per capita income scale. Some of the countries that you are most interested in do not fall within the bailiwick of AID's mandate. For example, Mexico, Brazil and Korea are countries that have already attained per capita incomes greater than the countries that we cover. However, in the countries that we do cover, the need is obviously extremely great, and the question is how can we match that need with the available technologies and assistance?

Our interest is to get the AID countries to use their indigenous resources to reduce their oil imports. The countries that we work with still suffer from high import bills. Even the reduction in oil prices has not been favorable to these countries. Many of them, for example, Francophone countries in Africa, are on the French Franc, and because of the exchange rates, their oil import bills have actually risen rather than decreased.

We also have a mandate from Congress, a special mandate, to meet the needs of the rural poor. Our interest is to find the best energy sources to meet key end-use applications in the developing countries, whether it is PV, wind, biomass, or coal, to power irrigation pumps, transport vehicles, communication systems, et cetera. We are not authorized to work in the nuclear area. We are very interested in working with you to assure that PV finds its proper role in the energy mix of developing countries.

Now, how do we do this? What is our overall program emphasis? In years past, AID's emphasis was on building the capital infrastructure in developing countries; however, we found in recent years that really does not work very well. Therefore, we have switched our focus to one of helping countries to build their human resource capacity and their institutional capacity, and to transfer the necessary technical knowledge, the analytical methodologies, et cetera, so countries can better make their own investment decisions regarding energy systems. We do not want to make these decisions for them, but we want to help them make and implement better decisions.

Errors that they make in investment decisions, and systems that do not work, are much more serious for LDCs than they are for us in the United States. We can afford to make some mistakes. With the financial and economic situation in these countries, they cannot afford to make very many mistakes in investment decisions.

We also are very interested in helping LDCs to develop sound national policies. Many of these countries have very large subsidies in the energy area. In Egypt, for example, the energy pricing subsidy is tremendous. It runs on the order of \$3 billion a year as a cost to the Egyptian government. That is three times as much as the total foreign aid assistance that we provide to Egypt. Therefore, it is in our interest to get these countries on a more sound economic and energy policy footing.

AID is not in the business of doing basic research in energy. We leave that to Pat Collins and his colleagues at DOE. Our business, we believe, is the adaptation of known systems to meet the needs of developing countries. What about the renewable area itself? We are more and more interested in assuring that the kind of systems that we support will yield productive uses in agriculture, industry, communications, health, et cetera.

I emphasize the word productive. What we do in providing assistance in energy should generate jobs in these countries. It has to improve their economic situation. In the past, we have to some extent put up hardware demonstrations that have not taken into account the real needs and social, institutional and infrastructure situations in those countries. We must be sensitive to their needs and situations in order to help them advance. If we help these countries, we also help the United States. World peace and world stability is very important, and depends, to a reasonable extent, on how stable these countries are and how they develop economically.

We are also very interested in building the private sector capacity in developing countries. We are convinced that, especially with relatively small-scale decentralized energy systems, it is the countries themselves that must be involved in manufacturing, assembling and installing these systems. It is the industry in these countries that largely has to manufacture and maintain the systems and develop the markets.

Unfortunately, the countries with the largest need usually have the least amount of money to spend. That is a very difficult problem for all of you in the industry. I do not have an easy answer for that one.

AID's emphasis is not on large capital transfers, it is more on developing the human resource and the institutional capacity in these countries to make their own decisions. In the long run, we think that has the highest payoff.

We spend about \$60 million dollars a year on foreign assistance in the renewable energy area, and unfortunately for the PV industry, only a very small fraction of that goes into photovoltaics.

Our programs, as a number of you know, are largely administered through AID missions out in the field -- missions connected to U.S. embassies. A very large bulk of our funds is spent by the missions. They make the decisions in consultation with Headquarters. They award the contracts. They provide the specifications.

We do have programs administered from Washington, and we have had a photovoltaics demonstration program run out of Washington by the Office of Energy in the Bureau for Science and Technology, but that activity is winding up this year. We have had a number of demonstrations of photovoltaics out in the field -- medical refrigerators, for example.

I must say that the performance of a number of AID's renewable energy systems and their impact has been much less than ideal. Some of the systems have had failures. The designs did not account for the conditions in the LDCs. We did not give adequate attention to maintenance and spare parts required. We did not really look adequately at the end-use requirements and at the institutional aspects of how these systems were going to be used in the countries. We did not involve the local industry adequately, and that is essential. Currently, we are assessing the PV systems experience and expect to have a report out in the coming year. The PV industry needs to take all this experience into account in designing its marketing, sales and service efforts in the developing world.

I might also say that we work through our field missions; but we really do not have many people in those missions who understand the energy business or the photovoltaic business. This is a disadvantage to all of you doing the marketing. I have to ask you, in essence, to help educate not only the people in the LDCs, but even the people in our own AID missions.

I think the opportunities are very great; the question is how do we translate this potential into reality? Over the past year we have taken steps to work more closely with U.S. industry, and I want to continue that effort. But, we are not in the business of pushing particular products or particular technologies. We only seek photovoltaics where it makes sense to the people in the developing countries. I might also say that the potential for direct export of U.S. products and systems is limited because many of the countries want to get into the business themselves.

Thus, I think the major opportunity for our industry is in developing joint venture arrangements, licensing agreements, and perhaps, from time to time, bringing some of the people from the developing countries to the United States for training opportunities. We have found that bringing these people into our own industrial operations in this country really opens their eyes as to how we do business, what our products are, and what our technology lead really means. While that is an expensive one-on-one operation, I think it pays off. To the extent that the companies represented here can work out those kinds of arrangements, with our help if necessary, I think that it is a very good opportunity.

We want to work together with you, to better identify what the needs are in these countries, what the key end-uses for PV are, and what the systems design should be in order to be applicable to the constraints that the developing countries face. Certainly, in the countries that we work with, the constraints are very, very serious.

We want to help you stimulate joint ventures. We want to help you develop the market opportunities. We want to hear what kind of problems you have had in working with AID. We want to hear your questions and over the coming days and months, work very closely with you to see how we can better collaborate.

2. DEPARTMENT OF COMMERCE

JAMES PHILLIPS, DEPUTY ASSISTANT SECRETARY
CAPITAL GOODS AND INTERNATIONAL CONSTRUCTION
INTERNATIONAL TRADE ADMINISTRATION

Many of you may remember my previous assignment as Director, Office of Major Projects, and I would like to tell you that going from that assignment to this one is not so much like going to the major leagues, it is more like going from softball to ice hockey.

But, in the Department of Commerce that change did herald a shift in our interest, or peaking of our interest, in supporting not only your industry, but all others in the export business. The recent restructuring of the Trade Development Organization within the International Trade Administration (ITA) created what we believe to be an ideal vehicle for addressing specific industry sectors. In fact, that was the whole idea.

We have created seven industry sectors: aerospace, auto and consumer goods, basic industries, services, science and electronics, textiles, and capital goods and international construction. It is not exactly a one-stop shopping center for the exporter, but it does identify the appropriate role that we believe we must assume at Commerce.

We believe the advocacy role in the international marketplace is an essential and hopefully supportive responsibility for the government. It is an extremely difficult marketplace in the international arena. It is an arena where other governments are providing a committed and dedicated support effort to their exporters. In addition, the predominant purchasers in many countries, particularly for products and services in the energy field, are also governments.

These conditions create a need for a partnership between U.S. industry and our government to counter the thrusts of some very effective foreign marketing strategies. Many of these so-called strategies are not available to us. We do believe in free enterprise. We do believe in the importance of free, but fair trade; and I am not certain the U.S. Government can or even should provide that elusive level playing field that industry longs for.

What is more likely, and perhaps possible, is assistance through a cooperative effort to help American industry compete and win on an unlevel playing field. Such an achievement requires the partnership that we seek. For us to be successful in assisting industry, we need the help of industry. This meeting today is an outwardly visible sign of the desire to develop that partnership.

The Basic Industry section at Commerce is responsible for energy matters in the form of fuel and basic science. Our group, Capital Goods and International Construction, has the responsibility for the hardware and technical services required for energy projects. In a way, they have the wind, water and sun, while we have the wind turbines, the hydroelectric dams and the photovoltaic cells and systems.

Actually, we are only a part of the total International Trade Administration that is important to the PV industry. The three parts of ITA important to U.S. exporters are: Export Administration, responsible for export controls; the U.S. and Foreign Commercial Service, responsible for the field work with U.S. companies and foreign entities, including the gathering of intelligence data valuable in developing marketing strategies; and Trade Development, which is responsible for marshalling and developing the support efforts of the Department of Commerce.

It is this last part of our efforts that I will describe to you today. It is in the Capital Goods and International Construction section that we have our industry specialist for renewable energy equipment. Most of you know Les Garden, who will be here later in the day. Our technical advisor is Dr. Skykind, who is in the audience. In addition to the U.S. and Foreign Commercial Service, a good place for a potential exporter to tap into Commerce is the Office of International Major Projects, represented here today by Janet Mazur. That Office follows every project around the world, and will assist industry in their marketing efforts.

I personally chair the Interagency Major Projects Coordinating Group which meets on the last Friday of every month. Once a month we list all new projects that come to the Office of Major Projects in a newsletter. They total about 25 or 30, with many of them energy projects. The mailing list for the newsletter has gone from about 100 to over 1200 recipients in the past eight months. Our office also briefs our Assistant Secretary, who sits on the Board of the Eximbank and also on the Board of OPIC.

During the past three years, we have increased efforts to promote U.S. renewable energy and equipment and to support industry in its efforts in the international marketplace. We have developed a close working relationship with the Department of Energy to assist industry more effectively. Through a Memorandum of Understanding (MOU) between Commerce and DOE, we have jointly developed a number of activities organized by the Department of Commerce and funded by the Department of Energy.

Under the MOU, a principle has been established to provide an industry-government sharing of costs for individual company participation in DOC trade events. We work closely with industry representatives and several U.S. Government agencies, most notably the State Department, to strengthen these program activities.

Activities include the preparation of a competitive assessment of the U.S. renewable energy industry sector in relation to competitor nations; the creation of renewable energy pavilions and overseas trade shows in Singapore and Hamburg; the sponsoring of U.S. renewable energy seminar trade missions to Southeast Asia, India, and the Arab Gulf states; and the development of videotape screenings and exhibitions.

The videotape produced by the Department of Commerce has now been shown in 32 countries, and is scheduled for an additional 30. An important additional activity has been a reverse trade mission approach with joint State, Energy and Commerce sponsorship. Visits have been organized for foreign government energy officials from around the world to attend the Renewable Energy Technology Symposium and International Exposition in Anaheim, California, and to meet with U.S. companies.

There is one additional activity that will be important to the future of the industry. Under the recently passed Renewable Energy Industry Development Act of 1983, DOE has been given the responsibility for developing a full renewable energy export support program. This program will be based on the competitive assessment now being prepared in coordination with the interagency working group chaired by the Department of Energy.

You will hear more today about what the government is doing, and I think you will be most interested in the observation that there is agency-wide cooperation going on. Today will help strengthen that coordination, help establish a government-industry dialogue on photovoltaics and illuminate opportunities for export assistance. We can use and need your help.

3. EXPORT-IMPORT BANK OF THE UNITED STATES

CHARLES ANDERSON, SENIOR LOAN OFFICER
EXPORTER CREDITS, GUARANTEES AND INSURANCE DIVISION

I would like to give you a feel for Eximbank, so that in any future dealings, you will have some idea of how to approach us and just what we can provide. Later this afternoon, Dick Dutton, who works in roughly the same area that I do, will deal with some of the programs themselves and give you some details.

This year, Eximbank is observing its 50th anniversary. We go back to 1934, when we were established by an Executive Order. And to give you a twist, at that point in time the United States had just recognized the new government of Russia. Russia had certain needs at that point in time, and the United States had agricultural surpluses. So, Eximbank was established to provide financing. At the same time, Cuba had its particular needs, and we were supporting trade with Cuba.

In 1945, Eximbank became an independent government agency by an act of Congress, and that is where we are today. At that point in time, it was felt Eximbank would play a major role in the reconstruction of Europe, principally in the war-torn world. In the early 1960s, Eximbank added a new direction in terms of its support. It had been a lender to foreign governments, and in the early 1960s we began to get involved in trade finance. Again, this was in response to the growth of these types of programs overseas from our official support counterparts.

The English have operated a program since 1919, right after the First World War, and we found that the Japanese and the Germans were coming in and playing a major role in assisting their exports. The U.S., which had been selling primarily on cash and letter of credit terms after the war, was now faced with some fairly stiff competition.

I want to give you an idea of some of the resources that we have to bring to bear for exporting. In 1983, which ended last October for those of us on the fiscal year basis, Eximbank authorized \$9.4 billion in assistance. Breaking this down, it was roughly \$1.0 billion in loans, \$1.7 billion in guarantees and \$6.8 billion in credit insurance.

The loan portfolio now stands at about \$17 billion. Eximbank has capital of about \$2.8 billion. Worldwide exposure is roughly, at this moment, \$38 billion. Since inception, Eximbank has supported about \$165 billion of U.S. exports. So, we do have the resources, we are out there, and we are very active on a year-to-year basis.

I have to say that in the last couple of years we have been reacting to the circumstances in Latin America, and doing what we can to remain in those markets and keep the goods flowing. We approved a \$1.0 billion facility for Brazil which we are operating in conjunction with a number of participating banks -- some 80 banks here in the United States. The Banco de Brasil is the chief agency on the Brazilian side. This is an effort to keep the goods flowing and to keep the normal trade flows open.

We have done a similar thing in Mexico for \$500 million. We are working with Nafinsa, Nacional Financiera in Mexico, and also their export-import bank, Banco National Commerce Exterior, in Mexico.

Additionally, on a case-by-case basis, we have been doing what we can with a number of the other republics in Central and South America to keep things moving. This year, I think we probably will have paid somewhere between \$600 and \$800 million in claims on nonpayments in those countries.

Eximbank's central purpose is to aid in financing, in order to facilitate exports. What makes us a little different from the other agencies here is that our niche is one of supplementing, trying to put together the package. At the same time, we work on the principle of reasonable assurance of repayment.

So, in terms of Eximbank, I guess it is safe to say that we are looking at things pretty much from a commercial viewpoint. That means a good deal of our support is still within what you may want to regard as rich nations. A good deal of support is also in the commercially developing countries. There is a good deal less support to the AID-type countries simply because of the circumstances that you find, although in a number of those instances we are dealing with the governments on a direct basis.

We do this through a number of normal programs, particularly with our guarantees and insurance, on which the emphasis has been placed in the last few years. The effort there is to remove a good deal of the risks that one would encounter in doing trade overseas, that is, the commercial credit risk as well as the political risk.

Therefore, Eximbank is viewed as supplementing private capital. Also, we have a good deal of concern about small businesses, and I recognize from this industry that it is fairly commonplace to be dealing with small- and medium-size firms. Eximbank does have a bit of an image problem with respect to small business, so Congress has been adding new things to our legislation over the last few years.

I work in our insurance program, and we have always done work with small businesses. In the last couple of years, we have shown that roughly 60 percent of the policyholders in the insurance program are, in fact, small business. We are getting better, and I think we are doing a better job at it. We have introduced a number of programs in which we are dealing directly with eligible small businesses.

I will give you a brief overview of the programs themselves. I do not really want to get into any depth here, but basically Eximbank has two divisions. The first we regard as buyer credits, which really translates to long-term lending. Long-term lending goes with major projects or big ticket capital goods such as commercial jet aircraft or locomotives. The tools that are used here are direct loans that usually are long-term (for example, 10-20 years in the instance of nuclear plants to governments). Usually, a government borrows, but there are some private borrowers with whom Eximbank deals.

Direct loans can be offered by themselves for a portion of the overall transaction, however, often they are offered hand-in-hand with what we call financial guarantees. A financial guarantee would be offered to a major lender

who is participating in the financing. Such guarantees include 100 percent coverage of principal and interest at the Treasury rate plus one percent. It is an unconditional guarantee. That is buyer credits, and that is what Eximbank has normally been known for. When you call it Boeing's Bank, people are talking about buyer credits and those large loans.

Supplier's credits, the area I represent, deals more with trade finance and the normal flow of commodities, spare parts, consumable goods, and capital goods of a more moderate nature. That could be general aviation. In terms of photovoltaics, we are looking at medium-term financing more so than anything else.

Within the supplier credits, Eximbank is broken roughly into two areas. First, insurance, which is the vehicle for short-term lending for commodities and related items. These days it is a major part of Eximbank in terms of authorizations. For insurance, we work in conjunction with the Foreign Credit Association. It is a group of U.S. property and casualty insurers headquartered in New York. They perform all of the business functions, and issue the policies and things of that nature. They have branches in Atlanta, Chicago, Los Angeles and Houston, but their main operations are in New York. They are our agent.

Within that insurance framework, we also have medium-term insurance, which would cover a capital goods sale at terms up to five years. After a 15 percent cash payment, you usually get a promissory note covering commercial and political losses. It allows you to sell it to a bank. Typically, that is what you want to do. You do not want to hold onto it.

The other segment of our supplier credit area (we used to refer to this as guarantees) includes exporter credits, guarantees, loans, and a number of other things. I will give you the major programs there. One is our Commercial Bank Guarantee Program. This is a medium-term vehicle. We provide a guarantee to a U.S. commercial bank that will purchase the loan that you have extended to your borrower, and cover commercial and political risks. Medium-term is anywhere from six months up to five years, depending upon the contract value. Normally, we require a \$200,000 contract value to meet the five-year term.

We also have a Small Business Credit Program. This program is directed specifically to small businesses. We use the standard industry codes to determine whether or not you are a small business; and, with the commitment that we give when you go to the field, it allows you to offer fixed rate financing. This program allows your bank the opportunity to discount, if and when it needs to utilize Eximbank services and if the rates are moving on you. This program is medium-term, not short-term, so we are hitting right where you want to be.

We also have another loan program within our supplier credits, called the Medium-Term Credit Program. This program is set up to meet those instances where there is official competition. What we usually try to do here is ask you to identify the others that are bidding on a given transaction. We are usually aware that countries such as France, U.K. and Japan have official agencies, and in the long run we are going along without a tremendous investigation to determine whether or not there is the head-to-head competition needed for us to offer this support. The medium-term credit is a discount loan, just like the small business credits, that I mentioned earlier. It allows you to offer fixed-rate financing, so you have a head-to-head competition arrangement.

Another program that recently was introduced is a Working Capital Loan Guarantee Program. I think there have been 17 authorizations to date. Principally, these guarantees are to be delivered to small businesses. The program allows you to get working capital loans, guarantee them to the bank in order to provide you with inventory or other requirements that you have in the way of expenditures, and put yourself in the export position.

Again, Dick Dutton will be here this afternoon to get into these programs in a little bit of detail. I would like to say that in terms of approaching Eximbank, one nice thing is that only 350 people work in the agency. This means that after three phone calls, you usually have the contact you want. A few of us work on flextime and leave by 4:30, so watch out if you are calling from the West Coast. But the loan officers are good, and they can help you. I think it is important, either before you go on a trip or certainly just after you come back, that you give Eximbank a call, talk to the loan officers, and get a feel for the programs and how they can assist you.

Additionally, we have economists at Eximbank that provide us with support. For example, if you are looking at a given country, the economists can discuss how things are in Argentina, Brazil, Mexico, and elsewhere. It would be good to talk with them because they can give you a feel for what the current conditions are, and how Eximbank is viewing these particular countries.

We are open worldwide, with the exception of a number of Communist block countries. We are dealing with Yugoslavia, Romania and Hungary. So, in a sense, we are not restricted, like some of the other agencies, in terms of which country we can deal in. When I say open, it does not necessarily mean we are doing business there, which is why it is good to ask the economists. We say we are open, but the country conditions may be such that given the transaction you have in mind at a particular point in time, it may be difficult to operate. For example, today we are not doing any new business in Argentina or a few other spots.

Another major mission of Eximbank, in an area of growing concern, is an effort to eliminate export financing subsidies in international trade. Eximbank, within the Organization for Economic Cooperation and Development (OECD) framework, makes whatever efforts it can to reduce subsidies and to eliminate concessionary financing. As mentioned earlier, a number of our overseas counterparts have made a very vigorous effort to promote exports. In terms of their economies, it may have a greater impact than we perhaps recognize here in the United States.

I do not want to talk specifically about the French or the Japanese, but that is what is going on; and I think that most of you out in the field run into this from time to time. Therefore, Eximbank has engaged in discussions and has been able to come up with a number of arrangements. One is the OECD consensus on minimum rates, which means that for a given type of country category (e.g., rich, intermediate, or poor) there are certain minimum interest rates that we will cover. This is an effort, first of all, to keep everyone in line, and secondly, to some degree, to help Eximbank out. Eximbank has a pretty high borrowing cost, and we have been on the short end of the spread for about four years now.

Further, there have been predatory practices such as mixed credits in the past. Certainly, within the last year of our charter, the Congress has directed us to involve ourselves in this along with AID, and we are making progress along those lines. Mixed credits typically mean that the government is supporting a given transaction, providing not only normal commercial support, but also some form of a grant element, meaning three, four, or five percent interest rates, on a 30 year term. Eximbank, at this point in time, has made an effort to eliminate mixed credits, not necessarily to open such offerings up as a program that is going to operate on a day-to-day basis. Eximbank has, on a handful of occasions, matched or at least attempted to match what has been offered by the Japanese or the French in terms of mixed credits. We are doing what we can to fight them, and if you encounter them, you should probably make an effort to bring it to our attention.

4. OVERSEAS PRIVATE INVESTMENT CORPORATION

GERALD WEST, VICE PRESIDENT FOR DEVELOPMENT

It is always a pleasure for someone from OPIC to talk to an audience like this because you know that at least 90 percent of the people out there initially associate you with money, oil or Arabs.

We are a very unique public corporation. I am proud to tell you we are the second smallest independent federal agency. There are about 130 people at OPIC, and we have a very unique mandate. We promote the economic and social development of friendly developing countries by assisting you, the American investor, in making productive investments in the approximately 100 countries in which we operate.

You have a very excellent write-up on OPIC in the brochure that is in your information package, and I have the luxury of two succeeding OPIC speakers who will be going into some detail on particular programs. What I would like to do this morning for just five minutes or so is supplement some of the information that is in the brochure, and go into a little detail about our political risk insurance program, which will not be covered in as much detail by my colleagues later in the day.

The first thing that is missing from the write-up is somewhat unique, and that is the fact that OPIC is a completely self-sustaining U.S. agency. I am not an example of a U.S. taxpayer's dollar at work here this morning. OPIC had a net income last year of \$83 million. I mention net income because it is not polite for a government agency to make a profit.

What also is unique about OPIC is that most of its staff is from the private sector, and intend to return there. That makes an important difference, because along with our legislative mandate to be self-sustaining, we know that if we do not satisfy the needs of the American business community, then we will not have any net income. If we do not have any net income, then we do not get paid, and I do not eat. As most of you know, that is a very powerful incentive to take care of the needs of our clients.

I mention this because we tend to be a little more blunt than most government agencies. If we have to say no, or we cannot assist you for some reason, we like to do it very quickly and move on to other things.

We have a specific and rather narrow job to do: to facilitate private investment that contributes to the development process in the countries in which we operate. We do that job by providing U.S. investors, contractors and exporters with a number of services that are broadly designed to reduce the real or perceived risks that inhibit you from going ahead with investments in those countries. They include loan guarantees, direct loans, and various support for pre-investment assistance, such as sponsoring investment missions, reconnaissance trips, feasibility studies, investment matching and brokering services, training grants, and other kinds of ancillary services.

Let me say a brief word about our major program -- providing political risk insurance. In 1983, we wrote about \$3.5 billion worth of political risk insurance.

We provide coverage to American investors against the risks of currency inconvertibility, expropriation, and physical loss due to damage in war, revolution, insurrection, or civil strife.

This coverage is available to you, an American investor, not to French, Japanese or other investors, at essentially fixed premium rates for up to 20 years. We are with you for the long haul.

We offer some very specialized services for contractors and a very specific coverage for exporters. In addition to those services, we have a special program to assist smaller U.S. contractors. We will guarantee an eligible financial institution for up to 75 percent of an on-demand standby letter of credit or other form of guarantee, issued on behalf of a contractor.

In talking with the American contractor community over the last three or four years, we discovered that one of the major inhibiting factors preventing them from bidding on many international contracts was the fact that many countries required the posting of letters of credit as bid, performance, or advanced payment guarantees. That succeeded in tying up, to a large extent, their lines of credit at the financial institutions that were servicing them. We think that this particular OPIC service has removed some of the credit restrictions under which contractors are operating by protecting against the arbitrary calling of those letters of credit.

Our insurance department currently has a total of six photovoltaic manufacturing projects registered for potential assistance. When I testified before Congressman Gore two years ago, we did not have any photovoltaic investors that were registered with us for potential assistance, so obviously your industry is coming of age in terms of looking at overseas investment opportunities.

We certainly look forward to doing more in this area, as the presence of three OPIC officials here today will attest. Every speaker today will probably end on an upbeat note, and I want you to remember me for ending on a downbeat note. Perhaps that will serve to engrain in your memory who we are and what we might do for you in the future.

While we are very interested in helping you, since helping you allows us to succeed, there are a number of situations in which we will decline to offer you assistance and I want to mention some of those. One is what we call a runaway plant situation. You may decide that you really should shut down your little plant up in Concord, Massachusetts, throw your American workers out on the unemployment rolls and ship everything, lock, stock, and barrel, off to Morocco, Haiti or wherever, and you decide to come to us for financial assistance or political risk insurance to make this move. Guess what? No help from OPIC. There are other kinds of projects that we turn down because we think the investment will not contribute to the development process in the host country. However, I can not imagine how that would be the case in the photovoltaic industry.

We frequently have to say no and refer people elsewhere when they become confused as to what we can and cannot do for them. There is a broad dividing line between ourselves and the Export-Import Bank that I would like to note in

simple terms. In a trade-related matter in which you are looking for insurance or credits, you need to go to our colleagues at the Export-Import Bank. If it is investment-related, you need to come to OPIC. Certainly, there are going to be borderline situations. For example, what is the difference between a debt investment and a long-term supplier credit? Well, in those particular instances, you can go to either one of us and we will coordinate and work out whether it is more appropriate for one or the other of us to assist you.

Thank you.

B. Photovoltaic Opportunities

WILLIAM H. O'CONNOR, MODERATOR
GENERAL MANAGER, SOLAVOLT INTERNATIONAL

Speaking for the industry panel and many other industry representatives present, may I express our appreciation to all of the government professionals and to those of other organizations for sharing your valuable time today for this dialogue.

In the industry presentation today, we wish to introduce you to the photovoltaic business -- to the variety of companies, the products and services we represent, to our world markets, and to our foreign competition. We will present examples of the offshore opportunities we encounter, opportunities in which we must predominate to maintain our leadership position in this growing business. In that process, we will improve our balance of trade and enhance the economic well-being and quality of life in other parts of the world.

In our presentations, we will attempt to provide a fair cross section of industry experience and viewpoints. Different companies may have different products, different objectives, and different emphases. This may be apparent in our discussions. However, we all share one primary objective, international market leadership.

As you are aware, photovoltaics is a technique for converting light energy, usually sunlight, directly to electrical power. We do this today by taking a wafer of pure silicon and chemically and physically processing it into a very large semiconductor cell. A number of these solar cells are wired together and encapsulated in glass and plastic, making up solar modules. The sunlight on the modules produces direct current electricity with no water, no steam, no fuel, and no moving parts. Today's typical silicon cell modules convert over 10 percent of the incident light directly to useable power. They are capable of doing this for 10, 20 or more years without significant attention or maintenance.

The cells and modules that we manufacture today are not laboratory curiosities. They are solid, mature, commercial products, in volume production, with reliability and quality to match or surpass other high technology items. We offer our customers a wide range of such modules and their associated electronics. We also can provide functional loads, turnkey system installations, cell and module manufacturing and test equipment, and even complete photovoltaic production lines. Our U.S. technology is second to none.

The U.S. photovoltaic industry itself is still maturing and going through a shake-out process, while trying to maintain technological and market leadership and posture itself for a period of sustained growth. We include both small laboratories and large production facilities, 500-person companies and five-person entrepreneurships, old established firms and newly formed businesses, those with extensive international experience, and those with none.

The before tax investment in photovoltaics by U.S. companies over the past four years has averaged over \$200 million per year. This does not include funds

received from the Department of Energy for R&D programs. I would expect that such substantial investments in operating expense and capital will continue for a number of years before the industry achieves overall profitability.

You may have recognized some of the companies represented in our industry immediately, since they are affiliated with major energy, electronics, and aerospace firms. A dozen of these firms are in the Fortune 100. You may ask why these people who have international experience are here today. They are here for the same reason that the many smaller companies you do not know of are here. That reason is that photovoltaics is new and different, and so is the PV marketplace. Exporting photovoltaics into today's market goes beyond conventional selling. We are not offering familiar products like computers, bulldozers or soft drinks to people who understand them, want them, and can afford them.

True, there are customers who are technically knowledgeable, who can determine where photovoltaics are cost competitive, and can afford to install them. And even in those countries where an electrical grid exists, there are PV applications that are practical and cost-effective today. Radio repeaters and other communication applications are the most common. However, the most important applications in the years just ahead may be those which meet the fundamental needs of people who have never had any electrical power available to them.

In underdeveloped countries, PV driven pumps can provide water for a second or even a third crop, for watering cattle, or for a sanitary water supply. A medical dispensary in a remote village can now have refrigeration for vaccines. We can provide emergency communications, lights in the village square and educational television in the school room. We can install a small electrical grid where none existed and do it within a matter of months, not years. Photovoltaic products can stimulate agriculture and manufacturing in emerging economies, and are themselves logical candidates for in-country assembly.

Frequent prerequisites for photovoltaic sales are the education of potential customers and users regarding the application, reliability, and cost-effectiveness of this new power source. Education is often difficult because the power source is usually incidental to the purpose of the procurement, be it for communications, water pumping or some other function. The customer will look carefully at the performance requirements on his operating equipment, but be unaware of his options for powering it. Where PV is a cost-effective alternative, we must insure that it is recognized and used.

In developing countries and emerging economies where PV is particularly attractive, financial support or guarantees are almost always required. While our competitors from Europe and Japan have used colonial or geographic ties to their advantage, their most successful sales tool, without a doubt, has been the structuring of attractive financial packages. They have fielded strong government-industry teams and programs that provide extensive technical consulting, feasibility studies, royalty-free licenses, equipment donations, and very attractive financing. They are also not bashful about it. I know of one installation in West Africa where the signs announcing who did it are larger than the array itself.

We know that we cannot always match foreign government programs, since the United States operates under different rules than our foreign competitors in terms of our government-industry relationships, antitrust law, free competition, and utilization of public funds. We certainly do not suggest that any of these rules be changed. However, we do suggest and believe that closer coordination of the capabilities that we do have can offset foreign competitive efforts, be it for a specific sales opportunity, establishment of a joint venture, or development of barter arrangements.

The United States Government already has made a significant and productive investment in our industry, through the DOE support of R&D, the Federal Photovoltaic Utilization Program, various demonstration projects, and other programs. We are now weaned and are playing hardball in the world markets; but your continued and dedicated support is vital. We do not need new programs, and we do not seek new funding. We do need the recognition of the role of photovoltaics.

We do need coordinated application of existing government resources to exploit the potential of PV. Our offshore competitors clearly recognize the economic value as well as the political value of photovoltaic export programs. It is important that we work together even more closely, so that the interests of the United States are best served.

1. INDUSTRY/MARKET OVERVIEW

JOHN DAY III, PRESIDENT
STRATEGIES UNLIMITED

My charge this morning is:

- (1) to provide a definition of the photovoltaic industry,
- (2) to review the economics of photovoltaics,
- (3) to discuss the market for photovoltaic modules, and
- (4) to review the competition for our country's photovoltaic products abroad.

INDUSTRY DEFINITION

To begin with the definition of the photovoltaic industry, Figure 1 presents a framework for describing the photovoltaic industry. This framework is the vertical integration chain of operations which are necessary to convert raw material into photovoltaic systems. This framework identifies a chain of related operations connected in series that we call the steps of vertical integration. Different companies perform each of the steps in this chain. Starting with the bottom of Figure 1, you see materials companies supplying module suppliers, module suppliers supplying system integrators, and so on. These companies work together, one company selling to another, ultimately the product ends with the system users.

Photovoltaics is an electrical source, but the electrical source must power a system to provide useful work. So, in the case of photovoltaics, we are ultimately talking about a systems market, systems to provide communications, water pumping, refrigeration, lighting, and so on.

One characteristic to describe the photovoltaic industry is the size of the companies in the industry. Generally, the companies at the lower end of the vertical integration chain are larger corporations. They are the major industrial concerns of our nation, large chemical or energy companies. The closer one moves to the end customer, the smaller the companies become. We have a number of companies of less than \$1.0 million per year involved in making particular systems. You will notice the kinds of systems include communications, water pumps, lighting, medical refrigeration, and so on.

If we aggregate this entire industry, we find over 96 companies active in the trade, accounting for between 4,000 and 6,000 jobs. Their aggregate sales approach \$345 million (see Figure 2). In addition to the companies I have identified here, there are perhaps another 100 companies doing incidental supply or component supply for the industry.

PHOTOVOLTAIC ECONOMICS

Now let us talk a little bit about energy and photovoltaics, and in particular, the economics of photovoltaics. Figure 3 shows the capital cost of electric generating capacity, as a function of the fuel and operation and maintenance (O&M) costs for the same technology. In this Figure, I have compared photovoltaic systems with the more traditional sources for electricity. The key point is that photovoltaics is highly capital intensive. Although the variable cost is low, the initial

cost is high. In contrast, oil or diesel electric generators have a low initial cost and a very high variable cost. Herein lies one of the difficult problems that our industry is facing.

When a country faces a choice between alternative technologies for electrical generation capacity, a number of variables enter into the economic decision. Indeed, there are considerations for the length of time that the product is to be used in the field, there are technical and operational considerations, and there are influences of national priority and environmental impact. But in making the economic comparison between a capital intensive alternative and a high variable cost alternative, paramount to all of these variables is the cost of capital.

Figure 4 is a move to compare photovoltaics with diesel electric generators under conditions of variable cost of capital, or interest rate. I have attempted to show a range of photovoltaic system costs against a range of diesel electric generator system costs. For the diesel, there are two key variables, the cost of the fuel and the efficiency of the generator. You will notice that at the bottom of the Figure we have presented a highly efficient diesel electric generator working with a fuel cost of \$1.00 per gallon, a situation typical of a multi-megawatt diesel installation on an electrical grid. You will notice that photovoltaics must reach prices down to between \$1.00 and \$2.00 per peak watt before it can begin to compete with this situation.

However, at the top of Figure 4, if you look at remote sites where the cost of fuel reaches \$2.00 a gallon, including the cost of transportation for the delivery of the fuel and with a diesel efficiency of five percent which is probably the result of a small load, we see that even at the price of \$9.00 per peak watt, and interest rates of over 14 percent, photovoltaics can reach economic viability.

One purpose of this Figure is to emphasize the sensitivity of the trade-off decision to the interest rates. Slight changes in interest rates make significant differences in the addressable market. The addressable market is that sector of the diesel electric generator market where photovoltaics is the least-cost alternative.

We know that photovoltaics is coming down in cost with time, but how far must prices go to reach large markets? There are two general classes of sites where photovoltaics might be considered: (1) sites which are remote and require battery storage, and (2) sites which are connected to a utility grid and do not require storage.

Figure 5 serves to show the significance of batteries. I have compared the cost of electricity at a remote site in which ten days of storage are included in the system, and with a system connected to a utility where no storage is required. Interest rate is a variable. You will notice that for remote sites we are talking about electricity that may well be over \$1.00 per kilowatt hour. I point out that there are a number of places in this world where that may be the least-cost alternative. Obviously, as the storage requirement goes down, so does the cost of electricity from the system.

If we assume some reasonable timeframe for the life cycle, Figure 6 presents the cost of power per kilowatt hour (kWh), compared to the average 24 hour per day equivalent continuous load. I hasten to point out that this is on a log scale.

You will notice in the upper left-hand corner that batteries, which represent the most expensive cost of electricity per kWh, are only suitable for very small loads where portability is an important factor. In the lower right, you will see traditional grid connected power generation systems, such as nuclear and hydropower. These are technologies which come in very large unit sizes and which provide the lowest cost of electricity per kWh.

In the intermediate range, I have identified photovoltaics with two areas on this curve. One area shows remote PV systems including batteries. The other, identified as utility PV, is the current economic situation without storage. It is important to note that photovoltaics can be the lowest cost alternative for small loads. The crossover point is increasing in size; that is, as the price of photovoltaics comes down, the size of the diesel necessary to be lower in cost than photovoltaics is getting larger.

Photovoltaics is still not a panacea. It is not the least-cost alternative if you are comparing it to large bulk generation systems normally connected to grids.

ENERGY DEMAND

Now, let us look at energy demand in terms of the market and the outlook for photovoltaics.

Population is the single driving force for energy, as shown in Figure 7, but energy itself is used to supply a variety of necessities of life. As the population grows, the demand for energy also grows. Over the next two decades, the world population is forecast to increase by 50 percent (see Figure 8).

As seen in Figure 9, the distribution of this population also is shifting. It is shifting from the developed world to the developing world. This means that it is the developing world with the greatest need for growth in energy over the next few decades.

Another characteristic of energy demand is the desire for electricity. As an economy expands, the percentage of the energy demand devoted to electricity increases. As Figure 10 presents, in the United States electricity represents about a third of our total energy demand. On a world scale, in 1970, six percent of the world energy went into electricity. In 1980, that percentage increased to nine percent. As the economy of the developing world improves, the percentage of their energy demand in electricity will rise toward the level of the U.S. By 1995, 15 percent of the world's energy is forecast to be required in the form of electricity.

Providing this electricity is a major problem of the world financial community. Indeed, energy and power represent the largest sector of loans from the World Bank to developing countries today. The world still has grids to build. There are large sectors without a grid. It is toward this sector of the world that photovoltaics should be directed.

PHOTOVOLTAIC MARKET

Let us now look at the history of photovoltaics over the last few years.

Since 1978, the world unit volume for photovoltaics has increased sixteenfold. Prices in real dollars have declined by 54 percent. Total industry shipments have increased sevenfold (see Figures 11 and 12). I am talking here about module shipments only. You can take this number and easily multiply it by about 2.5 to estimate the aggregate industry shipments.

World photovoltaic production for 1983 is divided by geography and by final market in Figure 13. It is interesting to note, first, that in the United States, about 57 percent of the U.S. product went into tax credit driven market applications. That includes a number of the demonstration projects that you saw in the earlier program presentation. However, you should also notice the very substantial element of export trade that has already appeared in the United States, Europe and Japan.

Figure 14 shows the long-term PV market. We see a continuation of technology advances. We see the history of what has occurred in the market since 1976, and we are forecasting that by 1990, industry shipments will reach a level of 190 megawatts peak. We expect the average selling price of modules to decline to less than \$3.00 per peak watt in constant 1984 dollars. We expect aggregate shipments to reach over a half billion dollars in the next seven years. I repeat, this is for module shipments only. System shipments will be higher.

Since we are talking of exports, in Figure 15, I have aggregated the commercial and the official development assistance exports provided by the U.S., Europe and Japan. About 2.95 megawatts of commercial products were exported in 1983 from these countries. In addition, one megawatt of official development assistance was supported through AID and its equivalent organizations around the world. Thus, the total exports for 1983 reached 3.95 megawatts peak. You will notice also that the U.S. market share of this export trade in 1983 was approximately 48 percent.

Growth in the photovoltaic industry has not gone unnoticed by other countries around the world. Today, over 80 companies are producing photovoltaics in 17 different countries, as shown in Figure 16.

As we see in Figure 17, the U.S. market share has been declining over time. In 1977, the U.S. market share was in excess of 90 percent of the world market. If we include the special tax driven projects of this past year, our market share remains about 60 percent. However, when you remove the tax credit driven investments, our share is down below 50 percent.

Why has this occurred? Other countries are providing a number of subsidies to their domestic photovoltaic suppliers. These subsidies take two forms, direct and indirect support (see Figure 18). I am sure these subsidies are not different than what the same countries are doing in other industries. However, we see direct subsidies to our competitors in the form of 50 percent support for market development expenses outside their home countries or in target countries. This practice is followed by countries in Europe and Australia. The governments actually subsidize travel and labor for promotional sales efforts.

Clearly, other governments and their industries are working together better than the United States. The goal of this industry is to provide electricity to remote sites where it is economical. The world population outlook continues to

drive the world demand for electricity. There are locations around the world that need a small amount of electricity for light, for water, or for education and communications, the kinds of applications for which photovoltaics are well suited.

We feel, and I am speaking on behalf of industry here, that there is a viable and growing market out there that can be enjoyed by American suppliers. It can be enjoyed, if we can, through meetings such as this, develop closer cooperation between our government and our industry in order to take full advantage of this export opportunity.

Thank you for your attention.

PHOTOVOLTAIC INDUSTRY

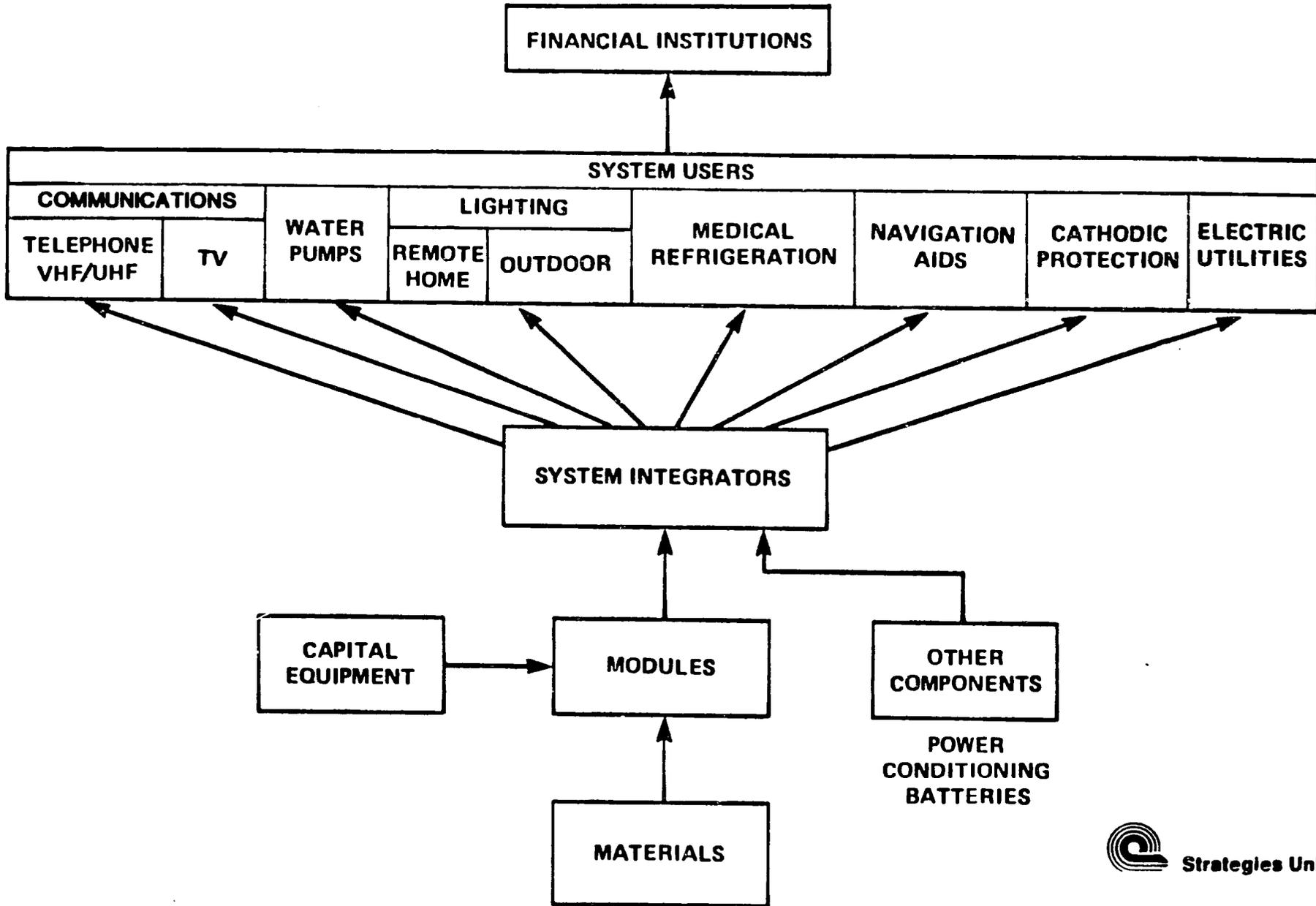


Figure 1

U.S. Photovoltaic Industry

	NUMBER OF COMPANIES	1983 SALES (EST)*
SYSTEM INTEGRATORS	45	\$170 MILLION
MODULE MANUFACTURERS	11 CURRENT SUPPLIERS 12 MAJOR R&D PROGRAMS	76 MILLION 25 MILLION
MATERIAL SUPPLIERS	5 MAJOR SUPPLIERS 6 MAJOR R&D PROGRAMS	25 MILLION 5 MILLION
MANUFACTURING EQUIPMENT	5	4 MILLION
BOS COMPONENTS	12	40 MILLION
- POWER CONDITIONING		
- BATTERIES		
- SMALL SYSTEMS		
ESTIMATED EMPLOYMENT	96 COMPANIES 4 TO 6,000 EMPLOYEES	\$345 MILLION

*SALES ESTIMATES DO NOT INCLUDE PRIVATE INDUSTRY R&D INVESTMENT WHICH IS ESTIMATED TO BE APPROXIMATELY AN ADDITIONAL \$75 MILLION.

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Figure 2

Capital Investment per KW(e) of Generating Capacity

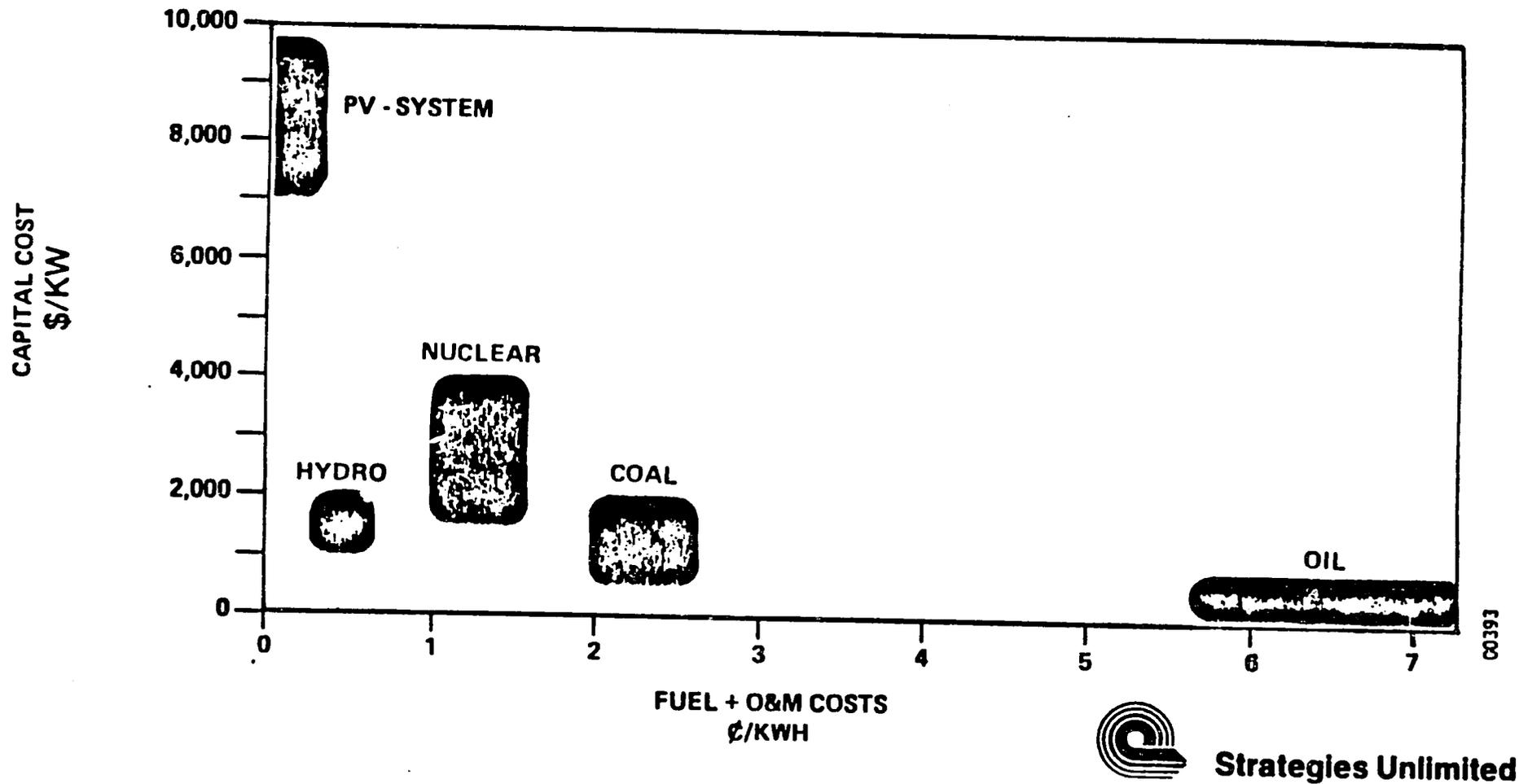
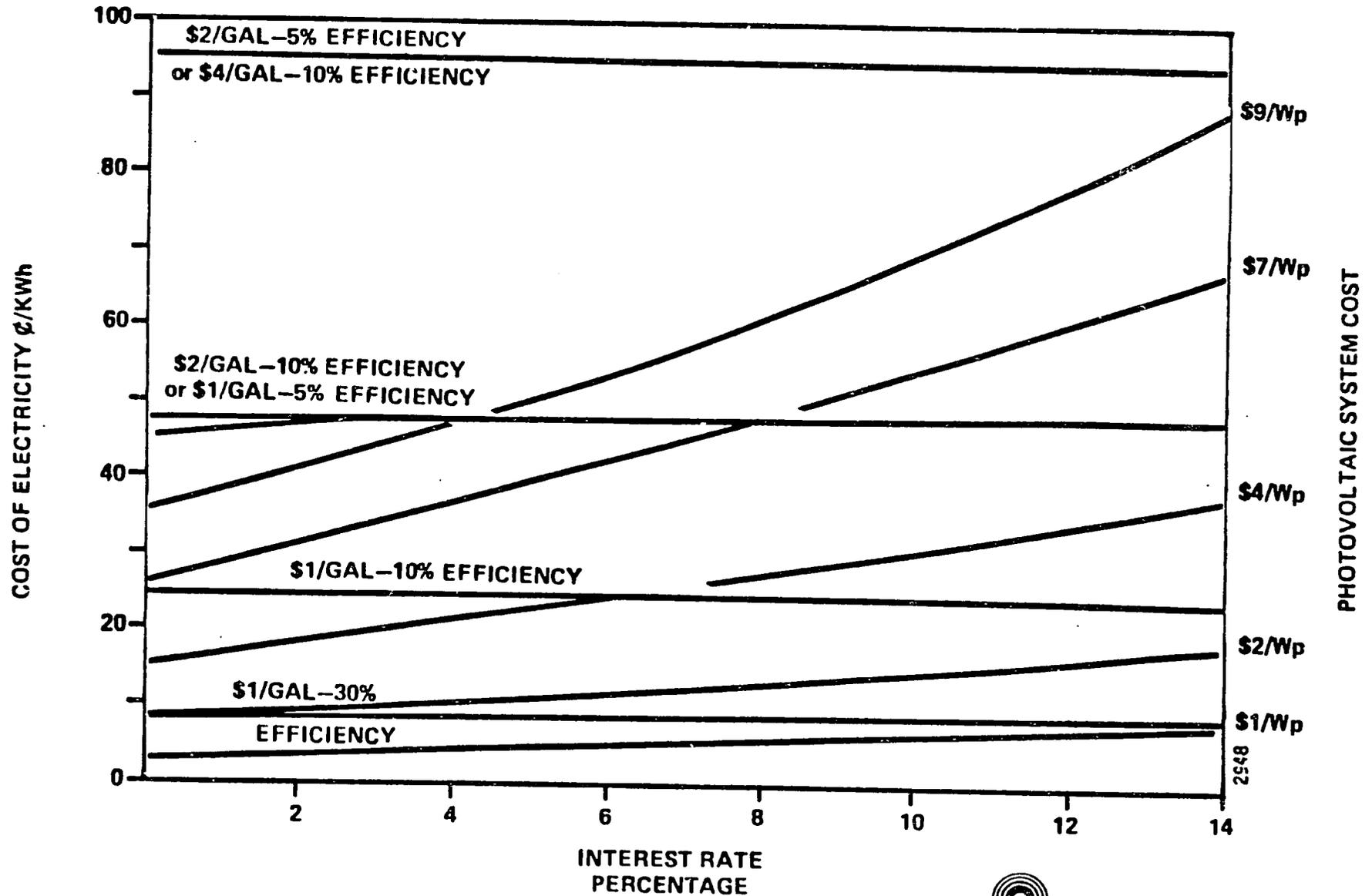


Figure 3



Economic Comparison PV vs Diesel



Electricity Cost vs Module Cost

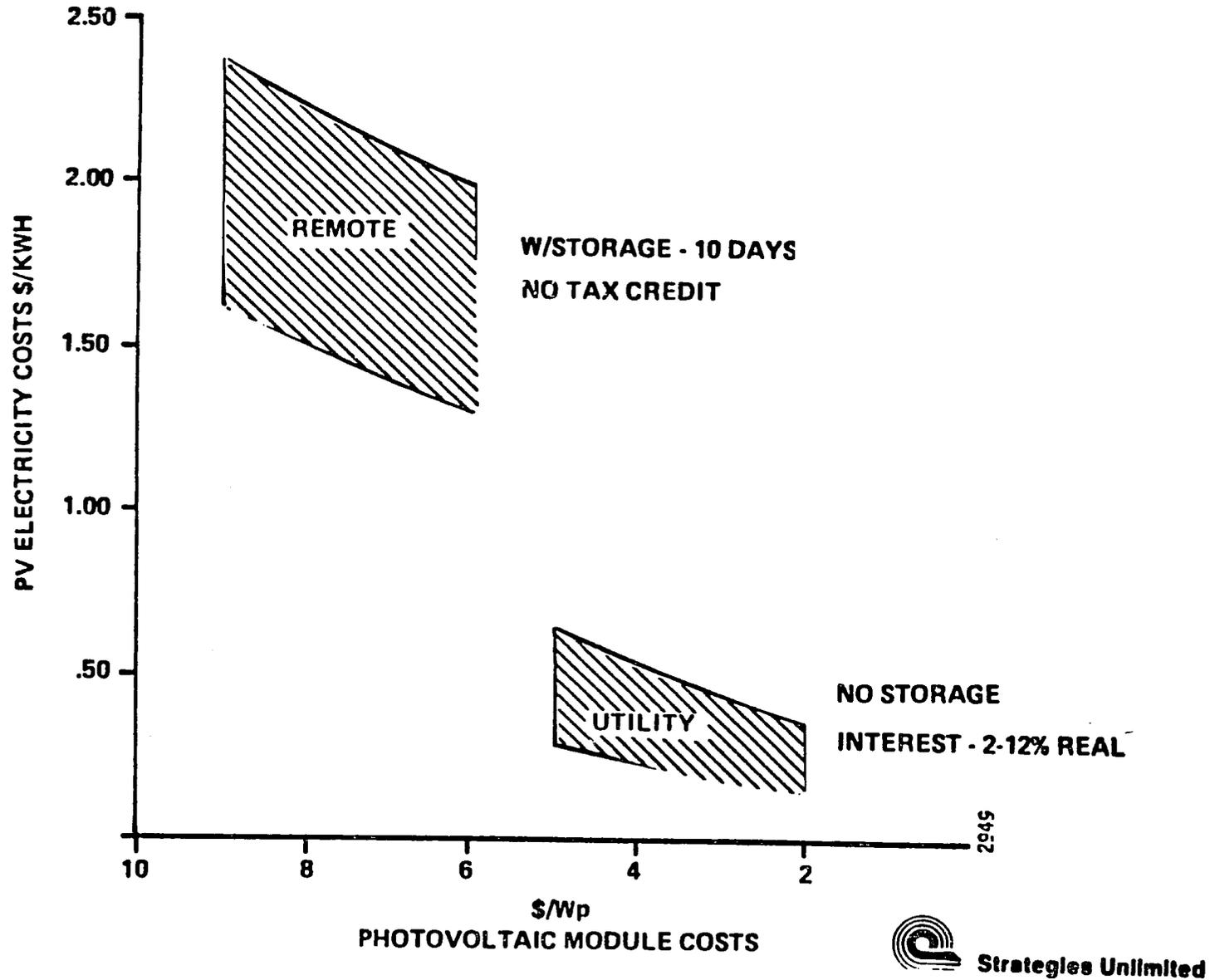


Figure 5

Economic Domains for Power Technologies

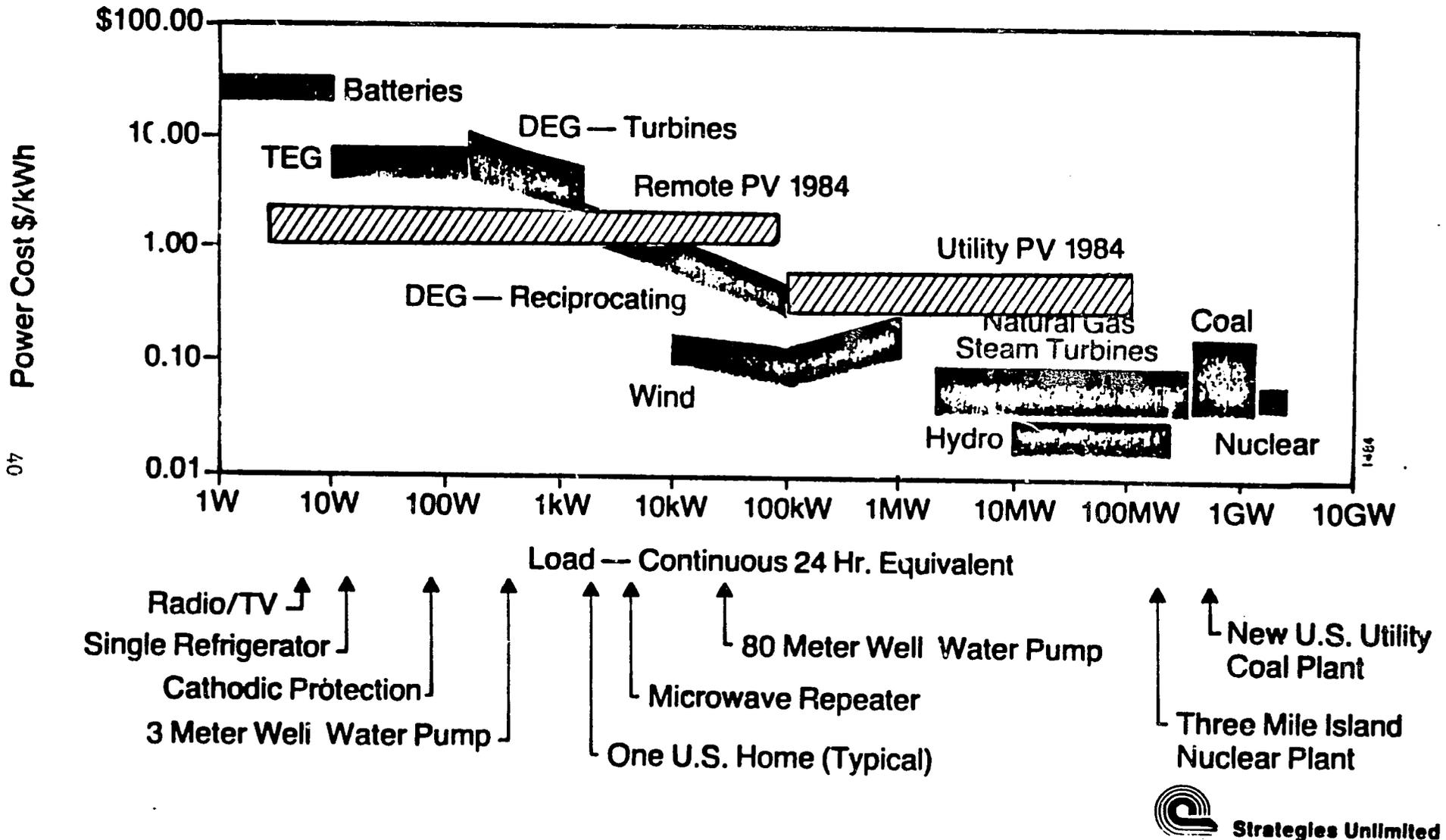
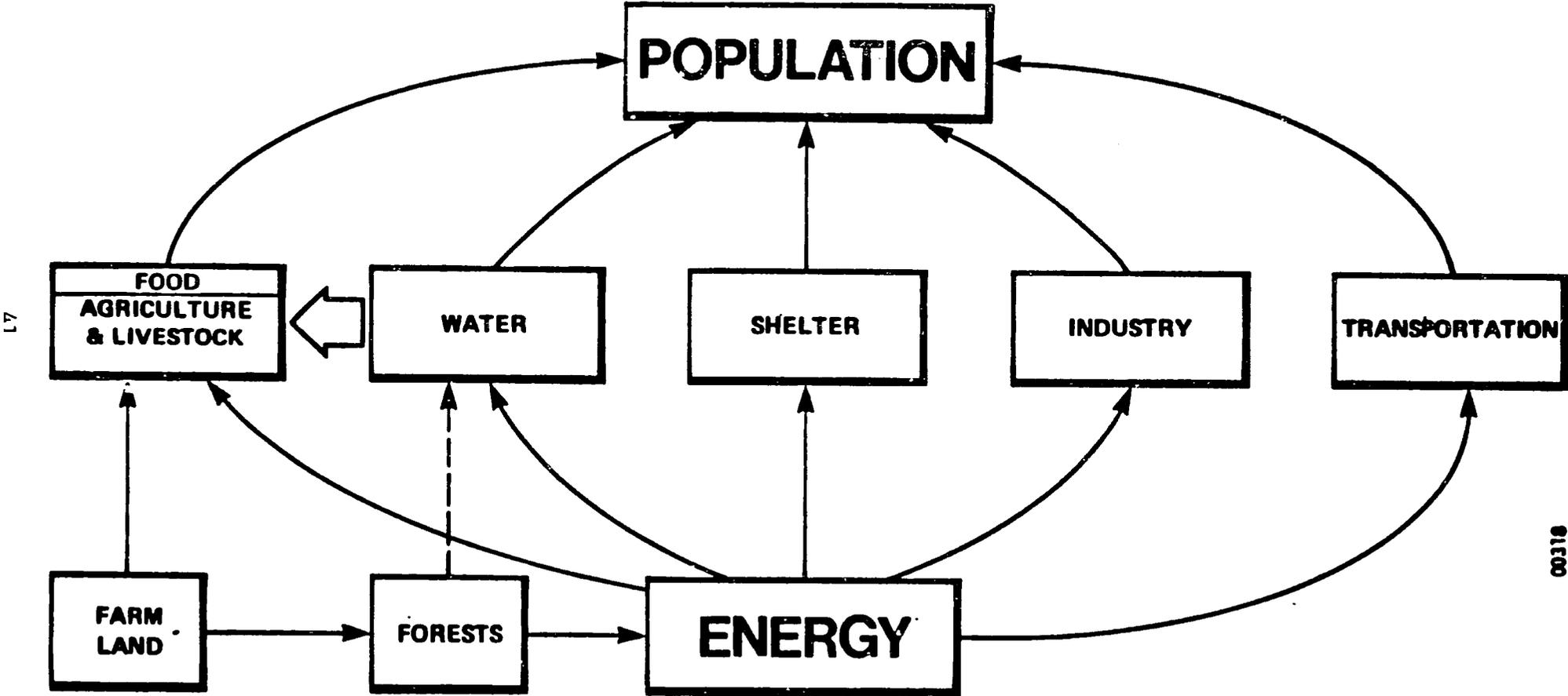


Figure 6

Structure of Energy Demand



L7

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Figure 7

Worldwide Population Growth

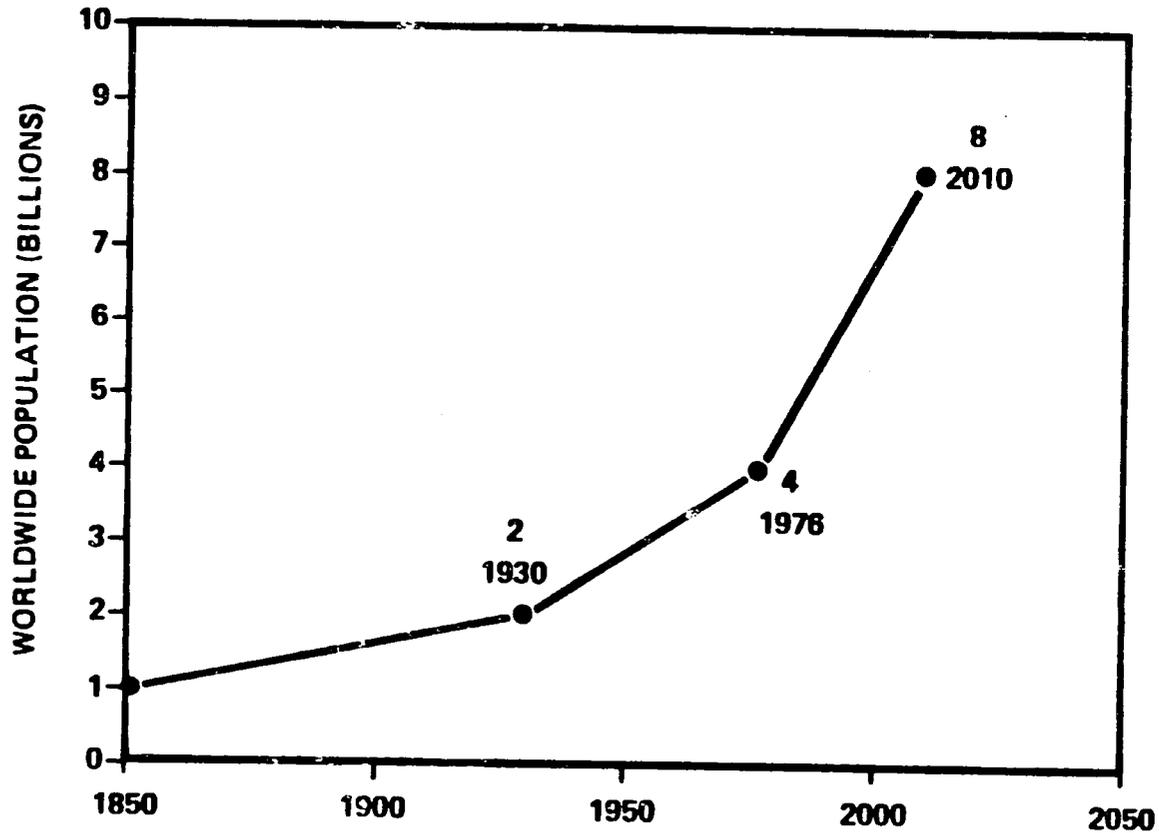
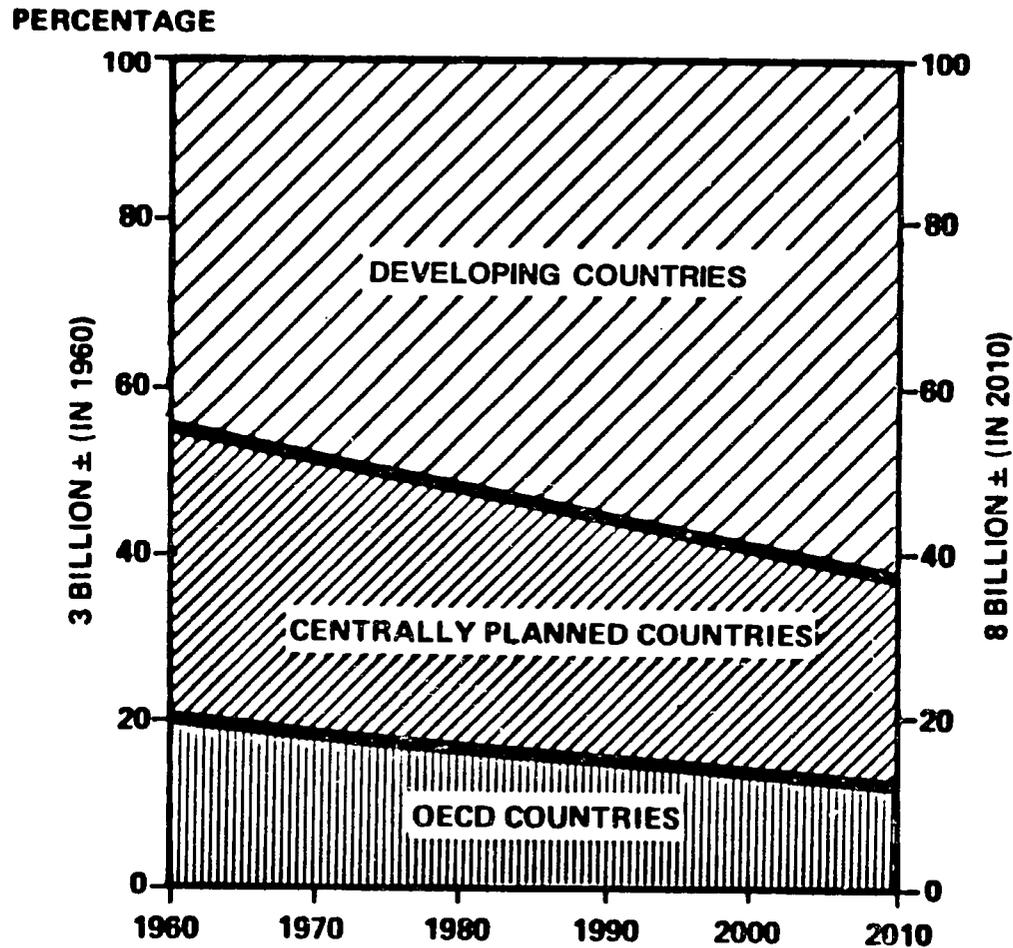


Figure 8

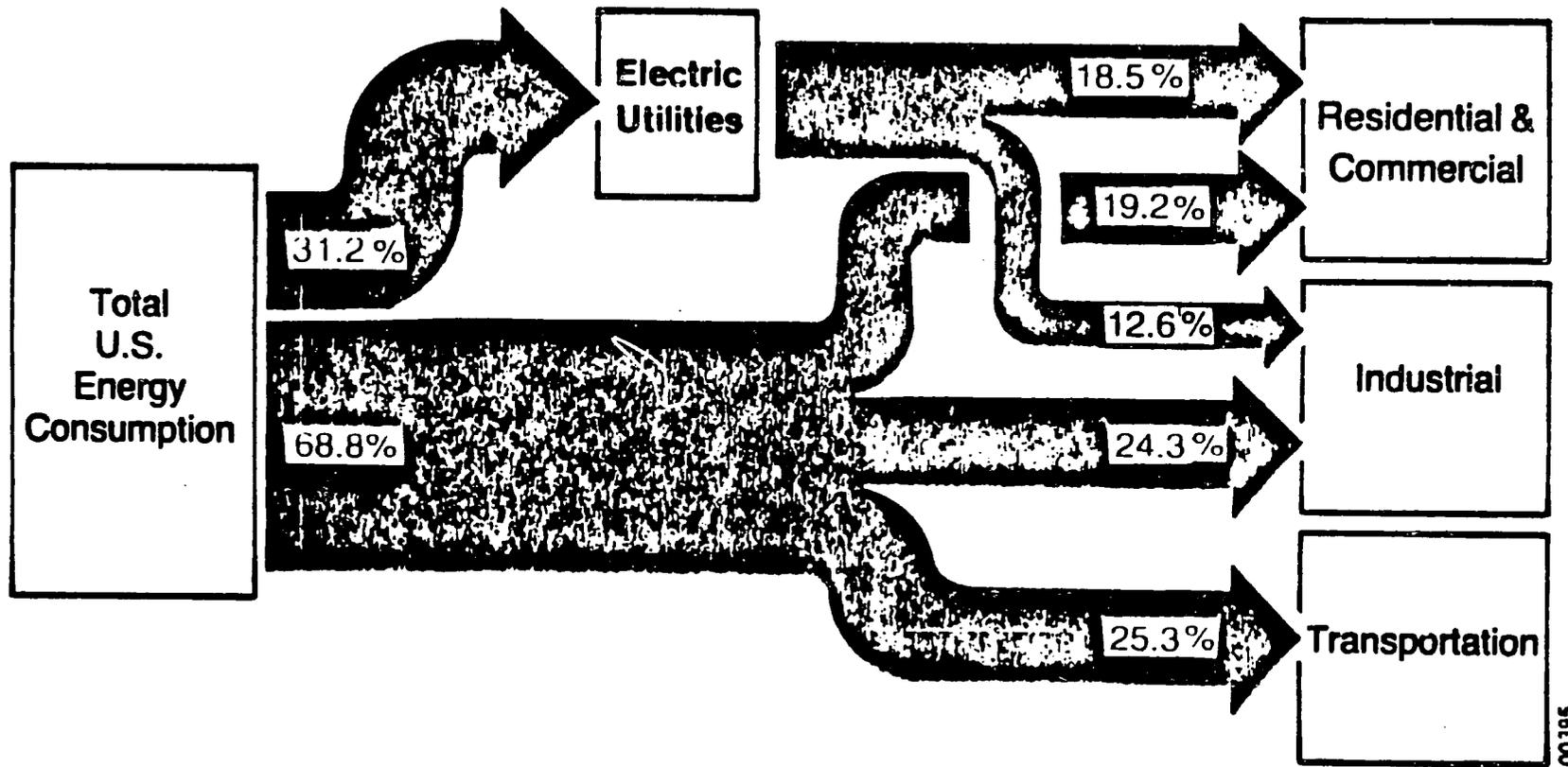
Population Shares of World Groups 1960-2010



43

Figure 9

U.S. Consumption of Energy by Sector



44

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Figure 10

Worldwide Module Shipments

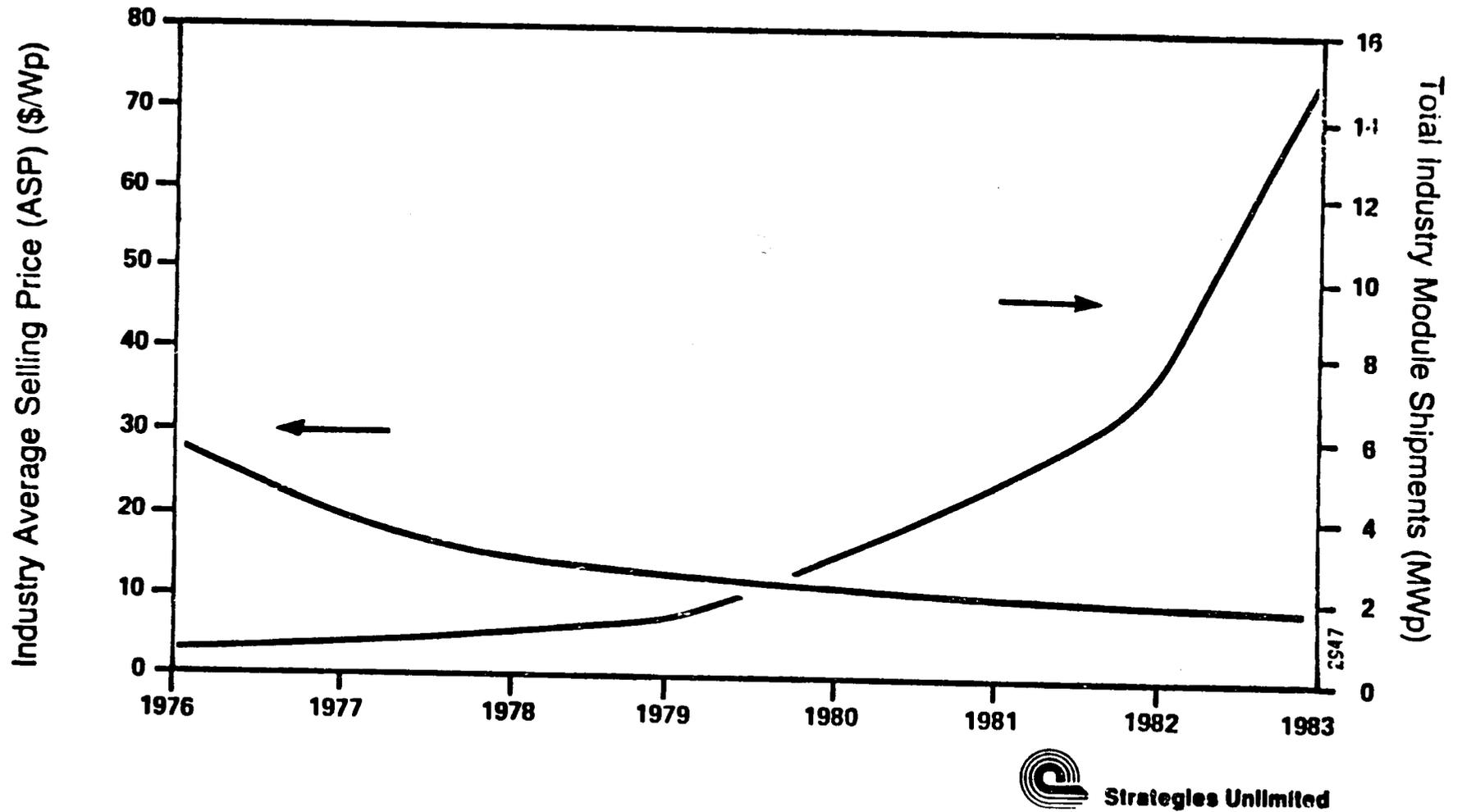


Figure 11

Worldwide Module Shipments

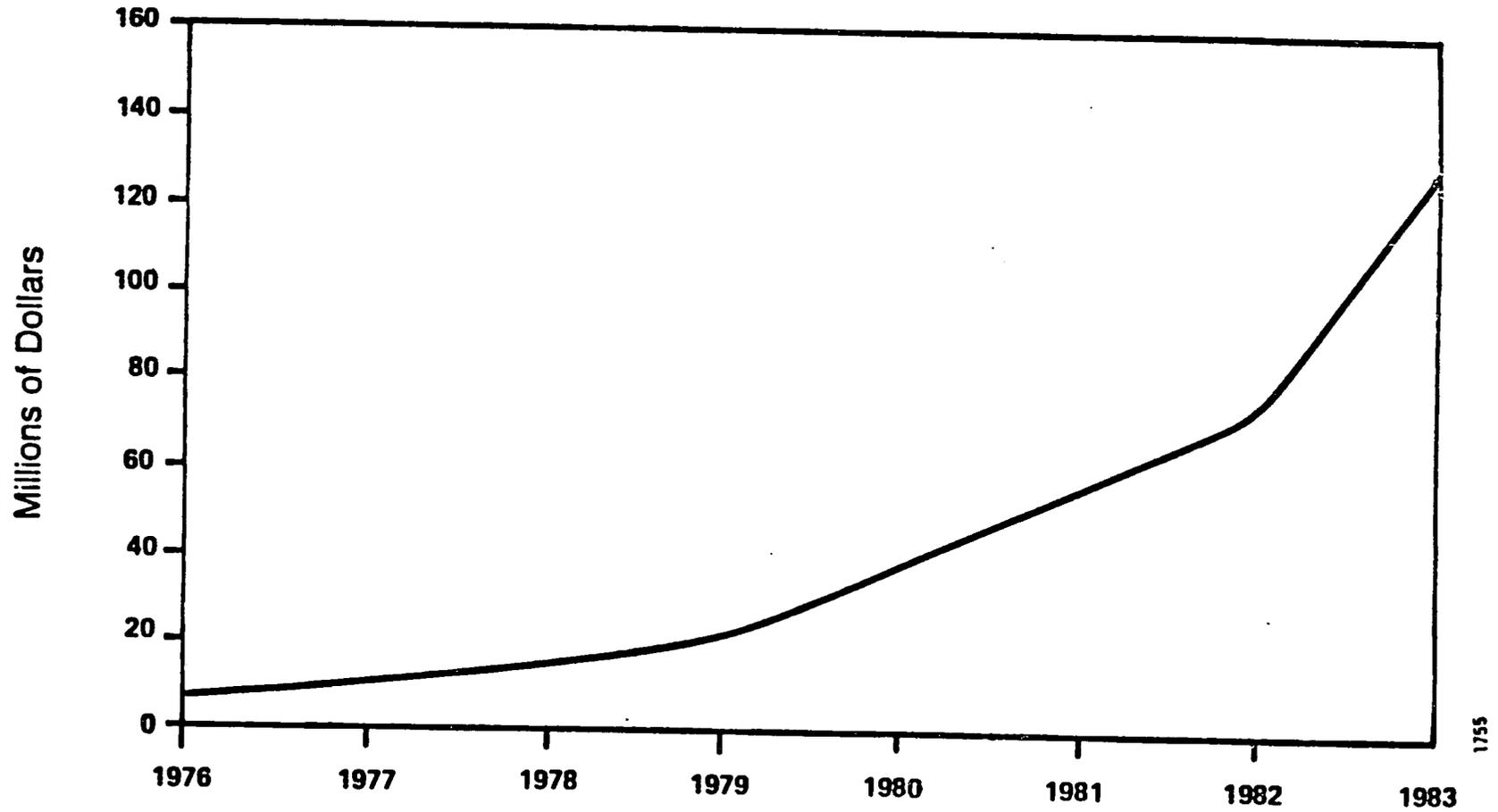
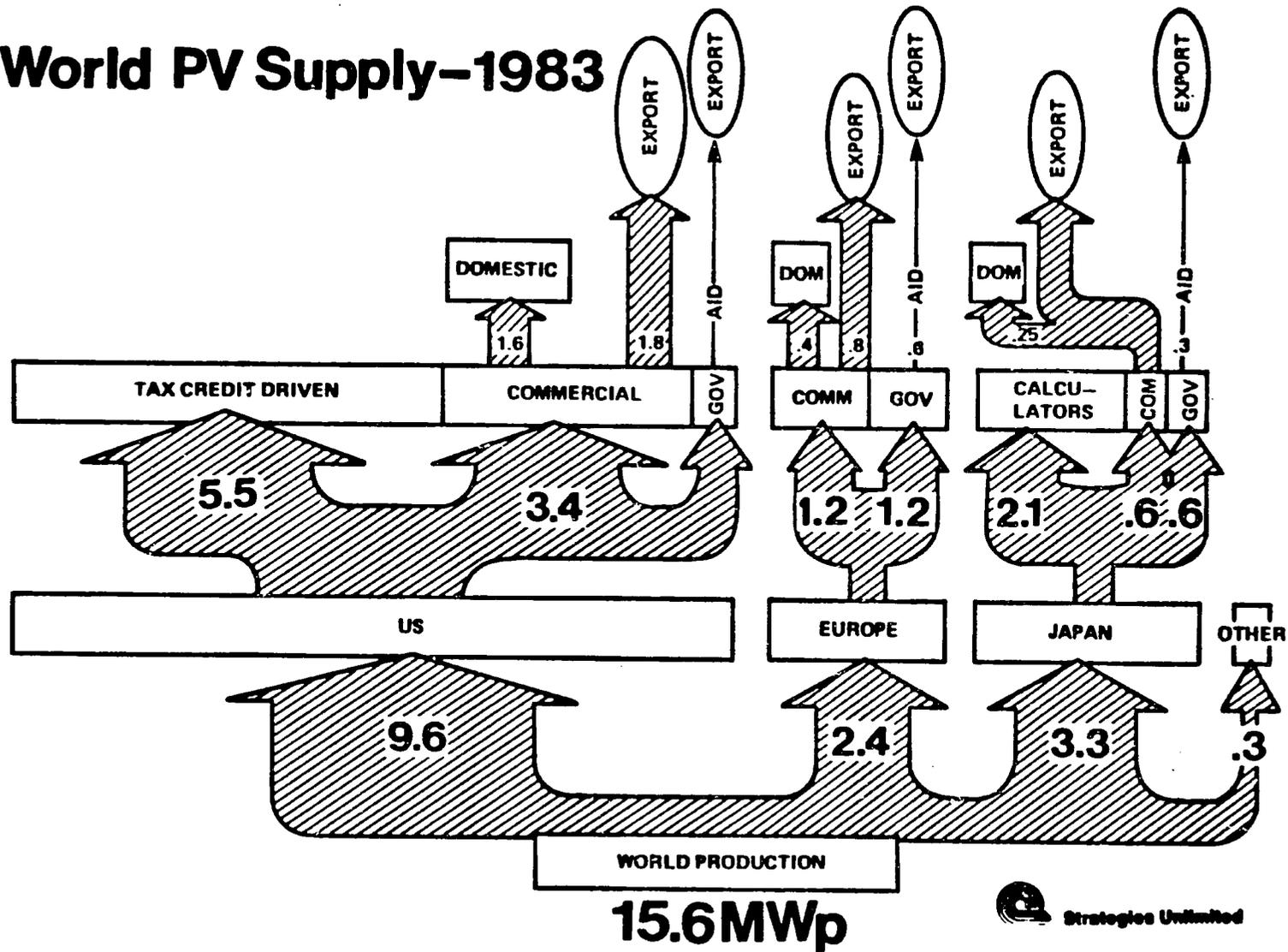


Figure 12

World PV Supply-1983



47

Figure 13

Long Range Outlook

	INDUSTRY SHIPMENTS MWp	ASP \$/Wp (CONSTANT 1984 \$)	INDUSTRY SHIPMENTS \$ MILLIONS (CONSTANT 1984 \$)
1976	.24	35	8.5
1980	3.3	13	43
1983	15.3	8.2	125
1990	190	2.85	550
2000	6 - 8,000	1.3	\$8 - 10,000

2950



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Figure 14

Export Analysis-1983

SUPPLIER	TOTAL COMMERCIAL	CONSUMPTION		AID EXPORTS	TOTAL EXPORTS	EXPORT MARKET SHARES
		DOMESTIC	EXPORT			
US	3.4	1.6	1.8	.1	1.9	48.1%
EUROPE	1.2	.4	.8	.6	1.4	35.4%
JAPAN	.6	.25	.35	.3	.65	16.5%
TOTAL	5.2	2.25	2.95	1.0	3.95	100%

49

2953

- EXCLUDES:**
- TAX CREDIT DRIVEN MARKETS
 - CALCULATORS
 - NON-AID GOVERNMENT PURCHASES



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Figure 15

Module Suppliers

	PRINCIPAL SUPPLIER (> 100kWp/YR)	SECOND-TIER SUPPLIERS	POTENTIAL SUPPLIERS	MAJOR RESEARCHERS		
U.S.	Arco-Solar ASEC Kobil Solar Solarex Solavolt Solec International	Intersol Martin Marietta Solenergy Tideland Signal UEC Others	Ametek Chronar Corp. Entech Sovonics	Alpha Solarco Acurex Bell Labs Boeing Chevron Crystal Systems	General Electric IBM IEC Kodak Monosolar Owens-Illinois	TELC TI UTC UTL Corp Varian Xerox 3M
EUROPE	AEG Ansaldo France Photon Helios Photowatt S.A. Pragma Siemens	BP Solar IDE Isotron RES Others	Copress MBB Nukem Omara PAG Solar Piher Pilkington Solems	Battelle Dornier Elkem A/S ENI	L.E.P. Nokia N.V. Philips	Plessey Volvo
JAPAN	Fuji Electric Komatsu Kyocera Sanyo Sharp Taiyo Yuden	Hoxan Kodenshi Matsushita Mitsubishi Showa Oil Others	Hitachi Kanegafuchi NEC Teijin	Anelva Central Glass Dainichi-Nippon	Fujitsu Kokusai-Denki Mitsui Toatsu	Sumitomo Electric TDK Toyobo Toyota
OTHER	Tideland Pty Ltd.	CEL Heliodinamica Phillips Australia SGS Pty. Ltd. Solarex Pty. Ltd. Solar Cells Ltd. TPK Solar Systems Others	Bharat Fonemat IPN (Mexico) Photowatt Afrique Solvimex	IPG (Indonesian)		

Worldwide PV Shipments

Supplier Market Share – kWp

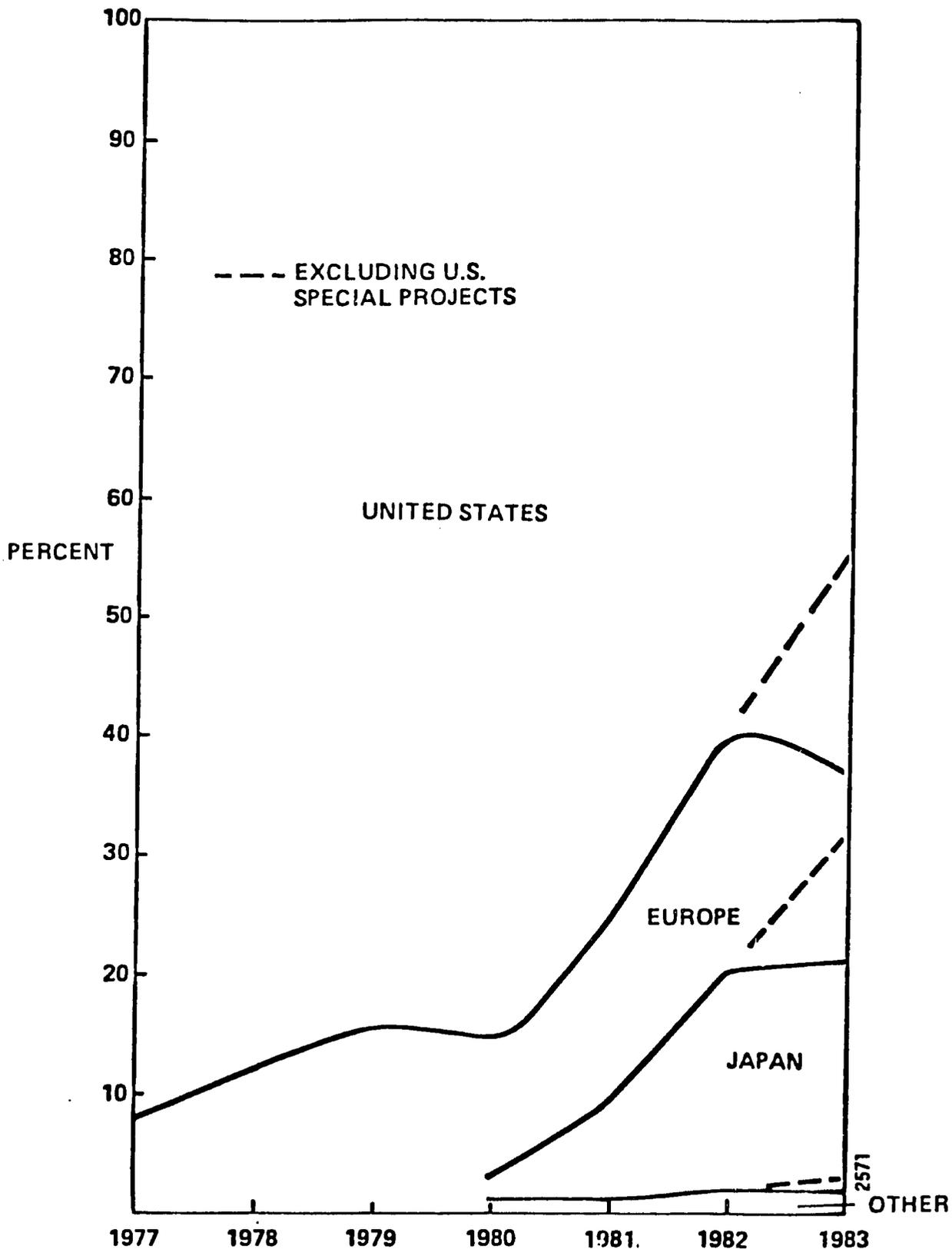


Figure 17



World Export Competition

DIRECT SUBSIDIES — 50% OF SALES AND MARKET — EUROPE
DEVELOPMENT EXPENSE AUSTRALIA

INDIRECT SUBSIDIES — EXPORT FINANCING — JAPAN
CO-FINANCING WITH AID FRANCE
OECD

3362



Figure 18

2. PV INDUSTRY EXPERIENCES OVERSEAS

MALCOLM REAM, DIRECTOR OF MARKETING
SOLAREX CORPORATION

I just wanted to say a few words about Solarex -- to give you a feel for what we have done and what our international experience is. Solarex is one of the leading photovoltaic companies in the world; we represent about 15 percent of the market. Through the last 11 years that we have been active, almost the entire time, in the international arena. Our experience includes the licensing of technology through the ownership of foreign ventures, the export of complete plants, the manufacturing of PV products overseas, the import of some photovoltaic products and components, and most of all, the export of photovoltaic products from the United States.

In certain years, the export part of our business has represented over 60 percent of our sales. It is now averaging about 50 percent, and I think I would be safe in saying that at no time in recent years has it gone below about 40 percent of our total sales figure.

Currently, Solarex takes advantage of many of the programs that the United States Government offers (see Figure 19). We have participated in Commerce Department programs, including being a showcase company in international trade shows in recent months. We have participated in OPIC missions abroad. We have received and performed well on U.S. AID contracts, and are actively seeking more AID contracts. We were the first photovoltaic company in the United States to use the Eximbank programs.

In summary, exporting is essential to Solarex. It is not only a key to our continued participation in the world PV market, but also a key element in our market growth strategy overall. We are grateful for the assistance that has been provided and rendered to Solarex and the industry throughout the years, and strongly encourage that this level of support continue. However, we join with the other people here today, the organizations and the industry, in seeking new ways in which we can strengthen the programs that exist. Perhaps some indications of where we can strengthen these can be gathered from some of Solarex's experience.

Let me first say a few words on the general education aspect about which you have heard so much. The PV industry is unusual. As Figure 20 shows, it has an unusual role in that it must continuously educate its potential user, particularly on the applicability and the reliability of its product. This is an expensive proposition, particularly since, as John Day indicated, we have many diverse markets, both in applications, and, internationally, in terms of diverse country markets. We welcome any assistance aimed at generally educating others on the benefits of photovoltaics and how these applications can apply to their problems today. The only caveat that I would put on this is that it must be done without interfering with free market forces. That is, we must not indicate preferred technology and approaches that would interfere with free market pricing and a free market choice of what technological approach to take. I believe that the latest DOE pamphlet, the brochure that was delivered today, meets this criteria and will be a valuable asset in helping us educate our customers.

In the U.S. Government's efforts to keep export promotion neutral (i.e., not favoring one competitor over another), we feel that they sometimes give up some of the effectiveness of the promotion dollar (see Figure 21). And while I do not believe that other nations always "do things right," it seems to me that sometimes we can learn from the experiences of others. Solarex has experience with some foreign export promotion programs which to us seem to contain some of the elements of very desirable techniques for increasing a nation's or an industry's exports.

Solarex does wholly own a manufacturing subsidiary in Australia, and you just heard John Day mention that Australia has a very good export promotion program. The impetus for establishing the operation in Australia was not to export jobs, it was to maintain a market share in Australia in the face of a 35 percent tariff barrier against the import of photovoltaic products. I want to emphasize here that we are not advocating tariff barriers. We believe that such attempts at protectionism are detrimental to the nation that institutes them, as well as to the industry as a whole.

However, Australia does have a substantial, stable export promotion program which, I must say, is effective and desirable. As Figure 22 summarizes, the Australian Government will reimburse our subsidiary for up to 70 percent of certain expenses incurred in the promotion of exports from Australia. This may include the operation of a foreign sales office, or the salary of the salesperson stationed in the foreign market. It can support certain literature and promotional expenses; it will support training of distributors and representatives in Australia; and in certain cases, it pays for a portion of a trip abroad to promote exports.

These supports are available to all companies that take the initiative to promote exports from Australia. And what is of key importance here, and presented in Figure 23, is that your support is related directly to the effort that you make. It is an expense sharing arrangement, so we do not incur it unless we think it is a viable export opportunity that will lead to more business. It is not dependent on an effort done in concert with your domestic competitors, as most American programs are. If we take the initiative to develop a sales lead from Australia, we are more likely to get the sale, at least we are going to have a better shot at it in most cases, which means that we, as a company, are willing to invest more of our time and effort in order to promote the export market. We would like to work with the U.S. agencies and the officials here today, including some of the people from Capitol Hill, to see if similar programs could be developed in the United States to supplement those already in progress.

Let me try to make a few points on financing (see Figure 24), a very complicated subject. I would like to preface these remarks with a few comments, some of which you have heard already, but I would like to emphasize them. We are not the aerospace industry. Our typical contract size on a large foreign contract is somewhere around \$100,000 and may get up to \$300,000 or \$400,000. We have received much larger ones, but they are not typical, at this time, and they will not be for awhile. The Eximbank contract I mentioned earlier was about \$320,000.

We are not large companies. Some of us are subsidiaries of very large companies. Solarex happens to be a subsidiary of Standard Oil of Indiana, which is Amoco. Typically, we are thinly staffed and operate on limited budgets. We do not have a stable of people sitting around our offices putting together financial deals. The people on this platform are most often the people who get involved in arranging financial assistance.

We have a very diverse customer base. They are diverse in terms of both applications and countries. Moreover, a lot of our customers in the developing countries are pushing against high debt ceilings, which is an additional problem.

Thus, as Figure 25 shows, financing assistance has to meet several criteria to be of use to us. It must be available in small increments, number one. It must be easily accessible, almost as easy as writing a check to our own account, because we do not have the manpower to go after complicated situations. In addition, since there may be credit problems, new and innovative approaches should be taken wherever possible.

To show you exactly what I am talking about, let me contrast two contracts that Solarex has worked on or completed. It will be easy for you to see which one we prefer. They are both based on money made available through U.S. Government programs.

The first involves our Eximbank deal where we sold 99 communication and repeater sites to a province authority in Colombia. As part of the sale, we promised to try to find a financial package. Figure 26 illustrates what we went through. Solarex went to Eximbank to explore the options. Once they were determined we went to our local bank, Maryland National Bank, which put together several alternative financial packages. We communicated those to our customer, who then made a choice of which package to pursue. We got involved in the transfer of a lot of credit information back and forth. A local bank in Colombia was brought in due to some desires on Maryland National's part, and finally Maryland National went back to Eximbank and finalized the discount loan commitment at a fixed rate.

Finally, the deal was struck. We got a financial deal with Eximbank, Maryland National, our customer, a local Colombian bank and Solarex. We shipped the goods and we were paid for the shipment.

Contrast this, if you would, to a recent Egyptian sale which utilized a foreign military sales credit. This deal is illustrated in Figure 27. Here we made a proposal to the customer, and we negotiated the contract. We delivered the goods and received payment in full from U.S. funds. Clearly, it is too good to be true compared to the other situation.

We had a similar experience in working with other international funding agencies, including the United Nations Development Program and the Inter-American Development Bank. All of these programs seem to be much easier and simpler than pursuing the Eximbank program.

What is the key to all of this? (See Figure 28.) The key is direct customer contact with the money and the funding source. Maybe we cannot do this with Eximbank all the time, but the direct credit program comes close in a lot of

ways. We would settle for anything in between in order to facilitate the effort involved. Solarex is anxious to work with federal agencies -- to establish mechanisms that would overcome these problems. We have some ideas on how to do this, other ideas have been expressed, and will be talked about at various times. One of the options is, perhaps, a special photovoltaic's window at Eximbank, which offers simplified and easier approvals. Eximbank recently spoke with us, and perhaps with others in the industry, about a leasing mechanism that they may be able to put together. These and other ideas should be pursued, and we would like to discuss them with the industry and the Bank.

While I am on the financing subject, I also would like to say a few words about AID. We have worked with some AID programs, and we would like very much to work more closely with the agency in finding easier ways to get available funds to our potential customers so they can make some purchasing decisions.

I realize that the AID program is not an export promotion program. We are all quite aware of that. It is an international development program, but it can serve dual purposes. We constantly run into international situations with our foreign competition where their AID programs do serve dual purposes. Our program too often seems to be encumbered with management contracts and funds that are never expended for hardware.

Let me cite just one example. Four years ago, under the Carter Administration, \$24 million in AID funds were given to Egypt for renewable energy programs. To date, all of that money has been retained by AID in terms of control. All of the contracts have been let by AID, and to date, numerous program management contracts have been awarded. However, there has not been \$1.00 spent on photovoltaic equipment. As a matter of fact, there has not been a request for proposal (RFP) for photovoltaic equipment coming out of that program.

I also would like to say that some of the AID experience has not been good. In some instances the equipment has not been designed for the particular environment, and I think this is another problem we could solve by having more customer involvement at a very early stage.

The program I just discussed, the \$24 million program, happens to be in a country, Egypt, where Solarex, being just one company, has done several million dollars worth of business over the last few years. It has ranged from sophisticated military equipment and navigational buoys in the Suez Canal, to water pumping systems in the middle of the Sahara Desert. I believe Egypt, perhaps with a little less guidance or a little less control, might be capable of making some of its own decisions on how best to spend the funds within the guidelines outlined by the AID program.

We believe there are ways we can work together to make these programs more productive, both for AID and for the eventual customer or recipient.

In summary, there is much that has happened in the federal export assistance area that has been a great help to Solarex and to the other people in the industry. We are happy to have the programs that we do have (see Figure 29). We, however, like you, are looking for ways to improve these programs. We believe the programs can be improved and strengthened for (1) the taxpayer, so he or she can get more benefit from each tax dollar; (2) the recipient of aid

or assistance; (3) the agency or organization offering a program; and (4) the photovoltaic industry.

We wish to work together with the people here today to ensure program improvements. We hope to find more ways to support the growth of the U.S. industry, to promote the growth of American jobs, and to ensure the viability of what we believe is one of the key future energy industries of America and the world.

FEDERAL AGENCIES UTILIZED

- **Department of Commerce programs**
- **OPIC trade missions**
- **AID contracts**
- **first PV company to use EXIMBANK**

EDUCATION

Need to continuously educate potential users

- many diverse markets
- expensive
- stimulate free market growth

EXPORT PROMOTION/SALES SUPPORT

- overly neutral program
- expenditures not always effective

EXPORT PROMOTION

Partial reimbursement of export-related expenses

- offices
- trade show participation
- salaries and expenses of overseas personnel
- training for distributors and representatives
- certain travel to promote exports

Figure 22

EXPORT PROMOTION

- support keyed to individual company's efforts
- expense sharing
- more incentive for individual firm to act when action not in concert with competitors

FINANCING

Unique industry requirements

- orders typically small: \$100K to \$500K
- firms small, thinly staffed
- diverse customer base
- large developing nation market

Figure 24

FINANCING

- available in small increments
- easily accessible
- innovative approach to credit-restricted customers

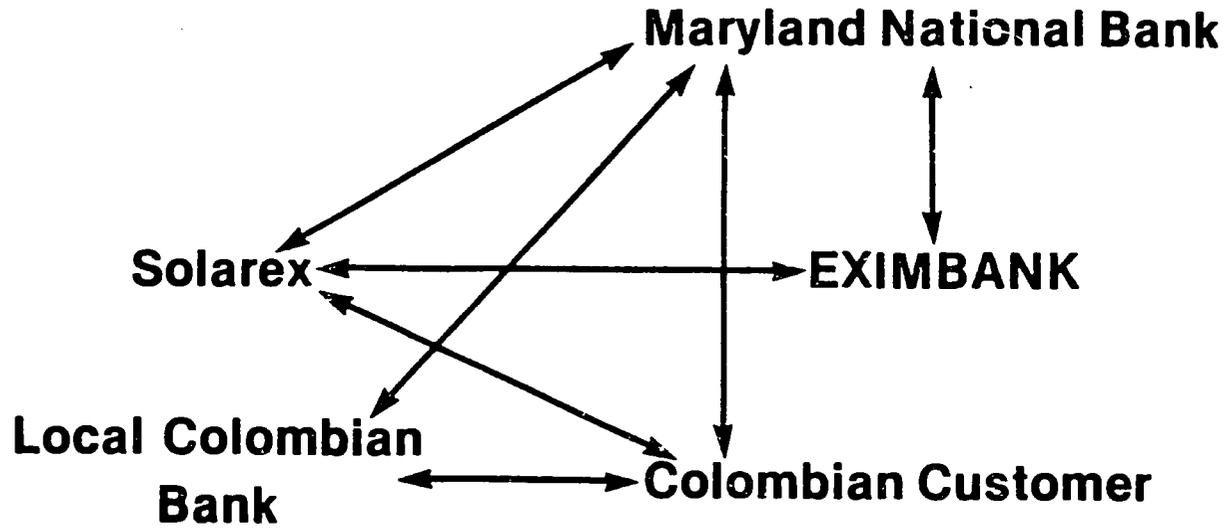
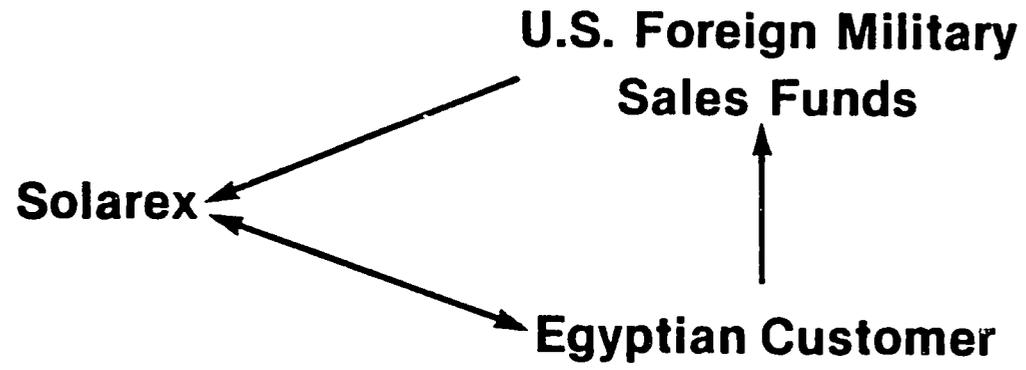


Figure 26



THE KEY

Direct customer contact with funding source
(and often, when source is AID, customer control)

SUMMARY

- Past support is appreciated
- We believe programs can be improved and strengthened
 - for the taxpayer
 - for the recipients/target countries
 - for the agency
 - for the U.S. PV industry
- Wish to work together to insure program improvement and growth of industry

VERN WEEKMAN, PRESIDENT
MOBIL SOLAR ENERGY CORPORATION

I appreciate the chance to share a few thoughts with you today. We are not here today to belly-up to the public trough nor ask for a permanent place in line. We are asking for very modest help from the government to let us build this very nascent industry so that we can become a substantial contributor to tax revenue in the future.

I have always been a bit of a fan of Milton Friedman, but I am sure Milton would not approve of our panel's objective today concerning how we can get help from the government. But maybe Milton is not aware that we lack a free market in the foreign PV marketplace. If we did have a free market, those of us on the panel would not be sitting here. We could compete among ourselves very nicely, and not need any government help. But as we all know, that is not the case. Foreign governments (especially Japan, France and Germany) may be seeing more clearly than the U.S. Government how powerful this industry will become, and what a major impact it will have on balance of trade. So they are putting major efforts into helping the young PV firms in their countries to compete in the foreign markets. That is basically why we are here today.

I thought I might give you a few examples from my experience in the foreign arena so that you can judge for yourself some of the activities that are going on. As you may know, Mobil has significant interests in the Middle East, and we do quite a bit of marketing there. And even though we are well connected, the Japanese may be better connected. For example, recently Japan invited some 15 key energy people from the United Arab Emirates back to Japan to give them a detailed picture of what is happening in the country's photovoltaic industry. In French Polynesia, the French Government is subsidizing PV directly. It is effectively selling PV systems to the end user at \$3.50 a watt. Since the market price is around \$7.00 to \$8.00 dollars per watt, you get some idea of the magnitude of the subsidy that the French Government is providing. It makes it very tough to compete in French Polynesia.

In South Africa, we recently found that the German Government and some German companies have put together a large demonstration package to win over the potential customers that we were talking to, and beat us out of that particular business.

In Colombia, the key Japanese PV companies, in cooperation with the government, are making a major move to capture market share, particularly the telecommunications market. It makes it very difficult for any of us to do business there today.

Also, you will find that in the bidding, most of the German, Japanese and French companies come in with very attractive financing packages as part of the bid. Many times we have to come back afterwards and negotiate financing, putting us at a real disadvantage.

I thought I would take a little time and talk about the diesel electric market, since it is going to be an important one for us. We have done a rather extensive study and have found a potential two gigawatt/year market for just

those diesel generators going into prime power -- not those used as back-up, nor those going into recreational vehicles, marine trades, et cetera. The figure includes only those below 25 kilowatts and manufactured in hard currency countries. That is 2,000 megawatts of hard currency sales in 1983 for small electric power systems. So the money is there, and the need is there. The question is how can we effectively penetrate this market?

As John Day indicated, diesel generators, in many cases, are much less cost effective than photovoltaics. We estimate that at the current price of \$7.00 a watt, at least half of that two gigawatts would be economical for PV today.

To understand PV's potential, we have to talk about life-cycle costs. What is a life-cycle cost? Since a PV installation will last about 20 years, you add the initial cost, the cost of financing, and the cost of maintenance required, and divide this by the total kWh produced. This gives you the life-cycle cost of power. Compare that with the 20 year life of a diesel project, where you have to buy maybe three complete sets of diesels during that period of time, provide the fuel, and all the expenses of maintenance. You will discover that the life-cycle cost of the PV system is substantially lower than that of a diesel.

If that is the case, why is the world not beating a path to our door to replace those two gigawatts/year with PV? Well, the hitch is the high initial capital cost of photovoltaics. For example, an administrator in a developing country has a certain amount of money, and initially can buy three times as much power from diesel generators as he can from PV. However, over the life of that project, the life-cycle of the diesel generators will be higher; but how do we convince them of that?

The key is education. Some of the government agencies already have programs that could help in educating LDC buyers to analyze true life-cycle cost. In the long run, it will be cheaper for those countries to put in PV, and will result in a more effective use of aid or local money. Maybe we should insist that the aid or loan recipients do a life-cycle analysis if U.S. money is to flow to these projects, insuring the most bang for our buck.

In summary then, how can the government help? Certainly in the education of the potential PV user. Also, we need financing help as part of our bidding. Much of the U.S. financing help is aimed at very large plants, as was brought out earlier by one of my colleagues. We need to streamline this procedure so we can use it more effectively.

These modest steps could greatly aid us in our international PV competition.

GEORGE NAFF, MANAGER
SOLAR ENERGY PROJECTS, HUGHES AIRCRAFT COMPANY

Many of the comments I will make this morning you have already heard by my predecessors here. Let me assure you that none of us had heard each other's speeches nor seen each other's slides, so the opinions offered are, for the most part, arrived at independently.

My talk will address solar energy projects as they relate to the international marketplace, and those in which Hughes has an interest. This information is summarized in Figure 30. We specialize in systems. We design, fabricate, integrate and install them. We do research and development. Normally we are involved in the higher-priced projects. We are not involved in the one module, one panel type applications. We do not manufacture terrestrial photovoltaic modules. Through our subsidiary, Spectrolab, we do have a substantial amount of PV cell business in the space program; but not in terrestrial. We prepare the specifications for modules and array subsystems, and test them to our designs. Our system packages include photovoltaic structures, controls, power collection and distribution systems.

You have heard about the international marketplace and it is described further in Figure 31. What I would like to do is to describe some of the projects in which we have been involved, with the thrust of trying to impress you with the maturity of these systems today.

The first project involves a very recent installation of a village electrification project on one of the Marshall Islands, a little island in the Pacific that supports about 450 people. Up until the time of our arrival, the only energy on that island was kerosene lamps. In one month we had installed a photovoltaic power system. We dug miles of trenches for laying the underground cable, all by pick, shovel and hands, using local labor. We put lights in every building and established some medical facilities. We put fans and refrigerators in the community buildings, schools and the church. We left these people with a source of western energy, and improved their lifestyle. Today, the system is working very well, day in and day out.

Another project has to do with military applications. For the U.S. Navy, we installed a system for driving a camera that tracks airborne targets on one of their ranges here in the United States. We know there are many types of military ranges throughout the world that have a need for these types of systems. In remote applications, they are very cost-effective.

For some of the larger array fields, we might want to look at grid interconnection. I might mention that at a village electrification system we did establish a grid. We started looking at the structure forms with a somewhat different configuration. This was a DOE demonstration project.

In a slightly larger project, we set up a PV system at Georgetown University in Washington, D.C. Power output for this system approaches almost a third of a megawatt. This system operates every day and is fully automatic.

I would like now to address some points, reasons, and needs pertaining to PV in the international marketplace, as shown in Figure 32. The point is that there is an international PV marketplace, but the level of sales of U.S. products is not being realized. One of the reasons is the lack of customer awareness, particularly concerning system performance, reliability, and maturity. The customer is not aware of what the real costs are, and thinks primarily in terms of initial capital outlays. Furthermore, the customer is not aware of what financing arrangements can be obtained for PV systems. As you have heard, there is some foreign competition with whom we have a very difficult time, because these competitors receive a tremendous amount of government assistance.

What is needed then, lies in two areas: (1) a little more education in the international arena, and (2) financial assistance. Let me cover these points, taking electrification as an example. These points also are summarized in Figures 33 and 34.

In a demographic study I looked at several years ago, it was stated that there are over two million villages in the sun belt throughout the world without any electric energy. Why? There are a number of reasons. One, in terms of looking at photovoltaics, they do not understand it, and they do not know much about it. The word has not reached them yet. The economics, that is, life-cycle costing, is new to them. They think primarily in terms of capital outlays. There is a certain amount of confusion and skepticism about photovoltaics. They are not sure of its maturity. They have heard some stories about what it does today, and what we can expect in the future, such as higher efficiency systems, and lower cost systems. They have heard about some photovoltaic successes, and they have heard stories about some of the failures of photovoltaic systems. It seems that they remember more of the failures than they do the successes. All of this contributes to confusion in the marketplace.

Sometimes the U.S. PV industry is its own worst enemy. In our own endeavors to succeed, we exaggerate our claims and we down our U.S. competitors' products. This leads to skepticism and confusion on the part of our potential customers.

As indicated in Figure 34, the customers do lack financing, particularly those of the lesser developed and developing nations. They do not have the financial resources for making a direct procurement; also, they have neither the incentives nor the support in which to proceed with buying electric power generation equipment from a U.S. supplier. They frequently drift toward our foreign competition -- to the foreign suppliers who do provide government assisted and government promoted projects. These government promoted and assisted projects frequently are tied to some form of a bilateral agreement, such as securing a favored position for the procurement of oil, or some other product in exchange. For example, the Government of Japan, through its industry, sponsored a village electrification project in exchange for other commodities they wanted in trade.

One thing I would like to point out is that in my history of working overseas, I have never run across two foreign companies from the same country competing against us. There has always been only one. There may be situations where this is not true, but I personally have not been involved in any.

In another example, we have seen German firms in Mexico and West Africa promoting projects tied directly to the German Government -- that is the German Government provides favorable terms through bilateral agreements with the recipient country.

As shown on Figure 35, we in industry believe that to combat efforts by other countries, we need to spread the word about U.S. photovoltaic power systems in the international marketplace, particularly the maturity of these systems, the availability of these systems, the reliability of these systems, and their cost-effectiveness, especially in stand alone systems at the lower end of the power scale.

We can point to systems that have been operating for several years, day in and day out; where the only maintenance required has been filling the batteries with water about every three months or so. There is no cost for the fuel since we all know the sun's energy is free.

We need to spread the word about the photovoltaic successes. There are a large number of projects that we can point to, downplaying the failures. But particularly, we need to spread the word that these are American successes, and point to the fact that we have tremendous American resources that stand behind our products. There are just as many horror stories about our foreign competition who will install a system regardless of whether it is photovoltaic or not; and they will leave it inoperative, unattended and unmaintained. Furthermore, these firms will not usually stand behind their products.

U.S. firms do have a reputation for standing behind their products, and we should stress that. How do we do this? How do we educate these foreign customers? I suggest that perhaps one of the best ways is to use the resources of foreign offices of the United States Government. In Figure 36, I have listed seven of them, including the Departments of State, Commerce and Defense. Defense in particular can be a tremendous asset to us. Military overseas projects through foreign military sales could promote the use of photovoltaics instead of constantly using diesel generators as the major source of energy.

We know that the Agency for International Development is involved in several power projects. One of the things that AID could do for us is to provide more hardware demonstrations, in terms of photovoltaic generated power, and perhaps reduce the number of studies and particularly the money that goes into these studies. Let us put more money into hardware and get the hardware out into the field where it can be shown and demonstrated.

The Department of Interior also can assist. The Department of Interior is overseeing the islands in Micronesia, and hundreds of other Pacific islands, that are without any energy whatsoever. We could spread the word through these Interior agencies to educate countries on the viability and successes of photovoltaics, and get potential users to think in terms of solar energy. In the Pacific, I have seen diesel generator systems sitting on these islands that are wasting away because they cannot be maintained. In many cases, they cannot be fueled because the fuel has to be floated ashore in barrels, and many are lost. There are many agencies that can help us, I am just listing these as specific examples.

Figure 37 addresses financing. Most of our foreign customers think only of how much it is going to cost out-of-pocket today, and do not consider long-term life-cycle costs. We need to find ways of educating these potential customers to think in terms of long-term costs, looking into ways to assist in securing financing, guarantees and low interest loans. Perhaps in lieu of loans, we can look at other ways of providing photovoltaic systems, particularly if one addresses the balance of payments. Our nation is experiencing a tremendous negative deficit in balance of payments; we can try to arrange financing on a government-to-government loan basis in order to promote U.S. PV sales.

As summarized in Figure 38, let us not allow the overseas marketplace be lost to foreign competition. Our net sales in the foreign marketplace are down and we need to get them back up. We do have the technology and the resources, so let us not lose them. We need to work together as a national-industrial team in the international marketplace to keep things going for us.

HUGHES TERRESTRIAL SOLAR SYSTEMS

HUGHES

- **WE SPECIALIZE IN SYSTEMS**
 - **DESIGN, FABRICATE, INSTALL--TURNKEY**
 - **RESEARCH AND DEVELOPMENT**
 - **LARGER SIZE PROJECTS**
- **WE DO NOT MANUFACTURE TERRESTRIAL PV MODULES**
 - **WE PREPARE SPECIFICATION**
 - **PROCURE/TEST TO OUR DESIGNS**
- **WE DO MANUFACTURE BALANCE OF SYSTEMS**
 - **STRUCTURES**
 - **CONTROLS**
 - **POWER COLLECTION/DISTRIBUTION**

Figure 30

INTERNATIONAL MARKET

HUGHES

REMOTE STAND-ALONE PHOTOVOLTAIC/HYBRID SYSTEMS

- WATER PUMPING/IRRIGATION
- COMMUNICATIONS
- VILLAGE ELECTRIFICATION
- CATHODIC PROTECTION
- MILITARY -- RANGES, COMMUNICATIONS
- REMOTE LIGHTING SYSTEMS

Figure 31

POINTS-REASONS-NEEDS

HUGHES

POINT

- AN INTERNATIONAL PV SYSTEM MARKET EXISTS, BUT –
SALES OF U.S. MANUFACTURED PV SYSTEMS ARE NOT
BEING REALIZED

REASONS

- LACK OF CUSTOMER AWARENESS
 - PERFORMANCE/RELIABILITY/MATURITY
 - CAPITAL OUTLAY--REAL COSTS
 - FINANCING
- FOREIGN COMPETITION--GOVERNMENT ASSISTED

NEEDED

- A MORE KNOWLEDGEABLE CUSTOMER
- FINANCING ASSISTANCE

INTERNATIONAL MARKETPLACE



POTENTIAL CUSTOMERS – SUBSTANTIAL

- OVER 2 MILLION VILLAGES WITHOUT ELECTRIC POWER
- UNINFORMED OR DON'T UNDERSTAND
 - PHOTOVOLTAICS
 - ECONOMICS-LIFE CYCLE COSTS
- SKEPTICAL/CONFUSED
 - MATURE VERSUS FUTURE
 - SUCCESS VERSUS HORROR STORIES
 - SALESMANSHIP

INTERNATIONAL MARKETPLACE



(con'd)

POTENTIAL CUSTOMERS

- LACK FINANCING
 - DIRECT PROCUREMENT
 - INCENTIVES--SUPPORT
- LOOK TO FOREIGN COMPETITION
 - GOVERNMENT ASSISTED/PROMOTED
 - GOVERNMENT BILATERAL AGREEMENTS
 - HOST COUNTRY PROJECT DEMONSTRATIONS
 - EXAMPLES:
 - JAPAN
 - GERMANY

Figure 34

INTERNATIONAL CUSTOMERS NEED TO BE EDUCATED



WE NEED TO SPREAD THE WORD

- **THE VIABILITY OF PV SYSTEMS**
 - **MATURITY**
 - **RELIABILITY**
- **AMERICAN PV SUCCESSES**
- **AMERICAN PV RESOURCES**

Figure 35

INTERNATIONAL CUSTOMERS NEED TO BE EDUCATED



USE THE RESOURCES OF U.S. FOREIGN OFFICES/AGENCIES

- STATE
- COMMERCE
- DEFENSE
- A.I.D
- INTERIOR
- OTHERS

Figure 36

INTERNATIONAL CUSTOMERS NEED TO BE EDUCATED



FINANCING

- **CAPITAL OUTLAYS**
 - **EXTENDED--LIFE CYCLE COSTS**
- **GUARANTEES**
- **LOW INTEREST LOANS**
- **IN LIEU OF LOANS**
- **BALANCE OF PAYMENTS**

Figure 37

INTERNATIONAL MARKET



- **LET'S NOT LET THE PV INDUSTRY BE LOST TO FOREIGN COMPETITION**

- **LET'S WORK TOGETHER AS A NATIONAL/INDUSTRIAL COMPLEX IN THE INTERNATIONAL MARKETPLACE**

Figure 38

ROGER LITTLE, PRESIDENT
SPIRE CORPORATION

Spire is a small business that manufactures the equipment to produce solar cells and modules. We fabricate machines that solder metal ribbons onto cells and connect them together into arrays. We make machines that laminate solar cells behind glass and plastic. We make machines that test modules to simulate sunlight. We sell individual pieces of equipment to the developed world, namely the U.S, Japan and Europe, and we sell turnkey production lines to the developing world for start-up business.

Our turnkey production lines assemble modules from solar cells. The solar cells are purchased typically from U.S. manufacturers such as Mobil, Solarex, Solavolt, et cetera. We give LDCs what they want, which is jobs, energy and technology.

We have equipment in more than 15 different countries. Approximately 75 percent of our business is international -- 25 percent U.S. The international business is divided equally among Japan, Europe and the developing world.

The purpose of my presentation today is to provide some examples of difficulties that Spire has encountered putting PV equipment into the field. I will not propose any solution; I will let you consider these problems and perhaps make comments during the discussion period.

First, in New Delhi, we sold some manufacturing equipment to a private corporation (see Figure 39). Problem: All financial transactions must be handled by the State Bank of India. No U.S. bank will accept a letter of credit from them. The purchase was only a few hundred thousand dollars. Could Eximbank help? I am not sure.

This brings up another point regarding India. We really need help in qualifying the leads. As you know, we get a lot of interest from India. I think the Indians are supported in their travel to the U.S. to explore photovoltaics. It is very difficult to qualify them.

Second, in Sao Paulo, Brazil, we sold some manufacturing equipment to a private company (see Figure 40). However, we were unable to get a letter of credit. The Eximbank had ceased helping to make funding available in Brazil. The country wanted to barter for our equipment with solar cells; this is not the way I like to do business. What I remember most about our last interaction in Brazil was that we had to paint the machine that we were planning to sell a particular shade of blue. Once the Brazil deal fell through, the machine sat on the floor for nine months or so because we could not ship it anywhere else given its color. We do not do that anymore.

Third, in shipping equipment to Japan, we had a delay with the Department of Commerce in obtaining a license for our goods (see Figure 41). This was something that occurred when the Department of Defense was tightening up on the export of certain U.S. products.

Our SPI-SUN SIMULATOR has a computer on it. It is an HP computer, and the only item that needs to go through the licensing procedure. Now, I point this out because timing is so important in these international sales. We have a manufacturing cycle of 16 weeks, typically a letter of credit which has a 20 week window, and a DOC licensing requirement which hopefully can be held to four weeks. Now, if these things do not overlap you are left with a piece of equipment and an expired letter of credit. So it gets to be very difficult.

Fourth, also in Japan, a company likes Spire laminators (see Figure 42). They have bought a few, and they have now decided to go into their own large production line automated primarily for making solar cells. I received a nice letter from them which said, "Dear Mr. Little: We like your business plan. We are going to manufacture solar cells. We are going to sell them to developing countries and new start-ups, for assembly into modules. Here is our new product literature." Coincidentally, their laminator looks almost exactly like our laminator. However, we believe that we have a better product.

Fifth, a group from China recently toured the United States, as well as other countries, looking for PV equipment, and ended up buying a cell and module manufacturing line from a Canadian company (see Figure 43). Currently, I am trying to sort this situation out, but what I understand is that a Canadian government organization paid for all sales and marketing expenses. The Export Counsel of Canada (ECC) is financing the buy, and also underwriting the insurance and delivery of the equipment. The Canadian International Development Agency is also helping.

My last example is a joint venture (see Figure 44). It is in Saudi Arabia, and I point out that in many countries it is illegal to gather licensing fees. Also, many countries require joint venture participation by American companies. We participated with this company in the sale of technology. We accepted equity for the technology value. Now the company in Saudi wants to borrow money from the Saudi Industrial Development (SID) Fund which requires our signature. OPIC could not guarantee this note because the Saudi Government is deemed to be stable.

In addition to the examples above which demonstrate problems encountered in PV exporting, there are a number of other difficulties. Customer financing, of course, is very important. So are export licensing, and protecting our interest in a country. The State of Massachusetts has initiated a program to help its indigenous industry. I think that federal funds might be used to help leverage through regional interest.

I would just like to end by saying that I think the DOE brochure is very impressive, and I think it is going to help us. This seminar is important, and we thank you for that.

NEW DELHI, INDIA

WHO? A COMPANY

WHAT? PV MANUFACTURING EQUIPMENT

PROBLEM? STATE BANK OF INDIA – ONLY

SAO PAULO, BRAZIL

WHO?	A COMPANY
WHAT?	PV MANUFACTURING EQUIPMENT
PROBLEM?	LETTER OF CREDIT

Figure 40

JAPAN

WHO? A COMPANY

WHAT? PV MANUFACTURING EQUIPMENT

PROBLEM? DOC LICENSING DELAY – MISSED QUARTER

Figure 41

JAPAN

WHO?	A CORPORATION
WHAT?	PV MANUFACTURING EQUIPMENT
PROBLEM?	EQUIPMENT "JAPANESE" COPIED

Figure 42

KUNMING, CHINA

WHO?	A PROVINCE
WHAT?	CELL AND MODULE MANUFACTURING LINE
PROBLEM?	NO SALE – CANADIAN DEAL

Figure 43

SAUDI ARABIA

WHO?	A JOINT VENTURE COMPANY
WHAT?	JOINT VENTURE
PROBLEM?	GUARANTEE OF IN-COUNTRY LOANS

Figure 44

MARTIN RECCHUITE, MANAGER, STRATEGIC BUSINESS DEVELOPMENT
ARCO SOLAR, INCORPORATED

My name is Martin Recchuite and I am Manager of Strategic Business Development for Arco Solar, Inc.

I sympathize with members of the various governmental agencies because within Arco Solar, Inc., I am Mr. AID, Mr. Eximbank, Mr. OPIC, Mr. DOC, and Mr. DOE. I am the guy that gets the call that runs as follows: "What's an AID?"

Let us put this business in perspective. We really are dealing with a world-wide capacity in 1984-1985 of 30 to 35 megawatts. We are looking at an expansion that is, frankly, a raw material constrained expansion. We do make our wafers from silicon, but it is not sand. We are small businesses that are fairly sophisticated at the manufacturing level because of the nature of some of the players. These players include Solarex, an Amoco subsidiary; Arco Solar, a subsidiary of the Atlantic Richfield Company; Solavolt, a Shell/Motorola conglomeration; and Mobil. We have lots of dealers and distributors who are the true, small business. We are in a competitive, high tech commodity type business.

The primary nondomestic markets are in countries with great needs, but with little money. The applications in such countries are not the large grid connected facilities like we have in Hesperia, CA. The applications are education, communication, agriculture, health and industry.

I want to reiterate that our typical overseas sale is between \$100,000 on the bottom end and \$750,000 on the top end. Every so often you get one of these great requests to put up a one megawatt plant, and everybody runs around and comes up with numbers in the millions of dollars. Then we start to really get in and play ball with the Eximbank.

Our product is the ultimate capital good -- you pay for it all today and you get free power and very limited O&M expenses for 20 to 30 years. So you are dealing with a relatively sophisticated life-cycle analysis requirement to explain to your customer, and to the various governmental agencies.

Photovoltaics are not bought on impulse. They are not picked up like a magazine at the village check-out counter. You have to sell them. They are not price static. This industry is one of the few industries that has the tremendous potential for an order of magnitude cost reduction, and this can occur very rapidly. There are plateaus and no plateaus. Right now we happen to be at a plateau.

Once an overseas market is lost to U.S. business you are not going to get it back. A strong domestic PV business is critical for a strong export business. We now have overseas operations, and when I say that, I mean marketing operations. Although we manufacture in Camarillo, California, we have regional bureaus covering the Far East, Middle East, Africa, South America and Europe. We have worked, or at least conversed (through various banking institutions), with Eximbank, OPIC and other key federal export agencies.

Because of the dynamics of the PV export market, U.S. AID is likely, in my opinion, to be the main player in determining whether we succeed in the short run export business. Everybody has their problems with AID. I am one of the people that believes you do not preach to either the saved or the people you cannot convert, and I would like to convert AID out of the feasibility study business and into the hardware business.

I am going to use a mechanism that avoids making up my own words. I am going to quote from a Mr. Mulqueen who is president of a wood burner company with five employees. He testified in March of 1984 to the Subcommittee on Energy Conservation and Supply of the Committee on Energy and Natural Resources. He sells stoves that burn wood chips and other related items. His comments on AID were as follows:

"AID seems to be interested in making studies. This whole town seems to be awash of papers. Probably half the people in here are consultants. AID seems to make studies, but they never seem to get demonstration projects going. The problem with AID is they hate to have a failure, which is probably Senator Hatfield's problem. (He was the senator in charge of the hearing.) Because when they have a failure, he probably jumps on them.

But it really is a problem, because all they want to do is study the problem. Now, I have been to Thailand, Indonesia and the Philippines; and I met a man that did an AID study in Thailand and he did an AID study in Costa Rica, and he did an AID study in the Philippines. I said, 'How much oil did you replace?' He said, 'I don't know, I just make studies.' I could tell then that the oil was causing Thailand, Costa Rica and the Philippines problems. You don't have to do a study. But a study never loses, you never have a bad study. It's just a study."

Well, I would like to suggest that the AID equivalent in competitor nations do not work that way. Maybe what we need is to get AID to behave a little like an Eximbank in meeting a competitive situation. When we go one-on-one with someone that has an attractive hardware package, AID should have the flexibility to meet them head on. Because if we do not, we never get through the door. People look at our products and say, "It's great, but I get several times as much from them, and it doesn't cost me anything."

I have inventory problems sometimes. We develop specifications for a particular project, AID approves it, we make it, and then we wait and wait. I end up paying the interest carrying charges for equipment sitting in my inventory. That impacts my working capital. You know, frankly, statements like "you are Atlantic Richfield Company, you can take it," are not true. I am a small company. I have an allowance; and when I go over my allowance, I get my knuckles cracked. If I go over my allowance too much, I am not an employee of Arco Solar anymore.

One comment on technical assistance. I am sure that if any government agency here needs to talk to any of our engineers or people to bring you up to

speed in any area, we would be more than happy to do it. When I say "we" I do not mean just Arco Solar, Inc.; I mean the PV industry. We hunger to educate your people. However, we need your assistance in telling us how to do this. We do not know when you have a conference of your technical people where we can come and bring in some touchy, feely goods. Because this industry has moved incredibly fast in just six years, I am a little constrained at being burdened with the NASA-Lewis studies which involve a seven year evaluation of PV in the field. Our product lines change from year to year. The price moved from \$35 per watt seven years ago to about \$8 per watt today. You cannot talk about what is affordable per se. What you have to say is, "Is this a good product? Where is the cost going?". If you wait until we get it to \$2.00 per watt, someone else is going to have the market.

Thank you.

PV INDUSTRY EXPERIENCES OVERSEAS: SUMMARY

WILLIAM H. O'CONNOR, GENERAL MANAGER
SOLAVOLT INTERNATIONAL

This completes our panel's presentation on the international marketing of photovoltaics. I trust some points came through clearly. It has been a long session, so I will try to summarize our thoughts on the Government's programs for export assistance. In doing this, I must again note that the number and variety of companies in the industry creates a wide variety of opinions, and some of them are in conflict. However, I think we do have reasonable consensus on the following:

First, we do not seek additional funding or new programs. We believe that what is available today may be adequate if PV is properly recognized and attracts its appropriate share of resources. Considering a national deficit situation, I think you are glad to hear that.

In a more positive and specific sense, we would like to see the broader education of U.S. Government people here and abroad on photovoltaics and on the role that it is capable of playing. Particularly, we want to make sure we talk about successes and not about the few failures that we have had.

We would like to see mandated consideration of photovoltaics in all government supported programs where it might be economically or politically practical. We would like to see expanded efforts to help educate offshore customers and users with an associated government endorsement of U.S. technology and industry. I think DOE's new brochure, Photovoltaics, Electricity From the Sun, is an excellent example of such an activity. In addition, we expect to see a continuation of existing market development and support programs, such as the Department of Commerce's trade shows, exhibits, agent/distributor services, Overseas Business Reports, et cetera.

We also would like to see greater recognition of the need for supporting smaller programs -- e.g., programs that are not in the million dollar range -- as a requirement for market development and growth to those larger programs.

We believe that grants, loans, credits, and other funding support should go directly to offshore customers, users and governments, with buy America provisions strictly enforced to provide competitive opportunities for our industry.

We recommend that demonstration projects, and we do think them important, should be carried out at the commercial level rather than through government agencies and laboratories that have high associated overhead and heavy demands for documentation and other non-hardware items.

Finally, as a specific counter to foreign government industry programs, we need incentives and mechanisms to develop more aggressive and comprehensive financing and support packages. We look forward particularly to discussions this afternoon on the subject.

With that summary, we close the Industry Panel presentation. We want to extend our deep appreciation to Secretary Hodel, Under Secretary Collins, Deputy Assistant Secretary San Martin, Photovoltaic Division Director Bud Annan, and all the others in DOE who conceived and supported this Seminar, as well as to all the other government people who are here today. I trust that the industry attendance and our enthusiasm tells you how much we appreciate this unique opportunity.

Thank you all.

C. Government/Industry Panel Discussion

GOVERNMENT/INDUSTRY PANEL DISCUSSION

PAT COLLINS, MODERATOR,
UNDER SECRETARY, U.S. DEPARTMENT OF ENERGY

MR. COLLINS, DOE: Thank you very much, Bill, and congratulations on a superb panel. I would like you to join me in co-hosting the government/industry panel, and particularly, I invite my government colleagues, who have specialists who are going to be here this afternoon but may not be here now, to begin to respond.

MR. WEST, OPIC: Let me respond to a few items that were brought up, not all of which even refer to OPIC. First, I hesitate to say this because I know that there are many marketing experts in this audience, but at OPIC, we have seen about 500 projects in the last three or four years involving U.S. investors going into developing countries and setting up anything from agribusiness to manufacturing operations. I would guess at least half of them have standby electrical systems. I cannot remember in the last three or four years one of them that involved PV in any way, shape or form.

Now, when you are looking to sell in the developing country, and you are running into all sorts of problems with potential financing and convertability of currency, and so on, I hope you do not overlook the fact that U.S. investors tend to have doubts that they can pay. Certainly, there is an unexploited market right there. It is a matter of public record which firms we have assisted and where. Our assistance certainly covers future investments in developing countries. Please orient your efforts and exhaust the possibility of trying to sell to American firms who are already planning on going to developing countries in need of energy sources.

MR. ANDERSON, EXIMBANK: Eximbank is the delivery vehicle, and I think many more of the comments made today were addressed to Eximbank. What I am worried about is that I can sit and ramble on for a long time about the problems with Eximbank and beyond Eximbank, but I do not know that it will get us anywhere. I think those who have been out in the field and have encountered the Japanese notice that they come in well prepared. You get the idea that their government is doing a considerable amount, and doing it fairly effectively, not only the financing. But what you have to keep in mind is that here in the United States there is not a political constituency looking at exports. The United States continues to look at a very large domestic market, and the concern on the political scene tends to be housing projects in St. Louis. So, there has to be a change there if you want to effect some changes at the very practical level of the things that have been discussed this morning.

After all, Eximbank is probably involved in no more than eight or nine percent of our total export picture. When you look at comparable government agencies in other countries, that is on the order of 30 percent or greater. It is much more critical to their overall economic performance, so they do it. I think that affects the attitudes.

With respect to the comments regarding medium-term financing -- on what dollar amounts get what type of support and the direct assistance to the actual user -- you have hit on a very good point. This problem has been around as

long as I have been associated with Eximbank. Major companies that sell construction equipment are constantly after us to see what we can do in the medium-term, or if we can provide a loan directly to a government. At this point in time, Eximbank has not seen fit to do that.

There are a couple of things at work here, and I think there is a good deal of relevance to them. First, as I mentioned earlier, the Bank operates to supplement private capital and not to compete with it. That is why you find us often trying to rely on indirect forms of assistance, such as guarantees and insurance, and holding back in terms of the loan programs, or at least positioning a U.S. commercial bank in the middle of it. That is an approach that Eximbank has taken, that the Congress has advocated, and one that we will continue to take unless there is a substantial change in attitude. I think that is why you find us not getting directly involved, with the exception of the long-term credits which tend to be multi-million dollar deals.

The other aspect is the fact that Eximbank has been charged to counter the subsidization that you find in international trade. In doing so, the effort here is more of a macro approach. That is, things are only going to get worse if Eximbank is out there feeding red hot dollars into the process. If you think the competition is bad, you can imagine what it would be if open warfare took place with respect to credit.

On the more practical level, some advice that I could offer would be in terms of your sales efforts overseas. As much preparation as you can do before you go is going to pay off. That is, getting to know Eximbank, and what is available, and what the problems may or may not be with respect to certain transactions that you are looking at. I think you can do that.

Second is a very critical problem. Again, we want to supplement private capital and we want to have U.S. commercial banks involved. It is difficult, I understand, with the smaller businesses, no question about it. But to the extent that you could find the bank that is going to give you the assistance, it is very important that you do that upfront.

As you can imagine, it is the major U.S. banks who have the expertise and resources to help you. They want a million dollar deal before you can even get in the door. But there are second and third share banks that can serve your needs. We cannot indicate which banks they are, that is not quite fair in the process we use. But, to the extent that you can do some work, and find those commercial banks that really have the expertise and know what they are doing, it will simplify that process. It will not be a four- to six-week process, with you not even getting them to come along on the deal.

I guess the last point I picked up, and I am not sure what can really be done about it, is that I hear from a lot of marketers about how they want to market. Perhaps you really should look at the question of finance types, using resources within your house to give you the assistance to build a little bit of in-house expertise. This is particularly true if you have gone this far, only to go out in the field and find out that you can not put the deal together financially at the last minute.

This is not peculiar to you. We have seen large companies that have large sophisticated financial groups and teams, and even they encounter this difficulty. But, these may be some practical points that would be useful to you.

MR. PHILLIPS, DOC: There is an area within Commerce where we desperately need assistance from industry -- the commercial service offices overseas. As most of you are aware, the commercial offices in the embassies began reporting to the Commerce Department rather than the State Department about five years ago. Since that time, we have met one of our goals, and that is to replace those people, or staff those offices, with foreign commercial service people who have come from industry. At least half of them are from industry, but not an equal amount from your industry.

Whenever you go to a country, please call on our embassy, please call on that commercial officer, and help him become educated about your industry. Call for his assistance; if you do not get it, if you do not get what you want, come back to us here in Washington and tell us. You can make some progress toward doing that by tapping into our offices here in Washington before you go, particularly if you have a specific project. If you contact the Office of Major Projects about what project you are following, they can make the arrangements and appointments for you with the commercial officer and with a representative of the government in the countries that you want to visit, so that your time there can be utilized more efficiently.

When you ask for that help, we ask for you to come back and tell us when it has not been effective so we can improve that service to you.

MR. VANDERRYN, AID: Let me go back to the comment I made at the outset with respect to hardware demonstrations. I agree that hardware demonstrations are important. People need to be able to kick the tires to get some real experience. However, if we are going to see widespread application of this technology in the kind of countries that we work in, the demonstrations themselves are not enough. One can demonstrate, but if we do not tie in with the local authorities, utilities, individual homeowners, communication organizations, local manufacturers, or financing organizations, we are not going to make the impact that needs to be made.

The U.S. industry needs to work with us, not only in putting up hardware demonstrations, but also in assuring that the institutional structure in the developing countries is such that if this demonstration is successful, and we assume that it would be, then there is going to be a multiplier effect.

That is the important aspect. It has to make a difference to economic development. That means not just putting up the demonstration. It means doing all of the homework that we need to do, that the industry needs to do, and that the various authorities in the developing country need to do in order to assure that the results of that demonstration are going to multiply and are going to make a difference. That is where we need to work together.

MR. NAFF, HUGHES AIRCRAFT COMPANY: Mr. Vanderryn, may I make a comment to that please? Notwithstanding what you said, I certainly concur with it, but as you pointed out yourself, a very small number of projects overseas are involved in photovoltaics. A very large number of the projects that do go overseas have power in them, mostly diesel power. Would you consider some formula that would mandate some of these overseas projects to be powered by PV and supplied by U.S. industry. This would assist in getting a little more exposure in the overseas marketplace. Of course, this implies that the system is economic on a life-cycle basis.

MR. VANDERRYN, AID: I will be very clear in my answer; the answer is no. We are not in a position to tell a developing country what kind of energy sources they ought to use. It is our job to look--help them look at the various energy sources that are available, help convince them, if you will, that PV makes sense in certain applications. But, I do not see any justification for mandating to a host country that is responsible for its own decisions, that we will go with a certain energy source. I do not think that makes any sense. I think it is counterproductive in terms of your industry to do that.

MR. COLLINS, DOE: I think, unfortunately, we are really at a great take-off point. I hope, and I know, that this will extend into lunch. I think we can pick it up this afternoon as part of the process. I know that my job within the working group is going to be focused on the things that were brought up this morning by the industry group.

I want to congratulate both the industry panel and my government colleagues for what I think was a full and frank exchange.

III. OPPORTUNITIES FOR GOVERNMENT ASSISTANCE

OPPORTUNITIES FOR GOVERNMENT ASSISTANCE

WILLIAM A. DELPHOS, VICE PRESIDENT FOR OPERATIONS,
OVERSEAS PRIVATE INVESTMENT CORPORATION

Let me start by telling you that it is very easy to do business with government agencies. What I hope to do is to show you, in a little different way than you are perhaps used to, that information, marketing leads, financing, political risk insurance, or judging a feasibility study for a product -- the whole nine yards -- is available from the federal government.

But, I want to caution you. Do not go out on an agency-by-agency, department-by-department, division-by-division and unit-by-unit hunt, because you will not leave Washington for a year and will not have even scratched the surface. Let me give you an example. A year ago we bureaucrats did not even know what the products were in our own store. So, how on earth could you ever think that you could come here and find these products and services yourself? That is caution number one.

Think of it this way: Imagine walking into your supermarket this evening and the aisles were labelled, Proctor and Gamble, General Foods, Beatrice, and Del Monte, and you were looking for chunky-style peanut butter in a reuseable plastic cup. I do not know about you, but I would go to the supermarket and be lost without someone in front of the store to help me. Which aisle do you begin with? You would just go searching.

I dare say that it is not too different than when you come to Washington to see the DOC, the DOE, the USDA, OPIC, Eximbank, TDP, AID, and SBA, to name just a few, and look for feasibility study assistance. I mean, these are only eight agencies that we have found so far. There are 21 different ways for you to finance the deal, and hundreds and hundreds of market reports. I suggest to you it is a thankless task, but we bureaucrats have to try, and we have tried to make it easier for you.

Unless you know that the Department of Agriculture and the Department of Commerce have 21 overseas offices that you can use as your office away from home for \$50 a day or less, complete with secretary and telex and interpretation services, you would probably never take advantage of that service. I have spent more time in places like Egypt than many of you. But I am sure that those of you who have been in lovely downtown Cairo and tried to use the Nile Hilton as your office away from home, can appreciate the luxury of knowing where you are going to be and how your office can reach you once you get to your destination.

On the commercial side of the federal government, not including Defense, there are 75,000 people who have something to do with international trade and investment policy. It may not be 100 percent of their job, but that is a big company, with billions and billions of dollars in available funds.

Today, we are going to talk about Washington's best kept secrets, that is, the programs and services available to assist you in exporting. And believe me, these programs did not get this title without working very, very hard at it, because they are secrets. In fact, they are even secrets to many of the

people within the agencies themselves.

What we are going to do today is go on a hypothetical shopping trip to a unique store. Let us call it Uncle Sam's Supermarket. What we will do is try to go through some of the aisles in the store in a logical way -- in the way that business people would go through; not by the way the government is organized -- and try to do it along the time line that one might use on an international endeavor. Now, just because I am here from OPIC, I am not talking strictly about investments. We will even pull out a few of the available products, read the fine print on the back of the box, and maybe even share some of the experiences of some people in your industry and some anecdotes of those in others. You will see that many of these products do not cost a dime.

Let us get started. I want to take you through the export services of the federal government supermarket, focusing on the following aisles; the markets, opportunities, planning the first trip, feasibility studies, regulations and requirements, financing, protecting the deals, and training, advice and assistance.

The Markets

We will walk in the first aisle of the store and talk about the markets. I think if you look at the market aisle, you will see that the products are broken down into three shelves: global information, industry/commodity information, and country information.

If I am going to start with a hypothetical illustration, maybe the best start would be the global approach. When we were getting together with our sister agencies, putting this whole program together last November, we were all astounded with the hundreds of reports. So, we sent an intern over to the Government Printing Office, because that is where they are all sold. Of course, you ladies and gentlemen all know that; you call up there regularly. We went over, and we went down a dark corridor and knocked on the screen and asked, "How do these sell?" The response -- not well.

I said, "What if we came along and offered to buy them, but we are not going to give you our working capital. We will take them on consignment." "That's okay. If they're going to go yellow on our shelves or yellow on yours, it really doesn't matter." So, we put them together in international kits, organized by countries.

You are looking overseas. You do not want to spend \$99 on phone calls trying to find all of the appropriate reports that might be available to you about China, Colombia, and other markets that might make sense. You can get them through one-stop shopping. Now you can get a starter kit.

And just like our admissions, we mark them up. Somebody has to pay for the packaging. They are available. They are still too low priced, they are all in one place, and you can get them for countries and regions. Not a bad place to start, and a pretty simple way to do it. It combines not only the reports from all of the government agencies, but also some of the international ones from the United Nations. So you are not just talking about information that is coming from 75,000 people. You are talking about information that is being pulled from hundreds of thousands of people, both here and abroad.

That is an example of just a few little things that come in a \$15 kit. You get the business and economic information package on countries and regions.

There are kits on ten regions and over 100 countries. A simple way for you to get started. A typical kit costs \$15 to \$20. The regional ones may range between \$55 and \$175.

Here is something I will bet that most of you have not heard about. It is called the "pink book." For about the same cost as your local newspaper, five days a week, on microfiche or hard copy, you can get excerpts on business, economic and political conditions in all the Latin American countries daily. Now, I could think of some banks that might find some of that information useful, but I suppose if I were looking to explore an opportunity, the pink book might be a useful resource, especially if I had some investment, inventory, or contracts there. Simple, inexpensive, excerpted for you by our friends in McLean or Langley, VA, and sold through the Commerce Department. They are available for other regions of the world as well.

Enough on the paper resources. We are just going quickly through the store. I wish I had time to go through the hundreds of products and services available from the government, but we do not, so I want to whet your appetite and then hopefully share with you some interesting experiences.

For example, "The Government Experts" are an overlooked resource that you should take advantage of. In my three years here I have been astounded with the level of expertise of some of the people working in our government. You are just not using them. So, in that sense, they are under-utilized.

Next is applied information on an industry. You may not be able to find how many hose and coupling assemblies are needed in a country. But if you go to the agricultural equipment and some of the truck parts, you can back count. You know how much of X goes into every Y out there, and I suggest that maybe some of these things are not too difficult in terms of judging potential markets for your firm.

How many of you use the 30,000-person army at the Department of Agriculture for market information? That is great. Two out of about 100? That is what I am talking about -- applied information.

The studies and people resources expert on irrigation requirements can save you an awful lot of time and money. Rather than running off to the airport and jumping on the first plane when you hear about an opportunity, there are many things that you can do right there in your office, from your arm chair, using the phone, using the mail intelligently before you go over and spin your wheels like I have, and probably, as many of you have done in the past.

Targeting Opportunities

Let us say you have become accustomed to an industry and you want to identify some specific programs. Let us just call this aisle of the store, "targeting the opportunity." We have identified a market -- maybe it is the Middle East -- and now we want to start to target some areas. I am going to go over some things you probably know. In the area of targeted information, there are publications and information systems that can be utilized, and they are improving. For many of the trade leads, the deal was done before the pouch arrived in Washington from the foreign post. The inventory of trade leads was so outdated that you just got tired of looking through reams and reams of material.

They are improving. We are finally looking at some of our home technology and putting some of this stuff on-line, right from the foreign post through to you. So, there is on-line information.

Customized services. You may have heard of the agent-distributor program. I think it costs \$90. You can have an exclusive search done for you to identify six potential foreign agent/distributors for your product or service. They will even give you background data on these contracts. That is much better than going into downtown Cairo and trying to look for an address.

There is much you can do from home. You can check out bank references, and you can even have a couple of telex exchanges because you have identified a contact. That might not be the right person, but we all know how small the business world is. Look at your industry. I heard somebody say there are only 100 people in the industry, and you all know each other. That is not so different from many of these emerging country markets. It is not so different from some of the business opportunities right in the United States.

There are things for minority businesses. There is something for everybody, big, small -- personal help. How about free legal advice? Free legal advice for first-time businesses looking to go overseas. Maybe you do not understand all of the implications. Lawyers can be expensive. This is provided on a grant basis from SBA.

Do not get misled because of the word "free." It is free because the government has not yet fully recognized that if they charge a price, you might take some of these things more seriously. So, I suggest that you hop on the free bandwagon before the government starts charging for it.

For example, there are student intern programs. We use 30 of them on an ongoing basis at OPIC. We are a small agency. We increase our manpower by 30 percent by using student interns. Through programs within a couple of agencies, the student interns are paid to come and grind and grunt through a lot of the available government information for you, whether it is the pink book or the stack of kits on the Middle East. They may pick and choose with a little direction from you.

Planning the First Trip

Let us move on. We want to take our first trip. We spent \$185 and about a week and a half of time in our office in Arizona. We picked the market, we found some folks, we got a couple of telexes going. We are talking about a service contract, maybe a little export, and we have checked out their bank references. I guess it is time to go.

One thing you might want to do before you leave is to contact some more of these experts. Maybe they can tell you a few things about how to act in those countries. Maybe they can tell you about some of the recent events, something that was not in the report written three, four or five months ago.

Therefore, you might want to reserve one of those offices for \$50 a day. After all, you have got the telex and the use of telephones. You do not have to wait an hour and a half in the hotel room to get a line to call overseas, and your office knows how to reach you. It is not a bad way to do it. There are a lot of ways to go overseas.

I am sure that most of you know that there are things like reconnaissance grant programs that pay for your first trip. There are also ways to go with groups, such as a group of folks in your industry.

As an example, let us look at the OPIC mission program. What do you get out of it? What we wanted to do was go over and do some business, make some deals and show some results. We did this for very self-serving reasons. We wanted to do more business; and if you do not make a deal, we do not sell you insurance. We are not the only ones that run this deal. But there are some advantages to going with Uncle Sam, whether it is in OPIC, USDA, DOE or DOC. You are going to meet a different level of people. You are going to save some time. I think folks that have gone with us in the last couple of years say, "Hey, you saved us six to 18 months. We didn't do a deal, but we want to say, thank you, because you saved us a lot of time, and now we're able to move on to someplace else."

If you can time your trips to coincide with something else that is going on, I would suggest you take advantage of it. There is a lot going on all of the time. This is one little agency, and I mentioned the results are there.

Seventy-eight to eighty percent of the firms that are going on missions with us are finding possible leads. We have gone back and reviewed the results, and we are finding out that one out of four firms that are going with us are ending up with investments. Now, for an investment, that is pretty good. Just think, if you could go on one with DOE or DOC, and one out of two or one out of four were striking a new trade deal, we would be moving pretty fast.

Before we get into the reconnaissance area, let us see what is happening. Let us go back a couple of years to a little experiment that a few agencies conducted. What if we had an investment mission that never left home. A mission in which people could spend a couple of hours in their own city and see almost first-hand whether they liked what they saw, and whether it looked like it made some sense. It is not the money, it is the time. So, we tried something and we dubbed it, Telemission, a videotape that described the business climate in Egypt.

We took two groups, followed up on those target industries over the following six months, and now, two years later, I can tell you that whole effort more than paid for itself. We just completed one of the first two loan agreements for companies that were part of Telemission. There were about 850. We took two groups of about 15 or 20 afterwards. We have written about \$45 million in loans, and we saved a lot of companies an awful lot of time. They got a feel for what was going on in Egypt in some targeted industries. I suggest that you look at some of these creative and new ways to take advantage of what the government has to offer.

We said that there were other things in this first trip aisle, and I mentioned that there were reconnaissance trip grants of \$5,000 for firms outside the Fortune 1,000. The application is not very cumbersome. It is a simple two-page letter stating that you have not been there on business, and that you are looking to go over and do a particular deal. There are other programs like that in agencies such as SBA.

We will go now to things like the Export Market Service Program that will allow you to save some of your debt capacity. I know many of the emerging companies in this industry are growth companies that tie up debt capacity on an export related project. That can get pretty expensive. There is money sitting between two agencies for revolving lines of credit up to a half million dollars, but it is not grant money. If you are tying up your balance sheet to do some extra things, you might have to wait. Or, your banker may say you have to wait, if it were not for some of these export-incentive type products available from the government.

They are not just for taking trips or for market information. They can be used to pre-produce products or maybe predesign something for straight sale, or for a distributorship arrangement overseas. A half-million dollar line of credit can go a long way, especially for a company in the emerging stage.

Feasibility Studies

At this point, let us say we have gotten our market information. We have targeted some opportunities. We have taken a first trip, and we have come back. I think most of you probably would want to judge the feasibility, whether it is an investment, a straight sale of technology, a sale of product, or something in between. We will call that a transactional investment. When the Export Trading Company Act came in, everybody came from out of town. Businessmen and women fell in a big gully between our friends at Eximbank and our friends at OPIC, because this legislation is great; but there are no products behind it. For example, where does an export end and an investment take off?

We are going to come back to that later because there are ways that you can get started overseas without building the plant. There are ways that you can compete in the markets overseas. When you get off the plane and you have an "E" on your cap for exporting (not energy) you do not get a warm greeting. They say, "We don't have money to pay you." There are ways to skin the cat, and we will get into some of those in-depth.

Most of you, I think, are aware of the TDP Program for large, infrastructure feasibility studies. There are two sides to the TDP effort. One involves half million dollar feasibility study programs, and the other is for specific company projects. Two out of the nine feasibility study programs are in TDP, and the others are located at five other agencies.

Typically, these feasibility studies are specific cost-sharing projects. We want to see you put up a little, and we will put up a little, as you will see if you spend the time finding out some of the eligibility areas. Before you go, call on the TDP office, the OPIC office, or the SBA office, and find out a little bit more about what there is and how you can use it. You would be saving yourself, and some of us that have jobs to do, from doling out all this money.

We want to see firms that have been in business, that have a track record, that can support up to this much investment or this much of an export or a service contract. We want to see this much payback, whether it is 75 times the amount of the study, in the case of TDP, or others that do not have the strings attached. Are there funny strings that get attached? You all must know how to match up with AID's developmental mandate. What is a developmental mandate?

In some of these studies, for example, you have to pay attention in your proposal to the environmental impact it might have on a country. For example, people have come and said, "Honduras doesn't have any environmental/EPA laws. What are you talking about?" Well, not that governments should play policeman, but Congress has said to us that there are certain things we can and cannot do. So, I suggest that you learn about some of the nuances of these programs, and in that light I want to ask Charlie Sills from Intersol Power Corporation to say a few words about some of the things that he has learned in his first experience with TDP.

MR. SILLS: I will just say a couple of words about the experience that John Sanders, president of Intersol Power Corporation, and I had this spring on the TDP prefeasibility mission to Tunisia.

One thing that I think we all have to constantly watch for is the special emphasis that some of the U.S. Government agencies chose to put on certain countries and regions. These can look random, but they come through political initiatives by the U.S. administration and special requests by the countries involved.

For example, the generating drive for this particular mission and TDP interest in Tunisia was the fact that the Tunisian government needs to help its balance of payments situation, so it needed money from exports. While the Tunisians realized there were approximately 300 French companies with subsidiaries or joint venture operations in Tunisia, many of them exporting and making money for the Tunisian balance of payments situation and creating jobs, there were only two American companies there. The result was a drive to get U.S. companies to come over to see if they would like to invest in and participate in Tunisia in an export free trade zone. That is what generated the mission.

The mission took about 26 American companies. We were the only solar company in the mission. In other words, this was not geared in any way towards any particular industry sector. Almost every company was in a different industry sector. There were fisheries, computers, agribusiness, and so forth. The only way that any photovoltaic companies can keep up with this opportunity is to keep in touch with some of the agencies, find out where the emphasis is, and what missions are being planned. That is really the way it happened.

We went over there, but we would not have been successful in any way had we not been very specifically prepared for the situation in terms of what we wanted to do there. We already had a basic outline, an industrial plan for setting up a photovoltaic factory to produce the kind of concentrating modules that we design and produce. Before we left we did not, of course, know the specific labor conditions and costs in Tunisia.

During this two-week period, we found ourselves in an escalating series of very rigorous interviews and discussions, not only with Tunisian government officials and the Tunisian Central Development Bank, but also with the other banks in Tunisia: the Kuwaiti, Katari, and Saudi-Tunisian Development Banks. That is where Tunisia is getting most of its capital funds to put into these development projects and these ventures. They are coming from the richer Gulf Arab states.

This is very good from a market point of view because if one of these joint ventures works out, then presumably the money generated is repaid to the Gulf State Banking Group, which will create an incentive for the Banking Group to use their local marketing network and to help expand the market for your joint venture in Tunisia into the export market.

So, we were really not looking to make products for the Tunisian domestic market, which is not that big for photovoltaics at all, but for the whole Mediterranean, Middle Eastern, and Arab-Gulf region. We found ourselves, luckily, not having to compete with Germans, Japanese, Italians, or French, because this was exclusively an American TDP mission. On the other hand, we were really up against having to prove our photovoltaic project, as opposed to a computer project, a hypodermic needle manufacturing plant or that sort of thing. We had to be convincing not only in terms of believing there is a market in the local region to support exports from Tunisia, but also in terms of believing that a photovoltaic factory makes at least as much sense as a hypodermic needle or a fisheries equipment factory, or something of that sort. Again, you have to be prepared to justify photovoltaics as a viable local joint venture industry.

After the mission, it turned out that about 11 of the 26 companies did get provisional confirmation from the Tunisian government, and Tunisian banks, that eventually funding would be available for the joint venture. But, there is a missing link here, and that is the feasibility study phase to prove definitively that the market does exist for the product that you want to manufacture in Tunisia.

What is happening now? At least with ourselves, we have been invited by OPIC to submit an application, which we have just done, to obtain partial funding/cost-sharing for a feasibility study to prove out the market, meet again with the Tunisians, have final discussions with the prospective joint venture partners, and then submit this study to the American and Tunisian committee for final approval of the joint venture. There is that missing link. And, in this case, if the funds are available, they will be available partially from OPIC, although TDP was the original agency that took the companies over for the reconnaissance survey. So again, you really have to follow through and keep up with the different agencies and find out what they are doing.

I will say that the conduct of the mission by TDP was superb. We really did meet the right people in Tunisia; it was very targeted, even though it was not a photovoltaic mission. Maybe in the future there will be something like that. But, we had to come up against the criteria of the local banks, and we really had to prove our product and our ideas against other competing industries.

Thank you, Charles. See how easy it is. I am not supposed to give any clues or hints as to how you access some of these programs, but let me share one with you. I suppose if you were going to go on one of these government-sponsored missions, it would make some sense to go with one that wants to see you move forward. One that has some goodies, like feasibility study money, to help you take that next step. There is nothing wrong with that. We are taking you over there not because we are looking for things to do. We want you to win overseas,

and we want you to make money. I mean, if you make money, we make money.

Let me put it this way: there is a built-in incentive on the part of some of those agencies that have some of these follow-on products to want to see you go forward, and I tell you, probably about half or 60 percent of OPIC's feasibility money goes to firms that go on investment missions or have taken advantage of our reconnaissance program.

Do not wait until you have to get the financing for your \$25 million dollar project to become introduced to an agency. Go in the earliest possible window along the time line. Go in even if it is just for market information; finding an opportunity through one of the data, trade or investment matching services; or for identifying folks that are going to help you take that first trip or judge the feasibility. Get in there early. Keep using it. They want to keep pushing you forward. As in the case of Intersol, we want to keep pushing you down the pipeline, so you can make some more money. Do not wait until you need the big bucks to get started. Start back here with easy stuff. Start with the ones that take a two-page letter to get started, because we are going to want to reinforce this.

I think I can paraphrase in about 15 seconds the funny little things that you or I would not think of. You have to pay attention, and you have to ask the right questions and learn how to apply for assistance because otherwise you will get blown out of the water. Do not come in and say, "We don't care about the EPA laws or the environment in Honduras. They don't have any laws." We have to pay attention to that, and there are ways to do it. There are certain things that we are not going to tell you. For example, we are not going to sit there and write your proposal for you. But I would suggest before any of you decide to apply to OPIC for a feasibility study, you call a firm in your industry, or maybe one that is not in your industry and ask some questions. Spend 20 minutes on the phone because it will help you. I would rather have you learn the easy way than have the door slam because you did not take the time to understand some of these things you need to know to deal with the government.

I mention that there are all kinds of feasibility study programs. Typically, these are reimbursable grants for big companies and interest-free and a little bit sweeter terms for small businesses. That is another point. I think many firms believe that all of these programs are for the big companies. The pie is sweeter, and there are more programs for smaller businesses than the big companies. That is important.

Regulations and Requirements

Let us move on to another aisle of the store. You have your market information. You have found that opportunity. You have taken that first trip. You have judged the feasibility study, and you are going to proceed. You have a deal with somebody who is going to import your products, or you have a deal to provide some services, or to make an investment, and you are ready to get going. Let me please suggest that you talk to your tax attorney or your accountant before you get too far into the final stages of any agreement. There are all kinds of trip wires in the aisle of the store called regulations and requirements.

And, in fact, Uncle Sam puts some trip wires out there of his own. You have

all heard the horror stories about sensitive exports? They may be improving; I hope they are. I worked for a firm -- this happened after I left -- that built an electronic plant in Austria. They had their deal over there, and the financing. They even hired 105 people, and the plant was built. This was on some business school pert chart. Everything was perfect. They were bringing the people on, doing a little training. Everything was ready to go, but the equipment got to the dock in New York, and bang. Nine months, \$35,000 a day later. That is Uncle Sam's trip wire. Make sure that you understand the rules and the fine print in the game before you close down your factory here because you made a simple little miscalculation in terms of planning your activity.

Financing

Let us move on to the area that we are going to spend more time on with some brighter people in a little while. It is called financing, and there is going to be a panel that will go into more depth later this afternoon. I have asked the panel to create a couple of hypothetical case studies to show you how U.S. Government loans -- I am not talking about the World Bank and the other international lending institutions and your own banks -- can be packaged to help you make a deal.

We will take a couple of minutes and go through the financing aisle now. You see three sections of aisles that we have touched before. You have the export sale, or the service sale shelf; you have the transactional shelf; and you have the capital asset investment shelf in this store. Each has different time frames, including short-, medium- and long-term. They are not giveaway finance programs. They are competitively priced finance programs, and I do not want to spend a lot of time discussing them.

If I tell you the number of times a U.S. firm has actually lost a sale or an investment opportunity, you will find those examples come down to about 25 different cases in about 15 separate companies. There are only one or two firms that might have ever gotten trapped in something like that. There is a great deal of smoke that we all as business people blow at each other about not being able to compete overseas because the interest rates are too high. There are ways to package this financing.

What you might see is a 12 percent rate because we have to tell you we do not have concessional loans. We have to say that so Bill Brock, our special trade representative, who goes over to the OECD meetings and negotiates to get everybody on equal par, can say, "Well, we don't offer concessional financing rates." However, I am going to tell you that a 12.5 percent, 10-year loan with three years of grace period, and a \$75,000 grant for training your people tacked on the back of a half million dollar deal, works out to be about 8.25 percent. Now, let us not tell that to your overseas competitors. It is how you package it. If you play the game intelligently, you can get the price of doing business over there down considerably.

It is important that you understand eligibility requirements. Meeting these requirements is a little bit more sophisticated than going in for different feasibility study project packages. There are 21 requirements, and the level of sophistication grows a little bit. I will tell you though, in many cases, especially for the small- and medium-sized firms (e.g., up to a couple

hundred million dollar sized companies or divisions of companies that ought to encompass just about everybody in your industry in terms of salespeople), there are things to help you walk before you run. Let us just make a quick analogy. When you arrive in Cairo, through our examples, you meet Abdela, your local partner. He says, "You know, in our telexes we said we were ready to go, but the government will not approve the project unless there is some local content." And you say, "I can't build a plant; we are just getting started." If they will not let you just export, why don't we form a distributorship. We will each put some money in." And behold, there are about three or four ways you can get working capital loans for that kind of project, just as if it were an investment. Only it is kind of an expert investment.

And you get started; you build up a little market. Maybe you even shut the door to some of your competitors when you are cutting your deal with the local government. What do they call it, a franchise? You and your partner now own the photovoltaic franchise, right? That means that nobody else can come in for awhile. You are exporting; you are using Uncle Sam's working capital to get started.

Then you begin training. I know this may not be totally appropriate for your industry, but you train your people on a little bit of after-sales service. Then, if you want to go from there, you start doing some local assembly.

We still have not built the plant. Maybe we will put a power pack together with a generator and some other things. We are going to start some local assembly and grow from there.

I will tell you another secret about every one of these finance programs. We love repeat customers, just as you do. I mean, come on back for more. I do not mean five years later, after paying your quarterly or semiannual interest payment. I am talking about a year later.

As I said, the panel this afternoon is going to get into financing in much more depth. A couple of case studies will show you how to package some of this, and I urge you to probe them and get as much out of them as you can in terms of some of the nuances and some of the card carrying parts.

But again, I would say to any one of you before you walk in that door at Eximbank, call up Malcolm Ream or John Corsi of Solarex who have obtained PV financing from Eximbank and ask them, "Tell me, how does this work?" If they do not want to tell you, call up the loan officer at Eximbank for the part of the world that you want and find out who in business, not just your industry, they have done loans for.

Tell Eximbank that you are not sure that you want to borrow their money, but you want to find out if the agency is really as good a lending institution as it portends to be. Tell the agency you want a few case examples and the names of some of its clients. If you do not want to be that brash, then just ask the agency to send you the annual report and pick a few customers off and call them up and find out. Do not come and spin your wheels picking the wrong product because the fine print did not tell you that it just did not work for you, or that it did not make sense to the particular project that you had in mind. Again, there are many things you can do from your arm chair in your office rather than coming to town and spinning your wheels. It goes for every one of the agencies in the store.

Protecting the Deal

There are risks that you are certainly going to want to protect against. You may cover them through assistance from several agencies such as the Eximbank, OPIC and others, with certain financial guarantees. The private sector will offer you protection against certain unusual risks. But they are not just for capital investments, medium repeat term policies, or single buyer transaction policies from Eximbank, OPIC or the other agencies. You are there for some of what I call the gully areas. Where does an investment start and an export end? What about leasing? Is there a possibility to lease some of the products in your industry? I believe that getting the money from someone up front might be kind of hard for a big installation or piece of equipment. Maybe a distributorship is not going to work, but what about a leasing transaction? There are programs built into financing that we address.

And what about insurance, for example, providing insurance for a transaction against currency inconvertibility, war, revolution, insurrection, and/or civil strife in a country. Or you may need insurance for offshore leasing companies or protection for both equity investment and direct loan components. This is available, and inexpensive, with OPIC coverage costing only 30¢ for every \$100.00.

I am going to just briskly go through insurance offerings. Let me suggest to you that it is probably a wise investment, whether you buy it from the private sector or from a government agency. It is peace of mind. These programs are available in most every country in the world when you combine the resources of the private sector. And, they are available not just for the sale of technology, financial lease transactions, distributorships and capital asset investments. There is also medium- and long-term protection for contractors. I have heard complaints such as the government does not do anything for the service industry and that is where the growth is. The service industry is starting to take advantage of some of the opportunities overseas, and we at OPIC are starting to design products and services to help them, both from the financial standpoint and from the risk protection area.

If I described all of the available insurance programs, you would be an expert and could come and take my job. They are not difficult programs. There is nothing fancy about political risk insurance. You may not understand the contract, but I think all of us in government are trying to do something called plain English contracts so that you do not have to spend more than the annual premium to figure out what you bought.

Training, Advice and Assistance

Now we have completed our deal. We are up and running. But there is a final aisle of the store; and we will call it training, advice and assistance. I think I mentioned in discussing distributorships how you get down to 8.25 percent interest, and I think I threw something out like \$50,000 or \$75,000, which is available from AID, OPIC, or other agencies in terms of training grants to help firms get started.

For example, someone built an isolated operation in Peru. They had about 80 employees. The only large medical facility was all the way in town, ten

miles away. A small \$75,000 grant to help provide medical service really decreases your cost of getting started.

A large company, American Motors, got all set up, ready to build Jeeps in China, and realized that all of their instruction manuals were in English. What were they going to do? Were they going to translate it into Chinese or teach them all English? Well, they got a \$75,000 grant to help teach English to their local employees and others in an incremental fashion.

As an example of this in action, a ceramics factory had a tremendous problem in the Philippines; they found a specialist in Buffalo, New York, who had run some plants. He went over to the Philippines and worked shoulder to shoulder with the local employees. His work over a four-month period meant a doubling in sales.

I can show you all kinds of success stories. They went to 100 new employees from a base of 60. It is there. Uncle Sam is paying for it. You cannot use the same excuse that Frank Perdue used when we said, "I don't expand overseas because I don't have the people resources." There are even ways to leverage on your own teamwork and your own team here at home.

Conclusion

So, there you have it, a pretty complete and full supermarket. We have barely had time to open a few of the products. There are hundreds of them in Uncle Sam's Supermarket. As we finish up with training, advice and assistance, and as you leave the store, your basket can be full of market information, ways to target opportunities, and ways to take the first trip on your first reconnaissance meeting. These programs can help you to judge the feasibility and find ways to watch out for some of those trip wires in that aisle labeled regulations and requirements. You have numerous ways to help finance and protect your overseas business venture once you have gotten started. We really do want to see you win overseas, and that, after all, is what Uncle Sam's Supermarket is all about.

I have enjoyed having this opportunity to share with you some of Washington's best kept secrets.

IV. SPECIAL FOCUS ON FINANCING

- A. Government Financing Program Review
- B. Question/Answer Session

A. Government Financing Program Review

ROBERT DRAGGON, MODERATOR
ACTING VICE PRESIDENT FOR FINANCE
OVERSEAS PRIVATE INVESTMENT CORPORATION

I am very happy to be here. I guess this is the wind-up session. We will try to keep you awake.

I would like to introduce the speakers and the panelists in the order that they will give their presentations. We have Bruce Bouchard who is the policy officer for the Bureau of Private Enterprise, Agency for International Development; Richard (or Dick) Dutton who is a senior loan officer with the Export-Import Bank; Dennis Chrisbaum from the Small Business Administration; Joe Sconce from the U.S. Trade and Development Program; and myself representing the Overseas Private Investment Corporation.

Presentations on the "how-to" aspects of export and investment financing will require about ten minutes per speaker, with questions and answers to follow.

I have a few introductory remarks. First, I think you will find today that there is a heavy emphasis on assistance for small U.S. businesses running through each of these programs. Second, the programs discussed today should be looked upon as complementary programs. You can access one or more to get the job done in whatever project you are undertaking. Finally, the services and assistance run from pre-export or pre-investment, such as feasibility study assistance, through financing for exports and investment both short-term and long-term. It is sort of a potpourri, but as I said earlier, they should be looked upon as complementary facilities. When you approach one of the agencies, you should be sure to ask what is available at one of the sister agencies, as well.

1. AGENCY FOR INTERNATIONAL DEVELOPMENT

BRUCE BOUCHARD, POLICY OFFICER
BUREAU FOR PRIVATE ENTERPRISE

What I would like to do today is spend just a few minutes talking briefly about AID in general, and then spend most of my time talking specifically about the Bureau for Private Enterprise (PRE), of which I am a part. I will then return to make a few closing general comments about AID.

As you heard this morning, one of the real difficulties in trying to deal with AID is that it is a highly decentralized organization. Much of the decision making on how resources are allocated and what they are going to be used for are made at the country level, as a result of bilateral negotiations that take place between the AID mission and the U.S. embassy on the U.S. side, and the host country government on the other side.

It is difficult, if not impossible, to go to one place in AID/Washington and find out what is going on in a general sense in the photovoltaic or any energy area throughout the organization. In fact, in taking a look at the resource book on federal export assistance for PV handed out today, there were a number of things that I learned about AID myself.

With regard specifically to the Bureau for Private Enterprise, this is a relatively new organization within AID. It was created about three years ago in response to the President's initiative to try to encourage more private business involvement in developing countries and was given a twofold charter or mandate. The first was to try to experiment with private enterprise, both here in the United States as well as in developing countries to see if there were not some ways that we could collaborate to encourage economic development in those countries where AID has programs. The second part of that mandate was to try to spin successful experiments out to the rest of AID, so that the AID missions of which there are about 65 or 70 worldwide, could then pick up on those kinds of experiences and develop similar types of programs and projects that incorporate private enterprise in the delivery of economic assistance.

I should mention to you that PRE is a relatively small one when you compare it in size to the rest of AID. It is a mere speck in the total foreign economic assistance package. Our annual budget in any given year varies from about \$25 to \$30 million dollars, which when you compare it to a total foreign economic assistance package of several billion, you can see that it is very small indeed.

And, I think there are a couple of reasons for our small size. Number one, the Bureau was designed, as I mentioned, to be small, highly experimental and innovative. It was also designed so that the bulk of resources would continue to be allocated to specific countries and programmed jointly by AID officers and host country officials located in those respective countries.

The \$25 or \$30 million budget that we have on an annual basis is divided into two major component parts. I would like to talk a little bit more specifically about those component parts, because I think there are two principal programs that we have that might be of interest to you, and which you might be able to access.

About \$15 to \$18 million a year is used for project financing, and I will come back to that particular subject. The remainder of it is used for technical assistance. Part of the technical assistance program that we have is a feasibility study program. Let me address that specifically.

Our feasibility study program is a relatively small one. We allocate on the order of \$500,000 to a million dollars for it, and it focuses on trying to identify and promote joint venture business investments between host country investors and U.S. investors. We participate in the cost of the feasibility study up to 50 percent or \$50,000, whichever is less. So you can see that we tend to focus on the smaller types of investments.

One of the requirements for participating in that program is: a tendency to focus on three or four of what we consider to be high priority sectors. Those are agriculture; health; the creation of new, intermediate financial institutions; and the energy sector, which we are just beginning to look into.

Secondly, any potential investment has to be able to demonstrate that it is going to have a substantial development benefit for the particular country involved. And when AID talks about development benefit, it refers to such criteria as the creation of additional employment, the generation of foreign exchange or the savings of foreign exchange, the transfer of the technology, or the transfer of managerial skills. These are the kinds of things that are going to contribute to the economic development of that country.

Thirdly, there must be some local equity participation in the deal. The reason for that requirement is that one of our overall objectives is to try to encourage local business development. We think that a good way of doing that is to require that any investment or feasibility study in which we participate has an element of local participation.

The way the program works is as follows: For feasibility financing requests, once we have received information that we need in order to make a decision on whether or not we want to go forward, we then communicate with the AID office in that particular country. We get a reading from them as to who the local investors are, whether or not the potential investment is consistent with the overall development plans and objectives of the country, and whether or not the AID mission would support that kind of investment. If we get a positive response, we then go forward and participate in the study. Generally, however, we provide no up-front costs. It is entirely on a reimbursable basis. That is, once the feasibility study has been completed and submitted, and a determination has been made that it adequately demonstrates whether the potential investment is or is not viable, we then reimburse for 50 percent of the costs, up to \$50,000.

If no investment takes place, or if the feasibility study determines that it is not a viable opportunity, then there is no further commitment on the part of the project sponsors. On the other hand, if an investment does take place, we then negotiate an arrangement over a period of time depending upon the nature of the project. Under this arrangement, the sponsors are required to reimburse us for the amount of funds that we put into the feasibility study. In addition, we like to have the opportunity to participate in the financing of the deal, and that is the second major program that I would like to talk briefly about.

As I mentioned, in any given year we have between \$15 and \$18 million to allocate to project financing. We have a relatively small staff which means that in any given year we only do between six and eight projects. We have only three or four people who are working on this particular activity. It is all centrally located here in Washington, so we end up doing a relatively small number of deals.

The requirements for the investment program are similar to those for the feasibility study financing program; that is, there must be some local equity participation, and there has to be a demonstrated development benefit for the country involved. We will provide up to 25 percent of the total project costs or a maximum, generally, of \$2.5 million. The reason, once again, is that with our relatively small budget, we tend to focus on the smaller types of business deals. We like to spread it out as much as we possibly can.

Let me talk just briefly about the terms and conditions of the financing that we do offer. It is unlike traditional AID project financing. First of all, the remainder of AID's resources generally flow from the U.S. government to a government agency in the particular country in which the project is involved. Decisions on how to allocate resources are made as a result of negotiations between the AID mission, the U.S. embassy and the host country government. Our resources, on the other hand, are completely outside of the AID bilateral program. Essentially, they flow directly from AID to the private businesses involved. Generally, we like to have a major portion of our portfolio flowing into or through other intermediate financial institutions. The reason is that we are a U.S. government agency. Should we participate in a business deal for a developing country on a loan basis, and for one reason or another that particular business deal should go "belly up," all of a sudden Uncle Sam ends up holding the assets of a private business activity in a foreign country. Not only could it be a political embarrassment, but what does Uncle Sam do with the assets of a private business activity in a foreign country? For that reason, we always like to work with another financial institution either directly or indirectly in packaging the deal to which we can provide our funds.

With regard to the terms and conditions of our lending, generally we quote an interest rate that we consider to be the cost of capital to the U.S. government on a rough order of magnitude. If you were to come in and say, "I need five year financing," we would go and see what the average yield on a five year treasury bill was and that would be about the interest rate that we would quote.

However, we are a development agency, and there is a degree of concessionality, and that concessionality generally is in the term. We will provide a five, eight or ten year term, depending on the nature of the project and its payout. And indeed, we will consider grace periods on repayment of principle.

Once again, the priority sectors for the financing program are similar to those for the feasibility study program, and include agriculture, health, recently energy, and as I mentioned, intermediate financial institutions.

Those are the two principal programs that PRE has that we think you might be able to access.

Let me turn now for just a minute to talk a little more generally about AID. The one program that offers potential for you business people, I think,

is the Commodity Import Program that AID has in a number of countries around the world. Under those programs, AID provides resources to those country governments on a negotiated basis. There generally is a list or a series of product categories under which those resources may be accessed by private businesses in those countries, in order to get foreign exchange to import equipment, supplies or systems.

Unfortunately, those agreements are negotiated on a bilateral basis. The best that I personally could do for you in terms of providing guidance would be to give you a list of those countries in which we have those programs. Fortunately, there are people in AID/Washington who tend to keep pretty close tabs on what is happening in each of the individual countries in which AID has programs, and those individual people can give you a lot more detailed information on the commodities, supplies and equipment that might be eligible for financing under those commodity import programs.

In closing, I would like to say that the document made available today, Federal Export Assistance Programs Applicable to the U.S. Photovoltaics Industry, is a very good introduction to AID. If you are interested in pursuing any of the programs that I mentioned, I would be happy to talk to you in more detail at some later date.

2. EXPORT-IMPORT BANK OF THE UNITED STATES

RICHARD DUTTON, SENIOR LOAN OFFICER

I am very gratified to look out and see so many people here. The last panel I served on was an export seminar up in Pittsburgh, and by the time we got to the wind-up group, I think out of an original group of 100 people there were only five left.

Starting out with the information in the Federal Export Assistance Programs Applicable to the U.S. Photovoltaics Industry, the Eximbank pages cover pages 56 to 66, and I think a good job was done on it. I found it very informative, so I would ask you to refer to that if you have any questions later on. My telephone number at Eximbank is (202) 566-8341. I am going to attempt, in this short ten minute period of time, to cover about six programs of Eximbank, each of which usually takes one hour. So, this is really going to be an overview.

I think the best way to get a handle on the Eximbank, and particularly the programs that I think would be beneficial to you today, is to think of Eximbank as being similar to a large commercial bank where you would have: (1) the industrial or commercial department, which is Eximbank's Direct Credits and Financial Guarantees Division for the \$10 million or larger projects, such as sales of jumbo jets or nuclear power plants, and (2) the Exporter Credits, Guarantees and Insurance Division, where I work, which you would compare to the installment loans, home improvement loans and tuition loans. I believe that this latter department is much more applicable to the PV industry, and thus will focus my presentation on this area.

In our Department, under four different programs, we do about 500 transactions a year. And the way we are able to do those transactions is that in 1962 we made a commitment that we were going to market and fund most of our programs to the commercial bank industry. Right now, we have about 400 participating banks. The whole concept is to look to Eximbank as being similar to General Motors, where we manufacture the program and the commercial banking industry is our dealer showroom. They are the ones that sell the products. If we had to do all the credit investigation and fact finding information for each transaction, instead of doing 500 transactions a year, we would probably do about 50. We are committed to marketing the programs through the commercial banking industry, either in the form of insurance, guarantees or direct loans.

The best way to get a concept of the first program I am going to cover, the Commercial Bank Guarantees Program, is to compare it to a four-way partnership where you have a U.S. seller, a foreign buyer, a commercial bank, and Eximbank, each participating in the transaction. Let me give an example. Suppose we had one of your companies that wanted to sell your product to a private buyer in Colombia. If some of you would like to jot these figures down, it might give you a pretty good handle on it. If the contract price were \$100,000, we would require a 15 percent cash payment to handle the guarantee or the financing, which in this example would be \$15,000. The financed portion would then be \$85,000. That is the amount of Eximbank's political risk guarantee, the full \$85,000, or the financed portion.

In that sale, we would require the seller or the exporter to take a ten

percent commercial risk. In this example, it would be \$8,500. That figure subtracted from the \$85,000 would be \$76,500, which is a guideline figure. Then, the commercial bank, participating in the transaction or applying to Eximbank for the guarantee, would take a five percent commercial risk. That would be \$3,825. That figure subtracted from the \$76,500 would give a figure of \$72,675. In other words, to recap this four-way partnership, it would be the exporter that wanted to sell his products to an overseas buyer who would apply to his commercial bank for an Eximbank guarantee. We would issue a guarantee after a 15 percent cash payment for \$85,000 political risk and \$72,675 commercial risk.

In the event that there would be a claim or a nonpayment, say the transaction went through and the buyer did not even make the first payment, we would, if it were for a commercial risk, pay a claim on the \$72,675. In other words, the four-way concept is a partnership with risk sharing between the seller, the buyer, the commercial bank, and Eximbank.

There is nothing mysterious about an Eximbank guarantee. We offer credit protection for political and commercial risks, and we charge a fee for it. Under that program, with 400 participating banks last year, we did a shade over 300 transactions in the amount of about \$500 million.

The second program that I would like to discuss, currently known as the Small Business Credit Program, more or less starts out with a "once upon a time" story. We had a program called the Discount Loan Program, and in 1974 we had a budget of \$2 billion. In that program, all the commercial banks had to do was prove to the Eximbank that an export was taking place. Then we would lend Eximbank's money at a very attractive interest rate for that bank to fund the transaction. Of course, what would benefit the sale was that the foreign buyer would find it attractive to purchase U.S. goods, and the sale would go forward.

About three years ago, the Administration, in studying different Eximbank programs, decided that the program was an entitlement program. In other words, one in which the taxpayers' money was not being used properly; therefore, the program was eliminated. However, we went back to the Office of Management and Budget, and due to the banks' and exporters' involvement, we told them that we had to have this program reinstated. What they did was approve a program called the Small Business Credit Program. Under that program, we have \$100 million set aside to assist in the funding of small business transactions. That particular program is very similar to the old Discount Loan Program, one in which Eximbank offers fixed rate financing to a U.S. bank for the purpose of funding a transaction. And I might stop just a second to say that in a commercial bank guarantee transaction, it is quite possible that one sale could encompass both programs. In other words, one would be the payment protection and the other would be the fixed rate attractive funding.

That program went on for about six months, and we went back to the Administration and in effect said, this Small Business Credit Program is nice, but it is not doing the job. We need something else. What they gave us was a \$500 million program, the third one I wish to discuss -- the Medium-Term Credit Program. It is a \$500 million funding program, very similar to the small business and the old discount program, but we can use this program for any

exporter, small or large, as long as we can prove the existence of officially supported foreign subsidized competition. In other words, we can use this program to help neutralize the foreign competition.

It is like trying to guess what is in a present on Christmas Eve before you unwrap the package. How are you supposed to know who the competition is and what they are offering until it is too late? Between the banks and the exporters and our own expertise, we are able to prove to our lending committee or board the existence of officially supported foreign competition. So far this year we have done approximately 250 transactions worth about \$400 million.

Let me just take a second now and recap the three programs discussed so far. We have the Commercial Bank Guarantees Program with credit protection for commercial and political risks. We have the Small Business Credit Program which by the way, all the bank and the exporter has to do is prove, by SBA standards using the Standard Industrialized Code, that the exporter is small. The SBA business size regulation has to do with sales in some cases, and the number of employees in other cases. We originally defined small as \$25 million in sales and then discovered, as some of my colleagues have mentioned, that there were about six different agencies with as many definitions of small. Thus, we decided to go with the SBA determination since they are the pros. It is the Standard Industrial Classification (SIC) that will determine whether you are small or not. We have the funding through the Small Business Credit Program, as well as the funding of the Medium-Term Credit Program, almost identical programs in mechanics, but different qualifications. One is specifically a small business and the other is for neutralizing officially supported foreign competition.

About a year ago, the Eximbank announced the Working Capital Guarantee Program. I will be truthful with you. Usually, for any program within Eximbank, we design the program and make the announcement. However, the program was given to us and for some of us in the trenches, it took about three months to understand what it was. Once we realized what it was, we discovered that this was Eximbank's first program in which we could issue guarantees to domestic companies. Our financing, as well as our guarantees, have always been with overseas buyers.

Fortunately for myself, I was in commercial banking for 12 years before I came to Eximbank. My boss was in commercial banking for about seven years. So we have a sprinkling of former bankers working for Eximbank, and I think we have a pretty good hand on the pulse of the exporting community. We know the pressures of sales, the compensating balance, the banker out there who does not want to cooperate with you, and so on.

In this program, as it was announced, there was another departure due to the fact that under the Commercial Bank Guarantee and the other two programs, we only dealt with banks. But, the eligibility requirements of lenders in this program include banks, commercial credit, savings and loan institutions, credit unions, or it could even be the New York Port Authority. What happens in its simplest form -- a U.S. exporter who needs a working capital loan would approach the bank and request a certain amount of dollars. The bank would investigate the credit aspects and the feasibility of making the loan, which you might look at as being similar to stretching a rubber band.

If the exporter needed a \$100,000 loan, and his banker felt that his credit qualification and the collateral were approximately \$40,000 and he was a little nervous of that, then he could apply to Eximbank for the full \$100,000. We would issue a guarantee for 90 percent of the principle, and we are back to risk sharing. The U.S. bank or U.S. financial institution takes a 10 percent risk, and Eximbank takes a 90 percent risk. As I say, there is nothing mysterious about that; we charge money for it. At Eximbank, we are supposed to be competitive and self-sustaining; and I think you all are aware of what happened south of the border, with Mexico, Central America and Latin America. Last year, Eximbank lost approximately \$247 million; and this year it is going to be worse, mainly because we issued guarantees. The exporting and bank community said, "step up to the front of the line and accept the responsibility," and we have.

But to recap, the four programs that I think would be beneficial to you are: the Commercial Bank Guarantees Program; the two funding programs, e.g., the Small Business Credit Program and the Medium-Term Credit Program; and the Working Capital Guarantee Program. I think some of you will have a fairly good handle on FCIA, the Foreign Credit Insurance Association, which is another affiliate of the Eximbank. FCIA deals mainly with short-term financing, which I do not think is appropriate to your business. The other direct loan and financial guarantee programs are for significantly larger activities than we are talking about today, e.g., over \$10 million, 20 year financing. I will be very glad to answer questions you may have after the other members have spoken.

3. SMALL BUSINESS ADMINISTRATION

DENNIS CHRISBAUM, EXPORT DEVELOPMENT SPECIALIST

I recognize some faces here, so I am sure that many of you, if not most of you, are small businesses by SBA size standards. It is a pleasure to be here. I am going to describe the SBA financing programs that are available to small businesses for exporting. As many of you are aware, our biggest loan program is guaranteeing normal business loans that can be used for working capital, plants, and equipment. Generally, there are seven to 15 year loans, and we have a guarantee authority next year of about \$3 billion. If you are turned down for some reason by the banking community, you can once again apply to SBA for direct funding since Congress put direct loans back in the budget. However, it is a much smaller program, about \$300 million a year.

The program that was specifically designed for exporting was given to us by Congress about four years ago. Congress and the Department of Commerce had done a number of studies about the problems that small businesses were facing in financing export transactions. The primary concern appeared to be the need for pre-export working capital. Therefore, written into legislation four years ago, was a very specific program called the Export Revolving Line of Credit Program.

It is a guaranteed loan program. The maximum term is only 18 months, and the loan cannot be extended. It is a revolving loan, which means you can come in and draw down for a transaction, pay it back, and continue to turn that loan over the term. Again, we guarantee 90 percent as Eximbank does, and interest rates are negotiated directly with the loaning bank.

Two weeks ago, we signed an agreement with Eximbank under which our two agencies will co-guarantee lines of credit and working capital lines of credit up to \$1 million. This will be possible through any of our 117 offices around the country. It will not be necessary for your bank to deal directly with Eximbank in Washington, since that will be handled between our two agencies. This Program may be of some interest to you as you begin to expand your exports overseas.

The proceeds of the Export Revolving Line of Credit Program can be used only for export-related activities, such as inventory, supplies, labor, et cetera, which are used to produce goods or services for sales abroad. The proceeds also can be used to develop overseas markets, go on foreign trips, attend trade shows, or carry foreign receivable accounts.

That basically is the program that we have. I think the good point about having a government panel like this is to tie all of our programs together. By our statute, SBA cannot make loans to overseas buyers. Eximbank primarily does that in export trade. We only finance U.S. suppliers; but by combining our program with AID, OPIC or Eximbank, I think we can put together a very attractive package. So, I will be glad to answer any questions later.

In brief, we have one program that is designed for export-related trade, it is called the Export Revolving Line of Credit Program. In the report you received today, Federal Export Assistance Programs Applicable to the U.S. Photo-

voltaic Industry, you have a list of the district offices. There have been some complaints about our finance people because, historically, they have only done domestic transactions. This week and next week around the country, one of our people from each of the district offices in finance is going to a two-day program on trade financing; they are being educated. I think when you call them in a week or so, they will be more than willing to talk with you about international trade.

Thank you.

4. U.S. TRADE AND DEVELOPMENT PROGRAM

JOE SCONCE, REGIONAL DIRECTOR FOR LATIN AMERICA

Our earlier OPIC representatives regaled you with thoughts of how small OPIC is, and Bruce Bouchard told you how small AID/PRE is. I am going to tell you that we absolutely are the smallest. Nobody can compete with us. We are the smallest independent agency ever conceived. We have a total staff of 18, of which 15 are on-board. We are also a very young program, about five years old. But, our budget is growing very rapidly, which sounds like heresy in these days of budget cutting. We have \$16 million this year and \$21 million beginning October 1st, 1984. A very rapid increase.

We have an altruistic purpose and a Machiavellian purpose. The altruistic purpose similar to AID's -- promoting development in friendly developing countries. The Machiavellian purpose is promoting U.S. exports. We are trying to play catchup with our friends in Europe and Asia, including the French, the Germans, the British, the Dutch, the Italians, the Japanese, and to some extent, the Canadians. They discovered long ago, long before we learned it, that there is a linear, very direct relationship between the nationality of those who do the planning on projects and the source of supply for those projects. Accordingly, in 1980, we decided to recognize that obvious fact and shift our emphasis from what was at that time a promotion of U.S. government technical services to countries that could afford to pay for them, such as Saudi Arabia. Emphasis is now on, and almost exclusively preoccupied with, promotion of U.S. private sector exports, using instruments such as the financing of planning services and feasibility studies, and in some cases, technical workshops and orientation missions for major development projects in developing countries. The premise is, of course, that if U.S. firms do the studies, and write the plans and specifications, we hope the U.S. will become the chosen supplier.

We finance these studies for both public and private sector projects. Public sector projects include major hydroelectric or coal burning power plants, bridges, ports or highways. In some countries, where industries are owned by the government, projects can include industrial construction in addition to the normal infrastructure or power projects.

In these cases, we finance the studies on a straight grant basis, making the grant to the host country entity and allowing the host country to select the U.S. firm to do the studies on a competitive basis. We look over their shoulder to make sure that the competitive process is bona fide.

In the private investment projects, we share costs with potential U.S. investors on projects that embody a substantial U.S. export potential. There may be something of a division of labor here between TDP and OPIC in the feasibility study program, in that OPIC's prime objective is the promotion of U.S. investment. Its intent, of course, is that U.S. exports will go along with that. Our objective is just the other side of that coin -- exports. If the investment is there, we see that as a way of financing the project to get the exports.

We generally will take projects that are heavy on export potential, while OPIC will take those where the objective is primarily the investment. There are practi-

cal financing limits; and with a \$21 million budget operating around the world, one has to draw a line somewhere. So, as a rule of thumb, I can say that for a typical planning mission or feasibility study for a major public sector project in the \$100 million to \$200 million export potential range, we put in \$500,000 to \$700,000 sometimes as a first phase, followed the next year by another phase, more or less of that size. In the private investor projects, which almost always are smaller, typically your feasibility study will be running somewhere around \$250 to \$350 thousand, of which we will finance half, with an agreement from the investor to reimburse us for our half if he or she goes ahead with the investment.

We also require some evidence that the potential investor actually has the money to make the investment. We cannot deal directly with project promoters, middle men or consulting firms whose principal interest would be to do the study. We have to deal with the principals whose interest is to carry out the project.

We operate in an active mode and a passive mode. The active mode requires that we aggressively go out and look for projects that we know will meet our criteria, both the developmental criteria and the export potential criteria. That is the most effective mode because we know what we are looking for, and we can very quickly, aggressively and effectively find those projects. The passive mode involves making known to the host countries what we do, and wait for their requests. We receive many requests from these countries, but unfortunately, since they do not always understand entirely what TDP's objectives are -- frequently these projects do not satisfy our criteria and we end up turning down many requests. Therefore, we prefer the active mode.

We also receive valuable input in terms of project possibilities from private U.S. firms that have made their forays abroad, found specific projects and brought them to us.

Another mode in which we operate and which I call, the pre-emptive strike, involves U.S. firms competing for major planning work or feasibility studies for which the host country has already put out Request for Proposals (RFPs). We know that the French, the Italians, the Germans and the Japanese are there, and probably, if not certainly, all of their firms are being subsidized by their governments. In these cases, if the project meets our criteria, we can make an offer to the host country to finance all or part of the study if they will agree to award it to a U.S. firm.

That works very well, and we get a lot of leverage that way. We get the added benefit of knowing that if the project reaches that stage, it is a real project. In some of the projects we have found that they may be some Minister's pet project, and not the President's pet project.

With regard to energy projects, I have to say -- and almost with fear and trembling before this audience -- that almost all of our energy projects have been big, conventional, centralized projects: hydroelectric, coal burning power plants, and so forth. Now I know that is not good in front of a photovoltaic crowd, but the fact is that this is where the demand has been. I appeal to you to enlighten us and to instill in us that the time for photovoltaics has come. I do understand that it is the wave of the future, and that the future is about to begin. If we can find some projects with substantial U.S. export potential, we would be delighted to work with you.

The photovoltaic projects that I have seen in the last couple of years frankly have been too small. Little projects out in the Sahara Desert, with a \$200,000 export potential do not stack up too well with the other projects that I have on my desk. But please, tell us about it and let us know where you see substantial opportunity. We are glad to begin our own photovoltaic epoch.

I would like to call your attention to page 86 of Federal Export Assistance Programs Applicable to the U.S. Photovoltaic Industry. Although, I have some brochures about the program, I do not have enough for the entire group. But, I find that the presentation in the resource book is much better than our own brochure. If you look on page 88, you will see that we are organized on a regional basis. I would like to suggest that you call the regional officers involved, and I will give you some different telephone numbers.

If you are interested in a project in Asia, you should call the regional director for Asia. For example, if it is in Latin America, you should call me on (703) 235-3657. If you are interested in Africa, the Director's name is Raymond Dinken on (703) 235-3657. Jim Grossman for Asia is on (703) 235-3660 and Ron Bobel for Middle East is on (703) 235-3657. I too would be delighted to answer any questions you might have.

5. OVERSEAS PRIVATE INVESTMENT CORPORATION

ROBERT DRAGGON, ACTING VICE PRESIDENT FOR FINANCE

I am not going to go into detail on the programs, they are more than adequately explained in Federal Export Assistance Programs Applicable to the U.S. Photovoltaic Industry. Let me give some highlights of the programs that I think can assist you in pursuing the export and investment opportunities in the developing world.

As a quick introduction, OPIC is a spinoff from AID which was set up in 1971 to encourage and facilitate private investment in the developing world. We operate in some 100 developing countries, and have a variety of programs to help small- and large-businesses and banks pursue long-term investments.

We have political risk insurance and direct loans to small businesses. We also have loan guarantees for large- and small-businesses, pre-investment services, feasibility studies, reconnaissance surveys, investment missions, and an opportunity bank data system that is computerized to match investor interests with overseas opportunities. All programs are designed to overcome the potential risk of doing business in the developing world.

Anyone will tell you that foreign investment promotes U.S. exports, and that foreign investment is sometimes the only way to enter a market. If you decide to move into the foreign marketplace, the OPIC loan and guarantee programs are sometimes the only mechanisms to help a small business find the capital needed for a long-term investment in a risky LDC such as Sudan, Tanzania, Kenya and about 96 more.

So, essentially, that is where we fit in, and again, we complement the programs at SBA, Eximbank, TDP and AID. For instance, you may in one project, potentially or theoretically, utilize all of these agencies' programs.

Let me just highlight three programs very quickly. First of all, in our Pre-Investment Services Program, we offer two programs that are similar to TDP's. In the Feasibility Study Program, we share the cost with companies going overseas to study the feasibility of undertaking a long-term investment in a particular developing country. We call them reimbursable grants, in the sense that if the project goes forward, the company reimburses OPIC, and if it does not, the cost is forgiven.

The second program -- and these are all adequately explained in the booklet -- is a reconnaissance survey to help a company, particularly a small company, go overseas for the first time to determine whether or not there is a market in that particular country. This is a program where we reimburse up to \$5,000 of certain eligible costs, salaries, travel, per diem, et cetera, for travel to a particular developing country to assess the market. If it proves viable, you come back for feasibility studies and the ultimate financing.

Lastly, I would like to mention a new pilot program that we are trying to get off the ground. It may be a little technical, but we are trying to adapt our programs to today's needs, particularly those of small business. We have

continually run into, or have clients who have run into, a situation where there may be a small growing company that wants to undertake a project overseas which is large in proportion to its overall business. They run up against the situation where bid, performance and advance payment bonds quickly consume working capital and bank lines of credit.

They say, "Hey, that's a nice project, but you're stretching your line of credit." So, we have come up with a program whereby OPIC will guarantee up to 75 percent on demand letters of credit and other advanced payment, or performance bond undertakings issued on behalf of U.S. exporters who are involved in turnkey situations -- situations that may take one or two years to implement in a developing country.

Essentially, the guarantee does two things. One, by providing a full faith and credit guarantee of up to 75 percent of the bid or performance bond, it frees up that company's working capital with its bank. This enables the bank to then support the working capital needed to get the equipment or perform the services to complete the contract.

Secondly, should there be a drawing under that advance payment, bid bond or performance bond, we will carry or finance that transaction until it can be determined whether the exporter was at fault or whether the foreign government or foreign enterprise was at fault. This gives the exporter time to work out the problem and not have to dip into his much needed credit and capital.

If you are a company with a situation involving a lucrative contract, bid performance and advance payment bonds, and requirements for additional working capital, I would suggest you contact OPIC. We will see if we can sit down and help you.

Again, my name is Bob Draggon. I am the Vice President of Finance at OPIC, and my number is 653-2870. I will sit down and try to answer questions with the rest of the panel.

B. Question/Answer Session

PAT COLLINS, MODERATOR
UNDER SECRETARY, U.S. DEPARTMENT OF ENERGY

MR. FRANKEL, HOUSE OF REPRESENTATIVES STAFF: I was struck this morning by something the person from Eximbank said about medium-term financing for small businesses. I wondered, since we expect photovoltaics projects to last for 20 years, is it feasible to extend longer term loans for these projects, which are going to be paying for themselves over a longer time period?

MR. DUTTON, EXIMBANK: Did you say if the amount of the financed portion is less than \$10 million, you would be restricted by medium-term financing and could not obtain long-term financing?

MR. FRANKEL, HOUSE OF REPRESENTATIVES STAFF: Yes, that is the impression I got from this morning's presentation.

MR. DUTTON, EXIMBANK: As I discussed before, in our Direct Credits and Financial Guarantees Program, the type of program where we make a loan directly to a foreign buyer, there is a cutoff point at \$10 million dollars. However, under our Medium-Term Program, we are restricted to terms of 180 days to five years. To meet officially supported subsidized competition, we could stretch the terms under the medium-term program to six years, seven years or even eight years.

This \$10 million guideline is a working figure. It is very possible that you could obtain eight year financing on the Direct Lending Program at a term of 10 or 12 years. It is a guideline figure; it is not in concrete.

In the \$10 million range, you could apply under several different programs. If the buyer is creditworthy and the project is feasible, you will get Eximbank's support under one or the other programs; and the terms would be competitive.

MR. CUNNINGHAM, MOBIL SOLAR ENERGY CORPORATION: I would like to ask a question of Joe Sconce from TDP on the feasibility study program for a project in a foreign country. You indicated that most of your projects are the big ticket projects and that the PV projects seem to have been on the small side. Let us say the project is a \$200,000 project; but one can demonstrate that if this project goes forward, you have an immediate export potential over a two-year period. Or, let us say, one might get ten additional projects exactly like that one. Is that the kind of project that would be very interesting to TDP?

MR. SCONCE, TDP: Ten additional ones at \$200,000 each. That would be of interest to us. Yes, it would.

MR. COLLINS, DOE: Mr. Sconce, nothing precludes smaller projects; it is just custom right now.

MR. SCONCE, TDP: It is not only custom. We have to make a track record like everybody else. Our job is promoting exports. We are looking for the big bucks, and the big bucks are in the \$500 million hydroelectric dams. Also, like a bank, the small transactions take as much overhead as the big ones; so there is a certain human tendency to select a \$100 million export potential over a \$500,000 one.

But, we are quite willing to entertain small projects, particularly where they involve U.S. private investment.

MR. HESSE, ENTECH, INC.: I have a question for Mr. Chrisbaum of SBA on your Energy Loan Program. When you give a loan up to \$500,000, does it require personal guarantees? What is the minimum interest one can expect from that?

MR. CHRISBAUM, SBA: Unfortunately, I am from the Office of International Trade, so all I do is international trade work. I believe Congress instructed us to reactivate that program last year. It was dead for awhile. All of our interests and direct loans, are charged at the Treasury rate of interest, which a few months ago was around 11.5 percent.

Every loan that SBA makes requires adequate collateral, whatever that may mean. There are certain meanings for certain loan officers, and SBA tends to be fairly conservative.

I think the exception is the SBA Export Revolving Line of Credit Program, because finally there are people in the agency who realize that if you are trading, it is very possible that all of your other collateral is tied up. Under this particular program, all we are really looking for is creating assets, for the most part, which will be inventory and accounts receivables.

So, should you begin exporting, or expand your export marketing, and certainly if you need a government guarantee, I would look closely at that particular program.

MR. HESSE, ENTECH, INC.: It sounds like you are flexible.

MR. CHRISBAUM, SBA: Yes, we are flexible on the Export Revolving Line of Credit. I would call the Finance Commission directly on the Energy Loan Program.

MR. LITTLE, SPIRE CORPORATION: I posed a situation this morning that maybe one or more members could address, concerning the small business community joint venture, for example, in Saudi Arabia. The joint venture is trying to borrow money, and has gotten authority to borrow money from the Saudi Investment Development (SID) Fund. Now they are asking us to sign for our piece of that loan. Is there some federal agency that would guarantee my part of that loan in Saudi Arabia?

MR. DRAGGON, OPIC: If you switch the example a little further south to Egypt, or the Sudan, or something like that, we can definitely help you. Let me see if I can quickly and succinctly illustrate that.

If you have a joint venture, and you are putting a capital loan with your joint venture partner and the balance has to be financed, OPIC can provide up to 50 percent of the total project cost on a long-term, nonrecourse loan, generally ranging from seven to twelve years with suitable grace periods.

After completing the project, as specified by the sponsors, their responsibilities for repayment drop away. We then look solely for repayment to the project itself, from the cash flow of the project. So, there is an agency that could provide that sort of assistance.

MR. LITTLE, SPIRE CORPORATION: I have a loan already. All I have to do is get somebody to guarantee it for me.

MR. DRAGGON, OPIC: This would be for new projects or expansion of existing projects.

MR. MURRAY, STRATEGIES UNLIMITED: I would like to direct a question to either Jack Vanderryn, the other gentlemen from AID, or anybody on the panel. I heard conversations or presentations about what we define here as concessional financing, and some comments from AID that they can not go out and back PV. I bring those two points up because it is exactly what our competition is doing. But their definition of concessional financing is two to three percent, and their idea of backing PV is to send government agency people, from their energy agencies and other areas, to educate and train potential customers in the country.

How, as an industry, can this group help us compete with them?

MR. COLLINS, DOE: Comments from anyone on the panel or certainly our friend, Jack Vanderryn, as well?

MR. VANDERRY, AID: We have been talking today with our friends at the Department of Energy about the potential for putting together a road show in one of the regions of the world where we will get some of the industry and government experts to start educating people about photovoltaics and its role in the total energy business. I think we will be working with a number of you in the coming months to see if we can put together some kind of an effort to start the education, not only of the people in the LDCs, but also of people in our own AID family.

With regard to concessional financing, of course, most of our loans from many of our loan programs involve concessional financing. So, when we are funding photovoltaic projects, it often involves concessional financing.

MR. LARSON, SUN WATT INTERNATIONAL: The domestic solar industry has been helped mainly by tax credits. Could somebody on the panel either address the issue in general or indicate whether any of their programs have additional tax benefits?

MR. SCONCE, TDP: I would like to make a remark on that. Four years ago, TDP did a study on solar energy applications in Brazil, and one of the principal recommendations to come out of that was that in order to develop the solar industry in Brazil, more tax incentives and subsidies were needed.

That report hit the Brazilians just at the time they were beginning to negotiate with the IMF on their debt problems. Of course, the IMF requirement was that they cut out all incentives and subsidies. That would be the case in any country with a debt problem these days.

Tax incentives, which is another way of saying subsidies, are going to be extremely difficult to institute or even keep in those countries that are trying to negotiate their way out of a debt.

MR. DRAGGON, OPIC: Turning to companies that might be pursuing an investment

in a particular country, I think you may find that a country may offer a wide array of incentives to make an investment in its markets. They range from tax credits, to import relief of various sorts, to other incentive programs. That is something you might want to consider, as well.

DR. PRINCE, DOE: In response to Mr. Larson, there is such a thing called the DISC (Domestic International Sales Corporation), of which some of you may be aware, which is a tax incentive for sales overseas. It does not cost anything to set up such an operation, yet you can save a significant amount of money.

MR. CHRISBAUM, SBA: Which has recently been revised and is now the FSC (Foreign Sales Corporation).

MR. GARDEN, DOC: I wonder if you would say something about the new Eximbank program on services?

MR. DUTTON, EXIMBANK: I think what you are talking about is under our Medium-Term Credit Program, the funding we had always been putting forth, and also the Small Business Program. As far as the services are concerned, we have expanded them to include engineering services, feasibility studies, and so on. In other words, I think that is an omission on our part because most Eximbank programs do cover capital goods and services.

MR. O'CONNOR, SOLAVOLT INTERNATIONAL: A question for Jack Vanderryn at AID. This morning you mentioned that you were targeting countries for technology transfer. It appears to be a little inconsistent that we try to take a high technology, which we have difficulty doing ourselves at times, and transfer that to the less developed countries which do not really have the resources and the trained people to handle it. Did I miss something there?

MR. VANDERRYN, AID: Well, first of all, in a general sense of course, our overall programs have, as one of their objectives, to transfer knowledge and increase the awareness of the technical possibilities to other countries. And, when I talk about transferring technology, I do not necessarily mean the high technology. It has to be technology suitable to their purposes.

If we are talking about photovoltaics, we recognize that much of the technology is proprietary. In that case, with our interest in seeing that developing countries have programs that create jobs, for example, we would encourage you to enter into joint ventures on your own; which would in part transfer technology to them. Whether that is high technology, medium technology or low technology simply depends on the kind of arrangements that you encourage.

MR. DELPHOS, OPIC. Let me just add, from the perspective of the Overseas Private Investment Corporation, that would be our goal and purpose, as well.

MR. DAY, STRATEGIES UNLIMITED: May I just comment on one thing? There was an interesting situation in Mexico in which telephone companies have entered into an arrangement. Mexico has certain restrictions on value-added conditions, and AEG has been able to meet the full requirement for domestic contribution to the manufacturer by setting up a small operation whose main purpose is to bend sheet metal and provide the structural support for the arrays that are still fabricated in Germany and still imported.

Eventually, they do plan to do some assembly work themselves; but for the moment they have fulfilled the letter of the law by knowing how to design, how to wire batteries, and how to put the support structure in. I think that is an appropriate technology to consider for these countries.

MR. KRANTZ, DOE: I would like to address a question to the entire panel. Is there anything that is in the planning stage that I might entice you to share unofficially with us, that we, as a community ought to be looking forward to? Perhaps, legislation that might be coming up, new programs under design? Anybody?

MR. COLLINS, DOE: Yes, is there anything else like that in a stage of development that you can mention now? Is there any prospective legislation or legislation that was pending and did not make it this time and may be up again?

MR. DUTTON, EXIMBANK: In my opening remarks, I neglected to cover a very important sales tool that I think would be advantageous to you all. As I mentioned previously, we had approximately 400 banks participating in our program. What we had for them to use as a sales tool is that after a bank has had a sufficient number of transactions with Eximbank, and we feel pretty comfortable with their credit criteria and expertise, we issue them what we call a commitment or delegated authority. In other words, what they can do is commit Eximbank's guarantee to a private buyer up to \$500,000 and to a public buyer up to \$750,000, without getting our prior credit approval. In other words, one of these gentlemen selling their products can go in and talk to their banker. If the banker is agreeable to financing it at that time, the banker can bless you and say, "You have the financing, and you have the Eximbank guarantee." What they do at that point is just send us a notification that they committed our guarantee, and make sure all the boxes are checked.

Also, what we have done in conjunction with the SBA under our Working Capital Guarantee Program is to start a four-state power project, in which we issue delegated authority to financial institutions for up to \$300,000 for a working capital guarantee. It would work principally the same way the other program does; they can commit Eximbank's 90 percent guarantee on their own credit criteria without getting our prior approval. This program is going to be in place within 30 days.

MR. CHRISBAUM, SBA: I do not know if this gentleman's question was answered on concessional financing. Did people speak this morning about Eximbank and AID?

MR. COLLINS, DOE: A little earlier this afternoon.

MR. CHRISBAUM, SBA: I am not going to address it; but if that question was not answered, somebody from AID or Eximbank might want to address concessional financing since Congress put it in the reauthorization.

MR. BOUCHARD, AID/PRE: I can speak briefly about that. Last year Congress included in the authorization of the Foreign Assistance Act what they referred to as a mixed credit financing program. This program requires that AID work the arrangements with the Eximbank and parameters for financing in establishing the program. They restricted the program to countries where AID provides what Congress calls "economic support funds." Essentially, that involves balance of

payment support to the host country government. There are about 20 or 30 countries around the world that actually receive economic support funding from the U.S. government. Arrangements for a mixed credit financing program would involve financing from both AID and Eximbank to a host country government. It may also involve commercial sources; the exact nature of the program is still being worked out between Eximbank and AID.

MR. LEVITT, RESOURCE PLANNING ASSOCIATES: I want to talk about one thing that is going to come out in October that should be of some use to the community. We are completing a competitive assessment for the Department of Commerce which compares U.S. federal export assistance programs to those in France, West Germany, Israel, Denmark and Japan.

I can make one comment now, which is that it is apparent that many export assistance programs are available in the United States. Our execution and implementation of those programs overseas have not been as impressive as the execution of the programs by some of our competitors. There are a number of joint ventures that have been supported by the European Economic Community (EEC), the Japanese, and the French, and are being established in Egypt, for example. We saw in Mr. Delphos' presentation that Egypt has attempted to encourage U.S. joint ventures. We have, to date, with U.S. government sponsored programs, not established any photovoltaics or flat plate programs there. There have been two false starts.

The use that the industry can make of the study is to continue to focus on the interagency working group required under P.L. 98-370. It is this interagency working group that should be able to coordinate the programs for all of these agencies resulting in projects that appear in the field. I think as an industry, that is what you ought to demand. It is very important that these programs are available and that the government makes attempts to reach out to the industry; to let you know about them. But, if the projects are not realized in the field, you will not improve your competitive position, and the market share of the United States in the photovoltaic field will not change.

MR. BOUCHARD, AID/PRE: Can I just address a question to you? I wonder if your research has led you to conclude why it is that we do not appear to be as good at implementation as our competitor nations?

MR. LEVITT, RESOURCE PLANNING ASSOCIATES: One of the problems in the field, is that our field people do not communicate with each other. DOC people do not often talk to AID people; and even stranger, AID people do not talk to AID people. There is an AID program in Egypt to support feasibility studies. It has supported two feasibility studies in the solar field, and the connection of that program with the \$24 million AID renewable demonstration project is very tenuous. It is an obvious place where the two agencies in the field could cooperate, but that communication is not happening.

The second thing is -- and this was a comment made by a DOC U.S. and Foreign Commercial Service officer in Kenya -- that the government programs in the United States often are judged by efforts and not by results. We have a great many programs and a great many presentations. People are very eloquent about telling what the United States might do, but the evaluation often stops there. The push to make sure that the joint venture is established or that the sale is

made does not occur. That is a very broad criticism. I know it is not true of every agency, but that is the impression that comes out again and again in the field.

MR. DRAGGON, OPIC: I would like to comment on that. It is clear that there are some far more fundamental problems than the ones you just mentioned. It is not really a problem that they do not talk to each other. The problem is, of course, that most of your competitors have state-owned enterprises. It is particularly true of France (but quite true of many of the other countries), where the full force and credit of the government of France is behind the efforts of the French firm because it happens to be owned by the government. Therefore, if the French want to send in a technical team, they just send in a technical team. I have to go out and compete, and that will take at least three months. Secondly, how many photovoltaic firms are there in France?

MR. LEVITT, RESOURCE PLANNING ASSOCIATES: Two.

MR. DRAGGON, OPIC: How many are there here?

MR. LEVITT, RESOURCE PALNNING ASSOCIATES: Many more.

MR. SCONCE, TDP: If you are trying to win a PV project in Colombia, our Ambassador is not in the same position as the French Ambassador who can go in and support his French company because it is owned by the French Government. Our ambassador has to say, wait a minute, we have a lot of U.S. firms that want to bid for that project.

MR. LEVITT, RESOURCE PLANNING ASSOCIATES: What you say is quite true. The Japanese government does not own Japanese photovoltaic firms. There are many competitors in Japan in the photovoltaics field. They are very aggressive today about searching for joint ventures, and their government is doing a very good job of working with them to establish those joint ventures. The same is true in sales, and it is not only true in photovoltaics. It is true across the range in renewable energy programs.

Thus, if programs in the United States are going to have any effect at all, the industry has to come to Washington or go to the branch offices and ask for those services. The government can not go out and create joint ventures if there is no industry asking for them.

MR. DUTTON, EXIMBANK: I would like to add something to that. At Eximbank, we have a one-day, no cost seminar for all exporters; and it is held every two weeks throughout the year. During that time, senior people from each program make presentations. Also during that time, the people attend the next business day to set up conferences with the particular programs of interest on a one-to-one basis. It is a situation of applying Eximbank to public affairs, signing up for the next seminar. I had ten minutes today to explain six public programs; and in that one-day seminar, the six programs will be explained in detail. We highly recommend it. If necessary, get your banker and bring him down, and both of you attend it. Because what happens, in many cases, is that an exporter will have a certain project or an idea that he wants, and he will go into his bank and make the proposal and the banker might start off by saying, "What is an Eximbank?" You really have to start the battle. Grab him by the ear, and

bring him down to Eximbank. I will guarantee that after that eight hours you will both leave with the knowledge of exactly what Eximbank can do.

MR. DRAGGON, OPIC: I might also add that the OPIC programs are covered in that.

MR. DAY, STRATEGIES UNLIMITED: I would like to share an experience that was in a different industry, if I can talk about wind for a minute, pertaining specifically to California and Denmark.

We have a situation in California where there has been a dramatic increase in the number of wind turbines installed. It happens that for some reason the Danish government -- and they have four suppliers of wind turbines -- decided that they wanted to improve their exports to the United States. They have two full time offices devoted to wind imports into California; one in San Francisco and one in Los Angeles.

What happened was that the four companies that were vying for participation, each sent their representatives to California to tour all over the state, with each pursuing their own business arrangements. I do not know of any requirements in Denmark that say when you find a good deal you have to put it out to competitive bid. But, I know that each of these four companies received the full guarantee of the Danish equivalent of the Export-Import Bank. I know that because of their success over the last three years.

Denmark first came in with machines that were installed for demonstration. These first machines were financed on a very concessionary bases. I mean, it was almost, "Why don't you put it up and run it for a year, and we'll see how it performs. We'll take data; we'll issue the statistics." All of this was done. The second year, the volume of turbines jumped up dramatically; but instead of one, there were a handful of projects, each with perhaps 20 machines. The volume grew.

To make a long story short, this year the Danes will install 1,600 wind turbines in California, and each of these turbines is worth about \$150,000 and up, depending on their size.

Suddenly, there are four substantial manufacturers in Denmark, all of whom are exporting. Because of the California tax credit program, they are now manufacturing very efficiently, and they are beginning to appear throughout the world, making a very good product.

Now, I point to a couple of differences. Number one, the government worked closely with the domestic manufacturers in terms of introducing them around and making sure they had all the right contacts. Then, they stepped back in some way and allowed them to negotiate their own arrangements. There was no requirement that said that here was an opportunity for 50 turbines, and it would have to be a competitive bid. I do not know if that kind of business relationship is compatible. Simply because an American supplier took the time and made the investment to develop a business opportunity, why should the opportunity then be put out on open bid? He went out and developed it; let him carry it forward.

MR. GARDEN, DOC: I have an overall comment, and that is that very few agencies really create their own rules and regulations. Most of our rules and regulations

are, in fact, given to us by Congress. I do not know this to be a fact; but I would guess that, for example, AID's tendency to go toward competitive bid is not something that AID itself put into the regulation.

I would say that the gentleman has a major point, and that is that in my experience in dealing with various commercial officers, they do not have either the time or the information to promote renewable energy equipment at their disposal. They do for specific occasions. If you happen to be in a particular city and go to the Embassy, they will in fact help you. If you are on a trade mission, or trade show, they will be there. But, setting up an office and assigning one individual to renewable equipment is not being done currently.

I would like to bring up my own particular experience. I happened to have been in the Middle East a year and a half ago. I was on a straight electric power trade mission; and quite by coincidence, there was a solar energy trade mission in Japan. The head of that trade mission was a fairly high ranking government official who signed an agreement on the behalf of the Japanese Government. The interesting aspect is that the Japanese government did not necessarily provide the financing. They simply provided the commitment for a Japanese company to put in a solar power Nissan plant, with financing guaranteed by the Japanese government. I think the important point was that there was a Japanese Government official acting on behalf of the industry. My own suggestion for photovoltaic companies would be to demand that the government basically act on its behalf more directly, either by sending a Department of Energy official to speak to an energy official counterpart overseas or the opposite. One of the more promising things that has occurred during the past two years has been a joint effort to bring energy officials here to the United States for the Renewable Energy Technologies Symposium and International Exposition (RETSIE) which takes place annually. Perhaps that is the occasion for oral presentations to be made. But the major point not to be lost is that the Japanese and European Governments promote the aims of their particular firms quite successfully. As the gentleman pointed out, they let their firms take over after that.

There is one other thing I would like to mention. From the foreign governments' point of view, as well as for the people involved in trade promotion, there is a tendency on the part of U.S. firms to explore and then leave. That is, U.S. firms frequently go on a trade mission, then go on a separate company mission, make contacts and then just disappear. I am embarrassed to say that the mission I led to Oman involved ten companies. Nine were straight conventional electric companies, and one was a solar photovoltaic company. Not one of them followed up on any of the contacts that were made in Oman. It left our embassy in a very embarrassing position, because they had been committing themselves to getting appropriate contacts to speak to these companies.

Individual company commitment is very important. If you make contact, follow up. If you cannot follow up on the transaction right away, make it clear to the individual you are in contact with that you will get back to them as soon as your priorities allow you. Do not leave the person hanging.

MR. COLLINS, DOE: This morning, your colleague from Commerce mentioned that about half of your commercial officers are from the private sector. One of the reasons we had the budget item in there about having money to support this activity was even if half of them are, this is a relatively new industry.

They are not overly familiar with renewable energy, in general, and particularly, photovoltaics. So that is another step beyond that we have to work on. That is an assignment for the interagency working group.

MR. BARON, INSTITUTE OF ENERGY CONVERSION: I wanted to raise an issue which is ancillary to the export of our technology, but which I think is very important. That issue concerns intellectual property and trademarks. As we take our photovoltaic technology and send it overseas I think we have to pay more and more attention to protecting the investment that American companies, and in some cases, the American Government have made, as well as the knowledge that went into these products. Foreign patents sometimes can appear as non-tariff trade barriers, making it harder for us to get it. Then, there are the perils of our own products coming back into this country, apparently infringing our U.S. patent rights, and we do not have recourse in the U.S. or we have to go to the International Trade Commission here in Washington. We have other problems with protecting our trademarks. We put much effort into getting the reputation and the recognition of a particular tradename or trademark, and then we invest the money abroad with the insistence of this group. All of a sudden, that product is pirated; the trademark is being infringed throughout the world; and our investment suffers.

Therefore, I would recommend to the working group that you get some input from the Patent and Trademark Office of the U.S. Department of Commerce, from the International Trade Commission, and from those people in our State Department who are constantly working on the interstate relationships on which the United States is signatory to a number of treaties having to do with intellectual property.

Another aspect of this problem is in protecting our trade secrets. Not all countries have the same laws and rules about trade secrets. Even a country quite similar to ours, Canada, has quite different rules and regulations when it comes to signing trade secret agreements. I think, again, the larger companies, the multinational corporations, are comfortable doing business in the world. They are on top of these things. They have the legal staff.

If we are going to encourage smaller companies to participate in this international transfer of products, we have to give them some kind of assistance; so they can look out for their intellectual property interests.

MR. COLLINS, DOE: That is a good point, and it comes up frequently with our operations and I am sure with others.

CLYDE RAGSDALE, SOLAVOLT INTERNATIONAL: I would like to make a suggestion to the working group. There is a fairly large gap that has been obvious in terms of our export activities. The incentives for investment are very well covered, I think. It sounds like you have all the programs available for that.

The assistance in large export sales programs sounds like it is fairly well covered. But our markets for quite some time in the international field are going to be a quantity of small systems, in many small countries. This upfront and heavy investment is going to be a key part of the problem that we are going to face in making these kinds of sales.

I think the working committee should address some kind of mechanism whereby smaller programs possibly can be given cost-sharing, or direct grants, but primarily, at least the concessionary loans to get the program started. In most cases, these people as everyone has said all day long, do not have the money to invest in the beginning, especially if it is a 20 year investment that they are talking about making up front.

GEORGE NAFF, HUGHES AIRCRAFT COMPANY: I have a comment on this morning's remarks about how countries who are asking for AID type projects can use photovoltaics as the power source, and it was stated that AID cannot tell them what power source to use. But in further discussions during the lunch hour, it was indicated that it may be possible to ask those host countries to conduct some kind of examination or a trade-off that would show that they have indeed selected the best power source, before they just arbitrarily eliminate photovoltaics. This requirement would be particularly relevant for some of these smaller systems, since they prove to themselves and prove to the U.S. investor that photovoltaics is a cost competitive and feasible asset to that project.

MS. TUOHY, COMMONWEALTH OF MASSACHUSETTS: I would like to refer back to a remark that Mr. Garden from the Department of Commerce made about what happens when foreign purchasers or potential purchasers arrive in this country. In Massachusetts we have recently had an influx of foreign visitors from the Middle East and from the Far East, and I realized that we do not do a very good job of educating people about photovoltaics once they arrive here, as well as abroad.

Our experience has been that when people do arrive here, they often will express their interests in extremely broad terms. They will say they are interested in solar energy. We currently do not have programs that can take that general interest and translate it into specifics sufficient enough for sales orders. We have been working in Massachusetts with industry and our universities, particularly the Massachusetts Institute of Technology where we are fortunate to have a large population of foreign students, to develop some kind of international training institute that can take people right from that first general expression of interest through a whole process, ending in sales orders.

I would like to know if there are any programs available from your agencies that might provide assistance for people once they actually arrive in this country. [No comment]

MR. HESSE, ENTECH INC: I would like to comment on John Day's scenario on what the Danish have done here in this country. If you really examine it, they have taken advantage of a special set of tax credits that exist in California and invested there. If I look at the large PV projects, not small ones, that are cost competitive in certain areas right now, we are not there yet with the large systems. We are not competitive overseas; that is why we are not marketing over there.

The way for us to get large PV systems competitive is to get the big systems in, and we had better get them in California pretty quickly, because the wind machines have already taken advantage of it and they are now lowering costs.

I come back and I say, what can DOE do to help us get large PV systems

more cost competitive. That is one element. There are other things we must do if we are really going to get competitive with the wind machines, and so on.

MR. COLLINS, DOE: That closes the question/answer session.

V. CLOSING REMARKS

PAT COLLINS, UNDER SECRETARY
U.S. DEPARTMENT OF ENERGY

I want to thank everyone here because this has really been an outstanding session. I have been looking forward to it since Bud Annan, Director of the DOE Photovoltaics Program, and his staff brought it up in the Spring. Furthermore, as Don Hodel said, this is a great opportunity.

I certainly thank my colleagues this afternoon, whose expertise was exceptional. I look forward to working with them on the working group continuing from the Administration's initiative and the Congressional mandate. Particularly, I thank Bob Dragoon for being the moderator this afternoon.

We have heard today from our friends from industry; and I thank them particularly for their candor. We deeply appreciate it, and we plan to respond.

Obviously, we need to review our programs; we need to review them in two ways. Number one, we must assure that the gears mesh; and number two, we must assure that the word is out. We must assure that assistance from the government is understandable by those who can take advantage of it; and of course, that is our goal. We want to help the industry maximize its use of existing programs.

We have got many players in here, as we do in the government, and in most areas it is the job of the working group to get them to work as expeditiously and as effectively as they can for the industry. Education regarding the usefulness of photovoltaics is necessary. Education should be conducted not only here but also abroad, and should perhaps include those who are coming from abroad to here, as we just found out.

I think financing also is extremely vital. I hope that by now people understand the commitment that is involved in this. The Secretary and I are extremely concerned and involved, and I think that applies for all of our other colleagues in the Administration. We know what the situation is with the balance of payments.

I want to congratulate Bud Annan, who is our PV division director, for the excellent job. He went through a great deal of material and arranged it so that we can better understand the major issues from the photovoltaics industry point of view.

I want to reiterate that this is the first step. We, at least in the government sector, will meet one-on-one and jointly until we get this worked out so it best facilitates those in both industry and government. That usually implies a lot of involvement myself, and I plan to praise highly my colleagues to their superiors. There is a flip side to that chart too. I plan personally to cover the waterfront door-to-door, and office-to-office, until we get the optimum level of cooperation.

I think the question is if not, why not? And, if not now, when? To that commitment, we have, at least in the Department of Energy and I am sure other Departments, increased our technology transfer budget 500 percent starting October 1st, and we consider this an integral part.

Once again, I want to say, that I was also told that I could skip this afternoon, because of the session this morning. I just want to reiterate that the Secretary and I are not putting up with any dog and pony shows or anything else like this. We are going to do whatever is necessary to make this effective. Now, part of this two-way street is one of the things that I did not want to hear when I worked on Capital Hill. That is you asking us to unravel this for you, because that is exactly what our job is, to unravel it for you. It is to illuminate what we already have on board, mesh the gears of that which is not working, and provide new programs or policies that will help achieve our results.

The door is open. In addition, my DOE phone number is (202) 252-2020. It has been delightful to be with you. Thank you very much. I look forward to our further discussions on this subject.

APPENDIX A

FEDERAL COOPERATION TO PROMOTE RENEWABLE ENERGY EXPORTS

DONALD P. HODEL,
SECRETARY OF ENERGY

APPENDIX A

FEDERAL COOPERATION TO PROMOTE RENEWABLE ENERGY EXPORTS

SECRETARY OF ENERGY DONALD PAUL HODEL

Good afternoon. It is indeed a pleasure to share lunch with you at this Photovoltaic Export Assistance Seminar. I hope that both government and industry are learning a lot from each other here today.

I will talk today about our national energy policy, how renewable energy fits into it, and most importantly, why we should all cooperate to promote renewable energy exports.

I believe that energy has an importance far beyond most commodities. Energy is significant, directly and indirectly, to every aspect of the U.S. economy. Domestic and international recovery and growth cannot take place without adequate energy supplies available at a reasonable cost. Economic strength, and ultimately the strength and security of the free world, are dependent upon efficient use of existing conventional resources and timely development of new technologies and resources (such as photovoltaics) for the future.

The United States is the major player in the world energy arena. As such, we have two essential areas of responsibility: 1) our national energy policy; and, 2) our role in the international energy market.

NATIONAL ENERGY POLICY

In October 1983, President Reagan submitted our National Energy Policy to the Congress. The policy consists of a goal, strategies, and programs to achieve that goal.

Our goal is a very simple and straightforward one: an adequate supply of energy at a reasonable price. We cannot quantify "adequate," but we can qualify it. It must mean a supply sufficient to assure us of "non-dependence" -- the ability to withstand an interruption of our imported energy without tremendous adverse impacts on our economy or strategic capabilities.

To realize this goal, our strategies are:

- 1) to minimize federal control and involvement in the energy market while maintaining public health, safety and environmental quality; and
- 2) to promote a balanced and mixed energy resource system.

We seek a balanced and mixed energy resource base ranging from essential conventional sources such as oil, gas, nuclear, and coal, to renewables such as photovoltaics, wind, geothermal, hydro, and biofuels, and new emphasis on conservation as a resource.

Achieving a balanced and mixed resource base is essential to achieving energy non-dependence.

ROLE OF RENEWABLE ENERGY

Thankfully, our nation is making progress toward a balanced and mixed resource base while at the same time lessening our dependence on imported oil.

Two very important resource areas that have played a major role in this progress are conservation and renewable energy.

Fortunately, energy conservation has become deeply rooted in our economy. The results of the last decade, and especially the last four years, have been striking. Last year, the United States consumed only 15.2 million barrels of oil per day -- 12 percent less than in 1973 and 19 percent less than in 1978, in spite of an 11 percent increase in population since 1973 and a 22 percent rise in Gross National Product.

In 1983, renewable energy sources provided about six percent of the primary energy needs of this country, and projections are that renewables will contribute over nine percent to our energy mix by 1992 and over 10 percent by the year 2000.

A one percent increase may not sound like much, but when you consider what a large and growing energy system we have in the U.S., you begin to realize that a very high growth rate is occurring in the renewables area.

For example, in wind energy, the number of small companies producing wind machines more than doubled between 1980 and 1983. Consider also that the number of active solar building installations in operation in this country has more than doubled since 1980 and that the use of passive heating and/or cooling has increased by nearly 100 percent since 1980.

You all heard many examples of the progress in photovoltaics this morning. It is this progress which permits us to meet today and discuss how all of us, government and industry, can better work together to increase and maintain exports of photovoltaic goods and services.

In this partnership, the roles assumed by each part will shift as a renewable technology (or any technology for that matter) matures. The roles can be discussed in terms of three main phases of technology development.

Initially, the federal government, through DOE, provides support for fundamental research and development. During the basic and applied research phases of renewable technology development, the federal government can serve a major role in funding tests, studies, and experiments to confirm the feasibility of various technology options. The primary result of these efforts will be the establishment of a scientific and engineering technology base.

From this technology base, it is the responsibility of industry to take the risk and develop specific products and manufacturing processes. As industry begins the development of the technology, banks and other financial institutions have a role to furnish financial support such as investment capital for technology development.

And finally, as private industry brings a technology such as photovoltaics into the marketplace, government again enters the picture by providing support to industry's business development efforts. Our federal government employs 75,000 people, in over 100 programs, to assist in domestic and foreign commerce.

That is a large and invaluable amount of resources committed to the task. Cooperation among the many federal agencies therefore is essential, just as government cooperation with industry is essential, for the support of industry's business development efforts to be useful.

In the export market, photovoltaics has reached this last stage. Photovoltaics is now ready. The many resources of federal export assistance programs are now needed by the photovoltaic industry.

Let us now take a look at the importance of renewable energy exports.

RENEWABLE ENERGY AND EXPORTS

Renewable energy technologies represent a significant export opportunity for the United States. Renewable energy technologies are particularly attractive within the international marketplace, since they allow the use of local resources in the manner best suited to national needs, economics, and technological requirements. Renewable energy technologies are the rare case where a technology is being developed to fit a need. All too often the reverse is true where a need must be developed to fit the new technology.

Renewable energy technologies are especially useful to countries attempting to expand their industrial economy without the benefit of indigenous supplies of fossil fuels. We are indeed lucky in this country that we were never -- not even during the shortages of the seventies -- as dependent on foreign oil as many developing countries still are today. Think of how difficult it is for a developing country to move forward when so much of its capital must go to pay for imported oil.

Energy is very crucial to improving the quality of life in the developing countries. What we in this country do in the consumption of energy, particularly oil, and what we in this country do in the creation of new sources of energy like photovoltaics, has an enormous impact on the less developed countries (LDC) of the world. And what we do has an enormous impact on achieving worldwide peace.

Fortunately, in many overseas applications today, renewable energy technologies are already cost competitive and more reliable than conventional energy forms. By promoting exports, we can help our nation maintain its world market leadership while at the same time developing countries improve themselves.

Many nations have recognized the trade opportunities of renewable energy, and are stepping up their trade development efforts -- thus enhancing their market share of the world renewable energy trade. Foreign governments aggressively subsidize and encourage renewable energy exports. Governments of competitor nations often provide liberal financing through export subsidies and mixed financing packages.

Our renewable energy industry faces disadvantages in competing in international markets. The industry is characterized by relatively small- and medium-sized firms that lack the marketing and export experience needed to compete effectively in world markets. Information on potential foreign markets is not readily available to most U.S. renewable energy firms. And sometimes

the federal government's efforts at assisting industry could be better coordinated.

Many federal agencies have already recognized this and have been aiding renewable energy exports. Some interagency cooperation already exists. The Departments of Commerce and Energy operate a Renewable Energy Trade Development Program under a joint Memorandum of Understanding signed in 1982. The Department of Commerce sponsors export promotion events such as trade missions and trade shows. Trade law studies have also been produced for a number of countries. The Department of Energy provides technical and financial support. Industry participates by leveraging trade shows and trade missions into U.S. export sales.

Trade events that have taken place since the signing of the DOE/DOC Memorandum of Understanding in October 1982, have led to projected overseas sales (as of February 1984) of \$14.6 million for a government cost of only \$187,000. This amounts to industry sales of \$78 for every federal dollar spent!

This example demonstrates the success that can occur when government agencies and industry cooperate to promote renewable energy exports.

Other agencies are also already active in aiding renewable energy exports, and are to be commended for their efforts. For example, the Export-Import Bank provided financing for the \$350,000 sale of photovoltaic generating equipment for a telecommunications system in Colombia. Additionally, several PV firms have participated in the overseas investment missions of the Overseas Private Investment Corporation (OPIC). This is only the beginning of activities that can be undertaken to assist PV firms in exporting.

One of the concepts that DOE has learned in its export promotion activities is that the process is a two-way street. A government export assistance program must go out and advertise to industry, "Hey, I am here to help you" -- otherwise nobody knows of the help that is available. In addition, industry must not be afraid to take advantage of the available export assistance programs.

I would now like to talk a little about the "Renewable Energy Industry Development Act of 1983," since this may be the first time many of you have heard of this new law just signed by the President in July. I do not view this new law as just another burdensome requirement to deal with. The law merely formalizes that third and last phase of technology development -- where the many resources of government come to aid industry's efforts to bring a technology to market.

The Act has three main mandates for renewable energy export development:

- o First, the Department of Commerce is to implement a program to strengthen and coordinate federal efforts in assisting renewable energy exports.
- o Second, the Department of Commerce is responsible for preparing a competitive assessment of the renewable energy industry and identification of export barriers.
- o Third, an interagency working group, chaired by myself as the Secretary of Energy, is to be formed to encourage cooperation among federal

agencies and industry and to assist the Department of Commerce in implementing the mandates of the new Act.

I will focus on the last mandate of the law, the Interagency Working Group, since it is a DOE responsibility.

Today's seminar serves as a precursor to the formation of the interagency working group. Most of the federal agencies who will be involved with this group are here today, as are many from the photovoltaic segment of the renewable energy industry.

As chairman of the interagency working group, I can tell you that DOE has already begun planning for the creation of this group. I intend to see the interagency working group formed and working within the coming months.

The goal of the interagency working group is to increase the efficiency of the federal government's ability to provide renewable energy export assistance so that our renewable energy industry maintains or strengthens its world leadership position.

The strategy to implement this goal is threefold:

1. Facilitate cooperation and coordination among and between the relevant federal export assistance programs;
2. Identify and eliminate duplication in federal export programs; and,
3. Identify and eliminate deficiencies in overall export assistance activities.

The interagency working group will work closely with all the appropriate federal agencies and industry in implementing its strategy.

On the interagency working group, the Agency for International Development will have a role since it offers loans and grants to less developed countries for development projects, and also provides technical assistance on energy projects.

The Department of Commerce has a role since it coordinates issues relating to trade administration, international export policies and trade programs - in addition to having a major role in the implementation of the Renewable Energy Industry Development Act.

The Export-Import Bank has a role since it provides export financing through direct loans, loan guarantees, and export credits.

The Overseas Private Investment Corporation encourages private investment in developing countries by providing political risk insurance and financial services, and thus has a role.

The Small Business Administration will be involved since it offers financial assistance, counseling, export workshops, and training to help small businesses enter international markets.

The Trade Development Program has a role since it conducts feasibility studies and other planning services leading to reimbursable programs for project implementation with other agencies or direct host-country contacts with private firms.

The Department of Energy, in addition to chairing the interagency working group, will take the first step in this effort by providing federal agencies with the information they need on photovoltaics and other renewable technologies.

As the chairman of the interagency working group, I am very excited about my role of working together with members of these and other federal agencies and industry. I look forward to working with you on such a vital issue.

I hope the cooperation we see here today will serve as a model for renewable energy export promotion. I am confident it will.

CONCLUDING REMARKS

I believe government and industry will do their share to develop ways to increase renewable energy exports - especially photovoltaics. The challenge is for us all to find creative ways to promote exports. This is not a challenge that is easy to meet, and it will require the support and commitment of each of you here today.

The export challenge is difficult. However, our country often works best when challenged. It is then that the American spirit truly shines.

As I travel around the country, I find a growing sense of confidence and hope. It is in our people and it infuses what they do and their attitudes toward science, toward technology, toward the promise of the future.

We have again in this country an atmosphere for ingenuity, innovation, and challenge. If we simply turn loose the tremendous machine that is America, there is no limit to what we can and will do.

Thank you.

APPENDIX B
PHOTOVOLTAIC EXPORT ASSISTANCE SEMINAR
AGENDA

PHOTOVOLTAIC EXPORT ASSISTANCE SEMINAR

LOCATION: L'ENFANT PLAZA HOTEL
September 12, 1984

CHAIRMAN: PAT COLLINS, UNDER SECRETARY,
U.S. Department of Energy

Morning Session

- 8:30- 9:00 I. WELCOME ADDRESS
PAT COLLINS
- II. PV POLICY FORUM
- 9:00- 9:30 A. INTRODUCTION TO GOVERNMENT POLICY
PAT COLLINS, MODERATOR
1. AGENCY FOR INTERNATIONAL DEVELOPMENT
Jack Vanderryn, Agency Director for Energy and Natural Resources
 2. DEPARTMENT OF COMMERCE
James Phillips, Deputy Assistant Secretary for Capital Goods and International Construction
 3. EXPORT-IMPORT BANK OF THE UNITED STATES
Charles Anderson, Senior Loan Officer
 4. OVERSEAS PRIVATE INVESTMENT CORPORATION
Gerald West
Vice President for Development
- 9:30-10:00 B. PHOTOVOLTAIC OPPORTUNITIES
WILLIAM O'CONNOR, MODERATOR
General Manager, Solavolt International
1. INDUSTRY/MARKET OVERVIEW
John Day III, President
Strategies Unlimited
- 10:00-10:30 BREAK
- 10:30-11:30 2. PV INDUSTRY EXPERIENCES OVERSEAS
Malcolm Ream, Director of Marketing
Solarex Corporation
Vern Weekman, President
Mobil Solar Energy Corporation
George Naff, Manager
Solar Energy Projects
Hughes Aircraft Company
Roger Little, President
Spire Corporation
Martin Recchuite, Manager
Major Projects Marketing
Arco Solar, Incorporated
- 11:30-12:00 C. GOVERNMENT/INDUSTRY PANEL DISCUSSION
PAT COLLINS, MODERATOR

Afternoon Session

- 12:00- 1:30 LUNCHEON
DONALD P. HODEL, SPEAKER
Secretary of Energy
- 1:30- 3:00 III. OPPORTUNITIES FOR GOVERNMENT ASSISTANCE
WILLIAM E. DELPHOS, MODERATOR
V.P. for Operations
Overseas Private Investment Corporation
- A. MARKET IDENTIFICATION
 - B. TARGETING OPPORTUNITIES
 - C. RECONNAISSANCE
 - D. FEASIBILITY STUDIES
Intersol/TDP Case Study
 - E. FINANCING
Solarex/EXIMBANK Case Study
 - F. PROTECTING THE DEAL
 - G. TRAINING AND TECHNICAL ASSISTANCE
- 3:00- 3:30 BREAK—GOING INTERNATIONAL VIDEOTAPE
- 3:30- 5:15 IV. SPECIAL FOCUS ON FINANCING
ROBERT DRAGGON, MODERATOR
Acting V.P. for Finance
Overseas Private Investment Corporation
- A. GOVERNMENT FINANCING PROGRAM REVIEW
 1. AGENCY FOR INTERNATIONAL DEVELOPMENT
Jack Vanderryn, Agency Director for Energy and Natural Resources
Bruce Bouchard, Policy Officer
Bureau for Private Enterprise
 2. EXPORT-IMPORT BANK OF THE UNITED STATES
Richard Dutton, Senior Loan Officer
 3. OVERSEAS PRIVATE INVESTMENT CORPORATION
Robert Draggon
Acting V.P. for Finance
 4. SMALL BUSINESS ADMINISTRATION
Dennis Chrisbaum
Export Development Specialist
 5. U.S. TRADE AND DEVELOPMENT PROGRAM
Joe Sconce
Regional Director for Latin America
- B. QUESTION/ANSWER SESSION
- 5:15- 5:30 V. CLOSING REMARKS
PAT COLLINS

APPENDIX C
LIST OF ATTENDEES

APPENDIX C

Photovoltaic Export Assistance Seminar - Attendee List September 12, 1984

<u>Name</u>	<u>Organization</u>
Mr. Charles W. Anderson	Export-Import Bank of the United States
Mr. Robert Annan	Department of Energy
Mr. Robert Archer	U.S. Agency for International Development
Dr. Allen M. Barnett	University of Delaware
Mr. Bill N. Baron	Institute of Energy Conversion
Mr. Jim Bishop	Chronar Corporation
Mr. Manuel Blanco	Solar International Trade
Mr. Richard Blieden	Energy Conversion Devices
Mr. Roberto Bobonis	Puerto Rico Office of Energy
Mr. Chris Boris	Pacific Resources
Mr. Rick Budzich	Department of Energy
Mr. Edward Eurgess	Sandia National Laboratories
Mr. James Caldwell	ARCO Solar, Inc.
Mr. William Callaghan	Jet Propulsion Laboratory
Mr. Robert P. Carter	Sovonics Solar Systems
Mr. Dennis Chrisbaum	Small Business Administration
Mr. William C. Clark	Solenergy Corporation
Mr. Joe Cohen	Science Applications, Inc.
Mr. Pat Collins	Department of Energy
Mr. Robert J. Cunningham	Mobil Solar Energy Corporation
Mr. John F. Day, III	Strategies Unlimited
Mr. William Delphos	Overseas Private Investment Corporation
Mr. Robert Draggon	Overseas Private Investment Corporation
Mr. Richard Dutton	Export-Import Bank of the United States
Mr. John Eberle	Meridian Corporation
Mr. Sam Enfield	U.S. Export Council for Renewable Energy
Ms. Debbie Eskenazi	Meridian Corporation
Mr. Claude Fontheim	Akin, Gump, Strauss, Haver and Feld
Dr. Eugene Frankel	House Science & Technology Committee
Mr. Robert Fritz	Marvel Division
Mr. Les Garden	Department of Commerce
Ms. Lisa Gray	Meridian Corporation
Mr. Allan Gunn	Georgia Power Company
Ms. Elaine Guthrie	Department of Energy
Mr. Lloyd Herwig	Department of Energy
Mr. Walter J. Hesse	Entech, Inc.
Mr. Donald Paul Hodel	Department of Energy
Mr. R. Thomas Hoffman	I.T. Power, Inc.
Ms. Judith Hogan	Meridian Corporation
Mr. John High	Hughes Aircraft Company
Mr. Tom Jaras	Science Applications, Inc.
Mr. Christopher Kelly	State Street Trade Development Company
Mr. Raffy King	Science Applications, Inc.
Mr. John Kondos	SOHIO Chemicals and Industrial Products Co.

Mr. Andrew Krantz	Department of Energy
Mr. Fred Krause	Georgia Power Company
Ms. Linda Kurkowski	Meridian Corporation
Mr. William Kurth	Energy Technology Systems International
Mr. Ron Larson	Sun Watt International
Ms. Heidi Lee	Meridian Corporation
Mr. Jim Levitt	Resource Planning Associates
Ms. Deborah Lindsey	I.T. Power, Inc.
Mr. Roger Little	Spire Corporation
Mr. Thomas LoGiudice	Photex Solar
Mr. Bradley Macaleer	Meridian Corporation
Mr. John K. Mackay	United Energy Corporation
Mr. Lawrence Mansueti	Meridian Corporation
Mr. Paul Maycock	Photovoltaic Energy Systems, Inc.
Mr. Tom Mayfield	U.S. Export Council for Renewable Energy
Ms. Janet Mazur	Department of Commerce
Mr. Brad Miller	Department of State
Mr. William J. Murray	Strategies Unlimited
Dr. George Naff	Hughes Aircraft Company
Mr. Joseph Najemy	Solar Marketing Associates
Mr. William H. O'Connor	Solavolt International
Mr. Anthony Pearson	Jet Propulsion Laboratory
Mr. James Phillips	Department of Commerce
Ms. Pat Pickering	Department of State
Mr. Robert Powell	Jet Propulsion Laboratory
Mr. Morton Prince	Department of Energy
Mr. Clyde Ragsdale	Solavolt International
Mr. Malcolm Ream	Solarex Corporation
Mr. Martin C. Recchuite	ARCO Solar, Inc.
Mr. Vince Rice	Department of Energy
Mr. Don Ritchie	Solar Energy Research Institute
Mr. Donald R. Roberts	Westinghouse Electric Corporation
Mr. Dan Saltzman	Office of Representative Wyden
Mr. John Sanders	Intersol, Incorporated
Dr. Robert San Martin	Department of Energy
Ms. Maxine Savitz	Lighting Research Institute
Dr. Frederick Schmid	Crystal Systems, Inc.
Mr. Sam Schweitzer	U.S. Agency for International Development
Mr. Tony Scolaro	Department of Energy
Mr. Joe Sconce	Trade Development Program
Mr. Sandy Selman	Edison Electric Institute
Mr. Charles Sills	Intersol, Incorporated
Mr. Edwin Skykind	Department of Commerce
Mr. Lawrence Slominski	Meridian Corporation
Mr. Dan Steinway	House Science & Technology Committee
Mr. Jack Stone	Solar Energy Research Institute
Mr. George Storty	Consultant
Mr. Nick Sundt	Office of Technology Assessment
Mr. Jim Sweeney	Business Publishers
Mr. Sam Taylor	Department of Energy

Mr. W. Peter Teagan
Ms. Jane Tuohy
Mr. Jack Vanderryn
Mr. Tony Velochy
Mr. Robert G. Walton
Mr. Raymond Watts
Mr. Vern Weekman
Ms. Nancy Weissman
Mr. Gerald West
Mr. Tom West
Mr. James D. Westfield
Mr. James White
Mr. Richard Wright

Arthur D. Little Company
Commonwealth of Massachusetts
U.S. Agency for International Development
Overseas Private Investment Corporation
Philadelphia National Bank
Battelle/Pacific Northwest Laboratories
Mobil Solar Energy Corporation
Mid-Atlantic Solar Energy Association
Overseas Private Investment Corporation
Consultant
Energy Technology Systems International
Meridian Corporation
Chronar Corporation