

Opportunity Knocks:

The Export Market for the Energy Efficiency and Renewable Energy Industry

A Report by the International Institute for Energy Conservation
for the U.S. Initiative on Joint Implementation

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Preface

North American, Japanese, and European firms that manufacture energy-efficient technologies or provide energy services have traditionally concentrated their sales activities on domestic markets or the markets of their Organization for Economic Cooperation and Development (OECD) competitors. There are, however, a growing number of opportunities for the energy efficiency industry in emerging markets of Latin America, Asia, Southern Africa, and Central and Eastern Europe. These opportunities are the result of developing and transitional economies currently being much less energy-efficient than the more technically advanced OECD economies. As a result, billions of dollars worth of cost-effective upgrades of their power sector and transport sector infrastructures, as well as of a range of end-use equipment, are waiting to be developed.

Besides providing immediate business opportunities for the energy efficiency industry, these economies promise to be the largest markets for energy efficiency in the 21st century. The OECD has been the world's largest market for energy technologies and services in the past, and will continue to be in the near future. However, the developing world—with population, economic, and energy demand growth that far outstrips the current growth of industrialized countries—will soon be the world leader. To illustrate, the current developing countries' rate of energy demand growth is more than double that of OECD countries, 3.7 percent to 1.7 percent. The implication? If projections hold, annual energy consumption of the developing world is expected to grow by 110 quadrillion Btus over the next 20 years. This is equivalent to the annual output of over 5,000 large coal, nuclear, or hydro plants. OECD energy consumption over that period, in contrast, is expected to grow by only 50 quadrillion Btus. Meeting the explosive demand for energy services in emerging markets will require the involvement of the entire energy industry. Meeting it at the least economic and social cost will require the especial attention of the energy efficiency industry.

This report aims to stimulate the involvement of energy efficiency firms by providing information on these immediate opportunities and on the forthcoming sea change in the market. It offers insight for both small and large companies on how to exploit this opportunity. For all firms, entering foreign markets can be risky business, but it need not be too difficult if firms first learn the basics of local regulatory systems, business practices, and cultural issues. Furthermore, ample government and not-for-profit resources exist to help businesses explore these markets. With these resources and information, as well as business skill and persistence, individual companies can capture the significant benefits of entering these growing markets.

Support for this report was provided by the U.S. Initiative for Joint Implementation. The International Institute for Energy Conservation is solely responsible for the report's contents. All monetary figures are given in U.S. currency.

Photo Credit: Peter du Pont, IIEC



Children walk through an alley in Jakarta, Indonesia. The skyscrapers are but one indicator of the rapid modernization and growth of the Indonesian economy.

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I. The Export Market for Energy Efficiency

The convergence of several factors—high energy intensities, rising energy demand, capital and capacity shortages, and environmental constraints including climate change—creates a huge potential market for energy efficiency in the developing and transitional economies of the world. Meanwhile, low energy demand growth and the demise of many utility-sponsored demand-side management programs have reduced the rate of growth of sales of energy efficiency products and services within industrialized countries. Manufacturers, distributors, and energy service providers who have traditionally looked to the United States and other OECD countries to bolster sales and profits must, in the future, turn their attention to the less developed countries of the world to realize continued growth.

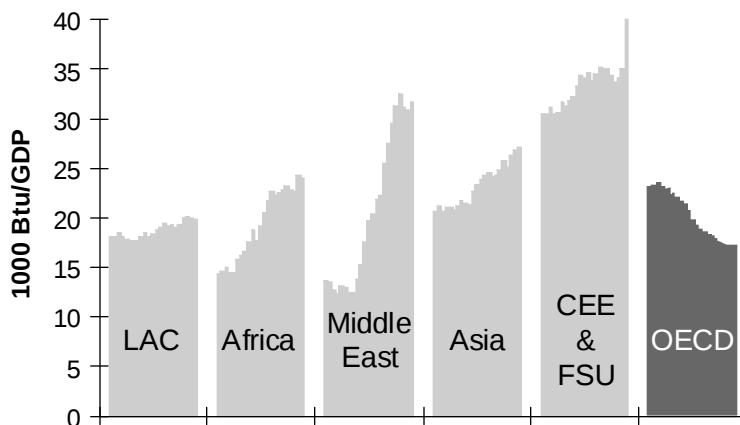
A Market for Today

The relatively high energy intensity of non-OECD economies creates immediate opportunities for cost-effective investment in the energy sector. As Figure 1 demonstrates, the need for these investments is acute. The graph shows that while the developed world became more energy-efficient over the past 25 years, developing and transitional economies became less energy-efficient. Part of the rise in the energy intensity of these economies is due to their rapid industrialization

during this period, but this growth could have been significantly less dramatic if they had adopted more efficient technologies. Whatever the cause, this inefficiency has had and will continue to have serious implications for the competitiveness of these economies in an increasingly unified world market. Developing country industries will not be able to compete when their outdated factories consume three times as much energy as more modern facilities. For US vendors of highly efficient products and services, these industries' efforts to cut energy costs and remain competitive are creating lucrative markets.

The faltering infrastructures of Central and Eastern Europe and the former Soviet Union provide a perfect example of the opportunities for profitable investment in power plant efficiency, transportation systems, and the transmission and distribution of energy products. The annual raw energy consumption of these countries stands at roughly 1.5 billion tonnes oil equivalent (btoe), yet the delivered benefit is less than one btoe.¹ That means more than one-third of the energy generated does not reach end-users; in other words, it is wasted. In sharp contrast, losses in Western Europe, Japan, and the United States amount to less than 20 percent of raw energy consumption. Bringing the former Eastern Bloc up to Western power standards would save energy equal to the annual production of all nuclear reactors in North America. As new

Figure 1. Energy Intensities by Region (1970-1992)



Source: Energy Information Agency (EIA), *Energy Use and Carbon Emissions Data— non-OECD Countries* (Washington D.C.: U.S. Department of Energy, 1995).

energy resources are needed, it is likely that efficiency projects designed to retrieve lost energy will be among the most cost-effective options.

The Power of Free Trade

Most of these supply-side energy efficiency projects have been cost-effective for years and have not been developed only for lack of access to Western technologies. This barrier is being removed by the rapid globalization of trade, strengthened by—among other factors—the completion of the Uruguay Round of the General Agreement on Tariff and Trade in 1994. Meanwhile, for those technologies and services that were not previously cost-effective, the recent wave of energy sector deregulation in developing and transitional economies has profound implications for the energy efficiency market.

The Role of Deregulation

For decades, governments throughout the world have subsidized energy consumption, either directly or indirectly. Government intervention has been especially common in the developing world; in the late 1980s, consumers there paid an average of 60 percent of the real cost of the energy they received.² While the reason for the subsidies was admirable—ensuring access of all citizens to affordable energy services and encouraging key strategic development sectors—the subsidies discouraged investment in efficient technologies and practices. In the drive for economic efficiency and international competitiveness, however, many governments are dismantling these outdated policies.

Countries from China to Chile to the Czech Republic are loosening government control; some are going so far as to seek private investment in the energy sector. As these changes occur, subsidies are disappearing and energy prices are moving closer to market prices. As a result, demand-side energy efficiency projects are daily becoming more attractive to developing world consumers of energy services.

As seen in the United States, the power of appropriate price signals can be enormous. Bolstered by utility regulatory reforms and government-sponsored voluntary programs, the cost savings achievable through energy efficiency have created a huge market for, among other technologies, energy-efficient lighting. US companies have upgraded roughly one billion square feet of commercial and industrial floor space to high efficiency lighting systems. Though these systems cost several times as much as their incandescent counterparts, they can pay for themselves in energy savings in less than one year. As price liberalization continues in developing and transition economies, lighting and other high-efficiency technologies will become more attractive alternatives in those markets as well.

In South Africa, for example, deregulation of the energy sector is helping at least one efficient transport option rapidly become economically viable. Electric vehicles that are 22 percent efficient at converting energy into motion enjoy a fuel cost per mile traveled advantage as compared to gasoline powered vehicles

that are only 10 percent efficient. Calculations by South Africa's national electric utility show that the fuel costs to drive a mile in an electric vehicle are less than one-third of those of a comparably equipped gasoline powered vehicle³. This savings in operating cost is largely sufficient to off-set the electric vehicle's higher first cost. Considering this cost advantage, three US firms and one Japanese company are exploring how to design and market electric vehicles for this market.

Together, the inefficiencies of their infrastructure and their move toward market pricing provide an immediate opportunity for the energy efficiency industry in developing and transitional country markets. In Europe and Japan, the business community has already learned the value of these markets. Business giants like Landis & Gyr, Philips, and Sanyo are successfully promoting the energy efficiency advantages of their products.

- Landis & Gyr is poised to land several hundred million dollars of deals in Central and Eastern Europe to simultaneously reduce energy consumption and improve energy services through energy efficiency improvements.
- In the Philippines, Philips is taking out newspaper ads that market its lamps based on the advantage of savings energy and thereby money.
- Sanyo is one of several Japanese appliance manufacturers voluntarily putting energy consumption information on products sold Southeast Asia.

If US firms want to share in these lucrative markets, they must make the commitment of time and resources to investigate and invest in them.

The Market of the Future

In the future, developed countries will offer limited markets for most energy technologies and services. Developing countries—driven by explosive population growth⁴ and rapid economic expansion, on the other hand, will offer lucrative opportunities for the sale of these products. All indicators of energy service demand—past growth, projections of future growth, and anecdotal evidence support this prediction. As this section explains, emerging economies will not be able to meet this demand with inefficient technologies and processes. Capital shortages and environmental constraints—including climate change—will require developing and transitional countries to look for energy-efficient solutions. Those companies and technologies first able to establish market share in these countries will hold a significant competitive advantage as these country's come to dominate the global economy in the 21st century.

Developing and transition countries will be the world's biggest markets for energy efficiency products and services in the 21st century.

Unsurpassed Energy Service Demand Growth

Changes in energy consumption are not foolproof indicators of changes in demand for energy services; however, they are closely tied. As depicted in Figure 2, the majority of recent growth in com-

mercial energy consumption, and thereby demand for energy services, has occurred in less developed countries (LDCs). Low and lower-middle income countries increased energy consumption by over 65 quads over from 1970 to 1992, during which period developed country growth was less than 50 quads.⁵ On an annual basis, the story is even more dramatic. While the nations of the developed world have experienced annual energy consumption growth of roughly one percent, the world's poorest countries have experienced growth of over five percent per year.

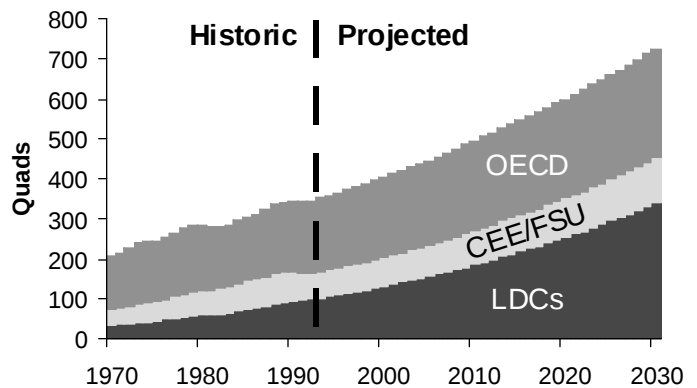
The fastest growing economies—the Asian tigers of Indonesia, Thailand, Malaysia, and South Korea—experienced energy consumption growth as high as 10 percent during the early 1990s. An example from the transportation sector puts this growth in understandable terms. In Bangkok, the largest city in Southeast Asia, vehicle registration rose from 600,000 in 1979 to three million in 1993, an annual growth rate of roughly 12 percent.

As Figure 2 also indicates, this growth shows few signs of slowing. The U.S. Department of Energy's Energy Information Agency predicts that most future energy consumption growth will occur in the developing world. For example, from 1995 to 2015, China and the rest of non-OECD Asia are expected to experience 3.5 percent annual energy consumption growth. This is almost three times the projected growth rate of OECD countries, where energy demand will expand by a significantly smaller 1.2 percent per year. To put this contrast in perspective, by the year 2010, annual increases in energy use for China alone will exceed those of the OECD nations by 0.5 quads—equivalent to the output of 26 coal-fired power plants with 1000 megawatt (MW) capacity each.

Within the transport sector, this trend is magnified. In 1990, the developing world accounted for less than 20 percent of the world's vehicle fleet, its vehicle-kilometers traveled, and its transportation fuel use. By 2030, these countries will account for roughly 50 percent of global demand in all three measures.⁶ China again provides a case study of what this transition will mean in concrete terms. Currently, there are just two million private passenger vehicles in a country of roughly 1.3 billion people. In ten years, the number of personal cars is expected to rise to 20 million. And if the Chinese government succeeds in its plans, 270 million vehicles will be on the road in China within the next thirty years.⁷ Overall, by 2020, developing countries will consume more 42 percent of the world's energy, up from roughly one-third in 1995 and only 15 percent in 1970. Clearly, the balance is swinging.

Finally, significant anecdotal evidence supports the surging demand for energy services in the developing world. For example, while developed country markets for residential air

Figure 2. Annual Commercial Energy Consumption (1970-2030)



Sources: Energy Information Agency (EIA), *Energy Use and Carbon Emissions Data — non-OECD Countries* (Washington D.C.: U.S. Department of Energy, 1995); and EIA, *World Energy Use, 1996* (Washington D.C.: U.S. Department of Energy, 1996).

conditioners are relatively flat, the Philippines' hot and humid climate and its burgeoning middle class have made air conditioners a growth commodity. From 1975 to 1995, a period that included a near decade long economic slump, annual sales of residential air conditioners increased by a factor of three, from 30,000 units to over 95,000 units. Today, bolstered by a more robust economy than the country has enjoyed in many decades, air conditioner companies are reporting to their association that sales are rising by as much 20 percent per year.⁸

Historic growth numbers, projections, and anecdotal evidence do not guarantee future growth, but they do offer a basis for prediction. All evidence points toward energy consumers in today's developing and transitional economies consuming as much, if not more, energy as the world's wealthiest nations within 25 years and demanding the same level of energy services.⁹ Clearly, these countries are the growth markets of the future for both supply-side and demand-side energy projects, technologies, and services. Meeting this demand poses enormous challenges—and opportunities—for the entire energy industry.

Paths to the Future

Emerging economies have two basic paths they can take to meet their burgeoning demand for energy services. Under the first—the *status quo* scenario—they will concentrate solely on supplying more energy to meet increased energy services demand and make no effort to improve system efficiency. Under the second—the *high-efficiency* scenario—emerging economies will adopt an integrated approach and squeeze as many energy services out of each unit of energy as is economically viable. According to the second scenario, countries will build new power plants, transmission lines, roads, and railways only when these options are cheaper than increasing the efficiency of existing systems and of end-use devices.

Besides the cost-effectiveness of energy efficiency investments, developing countries have two other motivations to pursue energy-efficient development: capital shortages and environmental constraints. Capital shortages will prohibit expansion of power and transportation infrastructures sufficient to keep pace with the dramatic growth in energy service demand. Only by saturating the market with high-efficiency products and services will developing and transitional countries will be able stretch their roads, rails, and power plants to meet this new demand.

Meanwhile, unchecked growth in fossil fuel consumption is fouling local air and water, and threatening the global climate through increased concentrations of greenhouse gases (GHG) in the atmosphere. Local actions in developing and transitional countries to reduce the health threats posed by air and water pollution are already providing increased impetus for sustainable energy projects. Meanwhile, the global response to climate change is creating an international framework in which environmentally beneficial energy-efficiency projects will receive financial advantages over their inefficient competitors.

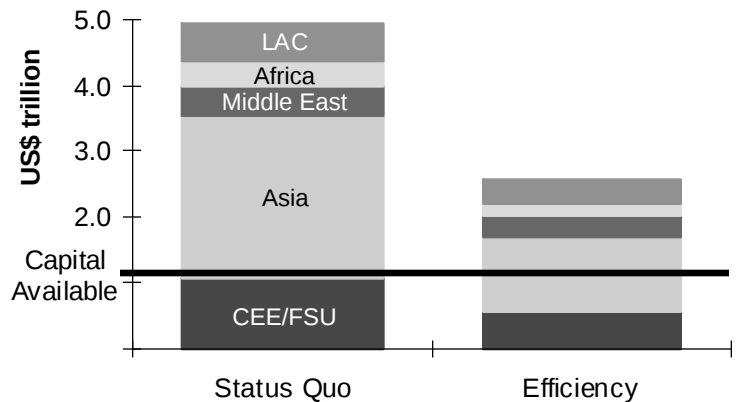
Getting Around the Capital Shortage

The construction of new power plants and roads and the purchase of oil, natural gas, coal, and other energy resources are extremely expensive. If developing and transitional countries focus exclusively on expanding conventional energy supply options to meet energy demand growth, they will quickly exhaust their capital resources.¹⁰ To meet projected growth, the World Bank estimates that developing countries will require investments of over \$100 billion per year for the next thirty to meet electricity needs alone.¹¹ Foreign exchange will be needed to pay for 40 percent of this total (\$40 billion per year). Yet, only \$10 billion to \$12 billion per year is expected to be available from the multilateral and bilateral lending agencies that currently provide 80 percent of the foreign exchange for power sector investments.¹² While commercial banks are rapidly becoming important sources of capital for developing countries, it is unlikely that these institutions will be able to supply the nearly \$30 billion annual shortfall.

As demand for energy and transportation services expands, developing and transition countries must find less capital-intensive means of providing services. Developing countries are beginning to realize that increasing the efficiency of transport systems, power plants, transmission and distribution lines, and end-use equipment is often the best option. Efficiency measures can allow these countries to free up energy resources and hard currency reserves for other purposes. For example, if urban planners in developing countries continue to promote urban sprawl through transport systems based on the automobile, they will have to build thousands of miles of urban highways. Highways cost up to \$100 million per mile to build, operate, and maintain. If, as seems likely, they adopt more efficient, less capital-intensive strategies such as rail expansion (\$15 million per mile) or bike lane expansion (\$100,000 per mile), billions of dollars could be saved. As Figure 3 demonstrates, even under the efficiency scenario, not all needs for capital will be met. Rather than meeting less than a quarter of those needs, however, nearly 50 percent will be met.

Several Asian countries have found that encouraging energy conservation among industrial consumers frees up capacity for new retail consumers and costs only half as much as building new power plants. In order to expedite investments in energy efficiency, India, for example, allows 100 percent depreciation on some energy-efficient products in the first year. Moreover, modest investments in energy efficiency projects can yield significant returns. In Thailand, Asia's acknowledged leader in implementing the efficiency approach, the Electricity Generating Authority of Thailand (EGAT) currently oversees a \$190 million,

Figure 3. Capital Requirements for the Energy Sector (1995-2025)



Source: Mark Levine, et al., *Energy Efficiency, Developing Nations, and Eastern Europe: A Report to the U.S. Working Group on Global Energy Efficiency* (Washington, D.C.: International Institute for Energy Conservation, 1991).

five-year program that was originally expected to reduce capacity needs by 238 MW and electricity consumption by 1,400 gigawatt-hours (GWh). EGAT successfully negotiated with lighting manufacturers to transform the Thai fluorescent lighting market to higher efficiency. This kind of direct outreach to equipment manufacturers, along with aggressive load management, has allowed EGAT to raise their capacity savings target to 285 MW. Building that much new capacity would cost Thailand about \$285 million.¹³

Energy efficiency investments provide a less costly alternative for emerging economies to meet demand for energy services than building new power plants. Given the capital constraints that prevent many countries from building adequate new capacity, such investment will be not only cost-effective but imperative. This imperative presents an opportunity that energy efficiency firms can not afford to miss.

Fighting the Greenhouse Effect

The greenhouse effect refers to the phenomenon by which the Earth's atmosphere traps infrared radiation, or heat. Gases that cause the greenhouse effect are mainly the natural compounds—water vapor, carbon dioxide, methane, and nitrous oxide—that keep the Earth habitable. But human activity is increasing the concentrations of these and other gases. If this trend continues, atmospheric scientists predict global climate change with uncertain but potentially grave long-term effects. The scientific consensus on global climate change is represented by the Intergovernmental Panel on Climate Change (IPCC), which brings together several hundred of the world's leading atmospheric scientists under the auspices of the World Meteorological Organization and the United Nations Environment Programme. A summary of the IPCC's consensus on global climate change appears below.

Table 1. Global Climate Change: The Scientific Consensus

As Table 1 suggests, scientists agree that perceptible environmental changes will occur as greenhouse gases increase. Specifically, the atmospheric models suggest that the Earth's temperature will rise about 1°C (1.8°F) by 2025 and 3°C (5.4°F) before the end of the next century. As a result, sea levels will probably rise 65 centimeters (two feet) by 2100.¹⁴ While scientists are unable to predict the social or economic consequences of climate change for specific countries or regions, the IPCC cautions its mem-

Statement	IPCC Consensus
Added greenhouse gas cause the Earth to warm	Virtually certain
Greenhouse gas concentrations increasing because of human activity	Virtually certain
Significant reduction of uncertainty will require a decade or more	Virtually certain
Full recovery will require many centuries	Virtually certain
Global-mean surface precipitation increase	Very probable
Rise in global sea level	Very probable
Local details of climate change	Uncertain
Tropical storm increases	Uncertain
* "Virtually certain" means nearly unanimous agreement among scientists and no credible alternative view. "Very probable" means roughly a 9 out of 10 chance of occurring. "Uncertain" means hypothesized effect for which evidence is lacking.	

Source: World Resource Institute, *World Resources 1994-95* (New York: Oxford University Press, 1994), p. 205.

ber governments that current efforts to reduce the risk of climate change are insufficient. As an analytic organization, the IPCC does

not recommend what actions governments should take. Yet its message is clear: immediate action is required to mitigate the threat of climate change. Governments around the world have been listening—and climate change has become an increasingly important driver of national and international policy.

The focal point for international negotiations and national action is the Framework Convention on Climate Change (FCCC). Signed by more than 150 countries at the 1992 Earth Summit in Rio de Janeiro, the FCCC establishes an ongoing process for national governments to work independently and together to mitigate climate change. Following the Summit in Rio, most industrialized countries adopted formal plans to address climate change; the U.S. 1993 Climate Change Action Plan (CCAP) is one example. CCAP called for \$60 billion in private investment in energy-saving programs and \$1.9 billion in federal spending to undertake domestic actions to reduce net GHG emissions.

While the FCCC encourages countries to undertake efforts within their own borders, it explicitly allows signatory nations to meet their obligations “jointly with other parties.” This includes both efforts to reduce GHG emissions and to improve carbon dioxide sinks. (Sinks are any source of absorption of greenhouse gases, such as forests.) Activities Implemented Jointly (AIJ) is a term adopted by the FCCC to describe a wide range of possible arrangements or projects between groups in two or more countries to reduce, avoid, or sequester greenhouse gases. AIJ offers benefits to both developing and industrialized countries. For developing countries, AIJ is a means of gaining access to cutting edge, environmentally beneficial technologies, as well as financing. For industrialized countries, AIJ reduces the cost of undertaking all the country’s climate change mitigation efforts within its own borders. For all countries, AIJ projects can create jobs, improve the local economy, and protect the environment.

Fossil fuel consumption is the largest single contributor to GHG emissions, accounting for well over 90 percent of the six billion tons of carbon released yearly.¹⁵ Thus, projects that reduce energy consumption could potentially do more to mitigate the threat of global warming than other activities. Gains from energy efficiency are also likely to be the least costly means of achieving reductions,¹⁶ and in many cases these projects could be highly profitable. Numerous energy efficiency projects will be carried out in industrialized countries, but AIJ opens up the possibility for North American, Japanese, and European firms to undertake GHG emission reduction projects overseas as well.

The stakes of AIJ projects are potentially quite high. Although GHG mitigation currently carries no economic weight, AIJ may help to create a trading regime (and hence a price) for GHG emissions permits. Under such a regime, every country would be given an annual allotment of GHG emission permits. Countries wanting to emit more GHGs would need to buy permits from countries that consumed less than their allotment. By placing an economic value on GHG emission reductions, the financial attraction of energy efficiency projects in developing countries would be greatly enhanced.¹⁷ Companies with developed AIJ

projects—or at least with a strong presence in the developing world markets—will be best situated to reap the financial rewards.

Already, electric utilities—some of the largest, most aggressive players in the international energy market—are actively looking for AIJ projects in which they can invest. These utilities realize that, if the world's governments agree to global and national limits on GHG emissions, they will bear a large responsibility for realizing the necessary reductions. For project developers interested in forming partnerships with utilities, AIJ provides an attractive forum.

Meanwhile, multilateral development banks—such as the World Bank and the Inter-American Development Bank—and bilateral aid agencies are actively seeking to promote carbon saving projects. In Mexico, for example, a project to replace incandescent light bulbs with compact fluorescent lamps (and thereby reduce carbon dioxide emissions by roughly 90,000 tons per year) received a \$10 million grant from the World Bank's Global Environment Facility and \$3 million from the government of Norway. Those project developers who enter the AIJ market early will be the best positioned. They will be the most likely to secure financing from the market for carbon offsets being developed by the interests of utilities, development banks, and bi-lateral aid agencies.

As the previous sections have shown, there are strong economic and environmental incentives for emerging economies to employ high-efficiency technologies and processes to meet their demand for energy services. These advantages have already encouraged many developing and transitional countries to seek out such innovative, high-tech, energy-efficient solutions. This market, however, has only begun to unfold. As the benefits of energy efficiency become more widely known, its inherent advantages promise to increase the global market for energy-efficient products and services. The opportunity exists. It is up to enterprising firms to engage this market, provide the necessary technology and knowledge, and reap the rewards.

Size and Value of the Opportunity

With skyrocketing energy demand, concern for climate change, and the potential of AIJ, one message seems clear. Regardless of the estimation technique, the future market for energy-efficient products and services in the developing and transitional world will be large. A 1995 study by Hagler Bailly Consulting, Inc. estimates that the annual market for energy efficiency technologies and services in the power sector will rise from about \$40 billion today to \$125 billion in 2015.¹⁸ According to Hagler Bailly, sales to industry will account for 45 percent to 50 percent of the total, sales to commercial establishments for roughly one-third, and sales to private homes for the remainder. An earlier study

The energy efficiency market in emerging economies will be worth about \$55 billion per year, the OECD market less than \$19 billion per year.

by the U.S. Working Group on Global Energy Efficiency estimated that over the next thirty years, on average, the energy efficiency industry would be worth roughly \$73 billion. According to the second study, the energy efficiency market in emerging economies

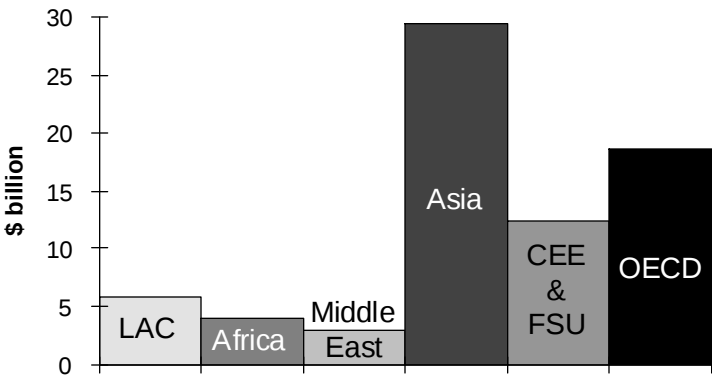
will be worth about \$55 billion per year, the OECD market less than \$19 billion per year (see Figure 4).¹⁹

Another study of the worldwide market potential for energy efficiency technologies and services was conducted by the U.S. Agency for International Development in preparation of the Department of Energy's National Energy Strategy.²⁰ The study breaks the market into three major energy technology categories: power generation, oil and gas exploration and production, and energy conservation equipment and services. The increment to be spent for energy efficiency equipment and services over the price to buy the conventional product is estimated to be \$252 billion for the period from 1990-2010. This figure significantly understates the value of actual sales of this equipment because it only measures a fraction of total sales—represented by the incremental cost of efficient devices over standard devices. This sum is expected to be spent at the rate of \$8.4 billion annually for the period 1990-2000, and double that for the period 2000-2010. Approximately half of these funds will be spent by developing and transitional countries.

Two other studies have looked at the potential for energy efficiency in more localized markets. A report by the Alliance to Save Energy estimates that the potential Eastern European market of energy-efficient industrial products (with paybacks of less than three years) is approximately \$20 billion.²¹ Finally, another study for the U.S. Agency for International Development estimated the potential Indian market for energy efficiency to be between \$3.1 and \$4.4 billion.²²

All of these studies point to a large and growing market for energy-efficient technologies and services in developing and transition economies. Companies serious about sustaining their long-term viability and profitability must be willing to make the commitment to exploring these markets. They will not be disappointed.

Figure 4. Average Annual Energy Efficiency Investment (1995-2025)



Source: Mark Levine, et al., *Energy Efficiency, Developing Nations, and Eastern Europe: A Report to the U.S. Working Group on Global Energy Efficiency* (Washington, D.C.: International Institute for Energy Conservation, 1991).

II. The Energy Efficiency Industry

The energy efficiency industry stands to benefit greatly from increased demand for their products in developing and emerging countries. But which firms constitute the energy efficiency industry? The answer is that the industry covers a range of firms within traditional industries that deliver *energy services* to consumers at lower cost than the more traditional approach of expanding supply-side energy resources. Energy services, to name a few, include: lighting, heating and cooling, transportation, and industrial drivepower. It is these services, not energy itself (such as gasoline or electricity), that people desire.

A large portion of the energy efficiency industry includes producers of advanced, energy-efficient lines of products traditionally associated with other established industries, including the automobile, motors, lighting, and appliance industries. Another segment of the industry is represented by emerging high technology and services firms. These companies—specializing in computer hardware and software, energy engineering, project finance, demand-side management consulting, and advanced building materials—are typically characterized by cutting edge innovation, limited capital resources, and immature marketing networks.

While both established and emerging firms can continue to market themselves as members of their traditional industries, they could individually and collectively benefit by marketing themselves as members of the energy efficiency industry. Developing countries will seek the energy efficiency “label”; those firms that successfully market themselves under that category will benefit. The following sections detail some of the technologies and services that will be in demand and provide evidence of the existing market.

Demand-Side Technologies and Services

Industrial, commercial, and residential end-use technologies consume roughly two-thirds of the world’s energy (the transportation sector accounts for the remainder). Much of this energy is used much less efficiently than it could be, especially by developing and transitional economy consumers. As this section demonstrates, there are already numerous opportunities for specific industry sectors to engage these markets, and more are created every day.

Energy Service Companies

Energy service companies (ESCOs) provide a range of services to implement energy efficiency projects. Services include engineering, financing, project construction, project management, and maintenance requirements to identify, implement, and maintain efficiency projects. While various types of companies make up the industry, engineering experience anchors these enterprises. The ability to identify opportunities for cost-effective energy efficiency investments, to utilize myriad energy efficiency producers and technologies, and to manage their operations, makes these engineering services essential

to the success of an energy efficiency project. ESCOs make use of all the energy technologies listed in the following sections.

Recognizing the power of ESCOs, developing and emerging economies around the world are working to build domestic ESCO industries. In Chile, for example, the country's largest copper mining firm, Codelco, is considering the establishment of an internal ESCO. Codelco sees ESCOs as a means of capturing large, cost-effective energy savings from their mining operations. Meanwhile, in China, the SSTC has secured funding from the Global Environment Facility to establish three ESCOs in Province.

Building Environment Controls

Building environment controls regulate one or more of a building's heating, cooling, lighting, and security needs. By turning off (or powering down) systems when they are not needed, building controls can save considerable energy. Most controls firms manufacture only one or two parts of a building's overall system, such as occupancy sensors that activate or deactivate lighting systems, as well as sensors that control heating, ventilating, and air conditioning systems. A few companies manufacture a range of controls and HVAC products and can offer integrated systems.

Yamatake-Honeywell, a Japanese firm owned in part by US-based Honeywell, has installed building controls in more than 20 large Indonesian office buildings through its in-country distributor. One of its recent projects was the 23-story headquarters of Indonesia's quasi-governmental Agency for the Assessment and Application of Technology (BPPT). According to Yamatake's in-country distributor, the prime selling point for the systems in the Indonesia market is energy savings, followed by efficiency and ease of maintenance.²³

Heating, Ventilating, and Air Conditioning (HVAC) Equipment

For commercial facilities, HVAC often accounts for most of the energy load; as a result, efficient HVAC equipment significantly reduces energy consumption. HVAC equipment can be sold as modular units, but it is most often sold as combined systems that can be integrated into a building energy management system to allow for automatic control. The various components of an HVAC system include: air conditioners, heat pumps, liquid chillers, thermal storage equipment, furnaces, and boilers.

In 1994, the government of the Philippines dramatically increased the market share of energy-efficient air conditioners by introducing energy performance standards. The standards drove the least efficient products off the market immediately. As the government continues to raise the standard, higher efficiency units will be in demand. (See also *Appliances* below.)

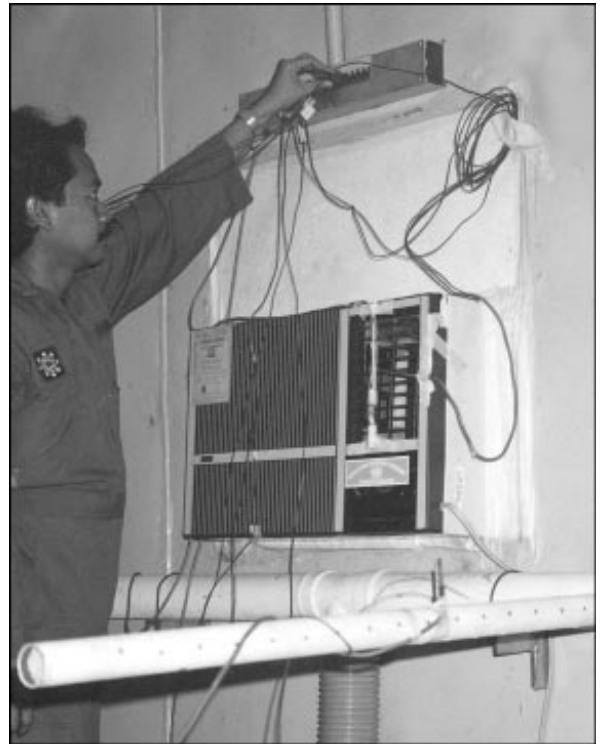


Photo Credit: Philippines Department of Energy

A technician monitors the energy efficiency of a residential air conditioner. The Philippines' tough standards have helped catalyze a market for high-efficiency products.

Lighting

Lighting is one of the easiest places to achieve significant energy savings. Upgrading incandescent light bulbs to compact fluorescents reduces energy consumption by up to 75 percent. Meanwhile, replacing energy-hungry magnetic ballasts with their high-efficiency electronic counterparts can reduce energy consumption by 25 percent. The technologies that define the lighting industry are not limited to lamps and ballasts. High-efficiency fixtures, luminaires, reflectors, and control systems are integral components in energy-efficient lighting systems.

Thailand is one example of a country that has moved strongly to endorse efficient lighting. In 1993, the Thai government signed an agreement with lamp manufacturers to convert all fluorescent tube production from 40-watt T-12 lamps to more efficient 36-watt T-8 lamps by 1995. The government's action created a market for these high-efficiency lighting products practically overnight, providing the infrastructure that producers needed to lower the risks of individually transitioning to higher value products.²⁴

Household Appliances

The appliance industry includes manufacturers of standard and solar domestic hot water heaters, room air conditioners, dehumidifiers, ranges and ovens, microwave ovens, refrigerators, freezers, laundry equipment, dishwashers, compactors, disposers, and temperature sensors. As a whole, appliances account for the bulk of residential energy use. Most have potential for significant efficiency improvements. For example, moving from a standard efficiency, 18 cubic-foot refrigerator to the highest efficiency model available on the market would reduce annual energy consumption by 75 percent (from nearly 1000 kWh to less than 200 kWh).

To capture some of these appliance savings, the Philippines' introduced minimum energy performance standards for air conditioners in 1994 that immediately forced the least efficient models off the market and expanded the market of high-efficiency models. The government targeted air conditioners because the country's hot and humid climate and burgeoning middle class have made the units a growth commodity. From 1975 to 1995, a period that included a near decade-long economic slump, annual sales of residential air conditioners there tripled, from 30,000 units to more than 95,000 units. Today, bolstered by a more robust economy than the country has enjoyed in many decades, air conditioner sales are projected to grow by more than 20 percent per year for the foreseeable future.²⁵

Building Materials

Proper insulation of walls reduces thermal transfer, conserving energy and thereby reducing pollution and operating costs. It minimizes heat loss from conduit and building shells, maintains proper operating temperatures in industrial equipment, and protects workers from high temperature surfaces. Meanwhile, the installation of windows with the correct insulation, radiance, and insolation properties can improve the overall thermal efficiency of a building. Together, the use of proper insulation and windows can cut energy bills for facilities of all types. With these benefits in mind, the South

African government is currently investigating the possibility of providing higher quality insulation and windows in the 1.5 million new homes it plans to construct over the next five years. While several established domestic insulation manufacturers exist in South Africa, the country might gain substantially by licensing more advanced insulation technologies from the United States or other OECD-based firms.

Industrial and Process Controls

The industrial and process controls industry covers a range of equipment such as sensors, transducers, signal transmitters, and actuators and controllers. The main tasks of these products are starting, regulating, stopping, and protecting electric motors. The controls are highly adaptable and their exact use and arrangement are based on the production requirements for a specific product. These instruments often interface with a computerized energy management system, allowing operators to control energy consumption and analyze energy use and loss patterns.

To achieve higher efficiency levels, the controls industry constantly updates information technology components. Manufacturers either develop their own microprocessor-controlled instruments, networks, and data management systems or work with computer and software firms to create the necessary technology. In addition, new communications software permits plant-floor control systems to communicate with centralized control systems, allowing for greater control of industrial processes and higher efficiency levels.

In Chile, significant investments in these technologies have already been made. Chile's Goodyear plant used to have fifty year old technology before it invested \$4 million in controls to update its tire manufacturing process. Similarly, Reynolds Aluminum invested in boiler controls, while Chilean pulp and paper companies have invested in burner control systems.²⁶

Motors and Adjustable Speed Drives

Motors are the primary consumers of electricity in the industrial sector of developed countries and are often the largest overall energy consumer in developing countries. Motors usually fall into two categories: fractional horsepower—less than one hp—and integral horsepower—one hp or greater. Fractional horsepower motors drive systems ranging from compressors in residential refrigerators to components of air handling systems in large industrial facilities. Integral horsepower motors are used almost exclusively by the commercial and industrial sectors.

In the past, end uses that required motors to operate at differing speeds employed high-cost, inefficient, and relatively unreliable controls. Today, industry increasingly uses

High-efficiency motors cost 10 to 20 percent more than their inefficient counterparts. Developing and transition country consumers, however, are coming to realize that the payback on this incremental investment can be as short as six months.

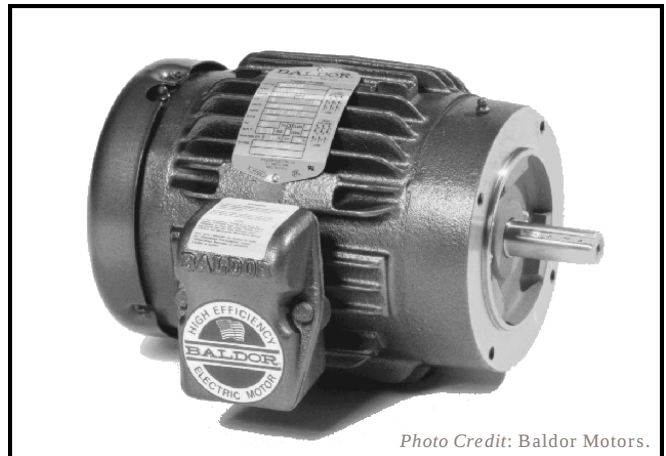


Photo Credit: Baldor Motors.

electronically controlled adjustable speed drives (ASDs) to vary alternating current motor speed to match process requirements. ASDs, when applied appropriately, improve motor energy-efficiency and prolong the life of the motor. However, ASDs are not appropriate for use in all motors.

The motor and ASD markets in emerging economies are ripe for energy-efficient versions of these products. One Indonesian company, P.T. Tatung Budi Indonesia, has already decided that the domestic market—and indeed the whole of Southeast Asia—is ripe for the sale of high-efficiency motors. The company, an Indonesian-Taiwanese joint venture, markets its “Super Max” motors throughout the region.²⁷

Supply-Side and Distribution Technologies

Independent power producers are aggressively entering emerging markets, realizing that it is in these countries that the growth of their industry lies. Most of these firms come in selling the coal or natural gas plants that they are accustomed to building domestically. High-efficiency supply-side power and distribution technologies, however, could be a large part of the solution for developing countries needing to meet 10 percent annual energy demand growth.

Cogeneration

At its simplest, a cogeneration system takes some of the heat that would normally be wasted in the generation of electricity and uses it to satisfy some or all the facility’s thermal requirements. Using “waste energy” to perform useful tasks is what makes a cogeneration unit different from other forms of power generation. In typical power plants, roughly two-thirds of the heat content of the fuel is lost as waste heat. Cost-competitive, high-efficiency cogeneration plants are capable of capturing and using 75 percent of the waste heat, bringing the plant’s overall efficiency to 80 percent or higher.

The potential for profits from retrofitting existing inefficient industrial and utility facilities in developing countries has already caught the interest of many power developers, and especially those in North America. The desire to find projects has even led two major North American utilities—TransAlta and Niagara Mohawk—to join forces in seeking sites in India. Meanwhile, in Thailand, European investors (NORDIC Power Invest) are constructing the first stage of a 300 MW cogeneration plant, and will be selling 60 MW of power to the national utility.²⁸

Transformers

Virtually all electric power passes through at least two transformers before it is converted to mechanical power, light, or heat, and each transformer loses some of its input power to internal inefficiencies. Efficiency in standard distribution models range from around 96 to 98.5 percent. High performance units are commonly 98 to 99+ percent efficient. While this may seem like a small efficiency spread, the sheer number of units and their high duty factor make distribution transformers a large source of cost-effective energy and capacity

savings. In the U.S., these systems have paybacks of one to four years.

At present, few high efficiency transformers are being sold in developing country markets, in large part because transformers have long service lives (up to 30 years), discouraging early replacement of systems. Nevertheless, the sheer volume of power transmission system expansion projects in developing countries offers an enormous opportunity to market high-efficiency transformers.

Cabling and Wiring

Largely invisible in most applications, cabling and wiring plays an important role in the overall energy efficiency of a given system. Even more so than transformers, minute improvements in efficiency of these ubiquitous products can produce dramatic savings since all electric power must pass through them on the way to its destination. In many applications significant improvements in cabling and wiring efficiency can be effectuated simply by increasing the gauge of the wire. In others, even large gains can be achieved by switching from an inefficient and dangerous conductor, aluminum, to one with superior cost and safety features, copper.

Already the market is in flux. India, which had long mandated the use of aluminum wire in residential buildings as a means of supporting the country's aluminum industry, recently dropped this requirement, opening the door to large-scale efficiency improvements. If, as seems likely, the mandate on commercial buildings is similarly dropped, a large market for high efficiency cabling and wiring will quickly be created.



Photo Credit: US Environmental Protection Agency

Like efficient motors, efficient transformers have higher up-front costs but lower life-cycle costs than their inefficient counterparts. The market for these products in developing and transition countries remains largely virgin territory.

Transportation Technologies and Services

In the industrialized world, the private sector is already responding to growing opportunities in the marketplace for “green” transport technologies. Much of this transportation technology and skill could be adapted for developing countries, where the transport sector requires urgent attention. Efficient transport products and services present a significant opportunity for developed country exports and joint ventures with host country firms.

Electric Vehicles

An electric car or bus is powered by motors fed by electricity stored in on-board batteries. Electric vehicles (EVs) are highly reliable, require little maintenance, and, with the right source of electricity, generate almost no pollution and few greenhouse gas emissions compared to conventional internal combustion engines. EVs, of course, are not a panacea—they have drawbacks as well, including higher price tags, shorter ranges, and longer



Monumental traffic jams have been a reality in Bangkok for over a decade. Thailand and other developing and transition countries need to invest massively in alternative transport options to reduce this burden on their economies.

refueling times than their conventional counterparts. Some of the components necessary to deliver an EV are: batteries, battery chargers, lightweight composite materials, controllers, and motors. Several emerging economies are beginning to promote EVs aggressively. In South Africa, the national utility is developing policies to encourage the proliferation of electric-powered public transport. Based on this initiative, three U.S. firms and one Japanese firm are already exploring how to design and manufacture EVs for this market.

Mass Transit Planning

Along with technologies, a wide range of technical support services enhance transport efficiency. As all levels of government try to address transport-related problems, these services, provided by private sector firms, are increasingly in demand. Transit services include the following:

- Comprehensive economic analysis and evaluation of planned transport projects, allowing countries to make well-informed investment decisions in transportation infrastructure.
- Innovative financing arrangements to develop light rail, such as “joint development” in which government and private sector partners jointly plan light rail infrastructure and associated commercial and residential development. Private developers gain because the rail system delivers a clientele directly to their door. The government gains because its share of the project cost drops, capital-intensive investment in auto-based infrastructure is deferred, and inner-city access to high-quality transportation is improved.
- Public participation programs designed to create sustainable transport systems and livable communities. These programs teach the sponsors of transit projects how to build a coalition of concerned, well informed, and committed stakeholders from every relevant background and perspective to help the process succeed.

Many large cities in the developing world have great need for these transit services. In Bangkok, Thailand, for example, traffic is so congested that workers spend an average of 44 working days in traffic each year, according to estimates from the city's Metropolitan Administration. If those lost hours were put to productive use, the Administration says, Thailand's gross domestic product would grow another 10 percent per year. In this service sector, as in the service and technologies sectors presented above, private sector companies from throughout the developed world can benefit enormously by marketing their products as solutions to pressing energy service needs.

III. Seizing the Opportunity

U.S. energy efficiency firms interested in entering—or deepening their engagement in—developing or transitional country markets, do not need to proceed blindly. There is an enormous amount of information and other forms of assistance available from public, non-profit, and private sources on developing and emerging country markets. To put any of this information to use, however, companies that do not currently have a department or individual responsible for international marketing must be willing to make that commitment. Further, success often requires the establishment of a local presence and a willingness to work through initial in-country difficulties. While it is possible that overseas project leads will arrive unannounced, the effort needed to find international opportunities for products is just as difficult—and often more so—than finding opportunities at home.

There is an enormous amount of information and other forms of assistance available from public, non-profit, and private sources on developing and emerging country markets.

Contact information for all the organizations listed in the following narrative can be found in the reference table at the end of this section.

The U.S. Government: Working for American Business

A myriad of U.S. government agencies provide information to U.S. businesses interested in expanding their markets overseas. For most firms, the first stop in their search for information should be the Department of Commerce's International Trade Administration (ITA). For those companies unfamiliar with the export process, the ITA publishes a report, *A Basic Guide to Exporting*, available from the Department of Commerce's National Technical Information Service (NTIS).²⁹ The ITA can also help firms: determine which countries represent the best markets for their products; obtain specific market research information; provide information on trade and investment practices in a certain country³⁰; and locate potential distributors in overseas markets.³¹

Another channel through which the ITA can provide assistance to U.S. firms looking to export is the Commercial Service, which ITA advertises as “an experienced, leading-edge, worldwide organization helping [U.S. firms] meet the challenges of the global economy.” The Commercial Service has a global network of more than 70 offices in the United States and more than 130 offices all over the world. The Service's main mission is championing the interests of U.S. business, particularly small and medium-sized enterprises, around the world. They accomplish this mission by providing one-on-one federal export counseling, and providing advice and trade facilitation to individual companies. Finally, for energy efficiency firms interested bidding on multilateral development banks' projects, the Commercial Service provides education and counseling on how to bid for these projects.

Assistance from the federal government is not restricted to the Department of Commerce. In fact, Commerce teams up with two other export assistance agencies—the Small Business Administration (SBA) and the Export-Import Bank (Ex-Im Bank)—through their joint U.S. Export Assistance Centers (USEACs). The USEACs are located in fifteen cities throughout the United States, and provide both export marketing and trade finance assistance and counseling. Export assistance from the SBA and Ex-Im Bank are not limited to the Centers. These two agencies also offer an additional service of great help to firms seeking export markets: financing.

SBA's Export Working Capital Program (EWCP) is designed to help small businesses export. The EWCP provides short-term, transaction-specific financing for loans of \$833,333 or less. Exporters may use this program for pre-export financing of labor and materials, financing receivables generated from these sales; and/or standby letters of credit used as performance bonds or payment guarantees to foreign buyers. The EWCP provides repayment guarantees of 75 percent or \$750,000 (whichever is less) to commercial lenders and offers exporters preliminary commitments that encourage lenders to provide credit.³²

Meanwhile, Ex-Im Bank—an independent U.S. government agency—helps finance the sale of U.S. goods and services to foreign buyers with transactions greater than \$750,000. The Bank makes it easier for overseas buyers to buy U.S. goods and services on credit. Ex-Im Bank can also provide loans directly to foreign buyers or encourage U.S. suppliers or their banks to extend credit terms to foreign buyers by providing loan guarantees. In some cases, the Bank can provide fixed-rate loans for capital equipment and related services. Finally, U.S. exporters have access to credit insurance to ensure repayment from Ex-Im Bank, as well as access to working capital and guaranteed loans for production or marketing of their goods.³³

There is one other U.S. government agency that can bring its resources to the aid of U.S. energy efficiency firms serious about exploring developing country markets, the Department of State. While trade promotion is not the agency's main focus, its mission does include bringing its formidable resources and skills to the table in helping U.S. firms find markets for their products. As the State Department says, "Our embassies abroad are increasingly approaching foreign governments on behalf of U.S. commercial interests." Energy efficiency service and technology providers probably should not turn to the Department of State initially. However, after other alternatives have been explored, the State Department's country desks in Washington, D.C. and its embassies and consulates overseas can provide significant help to serious firms.

USIJI is the largest and most developed of several pilot programs being created worldwide to explore the potential of AIJ.

A Note on Joint Implementation

Energy efficiency firms interested in pursuing Activities Implemented Jointly (AIJ), should contact the U.S. Initiative on Joint Implementation (USIJI). Launched in October 1993 as part of President Clinton's Climate Change Action Plan, USIJI is the largest and most developed of several pilot programs being created worldwide to explore the potential of AIJ.

The program is flexible and non-regulatory, encouraging private sector participants in the U.S. to engage in overseas projects that will reduce net GHGs. To support US project developers, USIJI offers the following:

- *Technical Assistance:* The USIJI Secretariat has assembled a team of technical experts to assist partners in calculating emissions, developing monitoring plans, and identifying sources of financing. The Secretariat provides assistance through:
 - ◊ technical consultations via telephone, e-mail, and limited on-site visitation;
 - ◊ technical guidance materials including manuals and technical papers; and
 - ◊ workshops, conferences, and training seminars.
- *Information Resources:* The USIJI Secretariat maintains a resource center that includes technical guidance documents, databases, information on financing projects, and analytical tools that are available for partners and other interested parties.
- *Public Recognition:* The USIJI Secretariat recognizes the achievements of project partners and provides tools to help partners increase the visibility of their participation in the program. The USIJI Secretariat will:
 - ◊ sponsor awards and public recognition events; and
 - ◊ showcase individual projects and partners in international publications, conferences, and workshops.

The USIJI evaluation panel meets regularly to accept project proposals into the program. U.S. developers desiring to submit their overseas projects for the consideration of the panel should contact USIJI (see below for address information). Each proposal will receive a preliminary review to determine whether it is complete and sufficiently detailed to being a more comprehensive technical review. Within two weeks of receipt, the Secretariat will advise partners if additional information is needed to continue proposal evaluation. USIJI encourages project partners to discuss potential proposals with Secretariat staff before the formal evaluation.

Non-Profits: Fulfilling a Mission

Several key non-profit organizations are working to increase the uptake of energy efficiency in developing and transitioning economies. For private sector firms interested in securing markets for their products and services, working with these non-profits can offer a number of advantages. First, since they are not driven by profits, non-profits often have more credibility in the eyes of developing countries—who often fear exploitation from their northern neighbors—than for-profit firms. Second, non-profits can bring substantial resources to the table, effectively “buying-down” the cost of doing business and gaining information. Finally, some non-profits

Non-profits can bring in-country experience, financial resources, and credibility to energy efficiency projects in developing and transition countries.

have experienced field staff with specialized knowledge on the intricacies of in-country energy efficiency markets.

When looking for export advice, energy efficiency firms should first turn to the Export Council for Energy Efficiency (ECEE). ECEE, formed in 1994 to systematically promote the use of energy-efficient products and services worldwide, is a consortium of five of the nation's leading advocates of energy efficiency. All of these advocates—the International Institute for Energy Conservation, the Alliance to Save Energy, the National Association of Energy Service Companies, the National Association of State Energy Officials, and the Solar Energy Industries Association—are well suited to aid U.S. energy efficiency firms in their efforts to market their products overseas.

The International Institute for Energy Conservation's (IIEC) mission is to accelerate the global adoption of energy efficiency policies, technologies, and practices to enable economic and ecologically sustainable development. To accomplish its mission, IIEC has established regional offices in Bangkok, Santiago de Chile, and London to spur development of market-based infrastructures to deliver energy efficiency products and services worldwide. This on-the-ground commitment allows IIEC to build relationships with potential in-country partners, facilitate technology transfer, and catalyze the commercialization of energy-efficient products throughout the world. IIEC has also developed market assessments for many developing countries that profile specific opportunities for U.S. firms to export or enter into joint ventures.

In complement to IIEC, the Alliance to Save Energy is a national non-profit coalition of business, government, environmental, and consumer leaders dedicated to increasing energy efficiency. The Alliance advocates policies and programs that promote energy efficiency and clean energy development. The organization's international program strives to work with the private sector to promote sustainable energy development worldwide.

The U.S. Export Council for Renewable Energy (ECRE) supports the U.S. renewable energy industries in efforts to accelerate international use of their technologies. As an umbrella organization for seven different renewable energy associations, ECRE represents over 1,000 wind, solar thermal, photovoltaic, biomass, hydropower, and geothermal companies. Since renewable technologies pair so well with energy efficiency, much of ECRE's work is directly relevant to the efficiency industry. ECRE's activities include conducting and disseminating market data on developing and transitional economies, organizing trade missions, facilitating project development and providing technical assistance and training.

The Business Council for Sustainable Energy provides a venue for firms looking to make their voice heard in the global climate policy debate. The more vocal private industry is in this debate, the more aggressive the policies adopted will be, and hence the larger the global market for sustainable energy technologies. For companies interested in joining this debate, the Business Council provides an excellent forum.

All of these groups have close contacts with the U.S. energy efficiency industry and can help international groups contact the appropriate U.S. company in any subsector of the industry. In addition, several of them maintain relationships with in-country firms and can help U.S. companies locate overseas partners. Finally, these non-profits also maintain contact with representatives from major financing institutions. Taken together, the non-profit community is an invaluable resource to U.S. firms looking to uncover opportunities, build partnerships, and complete deals.

Private Consultants: Providing Professional Assistance

Firms interested in overseas markets can also benefit from the counsel provided by private publications and consultants. For some small- or mid-sized companies in the initial stages of exploring emerging markets, these services might be too expensive for consideration; but for larger firms or firms already seriously committed to these markets, the benefits might far offset the costs. Providing a comprehensive or a ranked list of the firms that provide these services is not possible. One general source of information does, however, stand out.

The Economist Intelligence Unit (EIU), a part of the Economist Group (publisher of *The Economist*), provides up-to-date political, economic and business news on 180 countries worldwide. They provide the information in a number of different formats—print, electronic and customized analysis—and complement the publications in a range of forums and conferences for business executives. As mentioned above, services of this nature do not come cheaply. A complete set of Asia Pacific country reports costs more than \$5,500. (They are also available in many libraries). Customized analyses cost substantially more. Nonetheless, businesses willing to pay the price could benefit from the detail of analysis provided by the EIU.

Whatever approach energy efficiency firms take to assessing and entering a new emerging market, the most important asset is human commitment. Only by dedicating this resource to exploring the new and emerging markets of Asia, Africa, Central and Eastern Europe, and Latin America, will they be able to capitalize on the enormous opportunities these markets represent.

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- ¹ Richard House, "Saving on Demand," *Infrastructure Finance* (December / January 1996), p. 42. House actually considered all the .5 btOE as "wasted energy," and used for comparison the whole of the OECD's annual nuclear energy generation.
- ² U.S. Congress, Office of Technology Assessment (OTA), *Fueling Development: Energy Technologies for Developing Countries* (Washington, D.C.: OTA, 1992), p. 8.
- ³ Julia Philpott, *U.S.-South Africa Transport Technology Information Handbook* (Washington, D.C.; International Institute for Energy Conservation, 1996).
- ⁴ Over the next 30 years, the global population is expected to grow from 5.5 billion to 8.5 billion. Of the three billion increase, roughly 2.8 billion people will live in developing countries and only 200 million in industrialized countries. United Nations Population Division, *World Population Prospects: The 1992 Revision* (New York: U.N., 1993), p. 153.
- ⁵ A quad is a unit of energy equal to one quadrillion (10^{12}) British Thermal Units, or Btus.
- ⁶ Organization for Economic Cooperation and Development (OECD), "Pollution Prevention and Control: Environmental Criteria for Sustainable Transport, Working Paper" (Paris: OECD, 1996).
- ⁷ Edelstein, D., "A Car in Every Driveway? The Environmental Implications of China's ambitious Plans for Growth in the Transportation Sector" (Princeton, N.J.: Princeton University, January 1996).
- ⁸ Philippines Association of Home Appliance Manufacturers, "Air Conditioner Sales Data from 1975-1993."
- ⁹ Using the U.S. Department of Energy's projection numbers, by 2020, today's developing and transitional economies of the world will be demanding as many energy services as the wealthiest nations.
- ¹⁰ Andrew Barnett, "The Financing of Electric Power in Developing Countries," *Energy Policy*, vol. 20, no. 4 (1992), p. 332.
- ¹¹ World Bank Industry and Energy Department, "Capital Expenditures for Electric Power in Developing Countries in the 1990s, Working Paper #21" (Washington, D.C.: World Bank, February 1990).
- ¹² Michael Philips, *The Least-Cost Energy Path for Developing Countries: Energy-Efficient Investments for the Multilateral Development Banks* (Washington, D.C.: International Institute for Energy Conservation, 1991).
- ¹³ "Interview with Sitthiporn Ratanopas, DSM Office Director of EGAT," *E-notes: Quarterly Newsletter of the International Institute for Energy Conservation* (Sept. / Dec. 1995), p. 5.
- ¹⁴ Intergovernmental Panel on Climate Change (IPCC), *Climate Change: The IPCC Scientific Assessment*, J. T. Houghton, G. J. Jenkins, and J. J. Ephraums, eds. (United Kingdom: Cambridge University Press, 1990), p. xi.
- ¹⁵ Intergovernmental Panel on Climate Change (IPCC), *Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment*, J. T. Houghton, G. J. Jenkins, and J. J. Ephraums, eds. (United Kingdom: Cambridge University Press, 1990), p. 8.
- ¹⁶ World Resource Institute, *World Resources 1994-95* (New York: Oxford University Press, 1994), p. 202.
- ¹⁷ Current estimates for the value of mitigated carbon (or its equivalent) vary, but several experts suggest that the market value may approach \$20 per metric ton. A typical coal-burning power plant emits one metric ton of carbon dioxide for every 3 MWh generated.
- ¹⁸ Hagler Bailly Consulting, Inc., 1995.

- ¹⁹ Mark Levine, et al., *Energy Efficiency, Developing Nations, and Eastern Europe: A Report to the U.S. Working Group on Global Energy Efficiency* (Washington, D.C.: International Institute for Energy Conservation, 1991).
- ²⁰ U.S. Department of Energy (USDOE), *National Energy Strategy—Technical Annex 26* (Washington, D.C.: USDOE, 1992).
- ²¹ Mark Hopkins, *Business Opportunities in Eastern-Europe for Energy-Efficient Industrial Products* (Washington, D.C.: The Alliance to Save Energy, January 1992).
- ²² Curtis S. Felix, *Assessment of U.S. Trade and Investment Opportunities in Energy Efficiency Markets in India* (Washington, D.C.: International Institute for Energy Conservation, September 1990).
- ²³ Kelly Opheim, *Indonesia's Emerging Energy-Efficiency Market* (Washington, D.C.: International Institute for Energy Conservation, November 1995), p. 9-2.
- ²⁴ Peter Rumsey and Ted Flanigan, *Compendium: Asian Energy Efficiency Success Stories* (Washington, D.C.: International Institute for Energy Conservation, 1995), p. 30.
- ²⁵ Philippines Association of Home Appliance Manufacturers, "Air Conditioner Sales Data from 1975-1993."
- ²⁶ Deirdre Lord, *Opportunities for the U.S. Energy Efficiency Industry in Chile* (Washington, D.C.: International Institute for Energy Conservation, 1995), p. 51.
- ²⁷ Kelly Opheim, *Indonesia's Emerging Energy-Efficiency Market* (Washington, D.C.: International Institute for Energy Conservation, November 1995), p. 5-5.
- ²⁸ International Institute for Energy Conservation (IIEC), *Thailand's Energy Efficiency Industry: Potential for Investment* (Washington, D.C.: IIEC, 1995), p. 88.
- ²⁹ This brochure is available from NTIS for \$16.50 (stock number PB95-109799). The brochure can be ordered from NTIS by calling (703) 487-4650.
- ³⁰ The ITA compiles best prospects lists for United States exports to each country, included in the Country Commercial Guides (CCGs). The CCGs examine each country's trade regulations and investment practices and present a comprehensive survey of that country's commercial environment through economic, political, and market analyses. The CCGs and much other information are available from the National Trade Data Bank for a fee. Most of the information is accessible via the Internet at <http://www.stat-usa.gov>.
- ³¹ The Commercial Service International Contacts List (CSIC) provides the name and contact information for over 82,000 foreign agents, distributors, and importers interested in working with US exporters. The list can be found on the National Trade Data Bank (NTDB), and can be searched by product and/or country of interest. Customized searches on behalf of US companies seeking foreign representation, at a cost of \$250 per market, are also available and take 60 to 90 days to complete. Contact the Department of Commerce District Offices for more information.
- ³² To be eligible for EWCP financing, the small business concern must have been in operation, though not necessarily exporting, for at least 12 months. The EWCP offers a simplified application form. Interest rates and fees are negotiable between the lender and the small business exporter. An application can be requested by calling the SBA Answer Desk at 1-800-827-5722.
- ³³ For more information on Ex-Im Bank Programs, call their export finance hotline at (800) 565-3946.