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P A P E R



Strengthening U.S. International Energy Assistance to Reduce Greenhouse Gas Emissions and Improve Energy Security

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Tewodaj Mengistu, Endy Y. Min, Aimee E. Curtright,
Noreen Clancy, Eileen Hlavka



Environment, Energy, and Economic Development

A RAND INFRASTRUCTURE, SAFETY, AND ENVIRONMENT PROGRAM

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Preface

This study provides information and insights on how U.S. international energy-assistance programs can help reduce greenhouse gas emissions and improve U.S. energy security. Based on a review of U.S. government energy-assistance trends and strategies, similar data for Germany, and other recent efforts to improve U.S. energy and climate policy, the report presents observations that can inform efforts to improve U.S. energy assistance. It also recommends topics for further investigation.

This report is a product of the RAND Corporation's continuing program of self-initiated independent research. Support for such research is provided, in part, by donors and by the independent research and development provisions of RAND's contracts for the operation of its U.S. Department of Defense federally funded research and development centers.

The study findings should be useful for foreign-assistance policymakers considering how current U.S. energy assistance can be improved and how international programs can help reduce greenhouse gas emissions and improve U.S. energy security.

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Summary

The Obama administration faces the challenges of reducing global greenhouse gas (GHG) emissions and increasing U.S. energy security. This report provides information on U.S. international energy-assistance programs, a potentially important tool for addressing these challenges. Reducing global GHG emissions and increasing U.S. energy security are global problems that cannot be solved by changes made within the United States alone. Even if the United States acted aggressively to limit its own emissions of GHGs, the country would still be affected by the earth's changing climate and by higher and more volatile oil prices. Energy assistance may provide a lower-cost and more effective opportunity to reduce future growth in GHG emissions and oil consumption before current development patterns become increasingly locked in throughout the developing world. Developing and transitioning countries are projected to account for 91 percent of the *growth* in global GHGs and 96 percent of the *growth* in global oil consumption between 2006 and 2030. International energy assistance may help to reduce this growth, thereby benefiting both the recipients and the United States.

To examine the ways in which U.S. international energy assistance programs could be improved, we gathered and analyzed basic information about U.S. energy assistance for the five years between 2002 and 2006. We then gathered and analyzed similar information for Germany, which has a different approach to planning and implementing energy assistance. We also reviewed recent reports that addressed international energy issues to identify recommendations that could inform changes to U.S. energy-assistance programs. The information we obtained from these sources formed the basis for recommendations that can inform decisions about ways to improve U.S. energy assistance, reduce global GHG emissions, and increase U.S. energy security.

Review of U.S. Energy Assistance

U.S. international energy assistance has two major components. The first component consists of major foreign-policy goals and activities such as rebuilding the energy infrastructures of Iraq and Afghanistan. Investments in these activities between 2002 and 2006 amounted to \$3.4 billion. The second component—which we describe as core energy assistance—is longer-term in nature and consists of investments that are sustained from year to year. This component accounted for \$811 million over the five-year period.

Of the U.S. core energy assistance, \$631 million (78 percent) was focused on energy policy, education, and research. Nuclear power and anti-proliferation projects, non-renewable power generation, and energy distribution each received roughly \$50 million (6 to 7 percent each). Renewable power generation received \$22 million (3 percent). Geographically, the

Middle East and North Africa received the largest amount of aid over the five-year period, a total of \$343 million (42 percent). The next largest amounts went to Europe and Central Asia (\$266 million, 33 percent) and South Asia (\$88 million, 11 percent). East Asia and the Pacific, Sub-Saharan Africa, and Latin America and the Caribbean each received between \$27 million (3 percent) and \$18 million (2 percent). Projects with unspecified destinations received roughly \$50 million (6 percent).

We supplemented the information on energy-assistance disbursements with a brief review of the goals, strategies, and activities of the primary agencies involved in providing that assistance. The U.S. Agency for International Development (USAID) focuses primarily on promoting economic development, improved access to energy, energy-sector reform, and environmental improvement. The U.S. Department of State (DOS) coordinates all bilateral and multilateral efforts; represents the United States in international agreements, including the United Nations Framework Convention on Climate Change; and provides funding for energy-related foreign-policy matters that do not fit within the mission of other agencies.

The U.S. Department of Energy (DOE) supports research and development (R&D) and technical assistance to help developing and transitioning countries advance their energy efficiency and use of renewable, fossil, and nuclear power. The U.S. Environmental Protection Agency (EPA) has assisted in transferring successful U.S. programs to other countries. These programs include the ENERGY STAR labeling program (run jointly with DOE), the Methane to Markets Partnership (to reduce the venting of methane, which has 25 times the heat-trapping power of carbon dioxide), and emissions cap-and-trade programs modeled on the EPA's sulfur dioxide and nitrogen oxide trading programs. Finally, the Trade and Development Agency (TDA) provides technical assistance, feasibility studies, orientation visits, and trade missions to support economic development in low- and middle-income countries and to promote U.S. exports of products and services to developing countries.

Review of German Energy Assistance

There is a perception in the development community that Germany has a highly coordinated approach to international energy assistance. According to Organisation for Economic Co-operation and Development (OECD) data, Germany provided \$1.06 billion in energy-related assistance between 2002 and 2006.

The largest portion of Germany's funding, \$641 million (60 percent), was used to promote renewable power generation. The next largest categories were energy distribution (\$216 million, 20 percent); power generation from non-renewable resources (\$101 million, 10 percent); and energy policy, education, and research (\$103 million, 10 percent). Germany ended assistance to nuclear projects in 2003.

Over the five-year period, South Asia received the largest amount of German assistance, \$407 million (38 percent). The Middle East and North Africa received the next largest amount, \$250 million (24 percent). Europe and Central Asia received \$183 million (17 percent). Smaller amounts were provided to Sub-Saharan Africa (\$84 million, 8 percent); East Asia and the Pacific (\$75 million, 7 percent); and Latin America and the Caribbean (\$43 million, 4 percent). Unspecified regions received \$20 million (2 percent).

Germany's energy assistance differs from that of the United States in the way the funds are used and their regional distribution. Two other characteristics also distinguish German assis-

tance programs. First, Germany's assistance consists primarily of loans (57 percent), followed by grants (41 percent), whereas the United States provides only grants. Second, one German agency—the Federal Ministry for Economic Cooperation and Development (BMZ)—coordinates all overseas assistance but relies on the German Development Bank (KfW) and German Agency for Technical Cooperation (GTZ) to disburse and implement projects.

Review of Recent Reports

We reviewed nine recent reports (i.e., issued within the past 10 years) that address U.S. energy and climate policy. Among the recommendations related to international energy assistance in these reports, there was frequent agreement on the following:

- Increase energy research, development, demonstration, and deployment (ERD3).
- Use international cooperation to accelerate the transfer of knowledge.
- Improve U.S. interagency communication and coordination.
- Increase private sector investment by reforming existing financing mechanisms, creating new financing structures, and creating new public sector institutions.
- Reduce explicit and implicit subsidies to create a level playing field for clean-energy technology and biofuels.

Observations and Recommendations

Our review of U.S. energy assistance revealed the following:

- U.S. agencies pursue different goals with different capabilities and strategies.
- Reducing GHG emissions and improving energy security are not primary agency goals, but many agencies contribute to them indirectly.
- Expanding and replicating existing small programs could provide near-term options to reduce GHG emissions and improve energy security.
- Pursuing multiple goals may require trade-offs and increased coordination among agencies.

In our comparison of U.S. and German assistance programs, we found the following:

- German disbursements exceed U.S. disbursements for core energy assistance.
- German assistance is centrally coordinated, while U.S. agencies operate largely independently.
- German assistance focuses on direct investment in energy-technology deployment (e.g., renewable power), while U.S. aid focuses on energy policy, education, and research.
- German assistance is financed with loans and grants, while the United States uses only grants.

The review of recent reports, given its broader context, led to several additional observations:

- Energy assistance and increased ERD3 funding should support each other.
- Energy assistance can accelerate the transfer of knowledge.
- Energy assistance can be a focal point for improved interagency coordination.
- Energy assistance can and should seek to attract private investment.
- Energy assistance should include help to reduce subsidies and create a level playing field for new technology.

Finally, on the basis of the differences between the U.S and German approaches and perceived performance and our broader observations, we recommend that the following initiatives be undertaken to strengthen U.S. energy assistance over the longer term:

- Assess the effectiveness of U.S., German, and other approaches to providing energy assistance to determine the reasons for any differences in effectiveness and draw lessons for U.S. assistance programs.
- Compare the longer-term benefits of supporting energy-sector policy reform with the shorter-term benefits of supporting more-specific technical assistance or investment projects that reduce GHG emissions and oil consumption.
- Assess the advantages and disadvantages of focusing more U.S. energy assistance on fewer recipients.

These assessments would help inform efforts to improve U.S. energy-assistance programs, reduce global GHG emissions, and increase U.S. energy security.

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Acronyms and Abbreviations

APP	Asia-Pacific Partnership
BMZ	German Federal Ministry for Economic Cooperation and Development
CRS	Creditor Reporting System
DAC	Development Assistance Committee
DOA	U.S. Department of Agriculture
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOS	U.S. Department of State
EEB	Bureau of Economic, Energy and Business Affairs
EERE	Office of Energy Efficiency and Renewable Energy
EFC	Energy Future Coalition
EGAT	Bureau for Economic Growth, Agriculture, and Trade
EPA	U.S. Environmental Protection Agency
ERD3	energy research, development, demonstration, and deployment
Ex-Im	Export-Import Bank
FY	fiscal year
GAR	grid-appropriate reactor
GHG	greenhouse gas
GNEP	Global Nuclear Energy Partnership
GTZ	German Agency for Technical Cooperation (<i>Deutsche Gesellschaft für Technische Zusammenarbeit</i>)
IAEA	International Atomic Energy Agency
ICCTF	International Climate Change Task Force
IMF	International Monetary Fund
KfW	German Development Bank (<i>Kreditanstalt für Wiederaufbau</i>)
LDC	least-developed country
NCEP	National Commission on Energy Policy
NRC	Nuclear Regulatory Commission

NREL	National Renewable Energy Laboratory
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
OES	Bureau of Oceans, Environment, and Science
OPIC	Overseas Private Investment Corporation
PCAP	Presidential Climate Action Project
PCAST	President's Committee of Advisors on Science and Technology
PEPFAR	President's Emergency Plan for AIDS Relief
R&D	research and development
TDA	U.S. Trade and Development Agency
USAID	U.S. Agency for International Development

Introduction

The Challenge

The Obama administration seeks to reduce greenhouse gas (GHG) emissions and improve the nation's energy security, yet the energy assistance the U.S. government provides to other countries has received relatively little attention, despite its potential benefit to the United States.

International energy assistance is an important area for U.S. leadership, because, while the United States has until recently emitted the largest amount of GHG and consumes the greatest amount of oil, it is projected to play a smaller role, in percentage terms, in these trends in the future, because of rapid economic growth in China, India, Brazil, and many other developing countries.

Nevertheless, because climate change is a global challenge and energy markets are increasingly global, the United States could benefit from a global approach. For example, since a one-ton reduction in GHG emissions in the United States is environmentally equivalent to a one-ton reduction in another country, the U.S. would benefit from GHG reductions in other countries. Similarly, since oil and, increasingly, natural gas are bought and sold on global markets, the United States would also benefit from increased energy efficiency in other countries.

For these reasons, the relative lack of attention paid to international energy assistance suggests that U.S. officials may be overlooking cost-effective, high-leverage opportunities to reduce GHG emissions and oil consumption in other countries and regions before existing policies and practices lock in energy- and GHG-intensive patterns of growth. If U.S. energy assistance can be improved, the United States can help address these global challenges while also increasing its own energy security and reducing the risks of climate change.

Project Approach and Report Organization

To increase understanding of these opportunities and to take a first step toward improving U.S. international energy assistance, this report

- Presents recent projections of U.S. and global carbon dioxide emissions and oil consumption.
- Describes recent trends and agency approaches to U.S. international energy assistance.
- Provides a high-level comparison with Germany, which uses a different approach to providing energy assistance.
- Summarizes recommendations for energy assistance from recent reports.

2 Strengthening U.S. International Energy Assistance

- Presents observations, conclusions, and recommendations that could improve the effectiveness of U.S. international energy assistance, thereby helping to reduce global GHG emissions and improve energy security both domestically and globally.

The U.S. Role in Global Energy Challenges

Understanding the potential significance and value of U.S. energy assistance requires placing U.S. GHG emissions and oil consumption into a global perspective. It is necessary to understand not only historical and current trends, but also projections about the future. This is especially important in view of the fact that every emitted (or reduced) ton of carbon dioxide has the same impact on the planet, regardless of where it is emitted (or reduced). Similarly, since oil markets are globally integrated, increasing global demand has the potential to increase price and volatility worldwide. Since the United States is affected by what happens elsewhere, U.S. climate and energy security policy should use energy assistance to reduce emissions and improve energy efficiency in other countries. Doing so will benefit the United States, possibly at a lower cost than that of achieving similar reductions at home.

Projected Global Greenhouse-Gas Emissions

According to a 2009 reference scenario from the U.S. Energy Information Administration (EIA), the United States produced 20 percent of the world's GHG emissions in 2006. Projected slower domestic growth (0.3 percent per year) and more rapid growth elsewhere will lower the U.S. relative share of annual GHG emissions by 2030 to 16 percent. During this same period, however, GHG emissions are projected to grow much more rapidly in China¹ (2.8 percent per year), Brazil (2.5 percent per year), India (2.1 percent per year), and the Middle East (2.5 percent per year) (see Figure 2.1). According to these projections, in 2030, non-OECD (Organisation for Economic Co-operation and Development) countries will be responsible for 91 percent of global emissions growth since 2006 (Energy Information Administration, 2009a).²

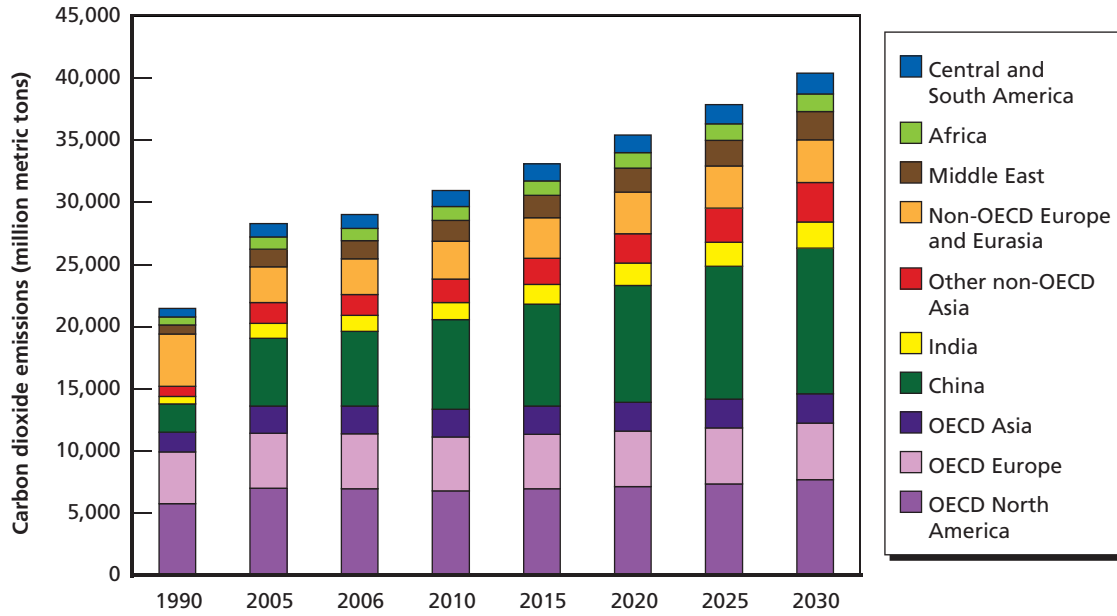
Projected Global Oil Demand

In the EIA reference scenario, the United States accounted for 24 percent of annual oil consumption in 2006, but projected slower domestic growth (0.2 percent per year) and more rapid

¹ For more detailed information about energy cooperation between the United States and China, as well as China's role in addressing climate change, see Asia Society and Pew Center for Global Climate Change, 2009; Price, 2008; Baldinger and Turner, 2002; U.S. Department of Energy, 2006; Fredriksen, 2008.

² We highlight the potential growth in emissions from non-OECD countries to illustrate the reductions that energy assistance could facilitate. Since warming is the result of cumulative, rather than annual, global emissions, it would be incorrect to conclude that the projected future increase in emissions alone would be responsible for climate changes that may occur in the future.

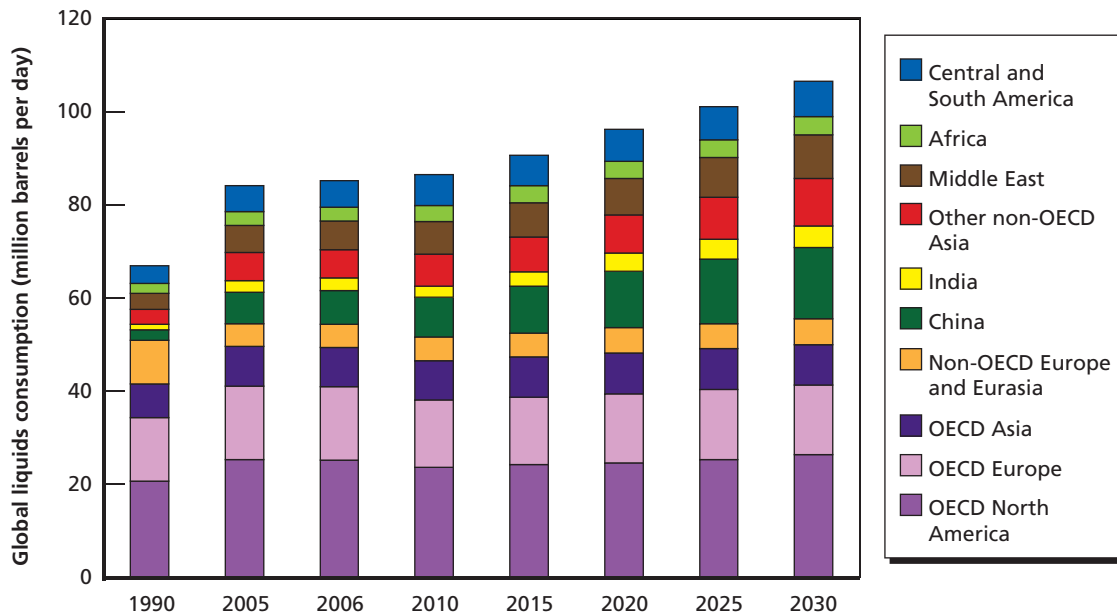
Figure 2.1
Global Carbon Dioxide Emissions, 1990 to 2030



SOURCE: Energy Information Administration, 2009a.

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Figure 2.2
Global Liquids Consumption by Region, 1990 to 2030



SOURCE: Energy Information Administration, 2009b.

RAND OP251-2.2

growth elsewhere will lower the U.S. relative share to 20 percent by 2030 (see Figure 2.2).³ During this same period, however, oil consumption is projected to grow much more rapidly in China (3.2 percent per year), Brazil (2.1 percent per year), India (2.4 percent per year), and the Middle East (1.8 percent per year). By 2030, non-OECD countries will be responsible for 96 percent of the growth in global oil consumption since 2006 (Energy Information Administration, 2009b).⁴

³ For a detailed discussion of the relationship between U.S. energy and national security, see Crane et al., 2009.

⁴ We highlight the potential growth in oil consumption from non-OECD countries to illustrate the reductions that energy assistance could facilitate.

U.S. Government International Energy Assistance

The U.S. government provides international energy-related assistance through a variety of channels and for a number of purposes. In this chapter, we describe trends in U.S. disbursement of energy-related official development assistance (ODA) between 2002 and 2006, based on data from an international database maintained by OECD.¹ Because ODA excludes assistance to countries that may be too wealthy to meet international definitions or U.S. government restrictions on development assistance, we also reviewed material published by the U.S. government agencies most involved in providing international energy assistance and interviewed their staffs to obtain information on their strategies and activities.

Disbursements

Categorization of Disbursements

To present the geographic distribution of U.S. disbursements, we aggregate the energy assistance to developing and transitioning countries into the following regional groupings, using the World Bank's regional categorization, which generally reflects the level of economic development of recipient groups.² These include the following regions:

- Sub-Saharan Africa
- Middle East and North Africa
- East Asia and the Pacific
- Europe and Central Asia
- Latin America and the Caribbean
- South Asia.

We limited our review of the purposes of energy-related ODA to the Creditor Reporting System (CRS) category of “energy and supply.” We aggregated the many component pieces of energy and supply in the OECD database into five broad categories that provide a general sense of the type of assistance being provided.³ These categories are presented in Table 3.1.

¹ ODA is formally defined as “flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent” (International Monetary Fund, 2003). Information on the underlying OECD data and approach is given in Appendix A.

² For more details on the World Bank country groups, see the World Bank's website.

³ The components in the CRS's “energy and supply” category are listed and defined in Appendix B.

Table 3.1
Aggregated Categories of Energy-Assistance Purpose

Purpose	Included OECD Categories
Energy policy, education, and research	Energy policy and administrative management, energy education/training, and energy research
Power generation from non-renewable sources	Power generation/non-renewable sources; oil-fired, gas-fired, and coal-fired power plants
Nuclear	Nuclear power plants and nonproliferation activities ^a
Power generation from renewable sources	Power generation/renewable sources; geothermal energy, hydropower plants, solar energy, wind and ocean power, and biomass
Energy distribution	Electrical transmission/distribution, natural gas distribution

^a The nuclear category includes assistance for both nuclear power plants and nonproliferation because it was difficult to differentiate between the two, especially in countries that were formerly part of the Soviet Union. When possible, the text indicates the type of nuclear assistance being provided.

Total Energy-Assistance Disbursements

Between 2002 and 2006, U.S. energy ODA disbursements totaled approximately \$4.2 billion. Annual funding rose substantially during this period, from about \$270 million in 2003 to more than \$1.7 billion in 2005. In 2006, assistance fell to \$1.3 billion.

The annual variability results from two types of international energy assistance. The first and more volatile component is driven by near-term foreign-policy objectives and activities. The second, more stable component consists of what we define to be “core energy-assistance” activities that reflect long-term strategies.

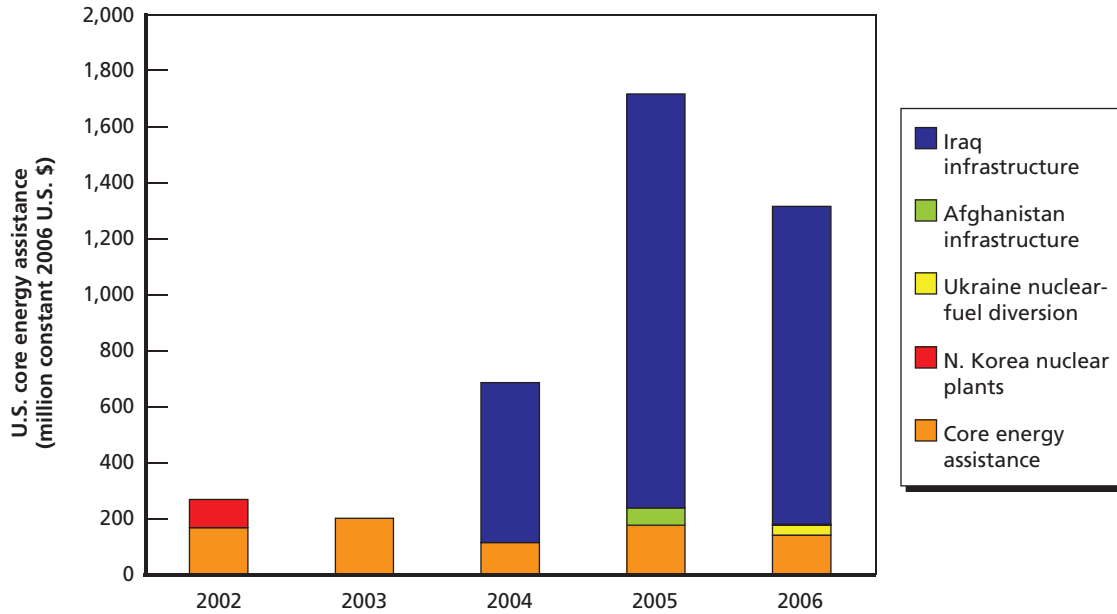
Near-term foreign-policy activities include funding to build and restore the energy infrastructure in Iraq and Afghanistan. To address this need, the U.S. Department of Defense (DoD) provided approximately \$2.5 billion to Iraq and approximately \$7.9 million to Afghanistan during the five-year period. The U.S. Agency for International Development (USAID) provided nearly \$720 million for energy-infrastructure projects in Iraq and \$58 million for such projects in Afghanistan. U.S. Department of Energy (DOE) and USAID funds were used primarily to support energy distribution and non-renewable-power generation.

In addition, in 2002, as part of an international agreement, the U.S. Department of State (DOS) allocated more than \$100 million to North Korea for nuclear-power-plant construction in exchange for North Korean compliance with International Atomic Energy Agency (IAEA) requirements regarding nuclear weapons (Pritchard, 2002). Finally, in 2006, Ukraine received \$34 million from USAID to help diversify Ukrainian nuclear-fuel sources away from Russia (U.S. Department of Energy, 2007b; Embassy of Ukraine, n.d.).

Figure 3.1 presents the assistance provided for near-term foreign-policy objectives, along with the remaining core energy-assistance activities.⁴ The near-term foreign-policy components dominate the core energy-assistance activities that are the primary focus of this report. The core energy assistance totaled \$811 million over the five-year period.

⁴ The examples shown do not constitute the entire list of near-term foreign-policy activities, but they are the largest examples of such activities. We present them separately from the remaining projects to more clearly characterize the U.S. energy-assistance portfolio.

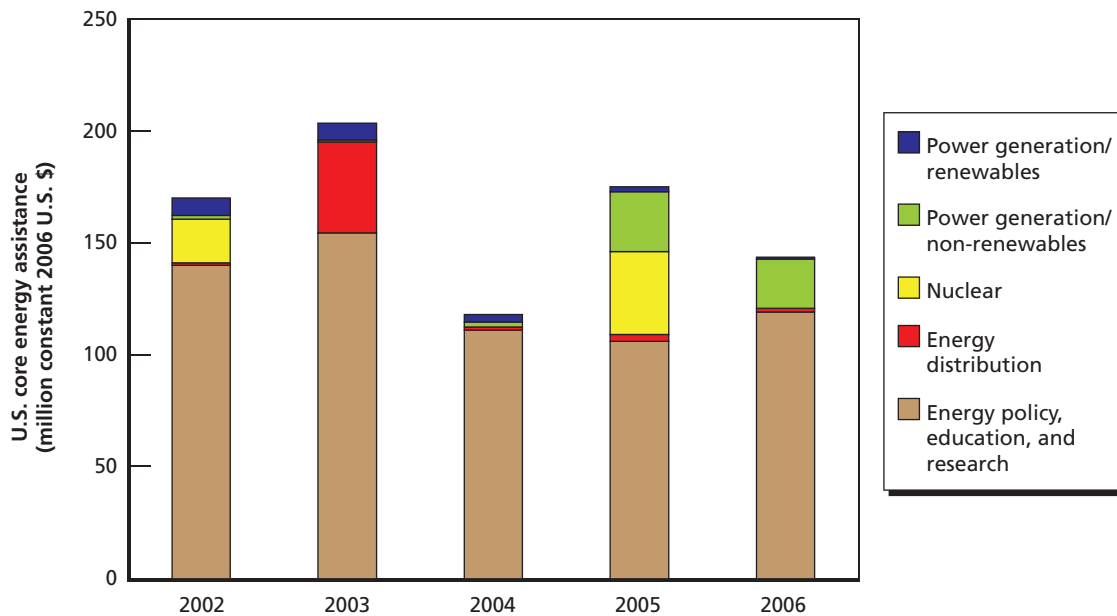
Figure 3.1
U.S. Core Energy Assistance and Major Foreign-Policy Goals and Activities



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Figure 3.2 presents the U.S. core energy-assistance disbursements for specific purposes. The largest share of the funding—\$631 million (78 percent of the core energy assistance)—was used to support energy policy, education, and research. Significantly less assistance was

Figure 3.2
U.S. Core Energy Assistance by Purpose



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devoted to nuclear power and nonproliferation (\$56 million, 7 percent); non-renewable-power generation (\$53 million, 7 percent); energy distribution (\$48 million, 6 percent); and renewable-power generation (\$22 million, 3 percent).

Core Energy Assistance by Region

The geographic distribution of the U.S. core energy assistance is shown in Figure 3.3. The Middle East and North Africa region received the largest amount of aid over the five-year period, \$343 million (42 percent of the total). More than \$341 million of this aid was disbursed to Egypt.

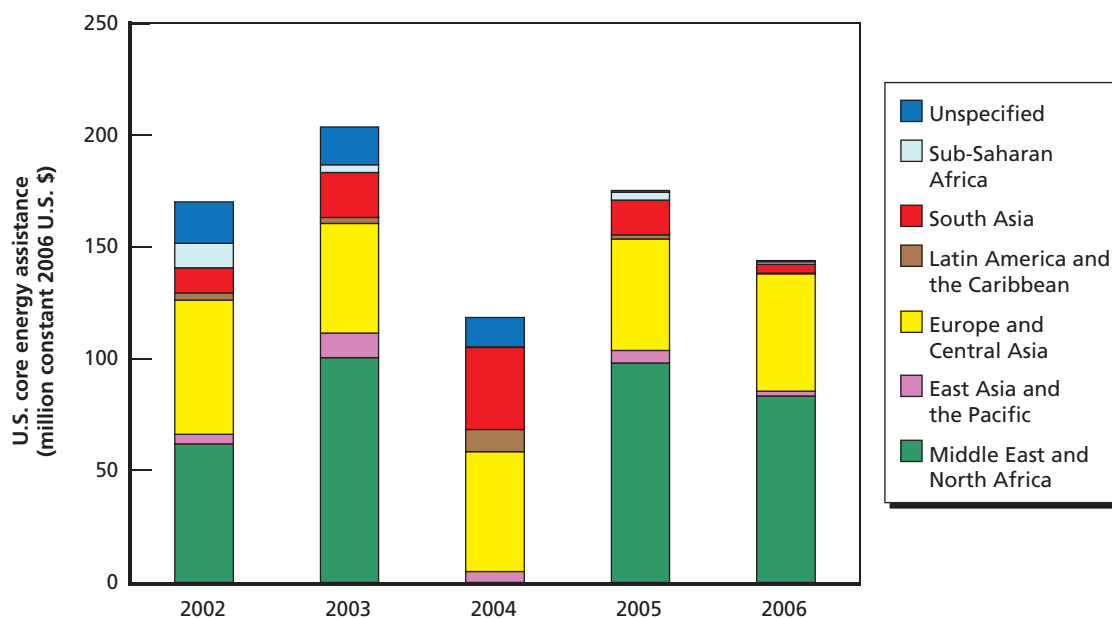
The Europe and Central Asia region received the next largest sum, \$266 million (33 percent). The primary recipients in this region were Georgia (\$87 million), Kazakhstan (\$45 million), Uzbekistan (\$37 million), Armenia (\$25 million), and Ukraine (\$24 million).

South Asia was also a major regional recipient, with \$88 million (11 percent). The primary recipients in this region were India (\$38 million), Bangladesh (\$22 million), South and Central Asia (\$21 million), and Nepal (\$5 million).

In addition, East Asia and the Pacific received \$27 million (3 percent), Sub-Saharan Africa received \$20 million (2 percent), and Latin America and the Caribbean received \$18 million (2 percent). Projects with unspecified destinations received roughly \$50 million.

The U.S. government restricts assistance to a number of countries because of human rights and other concerns. For example, USAID has been prevented from providing support to China, North Korea, and Cuba. In addition, some U.S. assistance is prioritized on the basis of the countries' level of need. As countries develop, they may "graduate" and no longer be eligible for assistance.⁵

Figure 3.3
U.S. Core Energy Assistance by Region



RAND OP251-3.3

⁵ Agency-specific limitations are discussed further in the next section.

Core Energy Assistance by Agency

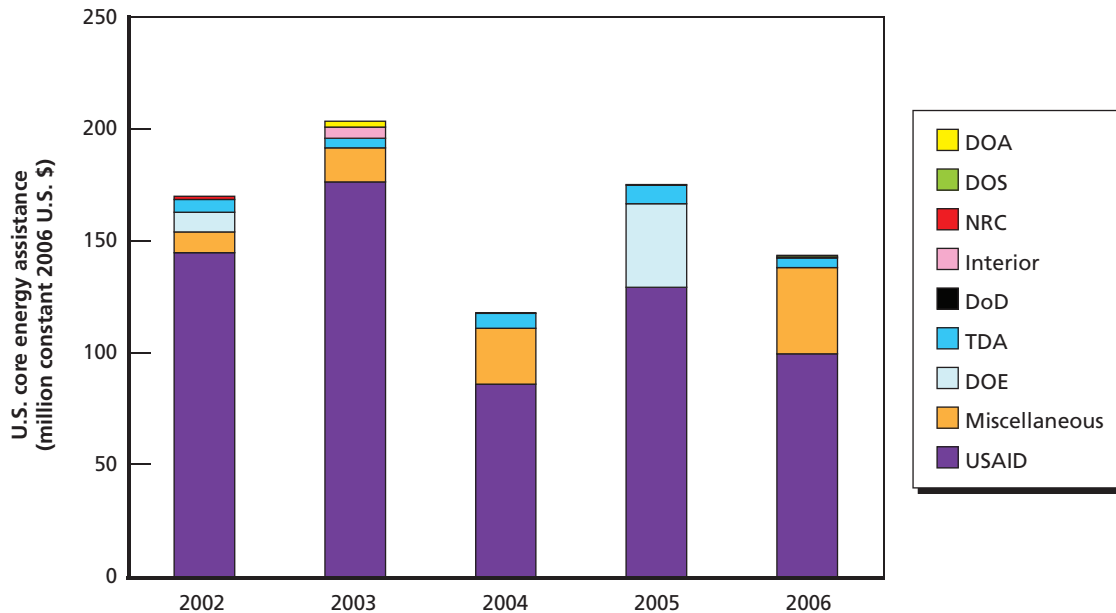
USAID is the primary agency implementing U.S. core energy assistance. As shown in Figure 3.4, USAID provided \$638 million in assistance, while miscellaneous agencies provided \$88 million, DOE provided \$46 million, and the U.S. Trade and Development Agency (TDA) provided \$29 million.⁶

In addition to restricting assistance to a number of countries, the United States also restricts the activities of specific agencies. For example, USAID does not have a presence or mission in China, and U.S. activities led by DOS and USAID have been primarily limited to democracy-related programs, support for Tibetan communities, and disaster assistance (Lum, 2007; USAID, 2005).⁷ Other U.S. government agencies, including DOE and the Environmental Protection Agency (EPA), have sponsored activities in China for many years.

Core Energy Assistance by Funding Type

The OECD database tracks three types of development assistance: grants, loans, and equity investments. Between 2002 and 2006, the United States disbursed \$667 million in grants. The database also includes \$144 million in projects that have no designation, although the limited data available indicate that these funds were primarily used to support energy

Figure 3.4
U.S. Core Energy Assistance by Agency



RAND OP251-3.4

⁶ In the OECD data, many projects are sponsored by a “miscellaneous” agency (see Appendix A). Some project descriptions identify the sponsor, but sponsors were not identified for \$88 million of projects funded in 2002–2006.

⁷ U.S. assistance to China has been increasing, and recent comments by Todd Stern, the U.S. Special Envoy for Climate Change, indicate that, depending on the outcome of upcoming climate negotiations in Copenhagen, the United States may begin providing energy assistance to China (Cover, 2009).

policy, education, and research. Since the U.S. government and the agencies listed in the database typically do not provide loans, these projects were probably all financed through grants.⁸

Agencies, Strategies, and Activities

The disbursements of energy-related assistance detailed above indicate the magnitude and focus areas of the U.S. portfolio, but they do not provide much insight into the roles of the various agencies, their strategies, or the types of activities they undertake. In this section, we provide a high-level overview of the U.S. government agencies that sponsor the bulk of the nation's core energy assistance. The discussion excludes several potential sources of energy assistance including:

- Multilateral organizations to which the United States contributes (e.g., the World Bank, the International Monetary Fund (IMF), and United Nations agencies). These organizations were excluded because they reflect the policy decisions of other stakeholders, not just those of the United States.
- Ex-Im (a federal government corporation) and OPIC (an independent agency). These organizations focus on facilitating international private investment, and while they are subject to congressional oversight and are required by charter to serve a public purpose (Kosar, 2008), we exclude them because of their quasi-independent nature.⁹

We collected information on the agencies described below by reviewing public documents and conducting supplemental interviews with staff at five agencies: USAID, DOE, DOS, EPA, and TDA.

U.S. Agency for International Development

USAID is the lead agency for providing energy-related official development assistance. It is involved in many international energy-assistance activities as part of its mission to “support long-term and equitable economic growth” and to provide humanitarian assistance (USAID, 2008b).

Organization. USAID's activities are primarily implemented by country offices and regional and technical bureaus. The bulk of USAID's energy assistance is funded by four regional bureaus: Africa; Asia and the Near East; Europe and Eurasia; and Latin America and the Caribbean. The technical bureau of greatest relevance to energy assistance is the Bureau for Economic Growth, Agriculture, and Trade (EGAT). Each regional bureau is supported by the Energy Team in the Office of Infrastructure and Engineering within EGAT (USAID, 2008a).

⁸ The U.S. government does provide some loans and equity investments through the Export-Import Bank (Ex-Im) and the Overseas Private Investment Corporation (OPIC), but no contributions from either entity were included in the portion of the OECD database used in this project. And although Ex-Im is in the OECD database of contributing agencies, there were no entries for it during the 2002–2006 period. OPIC was not listed as a contributing agency. The database also shows a number of loans made by USAID in 2002, but no funding was listed as disbursed.

⁹ Ex-Im and OPIC are expected to receive most or all of their funding from commercial sources rather than government appropriations. OPIC operates financially independently, while Ex-Im requested \$2.5 million in appropriations in fiscal year (FY) 2009 (USAID, 2009).

Approach to Energy-Related Development Assistance. USAID's energy-assistance activities vary, depending on local conditions and needs. Most of the assistance falls into six general categories:¹⁰

- **Energy-sector reform.** USAID seeks to improve the economic efficiency and financial and social sustainability of the energy sector by improving energy policies and governance systems.¹¹ Programs focus on public and private management approaches and incentives.
- **Improved access.** Improved access to modern and clean-energy services is part of a larger sustainable-development framework. The focus is on improved access for poor, rural communities through approaches that are financially sustainable.
- **Energy-sector restoration and reconstruction.** The wars in Iraq and Afghanistan have made energy-sector restoration and reconstruction an increasingly important USAID priority. USAID supports the reestablishment of basic services in Iraq and Afghanistan as a prelude to follow-up reforms when circumstances become more stable. Other countries that have received assistance include Pakistan, Sudan, Kosovo, Colombia, and Liberia.¹² Many investments are focused on electrical transmission and energy distribution (for electricity, natural gas, and petroleum) and large diesel generator sets, because these investments can provide significant improvements in a short time. However, USAID also provides smaller generation units, and in some countries, photovoltaic generation facilities (for example, in Mindanao in the Philippines) and hydropower facilities. USAID has rehabilitated several hydropower facilities in Afghanistan and has contributed funds to construct small-scale hydropower facilities.
- **Clean energy.** Reducing GHG emissions is not a primary component of USAID's mission, so relatively few of USAID's energy activities involve renewable energy and energy efficiency. USAID primarily seeks to create a better-functioning energy sector. In doing so, however, USAID is helping to create a foundation upon which renewable energy and energy efficiency can become sustainable in the future. The agency does support a small number of activities that facilitate the growth of large- and small-scale renewable energy, help countries assess options for biofuels, and reduce niche sources of GHG emissions. For example, after recent reforms in the Philippines and Jordan, USAID provided support for large-scale renewable energy, energy efficiency, and demand-side management.
- **Energy security.** USAID typically seeks to improve recipient-country energy security by assisting in the development of regional electricity markets and natural gas networks. By opening access to lower-cost energy, these networks improve regional integration, cooperation, and security coordination. Efforts include supporting the development of regional

¹⁰ Telephone interview with Allen Eisendrath, Senior Infrastructure Finance Specialist, Office of Infrastructure and Engineering, USAID, September 23, 2008.

¹¹ Such improvements include reducing energy subsidies and transitioning to full-cost recovery and competitive pricing, implementing metering and billing, providing training to utilities and independent regulatory institutions, and supporting commercialization and privatization of state-operated enterprises when desired.

¹² The OECD database does not show any USAID disbursements to these five countries between 2002 and 2005, but programs there may have been funded in other fiscal years or may have been included in unspecified bilateral programs and/or regional programs.

electricity grids in central Asia, southeastern Europe, the Black Sea, and southern, central, and west Africa.¹³

- **Support for special initiatives.** USAID assists in enabling other U.S. government initiatives that depend on reliable power generation to succeed. For example, USAID helps provide reliable electricity to health-care facilities that support the President's Emergency Plan for AIDS Relief (PEPFAR), as well as maternal and child health programs. Technical solutions provided include hybrid, decentralized systems such as combinations of diesel generator sets and small hydropower or photovoltaic power facilities.

The countries USAID assists have widely varying needs, and the agency constantly evaluates which solutions can best meet individual countries' needs. This means, for example, that USAID may choose to use photovoltaic power to meet basic needs and improve government stability in Mindanao, while favoring lower-cost approaches in other parts of the Philippines. Furthermore, USAID reassesses its strategies and tests new ideas to see which approaches provide the greatest benefits in the short and long run. New ideas being tested by USAID include training countries to cope with high energy prices; facilitating private investment in large-scale, grid-connected renewable energy; encouraging the growth of small- and medium-scale renewable-energy business development (e.g., off-grid solar); and helping countries assess biofuel options.¹⁴ While USAID does support renewable power, that support is driven by the specifics of the situation rather than by a commitment to renewable energy.

Recent Changes at USAID. Several changes have been made in USAID's energy-assistance strategy over the past decade. These changes include reduced support for policy reform, regional integration, technical support, and research and development (R&D). These investments have declined because improvements in recipient governance, a larger focus on infrastructure reconstruction and "critical priority countries" (e.g., Iraq, Afghanistan, Liberia, and Kosovo), and an increased focus on partnerships with the private sector have reduced the need for funding.¹⁵

Department of Energy

DOE's international activities are funded by several offices within the department. The activities are then typically implemented by DOE's 21 national laboratories or by private firms. This section describes funding by individual DOE offices. The DOE national laboratories can also receive funding from other government agencies and independent entities.¹⁶

Office of Energy Efficiency and Renewable Energy. The Office of Energy Efficiency and Renewable Energy (EERE) conducts its international work through the Weatherization & Intergovernmental Program and its own individual technology programs. The budget for EERE's formal international activities has typically been between \$8 million and \$9 million per year, but the amount has ebbed and flowed over the years. In FY08, the budget for its International Renewable Energy Program was zeroed out. Concurrently, EERE's FY08 budget

¹³ The OECD Development Assistance Committee's (DAC's) database, the CRS, did not include any USAID disbursements to Sub-Saharan African countries except South Africa and Nigeria, but other African countries may be included in unspecified bilateral programs or regional programs.

¹⁴ Telephone interview with Allen Eisendrath, September 23, 2008.

¹⁵ Telephone interview with Allen Eisendrath, September 23, 2008.

¹⁶ Because this study focuses on agencies that fund energy assistance, the DOE laboratories are mentioned only briefly.

formally included \$7.5 million for the Asia-Pacific Partnership (APP) on Clean Development and Climate, which encourages the adoption of clean-energy technologies in Australia, China, India, Japan, South Korea, and the United States (DOE, 2007a). (More information on APP is included in the section below on DOS activities).

The remaining international funding is primarily used to support R&D and technical assistance. Recent activities pursued by DOE national laboratories include:

- Joint R&D on wind and concentrating solar power, including thermal storage (with Spain), ocean thermal energy (with the United Kingdom), and wind (with Germany).
- R&D on ethanol in China, biodiesel in India, GHG life-cycles in Brazil, and biofuels in Sweden.
- Energy-efficiency programs, with a special focus on China.

Office of Nuclear Energy. The key international program of the Office of Nuclear Energy is the Global Nuclear Energy Partnership (GNEP), which began in 2006 (DOE, n.d.(c)). Its main goal is to promote nuclear power to meet both domestic and international electricity needs while significantly reducing long-term GHG emissions. To date, 20 nations have joined GNEP.

GNEP has two goals: development of new technologies, and “soft” infrastructure issues. It pursues technological development through an Advanced Fuel Cycle Initiative, which includes research into grid-appropriate reactors (GARs) (Ingersoll, 2008b).¹⁷ The initiative does not conduct the R&D but acts as a convener and facilitator. GNEP’s Infrastructure Development Working Group addresses the 19 “soft” infrastructure issues that the IAEA considers most important.¹⁸ Current work includes helping Ghana and Jordan assess whether they are ready to operate and sustain a nuclear-power program.

DOE provides 100 percent of the funding for GNEP. Funding grew from \$167 million in FY07 to \$181 million in FY08, with \$400 million requested for FY09. Only a small fraction of the budget is allocated to the international portion of the initiative. The GAR campaign officially began in 2008 with \$2 million. For FY09, it requested \$20 million, most of which would be used to support establishing a cooperative agreement with industry.¹⁹ The GAR campaign also plans to establish a cooperative agreement to encourage some redirection of private R&D investment into smaller plants for developing nations.

Office of Fossil Energy. DOE’s Office of Fossil Energy is involved in a number of bilateral and multilateral programs related to fossil-fuel research. These programs do not directly provide aid to other countries; rather, they facilitate research collaboration and dissemination of technical expertise. The programs include fossil-energy bilateral agreements with 17 countries; a coal working group with India; participation with DOS in the Carbon Sequestration Leader-

¹⁷ The GAR element of GNEP plans to “develop and demonstrate appropriately sized reactor designs that can provide infrastructure-limited countries with safe, simple, and robust sources of energy to meet their expanding needs for electricity, potable water, and district heating at an affordable price while minimizing the risk of nuclear proliferation” (Oak Ridge National Laboratory, 2008, p. 1).

¹⁸ These include energy planning, grid reliability, legal aspects, radiation protection, regulatory requirements, safeguards, human resource development, environmental protection, emergency planning, radioactive waste, and security and physical protection (interview with Craig Welling, Chair of the DOE Infrastructure Development Working Group, September 25, 2008; see also International Atomic Energy Agency, 2008).

¹⁹ Personal communication from Dan Ingersoll, Campaign Director of GAR, September 15, 2008.

ship Forum; and participation in the International Partnership for a Hydrogen Economy, the Global Gas Flaring Reduction Partnership (to reduce gas flaring and venting from crude oil extraction), and the North American Energy Working Group. The office also provides specific expertise to the Asia Pacific Economic Cooperation's Energy Working Group and the International Energy Agency (U.S. Department of Energy, n.d.(b)).

Office of Policy and International Affairs. The Office of Policy and International Affairs is responsible for coordinating DOE's international energy activities. It is uniquely responsible for negotiating bilateral energy-related agreements in conjunction with DOS. However, the office has limited programmatic funding, so it primarily works with other DOE offices to follow through on agreements, such as an agreement recently signed with the Chilean National Energy Commission to further collaboration on "high priority energy issues, such as energy efficiency technologies and developing renewable energy sources, including solar, wind, wave, geothermal and biofuels" (U.S. Department of Energy, 2009).

Department of State

DOS is organized into both geographic and functional bureaus. Energy-related activities fall into two functional bureaus: the Bureau of Oceans, Environment, and Science (OES), one of three bureaus reporting to the Under Secretary for Democracy and Global Affairs; and the Bureau of Economic, Energy and Business Affairs (EEB), which reports to the Under Secretary for Economic, Energy and Agricultural Affairs.

Bureau of Oceans, Environment, and Science. Several energy efforts are under way in OES, all under the Office of Global Change. These include the APP and 15 individual bilateral and regional climate partnerships. The APP provides technical assistance, though not generally within the DOS budget. OES facilitates U.S. government involvement with other countries in bilateral and regional climate partnerships on climate change and energy security, and it is the lead agency representing the United States in international climate-change negotiations.

Asia-Pacific Partnership on Clean Development and Climate. APP was launched in 2006. It is a U.S.-led effort to "accelerate the development and deployment of clean energy technologies through a voluntary public-private partnership" (U.S. Department of State, 2006). DOS coordinates U.S. participation in APP, which also includes involvement by EPA and DOE. APP addresses energy security, GHG mitigation, energy availability, and economic development, as well as increasing economic security, alleviating poverty, and improving human health.

As of early 2009, APP had more than 150 active projects in nine topic areas (Asia-Pacific Partnership, n.d.). These projects focus on technical assistance, with an emphasis on public-private partnerships and industry cost-sharing. However, many projects are led by other countries and may not involve the United States. While the U.S. government's FY07 contributions were up to \$47 million, the funds and project leadership were typically provided by agencies other than DOS (e.g., DOE, EPA, or government contractors).

To maximize the benefit of U.S. government funds, APP sought additional funding from other countries and industry partners. As a voluntary, non-binding program, APP does not set clear, quantitative benchmarks for success other than the creation of specific projects.

Two APP-related projects toward which EPA has contributed are energy-efficiency labeling in India and China and the harnessing of coal-mine methane for power production.²⁰ DOE has also helped develop international versions of energy-simulation software for buildings, conducted site-specific work on “zero energy” buildings, developed standards and certification processes for photovoltaic solar power in China, and supported an international expansion of the industry-focused Save Energy Now campaign.²¹ The U.S. government has also sought to encourage best-practice energy efficiency and high-efficiency coal-fired power generation with carbon capture and storage in the Indian and Chinese power sectors.

Bilateral and Regional Climate Partnerships. Since June 2001, the United States has established bilateral climate partnerships with 15 countries and regional organizations that, together with the United States, account for almost 80 percent of global GHG emissions. These partnerships encompass almost 500 individual activities in both developed and developing countries.²² Successful joint projects are under way in climate-change research and science, climate observation systems, clean- and advanced-energy technologies, carbon capture, storage and sequestration, and policy approaches to reducing GHG emissions.

Bureau of Economic, Energy and Business Affairs. EEB is the lead bureau at DOS for dealing with international economic issues. Energy was added to its portfolio in 2007, and its main role in this area is to promote energy security and transparent energy markets. EEB works with the International Energy Agency to engage China and India, promote biofuels, and encourage market-based energy reforms (U.S. Department of State, n.d.(d)). These roles are primarily diplomatic; EEB does not fund technical assistance programs.

Environmental Protection Agency

EPA is involved in many partnerships and activities aimed at reducing energy use, reducing emissions, and mitigating global climate change. Most of these efforts consist of voluntary programs and information-sharing (as opposed to direct aid to other countries) to promote clean and efficient technologies and encourage sharing of critical scientific information among a wide range of government, private sector, academic, and other interested stakeholders.

EPA’s international efforts focus on several priority areas—capture and use of methane gas, reducing emissions of other potent GHGs from industrial sources, and dissemination of technical information and GHG monitoring expertise to developing countries. EPA often participates with other U.S. departments and agencies to advance the multilateral partnerships in which the United States participates. The programs and partnerships described below constitute the bulk of EPA’s international energy assistance.

Methane to Markets Partnership. EPA coordinates U.S. involvement in the Methane to Markets Partnership, an initiative that seeks to reduce global methane emissions to “enhance economic growth, promote energy security, improve the environment, and reduce greenhouse

²⁰ The coal-mine methane project resulted from the efforts of APP, EPA’s Methane to Markets Partnership, a \$500,000 U.S. TDA grant, and a \$120 million investment by the Shanxi Jincheng Anthracite Coal Mining Group. The funds are being used to build a 120-MW plant, the largest coal-mine methane-powered facility in the world (U.S. Department of State, 2007).

²¹ For more information on the Save Energy Now campaign, see U.S. Department of Energy, n.d.(a).

²² Partnerships have been established with Australia, Brazil, Canada, Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), China, the European Union, Germany, India, Italy, Japan, Mexico, New Zealand, Russia, South Africa, and South Korea.

gas emissions.²³ The goal of the partnership is to advance, through voluntary action, cost-effective, near-term methane recovery and use as a clean-energy source. It works in four key sectors: agriculture (animal-waste management), coal mining, landfills, and oil and gas systems. In each sector, the program supports identification and use of cost-effective technologies and practices that can be employed to reduce methane emissions and generate clean energy.

As part of this program, EPA transfers knowledge and expertise gained from implementing its domestic voluntary methane partnership programs to other countries. EPA contributes approximately \$4 million a year to the International Methane to Markets Partnership, its largest international effort. DOE, TDA, DOS, the Department of Agriculture (DOA), and USAID are also involved in the partnership. EPA serves as the partnership's Steering Committee chair and supports its administrative tasks.

ENERGY STAR. ENERGY STAR is a voluntary labeling program (run jointly with DOE) that began in 1992 to encourage individuals and organizations to identify and purchase cost-effective, energy-efficient products. Products that meet energy-efficiency guidelines set by EPA and DOE receive the ENERGY STAR label, which signals to consumers that the product consumes less energy and will therefore result in lower energy costs.

ENERGY STAR is primarily a domestic program. However, EPA works with international partners to institute similar energy-efficiency labeling programs. It collaborates with APP and the China Standard Certification Center on standardizing information on energy-efficiency labels for consumer electronics and office equipment.

Emissions Cap-and-Trade Programs. EPA also provides technical assistance and information-sharing to countries interested in implementing market-based programs similar to the U.S. sulfur-dioxide and nitrogen-oxide cap-and-trade programs.²⁴ To date, EPA has shared lessons learned from designing, implementing, and enforcing similar programs with more than 50 governments around the world that have sought its help and advice in assessing the appropriateness of establishing programs of their own. EPA has developed formal working relationships with Canada, Chile, China, and Mexico and has provided technical assistance on the potential of cap-and-trade approaches for reducing emissions (Environmental Protection Agency, n.d.).

Other International Activities at EPA. The EPA Office of International Programs has undertaken a number of activities with counterpart agencies and organizations in the United States and other countries to promote information exchange. The International and Environmental Studies Group at the National Renewable Energy Laboratory (NREL) works with EPA to examine how air-quality improvements in other countries can be achieved as a co-benefit of reducing carbon-dioxide emissions. The Office of International Programs also partners with other governments and private sector organizations to bring about environmental benefits. It

²³ This program focuses on methane for two reasons. First, as the primary component of natural gas, methane represents a major source of energy. Second, methane has 25 times the heat-trapping power of carbon dioxide (when measured over a 100-year horizon) and accounts for about 14 percent of all GHG emissions (measured in carbon-dioxide equivalents) resulting from human activities (Intergovernmental Panel on Climate Change, 2007b). Ensuring that methane is brought to market and used to generate power or for other purposes is both economically and environmentally beneficial. For more information on the program, see Methane to Markets Partnership, n.d.

²⁴ In cap-and-trade programs, strict limits ("caps") are placed on emissions. Emitters are given allowances for the emissions they are authorized to emit, the total sum of which equals the cap. Participating sources then choose whether to reduce their emissions (through process changes, efficiency improvements, or pollution-control devices) or to buy (or sell) extra allowances (the "trade") from facilities that have reduced their emissions beyond the number of allowances they hold.

participates in the Partnership for Clean Fuels and Vehicles, a worldwide, public-private partnership aimed at reducing air pollution in developing countries (United Nations Environment Programme, n.d.) that is coordinated by the United Nations Environment Programme.

Trade and Development Agency

TDA has the dual purpose of supporting economic development in low- and middle-income countries and promoting U.S. business. TDA provides some conventional development assistance, and it also holds orientation visits to introduce American business representatives to host-country officials, conducts feasibility studies, and sponsors reverse trade missions to match U.S. businesses with appropriate overseas customers.

According to TDA reports, in 2008, energy projects constituted almost one-quarter of its activities, second only to transportation (U.S. Trade and Development Agency, 2008a). Most of TDA's projects are studies, evaluation, and technical assistance on infrastructure such as coal-bed methane power plants, geothermal plants, hydropower facilities, and power grid and transmission line upgrades (U.S. Trade and Development Agency, 2008b).

German International Energy Assistance

In this chapter, we review German international energy assistance. We selected Germany for comparison with U.S. energy-assistance programs because it has a more centralized approach to organizing and delivering assistance. While we did not assess the effectiveness of either approach, the German approach is commonly perceived by members of the development community as being more coordinated.

For our examination of Germany's international assistance, we use the same two-step process we used for the United States. We begin with an overview of trends in German bilateral ODA in the energy sector by purpose, region, agency, and type of assistance (grant, loan, and equity investments). The data were taken from Germany's official submission to the OECD database.¹ We then briefly summarize the offices, strategies, and activities of the German government agencies most involved in providing international energy assistance.

Disbursements

Total Energy-Assistance Disbursements

Between 2002 and 2006, Germany's energy ODA disbursements totaled \$1.06 billion, averaging \$212 million per year. Germany's annual disbursements have varied across the years, gradually decreasing from 2002 to 2005, then increasing in 2006 to almost their 2002 levels.

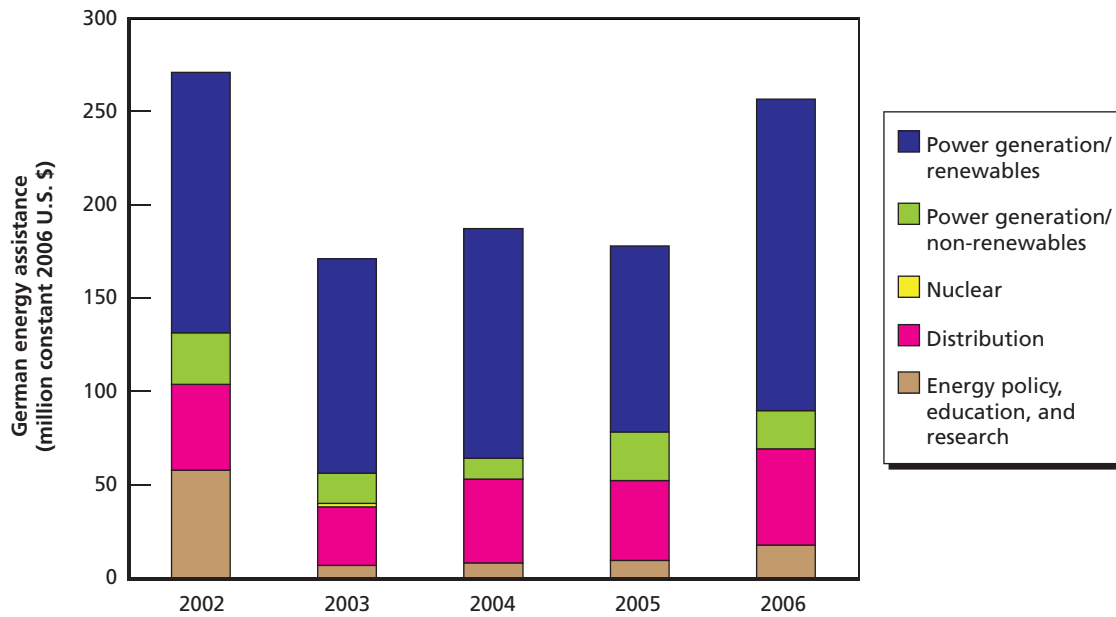
Energy Assistance by Purpose

For the five-year period, \$641 million (60 percent) of Germany's assistance was directed toward power generation from renewable sources. The next largest categories were energy distribution (\$216 million, 20 percent); power generation from non-renewable resources (\$101 million, 10 percent); energy policy, education, and research (\$103 million, 10 percent); and nuclear power (\$2 million, 0.2 percent).

As shown in Figure 4.1, disbursements for most categories remained relatively constant during this period. Funding for power generation from renewable sources ranged from \$100 million to \$166 million, while funding for non-renewable sources was between \$11 million and \$27 million. Support for energy distribution ranged from \$31 million to \$51 million. The exceptions were nuclear power, which was zeroed out after 2002, and energy policy, education,

¹ The categories of regional distribution and purpose of aid are the same as those used in the U.S. analysis, and disbursement amounts are reported in constant 2006 U.S. dollars. For additional information on the database and approach, see Appendix A.

Figure 4.1
German Energy Assistance by Purpose



RAND OP251-4.1

and research, which decreased from \$58 million in 2002 to less than \$10 million in 2003 and remained low. Funding gradually shifted toward renewable power.

Energy Assistance by Region

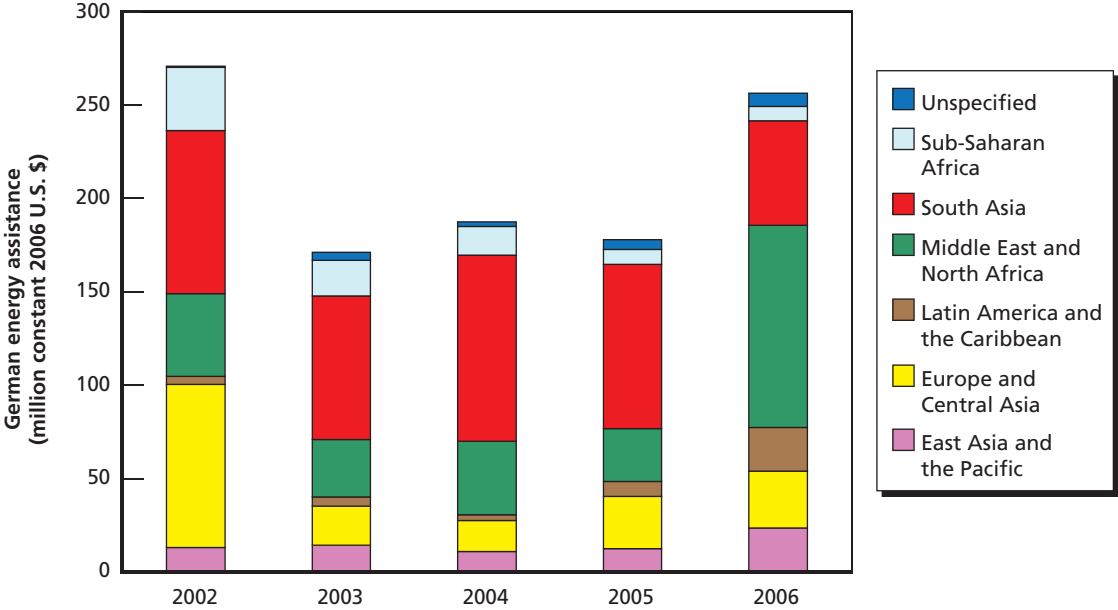
South Asia received the largest amount of German assistance, \$407 million (38 percent). The Middle East and North Africa received the next largest amount, \$250 million (24 percent). Europe and Central Asia received \$183 million (17 percent). Smaller amounts were provided to Sub-Saharan Africa (\$84 million, 8 percent); East Asia and the Pacific (\$75 million, 7 percent); and Latin America and the Caribbean (\$43 million, 4 percent). A total of \$20 million (2 percent) was provided to unspecified regions (Figure 4.2).

Germany's assistance to the Middle East and North Africa region increased almost four-fold in a single year, from 2005 to 2006, growing from \$28 million to \$108 million. Annual funding to Latin America and the Caribbean more than quadrupled, from \$4 million to \$23 million. Annual funding to most other regions fell over the five-year period: South Asia declined by more than one-third, going from \$88 million to \$56 million; Europe and Central Asia declined from \$87 million to \$30 million; and Sub-Saharan Africa declined from \$33 million to \$8 million.

Energy Assistance by Agency

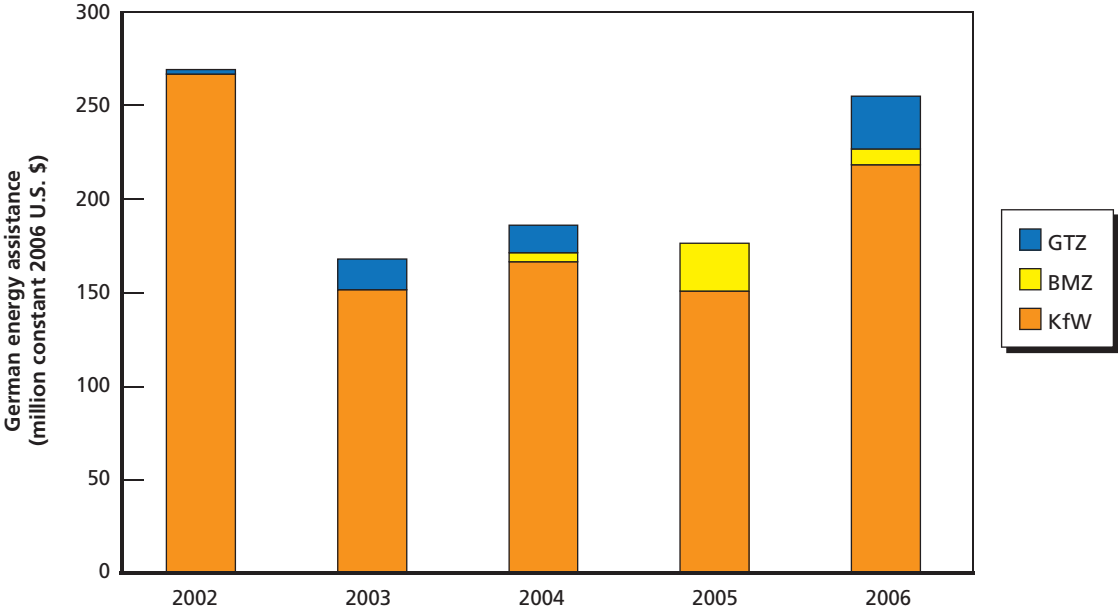
Most of the German energy assistance is distributed by three federal entities: the Federal Ministry for Economic Cooperation and Development (BMZ), the German Development Bank (KfW), and the German Agency for Technical Cooperation (GTZ) (Figure 4.3). Very small amounts of assistance (not shown in Figure 4.3, but totaling about 1 percent) are provided through other federal ministries and lower levels of government. The vast majority of German energy assistance is disbursed by KfW.

Figure 4.2
German Energy Assistance by Region



RAND OP251-4.2

Figure 4.3
German Energy Assistance by Agency



RAND OP251-4.3

Energy Assistance by Funding Type

As shown in Figure 4.4, Germany provided \$439 million in grants, \$600 million in loans, and \$23 million in equity investments over the five-year period. Loans constituted about 55 percent of the total aid, ranging from a low of \$72 million (42 percent) in 2003 to a high of \$182 million (67 percent) in 2002. In 2006, Germany provided \$23 million for equity investments in renewable-power generation (\$14 million) and non-renewable-power generation (\$9 million).

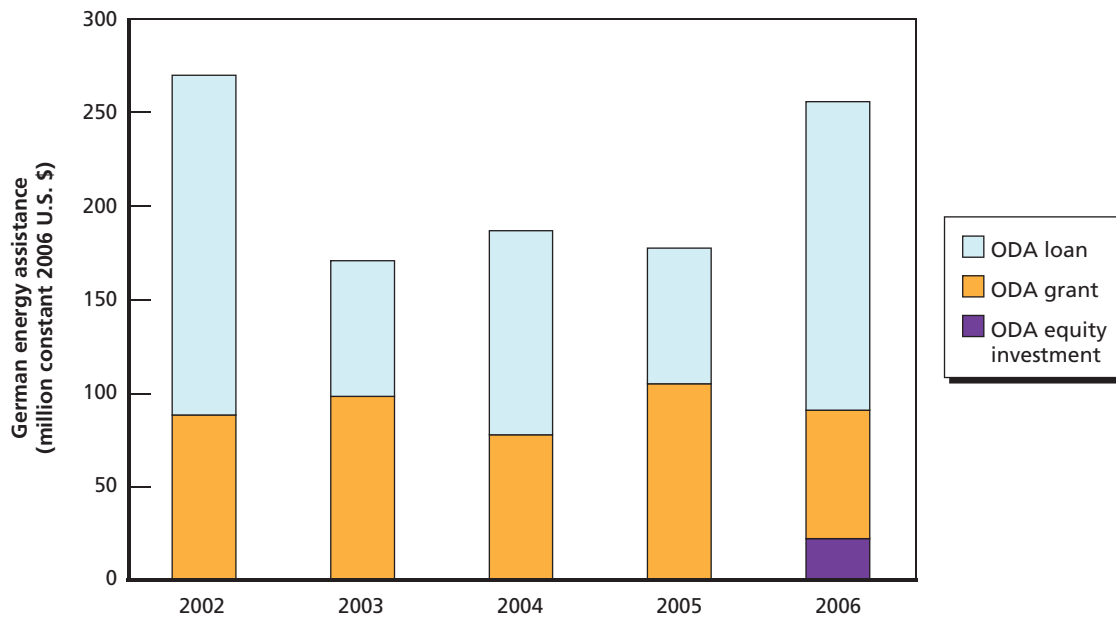
Agencies, Strategies, and Activities

Federal Ministry for Economic Cooperation and Development

BMZ is the government body primarily responsible for development cooperation. As such, it provides the funding for all of Germany's bilateral assistance activities, determines principles and guidelines, provides long-term strategies for cooperation, and sets the priority areas for assistance, as well as the priority countries.

As defined by BMZ, the main objective of development cooperation is to “help ensure that scarce resources are more equitably shared” and to make sure that the “environment is preserved for coming generations, and to help reduce poverty” (Federal Ministry (BMZ), n.d.). BMZ allocates funding to 12 priority areas,² including energy and climate protection and environmental protection.

Figure 4.4
German Energy Assistance by Type



RAND OP251-4.4

² Poverty reduction, peace-building, debt relief, environmental protection, energy and climate protection, human rights, good governance, education, health/population policy and combating HIV/AIDS, food security, globalization and trade, and private sector development.

Approach to Energy-Related Development Assistance. BMZ's objective is "to promote the creation of sustainable, decent living conditions, in particular for the poor" (Federal Ministry (BMZ), 2007). To achieve that objective, a recent sector strategy paper proposed a framework based on four relationships between energy policy, poverty reduction, and development:

- Energy plays a central role in the fulfillment of basic needs (e.g., heating, food production and preparation, and the provision of health and education services).
- A stable and adequate energy supply is a prerequisite for any form of economic growth. Conversely, inadequate supplies of energy, the lack of efficient energy use, and low levels of investment in the energy sector are major impediments to economic growth and poverty reduction.
- Changes in the energy market can negatively impact countries' stability. Sharp increases in oil prices, for example, may require import-dependent countries to borrow heavily to cover energy needs, thus increasing their level of debt, which in turn can result in macro-economic instability and also political instability if prices remain high.
- Energy production, particularly burning of fossil fuels, can have a negative environmental impact. As population and economic growth continue to increase in the developing world, rising demand for energy, especially from fossil resources, will increase GHG emissions and contribute to climate change (Federal Ministry (BMZ), 2007).

This framework, in turn, provides the basis for BMZ's goals for energy assistance (German Agency for Technical Cooperation (GTZ), n.d.):

- Increasing access to affordable energy services, particularly for the poor. In most developing countries, the poor lack access to modern sources of energy. As a result, they often have to rely on traditional biomass, which may require a large share of their income (e.g., to buy firewood or kerosene) or time (to collect firewood) and can also pose health threats to vulnerable populations. Increasing access to modern energy services will have direct beneficial impacts on the poor.
- Promoting growth through energy. Investing in efficient energy resources will remove an important obstacle to economic growth, will accelerate economic growth, and will expand opportunities for employment.
- Preventing crises resulting from unstable energy markets. Promoting regional energy cooperation can minimize tensions and conflicts.
- Minimizing local and global environmental degradation resulting from energy extraction and consumption. By focusing assistance on renewable energy and energy efficiency, Germany seeks to foster sustainable-energy systems.

The German development agencies have also started to think about the broader impacts of climate change and energy supplies on conflict and security and the appropriate strategies Germany should adopt to make assistance more effective in that context. Following the latest assessment of the Intergovernmental Panel on Climate Change (Intergovernmental Panel on Climate Change, 2007a), GTZ commissioned a study on the potential impacts of climate change on international conflict and the implications for development assistance (German Agency for Technical Cooperation (GTZ), 2007). The study concluded that in the long run,

growing demand and competition for energy resources could lead to shortages, which could in turn lead to instability and conflict.³

These goals and principles are generally reflected in the types of programs and projects that Germany supports. As Figure 4.1 demonstrates, assistance for renewable-energy resources and systems, such as sustainably produced biomass, geothermal power, wind power, solar power, ocean power, and small-scale hydropower, constitutes a large portion of the aid disbursed. Further, as a matter of national policy, the German government is phasing out its domestic use of nuclear power, and it does not “promote nuclear energy on account of the risk it entails” (Federal Ministry (BMZ), 2007, p. 15).

Recent Changes in Strategy. In the early 2000s, BMZ was restructured to increase its effectiveness. It focused assistance on a smaller number of recipients (Federal Ministry (BMZ), n.d.), effectively reducing the number of countries it supported from about 120 (in the late 1990s) to about 60 (in 2005). The countries are chosen on the basis of “development needs, governance performance, the relevance of Germany’s contribution compared with other bilateral and multilateral donors, political factors, regional aspects and established ties” (Federal Ministry (BMZ), n.d.). BMZ also funds regional and thematic programs from which non-partner countries can benefit.

Implementation. To implement development cooperation, including energy assistance, BMZ contracts with “implementing organizations,” agencies with expertise in providing financial and technical development assistance. For the energy sector, the two main implementing organizations are KfW and GTZ, which are responsible for financial and technical cooperation, respectively.⁴

German Development Bank

KfW *Entwicklungsbank* is one of the five main divisions of the KfW *Bankengruppe*, a public law institution jointly owned by the federal government (80 percent) and the federal states (20 percent). KfW *Bankengruppe* provides long-term capital in countries with underdeveloped financial markets, supporting investments in

- Social infrastructure (e.g., education and health facilities)
- Economic infrastructure (e.g., power supply, transport, and telecommunications)
- Financial systems
- Environmental protection.

KfW provides this support through a mix of loans and grants. Financing terms vary according to the income level of recipient countries: least-developed countries (LDCs) receive nonrepayable grants, while other developing countries receive loans either at concessional rates

³ For example, in the long run, climate change may reduce precipitation and increase the frequency and severity of droughts in some areas. This could become a threat to countries that rely on hydropower for 80 to 100 percent of their electricity supply (e.g., Nigeria, Zambia, and Uganda).

⁴ Other implementing organizations include the German Development Service (*Deutscher Entwicklungsdienst*); the German Investment and Development Company (*Deutsche Investitions und Entwicklungsgesellschaft*, which is a subsidiary of the KfW *Bankengruppe*); Capacity Building International, Germany (InWEnt); and the International Centre for Migration and Development (*Centrum für Internationale Migration und Entwicklung*).

(no interest, with repayments over 35 to 40 years) or at low interest (2 percent for 30 years, with a 10-year repayment grace period).⁵

German Agency for Technical Cooperation

GTZ's mission is to provide "viable, forward-looking solutions for political, economic, ecological and social development in a globalised world" (German Agency for Technical Cooperation (GTZ), n.d.). GTZ is a not-for-profit, government-owned corporation that provides technical development assistance and has a supervisory board composed of representatives from four federal ministries. While the majority of its work is carried out for BMZ, it also contracts with other German ministries, governments of other countries, international organizations (e.g., the European Commission), the World Bank, and private enterprise.

⁵ For more detail, see German Development Bank, n.d.

Recommendations from Recent Reports

Our review of recent studies on U.S. energy and climate policy identified several common findings and recommendations. While most of the studies focused on domestic energy policy and/or climate policy, they all provided some recommendations for international energy policy, although almost none of them address international energy assistance specifically. Most of the reports were published in the past decade. The recommendations presented here thus reflect recent views about how to improve the U.S. approach to international energy assistance.

We reviewed the following nine reports:

- President’s Committee of Advisors on Science and Technology (PCAST), Panel on International Cooperation in Energy Research, Development, and Deployment, *Powerful Partnerships: The Federal Role in International Cooperation on Energy Innovation*, June 1999.
- Energy Future Coalition (EFC), *Challenge and Opportunity: Charting a New Energy Future*, 2003.
- Kelly Sims Gallagher and John P. Holdren, *U.S. Government Policies Relating to International Cooperation on Energy*, December 2004.
- The National Commission on Energy Policy (NCEP), *Ending the Energy Stalemate: A Bipartisan Strategy to Meet America’s Energy Challenges*, December 2004.
- International Climate Change Task Force (ICCTF), *Meeting the Climate Challenge: Recommendations of the International Climate Change Task Force*, January 2005.
- Kelly Sims Gallagher, John P. Holdren, and Ambuj D. Sagar, “Energy-Technology Innovation,” *Annual Review of Environment and Resources*, Vol. 31, November 2006, pp. 193–237.
- Presidential Climate Action Project (PCAP), *The Presidential Climate Action Plan*, December 2007.
- Robert L. Hicks, Bradley C. Parks, J. Timmons Roberts, and Michael J. Tierney, *Greening Aid? Understanding the Environmental Impact of Development Assistance*, 2008.
- National Renewable Energy Laboratory, *Strengthening U.S. Leadership of International Clean Energy Cooperation: Proceedings of Stakeholder Consultations*, NREL/TP-6A0-44261, December 2008.¹

¹ This report summarizes nine recent energy-related reports (including four of those listed above) and one piece of congressional testimony.

Overview of Recommendations

Climate-change mitigation was the dominant theme of the reports we reviewed, followed by U.S. security, domestic economic well-being, and international human well-being, including providing energy for the “energy poor” and fostering development while minimizing its negative impacts. The main recommendations and the support for each are summarized in Table 5.1.

Recommendations

The recommendations in Table 5.1 are the general actions supported by the reports. Additional details are presented below.

Increase energy research, development, demonstration, and deployment (ERD3). PCAST (1999) recommended increased support for ERD3 research centers. NCEP (2004) recommended that support range from \$750 million to \$1 billion annually.² Specific recommendations regarding ERD3 included affordable renewable energy; low-carbon fossil-fuel technologies; carbon sequestration; efficient vehicles; natural gas regulations; building and equipment efficiency standards; and terrorism- and proliferation-resistant, safe nuclear technologies (NCEP, 2004; PCAST, 1999; NREL 2008). NCEP (2004) and NREL (2008) also recommended focusing energy investments on developing countries (e.g., China, India, and Brazil), where they would have the most impact.

Table 5.1
Recommendations for International Energy Assistance in Recent Reports

Report	Recommendation							
	Increase ERD3	International cooperation	Improve U.S. government coordination	Attract private sector investment	Reform existing finance mechanisms	Create new financing structures	Create new public sector institutions	Reduce subsidies to create a level playing field
PCAST (1999)	X		X	X		X	X	X
EFC (2003)			X		X			X
Gallagher and Holdren (2004)	X		X			X		X
NCEP (2004)	X	X		X				
ICCTF (2005)		X			X			X
Gallagher, Holdren, and Sagar (2006)				X				X
PCAP (2007)	X	X	X			X	X	X
Hicks et al. (2008)					X			
NREL (2008)	X	X	X	X	X	X	X	X

² According to NCEP (2004), such an increase would triple the level invested in the late 1990s. Gallagher and Holdren (2004) recommended a similar figure; however, their report was commissioned by NCEP, so these are not independent recommendations. Furthermore, PCAST (1999) was chaired by John Holdren (Gallagher and Holdren, 2004), so the similarity and progression in recommendations could be expected.

Use international cooperation to accelerate the transfer of knowledge. ICCTF (2005) recommended participation in the Clean Development Mechanism³ to enable developed countries to share expertise with developing countries. The ICCTF report also suggested building on the Group of Eight (G8) to form a G8+ Climate Group to pursue technology agreements. NREL (2008) recommended expanded U.S. government leadership, accelerated global cooperation, and partnerships with key countries.

Improve U.S. government communication and coordination. PCAST (1999) recommended the formation of an Interagency Working Group on Strategic Energy Cooperation to improve communication and coordination. EFC (2003) recommended the formation of a new U.S. Council on Energy and Development to help reduce energy poverty in developing countries. PCAP (2007) recommended merging the Small Business Administration with offices from DOE to form an Innovation and Economic Development Administration. NREL (2008) called for the President and Congress to set clean-energy goals and develop a governmentwide implementation plan.

Attract private sector investment. Gallagher, Holdren, and Sagar (2006) called for using long-term policy to stimulate private sector investment. They recommended that governments use “GHG concentration targets or stable tax incentives for private innovation” (p. 232). Most of the reports supported this recommendation implicitly, citing the use of trading markets or taxes to increase demand for energy efficiency. NREL (2008) argued that improving domestic programs and creating receptive policy and market conditions in major developing countries are key to achieving dramatic and sustained increases in renewable-energy and energy-efficiency investments by U.S. firms.

Reform existing financing mechanisms. EFC (2003) recommended that financial institutions extend the length of loans to developing countries and that the multilateral development banks create an International Energy Efficiency Financing Protocol to facilitate efficiency investments. ICCTF (2005) suggested increasing the World Bank’s target investment in renewable energy and making the terms used by export credit agencies for such projects as favorable as those for fossil fuel and nuclear power. Hicks et al. (2008) recommended that recipient countries that meet desired environmental standards be rewarded with other types of aid. NREL (2008) suggested strengthening “investment risk-mitigation vehicles for emerging markets” and consolidating and streamlining business-investment support services (p. 15).

Create new financing structures. PCAST (1999) suggested creation of a new fund to be overseen by OPIC, as well as technical assistance trust funds at DOE, EPA, USAID, and TDA. PCAP (2007) recommended creation of a clean-energy bank to provide grants and loans for sustainable-energy projects. EFC (2003) recommended a global development bond and a global rural energy best-practices fund, both aimed at financing energy projects in developing countries. NREL (2008) recommended creating a clean-energy fund in which the United States would “team with other developed countries and international institutions to provide co-financing for projects that advance [the] use of high-risk and emerging technologies and projects” (p. 28).

Create new public sector institutions. PCAP (2007) proposed a new Organization of Petroleum Importing Countries to increase opportunities to improve oil efficiency, reform

³ The Clean Development Mechanism was defined in the Kyoto Protocol as a way to implement emission-reduction projects in developing countries in exchange for credits that could be counted toward meeting a country’s emissions target. For more information, see United Nations Framework Convention on Climate Change, n.d.

petroleum-related subsidies, create a “global network of strategic petroleum reserves,” and collaborate on oil-shipment protection (Sec. 4, p. 5). PCAP (2007) also suggested creating an International Renewable Energy Agency to help shift global energy subsidies from fossil and nuclear sources to renewable sources. Finally, NREL (2008) recommended developing mechanisms for “joint U.S. government and private-sector planning and outreach, including possibly reinstating the Committee for Renewable Energy Commerce and Trade (CORECT) and Committee on Energy Efficiency Commerce and Trade (COEECT) forums” (p. 15).

Reduce subsidies to create a level playing field for clean-energy technology and bio-fuels. Many of the reports argued that aid should explicitly include environmental criteria and that both donors and recipients should consider how aid practices affect GHG emissions. The reports argue that such an approach would reduce both explicit and implicit subsidies and would create a level playing field on which clean-energy technology and biofuels would be better able to compete.

Observations and Recommendations for Future Study

In this chapter, we present a number of observations and recommendations that might inform the Obama administration's efforts to improve the nation's international energy-assistance programs and reduce GHG emissions and global oil consumption.

Specifically, the observations concern the U.S. approach to international energy assistance, insights from the comparison with Germany, and the actions that recommendations from recent reports may suggest for those considering changes to the U.S. approach. We conclude by presenting several recommendations for future study.

Observations on U.S. Energy Assistance

U.S. agencies pursue different goals with different capabilities and strategies. Agencies generally target different goals. Therefore, one would expect USAID, DOE, TDA, and other agencies to use different skills and capabilities to pursue their goals. While the decentralization inherent in multiple agencies may increase the complexity of managing this portfolio, it also allows for specialization. Trying to consolidate the many activities of these agencies into fewer agencies or requiring all of them to pursue common aims could diminish their ability to pursue their mandated goals.

Reducing GHG emissions and improving energy security are not the primary goals of agencies, but many agencies contribute to them indirectly. Reducing GHG emissions and improving U.S. energy security are not major drivers of agency activities, since these are not the agencies' primary goals. However, some agency goals are focused on creating the conditions that may be necessary or useful to achieve these energy improvements. For example, USAID's mission and primary goals call for creating the conditions needed for recipient-country energy sectors to become financially sustainable. Once such reforms are in place, recipient countries should be able to pursue energy-security improvements and GHG reductions on their own.

Expanding and replicating existing small programs could provide near-term options to reduce GHG emissions and improve energy security. Most agencies have programs that are compatible with reducing GHG emissions and improving energy security, but the programs are generally small. Some may be operating in one or just a few countries, despite their potential to benefit many more. It may be possible to scale these programs up or to extend them to other countries, thereby providing near-term options to accelerate emissions reductions or reduce oil consumption, even while larger changes are considered.

Pursuing multiple goals may require trade-offs and increased coordination among agencies. While multiple goals may not be incompatible, they do not always neatly coincide; goals may need to be prioritized and trade-offs may be required. The organization and implementation of the many U.S. government energy-assistance programs need to be flexible enough to allow for such changes in priority and related trade-offs. For example, near-term and longer-term objectives can conflict. The challenge is to determine how to pursue short-term interests without limiting longer-term alternatives. In its efforts to restore Iraq's energy infrastructure, the United States has provided diesel generators to rapidly restore power, but it has not yet created a sustainable utility that charges and collects funds for the power provided from the grid. An implication is that short-term solutions to pressing problems may lead to increased GHG emissions relative to alternative solutions.

While increased coordination across government agencies can help set priorities or make trade-offs, interagency coordination can also be time-consuming. An alternative would be to focus less on coordinating agency activities and more on reducing potential interference between agency strategies, especially over time. For example, near-term efforts to restore power and reform policy could seek to facilitate the introduction of distributed and renewable sources of power in the future.

Multiagency efforts such as APP are another example of coordination. Unfortunately, such efforts typically require extensive executive branch leadership, since each agency has its own budget, mission, and priorities, which usually differ from those of its partners.

Comparing U.S. and German Approaches

German disbursements exceed U.S. disbursements for core energy assistance. Except for U.S. funding for near-term foreign-policy goals and activities (as described in Chapter Three), Germany disbursed larger sums for international energy assistance between 2002 and 2006, even though U.S. 2008 gross domestic product was roughly five times larger than that of Germany and the current U.S. population is approximately four times that of Germany. Over this five-year period, Germany disbursed \$1,062 million, while the United States disbursed \$811 million.¹

German assistance is centrally planned, while U.S. agencies operate largely independently. The United States and Germany each have a primary aid agency—USAID in the United States and BMZ in Germany—but the similarities end there. USAID pursues its own goals,² focused primarily on the economic development of less-developed countries, and implements assistance either directly or through private contractors. Other U.S. agencies provide international assistance to both developing and developed countries, usually independently of USAID.

¹ Gross domestic product was compared on the basis of estimated purchasing-power parity for 2008. Population was compared using a July 2009 estimate. Data were obtained from Central Intelligence Agency (n.d).

² While USAID is an independent federal agency, it receives overall foreign-policy guidance from the Secretary of State. In addition, as part of the executive branch, its budget and activities are coordinated by the Office of Management and Budget within the Executive Office of the President.

In contrast, BMZ plays a coordinating role for German assistance and provides little aid directly to recipients. It works largely through KfW, the development bank, and to a far lesser extent through GTZ, which provides on-the-ground technical assistance.³

German assistance focuses on renewable power, while U.S. assistance focuses on energy policy, education, and research. Since 2002, Germany has significantly reduced its support for energy policy, education, and research and has increased its support for renewable energy. In contrast, the United States has maintained its focus on policy reform, providing little funding for renewable power. Furthermore, German domestic and international assistance appear coordinated in that both focus on reducing GHGs and promoting the growth and deployment of renewable energy.

German assistance is financed with loans and grants, while the United States uses only grants. Finally, the United States and Germany have different approaches to funding energy assistance.⁴ The United States typically seeks to create market reforms that will lead to stable, long-term markets. In theory, after such reforms are implemented, private capital should be available to finance needed infrastructure investments. In contrast, over the five-year period studied here, German energy assistance was provided in the form of loans (57 percent), grants (41 percent), and equity investments (2 percent) to produce near-term deployment of renewable-energy projects, among other projects.

Observations from Recent Reports

The review of recent reports led to several additional observations described in detail in Chapter Five:

- Energy assistance and increased ERD3 funding should support each other.
- Energy assistance can accelerate the transfer of knowledge.
- Energy assistance can be a focal point for improved interagency coordination.
- Energy assistance should seek to attract private investment.
- Energy assistance should include help to reduce subsidies and create a level playing field for new technology.

Recommendations for Future Study

We have identified several actions for the Obama administration to consider as it assesses opportunities for improving U.S. energy assistance, reducing GHG emissions, and improving U.S. energy security.

Assess the effectiveness of the current U.S. approach and alternative approaches to providing energy assistance. The effectiveness of U.S., German, and other approaches to energy assistance should be quantitatively assessed and compared. The evaluation should

³ As a further illustration of the different approaches, an equivalent structure in the United States would be for USAID (or DOS, of which USAID is a part) to coordinate aid, but for lending to occur through a U.S.-controlled development bank and for technical assistance to come from a third agency (e.g., DOE).

⁴ As previously stated, we did not assess the effectiveness of either approach, but we recommend such an assessment.

determine whether Germany's coordinated focus on renewable energy and public financing is creating sustainable, long-term private investments. It should also assess whether the U.S. investments in policy reform and education are stimulating private financing, whether the various approaches are replicable, and the potential they have to reduce GHG emissions and improve energy security.

Compare the long-term benefits of supporting policy reform with the short-term benefits of supporting projects that reduce GHG emissions and oil consumption. Determining how aggressively the United States should pursue GHG reductions or improvements in energy security requires greater understanding of the role that effective regulatory institutions and common energy-policy reforms play in providing a foundation for these goals. To address this knowledge gap, we recommend comparing the benefits that long-term policy reforms can play with the direct and indirect impacts of investments in short-term projects.

Assess the advantages and disadvantages of focusing more resources on fewer recipients. As described in Chapter Two, some countries and regions are projected to emit more GHGs and consume more oil than others. We recommend considering the advantages and disadvantages of allocating greater resources to fewer countries, focusing on those in which improvements can have a more significant impact.

The OECD Database

Recent trends in international energy assistance discussed in this report are based on information in a database maintained by OECD's Development Assistance Committee (DAC).¹ This database, the CRS, contains project-level data on bilateral ODA, where ODA is defined as

Flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent (International Monetary Fund, 2003).

The data are self-reported by donor countries and categorized using common definitions and classifications that are updated and harmonized during annual meetings of DAC.² The database is categorized by sponsor, recipient, committed aid, disbursed aid, sector, and purpose. The use of common definitions and standards makes it possible to compare donors' aid activities and to provide consistent ODA reporting over time for each donor since 2000.³

While CRS provides a foundation for comparing countries and examining trends over time, the quality of the data varies. Because figures are self-reported, countries may incompletely or inconsistently report data within and across years.⁴

In addition, CRS may not be comparable to national budgets and reporting efforts, because DAC and national definitions, classification procedures, and reporting resolution (i.e., the degree of disaggregation) may differ. As a result, it may not be possible to link the databases or identify a project in each dataset. For example, each aid activity in CRS can be assigned to only one sector, to avoid double-counting, whereas data reported by national systems may allow aid activities to be assigned to more than one sector.

Because of the lack of comparability between CRS and national budgets and reporting efforts, we did not attempt to independently verify or cross-check the CRS data with agency budgets or activities. We used the CRS data without modification, with two exceptions:

¹ More information on the databases is available at Organisation for Economic Co-operation and Development, n.d.

² Based on personal communication with administrators of the DAC/CRS database.

³ According to database administrators, the data are considered to be complete from 2000 onward; for prior years, it may be difficult to differentiate between an increase in aid and an improvement of aid reporting (personal communication from Oliver Bouret, 2008).

⁴ This may explain why, in the data on U.S. disbursements between 2002 and 2006, some projects lack agency sponsorship and some agencies do not show disbursements for every year.

- Projects sponsored by “miscellaneous” were reassigned to the correct agency if that agency was identified in other sections of the database (e.g., the project description field).
- Projects categorized as “energy policy and administrative management” were reassigned to the “nuclear” category when other sections of the database clearly stated that they were related to nonproliferation or sponsored by a nonproliferation-related government agency.

Finally, we analyzed disbursement data rather than commitments, because disbursement data reflect aid extended, while commitments can overestimate aid levels. For example, about 350 of the more than 1,100 energy-related projects between 2002 and 2006 in the database have no disbursements associated with them. And while disbursements are reported in both current and constant 2006 dollars, we reported them in constant 2006 dollars only.

Components of the OECD Energy and Supply Category

Purpose	Description
Energy policy and administrative management	Energy sector policy, planning, and programs; aid to energy ministries; institution capacity-building and advice; unspecified energy activities, including energy conservation.
Power generation/non-renewable sources	Thermal power plants, including plants for which heat source cannot be determined; combined gas-coal power plants.
Power generation/renewable sources	Policy, planning, development programs, surveys, and incentives.
Electrical transmission/distribution	Distribution from power source to end user; transmission lines.
Gas distribution	Delivery for use by ultimate consumer.
Oil-fired power plants	Includes diesel power plants.
Gas-fired power plants	—
Coal-fired power plants	—
Nuclear power plants	Includes nuclear safety.
Hydroelectric power plants	—
Geothermal energy	—
Solar energy	Includes photovoltaic cells, solar thermal applications, and solar heating.
Wind power	Includes wind energy for water-lifting and electric-power generation.
Ocean power	Includes ocean thermal-energy conversion and tidal and wave power
Biomass	Densification technologies and use of biomass for direct power generation; includes biogas, gas obtained from sugar cane and other plant residues, and anaerobic digesters.
Energy education/training	Applies to all energy subsectors and all levels of training
Energy research	Includes general inventories and surveys.

SOURCE: Organisation for Economic Co-operation and Development, Development Assistance Committee (OECD/DAC), 2002.

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