THE WORLD BANK

ASIA ALTERNATIVE ENERGY PROGRAM (ASTAE)

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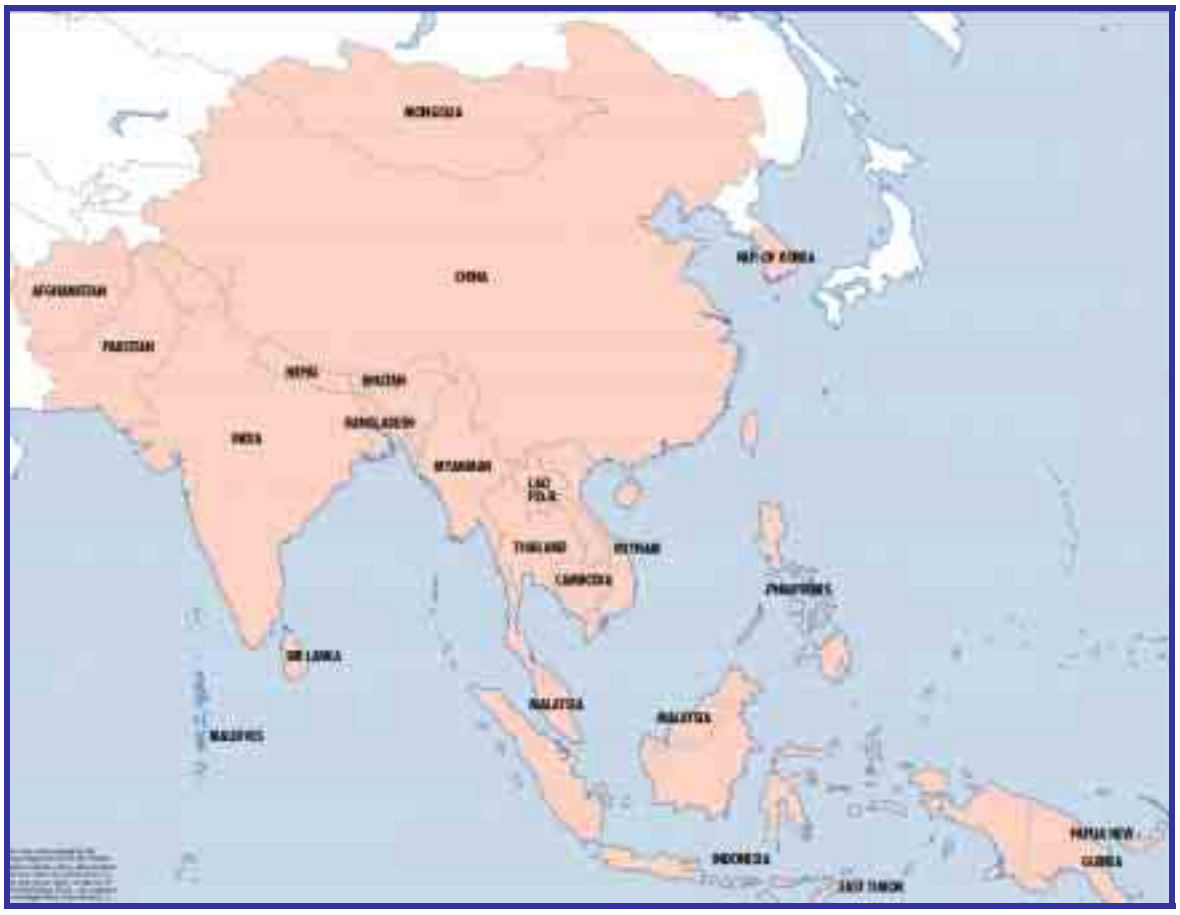

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Acronyms and Abbreviations

AAA	Analytic and advisory activities
AFRREI	Africa Rural and Renewable Energy Initiative
APEC	Asia-Pacific Economic Cooperation
APL	Adaptable program loan
ASTAE	Asia Alternative Energy Program
AusAID	Australian Agency for International Development
AWEA	American Wind Energy Association
BMZ	(German) Federal Ministry for Economic Co-operation and Development *(Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung)*
CCP	(India) Climate Change Partnership
CDM	Clean Development Mechanism
CEB	Ceylon Electricity Board
CIDA	Canadian International Development Agency
CRESP	China Renewable Energy Scale-Up Program
CSD9	U.N. Commission on Sustainable Development, 9th Session (April 2001)
DANIDA	Danish Agency for Development Assistance
DFID	(U.K.) Department for International Development
DGIS	(Netherlands) Directorate-General for International Co-operation
DSM	Demand-side management
EAP	East Asia and the Pacific Region
EdL	Electricité du Laos
EGAT	Electricity Generating Authority of Thailand
EMC	Energy management company
ESCO	Energy service company
ESD	Energy Services Delivery
ESMAP	Energy Sector Management Assistance Programme
EVN	Electricity of Vietnam
FINESSE	Financing Energy Services for Small-Scale Energy Users Project
GEF	Global Environment Facility
GOC	Government of China
GRIDCO	Grid Corporation of Orissa
GTZ	Deutsch Gesellschaft für Technische Zusammenarbeit
GW	Gigawatt
HVAC	Heating, ventilation, and air conditioning
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IDF	International Development Forum
IEA	International Energy Agency
INGO	International Non-governmental organization
IREDA	Indian Renewable Energy Development Agency
ISO	International Standards Organization
KfW	German Development Bank *(Kreditanstalt für Wiederaufbau)*

MEA	(Thai) Metropolitan Electricity Authority
MFI	Micro-Finance Institutions
MMS	Mandated market share
MNES	(Indian) Ministry of Non-Conventional Energy Sources
MoI	(Vietnam) Ministry of Industry
MW	Megawatt
NGO	Nongovernmental organization
NOVEM	Netherlands Agency for Energy and the Environment
PBS	Palli Bidyut Samitis
PDF	GEF-Project Development Facility
PHRD	Japan Policy and Human Resources Development Fund
PLN	Perushaan Listrik Negara (Indonesian State Electricity Corporation)
PPA	Power purchase agreement
PV	Photovoltaic
PV GAP	Global Approval Program for Photovoltaics
QuaP-PV	Quality Program for Photovoltaics
RAPSS	Remote Area Power Supply System
RE	Rural energy
REAP	(Vietnam) Renewable Energy Action Plan
REB	Rural Electrification Board
REDP	Renewable Energy Development Project
RPTES	Regional Program for the Traditional Energy Sector
SAR	South Asia Region
SDC	Swiss Agency for Development and Cooperation
SEIER	(Vietnam) System Efficiency Improvement, Equitization and Renewables
SHS	Solar home system
Sida	Swedish International Development Cooperation Agency
TA	Technical assistance
tce	Tons of coal equivalent
UNDP	United Nations Development Programme
US/ECRE	U.S. Export Council for Renewable Energy
US/IFREE	U.S. Internal Fund for Renewable Energy and Efficiency
US/NRECA	National Rural Electric Cooperation Association
US/NREL	National Renewable Energy Laboratory
USAID	U.S. Agency for International Development
USDOE	U.S. Department of Energy
USTDA	U.S. Trade and Development Agency
WB	World Bank

1. Overview

ASTAE'S First Decade

Ten years ago, the World Bank and donor partners established the Asia Alternative Energy Program (ASTAE) to support the transition to environmentally sustainable energy use in developing countries in Asia. This followed recommendations of Asian clients and donor partners, based on results of the Financing Energy Services for Small-Scale Energy Users (FINESSE) Project.[1] ASTAE's *strategic objective* during the past decade was to mainstream alternative energy in World Bank energy sector activities, by promoting the preparation and implementation of renewable energy and energy efficiency components in World Bank energy sector projects in Asia. This strategic objective has been achieved. For the period FY98-00, about 12 percent of the Bank's power sector lending in Asia was for alternative energy components/projects.

The portfolio of projects with alternative energy components under implementation has increased during the past decade, from a single US$2 million project in 1991 to 18 operations in 2000, involving 7 countries in the Asia region. The total estimated cost of projects completed or under implementation is US$ 1.1 billion, including Bank/GEF financing of US$ 480 million. In addition, there are 18 projects with alternative energy components under preparation in the Bank's work program for FY02-FY04. The total estimated cost of these 18 projects is US$ 1.6 billion, including Bank/GEF financing of US$750 million (see Annexes 1 and 2 for project details). Upon completion of the existing and planned projects, it is estimated that alternative energy would substitute for over 1300 MW of fossil fuel–fired generation capacity and provide electricity to an estimated 400,000–500,000 rural households that would otherwise lack access to modern energy services (see Annex 3). Largely as a result of ASTAE's support, South and East Asia have the strongest alternative energy portfolio in the Bank.

FY01 Activities and Achievements

Among ASTAE's significant activities and achievements in FY01 were (a) the adoption of the Renewable Energy Action Plan (REAP) by the Ministry of Industry in Vietnam, facilitated by a strong participatory process; (b) the progress made by the Energy Services Delivery (ESD) Project, and the request for a follow-up project, Renewable Energy for Rural Development, by the Government of Sri Lanka; (c) the publication of four manuals and training programs, as part of the Global Approval Program for Photovoltaics (PV GAP) in order to establish globally accepted standards, testing laboratories, reference manual, approval and certification programs, and a PV Quality Seal in ASTAE-assisted countries; (d) the successful restructuring of the Solar Home Systems Project in Indonesia after the macroeconomic and political crisis almost forced cancellation; and (e) using the lessons learned from the Bank/GEF REDP Project to develop the CRESP Project Brief, which was approved by GEF Council in May 2001. (See page 5-17, Work Program, for Details)

Specific Activities

In its support to client countries and Bank staff, ASTAE seeks to achieve the following:

- mainstream viable alternative energy options at all levels of decision making:
- strengthen institutional capacities to identify, assess, and implement proven, cost-effective alternative energy options; and
- foster public-private sector partnerships in the development of environmentally sustainable energy projects and markets.

Specific activities undertaken by ASTAE include the following:

[1] FINESSE was initiated by ESMAP and bilateral donors in 1989.

- identification, preparation, appraisal, and supervision of renewable energy and energy efficiency investments, supported by the World Bank, the GEF, and selected bilateral donors;
- technical assistance activities, including
    - studies to formulate policies to promote environmentally sustainable renewable energy and energy efficiency options;
    - technical assistance and training;
    - capacity building; and
    - technology assessments and feasibility studies;
- knowledge management; and
- coordination with donor agencies and resource mobilization to develop alternative sources of energy.

Asian Challenge

Of the 2 billion people who lack access to modern energy services, 1.2 billion live in Asia. Many governments give high priority to supplying electricity to all households, including those living in remote rural areas that cannot easily be reached by the national grid. Local renewable energy resources can be used to supply electricity to these areas, using individual systems or independent grids. The demand for remote area electricity services, along with growing concern for the environment and sustainable development, has increased the demand for alternative energy.

Demand is also growing for alternative energy projects that either reduce electricity requirements through increased energy efficiency, or can mobilize financing to increase generation on national grids through non-utility renewable energy plants. Asia is expected to require 300–400 GW of new capacity over the next decade. Governments, however, cannot organize quickly the massive financing required for provision of the required infrastructure. Alternative energy accounted for only 1 percent of the new capacity added in the region in the last decade (excluding large scale hydropower).

Next Decade

As noted in the introduction, ASTAE has made significant progress in its first decade. There have been three major areas of achievement:

- a significant portfolio of alternative energy projects is now under implementation or preparation in Asia. ASTAE is supporting implementation of 18 alternative projects, with a total project cost of $US 1.1 billion, and preparation of an additional 18 projects with a total cost of $US 1.6 billion. Through these projects, ASTAE has gained experience with the practical realities and difficulties of large-scale alternative energy promotion.
- ASTAE has contributed to a paradigm shift in Bank energy sector lending, by demonstrating that alternative energy solutions can indeed contribute to the Bank's energy-poverty alleviation and energy-environment agenda. This has in turn contributed to an increased emphasis on alternative energy in lending by other regions in the World Bank, as well as to efforts to "green the energy sector portfolio of multilateral banks" by developing similar institutions in other multilaterals.[2]
- analytical studies and project work have begun to address the economic and financial viability of alternative energy, its role in meeting energy requirements in client countries, and its incorporation in national energy plans and policies. Milestones in this area were Bank

[2] See "Greening the Energy Sector Portfolio of Multilateral Banks", Netherlands Development Cooperation, The Hague, November 2000.

assistance to China's State Development Planning Commission, for preparation of the first Renewable Energy Sub-Plan under the 10th Five Year Plan for Energy; and ASTAE/ESMAP support for the Renewable Energy Action Plan that was adopted by the Ministry of Industry in Vietnam.

While progress has been made through individual investment projects, client countries have not yet incorporated alternative energy fully into their official development strategies, plans and policies. Large-scale alternative energy development requires establishment of an institutional, policy, financial, and regulatory framework that helps attract capital from international financial institutions, export credit agencies and, most importantly, the domestic and international private sector. This framework or enabling environment would require measures to create and sustain the market for alternative energy by doing the following:

- providing adequate incentives to mobilize investment by public and private entities in alternative energy facilities;
- facilitating alternative energy project development, including clear and transparent rules, procedures, and approval processes; and
- encouraging the development of mature, internationally competitive local manufacturing industries for alternative energy equipment.

ASTAE's *strategic objective* for the next decade is to assist countries to develop and adopt appropriate strategies, plans and policies to enable alternative energy to play a significant role in economic development. This is a much more challenging objective than mainstreaming alternative energy within the Bank's programs in Asia. Developing and sustaining renewable energy in a rapidly changing environment will require extensive analytical studies on economic, financial and technical viability of different renewable resources and technologies. It also requires adaptation of policy mechanisms for countries with very different fiscal and legal systems, at different stages of energy sector reform. Finally, it requires a participatory process that involves and convinces all stakeholders from the village to the highest levels of national decision makers.

ASTAE will assist in the adoption of policies to support implementation of programs of alternative energy. Projects will not be ends in themselves, as in the past. Instead, longterm programs will build capacity and provide the momentum for policy and institutional change and the creation of an enabling environment to sustain the development of alternative energy. The World Bank/Global Environmental Facility (GEF) Partnership for Renewable Energy is an important vehicle that supports this longterm programmatic approach to alternative energy.

Development of long term policy-based programs is already underway in three countries, through the China Renewable Energy Scale-Up Program (CRESP), the Vietnam Renewable Energy Action Plan (REAP), and a nascent Climate Change Partnership with India:

- *China Renewable Energy Scale-Up Program (CRESP):* This program, currently under development, is a pilot program with the Government of China, under the World Bank/GEF Partnership for Renewable Energy. It aims to reduce emissions from coal-fired power generation by developing sustainable commercial markets for electricity from renewable energy. To do this, the program will support the establishment of a policy that mandates a large-scale market for renewable electricity, measures that are needed to make the market work, and actions to reduce the cost of mature renewable energy technologies, such as wind farms, small hydro, and biomass.

- *Vietnam Renewable Energy Action Plan (REAP):* The REAP, a sector study jointly funded with the Energy Sector Management Assistance Programme (ESMAP), lays out a 10-year program to accelerate large-scale development of renewable energy for rural energy and grid supply in Vietnam. This comprehensive program focuses on (a) policy development and capacity building;

(b) pico-hydro and solar PV development; (c) small hydro for village power using isolated grids; (d) renewable electricity sources for the main grid; and (e) resource and technology assessment and demonstration. The REAP has been formally adopted by the Ministry of Industry, and is being put into operation with assistance from a series of Bank/GEF projects. The first components in support of the plan are included in the System Efficiency Improvement, Equitization and Renewables Project.

- *India Climate Change Partnership (CCP):* Preparation of this program is just being initiated. The objective of the proposed program is to promote environmentally sustainable energy development to help achieve and complement India's poverty reduction goals. The CCP envisages supporting clean and efficient power generation within the broader sectoral context of establishing cost-effective policies and incentives that ultimately result in a transfer of expertise in project implementation to the state level. Sustainable energy technologies will be promoted in context of power sector reforms. Different project components are expected to be introduced in different states committed to reform to help develop experience and policies that may later be adopted at the national level. This approach will be taken because of India's vast size, and the variety of needs, opportunities, and capabilities related to energy efficiency and renewable energy technologies across different states, as well as the realities each state faces in the reform process.

ASTAE Strategy

To reflect the changed strategic objective, as well as the changes in the Bank and our client countries in the last few years, ASTAE needs to develop a well-articulated strategy and plan of action. A new initiative is being undertaken to prepare this strategy, in two phases. The first phase will result in a report that will: (i) provide an estimate of the expected contribution of alternative energy to client country's energy supply over a defined timeframe; (ii) review country progress in expanding alternative energy use; (iii) outline the status and priority of alternative energy in national energy strategies and plans, and the receptivity and capacity of clients to prepare and implement such plans; (iv) outline the Bank's role in supporting our clients' alternative energy plans in the context of regional/corporate strategic objectives; and (v) set criteria for the allocation of ASTAE resources, taking into account donors' objectives and our fiduciary responsibilities. The second phase of this initiative will begin in FY03, and will involve consultation with the countries and adjustment of the findings of the first phase accordingly.

2. Work Program

Lending Operations

Alternative energy accounted for 10 percent of total World Bank power sector lending between FY99–FY01. The ASTAE-supported portfolio of alternative energy projects under implementation or preparation for FY93-04 has grown to 36 renewable energy and energy efficiency projects in 11 countries in Asia, with a total alternative energy cost of nearly US$2.8 billion, including total projected Bank/GEF commitments of nearly US$1.2 billion.

ASTAE has supported the development of 18 alternative energy components/projects that have been approved by the Board (14 under implementation, four closed), totaling more than $480 million in Bank/GEF support. These projects represent more than $1.1 billion in alternative energy investments by the private sector, commercial banks, local governments, and bilateral and multilateral institutions (see Figure 1 and Annexes 1 and 2 for details of the project portfolio). A summary of the ASTAE-supported alternative energy portfolio is presented in Table 1.

Table 1: Summary of ASTAE Operations in Asia

ASTAE-Supported World Bank/GEF Investment Projects (FY93–04)

- 36 projects
  - ◊ 4 projects have closed
  - ◊ 14 projects under implementation
  - ◊ 18 projects under preparation
- Total alternative energy component/project costs of ~$2.8 billion; Bank/GEF assistance for alternative energy of ~$1.1 billion;
- Avoided capacity of ~1.3 GW for completed projects and projects under implementation.
- Number of households provided access 400,000–500,000

ASTAE Resources 1992–2001

Funds mobilized $29,223,497
Funds disbursed $24,535,838

ASTAE is also supporting project preparation work for 18 additional alternative energy components/projects, with an estimated total cost of more than $1.6 billion and World Bank/GEF support of $750 million.

An important ASTAE-assisted activity is the REAP (Renewable Energy Action Plan) developed in Vietnam. REAP is a long-term plan, developed through a participatory process that involved stakeholders, Electricity of Vietnam (EVN), the Ministry of Industry (MoI), and the Bank. The participatory process was key to reaching the strong consensus that led the Ministry of Planning and Investment to endorse the REAP, and MoI to take responsibility for implementing it. See Box 1.

Box 1: Participatory Process Built Strong Consensus on Vietnam REAP

ASTAE's strategy in Vietnam was to develop a long-term program framework before developing individual projects and activities. The framework is especially valuable because it was arrived at through a participatory process which resulted in consensus among a broad range of stakeholders. The framework provides a useful tool for coordination by all interested parties.

A participatory workshop was held in July 1999. The results were used to design a series of studies, carried out by local and international consultants, and supported by ESMAP and ASTAE. These complemented studies under the Bank's Rural Energy Project, funded by the Japan Policy and Human Resources Development Fund (PHRD), New Zealand, and Switzerland. A key result was a database on about 1,000 communes that would not be served by the electricity grid in the foreseeable future. A survey by the local Hydropower Center collected data on population, number of households, per capita income, village spacing, access to seasonal roads, perennial roads, health centers, schools, markets, and small hydro potential. The institute also compiled a database on known small hydro sites in the country, and plans to make this data available to the public.

After the studies were completed, the Renewable Energy Action Plan (REAP) report was drafted by the Bank team, circulated and presented at a second participatory workshop in October 2000. The report was unanimously endorsed. The final report was published jointly by MoI, EVN, and the Bank in Vietnamese and English.[1/] MoI adopted the REAP and took responsibility for coordinating its implementation.

The Bank and the Government of Vietnam are committed to implementing the REAP. ASTAE and EASEG are preparing several renewable energy components in the Vietnam System Efficiency Improvement, Equitization and Renewables (SEIER) Project. The SEIER project supports Phase 1 of the REAP. The Bank and the Government propose a follow-up, the Rural Energy II Project (FY04), to support Phase 2 of the REAP.

1/ Ministry of Industry, EVN, World Bank, 'Renewable Energy Action Plan", July 2001, available from the Infoshop in the World Bank, Washington, the World Bank publications office in Hanoi, and the Institute of Energy.

The development of the Renewable Energy for Rural Development (RERD) Project in Sri Lanka was a significant development in FY01. The RERD is a follow-up to the Energy Services Delivery Project (ESD), which is in its last year of operation, and has progressed exceedingly well. The ESD Project provides medium- and long-term financing to private project developers, NGOs, and cooperatives for off-grid electrification through solar home systems, and village hydro schemes, for grid-connected mini-hydro plants, and for other renewable energy investments. Also, it provides grant cofinancing from the GEF for project developers of off-grid village hydro schemes and solar home system projects, and has been instrumental in establishing a sustainable and commercial framework for off-grid activities. Box 2 highlights the achievements of ESD and the objective of the follow-on RERD Project.

Box 2: RERED Project Requested as a Follow-up to Successful Bank Project

The Energy Services Delivery (ESD) Project is expected to achieve results exceeding most of its original targets. As of July 31, 2001, the following had been accomplished:

- Fifteen grid-connected mini-hydro projects, representing a capacity addition of 28 MW (target 21 MW) were in place, and a further 9 projects were in the approval pipeline with commercial banks.[1]
- Twenty off-grid community-owned village-hydro projects with an aggregate capacity of 231 kW (target 200 kW), serving 997 rural households (target 2,000 households) were in place, and an additional 12 projects were under evaluation by commercial banks. A further 40 village hydro projects were expected to be financed by December 31, 2001.[2]
- Four private sector firms were actively marketing ESD-compliant solar home systems in rural Sri Lanka. These firms had set up more than 50 dedicated solar centers in the provinces for sales and service. Nearly 6,300 solar home systems were installed, compared with 968 systems by June 30, 2000. The figure is estimated to exceed 11,000 systems by the end of 2001 and 18,000 systems by the end of the project in December 2002 (target 15,000 systems).

Recognizing the delicate stage of the renewable energy industry, the Government has formally asked the Bank to continue support to this sector via a follow-on project, so that the new project will be in place before the present one closes in December 2002.

The objectives of the new Renewable Energy for Rural Development Project (RERED) are: a) to expand commercial provision and utilization of renewable energy; and (b) to pursue economic development and improvement in quality of life through more productive and efficient use of rural energy resources. It will adopt the successful concept of the ongoing ESD project while pursuing broader goals, namely, increasing rural electricity access of the poor, utilizing electricity as a means to further income generation and social objectives, and expanding the scope to include other rural energy resources and objectives. The strengths of the concept—community ownership and operation of village hydro assets, private sector and microfinance based model for solar energy, and private sector model for grid connected mini-hydro schemes—will be retained.

1/ Mini-hydro projects are private sector initiatives selling energy generated to the Ceylon Electricity Board through a Standard Power Purchase Agreement and a Small Power Purchase Tariff, both introduced by the ESD Project.

2/ These off-grid village hydro projects are community-based initiatives executed by Electricity Consumer Societies that build, own, and operate the schemes.

Wide Range of Technologies

ASTAE-supported World Bank/GEF investment projects include a wide range of alternative energy technologies. Renewable energy investments include solar photovoltaic (PV), small and mini-hydro, wind power, biomass cogeneration, small geothermal, and solar thermal electric projects or project components. Energy efficiency projects or project components fund investments in efficient lighting, appliances, motors, agricultural pumpsets, and heating, ventilation, and air conditioning (HVAC) technologies. Energy efficiency activities have included demand-side management (DSM), load management and load research, industrial cogeneration, and support for energy management services. As Tables 2 and 3 demonstrate, ASTAE project support has utilized technical assistance to build local

capacity, strengthen institutions, and address policy, regulatory, and other barriers to alternative energy investments while supporting development of a wide range of technologies.

Table 2: Renewable Energy—ASTAE-Supported Projects by Technology and Policy Measure

		Technical assistance and policies [a/]			Technologies					
Country	Project	Renewable Energy Plan/Policy Development	Small Power Purchase Agreement	Tariff and Duty Adjustment	Photo-voltaic	Solar thermal	Hydro [b/]	Wind power	Biomass power	Geo-thermal [c/]
China	Renewable Energy Development	●		●	●			●		
	Renewable Energy Scale-Up Program	●		●	●		●	●	●	
	Passive Solar Heating for Rural Health Clinics					●				
Bangladesh	Rural Electrification and Renewable Energy Development				●		●	●		
India	Renewable Resources Development				●		●	●		
	Enhancing Access through Off-Grid Electrification	●			●			●	●	
	Renewable Energy II						●			
Indonesia	Second Rural Electrification	●	●	●			●			●
	Solar Home Systems	●			●					
Lao PDR	Southern Provinces Rural Electrification	●			●		●			
Sri Lanka	Energy Services Delivery		●	●	●		●	●		
	Renewable Energy for Rural Development	●			●		●	●	●	
Vietnam	Power Development	●								
	Rural Energy	●	●	●			●			
	System Efficiency Improvement, Equitization and Renewables (SEIER)						●	●		

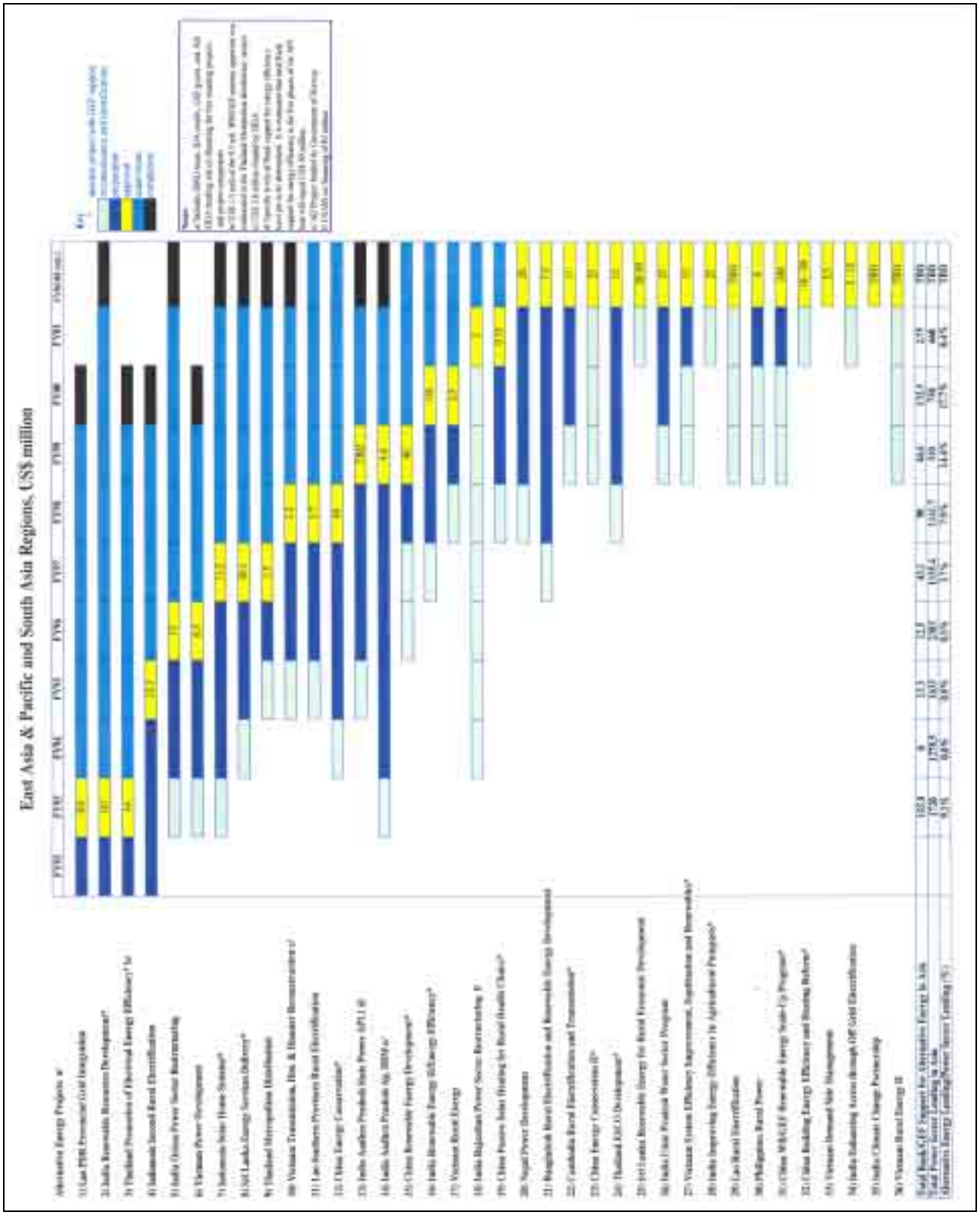
a/ Training and capacity building is supported in all operations.
b/ Includes small, mini-, and micro-hydro.
c/ Small, mini-, and micro-geothermal.

Table 3: Energy Efficiency—ASTAE-Supported Projects by Technology and Policy Measure

		Technical Assistance and Policies					Technologies					
Country	Project	Training/ Capacity Building	DSM Plans [a/]	Load Research [b/]	Codes and standards [c/]	ESCO dev.	Load mgmt.	Motors	Lighting	Appli-ances	HVAC [d/]	Cogen [e/]
China	Energy Conservation	●				●		●	●		●	●
	Energy Conservation II	●				●		●	●	●	●	●
	Building Energy Efficiency and Heat Reform	●			●				●	●	●	
India	Orissa State Power Sector Restructuring	●	●	●			●	●			●	
	Improving Energy Efficiency in Agricultural Pumpsets	●			●	●		●				
	Andhra Pradesh Integrated Agricultural DSM	●		●			●	●				
	Andhra Pradesh Power APL f/	●	●	●		●	●	●	●		●	
	Renewable Energy II/Energy Efficiency	●				●	●	●	●		●	●
Lao PDR	Provincial Grid Integration	●										
Sri Lanka	Energy Services Delivery	●	●	●	●	●			●	●	●	
Thailand	Promotion of Electrical Energy Efficiency	●	●	●	●	●	●	●	●	●	●	
	Metropolitan Distribution Reinforcement	●		●		●		●		●		
	ESCO Development	●				●		●	●	●	●	●
Vietnam	System Efficiency, Improvement, Equitization and Renewables	●	●	●		●	●	●	●		●	
	Vietnam Transmission, Distribution, and Disaster Reconstruction		●	●	●	●		●	●	●		

a/ Includes monitoring and evaluation activities.
b/ Includes institutional strengthening activities.
c/ Includes energy efficiency building codes and equipment standards.
d/ Includes vapor absorption technology
e/ Includes industrial and biomass cogeneration.
f/ Includes TA and technologies for the entire APL program.

Figure 1: ASTAE-Supported World Bank/GEF Alternative Energy Investment Projects, FY92–04



Flexibility in Design and Implementation

The China Renewable Energy Development Project was approved by the World Bank Board in June 1999. However, effectiveness was delayed until December 2001 because of institutional changes that included restructuring of the power sector to reduce the importance of the regional grids, including the regional grid that was to purchase windpower from 170 MW of the planned 190 MW of windfarms. These changes made the power sector more market oriented but highlighted the lack of market-oriented policies to encourage renewable electricity development. As a result of these institutional changes, the project needed to be restructured. (See Box 3).

Box 3: Changing Institutional Frameworks Leads to Restructuring of China Renewable Energy Development Project

The Bank/GEF REDP Project was restructured to remove 170 MW of wind farms and cancel $87 million of the original $100 million Bank loan and $8 million of the original $35 million GEF grant. REDP demonstrated the barriers to renewable energy in China: (a) the costs of environmental damage are not reflected in costs of conventional power (b) the costs of renewables are high because of immature technologies, insufficient competition, and a weak manufacturing and service industry; (c) renewables have a poor operating record and reputation; (d) markets are limited to environmentally or socially conscious cities and provinces, while best resources are in poor western provinces; and (e) no mechanisms are in place to spread incremental costs broadly across provincial grids during scale-up.

The Government of China (GOC) recognizes the need for a policy and supporting program to overcome these barriers. Bank TA assisted the GOC in developing a recommendation for a mandated market share (MMS) policy to create a market for renewable energy in the 10th Five-Year Plan for energy. An MMS policy is a legal requirement that a share of electricity should come from renewables. China's motivations in adopting this policy are local environmental protection and industrial development.

The China Renewable Energy Scale-up Program is being developed to assist in: (a) developing and introducing the MMS policy; (b) building capacity in the public, industry, and the financial sector; (c) introducing fiscal and other incentives for investors; (d) streamlining arrangements for project development (for example, concessions, Power Purchase Agreements, pricing); and (e) developing mechanisms for trading renewable electricity among regions, for example, green certificates; and (f) reducing costs and improving quality in local technology.

The CRESP Project Brief was approved by the GEF Council in May 2001.

The Solar Home Systems Project in Indonesia included a loan from the Bank and a grant from the GEF. Despite a good start, the project faced cancellation and early closure in FY01 because of the lingering effects of the financial crisis and the political events which took place in the last year. ASTAE undertook intense supervision activities in FY01 which restructured the project, aiming to achieve significant results despite the changes in country conditions. (See Box 4 for details).

Box 4: Indonesia Solar Home Systems Project Adapting to Changing Political and Economic Conditions

In 1997 the World Bank approved its largest photovoltaic project to date—the Indonesia Solar Home Systems (SHS) Project. The $118 million project was financed in part by an IBRD loan of $20 million.

Cross-Sector Applications

ASTAE has engaged in strategic development of alternative energy investments for cross-sector applications. Alternative energy technologies are ideally suited to supplying energy needs in a broad range of end-use applications (water pumping, refrigeration, lighting, and communications). These applications span a number of sectors in Bank operations, including agriculture, health and population, rural development, urban, and water. ASTAE is currently supporting several pilot projects promoting the use of alternative energy in cross-sector applications in China and Sri Lanka, and will continue to support activities that incorporate alternative energy solutions in rural development and the social sector in the EAP and SAR regions.

Non-Lending Activities

ASTAE engaged in significant technical assistance and capacity building work to advance alternative energy programs in client countries, including policy and regulatory support, education and outreach, local capacity building, and technical assistance and training. Lending, though vital, is not sufficient to mainstream alternative energy options because alternative energy projects typically involve new policy, financing, and delivery models. It has become clear that the development of sustainable alternative energy sources requires enhanced institutional capacity in both the Bank and in client countries. ASTAE's AAA work has provided significant support in this area.

The highlights in FY01 were (a) the launching of the ASTAE-DFID China EMC Training Project (see Box 5); (b) the completion of a major study on the impacts of the longstanding and uneconomic

practice of subsidizing power to agricultural consumers for irrigation in India; (c) training courses held in China, India, the Philippines, Sri Lanka, and South Africa as part of PV GAP; (d) the publication of the Vietnam Renewable Energy Action Plan in English and Vietnamese, jointly with the Ministry of Industry and Electricity of Vietnam; and (e) the Energy, Poverty and Gender (EnPoGen) study conducted to identify and document the impact of access to modern energy services on poverty alleviation and gender equity.

Box 5: ASTAE-DFID China EMC Training Project

Under the China Energy Conservation Project, which established three pilot energy management companies (EMCs) in Beijing, Liaoning, and Shandong in 1997, DFID agreed to support ASTAE's efforts to build capacity of an expanded and sustainable EMC industry in China. This is being accomplished through the development of an EMC Service Group, which would operate similarly to a Western-style energy service company (ESCO) association. The group would have primary functions of offering EMC member services to help expand business opportunities, thereby representing the EMC business and addressing relevant policy issues to the government, and promoting the EMC business.

Specific activities under this program would include (a) a major and comprehensive training program for new and potential Chinese EMCs on all aspects of EMC business operations, including setting up an EMC, business operations, business development, project management, and financial management; (b) activities to raise the awareness of the relevance of the local banking sector to the EMC business and its potential; (c) reviews of EMC business opportunities in China; (d) initiatives designed to facilitate partnerships between banks and EMCs, foreign and local EMC companies, equipment suppliers, service companies, and so forth; (e) institutional development of the EMC Service Group; and (f) EMC business marketing and policy advocacy.

Studies

Studies are used to set ASTAE's strategic directions and to develop the analytical framework for integrating alternative energy options into Country Assistance Strategies. ASTAE has helped provide an analytical framework for evaluating development strategies and donor activities related to alternative energy development. For example, ASTAE's significant studies and AAA work with the GOC directly supported the development of the Government of China's recommendation to introduce a Mandated Market Share Policy for renewable energy in the 10th Five-Year Plan. Box 6 presents ASTAE's support for sector work in the agriculture sector in India.

Box 6: Power Supply to Agriculture in India

In May 2001 the South Asia Energy Sector Unit completed a major study on the impacts of the longstanding and increasingly uneconomic practice of subsidizing power to agricultural consumers for irrigation in India. This sector work examined the situation in Andhra Pradesh and Haryana, two of the states that are working to reform their power sectors.

ASTAE contributed to this study, which included a section on the interrelated technical, economic, and institutional issues in the application of an Integrated Approach to Agricultural Demand-Side Management as an option to minimize costs of electricity services to rural consumers. This approach combines improvement in the quality of power supply through a rehabilitation of the electricity distribution network with the metering installation and replacement of existing with more efficient irrigation pumpsets to conserve energy and water while limiting the impact of tariff adjustments.

ASTAE continues to work on the further development of this approach, both through the ongoing AIJ pilot project and the new project recently accepted into the GEF pipeline: Improving Energy Efficiency in Agricultural Pumpsets.

The objective of the proposed project is to strategically increase the market penetration of energy-efficient agricultural pumpsets in India to reduce the environmental impacts of energy consumption by the agriculture sector. Another objective is to mitigate the impacts on the rural poor of planned tariff adjustments included in World Bank–supported power sector reform projects. This GEF project will include funding for the incremental costs of barrier removal by designing and testing the mechanisms to deliver approximately 200,000 high-efficiency pumping systems to end users, capacity building for various stakeholders to facilitate market development, and assistance to the government in preparing an information campaign and in developing better standards for efficient pumpsets to ensure sustainability of the program.

The Energy-Poverty-Gender (EnPoGen) study, initiated by ASTAE, is examining the linkages between energy, poverty, and gender. It is now in its final phase. The study, funded by the Government of the Netherlands, includes both research and operational components. The country studies in China, Indonesia, and Sri Lanka focused on identifying the relationship between access to renewable electricity and poverty alleviation and gender equity. Field studies provide empirical evidence of the actual and potential benefits to rural poor from electrification. The operational component is developing a comprehensive monitoring and evaluation methodology that will be tested in an ASTAE-supported rural electrification project in Cambodia, that will measure poverty- and gender-related impacts of World Bank rural electrification projects. The overall goal is to generate "Best Practices" for application in the Bank's future rural electrification projects. The final report, due early 2002, will highlight lessons learned that should help experts to improve future projects.

Technical Assistance and Capacity Building

Technical assistance supported by ASTAE has included pre-feasibility studies, performance testing, help in drafting standard power purchase agreements and tariffs for small power producers, developing analytic tools for evaluating least-cost energy alternatives, help in developing business plans, and other activities to develop institutional capacity. Wherever possible, the program uses local expertise to enhance in-country capacity for sustainable alternative energy development. In FY01, ASTAE contracted with experts, firms, agencies and NGOs in Cambodia, China, India, the Philippines, Sri Lanka, and Vietnam.

Capacity building activities in FY01 focused on such areas as technical, economic, and environmental aspects of alternative energy technologies; institutional requirements and regulatory frameworks; mechanisms for marketing alternative energy investments; and facilitation of public-private partnerships for private sector delivery of energy services. The success of these partnerships came about from careful matching of partners, appropriate attention to selection of participants, monitoring of impacts, rapid intervention for issue resolution and, most importantly, country "ownership" of the programs.

In FY01 ASTAE continued its utilization of the stakeholder consultation process as a key element of its project work. ASTAE will continue this process, which aids in the identification of win-win situations to improve project quality and stakeholder acceptance, thus increasing sustainability of alternative energy programs.

Many Asian countries seek support in the appropriate technical standards for alternative energy products. Standards for product design, installation, and maintenance help promote and sustain market penetration by reducing the consumer risks concerning the technical performance of alternative energy products. ASTAE's technical assistance and training to build capacity in alternative energy development relies on local consultants, stakeholder workshops, and targeted support and training for public and private sector participants. In FY01 ASTAE continued its work with PV GAP in an effort to establish globally accepted standards, testing laboratories, reference manuals, approval and certification programs, and a PV Quality Seal in ASTAE-assisted countries (Box 7).

Box 7: Quality Program for Photovoltaics

The World Bank, as a leading financier of solar photovoltaic (PV) systems, has recognized that the absence of a quality process infrastructure for PV has been a serious obstacle to the widespread and sustainable use of PV applications in developing countries. Component manufacturers have had few guidelines for producing good, reliable products. The lack of approved testing laboratories in developing countries complicates the logistics and cost of product testing for local manufacturers. Further, if systems are poorly installed or operated or if users are not educated in the proper use and maintenance procedures, even well-designed and tested systems may break down or fail to meet expectations.

The goal of the Quality Program for Photovoltaics (QuaP-PV) was to bring about validated and institutionalized quality programs for the manufacture, installation, maintenance, and testing of PV components and systems. QuaP-PV developed and applied a set of training modules. This involved the design of training courses and the delivery of training in the design, manufacture, testing, installation, and maintenance of PV products using quality standards and processes. Other tasks included a review of international quality processing procedures, accreditation and licensing procedures, and a study to harmonize China's PV standards with international standards.

Following are the four manuals produced under QuaP-PV:

Quality Management in Photovoltaics: Quality Control Training Manual for Manufacturers.
Training Manual for Quality Improvement of Photovoltaic Testing Laboratories in Developing Countries.
Certification for the PV Installation and Maintenance Practitioner: Manual for Implementing Qualified Certification Programs.
Manual for the Design and Modification of Solar Home System Components.

Training courses were held in India, Sri Lanka, China, Philippines and South Africa. QuaP-PV has generated strong, positive feedback from clients. The responses of the participants in the Jaipur, India training program confirmed that small companies are, indeed, interested in achieving quality production and ISO 9000 certification. The Indian Ministry of Non-Conventional Energy Sources (MNES) and representatives from Indian PV industry were considering widespread diffusion of the four quality process training manuals in a series of training courses. The MNES has indicated its willingness to help Indian manufacturers achieve ISO 9000 certification.

Technology Assessment and Feasibility Studies

ASTAE has also supported alternative energy technology assessment and feasibility studies. This work is a necessary precondition for project and program formulation. ASTAE released a Wind Energy Resource Atlas of South East Asia in September 2001 (see Figure 2). This report contains wind resource data on wind speed, power, seasonal variation data, and estimates for the wind energy potential of Southeast Asian countries. This report is downloadable from the ASTAE Web site and is available in CD-ROM format upon request.

Figure 2

ASTAE Knowledge Management

ASTAE has continued to disseminate knowledge gained from its experiences in alternative energy through the publication of best practices materials, presentations at conferences and training seminars, and maintenance of the ASTAE Web site. Details on ASTAE conference/seminar participation and publications are presented in Annex 4.

Web site. ASTAE maintains a Web site (see Figure 3) that includes comprehensive information on ASTAE's work program, project information, alternative energy publications, products, and donor information. ASTAE periodically updates this site to incorporate new features to better disseminate alternative energy best practices, project information, technical information and improved feedback options. This site can be found at **www.worldbank.org/astae/.**

Figure 3

3. Client and Donor Partnerships

Since its inception, ASTAE has been successful in building strong client partnerships with a number of organizations throughout the Asia region. ASTAE's utilization of the participatory approach has significantly aided in forging ties with new partners, which has broadened the base of its support. Partnerships have been strengthened with traditional clients such as national government agencies and power utilities, as well as a variety of new clients including provincial and local governments, utilities, NGOs, village cooperatives, and the private sector.

In its operational and nonlending activities, ASTAE has collaborated with a number of donors whose resources have been critical to ensuring a comprehensive, high-quality work program. Donors have included the Netherlands (Directorate-General for International Co-operation, DGIS, and NOVEM, the Netherlands Agency for Energy and the Environment), the Asian Development Bank, Australia (AusAID), Canada (CIDA), Denmark (DANIDA), the European Community, France (EdF), Finland, Germany (GTZ, KfW), the GEF, New Zealand, Norway, Sweden (Swedish International Development Cooperation Agency, Sida), Switzerland (SDC), United Nations Development Programme (UNDP), the United Kingdom (Department for International Development, DFID), the United States (USAID, USDOE), and the U.S. Export Council for Renewable Energy (US/ECRE).

Tenth Annual Donors' Meeting

Donor representatives from 11 countries met jointly on May 7–8, 2001, at the World Bank headquarters in Washington to bring greater coherence to the work of the trust-funded energy programs managed by the World Bank (ASTAE, ESMAP, AFRREI, RPTES). The donor meeting was chaired by Nemat Shafik, World Bank Vice President for Private Sector Development and Infrastructure.

The roundtable was convened with modules focusing on the future of the global energy business, results from the World Bank's energy activities, and ways of achieving scale-up. On May 8, joint business meetings of each trust-funded program were conducted with presentations by each program's management about its respective achievements. The donor meetings concluded with a discussion on the governance of these programs.

The sessions on the results from the implementation of the World Bank's energy projects focused on these successes and constraints, as well as the impact on the poor. Anil Cabraal (ASTAE), Teo Sanchez, and Willem Floor presented project examples from Asia, Peru, and Mali, respectively, to illustrate success stories and implementation constraints from the World Bank's energy activities.

Presentations about project examples illustrating the scaling-up of community involvement in energy service delivery (South Asia), cross-sectoral energy projects (Uganda), and renewable energy (China) were made by Alastair McKechnie, Arun Sanghvi, and Susan Bogach, respectively.

A summary is available at www.worldbank.org/html/fpd/esmap/news_section.htm.

4. ASTAE Resources

Resource Mobilization

Since FY92, more than $19 million has been contributed to ASTAE by donors. The World Bank and associated funding sources (e.g. GEF, PHRD, IDF and CTF) have contributed more than $10 million, for a total of more than $29 million. Total funding flows to ASTAE in FY01 were $4.2 million, including funding from UK DIFD, a new program partner.

Table 4 provides data on resource mobilization, including donor and World Bank funding flows to ASTAE, during FY92–01. Table 5 disaggregates total donor contribution by key ASTAE donors.

Table 4: Resource Mobilization, World Bank and Donors, FY92-FY01

	Donors [2/]		World Bank [3/]		Total	
	US$	*%*	*US$*	*%*	*US$*	*%*
FY92 [1/]	108,000	32	226,400	68	334,400	100
FY93	1,847,859	82	419,100	18	2,266,959	100
FY94	1,325,190	66	688,100	34	2,013,290	100
FY95	2,348,137	69	1,046,000	31	3,394,137	100
FY96	1,096,562	40	1,618,924	60	2,715,486	100
FY97	1,605,859	57	1,197,128	43	2,802,987	100
FY98	1,207,856	52	1,126,683	48	2,334,539	100
FY99	4,666,003	77	1,425,641	23	6,92,524	100
FY00	1,745,717	58	1,273,056	42	3,018,773	100
FY01	3,133,487	74	1,106,035	26	4,239,522	100
Total	19,085,550	65	10,127,066	35	29,212,616	100

1/ Actual expenses for the six-month period of January 1 through June 30, 1992.
2/ Includes The Netherlands, U.S. Agencies, New Zealand Ministry of Foreign Trade, German BMZ/GTZ, European Community, IEA, DANIDA, Swedish International Development Agency (Sida), and Government of the Swiss Confederation, and in-kind contributions.
3/ Includes World Bank/GEF Annual Discretionary Budget, Office occupancy, Consultant Trust Funds, Japan PHRD, IDF, and PDF Grants.

Table 5: Resource Mobilization by Donor Funding Source, FY1992-FY2001

	Netherlands		U.S. [2/]		UNDP		Finnish		Swiss		United Kingdom		Others [3/]		Total Donors	
	US$	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*
FY92 [1/]	-	-	108,000	100	-	-							-	-	108,000	100
FY93	1,558,288	84	289,571	16	-	-							-	-	1,847,859	100
FY94	821,140	62	345,300	26	98,750	7							60,000	5	1,325,190	100
FY95	1,497,237	64	756,400	32	35,000	1							59,500	3	2,348,137	100
FY96	-	-	509,462	46	377,100	34							210,000	19	1,096,562	100
FY97	537,522	33	720,574	45	347,763	22							-	-	1,605,859	100
FY98	226,256	19	294,537	24	287,728	24			306,791	25			92,544	8	1,207,856	100
FY99	3,970,000	85	474,688	10	12,733	-			157,379	3			52,083	1	4,666,003	100
FY00	1,530,000	86	42,147	2	-	1	173,570	10	-	-				-	1,769,571	100
FY01	1,250,000	40	42,147	1	848,806	27	359,166	11	-	-	633,368	20		-	3,133,487	100
Total	11,390,442	60	3,582,826	19	2,007,880	11	532,736	3	464,170	2	633,368	3	474,127	2	19,085,550	100

1/ Actual expenses for the six month period of January 1 through June 30, 1992.
2/ Includes USDOE, USTDA, USAID, US/ECRE, US/NREL, Sandia National Laboratory, US/NRECA, US/IFREE, and AWEA.
3/ Includes New Zealand Ministry of Foreign Trade, German BMZ/GTZ, European Community, IEA, DANIDA, Swedish International Development Agency (Sida), NOVEM, Government of Sweden, and in-kind contributions.

Resource Utilization

Total ASTAE expenditures in FY01 were just over $2 million. World Bank financial support for ASTAE accounted for 53 percent of FY01 total expenditures ($1.1 million), with donor support accounting for 47 percent ($970 million). World Bank support for ASTAE reflects the increased demand from World Bank Country Departments for ASTAE staff support, and ASTAE's mobilization and utilization of World Bank trust funds and other grant sources. Table 6 identifies ASTAE expenditures by the two key funding sources—World Bank and donors. Table 7 provides a breakdown of ASTAE resource utilization by donor source.

Table 6: Resource Utilization, World Bank and Donors, FY1992–FY2001

	Donors [2/]		World Bank [3/]		Total	
	$	*%*	*$*	*%*	*$*	*%*
FY92 [1/]	108,000	32	226,400	68	334,400	100
FY93	827,087	66	419,100	34	1,246,187	100
FY94	1,399,635	67	688,100	33	2,087,735	100
FY95	1,309,063	56	1,046,000	44	2,355,063	100
FY96	2,057,058	56	1,618,924	44	3,675,982	100
FY97	1,705,817	59	1,197,128	41	2,902,945	100
FY98	1,617,777	59	1,126,683	41	2,744,460	100
FY99	2,664,665	70	1,156,346	30	3,821,012	100
FY00	1,744,910	54	1,524,004	46	3,268,914	100
FY01	970,985	47	1,106,035	53	2,077,019	100
Total	14,404,997	59	10,108,719	41	24,513,717	100

1/ Actual expenses for the six-month period of January 1 through June 30, 1992.
2/ Includes the Netherlands, U.S. Agencies, New Zealand Ministry of Foreign Trade, German BMZ/GTZ, European Community, IEA, DANIDA, Swedish International Development Cooperation Agency (Sida), Government of the Swiss Confederation, and in-kind contributions.
3/ Includes World Bank/GEF Annual Discretionary Budget, Office Occupancy, Consultant Trust Funds, the PHRD, IDF, and PDF Grants.

Table 7: Resource Utilization by Donor Funding Source, FY1992-FY2001

	Netherlands		United States [2/]		UNDP		Finland		Swiss		United Kingdom		Others [3/]		Total Donors	
	US$	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*	*US$*	*%*
FY92 [1/]	-	-	108,000	100	-	-							-	-	108,000	100
FY93	436,487	53	390,600	47	-	-							-	-	827,087	100
FY94	855,535	61	433,200	31	50,900	4							60,000	4	1,399,635	100
FY95	570,563	44	606,500	46	72,500	6							59,500	5	1,309,063	100
FY96	978,496	48	521,562	25	347,000	17							210,000	10	2,057,058	100
FY97	877,032	51	612,500	36	216,285	13							-	-	1,705,817	100
FY98	669,086	41	334,576	21	459,656	28			61,915	4			92,544	6	1,617,777	100
FY99	1,786,031	67	491,594	18	12,733	-	-		322,224	12			52,083	2	2,664,665	100
FY00	1,662,817	94	42,147	2	-	1	-		39,945	2			-	-	1,744,910	100
FY01 [4/]	770,414	79	42,147	4	112,514	12	-		15,100	2	30,810	3	-	-	970,985	100
Total	8,606,462	60	3,582,826	25	1,271,588	9	-		439,184	3	30,810	0	474,127	3	14,404,997	100

1/ Actual expenses for the six-month period of January 1 through June 30, 1992.
2/ Includes the Netherlands, U.S. Agencies, New Zealand Ministry of Foreign Trade, German BMZ/GTZ, European Community, IEA, DANIDA, Swedish International Development Cooperation Agency (SIDA) and Government of the Swiss Confederation, and in kind contributions.
3/ Includes World Bank/GEF Annual Discretionary Budget, Office Occupancy, Consultant Trust Funds, the PHRD, IDF and PDF Grants.
4/ Expenditures for FY01 are as of July 1, 2000 through June 30, 2001.
5/ In FY99 and FY00, under B/NPP Trust Funds TF021717, TF021731, and TF021738, ASTAE mobilized $1,000,000, $200,000, and $800,000 respectively totaling $2,000,000. Of these amounts, only $879,417.20, $199,790.73, and $745,783.67 totaling $1,824,991.60 were utilized; the remaining balance of $175,008.40 was returned to the respective trust funds.

Staffing

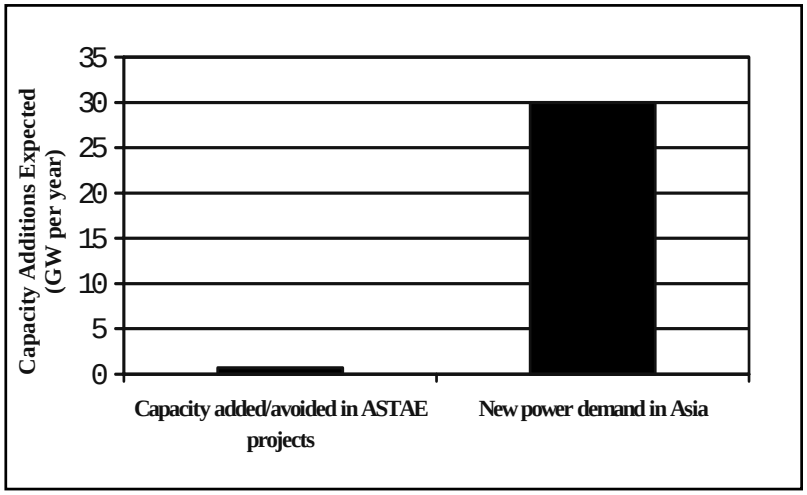
In FY01, ASTAE had 14 (Bank staff and consultants) members. Mr. Mohammad Farhandi, Acting Sector Director, East Asia Energy and Mining Development Sector Unit, is the ASTAE Program Manager. Mr. Noureddine Berrah serves as the Deputy Program Manager. Mr. Anil Cabraal is the Renewable Energy Team Leader. Supporting these individuals is a highly skilled team of alternative energy specialists, engineers, economists, and administrative staff (see Annex 6).

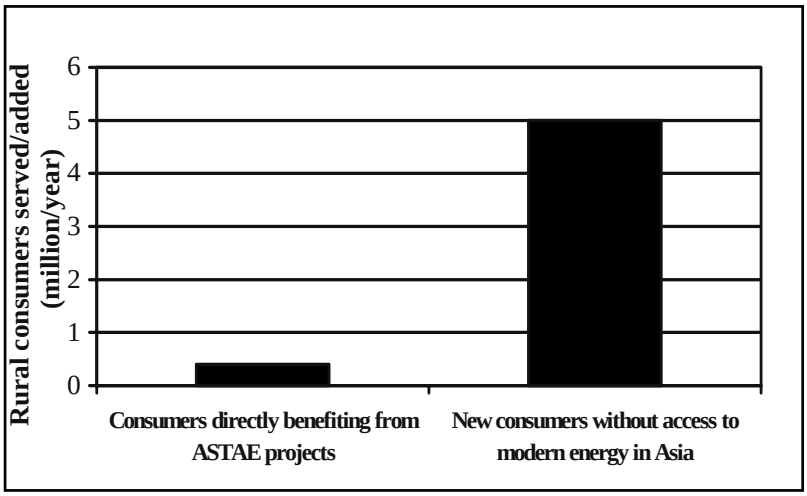
5. Conclusion

During its first decade, ASTAE achieved its initial strategic objective of having renewable and energy efficiency technologies widely mainstreamed as potential project components within Bank loans. Beginning its second decade, ASTAE has adopted the even more challenging objective of assisting countries to develop and adopt appropriate strategies, plans and policies to enable alternative energy to play a significant role in sustainable economic development.

Donor assistance has been essential in helping ASTAE achieve its results to date. The partnership model has proved to be extremely effective in promoting alternative energy within the Bank. Continued donor support is needed to ensure that the gains already achieved are maintained, and that ASTAE can effectively meet the new challenge of assisting countries to include alternative energy in their official development strategies, plans and policies, as well as to support programs to implement these policies and scale up the impact of alternative energy on poverty alleviation and increased environmental protection.

ASTAE's challenge is to have an impact on the fast-growing demand for power in Asia. Alternative energy is an area where World Bank involvement makes a difference and one in which ASTAE's added value is high. As the following charts demonstrate, ASTAE while successful in implementation of individual projects, has a long way to go before making a real impact on client countries needs for new capacity and providing access.





Without the creation of a strategic framework of policies and incentives and without capacity building on a large scale, it is difficult for the private sector to carry out alternative energy investments in the Bank's client countries. ASTAE's continued involvement can make a real difference by contributing to the formation of a solid sustainable base of local capacity for alternative energy development and by creating an enabling environment for sustainable market frameworks.

Annex 1: Status of ASTAE-Supported World Bank/GEF Loans, Credits and Grants for Alternative Energy in Asia

Closed Loans, Credits and Grants

1. **Lao PDR Provincial Grid Integration (PGI), Credit 2425-LA**

This project included components for demand-side management (DSM) and institutional building. ASTAE coordinated a South–South twinning arrangement between Electricité du Laos (EdL) and Tenaga Nasional Berhad (the Malaysian electric utility) to provide comprehensive training in utility operations to EdL. ASTAE also helped twin EdL with Tunisia's Agence pour la Matrise de l'Energie for training in commercial sector energy audits. Total World Bank support for the DSM component was **$0.9 million**. Board approval date: October 6, 1992; closing date: June 30, 1999.

2. **Thailand Promotion of Electrical Energy Efficiency, Loan 3598-TH, GEF Grants 28637 and 21221-TH**

This project provided support for the Electricity Generating Authority of Thailand's (EGAT's) implementation of a five-year DSM demonstration program. The project created considerable momentum in promoting efficient electricity consumption through utility-sponsored DSM programs and public education. EGAT's Demand-Side Management Office (DSMO) launched more than 17 efficiency programs for lighting, appliances, industrial/commercial buildings and load management. The DSMO exceeded its savings target of 238 MW in load reduction by 238 percent, and achieved 566 MW in avoided capacity through improved efficiency gains. The energy savings from this program avoided an estimated 2.3 million tons of CO_2 emissions. Total World Bank/GEF support for the DSM component was $**9.5 million** (not counting $6 million Government of Australia grant) although $1.5 million of this was later allocated to the Thailand Metropolitan Distribution Reinforcement Project. Board approval date: April 27, 1993; closing date: June 30, 2000.

3. **Indonesia Second Rural Electrification (REII), Loan 3845-IND**

This project provided support for PLN's least-cost rural electrification program, which included renewable energy generation components. Among the objectives of the project was the establishment of incentives for private sector and local cooperatives to take an increasingly larger share of rural energy (RE) distribution and renewable energy development within the framework of a least-cost RE Master Plan. ASTAE supervised the preparation, appraisal, and supervision of the small geothermal and grid-connected minihydro components. Private participation in small power generation was supported by the issuance of regulations and letters of awards, announcement of purchase tariffs, but the financial crisis in 1997 prevented further progress. The minihydro projects (7.8 MW) were commissioned at about 14 percent below estimated cost. PLN prepared additional minihydro and minigeothermal projects with an aggregate capacity of about 30 MW for future assistance, but no follow-up investment was made on account of the negative impact of the financial crisis. Total World Bank lending for the renewable energy components of this project was **$13.3 million**. Board approval date: February 28, 1995; closing date: extended to March 31, 2000.

N.B. The portfolio of ASTAE-supported projects does not include projects that have been canceled or dropped. The Asia financial crisis had a severe impact on lending operations in Indonesia, forcing the cancellation of two projects under implementation (the Sumatra and Kalimantan Power and the Renewable Energy for Small Power Projects) and three projects under preparation (Eastern Indonesia Renewable Energy Development Project, Eastern Islands Power Sector Development Project, and the Sumatra, Kalimantan Sulawesi Rural Electrification Project). The Henan (Qinbei) Thermal Power Project in China, which included an energy efficiency component, was canceled shortly after loan approval. The Philippines Renewable Energy Isolated Grids AIJ project is no longer being implemented by the Bank. Four projects in India were also dropped in FY01. These are the Solar Thermal Project (no longer implemented by the Bank), UP Power Sector Restructuring APL, Haryana Power Sector Restructuring APL II and Calcutta Municipal DSM Project.

4. **Vietnam Power Development, Credit 2820-VN**

This project supported the development of new gas-fired generator at Phu My and augmentation of transforming capacity to meet the electricity needs of Vietnam. ASTAE assisted in the preparation of Terms of Reference for a Rural Electrification Master Plan that included renewable energy technologies and assisted in the supervision of the Master Plan's preparation. Total World Bank support for the alternative energy component was estimated at **$0.5 million**. Board approval date: February 20, 1996; closing date: December 31, 1999.

Loans, Credits and Grants Under Implementation

5. **India Renewable Resources Development, Loan 3544-IN, Credit 2449-IN, GEF Grant 28633-IN**

ASTAE assisted in the overall design, appraisal and supervision of this project, which included solar photovoltaic (PV), wind and minihydro components totaling $284 million in investment. The Project will close on December 31, 2001 and is expected to successfully meet its development objectives, IREDA has played a direct as well as catalytic role in successfully commercializing renewable energy. Renewable energy share of power generation capacity in India is now growing faster than ever before. It increased from about 0.1 percent of total generation capacity in 1992 to 3 percent in 2000. Nearly 3000 MW of wind, small hydro, biomass and solar photovoltaic power systems were in operation by March 2001 compared to about 100 MW in 1992. IREDA has supported about half this capacity additions while the balance were financed through private sector equity, MNES support and loans from other lenders. The project financed over 113 MW of small hydro capacity in 33 projects compared to a target of 100 MW. During this period IREDA financed an additional 155 MW of small hydro using other resources. Wind farm capacity financed under the project was 87.2 MW in 27 projects compared to 85 MW envisaged at project appraisal. During this period IREDA financed an additional 184 MW of wind power using locally mobilized resources. Solar PV projects financed totaled 2.145 MWp in 78 projects, or slightly below the target of 2.5 MWp. Products financed ranged from solar lanterns, PV irrigation pumps, village solar power schemes to a 200 kWp grid-tied system. In addition, IREDA financed an additional 4 MWp of PV irrigation pumps with MNES assistance. Technical Assistance supported 50 activities that included technology promotion campaigns, training IREDA staff and various stakeholders, upgrading IREDA computer facilities, improving its financial management systems, conducting business meetings, technical reviews of sub-projects, and a comprehensive review of IREDA's loan portfolio and a financial audit of its operations by independent consultants. A $26.0 million GEF grant supported both the wind farm and solar PV market development components. Total World Bank/GEF support for the renewable energy components is **$141.0 million**. Board approval date: December 17, 1992; closing date December 31, 2001.

6. **India Orissa State Power Sector Restructuring, Loan 4014-IN**

ASTAE assisted in the preparation of a DSM component in the state's power sector reform program and is now supervising implementation of this component. A DSM cell has been set up within the Grid Corporation of Orissa (GRIDCO) to facilitate load research and DSM program development. DSM investments include municipal water pumping and storage systems, motor rewinding and motor efficiency programs, load research linked to a proposed metering program and various DSM opportunities in the industrial, residential, commercial and agricultural sectors. The DSM component was restructured during implementation and total Bank support for the DSM component is **$10 million**. Board approval date: May 14, 1996; closing date: December 31, 2002.

7. **Indonesia Solar Home Systems (SHS), Loan 35544-IND, GEF Grant 3700-IND**

ASTAE assisted in the design of this project, which supports solar home system investments funded and/or implemented by the private sector, NGOs and cooperatives. Within the framework of a least-cost rural electrification strategy, the project supports investments in approximately 70,000 solar home systems to areas not expected to receive grid-connected electrical services for at least three years. Components include technical assistance for developing energy strategies and strengthening institutional capacities. Total World Bank/GEF support for this stand-alone solar PV project is **$11.5 million**, of which $0.5 million is World Bank loan and $11 million is GEF Grant. Board approval date: January 28, 1997; closing date: April 04, 2004.

8. **Sri Lanka Energy Services Delivery (ESD), Credit 2938-LK, GEF Grant 39965-LK**

ASTAE task manages this project, which encourages the provision of grid and off-grid energy services using renewable energy and DSM investments. The project includes an ESD Credit Program Component to help finance investments by the private sector, NGOs and cooperatives in off-grid solar PV and village hydro schemes, of grid-connected mini-hydro sites and other renewable energy applications. The other components are (a) CEB-executed grid-connected Pilot Wind Farm; and (b) technical assistance to the CEB to strengthen its capacity to (i) help ESD Credit Program subproject developers and (ii) to undertake DSM activities, including DSM program design and implementation, load research and an energy efficient building code. Total World Bank/GEF support for this stand-alone alternative energy project is **$30.1 million**, of which $24.2 million is World Bank credit and $5.9 million is a GEF Grant. Board approval date: March 18, 1997; closing date: December 31, 2002.

9. **Thailand Metropolitan Distribution Reinforcement, Loan 4199-TH**

This Bank-assisted project seeks to meet the anticipated growth in demand during 1997–2001 by improving system reliability and restructuring the Metropolitan Electricity Authority (MEA) in preparation for its commercialization and corporatization. ASTAE assisted in the preparation and is supervising the DSM component, which includes the creation of an appliance-testing laboratory, load research, load control and energy service company (ESCO) development. **$1.5 million** grant from EGAT's Project has been allocated to MEA to support this program. Board approval date: June 24, 1997; closing date: October 31,2002.

10. **Vietnam Transmission, Distribution and Disaster Reconstruction, Credit 3034-VN**

The project is financing the expansion of transmission systems in south and central Vietnam, and rural electrification in selected areas. The Swedish Sida-supported DSM component consists of technical assistance to prepare a DSM policy and regulatory framework, load management program and energy efficiency standards and codes. The Sida commitment stands at **$3.0 million**. Board approval date: January 20, 1998; closing date: June 30, 2002.

11. **Lao PDR Southern Provinces Rural Electrification, Credit 3047-LA**

The project will focus on the expansion of rural electrification in southern and central Laos. ASTAE is assisting in the supervision of a renewable energy component, which includes investments for off-grid electrification in solar PV and microhydro. Bank/GEF support for this project is $35.4 million, with an off-grid electrification component of **$1.7 million** consisting of a $1 million IBRD loan and a $.7 million GEF grant. Board approval date: March 17, 1998; closing date: June 30, 2004.

12. **China Energy Conservation, Loan 4304-CN, GEF Grant 28323-CN**

This project is designed to introduce, demonstrate and disseminate new project financing concepts and market-oriented institutions to promote and implement energy efficient measures in China. ASTAE is assisting in the supervision of this project, which has established through demonstration Energy Management Companies (EMC), to implement largely industrial efficiency projects through performance contracts. The project will also support a more efficient national energy conservation dissemination center. Funding for this project stands at **$85 million**. Board approval date: March 26, 1998; closing date: June 30, 2004.

13. **India Andhra Pradesh Integrated Agricultural DSM**

This project seeks to improve power sector efficiency in Andhra Pradesh through the implementation of an integrated agricultural DSM project. The project includes improvements in distribution system efficiency, metering, and end-use efficiency improvements in irrigation systems. Total grant by the Activities Implemented Jointly (AIJ) program, which is being implemented by the Bank with funding from the Government of Norway is **$4.6 million**. Board approval date: June 1999; closing date: December 31, 2001.

14. **China Renewable Energy Development, Loan 4488-CN**

This stand-alone renewable energy project will support the accelerated development of renewable energy resources. The project includes 20 MW of wind farms, ~10MW of solar home systems plus a PV technology development component. Total Bank/GEF support for this project is $**40.0 million**, consisting of an IBRD loan of $13 million and a GEF grant of $27 million. Board approval date: June 8, 1999; closing date: June 30, 2007.

15. **Vietnam Rural Energy, Credit 3358-VN**

This project will provide energy to about 450,000 households in 32 provinces in rural Vietnam. The Project includes technical assistance components to develop institutional capacity and policy frameworks to encourage the use of renewable energy to supplement grid supply or serve isolated communities where renewables are the least cost option. Total support for alternative energy is **$2.5 million**. The World Bank Group is financing $2.2 million through ASTAE, the IFC, PHRD, ESMAP, and the Swiss consultant trust fund. New Zealand is cofinancing $0.3 million in alternative energy costs. Board approval date: May 30, 2000; closing date: June 30, 2004.

16. **India Renewable Energy II/Energy Efficiency, Loan 3396-IN**

This project is a follow-up to the first Renewable Resources Development Project and expands support for the small hydro program beyond the southern region to include other states in India. The project also provides support for IREDA to promote and finance energy efficiency investments and foster the development and operation of energy service companies. The total **$135 million** in World Bank support for this project consists of an $80 million IBRD Loan, $50 million in IDA assistance, and a $5 million GEF grant. Board approval date: June 28, 2000; closing date: March 31, 2006.

17. **India Rajasthan Power Sector Restructuring Project, Loan 4594-IN**

This project will directly support the implementation of the power sector reform program in the state of Rajasthan in order to improve the efficiency of electricity service and enable the sector to gain access to capital markets and commercial financing. ASTAE is assisting in the design of the DSM component comprising technical assistance for DSM and load research. The estimated level of World Bank support for this project is $180.0 million, with a USAID cofinanced DSM TA component estimated at **$2 million**. Board approval date: January 18, 2001; closing date: June 2005.

18. **China Passive Solar Heating for Rural Health Clinics**

This GEF project will strengthen the capacity of architectural and engineering design institutes in China to design and build energy-efficient passive solar buildings. The project will fund the incremental cost of constructing 30 energy efficient rural health clinics as a component of an ongoing World Bank health sector project in 2002. Energy savings and service improvements in these demonstration clinics will be evaluated and this experience will be disseminated within the health sector and to other sectors in 2003. GEF support for this project is **$0.75 million**. GEF grant approval date: June 4, 2001; closing date: December 31, 2003.

Loans, Credits and Grants in the Pipeline

19. **India Andhra Pradesh Power APL I, Loan 4441-IN**

This project supports the major restructuring and policy reforms in the Andhra Pradesh power sector. Although the first two phases are under implementation, they did not energy efficiency components. These components are expected to be included in future phases of the APL currently in the pipeline. ASTAE is assisting in the design of the DSM component comprising technical assistance for DSM and load research. Specific focus will be on improvements in efficiency in the agricultural sector through innovative energy efficiency procurement mechanisms. The total proposed spending on energy efficiency in all five phases of the APL is **$50 million**, although there was no Bank financing for DSM in the first 2 phases of the APL. Board approval date: February 1999; closing date: August 31, 2003.

20. **Nepal Power Development**

This project will support private development of small hydro schemes, catalyze the scaling-up of community-based rural electrification through microhydro development, and improve transmission and distribution facilities of the Nepal Electricity Authority. Estimated IDA support for alternative energy is **$28 million**. Estimated Board date: July 2, 2002.

21. **Bangladesh Rural Electrification and Renewable Energy Development**

The project will support the Government's efforts to find meaningful and sustainable solutions to meet the challenge of rural development. A grid component of the project will support (a) line expansion and intensification in areas currently under the PBSs; (b) Distribution area rationalization and rehabilitation of networks in new areas taken over by the PBSs; (c) Technical assistance for REB/PBS institutional development, financial restructuring, socioeconomic program and poverty reduction aspects of electricity provision and development of the small power generation program. An off-grid component will support (a) financing and subsidy mechanisms for solar home systems through PBSs, NGOs and MFIs; (b) financing RAPSS; (c) technical assistance for promotion of solar home systems and development of RAPSS; and (d) technical assistance for development of pilot wind and microhydro projects. Total project cost is estimated to be $187 million of which **$30.2 million** is for alternative energy. IDA support would be of the order of $142 million and GEF $8 million. Estimated Board date: FY02.

22. **Cambodia Rural Electrification and Transmission**

This project will support renewable energy activities as an integral part of the government's rural electrification program. It will help to strengthen the country's policy and legal framework, and to build capacity of various stakeholders. The investment has two parts: (a) investment in grid connected small hydro and (b) off-grid systems (village hydro and solar). Estimated Bank/GEF support for alternative energy is **$11.08 million**. Estimated Board date: FY02.

23. **China Energy Conservation II**

This project will serve as a follow up to China Energy Conservation I Project, Loan 4304-CN. The first phase project efforts have been successful so far in introducing and adapting energy performance contracting to Chinese conditions, developing a viable business model in the three EMCs (ESCOs), and developing an initial market among client enterprises. The objective of the proposed Phase II project is to expand the EMC market in China by establishing a loan guarantee facility and national EMC association. Estimated GEF support for this project will be **$26 million**. Estimated Board date: FY02.

24. **India Uttar Pradesh Water Sector Program APL**

The project aims to set up an enabling institutional and policy framework for water sector reform as well as to increase and sustain water and agricultural productivity. This project is expected to include

canal-based hydro components. Estimated support for renewable energy is **$25** million. Estimated Board date: FY02.

25. **Vietnam System Efficiency Improvement, Equitization and Renewables (SEIER)**

This project will include renewable energy and energy efficiency components. The project will support Phase 1 of the Renewable Energy Action Plan (REAP) developed jointly by EVN and the Bank, and adopted by the Ministry of Industry. SEIER will support renewable energy policy development, pilot community-scale microhydro, development of grid-connected small power producers, and rehabilitation of small hydro facilities owned by EVN. It will also include a follow-on component to the Sida-supported DSM program and include a second phase utility DSM program and a pilot commercial energy efficiency program. Estimated Bank/GEF support for alternative energy is **$20 million**. Estimated Board date: FY02.

26. **Philippines Rural Power**

This project will support rural electrification efforts in the Philippines over a 10–15 year period. The core investment component of the proposed APL1 will develop and implement new public/private partnership business models for decentralized electrification as well as improved energy efficiency in existing rural cooperatives. World Bank/GEF support for renewable energy under the first phase of the APL is estimated at **$6 million** and energy efficiency at **$5 million**. If successful, these models are to be replicated and scaled up in other parts of the country under subsequent phases of the APL. Estimated Board date: FY03.

27. **India Improving Energy Efficiency in Agricultural Pumpsets**

The objective of the proposed project is to strategically increase the market penetration of energy efficient agricultural pumpsets in India to reduce the environmental impacts of energy consumption by the agriculture sector and to mitigate the impacts of planned tariff adjustments included in World Bank supported power sector reform projects on rural consumers. The proposed level of GEF support for this project is estimated at **$25–30 million**. Estimated Board date: FY03

28. **Thailand ESCO Development**

This project will seek to overcome barriers to expanded commercial financing of energy efficiency projects in Thailand. The project would develop financial schemes, using a blend of GEF, Thai Energy Conservation Fund, and commercial bank funds to provide affordable project financing for energy efficiency projects. It would also promote the development of ESCOs to bridge the gap between banks and energy end-users. Estimated GEF support for this stand-alone project will be about **$15 million**. Estimated Board date: FY03.

29. **Sri Lanka Renewable Energy for Rural Economic Development**

This project is a follow up for ESD I. The objective of ESD II is to expand the commercial provision and utilization of renewable energy resources and pursue economic development and improvement in quality of life through more productive and efficient use of rural energy resources. Estimated World Bank/GEF support is **$92 million**. Estimated Board date: FY02.

30. **China Renewable Energy Scale-Up Program (CRESP)**

The CRESP aims to support the GOC Renewable Energy Program in the 10th and 11th Five-Year Plans. The objective would be to reduce environmental emissions from coal fired power generation by developing sustainable commercial markets for electricity from renewable energy. This would be done by implementing a policy to create a mandated large-scale market and programs aiming to reduce costs for mature technologies such as wind farms, small hydroelectricity and biomass. Estimated Bank/GEF support for this long-term program will be **$240 million**. The GEF Project Brief was approved in May 2001. Estimated Board date: FY03.

31. **China Building Efficiency and Heat Reform**

Chinese buildings consume three times as much energy for space heating as buildings in Western countries in comparable climate conditions. The China Building Energy Efficiency and Heat Reform Project will develop recommended actions to be taken by national and local institutions to effectively accelerate the transformation of (a) markets for energy efficient building materials and products and (b) district heat pricing, metering, and billing in major urban areas in China's Heating Zone. Estimated Board date: FY04.

32. **India Enhancing Access Through Off-Grid Electrification (Rajasthan)**

The project supports an important element of Rajasthan's Power Sector Reform Policy, which calls for improved access of remote rural areas to energy services, including through promotion and development of renewable energy systems. The project would involve electrification of about 500 villages and 500 hamlets envisaged to be serviced by stand-alone solar photovoltaic (PV) Systems, PV minigrids, biomass, diesel, among others. Technical assistance will be provided for local capacity building to facilitate market development, as well as to assist the Government of Rajasthan in formulating off-grid/minigrid action plans and regulatory framework aligned with ongoing power sector reforms. The project could be fully blended into the Rajasthan Power Sector Restructuring II, should project preparation schedules converge. Total project cost is tentatively estimated at **$55 million**, of which IBRD/IDA assistance would be in the order of $25 million, and GEF funding of $15 million. Estimated Board date: FY03.

33. **Vietnam Demand-Side Management**

This project will contain energy efficiency components supporting EVN's DSM program. Estimated level of World Bank/GEF support is **$5.3 million**. Estimated Board date: FY03.

34. **Lao Rural Electrification**

This project will contain renewable energy components for rural applications. Additional information on this project is not yet available. Estimated Board date: FY04.

35. **India Climate Change Partnership (CCP)**

The objective of the proposed program is to promote environmentally sustainable energy development to help achieve and complement India's poverty reduction goals. The CCP envisages supporting clean and efficient power generation within the broader sectoral context of establishing cost-effective policies and incentives that ultimately result in a transfer of expertise in project implementation to the state level. Estimated support is **$150 million**. Estimated Board date: FY04.

36. **Vietnam Rural Energy II**

This project will be a follow-up to RE I. Estimated support for alternative energy is **$40 million**. Additional information on this project is not yet available. Estimated Board date: FY04.

Annex 2: ASTAE Project Portfolio

ASTAE-Supported Investment Projects

Country	Project	Approval/ End Date	Cost in Millions of Dollars						Primary Project Components
			Total Alternative Energy Project Cost	Source of Financing					
				IBRD/IDA	GEF	Govt.	Private	Other	
East Asia and Pacific Closed Loans/Grants [1/]									
Indonesia	Second Rural Electrification	2/95-3/00	19.3	13.3	-	6.0	-	-	Mini-hydro, geothermal resource assessments, and technical assistance.
Lao	Provincial Grid Integration	10/92-6/99	.9	.9	-	-	-	-	DSM, institution building
Thailand	Promotion of Electrical Energy Efficiency	3/93-6/00	59.3	-	8.0	20.3	-	31.0	DSM, capacity building.
Vietnam	Power Development	2/96-12/99	1.6	0.5	-	-	-	1.1	Renewable energy capacity building.
East Asia and Pacific Projects Under Implementation [2/]									
China	Energy Conservation	3/98-6/06	150.8	63.0	22.0	7.0	54.3	4.5	Energy efficiency, technical assistance
China	Renewable Energy Development	6/99-6/05	205.4	13.0	27.0	-	165.4	-	Windfarms, solar PV, PV technology improvement
China	Passive Solar Heating for Rural Health Clinics	6/01-12/03	1.5		.75	.75			Energy efficient building design
Indonesia	Solar Home System (SHS)	1/97-4/04	33.0	0.5	11.0	1.5	20	-	Solar home systems and technical assistance 70,000
Lao	Southern Provinces Rural Electrification	3/98-6/04	2.2	1.0	0.7	0.5	-	-	Solar battery charging and micro-hydro projects.
hailand	Metropolitan Distribution Reinforcement	6/97-12/02	4.0	-	1.5	2.5	-	-	Demand-side management capacity building.
Vietnam	Transmission and Distribution Project	1/98-6/02	3.3	-	-	0.5	-	2.8 [3/]	DSM capacity building, equipment standards, building code development
Vietnam	Rural Energy I	5/00-6/04	2.5	1	-	--	-	1.5	Renewable energy TA & pilot mini-hydro
Total EAP Projects Completed/ Under Implementation			**483.8**	**93.2**	**70.95**	**39.05**	**239.7**	**40.9**	

1/ Source: ICR.
2/ Source: SAR, updated by TM if needed.
3/ Figure is less than at appraisal due to currency devaluation.

South Asia Projects									
Country	Project	Approval/ End Date	Cost in Millions of US Dollars						Primary Project Components
			Total Alternative Energy Project Cost	Source of Financing					
				IBRD/IDA	GEF	Govt.	Private	Other	
South Asia Closed Loans/Grants									
India	Renewable Resources Development	12/92-12/01	284.0	115.0	26.0	17.0	72.0	54.0	Small hydro, wind farm, solar PV, technical assistance.
South Asia Projects Under Implementation									
Sri Lanka	Energy Services Delivery	3/97-12/02	55.3	24.2	5.9	1.9	23.3		SHS, village and micro hydro, pilot wind farms, DSM capacity building.
India	Renewable Energy Project II	3/01-3/06	300.0	130.0	5.0	25.0	140.0		Energy efficiency, mini hydro, TA
India	Orissa Power Sector Restructuring	5/96-12/02	12	10.0				2.0	Demand-side management, technical assistance
India	Andhra Pradesh Integrated Agricultural DSM AIJ Project	6/99-12/02	4.6	-	-	-	-	4.6	Energy efficient agricultural pumpsets.
India	Rajasthan State Power Sector Restructuring	1/01-6/05	2.0	-	-	-	-	2.0	TA for DSM/Energy Efficiency for privatized distribution companies.
Total South Asia Projects Under Implementation			**657.9**	**279.2**	**36.9**	**43.9**	**235.33**	**62.6**	
Total EAP & SAS Projects Under Implementation			**1141.7**	**372.4**	**107.9**	**83.0**	**475.0**	**103.5**	

ASTAE's Project Pipeline
ASTAE-Supported Investment Projects Under Preparation

Country	Project		Millions of Dollars		Primary Project Components
		Estimated Submission Date	Estimated Alternative Energy Project Cost	Estimated WB/GEF Financing	
East Asia and Pacific Projects Under Preparation					
Cambodia	Rural Electrification & Transmission	FY02	17	11	Renewable energy for rural applications.
China	Energy Conservation II	FY02	281	26	ESCO market development.
China	WB/GEF Renewable Energy Scale-Up Program.	FY03	431	240	Implementation of mandated market share policy for renewable electricity plus demonstrated investment
China	Building Energy Efficiency and Heat Reform	FY04	TBD	15 +	Energy efficiency in buildings
Lao	Rural Electrification	FY04	TBD	TBD	Renewable energy for rural applications
Philippines	Rural Power	FY03	24	6	Renewable energy for rural applications
Thailand	ESCO Development	FY03	100	15	ESCO market development and financing
Vietnam	System Efficiency Improvement	FY02	33.5	20	Renewable and energy efficiency components
Vietnam	Demand Side Management	FY03	10.7	5.3	DSM support.
Vietnam	Rural Energy II	FY04	75 +	40 +	Renewable energy technologies for remote villages.
Total East Asia and Pacific Projects Under Preparation			**972.2 +**	**378.3+**	
South Asia Projects Under Preparation					
Bangladesh	Rural Electrification and Renewable Energy Development	FY02	30.2	7.5	Off-grid renewables
India	Uttar Pradesh Water Sector Program	FY02	40	25	Canal-based small hydro
India	Andhra Pradesh Power Sector Restructuring APLIII-V	FY02	50	50	Energy efficiency, DSM, capacity building
India	Improving Energy Efficiency in Agricultural Pumpsets	FY03	107.5	25 +	Energy efficiency pumpsets
India	Enhancing Access Through Off-Grid Electrification (Rajasthan)	FY03	50	15 +	Solar PV off grid and mini-grid
India	Climate Change Partnership	FY04	150+	150	Renewable energy
Nepal	Power Development	FY02	60	28	Mini & small hydro
Sri Lanka	Renewable Energy for Rural Economic Development	FY02	194	92	Renewable energy in rural areas
Total South Asia Projects Under Preparation			**681.7+**	**392.5+**	
Total EAP & SAR Projects Under Preparation			**1,653.9+**	**770.8+**	
Total EAP & SAR Projects Under Implementation & Preparation			**2,795.6+**	**1,251.1+**	

Annex 3: Estimated Total Renewable Power Capacity Installed and Avoided in World Bank/GEF-Assisted Alternative Energy Projects/ Project Components in Asia (FY1993–01)

Renewable Energy Projects:		**Renewable Energy Installed (MW)**	**Number Off-Grid Households Provided Access ('000s)**
China	Renewable Energy Development	30*	300–400*
Indonesia	Second Rural Electrification	7.8	
	Solar Home Systems	10*	70*
India	Renewable Resources Development	202	
	Renewable Resources II/Energy Efficiency	200*	
	Southern Provinces Rural Electrification	0.3*	4.6
Sri Lanka	Energy Services Delivery	28	18
Vietnam	Power Development	TA	
	Rural Energy	TA	
Totals:		**476.1**	**390-490**
Energy Efficiency Projects:		**Capacity Avoided (MW)**	
China	Energy Conservation [a/]	n.a.	
	Passive Solar Heating for Rural Health Clinics		
India	Orissa Power Sector Restructuring	234*	
	Andhra Pradesh Integrated Agricultural DSM	8*	
	Renewable Energy II/Energy Efficiency	n.a.	
	Rajasthan Power Sector Restructuring Project		
Lao PDR	Provincial Grid Integration	TA	
Sri Lanka	Energy Services Delivery	18*	
Thailand	Promotion of Electrical Energy Efficiency	558	
	Metropolitan Distribution (MEA)	TA	
Vietnam	Transmission, Distribution and Disaster Reconstruction	TA	
	Total Capacity Avoided:	**858**	

* Projected figures.
n.a. - Not yet available.
TA - Technical assistance only.
a/ MW savings not available; project will save 13 million tce (tons of coal equivalent) over seven years.

Annex 4: Conferences, Workshops, Seminars, and Publications in FY01

Location	Paper presented/speech given	Date	Title of conference/workshop/seminar and sponsor	ASTAE speaker/ representative	Audience
Hanoi, Vietnam	Renewable energy options and strategies for grid, and off-grid applications (several papers/presentations)	October 2000	Workshop on Renewable Energy Action Plan EVN and World Bank	Anil Cabraal Susan Bogach Jon Exel	Energy and rural development specialists
Marrakech, Morocco	Making a Difference in Emerging PV Markets: Strategies to Promote PV Energy Generation—Review and Outlook	September 2000	GEF Workshop on Making A Difference in Emerging PV Markets	Anil Cabraal	PV investment, implementation and development community
India, South Africa, Philippines, China, Sri Lanka		FY00–01	Training Courses in Quality Program for Photovoltaics	Enno Heijndermans and Anil Cabraal	PV specialists
Bangkok, Thailand	Financing and Implementing Energy Efficiency Programs in a Restructured Electric Industry	September 2000	APEC Energy Working Group	Jas Singh	APEC government and utility staff
Montevideo, Uruguay		October 2000	ESMAP, CIER, UTE Operating DSM Programs in a Restructuring Electricity Sector	Jas Singh Chandrasekar Govindarajalu	Government staff, regulators and utility staff from 12 countries

Papers published by ASTAE or through ASTAE-funded initiatives
Martinot, E., A. Cabraal, and S. Mathur. 2000. "World Bank/GEF Solar Home Systems Projects: Experiences and Lessons Learned 1993–2000." *Renewable & Sustainable Energy Reviews* 5 (2000) 39–57.
Palz, W., and A. Cabraal (eds.). "Photovoltaics in Developing Countries." Report of a Joint World Bank–European Commission Workshop.
Publications of the Quality Program for Photovoltaics, managed by A. Cabraal and E. Heijndermans, ASTAE, April 2001: • Atmaram, G. H., and J. D. Roland. *Quality Improvement of Photovoltaic Testing Laboratories in Developing Countries.* • Fitzgerald, M. C. *Certification for the PV Installation and Maintenance Practitioner: Manual for Implementing Qualified Certification Programs.* • PowerMark Corporation. *Observations of China PV Module Testing Program and National PV Standard Meeting.* • Varadi, P. F., R. Dominguez, and D. McGlauflin, *Quality Management in Photovoltaics: Quality Control Training Manual for Manufacturers.* • Vervaart, M. R., and F. D. J. Nieuwenhout. *Solar Home Systems: Manual for the Design and Modification of Solar Home System Components.*
Voravate, T., D. F. Barnes, V. S. Bogach. *Assessing Markets for Renewable Energy in Rural Areas of Northwestern China.* World Bank Technical Paper No. 492.
Winrock International India. *Improved Rural Access to Electricity Services in India.* Proceedings of a workshop held in New Delhi, India, on May 22–23, 2000.
ASTAE. *Options for Renewable Energy in Vietnam.* A report on the June 15–16, 1999. Participatory Workshop in Hanoi. ESMAP Technical Paper No. 1, July 2000.
Singh, Jas, and Carol Mulholland. *DSM in Thailand: A Case Study*. ESMAP.
Bogach, V. S., A. Cabraal, J. Exel, and P. N. Anh. "Vietnam—Renewable Energy Action Plan." ASTAE/ESMAP.
TrueWind Solutions, LLC. *Wind Energy Resource Atlas of South-East Asia.* ASTAE.

Annex 5: Key ASTAE Funding Events

Year	Month	Agency	Event	Amount *$*	Source
1992	January	WB	Creates ASTAE with 2 WB staff and 1 seconded USDOE Renewable energy consultant	$327,000 [a]	WB/USDOE
	March		*ASTAE Donors Meeting #1 (WB/ASTAE funding proposal to donors)*		
	May	ASTAE	Submits funding proposal (revised) to Netherlands DGIS ($4,798,500)		
	July	USAID	Approves ASTAE funding through USAID/WB Trust Fund	$200,000	USAID
	July	UNDP	Submits funding proposal to Netherlands DGIS for ASTAE support ($607,392)		
	September	USDOE	Funds to USTDA Trust Fund for ASTAE support	$200,000	USDOE/USTDA
	November	WB	Creates Interim Fund for ASTAE while awaiting donor funding	$500,000 [b]	WB
1993	March	ASTAE	Submits funding proposal to USDOE ($3,500,000 for ASTAE)		
	May		*ASTAE Donors Meeting #2*		
	May	NETH. DGIS	Netherlands Trust Fund Arrangement signed	($4,401,180) [c]	NETH. DGIS
	June	NETH. DGIS	Netherlands Trust Fund Tranche #1	$1,558,290	NETH. DGIS
	September	UNDP	Netherlands DGIS/UNDP Funding Agreement signed	($479,520) [d]	NETH/ UNDP
	October	USDOE	Funds to USTDA Trust Fund for ASTAE support	$250,000	USDOE/USTDA
	November	UNDP	UNDP Trust Fund Tranche #1	$29,250	NETH. /UNDP
	December	NETH. DGIS	Netherlands Trust Fund Tranche #2	$821,140	NETH. DGIS
1994	April		*ASTAE Donors Meeting #3*		
	May	UNDP	UNDP Trust Fund Tranche #2a	$69,500	NETH /UNDP
	September	NETH. DGIS	Netherlands Trust Fund Tranche #3	$914,020	NETH. DGIS
	September	USDOE	USDOE Funding Agreement signed	($3,000,000) [e]	USDOE
	October	USDOE	USDOE Trust Fund Tranche #1 (for ASTAE)	$715,837	USDOE
	October	WB	Japan PHRD Grant approved for use for India DSM	$700,000	WB/JAPAN PHRD
	November	NETH. DGIS	Netherlands Trust Fund Tranche #4	$583,220	NETH. DGIS
1995	April	WB	Approval IDF Grant for Philippines DSM capacity building	$245,000	WB/IDF
	May		*ASTAE Donors Meeting #4*		
	May	UNDP	UNDP Trust Fund Tranche #2b	$35,000	NETH./UNDP
	September	WB	Approval Project Preparation Facility (PPF) Advance for Sri Lanka Energy Services Delivery	$340,000	WB/GEF
	September	UNDP	UNDP Trust Fund Tranche #4	$377,100	NETH./UNDP
	October	WB	Approval GEF-Project Development Facility (PDF) Grant for Sri Lanka Energy Services Delivery	$200,000	WB/GEF
	October	WB	Approval GEF-Project Development Facility (PDF) Grant for China Renewable Energy	$140,000	WB/GEF
	October	USDOE	USDOE Trust Fund Tranche #2 (for ASTAE)	$339,000	USDOE
1996	May		*ASTAE Donors Meeting #5*		
	August	WB	Japan PHRD Grant approved for use for India DSM	$800,000	WB/JAPAN/PHRD
	October	USDOE	USDOE Trust Fund Tranche #3 (for ASTAE)	$180,000	USDOE
1997	January	UNDP	UNDP Trust Fund Tranche #5	$347,763	NETH./UNDP
	April		*ASTAE Donors Meeting #6*		
	April	NETH. DGIS	Netherlands Trust Fund Tranche #5	$530,525	NETH. DGIS
	October	NETH. DGIS	Netherlands Trust Fund Tranche #6a	$215,000	NETH./UNDP
	October	UNDP	UNDP Trust Fund Tranche #5b	$287,728	NETH. DGIS
	December	GOV. SWISS	Swiss Trust Fund Agreement Signed	($470,000)	GOV. SWISS
	December	GOV. SWISS	Swiss Trust Fund Tranche #1	$309,447	GOV. SWISS
1998	April		*ASTAE Donors Meeting #7*		
	June	Netherlands	B/NPP Agreements Signed	($3,250,000)	B/NPP
	August	Netherlands	Dutch Partnership Trust Fund	($2,250,000)	NETH. PARTNERSHIP
	August	Netherlands	Dutch Partnership Trust Fund Tranche #1	$750,000	NETH. PARTNERSHIP

Year	Month	Agency	Event	Amount *$*	Source
1999	January	GOV. SWISS	Swiss Tranche #2	$154,723	
	March	Netherlands	B/NPP Tranche #1	$2,250,000	B/NPP
	March	ESMAP	ESMAP Agreement Signed	($223,000)	ESMAP
1999	April		*ASTAE Donors Meeting #8*		
	April	ESMAP	ESMAP Transfer	$223,000	ESMAP
	May	Netherlands	Dutch Partnership Trust Fund Tranche #2	$970,000	NETH. PARTNERSHIP
	July	WB	Japan PHRD Grant approved for use for Vietnam REAP	$100,000	WB/JAPAN/PHRD
	August	GOV. FINLAND	Finnish Trust Fund Agreement Signed	($569,000) [f]	
	October	GOV. FINLAND	Finnish Trust Fund Tranche #1	$173,570	
2000	January	Netherlands	Dutch Partnership Trust Fund Tranche #3	$530,000	NETH. PARTNERSHIP
	April		*ASTAE Donors Meeting #9*		
	May	U.K.	DFID Tranche #1	$633,368	U.K.
	May	Netherlands	B/NPP Tranche #2	$1,000,000	B/NPP
	July	Finland	GOV. FINLAND Tranche #2	$179,583	FINLAND
	October	UNDP	UNDP Trust Fund Tranche #6	$848,806	NETH./UNDP
	November	Finland	GOV. FINLAND Tranche #3	$179,583	FINLAND
2001	April		*ASTAE Donors Meeting #10*		
	April	Netherlands	Dutch Partnership Trust Fund	($1,250,000)	NETH. PARTNERSHIP
	April	Netherlands	Dutch Partnership Trust Fund Tranche #4	$1,250,000	NETH/PARTNERSHIP
	May	CIDA	Application to Canadians Climate Change Development Fund	($2,750,000)	CANADA
	August	U.K.	DFID Tranche #2	$745,193	U.K.
Projected:					
2002	April	Canada	CIDA Climate Change Development Fund Tranche #1	$2,750,000	CANADA
	January		ASTAE Donors Meeting #11		

Note: Does not include annual World Bank support.

Footnotes:

a. Includes $227,000 committed by WB plus secondment by USDOE of Anil Cabraal and other consultants to ASTAE during FY92 (January–June 1992).

b. Reimbursed to WB in June 1993, following receipt of Netherlands funding.

c. To be disbursed in five tranches over three-year period. Retroactive to July 1992.

d. To be disbursed in tranches over three-year period.

e. To be disbursed in tranches of $1,000,000 per year over three-year period, of which ASTAE receives $700,000 per year. Retroactive to July 1994.

f. To be disbursed in equal tranches over 3 year period.

Neth. DGIS: Netherlands Directorate General for International Development	USAID: United States Agency for International Development
UNDP: United Nations Development Programme	IDF: World Bank Institutional Development Fund Grant
USDOE: United States Department of Energy	GEF: Global Environmental Facility Grant
USTDA: United States Trade and Development Agency	PPF: Project Preparation Facility
WB: World Bank	PDF: Project Development Facility—GEF
GOV. SWISS: Government of the Swiss Confederacy	DFID: Department for International Development (United Kingdom)
GOV. FINLAND: Ministry of Foreign Affairs, Government of Finland	
B/NPP: Bank/Netherlands Partnership Program	

Annex 6: ASTAE Staff

(July 2000–June 2001)

Mohammad Farhandi	Program Manager, ASTAE
	Acting Sector Director, East Asia Energy and Mining Development Sector Unit
Noureddine Berrah	Deputy Program Manager
Anil Cabraal	Senior Renewable Energy Specialist/Renewable Team Leader
Susan Bogach	Senior Energy Economist
Enno Heijndermans	Alternative Energy Specialist
Jas Singh	Energy Efficiency Specialist
Chandrasekar Govindarajalu	Energy Specialist
Johannes Exel	Alternative Energy Engineer
Jeremy Levin	Alternative Energy Specialist
Kevin Fitzgerald	Alternative Energy Policy Specialist
Shelly Thorpe	Budget/Program Assistant
Teresita G. Velilla	Program Assistant
Cristina Hernandez	Team Assistant
Saroj Iyer	Consultant