

# **Update of Country Activities and Progress Technology Cooperation Agreement Pilot Project (TCAPP) and the Southern African Project Supported by the Climate Technology Initiative (CTI)**



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# *Summary of TCAPP and CTIP Methods and Results*

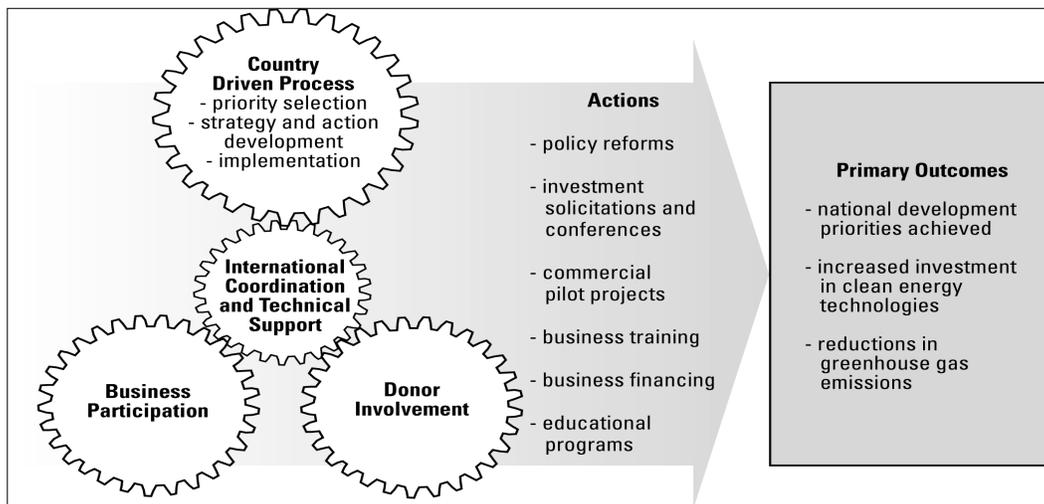
The U.S. Government launched the Technology Cooperation Agreement Pilot Project (TCAPP) in 1997 to provide a model of a country-driven and market-relevant approach to technology transfer implementation under the UNFCCC. TCAPP is currently assisting Brazil, China, Egypt, Kazakhstan, Mexico, Philippines, and South Korea in implementing actions to attract investment in clean energy technologies that will meet their sustainable development goals, while reducing greenhouse gas emissions. The international business and donor community are actively engaged in the implementation of these clean energy technology actions in the countries. On behalf of the Climate Technology Initiative (CTI), the National Renewable Energy Laboratory (NREL) is also assisting 14 countries in the Southern African Development Community with the development and implementation of a clean energy technology investment plan. This CTI work is referred to as support for Cooperative Technology Implementation Plans (CTIP) and builds on the TCAPP approach, applying this framework at a multilateral scale with active participation of numerous OECD countries through CTI.

This report is an update of the TCAPP report prepared in October, 1999 for distribution at COP-5 and discusses recent progress and results of the work in each of the participating countries. Following this summary chapter, the report contains chapters that describe the status and results of the work in each of the participating countries and that provide conclusions prepared by the participating countries on the TCAPP and CTIP integrated approaches to climate change technology transfer. Further information is also available from the TCAPP web site at <http://www.nrel.gov/tcapp>.

## **TCAPP APPROACH**

TCAPP applies an integrated approach that couples four major activities together to help countries accelerate implementation and investment in their clean energy technology priorities. As depicted in the figure below, these activities include:

- ❖ A country driven process for selecting priority technologies and for designing and implementing actions to overcome barriers to investment and deployment of these technologies.
- ❖ Active in-country and international business and investor participation in the design and implementation of these actions to ensure that they will be effective at catalyzing sustained private investment in the priority technologies
- ❖ Bilateral and multilateral donor participation to secure ongoing donor support for actions that require further donor funding and to promote effective integration with current donor programs
- ❖ International technical support to assist countries with the design and implementation of their actions and to effectively link the work of the country teams with the business and donor community.



Through these activities TCAPP integrates the major elements of a technology transfer framework into one comprehensive program where developing countries, developed countries, the business and donor community operate in close partnership. The CTIP program of the Climate Technology Initiative follows a very similar integrated approach. A short description is provided below of how TCAPP and CTIP address the major elements of the technology transfer framework that have been proposed through the technology transfer consultative process.

- ❖ **Needs Assessment:** The TCAPP priority setting process enables countries to complete technology needs assessments with active in-country stakeholder participation. TCAPP provides technical and financial support to the country teams for this needs identification process. TCAPP helps facilitate active participation of key in-country stakeholders and international experts and businesses (where appropriate) to help countries identify high priority actions that will be most effective at catalyzing technology transfer and investment and will enjoy broad support.
- ❖ **Capacity Building:** Once priority technologies are defined, TCAPP facilitates a partnership between the developing countries, the U.S. Government and other donor organizations, and the business community to implement 4-6 high priority actions for building capacity and overcoming barriers to technology transfer and investment in the priority technologies. These capacity building activities have included training workshops and study tours on technology applications and implementation, assisting in-country and international businesses in developing and financing joint projects, technology testing and verification, assisting countries with development and implementation of pilot programs, policy reforms, and public education programs. TCAPP assists countries with the design and implementation of these programs and where needed helps countries secure active international business and investor and donor participation and support.
- ❖ **Technology Information:** TCAPP provides developing countries with access to technology information to assist them in setting priorities and designing and implementing technology transfer actions. This includes providing countries with the most current information on technology performance, costs, applications and implementation strategies. TCAPP compiles technology information in reports presented to countries, supports workshops and study tours to present technology information to country teams, and helps countries learn about and gain access to international sources of technology information.

- ❖ **Technology Transfer Mechanisms:** TCAPP can be viewed as a possible bilateral technology transfer mechanism, with the similar CTIP program of the Climate Technology Initiative as an example of a possible multilateral technology transfer mechanism. While both TCAPP and CTIP have focused on the energy sector to date, these approaches could easily be expanded and refined to address non-energy technologies and to address adaptation technology transfer.

## **SUMMARY OF TCAPP AND CTIP PROGRESS AND RESULTS**

The Technology Cooperation Agreement Pilot Project (TCAPP) and the related CTIP work in Southern Africa has made considerable progress in removing market barriers and increasing implementation and investment in the clean energy technology priorities of the participating countries. TCAPP and CTIP have also become leading models for implementation of technology transfer under the UNFCCC. Highlights of TCAPP and CTIP results to date, include:

- ❖ Implemented more than 20 actions to remove clean energy market barriers and build technology and business capacity in the participating countries. For example these actions include a sugar mill co-generation financing workshop in Brazil, a wind turbine testing training workshop in China, refinery energy efficiency pilot projects in Egypt, energy auditing training in Korea, development of an ESCO pilot program in Mexico, and renewable energy policy reform in the Philippines. The table on the following pages provides a more complete description of these actions across all of the countries.
- ❖ Facilitating the development of 13 clean energy business projects in the participating countries and initiated work on over 10 additional prospective projects. These projects involve partnerships between in-country and international businesses designed to accelerate the pace of implementation of priority technologies. If these projects are fully implemented, they will result in up to \$100 million of investment in the clean energy priorities of the participating countries and reductions in GHG emission of up to 200,000 tons of carbon/yr. (4.0 million tons of carbon over the lifetime of the projects).
- ❖ TCAPP and the CTIP work in Southern Africa have become leading international models for technology transfer implementation under Article 4.5 of the UNFCCC. The TCAPP and CTIP approaches have been highlighted as effective approaches for technology transfer implementation during the UNFCCC technology transfer consultative process and during side events at the climate change negotiations.
- ❖ Over 400 international business representatives are participating in TCAPP, including engaging in the development of investment projects and in business to business training and capacity building activities and in providing input on the implementation of barrier removal actions in the countries.
- ❖ More than 10 bilateral and multilateral donors are engaged in TCAPP and the CTIP work in Southern Africa and TCAPP and CTIP are helping the countries secure ongoing support from these donors for continuing implementation of technology transfer actions.

## *Summary of TCAPP and CTIP Technology Transfer Actions and Results*

Country	Lead Agency	Technology Transfer Actions	Key Results to Date
Brazil	Ministry of Mines and Energy	<p>Co-generation Pilot Project Development</p> <p>Transportation Conference and Fleet Management Software Implementation Projects</p> <p>Fuel Cell Demonstration Projects</p> <p>Rural Renewable Energy Field Tests</p>	<p>Have identified partners to potential sugar mill co-generation projects, discussions underway about attracting project financing.</p> <p>Developing joint ventures between international suppliers of fleet management software and Brazilian partners, assisting in identifying fleet managers to participate in a demonstration project.</p> <p>Developed collaborative proposal between international and Brazilian businesses for fuel cell demonstration projects. Currently seeking funding</p> <p>Developed PRODEEM Solicitation for Expanded Rural Renewable Energy Field Testing. Solicitation release pending with PRODEEM</p>
China	State Development Planning Commission	<p>Wind Turbine Testing for Certification</p> <p>Wind Business Partnerships</p> <p>Wind Resource Assessment</p> <p>Motors efficiency financing and business partnerships</p> <p>Motors Testing, Certification, Standards, and Labeling Efficient Motors Training and Demonstration</p>	<p>Held training for Chinese turbine manufacturers and technical institutes on testing and certification of wind turbines. Certification program under development.</p> <p>Regional workshops to assist local power bureaus in developing and issuing competitive solicitations under development</p> <p>Prepared proposals for resource assessment and monitoring work to UNEP/GEF and UNDP and assisting with measurement standards for China</p> <p>Convened motors financing seminar in China with 80 participants, completed motors study tour in U.S., several pilot projects under development</p> <p>Providing technical assistance on motors testing protocols, certification, and standards</p> <p>Prepared proposal for motors exhibition and training center and identified interested business partners, assisted with motors conference in Beijing, presented proposal to companies and donors.</p>

Country	Lead Agency	Technology Transfer Actions	Key Results to Date
Egypt	Egyptian Environmental Affairs Agency	<p>Refinery Efficiency Project Development</p> <p>Energy Efficiency &amp; Natural Gas Investment Workshop</p> <p>Energy Efficiency Technology Center</p> <p>Energy Efficient Lighting Program</p> <p>Renewable Energy Investment Conference</p>	<p>Held joint meetings between Ministry of Petroleum and efficiency vendors to identify potential pilot projects, work on pilot projects has been initiated with one major international company.</p> <p>Workshop tentatively planned for early 2001 with goal of developing actions to remove barriers to conversion of industrial facilities from fuel oil to natural gas and identify other steps for facilitating energy efficiency markets</p> <p>Currently developing detailed plans for the design of this center in collaboration with Egyptian partners and the business community</p> <p>Specific activities still under discussion</p> <p>Conference planned for early 2001</p>
Kazakhstan	Ministry of Energy, Industry and Trade	<p>Oil Refinery Gas Utilization Pilot Projects</p> <p>Coal Bed Methane Recovery Pilot Projects</p> <p>Small Hydropower Pilot Projects</p>	<p>Initial evaluation conducted in May 2000 to assess potential project opportunities. Project developers are being interviewed to identify barriers to project implementation and future replication. Follow-up activities are now under consideration.</p> <p>Currently conducting interviews with project developers in this sector to identify specific barriers to project development and replication. Actions based on this feedback will be designed and implemented in early 2001.</p> <p>Data collected on market potential and specific project opportunities identified through collaboration with EIC and KazNPIEenergoprom. Development and circulation of project briefs in coordination with the U.S. Hydropower Council is planned.</p>
Korea	Korean Energy Management Corporation	<p>ESCO Pilot Projects and Energy Management Training and Certification</p> <p>Landfill Methane Pilot Projects, Study Tour, and Training</p> <p>Waste Heat Recovery Pilot Projects</p>	<p>ESCO pilot project under development between Hyundai, Sempra, and EPS Korea for energy efficiency retrofits for Hyundai Ulsan plant. Energy auditing training conducted in January, 2000. Assisting KEMCO with development of certification program for the energy services industry.</p> <p>Methane recovery project under development between City of Ulsan, SK Corporation, and Duke Engineering. Study Tour visiting U.S. in October, 2000 and methane recovery training course planned for early, 2001</p> <p>Pilot projects being identified by KEMCO. Korean waste heat recovery experts conducted study tour in U.S. in October, 2000</p>

Country	Lead Agency	Technology Transfer Actions	Key Results to Date
Mexico	National Commission for Energy Conservation	<p>ESCO Pilot Program for Industrial and Municipal Sectors</p> <p>Solar Water Heating Financing and Business Partnerships</p> <p>Steam Generation and Distribution Investment Partnerships</p>	<p>Pilot program approved and initiated by CONAE. In response to a solicitation and outreach to Mexican end users, several pilot projects have been proposed that are currently undergoing further evaluation and development. Guidelines for performance contracting have been developed for Mexico.</p> <p>Solar Water Heating Investment Roundtable held in May 2000, which has led to an agreement to prepare a proposal for World Bank and GEF financing. Business matchmaking mission held in May, 2000 resulting in sale of solar hot water heaters from AET to Optima Energia of Mexico. Established web site for business matchmaking. Developing solar water heating projects with Mexican Hotels.</p> <p>Assisting CONAE and other partners in identification of project opportunities and business matchmaking.</p>
Philippines	Philippines Department of Energy	<p>Fast Track Renewable Energy Policy Reforms</p> <p>Solar Powered Agricultural Water Pumping Pilot Program</p> <p>Hydropower Market and Project Development</p> <p>Isolated Grid Hybridization with Wind Energy</p>	<p>Philippines Secretary of Energy signed a Department Circular in March, 2000 approving 5 major policy reforms that will streamline accreditation of renewable energy generation facilities. President Estrada signed Executive Order 232 in April, 2000 that allows PDOE to revise regulations on private sector participation in utilization of wind, solar, and ocean resources. PDOE has drafted the revised regulations for public comment.</p> <p>Draft MOU developed with Department of Agriculture, WorldWater Corporation and other parties to establish this pilot program. Initial economic analysis conducted of solar powered water pumping underway.</p> <p>Data collection on hydropower market opportunities completed in collaboration with Philippines DOE and U.S. Hydropower Council. Currently developing retrofit projects with rural electric cooperatives, North American Hydro, and others.</p> <p>In collaboration with PDOE, NPC-SPUG, and Breeze Electric Philippines, evaluated the technical potential for wind-diesel projects and identified potential sources of financing for such projects. Training for electric cooperatives planned for November, 2000 to prepare cooperatives to manage technical issues of wind-diesel projects.</p>

Country	Lead Agency	Technology Transfer Actions	Key Results to Date
Southern African Development Community (CTIP work)	SADC Environment and Land Management Sector (SADC-ELMS)	<p>Draft Action Plan developed. This plan proposes a portfolio of actions for 6 priority technologies, including:</p> <p>Efficient and PV Lighting: Develop regional standards and ratings and establish revolving loan fund</p> <p>Efficient Motors and Boilers: Training program for industries and guidelines and establish low-cost financing</p> <p>Efficient Housing Design: Regional seminar to develop standards and design guidelines and training program for architects, and developers.</p> <p>Solar Crop Drying: Public education campaign and business network for manufacturing and distribution</p> <p>Biomass Electricity Generation: Regional model independent power purchase agreements and investment workshop</p> <p>Natural Gas: Assistance with gas development plans, legal frameworks and guidelines and regional loan fund for capital investments</p>	Further work on design and implementation of these actions will start once CTI and SADC review of these actions is completed and further CTI funding is provided. It is anticipated that 4-6 actions will be selected for immediate implementation and that these actions will be initiated by January, 2001

# ~ Brazil ~

## UPDATE OF TCAPP ACTIVITIES

OCTOBER 2000

Brazil has participated in TCAPP since mid-1998, when an interagency team led by the Ministry of Mines and Energy selected five priority areas. Since that time, TCAPP has worked closely with existing Brazilian programs and other institutional partners in the area of energy efficiency and renewable energy to devise approaches to increasing private investment in the priorities. Recent activities have been focused on three areas where technology cooperation could play an instrumental role in stimulating private investment, including transportation energy efficiency, cogeneration and fuel cell deployment. TCAPP has worked closely with Brazilian partners and the international business community in all three areas and has made good progress in accelerating private investment in these clean energy technologies.

### OBJECTIVES

Brazil has long recognized that many of the technologies that can reduce greenhouse gas emissions can also produce an economic benefit. Developing an energy system that benefits the country, both economically and environmentally, is a high priority. Brazil recognizes that TCAPP is a program that can help produce both of these benefits. Brazil's goals in TCAPP are:

- ❖ to foster private investment in clean energy technologies that speed economic development;
- ❖ to engage host country and international donor support for actions to build sustainable markets for clean energy and clean energy technologies;
- ❖ to enhance Brazilian technology development in emerging technologies such as fuel cells and renewable energy (solar, wind and biomass);
- ❖ to promote cooperative work between local and international technical groups.

### TECHNOLOGY PRIORITIES

An interagency team, led by the Ministry of Mines and Energy, selected priority areas after deciding to participate in TCAPP in mid-1998. Other agencies participating in the interagency group included the Ministry of Science and Technology, the Ministry of Foreign Relations, the National Agencies for Fuel (ANP) and Electric Energy (ANEEL), the National Council for Scientific and Technological Development, PROCEL, Eletrobras and CEPTEL. Later that year the initial set of priorities were revised into a list of five:

- ❖ Transportation Energy Efficiency
- ❖ Direct Use of Natural Gas
- ❖ Electrical Energy Efficiency
- ❖ Rural Renewable Energy
- ❖ Fuel Cells

The national programs for electrical energy efficiency (PROCEL), fossil fuel energy efficiency (CONPET) and rural renewable energy (PRODEEM) first led the development of a technology cooperation strategy. This strategy provided guidance as more partners became involved,

including business groups, trade associations and non-government organizations. Together, they identified a variety of investment actions” including workshops, trade missions, business solicitations, and investment training. TCAPP is now pursuing these actions to attract international companies to the Brazilian market and support development of joint investment projects with Brazilian partners.

## **TECHNOLOGY COOPERATION ACTIONS**

### ***1. Cogeneration Project Development***

*Investment Action:* TCAPP is attracting international companies to the cogeneration market in Brazil and supporting development of projects in partnership with Brazilian and international organizations. (This activity area evolved out of the Industrial Efficiency priority and the Direct Use of Natural Gas priority.)

*Participating Organizations:* TCAPP has been working very closely with the National Institute for Energy Efficiency (INEE), the most visible proponent and convener of cogeneration interests in Brazil over the last several years, Copersucar (Brazil’s sugarmill association), the International Cogeneration Alliance, the International Institute for Energy Conservation (IIEC) and Econergy International.

*Activities:* TCAPP has been making progress in supporting cogeneration project development in Brazil. TCAPP’s efforts to date include:

- ❖ Convening a seminar on Brazil cogeneration in Washington D.C. in February where Brazilian officials presented information on the cogeneration market to potential international partners.
- ❖ Conducting an ambitious outreach to more than 2000 contacts around the world, to publicize INEE’s May, 2000 conference on cogeneration and distributed generation. The conference attracted more than 200 participants - confirmation that cogeneration is a promising market opportunity. The conference highlighted the fact that a large supply deficit is encouraging utilities to buy power - and they are responding by signing power purchase agreements. The conference also identified cogeneration in sugar mills as a particularly attractive opportunity, noting that achieving the full potential on a sugar mill project will require access to international financing and the participation of international companies.
- ❖ Following the cogeneration conference, TCAPP has collaborating with Copersucar, the sugar mill cooperative, and with sugar mill owners. TCAPP will be assisting sugar mill owners in attracting financing.

Some of the key next steps include:

- ❖ Assisting a few sugar mills as they finalize financing for their projects.
- ❖ Working with Copersucar to identify a few more sugar mill owners who are interested in pursuing projects. (Copersucar is hosting a workshop in early December.)
- ❖ Assisting sugar mill owners in project development by identifying sources of financing and expert financial consultant support.

### ***2. Transportation Energy Efficiency Investment Conference***

*Investment Action:* To support the development of projects designed to demonstrate energy efficiency transportation technologies for fleets.

*Participating Organizations:*

- ❖ The Brazil National Program for Fuel and Natural Gas Conservation (CONPET),
- ❖ The Ministry of Mines and Energy (MME)
- ❖ The Ministry of Transportation (GEIPOT)
- ❖ The Ministry of Justice – National Transit Department (DENATRAN),
- ❖ The State of Rio de Janeiro Department of Energy, Naval and Petroleum Industry (SEINPE)
- ❖ The Special Transport Department of the City of Rio de Janeiro (SETP)
- ❖ The National Transport Confederation(CNP)
- ❖ The National Association of Public Transport (ANTP)
- ❖ PETROBRAS
- ❖ The National Petroleum Agency (ANP)
- ❖ The Institute of Technical Assistance, Development and Quality in Transport (IDAQ)
- ❖ The Foundation for Sustainable Development (FBDS)
- ❖ The Brazilian Association of Highway Concessionaires (ABCR)
- ❖ The U.S. Agency for International Development (USAID)

*Activities:* TCAPP assisted CONPET as they convened a conference on energy efficiency in road transportation, by:

- ❖ Recruiting international experts to speak at the conference.
- ❖ Helping to publicize the conference.
- ❖ Conducting market research which showed that fleet management software could help fleet managers in Brazil become more energy efficient.
- ❖ Identifying two fleet management software companies from the U.S. that were interested in the Brazil market.
- ❖ Identifying prospective partners and potential customers in Brazil and by setting up meetings during the transportation conference.

There was a great deal of interest in the software, and TCAPP is following up by:

- ❖ Continuing dialogue with the U.S. fleet management software companies and the Brazilian consulting firms to facilitate partnerships.
- ❖ Identifying possible partners and participants for a demonstration project.

### ***3. Fuel Cell Market Development***

*Investment Action:* To assist partners in Brazil in demonstrating fuel cell technologies as a way to accelerate market development.

*Participating Organizations:* Catholic University of Rio de Janeiro, (PUC-Rio) and a number of private sector partners, including Seimens Westinghouse, GE Power Systems, AeroVironment, Inc., Boilingstone Energy, Enc., the American Hydrogen Association, Gridwatch.com, and the Distributed Power Coalition of America.

*Activities:* TCAPP recruited eight international partners for a proposal that PUC-Rio developed for their proposed fuel cell demonstration project.

Although the first proposal to a Brazilian oil royalty fund was not funded, PUC-Rio remains committed to the project and will be submitting the proposal to other prospective funders. Next steps include:

- ❖ TCAPP is assisting PUC-Rio on another component of the project, by identifying international suppliers of conversion kits to convert diesel generators to natural gas.
- ❖ TCAPP will continue to assist PUC-Rio in identifying international partners to the project.

#### **4. Rural Renewable Energy - Introduce New Technologies to PRODEEM**

*Investment Action:* To assist PRODEEM in attracting renewable energy technologies into the rural renewable market to help expand their efforts beyond photovoltaics, which has been the main emphasis up to now.

*Participating Organizations:* PRODEEM, a national program on rural renewable energy.

*Activities:* TCAPP helped PRODEEM design a solicitation process to attract more private sector investment. TCAPP completed a draft Request for Proposal for a Renewable Energy Field Test and worked with the Business Council for Sustainable Energy to identify over 20 companies interested in this solicitation. New leadership at MME has not yet set a date for issuance of the RFP.

## **CONCLUSIONS**

TCAPP has been underway in Brazil for a little more than two years. The effort has evolved, and seems to be continuing its evolution as it becomes more focused on specific projects. More Brazilian partners are getting involved as TCAPP becomes more specific. Although there is much left to be done, some conclusions can be drawn at this stage:

- ❖ TCAPP has succeeded in engaging a wide variety of Brazilian participants, from the level of national policy makers to the companies interested in greenhouse gas emission reduction activities.
- ❖ TCAPP's priority setting process has proven to be effective. Two years after the priorities were set, TCAPP's work continues to focus on important Brazilian development goals. The cogeneration activity helps increase electric supply. The transportation work will increase efficiency and reduce air pollution. The fuel cell demonstration will help Brazil gain access to an important new technology.
- ❖ The participation and interest in Brazil is evidence that the priorities selected for TCAPP are solid and compatible with Brazil's needs and opportunities. The participation of Brazilian organizations in the TCAPP effort is also assurance that the basic direction is driven by Brazilians.
- ❖ The market orientation of TCAPP is becoming more evident as more private firms, in Brazil and internationally, show interest in making investments in the TCAPP priority areas.
- ❖ The TCAPP effort in Brazil has been a useful exercise for Brazil to be involved in as the technology transfer issue has been addressed in the climate negotiations.

### **SCHEDULE OF KEY NEXT STEPS**

- December, 2000 Copersucar workshop to attract the interest of a few additional sugar mills in pursuing cogeneration projects.
- December, 2000 Fleet management software partnerships firmed up.
- December, 2000 Possible workshop for fleet managers to build support for a demonstration project.
- March, 2001 Feasibility study partners on board and studies underway for cogeneration projects.
- April, 2001 Fleet management demonstration project underway.

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# ~ CHINA ~

## US/CHINA CLEAN AIR AND CLEAN ENERGY TECHNOLOGY COOPERATION UPDATE OF TCAAP ACTIVITIES

**OCTOBER 2000**

A collaborative project has been established between the U.S. and Chinese governments to contribute to the implementation of technology transfer under the UNFCCC. This technology cooperation project targets technologies which have the dual benefits of promoting efficient economic development and reducing air pollution and greenhouse gas emissions at the project level. The project supports the provisions of UNFCCC and relevant decisions made by the Conference of the Parties on Development and Transfer of Technology.

This project was formerly led by the Chinese Ministry of Science and Technology, but since 1999, has been led by the Chinese State Development Planning Commission (SDPC) and the U.S. Environmental Protection Agency (EPA). The six technology priorities, which have been selected in an interagency process, include: high efficiency electric motors, grid-connected wind electric power, efficiency improvements in coal-fired industrial boilers, cleaner coal technologies for power generation, biomass gasification, and natural gas combined cycle power generation.

During 1999-2000, this project focused on the wind and motors sectors, which were analyzed by technology teams comprised of Chinese and US experts. Each technology team proposed six action options for overcoming barriers to development of their sector and an interagency team selected three of these actions for implementation in each sector. Actions ranged from capacity building to business development to pilot project development activities. For example, during the first year, training was held on wind turbine testing and certification, a proposal for a motors demonstration center was developed and discussed with industry, and financiers for motors projects were identified and linked with suppliers and end-users. During 2000-2001, this project will complete activities in the wind and motors sectors and begin work in the clean coal and boilers sectors.

### **INTRODUCTION**

In early 1998, TCAPP was initiated in China through cooperation between the U.S. National Renewable Energy Laboratory (NREL), the Chinese Ministry of Science and Technology (MOST), and Tsinghua University (TU) of China. During this time, MOST was one of the major coordinators for Chinese climate change activities. A reorganization in late 1998 led to the designation of the SDPC as the lead organization in China's National Coordination Committee for Climate Change. The Office of National Coordination Committee for Climate Change within SDPC leads the negotiations for China in the UNFCCC, and staff from this office participate in the SBSTA and COP events.

As a result, SDPC assumed responsibility for the technology cooperation work, which was renamed the Clean Air and Clean Energy Technology Cooperation project. The project is based upon the Statement of Intent signed by Minister Zeng Peiyan of SDPC and EPA Administrator Carol Browner in April, 1999.

## **OBJECTIVES**

The goals of this project, as stated in the Statement of Intent, are to:

- ❖ Further identify priority energy technology areas that support the sustainable development priorities of China and simultaneously reduce greenhouse gas emissions at the project level;
- ❖ Identify environmentally sound energy technologies in energy field that are suitable for China and can be facilitated through Sino/U.S. bilateral cooperation;
- ❖ Analyze and identify barriers of priority technology transfer to China; and
- ❖ Put forward proposals for overcoming barriers of priority technology transfer.

## **PROJECT TEAMS**

On the Chinese side, the main institutions and teams are:

- ❖ SDPC – Lead Chinese agency; provides guidance and direction for the program and ensures participation of relevant ministries.
- ❖ Inter-Agency Team – Broad-based stakeholder group, including key members of the National Coordination Committee for Climate Change which reviews and approves every key step of the project process including the selection, design, and implementation of actions.
- ❖ Tsinghua University (TU) – Lead focal point and technical institution, coordinating all project activities and main counterpart for NREL.
- ❖ Wind and Motors Technology Teams – Lead analysis and the design and implementation of specific technology actions.

On the U.S. side, the main organizations are:

- ❖ EPA – Lead U.S. agency; provides overall guidance and direction for U.S. teamwork and financial support.
- ❖ National Renewable Energy Laboratory (NREL) – U.S. focal point, lead technical institution; coordinates U.S. technical assistance, assists in attracting donor support and international business participation.
- ❖ Business Council for Sustainable Energy (BCSE) – coordinates and engages international private sector businesses and investors through their network of over 300 international businesses.
- ❖ Other Technical Support – national laboratories and other experts provide specific technology, business and project development, and financing expertise. These include the Lawrence Berkeley National Laboratory (LBNL), Pacific Northwest National Laboratory (PNNL), National Energy Technology Laboratory (NETL), and International Institute for Energy Conservation (IIEC).

## **TECHNOLOGY PRIORITIES**

In 1998, a one-day scoping meeting was held in Beijing to select clean energy technology priorities for China. Both domestic and U.S. technical experts from a variety of energy sectors participated. After extensive discussion, preliminary priority GHG mitigation technology areas in China were identified using the analytical hierarchical process. First, the experts identified 5 categories of criteria to screen technology priorities. Second, based upon these criteria, the experts listed mitigation technologies in different sectors and proposed 19 technologies for further consideration. Third, about 20 domestic technical experts in the meeting were asked to score each of the 19

technologies according to each criterion. Each criterion was given equal weight and scores were added. The top five technologies were identified as the priority energy technologies for GHG mitigation in China. The selected priorities were:

- ❖ high efficiency electric motors,
- ❖ grid-connected wind electric power,
- ❖ efficiency improvements in coal-fired industrial boilers,
- ❖ cleaner coal technologies for power generation, and
- ❖ coal bed methane recovery.

Using this methodology, the Chinese ensured that their technology priorities had substantial environmental and economic benefits, were viable candidates for successful technology transfer, and had sizeable investment opportunities.

During 1998, TU and NREL guided a team of Chinese technical experts through the process of developing a technology cooperation framework that discusses market barriers and technology options to overcome these barriers for each technology priority.

In 1999, SDPC and EPA agreed to build on and greatly expand this collaborative technology cooperation process over the next three years. This bilateral agreement supports the development and implementation of projects and their action proposals in the first four priority energy technologies (coal-bed methane was taken out of this project and became a separate bilateral project) identified in the 1998 scoping meeting, and the identification of additional priority energy technologies for this process. During an interagency team meeting in January 2000, two additional priority technologies – biomass gasification and natural gas combined cycle power generation – were selected using the same analytical hierarchical process from the 1998 scoping meeting. SDPC and EPA agreed to focus on wind and motors in the first year of the project, then add clean coal and boilers during the second year, and finally focus on biomass and natural gas in the third year.

## **TECHNOLOGY COOPERATION ACTIONS**

A delegation including officials from EPA and technical experts from NREL, LBNL, PNNL, and NETL visited Beijing, China during July, 1999. In order to provide a forum to invite comments from experts on the work plan of the project, a series of informal technical meetings were held in each of the four priority technology areas: high efficiency electric motors, grid-connected wind electric power, efficiency improvements in coal-fired industrial boilers, and cleaner coal technologies for power generation. Participants included Chinese technical experts, experts from local offices of foreign corporations and institutions, and experts from U.S. national laboratories and institutions. The main purpose of these meetings was to have a brief and general discussion of the various technology options within each of the four priorities, the barriers to implementation of these options, and possible solutions for overcoming these barriers.

In the fall of 1999, motors and wind teams were established. They analyzed their sectors and completed reports on the current status of these technologies in China, conducted case studies of past technology transfer efforts, and identified needs for advanced technologies, difficulties and obstacles for development of these technologies, and market strategies for development of these technologies. Each team proposed 6 action options to overcome barriers and facilitate investment in each sector. During an interagency meeting in January 2000 in Beijing, 3 actions

in each sector were selected for implementation. Teams then detailed action proposals and began implementation of activities. Thus far, good progress has been made in six areas:

### **Wind Actions**

- 1) ***Wind turbine testing for certification*** – Through an information exchange, NREL provided international recommended practices and standards information to the wind team and met with members of the wind team to explain the testing and certification process in the US. During this meeting, the wind team identified high priority needs: safety, system verification, and power curve measurement. During July 26-27, 2000 in Beijing, the wind team organized a wind turbine testing workshop to build local capacity in types of testing and certification, testing protocols and testing equipment. The Chinese government is currently identifying which organizations will be responsible for testing and certification and the China Classification Society is preparing the Chinese certification scheme for wind turbines.
- 2) ***Wind business partnerships*** – The wind team is investigating regional workshops to inform local utilities about the benefits of wind power and how wind power may be cost-effectively implemented and assist local utilities in issuing competitive solicitations for wind power generation. The team, in conjunction with NREL and Yuehua Company in Guangzhou, are considering a regional workshop to help utilities work through these issues in wind development. Our goal is to influence at least 1 local utility to issue an international competitive solicitation for wind power by mid-2001. A wind industry roundtable was held in DC in April, 2000 with members of the wind team, Chinese wind companies, and US wind companies to further business partnerships between international and Chinese companies and begin a dialogue on windpower development in China that will attract private investment and reduce costs through competition.
- 3) ***Wind resource assessment*** – The wind team has translated the US wind resource assessment and monitoring handbook into Chinese and will use it as a reference for developing domestic standards for resource measurement. The team has identified high-priority regions for assessment and prepared a proposal with NREL to secure funding to expand earlier assessment activities through participation in the UNEP/GEF Solar and Wind Energy Resource Assessment Project. The team has already been instrumental in securing endorsement from the Ministry of Finance for this project proposal. Hopefully work can begin on this project in 2001-2002.

### **Motors Actions**

- 4) ***Motors financing and business partnerships*** – The motors team and IIEC co-sponsored an International Financing Seminar on China High Efficiency Motors during July 19-20, 2000 in Shanghai to develop pilot projects between end-users, suppliers and financiers. This seminar disseminated information on financing mechanisms to 80 participants from international and local investment communities, motors manufacturers and end-users. Follow-on work will include project development activities and identification of financing for pilot projects. Our goal is to develop at least 2-3 motors projects by November 2000 as a result of partnerships from the seminar. During September 18-29, 2000 members of the motors team, SDPC and Tsinghua University participated in a study tour of the US. The goals were to further develop business partnerships with US motors and drives companies and to discuss potential projects with financiers and donors. This included visits to Rockwell, Robicon, Magnadrive, WorkSmart Energy Enterprises and Bechtel and a roundtable discussion hosted by BCSE, which included several companies and financiers. The motors team has identified Chinese companies that are interested in potential joint ventures with Magnadrive and WorkSmart Energy Enterprises.

- 5) ***Motors Testing, Certification, Standards, and Labeling*** – The goals of this action are to provide information on test protocols, certification and standards; assist in selection of appropriate protocols, certification and standards; find potential hosts for testing; help secure funding for testing facility and equipment; and initiate training in testing, standards, and certification. Participating organizations include the Beijing Power Electronics R&D Center and IIEC. A Chinese motors delegation visited the US with IIEC in Feb. 2000 to learn about testing and visit US labs and companies. Information on test procedures, certification, and standards has been provided to the motors team.
- 6) ***Efficient Motors Training and Demonstration*** – The goals of this action are to identify training needs and potential host institutions; secure funding for a training center; provide motors selection and motors systems design software and training; and initiate training. Participating organizations include: Beijing Power Electronics R&D Center, Local Government of Fengtai District, LBNL, American Council for an Energy-Efficient Economy, IIEC and NREL. Previous US-funded motors activities included training workshops and a study tour. To supplement these training activities, funding was sought from other international organizations. The training will involve development of educational materials, analysis tools and standards for promoting motor system optimization in China, and development of local infrastructure. To fund the establishment of an Efficient Motors Exhibition and Training Center to house training activities, the motors team has prepared a proposal which can be used to solicit additional donor support. The motors team is helping to co-sponsor the Power & Electronic and Motion Control Conference, and the Power & Electronic and Electric Drive Exhibition in August 16-18 in Beijing, during which the motors team will present this proposal. The Business Council on Sustainable Energy has assisted in attracting US suppliers to this conference. For example, Rockwell has expressed interest in the Center and is also interested in joint work with this project on standards and policy issues.

During the second year of the project, work will be started in the clean coal and industrial boilers sectors. During the 9/00 US study tour, the Chinese delegation visited NETL and developed a workplan for these new technology priorities. Teams and team leaders on the US and Chinese sides will be established during October 2000 and in November/December 2000, the US clean coal and boilers teams will attend a series of meetings with the Chinese teams in Beijing to discuss the technology situation in China and propose actions to overcome barriers in implementation of these technologies. An interagency team will select 2-3 actions in each sector and the US and Chinese teams will design action plans that will be implemented in 2001.

## CONCLUSIONS

A project review meeting was held during September 2000 with SDPC, EPA, NREL and TU. The team agreed that the first year of the project had been successful and that substantial progress had been made in technology cooperation between the US and Chinese teams on wind and motors. The International Financing Seminar on China High Efficiency Motors and the Wind Turbine Testing Training Workshop built a good foundation for further business partnerships and capacity building activities. Furthermore, good working relationships were established with US companies and national laboratories through study tours and business roundtable meetings. During the next year, it is hoped that the work can progress more efficiently and quickly as the team learns from last year's experiences and that this can lead to more pilot project implementation. It is also hoped that this project can build interest of international financiers in China's renewable energy and energy efficiency markets.

## **TIMELINE OF ACTIVITIES AND SCHEDULE FOR NEXT KEY STEPS**

March 1998 – Scoping meeting – interagency team selected wind, motors, clean coal, boilers, and coal-bed methane technology priorities.

October 1998 – Technology Cooperation Framework for 5 technologies completed.

April 1999 – Statement of Intent for this project signed by EPA and SDPC. Coal-bed methane technology priority became a separate bilateral project.

July 1999 – Wind, motors, clean coal, and boilers technology team meetings in Beijing.

November 1999 – Establishment of wind and motors teams and points of contact for clean coal and boilers.

January 2000 – Completion of technology and market strategy reports and 6 action options in wind and motors sectors.

January 2000 – Interagency team meeting in Beijing: review of reports; selection of 3 actions in each sector; and selection of 2 additional technology priorities – biomass and natural gas.

April 2000 – Wind team study tour to the US.

April 2000 – Wind industry roundtable meeting in Washington, DC.

July 2000 – International Financing Seminar on China High Efficiency Motors in Shanghai.

July 2000 – Wind Turbine Testing Training Workshop in Beijing.

August 2000 – Power & Electronic and Motion Control Conference, and the Power & Electronic and Electric Drive Exhibition in Beijing

September 2000 – Motors team study tour to the US.

September 2000 – Energy Efficiency business roundtable meeting in Washington, DC.

October 2000 – Establishment of US and Chinese teams for clean coal and boilers and points of contact for biomass and natural gas.

November 2000 – Identification of 2-3 efficient motors systems implementation projects.

December 2000 – Technology team meetings in Beijing to propose 6 action options in clean coal and boilers sectors. Interagency team meeting to select 2-3 actions in each sector. Technology team meetings to design action plans.

January 2001 – Initiate implementation of actions for clean coal and boilers.

mid-2001 – Identification of utility to issue pilot competitive solicitation on wind development.

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# ~ EGYPT ~

## UPDATE OF TCAPP ACTIVITIES

**OCTOBER 2000**

As part of the work of the Science and Technology Subcommittee and the Subcommittee on Environment and Development under the Gore-Mubarak Cooperative Agreement, Egypt identified technology transfer as one of its highest priorities. The Egypt Technology Cooperation Agreement Pilot Project was initiated in September, 1999, as a means to further this technology transfer objective. After defining four technology priority areas, the project team began the process of designing and implementing actions to address barriers to the market penetration in these technology areas. In the next few months, Egypt TCAPP will focus on actions to facilitate technologies for the increased use of natural gas in industry and related technologies to increase energy efficiency in this sector. TCAPP is also facilitating discussions of a significant energy efficiency retrofit in the refinery sector. In early 2001, Egypt TCAPP is planning for actions to promote the use of renewable energy technologies for remote applications.

### **OBJECTIVES**

The project has the following overall goals:

- ❖ Develop consensus among key Egyptian organizations on a set of high priority, climate-friendly mitigation technology areas where both domestic and international actions are necessary to promote their effective deployment in the Egyptian economy.
- ❖ Identify and prioritize the actions necessary to remove barriers to the penetration of these technologies.
- ❖ Develop and carry out a plan to implement these actions, leading to the development of projects in the priority technology areas.

### **EGYPT TCAPP TEAM**

The Egyptian Environmental Affairs Agency (EEAA) has the lead role in this effort. The interagency working group for TCAPP also includes members from the New and Renewable Energy Authority, the Ministry of Electricity, and the Organization for Energy Conservation and Planning. The Ministry of Petroleum has recently agreed to nominate representatives to the working group. Private sector participants include BP Amoco Egypt, Esso Egypt, and Honeywell. Consultants from the Advanced Technology Consultant Group, the Tabbin Institute for Metallurgical Studies, Cairo University, and Zagazig University and Nexant are also participating in the project.

### **TECHNOLOGY PRIORITIES**

Through an interagency process during the Fall of 1999, Egypt identified the following technology priority areas:

- ❖ Industrial energy efficiency measures, especially combustion efficiency, and fuel switching to natural gas

- ❖ Lighting efficiency technologies and renewable-powered lighting in semi-remote applications
- ❖ Small-scale cogeneration applications
- ❖ Renewable energy applications in rural areas

These technologies were proposed by the TCAPP working team, based on data and analysis developed in the Egypt Country Study and other previous work. The Inter-ministerial Committee on Climate Change then ratified the technology priorities.

## TECHNOLOGY COOPERATION ACTIONS

The Egypt TCAPP team has recently begun the process of defining specific actions to facilitate investment in the priority technology areas. Actions underway or under consideration in each area are as follows:

### **Industrial Energy Efficiency and Natural Gas Conversion**

*Refinery energy efficiency project facilitation.* The TCAPP team had the opportunity to facilitate discussions between the Ministry of Petroleum and vendors of energy efficiency equipment to support development of one or more efficiency retrofit projects in refineries operated by the Ministry. The TCAPP team will continue to facilitate these discussions, and will work to implement programs to promote broader use of related energy efficiency technologies by other refineries and other industrial facilities. Through this work, the TCAPP team will refine its understanding of the practical barriers that impede the penetration of industrial energy efficiency technologies. To date, TCAPP has set up meetings between the Ministry and proposed technology vendors, and has been instrumental in acquiring commitment from both sides to proceed. In the future, TCAPP expects to pursue specific measures to broaden the use of related technologies in the Egyptian industrial sector through outreach programs that highlight project success, technical support for feasibility studies for additional projects, finance methodology and matchmaking, and other activities as appropriate.

*Energy Efficiency Investment Workshop.* The TCAPP team has begun discussions with the staff of the National Energy Efficiency Strategy (NEES) on a jointly sponsored energy efficiency investment workshop tentatively scheduled for early 2001, subject to further discussions and approvals. This conference will address key barriers to the conversion of industrial facilities from fuel oil to natural gas, identify steps for facilitation of markets for energy efficiency technologies, and promote business matchmaking and project development. It will be structured largely as a dialogue between businesses and government agencies in the relevant markets. It will also address the areas of lighting efficiency and small-scale cogeneration, which are also priority areas for Egypt TCAPP. Activities include: careful structuring of public-private dialogues during the conference so that they result in commitment to the key actions necessary to move energy efficiency markets forward; follow-up after the conference to facilitate the implementation of actions; outreach to businesses to encourage them to take advantage of emerging business opportunities in the energy efficiency sector.

*Enabling Policy Environment.* TCAPP, in partnership with EEAA and NEES, is evaluating the actions needed to accelerate private investment in energy efficiency and natural gas technologies, especially the arrangements for provision of natural gas service to new industrial customers. Activities so far have included detailed discussions with industry partners to identify the policy and institutional barriers. Future activities will include focused working sessions with the

requisite public and private organizations aimed at developing consensus on actions needed to facilitate investment in the priority technology areas.

*Energy Efficiency and Environmental Technology Center.* In order to capitalize on the lessons learned from ongoing work in energy efficiency, natural gas and other technology markets, TCAPP will work with EEAA and other partners to create a Natural Gas and Energy Efficiency Center. The Center will serve as a demonstration site and focal point for ongoing efforts to facilitate and accelerate the markets for natural gas and efficiency technologies in Egypt. The next steps in this effort will be discussions with business partners who might have an interest in providing financial support as well as showcasing their technologies in the Center and participating in its operation.

### **Efficient Lighting Technologies**

This priority area will also be supported by the energy efficiency workshop mentioned above. The following additional actions are under consideration:

- ❖ Developing a national plan of programs and policies for “green lighting,” i.e., efficient lighting technologies combined with daylighting.
- ❖ Creating links in the form of joint ventures and information exchanges between international ESCOs and the emerging ESCO industry in Egypt.

The next TCAPP working group meeting (December 2000) will focus attention on refining the actions to be taken in this priority area.

### **Renewable Energy for Remote Applications**

The TCAPP team will sponsor an investment conference during 2001. This conference will work toward a national plan of action for promoting renewable energy technologies in remote areas and areas of new development such as Upper Egypt, and will directly facilitate new investment partnerships by bringing international businesses to Egypt to participate in the conference. Key activities include establishing a partnership with the Joint Science and Technology Board and the New and Renewable Energy Authority, organizing and carrying out the conference, and follow up activities to facilitate both the policy support needed to facilitate these markets and to promote individual project opportunities expected to arise through interactions at the conference.

## **CONCLUSIONS**

The TCAPP was developed to develop consensus among key Egyptian organizations on a set of high priority climate –friendly technology areas, identify and prioritize the actions necessary to remove barriers to the penetration of these technologies and finally to carry out a plan to implement some actions leading to market development of certain technologies.

The most important output of the TCAPP work is to ensure the effective transfer of clean energy technologies and its know-how, and to create national mechanisms to ensure sustainability of applying those technologies.

## **SCHEDULE OF NEXT KEY STEPS**

Over the next few months, Egypt TCAPP work will proceed in the following steps:

December 2000	TCAPP working group meeting
Beginning October 2000	Outreach to energy efficiency business and customers
Early 2001	Energy Efficiency Investment Workshop
December 2000	Initial planning for Energy Efficiency Center
Spring 2001	Renewable Energy Investment Conference
Spring 2001	Publicize results of refinery pilot project
Beginning February 2001	Outreach in renewable energy area

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# ~ KAZAKHSTAN ~

## UPDATE OF TCAPP ACTIVITIES

**OCTOBER 2000**

Kazakhstan was one of the first countries to join TCAPP and has been a leader in developing this process. In 1997, an interagency team of Kazakh climate and energy organizations selected technology priorities and prepared a technology cooperation framework that described development and climate benefits of these technologies and market barriers to development of these technologies. In late 1999, the Kazakhstan TCAPP team reorganized around a strong new group of specialists including representatives from the Ministry of Energy, Industry and Trade, the Kazakh Electricity Grid Operating Company (KEGOC), the Kazakh Scientific and Research Institute of Power Engineering (KazNIIE), the Kazakh Scientific Research Design Engineering and Survey Institute (KazNIPIEnergoprom), the Almaty Hydroproject, and KazNIIMOSK. TCAPP activities are currently focused on development of specific priority projects, and during the next year the team will move these projects through the development pipeline, identify barriers to market development and investment, and propose actions to overcome these barriers.

### **OBJECTIVES**

- ❖ Facilitate near-term private investment for high-priority technologies and projects
- ❖ Secure support for actions to remove market barriers for priority technologies

### **TECHNOLOGY PRIORITIES**

Under the initial phase of work with the TCAPP working group, Kazakhstan selected four technology priorities through interagency consultations and analysis. These technology areas included: power plant carbon efficiency (fuel switching, combined-cycle gas, and improved heat rate); energy-saving and district-heating improvements; wind power; and, small hydropower.

In April 1999, the Government of Kazakhstan approved the Program of the Development of the Power Sector until 2015. The TCAPP team focused on those projects in this program that overlap with TCAPP priorities and that could be advanced in a short period of time with limited investment resources. The list of projects included small hydropower stations, small combined heat and power projects, and power generation using waste gas from oil refineries.

### **TECHNOLOGY COOPERATION ACTIONS**

During May 2000, Econergy International Corporation (EIC) worked with the TCAPP team to investigate these projects and select those that would have greatest potential for replication and would be most likely to attract investment. The projects that are most promising for further development in the near term are those involving waste gas from oil refineries. EIC also recommended a coal-bed methane project for the TCAPP project pipeline. Small-scale hydropower was recognized as a longer-term potential project area due to the abundant hydro resources in the country. EIC and the TCAPP team are currently working to further refine these projects, identify financing sources, and promote replication of these projects to catalyze market development.

### **Oil Refinery Gas Usage**

Based on the analysis of the TCAPP working group and supporting institutions, there are three potential projects proposed for the utilization of oil refinery gas, they include:

- ❖ The Shymkent oil refinery plant is interested in installing a 17-MW gas turbine to cover the heat and electrical needs of the plant. The fuel for this project would be the gas that is produced as a by-product of the oil refinery process. Some of this gas is used in the processing of oils but most is burned after the processing. This project would generate 130 million kWh of electricity and 120 Gcal of heat. Successful implementation of the project would decrease CO<sub>2</sub> emissions by approximately 90 thousand tonnes per year.
- ❖ The “Condensat” plant near the Karachganak gas deposit (western Kazakhstan oblast) is interested in installing a 51-MW (three turbines at 17 MW each) gas turbine power station. Mazut, the gaseous waste after processing the condensed gas can be used as fuel for the project. At present this gaseous waste is burned. Annual electricity generation would be 180 million kWh and successful implementation of this project would result in the lowering of CO<sub>2</sub> emissions by 180 thousand tonnes per year.
- ❖ Associated gas from the oil deposit “Kumkol” (Kzyl-Orda oblast) could be used to fuel a 35-MW gas turbine power station. This would generate 250-275 million kWh annually and decrease CO<sub>2</sub> emissions by approximately 250 thousand tonnes per year.

### **Coal Bed Methane Recapture**

Coal bed methane released by Kazakhstan’s extensive coal mining industry is a significant source of greenhouse gas emissions. As methane has a global warming potential almost 21 times that of carbon dioxide, the efficient use of this gas would not only reduce Kazakhstan’s total greenhouse gas emissions but would also provide a new captive source of energy for facilities near or at these mines. Potential project opportunities exist near the Karaganda coal fields that would provide for the efficient capture and use of methane from these sources.

The TCAPP team is currently assessing these opportunities in cooperation with other partners. Next steps may include the development of specific project briefs or market assessments as a market development strategy in the coal bed methane sector.

### **Small Hydropower**

One potential small hydropower project is on the Uzyn-Karagaly river near the settlement in the Karagaly, Zhambyl region, Almaty oblast. This site has a 30 meter head and a flow of 1.5 m<sup>3</sup>/s. Electrical capacity is about 350 kW, and electrical consumers would be the local population, a cloth factory, and Almaty Power Consolidated. Existing electrical grids are 10 kV, sufficient road infrastructure exists to support the station, labor force is redundant, and the area is located on private property.

The TCAPP team recognizes that small hydropower may present opportunities for clean energy development in the longer term. Next steps may include the development of a brief on the market potential for this resource and the creation of a medium to long term market strategy for investment in small to medium hydropower in Kazakhstan.

### **Market Barrier Removal**

Through the project development activities, the TCAPP team will also identify barriers to project development and investment and will propose investment actions that can be implemented to overcome these barriers and promote replication of these projects. Actions to address these barriers will then be selected for implementation during 2000-2001.

The TCAPP team has also established contact with the Kazakhstan Climate Change Coordination Center and looks forward to working with this group to advance project activities of mutual interest. As the national focal point for all climate change related activities in-country, the Coordination Center will be a valuable resource for promoting project development and technology cooperation in Kazakhstan.

## CONCLUSIONS

Although the current TCAPP work in Kazakhstan is still focused on initial activities to assess technology needs, find financing opportunities for priority projects, and to identify general barriers that are relevant to mechanisms to finance TCAPP projects, the TCAPP activity is very important for Kazakhstan. It is included in the national climate change strategy and working plan of Interagency Center on Climate Change, and can support the introduction of GHG emission reduction projects and environmentally sound technologies in the future. As the TCAPP work is intended to be based primarily on private sector investment, this effort can support business investments by partly providing technical and financial assistance to mitigation technologies. It is also possible to use the Climate Technology Initiative as a mechanism to coordinate donor responses in this area.

The elements of TCAPP that serve best as models for technology transfer efforts under the UNFCCC include the emphasis on developing partnerships, cooperation, exchange of information on experience and know-how, and the development of databases on environmentally sound technologies. Recommendations to improve TCAPP's approach and initiatives include:

- ❖ Adaptation technologies should be taken into account;
- ❖ An innovative financial mechanism should be developed for technology transfer technologies and;
- ❖ Parties should establish focal points to coordinate technology transfer activities in their countries and to include this studies and results into National Communications.

## SCHEDULE OF NEXT KEY STEPS

- ❖ Initiate project development support in the coal bed methane and oil refinery waste gas sectors in coordination with developers and relevant industry representatives (October 2000)
- ❖ Identify actions to promote replication of projects in these sectors and address broader market barriers through consultation with the Kazakhstan TCAPP working group (November 2000)
- ❖ Develop list of specific strategies in coordination with the Kazakhstan working group to implement the actions identified for project replication (December 2000)
- ❖ Prepare market assessment for longer term investment opportunities in the hydropower sector (November 2000)
- ❖ Develop detailed project briefs in the small hydropower sector for circulation to potential project developers (December 2000)

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# ~ KOREA ~

## UPDATE OF TCAPP ACTIVITIES

**OCTOBER 2000**

The Republic of Korea joined TCAPP in January 1999, with TCAPP work lead by the Ministry of Commerce, Industry, and Energy (MOCIE) and the Korean Energy Management Corporation. Since that date Korea has made outstanding progress in implementing actions to accelerate investment in three priority areas: energy management, methane recovery, and heat recovery using heat pumps. Energy management is the highest priority for the TCAPP work in Korea. In this area, an energy efficiency upgrade investment project is under development with Korean and U.S. business partners and training activities have been completed. Landfill methane and waste heat recovery projects and technical assistance activities are also under development.

### **KOREAN TCAPP TEAM**

The Ministry of Commerce, Industry and Energy (MOCIE) of the Republic of Korea chairs a TCAPP steering committee and has designated Korea Energy Management Corporation (KEMCO) to lead the implementation of technical TCAPP activities for Korea.

### **TECHNOLOGY PRIORITIES**

The Korean team held a scoping meeting in March 1999 to select priority technologies for climate change technology cooperation. In addition to greenhouse gas mitigation potential and energy development benefits, four additional criteria were used in selecting priority technologies:

- 1) The technology must hold near-term market potential
- 2) Successful widespread implementation of the technology requires intervention by public institutions to overcome market barriers
- 3) There is a need for demonstrating new technologies or energy management systems to open up new markets for advanced technologies
- 4) Soft technologies (e.g. energy management systems and other tools for use of advanced technologies) should be given consideration along with hardware.

Based on these criteria, three priority technologies were selected. The three priority technologies are:

- ❖ Energy management (Know-how in energy management, advanced energy auditing and ESCOs, etc.)
- ❖ Methane recovery from organic waste
- ❖ Waste energy recovery using heat pumps

## TECHNOLOGY COOPERATION ACTIONS

### Energy Management

The energy management and auditing concepts being pursued under TCAPP are working to increase the knowledge of Korean industry, ESCOs, and government agencies involved with energy auditing. It includes both training by international experts and involvement with joint projects being pursued by Korean and international ESCOs. This concept is the first priority for TCAPP Korea. The other technologies will be pursued as part of this concept, or as time and resources permit.

Actions are also underway to improve the Korean ESCOs' ability to install energy savings projects by removing barriers to investment. Another major initiative that is part of this concept is encouraging international ESCOs to partner with Korean ESCOs in the pursuit of energy saving projects. The partnering process is aimed at improving local ESCOs' ability to install projects, as well as developing international dialog between ESCOs from Korea and other countries related to the implementation of energy saving projects.

#### **a. Training**

To meet the goals of TCAPP in Korea training has been held in Korea to teach energy auditing techniques and considerations. The first of these courses was an advanced auditing class conducted in January 2000. This course was an advanced level course. Topics such as risk analysis and compilation of findings were addressed in the course. The aim of the second course was to move beyond the simple gathering of data to a sophisticated analysis and use of the information.

The class was designed to build on the basic information presented in a class given in the fall of 1999. The Asian Economic Program (AEP) arranged the first class. It covered the essential elements of an audit, and how to use such an audit in implementing energy efficiency projects.

U.S. experts in the field of energy auditing taught both of these courses, in Korea. Arrangements for the training, and advertisement for the courses were coordinated by the Korean Energy Management Company (KEMCO). The Korean Association of Energy Service Companies (KAESCO) was also instrumental in announcing the events to its members.

#### **b. Certification**

KEMCO is working with MOCIE to develop a certification program to provide a measure of expertise to the energy service industry. A system of training and testing is envisioned to give energy engineers an opportunity to gain the knowledge they need. The testing and certification will provide a standard against which to measure the knowledge of energy professionals. The U.S. Association of Energy Engineers is expected to provide some assistance, based on their system of certification of energy engineers.

#### **c. Pilot Projects**

The initial joint project of the energy management concept is in its initial stages. Hyundai Motors' Ulsan manufacturing complex has agreed to participate as the initial pilot project. The preliminary site survey was conducted in late September. It is anticipated that a decision regarding the feasibility of the project will be made by the end of November. If the feasibility study finds a likely project, installation of energy conservation measures is forecast for the summer of 2001.

A series of meetings were held in January of 2000 between U.S. and Korean companies interested in partnering on future energy efficiency projects. KEMCO and NREL facilitated these discussions. KEMCO and NREL continued to facilitate communication between interested companies through July of 2000. At this time Sempra Energy Services of the U.S. and EPS Korea decided to proceed to the next step, a joint audit of the Hyundai facility at Ulsan. The audit was conducted during the fourth week of September.

The audit required the joint efforts of Hyundai, EPS Korea, Sempra Energy Service, and KEMCO. Engineers from Sempra spent a week with auditors from EPS Korea and KEMCO at the site. The entire team developed priorities for auditing the plant based on the greatest potential for energy savings. The Sempra team has developed an initial proposal, based on information already received about the plant, information gathered during the week in Ulsan, and other data received from Hyundai. That proposal is now being evaluated in Korea.

During the on site visit at the plant, as well as during development of the initial proposal, the parties involved began refining the roles each will play in implementation of the project. These roles are being developed based on the capabilities of the parties and requirements of the project. Developing these roles is essential to successful project implementation, and is one of the most challenging aspects of this type of international undertaking.

It is envisioned that the majority of the technical support of the contract will be coordinated by the Sempra, EPS Korea, Hyundai team. KEMCO's role, as well as supplying audit expertise during the initial audit will include review of the proposal, barrier reduction and financing assistance. NREL will continue to support through facilitation of communications between the parties, review of the proposal, and assistance with performance contracting questions as needed.

NREL and KEMCO will also use this pilot project to develop a model for further joint projects in Korea. It is expected that the model developed during this project will be used to put several other projects in place. These projects will be used to improve the capabilities of other Korean ESCOs and make energy saving projects easier to put in place.

### **Methane Gas**

The goal of this concept is to capture methane gas that is produced from various industrial and commercial operations. The goal of this concept is to directly reduce the amount of hydrocarbons released into the atmosphere, while offsetting the use of petroleum based fuels. This concept is being pursued through a combination of outreach and direct project assistance as in the energy management concept.

#### **a. Outreach**

In this concept the U.S. Environmental Protection Agency's (EPA) methane outreach team will present one or more seminars to the management of possible user sites. This audience is made up of academics, national government agency officials, municipal government officials, and industrial officials.

The first outreach visit is tentatively scheduled for early 2001. The trip will be coordinated by KEMCO. The session will showcase successful projects that are operating in the U.S. The EPA team will answer questions on the successful implementation of projects. They will also address common obstacles to successful implementation of methane recovery projects, and how they have been overcome in the U.S. and other countries.

## **b. Pilot Project**

Direct project assistance is being pursued by pairing up Korean firms interested in pursuing methane recovery projects with international firms, which have expertise in this area. It is anticipated that these partnerships will help native Korean firms develop expertise in this area, while initiating international dialog on these kinds of projects.

A pilot project for this concept has been identified near the city of Ulsan. A large landfill there is in close proximity to a major industrial campus. The tentative project envisions purification of the landfill gas and use of the methane for typical natural gas applications in the industrial park.

SK Corporation of Korea has tentatively agreed to pursue the project under the TCAPP program. Duke Engineering of the U.S. has initially agreed to investigate the project as the U.S. partner. Initial communications between the two possible partners and other partners in Korea and the U.S. is taking place.

An initial scoping of the project and further testing of the site is expected this fall. An initial joint meeting of the partners that may be involved with the project, as well as a site visit to the landfill and industrial park is also expected in late 2000.

KEMCO and NREL will coordinate these visits, as well as securing additional technical expertise if needed. They will also work together to identify barriers to successful project completion and solutions to these problems.

Financing of the project is as yet an unanswered question. Financing a third party and repayment from the sales of the gas is one approach to financing this project. It may be possible for this project for the installing companies to finance the project independently. This is one of the questions to be answered during negotiations between the partners involved with the project.

### **Recovery of Waste Heat Using Heat Pumps**

The goal of this concept is to increase the acceptance of this technology in projects in Korea. To do this it has been determined that the quality of heat pumps must be improved, the cost decreased, and the advantages of heat pumps must be disseminated better.

This concept is being pursued through looking for opportunities for use within the energy management projects, as well as in stand-alone project to showcase the technology. The concept will make use of internationally manufactured heat pumps, and look for opportunities to develop Korean/International partnerships between hardware manufacturers.

The ESCOs involved in the Hyundai project will look for opportunities for use of heat pumps to recover waste heat in that project. At the same time KEMCO has identified a government agency the Korean District Heating Corporation that is trying to showcase combined heat and power technologies. This agency is developing a plan and searching for a pilot site to showcase the technology.

KEMCO and NREL are currently looking for Korean and U.S. companies interested in working together on a pilot project to demonstrate this technology. The Business Council for Sustainable Environment is assisting in the search for an international partner.

The goal of this concept, as with the other two, is not to simply put some pilot projects in place. The idea with these projects is to overcome barriers for successful implementation of the

projects, and development of models that can be applied to similar projects. In this way, these technologies and techniques for energy savings will become better understood and more projects will be put in place.

## **CONCLUSIONS**

TCAPP has become a leading model for implementation of technology transfer under the UNFCCC. It is effective because it depends on the host country playing a pivotal role in the identification and prioritization of the technologies being pursued. This is an important factor in the success of TCAPP in Korea.

The reliance on the role of private industry is another key to the success of the program. This provides opportunities for the companies from developed as well as developing countries as the primary motivation for involvement of companies from both countries. While a tremendous strength, the negotiation of protections for the private industries from each country involved in the project is also sometimes one of the most sensitive aspects of project completion. This is especially true in countries like Korea that have significant competitive industrial and commercial capabilities.

Participation of the Korean government stakeholders in each project is important in uncovering barriers to successful project implementation, and successful technology transfer in all areas. The government's role is also critical in overcoming barriers once they are discovered

International donors play a critical role in funding support for the facilitation and successful implementation of projects. In many cases one of the key barriers to successful project implementation is securing, or augmenting available funding. While this isn't necessarily the case in Korea, where the government has generously funded support for energy efficiency, these international donors are critical in filling these voids in other countries.

Supplying needed technical support is also a critical role for international donors. This support is vital in providing an honest broker to assist in the evaluation of the advisability of these projects. These international experts provide essential back up to the in country experts who are tasked with oversight of the projects in Korea. In addition, an international donor's full understanding of market structure and situation in Korea is another important factor of the success.

The final key aspect of TCAPP, which makes it an effective technology transfer mechanism is that the pilot projects pursued under the programs are not the goal or objective of the program. Instead they are tools for developing models, which will be replicated many times within Korea and other countries to ensure effective transfer of clean energy technologies through out the developing world.

## **SCHEDULE OF KEY NEXT STEPS**

### **September 2000**

- ❖ Conduct initial survey of Hyundai facility – Sempra, EPS Korea, and KEMCO
- ❖ Determine applicability of using heat pumps at Hyundai plant – Sempra, EPS Korea, KEMCO, Hyundai

### **October 2000**

- ❖ Prepare initial Hyundai proposal – Sempra

### **November 2000**

- ❖ Evaluate initial Hyundai proposal and provide feedback to Sempra and EPS – Hyundai, KEMCO, and NREL
- ❖ Discussions with municipality and contractors of needs and roles for methane project – KEMCO, NREL, Ulsan, SK, Duke

### **December 2000**

- ❖ Decision by Hyundai project team of whether or not to proceed with the performance based energy project
- ❖ Begin communications between international and Korean partners for heat pump project.
- ❖ Draft request for proposal for heat pump project – KEMCO, NREL

### **February 2001**

- ❖ Begin detailed energy survey/investment grade audit of Hyundai site – EPS Korea, Sempra, KEMCO
- ❖ Conduct methane project, other outreach and discussions – KEMCO, officials from municipalities, U.S. EPA, NREL
- ❖ Coordination of Methane Team – Determine roles and responsibilities of participants, KEMCO, Duke, SK Corp., and others
- ❖ Determine scope of the methane project – SK Corp and Duke perform further testing, and coordinate with the site in conjunction with KEMCO
- ❖ Draft methane project plan – methane team
- ❖ Identify site for possible heat pump project – KEMCO and NREL
- ❖ Identify possible international partners for heat pump project – NREL

### **March 2001**

- ❖ Prepare initial methane project proposal – U.S. and Korean companies
- ❖ Begin communications between Korean, international heat pump companies, KEMCO, project site, and NREL

### **April 2001**

- ❖ Completion of final proposal for Hyundai project – Sempra and EPS Korea

### **May 2001**

- ❖ Evaluation of technical and financial acceptability of final Hyundai proposal
- ❖ Evaluation of initial methane proposal – KEMCO, customer, NREL
- ❖ Decision by methane team of whether or not to proceed with the recapture and purification project
- ❖ Begin initial proposal for heat pump project – Korean and international heat pump companies

### **June 2001**

- ❖ Negotiation of technical and financial terms of Hyundai proposal
- ❖ Preparation of initial proposal for heat pump project
- ❖ Begin preparation of final proposal for methane project

### **July 2001**

- ❖ Award of Hyundai project
- ❖ Submission of initial heat pump proposal
- ❖ Initial project analysis of heat pump project by the project team

**September 2001**

- ❖ Submission of final proposal for methane project – Korean and international heat pump team
- ❖ Evaluation of final proposal for methane project – Facility, KEMCO, NREL

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# ~ MÉXICO ~

## UPDATE OF TCAPP ACTIVITIES

**OCTOBER 2000**

Mexico's National Commission for Energy Savings (CONAE) leads an interagency Mexico TCAPP team, that also includes the National Ecology Institute (INE), the Secretary of Energy (SE), the Trust Fund for Electric Energy Savings (FIDE), and two non-governmental organizations, the National Solar Energy Association (ANES) and the Technical Professionals Energy Conservation Association (ATPAE). The Mexico team has established priorities and is currently implementing a broad portfolio of investment actions together with the U.S. TCAPP team. The TCAPP effort is seen by many high-level officials in Mexico as a useful mechanism to seek resources for implementation of investment projects, and to bring in technical assistance to create sustainable markets for clean energy technologies that reduce greenhouse gases. In addition, TCAPP has been noted in Mexico as a practical model for technology transfer under the UNFCCC.

### **OBJECTIVES**

- ❖ To broaden the consultative process in Mexico to achieve active participation of all key private and public institutions and agencies engaged in energy development and climate change issues in further work under TCAPP
- ❖ Implement established priorities in energy efficiency and renewable energy, continuing with the efforts developed during the recent years by several public and private institutions
- ❖ To secure donor and domestic support for actions to remove market barriers for Mexico's priority technologies
- ❖ To facilitate private investment for selected priority technologies

### **TECHNOLOGY PRIORITIES**

Based on the current objectives of Mexican energy conservation institutions, the Mexico team developed a Technology Cooperation Framework that established technology cooperation priorities based on their economical and technical feasibility as well as their attractiveness for near-term investment. The U.S. - Mexico Bi-National Team has also identified these technologies as having important benefits for both countries. The three technologies that Mexico selected are:

1. Efficient lighting in buildings, and Energy Service Company (ESCO) project development
2. Solar Water Heater Systems
3. Steam generation and distribution systems

## TECHNOLOGY COOPERATION ACTIONS

CONAE, in collaboration with other national and foreign agencies, is now implementing investment actions for the three technology priority areas. These investment actions include:

### **1. ESCO Pilot Program for the Industrial and Municipal Sectors**

The CONAE/TCAPP Mexico team, together with EIC Consultores de Mexico, the Trust Fund for Efficient Use of Energy (FIDE), the National Ecology Institute (INE), National Bank for Public Works and Services (BANOBRAS), and several private companies worked together to develop the CONAE/TCAPP ESCO Pilot Project Development Strategy. The objective of this effort is to develop the necessary elements to facilitate the application of the Energy Service Company (ESCO) strategy in Mexico, and to help develop new public and private sector ESCO projects in collaboration with international and Mexican business partners. The near term target is to assist in advancing 4-8 pilot ESCO projects through this initiative.

The ESCO strategy for Mexico has three major elements:

#### **a) Guide to Performance Contracting in Mexico**

The CONAE/TCAPP team has elaborated a guide to develop energy savings projects under the ESCO strategy, which will help educate Mexican and international ESCOs, consulting firms and energy end users interested in investing in Mexico. This guide provides the reader with specific steps to follow as well as support documentation to obtain the maximum benefits of existing tools and documents.

One of the most important parts of this document is the "guide for performance contracting", which was prepared by EIC Consultores de México working in partnership with the CONAE/TCAPP team. This document was shared with Mexican ESCOs to promote understanding of performance contracting and consensus on the appropriate type of performance contract to be used in Mexico.

#### **b) Identification of ESCO Pilot Projects**

The CONAE/TCAPP team has taken several actions to help identify potential pilot projects in the industrial sector. The team has organized several meetings with Mexican ESCOs and consulting firms to promote consensus on the appropriate type of performance contracts for Mexico. The team has also held meetings with energy end users and ESCOs to present the strategy and discuss their potential interest in the pilot program. Follow-up conversations with energy end users, including presentations to industry chambers, have resulted in identification of major energy end users interested in participating in the pilot program, and in exploring specific next steps. For example, a visit to the largest steel plant in Mexico, Altos Hornos de México (AHMSA) in Monclova, Saltillo with 2 ESCOs allowed the energy end user and the ESCO to examine the possibilities of working together. Both ESCOs are currently preparing proposals to participate in the pilot program.

This process has resulted in:

- ❖ Information on the benefits of performance contracts provided to 27 energy end users who have been encouraged to submit proposals
- ❖ Presentation given to two industry chambers: CONCAMIN (National Confederation of Industrial Chambers) and CANACERO (the Industrial Chamber for Iron and Steel), who are currently inviting the CONAE/TCAPP team to make presentations on performance contracting to other companies

- ❖ Three energy end users have provided the CONAE/TCAPP team with preliminary proposals for ESCO projects and several more proposals are expected over the next couple of months
- ❖ Two visits to industrial plants (Campos Hermanos, a metallurgic plant, and AHMSA, a steel plant) were conducted with ESCOs to explore potential projects, with additional visits to other plants planned.

In addition, CONAE and TCAPP are working with Mexican ESCOs to determine if they already have projects identified that may be included within the 4-8 selected projects. Once information is gathered from the end-users and from the Mexican ESCOs, a meeting will be held to discuss the potential projects, and then project briefs will be shared with international ESCOs to seek partnerships and investment opportunities.

The CONAE/TCAPP team will be providing assistance to building and plant managers and ESCOs to support project development. TCAPP will provide various forms of technical assistance, including:

- ❖ Where needed, identifying suitable ESCO partners for the projects through the Business Council for Sustainable Energy (BCSE), the North American ESCO Association (NAESCO), and other ESCO associations
- ❖ Working with the ESCO to identify the most appropriate finance mechanism for the specific project, if necessary.
- ❖ Developing performance contracts tailored from the model contracts
- ❖ Providing additional assistance as needed (e.g. monitoring and verification, etc.).

Several projects are already being considered through this effort in the industrial sector, with investment opportunities for the projects ranging from \$500,000 - \$2 million. The energy savings and carbon reduction should be significant. Among the projects includes retrofits in two industrial plants: AHMSA and Campos Hermanos. Identification of projects in the public sector will begin in early 2001.

**c) Dissemination of Information to Promote Broad Use of Performance Contracting.**

This outreach effort will consist of workshops in several Mexican cities with high industry participation (i.e. Monterrey, Guadalajara, and Cancun). These workshops will allow energy end users and Mexican ESCOs, financing institutions and government agencies to examine the possibility of developing ESCO projects. The first workshop will take place in Cancun, Quintana Roo on November 16, and 17 2000. The Quintana Roo Hotel Association will coordinate this event. There are three goals for this event: promotion of ESCO pilot projects, the dissemination of information on performance contracting, and the facilitation of partnerships between financing institutions and ESCOs. For all new ESCO projects, the TCAPP team will prepare and disseminate summary information on these projects to help educate a broad group of facility managers, ESCOs, government agencies, and others about ESCO and performance contracting opportunities in Mexico.

**2. Solar Hot Water Heater Financing and Business Partnerships**

Officials of the Government of Mexico have recommended that replacing or substituting liquid petroleum (LP) gas tanks with solar water heaters to heat water in the residential and commercial sector will have positive impacts on air quality, health, and the economy. INE, CONAE, the

National Autonomous University of Mexico (UNAM), and others, through World Bank funding, have been developing a feasibility study to prove that this recommendation is viable.

The TCAPP role in this activity is to identify potential joint ventures or partnerships between Mexican and international solar companies and to support other efforts to establish solar water heating financing programs. The goal is to work closely with CONAE, INE and other organizations in expanding the World Bank solar water heating pilot program, and the solar water heating market in Mexico.

A Solar Water Heating Investment and Matchmaking Roundtable was held in May 2000, organized by INE, CONAE and TCAPP with over 30 participants from the government, industry and academic sectors. Much interest was expressed regarding solar business matchmaking, and TCAPP is working with the Mexican industry to release a solicitation to an international audience in September describing equipment needs in Mexico, which will then be included in the virtual Business Matchmaking website, as described below. Another outcome of the Roundtable was the decision by INE, CONAE and the World Bank to work jointly to develop finance options to propose to the Global Environment Facility (GEF).

TCAPP also organized a Solar Water Heater Trade Mission in May 2000, in which several Mexican solar businesses discussed potential business opportunities with the Solar Energy Industries Association (SEIA) and a participating U.S. company, American Energy Technologies (AET). The representative from AET noted that the Trade Mission significantly furthered relationships with companies and fostered new ideas. One outcome of the mission was the identification of equipment needed in Mexico that may be acquired from the U.S. or other countries. Another outcome was the sale of 356 solar water heaters from AET to Optima Energia of Mexico for a hotel project in Cancun. Each collector will save 350 kg. of LP gas or the equivalent of 80 metric tons of carbon per year for the 356 solar water heaters combined.

TCAPP assisted with the organization of a side event at the International Solar Energy Society (ISES) Solar Forum 2000 in September in which international solar companies had the opportunity to meet with Mexican solar companies to discuss potential business opportunities. Prior to the forum, CONAE and TCAPP collected information from potential vendors and customers on an international level, which was posted on a "bulletin board" on the CONAE website. The website serves as a Virtual Business Matchmaking mechanism, which provides the user with a proper space to establish communication with companies, which share the same interests. The Virtual Business Matchmaking started operating within the ISES Millennium Solar Forum, however now that the Solar Forum has ended, this tool will remain active, and become a permanent forum. The website is under modification and will be promoted actively as soon as it is optimized.

NREL/TCAPP helped to sponsor the forum by donating money to the general organization of the event, and is also purchased a booth for promotion of the virtual business matchmaking website and other TCAPP activities.

TCAPP is also planning to work with hotel associations throughout Mexico to encourage hotel managers to purchase solar water heaters. The Quintana Roo Hotel Association in Cancun was notified of this opportunity in June, and the TCAPP team followed up with a visit to Cancun in October to discuss the process of inviting hotel members to learn more about the benefits of solar water heaters, and opportunities for financing. TCAPP will assist the interested hotels in finding a company from which they can purchase the solar water heater. As a participant in this effort,

the hotel will receive recognition from the CONAE/TCAPP team who will provide a means of promotion to the international sustainable tourism sector through a Green Hotels recognition program.

There is also a great opportunity for the Hotel Industry to become involved in the ESCO pilot program. Hagler Bailly and the Caribbean Alliance for Sustainable Tourism are planning to work with hotel associations throughout Mexico on water savings and other conservation methods. The CONAE/TCAPP ESCO program may add additional value to this effort by promoting energy savings in the hotel industry through ESCO projects. The first event will take place in November 16 and 17, 2000. Hotels that participate in the ESCO program would also be recognized through the CONAE Green Hotels program.

### ***3. Investment Partnerships for Steam Generation and Distribution***

Through AID Mission funding, CONAE, together with Hagler Bailly completed a pilot activity last year, resulting in the analysis of 37 large and small installations that use steam in their processes. The CONAE/Hagler Bailly team is now entering the second phase of activities, in which part may be the identification of specific project opportunities for implementation later this year. The TCAPP role in this activity is to assist in attracting increased investment in steam generation and distribution projects by utilizing the international business network to help attract private sector interest, and aggressively recruiting the best possible project teams and securing commitment from facility management.

TCAPP presented a proposal to the CONAE/Hagler Bailly team describing TCAPP assistance in advancing real steam generation and distribution projects. This assistance may begin by January, 2001. In the mean time, the CONAE/TCAPP team is proposing to invite the 37 audited plants to participate in the CONAE/TCAPP ESCO Pilot Program.

Recently, this priority has raised interest of several entities: Mexican ESCOs and engineering firms, the Electric Research Institute (Instituto de Investigaciones Eléctricas), a Spanish company related to solar industrial process heat, and the Mexican Industry Chamber (CONCAMIN). A representative from the Electric Research Institute discussed his recent research results with the CONAE/TCAPP team. He is willing to share his results (information collected from 363 companies) and combine them with the information compiled from the 37 audited plants. There is much potential in combining these two sources of information, as a detailed analysis of possible energy saving measures will be integrated.

## RECENT DEVELOPMENTS AND SCHEDULE OF KEY NEXT STEPS

February, 2000	Participated in NAESCO Workshop in Mexico City
Feb. - May, 2000	Developed CONAE/TCAPP ESCO Pilot Project Development Program
March 2000	Representative of CONAE presented TCAPP activities at the UNFCCC regional Latin America workshop in El Salvador
May 2000	Organized successful Solar Trade Mission with U.S. and Mexican Companies
May 2000	Assisted CONAE, INE and the World Bank in organizing Solar Water Heater Finance Workshop
May 2000	Identification of Assistance to Pluz S.A. for an ESCO project in Metallurgic Plant (Project to be included in CONAE/TCAPP ESCO Pilot Project Program)
June 2000	Representatives of CONAE and INE presented TCAPP activities at SBSTA-12
August, 2000	Solar Water Heater Business Deal complete between U.S. and Mexican company for Cancun Hotel project, with TCAPP facilitation
August 2000	EIC Consultores de Mexico completes draft model performance contract and guidelines for review by Mexican ESCOs
August 2000	Mexican ESCO meeting to discuss and finalize model performance contract and guidelines for Mexico
September 2000	Request for Proposal sent to targeted energy end-users for inclusion in ESCO pilot project database
September 2000	Meeting held with end-users and Mexican ESCOs to discuss project potential
September 2000	Solicitation released through BCSE network for solar water heater business opportunities in Mexico on Virtual Business Matchmaking website: <a href="http://www.conae.gob.mx/tcapp/tcapp.html">www.conae.gob.mx/tcapp/tcapp.html</a>
September 2000	Organization of solar business side event at the Solar Forum 2000
September 2000	Organization of climate change technical session at the Solar Forum 2000, with participation by NREL climate change expert
October 2000	Follow-up with energy users. Presentation of the ESCO scheme in several forums (industry: CONCAMIN, CANACERO). Visits to plants. (AHMSA)
Oct - Nov. 2000	Initiate collaborative work with Hagler Bailly and Caribbean Alliance for Sustainable Tourism for inclusion of ESCO activities in Green Hotels Program
Oct-Nov. 2000	Dissemination of the ESCO scheme in other Mexican Cities (Monterrey, Guadalajara, Cancun or Cozumel)
Oct-Nov. 2000	Request of Interest forms distributed to members of Quintana Roo Hotel Association and other hotel associations for purchase of solar water heaters and/or participation in ESCO program
November 2000	Technical review completed, 4-8 pilot ESCO projects selected, and distribution of Project Briefs to national and international ESCOs
November 2000	Reviewing, finalizing and signing the NREL/CONAE/INE Memorandum of Understanding
Dec - Jan. 2000	Explore activities to attract increased investment in steam generation and distribution projects

## CONCLUSIONS

Investment actions under the Technology Cooperation Agreement Pilot Project in Mexico are being effectively implemented. The CONAE/TCAPP ESCO pilot program has made great progress, and several potential pilot projects have been identified. The Solar Water Heater Business Matchmaking and investment program has resulted in successful transactions between

Mexican and U.S. companies, and the great potential for expanding the use of solar water heaters and ESCO projects in the hotel industry is being explored. The development of proposals to finance organizations is also underway for implementation of pilot projects in both technology areas.

From the point of view of the Mexican government, the main advantage in participating in TCAPP is the possibility to integrate, in a single contact and institution, an easy access to a great number of foreign donors, such as public institutions (research laboratories and ministries), financial institutions (both unilateral and multilateral funds), and private sector actors (consulting firms, product manufacturers and distributors). This approach, along with the collaborative effort of the Mexican actors creates a network, which facilitates the project developers to easily obtain the needed information and resources for the market expansion.

In the actual conditions, only a few Mexican companies (energy services, solar companies, etc.) have enough economical resources to implement a considerable number of projects. Within this context, TCAPP activities will be oriented to the creation of joint ventures among Mexican companies and financial resources providers, and the expansion of the market by means of the promotion and initiation of a small number of pilot projects. The consolidation of the ESCO market in Mexico could catalyze several priority areas into one, resulting in major benefits in the short and long run.

Mexico is going through a political and economic historical moment, where the main decisions in the energy sector, and participation of both national and foreign entities (i.e. private sector, non-governmental organizations, public sector and financial institutions) could be translated into a boom for the use of clean technologies. TCAPP plays a very important role in helping Mexican companies build economic capacity in the short-term and to be ready for the moment when extensive production of products and services will be required. This is necessary in order to play a key role in the market and to have the ability to directly access financing and technical support, which helps them avoid a long and time consuming search. The process also helps coordinate, in a very simple way, activities between national and international institutions. The flux of updated information through international sources provides a significant added value to this project.

In the context of the United Nations Framework Convention for Climate Change, and according to the diverse efforts developed to define the specific mechanism for implementation of Art. 4.5, TCAPP provides, from the point of view of the Mexican Government, a good model for technology transfer. The main assets of this initiative are its country-driven approach, the involvement of a wide range of local actors, and its flexibility, which makes it possible to easily adapt the process to the national context and needs.

The TCAPP approach could be significantly improved if it provided not only the direct link and communication among local and foreign actors, but also the concrete financing support for the catalysis of specific activities and, if possible, pilot projects.

One of the most important steps in the future of TCAPP is the evaluation of the results, and the distinction of the specific benefits obtained from either the involvement of the Annex I country or the national efforts. This activity will be very useful as a way to assess the additional effects generated by the technology cooperation process.

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# ~ PHILIPPINES ~

## UPDATE OF TCAPP ACTIVITIES

OCTOBER 2000

The Philippines has been active in the TCAPP program since its inception. The Government of the Philippines implemented a broad range of renewable energy policy reforms in response to initial TCAPP actions. In collaboration with the Government of the Philippines, TCAPP is also promoting investment in hybridization of diesel electricity generation with wind energy, in solar energy-powered agricultural water pumping, and in hydropower projects. Efforts in these areas have advanced specific investment projects through project feasibility analysis, facilitation of project financing, integration with government programs, and market information dissemination. Future TCAPP actions will continue to catalyze private investment in these technology areas. This Country Update provides an overview of progress since the COP-5 Report, "Technology Cooperation Agreement Pilot Project: A Collaborative Model for Clean Energy Technology Transfer," October 1999.

### PHILIPPINES TCAPP TEAM

Philippines TCAPP relies on collaboration with a wide variety of groups and individuals. As described in the COP-5 report, the lead coordinating agency is the Philippines Department of Energy, Energy Utilization Management Bureau (EUMB), Non-Conventional Energy Division, and information on TCAPP progress is available to IACCC through DOE and DENR. Since COP-5, TCAPP has started working with several additional government agencies, including Mini-Hydro Division of EUMB, the Philippines Department of Agriculture, and the Strategic Power Utilities Group of the National Power Corporation, as well as additional private sector and non-government organizations, described below within the section on Technology Cooperation Actions. The National Renewable Energy Lab staff provide technical assistance to the Philippines TCAPP team.

### OBJECTIVES

The overall objectives the Philippines National Action Plan on Climate Change that guide the approach to TCAPP include:

- ❖ To integrate climate change concerns into the country's national development plans and programs;
- ❖ To develop adaptation responses to climate change impacts;
- ❖ To design mitigation measures which are "no regrets"<sup>1</sup> in character.

The specific goals of the Government of the Philippines in implementing TCAPP include:

- ❖ Addressing government sustainable economic development priorities by improving energy services to support economic development in rural areas
- ❖ Using clean energy technologies for improved energy services because of concerns about climate change
- ❖ Looking at possible technology transfer models.

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<sup>1</sup> Measures that can be justified for other reasons besides mitigating GHG emissions.

Policies conducive to sustainable economic development are crucial to implementing climate actions. Therefore, initial TCAPP actions in the Philippines encouraged policy reforms that would facilitate private investment in clean energy technologies. In response to this TCAPP initiative and other collaborating efforts, Secretary Tiaoqui (Department of Energy) signed a departmental circular changing DOE policy and President Estrada signed an Executive Order for additional energy policy changes. Following these policy reforms, TCAPP developed actions to promote investment in hybridization of diesel electricity generation with wind energy, in solar energy-powered agricultural water pumping, and in hydropower projects.

The table at the end of this section on the Philippines shows a timetable of significant activities of the Philippines TCAPP team.

### **PRIORITY SELECTION**

In the Philippines, the country-driven process for priority selection featured strong public participation, to ensure the local relevance of the TCAPP priorities. Economic development and poverty alleviation are high priorities for the people and the Government of the Philippines, driving the TCAPP priority selection. Before TCAPP started, meetings of stakeholder groups regarding renewable energy and energy efficiency opportunities, as well as previous analytic work, had already gathered information about an initial set of priority technologies and issues. Building on these efforts, TCAPP sponsored additional analysis and outreach to develop priority selection criteria, shown in the box below. Renewable energy for rural economic development, energy efficiency, and cross-cutting support activities were initially identified as important priority areas.

TCAPP Priority Selection Criteria	
Priorities for TCAPP should:	
❖	Be priorities of the energy efficiency and renewable energy sectors
❖	Require reasonably achievable financing
❖	Contribute to social development and improvement of the environment and human health
❖	Have commercial potential
❖	Develop enabling mechanisms and build capacity

In identifying the country-driven TCAPP priorities and establishing the implementation approach, several Philippines government agencies provided technical and policy direction for the TCAPP efforts including, contacts in the Office of the President - National Anti-Poverty Commission, the Department of Energy, and the Department of Environment and Natural Resources (DENR). The Department of Energy, through the Energy Utilization Management Bureau (EUMB) serves as the lead coordinating and implementing institution. Based on the priority selection process, criteria, and government agency input, renewable energy for rural development along with associated support activities became the central focus of Philippines TCAPP. The local availability of renewable energy in remote regions can support economic development where other energy sources would be more expensive and less reliable.

While TCAPP has emphasized renewable energy for rural development, energy efficiency is clearly an important area for technology cooperation and could be pursued if future resources and partnerships were developed.

## TECHNOLOGY COOPERATION ACTIONS

With renewable energy for rural economic development as the highest TCAPP priority, the TCAPP team sought action areas where near-term international business investment was likely that would contribute to the Philippines sustainable development goals. First, the team identified a few policy reforms that could be made quickly and would strongly encourage business investment, the “Fast Track Action Recommendations.” Next, through consultation with the Philippines team, three groups of investment actions were selected: : Solar Energy-Powered Agricultural Water Pumping, Isolated Grid Hybridization with Wind Energy, and Hydropower Market Development. Investment in these areas appeared likely because firms or trade organizations were actively interested in each area and the Philippines government agencies were interested in addressing market barriers in these areas.

### **Fast Track Action Recommendations Catalyze Policy Reforms to Encourage Business Investment**

Recommendations were formulated through TCAPP efforts for policy reforms that PDOE could quickly make to improve the business investment situation. These recommendations were developed in partnership with others, including policy reform initiatives of USAID/Manila Philippines, the World Bank, and Preferred Energy Incorporated. In response, PDOE modified an Energy Regulation and recommended an Executive Order which President Estrada signed.

On March 17, 2000, Secretary Tiaoqui signed a Departmental Circular that modifies Energy Regulation 1-95, which addresses accreditation requirements for Private Sector Generation Facilities, to make the following improvements for renewable energy:

- ❖ Streamlines the corporate **track-record** requirement for new and renewable electricity generation projects;
- ❖ Establishes a case-by-case evaluation for a **spinning reserve requirement** on new and renewable electric generation projects for the backbone grid, and clarifies that spinning reserve requirements don’t apply to new and renewable energy on small grids;
- ❖ Removes the **thermal efficiency requirement** for cogeneration facilities using new and renewable energy;
- ❖ Eliminates the requirement for a **power purchase agreement** for new and renewable electricity generation projects; instead, requires demonstration of foreign exchange savings;
- ❖ For projects that supply electricity to a designated utility or user, removes DOE **power development plan** review and approval requirements.

In April, 2000, at the recommendation of Secretary Tiaoqui, President Estrada signed Executive Order 232, which provides PDOE with the opportunity to revise regulations regarding private sector participation in “exploration, development, utilization and commercialization of ocean, solar, wind (OSW) energy resources for power generation and other energy uses.” As of October, 2000, PDOE has drafted the revised regulations and solicited public comment.

### **Solar Energy-Powered Agricultural Water Pumping**

TCAPP-Philippines identified an agricultural water pumping investment action area through discussions with Department of Agriculture, Department of Energy, WorldWater Corp., and NREL staff on the Philippines Renewable Energy Project, Market Infrastructure Task. WorldWater Corporation is seeking to expand its existing Philippines activities to include agricultural water pumping markets, and sought the assistance of NREL and TCAPP to help

work with the Department of Agriculture to change its program that subsidizes only diesel pump purchases to improve opportunities for other technologies.

This team has engaged in discussions with the Department of Agriculture (DA), DOE, Land Bank, and Central Luzon State University (CLSU) to develop an agricultural water pumping pilot program concept. Additional in-country expertise in PV water pumping is available through the University of San Carlos Water Resources Center. This pilot program would develop capability in the Philippines to select agricultural water pumping technology that will lower pumping costs, reduce demand on petroleum imports, and improve environmental performance. As a starting point, small diesel-powered pumps (currently subsidized by DA) can be compared with photovoltaic-powered pumps. Pumps powered by photovoltaics are appropriate for many irrigation applications that use shallow tubewells, where they displace diesel-powered pumps. Development of the pilot program could lead to a PV-powered pump market of up to 10 MW (\$100 million) per year. If successful, this pilot program would ensure that PV-powered pumping was considered on an equal basis with diesel powered pumping when agricultural pumping subsidies are rationalized as part of the Agricultural Modernization program.

The result of this effort to date is a draft Memorandum of Understanding (MOU) among the parties that are interested in pursuing this pilot program. This team has also supported:

- ❖ initial efforts by Eenergy International Corporation to gather data for economic evaluation of the water pumping application of solar water pumps through discussions with CLSU;
- ❖ development of a draft Statement of Work for CLSU which will be used for program planning and also can be used to request funding from UNDP for the CLSU team; and
- ❖ a draft literature review that details the worldwide cost and performance of photovoltaic-powered pumps that can replace diesel pumping.

Next steps include:

- ❖ Signing of the MOU
- ❖ Collection of diesel pumping cost data
- ❖ Economic and financial comparison of diesel and PV-powered water pumping costs for different applications
- ❖ DA decision on pursuing the pilot program
- ❖ Implement the pilot program (if approved)

Work to date puts the team in a good position to complete a pre-feasibility study of PV-powered agricultural water pumping, obtain a DA decision on whether or not to pursue a pilot program, and, if results are favorable, implement the pilot program.

### **Hydropower Market Development**

A TCAPP-Philippines investment action for hydropower market development was initiated in October, 1999, in response to interest from the Philippines Department of Energy Mini-Hydro Division and the U.S. Hydropower Council for International Development (US Hydropower). U.S. Hydropower, at the request of its member companies, placed priority on Philippines market development, and established a collaborative effort with TCAPP, while some of its members, such as North American Hydro, are actively developing hydropower retrofit activities.

Improving international access to information about existing and potential hydropower sales and investments was the first step in a market development strategy for hydropower in the Philippines. TCAPP worked with DOE and U.S. Hydropower Council for International Development to draft this strategy, which implemented recommendations of a US Hydropower mission to Manila in September 1999, when industry representatives identified priority actions to address barriers to international investment. This partnership between Philippines DOE, TCAPP, and US Hydropower for Philippines actions is founded on mutual strong interest in developing hydropower markets in the Philippines. Other partners in an informal coalition to advance this goal include USAID, USDOE, USEPA, Winrock, PEI, and NREL renewable energy policy experts.

While these coalition members share the overall goals of achieving international investment in the Philippines hydropower market, they have specific priorities that differ. TCAPP-Philippines seeks to focus on investments that will not involve construction of new reservoirs: retrofits of existing facilities and run-of-river minihydro and microhydro. These markets are of great interest because of the rural economic development benefits that could be achieved, without greenhouse gas emissions.

Through a cooperative effort, this initiative has already removed information barriers by assisting DOE in organizing data on current hydropower opportunities, and by disseminating that data to international businesses. Senior DOE managers are committed to on-going dissemination of the data, which is now ready for posting on the DOE Web Site as HTML, downloadable spreadsheet, or Adobe Acrobat files. This improved information is useful to potential project developers, and has already attracted the interest of North American Hydro in developing projects with electric cooperatives to improve the efficiency of existing hydro facilities.

Future activities include a retrofit technology outreach session for Philippines Hydropower conference, including opportunities for businesses to discuss new retrofit technologies with electric cooperatives and other potential purchasers of hydropower.

### **Isolated Grid Hybridization with Wind Energy**

Previous NREL work with NPC-SPUG identified good technical opportunities for hybridization of diesel generation for isolated electrical grids using wind energy. High diesel costs in remote areas can make wind generation an economically competitive alternative. A private firm, BreezElectric Philippines, is pursuing opportunities to hybridize diesel electric generation for isolated grids, and requested NREL and TCAPP technical assistance and exploration of financing options. With the interest of the Philippines DOE and BreezElectric Philippines, TCAPP identified this as a likely area for private investment. In addition to the technical and economic opportunity, TCAPP sought to improve the opportunity for financing and institutional acceptance for BreezElectric Philippines and all companies that might enter this market. TCAPP has provided the following technical assistance to BreezElectric Philippines:

- ❖ Evaluated their technical analysis
- ❖ Facilitated discussions with financial organizations to explore their interest in financing this type of project, with Econergy International Corporation as facilitator

Future activities include providing training in October – November, 2000 for electric coops that could benefit from diesel wind hybrids in their service territories so that they will understand the opportunity. The electric coops are the customers for the generation, and need technical understanding of diesel-wind hybrid opportunities to be able to make decisions about using wind energy technologies.

## CONCLUSIONS

The TCAPP Program in the Philippines has been formulated to support the overall government policies such as climate change mitigation, poverty alleviation, rural development and sustainable development. The identified activities under TCAPP have been geared towards the development and widespread utilization of NRE systems as viable and clean technologies in providing energy services in the rural communities.

Major TCAPP initiatives in the country include: (1) Fast Track Action Recommendations on Policy Reforms; (2) Solar Energy- Powered Agricultural Water Pumping; (3) Hydropower Market Development; and, (4) Isolated Grid Hybridization with Wind Energy. Said efforts have been designed and implemented with the overall goal of stimulating the participation of private sector in NRE commercialization in the country. To date, the Fast Track Action initiative has resulted to several policy and regulatory reforms that removed provisions of existing laws disadvantageous to NRE projects. On the other hand, the Hydropower Market Development activity has successfully informed the government and the energy sector of the various potential of international investments for local hydro projects. Other initiatives are expected to yield specific NRE projects with high level of involvement and financing by the private sector.

The Program has demonstrated the important role of the private sector in massing up necessary resources in developing NRE projects in the country. Future initiatives may also include energy efficiency as another important area for technology cooperation if future resources and collaboration are developed.

## TIMELINE AND SCHEDULE OF NEXT KEY STEPS

Table 1. Timeline

Activity	Date
Participation in NREL international workshop to design TCAPP	Nov. 1997
Participation in COP-3 event	Dec. 1997
Consultation to initiate TCAPP activities	Mar. 1998
Preparation of Technology Cooperation Framework	Aug. – Sep. 1998
Presentation of Framework at Donor’s Meeting	Oct. 1998
Philippines delegation highlights TCAPP in intervention at COP-4	Nov. 1998
Actions development begins: DOE request for Fast-Track Actions	Dec. 1998
Industry consultation on Fast-Track Actions	Dec. 1998-Feb. 1999
Development of Fast-Track Actions	Feb. 1999
Secretary Tiaoqui’s approval of Fast-Track Action Recommendations	Mar. 1999
Development of implementing policy documents in response to Fast-Track Action Recommendations	Mar. 1999 – Mar. 2000
Initial identification of Hydropower Market Development investment action area	Oct. 1999
Agreement with DOE on investment action areas: Solar Energy-Powered Agricultural Water Pumping, Isolated Grid Hybridization with Wind Energy, and Hydropower Market Development	Jan. 2000
Technical review of BreezElectric Wind/Diesel Hybrid analysis approach	Feb. 2000
Secretary Tiaoqui’s signing of revisions to ER 1-95	Mar. 2000
President Estrada’s signing of E.O. 232	Apr. 2000
Department of Agriculture request for solar energy-powered water pumping economic analysis	Jun. 2000
Hydropower project data updated and disseminated with DOE Mini-Hydro Division (EUMB)	Jul. 2000
Train electric cooperatives to evaluate Wind/Diesel Hybrid project opportunities	Nov. 2000
Complete preparation for Department of Agriculture decision on solar energy-powered agricultural water pumping pilot program	Nov. 2000
Retrofit technology outreach session for Philippines Hydropower conference	Nov. 2000

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## UPDATE OF CTIP ACTIVITIES

**OCTOBER 2000**

This initiative grew out of a request by ministers and other senior officials from the Southern African Development Community (SADC) attending the Climate Technology Initiative (CTI)<sup>2</sup> Industry Joint Seminar on Technology Diffusion in Southern Africa on March 17-18, 1999 at Victoria Falls, Zimbabwe. The Ministers requested that CTI support a technology needs assessment that would identify actions for attracting investment in clean energy technologies that would promote economic development while helping avoid greenhouse gas emissions. This SADC-CTI initiative is designed to identify the clean energy technologies that have the greatest potential across the SADC region for meeting sustainable development needs while reducing greenhouse gas (GHG) emissions through accelerated private investment and to assist the SADC countries in mobilizing this investment. The SADC Environment and Land Management Sector (SADC ELMS) in Maseru, Lesotho, administers this project in close collaboration with lead officials in each of the countries. The Zimbabwe-based Southern Centre for Energy and the Environment and the U.S. National Renewable Energy Laboratory provide technical support for this effort.

### **OBJECTIVES**

- ❖ Identify shared priorities within SADC for attracting investment in clean energy technologies that will meet sustainable development objectives and reduce greenhouse gas emissions
- ❖ Develop a cooperative technology implementation plan that identifies actions that SADC countries and regional institutions can undertake in partnership with international donors and the private sector to accelerate investment in these technologies
- ❖ Assist SADC in securing international donor support and private sector participation in implementation of actions to attract private investment
- ❖ Enhance the technical and institutional capacity of SADC countries and regional institutions to attract international investment in clean energy technologies

### **TECHNOLOGY PRIORITIES**

During a workshop in September, 1999, the SADC countries reviewed and refined the project workplan and established criteria for selecting priority technologies. These criteria are:

- ❖ The development benefits the technology would provide
- ❖ The technologies' market readiness
- ❖ The greenhouse gas (GHG) avoidance potential
- ❖ How appropriate the technology was for the region as a whole, and
- ❖ The local environmental benefits (besides GHG avoidance) the technology might offer

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<sup>2</sup> The Climate Technology Initiative (CTI) was launched at the First Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). CTI is a multilateral initiative of 23 IEA/OECD countries and the European Commission to promote the objectives of the UNFCCC by fostering international cooperation for accelerated development and diffusion of climate friendly technologies and practices for all activities and greenhouse gases.

This workshop also established preliminary priority areas that have been refined through national consultations by the participating countries. These priorities are discussed below.

Following the September workshop, the participating countries completed national consultations to identify specific technology priorities, define market barriers that must be overcome for these priorities, and propose regional actions to address these barriers and accelerate investment and implementation. SADC ELMS, the Southern Center for Energy and the Environment and the National Renewable Energy Laboratory assisted the countries with these consultations. During these consultations, representatives from key government agencies meet with businesses, technical experts, and other stakeholders to identify the specific technologies within the six broad priority areas that will support the regions sustainable development goals while addressing the other selection criteria. Once these priority technologies are identified the participants in the consultations then review barriers to widespread implementation of these technologies and propose actions that can be implemented across the region to overcome these barriers. In a few cases, existing studies and development plans for the clean energy sector were used instead of national consultations to provide input on technology priorities and actions.

### **TECHNOLOGY COOPERATION ACTIONS**

The Southern Center for Energy and Environment has prepared a draft report synthesizing the results of the national consultations, supplemented with information from existing studies. This report identifies the following specific technologies and recommended actions as the highest priorities resulting from the consultations:

#### ***Efficient and PV Lighting***

- ❖ Develop regional standards and ratings
- ❖ Establish revolving loan fund

#### ***Efficient Motors and Boilers***

- ❖ Training program for industries and guidelines
- ❖ Establish low-cost financing

#### ***Efficient Housing Design***

- ❖ Regional seminar to develop standards and design guidelines
- ❖ Training program for architects, developers, etc.

#### ***Solar Crop Drying***

- ❖ Public education campaign
- ❖ Business network for manufacturing and distribution

#### ***Biomass Electricity Generation***

- ❖ Regional Model Independent Power Purchase Agreements
- ❖ Investment Workshop

#### ***Natural Gas***

- ❖ Assistance with gas development plans, legal frameworks and guidelines
- ❖ Regional loan fund for capital investments

This draft report has undergone initial review by the SADC countries and SADC ELMS and is currently under review by the Climate Technology Initiative and international technical and investment experts. Through this review process, 4-6 actions for mobilizing clean energy investment across the region will be selected for implementation.

## **CONCLUSIONS**

SADC energy protocol commits member states to cooperation and to the harmonizing of national and regional energy policies, strategies and programs on the basis of common interest. The most common policy goal is ensuring that sufficient, reliable, least cost energy supplies are available to assist in the attainment of economic efficiency. A further important goal is the advancement of the environmentally sustainable use of energy resources. The SADC-CTI work, with its bringing together of interest of all member countries, fully supports SADC's energy policy of providing sustainable energy to trigger economic efficiency. The energy policy goes on to specify the measures of achieving this policy, including: enhanced security and reliability of supply through energy pooling; cost effective, efficient and sustainable provision of energy services; development of human resources; research and development and data base development activities; the adoption of common standards where appropriate; and the mobilization of finance. Most of these measures will be enhanced by the activities of CTI, especially through capacity building.

The whole of SADC participated in the CTI process with keen interest. They view this as the only opportunity to access valuable investment to have sustainable energy in an environmentally benign way. The CTI process will help SADC states prepare not only for investment in the energy sector, but also can support related development goals including environmental and natural resource protection, social development, housing, and transportation planning. While this CTI work has managed to bring together interests of different countries and come up with a common strategy of attracting investment, the respective countries do have some differences in needs which may need particular attention.

## **SCHEDULE OF NEXT KEY STEPS**

- ❖ Revised investment plan prepared based on review comments and initial actions selected for implementation (November-December, 2000)
- ❖ Develop detailed workplans and secure funding for implementation of the selected technology transfer actions (November, 2000-December, 2000)
- ❖ Initiate work to further develop and implement the high priority technology transfer actions (January - February, 2001)
- ❖ Establish regional and international business network to support design and implementation of the actions (January-February, 2001)

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