EE News

A quarterly newsletter of the Regional Energy Resources Information Center

Vol. 7 No. 3 September 2005 ISSN 1513-3605

Promotion of Sustainable Energy in ASEAN

"Ensure environment sustainability" is one of the United Nations Millennium Development Goals. With the ever-increasing fossil fuel prices of oil (increases from US$ 49 to US$70 per barrel within last 7 months), renewable energy sources (RES) have becoming a more attractive option for electricity generation, considering also that countries in ASEAN region are richly endowed with RES.

In power generation, cogeneration or CHP (Combined Heat and Power) is the most efficient technique for electricity production. It also makes possible to create a decentralised energy system (DES), in which electricity is generated on-site and distributed to the areas nearby, minimising electrical energy losses from transmission and distribution. DES is also an appropriate solution for remote areas that do not have access to the electricity grid or for countries consisting of many islands like Indonesia and the Philippines.

There is an emphasis for cleaner, efficient ways of energy creation and utilization of renewable energy. ASEAN countries offer a lucrative market for alternative generation of energy form cogeneration due to various reasons to compensate for their insufficient existing installed capacities of power generation. An ever increasing demand for power foreseen as their economies continue to grow, abundant availability of agricultural wastes like rice-husks, bagasse, palm oil wastes is also seen as a contributing factor for seeking alternatives for energy generation.

Despite a long-term effort in the ASEAN region renewable energy sources, energy efficiency and cogeneration are not

(Continued on p. 2)

REDEO - Rural Electrification Decentralised Energy Options

Electrification levels in the ASEAN countries ranges from 15.8% in Cambodia to 100% in Singapore. Specifically, the electrification levels in rural areas in many countries are low. Off-grid options could be considered for providing electricity to these populations thereby integrating with the grid, and locally generated power could feed into the interconnected grid. This would offer support to weak grids at their tail end.

A large renewable energy potential (namely, hydro/biomass) could be thus mobilised. Most power sector planning tools addresses main interconnected network expansion, while those which address local issues – and renewable in particular, are generally limited to techno economic analysis or very local distribution planning – and are in all cases limited to electrification issues. To achieve maximum impact, rural or local electrification must be viewed in the global context of local development conditions, considering other related infrastructure (health, education, telecommunications, etc.) and dynamics – agriculture, cottage industries, etc.

Objective

The main objective of the REDEO project was to provide energy planners of rural electrification (RE) with a set of flexible and computerized decision aid tools for integrating sustainable and off-grid distributed generation options in planning for rural electrification. The proposed approach is cross-sectoral in essence and uses the support of Geographical Information System (GIS). The first three countries for testing, developing and implementing the proposed approach are Cambodia, Laos and Vietnam (CLV).

REDEO developed GIS tool offers different levels of opportunities in this context, e.g.: as the structure of the tool being developed is modular, and has "independent" calculation modules for various applications, including load forecasting, grid extension, comparison with renewable energy options for local grids (namely, diesel, hydro, biomass). This also allows independent use of the various modules as required by the user, as well as adapting to the reality of local data available.

(Continued on p. 3)

CONTENTS

(Continued from p. 1)

Enhance Sustainable Energy.....

yet utilised to anywhere near their potential. The major barriers are the lack of consistent policy instruments between the different countries, lack of clear rules and still a lack of awareness among decision makers in both governments and enterprises. Taking into account the ASEAN Plan of Action for Energy Cooperation, there is a need to formulate and harmonise the policy instruments within the ASEAN Member Countries in order to ensure that the objectives of the plan can be achieved in an effective way.

With the Kyoto Protocol entering into force on 16 February 2005, the ASEAN Countries are well positioned to benefit from Clean Development Mechanism (CDM) projects, especially in the areas of cogeneration, renewable energies and energy efficiency. However, in many cases these countries require support to develop sustainable infrastructures for projects to be available to the CDM. In particular, there is a need to build capacity in each country to adapt policies and regulations, harmonise policy instruments and achieve local teams to promote these concepts. These two EAEF projects will provide a significant boost to these needs.

The first project focuses its efforts in setting up National Associations for Cogeneration and Decentralised Energy Systems in ASEAN countries. The second project aims to provide recommendations in harmonising policy instruments for the promotion of Renewable Energy and Energy Efficiency. The projects started in January 2005 and will be completed in January 2006.

This issue only cover in the first project called 61-2003, titled **'Setting up of National Association for Cogeneration and Decentralised Energy Systems in ASEAN Countries'**. The main objective of this project is to establish setups for disseminating cogeneration and distributed system projects in individual ASEAN countries as a means to achieve an increase in awareness of cogeneration projects and implementing such projects leading to adoption of energy efficient technologies for providing the need in electricity sector. The Specific Objectives of the project are:

- Identifying the Countries that are most ready for setting up of National Associations for Cogeneration and Decentralized systems for countries like Malaysia, Thailand and Singapore which have more cogeneration installation compared to their neighbours like Indonesia, Philippines, Laos, Cambodia and Vietnam. These countries also have well defined energy plans where more emphasis has been placed for Renewable Energy system and cogeneration systems too. These countries are identified as the countries most ready for cogeneration projects dissemination and then spread to the remaining countries.
- Conducting Initiation-meetings amongst the partners and working committee for setting up the Associations across ASEAN for designing policy framework
- Setting up of the initial structure and working team for individual associations in different ASEAN countries.
- Formulation for working policies statutes for functioning of the associations.
- Creation of ASEAN-wide network among these associations in the different countries for that will strive towards better understanding, formulation and adoption of appropriate cogeneration and Distributed Systems in consistent with their own countries policies and needs.

The 2nd project called 62-2003, titled, **'Capacity building in formulating harmonised policy instruments for the promotion of renewable energy and energy efficiency in the ASEAN Member Countries'** The objective of this project is to make valuable inputs to the development of harmonised regional policy instruments, which would eventually help to stimulate RES and EE projects in the ASEAN region. The results expected from this project are:

- Current status of RES and EE policies in the different ASEAN Member countries; specific difficulties and barriers faced by ASEAN countries in disseminating and promoting RES and EE and the identification of the gaps that need to be filled in terms of policies and regulations;
- Assessment of the relevant European policy instruments that promote RES and EE development that are transferable to the ASEAN scene;
- Recommendations on harmonised policy and regulation tools for the development of RES and EE in ASEAN;
- A network of policy makers, business executives, consumers and civil society that will push for the formulation and adoption of appropriate and consistent policy instruments in their own countries.

The initial thoughts and background experience of the project was presented at a special session of the Sub-Commit-tee on Energy, Communication and Telecommunication of the Thai Senate on 24 March 2005. Speaking in the Thai Senate, Dr Simon Minett, Managing Director of COGEN Europe, noted that "this is an important opportunity to develop the infrastructure necessary to expand sustainable energy systems in ASEAN, especially as preparation for encouraging investments supported by the CDM of the Kyoto Protocol".

For more information please contact Project managers: Renewable Energy and Energy Efficiency: Christine Widjaya, +66 2 524 5399, christine@ait.ac.th or Cogeneration and Decentralised Energy System, Remigio Henson, +66 2 524 5399, rem@ait.ac.th ❖

(Continued from p. 1)

REDEO - .....

Through the REDEO tool, the planners will be able to:

- Identify the main population settlements of a given area (eg province)
- generate the load demand of each village of a province
- estimate the resource available
- do a scenario analysis considering the load and decentralized energy options and
- conduct financial analysis for the selected options by ranking investment costs and producing financial indicators.

Project Methodology

First, a detailed analysis of the rural electrification institutional frameworks in the target countries, and a review of existing softwares available for rural electrification planners were carried out. The design of methodology for rural electrification planning at a provincial level in CLV countries using the REDEO tool was done, along with an assessment of pilot site selection, and data requirements and collection procedures. This led to the development of a preliminary version of a GIS-based decision-aid tool for rural electrification planning. After further discussions and data collection, the final specifications of the REDEO tool were agreed and developed. Test of the final version of the tool using case studies (one province in each of the three target countries) was carried out, and a final workshop was organized inviting participants from other ASEAN countries as well, where the tool was presented and feedback was obtained.

The REDEO tool has been developed under Manifold software which is a GIS environment in Windows XP (does not support Windows 95). The REDEO tool also needs Microsoft.NET Framework 1.1(available for free on the Internet) and Microsoft Internet Explorer 5.01 (but the user may use their preferred browser). It consists of a toolbar that is automatically created each time Manifold starts, and which gives the user some additional functionalities compared to the basic Manifold software.

In order to reduce the number of load points which have to be taken for the load forecast and electrified options, the concept of cluster is defined in REDEO tool as composing of Center with High Potential for Development (CHPD) and its "satellites" or Ordinary or Other" Localities (OL). Those localities which are not included in the clusters are excluded from the analysis. Electricity demand is forested over a plan period by every 5th year for each of clusters by categories of its electricity demand. The peak power and energy demand will be forecasted for each of clusters.

Resource options considered by the tool are hydro potential sites, biomass availability, high voltage lines and substations are to be considered as potential sources points (as candidate production options).

In the phase of scenarios analysis, the REDEO tool links resource candidate

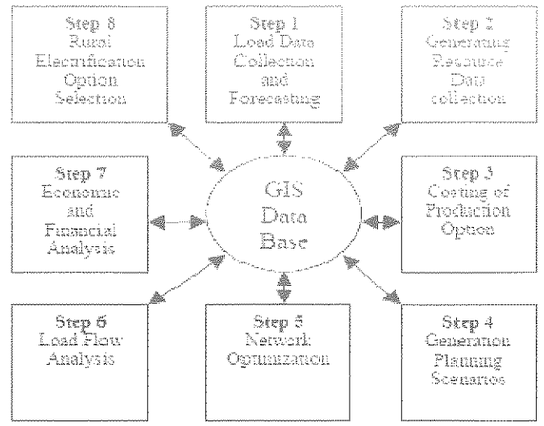


Figure 1: REDEO Methodology

sites to clusters together by medium voltage lines considering constraints of availabilities of resource candidates and electricity demand. In this step, REDEO tool will calculate the average life cycle cost of the electricity production (up to each of clusters) in terms of USD/kWh or other similar indicators (e.g. present value of the investment cost). For clusters where the electricity demand could not be met by the candidate production options, diesel will be considered as electricity production option. REDEO tool also considers whether the least cost is for stand alone diesel for a cluster or it would be cheaper to connect another cluster by increasing the generator units. The results presented are a set of indicators of economic, financial and socio economic for each of network configuration (e.g. a combination between a generation candidates and clusters). The database developed for REDEO model tool consists of GIS data, socio – economic data, data of power sector (e.g. power infrastructures, specific energy consumption etc.)

Outputs

The tool provides maps, graphs and tables with specified principal indicators (e.g. status of electrification such as provincial power demand, potential of renewable energy options, household electrification rate, health centre and education electrification rate, production cost, and total investment for each of power systems etc,) for decision makers to assist plan rural electrification options. Indicators on impact of the scenario on environment and development are optional.

Project Team

The French engineering and consulting firm IED (Innovation Energie DŒveloppement), the Energy Field of Study of the Asian Institute of Technology (AIT), and the Center for Energy and Processes (CEP) of the French research centres association ARMINES (Association pour la Recherche et le DŒveloppement des MŒthodes et Processus Industriels). This project is funded by the ASEAN Center of Energy (ACE) through the EAEF facility of the European Commission.

For more information please contact:
Prof. S. Kumar,
Energy Field of Study,
School of Environment, Resources and Development,
Asian Institute of Technology,
P.O. Box 4, Klong Luang,
Pathumthani 12120, Thailand,
E-mail: kumar@ait.ac.th; ❖

Conference /Workshop Report

Workshop on Rural Electrification Decentralized Options (REDEO)

The final workshop of the Rural Electrification for Decentralized Energy Options (REDEO) project was held at AIT during 30th June - 1st July 2005. The partners of this project are the Innovation Energie Development (IED), Asian Institute of Technology (AIT) and Association pour le Recherche et le Development des Methodes et Processus Industriels (ARMINES)/ Centre d' Energetique des Procedes– Energetics Centre (CEP) of the Ecole des Mines des Paris. The project is funded by the EC ASEAN Energy Facility through the Asean Centre of Energy, Jakarta.

The workshop was aimed to present the REDEO tool, its applicability, methodology, and cases studies to the participants, and to discuss the improvements that could be considered. The tool has been developed targeting the three countries: Cambodia, Lao PDR and Vietnam. Participants from the Philippines and Indonesia were also invited to this workshop to learn about the developed tool and to obtain their suggestions. Participants were requested to provide feedback regarding the REDEO tool .

Final Workshop

Rural Electrification Decentralized Energy Options (REDEO)

Asian Institute of Technology, Thailand

30th June - 1st July 2005

For more information please contact:
Prof. S. Kumar, Energy Field of Study,
School of Environment, Resources and Development,
Asian Institute of Technology,
P.O. Box 4, Klong Luang,
Pathumthani 12120, Thailand;
E-mail: kumar@ait.ac.th

Innovations / New Technologies / Research Initiatives

Fuel Cell Vehicles : Transport of Future

Fuel cells produce electricity through a chemical reaction between hydrogen and oxygen, and produce no harmful emissions. Hydrogen fuel cells have long been used to generate electricity in spacecraft and in stationary applications such as emergency power generators. In fuel cell vehicles (FCVs), hydrogen may be stored as a pressurized gas in onboard fuel tanks. The electricity feeds a storage battery (as in today's hybrids) that energizes a vehicle's electric motor.

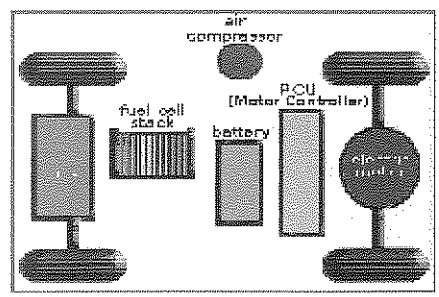
A fuel cell vehicle (FCV) is an electric vehicle that uses a fuel cell rather than a battery to provide electricity that powers motors at the wheels. While a battery must be recharged after all its fuel has reacted; a fuel cell is a "refillable battery"—filling the fuel tank recharges the vehicle. The fuel cell onboard the vehicle produces electricity directly from the reaction of hydrogen and oxygen. FCVs can be twice as efficient as similarly sized conventional vehicles. They can also be equipped with other advanced technologies to increase efficiency, such regenerative braking systems that capture the energy lost during braking and store it in an upsized battery. The diagram below shows the basic components of a hydrogen-fueled FCV.

An FCV may be thought of as a type of hybrid because its electric battery is charged by a separate onboard system. This underscores the importance of advancing present-day Hybrid Electric Vehicles (HEV) technologies.

HEVs help reduce petroleum consumption immediately and provide lessons about batteries, energy storage, fuel advancements, and complex electronic controls that may apply directly to future transportation technologies. HEVs have federal and state purchase incentives that make them approximately cost-competitive with conventional cars and trucks.

The question is how do you fuel a fuel cell vehicle? FCVs can be fueled with pure hydrogen gas stored directly on the vehicle in tanks or extracted from a secondary fuel, like methanol, ethanol, or natural gas that carries oxygen. These secondary fuels must first be converted into hydrogen gas by an onboard device called a reformer. FCVs fueled with pure hydrogen emit no pollutants only water and heat vehicles that use secondary fuels and a reformer produce only small amounts of air pollutants.

So, FCV are making history. The challenge now is to make it cost effective and increase the sells.



For more information please contact: *National Renewable Energy Laboratory, www.nrel.org*