



**Theme 4**

**Water Use and Supply Management**

**WORKSHOP 1:  
ALTERNATIVE ENERGY – A SOLUTION  
FOR ENERGY SECURITY FOR  
ISLANDS AND REMOTE AREAS**

**25 November 2009**



**Korea Ocean Research Development Institute**

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**The East Asian Seas Congress 2009**

**“Partnerships at Work: Local Implementation  
and Good Practices”**

**Manila, Philippines**

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**Theme 4: Water Use and Supply Management**  
**Workshop 1: Alternative Energy – A Solution for Energy Security for Islands  
and Remote Areas**

**24 November 2009**

**Co-Convening Agency:**  
Korea Ocean Research Development Institute (KORDI)

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**BACKGROUND AND OBJECTIVES**

"Energy is essential to economic and social development and improved quality of life. Much of the world's energy, however, is currently produced and consumed in ways that could not be sustained if technology were to remain constant and if overall quantities were to increase substantially." As clearly stated above in Chapter 9 of the Agenda 21, the promotion of technology development and the use of alternative energy is one of the key essential elements for the sustainable development.

Islands are surrounded by the oceans which are abundant in the sources for alternative energy. At the same time, small islands as well as remote areas are facing difficulties in securing the energies, which is inevitable for economic and social development and better quality of life. How to secure energy supply in the islands and remote areas is one of the facing issues to be addressed in order to achieve sustainable development.

Is introducing alternative energy in small islands and remote areas feasible? The workshop focused on:

1. The status of the technology development of alternative energy;
2. Feasibility of alternative energies; and
3. Utilization of a new finance scheme for promoting alternative energy development and expansion.

## PART 1: OVERVIEW OF TRENDS OF POLICY AND TECHNOLOGY ON ALTERNATIVE ENERGY

The morning session of the workshop started with an overall picture on the status of technology development for alternative energy sources in the East Asian Seas region. A presentation was made by the Chair, Dr. Ki Dai Yum (KORDI), on the “Status of Technology Development on Alternative Energy in the Seas of East Asia.” He began his presentation by highlighting ocean energy as one of the largest potential sources of energy in the East Asian region. Ocean energy can be exploited from a number of conversion methods, such as wave power, hydrokinetic energy from tides and ocean currents, tidal barrage, and ocean thermal energy conversion. He gave an overview on the status of each ocean renewable energy source citing that the technology on tidal energy and offshore wind utilizations are already commercially available while wave and current energy are still under development. On the other hand, thermal and marine biomass are still in the early stages of research.

Figure 1: Status of Technology Development on Alternative Energy in the Seas of East Asia.



Ocean Renewable energy sources	
Tide:	→ commercialized
Wave :	→ under development
Offshore Wind:	→ commercialized
Current :	→ under development
Thermal:	→ under study
Marine Biomass:	→ under study

Dr. Yum also noted that energy resources should have diversity so that there will be more security in case a particular resource is in short supply. He expressed optimism that ocean energy can meet a significant share of the world renewable energy aspirations and is adequate enough to supply local requirements. However, the severe maritime environment is also providing difficulties in terms of economics, survivability and reliability of the energy

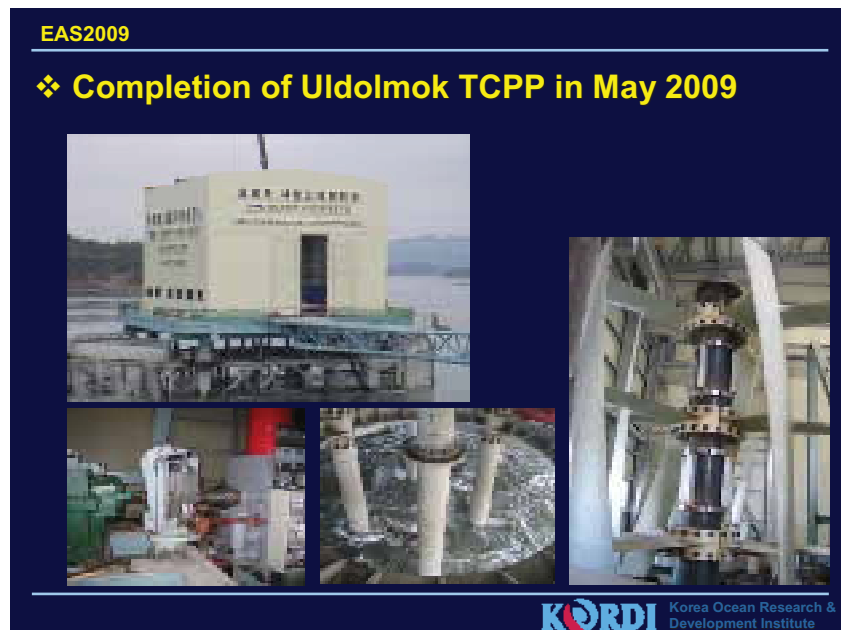
converting systems. Thus, the system should be harmonized with the environment and ocean energy R&D should be accelerated.

## **PART 2: STATUS AND FEASIBILITY OF INTRODUCING OCEAN AND COASTAL ENERGIES**

The second part of the workshop dealt on the variety and viability of alternative energy sources with a special focus on ocean and coastal energy sources. A presentation on coastal wave energy utilization in India was made by Dr. Paimpili Joseph of the Center for Earth Science Studies in Kerala, India. The presentation cited the benefits of harnessing coastal wave energy. It posited that India has a lot of potential for new fishing harbors in the near future and the development of new cost-effective breakwater systems is a viable option since costs are being shared between the breakwater wall and the power plant. He concluded that wave power offers many advantages over renewable sources, like wind and solar energy, since the latter forms of energy require hundreds of square acres of useful open land for their installation. In addition, wind farms are also the source of noise pollution and solar energy is largely dependent on weather consistency. Moreover, wave energy can help reduce the consumption of fossil fuels and pollution.

A presentation on tidal current power development followed, focusing on KORDI's work on harnessing the energy from tides using state-of-the-art technology. Dr. Kwang Soo Lee presented KORDI's experimental Tidal Current Power Project (TCPP) in the Uldolmok channel. Started in 1986, the project involves a series of comprehensive field measurements and numerical modeling. Prior to the commercial plant, the pilot TCPP was designed and constructed with a capacity of 1 MW. To enhance the efficiency of the generating system, research works are being conducted in the pilot TCPP, including monitoring of the structural stability diagnostic system. The basic development plan of Uldolmok tidal current power plant will be established on the basis of experimental results from the pilot TCPP.

**Figure 2: KORDI's Tidal Current Power Project in the Uldolmok Channel.**



The next presentation was on the Philippines' initiative in harnessing marine current energy resource. Engr. Albert Mariño of the Philippine Council for Industry and Energy Research and Development (PCIERD) highlighted local initiatives including marine current assessment activities and the identification of appropriate technologies to harness marine current energy resource. In the Philippines, harnessing and utilization of renewable energy are one of the strategies of the government to provide sustainable energy supply for the country. Thus, current initiatives are directed towards creating a market-based environment that is conducive to private sector investment and participation, at the same time encouraging technology transfer and research and development in this field.

Among the renewable energy sources, ocean energy resource has been recognized as having significant potential for future energy development. Its application can significantly contribute in the self-reliance program of the government. Attributed by its archipelagic nature, the country's ocean energy resource area is about 1,000 km<sup>2</sup> and the potential theoretical capacity for this resource is estimated to be about 170,000 MW (Department of Energy Report). Based on the convergence from large bodies of seawater in the Philippines and the constricting point of islands, the San Bernardino Strait, Basilan Strait, Ilo-ilo Strait, San Juanico Strait and Surigao Strait are initially identified with tremendous marine current strength. Among these potential sites, San Bernardino Strait proves to have the highest potential in hosting large ocean current power plant stations. After identifying selected areas in the country, PCIERD also conducted an initial technology search and assessment to identify marine current technologies that have potential for application. Most of these technologies, however, were developed abroad. While there are technologies developed locally, these are still at the prototype development stage and no working system is installed in actual local power application.

Another Korean alternative energy technology was showcased in the workshop. The Shihwa Tidal Power Plant Project was presented by Dr. Sang-Hoon Kim of Daewoo E&C Co. The power plant has ten 25.4 MW turbines that can generate a total capacity of 254 MW. The amount of annual generation is 552.7 GW which can supply energy for 200,000 residents. To ensure enough water circulation, eight culvert-type sluice gates were also planned. The project, started in 2003, will be developed in seven years and will cost about US\$ 355 million. The Shihwa Tidal Power Plant will help boost RO Korea's energy self-sufficiency through renewable energy development and contribute to cutting down oil imports by 862,000 barrels/yr and reducing carbon dioxide emissions by 315,000 tons/yr.

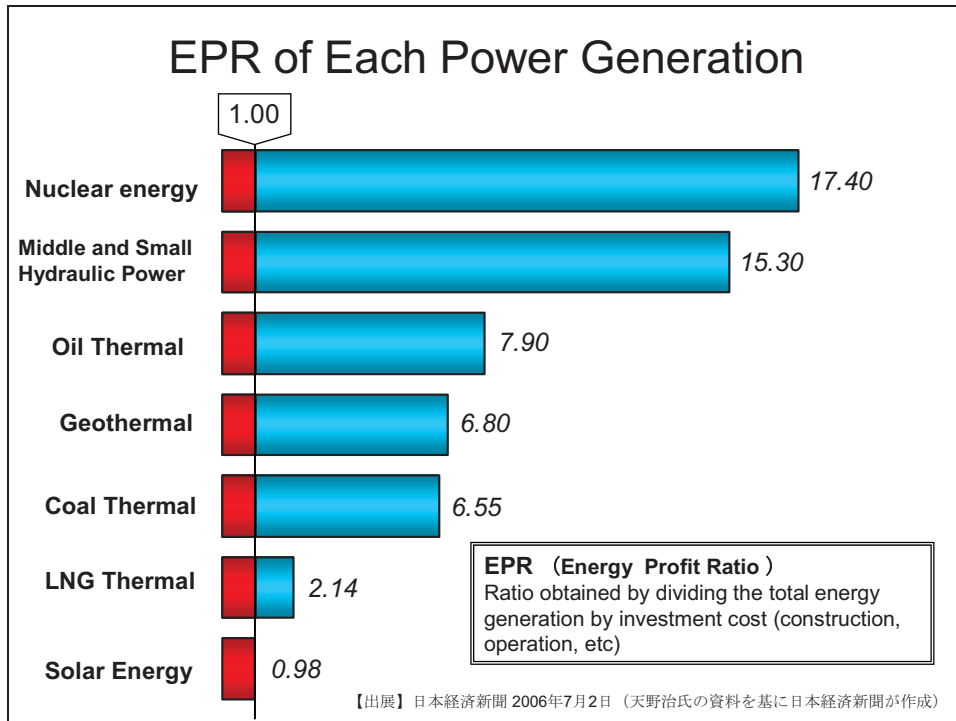
### **PART 3: VARIOUS APPROACHES OF UTILIZING ALTERNATIVE ENERGIES THROUGH PARTNERSHIPS AND INNOVATIVE MECHANISMS**

At the start of the afternoon session, the presentation topics shifted to the different approaches of utilizing alternative energies through partnerships and innovative mechanisms — showcasing various experiences from Japan, Philippines, Indonesia and Thailand.

The first presentation was from Dr. Kotaro Takemura, Secretary General of the Japan Water Forum. He discussed Japan's experience from having centralized energy to distributed energy from modern to post-modern. Japan relied on firewood under the federal system of the Edo Era for 250 years, from the beginning of the 17th century. At the onset of the Meiji Era 150 years ago, Japan achieved its modernization by introducing new energies such as coal and oil. For the 21st century, Japan is urged to seek out future energy alternatives. Japan identified solar and water resources as alternative energy sources. In 2005, the National

Committee for Promoting Small Hydraulic Power Generation was established. It has been doing research on technical improvements to reduce the cost and possible policy support in order to expand the small hydraulic power generation. Although small hydraulic power generation alone cannot sustain big cities, it can be an important energy source for local communities that plan to self-sustain.

Figure 3: Investments in Middle and Small Hydraulic Power yields high profitability.



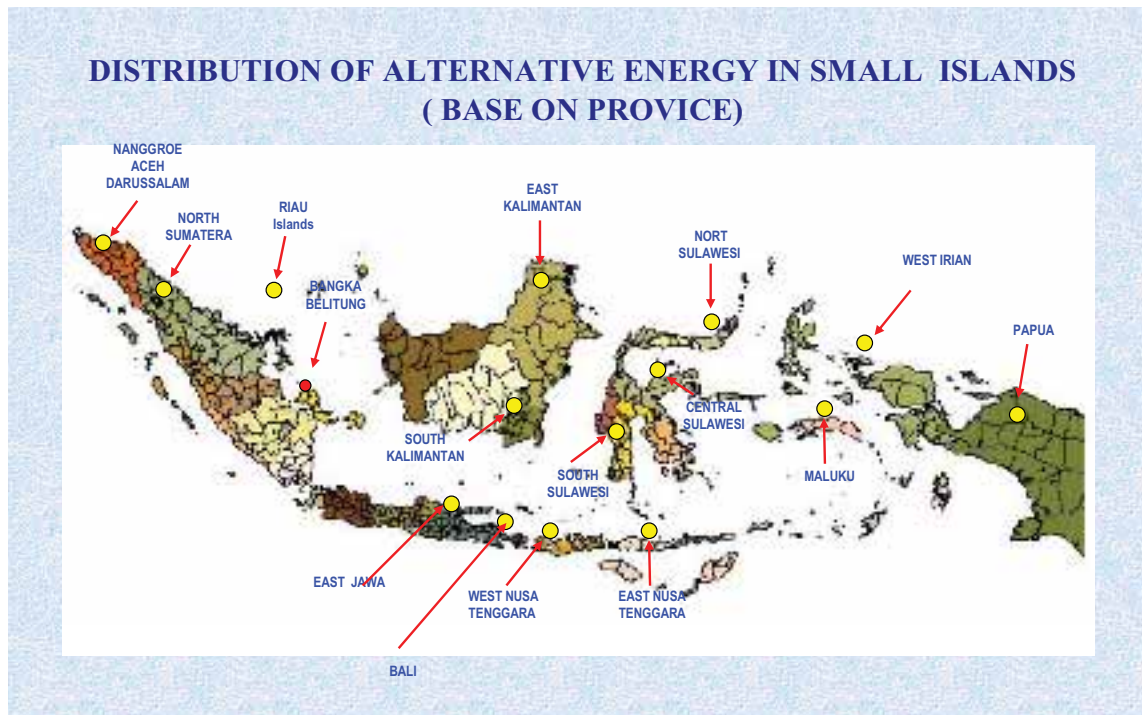
The next presentation was on micro-hydro projects in the Philippines and was delivered by Mr. Ronnie N. Sargento of the Philippine Department of Energy (DOE). He noted that DOE's primary thrusts are on energy security and power sector reforms. One of the objectives under Energy Security is to aggressively develop renewable energy potential such as geothermal, biomass, hydropower, solar, wind and ocean energy resources. He informed the participants that the Renewable Energy Law, created in 2008, will provide an impetus towards accelerated development of renewable energy in the next 20 years. He cited several DOE programs on micro-hydro energy projects including the UNDP-CBRED, the JICA supported Village Electrification Project, the NEF Mahaganao Micro-hydro project, the ADB-funded Renew Negros Project and the e8's Ambangal Mini-hydro project. The challenges faced in project implementation include the high initial costs and limited financing mechanisms, limited technical capabilities and the reliability of equipment used and limited expertise on management and operation.

The next presentation focused on the development of alternative for small energy in small islands in Indonesia. Mr. Toni Ruchimat, Director of Small Islands Empowerment from Indonesia's Ministry of Marine Affairs and Fisheries, tackled the general condition of small islands in Indonesia, the issues and problems surrounding them, Indonesian government's energy policy and future development based on the available resources of small islands. He



emphasized the need to develop alternative sources of energy for small islands based on its resources to increase the quality of lives and the prosperity of communities. Among the possible options are sea current energy and wind energy, which are ongoing projects. Indonesia is also undertaking research on the wave energy and another prospect will be the Ocean Thermal Energy Conversion.

Figure 4: Indonesia's small islands greatly depend on alternative energy sources.



Another presentation from the Philippines showcased USAID's experience on renewable energy for small islands and other remote communities in Mindanao. Ms. Cris Cayetano (USAID-Philippines) provided information on the AMORE project, or the Alliance for Mindanao Off-Grid Renewable Energy. AMORE is a rural electrification program that uses renewable energy technologies, i.e., solar and micro-hydro to bring light and renewable energy-based social services to remote, off-grid, and mostly conflict-affected areas in Mindanao. The project was able to achieve the following milestones: secure energy support and community assistance, BRECDA formation, formulation of policies, mobilization for household electrification and BRECDA strengthening. Since September 2002, it was able to provide electricity to 474 *barangay* (villages) and 13,014 households, energized 224 schools with 43,972 student beneficiaries, and improve the access of safe water for 155 *barangay*. Other benefits such as carbon dioxide mitigation, job creation, improved living standards, increased productivity and more livelihood opportunities, health benefits, increased student participation and peace promotion was also created by the AMORE project.

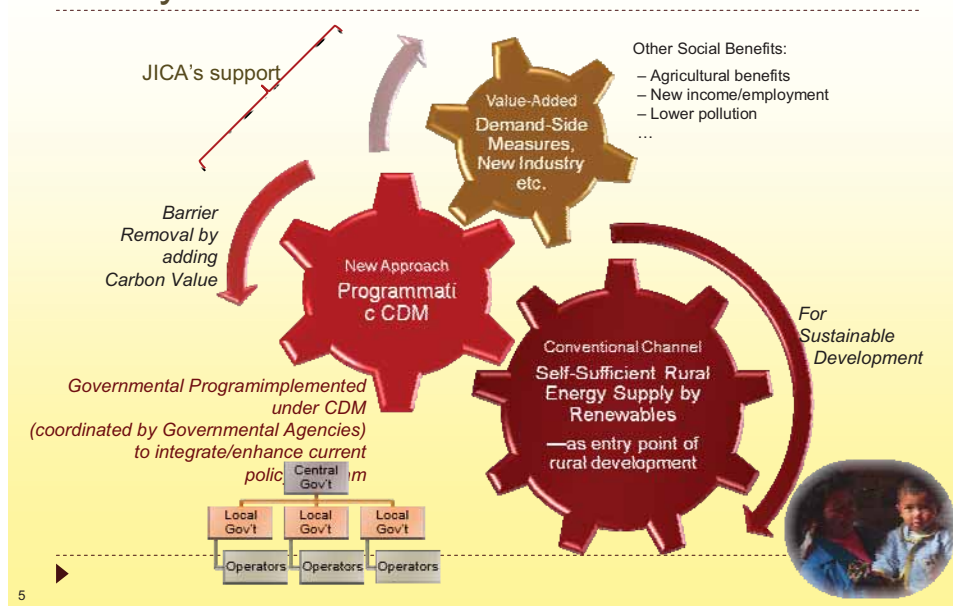
The experiences from the Asia-Pacific Region on financial sustainability of access to energy services for the poor were shared by Dr. Thiyagarajan Velumail from UNDP Regional Center in Bangkok. Energy is critical in the achievement of the Millennium Development Goals (MDGs) as it is the basic foundation in the attainment of the MDGs. It is estimated that about

1.6 billion do not have access to electricity and about 2.4 billion are still dependent on traditional biomass for cooking needs. Limited access to energy also has implications to health. The World Health Organization estimates more than 4,000 premature deaths per day, more than half of these are under five years, and are due to indoor air pollution caused by the use of solid fuels (85% from biomass). The poor pay more for their basic energy needs. Enabling energy access to the poor, therefore, would make a difference in achieving the MDGs. A major strategy is promoting community-based access to energy to promote equitable energy access and to maintain sufficient power to fuel productive uses. Experiences in Indonesia (Cinta Mekar), Bhutan (Sengor) and Nepal (Rural Energy Development Programme) prove the reality that energy should be used to increase income. More attention should be given to linking energy and its productive uses to promote livelihood and other income-generating activities among communities. This should be done with the help of micro-finance institutions. In the same manner, there is a need to link NGOs, governments and bilateral and multilateral institutions engaged in livelihood enhancement initiatives to introduce energy services especially at the community level. Small and medium-scale enterprises should promote programs where renewable energy can make a contribution. Private sector vendors of renewable energy targets (RETs) should also focus on income-generating activities.

The overview, status and challenges of the utilization of the Clean Development Mechanism (CDM) in rural development combined with biogas production in the region were introduced by Dr. Naoki Matsuo, Climate Experts, Ltd., Japan. In the presentation titled "Biogas Micro-Digester as a Rural Development Program under CDM: How to utilize programmatic CDM to enhance low-carbon development policy," it was introduced that the Government of PR China has a subsidy program to introduce the Biogas Micro-Digester with CDM utilization in rural development as one of the examples of policy support. It was also emphasized that cooperation and coordination with the local government was inevitable for the successful programmatic CDM. The coordination of the small-scale renewable energy activities as a programme under CDM can be a new channel and provide additional benefits to enhance governmental policy for achieving self-sufficient rural energy supply by promoting renewable energies. Furthermore, the CDM projects can provide not only greenhouse gas reductions and Certified Emission Reductions (CERs) but also local employment, environmental protection and energy security, among others. Utilization of CDM would open a new door for successful implementation and/or enhancement of the existing programmes on energy supply and sustainable development of the remote areas by the national and local governments.



**Figure 5: New Channel to Enhance Governmental Policy utilizing CDM.**



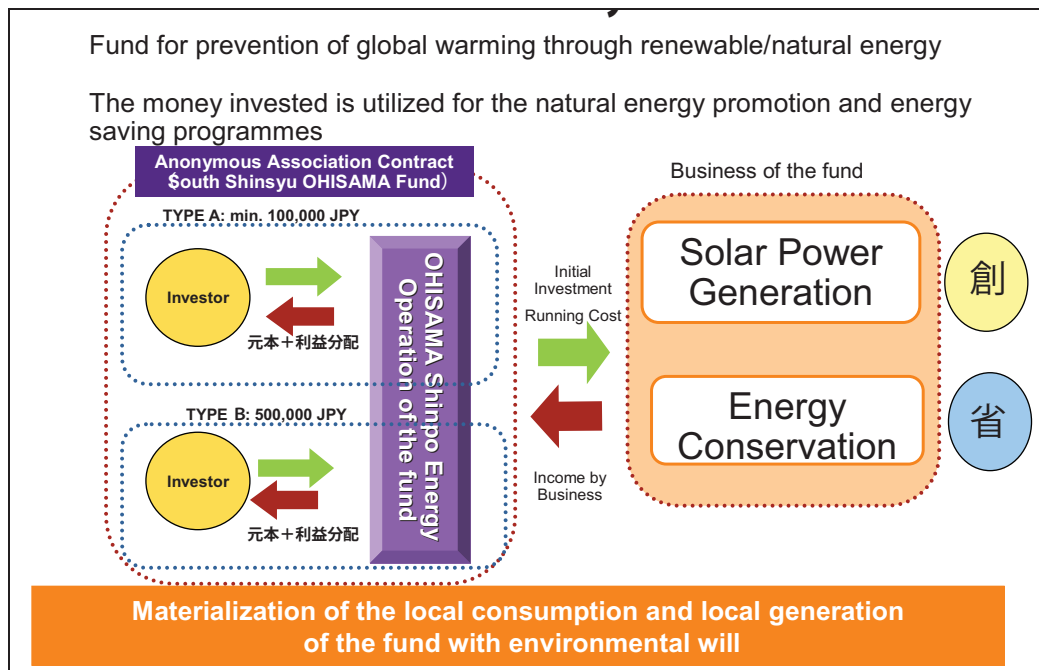
The example of the methane gas recovery CDM project was presented by Mr. Gerardo Tan Tee, Absolut Chemicals, Inc., Philippines. Absolut Chemicals, Inc., in cooperation with Mitsubishi Corp., Japan, registered the CDM project, which has 96,000 ton-CO<sup>2</sup> e/year emission reductions, in October 2006. Under the guidance of the Department of Environment and Natural Resources (DENR) Philippines, through a series of orders issued, Absolut Chemicals, Inc. has developed the projects and programmes which contribute to comply with environmental laws and orders. It was emphasized that cooperation with the Mitsubishi Corp., in terms of technology introduction of the Hybrid Anaerobic Digester System and a Covered In-ground Anaerobic Reactor Lagoon to capture the methane, as well as coordination with investors/buyers of the CERs enabled the CDM project to materialize.

The overview of the initiatives on the biogas digester of animal waste in Bali was presented by Dr. I Nyoman Suprpta Winaya, Udayana University, Indonesia. Taking advantage of the condition that Bali is agriculture-dominant and has high availability of land space, the biogas digester utilizing animal waste was introduced. Through the biogas digester, methane is captured and converted into energy, which can be utilized for cooking and electricity. In addition, the biogas digester produces remaining solids which can be used for fertilizers. The biogas digester also reduces odor and contamination of surface and groundwater, among others. Some problems that need to be overcome to promote alternative energy utilizing animal waste include the short lifespan of the plastic tube digester and financial difficulties for installation of the digester. It was found that public opinion on biogas technology from animal waste is generally positive. Although the family-size biogas digester is dominant in Bali, biogas production for big farms is expected in the future.

Mr. Akihiro Hara, OHISAMA Energy Corporation of Japan, presented the initiatives of promotion of solar power with the establishment of the innovative fund which is utilized for solar power generation and energy saving promotion. The OHISAMA Energy Corporation was

established through the Environmental Public Benefit Project through public-private partnerships which was implemented by Iida City with support from the Ministry of Environment, private companies and an NGO on environmental education. The corporation established the fund titled “South Shinsyu OHISAMA Fund” which materializes the local consumption and local generation of solar energy by utilizing the investor funds to promote the expansion of solar power generation in Iida City. By November 2009, 162 solar power generators were introduced in public places, such as nursery centers. By setting up the solar power generators in public places, especially in those related to children’s activities, the corporation also promotes environmental education programmes to children. It was emphasized that the investors were happy with the installation of the solar power generators, which proved their environmental will. It was introduced that changing society through change in money flows can be done for sustainable development. Local generation and consumption of the energy can be one of the measures to ensure energy security in the remoter areas.

**Figure 6: Mechanism of “South Shinsyu OHISAMA Fund” to promote renewable energy.**



## CONCLUSIONS

The following are the major conclusions of the workshop:

- Ocean energy sources are very much site-dependent, therefore the relevant technologies should be pursued accordingly.
- Tidal power, which is suitable for large scale, is in the commercial stage; on the other hand, wave, current, and offshore wind power technologies, which could be installed in the local scale, are still in the development stage.

- Small/micro-hydropower, solar energy and biogas could be good solutions for energy supply and security for small islands and remote areas which contribute to improve the quality of life of the people. However, expansion of these energy generation systems have some difficulties, e.g., low cost-efficiency and technical limitation.
- The Clean Development Mechanism (CDM) could put an additional benefit in energy supply and security through utilizing the money generated by CDM to be invested on another energy project using CDM.
- Energy resources should have diversity for security, centralized and localized.
- Alternative energy conversion system should be harmonized with the environment.

## **RECOMMENDATIONS**

The workshop participants have agreed on the following recommendations:

- To secure the viability of alternative energy and its expansion, further research, technical development, more experiences and projects should be pursued.
- To promote alternative energy, support from the government is inevitable including policy and budget for both large and small-scale alternative energy.
- Promote north-south and south-south technical transfer, knowledge and information exchange.
- Integrated and comprehensive investigation on alternative energy resources in each country is recommended for the establishment of the long-, mid- and short-term national plan for the development of technologies and the practical use of energy economically and efficiently.
- Collaboration among various stakeholders, including national and local governments, academe, NGOs, and the private sector is one of the keys to make alternative energy projects successful.