2012 International Conference on Life Science and Engineering
IPCBEE vol.45 (2012) © (2012) IACSIT Press, Singapore
DOI: 10.7763/IPCBEE. 2012. V45. 2

Review and Evaluation of Successful and Unsuccessful Renewable Energy Projects in South Asia

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Abstract. In South Asia, as in other parts of the world, a number of renewable energy projects were started with a great deal of enthusiasm. Many of these collapsed within a few years of their implementation, either due to the declining oil prices or because of the institutional and other reasons. A few projects survived and have met the desired targets. Keeping in view the above facts and importance of renewable energy the SAARC Energy Centre adopted a methodology to evaluate renewable energy projects by conducting a study on Critical Success Factors for Renewable Energy Projects in South Asia (Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) by engaging country experts who prepared country reports of their respective countries. The country reports were synthesized to prepare the regional report by the regional expert engaged from the SAARC region. The Study was aimed to review and evaluate the success stories as well as the expensive failure undertaken over the last 30 years in South Asia and to determine the critical success factors and reasons for failure of the renewable energy projects. The primary focus of the study was on stand-alone wind power, solar photovoltaic and other renewable energy projects especially those in the remote locations.

The lessons drawn from analysis can contribute greatly to design and development of renewable energy projects in South Asia. Identified risk factors will help the policy makers and developers to avoid steps that would lead to failure of similar technology projects contemplated to be built now. From critical review and evaluation of most successful projects from each country and unsuccessful projects that failed to achieve anticipated results it has been concluded that success of the renewable projects require appropriate policy initiatives, institutional mechanisms, provision of required human and financial resources, R&D and capacity building, total RE potential assessment, regional and international cooperation and support, selection of appropriate technology and community participation etc. These elements will be useful for replication, attracting fresh investments, technology transfer and sharing the best practices in renewable energy projects for rural development in South Asia.

Keywords: Renewable energy projects, Critical success factors, South Asia

1. Introduction

The South Asian Association for Regional Cooperation (SAARC) comprises eight countries namely, Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Energy supply security has become an issue of paramount importance for sustainable growth. All countries of the Region are highly dependent on imported energy especially oil whose price is volatile. There is greater urgency of developing indigenously available renewable energy resources (RES) like solar, wind, micro hydro and biomass. The extent of utilization of renewable energy also varies, though the highest level of utilization is not over five percent of the total commercial energy consumption in any of the South Asian countries. The potential of usable RE is a function of the technology available for its utilization and the extent of area surveyed in a country as available for renewable energy development after allowing for the other uses. As RE development has become an important issue in energy management and economic development in all the countries of the region, each country has taken initiatives to formulate RE Policy, Bangladesh, India, Nepal,

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Pakistan and Sri Lanka have formulated RE policies exclusively for renewable energy development. Some of the countries have specific policies in respect of certain RE resources and have set up institutional arrangements for promotion of renewables. Most of the country policies focus on providing incentives to promote Renewable Energy Technologies (RETs) by way of subsidy or tax concessions. The use of feed-in-tariff to encourage the sale of electricity through the use of RETs is slowly gaining momentum. It is encouraging that all countries are aware of the importance of RET development for energy security and environment protection. In fact, all the countries in the region have experimented with many renewable energy technologies and appliances. Several of these projects and programmes have been supported through technical and financial assistance of external agencies. Among the projects some in a few countries have proved to be of outstanding success, while, many launched with high expectations could not deliver as anticipated. Even among the unsuccessful projects some are still languishing as pilot schemes, some have been abandoned. In respect of the successful projects the countries are attempting to replicate these to the best extent possible.

This paper briefly highlights outcome of the selected successful as well as unsuccessful projects of SAARC countries except Afghanistan. It presents the critical success and failure factors of RE initiatives in the region and lessons learnt from RE projects installed during last three decades.

2. Countrywise Successful Projects

2.1. Bangladesh: Solar Home Systems, Grameen Shakti

The Grameen Shakti (GS), sister organization of the pioneering micro financing institution Grameen Bank, has made commendable contributions in popularizing RE especially Solar PV (Rahmathulla 2008). By 2008, GS has installed nearly 204,000 SHS and achieved 518210 SHS in 2010. Its installation rate in 2008 was 8,000 units per month. Depending on the size, SHS provide 2-6 CFL lights, 1-3 fans and radio socket, socket for a B&W TV and mobile charger. This is most successful because of some novel features like leadership, vision, soft micro credit, Vast Rural Network of Grameen Bank, local technician training, community involvement and social acceptance, effective after sale service, blending technology with market forces and local manufacturing of SHS accessories.

2.2. Bhutan: Chendebji at Trongsa Hydel Project

The country has surplus energy in the form of large hydro-electric potential and has plans for extending the grid supply to all villages (Adhikari 2008). A micro hydel project, Chendebji at Trongsa has been selected as the successful project, because of the innovative and efficient management. It is community owned and community managed project with a capacity of 70kW.

2.3. India: Wind Power Generation programme

The wind power is the most successful of all RE programmes in India (Sankar 2008). Wind power generation by private sector players has grown so rapidly in the last five years that it contributes in 2009 over 8,757 MW (15,683 MW in January 2012) which is more than 70% of the total contribution of renewable energy resources to power generation in India. This has been achieved without any "cash subsidy", as in the case of most RE programmes. The package of incentives to investments in wind-power generation by private sector included fiscal concessions like, accelerated depreciation, tax holidays, customs duty relief, and liberalized foreign investment procedures. The other factors contributing to the success of wind energy are that all likely impediments to the projects, such as, sales and price are removed by the facility for transmitting the power generated to any place, banking the power produced, as and when wind conditions permit, and keep it "on account" with the Discom concerned till its transmission becomes necessary, and a feed-in-tariff for all utility purchase of this power.

2.4. Maldives: Laamu Atoll PV Project

The most successful project is the Laamu Atoll PV project funded by the Japanese government grant and implemented by a Japanese contractor (Latheef 2008). Under this project, solar panels of 2.8 kW, 4 in number, were installed to produce about 11 kW power to satisfy the power needs of multi purpose building and the island office. The project was commissioned in 2006 and has been functioning very efficiently. Though the power is costly, it provides a model for providing the power needs of holiday resorts, which

come up on small islands with zero pollution. The factors, which contributed to the success of the scheme, are selection of superior technical design and good implementation. Cost was not an inhibiting factor as it was taken as a pilot research project.

2.5. Nepal: Rural Energy Development Programme

The most successful renewable energy programme is Rural Energy Development Programme (REDP) which promotes decentralized energy planning at district level (Acharya 2008). An establishment of community organization at the village level for the operation of micro Hydel plants is underpinning component. The programme relies greatly on community participation in planning and management of the district energy systems. It has been extended to 15 districts, and is funded by Government of Nepal and UNDP. Though it is essentially based on micro Hydel schemes, it has other RET equipment also like solar PV lighting, biogas, improved cooking stoves, etc. Rural energy supply is taken up as an effective entry point for sustainable development and poverty reduction through community managed energy service delivery. The World Bank has also joined the programme as a partner. For this purpose, community organizations (COs) were created with the members representing each household in the target settlement, and each CO is oriented on energy and other related socio-economic development issues. The factors which contributed to the success of the REDP programme in Nepal are: Conceiving the programme as part of the overall socio-economic development of geographically and administratively defined area like a district; the development of locally available energy resources like Mini and Micro Hydel which is the core of the development efforts; and generous funding by international aid agencies.

2.6. Pakistan: Aga Khan Rural Support Programme, (AKRSP) Microhydel, Chitral

The AKRSP is a non-profit organization, which was established in 1982 by the Aga Khan Foundation of Pakistan. The main purpose of the AKRSP is to reduce poverty in Northern Pakistan (Alauddin 2008). The Chitral Office of the AKRSP manages the microhydro programme in the area. The focus is on the communities in the remote areas of the Hindu Kush mountains that are scattered and isolated, and far away from conventional electricity supplies. They have traditionally used smoky and unreliable pinewood torches and, more recently, costly kerosene lamps for lighting. The region's many fast-flowing rivers, however, make it well suited for the generation of electricity through small-scale hydro power, produced without the use of intrusive large dams. The AKRSP has installed over 180 micro-hydro power units with capacity 20 to 75 KW. These community collaborated projects supply electricity to about 175,000 people for lighting, and operating radio, television and electric butter churners. This community based RE development is registered as CDM project in 2009.

2.7. Sri Lanka: Energy Services Development/ RE for Rural Economic Development

The most successful renewable energy project that spread through the country to reach over 100,000 households was the Energy Services Development/ Renewable Energy for Rural Economic Development (ESD/RERED) project targeting off-grid electricity supply, from solar home systems and micro-hydroelectric systems (Saiyambatapitiya 2008). In the same project, funding was provided to develop an estimated 126 MW of grid-connected power plants (some of which are still under construction), which may be expected to generate an annual average of 419 GWh. This amount of energy is presently adequate to serve 500,000 households (without adjustment for network losses) at the present average annual household consumption rate of 840 KWh/year. Thus in terms of consumer outreach, the ESD/RERED project has been able to serve a significant number of households, than any other project or program launched in Sri Lanka. Sustained support from the lending agency, Project Management by private institutions (DFCC Bank and participating credit institutions), matching funds provided by the government through the provincial councils, minimal dependence on “foreign” expertise for the design and implementation of village hydro system, and quick move-in by active group of solar industry players to implement the solar home systems on a commercial scale are he important factors that made the project a success.

3. Critical Success Factors

The critical factors that have contributed to the success of RE projects in South Asia are: (i) The presence of an approved policy for the renewable energy sector as a whole, or sub-sector policies relating to each technology or sub-sector. (ii) availability of reliable resource assessment data; (iii) Well-established,

efficient, institutional arrangements for planning and implementation of RE projects/programmes; (iv) Incentives–financial, fiscal, and supportive feed-in tariff systems; (v) Community participation; (vi) Project identification and prioritization according to the needs of the beneficiaries;(vii) Project financing tied up fully in advance for smooth flow of funds for implementation; (viii) Standardization of design, technology and specifications.; (ix) Due diligence of the needs, locally available capability, and resources of the area in advance; (x) The training needs identification and provision of capacity building assistance ahead of launching a programme and continuous capacity augmentation support throughout the life of the project; (xi) Availability of efficient consultancy companies and well-established and reliable contracting firms; and (xii) Availability of knowledge support from reputed academic or technical institutions.

4. Country Wise Unsuccessful Projects

4.1. Bangladesh: Wind Power Programme

The unsuccessful programme in Bangladesh is its Wind Power Programme. Some small wind turbines were installed in the late 90s and early 2000s (Rahmathulla 2008). They all failed within a short time. The Power Development Board (PDB) installed two units of 0.98 MW each in Feni but they are also not functioning now. Another two units were set up in Kutobtia, but they also failed due to technical problems. These appear to be mainly design deficiency and use of non-validated wind energy data.

4.2. Bhutan: Solar Photovoltaic

Early efforts in developing solar PV systems have not been successful. It has not been popularized as a scheme to bridge the time gap between the present situations of non-supply of electricity to a distance date when there will be grid connected electricity supply (Adhikari 2008). The failure to appreciate and address the issue of differential cost between PV based power and Hydel power from large power stations like Tala hydel power project have led to the consumers showing very little interest for such projects. The lack of trained manpower to provide technical support for maintenance and repair has also contributed to this.

4.3. India: Improved Cooking Systems

The "unsuccessful project" is Improved Cooking Systems in poor households to replace firewood and to reduce the adverse health impact of the indoor pollution (Sankar 2008). Many enthusiasts of the renewable energy technology might object to the naming of this scheme as a failure. The Improved Cooking Systems (ICS) have led to the introduction of millions of smokeless Chulhas in the villages and over 0.6 million solar cookers have been deployed. Still it is not considered as commercially and convenience-wise preferable to traditional cooking stoves by users. The Programme has not considered the zero cost of traditional Chulhas.

4.4. Maldives: Landfill Gas Project at Thilafushi

In 2004 a project was undertaken with UNDP assistance to explore the possibility of utilizing the gases produced from landfill for power generation in Thilafushi Island (Latheef 2008). This island receives waste from Male, Villigili and other surrounding tourist resorts. However, on commissioning the project, it was found that the burning of the waste in open fire produced foul smell, which was spreading to the neighboring islands. The contamination of sea and air triggered strong objections from environmentalists. The presence of sub surface seawater made the landfill gas extraction very difficult. Very poor project investigation, selection of ineffective technologies, lack of an critical evaluation of the appropriateness of the selected project parameters with reference to local conditions and the failure to visualize the adverse environmental impacts have made the project a non-starter from the beginning.

4.5. Nepal: 10 KW Wind Turbine at Kagbeni

The first effort to harness the wind energy potential in Nepal was the installation of a 10 kW wind turbine in the Kagbeni by Nepal Electricity Authority (NEA) in 1989 (Acharya 2008). The feasibility study of wind power plants in Mustang and Myagdi districts in 1985 estimated the wind speed in Kagbeni to be about 10 m/s during the day time. However, improper dimensioning the turbine vis-à-vis the wind speed at that location resulted in the breakdown of the plant after two months of the installation. Lack of sufficient wind data and rugged topography resulting in variations in the wind speeds within a region, has posed a significant challenge in harnessing the wind energy resource in Nepal.

4.6. Pakistan: Solar Photovoltaic

In early 1980s, Directorate General of New and Renewable Energy Resources (DGNRER) installed eighteen imported PV systems with an installed capacity of nearly 440 KW in different parts of the country for the village electrification (Alauddin 2008). The project was unsuccessful due to lack of technical know-how and inadequate follow up since the package of project development did not include capacity building (both for working team & the beneficiaries); Non-sustainable methodology, high cost and without community cost sharing.

4.7. Sri Lanka: Pattiyapola Project

In Sri Lanka, an example of a failed project is one of the earliest attempts to promote a village energy system integrating several resources to demonstrate that all the village energy needs could be met from local renewable energy resources (Saiyambatapitiya 2008). The project, along with two others established in Africa and Latin America was intended to serve as models for the rest of the world. This project Pattiyapola Rural Energy Centre was financed and implemented by UN Agency for Habitation. It must be emphasized that the project though classified as a failure, as it was unsustainable, had some positive outcomes as well. For example, it was able to demonstrate the workings of new technology to Sri Lankan professionals, to understand its capabilities and limitations.

5. Critical Failure Factors

The major causes for the failure of renewable energy projects in the SAARC countries are : (i) Lack of comprehensive resource potential assessment of the Renewable Energy Resources mainly solar, wind and small hydro; (ii) Lack of an exclusive Renewable Energy Policy Statement or Act and the lack of sustained interest on the part of the government in implementing the policy; (iii) Inefficient technology selection for the project or programme leading to the choice of immature technology or unreliable implementing agency or machinery supplier; (iv) Non-inclusion of study of the total impact of the project on the local community environment at project planning stage; (v) The technology development efforts do not take into account the consumers' traditional ways of obtaining that service and underlying causes required for energy supplies in a particular form while designing the programme; (vi) Limited manufacturing (vii) Non availability of appropriate technology and high cost (viii) Lack of adequate preparation including capacity building before launching a large RE programme; and (ix) Lack of effective coordination mechanisms among project/programme implementing public and private agencies.

6. Lessons Learnt

A number of very useful lessons regarding the design and implementation of RE policies, programmes and projects are learnt from the analysis of the factors leading to the successful and un-successful RE experiments, programmes /projects in South Asia. The Major lessons learnt are: (i) Establish a nodal agency to deal exclusively with RE resources; (ii) This agency should first Prepare a well designed and time bound programme for the scientific assessment of the RE resource potential of the country; (iii) Draft an appropriate comprehensive Renewable Energy Policy for the country and work towards obtaining enthusiastic support and cooperation from all concerned agencies for implementation; (iv) Establish at least one pilot project in the public or private sector using the-state–of-art technology and through reliable contractors for each RE resource like wind power, solar and small hydro-power generation etc. Make this project a model for other prospective investors and for launching a larger programme by the Government or the Non-Government Agencies; (v) Use these model projects to induce external development aid agencies bilateral and multilateral and philanthropic organizations to take large of RETs programmes; (vi) Simplify and quicken procedures for identifying project locations, obtaining licenses and permissions and clearances by investors in RE projects in consultation with key stakeholders at all stages of project; (vii) Smooth and timely funds flow to RE projects; (viii) Incentivize academic and technical Institutions to take up research on all aspects of RETs for wide scale adoption and create ample opportunities their participation to provide intellectual and knowledge support to RE projects; (ix) Encourage the establishment of efficient energy

consulting organizations and contracting firms to support implementation efforts in RE sector; and (x) Launch Nation-wide campaigns to educate civil society on the need and benefits of adopting RETs.

7. Acknowledgements

This paper is benefited from the Study on Critical Success Factors for Renewable Energy Projects in South Asia conducted and published by SAARC Energy Centre in 2009. We are grateful to Mr. Hilal A. Raza, Director, SAARC Energy Centre, Islamabad, Pakistan for Guidance in conducting study and permission to submit this paper for ICPSD 2012.

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