7 AFFORDABLE AND CLEAN ENERGY

Synopsis of Funded Research Projects on Renewable Energy: Daffodil International University

Daffodil International University

Managed and Prepared by:

Department of Electrical & Electronic Engineering

Daffodil International University

Project 1: Mobile Monitoring Station of Solar Home System (SHS)

Principal Researcher: Professor Dr. M. Shamsul Alam, Dean, Faculty of Engineering, DIU

Co-Researchers: 1. Dr. Md. Alam Hossain Mondal, Associate Professor, Dept. of EEE, 2. Tasmia Baten, Senior Lecturer, Dept. of EEE, 2. Nusrat Chowdhury, Lecturer, Dept. of EEE

Funding Agency: The German Academic Exchange Service (DAAD), Germany

Project Synopsis:

This project describes measurement and evaluation of three PV solar panels and an attempt has been taken to fix standardization for solar PV systems to accelerate implementation of efficient, sustainable and reliable solar electrification project in Bangladesh. DAAD provided some advance performance measurement meters and loggers that are capable for measuring system voltage, current, power, efficiency, and solar irradiance along with the other weather parameters. The research grant facilitated the purchase of the equipment for Electrical and Electronics Engineering Department, Daffodil International University (DIU). The project is located at Daffodil International University, administrative building rooftop, Dhaka, Bangladesh. Dhaka is situated 23°42 North latitude and 90°24´ East longitudes means 12-13 hours/day sunshine is available in average. Three capacities with 45W, 60W, 100W DC solar PV systems and a 1 kW on-grid system have been installed on the roof of the university building for performance testing. All systems are oriented to the south with a tilt angle of 23°. This project has been emphasized on stand-alone systems for standardization that are mostly using for off-grid electrification in Bangladesh. It proposes a base study of solar energy potentiality precisely focusing on Dhaka division. This research activity facilitates to assess the technical and economic feasibility to get the efficient solar system as well as confirms the standard (proper or below standard) of the solar system. The energy generation by PV modules were measured with solar analyser, whereas the solar irradiation was captured by radiation sensor mounted with the analyser. The data of the real-time power were displayed and stored in the equipment. All the experimental data were measured and recorded for whole day throughout the year.

Project 2: Ethiopian Energy Stakeholder Capacity Development on Energy Modelling for Policy Planning

Principal Researcher: Dr. Md. Alam Hossain Mondal, Associate Professor, Dept. of EEE

Co-Researcher: 1. Md. Dara Abdus Satter, Associate Professor, Dept. of EEE

Funding Agency: International Food Policy Research Institute (IFPRI), USA

Project Synopsis:

This project emphasises on the identification of participants to create a core energy modelling team from relevant organizations such as MOWIE, Ethiopian Electric Power Company, Ethiopian Electric Utility and its Universal Electricity Access Program, Ethiopian Electric Agency, the Power Africa initiative in Ethiopia, World Bank's Ethiopia Electrification Program and academic institutions. During this project a good number of workshop/meeting/training will be arranged to develop an energy planning for the core team. The ultimate goal of the project is the identification of data gaps, data gathering and management for the TIMES (The Integrated MARKAL/EFOM System) model development for the electricity sector and co-development of a basic Ethiopia-TIMES model. Development of a data collection and management system for TIMES that includes the following key sectors: agriculture, households, industry, commercial, transport and others and development of a complete energy system. Work with the core team to develop alternative policy scenarios such as NDCs, energy efficiency/improve cookstoves, universal electrification, energy trading/export to the neighbouring countries and promotion of renewable energy technologies and develop at least one research paper and one policy note.

Project 3: Support for Clean Energy Scale Up and Investment in Bangladesh

Principal Researcher: Dr. Md. Alam Hossain Mondal, Associate Professor, Dept. of EEE

Co-Researcher: 1. Md. Dara Abdus Satter, Associate Professor, Dept. of EEE, 2. Dr. Md. Rezwanul Ahsan, Assistant Professor, Dept. of EEE.

Funding Agency: National Renewable Energy Laboratory (NREL), USA and United States Agency for International Development (USAID), USA

Project Synopsis:

The National Renewable Energy Laboratory (NREL), in conjunction with the United States Agency for International Development (USAID), has been providing technical assistance to support the Government of Bangladesh's (GOB) goal of promoting wind development to stimulate private sector investment, rural economic development, and to meet growing energy demand through domestic energy resources. NREL has worked with in-country partners to install, operate, and maintain state-of-art wind measurement systems at nine strategic locations across Bangladesh – taking the first step toward developing the resource data infrastructure required to develop commercial utility-scale wind projects. As a result of the Wind Resource Mapping project, the private sector has access to wind resource data, transmission maps, other land use data and analytical tools, and transmission maps that help accelerate project siting. Additionally, GOB can also use the same data and tools to improve decision making for clean energy policy, transmission planning and designing competitive procurement processes. As part of the USAID-NREL Bangladesh second phase work, NREL will build on the results of the wind resource assessment completed in June 2018 and continue to provide technical support to the GOB to meet development goals and renewable energy implementation targets. Promoting public and private sector investment in clean energy and strengthening the capacity of relevant GOB officials and private sector stakeholders facilitates improved data-driven decision making. The focus of support in FY19 and FY20 will be in the areas of improved access to data and development support, procurement design support, energy planning and grid integration assistance. The work plan remains flexible, within the defined priority areas, to respond and adapt to shifting priorities as technical assistance progresses. NREL will collaborate closely with USAID and GOB to update the work plan and scheduled activities as necessary.

Project 4: Web-based Electricity Cost Management (W-ECM)

Principal Researcher: Professor Dr. M. Shamsul Alam, Dean, Faculty of Engineering, DIU

Co-Researcher: 1. Dr. Md. Alam Hossain Mondal, Associate Professor, Dept. of EEE, 2. M A Razzaque Rupom, CEO of OS CLiCKS, Dr. Marzia Zaman, Senior System Engineer, E-Power, Queen's University. Canada

Funding Agency: Self-funded

Project Synopsis:

The proposed work is targeted to develop electricity cost model in order to ensure least cost energy supply by considering Bangladesh as model validation. In Bangladesh (and many other developing countries) the electricity market is regulated. Due to lack of proper regulation the least cost energy supply is not yet achieved. The only way to ensure proper regulation is through ensuring competition among investors as well as among utilities under independent regulatory body. In order to ensure perfect competition, the energy sector has to be levelled playing field, which is almost absent in Bangladesh due to incompetent regulatory body. The web-based application envisioned here will be effective in achieving that. In developed countries there are many web-based applications in different public and private sectors, but there is no such application for managing the cost of electricity supply. Because, the electricity systems in the developed countries are entirely privatized, decentralized and deregulated, there is limited or no scope of such application there. The web application itself and the various analysis techniques proposed here are not new, but the overall model development for electricity cost through web is quite innovative. The analysis of the collected data (in two categories; static data – the data which do not change over time and periodic data – change over monthly or yearly or even time to time) will include cost benefit analysis including area of expenses and losses in electricity generation, transmission and distribution. The overall system architecture of the Web Electricity Cost Model (W-ECM) can be used to accommodate different classes of stake-holders namely,

the administrator, the policy maker, the regulator and the consumer. These four classes of users will be able to use/access web application under their scope of usage. In addition, the web-based cost management model will have a great contribution in educating the consumer and empowering them to participate in energy sector development. The consumers will be able to access data and visualize their energy consumption pattern using the proposed web-based application. This will allow them to think wisely and proactively change their behaviour and attitude towards energy consumption. This will have a positive impact in ensuring energy conservation and replacement of fossil-fuel based energy by renewable energy. Also, the web application will empower them to raise their voice against unfair energy pricing and unusual increasing of energy supply cost. This application will serve Bangladesh Energy Regulatory Commission (BERC), Department of National Consumer Right Protection (DNCRP) and Consumers Association of Bangladesh (CAB) to protect consumers' right and interest under BERC as well as DNCRP Acts. Enhancing consumers' knowledge-base through web can be extremely powerful in bringing revolution in energy sector development. To consumers, it is of great value to gain knowledge about different aspects of energy e.g. energy efficient appliances, general energy consumption pattern, peak hours, different tariff slabs and their implications. Through the web application, users will be able to visualize their present energy consumption and cost pattern as well as anticipate the future consumption and cost based on past data. The proposed web-based model application once fully developed will become an essential tool for different stakeholders in energy sector of Bangladesh.