

Abstracts of the
National Seminar on
Renewable Energy: Solar Thermal Energy

March 22, 2009

Dhaka

Organized by
Renewable Energy Research Centre, University of Dhaka
Bangladesh Solar Energy Society, Dhaka

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The role of Academic Institutions for policy formulation to the Global Climate Change

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Climate change means change in the long-term meteorological parameters and variables. A change from one climate mode to another which is outside the range of natural climate variability creates climate change. Climate change is associated with changes in the natural forces that control climate such as earth-orbital parameters which effects in the solar radiation and temperature circulation. Increased GHG has the potential to change this space time patterns of global climate. Potential impacts of Global climate change on the natural environment, human life, health, socioeconomic activities in various sectors are important attributes to identify and develop technologies & formulate policies to be adopted for sustainable development. “It is the cause that produces effect, the effect cannot come by itself. The realization of the idea is the effect. The means are the cause, attention to the means, therefore is the great secret of life”- Swani Bibekando. The role of academic institution are: a)to design and development of renewable energy education program, 2) to develop methodologies to asses climate change,3) observation of climate change etc. Education in general and the renewable energy education in particular, is the selection of the right means for the mitigation of he global climate change. Introduction and elementary courses of renewable energy at primary and secondary level. Introduction of relevant subjects at graduate, post graduate and higher level in degree colleges, institutions and universities. Launching of programs for mechanics, technicians, scientists and engineers to implement RET at various levels. Providing sufficient financial support for renewable energy research including industries oriented research for production and exploration. Establishment of institutions and R & D centers for fabricating sophisticated renewable energy devices including nanodevices. Launching a people oriented renewable energy education programs by folk song, dance, drama etc.

Development Status and Market Potential of Solar Water Heating Systems in Bangladesh

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Flat plate collectors absorb solar radiation falling on them, convert radiant energy into heat and then transfer heat to a fluid, very often water. In warmer climates like Bangladesh, a need for hot water in homes exists only in winter. But solar water heaters may also be profitably used for commercial and industrial hot water supplies to hotels, hospitals, canteens, dairy farms, cold storage units, textile/handloom industries etc. Previous researches on flat plate, dish, and parabolic collectors show that flat plate thermo siphon type solar water systems can be a good option for solar water heating in Bangladesh. Studies on different types of selective coatings in different methods have also been done. An optimal sized SWHS shows that it can be used over the year with about 60% efficiency. For a typical handloom industry the 64% energy can be extracted from solar. If debt ratio is 50% with 10% interest rate for 5 years the payback period is 9.6 years and benefit to cost ratio is 1.84. This typical system can be used for 165875 handloom industries. SWHSs can also be used in health clinics and parzatan hotels and can save a significant amount of electricity.

A case for the use of human power over solar PV for supplying electricity to rural homes

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This paper presents a model for the use of human power for providing electricity to rural homes as against solar PV which is in vogue at present. Lighting is an important aspect for the enhancement of the quality of life of the rural people and the target considered in this paper is the provision of at least one or two white LED lamp(s) with a total of 5W per household throughout Bangladesh, requiring a total of about 140MW. Details of the basic generator modules each of which will provide 120W for distribution will be given in the paper. This will not use any battery, thus causing no pollution as created by Solar PV. Power will be delivered directly to homes for 4 or 5 hours in the evening. The total cost requirement

will be 3 times less than needed for a solar PV system with a longer effective lifetime, requiring very little in maintenance and repair. It will also provide part time employment to many people, and the energy will be really green. A comparative analysis will be made in the present paper based on the following considerations.

1. Total cost and affordability
2. Sustenance (maintenance and repair)
3. Environmental considerations

The analysis will show that on all these considerations a human powered rural electricity system is a much better option than Solar PV for providing electricity to a large number of people in Bangladesh and other Third World countries.

Renewable Energy Usage in Bangladesh Air Force

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Bangladesh is a developing country having limited amount of Gas and Coal reserves. Country is having significant shortages in electrical energy and in last seven years period this sector suffered a major set back. However, the present natural gas reserve is giving a very strong and essential support to our energy requirement and Economy. This is not a never ending source of energy but this fossil fuel reserve is already giving last warning of depletion to its end point. There is no other stronger alternative energy source except Nuclear Energy than the Solar Energy. Nuclear energy requires huge investment and many barriers and hurdle to cross before final launch of such project. The geographical situation of our country gives an advantage to avail 'Solar Energy' as a never ending source of energy. As a developing nation Bangladesh needs expertise to help in the research and development fields regarding this 'Renewable Energy'. The role of Armed Forces could be very effective for the development of the renewable Energy source and in-turn help face the challenge of the climate change. The advent of global warming, ozone hole and fossil fuel reserve depletion makes the issue of using renewable energy as a prime requirement of present day.

Green Building Design
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Introduction:

A healthy and friendly environment is that which helps human beings, animals, plants and all creatures to be enriched with its pollutant free characteristic resulting to keep also the mind fresh and so on. It is synergic with similar words like natural environment, social environment, family environment, political environment which flute the same tune. Here in this article I am trying to show analogy of all these cases giving emphasis on natural environment. Can we make an estimate the production cost of unit of air or water which we are get from the nature by the grace of Almighty ? Tree gives oxygen to the nature for human being. Human being needs oxygen for living.

On 11/10/2008, the Daily Ittefaq [local news paper of Bangladesh] published news on page - 16 that in South Africa scientists have found some bacteria in the deep gold mines that does not need oxygen for their survival. So, these bacteria give indication of existence of lives in other planets of the universe. Very interesting, no doubt, if any physician come forward to cooperate with those scientists in South Africa may find out some way or develop some cells in human body like those newly discovered bacteria, then the human being may not require oxygen for survival and that would have been the latest best medicine of this world.

I believe, in the future, there will be more and more interesting findings and discoveries in this world. Should not all or part of these would be used to destroy peace of human being and all other living creatures, rather all should be used in favor of all living creatures. There should not be any more atom or gas bomb or some more dangerous bombs discovered by any scientists and used by anyone or the United States of America. There should not be any increase of poisonous gas in air and water of this world by the industries, agricultural activities, transports and any activity of human being by any country.

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European Community(EC) for reducing greenhouse gas (GHG) emissions .These amount to an average of five per cent against 1990 levels over the five-year period 2008-2012.

The Kyoto Protocol is generally seen as an important first step towards a truly global emission reduction regime that will stabilize GHG emissions, and provides the essential architecture for any future international agreement on climate change.

By the end of the first commitment period of the Kyoto Protocol in 2012, a new international framework needs to have been negotiated and ratified that can deliver the stringent emission reductions, the Intergovernmental Panel on Climate Change (IPCC) has clearly indicated are needed.

Performance Analysis of Solar Water Heater

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Two solar water heaters of 100 liter and 200 liter were installed on the roof-top of electronics laboratory at Old Academic Building of Electrical and Electronics Engineering Department of BUET. The data of 4 months have been collected and analyzed in this paper. It is found that the incoming hot tap water is about 30° C higher than the room temperature during day time during winter months. This is about 25° C in afternoon hours.

Nanomaterials in the Energy sector: Solar thermal domain applications

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Applicability of nanomaterials in the energy sector has been searched and analyzed. It has been found that the main challenge of nanomaterials are to improve the efficiency, reliability, Safety and life time of the energy producing system. In the energy sector the application areas are: Energy conversion/production, energy storage and energy saving. It has been realized that in each domain, applicability of nanomaterials have the tremendous potential. The most promising application fields for the energy conversion are bioenergetics, thermo photovoltaic and fossils energy. The products are aero gels for solar collectors thermoelectric devices, ad fuel additives, catalyst. Nanomaterials are nonocrystalline titanium dioxide, Nanostructured

materials and carbon nanotubes Si,Ge nanowires. In the energy storage system the most promising application fields are rechargeable batteries and super capacitors. The products are rechargeable fuel cell catalyst etc Nanomaterials are: C-nanotubes Nano-sized lithium titanate Nano magnesium/magnesium alanate, Nano titaniumHoneycomb nanostructures, C-nanotubes. For energy saving, the application fields are insulation, more efficient lightning point sources, more efficient lightning for large areas, combustion, lighter stronger materials. The products are aerogels, smart glasses, inorganic LEDs made from III-V semiconductors, small molecule organic LEDs Nanotubes LEDs, Fuel additives, catalyst. Nanomaterials are: Nanolayers, Nanostructured polymer films, metal oxide nanoparticles, nonporous metal oxides/ceramics, nanocrystalline ceramics, and nanocomposites coatings. In the context of Bangladesh researchers and technological development are needed are nanotechnology based thermal system.

Applicability of Nano tech for Solar Thermal Application

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Applicability of nanotechnology for harnessing solar energy for the production of thermal energy has been studied. For this, conventional solar thermal energy has been reviewed. It has been found that available solar thermal collectors are in three categories: Low Thermal collector (LTC), Medium Thermal Collector (MTC), High Thermal Collector (HTC). LTC is used for heating, cooling, ventilation of thermal energy. MTC is used for solar cooking, drying and pasteurization. HTC consists of system designs such as parabolic trough design, power tower design, dish design, Fresnel design, micro CSP. But the heat exchange rate using traditional techniques is not satisfactory. Only 41% to 61% is possible. Conversion rate from solar energy to thermal energy is also very low with conventional heat materials. Recent research shows that nanomaterials and nanostructured coating is the probable technique for the application of optical selective absorber coating in solar thermal collector that will effectively increase the efficiency. Coating materials are based on amorphous hydrogenated carbon and include novel nanostructured materials of type $\text{Si}_x\text{C}_{1-x}$: He/Me. These coatings can be deposited by physical vapor deposition technique or plasma enhanced chemical

deposition technique. The thermal and optical properties can be determined by spectrophotometry, spectroscopic ellipsometry, and real time laser reflectometry. Edging test can also used. Optical selective optical absorber is the probable candidate for achieving solar thermal system. Recent research shows that nanotubes are good thermal conductor exhibiting “Ballistic conduction”. It is predicted that carbon nano tube has the capacity to transmit up to 6000 watts /m/k at room temperature. The temperature of stability of CNT is estimated upto 2800°C in vacuum and about 750°C in air. So it is suggested that nanostructured materials may be effectively designed and implemented for solar thermal applications. Extensive research work, design and techniques are suggested for this.

Ready, Set, Green Transition to Renewable Energy for Mitigation of Global Warming

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World energy demand is about 20 Trillion Watts. Most of this comes from fossil fuels. The CO₂ is leading to global warming. We should immediately start the transition process from fossil fuel to solar economy. Why Solar Energy? Because of the sheer amount of energy the Sun gives us – 120,000 Trillion Watts! Our Challenge – Harvest these “Free Photons” to solve our energy and food needs. RET (Renewable Energy Technology) in Bangladesh could be scaled-up successfully when there will be a united effort from people, Government, Academics, Private Enterprises and all other Development Agencies. Our Role for Adaptation to RET is to create more awareness, Dissemination of knowledge through training, Improvement of technology designs, Innovative solutions to rural and urban sectors, Enhancing manufacturing and service facilities, Maintaining quality and service for reliability, Facilitate research at the university level for high efficiency and Nanosolar based solar cell fabrication to reduce foreign dependence, Formulate laws to Increase/replicate urban usage of solar energy in the buildings and offices, Involve qualified professional with adequate background on solar energy in policy making activities in the future, Formulate immediately incentive based Net Metering rules to buy electricity from Renewable based power generation by small and medium private entrepreneur, Promote Biomass based power generation, bio gas plant, Encourage BIPV (Building Integrated Photolytic system) in

urban areas, Encourage solar home system installation all over the country to increase income at rural level Promote innovation in the field of renewable energy, Give incentives to energy efficient building, industries and projects, Encourage energy saving devices through tax benefit or by giving subsidy, Take initiative to fabricate solar cell and solar panel locally, Encourage energy savers for motors, tube light, air conditioner, Introduce electronic ballast for tube light, CEFL lamp and LED lamps where ever applicable, Take measure to advocate awareness in renewable and energy conservation, Promote solar water heating, solar power irrigation and water pumping, solar powered mobile base station, Traffic signal, Harness Wind power from coastal and hilly areas.

Studies on a Solar water Heater and Determination of Its Efficiency Factor

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A prototype solar water heater was constructed and studied. As a glazing, glass and polyethylene have been used and their transmittance factors (τ_s) have been measured. The optimal height of water column to be used in the collector was found to be 4 inches. Efficiencies (η) of the water heater were found different for different glazing materials for the same radiation and a mean value was found to be $(55 \pm 5)\%$

Performance Study Of Electricity Generation From Pathor Kuchi Leaf (*Bryophyllum Pinnatum*)

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A new method of electricity generation based on Pathor Kuchi (Genus: *Kalanchoe*, Section: *Bryophyllum*) Leaf has been developed at SERC (Solar Energy Research Center), Department of Physics, Jagannath University, Dhaka-1100, Bangladesh. This electricity generation method has several advantages over the conventional electricity production. This method is likely to generate the employment particularly in the rural areas of Bangladesh where grid electricity is absent. This thesis paper reports an invention made on Pathor Kuchi Leaf (PKL) electric power plant to enhance the PKL electricity production. The efficiency of the PKL electricity

production device, Short Circuit Current (ISC), Open Circuit Voltage (VOC), Temperature effect of the PKL malt, p^H of the PKL malt, Titratable acidity of the PKL malt, Generation of PKL electricity, Storage system of the PKL electricity, Practical utilization of PKL electricity, I-V characteristics of the PKL electricity, Classification of PKL, Longevity of the PKL malt for PKL electricity generation, Preparation of PKL electric unit cell, module, panel, arrays and the constituent elements of the PKL have been studied. In experimental study, it is shown that the maximum efficiency of the PKL electricity production device is $\approx 34\%$, the p^H of the PKL malt is ≈ 4.6 (without water), p^H of the PKL malt is ≈ 4.8 (with 10% solution), the titratable acidity of the PKL malt is $\approx 0.88\%$ and the constituent elements/ ions of the PKL malt is Fe^{++} and Cl^- . Most of the results have been tabulated and graphically discussed.

Study of Generation of electricity from the rural corrugated iron sheet model house utilizing Seebeck effect

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When a temperature gradient exists between two junctions formed by two dissimilar metals an electromotive force (EMF) is developed in the junction. This junction is known as a thermocouple and the effect is named as Seebeck effect. The generated EMF depends on the two metals, which are in contact and amount of temperature difference between the metals. These E.M.F. can be used to drive an external circuit and as a source of thermodynamic terms, his device acts as a heat engine which converts a small part of thermal energy that flows from the hot to cold junction directly to electricity. In day time a significant amount of solar energy is absorbed by the sheets and the temperature may reach as high as $70^\circ C$. but as the temperature on the ground is about $30^\circ C$, a large temperature difference exists between them. This temperature difference may be utilized for generation of electricity. Electrical connection from the roof to ground is made by a copper wire through a load. When the roof is hot, a significant amount of current flows through the load, results a voltage drop. This current can be used to charge a storage battery (Lead acid battery). This battery can provide electrical power at night time. Voltage drop across the load may be utilized to drive an electric motor for household purpose.

Study on Wind and Solar energy resource based power options at Swandip

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In this paper, studies have been carried out for the development of a Base Transceiver Station (BTS) at Swandip through 100% renewable energy. A 25 years project of net present cost 6139983.00 TK was estimated on power system sizing with 0% capacity shortage and cost of energy (COE) of 28.81 TK/KWh. In this project the contribution of power was 40% from solar and 60% from wind and energy resources with 85% state of charge of the battery bank. The proposed optimized hybrid system was the best option of power as it has reduced the COE 44% and 22% respectively with respect to PV-Battery and Wind-Battery systems.

Application of TiO₂ Nanotubes for Hydrogen generation from water splitting using solar energy, a technical review

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Hydrogen can be a sustainable source of energy. Hydrogen generation by water photo electrolysis can be a feasible, efficient and economic process. We have reviewed the potential application of TiO₂ nanotubes for hydrogen generation from water splitting. Our review suggests that the efficiency can be improved by using (i) hybrid titanium nanotubular arrays, which can be prepared by electrochemical anodization of solid titanium metal in different inorganic and organic electrolytes in the presence of fluoride ions (ii) using ultrasonic assisted process for nanotubes generation (iii) using these nanotubes as a cathode by nanoparticles modification (iv) using modified electrolyte such as ethylene glycol and diethylene glycol.

Biogas potential in Bangladesh: An economical analysis

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Bangladesh is an agricultural country .It has a population of some 130 million and more than 85% of the population live in the rural areas .Biogas is the major source of energy in Bangladesh .Biogas technology, as it uses animal and agricultural wastes and returns the wastes as fertilizers, supplies energy as bonus .Biogas energy is used in domestic cooking ,food processing and industries transport, agriculture and other economic activities. Dissemination of biogas technology is gaining momentum. A good number of institutions are already involved in planning research, development and dissemination of this technology. This technology may also contribute considerably towards rural electrification and growth of rural industries in the country .In Bangladesh poverty reduction is the main target for any kind of development. Biogas technology can play a vital role to reduce poverty. In future, biogas will be used for electricity generation opening a new avenue for economic activities. Since modern facilitates and employment opportunities will be created in the rural areas tendency of moving poor people from village to urban area will be decreased. In the present paper deal with biogas potential in Bangladesh .Also economical analysis presented here.

An Efficient Energy System for Sandwip Island

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Sandwip is a highly potential area for wind power generation showed by Wind Energy Resource Mapping (WERM) project. In paper solar radiation over the Island is measured from climatological parameters such as cloud cover and sunshine duration. The monthly averaged solar radiation is 4.26 kWh/m². Then an optimized Wind-PV hybrid system is designed to meet the demand of a community consuming 210 kW/day. The analysis shows that Net present value (NPC) and cost of energy (COE) is 20, 93556 Tk and 18.962 Tk respectively. The analysis shows that wind energy capacity factor is 22.6% which indicate strong wind energy potential. If existing diesel generator is replaced by such an environmentally friendly hybrid system then about 65 tons CO₂ can be mitigated.

Application of Wood Seasoning Solar Kiln Augmented With Residue Burner

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Aiming at better conservation and utilization of different commercially important and less important indigenous timber species, the Bangladesh Forest Research Institute (BFRI) has developed a solar kiln, which has been successfully applied since 1980s. Constructed following the principles of green house effect the solar kiln (125 cft. capacity) is generally operated for 6-8 hours (from 9-00 a.m. to 5-00 p.m.) in the daytime. Depending on the species and climate variation the time for wood seasoning through the solar kiln varies form 10 days to 27 days in the winter season (November-March).

The advantages of using the solar kiln for wood seasoning are manifold. Solar kiln seasoning helps attaining the wood moisture content at the level of 12-145, which is optimal for Bangladesh conditions. It improves the natural durability of different woods. No defects like shrinkage and swelling, cracks, bending, internal structural deforms including other seasoning qualities in the wood were apparently observed.

However, elongated time period does not often satisfy the business need of the wood traders. Therefore, improvement of the existing solar kiln is needed Aiming at minimizing seasoning time, the solar kiln was brought under modification by augmenting a heating device for supply of additional heat with waste wood, which was installed outside the solar kiln. The plunks of rain tree (*Samanea saman*) wood numbering 21 with 4' - 6' X 1' - 1.5' X 1" - 2" size were tested in the solar kiln along with additional heat ranging 45-50⁰C for 3-5 hours (from 7-00 p. m. to 11-00 p. m.) using waste wood. Average data shows that Solar Kiln with Residue Burner reduced the seasoning time for more than 50% in comparison to the solar kiln alone. It is mention worthy that the seasoning time for rain tree wood through solar kiln was 17 days during winter (November-March). The wood quality remained the same as the seasoning by solar kiln.