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2015

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Welcome from the General Chairs

Welcome to the 3rd International Conference on Green Energy and Technology (ICGET) at the University of Dhaka, Bangladesh. We held the conference at the University of Dhaka in 2014 and at The University of Kitakyushu in 2013. We are grateful to IEEE and IEEE Power and Energy Society for being the technical co-sponsor of the conference for the 2nd time. We have received 93 full papers. After rigorous peer-review by at least two reviewers, 46 papers have been included in the final program. Papers are accepted with minor revision and major revision. After revised submissions, authors' rebuttals are addressed and re-reviewed before accepting the papers. Seven keynote speakers will deliver expert talks during the conference. We keep the conference free access for all to listen, share and learn. We have placed the papers in six Interactive Poster Sessions (IPS), where Session Chairs will move to each session and judge each paper. IPS is introduced as it helps young authors to learn from experts through longer and open-discourses, as well as, young researchers can ask authors even a trivial query to learn from them. Some selected papers will be asked for submission to Intl. Journal of Environment http://benjapan.org/IJE & Intl. Journal of Electronics & Informatics http://cennser.org/IJEI. You are welcome to submit there.

We hope that we can meet many friends and the conference will end up in a successful mood. We would like to thank the core committee members, reviewers and volunteers to help to organize this conference without any funding from any source. After rigorous peer-review process, we have accepted some papers and hence, the number of registered participants is limited. Therefore, financially, it becomes extremely tough to manage. We are very much thankful to the Center for Natural Science & Engineering Research (CNSER) for taking the responsibility to organize the conference successfully. Due to financial constraints, we have to shrink the conference in a day, instead of two-day plan. We apologize to the honorable Keynote Speakers, Authors, distinguished guests and participants for not being able to arrange any reasonable hospitality for you. We hope to serve better in the future.

IEEE Student Branch University of Dhaka (IEEESBDU) has arranged the Student Conference on Science & Engineering (SCSE) along with the 3rd ICGET. We hope that you will enjoy the student papers and project exhibitions. The members of IEEESBDU have worked hard to accomplish this. We specially thank Md. Zahidul Islam (Lecturer, Dhaka International University) for his committed efforts for local arrangements.

The goal of the conference is to make a strong network of researchers on green energy and technology. We feel that these areas are very important for now and future; hence, more researches are required. Researchers play a major role to help any Government and policy-makers. Environmental problems are diverse and severe to human life. On the other hand, their solutions are not easy. Policy-makers, researches, social movements, law enforcement, business policies on social and moral bases are required to mitigate core environmental problems. We sincerely hope that with all of our persistent efforts, we can be able to overcome the problems in the long run and make a sustainable livable place for our future generations.

We sincerely thank you for being part of this conference. Sorry for any mistakes. Welcome!

Md. Atiqur Rahman Ahad, University of Dhaka

Hiroyuki Miyake, The University of Kitakyushu

General Chair, ICGET 2015

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August 25, 2015

Message

It is my great pleasure to welcome you at the 3rd 2015 *International Conference on Green Energy and Technology* (ICGET), to be held during 11~12 September, 2015. It is wonderful to know that the *IEEE Power and Energy Society* is the Technical Co-sponsor of this conference. It reflects the quality and standard of the conference in academic arena. It is a very timely-conference for the development of the future. I am glad that the University of Dhaka is a partner of this conference. I welcome you to the lush green and colorful campus of the University of Dhaka.

I welcome keynote speakers and authors from across the world. I wish that the ICGET2015 will be very vibrant and successful event. I myself feel very much enthusiastic about this conference and hope that through mutual collaboration, we all will get benefit academically. I sincerely thank the top-class committee of the ICGET, especially the General Chairs (Md. Atiqur Rahman Ahad and Hiroyuki Miyake) for their tremendous and sustained efforts to hold this conference at regular interval, especially with very low-budget.

My heartiest thanks to all the participants for their contributions in making the conference a grand success. I hope that this conference will promote collaboration among researchers in green energy and technology in Bangladesh and abroad, and create partnerships between universities and industries.

(Professor Dr. A A M S Arefin Siddique)
Vice Chancellor

Keynote Speech:

Emerging semiconductor materials for high efficiency solar cells

by, Nazmul Ahsan

Short Biography:

Nazmul Ahsan is Associate Professor at the Research Center for Advanced Science and Technology (RCAST), The University of Tokyo. For his bachelor in electrical engineering (BE), after a short enrollment in Bangladesh University of Engineering and Technology (BUET) in 1991, he pursued and completed BE from Toyohashi University of Technology, Japan in 1997. He received the M.S. and Ph.D. degrees in electronic engineering from The University of Tokyo (UT), Japan, in 1999 and 2002, respectively. He then held Japan Science and Technology Agency (JST) research fellowship at UT, and worked on photonic and electronic control of ferromagnetism using III-V semiconductor heterostructures.

In 2007, he became Assistant Professor with the Department of Electronic Engineering, UT. In 2009, he joined RCAST, UT, where he is currently Associate Professor in the Department of New Energy. His research interests include ultra high-efficiency photovoltaic devices based on emerging materials such as dilute nitride/antimonide semiconductors, dilute magnetic semiconductors, etc.

Dr. Ahsan is a member of the Japan Society of Applied Physics (JSAP) and the American Physical Society (APS). He received the Bangladesh Prime Minister Gold Medal Award for securing the top position in Higher Secondary Certificate Examination in 1990 (Comilla Board). He has been a scholar with the Japanese Ministry of Education, Culture, Sports, Science & Technology (MEXT) during 1991-1997, the Rotary Yoneyama Memorial Foundation during 1997-1999, and the Honjo International Scholarship Foundation during 1999-2002. He also received the 2002 Marubun Research Award from the Marubun Research Promotion Foundation and the 2003 Best Research Paper Award from the JSAP.

Abstract:

The increasing demand for energy as well as environmental protection has raised widespread interest in photovoltaic (PV) technology since the past decades. Since the first demonstration of practical Si-based p-n junction solar cell in 1954 with a conversion efficiency of 4.5%, the development of PV technology can be divided into three generations. The first-generation solar cells consisted of highpurity single crystal silicon wafer. So far, its conversion efficiency is up to 24.7%. Despite its rich earth abundance, the energy consumption of high-purity single crystal silicon wafer growth is tremendous, and costly. The need for the reduction of material consumption and cost becomes the starting points for the development of the second-generation solar cells. Thin films such as, polycrystalline silicon, amorphous silicon, CdTe, Cu(In,Ga)Se2 alloy can significantly reduce the material consumption and the cost of solar cells. But the conversion efficiency of thin-film solar cells is still lower than that of single crystal silicon. The need for the increase of the conversion efficiency becomes the starting point of third-generation solar cells, based on an investigation of the theoretical limitation and the mechanism of energy loss of solar cells, such as, multijunction solar cells, impact ionization (quantum dot) solar cells, multiband solar cells, hot carrier solar cells, multiple electron-hole pairs solar cells, and thermophotovoltaic solar cells.

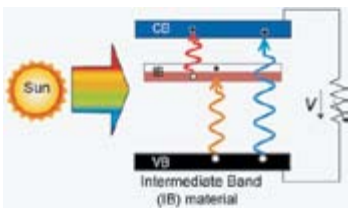

Fig. 1. Schematic diagram of an intermediate band solar cell (IBSC). The infrared photons of the solar radiation, which are otherwise transparent to the solar cell and lost, are captured by

Recently, multijunction tandem solar cells have demonstrated record conversion efficiency of 46%. Among others, multiband (namely intermediate band, IB) solar cells have attracted the most attention. IB solar cells (IBSCs) incorporate impurities that can provide a single or multiple bands of states inside the fundamental bandgap, thereby absorbing different wavelength photons, specially the infrared photons of the solar radiation which are otherwise transparent to the solar cell and lost. The limiting efficiency of IBSC solar cells with a single IB is the same as three stacked tandem solar cells, up to 63% under condensing conditions. At the same time, it not only avoids the complex process of tandem solar cells and thus reduces the cost, but also provides adjustable impurity energy levels and thus wider device design potentials. Although IBSCs will have a better and wider application potential, the relevant research is still at the beginning.

In this presentation, our recent achievements in multijunction tandem solar cells and intermediate band solar cells will be discussed. The single crystalline thin films and solar cells were fabricated using molecular beam epitaxy technique. Special focus will be placed on IBSCs emphasizing emerging semiconductor materials such as III-V dilute nitrides, III-V magnetic semiconductors, chalcogenides and quantum dot superlattice.

Ref: N. Ahsan et al. "Two-photon excitation in an intermediate band solar cell structure," Appl. Phys. Lett. 100, 172111 (2012).

Keynote Speech:

Solar Photovoltaic in Saudi Arabia: Present Status and Future Outlook

by, Abdulrahman Alamoud

Short Biography:

Abdulrahman (A.R.) M. Alamoud was born in Onaizah, Saudi Arabia. He earned his B.Sc. degree in Electrical Engineering, College of Engineering (COE) from the University of Riyadh (renamed later as KSU). He earned his M.Sc., in Microelectronics, and Ph.D. in 1984, in photovoltaic solar cells, from West Virginia University, Morgantown, W.V., USA. In June 1984, he joined the Department of Electrical Engineering as an Assistant professor and was promoted to the rank of Associate professor and Professor in 1989 and 1999 respectively.

In 1991 he took a one year leave of absence from KSU and joined the Advanced Electronics Company AEC), Riyadh, Saudi Arabia as the Special Projects Director. In 1992, he was appointed as Director, Research Center, COE, KSU for a two term period. In the academic year July 15- Dec. 15, 1996, he was a Visiting Research Associate Professor, National Renewable Energy Laboratory, Golden, Colorado, USA.He worked on the development of thin films CdTe Solar Cells and characterization of materials (such as semiconductors thin films and Saudi white sand rocks).He was alsoa Visiting Research Associate Professor (Mar. 9- Aug. 22, 1997), VLSI Research Group, Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, ON, Canada, where he worked on the design of VLSI circuits using Cadence. He was chosen to be the Vice Dean for Administrative Affairs, COE, KSU during the period of June 1999- June 2005. He joined NREL during the summer of 2011 and 2012 where he worked on PV module degradation and hot spots, new thin film materials such as CZTS, and ink-injection solar cell fabrication. His research interests are in Nanoelectronics, Solar Cells and materials, PV module degradation and standards, PV system, and Photovoltaic Systems where he published more than eighty papers

Abstract:

Saudi Arabia's large area and high concentration of solar energy makes it ideal for a vast number of applications such as generating electricity for home use, mobile phone towers, road signs, roads emergency phones, mobile military forces (army, national guard, and border guard), medical ambulances, and oil pipe lines cathodic protection to name but a few. As such, there is a need for a grid-connected photovoltaic (PV) system for rooftop electricity generation and stand-alone PV electric generators for use in remote locations where the grid system is not available.

A case in point is Saudi Arabia's long borders with different countries pose a threat of multiple dimensions: infiltration of illegal individuals seeking work, smuggling arms and/or drugs, or planning to conduct crime or actions that threatens the national security. The remoteness of border guard posts and the high concentration of solar energy make it ideal for this application.

This presentation will summarize the present PV achievement and the potential of PV energy in Saudi Arabia.

Keynote Speech:

Solar Photovoltaics: The Current Status of All Generations

by, Nowshad Amin [1,2,3]
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Faculty of Engineering and Built Environment
The National University of Malaysia, 43600 Bangi, Selangor, Malaysia
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[3]Advanced Materials Research Chair, College of Sciences, King Saud University, Riyadh 11451, Saudi Arabia
e-mail: nowshad@ukm.edu.my

Short Biography:

Dr. Nowshad Amin is a Professor at the Dept. of Electrical, Electronic & Systems Engineering of The National University of Malaysia (@ Universiti Kebangsaan Malaysia), where he also leads the Solar Photovoltaic Research Group at the Solar Energy Research Institute (SERI). After the higher secondary education from native country, Bangladesh, he received the Japanese Ministry of Education (MONBUSHO) scholarship, where he achieved a diploma in Electrical Engineering (1994) from Gunma National College of Technology, Bachelor (1996) in Electrical & Electronic Engineering from Toyohashi University of Technology, Masters (1998) and PhD (2001) on solar photovoltaic technology from Tokyo Institute of Technology (Tokyo, Japan). His areas of expertise include Microelectronics, Renewable Energy, Solar Photovoltaic Applications and Thin Film Solar PV Development. Additionally, his research focuses on the commercialization of Solar Photovoltaic Products from his patented entities, as such he is also serving as the CTO of a University Spin-off company financed by the Malaysian Technology Development Center (MTDC). He has been serving as the project-leader as well as co-researcher of many government (Malaysia) and international (Saudi National Grant, Qatar Foundation etc.) funded projects. He has authored more than 200 peer-reviewed publications, a few books and book chapters. He has been holding a visiting professorship position at the King Saud University of Saudi Arabia since 2009. He is actively involved in promoting Renewable Energy to the developing countries in South and South East Asia, working as an enthusiastic promoter for the affordable solar photovoltaic technologies.

Abstract:

We have come across solar cells of generations after being demonstrated first at Bell Labs (6% in 1954) to today's multi mega watt-peak solar farms with the utmost achievable conversion efficiencies (over 22%) for electrical power generation. So far, researchers around the world try to find energy harvesting in the form of electricity with many kinds of solar cells starting from inorganic silicon based to organic based ones. Even though, the first generation solar cells that are mainly crystalline or multicrystalline silicon based ones are still dominating, the quest for other options presented many other potential candidates such as amorphous silicon, cadmium telluride, copper-indium-suphide, etc. since early 70s. Ever since the second generation solar cells came into the scenario, most of these are thin films based which require many supporting layers to form the complete cells in homo or hetero junction configurations but within a total thickness of 2-10 micron. Semiconductor material science including fabrication technology on many compound semiconductors has been evolving over the period of time to take them to commercialization stages whereas conversion efficiencies continue to mark over 20% till present (e.g., CIGS, CdTe, CZTS). This talk will include thin film solar cells from its inception in research arena toward successful commercialization till to date. However, this will also include the current status on many novel materials like Perovskites based solar cells as they have tremendously achieved conversion efficiencies to the extent in just 2 years that 2nd generation e.g. thin films have got in 20-30 years. This will boost the hope for alternatives in the coming era of energy crisis.

Keywords: Solar Photovoltaics; Thin film solar cells; Novel Materials; 3rd Generation PV

Keynote Speech:

Genetic modification of plant cell walls by application of bacterial genes for lignin degrading enzymes

by, Hirofumi Hara[1], Shinya Kajita[2] and Eiji Masai[3]
[1]Department of Environmental Engineering and Green Technology,
Malaysia-Japan International Institute of Technology, UniversitiTeknologi Malaysia,
[2]Graduate School of Bio-Applications and Systems Engineering
Tokyo University of Agriculture and Technology,
[3]Department of Bioengineering, Nagaoka University of Technology

Short Biography:

Dr. Hirofumi Hara is now associate professor at Malaysia-Japan International Institute of technology (MJIIT), UniversitiTeknologi Malaysia (UTM) since 2013. He received Associate degree from Kurume National College of Technology, Japan in 1999 specialize in Industrial chemistry, Bachelor degree and Master degree from Nagaoka University of Technology, Japan in 2001 and 2003, respectively, and PhD degree in 2003, specialized in Information Science and Control Engineering. After getting PhD, he worked at Department of Microbiology and Immunology, The University of British Columbia, Canada, and Graduate school of Agricultural and Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan, as a pot-doc for 5 years. During this time, he published several paper of complete genome sequence of Actinomycetes, such as Streptomyces sp. and Rhodococcus sp. and developed microarray technology. After that, he worked at Okayama University of Scienceas lecturer and then associate professor. His research activities are now focused on applied microbiology and metabolic engineering using tropical microbes from ASEAN region.

Abstract:

Urgent actions for energy generation based on biomass utilization should be needed to cut its emission of greenhouse gas, and retain the secure and reliable energy supply. Woody biomass, which is primary composed of lignocellulose is expected to be the larger source of renewable energy. Structure and chemical composition of plants cell walls with lignocellulose by genetic engineering can contribute to efficient generation of bio-energy from woody biomass. Sphingobium sp. SYK-6 is able to catabolize a variety of phenolic compounds by its unique enzymatic system. Some of the phenolic compounds catabolized in SYK-6 are also found in plant cells as monolignol precursors and lignin dimmers. Therefore, genetic manipulation of lignin biosynthesis in transgenic plants can be performed by expression of the catabolic genes from the bacterium. Our manipulation of lignin is expected to realize efficient saccharification of the lignocellulose from the transgenic plants

Keynote Speech:

Solar Energy: Bangladesh Perspective

By, M. Rezwan Khan

Short Biography:

Prof. Dr. M. Rezwan Khan completed his B.Sc. in Electrical and Electronic Engineering in 1980 from Bangladesh University University of Engineering and Technology (BUET) and subsequently joined BUET as a lecturer in the same year. Prof. Khan did his M.Sc. and Ph.D. from University College London in 1982 and 1986 respectively and served BUET till 2004 before joining UIU. He is presently serving as the Vice Chancellor of United International University, Dhaka. Prof. Khan has been working in the fields of energy efficiency and renewable energy for a long time. He served as a consultant for Grameen Shakti (1999-2000), the renowned organization involved with dissemination of renewable energy technology in Bangladesh. Right from the beginning of the IDCOL (Infrastructure Development Company Limited) Solar Home System micro financing project (REREDP), initially funded by World Bank, Prof. Khan served as the Chairman of the Technical Standard Committee contributing significantly in designing the solar home systems, setting the standards and monitoring the technical aspects of the dissemination process. The tremendous success of IDCOL within a very short period of time was highly appreciated at home and abroad and Prof. Khan received the Prime Ministers award for his outstanding contribution in popularizing Solar Home System in Bangladesh (September 2005). Prof. Khan leads the Bangladeshi teams in two DFID/EPSRC, UK funded ongoing projects namely 'Solar Nano-grids as an Appropriate Solution to the Limitations of Solar Home Systems in Rural Communities in Kenya and Bangladesh' and 'The Next Generation of Low Cost Energy-efficient Appliances and devices to Benefit the Bottom of the Pyramid' with Loughborough University and Open University as the lead partners respectively. Under these projects Prof. Khan is involved in designing nanogrids as an inexpensive solution to energy access for off grid rural communities, development of low cost improved cooking stoves and low cost irrigation systems. He has published more than 100 research papers in different journals and conference proceedings. He was awarded the Bangladesh Academy of Science gold medal in 2005 for his outstanding research in Electrical Engineering.

Abstract:

With the falling price of solar PV, application of solar energy as a economically viable power source has opened up a number of possibilities. Grid connected solar PV systems are the larger schemes that is becoming competitive to diesel or furnace oil based power generating units - the only limitation seems to be the requirement of vast amount of land that raises the question of food security in an agricultural country like Bangladesh. Solar Home System (SHS) in Bangladesh is one of the most successful programs in the world with more than 3 million systems already installed in the rural areas. However, the main Today, the total installed capacity of the SHSs is around 120 MW. Despite the success of SHS, it has the limitations in generating energy high enough for directly incorporating any economic activities. Bangladesh being an agricultural country, the most demanded application of power in the rural Bangladesh is irrigation. There are some efforts to replace some of the diesel irrigation systems by solar PV - the main difficulty to make it economically viable comes from a very different direction. Irrigation is a season phenomenon with a typical demand for irrigation is 100-120 days in a year. In diesel based irrigation cost of diesel incurs only when diesel pumps are run. On the other hand in PV based irrigation system the energy will be wasted if irrigation is not required over a significant part of the year making the solar PV based irrigation more expensive. Hence, alternative usage of the energy from the solar PV has to be incorporated with the irrigation schemes. Recent studies indicate that stand alone mini/micro grids or nanogrids with the facilities for irrigation can be very attractive in rural Bangladesh as these small grid systems always have alternative loads connected to them and seasonal variation of sunshine is very efficiently taken into consideration. Another very interesting application of solar PV could be energizing small scale cold storages where farmers would have the opportunity to keep their agro-products for 1-2 weeks. This is particularly important when the perishable crops like tomato, carrot and other vegetable are harvested and the market gluts. Sometimes farmers even fail to earn back their investment on the crops. A small scale cold storage can give the farmers a breathing space to look for alternative markets for their crop. Besides there are opportunities for applications like solar PV driven ferry boats, aeration of the fish ponds, lighting of the poultry farms and drug preservation.

Keynote Speech:

Crisis of democracy in Japan behind clean Energy and other issues

by, Hiroyuki MIYAKE

Short Biography:

Hiroyuki MIYAKE, professor, Dept. of policy studies, the University of Kitakyushu, Japan

Abstract:

In March of 2011, the biggest sized earthquake hit the east part of Japan with much victims and damages. Explosion of Fukushima nuclear power station, which shocked all of people living in the world, lead to give big opportunity to reconsider the life style. Japanese government decided to all of nuclear power station stopped and look for a new energy policy with clean energy like solar power. But recently, present government has generated much political confusion. It ignored public opinion on many issues representing enacting process of security bills.

Keynote Speech:

Indigenous efforts in Biomedical Engineering

by, K Siddique-e Rabbani

Short Biography:

Dr. Rabbani taught Electronics and Medical Physics in the Department of Physics, Dhaka University, Bangladesh from 1978 to 2008 where he was also active in carrying out research in Solar Energy, Biomedical Physics and Engineering, and supervised more than 80 Masters students and a few PhD and MPhil students during that period. A Professor since 1988, he was given the responsibility of establishing a new department of Biomedical Physics & Technology as its founding Chairperson in 2008 which he continued till 30 June 2015 since when he is on leave preparatory to retirement. Of course he still continues to lead all research activities of the department. His vision is to establish research that helps the common people, particularly in the low resource countries like Bangladesh who have been deprived of a quality life through the huge technology disparity growing over the last few centuries. Therefore he started with only PhD and MPhil programmes, and started Masters programmes later, about three years back. Professor Rabbani currently supervises 15 PhD/MPhil students and Research Fellows and a good number of MS students for their research projects. Under his leadership these young researchers have already been able to develop several Medical Devices that are ready to go to the market or for technology dissemination. Professor Rabbani has given more than 90 invited lectures at home and abroad and has published more than 100scientific papers, one text book, and has written chapters in 5 books.

He organised several associations related to Electronics and Healthcare technology like 'Centre for Technology Equalisation', 'Relevant Science & Technology Society, Bangladesh', 'Bangladesh Institute for Biomedical Engineering and Appropriate Technology' which later led to 'BiBEAT Ltd.', a non-profit company for dissemination of indigenously developed medical devices. Under his leadership his team has a philosophy of not patenting inventions related to healthcare, rather they would make these open once matured. The main aim is to bridge the global technology gap through which, he feels, the global disparity in economy and quality of life can be alleviated to a great extent.

Abstract:

ECG and X-ray equipment were invented more than a century back, but 80% of the global population is yet to get their benefits. These two examples are enough to speak of the failure of the current commercial model for dissemination of technology that has created a large technological disparity throughout the globe, which in turn has led to an unacceptable state of human disparity and deprivation. A solution to this global problem is only possible if people are empowered in technology globally; there should be capability for design, development and manufacture of technology based products in each country, and medical devices form the topmost priority.

This realisation made the author dedicate his career into design and development of medical devices that are needed by a majority of the population in the Low Resource Countries (LRC) and in inducing and training the younger generation in this vision. He and his team of students at the Department of Physics and now at the Department of Biomedical Physics & Technology of Dhaka University have developed several equipment which are being used in hospitals, clinics or by patients themselves. The devicesinclude, i) Very low cost solar water Pasteuriser and rainwater collector for providing safe drinking water in rural areas, ii)Telemedicine system with integrated diagnostic devices like ECG, Respiration monitor, Microscope, Stethoscope, etc., for providing a better healthcare in rural areas, iii) Computerised EMG/Nerve conduction equipment, iv)Computerised ECG, v)Computerised dynamic Pedograph, vi)Iontophoresis equipment for treatment of excessive sweating, vi)Muscle & Nerve stimulator, vii) Intraoperative Neuro Monitor, etc. The costs are significantly lower than that of similar imported ones and can survive the extreme weather and power line conditions of our country giving decades of service. The author's team is also carrying out R&D on a number of methods for medical diagnosis where the outcomes of their innovations have drawn international attention with several already taken up by researchers in advanced countries as well. These include i) Focused Impedance Method (FIM), an electrical impedance technique which is being tried for application in the detection of childhood pneumonia, localized lung ventilation and cervical cancer; in the measurement of stomach emptying, stomach acid secretion, abdominal subcutaneous fat thickness and blood vessel stiffness; in the characterization of breast tumour, ii) Distribution of F-Latency (DFL), a new nerve conduction parameter innovated by the author which has been established to give Distribution of Conduction Velocity (DCV) of large motor fibres, which in turn has been established to provide an early detection of neuropathy due to compression of nerve roots or of spinal cord in the Cervical or Lumbo-sacral regions; making it a potential screening tool in peripheral neuropathy.

The author's group is not patenting their innovations. They intend to open up the technology once mature so that persons in other low resource countries can provide similar services to their own people.

Accepted Papers as Abstract

Accepted Papers as Abstract

Paper ID : 5

Consumer is Producer- A Novel Model for Electricity Generation

Alimul Haque Khan* (Bangladesh University)* Hafsa Pial (University of Dhaka) Asif Islam, Mohammad Islam (University of Queensland) Mohammad Rahman (Bangladesh University of Engineering & Technology)

The aim of this paper is to explore a new model to generate electricity with higher penetration rate of renewable energy. Conventional system to generate electricity is to generate large amount electricity at power station and then deliver to the consumer through long transmission line and distribution system. The losses and costs, incorporated with these processes, are not negligible. Another System is the Solar Home System (SHS) which is being used to replace traditional kerosene based lamp, battery based TV, fan and light bulb from 1998 in Bangladesh. But with the advancement of technology, the demand of the consumer is increasing significantly. To meet this demand it is necessary to expand national grid connection. An alternative way is to produce sufficient power using renewable resources at consuming spots. A novel method to achieve this goal has been discussed in this paper which is supported by the field study of Bangladesh University. Also a comparison has been shown with traditional power system.

Paper ID : 6

A Review of Current Renewable Energy Activities in Bangladesh

Alimul Haque Khan*, Kazi Zafreen, Mir Hossain (Bangladesh University) Maidul Islam (Eastern University)

This paper reviews the prospects of available renewable energy resources along with various private and government future project plans to incorporate renewable energy sources and its potentials in perspective of Bangladesh. In an arising country like Bangladesh demand for energy will be burgeoning. Present day, in Bangladesh dearth of energy is ubiquitous and near about 70% of its population is excluded from access to electricity and bulk of the people are living in rural areas. Among several renewable energy resources, the application of solar Photo Voltaic (PV) is renowned although the largest plant based on renewable energy goes into hydroelectricity. Additionally, wind, biogas, mini hydro and tidal are also well known. A plan has been initiated by the Government of Bangladesh (GOB) to generate 5% of the total energy from renewable energy resources within 2015 and 20% by the year of 2020. Through the approved renewable energy policy, the GOB is devoted to facilitate investment in both public and private sectors in renewable energy projects to substitute contemporaneous non-renewable energy resources and escalate the contributions of renewable energy based electricity generation. With this context, review of recent activities on concurrent renewable energy resources is imperative as well as to explore potentials of the resources. However, not all renewable energy sources are suitable to install indiscriminately in all regions, rather there are certain parameters to choose a source of RER for efficacy. After reading this paper, an investor will get significant information about current scenario and steering for future involvement of renewable energy sources in Bangladesh. Furthermore, this paper will be instrumental to select optimum efficacious renewable energy sources for a particular region.

Paper ID : 20

CPU Power Consumption Reduction in Android Smartphone

Masuma Akter Rumi*, D. M. Hasibul Hasan, Asaduzzaman (CUET)

Despite the growing popularity of smartphones, it's extensive power consumption is still now a burning issue. In this regard, we propose and evaluate a system of CPU power consumption reduction which supports Dynamic Voltage and Frequency Scaling (DVFS) and User Driven Frequency Scaling (UDFS) at the same time. At first, a DVFS is used to scale the frequency level continuously based on loads present at that time. Then a UDFS is used to consider user satisfaction. Starting from the highest frequency level, UDFS gradually reduces the frequency level until users feel discomfort. The proposed technique calculates an optimum frequency as the starting frequency and then reduces that frequency until user shows discomfort. When CPU reaches in ideal state, processor frequency goes to the lowest level to save battery life. Our proposed technique is implemented in Samsung Galaxy S2 and it reduces 25% power consumption compared to default DVFS and 3% than existing UDFS technique.

Paper ID : 23

Optimization of Distributed Energy Resources to Balance Power Supply and Demand in a Smart Grid

Shah Md. Al-imran* M. A. Raqib Fuad, Tashrik Ahmed, Md. Rashed Ali, Md. Nasimul Islam Maruf (American International University Bangladesh)

The energy crisis is one of the major problems for the economic growth and development of Bangladesh. The gap between power supply and demand is increasing every day. Moreover, most of the power plants are fossil fuel based which will be phased out in future. This paper aims to solve these problems by balancing the power supply and demand in a smart environment, focusing mainly on distributed energy resources (DER). The main DER components of the system are a renewable energy source (RES) based power plants. Since RES are intermittent, back up from fossil fuel based plants are also integrated to increase the system reliability. During off-peak hours residual energy from RES will be stored in the storage system. The proactive consumer (prosumer) will have the scope to sell this energy to the national grid during peak hours on the smart bilateral network. Finally, grid monitoring and metering interface with an advanced control mechanism has been developed, which is expected to increase the flexibility of the prosumer to handle their energy usage and costs.

Paper ID : 37

Simulation of Standalone 80kW Biomass Fueled Power Plant in Sailchapra, Bangladesh

Muktadir Ahmed*, Md. Salahuddin Parvez, Md. Mozammel Hossain (Mymensingh Engineering College) Md. Maksudur Rahman (American International University Bangladesh)

In this era of globalization to keep pace with the world Bangladesh is also going forward, but the people of rural areas being deprived from modern facilities & our country's economy is falling apart. For development of rural place of Bangladesh electrical power is necessary. Scientists are working desperately to power up the whole rural areas. Energy generation from biomass will be revolutionary system to power up rural areas of Bangladesh like Sailchapra. In every season about thousands tons of straw and two hundred tons of husk are produced from paddy in Sailchapra, which is a good source of biomass fuel. The Sailchapra can generate a large amount of electric power by gasification of this biomass fuel. The aim of this paper is to power up Sailchapra by implementing a biomass power plant.

Paper ID : 38

Minimization of Power Shortage by Using Renewable (Solar) Energy through Smart Grid, Perspective: Bangladesh

Muktadir Ahmed*, Md. Salahuddin Parvez, Md. Mozammel Hossain, Arup Kumar Pal (Mymensingh Engineering College) H.M. Imran Hassan, Md. Shahid Iqbal (Khulna University of Engineering and Technology)

A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers via two-way digital communication. This system allows for monitoring, analysis, control and communication within the supply chain to help improve efficiency, reduce the energy consumption and cost, and maximize the transparency and reliability of the energy supply chain. The term "smart grid" is not familiar to Bangladesh. It will be good if it can be implemented in Bangladesh because of having load-shedding problem. The power system of Bangladesh is very complex and antique. If we want to reduce the complexity and eliminate load-shedding problem, there is no better way without smart grid. The regular grid system can easily be replaced by "smart grid". The main theme of this paper is to implement smart grid in Bangladesh and to integrate renewable (mainly solar energy) energy with it to increase production of power and eliminate power shortage in Bangladesh.

Paper ID : 40

An Automatic Monitoring and Control System inside Greenhouse

Niamul Hassan, Shihab Ibne Abdullah, Ahmad Shams Noor, Marzia Alam* (BRAC University)

In this work, we have proposed a framework that can gather the data identified with greenhouse environment and yield status and control the system automatically in view of the gathered data. By throatily observing periodic conditions, this study has the reason for securing connection between sensors flags and reference estimations. Control programming will give information finding of the ongoing show. Through long time running and functional utilizing, the framework has been demonstrated that it has numerous points of interest. To monitor the environment inside greenhouse different parameters have been considered such as light, temperature, humidity, soil moisture etc. using different sensors like DHT22 temperature and humidity Sensor, LDR, grove-moisture sensor etc. which will be interfaced with microcontroller. It is a closed loop system that will execute control action to adjust temperature, humidity, light intensity and soil moisture if any unwanted errors (high/low) occur.

Paper ID : 43

Harvesting Green Energy from Wastage Energy of Human Activities Using Gymnasium Bicycle at Chittagong City

Md. Thuhid Ullah*, Muhammad Helal Uddin, Md. Atif Bin Karim (Chittagong University of Engineering & Technology) Giasuddin Muhammad Tauseef (Technical University Darmstadt)

Energy crisis is the most critical infrastructure constraint in Bangladesh's economic growth. Limited resources for generation of electricity is one of the major reason behind that. It is happening because of the limitation of technology in the field of electricity. Though renewable energy is introduced, the impact of this new technology is not significant. This is why this paper introduces a mechanism to produce green electricity from human wastage energy. In this mechanism the pressure energy from the movement of human body is used to harvesting electricity using gymnasium bicycle. This paper also presents a field survey on the human and gymnasium at Chittagong city to find out the feasibility of this mechanism. A hardware implementation has been done to produce electricity through the use of gymnasium bicycle. A detailed cost analysis has also been done to find out the economic generation of electricity. Actually the authors are trying to introduce such a mechanism through which the electricity problem of Bangladesh will be reduced significantly.

Paper ID : 45

Prospect of Green Power Generation by using Nuclear Energy in Bangladesh

Rajon Bhuiyan, Hafez Nasim Bin Jasim* (Rajshahi University of Engineering and Technology) Mahamudul haque Taluckder (North South University) Sourav Sarker (Rajshahi University of Engineering and Technology)

#Bangladesh is said to be one of the biggest energy starved countries, with the present demand for electricity at 9000 plus MW (Mega Watt) as opposed to the production of 6500 to 7500 MW. Access to electricity in Bangladesh is one of the lowest, about 40 percent of the total population are without access to adequate, cheap and quality energy. At present, we have to depend on indigenous energy resources, which are finite as well - gas, oil, furnace oil and coal to produce electricity. And about 55 per cent of our natural gas is used to produce this power. The reserve of gas is not infinite and will soon run out and before that happens, we must adopt alternative energy sources, be it renewable with a bio ecological/ green revolution or build nuclear power plants (NPP). Hence, the government recently decided to join the world's 30strong nuclear power club, signing an intergovernmental agreement (IGA) with Russia on November 2, 2011 for a nuclear power plant at Rooppur, Ishwardi of Pabna district, in the country's northwest region. This paper discusses about the prospect of green power generation in our country by using nuclear energy and find out if it is a proper decision to build a nuclear power plant in Bangladesh.

Paper ID : 47

Scope of Geothermal Potential of Bangladesh: A Review

Kamruzzaman Khan (University of Toledo, Ohio) Muktadir Ahmed*, Md. Salahuddin Parvez, Md. Mozammel Hossain (Mymensingh Engineering College (University of Dhaka))

Bangladesh is facing a lot of drawbacks to acquire sustainable development owing to lack of electricity. Now a days the demand of power is increasing day by day in Bangladesh. Now Bangladesh needs a reliable green energy source to meet the demand. To improve the power crisis in our country geothermal energy can be a vital & useful alternative. Bangladesh is one of the largest deltas and having a large sedimentary basin. It has many abandoned gas wells (temperature: more than 100°C in the depth of 3 km to 4 km). The main theme of this paper is to discuss about geothermal energy and its prospects in Bangladesh.

Paper ID : 48

Distributed Storage Based DC Micro Grid: A Reliable PV based Solution for Rural Electrification of Bangladesh

Shahid Jaman*, Minar Mahmud Hossainy, Saiful Huque (University of Dhaka)

This paper proposed a conceptual design and economic analysis of a distributed storage based DC micro grid system for rural area electrification of Bangladesh. In this design we has taken an average load consumption about 34.3kWh including the rural household load and irrigation facility with seasonal load variation. After that we have estimated required specification of DC micro grid components such as solar PV, micro grid charge controller, battery, distribution system etc. Moreover, we have also shown the cost analysis of our proposed micro grid system. Cost analysis estimated about 17.80 BDT/kWh electricity cost with seasonal irrigation facility. It is argued that the developmental activity should be chosen in such a way that it matches with the seasonal variation in insolation and load demand may keep the energy cost to a minimum.

Paper ID : 50

Designing of a 2kW Stand-alone PV System in Bangladesh Using PVsyst, Homer and SolarMAT

Md. Sifat Morshed*, Shoaib Mohammad Ankon, Md. Tanzil Hoque Chowdhury, Md. Anikur Rahman (Ahsanullah University of Science and Technology)

#In today's world the demand of energy is incredibly high and non- renewable resource such as ore, fossil fuel and nuclear fuel are not sufficient to meet this demand. Eventually renewable energy is a better choice. There is an increasing trend of using solar cell in the industry as well as to household appliance because solar energy is expected to play a prominent role in future smart grid as a distributed renewable source. For optimal and large scale integration of solar energy several modeling software and computer program is used. In this paper a stand-alone solar system of 2kW with battery backup, being located in Dhaka, Bangladesh is designed by using a MATLAB program named SolarMAT and two popular software PVsyst v5.06 and HOMER. Both Pvsyst and HOMER are versatile and renowned software in the field of solar system design and modeling. Pvsyt and HOMER have to be purchased, unlike SolarMAT, which is a free tool and it is developed in MATLAB environment which can also accurately design a solar system but not that much like the other two. To check the acceptance of these software, the final result will be compared with the practical data. Another widespread photovoltaic solar system configuration known as grid tie system can also be designed by both of these tools.

Paper ID : 51

Prospect analysis of biofuel production and usage for transportation in Dhaka city, Bangladesh

A S M Monjurul Hasan* (Linköping University) Sanjib Chakroborty (Go for Green) A S M Muhaiminul Hasan, Tousif Ashraf Niloy (Ahsanullah University of Science and Technology)

#World is heading towards the crisis of fossil fuel. Energy crisis is more acute in Bangladesh, as there is no petro-fuel source but only natural gas. It has among the lowest per capita energy (240 kg oil equivalents) consumption in the world and is severely dependent on additional environmentally friendly renewable energy resources in the future. To cope up with present situation and to reduce dependency on imported fuel, Bangladesh government is encouraging the use of renewable energy sources. In this circumstances, biofuel can be a very good alternative fuel for transportation. This paper gives insight into biofuel production feasibility and it's usage for road transport can play an important role in the biggest metropolitan city of Bangladesh and contributes to knowledge on how to perform similar studies. Resource-focused assessment including feedstock from the waste sector, agricultural sector, forestry sector and aquatic environments partially considering technological and economic constraints. Sufficient evidence have been found for biofuel production and can met at-least 10% of energy demand for road transport of Dhaka city, Bangladesh. Without compromising with food security the study suggests that it is possible to significantly increase the biofuel production, and to do this as an integrated part of the existing society also contributing with positive societal synergies.

Paper ID : 52

An Objective Assessment of Walkability in Khulna City: A GIS Based Approach

Sourav Bhadra*, A. K. M. Tanbir Sazid, Md. Esraz-Ul-Zannat (Khulna University of Engineering & Technology)

Walking acts as an authentic link for intermodal transfer in major activity centers and helps to fulfil recreational and utilitarian trips in a city. To assess the condition and pattern of walking, walkability assessment is the primary option. In the last decade a large number of literatures in urban planning, public health and transportation have analyzed the role of the built environment on physical activity, typically walking. This study is the first approach of measuring neighborhood walkability for Khulna City which is the third largest city in Bangladesh. Different spatial analyses have been carried out to objectively assess walkability score for all 31 wards of Khulna City Corporation area using Geographic Information System (GIS). Final result shows the ranking of each ward based on their respective scores. The standard method of walkability measurement provided by IPEN (International Pedestrian Environment Network) has been followed in this study. Net residential density, net intersection density, land use mix and net retail floor area are selected as built environmental criteria. The result indicates that ward no 11 shows the highest standardized walkability score, where the lowest score was found for ward no 4. It was also found that 19.27% people live in high walkable area and 39.48% people live in low walkable area of the city. Outputs of the research will be very helpful for the decision makers, city managers etc. who are dealing with the development and environment of a city and finally the researcher to do research further on the given subject.

Paper ID : 53

Green Spaces: Assets or Liabilities? An Economic Study on the Urban Residential Neighborhood of Dhaka

Bushra Nayeem*, Faria Sharmin (Stamford University Bangladesh)

Within the context of the economic valuation of open space, the presence and absence of open space has an effect on the residential property value in urban areas. This study only concerns with the valuation of open spaces specially parks and water bodies of different urban residential neighborhoods of Dhaka city in Economic terms. To analyze the impact of open space attributes on real price of residential properties, an empirical analysis is carried out by employing Hedonic Price Method (HPM). Together with a set of structural, location and socio-economic variables use to explain residential property prices; the study focuses on three amenity or environmental variables which include the existence of views of park or lake, the distance from the housing unit to the nearest open space, and the size of that open space. The regression analysis results from the first stage hedonic estimation reveal that home buyers are willing to pay only for scenic views and living in the closest proximity to open spaces especially as parks and lakes. In contrast results for the size of the nearest open space for houses do not show a significant relationship on nearby property values. This estimated valuation of open spaces and their amenity benefits will be useful for decision making in urban design, land use planning and open space preservation.

Paper ID : 54

Numerical Analysis of Deep Level Defects in Cu2ZnSnS4 (CZTS) Thin Film Solar Cells

Abu Shama Mohammad Miraz*, Md. Mortuza Faruk, Muhammad Asad Rahman (Chittagong University of Engineering and Technology)

Cu2ZnSnS4 (CZTS) absorber layer has recently been put under extensive research as a potential replacement of CIGS absorber layer because of its excellent electrical and optical properties. In this work, CdS, ZnS, ZnSe, In2S3 and TiO2 have been used as buffer layers in a CZTS/Buffer/i-ZnO structure. The use of i-ZnO as a Transparent Conducting Oxide (TCO) layer has been seen to enhance the performance of an ideal CZTS absorber layer without deep level defects. The effects of deep level defects on the performance of the cells have been numerically analyzed in terms of the energetic distribution and capture cross-section parameters. CZTS/In2S3/i-ZnO structure showed the best efficiency of 11.68% (with VOC = 0.77V, JSC = 26.66 mA/cm2 and Fill Factor = 56.96%). A variation of impurity concentrations have been used to offset the deterioration of efficiency and an optimum acceptor concentration of 2×1016 cm-3 was found for the enhancement of lower performance caused by electron and hole capture cross section parameters. The efficiency of the CZTS/In2S3/i-ZnO structure improved up to 14.56%. Furthermore, layer thickness has also been investigated as a potential way of compensating the effects of deep level defects. Finally, temperature dependence of various structures has been observed.

Paper ID : 57

Application of Short Term Energy Consumption Forecasting for Household Energy Management System

K.M.U. Ahmed*, M. A. Al Amin, M.T. Rahman (University of Asia Pacific)

In the context of the smart grid, energy management systems at household level has a vital impact on distribution grid. PV based energy systems at household level become more popular day-by-day. Thus scheduling residential energy storage device is necessary to optimize technical and market integration of distributed energy resources (DERs), especially the ones based on renewable energy. The first step of electricity consumption forecasting at individual household level is used to achieve proper scheduling of the storage devices. Then an intelligent agent based controlling technique is proposed to make sure the financial benefits of end-user as a part of energy management system. In this paper the forecasting ability of Artificial Neural Network (ANN) is evaluated to capture the daily electricity consumption profile of an individual household.

Paper ID : 59

Modelling of Solar Cell Characteristics Considering the Effect of Electrical and Environmental Parameters

Md Faysal Nayan* (Ahsanullah University of Science and Technology) S.M. Safayet Ullah (Daffodil International University)

This paper focuses on a generalized model of eco friendly green power technologies like photovoltaic cell using MATLAB. Fundamental mathematical equations based on equivalent circuit of solar photovoltaic cell are used to set up the model. This model shows an overall performance of Photovoltaic cell characteristics by analyzing different types of electrical and environmental parameters. In this paper, MATLAB is used to investigate the I-V and P-V characteristics of solar photovoltaic cell considering the effect of temperature, solar radiation, ideality factor, series resistance and shunt resistance of solar cell, number of cells in PV array and reverse saturation current.

Paper ID : 60

The Prospect of Renewables of Bangladesh: A Study to Achieve the Policy Goal

Tanvir Ahmed* (Islamic University of Technology)

Sufficient energy supply capability is the key factor for the development of any country. Present world is mostly depended on natural resources for energy production. But as the amount of natural sources of energy are declining day by day, to meet the increasing power demand with the renewable energy sources are becoming important. This issue is important for country like Bangladesh as it faces high power demand for high population growth rate. The aim of this paper is to overview the present condition of renewable energy in Bangladesh and hence, different types of renewable energy are discussed from global perspective to achieve a transparent perception about solving power crisis issues with this sustainable approach.

Paper ID : 61

Performance Characterization of Photovoltaic Technology with Highly Efficient Multi-Junction Solar Cells for Space Solar Power Satellite System

Golap Kanti Dey, Kazi Tanvir Ahmmed (University of Chittagong)

In our research work electrical characterization with different generation of solar cells depending upon the emergence as- First Generation: Mono and Poly-crystalline Silicon, Second Generation: Thin-film Solar Cell, Third Generation: Full Spectrum Utilization with comparative efficiency study of different solar cells is investigated. Besides, major part of our research is Multi Junction Solar Cells (MJSC), for Space Solar Power Satellite (SSPS) system, created from III-V semiconductor materials, exhibit high efficiencies comparing to other existing photovoltaic technology. Here we have shown MJSC's are composed of 3 layers of material that have different bandgaps. The upper layer has the largest bandgap while the lower layer has the smallest bandgap. This model allows less energetic photons to pass through the upper layers and be absorbed by the lower layer, which increases the overall efficiency. One significant estimation is that generated photocurrent in each layer must be the same since the layers are in series. Besides, for most effective absorption from the spectrum of incident radiation, the bandgaps of each layer should differ by approximately equal energies . Due to the high cost, multi-junction solar cells are usually used in the SSPS system, in Microwave Power Beaming from space to ground based receiving station and as collector cells where a large amount of sunlight is reflected onto the cell.

Paper ID : 63

Solid State Lighting can resolve the present power crisis in Bangladesh

Md. Meganur Rhaman (Ahsanullah University of Science & Technology) M A Matin (Bangladesh University of Engineering and Technology) Tanvir Ahmed Toshon (Ahsanullah University of Science & Technology)

Power crisis is the most concerning problem in Bangladesh for the past few decades. Despite a lot of attempts by the Bangladesh Government, due to increasing population & rapid industrial growth, this problem seems to be augmenting day by day. Energy preservation is the result of financial capital increase of the country and also increases the environmental values. Being a developing country, Bangladesh lacks the utilization of renewable energy sources, so almost majority of the power generation techniques are based on Fossil Fuel, Gas and Coal, which is created air and water pollution, also negative impact on global calamity. So, to solve the power crisis, alternative means are needed to be taken account of. If power consumption can be reduced somehow, then with the present generation capacity, it would be possible to generate power in coherence with the demand of the consumers. In this paper, we have discussed about how Solid State Lighting (SSL) like Light Emitting Diode (LED) can reduce the daily power consumption in Bangladesh. SSL offers many benefits such as long life, energy saving, better quality light and so on. By utilizing the features of SSL the power consumption in Bangladesh can be reduced significantly. We have represented the features of solid state lighting compared to other means of lighting sources. We have shown LEDs prospective contribution in reducing the power consumption with necessary calculations and statistics.

Paper ID : 65

Study of Power Quality with changing customer loads in an urban distribution network

Tareq Aziz (Ahsanullah University of Science & Technology) Sanjib Kumar Nandi*, Md. Siddikur Rahman, Ridown Rashid Riadh (American International University-Bangladesh)

Power quality is one of the most significant current discussions in electric energy distribution systems. The issue of harmonics has been a controversial and much disputed subject within the field of power quality. Harmonic current originates from all types of nonlinear loads. This paper attempts to show the impacts of rapidly increasing share of nonlinear loads on harmonic distortion of urban distribution feeders. The recommendations of IEEE Std. 519 1992 and Bangladesh Grid Code are considered carefully. Simulations have been carried out to find out how far the existing distribution system can accommodate non-linear loads. Results show that though the connected load is not hampering power quality of test distribution at present, an increase of nonlinear load share above 30% would cause Total Harmonic Distortion (THD) go beyond tolerable limit and result in poor power quality.

Paper ID : 67

Electricity Generation by Using Amplitude of Ocean Wave

A.H.M. Zadidul Karim (University of Asia Pacific) Md. Mizanur Rahman* (Islamic University of Technology) Subrata Karmoker (University of Asia Pacific)

Among available technologies for energy production from renewable sources, ocean wave energy and tidal power could give a significant contribution to develop a more sustainable energy system. Tidal power is one of the best renewable energy sources in coastal area and becoming popular around the world due to its own facilities. Ocean wave energy can play a vital role for producing electricity as new source of renewable energy to the off-grid power connection in isolated areas, namely Sandwip, in Bangladesh. Ocean wave energy having environmental friendly is the only sustainable solution of secure energy system in coastal area. Bangladesh has a huge potential of tidal power at different locations. It has a long costal area with 2-8 m tidal head/height rise and fall. This height is sufficient enough to produce power. So, tidal power has a bright future in Bangladesh. It can reduce the present energy crisis and improve the social, environmental and economic perspective of Bangladesh. But effective measures on this issue have not been considered sincerely. In this paper we propose a system which can be generated electricity by using amplitude of Ocean wave which may be an effective solution to overcome the recent power crisis in Bangladesh.

Paper ID : 68

A comprehensive study on green technologies used in the vehicle

Muhammad Sifatul Alam Chowdhury* (International Islamic University Chittagong) Al Mahmudur Rahman (Karlsruhe Institute of Technology) Nahidul Hoque Samrat (University of Malaya)

To ensure the safety of environment a major challenge to the vehicle manufacturer is the emission rate of vehicle. Emission of environment polluting particles especially carbon-di-oxide from conventional vehicles is a direct threat to the environment. As global vehicle market are expanding day by day so this high rate of emission is already a nightmare to the environment specialist. That's why some of green technologies are introduced in the vehicle by which energy reuse can be happened in the vehicle. Which can impressively reduce the emission of polluting particles from the vehicle. The impressive add-ons among this technologies are fuel cell which can reduce the rate of environment pollution near zero level. Research are going on full swing on the other green technologies like the addition solar cell in the vehicle. Due to some limitations this awaited technology is yet to reach the remote people. Recovering exhaust heat and vibration energy can be a good source of energy in the vehicle. In this paper technologies invented in various time, used in the vehicle for a greener world like regenerative breaking system, fuel cell, energy harvesting from vibration, recovering exhaust heat and the use of photovoltaic panel in vehicle are briefly discussed. Beside this the business perspective of this technologies and cost of producing power from them are discussed.

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Paper ID : 73

Biomass energy an alternative solution for Bangladesh

Naznin Nuria Afrin*, Shah Md. Rahmot Ullah, Khandaker Anamul Hoque, Abde Mayeen Shafi (University of Dhaka (Mymensingh Engineering College))

Bangladesh has been experiencing several problems over the past few decades. Adequate amount of power generation in a sustainable way is an important issue for rapidly increasing population and economic development. Renewable energy can play an effective role to meet energy demand. Since it is an agrarian country, biomass is one of the potential renewable energy sources in Bangladesh. A large amount of cattle dung, agricultural residue, poultry dropping, water hyacinth, rice husk etc. are available in Bangladesh which is used for power generation. Already some private organizations are producing power from the biomass. Biomass gasification has yet to consolidate its position compared to other techniques for exploiting biomass energy. In this paper, gasification techniques have been reviewed. This paper also presents the scope, potential and technologies related to the use of biomass resources.

Paper ID : 76

An Efficient Wind Speed Sensor-less MPPT Controller Using Artificial Neural Network

M.M. Atiqur Rahman*, A.H.M.A. Rahim (Ahsanullah University of Science & Technology)

An artificial neural network (ANN) based maximum power point tracking (MPPT) algorithm has been developed. The proposed ANN based controller has the ability to estimate wind speed by tracking the maximum power point (MPP) and the optimal rotor speed with very low error compared to the conventional MPPT methods. The algorithm is based on two series neural networks, one for wind speed estimation and the other for tracking maximum power point. The method demonstrates remarkable performance in estimating wind speed under rapidly changing wind conditions. It can also predict MPP accurately avoiding undesired oscillations around maximum power point. The algorithm does not require any mechanical sensor for wind speed measurement. Nonlinear time domain simulations have been carried out to validate the effectiveness of the proposed controllers in terms of wind speed estimation and MPPT under different operating conditions. Simulation results confirm the effectiveness of the MPPT controller in tracking the maximum power point under rapidly changing wind conditions.

Paper ID : 78

Feasibility Analysis of Solar DC Nano Grid for Off Grid Rural Bangladesh

M. Mahmudul Hasan Sajeeb*, Md. Aminur Rahman, Shaila Arif (Ahsanullah University of Science and Technology)

Due to the gradual reduction of fossil fuel, renewable energy resources have become the next best alternative to meet up the accelerating demand of electricity. Among all kinds of renewable energy resources solar energy is the best suited source of power for the perspective of Bangladesh. Nano grid is a vital element of smart grid which is one of the talked topics around the world facilitating the system reliability with distributed generation. Solar DC Nano grid is a modern renewable technology which can efficiently be used to meet up the power demand for off grid rural areas. In this paper we have represented a rudimentary discussion about Nano grid, its advantages and challenges, all necessary survey data about an installed DC Nano grid in Kushita district and how solar DC Nano grid can be an essential driving element to combat future power demand in rural areas of Bangladesh.

Paper ID : 81

Design, Implementation and Cost Analysis of a Solar Powered Water Pump for Multistoried Building

Mohammad Rejwan Uddin*, Mohammad Rabiul Hossen, Khosru M Salim (Independent University, Bangladesh)

Electric motors are used to pump water in multi-storied building. Total power consumed by those motors is huge in urban area. By implementing a renewable energy source to run those motors can save energy from national grid. The purpose of this paper is to provide information about planning and installation of solar powered water pumping systems by using Thin Film PV (Photo Voltaic) Module. 20 panels of 95 Watt are mounted by using movable concrete pillar for flexibility. A 3D design was created by using SketchUp 3D to bring perfection in mounting solar panels. A three phase inverter is used to operate with higher output voltage of Thin Film PV Module. To avoid starting torque and maintenance cost, a three phase 2 HP AC water pump is used for pumping water. A four storied building is considered to lift water from reserve tank on ground. The system has been tested successfully in delivering 500 liter water in 17 minutes to the over head reserve tank at broad sunlight. Total cost for installing this project is also analyzed in this paper.

Paper ID : 82

Efficient Hybrid Renewable Energy System for Industrial Sector with On-Grid Time Management

Md. Mehedi Hasan (Ajou University) Aman Abdulla Tanvir (Saint Mary University) S.M. Shahnewaz Siddiquee (International Islamic University Chittagong) Ahmed Zubair* (Bangladesh University of Engineering & Technology)

Hybrid renewable energy system shows a good potential for electricity generation in Bangladesh. Hybrid renewable energy system can be set up such a way that the electricity will add to national grid connection and it will eventually reduce the pressure of electricity demand from national grid. Abundance of renewable energy sources in the form of solar energy provides opportunities of renewable energy based hybrid energy system in the industrial areas of Bangladesh. This work is an in-depth scenario and analysis of the renewable hybrid energy system in Tongi, an industrial area of Bangladesh. This study is also includes co-production of diesel generator, solar PV and grid system. Optimization of hybrid renewable energy systems looks into the process of selecting the best components and its sizing with appropriate operation strategy to provide cheap, efficient, reliable and cost effective alternative energy. This paper analyzes all the conditions and constraints of the renewable energy integrated grid connection system with compensation and proposes an optimal combination of energy components for compensating regular grid failure in industrial area with minimizing the pressure of electricity demand from national grid and minimizing the life cycle cost. The final optimization result from HOMER shows that the cost of energy (COE) for 0 hour , 1 hour , 2 hour , 3 hour , 4 hour , 5 hour , 6 hour , 7 hour , 8 hour and 9 hour compensation is respectively $0.092 , $ 0.098 , $0.106, $0.113, $0.123, $0.133, $0.144, $0.152, $0.159 and $0.163.

Paper ID : 83

Developing a Sustainable Peer-to-Peer Network Infrastructure for Rural Areas

Farhan Bin Tarik*, Walid Bin Habib, Rawdah Mahmood (University of Dhaka)

The necessity of information and communication technology beggars description. But in developing world, proper ICT facilities have not been achieved yet, especially, in the rural or remote areas. In this paper, an incentive has been presented to develop a sustainable peer to peer network for those areas. The connected peers will be able to share important information shared without the requirement of any special central server. For better communication and access to internet, directory center can be connected to broadband (if available) or mobile network based internet. Since energy crisis is a major problem in developing countries, alternative power system with renewable sources has been proposed. The deployment of energy-efficient ICT with the optimization of renewable energy also sets the way towards green growth and sustainable development.

Paper ID : 84

Roadside Power Harvesting for Auto Street Light

Mrinmoy Dey, Tawhida Akand*, Saddeka Sultana (Chittagong University of Engineering and Technology)

Present development of the world is measured by the amount of energy consumption. Energy of today world is generated from conventional energy sources mostly which are decreasing day by day. Moreover, these conventional energy sources causes pollution and responsible for global warming of the world. To solve these problems, researchers are trying frequently to explore new sources of energy which are clean, environment friendly, sustainable. This research is focused on auto lighting on street lights utilizing the jerking pressure which is wasted during the vehicles passes over speed breaker in roadside. In this work, the amount of electricity generation depend on spring constant, displacement of rack, number of vehicle, weight of the vehicle, gear ratio and number of gear combination are addressed as well as the techniques to increase the efficiency of the system is discussed. In response of public demand, number of vehicles is increased day by day for transportation facilities and hence this system can fulfil the demand of electricity in roadside and small area also. Auto street lights secure safety to the passer-by at roadside and raise awareness towards the new technology.

Paper ID : 85

Alternative Technology for Cooling

Kutub Uddin* (Jagannath University) Takahiko Miyazaki, Bidyut Baran Saha, Shigeru Koyama (Kyushu University)

To provide thermal comfort to the human being many types of cooling technologies are available in the market. These technologies are more essential in the region where the average ambient temperature is high. But every system has some limitations especially for environmental aspect and energy consumption. Open literature shows the available commercial cooling technology used almost 45% of electricity consumed in a house. To keep the system running a lot of fossil fuels need to be burned as a result the volume of greenhouse gases into the air increases. This study introduces a new technology which is emerging as viable alternatives of conventional vapor-compression systems and is known as adsorption cooling system. This system is environment friendly since it uses natural refrigerants and it is driven by low temperature waste heat or solar energy that is why it can solve the existing challenge of global warming and energy crisis.

Paper ID : 88

Enhanced Audio-Visual Warnings for Reducing Bird Fatalities at Wind Turbines

Shahriar Khan*, Md. Ikramul Haque (Independent University, Bangladesh)

Bird and bat fatalities by wind turbines has slowed the installation of new turbines, and even prompted the dismantling of existing turbines. Other animals can coexist in artificially created dangerous environments, like dogs maneuvering among cars in busy streets. Based on this concept, a previous paper has proposed that bird and bat mortality can be reduced by audio visual warnings in the proximity of wind turbines. This paper proposes further details of audio visual warnings, including directional lights, which will enhance the learning process and act as warnings. The leading edges and the peripheral regions of the blades are most likely to strike birds and bats, which may be trained to keep away by the colors, lighting and sounds of leading edges. Lights and sounds need only have a range of a few tens of meters and directionality towards the danger zone, meaning the lights and sounds will be imperceptible to humans in the vicinity. So that the globally mobile birds do not have to relearn the warning signals, countries can converge towards common standards for the warning colors, lights and sounds on wind turbines.

Paper ID : 89

Design and Performance Analysis of a Directly-Coupled Solar Photovoltaic irrigation pump system at Gaibandha, Bangladesh

S.M. Shamim Reza (Bangladesh University of Engineering & Technology) Md. Nazmul Islam Sarkar* (University of Dhaka)

Due to climate change and high price of fossil fuel, demand of electricity for irrigation need is increasing. Harnessing solar power to meet this increasing demand can be a good solution. In this paper, we have shown the design and performance analysis of a directly coupled solar photovoltaic (PV) motor-pump system operating at Gaibandha, Bangladesh. Three 1kW DC series motor coupled with pumps was powered by photovoltaic panels of 2kWp. The motor pumps were directly connected without any converter. All of the components of the system was available and bought from the local market. With average insolation the system can lift 1, 20,000 to 1,72,000 lit/day. We have calculated the efficiency of the motor-pumps at different time of the day. Finally, we have calculated the simple payback period of the system. We found the system to be viable technically and economically.

Paper ID : 90

Design of Blades for a Low-Speed 400W Wind Turbine Suitable for Coastal Area of Bangladesh

Mahtab Murshed*, Md. Yeasin Arafat, M. Abdur Razzak (Independent University, Bangladesh)

Implementation of wind turbines has been increased significantly because of its availability, easy and low cost generation around the world. Meanwhile in Bangladesh wind energy conversion is a very recent concept compared to other renewable energy conversion techniques and yet in many places research is going on to measure and analysis the wind velocity. The primary target of this research is to determine the wind prospects of Teknaf coastal area in Bangladesh by developing a statistical analysis of wind velocity at that region and to propose the design of blades for a low-speed wind turbine using theoretical analysis of power availability and wind velocity at different heights. The design approach can be applied successfully to develop a low-speed wind turbine pole and blade developments.

Paper ID : 91

Empowering Remote Area of Bangladesh Using Pedal Generator

Alimul Haque Khan*, Md. Moniruzzaman, Md. Muhibbullah, Mehedi Hasan, Niyaz Morshed (Bangladesh University)

Now-a-days, Bangladesh is facing a problem with shortage of natural resources especially in gas sector. A large number of population in Bangladesh do not have the facilities of electricity. Besides that the people of remote area are normally far from modern facilities such education, health, online services etc. In general, they use kerosene as fuel for lighting purpose and it is hard for them to access modern technologies such as mobile, computer, internet, e-health. Pedal generator, a flywheel driven by human and coupled with an electric generator, may be an alternative solution in these situations. The efficiency and the performance was good. It can be operated in a standalone mode or may be used with PV module as a hybrid system. Though, the research has been done with respect to Bangladesh, this can be applicable everywhere. This will provide an easy, cheap, handy and pollution free source of energy by means of pedal generator.

Paper ID : 92

Design and Analysis of an Outer Rotor Permanent Magnet Alternator for Low-Speed Wind Turbine

Md. Yeasin Arafat*, Mahtab Murshed, M. Abdur Razzak (Independent University, Bangladesh)

The outer rotor permanent magnet alternator (PMA) is superior for small wind turbine system due to its robust, little maintenance and low cost configuration. In this research, the design and performance analysis of a radial flux outer rotor type PMA used for gearless, extremely low-speed, and small capacity wind turbine system has been discussed. The design has been simulated to analyze this PMA. The elementary configuration like material types, magnet types and additional electrical and mechanical parameters are studied, and the performances parameters of PMA are improved by changing these elementary electrical and mechanical parameters or some other related factors such as reducing the cogging effect. Cogging torque has been reduced by employing fractional slot per pole, width of slot opening, mounting of the magnets. Also the slot shape has been custom-made to increase the efficiency. The slot fill factor was improved by using different wire diameter used as winding coil. This improvement has been played a great role to reduce copper losses thereby improving the thermal condition of the slot. Finite element analysis (FEA) method was used to analyze this PMA in order to test the real time performance simulation with loss and cogging torque calculation. By taking all these considerations into account, higher efficiency from the outer rotor arrangement with minimum losses has been achieved.

Paper ID : 94

A Novel Model of Electricity Generation to Change the Direction of Grid Expansion and Power Flow Network

Alimul Haque Khan*, ASM Shamsul Arefin (Bangladesh University) Maidul Islam (Eastern University) Asif Islam (University of Queensland)

The aim of this paper is to explore a new model of electricity generation with a different topology of grid expansion and different direction of power flow network as well as higher penetration rate of renewable energy. Conventional system to generate electricity is to generate large amount electricity which reaches to the consumer end through long transmission line and distribution systems. The expansion of grid follows "generation, transmission, distribution and consumer" network. Expansion of grid nearby the existing one is not so difficult. However, it needs longer time to reach electricity to a residency of remote area because of higher cost associated with long transmission and distribution line. Unavailability of electricity is one of the most important reasons to deprive the population of remote area. It is possible to confirm electricity to the citizens of a remote area by producing small scale electricity at or nearby the consuming spot instead of bearing it through long transmission and distribution lines. Interconnection of multiple small scale generation units may form a different network in comparison to traditional power flow network. A novel method to achieve this has been discussed in this paper. The analyses have been done mainly based on the condition, environment, data and other factors of Bangladesh. This work is not to replace the traditional grid expansion topology rather to assist it with an alternative way.

Paper ID : 95

Facts and Popular Perceptions on Saving Energy and the Environment

Shahriar Khan* (Independent University, Bangladesh)* Abdus Salam (Military Institute of Science and Technology) Samina Alam (Premier University)

Although today's major concerns are moving to renewable energy and the saving of energy, there are deeper energy-related issues which are less discussed and explored. To what extent can renewable energy take over from conventional sources? How much into the future should we be concerned about? Electricity generation for stationary applications can be from coal, nuclear power, solar power and wind turbines, whereas transportation relies mostly on increasingly scarce oil. Coal and nuclear fuel will be nowhere close to depletion over the next 100 years. Both governments and commercial organizations mostly benefit from increased energy consumption, and cannot be fully relied upon to pursue saving energy and the environment. It is private citizens who are most concerned about saving energy, being concerned about availability in their own lifetimes and that of their children. However, the general public is less aware of the deeper issues involved. The issues of energy and the environment are interdependent on each other, and determine the quality of life for ourselves and our future generations. As the attitude of people to saving energy determines availability (or depletion) for future generations, this paper explores facts vs. public perceptions on energy. A preliminary survey was conducted, which found that there are genuine concerns about saving energy and the environment. Areas where there were misconceptions were identified. Although the sample size was small (<100), the survey paved they way for a broader survey with a larger sample size.

Paper ID : 97

Simulation of Saturation Current in In1-x GaxSb Based Solar Cell

Asif Hassan* (Khulna University of Engineering and Technology) Raktim Kumar Mondol, Imran Bin Jafar (BRAC University)

After the golden era of silicon, nowadays compound semiconductors from III-V group is extensively studied to observe their application in electronic as well as in other field. Solar cell which is providing an alternative source in our industries, houses and laboratories. Researchers are now trying to find out new features by using these inorganic materials based solar cell which can easily be paved the way of better controlling and maximizing the efficiency. In previous literature, and based solar cell has already been studied. In this paper, based solar cell is analyzed through their electronic responses. Here, we will observe the bandgap energy response for different proportion of gallium, temperature dependent energy, temperature dependent saturation current which will help in predicting a good level of solar efficiency.

Paper ID : 98

Study of PV Implementation for Electricity Generation in Bangladesh

Abu Bakr Siddique Abu Bakr, M. Tanvirul Hoque*, Tashfique Sibgat Ullah, Rakibul Hasan Sagor, Md. Shahid Ullah (Islamic University of Technology)

The goal of this paper is to make effective use of solar energy of Photovoltaic (PV) module so that we can get maximum power output from sunlight. Since the performance of a PV cell depends on maximum efficiency factors, mainly on solar radiation and temperature, this paper examines the performance parameters of PV module for various locations by analyzing twenty-two years average solar radiation data in Bangladesh. To examine the performance parameters, the Solarex MSX60, a typical 60W PV module is chosen. The mathematical model for the chosen module is implemented on MATLAB. The result of this paper shows the effects of variation of solar radiation on PV module within Bangladesh. Eventually, this paper proposes suitable locations for implementing solar PV modules based on maximum efficiency within Bangladesh.

Paper ID : 100

A Hybrid of 30 KW Solar PV And 30 KW Biomass System for Rural Electrification in Bangladesh

Sayed Ahammad* (Electricity Generation Company of Bangladesh Ltd.) Alimul Haque Khan, Tabassum E Nur, Sanchita Ghose (Bangladesh University)

This paper is mainly addressing the design and analysis of a hybrid Solar and Biomass System for rural electrification in a remote area in Bangladesh by Decentralized Distributed Generation & Rural Power Distribution Management. Energy is crucial input in the process of economic, social and industrial development. Energy plays a vital role in our daily life. But the conventional source of energy to produce electricity is decreasing day by day significantly. In this regards non-conventional or renewable energy resources such as bio-energy, Solar, Wind, Ocean and Geothermal are taking this challenge. A large proportion of the world's population lives in remote rural areas and far away from grid. The installation and distribution costs are considerably higher for remote areas. Moreover, there is greater transmission line losses and poor supply reliability. There is growing interest in harnessing renewable energy sources since they are available in abundance, pollution free and inexhaustible. Not only that, The combining of technologies means Hybrid technology provides interesting opportunities to overcome certain technical limitations and to mitigate fuel price increases, deliver operating cost reductions, and offer higher service quality than traditional single-source generation systems. A hybrid system is a dynamic system that exhibits both continuous and discrete dynamic behavior a system that can both flow and jump.

Paper ID : 102

Design of High Efficient and Stable Ultra-Thin CdTe Solar Cells with ZnTe as a Potential BSF

Mrinmoy Dey* (Chittagong University of Engineering and Technology) Maitry Dey (Premier University) M. A. Matin (Chittagong University of Engineering and Technology) Nowshad Amin (The National University of Malaysia)

The polycrystalline ultra-thin cadmium telluride (CdTe) is familiar as the potential solar cell material for its higher efficiency, cost-effective, cell stability and clean generation of solar electricity. In this study, a numerical analysis has been performed utilizing AMPS (Analysis of Microelectronic and Photonic Structures) simulator to examine the cell performances (Voc, Jsc, FF and conversion efficiency) of ultra-thin CdTe solar cell. During the research, reduction of CdTe layer was done in the proposed cell and found that 1?m absorber layer is enough for acceptable range for cell conversion efficiency. The possibility of this ultra-thin CdTe absorber layer was examined, as one with 100 nm ZnTe back surface field (BSF) layer to minimize the recombination losses at the back contact and to reduce the barrier height in the valence band of the proposed cell. Higher conversion efficiency of 22.53% (Jsc = 24.28 mA/cm2, FF = 0.875, Voc = 1.06 V) has been achieved with only 0.8 ?m of CdTe absorber layer along with 100 nm ZnTe BSF where as conversion efficiency is 18.68% (Jsc = 21.47 mA/cm2, FF = 0.85, Voc = 1.02 V) without BSF layer. Moreover, the proposed CdTe solar cell showed better stability as the normalized efficiency of the proposed cell linearly decreased with the increasing operating temperature at the gradient of -0.16%/°C.

13~14 May, 2016 | Dhaka, Bangladesh http://CenNSER.org/ICIEV

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Keynote Speakers: Anton Nijholt (U of Twente) (... *more to add*)

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Special Session / Tutorial proposal	30 Oct., 2015
Project submission	30 Jan. 2016
Graduate consortium	30 Jan. 2016
Review result:	15 Feb., 2016
Final camera-ready / Exhibition submission / Graduate consortium:	5 Mar., 2016
Early-bird Registration:	5 Mar., 2016
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