**Saturday, October 22, 2016 09:00AM - 12:00PM**

**Session A; New Energy, Emerald Hall A**

**Session Chair: Afsin Gungor, Akdeniz University Antalya, Turkey**

**9:00AM A.01 Muhammad Haris Akram, COMSTECH Secretariat, Pakistan, *Renewable Energy in OIC Countries* ―** Energy security and diversification of the energy mix is a major policy driver for renewables. Growth of renewables generally contributes to energy diversification, in terms of the technology portfolio and geographical sources. The global installed capacity of renewables (excluding hydro & nuclear) has grown up to 667GW and major contributions are from China (153 GW), USA (105 GW) and Germany (86 GW). The trend of renewable energy has grown tremendously in last three years in OIC member states and the total installed capacity has reached to 12.15 GW (1.88% of world total). Due to subsidized electricity prices in most of the OIC member states renewable energy integration is not very popular. But the depletion of fossils, increase in carbon footprints and reduced subsidies in energy sector has made a way forward for the renewables. Many aggressive RE targets and policies have been announced for the promotion of renewables in the OIC member states. Apart from RE, energy efficiency can play a vital role in decreasing the energy use per capita as it has been witnessed that almost 60% of energy is consumed in residential & commercial sectors by air conditioning only. Likewise renewable energy targets and policies, energy efficiency policy and targets are also set to reduce the losses in power generation, transmission and consumption sectors. Globally the main focus on GHG emissions reduction, contribution of INDC’s, COP21 and Carbon Capture & Storage (CCS) are the new avenues for discussion.

**9:12AM A.02 Najam-ul-Hassan, Azhar Abbas, Muzaffar Ali, University of Engineering and Technology Taxila, Pakistan, *Prospects and Scope of Solar Thermal Power Tower Plant in Pakistan* ―** Fossil reserves around the world are depleting at a steadier pace. Also, their consumption in conventional way is rising environmental concerns. Therefore, each nation is shifting towards renewable and clean energy resources to meet up its electricity demands and ensure a sustainable future. Pakistan lies in a hot zone with average solar irradiance of 5.3 kWh/m2/day. This shows strong potential for harnessing solar energy in our country. Currently, entire of our energy requirement is produced from hydro, thermal and nuclear power plants. Although, a solar park with 100 MWe capacity has been set up recently and is under expansion, but this is not sufficient. Establishing concentrated solar thermal power plants, especially solar power tower plants can lead up to a sustainable future of our country. This paper reviews solar thermal power tower plant design and establishes its viability in Pakistan. An analysis has been presented for factors affecting its performance, prospective locations, expected outcome and challenges for setting up solar tower power plant.

**9:24AM A.03 Fahad Ishaq, University of Engineering and Technology Taxila, Pakistan, *Design and performance analysis of encapsulated phase change material (EPCM) based thermal energy storage (TES) system for concentrated solar plants (CSP)* ―**The purpose of the work is to form a method of thermal energy storage (TES) using encapsulated phase change materials (EPCMs) in the temperature range of up to 200°C used in concentrating solar plants (CSPs). Adipic acid is selected as the heat storage medium. Stainless steel (SS) capsules containing adipic acid are fabricated and installed in a TES section for experimentation. Shell Heat Transfer Oil S2 is used as heat transfer fluid (HTF). The test section (T/S) equipped with EPCM capsules demonstrates effective heat transfer with the HTF, completing energy storage and retrieval in multiple charging and discharging cycles. The total heat captured by EPCM during charging is 933 kJ, of which capsule#1, #2 and #3 absorb 370 kJ, 344 kJ and 219 kJ respectively. The latent heat contributes 30% of the total heat captured by EPCM. The energy captured by capsules is 1.6 kJ. The observed charging and discharging time was 3 hours and final temperature of capsule#1 was 65°C for discharging. A mathematical model has been developed for the T/S with EPCM capsules and its predictions for rate of energy storage vary by half an hour because of losses, heat captured by T/S, SS capsules and insulation.

**9:36AM A.04 Syed Asad Ali Naqvi, Lahore University of Management Sciences, Pakistan, *Porous carbon nanofibers (PCNFs) derived from Electrospinning of polymeric blends: A study of their electrochemical performance* ―**Carbon 1D nanomaterials such as nanofibers and nanotubes have proven themselves as potential candidates for electrode materials in energy storage devices due to their chemical and thermal stability, high conductivity and relatively low cost. Surface area enhancement by inducing porosity is expected to improve their energy storage capacity. The aim of the present study is to get enhanced electrochemical performance through optimization of pore characteristics in porous carbon nanofibers (CNFs). Electrospinning was adopted for the synthesis of polymer nanofibers which were than stabilized and carbonized at elevated temperatures to get CNFs. Polymer blends of polyacrylonitrile (PAN), acting as the carbonizing polymer, with other polymers [polystyrene (PS), polymethylmethacrylate (PMMA), polyvinylacetate (PVAc), polyvinylpyrrolidone (PVP), and polyvinyledene fluoride (PVDF)], acting as the pyrolyzing polymers, were electrospun to get porous CNFs. The material characterization was done by scanning electron microscopy (SEM), energy dispersive X-Ray spectroscopy (EDX), thermal analysis (TGA-DSC), X-Ray diffraction (XRD) and surface area analysis by N2 physiosorption. The electrochemical performance of these materials have been estimated through cyclic voltammetry. The specific capacitance values range from 48 F/g, in case of pure CNFs, to 178 F/g for porous CNFs obtained from bi-component polymer blends. Cycling performance also exhibited 82% retention of charge densities and specific capacitance even after 300 cycles.

**9:48AM A.05 Umer Farooq, U of Calgary, Canada, *Flexible polymer-ceramic composite electrolyte for all-solid-state Li-ion battery system*** ―In recent years, an intensive research has been conducted to introduce the solid-state electrolytes for the safe and high performance Li-ion batteries. In this work we prepared ceramic electrolyte Li6.5 La2.5 Ba0.5 NbZr O12 (LLBNZO) and made a composite with polyethylene-co-propylene polymer membrane. The objective of this research was to synthesize a flexible composite membrane with better mechanical strength. Preliminary results that include physical morphology of materials suggest that the material has better stability after sintering at elevated temperature. It is expected that this flexible membrane would enhance the transport properties of battery system.

**10:00AM A.06 Zahoor Hussain, Shahzad Memon, Lachhman Das, IICT, U of Sindh, Pakistan, *Logical architecture for on demand electrical power load management service (EPLMS) for smart metering using GSM technology*** ―Energy is one of the most fundamental components of daily life and plays a vital role in the growth of economy. Due to recent severe energy crises in Pakistan, the government focuses on to build new power generation plants. However, nowadays the management and control of electricity are actually the challenging tasks. The government of Pakistan has taken many actions for energy saving but still there is no any major progress in the control of electricity theft and efficient power load management. For domestic consumer, the management of the power load is mostly done through the manual request system which takes time in process and may consumer not get any feedback / result of his/her request on time. Also, there is no service/method exist which makes a direct interaction between MS (Smart Meter), ESP (Electricity Service Provider) and EC (End Consumer). In this research, a service model called EPMLS (On Demand Electrical Power Load Management Service) for smart meters using GSM (Global System for Mobile) will be proposed, and develop a system architecture. It is approaches which will be propose an additional power load management service module for existing smart meters. The implementation of this service module will be helping to develop a real time interaction between EC and ESP to manage load automatically.

**10:12AM A.07 Muhammad Junaid Qamer, Muhammad Ayaz, Ahtsham-ul-Haq, Waheed Noor, Anwar Ali Sanjarani, Mustafa Ali, IICT, U of Balochistan, Pakistan, *Instant view of used electricity in home*** ― In Pakistan, the electricity meter is installed outside the home which is not providing an instant view to the user. This gap generates a distance between consumer and meter, and not able to see the daily reading of used electric energy. These studies focused the saving of electricity in homes. A sub-digital meter was installed inside a home in a prominent place. The user noted everyday electricity consumption of electricity units which distinguished estimated energy. Discover and reduce daily consumption of electricity units. The main aim of this research was to provide instant information about consumed units, which motivate home members toward saving of electricity.

**10:24AM A.08 Muhammad Azam Qamar, U of Management and Technology Lahore, Pakistan, *Antibacterial Activity of Energy Efficient Co Doped SnO2 Nanoparticles*** ― The synthesis of highly pure cobalt-doped SnO2 nanoparticles was carried out by applying simple co-precipitation method. The characterization of the fabricated particles was done using Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD) analysis, and UV-Vis. spectroscopy. The applied characterization techniques confirmed the formation of doped particles. The average size of the particles was found to be 24.86 nm. Doping of the cobalt was confirmed by using SEM/EDX analysis. The optical properties were studied by measuring the energy band gap. The Energy band gap was found 1.477 eV for un-doped SnO2 and 1.450 eV for doped SnO2 nanoparticles. The antimicrobial activities of the synthesized nanoparticles were carried against both Gram-negative than Gram-positive bacteria. The antimicrobial activity of doped SnO2 nanoparticles was good against Gram-negative as well as against Gram-positive bacteria. The synthesized Co-doped nanoparticles can be applied for various energy efficient devices and processes.

**10:36AM A.09 Mudassar Sher, U of Management and Technology Lahore, Pakistan, *Enhanced Optical and Antibacterial Activity of Energy Efficient Ni-Doped ZnO Nanoparticles*** ― In this work, we successfully fabricated un-doped zinc oxide nano-particles and Ni-doped zinc oxide nano-particles via solvo-thermal method. The synthesized nano-particles were characterized by using X-ray diffraction analysis. Ni doping to zinc oxide nano-particles is validated through Energy Dispersive X-ray analysis. Scanning Electron Microscopy analysis was applied to study shape and morphology of the synthesized nano-particles. These results confirmed successful preparation of zinc oxide and Ni-doped zinc oxide nano-particles. The synthesized zinc oxide and Ni-doped zinc oxide nano-particles were also used to check their optical activity. Band gap analysis was performed to check optical activity zinc oxide and Ni-doped zinc oxide nano-particles. Band gap results were obtained using Ultra Violet visible spectroscopy decrease in band gap from 3.37 to 1.47 eV. The result shows Ni doping has enhanced optical character of zinc oxide when compared with un-doped samples. This may be employed in formation of energy efficient solar cells.

**10:48AM A.10 Malik Imran Afzal, Sammia Shahid, U of Management and Technology Lahore, Pakistan, *Fabrication of CdS nanowires for replacement of CdS Film solar windows*** ― Cadmium sulfide nanowires have unique electrical and optical properties and applications with band gap 2.42eV at room temperature. 100 nm long Cadmium sulfide nanowires, if used as replacement for CdS nano-film window layer, enhances the photocurrent by approximately 20% and circuit voltage by 10%. We report the CdS nanowires fabricated for this purpose, at initial stage, using porous anodized aluminum oxide templates through electerochemical deposition. Aluminum was anodized using two-steps method. Templates were prepared through anodization of comparatively low purity aluminum sheets at 5-6°C in 1M phosphoric acid as electrolyte. Cadmium sulfide was deposited electrochemically using a co-solution of thiourea, cadmium acetate and ammonium acetate. pH was maintained at 11 in a heat bath at 75°C during deposiion of CdS. 5Volts electric potential was applied during electrodeposition with 0.5Ampere/cm2 charge density, As prepared templates and nanowires were characterized by SEM (Scanning Electron Microscope) and AFM (Atomic Force Microscope). Nanowires obtained were smooth with good morphology and repetitive structure. A good quality Nanowires were obtained in bunches with reasonably high aspect ratio.

**11:00AM A.11 Muhammad Ghaffar Doggar, COMSATS Institute of Information Technology Lahore, Pakistan, *A Comparative Study of Solar, Diesel and Electric tube wells in Pakistan*** ― The problem of power shortage is more severe in rural areas of Pakistan than in the urban towns. About 61% of the people live in rural areas, and 30% of the population do not have access to grid connected electricity. Even if they have electricity, blackouts continue for more than 12 hours per day. Agriculture farms do not enjoy modern electricity supply and farmers operating tube wells and equipment on grid connected electricity suffers the most. The cost of electricity (if available) is high and affects the productivity and profitability of farms. Agriculture sector contributes 21% of the national GDP, employs 45% of the labor force and have major (63%) share in exports; and consumes 1.5% commercial energy. Problem of shortage of electricity is severe at farms. Diesel oil and electricity are used for on-farm operations which are performed through tractor and tube-wells. The cost of diesel oil has increased almost by 350% during 2005-14 but slightly reduced later on. The energy cost] of a farmer having diesel tube well is 30% + of input costs. Thus if the irrigation cost is reduced the profitability of farms shall increase. Punjab province has the largest canal network in Pakistan. The canal water received at farm gate is 35 MAF/annum (excluding conveyance losses in canals and channels) which is sufficient to maintain only 50% cropping intensity (CI). At 125% CI the shortfall is met by one million agriculture tube wells. Majority of the tube wells (85%) have prime mover &lt;=20 HP. According to Agriculture Department these tube wells pump out 30 MAF/ annum. The electric tube wells are not energy efficient and consume more energy; 40% of the electricity consumed by these tube wells can be saved by introducing energy efficiency measures in electric tube wells. The annual operational cost of one million diesel and electrical tube wells is Rs. 1.50 billion US$. This is a heavy burden on the national economy as well as an expensive option for the farmers. The operational costs of tube wells can be reduced by 30%-40% using solar submersible pumps. The potential of solar resource base is excellent; bright sunshine spell prevails over 2400 hour/annum and 5.5 KWh of energy is received on each square meter area/day. Solar PV systems are reliable, long life and well tested worldwide and can supply electricity to run the light loads in all economic activities. The solar PV water pumps are imported by private sector and sold to farmers who have no awareness about the quality of products and warranty issues. Solar pumps are costly and its components are not efficiently matched. The manpower involved in solar business is not well trained and needs capacity building for designing, installation and operation and maintenance of the PV systems including solar pumps. Local manufacturing industry of PV systems covering all aspects of the technology has not been established yet. Some business groups/ companies are assembling PV panels using imported cells the quality of which is not certified in labs. This paper aims at evaluating the costs of solar water pumps in comparison to conventional pumping systems and study the viability of solar pumps for a 12-25 acres farm under same agro climatic conditions.

**11:12AM A.12 Muhammad Usman Sardar, Syed Muhammad Imran Ahmad Shah, Ishfaq Ahmad, Jameel Ahmed, Riphah International U Lahore, Pakistan, *A review of technology roadmaps for commercialization of solar photo-voltaic energy systems*** ― The marketing of solar photovoltaic energy systems have one of the monetary settlements to address the higher rate to pay in advance with the purchase of two decades worth of electricity services. To deploy solar photo-voltaic technologies and energy setups in areas, it’s important to create a system of credit that can ensure the availability of subsidized capital and commercial conditions for the society. Meanings of energy in developing countries like Pakistan were strongly prompted-by marketable interests and industrialization trend influences within their culture. It’s going to be essential to prepare the concerned proceeding models of energy development strategies. This paper discuss the impact and share of environmental friendly solar photo-voltaic energy, researching to find the most appropriate alternate solutions for balance the energy demand and supply and current progressive position in different countries regarding to development and deployment. Based on the literature reviews, its being found that most beneficial and concerning policies have implemented in several countries around the globe.

**11:24AM A.13 Muhammad Nawaz, Muhammad Asghar Saqib, Syed Abdul Rahman Kashif, U of Engineering and Technology, Lahore, Pakistan, *Model Predictive Control in Induction Heating*** ― The DC voltages of solar cells are combined at a common DC bus. A switch mode regulator is used to adjust the DC voltages and a smooth DC current is supplied to the heating inverter. The induction heating inverter technology advantages are its good environmental features over other heat treatments such as a gas heater emits the greenhouse gases and enhance the atmospheric pollution. The other benefits of heating inverter are its running cost, well-controlled response and effective heating. In this paper, control of heating power is achieved through a predictive control technique.

**11:36AM A.14 Tania Rao, Muhammad Arfin Khan Lodhi, U of Management and Technology Lahore, Texas Tech U Lubbock USA, *Power production and pollution suppression*** ― The present atmosphere has been damaging health and enhancing death number due to that almost in the entire world. There is life threatening hazardous gases in the atmosphere. To control this hazardous situation solar chimney is being proposed to purify air pollution. The other kind of pollution created by the brine produced in oil industry is proposed to be eliminated by utilizing salt gradient solar pond. The heat pollution, producing by the photovoltaic cells (PVC) and causing to lower their efficiency is also addressed, which may further produce energy.

**11:48AM A.15 Khurram S Joya, University of Engineering and Technology Lahore, Pakistan, *FUN-Materials & Devices for Solar and Chemical Energy Conversion and to Make Renewable Fuels*** ― Solar energy is abundant, clean and widespread. Using solar energy, water and CO2 can be split and convert into clean and renewable fuels and many other useful chemicals. In this regard, developing stable and high performance catalysis modules, both for water oxidation and CO2 conversion, and their synergistic interfacing with efficient light-harvesting systems is imperative to construct a solar to fuel conversion system. For last decade, our research is primarily focused on the development of robust and active catalytic systems and functional nanomaterials for light-driven electrocatalytic water splitting and CO2 reduction. We have shown several working models of stable and efficient molecular as well as nanoscale materials for water oxidation. Their effective interfacing with semiconductor photo-responsive materials and respective catalytic modules can provide a potential scheme to make renewable energy carriers. We also describe that hybrid catalyst-light harvester combination is an important development in the field of solar to chemical energy conversion, leading towards designing a tandem device for solar fuel production for large scale terrestrial application