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

**Session G; Hydrogen and Renewable, Board Room G**

**Session Chair: Kaneko Hiroshi, University of Miyazaki, Japan**

**9:00AM G.01 Haseeb Yaqoob, Mohammad Javed Hyder, PIEAS, Islamabad, Pakistan, *CFD based Pelton Wheel Bucket Thickness Optimization* –** The optimization of 0.5 MW Pelton wheel turbine using ANSYS has been carried out. First of all design the Turbine and model the runner in the SOLIDWORKS then import the model in the ANSYS and performed the CFD analysis on the bucket in the Fluent. In CFD analysis the pressure contours on the wall of the bucket were plotted due to the water jet effect. These pressure contours values are used in the Static structure analysis of the runner of the turbine. Thickness of the bucket was varied from 22 mm to 16 mm to check the values of Equivalent Stress and Total Deformation. From this select the bucket thickness 20 mm. The effect of speed of the turbine varied from 0 to 1550 rpm on the bucket thickness 20 mm was analyzed.

**9:12 AM G.02 Tarique Panhwar, Sarfaraz Ahmed Mahesar, Aftab Ahmed Kandhro, Farah Naz Talpur, Syed Tufail Hussain Sherazi, U of Sindh Jamshoro, Pakistan, *Improving biodiesel properties using pre blending of feedstock* –** World energy demand is increasing day by day due to modernization and increasing population. Developed and developing countries are now in search of alternative sources of energy. Biodiesel (BD) is prominent alternative fuel for diesel engines. In present work, biodiesel was produced form pre-blending of cotton and castor seed oil. For quality evaluation, physicochemical parameters of crude cotton and castors oil were checked followed by FTIR and GCMS techniques for compositional analysis. Transesterification reaction was employed for biodiesel production under optimum conditions. Measured yield of BD samples were as follows; cotton B100 (92%), castor B100 (78%), blend-1 (90%), blend-2 (88%) and blend-3 (83%). Kinematic viscosity of BD was calculated as; cotton B100 (5.64cSt), castor B100 (11.54cSt), blend-1 (7.11cSt), blend-2 (8.59cSt) and blend-3 (10.06cSt). Ester content values for biodiesel were found as; cotton B100 (96.62%), castor B100 (86%), blend-1 (96.72%), blend-2 (96.52%) and blend-3 (94.33%). All other quality parameters calculated were within ASTM and EN specifications. The current research work suggested the possible pre-blending of castor oil with cottonseed oil in order to improve the quality of BD as an alternate source.

**9:24 AM G.03 Saad Tariq, Sohail Nadeem, M Imran Jamil, Punjab College, Lahore, Pakistan DFT Investigations of Half-Metalic Properties on Lanthanum-Based Ferrite –** In the frame work of density functional theory we have investigated for the structural, electronic, magnetic, thermal and elastic properties of lanthanum based ferrites. We have found the compound stable cubic phase under ambient conditions using elastic stability criteria and structural tolerance factor. In electronic properties pronounced half metallic character has been veiled off with the help of projected density of states. Thermal stability has shown the Ferro magnetic response which may be attributed to Fe-O bonding situation. Compound exhibited indirect band gap, half metallic nature with ductile properties in the bulk phase. These properties may be exploited in suitable energy storage spintronic applications.

**9:36 AM G.04 Ali Raza, Manzoor Ellahi, Hafiz Ghulam Murtaza, Saima Shaheen, Hafiz Tahzeeb ul Hassan, Xu Dianguo, U of Lahore, Pakistan, *Techno-economic Comparison of HVDC over HVAC for the Connection of Renewable Resources in Pakistan* –** Wind energy is the cleanest resource for electricity generation in coastal areas of Pakistan. It poses challenges of mega sized wind farms (WF) integration with the national grid and bulk power transmission to the load centers. High voltage direct current (HVDC) and high voltage alternating current (HVAC) transmission systems are possibilities considered for the integration of WFs and solar plants (PV) with onshore grid and bulk power. This paper designed to present the comparison of both systems for 4000MW from southern part of Pakistan to Lahore, on an economic basis using a discounted cash flow analysis. Microsoft Excel is used to develop the computational tool for quick insight in the variation of input parameters.

**9:48 AMG.05 Jameel Ahmad, Muhammad Imran, Syed Rehan Ashraf, Muhammad Asim Butt, U of Management and Technology Lahore, Pakistan, *Wind Farm Technologies and Integration Challenges with National Power Grid for Pakistan* –** In this paper wind energy potential of different areas of four provinces of Pakistan has been presented and analyzed for average wind speed, Weibull distribution parameters and wind power density estimate at different heights of wind turbines. The objective of this paper is to analyze how much renewable energy can be harnessed from these sites whose data is available through Pakistan Meteorological Department wind profiling campaign under Ministry of Science and Technology and wind power assessment through National Renewable Energy Laboratory (NREL) USA. Based on available power density and land areas, a general scheme for wind farm sizing and installation is provided for power generation and transmission. Suitable wind turbine technologies are identified for operation in fixed and variable speed regimes. Parameters that affect optimal layout of a typical wind farm are also proposed. The issues of construction, operation and management of wind farms and challenge of designing transmission and distribution network are identified. Operation of wind farm as stand-alone or grid-connected mode power source and stability aspects are highlighted. Various communication enabling technologies are identified for SCADA and efficient operation of wind turbine technology. The paper also aims to propose a scheme for production of hydrogen from wind farm. This paper is expected to serve as a comprehensive database of technology trends, requirements and best practices for use by power engineers, manufacturers, suppliers, operators and communication engineers when designing a smart grid network for seamless integration of wind energy with national grid of Pakistan. Keywords: Wind Energy, Wind Farm, Grid Integration, Weibull Distribution, Feasibility Analysis, Transmission and Distribution, Power system stability.

**10:00 AM G.06 Nasrullah Khan, Aun Haider, Muhammad Shoaib Saleem, Naeem Abas, U of Gujrat, Pakistan, *Comparative Study of Alternative Power Policies* –** After hydel power plants the coal, gas and oil fired power plants have remained the conventional power plants until first half of twentieth century. Power producers welcomed the innovatory nuclear energy in second half of twentieth century. Nuclear reactors construction rate peaked in 1970s followed by a steep decline in 1980s due to Three Mile Island and Chernobyl reactors accidents. Nuclear power adoption trend kept on rising until Fukushima Daiichi incidence in 2011 which relayed far reaching domino effects on nuclear power policies worldwide. Japan shut down all 55 nuclear power plants within one year bearing the blunt of 49,580MW power loss. Germany shut down 7 out of 18 reactors and pledged to phase out the rest gradually by 2020. Fukushima nightmare spread the myth that if it can happen thrice on lands of most skilled countries then it can happen by human error, natural cause or any new basis again and again anywhere anytime. This work compares economic, environmental and mortality rates of nuclear, fossil fuels and renewable energy options to conclude that nuclear power its scary outlook is more economic, eco-friendly and harmless compared to conventional fossil fuels, especially, open fired coal power options.

**10:12 AM G.07 Hafsa Waheed, U of Management and Technology Lahore, Pakistan, *Plasma; The way to new energy* –** Hydrogen is one of the most abundant elements in the universe. Hydrogen and plasma are closely related to each other. Plasma can be generated either by the controlled thermonuclear fusion reaction in a tokamak fusion reactor or by the laser matter interaction. For several decades plasma science and technology has been widely used in different energy projects e.g. ITER is an international project by the collaboration of 35 nations in the world and it is a new way to energy. The process involves the interaction of hydrogen isotopes (deuterium and tritium) with the material of the wall. Similarly, plasma etching process is used to produce thin silicon wafers by the localization of hydrogen at depth. Due to its low health hazards, plasma technology is considered environment friendly. This paper offers a review about the relationship between plasma generated by different techniques and the hydrogen energy.

**10:24 AM G.08 Syed Muhammad Osama Ahmed Gillani, NUST, Pakistan: *Energy Security and Sustainability plan* -** This paper aims to present the current problems faced by the energy sector and present appropriate remedies keeping in view current and forecasted demands. Current situation of electricity generation capacity is 24902 MW or nearly 25GW. Power from hydro plants constitutes 28.66% (7115MW), Thermal (public and private) 69% and nuclear consists of 3.2% of the total electricity. Analytics of problems faced in power generation for electricity are presented and current available potential for power generation from sources scuh as solar, hydel, coal fueled plants are presented. The rising problem of circular debt and unavailability of natural gas are analyzed. Sector wise breakdown of gas usage in transport and heating is discussed. A detailed resource analysis of hydel, solar and wind energy is conducted to depict resources at hand. Short term and long term technology selection and policy reforms are presented. Pakistan energy policy and its evolution during different periods are reported and their effects are analyzed. The key issues Pakistan is currently facing with regard to its energy needs are inefficient energy utilization, the indiscriminate use of subsidies, lack of public awareness, ineffective or unenforced legislation, poor governance and under developed infrastructure.

**10:26 AM G.09 Nasrullah Khan, Anam Kalair, Naeem Abas, U of Gujrat, Pakistan, *In Situ Hydroxy Production and Combustion* –** Automobiles waste 70 to 80% fuel energy in exhaust, coolants and brakes which can be harnessed by waste heat recovery technologies to decarbonize the transport sector. An internal combustion engine converts 20-35% of fuel energy into useful power wasting 35-40% in exhaust gases and 25-30% in coolants. Ex situ electrolysis and in situ thermolysis techniques enhance fuel efficiency from 30-40% to 70-75%. This work reviews the current state-of-art waste heat recovery technologies and introduces a new-fangled method of in situ thermolysis to convert water into hydroxy using engine waste heat. Acetylene or hydrogen fueled engines produce high temperatures which can thermally split the water. Combustion of acetylene or hydrogen produces 2210 to 3300°C temperatures in air and 2807 to 3600°C in pure oxygen. Conventional aluminum/cast iron pistons and cylinders melt at 950 and 1250°C temperatures. In situ thermolysis requires tantalum grade materials to survive the high temperature gradients. Low temperature internal combustion engines use water injection to cool engine to reduce NOx emissions and increase power by steam pressure. Timed acetylene and water injection systems in six cycle designs can increase vehicle efficiency. This is first step to the vision of in situ thermolysis which might become a future reality.

**10:48 AM G.10 Syed Muhammad Zafar Iqbal, Murad Ali, Zolkafle Buntat, Shazia Kousar, Muhammad Abu Bakar Sidik, Ivor Smith, Khwaja Fareed U of Engineering and Information Technology, Pakistan, *Spectroscopic Detection of enhanced Hydrogen production under LPG Arc Plasma compare to pure methane* –** In this paper, spectroscopic detection of hydrogen concentration and carbon deposition is studied under arc plasma decomposition of pure methane and Liquefied Petroleum Gas (LPG). The arc discharge plasma was ignited by high voltage (HV) power source inside a Pyrex tube reactor at different flow rates of gases. The experiment was performed under atmospheric pressure conditions and the frequency of HV power source could be varied in the range 50-100 kHz. The Optical Emission Spectroscopy (OES) technique is used in situ to characterize the arc plasma and the arc emission was captured through computer interfaced spectrophotometer. The production of hydrogen was recognized by the intensities of evolved species Hα and Hβ (Balmer lines of hydrogen) in the OES spectra. The results suggest that high intensity of hydrogen is detected during flow of Liquefied Petroleum Gas (LPG) than pure methane case. The arc plasma extinguish due to depositions of conducting grade carbon depositions between electrodes. These results also suggest that the LPG mixture contains higher C/H ratio than pure methane that causes high intensity of hydrogen. It is might be due to dilution effect of hydrocarbon gases in LPG that enhances the decomposition process. This study has promising scope for both productions of hydrogen as well as conducting grade carbon depositions. The SEM results in both cases reveal that growth of carbon has more graphite nature than LPG carbon depositions.

**11:00 AM G.11 Naseem Abbas, Muhammad Sajid Kamran, Muhammad Bilal Awan, Mohsin Ali Badshah, U of Central Punjab, Lahore, *The Investigation on the Performance and Gaseous Emissions of Spark Ignition Engine Fueled with HHO and Petrol* –** Hydroxyl gas (HHO) has recently been introduced to the auto industry as a new source of energy. The objective of this work was to investigate a simple innovative HHO and petrol engine and evaluate the effect of hydroxyl gas HHO addition, as an engine performance improver, into gasoline fuel on engine performance and emissions. HHO is mixture of mono-atomic oxygen (O) and di-atomic hydrogen (H2) that is produced by electrolyzed conversion of water (H2O). Due to high reactive and burning property, it increases the combustion efficiency of gasoline or diesel engine when mixed and burnt with diesel or gasoline fuel. HHO gas kit was installed with engine. Performance analysis and emission analysis has been done by using Petrol and Petrol-HHO separately on engine. This study proposes design of HHO production device, attached to Petrol Engine. In addition, the CO, HC and NOx emissions were measured using exhaust gas analyser EMS-5002. Further effect of HHO co-burning with petrol on engine efficiency and environment are discussed. Experimental investigation is conducted on a 70-cc, four stroke, air cooled, single cylinder internal combustion engine. Results have shown that the engine power is enhanced by 12.2%, specific fuel consumption (SFC) has been significantly reduced approximately 37.5% and 41.5% overall efficiency (?o) has been increased successfully around Unburnt HC concentrations, CO2 and CO have been reduced by 39.9% and 38% and 53% respectively.

**11:12 AM G.12 Umair Jamil, Awais Javaid, Zara Maqsood, Maheen Asad, Fiza Sarwar, Bahria U, Islamabad, Pakistan, *Waste Water Treatment and Electricity Generation Using Microbial Fuel Cells* –** Microbial Fuel Cells (MFCs) is an emerging technology that makes use of waste water as source of energy. This study aims to evaluate the potential of raw untreated sludge and partially treated sludge as substrate with and without use of glucose as mediator to produce electricity in lab scale single chambered MFCs. For the construction of lab scale sediment type MFCs, waste water and raw sludge samples were collected from Nala Lai, Rawalpindi and partially treated sewage samples from Sewage Treatment Plant, I-9, Islamabad. Five lab scale sediment MFCs were constructed, out of which, two were augmented with Glucose as mediator and one was used as control. Graphite electrodes were used in each MFC with anode submerged inside the sediment bed while cathode remained suspended in the waste water. The whole apparatus was kept at room temperature in the laboratory for a period of eight weeks. Waste water treatment was evaluated on the basis of changes in Biological Oxygen Demand and Chemical Oxygen Demand before and after the course of experiment. Voltage, Current and Power densities were measured every week over the period of eight weeks. The Biological Oxygen Demand of waste water from Nala Lai and STP were 234ppm and 95ppm respectively before the experiment was conducted and was significantly reduced to 58ppm and 40ppm respectively at the end of experiment. In experiments where Glucose was used as mediator in MFCs, the BOD was reduced to 106ppm and 31ppm for Nala Lai and STP respectively. The Chemical Oxygen Demand of waste water from Nalalai and STP were 455ppm and 85ppm respectively before the experiment and were reduced to 136ppm and 45ppm respectively. The COD of Nala Lai and STP MFCs with glucose mediator were reduced to 142ppm and 37ppm. Average power densities, over the period of eight weeks for waste water from Nala Lai was recorded as 0.125 W/m2 and 0.008 W/m2 for STP MFCs. Average power densities in glucose mediated MFCs were 0.077 W/m2 for Nala Lai and 0.036 W/m2 for STP samples. The results indicate that raw sludge from of Nala Lai is a better substrate for MFCs when used without mediator and can be considered as a potential renewable source of electricity generation to help solving extensive energy crises in Pakistan.

**11:24 AM G.13 Samreen Hamid, Ayesha Mohyuddin, Maria Kaynat, Rafia Yaseen, U of Management and Technology Lahore, Pakistan, *Screening of Camellia Sinensis (Black Tea) for its Active Constituents* –** *Camellia sinensis (C. sinensis)* L. is a tea plant which is most drunk beverage in the world. India, china and Iran are famous for the cultivation of tea. C. sinensis is a medicinal plant which belongs to the Theaceae family. Its medicinal value was proved by alkaloids, flavonoids, saponins and tannins present in its leaves extract. These all compounds of this plant are very effective and have pharmacological effect such as anticancer, analgesic and antiviral. In Pakistan these viral diseases are so common because bacterial strains have been developing day by day and they are showing resistance to all antibodies. Camellia sinensis extracts showed both antibacterial and antioxidants activities. As it is found in Pakistan on wide land so it should be used as medicine in an economical way. Three brands of black tea (Tapal, Supreme and Lipton) were taken and their extracts were prepared in methanol, ethanol and in aqueous. Aqueous extracts were prepared at three temperatures 70oC, 80oC and 100oC. All the extracts showed significant activity against three bacterial strains. Samples of Tapal showed good results in all solvents against E. coli in the range of 7 mm to 20 mm. Low activities were displayed by Lipton in the range of 7 mm to 12 mm against E. coli. Whereas Supreme behaved consistently in aqueous extract at all temperature but in compared to ethanolic and methanolic solvents it gave higher activity against *E. coli.* The highest activity was shown by alcoholic samples of Tapal and Supreme. Values of Tapal ranges from 13mm to 20 mm and for Tapal it was from 17mm to 20mm that indicate that alcoholic extracts are good source of medicine against viral disease. Antioxidant activity was performed of these extracts using gallic acid as standard. Absorbance showed that which sample is more antioxidant. Maximum absorbance (2.5885 nm) was shown by methanolic extract of Tapal black tea that indicated the high concentration of phenolic compounds.

**11:36 AM G.14 Abdul Ghaffar, University of Education Lahore, Pakistan, *Construction of Multi Kink and Soliton Solutions of Whitham-Broer-Kaup (WBK) System* –** In this article, the Whitham-Broer-Kaup (WBK) model for the dispersive long wave in the shallow water is considered and the Backlund transformation method is used to get single/multi kink and soliton solutions to the model. Additionally, the direct traveling wave and periodic traveling wave hypothesis also lead to solitary wave, periodic wave, and singular soliton solutions.

**11:48 AM G.15 Khuda Bukhsh, Sikandar Ali, Dawood U Karachi, Pakistan, *Performance evaluation of rectangular and basin shaped solar collector with reflector and photocatalyst* –** Clean drinking water is the basic requirement for every human being, but about 1.1 billion people in the world lacked pure drinking water. There are many different types of water purification processes such as filtration, reverse osmosis, ultraviolet radiation, carbon absorption, but the most reliable processes are distillation and boiling. Water purification, such as distillation, is especially important in regions where water resources or tap water is not suitable for drinking without boiling or chemical treatment. Distillation is literally the method seen in nature, whereby: the sun heats the water on the earth & surface, the water is turned into a vapor (evaporation) and rises, leaving contaminants behind, to form clouds. As the upper atmosphere drops in temperature the vapors cool and convert back to water to form water. Water is important for life. The origin and continuance of mankind is based on water. The supply of drinking water is an significant problem for the developing countries. The increasing world population growth together with increasing industrial and agricultural activities all over the world pays to the depletion and pollution of freshwater resources. The rapid increasing need for energy and environmental concerns has focused much attention on renewable energy resources. Among the non-conventional methods to desalinate brackish water or seawater, the cheapest method is solar distillation. This work focusses on an experimental investigation by comparing the performance of two solar stills such as rectangular shape and basin shape solar still, with photo catalyst and reflector base solar still. The comparative performance study is analyzed for the same weather conditions with different design parameters and some important conclusions were assigned at.