

## RENEWABLE ENERGY'S ROLE IN A CHANGING WORLD

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Since the Industrial Revolution in the 19<sup>th</sup> century, the concentration of carbon dioxide in the atmosphere has increased significantly, from 280 parts per million (ppm) to 401 ppm. This data was taken from the Mauna Loa Observatory, Hawaii, on October 4, 2016. The safe level of carbon dioxide in the atmosphere is 350 ppm. The only way to reach that level is to immediately transition the global economy away from fossil fuels and into renewable energy and energy conservation. However, developing countries have the right to limit their emissions less than developed countries, which means the responsibility for lowering emissions falls even more upon already industrialized countries. In other words, industrial countries need to reduce their emissions significantly. Actually, a reduction in emissions will not necessarily lead to less economic growth; from 1990 to 2014, European Union member states reduced their carbon emissions by 19 percent even though they achieved 45 percent economic growth. In 2014, Germany's economy grew by 1.6 percent, while gas emissions from fossil fuel consumption fell by almost 5 percent.

Nowadays the costs of renewable energy has become more competitive compared with fossil fuels in countries across the world. For example, solar photovoltaic technology has already become cheaper than diesel generators, with clear benefits for communities in areas far away from the utility grid. Renewable energy is also increasingly the most economical solution for new grid-connected capacity where very potential resources are available. In May 2016 the Dubai Electricity & Water Authority revealed that the lowest bid received for a solar project was US 2.99 cents/kWh, which is the lowest winning bid yet globally for a solar photovoltaic system. Meanwhile, the electrical power produced from natural gas in the Middle East is around 7 cents/kWh on average. Renewable energy technology is ready to be implemented massively and it is working reliably in many countries around the world. By 2050 almost all global energy needs can be met with renewables. Germany, Europe's biggest economy, already gets 25% of its electricity from renewables, and is aiming for 80% by 2050. Wind power was Spain's top source of electricity in 2013, ahead of nuclear, coal, and gas. Renewables supplied 42% of mainland Spain's electricity in 2013. In 2012 China's wind-power generation increased dramatically more than generation from coal. Portugal generated more than 70% of its electricity from renewable energy sources during the first quarter of 2013. In the US, nine states are getting 12% or more of their electricity from wind. The Philippines produces 29% of its electricity with renewables, targeting 40% by 2020. Denmark is going to produce 100% of its heat and power with renewable energy by 2035.

The issue of renewable energy is also closely related to IoT (Internet of Thing) technology, as the next wave of innovation will be driven by sophisticated sensors, digital communication infrastructure, and big data; we call it the "smart grid." A smart grid uses information and communications technologies with the electricity network to enable a real-time monitoring, two-way communication between supply and demand, creating more dynamic interaction on energy flow, which will help deliver electricity more efficiently and reliably. With a smart grid system, each house can be a prosumer, acting as active producers and consumers of energy.

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All the issues mentioned above are elaborated on and presented in the special edition of *IJTech*. It contains 20 papers selected from the International Tropical Renewable Energy Conference (i-TREC), held in October 2016 as the first international conference of renewable energy, organized by the TREC (Tropical Renewable Energy Center) Faculty of Engineering at the Universitas Indonesia.

Three papers discuss energy storage technology. Fredina Destyorini et al. reported on the preparation and characterization of carbon composite paper from coconut coir. Heri Jodi et al. presented electromechanical properties of  $\text{Li}_3\text{PO}_4$ -MMT-PVDF composites for solid electrolytes. Zulkarnain Jalil et al. elaborated on the desorption temperature characteristics of Mg-based hydrides catalyzed by nano- $\text{SiO}_2$ .

Four papers present issues of nanostructured energy material. Nofrijon Sofyan et al. discussed lithium batteries, focusing on the performance of vanadium doped  $\text{LiFePO}_4/\text{C}$  used as a cathode. Akhmad Herman Yuwono et al. presented the influence of deposition time on fabrication of fluoride-doped FTO conductive glass with spray pyrolysis. Non-sulfurization for synthesizing CZTS thin film was presented by Bayu Eko Prastyo et al. Akhmad Herman Yuwono et al. investigated the influence of substrate temperature and deposition time of spray pyrolysis technique on the thickness and conductivity of fluorine tin oxide glass.

Fluid-dynamics topics were discussed by Yuswan Muharam and Aditya Kurniawan. They focused on Computational Fluid Dynamics (CFD) application of stirred batch reactors for the degumming process for crude palm oil. Hafif Dafiqurrohman et al. shared a discussion of air intake modification for pyrolysis on a rice husk downdraft fixed-bed gasifier. Gun Gun Ramdhan et al. investigated the turbulence model and validation of air flow in wind tunnels and Muhammad Taufiq Suryantoro et al. presented deposit characterization of diesel engines by the effect of droplets at hot room temperature on evaporation time.

Seven papers on bioenergy were presented. Dijan Supramono et al. discussed improving bio-oil quality by co-pyrolysis of corn cobs and polypropylene in a stirred tank reactor. Heri Hermansyah et al. presented solid state fermentation using agroindustry wastes using an adsorption crossing method. Bambang Heru Susanto et al. reported on the synthesis of renewable diesel from palm oil and *Jatropha curcas* oil through hydride-oxygenation using NiMO/ZAL. Saroni et al. explored the performance of biogas production from pome at different temperatures. Nelson Saksono et al. presented a high-performance electrolysis plasma reactor for hydrogen production using a NaOH-methanol solution. The influence of a particle of the organic fraction of municipal solid waste on biogas production was presented by Paraginta Basaria and Cindy Rianti Priadi, and the composite of lignin and cellulose from wood waste decortication ramie and shell coffee for the gasification process with a downdraft reactor was investigated by Asri Peni Wulandari et al.

The renewable energy policy and market issue was presented by Mohammed Ali Berawi et al., with the focus on an analysis of lifecycle costs for Indonesia's energy infrastructure and sufficient demand in 2030. The last paper, improving hydrogen energy on SWCNT by structure optimization and metal doping substitution, was presented by Nasruddin et al.

We are successfully nearing the completion of our publication for this year and we would appreciate any suggestions and any ideas that can help us to maintain and improve the journal's quality. We wish you all happiness and a Happy New Year in 2017.

With kindest regards from the Editor's Desk,



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