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Experiences and Prospects of Fluid Machinery Researches in Renewable Energy

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Abstract. In renewable energy sectors, turbo machinery have significantly contributed to the related technology development and industry growth. Traditionally, several types of hydro turbines have attained high efficiency and sufficient durability by long years dedicated global research works. Recently, Pump storage as a mechanical ESS (Energy Storage System) is greatly welcomed for securing safe and effective power flexibility required definitely in national grid system. In case of wind energy, small wind turbine system, typically, less than 100KW power output is used widely to supply individual home electricity or community independent energy infra structure. The largest contribution of modern big wind power system, up to 15-20MW class, to the current global society is a crucial renewable energy source to guarantee sustainable society free from GHG (greenhouse gas). Above all things, offshore wind, fixed and floating, becomes well proven energy producing system as found in above 5GW class wind farms construction existing in Ulsan EEZ offshore. Another effective energy transition technology from wind energy to e-fuel such as green hydrogen and ammonia, so called, Power to X via electrolysis is recognized as a next generation energy key player to arrive at genuine global carbon neutral and safe society. From this background, some representative technologies related to this topics are introduced briefly from literatures and my personal research experiences. Involvement in MW class wind turbine aerodynamic design by CFD is my first challenge at renewable energy research in 2001. Since then, ocean energy researches including wave energy converter and tidal current turbine design have marked long year research achievements. Micro hydro turbine, for example, cross flow turbine made recently an impressive contribution to the fixed and floating wave energy turbine design for high efficiency performance. New frontier research topics are now emerging continuously in the field of wind, ocean and hydro machinery technology, waiting for the future generation challenge.

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