An Overview of Current Development, Vision and Challenge of Global Offshore Wind and Marine Energy Power

Energy is becoming an increasingly important priority for every country around the world. In order to reduce CO_2 emissions and meet the 2°C Scenario (2DS) set by IEA, governments around the world have proposed various energy policies and development roadmaps in addition to developing suitable energy foresight technology. Currently, PV, Wind Power, Electric Vehicles, and Energy Storage are the 4 main pillars of development and deployment in most countries. The targets of these next stage efforts include building demonstration pilot sites, improving systems integration & efficiency, and reducing the costs from manufacturing & maintenance for commercialization.

To achieve the vision of a nuclear-free nation by 2025, the Taiwan government in 2016 initiated new energy policies. These policies include establishing energy transformation and an amendment of its Electricity Act. The power generated from renewable energy is expected to reach 20% by 2025 from exploring clean energy source and by adjusting current development strategies. In addition, most coal-fired power plants will be gradually replaced by natural gas-fired power plants to reduce air pollution and carbon emissions.

In 2016, the Taiwan government launched an Intelligent Green Energy Technology Park Construction in Shalun, Tainan for the purpose of promoting energy technologies and applications. The Park aims to boost research innovation, increase industrial applications, develop innovative products, increase smart systems & services, and initiate technology commercialization. These tasks will be performed through a green energy technology test platform as well as regional energy storage demonstration sites and test programs. Also in 2016, the Taiwan government launched a two-year Photovoltaic Project and a four-year Wind Power Project to accelerate renewable energy development. Under the two-year Photovoltaic Project, the performance and competitiveness of domestic PV farms will be raised through customized PV module development and improved reliability with increased security. The goal of the four-year Wind Power Project is to work with global wind power companies and increase the Asia-Pacific wind power market by using demonstration sites.

In addition to PV and Wind Power, Marine Energy is one new renewable energy focus which is not limited by land area. The estimated electricity potential from global marine energy is about 93,100 TWh, which is 5 times the electricity generated per year in Taiwan. Taiwan is an isolated island with about 10 GW of potential marine energy. The related marine technologies include marine wave power, marine current power, and

ocean thermal energy. These technologies have the potential to raise the capacity of future total renewable. With this foresight, the Taiwan government has already initiated development strategies with this focus and has set-up demonstration sites with 10 kW generators. The next step will be developing larger generators and typhoon resistant designs for increased commercialization.

For the offshore wind energy development, Taiwan aims to reach 5.5GW of offshore wind energy by 2025, of which 738MW will be completed before 2020. Also, after 2025 the plan is to add another 5-6GW installed capacity, making Taiwan a major offshore wind farm in the world.

Wave energy and marine current energy have great development potential in Taiwan. CSBC, a major ship building company in Taiwan, in conjunction with Industrial Technology Research Institute, has developed a wave energy conversion system. A 20kW prototype has been tested in National Taiwan Ocean University test site in 2015. Research projects on current (Kuroshio) power system have been sponsored by Ministry of Science and Technology. Wanchi company has carried out the towing test of a 50kW prototype ocean current (Kuroshio) energy conversion system in March 2015 and deep-water mooring test in July 2016 for a week. CSBC Corporation Taiwan has also cooperated with National Taiwan University to develop a horizontal-axis ocean current (Kuroshio) power system, which is under small scale tank test. The goal is to build a 6MW demonstration power plant by 2025.