Embracing Marine Renewable Energy: Charting a Course to Sustainability!

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Ocean-based renewable energy resources represent the fundamental pillars of sustainable blue growth due to their inexhaustible and renewable nature. As the world grapples with the escalating demand for diminishing and ecologically harmful fossil fuels, these renewable energy sources emerge as the quintessential solution to safeguard a nation's energy security. The term "Marine Renewable Energy" (MRE) is often used interchangeably to encompass ocean-based resources. MRE resources encompass a spectrum of kinetic, potential, chemical, or thermal properties intrinsic to seawater.

In this context, offshore wind energy falls under the purview of wind energy technology, while biofuels derived from marine biomass are categorized as a subset of bioenergy. Within this definition, MRE resources encompass an array of elements, including ocean waves, tidal currents, tidal range, ocean currents, as well as gradients in ocean temperature and salinity.

However, it is imperative to shift the focus towards harnessing the vast potential of all ocean-based renewable energy resources, rather than dwelling on conceptual nuances and disparities.

The traditional utility of ocean-based renewable energy resources lies in power generation, particularly the production of electricity through various conversion technologies. These alternative energy sources have the potential to significantly mitigate the conventional practices of greenhouse gas (GHG), intensive electricity generation, thereby contributing to global efforts to combat climate change, an acknowledgment underscored by the Intergovernmental Panel on Climate Change (IPCC). According to estimates by the High-Level Panel for a Sustainable Ocean Economy (Ocean Panel), ocean-based energy solutions possess the capability to curtail GHG emissions by almost four billion tons of CO2 equivalent annually by 2030.

Power generation from these resources holds substantial theoretical promise, surpassing global energy demands with surplus production potential. A report by the International Renewable Energy Agency (IRENA) in 2020 revealed that the projected global electricity production capacity from all marine renewable technologies ranges from 45,000 to 130,000 terawatt-hours (TWh) per year, while the annual energy demand stands at 25,814 TWh. However, the practical reality on the ground differs significantly, with the cumulative global capacity for electricity generation through MRE resources in 2020 amounting to a mere 535 megawatts (MW) only.

The Bay of Bengal holds a paramount status as Bangladesh's vital conduit to the open sea, stretching over approximately 710 kilometers from the southeastern St. Martin's Island to the southwestern Sundarbans region. This extensive coastal expanse, replete with numerous petite isles, emerges as an ideal canvas for electricity generation, thanks to its perpetual exposure to the ceaseless interplay of tides, winds, and waves. Yet, in consonance with the global narrative, Bangladesh confronts parallel challenges rooted in technological preparedness.

Among the multifarious Marine Renewable Energy (MRE) technologies, tidal power stands as the most mature and commercially promising, albeit its progression within Bangladesh remains somewhat lethargic despite its geographical aptness for robust power generation. The initial stride in erecting a tidal power plant hinges on judicious site selection, with the cardinal criteria being the presence of high tide waves exceeding the 5-meter threshold and amenability to embankment construction. Additional factors encompass enduring stability, isolation from populated locales, streamlined transmission infrastructure, and adequate spatial dimensions to accommodate a power plant.

Several coastal enclaves in Bangladesh, such as Hiron Points, Sundarikota, Mongla, Char Changa, Cox's Bazar, Golachipa, Patuakhali, Sandwip, and Barishal, embody the potentiality for hosting expansive tidal power facilities, endowed with the capacity to harvest bountiful electricity from the rhythmic embrace of tidal waves. Notably, Sandwip, perched at the estuarine confluence of the Meghna River and the Bay of Bengal, boasting tidal fluctuations of 5 to 6 meters, emerges as the preeminent hotspot for tidal power generation.

Wind energy, a newfound favorite within the gamut of renewable energy resources, has garnered global momentum at a swift clip. Bangladesh's extensive coastline offers a distinctive prospect for harnessing wind turbine-generated electricity, warranting expedited techno-economic evaluations. Evident strides are already underway, exemplified by the operationalization of the 60 MW wind power plant in Cox's Bazar. Additionally, plans are afoot to establish significant wind energy facilities along the coastal frontiers, including projects such as the Matarbari 100 MW Wind Power Plant, Payra 50 MW Wind Power Plant, Cox's Bazar 50 MW Grid-tied Wind Power Plant, Patuakhali 10 MW Wind Power Plant, etc.

Waves, often deemed the secondary manifestation of solar energy, proffer a lavish bounty of untapped, sustainable kinetic energy. This wealth in wave energy outpaces wind energy by a factor exceeding a thousandfold. Technological avenues for harnessing Wave Energy Converters (WECs) span the Oscillating Water Column (OWC), Oscillating Bodies (OB), and Overtopping varieties. In the context of Bangladesh's geographic and socio-economic milieu, OWCs and the Pelamis device surface as the most fitting candidates for capturing the essence of wave energy.

Across the Bay of Bengal, the annual average wave power density ranges between 8 to 15 kilowatts per meter, signifying a reservoir of energy deemed moderate in concentration. Within this canvas, Saint Martin, Kutubdia, and Sandwip Islands manifest as prime candidates for deploying OWCs, their wave power densities optimally poised for cost-effective operation. Notably, wave heights along the Bangladeshi coastline oscillate between 1 to 2 meters, their variations mirroring the cadence of seasons. A meticulous analysis of daily wave height data discerns May to October as the peak window for solitary wave energy concentrations in Bangladesh's coastal domains.

The fulsome exploitation of renewable and inexhaustible local resources remains pivotal to fortifying Bangladesh's energy security. Given the finite terrestrial energy reserves and a burgeoning populace, ocean-based renewable energy resources assume a cardinal role in fulfilling Sustainable Development Goals (SDGs) and National Determined Contributions (NDCs) to counteract the perils of climate change.

In this vein, the Government of Bangladesh (GoB) has instituted a dedicated authority, the Sustainable and Renewable Energy Development Authority (SREDA), under the aegis of the Power Division within the Ministry of Power, Energy, and Mineral Resources. Nevertheless, a robust collaborative framework between SREDA and maritime stakeholders, including the Blue Economy Cell within the same ministry and affiliated authorities under diverse ministries, is imperative. Such coordination must embrace a comprehensive perspective, encompassing matters of technological readiness, infrastructure development, and the formulation of commercially viable distribution mechanisms, among other intricacies.

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