Pelamis (wave energy system)

Engineering

Pelamis (Wave energy system) One of the greatest strengths of the Pelamis wave energy converter is the fact that it has minimum impact on the environment. The energy produced is clean and it produces no polluting chemicals or greenhouse gases. It is potentially the most environmental benign form of electricity production, as it has a small environmental footprint due to the fact that it remains stationary during performance. It is more efficient this way and the kind of marine growth which causes drag to other moving vessels is negligible for the converter. Anti-foulants are also limited by the fact that the converter is semi-submerged in the water. It also requires minimal onsite construction which makes it have less impact on the nearby shoreline due to its unique design. Generally, offshore devices have the lowest potential impact1. Wave energy is also not expensive to maintain and operate. It guarantees 100% available technology and when complete, it can serve a high demand of electricity. It is also tuneable, power smoothing and has maximum site flexibility. The converter can be maintained off site and has minimum work on site. It is also almost invisible to large hydrodynamic effects, making it strong on survivability. The converter is also a great relief to the impending exhaustion and reduced reserves of fossil fuels, and the geopolitical issues related to the control of reserves, and which have been the core of many armed conflicts in the past decades. Moreover, the global economy has suffered a negatively from the continuous fluctuations of the prices of oil. 2Therefore, the globe should rely more on low carbon technologies like wave energy which displaces more than 2000 carbon dioxide emissions per year, and avoids pollution to a great degree. This is because no form of fuel is used, and no waste product is produced. Wind waves can be regarded as a concentrated form of solar energy, and so

have more power density. Here, the energy is transformed from solar energy to wind energy, and then to wave energy. This transformation increases in a concentration process, and enhances great power density on the wave energy. Waves also travel long distances without energy loss. A wave power device can produce or generate power up to 90% of the time, unlike solar and wind which generate ~20-30% of the time. Wave energy is also renewable. The weaknesses of the converter include the fact that it depends on the waves' intensity, and needs suitable sites where waves are consistently strong. The infrastructure of the converter should also be very strong to withstand the rough weathers. The machines are also possible threats to navigation by collision due to their low profile which makes them undetectable through direct sight or by radar. 3 To realise the benefits of the converter, we have to overcome technical challenges such as the conversion of the slow, random and high force oscillatory motion into useful motion to drive a generator and get quality output. A good energy storage system or a method of compensating energy is required since waves vary in height and periods; hence, power levels vary to a great extent. The wave devices must also be capable of aligning themselves accordingly on compliant moorings, or made symmetrical since wave direction is highly variable. The pelamis wave energy converter feasibility or practicability has been tested in different occasions it is technically feasible within estimated costs and will save a lot economically and environmentally. Operational and installation offshore activities require special equipment such as barges, anchor handler vessels and heavy uplift cranes. 4 A lot of care is, therefore, necessary as machinery and labour is vital to install the subsea cables, the mooring system, cable landing and grid interconnection, as well as the commissioning

and deployment of pelanis. 5 The Scottish Power Renewables (SPR) already completed their Pelamis P2 one year robust testing. The test programme accumulated 7500 grid connected operated hours and exported 160MWH of electricity to the national grid. These encouraging figures during this stage of the testing program give the anticipation that generated powers will continue to rise as the program develops. The operating hours of the P2 bring the cumulative total of pelamis technology to over 10, 000 grid connected operating hours. The machine has been undergoing progressive work up testing program by being exposed to increasingly large wave conditions for longer deployment periods. The machine has experienced an average year 90% of sea state occurrences allowing the team to quantify the performance and electricity output, and gain insight on the factors influencing them. Its electricity production has doubled from the initial test parameters of medium seas. 6 As experience is gained, the output of the Pelamis wave energy controller is steadily increasing towards commercially viable status. The Pelamis 2 has been towed and installed in wave heights of up to 2. 5 metres as well as in darkness which greatly expands opportunities for operation and safe intervention. Bibliography Aldrich, Rosaline. Ocean Energy Handbook. New Delhi: World Technologies. (2012). http://public. eblib. com/EBLPublic/PublicView. do? ptiID= 840739. Dalton G. J., Alcorn R., and Lewis T. " Case study feasibility analysis of the Pelamis wave energy convertor in Ireland, Portugal and North America". Renewable Energy. 35 (2) (2010): 443-455. Henderson, R. " Design, simulation, and testing of a novel hydraulic power take-off system for the Pelamis wave energy converter". Renewable Energy. 31 (2) (2006): 271-283. Parker, R P M, G P Harrison, and J P Chick. " Energy and carbon audit of an offshore wave energy converter".

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