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Wind power: a major opportunity for the UK

R. ffrench, D. Bonnett and J. Sandon

Proceedings of the Institution of Civil Engineers—Civil Engineering, **158**, Special Issue 2—Sustainable power: the role for engineers, November, 20–27

Worldwide wind power has grown at an average rate of almost 30% over the last decade to reach 48 GW at the end of 2004. The UK now has over 1 GW installed capacity including 124 MW offshore. Wind turbines have steadily grown in size and 5 MW prototypes have been erected. The future development of wind power in Britain is likely to depend mainly on Government policy and the prices of oil and gas. This paper describes the main technical and non-technical issues facing wind power today and looks at the prospects for further UK development of wind power.

Marine energy: getting power from tides and waves

D. Kerr

Proceedings of the Institution of Civil Engineers—Civil Engineering, **158**, Special Issue 2—Sustainable power: the role for engineers, November, 32–39

Marine renewable energy has the potential to make a significant contribution to energy supplies in the future. Tidal barrages and wave energy could make the largest contribution, both in the UK and elsewhere, and tidal streams could make a smaller but still useful contribution. This paper provides an overview of the current status and prospects for electrical generation from marine energy. It concludes that a realistic target contribution to UK electricity supplies would be about 75 TWh. However, although tidal power is predictable, all forms of marine energy are variable and intermittent and integration into the electrical grid is a critical issue if they are to achieve their potential contribution.

Severn Barrage, UK—environmental reappraisal

R. Kirby and T. L. Shaw

Proceedings of the Institution of Civil Engineers—Engineering Sustainability, **158**, No. 1, March, 31–39

The biological and chemical regimes of the Severn Estuary are severely stressed by its physical regime. Estuarine flora and fauna naturally adapt to habitat conditions. The Severn is dynamic and turbid to such a degree, however, as to put it beyond the tolerance of most species. The foreshores have an exceptionally low carrying capacity for shorebirds and provide poor feeding and nursery areas for fish. Parts of the subtidal bed regime are barren and few support any live organisms. The turbid water excludes sunlight and suppresses dissolved oxygen. The ecosystem is limited to the most hardy and immature estuarine organisms and these are only present as a result of continual recruitment from the Bristol Channel. Furthermore, combined sea level rise, increased storminess and foreshore erosion are sustaining the downward spiral in ecosystem biodiversity. This severe suppression is natural; it is not induced by anthropogenic contaminants. Should a tidal power barrage be built, mean water level and shelter would increase and current strengths diminish. Large-scale reductions in suspended load and greater bed stability would encourage colonisation. Mixed substrates would develop, leading to biodiverse and abundant invertebrate and vertebrate communities. It is unusual for a major engineering project to result in the large-scale invasion of a suppressed ecosystem by organisms; this is an inevitable consequence of this project.

Design procedures for installation of suction caissons in clay and other materials

G. T. Houlsby and B. W. Byrne

Proceedings of the Institution of Civil Engineers—Geotechnical Engineering, **158**, No. 2, April, 75–82

Suction-installed skirted foundations, often referred to as suction caissons, are increasingly being used for a variety of offshore applications. In designing a caisson a geotechnical engineer must consider the installation process as well as the in-place performance. The purpose of this paper is to present calculation procedures for the installation of a caisson in clay. For clay sites, the caisson will often be used as an anchor, with the ratio of the

skirt length (L) to the diameter (D) as high as 5. Calculation methods are presented for determining the resistance to penetration of open-ended cylindrical caisson foundations with and without the application of suction inside the caisson. Comparisons between predictions and case records are made. A companion paper describes the calculation procedure for installation in sand soils. Finally, comments are made here about installation in a variety of soils other than homogeneous deposits of clay or sand.

Design procedures for installation of suction caissons in sand

G. T. Houlsby and B. W. Byrne

Proceedings of the Institution of Civil Engineers—Geotechnical Engineering, **158**, No. 3, July, 135–144

Suction-installed caisson foundations are being used or considered for a wide variety of offshore applications ranging from anchors for floating facilities to shallow foundations for offshore wind turbines. In the design of the caissons the installation procedure must be considered as well as the in-place performance. The scope of this paper is to consider the calculations appropriate for the installation of caissons in sands. Calculation methods are presented for determining the resistance to penetration of open-ended cylindrical caisson foundations both with and without the application of suction inside the caisson. Comparisons are made with case records. A companion paper addresses the calculation procedure for installation in clays as well as in other soils.

Community involvement in coast protection at Lyme Regis, UK

G. M. Davis and K. Cole

Proceedings of the Institution of Civil Engineers—Municipal Engineer, **158**, No. 1, March, 17–22

The town of Lyme Regis is located on an unstable and eroding section of the West Dorset coastline in the UK. Such are the

threats to the long-term future of the town from continuing instability that West Dorset District Council is promoting the implementation of a series of coast protection schemes to reduce the risk of destructive landsliding and coastal erosion from occurring in the future. The schemes involve major foreshore and slope stabilisation works which impact upon the town's residents and the tourist industry, both in their completed form and in terms of the disruption they may cause during construction. This paper outlines how heavy investment in public consultation by West Dorset District Council and high levels of participation from all interested parties minimises potential conflict and produces a sense of public ownership and a high level of consensus across the town.

Neural networks for predicting seawater bacterial levels

S. M. Kashefipour, B. Lin and R. A. Falconer

Proceedings of the Institution of Civil Engineers—Water Management, **158**, No. 3, September, 111–118

In this study artificial neural networks (ANNs) have been applied to predict faecal coliform concentration levels at compliance points along bathing water zones situated in the south west of Scotland, UK. Hydrological parameters, such as river discharges, sunshine, rainfall and tidal conditions, were used as the input data for these networks. Data collected at seven locations during the period 1990–2000 were used to train and verify the neural networks. A novel technique called the gamma test was used for data analysis to aid in the construction of ANN models. In general, the river discharges and tidal range were found to be the most important variables affecting the level of bacteria concentration at the compliance points. For compliance points close to the meteorological station, the amount of rainfall was found to be relatively significant in the model results. Relatively good correlation coefficients were obtained for the learning and verifying process for all of the ANNs and these networks confirmed that the samples failed to comply with the standard values specified in the European Union Bathing Water Directive in 57.4% of the cases.