'Blue energy' seems feasible and offers considerable benefits

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Generating energy on a large scale by mixing salt and fresh water is both technically possible and practical. The worldwide potential for this clean form of energy - 'blue energy' or 'blue electricity' - is enormous. However, it will be necessary to work actively on several essential technological developments and to invest heavily in large-scale trials. On 3 November, Jan Post hopes to obtain his doctorate on this subject from Wageningen University, The Netherlands.

The principle of generating electricity by mixing salt and fresh water, taking advantage of the difference in charge that results, has been known for more than 100 years. It was first tested in practice in a laboratory in the 1950s. There are two methods for generating blue energy: pressure-retarded osmosis and reverse electrodialysis.

Jan Post, in his research, has focused mainly on the latter because it is the more attractive method of generating energy from sea and river water. With his research into the practical applicability, techniques and preconditions for large-scale energy generation from salinity gradients, he was the first to demonstrate that very high yields are possible. In the laboratory, it is possible to recover more than 80% of the energy from salinity gradients; the technical feasibility would be 60-70% and the economic feasibility a little lower than that.

There are differences among continents: the technical potential in Australia (65%) or Africa (61%) is greater than in South America (47%). There are also considerable differences between rivers - there are

5472 large rivers worldwide. These differences depend on the salt concentration in the rivers and seas, temperature, and environmental factors. The Rhine is one of the most 'energetic' rivers in Europe.

Jan Post investigated the possibility of recovering energy from the Rhine and the Maas rivers. He estimated the technical potential of both rivers to be 2.4 gigawatts per year. He believes it would be economically feasible to recover 1.5 gigawatts; enough to supply 4 million households in the Netherlands. A power station of around 200 megawatts - comparable with a park containing 200 wind turbines - could be placed at the Afsluitdijk (the famous Closure Dike in the Northern part of the Netherlands) which, according to Post, is a rather suitable place for the large-scale trials that need to be carried out. This test location on the Afsluitdijk could be combined with the redesign of the dike that is already being planned. Heavy investment is necessary but this type of clean energy is extremely promising and, since it is essential to look for alternatives to fossil energy, this investment would be worthwhile in every respect. It will be at least ten years before the first commercial power stations are operational, Post says.

Jan Post believes that in the next few years it will be necessary to work even more intensively on two technological developments that will bring down the present, rather high, price of generating blue electricity. An appropriate membrane technology should be developed and, furthermore, such membranes should become much cheaper by introducing mass production. The technique should also be robust enough to work both when the water is polluted and when living organisms accumulate on the membranes (biofouling). His research showed that both hindrances could be removed in the future.

Provided by Wageningen University