Aalborg Universitet
Department of civil Engineering
Sohngårdsholmsvej 57
9000 Aalborg

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Subject: The SSG wave energy converter and application on the breakwater of the new Liseleje harbour.

Lucia Margheritini, Peter Frigaard

Working principles

The SSG (sea Slot-cone Generator) is a wave energy converter of the overtopping kind. It consists of different reservoirs one on the top of each other where the overtopping water from the incoming waves is temporarily stored at a higher level than the sea water level. The potential power of the water in the reservoirs is then transformed in pollution-free electricity by a number of low-head turbines.
The turbines and their strategy are a challenging part of the power take off. Along with the structure, a multistage-turbine is underdevelopment for future applications. This kind of turbine sits in a common well and works even if only one reservoir is filled with water resulting in a higher degree of the overall efficiency.
The patent of the device has been sold in 2002 and since then the Company WaveEnergy AS is developing the device.

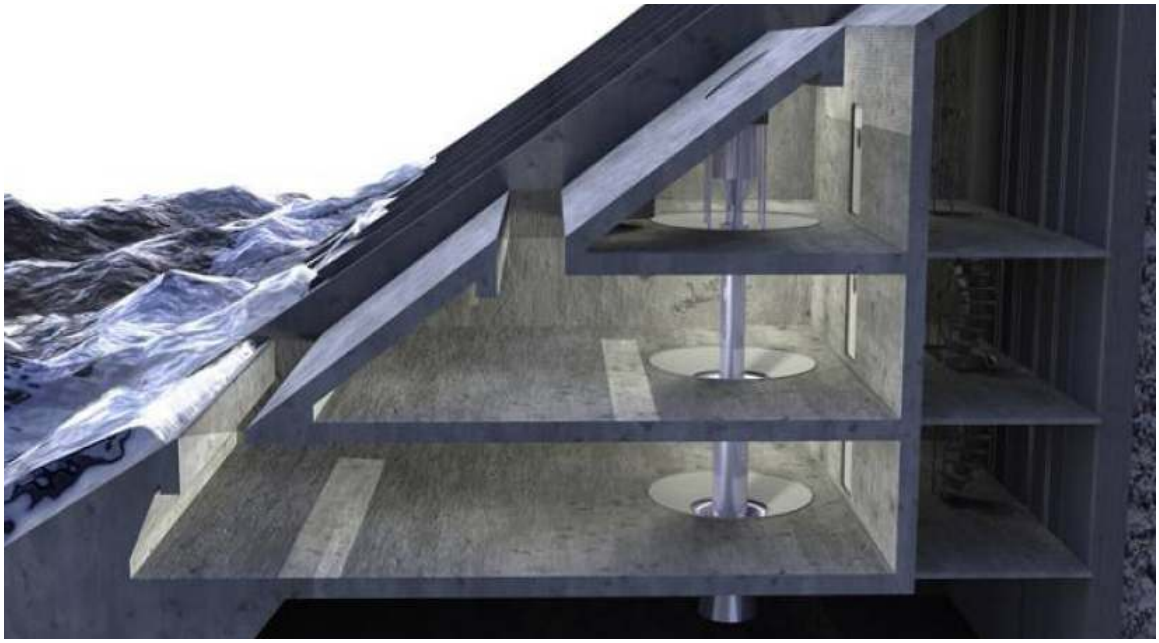

Figure 1. Artistic drawing of the SSG concept. 3-level reservoir and multistage turbine (WaveEnergy AS).

The pilot project in the island of Kvitsøy, Norway

The SSG concept has been studied and the design optimized during the last 3 years. These optimizations let to the confidence of building the full SSG device. The chosen location is the island of Kvitsøy, in Norway, close to Stavanger. The island has 520 inhabitants and the Municipality is strongly supporting the project attaching importance to the plant due to environmental issues but also to the potential of the device of creating occupation and increasing tourism in the island. The construction of the pilot plant regards a 10 m width (along the shore), 16 m length and 7 m height 3-level structure, built directly on the rocky cliff in a 19 kW/m wave climate. The construction of the structure is on at the present time and will be finished by the spring and ready to be installed during summer 2008. As a pilot project, the structure will be highly instrumented and the performance monitored.

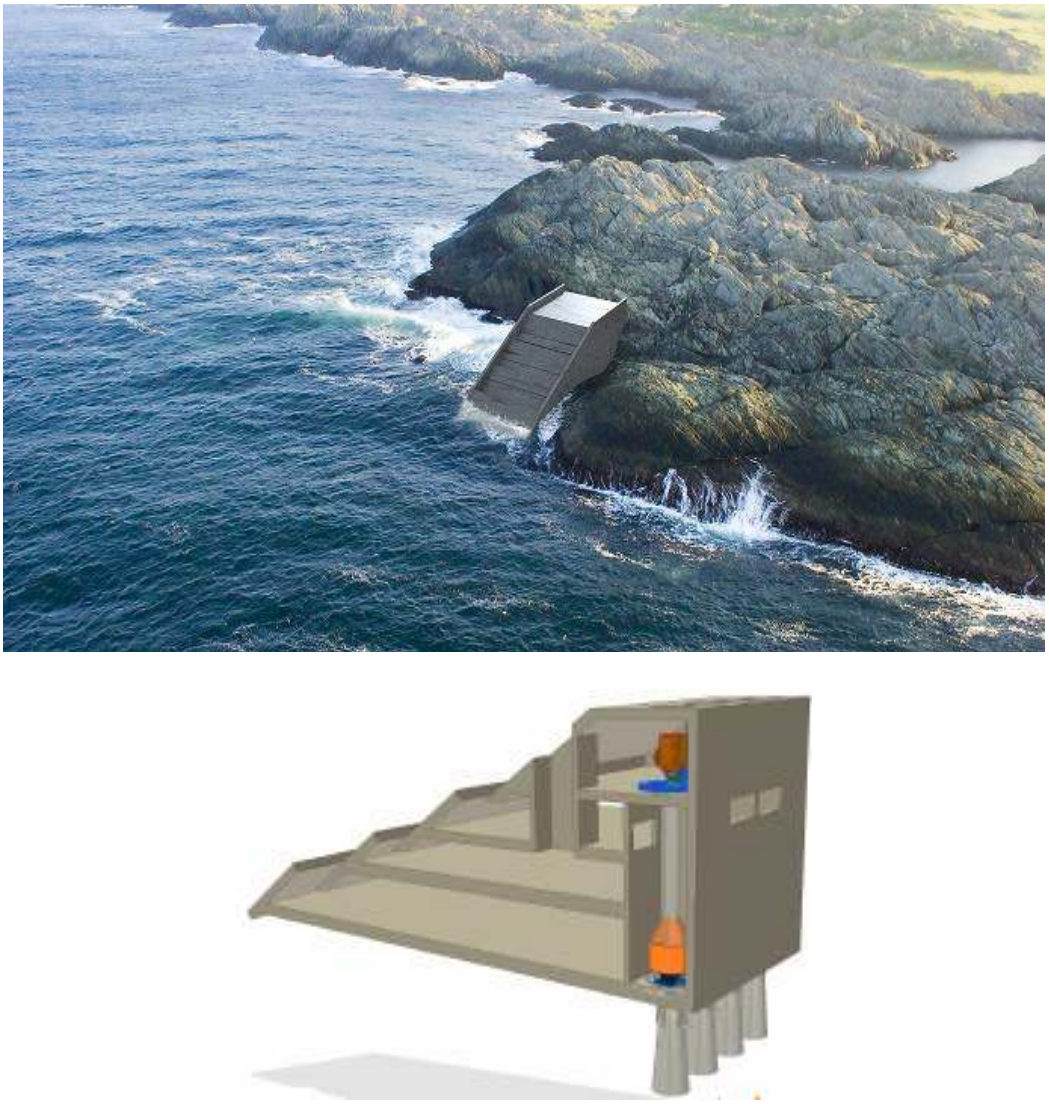

Figure 2. SSG pilot plant at Kvitsøy Island, 3-level reservoirs. Below, drawing of the device with view of the low-head turbines.

SSG on breakwaters

Even thought the pilot plant configuration will be on the coastline and an offshore solution will be studied in details in the near future, at the present time the best setup for the SSG is on breakwaters. Some of the advantages can be seen in the following points:

- Active reflection absorption.
- Recirculation of water from the turbines outlet.
- Share of costs.

Figure 3. SSG concept applied on breakwaters.

Liseleje

The case of Liseleje harbor has been briefly investigated after an accurate wave climate study of the location has been finalized (see the document "Estimation of wave conditions at Liseleje location",B. Borgarino and M. Brorsen). This study enabled the identification of the most energetic direction that is 300° (NW).

In order to elaborate the following considerations, a simulation program ("User Manual for SSG Power simulation 2", P. Meinert, L. Gilling and J. P. Kofoed, AAU) has been used. It has been found that no more than two reservoirs would be needed to optimize the performance of the device due to the wave climate at the location. In these conditions the overall efficiency of the converter is expected to reach the 19%, which is considered to be very close to the maximum efficiency tested. Referring to a 10 m wide and 5 m length structure with a maximum crest level of 1.5 m (higher reservoir) and an installed capacity of 80 kW, the power production would be around 12 MWh/y. Also a calculation on the discharge has been done in terms of water flow to the inside of the harbor; this value has been estimated to be around 7,4M m^3/y.