

## Integrating flood management and sustainable energy

### *Lessons from five attempts to realize multifunctional Energy Dams*

#### **Introducing the case Swansea Bay**

In 2010 the department of Energy and Climate Change of the British national government together with some local governments conducted a feasibility study into the possibility of a tidal power scheme in the Swansea Bay in Wales. They concluded that such a scheme would be 'high cost and high risk in comparison to other ways of generating low-carbon electricity', that a scheme 'is unlikely to attract the necessary private investments' and that 'local benefits would come at the expense of a lot of negative local impacts'. Nevertheless, in that same year, 2010, the British entrepreneur Mark Shorrock took the initiative to realize a tidal energy plant in the Swansea Bay.

Mark Shorrock is an experienced initiator of innovative sustainable energy projects and the CEO of an organization that matches private investors to energy projects. From his personal network, he brought together a 'coalition of the willing' of private actors, individuals and (construction) firms. The first investigations took place in 2010. In the summer of 2014 the project organisation applied for the necessary permits. A decision is expected in the beginning of 2015. If the necessary financing is also found, construction will start in 2015. The aim is to finish construction and start generating energy in 2018.

The project aims to create a tidal lagoon by building a 9,5 kilometer long dam in the bay. Halfway round the dam a 550 meter long turbine housing will be constructed, housing up to 26 turbines. The turbines aimed for are 6 meters in diameter, 18 meters in length, each one generating 16 MW of energy per hour. As the tide rises or falls the wicket gates around the turbines are closed, isolating the lagoon and creating



the necessary water level difference between the lagoon and the sea. When the gates are opened water flows into or out of the lagoon, driving the turbines and generating electricity.

The aims of the project, presented by the initiators:

- 320 MW of energy, reliable energy generation 14 hours a day
- energy for 155 thousand households for 120 years
- over 236 thousand tons CO<sub>2</sub> saved per year
- £500m investment in the local economy
- up to 1900 (local) jobs created in the construction phase
- community and tourism opportunities in sports, recreation, education, arts and culture
- conservation, restocking and biodiversity programs
- coastal flood protection

### **Observations and lessons learned from the Swansea case**

#### **Initiative and coalition-building**

Shorrocks set up a project organisation named 'Tidal Lagoon Swansea Bay' (TLSB). He put together a varied project team of around 60 people with backgrounds in knowledge institutes, government, trade and industry, now all employed by TLSB. The project organisation is concerned with design of the construction, the consultation of stakeholders and the search for financing. TLSB contracted a couple consultancy firms to assist them with the preparation of the project, e.g. for project management and conducting the mandatory environmental impact assessments.

The Swansea case shows that the initiative for an 'energy dike' does not necessarily have to come from a government or construction company (as in most Dutch cases). In this case, a single person forms an important driver for success. Without Mark Shorrocks there probably would have been no Tidal Lagoon Swansea Bay. Besides his financial capital and willingness to invest this, also his courage, dedication, personal network and capability to convince others seems indispensable.

From the early stages of the project, the project organisation made a lot of efforts to involve Swansea citizens, stake- and shareholders. They are all extensively consulted and informed about the benefits of the area. A survey is spread among 5000 people living in the area to map their views and concerns. In the period of statutory consultation, prescribed by the spatial planning act, from July to August 2013 TLSB received 'several thousand' reactions. The most important concerns relate to water quality, visual impact, navigation for ships, sediment of the bay and pollution. The different consultations have resulted in multiple adjustments in the project plan.

TLSB has managed to generate a lot of public attention for the project. They arranged many workshops and events. By offering small stocks to citizens, TLSB tried to involve the local community and enlarge local support even further. Also by adding facilities for sports, recreation, education etc. TLSB generated local support.

### *Private collaboration*

Since the start of the project, TLSB worked together with the Dutch construction companies Van Oord and Ten Cate. The firms thought along with the design of the lagoon and invested in the development of technologies and building methods for the Swansea project. TLSB and the firms did not sign a contract, Van Oord and Ten Cate didn't get financially compensated for their work. The firms were not involved in the permit application process, information activities and the search for financing. These activities are in the hands of TLSB. TLSB was always eager to get detailed information from the firms to ease the process of permit application and building a business case. The companies however were not willing to share detailed information because it could harm their competitive position.

The initial plan was to establish so called Early Contractor Involvement. For certain aspects of the construction there would be no tender, the work would be directly given to Van Oord and Ten Cate. However, according to TLSB, the preferential treatment that was offered to the firms did not lead to the expected competitive price and financial investments of the companies. Now, the firms have the opportunity to make a bet in the launched tender. They hope that they made themselves indispensable with their work the past years. They believe that they have unique knowledge and are therefore hard to replace.

### *Collaboration with knowledge institutes*

The University of Liverpool (among others) researches the possible energy revenues and environmental impact of the planned project. Researchers are keen to work on the project because it gives them access to the business world. It contributes to their professional growth and profile. For the university in general, cooperation with the project is important because it enlarges the valorization of their work. Also with the university, TLSB didn't sign a contract, there is no financial compensation from the project organization; there are only the informal agreements. The researchers and people from TLSB meet regularly to discuss their wishes and possibilities, TLSB makes clear on what topics they would like to have more information. The research is financed by the university itself and EU research grants.

Collaboration with knowledge institutes showed beneficial for all actors involved: researchers get the opportunity to work on socially relevant research questions and get access to new research fields. Private actors get access to professional knowledge. Governments can contract out the research they need for the assessment of permit and subsidy applications.

### *Role of government*

The project is a private initiative. The government is 'only' responsible for granting the permits. Because of the size and impact of the project, the national planning inspectorate instead of local authorities handle this. The final decision will rest with the Secretary of State for Energy and Climate Change. The British spatial planning act PA 2008 describes how large infrastructure projects should be realized. The act has the goal to safeguard 'a planning process aimed at streamlining decision-making for large infrastructure projects, making it fairer and faster for communities and developers alike, and securing the delivery of vital national infrastructure'.

For the project in Swansea Bay the act prescribes who should be consulted and how the project organisation should deal with concerns and suggestions from citizens and other stakeholders. The act contains the impact studies that should be conducted and the permits that have to be applied for. Also the throughput time and the decision making moments are fixed by the act. The whole process have to be documented and traceable online. In the case of the Tidal Lagoon Swansea Bay, it is not always clear for the government how to assess the permit application. The project is the first in his kind and there are specific policies yet. Therefore, there has been much dialogue between TLSB and the authorities.

### **Defining the business case**

The current planning phase of the project is financed by private investors. The estimated costs of this phase are up to 25 million pound. Shorrock is the owner of a company that brings together investors and sustainable energy projects. He himself invested a part of his capital. Other financiers are 'energy related high net worth individuals'. Because the investments in these phase are 'high risk' TLSB offered high returns on their investments. TLSB also gave Swansea citizens the opportunity to buy a share and invest in the project. People can subtract this kind of investments from their taxes. Shorrock: "We are keen to attract investment from ordinary individual shareholders who like the idea of shifting the energy mix to a low-carbon, benign format".

The next phases, construction and exploitation, will also be privately financed. The cost for realization are estimated at one billion pound. TLSB expects financing form pension funds, the governmental green investment bank and other investments banks. In November 2014 insurance company Prudential invested 100 million pound. The company does this in the framework of an agreement with five other insurance companies to invest a total of 25 billion in British infrastructure project. According to TLSB, the project is 'over scribed' meaning that there are more actors willing to invest than that there are needed. Apparently, since the financial crisis investors prefer 'real', infrastructure projects above complex financial products. They look for long term investment opportunities and value the green and innovative character of the Swansea project.

Besides the private investments, an essential part of the business case is a so called 'strike price'. A strike price is a government subsidy in the form of a granted financial contribution for every megawatt generated sustainable energy (comparable to the Dutch SDE subsidy). TLSB negotiates with the ministry responsible for energy about the strike price. Consultancy firm Pöyry calculated that the project will need a strike price of 168 pound for the coming 25-35 year to succeed. Shorrock points out that this is 'only' 20 percent more than offshore wind parks get nowadays. TLSB presents the Swansea project as the first of more to follow. The project organization want to realize five comparable projects in the coming ten years. They state that the cost will become less with every project. According to Pöyry, the second and third project will need less government aid. From the fourth project on, financial support from the government would no longer be necessary. Pöyry states: "The initial lagoon project will require support of around £50m per year. This relatively low level of support is justified as it creates the option to develop the larger and cheaper projects in the pipeline".

By presenting their project as the first of multiple, TLSB increased public financial support. They present subsidy as an investment for the government. The knowledge that is gained in this first project will be used in the following. Future projects will have the same social revenue without needing the financial aid.

The environmental conditions in the Swansea bay differ strongly from the Dutch situation, there is much more tide and change in water level. The conditions for energy generation are therefore much better than in the Dutch tidal energy projects. In Swansea there is no need to connect energy production to other possible sources of income. The energy production will probably generate sufficient revenues.

Besides the lagoon, the Swansea project includes different facilities for sports, recreation, education, arts and biodiversity. These facilities are important generators of public support and a prerequisite for the permit and public subsidies. The facilities are not really part of the business case. TLSB will contract a constructor to realize these facilities, the costs and benefits are negligible in comparison to the costs and benefits of the lagoon itself.

### **Arranging collaboration around realization**

TLSB have separated the construction in three parts: the 9,5 km lagoon wall, the concrete turbine housing and the turbines itself. The three parts are separately tendered. For the first two parts, TLSB will sign 'design & build' contracts with construction companies. For the third part, the contractor will supply and install the turbines but this firm also has to sign a 'guaranteed output agreement'. It will guarantee a certain energy output for the coming years, otherwise there will be a financial penalty. This way TLSB secures its income and return on investments.

Early Contractor Involvement to pre-sort construction companies is an option when specific firms are involved since the start of a project. It makes it possible that project and contractor co-evolve. The Swansea case shows however that Early Contractor Involvement is hard to realize and does not always lead to the hoped for advantages.

### **Exploitation and management**

Exploitation and management will be in the hands of TLSB. See also the section about the business case.

### **Note**

The various projects are still "under construction" and the planning processes are rather dynamic. This description is completed autumn 2014. That means that still many aspects are not clear, or still highly changeable.

This description is based upon the master thesis of Koen Vermeulen (M.Sc. Public Administration, Erasmus University Rotterdam) and completed by Sanne Grotenbreg (junior researcher).