

**Integrating flood management and sustainable energy**

*Lessons from five attempts to realize multifunctional Energy Dams*

**Introducing the case Afsluitdijk**

**1. Introduction**

The Afsluitdijk (literal Enclosure Dam) is a 32 kilometers long dam in the north of the Netherlands. The dam is constructed in 1927-1933 to enclose a salt water inlet of the North Sea, creating a fresh water lake called IJsselmeer.



Today, the dam is an essential work for water safety. Furthermore, the highway on the dam connects the Northern provinces and the lake behind it is an important source of fresh water. At the beginning of the twenty-first century some initiatives started to combine the dam with some forms of sustainable energy production (see text boxes 1 & 2).

### **Text box 1. TTC Den Oever**

Tidal energy is generated with turbines in flowing water. The water flows through the tide, a (river)stream or water drop. Since 2005 tidal energy company Tocardo conducts tests with generating tidal energy at the Afsluitdijk. For this it received various subsidies from national and local authorities. Since 2008 Tocardo operates a pilot installation, generating 80 kW of energy, in one of the shafts of an outlet sluice. The sluices are used by asset manager RWS to drain water from the lake to the sea, RWS has given a permit to Tocardo to install turbines in two of the shafts. In 2009, with a European subsidy for regional development, Tocardo establishes the non-profit foundation 'Tidal Testing Centre', a test facility and knowledge center for tidal energy. The testing center is included in the 'ambition agenda', the joint policy document of the municipalities and provinces around the Afsluitdijk. With a subsidy of the regional Wadden (investment) fund, the ambition to expand the pilot installation and install three more turbines in the sluice is realized in the beginning of 2015.

### **Text box 2. Pilot Blue Energy**

Blue energy is generated by leading fresh and salt water along a membrane, a process called osmosis or reverse electro dialysis. There have been test with blue energy in the Netherlands from the eighties on. Since then different organizations and companies have pursued the development of blue energy, sometimes with financial support from the government. In different consortia an energy suppliers, engineering company, salt factory and packing material producer have been involved. Since the beginning, there is the belief that it is possible to realize a power station that generates 200 MW of blue energy at the Afsluitdijk.

In 2006 one of the knowledge institutes establishes REDStack, a commercial spin-off to further develop and market the so-called RED-technology. In 2011 REDStack receives 3,2 million euro subsidy from the three provinces in the region to realize a pilot installation at the Afsluitdijk. The total cost of the project are 8 million, other financiers are REDStack's shareholders, mother knowledge institute Wetsus and FujiFilm, the company that develops the membranes. Asset manager RWS gives a permit for the pilot installation at the dam. The pilot is included in the 'ambition agenda', the joint policy document of the municipalities and provinces around the Afsluitdijk. The installation is running since spring 2014. Goal is the advancement of the technology. Besides, REDStack is running tests on the environmental impact of the installation, partly financed by the regional Wadden (investment) fund.

## **2. The renovation as opportunity for innovative energy production?**

Since 2006 the dam doesn't meet the safety criteria anymore, it needs an extensive renovation. The national government is responsible for water safety in The Netherlands and is the asset owner of the dam. The Department of Waterways and Public Works (Rijkswaterstaat, RWS) acts as the asset manager and is in charge of the renovation. At the beginning of the planning phase of the renovation, RWS organized a prize contest (market consultation). It invited private parties to hand in their ideas for a new, inclusive Afsluitdijk. Eight consortia of private sector firms came forward with extensive and expensive plans for multifunctional use of the Afsluitdijk, combining water safety with nature, sustainability energy production and tourism. But the financial crisis hit, the national government had to make cutbacks and reformulated its objectives and subsequently, its role. It decided the focus solely on flood risk safety and pay only for a sober and efficient renovation of the dam. Realizing (and financing) complementary ambitions was left to regional and local government bodies and private parties. From a rather open, explorative asset management style, Rijkswaterstaat shifted towards a more closed, exploitative style.

For the regional actors around the Afsluitdijk, the plans for nature development, tourism en sustainable energy production are very important. Local authorities expect that the region will greatly benefit from a transformation of the Afsluitdijk in an 'icon of the 21<sup>st</sup> century'. The nature, tourism and

energy projects are believed to generate a, much needed, impulse to the regional economy. The two provinces and three municipalities around the Afsluitdijk were disappointed when national government decided not to take responsibility for the additional plans anymore. They decided to combine forces in a project called 'De Nieuwe Afsluitdijk' (The New Afsluitdijk, DNA) to try to realize the additional plans for the dam after all.

After a successful political lobby, the national and local governments signed an agreement on the division of responsibilities and activities. The national asset manager RWS is solely responsible for flood risk safety and will take care and finance the (plain) renovation of the Dam. Estimated costs are around 800 million euro. The national government (Ministry of Infrastructure and Environment) acts as principal and watches over budget and progress. The region is responsible for developing and realizing all other ambitions. Local authorities will have to take initiative, bring together willing consortia and find the necessary funding for all the projects it wants to realize. RWS is responsible for facilitating the realization of these ambitions. RWS gives the region the opportunity to 'couple' the regional project to the renovation trajectory and include them in the tender. Besides, the national government established a fund of 20 million euro for sustainable regional development, to contribute to the regional plans. If the local authorities decide to subsidize a project, the national government will donate an even amount of money.

Within the regional ambition agenda one energy initiative is quite far elaborated on. This initiative aims to enlarge the capacity for tidal energy production, by using the sluices of Kornwederzand for instalment of 30 turbines.

### **Text box 3. Upscaling tidal energy**

Tocado wants to realize a second pilot installation at the Afsluitdijk, in another sluice. This project is also included in the 'ambition agenda', the joint policy document of the municipalities and provinces around the Afsluitdijk. The ambition is to install 15-20 turbines in 6-10 shafts of the sluice. Estimated costs for realization are 8 million euro. There have been talks with different possible investors and participants, including a building constructor and local energy cooperatives. RWS is going to renovate this sluice, as part of the overall renovation of the dam. This creates the opportunity to combine the building of the tidal energy installation with the renovation, possibly saving costs. Tocardo however also sees the disadvantages of this approach and explores the opportunity to realize the project themselves

At the one hand there is a strict boundary between the renovation trajectory and the regional ambition agenda. Actors agree that it is possible to further release the connection between both, when it proved to be difficult to synchronize different time horizons. At the other hand there are clear appointments about how and when to synchronize both processes. Although the regional actors face various difficulties in keeping up with the renovation process, they agree that these appointments are helpful in structuring the process and putting pressure on the regional decision-making process. For RWS facilitating the regional ambition agenda is a strategic choice, by doing so it creates support and commitment for a supple renovation.

### **3. Outcomes**

Until now it is uncertain whether successful combinations can be made. For blue energy the connection of up scaling the pilot with the renovation proved to be unfeasible due to the development phase in which the technology is. For the up scaling of tidal energy it is questionable whether the private initiators are successful to meet the deadline of Rijkswaterstaat to hand in a proposal which meets the demands in terms of concreteness and (financial) underpinning. Probably the contractor who will realize the renovation gets the obligation to ‘tack into account’ the upscaling plans of energy projects, so upscaling in the future is not made impossible.

#### **Observations and lessons learned**

##### **1. Initiative and coalition-building**

There is no one consortium which tries to realize “the” Energy Dam. There are multiple (nested) consortia active in the process of the renovation and renewal of the Afsluitdijk. At the national level, the asset manager (Rijkswaterstaat) is busy with the renovation of the Afsluitdijk. The region has several ambitions for the Afsluitdijk including sustainable energy production. A project bureau is supposed to coordinate all projects, but a clear overarching program structure lacks. The ambition sustainable energy consist of different projects, each with a different consortium of actors. There are rather good connections between the various consortia.

The asset manager (Rijkswaterstaat) focuses solely upon the renovation of the dam and draws a clear line between this trajectory and the additional regional ambitions. The asset manager doesn’t take initiative and doesn’t provide funding for the regional projects. The renovation process leaves no time for delay and no room for scope-adjustments (other than defined by the asset owner).

The asset owner (Ministry of Infrastructure and Environment) is mainly concerned with the primary function of the Afsluitdijk and sees other functions as secondary and less important elements. The asset owner steers on the formal timeline and the budget allocated. Combinations with other functions are allowed, but only if they do not interfere with the renovation process. The minister however underlines her desire of the Afsluitdijk becoming an Energy Dam.

The asset owner and asset manager do not have any formal obligations to become involved in innovation processes and in sustainable energy production. To some extent they facilitate both, but do not participate in concrete initiatives<sup>1</sup>. At the same time policy actors dedicated to issues like innovation and sustainable energy (e.g. Ministry of Economic Affairs) are not included in the decision-making process around the Afsluitdijk.

There is broad regional support to explore the possibilities for enriching the new Afsluitdijk with innovative functions. But sustainable energy production is only one ambition among many and has to compete for attention and scarce resources. The budget and political attention is limited. There is no formal policy urgency to explore and realize this specific form of sustainable energy.

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<sup>1</sup> [http://www.rijkswaterstaat.nl/zakelijk/duurzaam/energie\\_winnen/](http://www.rijkswaterstaat.nl/zakelijk/duurzaam/energie_winnen/)

The regional authorities wrote down their ambitions and possible ways of financing in a policy document. The involved private parties consider this 'ambition agenda' as formal policy ambitions and expect follow-up actions. The regional authorities act as if the ambitions are only intentions. This frustrates the process of coalition building and constructing a business case.

In the Afsluitdijk case, the main initiator is an employee of Energy Valley, which is a collaboration of the Northern provinces. He is responsible for the sustainable energy ambition. He acts as a broker and tries to create a viable consortium by bringing together willing parties. He facilitates and stimulates private parties (mainly technology producers) to take the initiative to realize the projects. Without the presence of such a boundary spanner it is questionable whether an initiator had been found.

## **2. Defining the business case**

The techniques applied in the projects at the Afsluitdijk (blue energy and tidal energy) are only in a development phase. They produce a limited amount of energy at relatively high cost, in these terms the projects are not profitable. The main revenue is related to technology development, other possible revenues are e.g. employment in the region, added economic value, a tourist attraction etc. Because the projects are not profitable on the short term, there are (hardly) no private parties who want to invest. The main share of funding will be public money (subsidies).

The private parties that take the initiative have a difficult time articulating the societal relevance of the projects and persuading the possible public financiers of the need and appropriateness to invest. At the other hand, policy makers complain that it is difficult for them to 'get the story told'.

The projects can't make use of national funds for sustainable energy production because the technologies are not 'proven' technologies yet. Because the revenues of the Afsluitdijk as Energy Dam are difficult to capitalize, it is important that public funds with a more general scope are available (the Wadden fund for example). However it proved difficult to develop a convincing argumentation to get public funding.

Funds for regional development and more general funds (like the national contribution to strengthen the Afsluitdijk as a national icon – the so-called Atsma funds) lack clear rules of the game and are perceived as difficult to obtain for private actors.

A dead lock seems to emerge when possible private and public investors 'wait for each other'. Private parties only want to invest when public funding is guaranteed, public parties only want to invest when there is a plausible business case.

For both public and private investors, publicity is very important. The initiators look for parties that can generate this publicity. Also, although the delivery of electricity is not profitable, it will be done for exposure and publicity.

## **3. Arranging collaboration around realization**

It is questionable whether the connection with the renovation is profitable for realizing sustainable energy innovations. An advantage is that the deadline of the renovation creates urgency in the region that otherwise might not have been there. The regional projects can participate in different aspects of

the renovation process (e.g. public information meetings and the tendering process). And the contractor that will do the renovation can also build for the additional projects (or take some preparative actions), which will save costs.

However, the coupling makes other things more difficult. The most important barrier has to do with synchronizing different time horizons: the pressing deadlines of Rijkswaterstaat are difficult to match with the evolution of the ideas for tidal energy production, which needs more time for developing a viable business case et cetera.

Public-private collaboration with regard to realizing the tidal energy plant is strongly focused upon bringing together the necessary means for realizing the plant. There is no public-private collaboration focused upon the subsequent phases. Public authorities are hesitant to participate in the exploitation phase: they prefer a clear separation of responsibilities and do not opt for involvement in energy production – what they see as private activities. They thus also do not consider the possibility of a special purpose vehicle to participate in innovative energy production.

The realization of the tidal energy component is kept apart from the availability-based contract which is used to tender the renovation. This also means that the public asset manager keeps other functions from interfering with the renovation works. Only when the necessary permits are given, the tidal energy plant can be realized as an additional, private function of the dam.

#### **4. Exploitation and management**

Until now, there seems to be little attention for the phase after realization of the Afsluitdijk. As said, the sustainable energy projects are not part of the innovative contract (DBFM) which will be used to involve a private partner which will realize the Afsluitdijk based upon an availability-based contracting.

For the asset manager, sustainable energy production and innovation are no objectives in itself, so they will be no part of the tender for the renovation. Sustainability will be a criterion when selecting a building contractor, but as energy production at the Afsluitdijk is not profitable at this moment, the contractor will not include the energy projects in his offer.

The asset manager has looked into the possibility of buying the energy generated by the diverse projects and using it for its own installation, hereby realizing an 'energy efficient dam'. But the amount of energy produced is too small and the tariffs are too high.

#### **Note**

The various projects are still "under construction" and the planning processes are rather dynamic. This description is completed early 2015. That means that still many aspects are not clear, or still highly changeable.

This description is based upon empirical research of Hans Bil (master student Public Administration of the Erasmus University Rotterdam) and Sanne Grotenbreg (junior researcher).