



NORTH WEST ENERGY SQUARED LTD (NWE2)  
NTPG LTD IS A WHOLLY-OWNED SUBSIDIARY OF NWE2

## Introduction

NWE2 was established in 2014 to create a model of the North West of England, to establish if there were any consistent reasons for the relatively high unemployment, and relatively low wages and productivity in the North West coastal areas.

Attached to these situations were high levels of dysfunctionality of families, with too many existing where no adult was in work, where the families were living in poor quality housing, and where school attendance was low.

The model of the whole north-western coast, from North Wales to South West Scotland, was created to showcase our initial concept. That concept was to put gateways across all of the major estuaries on the coast, and to put roads on top of them and tidal range turbines into them. This would both improve connectivity between coastal towns and generate emission-free electricity for these towns to use.

The model was exhibited for several weeks at a time in Liverpool, Manchester, Whitehaven, Barrow-in-Furness and Morecambe. We asked for comments on the concept and the possibilities that would arise from it, many of which were put forward in writing and/or verbal communication.

The model, and the concept, attracted the attention of Professor George Aggidis, Director of the Lancaster University Renewable Energy Group & Fluid Machinery Group, and Dr. David Howard of the Centre for Ecology and Hydrology (CEH), also attached to Lancaster University. From discussions with these gentlemen, the conclusion was to move from the concept phase to a specific project, named Northern Tidal Power Gateways Ltd (NTPG), organised as a wholly-owned subsidiary of NWE2.

NTPG intends to put barrages across Morecambe Bay and the Duddon estuary, with dual carriageways on those embankments. The dual carriageways will be connected to each other, either through or around Barrow-in-Furness, to the M6 in the south and to the A595 north of Millom.

Tidal range turbines will be inserted into these barrages within prefabricated turbines houses which will produce renewable, emission-free electricity.

A Preliminary Information Memorandum (PIM) was commissioned from Mott MacDonald, a major infrastructure and engineering consultancy, and it produced some positive conclusions on which to build, intimating that the project is both viable and transformational to the surrounding areas and beyond.

## Location

Morecambe Bay and the Duddon Estuary are located in the north-west of England on the eastern edge of the Irish Sea. Morecambe Bay covers an area of approximately 455 square kilometres and around 1 billion cubic metres of water enters and leaves the Bay with every tide, covering an inter-tidal zone of approximately 340 square kilometres.

The Duddon Estuary lies north of Morecambe Bay on the west Cumbrian coast. It is formed by the River Duddon and the smaller Kirkby Pool. It has a shoreline length of approximately 65km, a primary channel length of approximately 23km, and a core area of approximately 61 square metres.



## Potential Benefits of the Project

1. Improvements in transport connectivity
2. Production of renewable, emission-free and economic electricity from indigenous sources
3. Protection and possible improvement of the environment
4. Economic growth, both in the North West and the whole of the UK, arising from the extensive supply chain
5. Direction of some of the wealth created into positive action to improve social welfare

## **1. Transport Connectivity**

The dual carriageway roads from North Lancashire to West Cumbria will reduce journey distances by up to 50%, and journey times on the same route by up to 75%. For example, travelling from the M6 at Lancaster to the A595 at Bootle would reduce from 60 miles to 30 miles, and from 2 hours (averaging 30mph), to 30 minutes (averaging 60mph).

An initial estimate envisages around 4.5 million journeys each way over the crossings each year. Overall, the crossings would result in fuel consumption and emissions savings equal to 750,000 litres of fossil fuel a year, and provide cost savings totaling over £200,000,000 per year for individuals, businesses, and the NHS and emergency services.

There would also be cost savings in the existing road networks as they may no longer require the same maintenance and upgrading as initially predicted in council road strategies.

It could be particularly beneficial to the Lake District National Park, with some of the traffic currently congesting the eastern approach to Windermere being transferred up the west coast.

The gateways could also be used as a conduit for other utilities, such as cables, power or fibre optic, probably in 4m diameter prefabricated pipelines under the central reservation of the roads.

## **2. Production of Renewable Electricity**

The gateways will incorporate 132 30MW tidal range turbines in prefabricated turbine houses to harness the vast renewable energy of the large tidal range – up to 10m – in Morecambe Bay and the Duddon Estuary. These turbines are estimated to produce 8,000,000 MWh of electricity per year, approximately equal to the existing Heysham Nuclear Power Station. This equates to 7% of the North West's electricity requirement or 2% of the country's requirement, and enough for 2,000,000 homes.

Although most of the cost is up-front capital, it should be appreciated that the turbines in the gateways are expected to have a lifespan of 120 years, and to be capable of improvement and update over that period. It is also unlikely that there will be any decommissioning costs.

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A similar set up of a barrage with turbines across the La Rance estuary in Brittany has been running successfully since 1966. A recent inspection has found little damage and relatively easy improvement prospects, particularly by using computers for control, the option for which wasn't available in 1966. It now produces electricity for as little as £10/MWh.

NTPG estimates that if the overall time - and therefore cost - for production can be kept down, direct savings can be made in other areas, meaning capital costs can be kept down. Due to this, the price for electricity could be £50/MWh or lower.

### **3. Protection and Improvement of the Environment**

Both estuaries are areas of outstanding importance from almost every environmental aspect, therefore, great care needs to be taken in dealing with this. It will be appreciated that if no action is taken to reduce emissions from energy production, global warming will continue at speed – estimates of sea levels rising by 50cm or more before the end of the century are thought to be almost a certainty. The establishment of a large supply of ‘green’ energy is, therefore, positive in this connection.

With this in mind, environmental considerations will be an integral part of the development of the NTPG project. We have agreed with the National Environment Research Council (NERC) that they will provide a team that will examine all aspects relating to environmental care in the areas we are discussing. They would then produce a report setting out details of the current environmental state, the environmental state of the area over the last 50 years, and what the environmental state may be after the project goes ahead, along with any recommendations of how best to ensure NTPG’s project has the most positive impact on the areas it can.

The NERC have also agreed to monitor NTPG’s adherence to any recommendations they make, and to submit the end result to an effective environmental audit.

The team will also carry out the necessary Strategic Environmental Assessments. All of this may enable some of the key environmental work to be carried out more efficiently and on a shorter timescale, thus reducing costs and enabling cheaper electricity to be produced more quickly.

We believe this is an important, and possibly unique, way of dealing with the environmental aspects of a major infrastructure project.

### **4. Economic Growth**

The project is expected to make a major contribution to the economic regeneration of North Lancashire and West Cumbria, helping to bring these communities closer together with greater cumulative benefits to the region and the North as a whole. A number of factors will create substantial growth, both during the construction period and after completion.

Initially, the most immediate impact will be in jobs. It is estimated that 6000 jobs will be created during the construction phase, which will start 2-3 years after planning and development consent has been obtained. These jobs will range from being technical and scientific, through senior administration, to skilled and then unskilled work. There are estimated to be 24,000 unemployed people in the get-to-work area of the project, so even with some substitution impact, there will be a major reduction in social security benefits; 6000 people paid maximum social security of £26,000 per year comes to £156,000,000 per year.

With pay of £30,000 per year, this will change into a surplus of some £4,400 per year from tax, including VAT, making a total cost benefit to the treasury of £182,000,000 per year.

With an ordinary employment multiplier of 2, this would mean a benefit to the treasury, once the maximum number of jobs is reached, of £338,000,000 per year.

Further growth will arise from a number of sources:

- the material needed for the gateways' construction - obtained from local quarries or the seabed
- the prefabrication of turbine houses
- the manufacture and fabrication of the turbines - which, it is assumed, will have transferred to the North West of the UK
- all the other electrical and necessary materials in the pipeline

Growth after completion will result from the improved connectivity; the basic benefits will continue but they are also likely to lead to:

- a greater size and efficiency of existing industry
- new industries – a continuation of turbine building for other areas, even exports; the establishment of new industries to use electricity, e.g. hydrogen or ammonia manufacture
- tourism – increased traffic flow up the west coast will increase tourism whilst spreading it across the Lake District National Park

There would also be an opportunity for the establishment of a service station on the new road, perhaps north of Millom. There could be a link created to the Eskdale and Ravenglass railway, together with the existing Mountain Goat service (or its equivalent, using electric vehicles), to provide access to the west side of the Lake District National Park. This would create 300 direct jobs in the service station, plus a further 300 in the supply chain.

## **5. The Direction of Wealth**

Applying some of the wealth created to social welfare, particularly of the underprivileged and dysfunctional, takes us right back to the original purpose in examining the North West coast: to see why unemployment was above average, why wages were below average, and why there was a disassociation between businesses and people, and politicians and people. This needs to be done by examining circumstances in which a number of people out of work for a long period of time, living in substandard housing, and not attending school regularly are substantial problems.

The Centre for Social Justice did some interesting work on this a few years ago, and one of our aims is to do extensive work on tackling the problems at hand constructively, to improve the overall situation for all of the people in the area, particularly the underprivileged, by establishing a community trust from the shareholdings of the major private investors.



£250 million a year in improved  
transport connectivity

£370 million a year  
from emission-free  
electricity at £50  
per MWh

£338 million a year  
from the creation of  
6000 jobs during  
construction and 7000  
on a permanent basis



£100 million a year from  
improving, protecting and  
maintaining our  
environment (including  
flood control)

>£20 billion over 20 years  
from the creation of a new  
industry and creation of a  
new UK supply chain

£400 million a year  
from economic growth

## Improvement of £1 billion each year

## Background, Cost and Business Plan

### Existing Barrages with Roads and Electricity Generation

La Rance Tidal Power Station, France

Opened in 1966

0.75km in length

Generates 523,000MWh per annum (as of 2010)



The Sihwa Embankment, South Korea

Opened in 2011

12.7km in length

Generates 553,000MWh per annum (as of 2016)

### Strategic Outline Business Case

Morecambe Bay and Duddon Barrages:

Travel Routes

- Heysham – Rampside: 17km
- Askham-in-Furness – Haverigg: 6km
- New/updated routes from the M6 to Heysham, Rampside to Askham-in-Furness and Haverigg to the A595

Energy Production

- 8 million MWh per annum
- 2 million homes supplied
- 2% of UK requirement or 7% of NW requirement



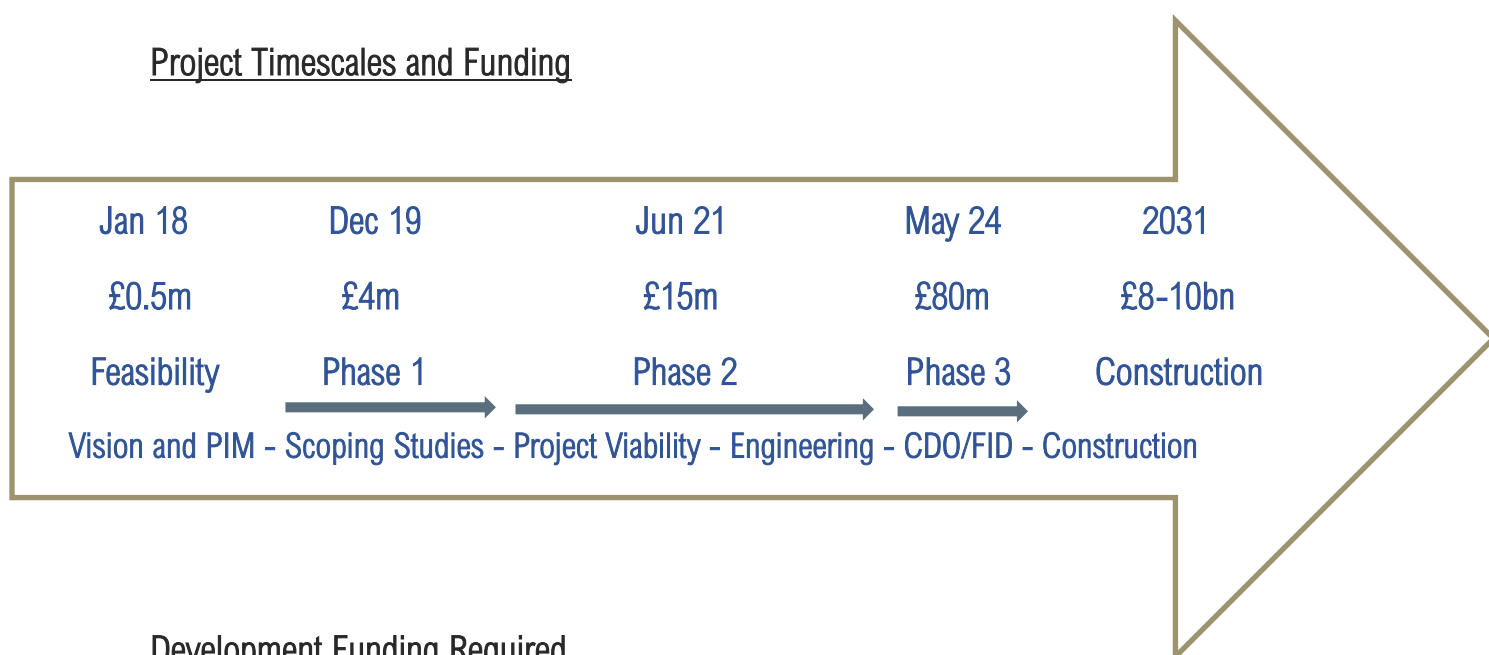
## Project Cost Summary

Construction cost estimates (excluding finance)	Estimated costs	Contingency	Per Mott Macdonald
	£m	%	£m
Green electricity generation	£7,270.00	20%	£8,724.00
Causeway	£1,140.00	29%	£1,469.00
<b>Total</b>	<b>£8,410.00</b>	<b>21%</b>	<b>£10,193.00</b>

Development cost estimates (excluding finance)	Timescale	Current Estimates
	Months	£m
Development phase	66	£99.50
Corporate costs	12	£0.57

## Project Timescales and Funding



## Development Funding Required

Development cost estimates (excluding financing) over next 6 years	Timescale	Current Estimates
	Months	£m
Vision and PIM	Complete	0.5
Phase 1 (scoping studies)	12	4
Phase 2 (viability, engineering and planning)	18	15
Phase 3 (DCO/FID)	36	80
<b>Development phase</b>	<b>66</b>	<b>99.5</b>

NTPG Leadership

