Project Update to Tidal Lagoon Swansea Bay

February 2014

Energy & emissions context

UK energy sources (2011) – 88% fossil fuels, 8% nuclear, 4% renewables. 43% imported

- Only Malta and Luxembourg produce less renewable energy in Europe
- CEO of Ofgem predicts UK 'energy crunch' & black-outs by 2017 as power plants expire faster than they are built, nuclear build program falters, and fossil fuel prices rise (Feb '13)

Climate Change Act 2008 – 80% reduction in carbon dioxide emissions by 2050

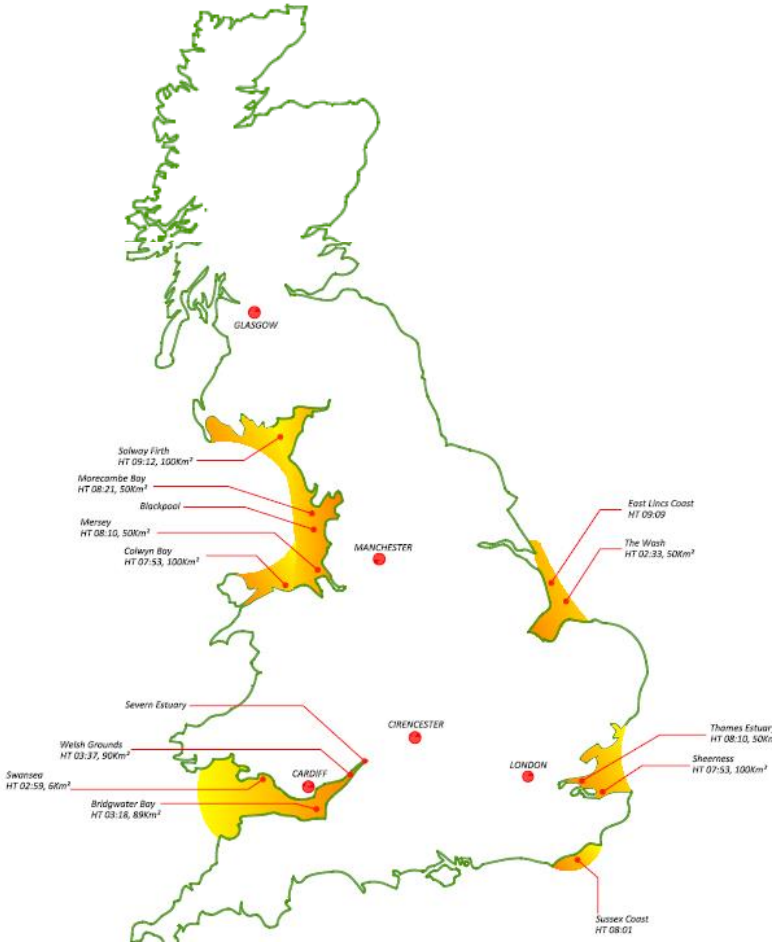
- 25% reduction in energy consumption
- Transition of energy for transport and heat from fossil fuels to low carbon sources
- 100% increase in electricity generation

EU Renewables Directive 2009 – 15% of UK energy needs from renewables by 2020

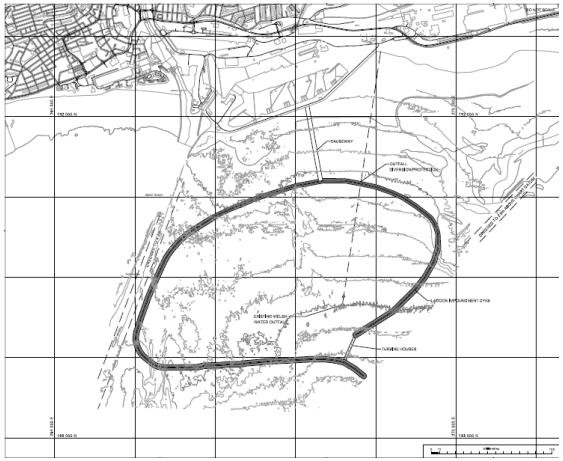
- Equates to 30% of renewable electricity
- Requires investment in 30GW of renewable energy capacity
- Also requires substantial investment in gas to provide back-up

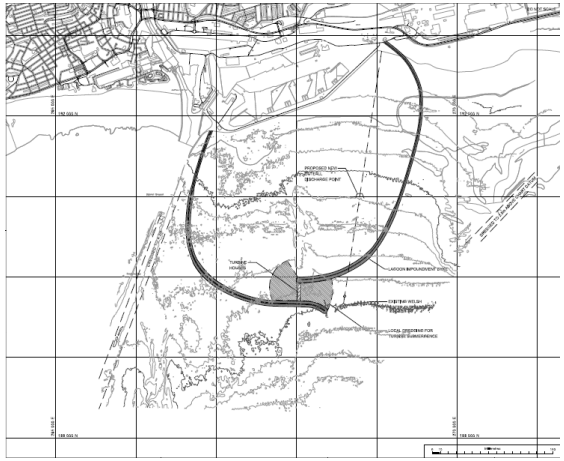
UK tidal energy resource

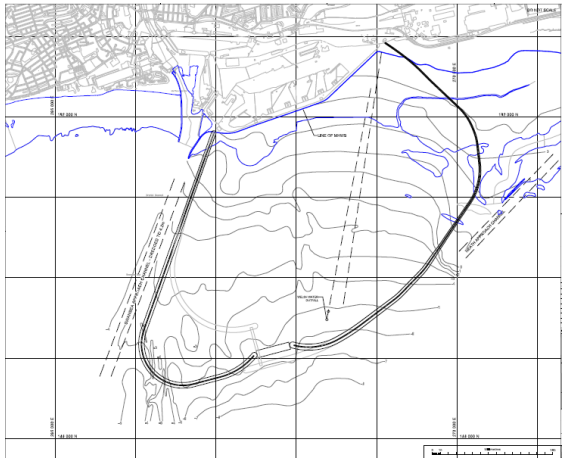
- Island nation with largely un-tapped marine energy resource – best in Europe
- Tidal lagoons require:
  - Shallow water
  - Large tidal range
- Difference in high tide times around the UK creates potential to produce 24-hour base-load renewable electricity from a network of lagoons
- Essential part of energy mix and a new, exportable industry

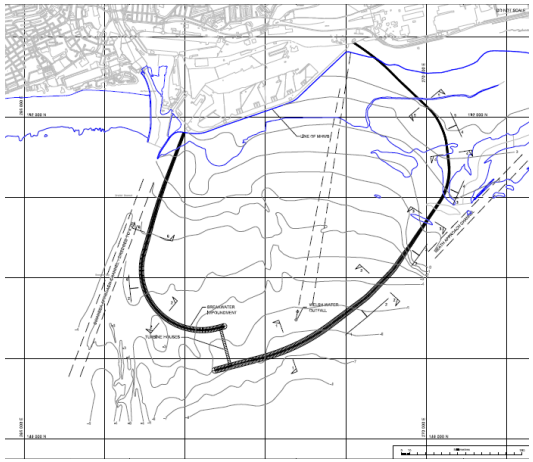


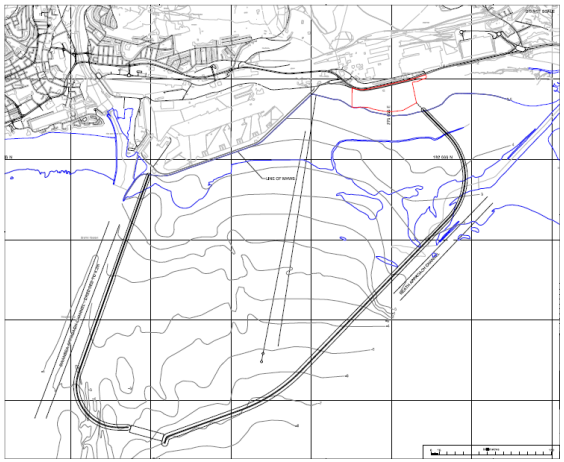
Summary of 14 lagoon options considered

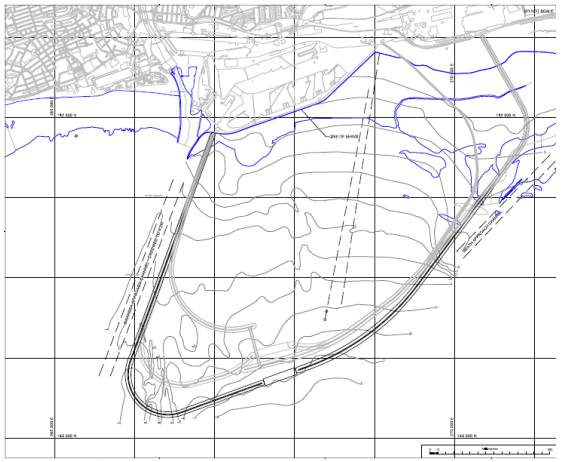












Swansea Bay Tidal Lagoon

Wall length	9.5km
Area	11.5km^2
Rated capacity (@4.5m head)	240MW
Annual output (net)	420GWh
Design life	120yrs
Height of wall	5-20m
Wall above low water	12m
Wall above high water	3.5m

Tidal range Neaps	4.1m
Tidal range Springs	8.5m

121,000 homes powered

- **c.70% of Swansea Bay's domestic use**
- **c.9% of Wales' domestic use**

Ongoing EIA, viability & design refinement

18 months of development work suggests Swansea Bay offers great potential for lagoon construction. Key ongoing work streams:

- **EIA** – scope agreed with regulators, EIA now underway, with collaborative input from statutory consultees (including NRW and LPAs). PEIR published 4 July.
- **Hydrodynamic modelling** – multiple lagoon shapes/sizes tested for water quality, sediment transport and sand erosion/deposition impacts
- **Value engineering** – reduce cost of sea wall, turbine housing, construction methods
- **Turbine design** – leading manufacturers Voith/Alstom/GE/Andritz Hydro refining specifications for low-head bulb turbines
- **Grid** – planning application has been sent to National Grid & Western Power Distribution relating to the likely grid connection, network capacity and timescales
- **Leasing & consents** – engagement with landowners including The Crown Estate, ABP Swansea, Swansea University, St Modwen
- **Onshore masterplanning** – maximising onshore opportunities with ABP & University

Environmental Impact Assessment

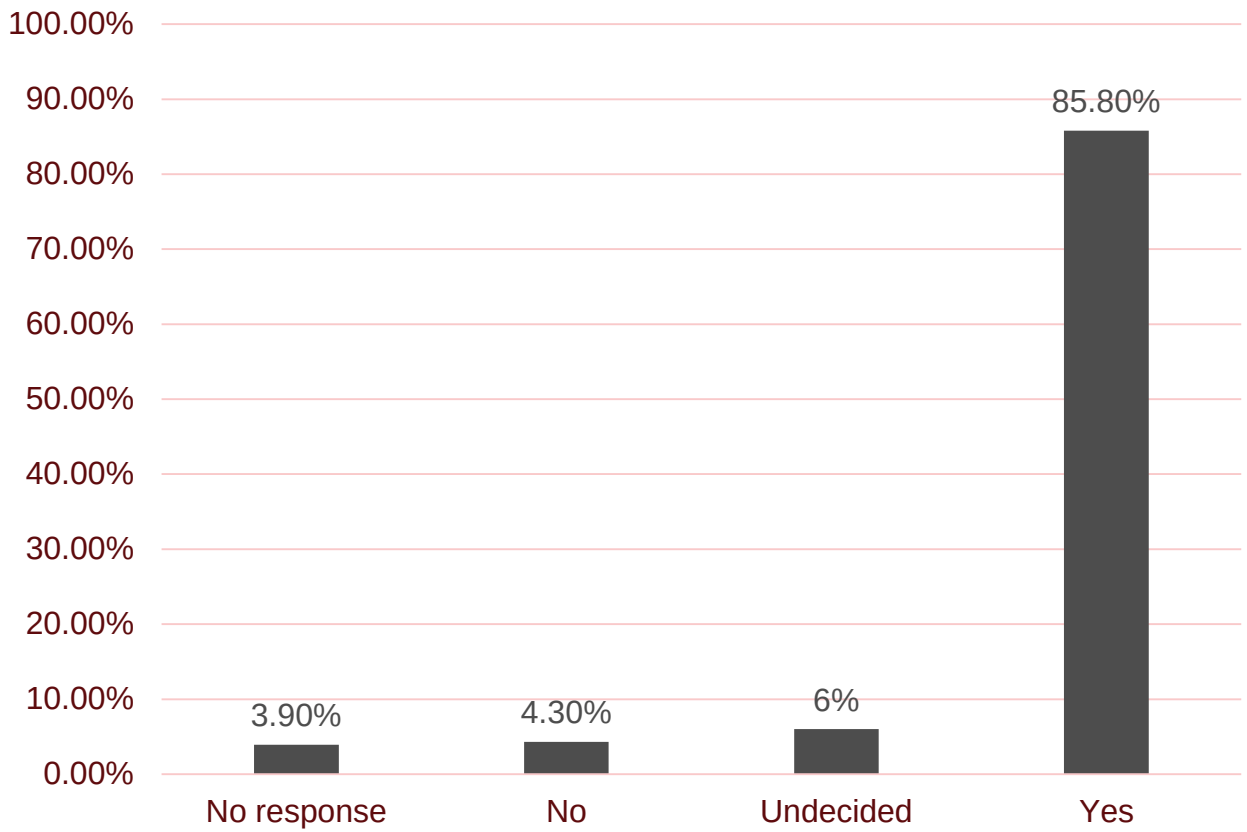
Comprehensive assessment of impacts, from construction to decommissioning, and including cumulative impacts from other proposed development and activities

- Coastal processes, sediment transport & contamination
- Marine water quality
- Intertidal & sub-tidal benthic ecology
- Fish, recreational & commercial fisheries
- Marine mammals
- Coastal birds
- Navigation & marine transport
- Terrestrial ecology
- Seascape & visual amenity impact
- Onshore transport & air quality
- Economy, tourism & recreation
- Marine & terrestrial noise
- Archaeology & historic landscape
- Flood risk
- Land quality
- Habitat regulation assessment
- Water Framework Directive assessment

EIA scoping report submitted to PINS:	*Oct 2012*
EIA scoping response received:	*Nov 2012*
Baseline reviews:	*Q1 2013*
Preliminary Environmental Impact Report ready:	*4 July 2013*

Headline Statistics Following Public Consultation

Having heard more about the project, do you support the proposal for a tidal lagoon and associated facilities in Swansea Bay?



Planning context

Planning Act 2008

- +100MW offshore lagoon = Nationally Significant Infrastructure Project
- Application to Planning Inspectorate (PINS) for decision by Sec. of State for Energy
- Development Consent Order (DCO) combines previous separate consent procedures
- DCO will comprise: lagoon structure, onshore grid connection, supporting development

Marine and Coastal Access Act 2009

- Marine license required for construction and dredging in Welsh waters
- Issued by Welsh Govt. Marine Licensing Team (MLT)
- PINS and MLT cooperate; processes run in parallel

Town & Country Planning Act 1990

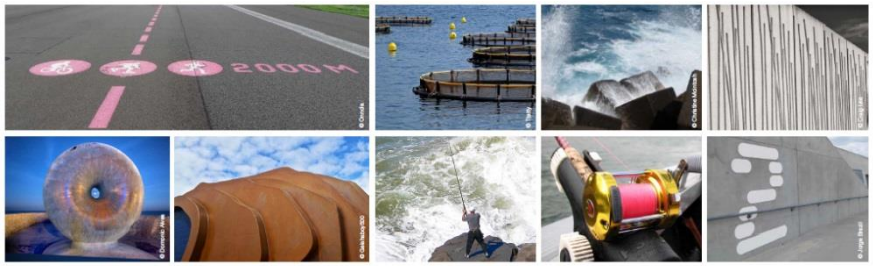
- Apply to Swansea/NPT Councils for elements outside the NSIP above Mean Low Water, e.g. bio-fuels facility

Landscape concepts – 4 marine parks

The lagoon provides a unique opportunity to establish ‘marine parks’ where new buildings and public spaces respond to their surroundings both on and offshore

Landward Urban Park – at western landfall

Landward Ecological Park – at eastern landfall



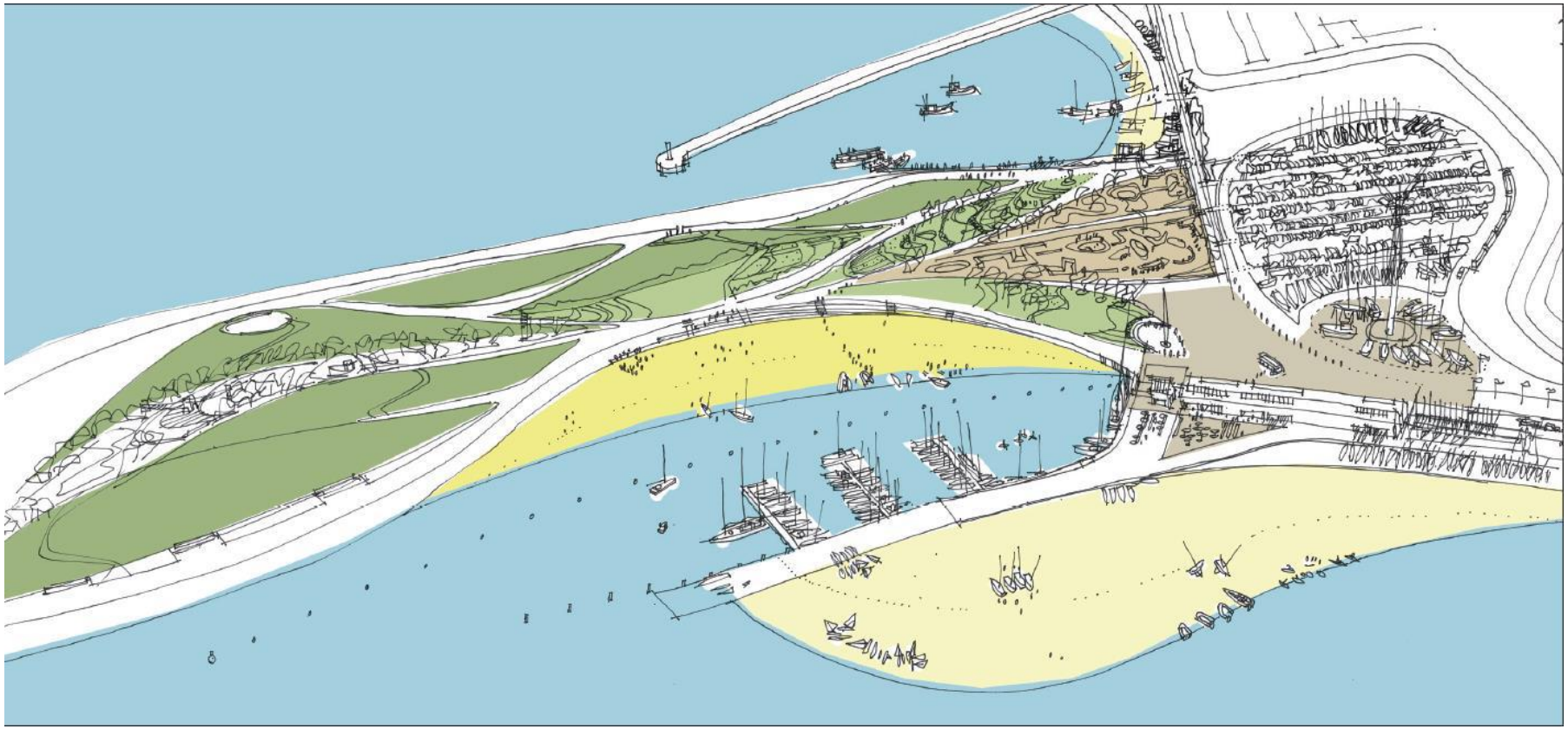
Broad Seaward Park – western seawall to turbine housing/offshore buildings

Narrow Seaward Park – turbine housing eastwards

Landward Urban Park CGI

Broad Seaward Park

Western landfall facilities



Western Landfall Building

Visitor orientation, operations & maintenance, boating centre

Offshore Building

Offshore Building – by night

Swansea Bay Timeline

2013

October	• Crown Estate Head of Energy key process meeting • Environmental Impact Assessment presentations
December	• First exchange of contracts turbines and construction

2014 January	• Submission of planning application • Investment round closes
May	• Preliminary Meeting with the Planning Inspectorate Commissioners and commencement of 4-6 month examination phase
July	• Completion of Turbine Model Testing • Completion of Geotube full scale deployment tests • Agreed form leases with three key landowners • Agreement of all construction contracts
November	• Inspectors begin writing up their report • Construction Financier due diligence commences
December	• Final form contracts for funding

2015

January	• Inspectors' report arrives with Secretary of State
March	• Planning approval

BUILD PHASE

Construction start	**March 2015**
Construction complete	**June 2018**

Job Creation

- Construction
- Operations and maintenance
- Building a local supply chain
- Long term economics

Swansea Bay – opportunity overview

- **240MW** tidal lagoon generating up to **400GWh** (net) annually. Electricity for **121,000 homes** (equivalent to Swansea's domestic use, 70% of the Bay's, or 8% of Wales')
- An extremely **reliable electricity source** offering predictable, zero carbon, electricity for 100 years. Saving c.216,000 tonnes CO_2 p.a.
- **World's first man-made lagoon** capable of generating electricity avg. 14 hours a day using both ebb and flood tides
- An iconic **education, sports** and **art amenity**
- An opportunity to develop a **tidal range industry** for the UK, centred around Wales
- Low risk adaptation of **proven components**. Project is comprised of UK standard sand core breakwater & bulb hydro turbines mounted inside concrete turbine housings

Welsh Power Comparison

Alltwalis, Carm. (wind)	23MW
Barry Power Station (gas)	235MW
Gwynt y Môr (offshore wind)	576MW
Wylfa, Anglesey (nuclear)	490MW

Construction and O&M employment

- **Job creation** – Independent study by Cardiff Business School estimates 5,220 new job years directly created across wide range of sectors & skills in Wales, such as:

  - **Manufacturing & construction** – 3,940 job years. Turbine forgings, machining of blades, stainless steel draft tubes, pre-cast elements for turbine housings, sluice gates, flood doors, rails, electrical controls, hydraulics, the visitor centre & ancillary buildings could all be manufactured/built locally
  - **Quarrying** – TLSB securing supply from Welsh and English (Cornwall) coastal quarries, min. 60 jobs for 3yrs (excl. indirect/induced)
  - **Operations & maintenance** – est. 60 long-term, permanent jobs running the lagoon

- **GVA** – £165m during construction

Long-term economic benefits - Con't

Location	Bund	Coffer Damn	Turbines & Sluices	Housing	Public Realm	Total (£m)
Swansea	£204	£67	£307	£109	£60	£748
Colwyn Bay	£408	£294	£1,344	£479	£100	£2,625
Lagoon 3	£816	£554	£2,112	£884	£100	£4,466
Lagoon 4	£360	£202	£768	£322	£100	£1,751
Lagoon 5	£306	£294	£1,344	£479	£100	£2,523
Total:	**£2,094**	**£1,411**	**£5,875**	**£2,273**	**£460**	**£12,113**

Long-term economic benefits - Con’t

Summary of Long Term Economic Benefits:

Tidal Lagoon Power will:

- Impose its own 65% UK content rule - £7,873 million
- Impose its own 50% Welsh content rule - £6,056 million

An initial 20,000 jobs created

Assume 9000GWh – then the on-going annual income to UK from lagoons is £1.035bn/year, for 120 years

Note: These figures do not include that income from:

- Tourism
- Sporting events
- Other

Swansea Tidal Lagoon Power – Business Hub

Purpose:

To foster a world class cluster of manufacturing, assembly and construction businesses capable of supplying an initial 5 tidal lagoons in the United Kingdom, with the potential thereafter to supply up to 50 locations world wide.

The Business Hub is centred on the Swansea City Region where the most attractive packages can be offered.

Anchor tenants of the Zone will be core Tidal Lagoon Power consortium members, who can then support a new Tier 1 and Tier 2 infrastructure.

Anchor tenants include Alsotm, Voith and Costain

Building a local supply chain

- Shopping list of turbine/other component parts identified. Scoping in progress to identify which companies in Wales can support this requirement. Support from:
  - IoD, Chamber of Commerce, Federation Small Businesses, CBI plus TLSB civil engineering partner, Costain

- Industry Champions being identified, and recruited on a voluntary basis, to help meet TLSB's **65% UK content rule**, All Champions are senior business leaders, experts within their field, and share TLSB's ambition of Wales becoming a world leader in turbine technology, design, assembly and manufacture

- Producing a Road Map by Summer 14

Key partners

ATKINS

Design, engineering
& project management

ALSTOM VOITH

Turbine design & testing

Van Oord
Marine ingenuity

Dredging, marine
engineering &
offshore projects

KGAL
consulting engineers

Specialist in control &
design of water gates

COSTAIN

Tier one, engineering
solutions providers

LDĀDESIGN

Masterplanning & landscape design

TENCATE
materials that make a difference

Textiles technology,
Geotubes®

sgurr energy
Sustainable Engineering Worldwide

Engineering consultancy
specialising in renewables

Potential Cruise Liners