South West Wales

Best Practice Club

Tidal Lagoon

10th September 2013

ADEILADU ARBENIGRWYDD YNG NGHYMRU

CONSTRUCTING EXCELLENCE IN WALES

Martin Nicholls

Chair

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Tidal Lagoon Swansea Bay

Project Introduction

September 2013

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

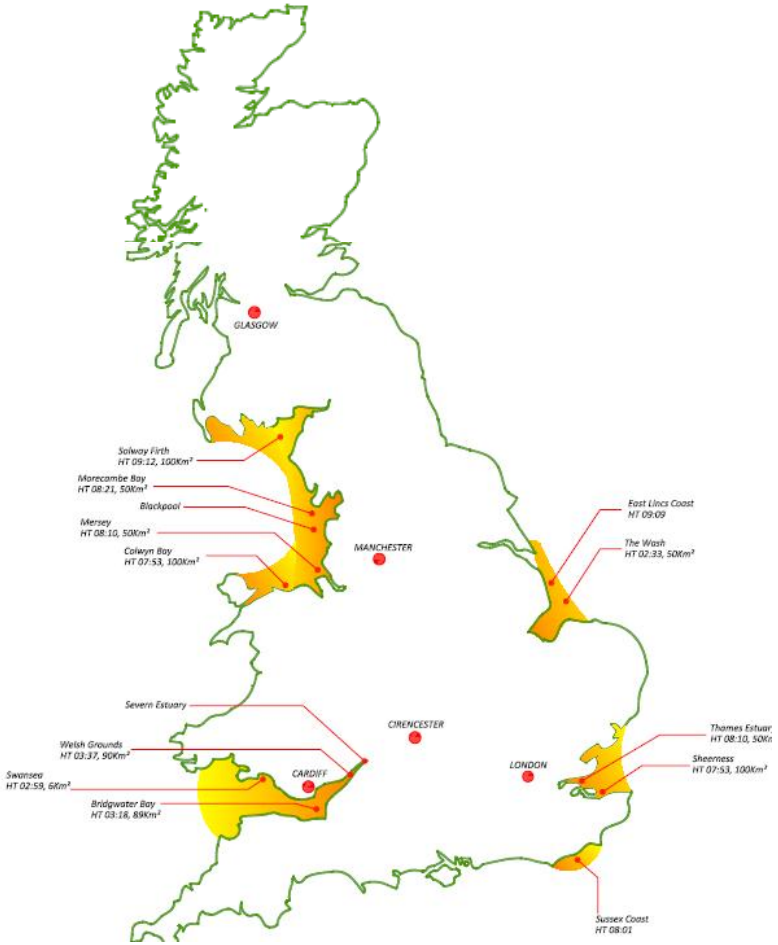
- 25% reduction in energy consumption
- Transition of energy for transport and heat from fossil fuels to low carbon sources
- 100% increase in electricity generation

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

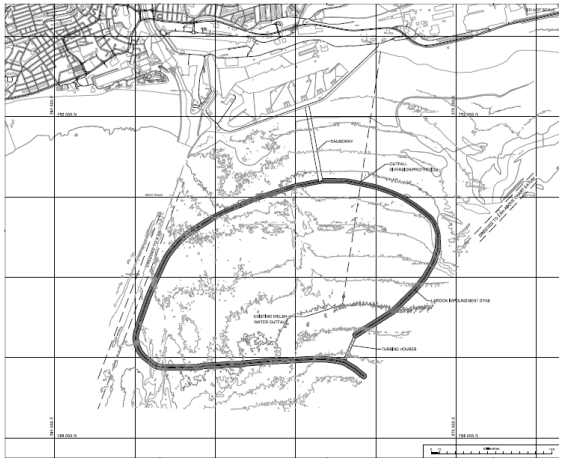


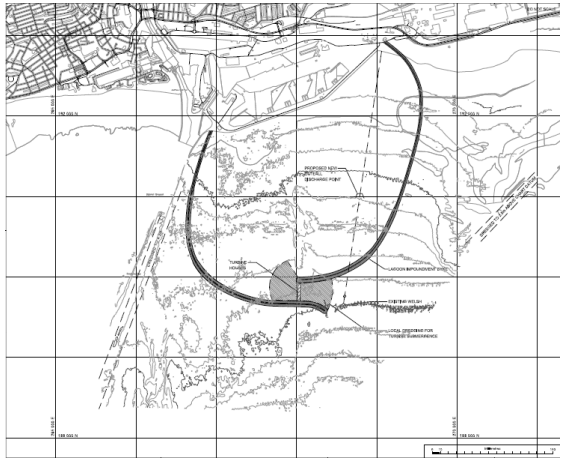
Ongoing EIA, viability & design refinement

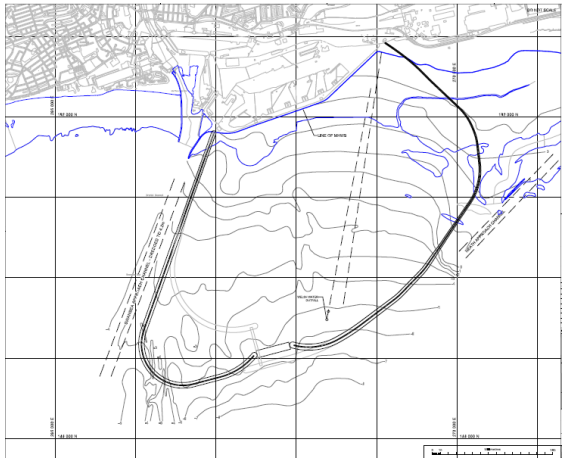
18 months of development work suggests Swansea Bay offers great potential for lagoon construction. Key ongoing work streams:

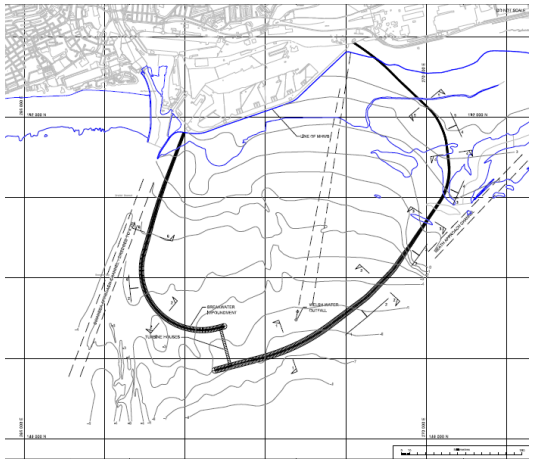
- **EIA** – scope agreed with regulators, EIA now underway, with collaborative input from statutory consultees (including NRW and LPAs). PEIR published 4 July.
- **Hydrodynamic modelling** – multiple lagoon shapes/sizes tested for water quality, sediment transport and sand erosion/deposition impacts
- **Value engineering** – reduce cost of sea wall, turbine housing, construction methods
- **Turbine design** – leading manufacturers Voith/Alstom/GE refining specifications for low-head bulb turbines
- **Grid** – pre-application discussions with National Grid & Western Power Distribution to identify 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

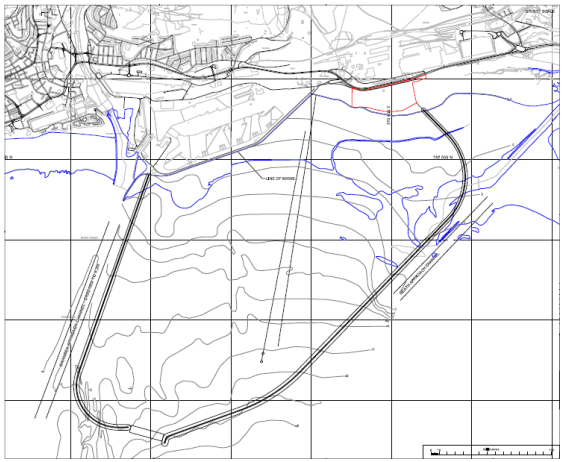
Summary of 14 lagoon options considered

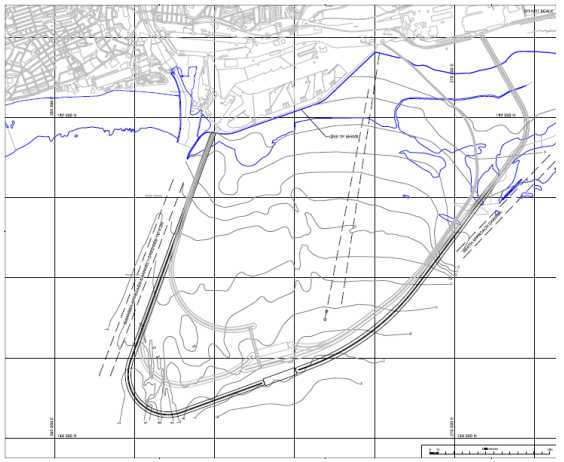




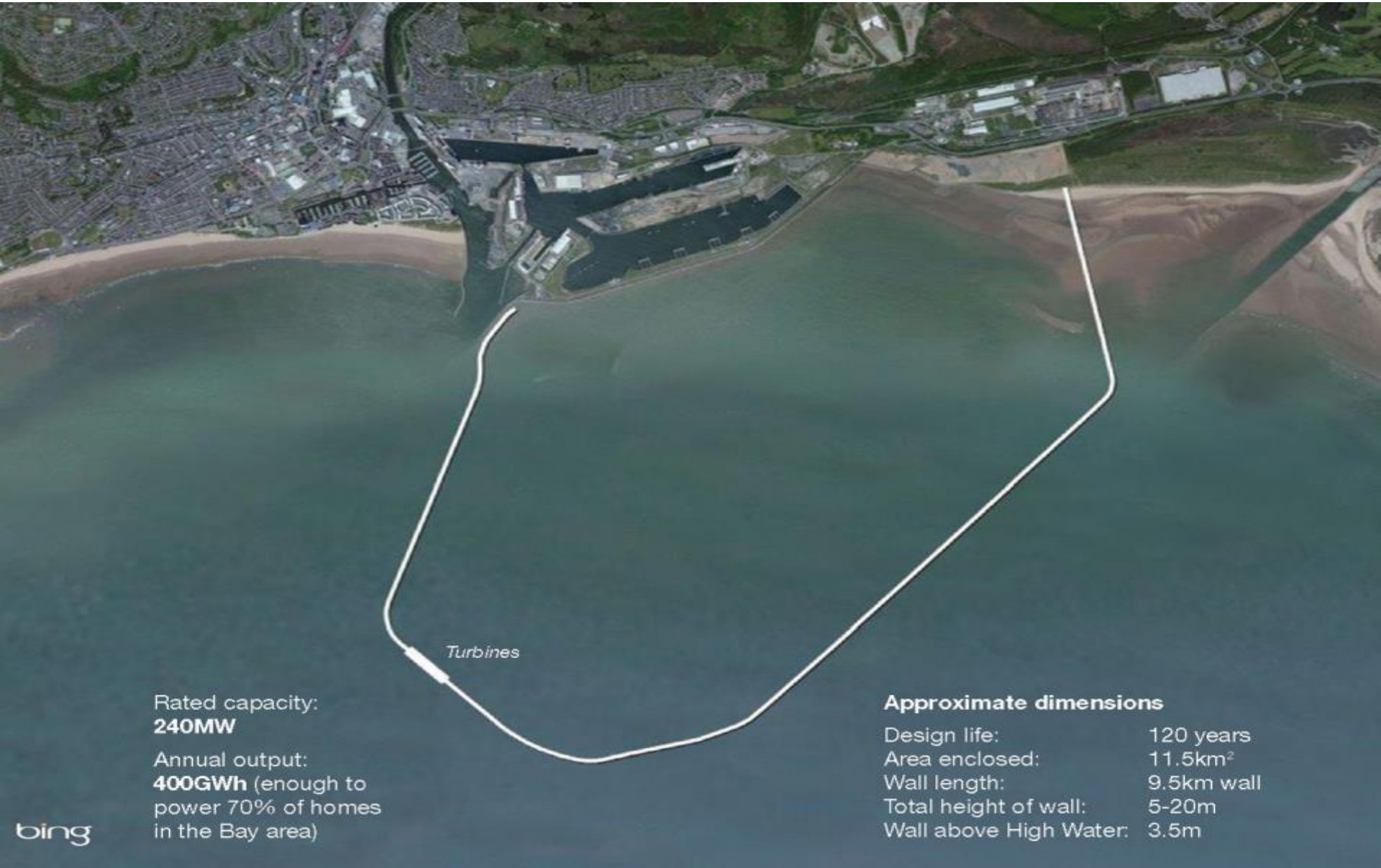








Current preferred option under review



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

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*
EIA Submission	*Dec 2013*

Consultation phasing

Phase 1, informal consultation with selected stat-cons and the public

- Issues & Options
- Phase 1a (basic project intro): autumn 2011 to February 2013
- Phase 1b (refined project intro/design): March to July 2013

Phase 2, formal consultation, s42 & s47 in parallel

- Preferred Option & the PEIR, 4 July to 5 August 2013
  - Approach agreed with LPAs & set out in SoCC
  - Incorporating EIA consultation requirements, publicity, etc

- **The EIA, Dec 13**
  - Additional phase, beyond that set out in SoCC, in response to concern over submitting EIA/DCO in late Oct without further consultation
  - 'Conference event': for stat-cons/key stakeholders and general public

Results-to-date: informal consultation

KEY ISSUE	RESPONSE
Coastal processes/sediment transport – impact on beaches in the Bay and further afield	EIA / iterative design process to minimise impact – e.g. changes to lagoon shape
Ecology – impact on fish, birds, marine mammals, other marine organisms	EIA / iterative design process to minimise impact – e.g. fish-friendly turbine design
Water quality – impact on designated bathing beaches, shellfish areas, other water uses	EIA / iterative design process to minimise impact – e.g. provision of storm water treatment
Visual impact	Increase no. of CGI views in EIA (LVIA)
Energy – how much energy, and when?	Energy optimisation studies / iterative design process to maximise energy production – e.g. changes to lagoon size/shape, number/size of turbines

Results-to-date: informal consultation

KEY ISSUE	RESPONSE
Navigation – impact on large & small vessels	EIA / consultation with port owners & users / iterative design process to minimise impact – e.g. changes to lagoon shape
Traffic & transportation – during construction, operation, events	EIA and masterplanning study. Aim to maximise use of rail/sea transport during construction
Planning – the process by which consent will be sought	Provision to include description in consultation materials
Deliverability – will it ever happen?	Provision to include company background, consultants' credentials, & project finance info in consultation materials

While a wide range of issues have been raised by stakeholders and the public, the balance of responses has been very positive.

Results-to-date: informal public consultation

Event	Swansea Civic Centre	Mumbles, Ostreme Centre	Port Talbot, Princess Royal Theatre	TOTALS
Date	11 April, 10am-6pm	16-17 April, 12-6pm each	18 April, 10am-6pm	~
Attendance	197	176	58	**431**
Feedback forms	77	93	32	**202**
In favour / undecided / opposed	71 / 6 / 0	78 / 14 / 0	25 / 7 / 0	**174 / 27 / 0**

- Common concerns as summarised, more info on EIA preferred
- Over 80% of attendees rated the event (useful/informative) as 8/10 or above

Results-to-date: formal public consultation

19 public events held, +1,100 attendees. +2,500 questionnaires completed

QUESTION	RESPONSES
Do you support reducing carbon emissions to help tackle climate change?	**91% yes**
Do you support the use of marine renewable energy sources to help reduce carbon emissions and assist the UK in meeting future energy demand?	**92% yes**
What forms of power generation do you think are suitable for the Swansea Bay region?	Onshore wind, Offshore wind, Nuclear, Coal, Gas, Fracking **Wave/tidal – 92% support**
Do you support the proposal for a tidal lagoon in Swansea Bay?	**86% yes** 4% no 6% undecided 4% no response

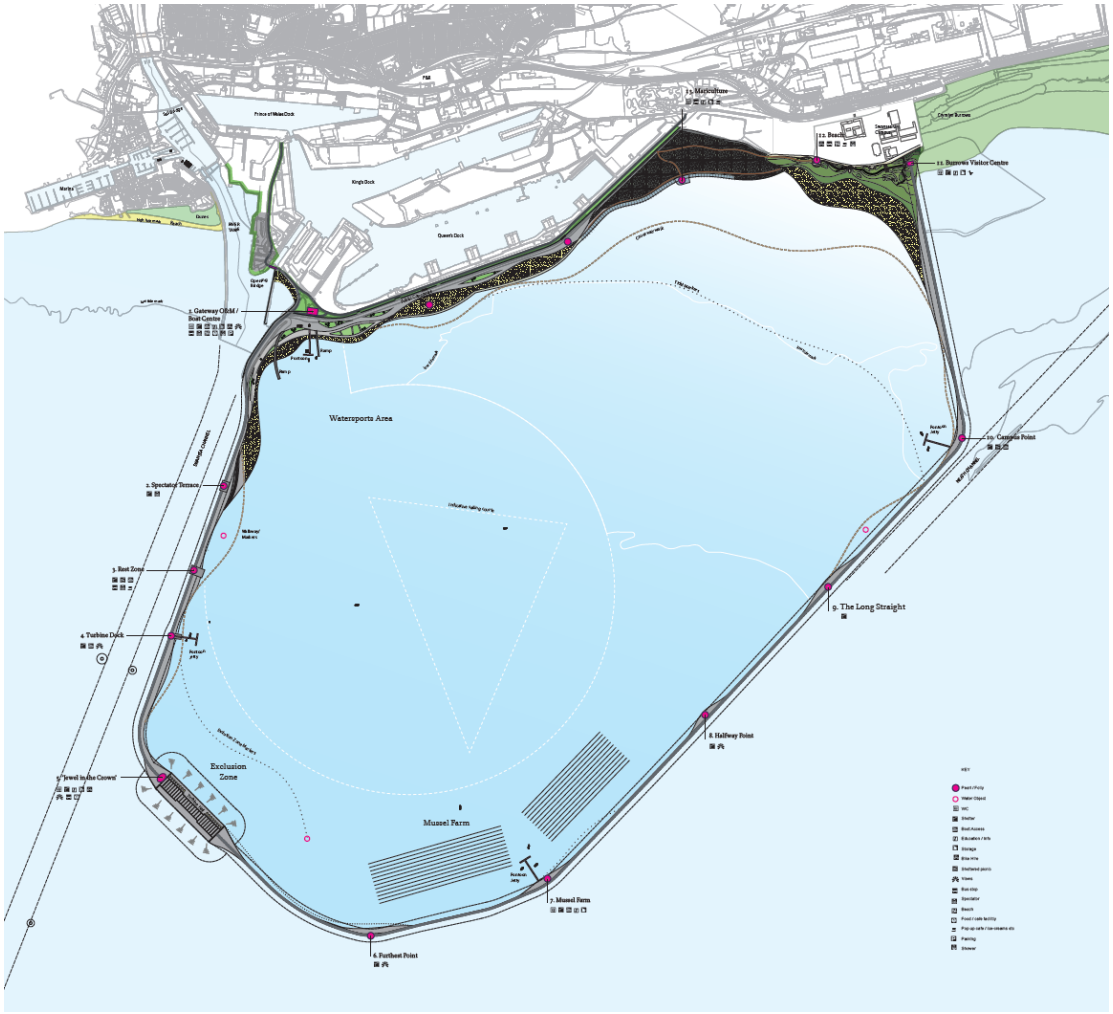
Results-to-date: formal public consultation

QUESTION	RESPONSES
Which potential effects are the most important to you? (% scoring 4 or 5 out of 5, on a scale where 1 is not important and 5 is very important)	Water quality – 88% Ecology – 85% Air quality – 81% Coastal processes – 75% Flood risk – 75% Visual impact – 68% Marine/onshore noise – 67% Archy/hist. landscape – 61% Rec. & comm. fishing – 56% Navigation – 56% Onshore transport – 53%

Results-to-date: formal public consultation

QUESTION	RESPONSES
Which benefits associated with the scheme are most important to you? (% scoring 4 or 5 out of 5, on a scale where 1 is not important and 5 is very important)	Clean energy – 90% New jobs – 85% Reduced local electricity tariff – 81% Regeneration – 81% Aqua/mariculture – 78% Sports & leisure – 77% Community benefits – 75% New tourist attraction – 74% Education – 71% World's first for Swansea – 65% Culture (incl art) – 46%

Masterplanning/landscape concepts



- Visitor facilities, sports, recreation, arts/culture and mariculture
- Improved connections across Swansea Docks from SA1 to new Uni SAIC along 3.5km waterfront
- 4 new ‘marine parks’, new habitats created
- 3 main buildings, (plus series of smaller structures TBC)

Marine Park 1 - Landward Urban Park

Landward Urban Park – at western landfall

- Main entrance to the lagoon from the land, including opportunities for recreation, sport and play, attracting a diverse range of people & creating a lively atmosphere
- Wide promenades, terraced platforms, a beach front, play spaces, attractive lighting, stretches of waterside parkland, trees and decking
- Access for boating associated with the Western Landfall Building(s)

Landward Urban Park CGI

Western Landfall Building concept

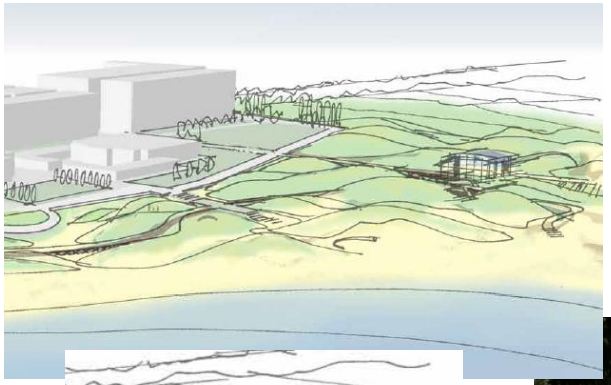
- Onshore Operations & Maintenance (O&M) and emergency facilities
- Boating centre PLUS: arrival/orientation/other facilities for visitors

Marine Park 2 - Landward Ecological Park

Landward Ecological Park – at eastern landfall

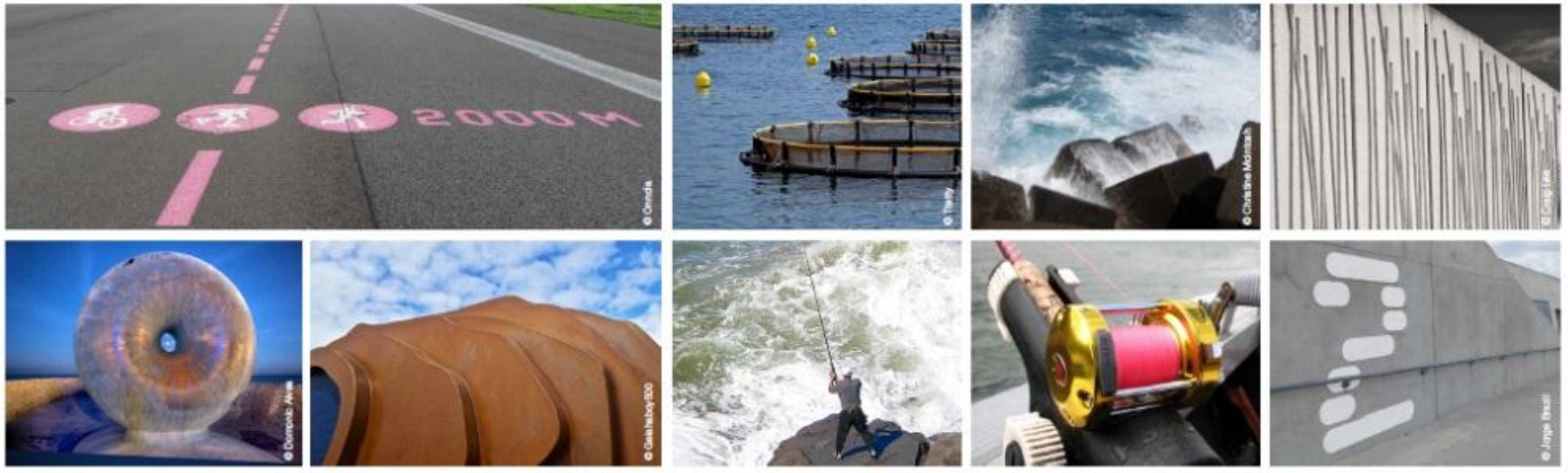
- Natural edge to the north-eastern section of the lagoon abutting Crymlyn Burrows
- New wildlife habitats (grasslands, saltmarsh, sand dunes) linked to the SSSI, a beachfront to the University SAIC and opportunities for mariculture production
- Timber boardwalks, informal paths, wild grasses, natural landforms and mariculture allotments

Eastern Landfall Building concept



- Seawall access control, onshore O&M facilities (as required) & info facility related to Crymlyn Burrows SSSI and the lagoon
- Single-storey building on proposed dune & grassland between SAIC & seawall
- Natural form echoing the dune system, views through and from the building

Marine Park 3 - Board Seaward Park

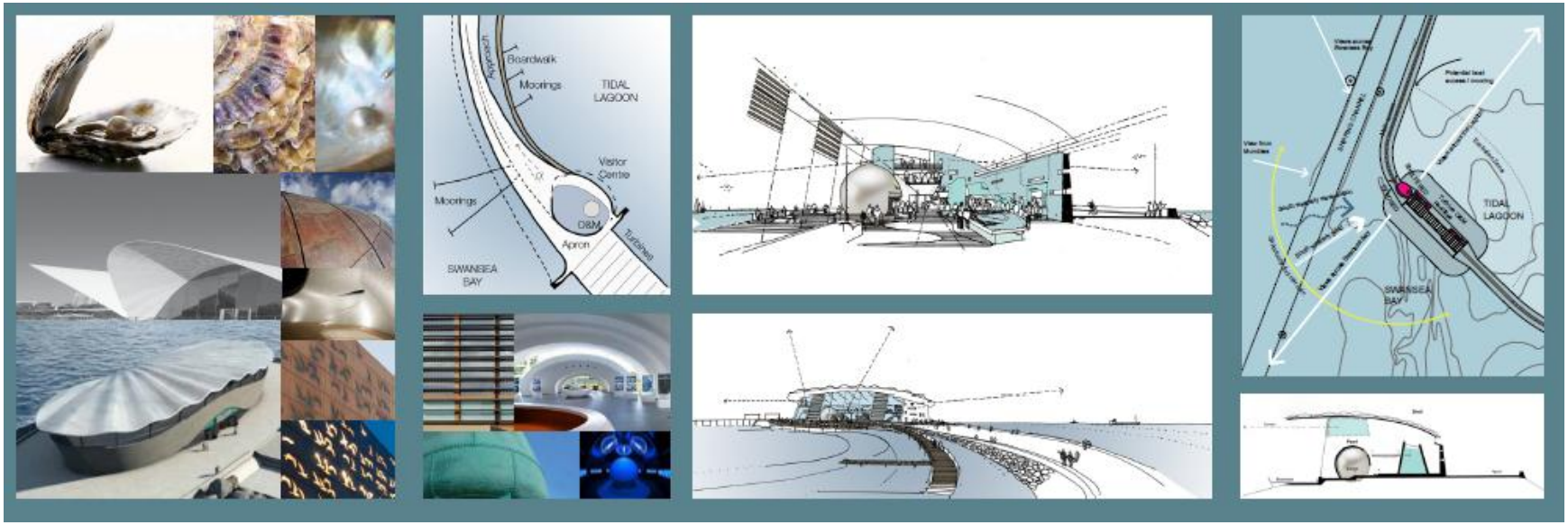


Broad Seaward Park – western seawall to turbine housing/offshore buildings

- Offering visitors a choice of cycle & pedestrian routes with opportunities for upper and lower level tide routes, straight and sinuous
- Typically hard landscape, with crisp concrete edges, cantilevered decks, sinuous walkway structures extending from the seawall, spectator seating, viewing platforms and access to the water's edge

Broad Seaward Park CGI

Offshore Building concept – ‘the Oyster’



- Offshore Operations & Maintenance (O&M) and emergency facilities
- Turbine visitor centre, exhibition centre, café, 360 views
- Visitors able to enter turbine housing from here

Marine Park 4 - Narrow Seaward Park

Narrow Seaward Park – turbine housing eastwards

- Extending along the most remote sections of the seawall, including the furthest point from land & the deepest waters of the lagoon
- Functional character with a hard, engineered landscape
- Typical features include patterned concrete, rock armour, follies & fishing platforms

Long-term economic benefits

- **Job creation** – internal estimate (subject of an independent study), but new jobs will be created directly & indirectly across wide range of sectors & skills, e.g:
  - **Supply chain & construction** – c.2,880 new jobs of which 1/3 direct & 2/3 indirect/ induced, c.80% local. Turbine housings, sluice gates, flood doors, rails, electrical controls, hydraulics, precast concrete components, the visitor centre & ancillary buildings could all be manufactured/built locally
  - **Quarrying** – preferred North Wales quarry, min. 40 jobs for 3yrs (excl. indirect/induced)
  - **Operations & maintenance** – min. 20 long-term, permanent jobs running the lagoon
  - **Tourism** – min. 40 permanent jobs created in visitor facilities (excl. indirect/induced)

- **Community fund** – 'lagoon grants' for community programmes, e.g. education outreach, energy efficiency schemes, recreational equipment for outdoor pursuits
- **Share offer** – public investment in the lagoon with South Wales prioritised
- **Cheaper electricity** – local lagoon electricity tariffs via partnership with Good Energy plc.

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

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®

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Engineering consultancy specialising in renewables

Tidal Lagoon Swansea Bay

An artist's impression *(CAD used to size wall heights)*