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BVGassociates

PowerPark Demand & Need Report

October 2009

PowerPark Demand and Need Report

REV	DATE	DESCRIPTION	PREP	CHK	APP
1	2nd June	First Draft	RMK	RHD	JW
2	31st October	Final	RMK	BAV	JW

CONTENTS

1 Background

BVG Associates Ltd and Douglas Westwood Ltd were commissioned by 1st East in early 2009 on behalf of the PowerPark Implementation Team which is a public/private sector partnership consisting of the East of England Energy Group, Renewables East, Associated British Ports, Suffolk County Council, SLP Engineering, East of England Development Agency, Waveney District Council and NWES. The commission was to undertake a demand and need study that would identify the optimum energy sector activity at the proposed Lowestoft PowerPark. 1st East promote employment led regeneration in the Lowestoft & Great Yarmouth sub region such as the PowerPark which is integral to realising Suffolk County Council's strong economic policy in being the greenest county.

The PowerPark Implementation Team believes that the opportunities outlined in the Executive Summary are on balance the best mix of energy sector activities for the PowerPark.

The aims of the study were to:

- Identify the vision for the optimum single or complimentary mix of energy-cluster activity at the PowerPark, factoring in the broader development context of maximum long-term sustainable economic development outputs and long term local jobs.
- Provide a simple summary of the appropriateness of each energy sector to operate within the PowerPark. Analyse and grade each option with a robust, evidence based Strength / Weakness / Opportunity and Threat matrix (SWOT.)
- Provide a national and regional market analysis of the defined[1] energy sectors that are potential PowerPark residents.
- To identify and undertake a structured appraisal of potential development options for PowerPark in (terms of uses, activities and mixes thereof) which would most effective support the long-term sustainable development of the sub-regional energy cluster and recommend a preferred option.
- Provide a robust evidence base fit for the purpose of: supporting/informing the Area Action Plan development; informing development of a robust business/investment case fit for Green Book Appraisal purposes; informing and support land acquisitions and negotiations; informing any master planning work.

This study is Phase 1 of a 2 phased approach to the Demand and Need assessment which collectively seeks to determine and identify the form and nature of the hard and soft infrastructure needed to best capture the opportunities for the growth of the offshore renewable/energy sector. The outputs of Phase 1 work - the activities and potential occupier requirements identified - will inform the Phase 2 Demand and Need work. The Phase 2 'spatial conversion' work will address the more technical, land/property related elements, to the overall demand and need work - deriving specific spatial/infrastructure requirements from the high-level requirements presented in this document,

Importantly, in this work, we are considering the PowerPark's development as being one component, albeit central, in a sub-regional portfolio comprising the hard and soft infrastructure needed to support and maximise the opportunities for growth of the energy sector across the Great Yarmouth-Lowestoft sub-region. It is in this broader context that the Power Park concept, its positioning and mix of the types of activities/uses most appropriate, are being researched and considered.

The work aims to capture emerging market interest/requirements and consider them aside both the potential capacity of PowerPark to accommodate them and the comparative long term contribution they may offer towards the development of a sustainable offshore energy cluster in the sub-region.

[1] Oil, gas, CSS, biomass, Gas storage, nuclear, offshore wind operations and maintenance, offshore wind project construction, offshore wind foundation manufacture, tidal and wave energy.

2 Demand and Need Report Summary

This document explains the background and vision for the PowerPark. The primary datasets referenced were correct at time of research in early 2009. The SWOT methodology is explained in Chapter 5. The SWOT summaries of each sector (Chapters 6-16) provide the robust evidence based data on which the recommendation is made. The opportunities and dangers are explained within each energy sector (Chapters 17-26.) Additional detail (Appendix 1-2) for renewables policy and offshore wind (Appendix 3-6.) are included.

3 Executive Summary

3.1 Summary

The energy production industry offers considerable development opportunities for the PowerPark, Lowestoft region and sub regional area.

The options appraisal has identified that a mix of complimentary energy sectors will deliver the maximum economic and employment benefit for the PowerPark. No single energy sector makes a strong enough case for sole use of the entire proposed 15 hectare PowerPark space. The biggest threat to the proposed development is that competing land and port owners within the PowerPark reduces the amount of space available. If the competing owners do not buy into the same regional / sub regional vision then the local capability will be reduced. This will ultimately dilute the size of the opportunity.

Offshore wind Operations and Maintenance (O&M) comprises a large part of the mix and is covered in detail.

A PowerPark champion will be needed to unite the competing land and port owners to deliver the vision.

3.2 What is the vision?

Based on careful analysis of the SWOT of each energy sector and of the identified development options against the agreed criteria we recommend:

A centre of excellence in offshore marine engineering
focusing on a mix of:

1. Offshore wind Operations and Maintenance (O&M).
2. Offshore marine energy Research and Development (R&D).
3. Existing traditional marine and underwater engineering facilities.
4. Mixed use area with blend of other energy activities that do not require significant land or quay space. These include
   a. Carbon Capture Storage (CCS).
   b. Gas storage.
   c. Nuclear.
5. On-site training centres to supply the energy sectors.[2]

3.3 Size of the opportunity

By 2020, based on industry estimates, an additional 950 direct and almost 4000 indirect jobs will be created. Indirect jobs are in local supply chain, hospitality and other fields. Economic benefit from offshore wind O&M[3], within the sub region alone, is expected to be £3 billion in total up to 2020. Economic benefit is difficult to predict for the other sectors due to the immaturity of their markets. It must be remembered that many of these sectors are still ten years from being active and determining requirements/skills/facilities etc for such sectors is not an exact science and we have estimated these requirements through our own experience.

3.4 Conclusion

The opportunities for the PowerPark and the region are considerable.

A certain amount of organic economic and employment energy sector growth **will** happen without any proactive intervention.

The PowerPark, Lowestoft area and sub regional will only be able to maximise the economic and employment benefits when a co-ordinated, complimentary and proactive environment between stakeholders, policy, and land / port owners is put into place.

Policy: It is very important that delivery is aligned across the region. East of England Energy Group (EEEGR), East of England Development Agency (EEDA), 1st East, Renewables East, Waveney District Council, Suffolk County Council and East of England Regional Assembly (EERA) through the Demand and Needs study co-ordinate and unite to promote the capability of existing regional facilities, skills and ports via a single point. This includes a marketing strategy for the area to be recognised as the most committed, responsive, flexible and pro-active sub region.

Ports: There are 2 competing commercial port companies close to each other, EastPort UK (Great Yarmouth) and Associated British Ports (Lowestoft.) The size of the combined energy sector opportunities is large enough that each individual port will benefit more by coordinating their offerings than competing.

[2] A key component of the sector selection process was the ability to use a local pool of engineering graduates, office staff and marine experts.
[3] The Offshore Wind O&M benefit is covered in detail in Appendix 2.

Funding: We have assumed that in the current economic climate we believe there will be constraints in public funding. We have weighted favourably energy sectors that do not require significant initial amounts of public funding. Much policy and planning preparation can be done without significant public funding. Given that significant areas of the PowerPark land are in public ownership this could provide a significant contribution to realising the investment required.

Land: There is one single critically important requirement for land and quay space capability. Offshore wind O&M will require in the outer harbour at least 50m of continuous quay space close to a warehouse in 2014. Alternative uses of land that are in competition could deliver short term benefits but destroy the long term vision. If the critical area of land / port is occupied then the development will be restricted and the PowerPark becomes a less attractive offshore wind base option. This quay space can be anywhere in the outer harbour.

Skills: The economic benefit of placing Higher Education and Further Education (HE/FE) facilities within the PowerPark (up to the 2020 timeframe) is small however we see reasons to attract HE/FE centres to the PowerPark. It is very important, in the long term, that links are built from industry to HE/FE in order to strengthen the local skills capability and provide greater long term local employment.

These links / relationships will be stronger by placing them in close physical proximity. Current local[4] HE/FE facilities already have space constraints and moving to the PowerPark can only be of benefit.

One of the roles of the PowerPark Champion will be to maximise the potential for relationships, identify links and opportunities and identify skills demands - this would include working with the OrbisEnergy Centre and other local energy companies.

We recommend the facilities focus on three skill sets – the details of which will become clearer as the PowerPark progresses and the champion defines them.

The skills that need to be developed within the sub region are:

- Engineering (electrical, mechanical, marine and possible civil.)
- Office and Management – including logistics and general office functions.
- Marine Operations – Including underwater and Health and Safety.

[4] Lowestoft College 2009

4 Vision

4.1 Summary

This section outlines the requirements of each individual sector within the energy cluster mix. The individual sectors within the energy sector mix have been selected for maximum benefit in terms of economic and employment growth. One of the aspirations for the PowerPark is that it is powered by renewable energy such as biomass or wind. If a wind turbine manufacturer becomes a resident in the PowerPark they, not the stakeholders of the PowerPark, would like to select the manufacturer of the visible onshore turbine.

4.2 Spatial Requirements

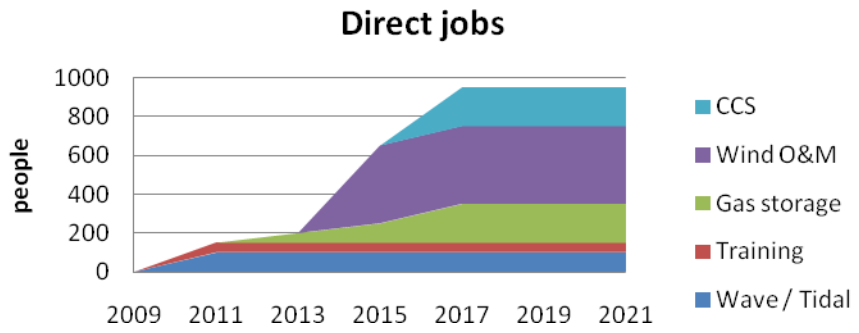
To satisfy the requirements of the energy sector mix the following must be available:

- 100m (in 50m sections) of non continuous quay length available in 2010 rising to 300m by 2020. 40-60m pontoons need to be placed at various locations close to available quay.
- 7,000m^2 of flexible, secure and bonded warehouse space.
- Flexible, secure and private office spaces with separate and private meeting facilities and high speed internet facilities to accommodate 1,000 people. 100 of these spaces are for training and the configuration requirements for these would be provided by the relevant HE/ FE facilities in advance of residence.
- 3000m^2 of light marine engineering workshops with access to compressed air and the ability to drain industrial oils.
- 30,000m^2 of flexible, fenced, secure and CCTV monitored outdoor storage space.
- Wet and dry storage rooms with secure storage of personal effects for 270 people. This is separate to office space.
- Skills and training facilities – subject to on-going research.
- Parking spaces for a mix of private, light and occasional heavy commercial vehicles.
- The ability to easily move heavy loads around within the PowerPark by forklift or truck. External traffic, road and street furniture amendments are minimal due to the existing complex local traffic network.

The tidal R&D centre has additional requirements for underwater testing and underwater power. The facility requirements would be provided by the prospective customers in advance of their taking up residence.

Demand should scale in a linear fashion with time except for offshore wind O&M – which requires a large facility investment around 2014/5.

The following charts have been created to give an indication of possible facilities requirements over time. We have gathered what facilities and skills are required based on current operating methods. Timelines are based on industry expectations. For some of the more immature sectors (CCS and Gas storage) the values are by their nature necessarily **speculative** but are included in order to simplify the demand and need chart report.


Direct jobs
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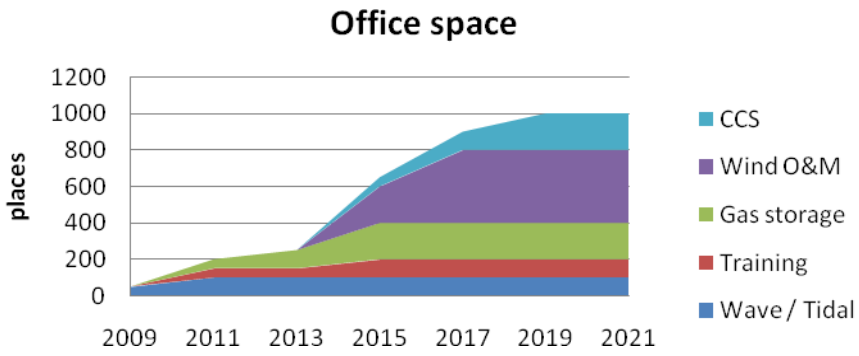
CCS
Wind O&M
Gas storage
Training
Wave / Tidal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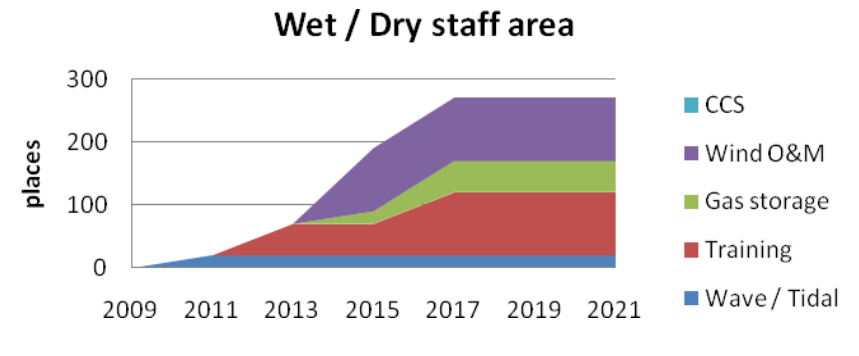
Wet / Dry staff area
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Gas storage
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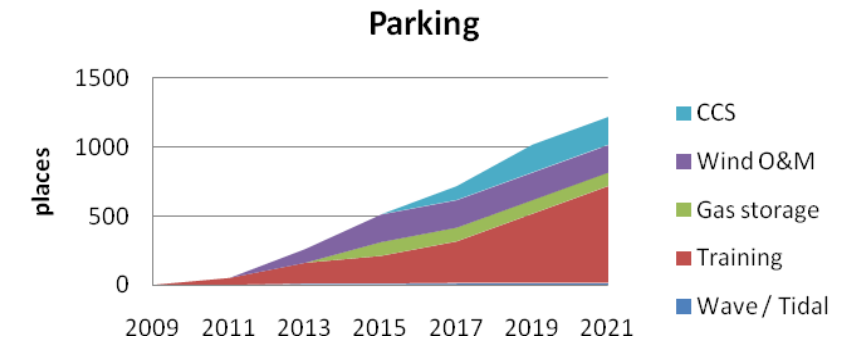
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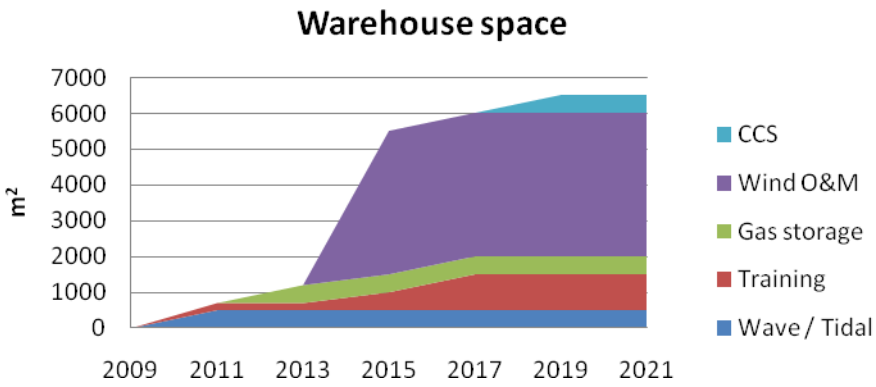
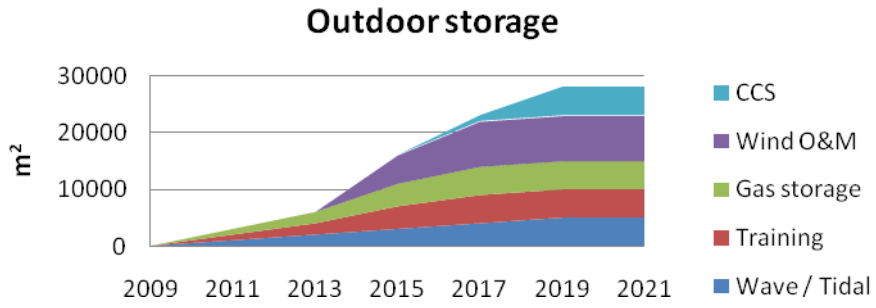
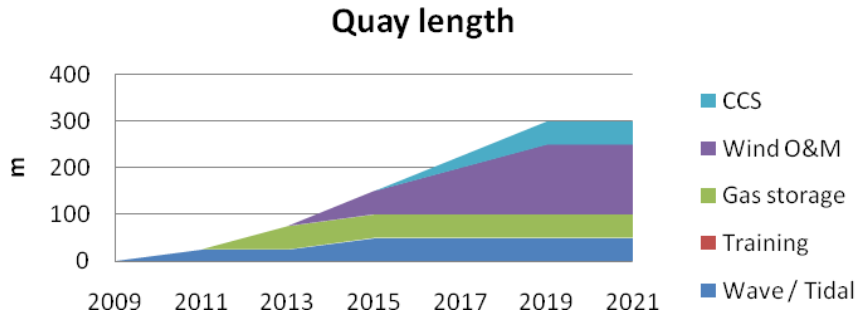
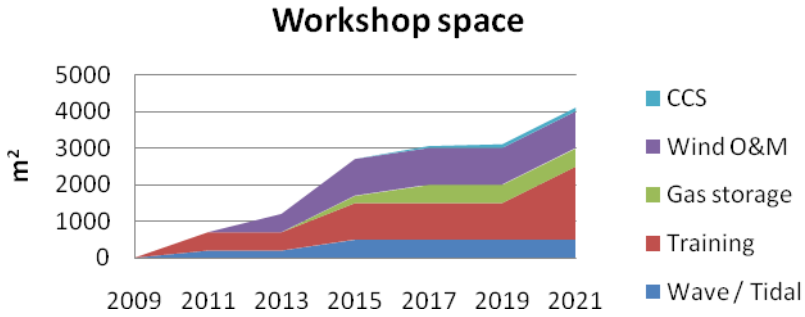








4.3 *Spatial requirement detail:*

The following section outlines the exact specifications of each energy sector, focusing on timelines, funding and facility requirements.

Offshore Wind O&M

Timeline: The offshore wind O&M market off the East of England coast will significantly increase with the development of the nearby Round 3 zones (particularly the Norfolk zone). It is expected that Round 3 developments will begin in earnest from 2015. Initially the activity will include surveys and environmental assessments of potential sites. Wind O&M customers usually deliver a Letter of Intent (LOI) to the port or

land owner 18 months prior to start of operations. Any development required would need to be completed within that timescale or begun at a risk – this has been the experience of similar developments.
Funding: No significant initial public funding is required but the important quay space must be available with warehouse space in close proximity. The "spatial conversion" study should provide potential customers with a list of options for space, quay length and facilities. This will allow them to quickly understand available or potential facilities. Obviously any public funding availability to help reduce the CAPEX outlay by a potential customer will make the PowerPark more attractive.
Requirements[5]:

- Blocks of 50m of non consecutive quay side space. Ideally three – so 150m in 50m blocks. Not all blocks will be required at once.
- 4000m^2 warehouse as close as possible to contracted quay space. Warehouse ideally has 6m roof height with shelving units to handle 1,000kg weights in a bonded area.
- Open Area for high turnover of crates. Note: Different turbine manufacturers prefer to be separate from each other, with secure private space. At the moment the area needs to store a complete set of spares for each project.
- Generic office space for 400 people with high speed data connection with:
    - Private meeting space..
    - Open plan seating to handle frequent changes in staffing levels.
    - Marine control centre.
    - Logistics control room.
- Engineering workshops for light use. Workshop requires compressed air and drainage to handle light / medium oil recycling.
- Parking.
- Staff area including:
    - Changing rooms.
    - Storage rooms.
    - Dry rooms with air blowers and no carpet with space to hang and drip dry clothes.
    - Wet rooms to store immersion suits or anything that can be wet (PPE – equipment and clothing etc.)
- 60m pontoon and marine lift facilities (small mobile cranes) to load 1,000kg weights quickly and easily from quay to vessels.
- Road or land based systems to move 1,000kg units quickly and easily around site with forklifts.
- General facilities – for day to day operations of vessels and land based operations.

Tidal R&D
Timeline: Promotion for this can start now and will run until at least 2030 .
Funding: Initial public investment in the form of R&D capital expense is expected to be high for tidal R&D. Most tidal companies are not commercially profitable.
Requirements:

[5] Based on **current** operational models. Vestas. GGWE and Siemens.

- Small scale flexible office space. We would not expect it to exceed seating for 20 employees per company. We expect a high churn rate as companies succeed or fail.
- Flexible, secure and separate small warehouse space.
- Light fabrication space.
- Marine engineering facilities.

The nearest Tidal Resource for R&D is located off the Norfolk coast, and therefore the ambition in Lowestoft is to concentrate on the office based functions and linkages with skills providers and the benefits of being in close proximity to other research being carried out by similar companies and research institutions.

Carbon Capture and Storage

Timeline: This sector is likely to start full operations around 2020 with long-term growth driven by emissions targets and regulations surrounding CCS for gas and coal power plants in the UK. Facilities should be in place 12-18 months prior to operational start-up.

Requirements: The following requirements are based on a CCS operational based being established at the PowerPark. They are an estimate and subject of some uncertainty reflecting the relative immaturity of the sector

- Less than one hectare of land (Initially)
- Up to 50 metres of non continuous, non-exclusive quay space
- Warehousing (>500m^2) easy quay side vessel access
- Engineering space
- Security – Fenced area with CCTV
- Flexible Office space
- Parking
- Staff area including wet rooms, dry rooms (for planned O&M activities.)

Gas Storage

Timeline: This sector is likely to start full operations around 2012 with short-term growth driven by energy security and future demand. Companies would initially require flexible office space and warehousing some 12-18 months before this date.

Requirements: The following requirements are based upon a gas storage operation being set up in the PowerPark to provide O&M services. They are an estimate and subject of some uncertainty reflecting the relative immaturity of the sector.

- Less than one hectare of land.
- Up to 50 metres of non continuous, non-exclusive quay space.
- Warehousing (500>m^2) easy quay side vessel access.
- Engineering space.
- Security.

- Flexible office space.
- Parking.
- Staff area including wet rooms, dry rooms (for planned O&M activities.)

Existing Marine Engineering
Timeline / requirements: This sector is already in place. A detailed land study is underway with 1st East to determine land ownership and reservation.

Nuclear
Timeline / requirements: Nuclear activities do not need any significant space or investment and could utilise the port facilities that are available today. Equipment passing through the port is the main opportunity, but off-site office and project management requirements are also being investigated with the Utility companies.

Skills / Training Centre
Timeline: Timeline: This can start now and will run until at least 2030. Some of the local colleges / universities are already undertaking their own feasibility studies. Discussions are ongoing with training providers on any requirements in the PowerPark area.
Funding: A high level of initial level of public funding is assumed for FE/HE facilities. However the benefits in local job creation are considered to be important enough to justify the placing of such facilities on site. In addition some local facilities have existing space constraints and wish to expand.
Requirements: It is difficult to estimate requirements currently but in order to make sure that teaching facilities cannot be excluded we have gained some optimistic requirements data. These requirements are being refined with local skills providers in discussions instigated by 1st East and will be investigated further in Phase2 Demand and Need work.'

4.4 Soft requirements:

4.4.1 Skills

By 2020 we expect the following direct jobs as a result of the proposed PowerPark development.

	2020
Electrical engineers	100
Civil engineers	200
Marine engineers	100
Marine operations	100
Office / general	100
Management	70
Logistics	50
Marine / R&D	40
Geotechnical / R&D	40

4.4.2 Funding

Criteria, access and options around public funding for the PowerPark requires further investigation by experts in the field.

The phasing of funding is important. Initial minor amounts of public funding would allow co-ordinated marketing and proactive preparation of the PowerPark site for the energy sectors of offshore wind O&M, wave, gas and carbon storage and nuclear. This could be initiated by funding a champion and possibly some selected direct marketing. Only then, if required, the business case could be made to justify the purchase or reservation of important land or quay space (or other investments to pump prime and catalyse development) to ensure the long term vision of the PowerPark.
The ideal outcome of the role of the champion is ensuring the creation of jobs and economic benefit by maximising commercial returns for land / port owners so that there is a lower requirement for public funding.

Infrastructure investment is expected to be low but phase 2 Demand and Need 'spatial conversion' work will give a better estimate of the detailed requirements.

Tidal research and Training facilities are the only 2 sectors that require large initial public investment. Testing tanks are very expensive to build and maintain.

Commercial companies look for ways to reduce their capital expenditure (CAPEX) and would obviously welcome any public funding money - as long as there were no fundamental restrictions that impacted their commercial business model. A co-ordinated regional strategy will define energy sectors where capital investment makes economic sense for the sub-region – as long as Green Book and State Aid criteria are met.

4.4.3 Champion

Experience of similar developments[6] demonstrates that a single point of contact can be critical to success. The champion would:

- Co-ordinate internal and external delivery.
- Manage customer queries.
- Initiate proactive initial contact with all prospective customers and others.
- Align capability (facilities, land and port owners)
- Distribute reports, studies and policy.
- Liaise with FE/HE facilities
- Channel R&D requirements and opportunities.

4.4.4 "What if" scenarios

Commercial forces will ultimately determine how successful the PowerPark is. The role of the champion will be to maximise the attractiveness of the PowerPark to commercial residents. If a major part of the mix (offshore wind O&M) decides against the PowerPark or the wind market collapses due to low hydrocarbon prices – then the mix is designed to maximise the existing marine engineering. Exhaustive risk analysis was undertaken for offshore wind O&M as a result and the options appraisal work identified and appraised alternative development options which may be revisited and pursued if circumstances necessitate. The broad portfolio mix minimises the risk in the eventuality of any one energy sector failing.

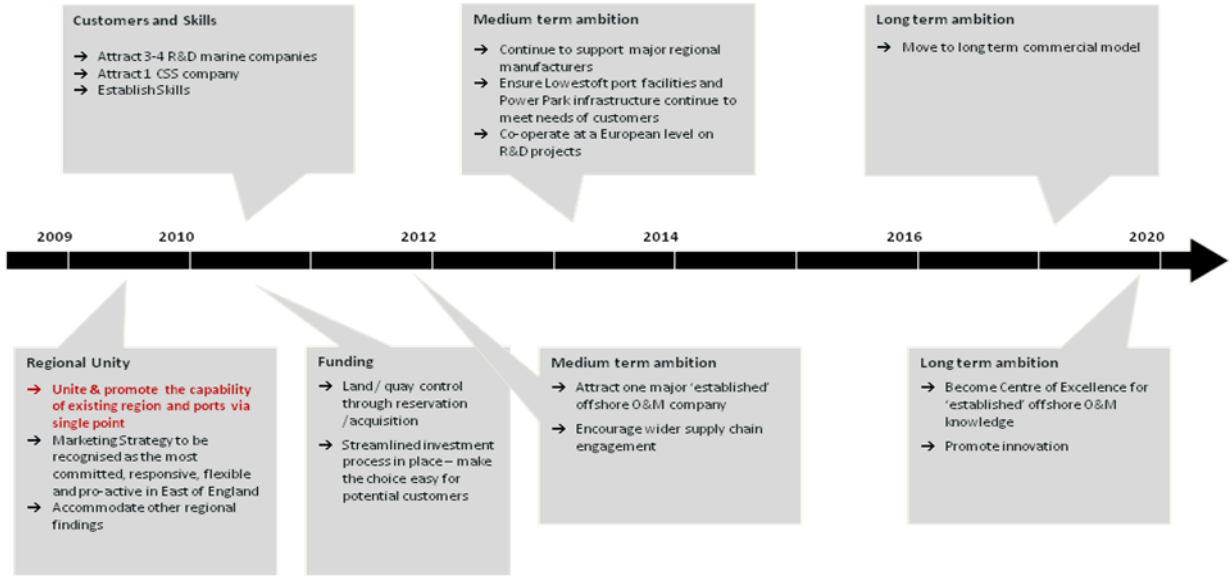
Delivery model and phasing
Be united, proactive and fund critical components (if required) such as infrastructure to ensure success.

[6] Bremerhaven, Fife Energy Park

The delivery model we suggest, based on other sites and the current economic climate, says:

ENGAGE: (now) Unite and co-ordinate local policy, land and port owners. Create a single champion. Create a single coherent marketing strategy to take to markets. Engage with markets.
PLAN: (2010) Define thresholds for success / failure. Define change process for exceptional success /failure. Plan the transformation of the PowerPark – including funding and land reservation options. Ensure the critical PowerPark components (Quay space) are available.
TRANSFORM and REALISE: (2011-15) Transform the existing PowerPark to realise the Vision.
REVIEW: Have review gates to measure success. Refine a "continuous improvement process" to maximise potential.

We would expect the champion to provide / maintain a roadmap (indicative example below)



5 SWOT Methodology

Methodology:

The methodology consisted of telephone and face to face interviews, report analysis and site visits focusing on the capabilities / restrictions of Lowestoft and the requirements of the various energy sectors.

All of this work was undertaken in context of the wider regional development strategy.

In detail, the report focused on:

1. Collection of key data on land ownership, port and the harbour in the Lowestoft both by web based research and direct contact with port owners.

2. Questionnaire-based interviews and consultation with:

   - Relevant customers including developers, manufacturers and supply chain.
   - Regional stakeholders including the local councils and development agencies.
   - Regional capability suppliers including FE/HE.

3. Shortlist of previous reports, from DECC, EEGR, RE, 1st East and others, used to validate local capabilities and energy industry requirements. Many existing policy initiatives and studies are relevant to a consideration of PowerPark opportunities in the East of England region. These are cited in the bibliography.

4. Informal discussions with site owners of suitable similar sites to gather lessons learned.

5. Previous research in similar fields.

It must be remembered that a number of these sectors are still ten years from being active.

A full list of interviews is found in the Appendix 1.

Note: The onshore wind, oil, gas, carbon capture, microgeneration, biomass and nuclear sectors were reviewed and scored by Douglas Westwood Ltd (DWL.). These DWL sections are shown by red SWOT tables. All the other sectors were done by BVG Associates Ltd.

6 Offshore Wind O&M SWOT Analysis

6.1 Summary

Lowestoft is almost ideal for the offshore wind O&M industry. Historically, Lowestoft and Great Yarmouth have supported the development of the gas fields in Southern North Sea (SNS). This has left a valuable legacy of experience and supply chain synergy, particularly in the delivery and project management of off-shore structures. The benefits of offshore O&M are long term, high-income employment. Wind O&M has minimal facilities requirements, typically less than a hectare of warehouse, office and light engineering space per customer. A maximum section of 50 meters of continuous quay space is required - up to a maximum of three sections of 50m. We recommend marketing and promotion of Lowestoft PowerPark to attract the attention of the industry.

6.2 Background

The operational support and maintenance of an offshore wind farm is usually carried out from the nearest suitable port. The O&M supplier plans daily trips to maintain the wind farm. Summer work is more intensive and requires more people and equipment. The O&M crews also respond to faults at the wind farm but this is usually done within the daily scheduled trips – it is rare for an unscheduled trip to happen unless it is a serious fault. Weather has a big impact on the amount of work that can done – bad weather limits access to the fixed platform wind turbine. Most offshore O&M ports currently expect about 40% downtime for bad weather.

The O&M base location is usually decided by the Wind Turbine Manufacturer (WTM) since they provide the Original Equipment Manufacturer (OEM) warranty and have contracted service levels to meet in the early years. The location decision is made in consultation with the wind farm developer as they may choose to move away from the OEM post warranty. The order of priority for choosing the O&M base is[7]:

1. Travel time to site. This includes the distance from port to wind farm and the internal port travel time.
2. Access to port/site (locks arrangements / berthing options / tides etc.) to facilitate operation on a 24x7x365 basis.
3. A good relationship with port owner including flexibility.
4. Cost reduction including existing infrastructure, funding options and value for money.
5. Other low level general factors including local facilities and skills sets

6.3 Technical requirements and timelines

Timeline:
Work is expected to start in 2016. Facilities need to be in place before that. Usual industry engagement is 18 -24 months prior operational go-live.

Requirements:

- Blocks of 50m non consecutive quay space.
- Warehouse (>4000m2) with easy quay side vessel access and pontoons.
- Light engineering space for medium and light mechanical work.
- Small shared secure bonded space.
- Flexible office space.

7

- Parking.
- Staff area including wet rooms and dry rooms.

6.4 SWOT Analysis

Strengths	Weaknesses
High • Requires small amount of warehouse /office / light engineering and quay space. Less than 1hec of land is required based on 150m of available quay length. • Best and closest port to proposed 5GW Norfolk Round 3 wind farm zone. • Port owner is flexible and enthusiastic because frequent and scheduled harbour use is profitable. • Port has no restrictions or delays in day to day operations. **Medium** • Good existing infrastructure makes site attractive to wind customers. • Small supply chain required. **Low** • Existing oil and gas skills can be transferred to wind O&M. • Correct zoning reduces planning permission delays. • Skills for Energy – training programs are available to people who want to work in the sector in an attempt by the industry and region to bridge the skills gap	**Medium** • PowerPark currently limited to 150m quay length which limits operational support capability. • Proposed PowerPark is in a flood risk area. We understand that positive initial discussions with the Environment Agency have been had about ways to reduce the flood-risk spectre. • The PowerPark has existing tenants who would need to be relocated if required. • Lack of current parking for private and commercial vehicles. **Low** • Poor road infrastructure e.g. no direct motorway, large vehicle access difficult.
Opportunities	**Threats**
High • Best option to deliver high value, long term employment throughout the region covering a wide range of skills. • High (direct and indirect) port spends by operator. • Continued development of the regional supply chain. • Redevelopment of PowerPark could be JV funded by commercial companies. • Could use Lake Lothing area to extend the O&M offering to the industry. **Medium** • Experience gained could create a centre of excellence in UK market which could be transferred to global market. **Low** • Option to expand into onshore wind O&M by using available offshore crews /equipment during bad weather.	**High** • Important land or quay space will be bought by others before 2016 and will make port unviable to potential customers. • Competing sub-regional facilities. • Competing international facilities. • Competing regional development agencies / ports means there is no single cohesive message / champion to give a clear offering to the industry. **Medium** • Policy change / economic situation could impact cost models and remove / reduce the Round 3 Norfolk zone. • offshore floating hotels and the future operational support method could reduce PowerPark benefit.

7 Offshore Wind Project Construction SWOT Analysis

7.1 Summary

We do not recommend Lowestoft for offshore wind project construction since developers are looking for construction ports now. There are many regional competitors with larger ports / spaces under a single owner who can move quicker than Lowestoft and its multiple land owners. In addition, project construction is high risk as a result of the undecided operational model – there is a high risk that developers stop using local construction ports entirely and directly ship from the manufacture base to the wind farm site. All benefits to the port are then lost.

The size and facilities within the PowerPark area / port are also not ideal due to size constraints. Lake Lothing expansion is currently not an option with its 20m beam restriction because project construction requires at least a 40m jack up barge. The business model and business case for the port owner (ABP) is not as profitable as other energy sectors. Large amounts of storage space to lay down blades and other equipment does not generate jobs or economic benefit. The employment opportunity requires a lower skill set level.

As a result of these negative assessments we would recommend a focus on more profitable and guaranteed energy sectors.

7.2 Background

Project Construction involves the pre-assembly of components supplied by a wind turbine manufacturer. These typically include all elements of the turbine (i.e. blades, rotor, nacelle and tower) except for the foundations. The components are delivered from the factory to the construction port. The components are assembled at the construction port before being loaded on to a jack-up barge and taken out to the site for installation. Foundations are typically delivered to site for installation direct from the manufacturer or stored at another similar nearby port. There are proposed plans to construct projects straight from the manufacturing base using high speed jack up vessels or feeder barges – which would go straight from manufacture to the wind farm site. These plans would bypass local ports and local assembly.

7.3 Technical requirements and timelines

Timeline: It is expected that project construction developers will be actively looking for ports in autumn 2009.

The requirements of a typical Round 2 project are to handle 100 turbines in one year: (This is to give an indication of the amount of port space required. Note: larger facilities are expected for Round 3 projects)

- At least 80,000 m2 (8 hectares) suitable for lay down and pre assembly of product;
- 200–300 m length of quayside with high load bearing capacity and adjacent access;
- Water access to accommodate vessels up to 140m length, 45m beam and 6m draft with no tidal or other access restrictions;
- Overhead clearance to sea of 100m minimum (to allow vertical shipment of towers); and

- Sites with greater weather restrictions on construction may require an additional lay-down area, up to 300,000 m2 (30 hectares).
- Other requirements relating to cranes and load bearing points are relatively easily achieved through local engineering works. Ideally, sites should have good land-side transportation access to facilitate their use also in transportation for onshore wind farm construction.

7.4 SWOT Analysis

Strengths	Weaknesses
Medium • Port has no restrictions or delays in day to day operations.	**High** • PowerPark is probably too small for a Round 3 project construction (both lay down area and port handling next generation installation vessels). • Proposed PowerPark is in a flood risk area. We understand that positive initial discussions with the Environment Agency have been had about ways to reduce the flood-risk spectre. • Port owner does not like business model that requires large storage and lay down space. • The job density is not high. **Medium** • Minimal local supply chain requirements/opportunity for development. • Bad Road infrastructure – no direct motorway, large vehicle access difficult.
Opportunities	**Threats**
High • 100 direct jobs.	**High** • Dependency on single big customer taking space. • Important land or quay space will be bought by others before 2016 and will make port unviable to potential customers. • Other east coast ports have far more lay down space. • Competing regional development agencies / ports means there is no single cohesive message / champion. **Medium** • Policy change / economic situation could impact cost models and remove / reduce Round 3 Norfolk zone. • Undecided future installation models means PowerPark benefit could be reduced. **Low** • Other East coast and European facilities could compete and reduce benefit to PowerPark.

8 Offshore Foundation Manufacture SWOT Analysis

8.1 Summary

We do not recommend Lowestoft for offshore wind foundation manufacture. Many international and national competitors with larger ports under single ownership means Lowestoft faces stiff competition in this area. Foundation manufacture requires a large amount of storage space to lay down equipment. Lowestoft would be stretched to its limit to accommodate this kind of construction. When compared to other energy sectors - this option does provide a large employment benefit, either in terms of numbers or advanced skills needed.

8.2 Background

Offshore wind turbines use a variety of foundation designs subject to the water depth and conditions.

Whether steel monopiles, concrete gravity bases, steel jacket or steel tripod structures, all offshore wind foundations are very large and once produced can only be transported by water thus they need to be manufactured at port side.

The high volume of raw materials should come in by ship or barge rather than on the limited road access available in Lowestoft.

8.3 Technical requirements and timelines

Timelines: Foundation manufactures are looking for sites now in preparation for ramping up production by 2015.

- Office space,
- 10-15 Hectares of land
- 150 metres of continuous Quay space
- Very large warehouse space

8.4 SWOT Analysis

Strengths	Weaknesses
High • Closest Port to proposed 5GW Norfolk Round 3 zone. • Port has no restrictions or delays in day to day operations. **Low** • Correct zoning reduces planning permission delays.	**High** • PowerPark maybe too small for foundation manufacture depending on the final total usable space. • Missing a deep channel from the Harbour to sea and missing a deep water pit in Harbour. • Proposed PowerPark is in a flood risk area. We understand that positive initial discussions with the Environment Agency have been had about ways to reduce the flood-risk spectre. • The job density is not good. **Medium** • Supply chain is not developed • Poor road infrastructure – no direct motorway, large vehicle access difficult
Opportunities	**Threats**
High • Could be as high as 350-500 direct jobs.	**High** • Requires very large facilities and potentially noisy outdoor activity. • Important land or quay space will be bought by others before 2016 and will make this option unviable to potential customers. • Great Yarmouth has superior facilities with more space for manufacturing. • Competing regional development agencies / ports means there is no single cohesive message / champion. **Medium** • Policy change / economic situation could impact cost models and remove / reduce Norfolk Round 3. **Low** • East coast UK and European facilities could compete and reduce benefit to PowerPark.

9 Marine Renewables (Tidal and Wave) SWOT Analysis

9.1 Summary

A tidal research centre would deliver the highest value in long-term employment, with the smallest land footprint. Therefore we recommend this as a component of the energy cluster mix. It is not suitable for sole use since it is unlikely that 15 hectares could be filled with only tidal / wave research facilities by 2020.

Salaries for technical R&D tend to be higher than other energy sector work. Added to this benefit is the increased intellectual property value created by innovative research. This becomes a local asset that could have long-term benefits in terms of skills growth and attracting more inward investment and interest.

The nearest tidal resource for R&D is located off the Norfolk coast which has more benign marine conditions for early stage testing, complimentary to prototype testing at EMEC, Wavehub and Narec. Therefore the ambition in Lowestoft is to concentrate on the office-based functions and linkages with skills providers and the benefits of being in close proximity to other research being carried out by similar companies and research institutions.

9.2 Background

The industry is immature but requires testing sites in order to develop and prove prototypes. Testing sites vary – they include tank testing, gentle or rough open water. In addition the more mature units need electrical generation testing, focusing on rating and array design.

9.3 Technical requirements and timelines

Small land based operations in comparison to other energy sectors.
Detailed requirements and timelines will depend on type of facility but could involve testing tanks and underwater grids and connection facilities.

- Hard standing area of between 1 to 5 hectares
- Warehousing (>1,000m^2)
- Engineering space (Mechanical engineering)
- Security – fenced area, CCTV
- Flexible office space
- Parking
- Staff area

9.4 SWOT Analysis

Strengths	Weaknesses
High • Requires little space in terms of office / warehouse and quay space. • East of England has good tidal capability. • Port has no restrictions or delays in day to day operations. • Flexible and tailored office space already exists at OrbisEnergy. • OrbisEnergy attempting to bring companies into region. **Medium** • Funding opportunities can make the CAPEX spend more attractive to new customers. • Small supply chain required. • Enthusiastic Council. **Low** • Existing oil and gas skills can be transferred to Wave and tidal R&D. • Correct zoning reduces planning permission delays	**High** • This sector is very small & immature. The size of the opportunity is small compared to other options. • Companies might only use the testing facilities temporarily – and not employ people directly. • Lowestoft is remote from existing centres of research. • Lowestoft is distant from main commercial deployment locations. • Proposed PowerPark is in a flood risk area. We understand that positive initial discussions with the Environment Agency have been had about ways to reduce the flood-risk spectre. • Maintenance cost of testing tanks is high. **Low** • Poor road infrastructure – no direct motorway, large vehicle access difficult.
Opportunities	**Threats**
High • High value, long term employment for people throughout the region covering a wide range of skills. • Continued development of the regional supply chain. • Redevelopment of PowerPark could be JV funded by commercial companies. **Medium** • Experience gained could create a centre of excellence in UK market which could be transferred to global market.	**High** • Important land or quay space will be bought before 2016 and will make port unattractive to potential customers. • Competing against existing centres of excellence such as Cambridge, Wave Hub, EMEC and others. • Competing regional development agencies / ports means there is no single cohesive message / champion. • Lowestoft College (not within the PowerPark) has an existing testing tank.

10 Oil & Gas SWOT Analysis

10.1 Summary

Developing the PowerPark as a purely decommissioning facility is seen as risky given the superior strengths and capabilities of other yards both on the east coast of the UK and on the continent. A mix of gas and oil facilities within the PowerPark could be seen as a better solution.

According to the recently published Oil & Gas UK 2009 Economic Report, oil and gas currently provide more than 75% of the UK's total primary energy with the United Kingdom Continental Shelf (UKCS) satisfying about two thirds of the country's primary energy demand (97% of oil demand and 73% of gas demand). In 2020, 70% of primary energy in the UK will still come from oil and gas; even if the 15% target for renewable energy is met (The UKCS has the potential to satisfy 40% of the UK's oil and gas demand in 2020).

The East of England has a strong oil and gas sector, with gas in particular a key element of Great Yarmouth and Lowestoft's (and indeed the whole region's) economy. Significant export of services is currently seen from the region. Substantial opportunities exist within the sector in operations and maintenance but more crucially, in the massive future decommissioning programme.

The oil and gas sector will continue to deliver long term, high value jobs for Lowestoft but the port will need to provide the sector with additional facilities in order to capture some of the decommissioning work that the Southern North Sea (SNS) will provide over the next 30-40 years. In terms of oil and gas fabrication and decommissioning work the requirements are almost the same. Using SLP as an example, the port will need to provide a minimum of 5 hectares of site space to accommodate this work along with at least 120 metres of continuous quay space for load in/out. It is likely that SLP, who already provides Engineering, Procurement and Construction (EPC) contracting for both the oil & gas and renewable sector, would look to offer this service in the future and therefore might be interested in some extra hard standing area. This would then allow other offshore sectors the space they require for their operations from the port and help to create an offshore energy cluster.

Transport vessels loading topside and jacket structures from SLP Engineering facilities in the port already enter the Waveney dock (barges 120m long and 35m wide can be moored at its load-out quay) and therefore could be used for receiving decommissioned structures and jackets in the future.

The Southern North Sea (SNS) gas fields still require continued seabed management and this is work, along with support services for decommissioning, that can be undertaken locally by marine service companies in the area.

Other areas within the region could be used for decommissioning work such as Great Yarmouth and Lake Lothing. For example, Lake Lothing and the Inner Harbour area offer potential quay space and facilities to accommodate operations around decommissioning, however, the Bascule Bridge with its raising times and width restriction (20 metres) require further investigation and discussion with local businesses in this section of the harbour. This option might offer the sector the land requirements its need for decommissioning.

10.2 Technical requirements and timelines

Economic Benefits:

The oil and gas sector will continue to play a key role in the region's economy for the foreseeable future. The region currently provides a wide range of services that have and will be adapted to the enormous opportunities that exist within the sector in operations and maintenance but more crucially, in the massive future UKCS decommissioning opportunity that is valued at £23 billion. On the back of its business for the UKCS, this supply chain will export goods and services forecast to be worth in excess of £5 billion in 2009. The region's experience in the oil and gas sector also provides its companies with an opportunity to provide services to other offshore sectors.

Timeline: The port already has a 40 year history in the oil and gas sector (predominately gas in southern North Sea) with a number of companies currently supplying a variety of services from diving to topside fabrication, reflecting the opportunities the sector currently offers.

Decommissioning of the aging Southern North Sea is likely to see increased activity from 2013 onwards with work spread over 40 years. Facilities need to be in place before that, requiring at least 12 months to set up.

Gas Storage and CCS are also likely to provide opportunities to the regions companies (They are both discussed in more detail within the report).

Requirements: (Based upon SLP facilities in the port)
The following requirements are based upon expanding the existing oil & gas capabilities and developing decommissioning infrastructure and capabilities. These spatial estimates are based upon existing facilities

- At least one block of 120 meters of continuous quay space (Load In/Out)
- Have a nominal load bearing capacity of 10t/m^2
- Have the capacity to transfer up to 10,000 tonnes (Mobile & Fixed Heavy lift cranes)
- Hard standing area of between 5 to 15 hectares
- Warehousing (environmentally controlled conditions might be required)
- Engineering space (mechanical engineering)
- Security – CCTV, fenced
- Flexible Office space (500<m^2)
- Parking
- Staff area including wet rooms and dry rooms

Job Skills: For all oil & gas activities (O&M, Manufacture & Decommissioning)

- The skills required for the sector if it uses the PowerPark would be office, marine and civil engineering personnel.

Potential Job Creation:

- Potentially over 200 direct jobs could be created at the PowerPark from this sector.
- The oil & gas sector will continue to provide Lowestoft and the region with long term high value employment opportunities within operations and maintenance and more crucially, in future decommissioning activity.

Decommissioning Oil & Gas ideally requires facilities with the following:

Able UK Ltd's 15 hectare Middlesbrough facility provides the PowerPark with a good example of what is required to provide this service on a large scale to the oil and gas sector:

Facilities

- 15 hectare site
- 1,000m deepwater quay, heavy duty including 260m x -7.6 LAT deep special berth/outfitting quay

- Fully serviced (Depends on the client's needs)
- 61,000 m^2 covered storage/warehousing
- Offices - 6,000 m^2
- Comprehensive cranage
- Haulage
- 24 hour security, floodlights, fenced, CCTV
- All the required permissions & licences
- Easy North Sea access
- Uninterrupted and long mooring/berthing
- Dry Dock
- 24 hour working availability
- LSA contaminated materials - receiving, processing and disposal
- Waste removal service operated on site

Case Study

Able UK Ltd has been involved with the onshore disposal of offshore asset decommissioning since 1984, following many years constructing offshore platforms. In addition to its decommissioning capability Able also provides unique facilities on a multi user basis for offshore fabricators/constructors and industrial and civil engineering contractors. The facilities are available under a variety of leased/rented, serviced/non-serviced arrangements to suit all projects and client requirements.

Decommissioning Facilities:

- **Seaton Port/TERRC** – a 51 hectare former offshore fabrication and assembly facility (Laing Offshore) which includes a 10 hectare dry dock/wet basin (largest in Europe) with a 122m wide gate. This unique facility located close to the River Tees mouth, is also known as the Teesside Environmental Reclamation and Recycling Centre (TERRC). It is adjacent to the Seaton Meadows landfill ensuring that ABLE can provide the BPEO (Best Practicable Environmental Option).

- **Middlesbrough Port** – a 20 hectare site, formerly Odebrecht/SLP Dock Point, located within the centre of Middlesbrough. This is a fully serviced; multi user facility is designed for offshore and marine related operations and has a 260m deepwater fitting out quay.

Able state that the proximity of the decommissioning facilities to both the Seaton Meadows special waste landfill and the Corus Redcar steelworks ensures that the Teesside location provides the most efficient waste disposal route.

Basis for estimates

- **Economic Benefit –** Based upon DWL forecast and figures published in public domain by Government and industry (Secondary).

Some source examples:

www.publications.parliament.uk/pa/cm200809/.../34110.htm

www.oilandgasuk.co.uk/issues/economic/econ09/p46-49.pdf

http://www.oilandgasuk.co.uk/issues/economic/econ09/economic_report_09.pdf

http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

- **Timeline –** Based upon DWL forecast and information from industry (Secondary).

  Source examples:

  http://www.oilandgasuk.co.uk/issues/economic/econ09/p46-49.pdf

- **Job Skills –** Based on DWL estimates and information in the public domain (Secondary).

  Source examples:

  http://www.oilandgasuk.co.uk

- **Potential Job Creation –** Based on DWL estimates. (Will depend upon size of facility and the services offered)

- **Facilities –** Based upon facilities already present in the UK decommissioning sector – ABLE UK Ltd) and Shetland Decommissioning Company (Secondary). SLP Lowestoft facilities also used as an example.

  Some source examples:

  http://www.ableuk.com/offshore.htm

  http://www.lerwick-harbour.co.uk/decommissioning

10.3 SWOT Analysis

Strengths	Weaknesses
High • An established sector within the region already with some 40 years of experience particularly in shallow-water gas developments • Hub for the Southern North Sea gas sector • Ports (Lowestoft & Great Yarmouth) have unrestricted access to the North Sea and are able to facilitate the sectors needs 24/7 • Ports infrastructure is good with warehousing and office facilities – e.g. SLP already fabricate and service offshore rigs and platforms **Medium** • Norwich International Airport in the region is used for helicopter flights to and from the platforms – there are plans for a dedicated Helicopter Terminal • Planning consent was given for Bond Air Services to build a helicopter pad and hangar at Lowestoft Harbour's docks area • Skills for Energy – training programs are available to people who want to work in the sector in an attempt by the industry and region to bridge the skills gap	**High** • Aging workforce – current workforce nearing retirement age • Not enough skilled, in particular engineering, labour in the region • Difficult to attract skilled labour to the region and sector **Medium** • Road infrastructure – no direct motorway, large vehicle access difficult **Low** • Port locations remote for office-based services – away from more attractive City locations
Opportunities	**Threats**
High • Training future offshore workforce – especially on decommissioning, MMO and seabed management (pipelines etc) • Decommissioning will be a major issue for the sector as the North Sea oil reserves decline and therefore require a base of operation – Oil & Gas UK, believes that decommissioning in UK waters will be valued at £23 billion • Continued stewardship & management of seabed & asset integrity of platforms **Medium** • Significant export potential exists • The growth of the deepwater market offer the region opportunities globally in providing a variety of services	**High** • Other regions port facilities on east coast – Grangemouth and the Medway ports • Other European ports already used in the sector – Norway, the Netherlands etc • Lack of due support for sector from regional agencies that are increasingly focused on renewables **Medium** • Declining oil & gas fields will impact on businesses that supply the sector • Future employees – lack of skilled engineers willing to work offshore in this sector – not just a local problem • Other sectors competing for skilled workforce – e.g. renewables

11 Onshore Wind SWOT Analysis

11.1 Summary

The PowerPark is unlikely to attract the onshore wind sector to it as the region (East of England) has little operational onshore wind, while the supply chain is based in mainland Europe.

The East of England is not a particularly strong region for onshore wind. Few projects will be built within the region due to relatively poor wind resource and active planning resistance, with better sites available elsewhere. Whilst there are certain elements of the supply chain in place, the region fails to generate any significant revenue from the sector and this is not expected to change markedly although key competencies do exist in some areas. Little manufacturing capability exists or is likely to start-up and the region is not sufficiently attractive to companies to see major supply chain development take place.

The only real potential for the PowerPark in onshore wind is the import (and potential export) of wind farm hardware into the region and beyond. This will not require the creation of any facilities within the PowerPark. It is unlikely any other onshore wind companies would wish to establish in the PowerPark given low regional activity and prospects. The strong offshore wind sector which is driven by the UK's round three projects is more likely to utilise these facilities instead.

The PowerPark could attract and provide facilities for the Eastern Region Wind Energy Group (ERWEG), a cluster of 24 automotive, aerospace and marine businesses across East Anglia. It wants to develop a pilot test turbine to ultimately market the groups' components, with the ultimate aim of establishing a supply chain for both the onshore and offshore wind markets. ERWEG could play an important part in profiling UK onshore and offshore supply chain capability within the European mix.

Other potential opportunities exist if office-based companies in the sector can be drawn to the PowerPark, such as environmental and planning consultants, project developers etc. It should be noted that OrbisEnergy is, however, likely to offer a more attractive proposition and sufficient capacity is foreseen there for some time to come.

11.2 What is the onshore wind model for the PowerPark?

The only real potential for the PowerPark in onshore wind is the import (and potential export) of wind farm hardware into the region and beyond. This will not require the creation of any facilities. It is unlikely any other onshore wind companies would wish to establish in the PowerPark given low regional activity and the availability of better locations in the UK.

11.3 Technical requirements and timelines

Economic Benefit:

With the UK expected to install almost 13 GW of onshore wind in the period to 2020, there could be some opportunities for the region to supply some of the estimated £14bn that will be required to achieve this figure. However, the current supply chain for this sector is based in mainland Europe and it is unlikely that companies would move to the PowerPark. The strong offshore wind sector which is driven by the UK's round three projects is more likely to utilise these facilities instead.

Timeline:

Facilities would need to be in place now in order to supply future projects in the region.

Requirements:

The following requirements are based upon the setting up of an onshore wind operation at the PowerPark that includes a number of supply chain services (Storage, R&D, Project Management, Engineering etc).

- At least one block of 130 metre non-continuous, non-exclusive quay space
- Hard standing area of up to1 hectare (For potential test turbine)
- Warehousing (>1,000m^2)

- Engineering space (mechanical engineering)
- Security – fenced area, CCTV
- Flexible office space
- Parking
- Staff area

Job Skills:

- The skills required for the sector if it uses the PowerPark would be office, stevedoring and engineering personnel.

Potential Job Creation:

- Potentially up to 50 direct jobs could be created at the PowerPark from this sector – this figure is an estimate based on DWL's knowledge and experience.

- If the Eastern Region Wind Energy Group set up an operation at the PowerPark then there is potential for the sector to create jobs supplying the wind sector if they are successful in meeting their goals.

Basis for estimates

- **Economic Benefit –** Based upon DWL forecast and figures published in public domain by Government and industry (Secondary).

  Source examples:

  http://www.berr.gov.uk/files/file46792.pdf

  Timeline – Based upon DWL forecast and information from industry (Secondary).

  Some source examples:

  http://www.bwea.com/onshore/index.html

  http://www.bwea.com/media/news/060327.html

- **Job Skills –** Based on DWL estimates and information in the public domain (Secondary).

  Some source examples:

  http://www.vestas.com/jobs

  http://www.powergeneration.siemens.com/jobs-careers/who-we-are-looking-for/

- **Potential Job Creation –** Based on DWL expertise knowledge/experience and information in the public domain (Secondary). The client and services offered will affect these numbers considerably.

  Some sources:

  http://www.invest-in-southampton.co.uk/news/SEEDA-Vestas.asp

- **Facilities –** Based on DWL expertise knowledge/experience and information from industry in the public domain, for example looking at current companies' facilities. The decision over the facilities needed will ultimately depend upon the amount of space dedicated to the sector within the PowerPark. Will require further research if chosen for PowerPark cluster. Consultation with the Eastern Region Wind Energy Group is suggested as they looking to develop a wind supply chain in the region for both onshore and offshore.

Some source examples:

http://www.greenwisebusiness.co.uk/news/vestas-seeks-planning-consent-for-50-million-uk-randd-centre.aspx

http://www.iwcp.co.uk/news/news/vestas-research-centre-unveiled-27073.aspx.

11.4 SWOT Analysis

Strengths	Weaknesses
Medium • 128 MW of installed capacity in the region as of December 2008 (approx 71 turbines) • Port facilities that can receive turbine shipments from Northern Europe (Denmark and Germany) • SLP manufacture towers and foundations for wind turbines and are already based in Lowestoft **Medium** • Region gearing up for renewable energy sector • Local colleges are geared up to developing renewable energy employees of the future • Support of regional agencies – Renewables East, EEEGR, EEDA, etc.	**High** • The slow progress of onshore wind projects through the planning system, commonly now involving not only refusal by the local planning authority and appeal, but also the use by objectors of the Judicial Review mechanism, means that it is now certain the region will not meet its 2010 onshore target • Lack of onshore wind projects approved for the region – 273 MW proposed currently and only 6 MW approved. Only two single wind turbine schemes were built in the six months to December 2008 • Relatively un-developed supply chain. Little regional value generated through onshore wind projects • No wind turbine manufacturer in the region • Little potential for EoE supply chain development • Road infrastructure – No direct motorway, large vehicle access difficult
Opportunities	**Threats**
Low • Limited manufacturing opportunities for the sector across the supply chain – turbine, generator, bearings etc (However, difficult to achieve due to lack of local manufacturing companies.) • Long term employment in the renewables sector covering R&D, manufacturing, construction and maintenance etc • Wind is the onshore renewable technology with greatest potential and will need to increase its rate of delivery as the region refocuses on achieving the 2020 targets of the East of England Plan, the Regional Spatial Strategy published in May 2008.	**High** • Stronger offshore wind sector • Local opposition to onshore wind farms – NIMBY • Slow planning permissions • Lack of major UK-based turbine manufacturers • Grid connection/transmission • Other regions more attractive to build projects in **Low** • Policy changes

12 Biomass SWOT Analysis

12.1 Summary

There is a strong agricultural industry within the region that supports the development of biomass/ biofuels. Opportunities for the PowerPark with the biomass energy sector are however small and limited to storage and import/export activities. There is no comparative advantage to the PowerPark overall in accommodating elements of this sector.

12.2 Background

The PowerPark could be an option to a Biomass feedstock company that wants to have storage for its feedstock – but this would be dependent on new biomass plants coming online in the vicinity. The most likely opportunity is for the importing and exporting of feedstock through the port – and this is expected to be minimal. No new facilities are anticipated to be needed within the PowerPark to support this or any other biomass sector activity.

12.3 Technical requirements and timelines

Economic Benefit:

The East of England has very strong potential with much agricultural and forestry land for which biomass offers an opportunity for improved rural income. The market for power generation from biomass should reach around £1.6 billion in 2010 from £1.1 billion currently.

Timeline:

This sector is already operational but is not expected to see huge growth in the near future with only the biofuel obligations driving the sector currently.

Requirements:

The following requirements are based on a Biomass company setting up a storage facility at the PowerPark for imports and exports of feedstock.

- 100 metres of continuous quay, non-exclusive quay space
- Less than one hectare of land
- Office space
- Warehousing (<500m^2) with easy access to quay
- Security – Fenced area, CCTV
- Staff area
- Parking

Job Skills:

- The skills required for the sector if it uses the PowerPark would be office and stevedoring personnel.

Potential Job Creation:

- Potentially up to 15 direct jobs could be created at the PowerPark from this sector.
- A Biomass operation in the PowerPark is likely to provide long term employment for small numbers of local/regional people.

Basis for estimates

- **Economic Benefit –** Based upon DWL forecast and figures published in public domain (Secondary).

  Some source examples:

  www.eeegr.com/About-Us/Bio-Energy.php

  http://www.defra.gov.uk/Environment/climatechange/uk/energy/renewablefuel/pdf/ukbiomassstrategy-0507.pdf

  http://www.defra.gov.uk/environment/waste/topics/pdf/wastewood-biomass.pdf

  Timeline – Based upon DWL forecast and information from industry (Secondary).

  Source examples:

  http://www.defra.gov.uk/Environment/climatechange/uk/energy/renewablefuel/pdf/ukbiomassstrategy-0507.pdf

  http://www.berr.gov.uk/files/file46792.pdf

- **Job Skills –** Based on DWL expertise knowledge/experience and information in the public domain (Secondary).

  Source examples:

  http://www.biomassenergycentre.org.uk

- **Potential Job Creation –** Based on DWL *expertise knowledge/experience*. The clients attracted and services offered will affect these numbers.

- **Facilities –** Estimate based upon DWL *expertise knowledge/experience* and covers basic import/export services. The decision over the facilities will ultimately depend upon the operation offered at the facility and the client. If chosen for the PowerPark cluster (which is not recommended) further consultation with potential clients required dependent on space made available.

12.4 SWOT Analysis

Strengths	Weaknesses
High • A strong agricultural base which can and does supply the existing plants in the region • Port facilities able to handle large biomass feedstock cargo that are used to fuel plants – import, export and storage **Medium** • A number of biomass supply chain businesses already in region – Banham Power, Anglia Woodfuels, Renenergy ,etc. • Existing Biomass plants **Low** • East Anglia University building its own biomass power station. Fuel will be supplied locally (from within the region)	**Medium** • Road infrastructure – no direct motorway, large vehicle access difficult • Planning permission requirements unknown
Opportunities	**Threats**
High • Some employment for people throughout the region covering a wide range of skills • Continued development of the regional supply chain, especially agricultural and engineering businesses • Commercial and public buildings will look at this option for energy self sufficiency **Medium** • Experience gained in UK market can be transferred to global market • Extra revenue from selling energy, fertiliser and fibre products can have a positive effect on rural development • Increasing import of feedstock from outside the UK – port opportunities **Low** • Surplus feedstock could be sold to Continental European market	**Medium** • Policy change • Costs • Increasing import of feedstock from outside the UK **Low** • Other renewable industries could take the space e.g. microgeneration

13 Microgeneration SWOT Analysis

13.1 Summary

Whilst micro-generation is seeing growth and there exist deployment opportunities within the region, manufacturing within the region is expected to be minimal, and overall revenue accrued largely insignificant in comparison to other sectors. There is no comparative advantage to such operations or to the PowerPark overall offer in accommodating elements of this sector within the overall vision.

13.2 What is the Microgeneration model for the PowerPark?

The PowerPark might be an option for companies involved in this sector who require office and warehousing facilities but they are more likely to position themselves inland near cities and towns that will require their services. There is no particular advantage to locating in the PowerPark area.

13.3 Technical requirements and timelines

Economic Benefit:

Whilst micro-generation is seeing growth and there exists deployment opportunities within the region, manufacturing within the region is expected to be minimal, and overall revenue accrued largely insignificant in comparison to other sectors. It is unlikely that this sector will set up in the PowerPark.

Timeline:

This sector is already operating within the region and is expected to experience slow grow driven by building policy and regulations.

Requirements:

The following requirements are based on a microgeneration company setting an operational base at the PowerPark.

- Less than 1 hectare of land
- Warehouse (<500m^2)
- Engineering space
- Security – fenced/CCTV
- Office space
- Parking
- Staff area

Job Skills:

- The skills required for the sector at the PowerPark will be office and engineering (electrical).

Potential Job Creation:

- Potentially up to 50 direct jobs could be created at the PowerPark from this sector.
- A microgeneration operation based in the PowerPark could provide long term employment to a small number of people from the region.

Basis for estimates

- **Economic Benefit –** Based upon DWL forecast and figures published in public domain by Government and industry (Secondary).

Some source examples:

http://www.berr.gov.uk/energy/sources/sustainable/microgeneration/index.html

http://www.energysavingtrust.org.uk/

Timeline – Based upon DWL expertise knowledge/experience and project work carried out for BERR.

- **Job Skills –** Based on DWL estimates and information in the public domain (Secondary).

  Source examples:

  http://www.berr.gov.uk/files/file27583.pdf

- **Potential Job Creation –** Based on DWL expertise knowledge/experience. Figures will depend upon the client and the services offered.

Facilities – Based upon DWL expertise knowledge/experience. The decision over the facilities will ultimately depend upon the operation offered at the facility and the clients associated requirements. Further consultation required if chosen for PowerPark with local companies active in the sector like Renenergy as each will have specific requirements.

13.4 SWOT Analysis

Strengths	Weaknesses
Low • The finalisation of the East of England Plan (Revision of Regional Spatial Strategy) and its policy relating to micro-renewables will assist development • The East of England Plan encourages innovation, including the formation of Energy Services Companies (ESCO's), in order to realise ambitious levels of carbon-saving	**High** • Lack of a decentralised grid means businesses and public unable to sell their excess power generation back to the grid but there is the possible option to do low power versions.
Opportunities	**Threats**
Medium • Creation of new jobs and skills that will be needed in the long term to meet carbon emission targets regionally and nationally • Regional policy changes (ENG1) requires new developments to be located and designed to optimise carbon performance and supply energy from decentralised, renewable or low-carbon sources. New homes planned for the region could well have their heat and power requirements met by 100% renewable energy locally generated • Removal of planning permission (April 2008) for solar and heat pump installations installed on homes. Further change is expected soon for small building mounted wind turbines **Low** • For local businesses like Renenergy to help companies in the region reduce carbon emissions and become energy efficient • People increasingly keen to make businesses & homes more energy self reliant • National Core Outputs Indicator now requires local authorities to report all installations granted planning permission and installations by technology	**High** • Little incentive for adoption

14 Nuclear SWOT Analysis

14.1 Summary

The Lowestoft PowerPark is unlikely to have a nuclear power presence within it as the sector would only use the port for importing/exporting shipments relating to the nuclear sector. The exception may be some limited office based project management functions. There is no foreseen opportunity for a significant nuclear energy mix within the PowerPark.

Based on existing facilities, the region gains significant economic benefit from nuclear power, both in terms of stimulation of the regional economy and employment. New build nuclear will continue to bring money into the region and offer employment (During operation British Energy estimates that some 600-900 full-time will be created)[8].

It is unlikely that the Government will establish its planned £15 million nuclear skills development facility at the PowerPark or the wider region. However, the regions colleges already work quite closely with the nuclear sector in the region (Sizewell) on training schemes for the sector.

The demand for energy and the need to reduce carbon emission levels means that the nuclear sector will have a presence in the region for the foreseeable future providing economic benefits.

14.2 What is the nuclear model for the PowerPark?

The Lowestoft PowerPark is unlikely to have a nuclear power presence within it as the sector would only use the port for receiving shipments relating to the New Build program that is planned to start at Sizewell C around 2013 and possibly Bradwell.

Ongoing decommissioning at Sizewell A and future work on Sizewell B (around 2035) might require the use of the Lowestoft port but not the PowerPark itself. It should be noted that UK companies will be involved in the construction and fabrication work for the new build program so imports from abroad will be limited to more specialised components. Any office space etc. is likely to be set up at the plants themselves. There is no large foreseen opportunity for nuclear energy within the PowerPark.

14.3 Technical requirements and timelines

Economic Benefit:

Based on existing facilities, the region gains significant economic benefit from nuclear power, both in terms of stimulation of the regional economy and employment. The long term future of the sector in the region is set to continue beyond 2050 with two new nuclear power plants proposed for the region. The Lowestoft port rather than the PowerPark itself is more likely to be used for transportation purposes.

Timeline:

The sector is currently approaching the beginning of a new cycle after the Government announced that it would support the new nuclear build programme. The East of England is likely to see the following timeline for its nuclear sector:

- **New Build –** work is expected to start on Sizewell C in 2013.
- **Operations & Maintenance –** Sizewell B was built in 1995 and will require O&M through to 2035. Sizewell C has a planned operational year of 2017 and will operate until around 2050.
- **Decommissioning –** Sizewell A is currently being decommissioned with Sizewell B to follow in 2035.

Requirements: New Build/O&M/Decommissioning

The following requirements are based on the nuclear sector setting up a small operation at the PowerPark.

[8] http://www.british-energy.com/pagetemplate.php?pid=453#employment

- 100 meters of non-continuous, non-exclusive quay space
- Hard standing area – Less than one hectare
- Flexible office space
- Security – CCTV, Lighting, fencing, secure area
- Parking
- Staff area

Job Skills: New Build/O&M/Decommissioning

- The skills required for the sector at the PowerPark will be office, civil engineering and marine.

Potential Job Creation:

- Potentially up to 10 direct jobs could be created at the PowerPark from this sector– this figure is an estimate based on DWL's knowledge and experience.
- The nuclear sector is a long term high value employer within the region and a small operation within the PowerPark would provide a range of long term jobs.

Basis for estimates

- **Economic Benefit –** Based upon figures published in public domain by Government and industry (Secondary).

  Some source examples:

  http://www.nda.gov.uk/

  http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

  *www.niauk.org/...**nuclear**.../**nuclear-decommissioning**-authority-launched.html*

  *www.iaee.org/en/publications/**nuclear**.aspx*

  http://www.british-energy.com/pagetemplate.php?pid=425

  http://www.edfenergy.com/media-centre/press-news/EDF-Energy-to-hold-UK-nuclear-suppliers-forum-on-30-June.shtml

- **Timeline –** Based upon DWL forecast and information from industry (Secondary).

  Some sources:

  http://www.nda.gov.uk/

  http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

- **Job Skills –** Based on DWL estimates and information in the public domain (Secondary).

  Some source examples:

  http://www.british-energy.com/documents/Sizewell_Nuclear_New_Build_Newsletter_-_December.pdf

- **Potential Job Creation –** Based on DWL estimates from expertise knowledge/experience. Will depend upon type and size of the facility or services offered.

- **Facilities –** Based upon DWL expertise knowledge/experience and covers simple transportation operation at the PowerPark. The decision over the exact facilities required will ultimately depend upon negotiation with clients.

14.4 SWOT Analysis

Strengths	Weaknesses
Medium • The region has a long history of Nuclear power with Sizewell A , B and Bradwell plants • Workforce and infrastructure already in place • Experience and knowledge of the sector • Jobs – Long term employer (approx 500 jobs per site) • Long term need for local services • Local community spend of £30 million per annum from salaries and services (Sizewell, British Energy) • National training scheme for Nuclear sector available in region • National Grid infrastructure already in place	**High** • Road infrastructure (Bradwell Road 50 years old, Sizewell requires new road) • Lack of highly-skilled engineering labour in the region **Medium** • Image of the sector still negative which affects recruitment
Opportunities	**Threats**
High • Continued long term employment • Decommissioning of Sizewell A currently underway • Decommissioning of Sizewell B after 2035 • New Sizewell plant expected to be operational by 2017 • Bradwell proposed as a site for the next generation of nuclear power • Retro fitting electrical components in Sizewell B – wiring system probably already dated • Work and experience gained from Sizewell A and B can be used in Sizewell C • Upgrade to intelligent grid system and the associated work will provide opportunities for companies within the region • Work related to coastal protection and flood defence **Low** • Development of rail and sea infrastructure for transport of personnel and materials • Sizewell propose new road into site	**High** • Timescale – new nuclear facilities still a long way off • Sizewell – concerns have been raised about the impact of flooding and tidal surges • Bradwell – flood defence improvements and coastal protection measures are required for the site **Medium** • Other environmental effects – wildlife, flora and fauna • Policy changes – 2020 before first next generation plants operational **Low** • Storage and disposal of radioactive waste • Cost of development • Cost of decommissioning

15 Carbon Capture & Storage SWOT Analysis

15.1 Summary

CCS offers massive potential and early adoptive measures within the region could lead to big successes. High costs and lack of clarity on legislation will be initial hurdles but the size opportunity must be considered. The proximity of the region to the gas fields in the Southern North Sea is a major advantage.

In the short term the PowerPark could offer the CCS sector an operational base for developing the technology and techniques required to utilise the SNS gas fields with a long term view of providing O&M to the sector from companies already involved in the oil and gas and marine sectors. The PowerPark's proximity to the gas fields of the Southern North Sea which are likely to be used for storage along with the companies from the Lowestoft region that already provide services to the oil & gas sector make it an attractive option for the sector running an operation from the PowerPark in the future.

15.2 What is the CCS model for the PowerPark?

In the short term the PowerPark could offer the CCS sector an operational base for developing the technology and techniques required to utilise the SNS gas fields with a long term view of providing OMM to the sector from companies already involved in the oil and gas and marine sectors.

15.3 Technical requirements and timelines

Economic Benefit:

This sector will provide the region with huge opportunities in the future, especially for the companies that supply the oil and gas and marine sectors. In the short term there could be some potential for the PowerPark/region to provide facilities for demonstration projects planned by companies in the sector. The PowerPark's position and quay offer the sector the facilities required to service this future sector.

The Government has made CCS a key element of its transition plan for carbon emission reductions and this coupled with the location of Lowestoft and the region to the SNS gas fields will provide opportunities to local companies and people.

Timeline:

This sector is likely to start full operations around 2020 with long-term growth driven by emissions targets and regulations surrounding CCS for gas and coal power plants in the UK. Facilities should be in place 12-18 months prior to operational start-up.

Requirements:

The following requirements are based on a CCS operational based being established at the PowerPark.

- Less than one hectare of land (Initially)
- 50 metres of non continuous, non-exclusive quay space
- Warehousing (>500m^2) easy quay side vessel access
- Engineering space
- Security – fenced area with CCTV
- Flexible office space
- Parking
- Staff area including wet rooms, dry rooms (will be used by O&M staff working offshore)

Skills Required:

- The skills required for the sector if it uses the SNS gas fields will be office, civil engineering, geotechnical, R&D and marine personnel.

Potential Job Creation:

- Potentially up to 200 direct jobs could ultimately be created at the PowerPark from this sector.
- The CCS sector will provide continued employment in the long term for Lowestoft and the wider region. Local companies involved in the oil & gas sector will be able to offer their services because they will be working on existing infrastructure.
- The the PowerPark will play an important part in assessing the sites accessibility to the regions workforce (Great Yarmouth, Lowestoft, Norwich, Bury St Edmonds and Ipswich).

Basis for estimates

- **Economic Benefit –** Based upon information published in public domain by Government and industry (Secondary).

  Some source examples:

  http://www.ccsassociation.org.uk/

  http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/ccs/ccs.aspx

  http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/ccs/demo_comp/demo_comp.aspx

  http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

- **Timeline –** Based upon DWL forecast and information from industry (Secondary).

  Some sources:

  http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/ccs/ccs.aspx

  http://www.decc.gov.uk/en/content/cms/news/pn050/pn050.aspx

- **Job Skills –** Based on DWL expertise knowledge/experience covering a wide range of potential services – O&M, R&D, Fabrication etc. The fact that this sector will be using offshore storage means the use of a range of skill s already available in the region from the offshore marine sector (Oil&Gas).
- **Potential Job Creation –** Based on DWL expertise knowledge/experience. Will depend upon type and size of the facility and the clients attracted.
- **Facilities –** Based upon DWL expertise knowledge/experience and covers an O&M service from the PowerPark. Negotiations with end users will determine exact usage.

15.4 SWOT Analysis

Strengths	Weaknesses
High • Proximity to depleted gas fields in the Southern North Sea • Pipeline infrastructure to aging SNS gas fields already in place • SNS gas fields already used for gas storage (Rough and Baird) • Onshore and offshore infrastructure already in place to support this market (SNS fields platforms and port facilities) **Medium** • Carbon Connections is based at the University of East Anglia, recognised as a world leading research centre for environmental sciences – potential funding for projects relating to CCS possible • Tilbury power station is looking to be one of the first to use CCS which could position the region favourably in the future	**High** • No storage sites yet proposed within the region • Question mark about using the existing pipelines and whether they are suited to CO_2 transmission?
Opportunities	**Threats**
High • Employment across a full range of services relating to the sector from R&D to operations • The CCS industry has been projected to grow to more than a trillion dollars worldwide by 2050 (Element Energy) • The Element Energy study state that there is excellent potential to store CO_2 in depleted gas fields in the Southern North Sea, and that transport and storage costs will not be high • Business opportunity as it is likely that a pipeline network will be required regionally/nationally/internationally for CO_2 to be transported to storage facilities onshore and offshore • CCS could be used for enhanced oil recovery techniques in other parts of the North Sea	**High** • Costs – feasibility • Permitting process not fully clarified **Medium** • Policy change • Environmental Issues **Low** • Fields used instead for gas storage

16 Gas Storage SWOT Analysis

16.1 Summary

The region is ideally situated for the predicted growth in gas storage, being the hub of the Southern North Sea. With its strong track record in the gas sector, this could be a major revenue generator for the towns and wider region.

The Lowestoft PowerPark will be able to offer this sector a base of operations covering office space, warehousing and a quay side for vessels used in OMM related to gas storage offshore. The proximity of Lowestoft to the SNS gas fields along with the companies from the region that already service the oil & gas sector, make the PowerPark an ideal operational base for the gas storage sector. In many respects it will be a natural development of these companies' services as they will be working on infrastructure that is already in place in the SNS.

16.2 What is the Gas Storage model for the PowerPark

The Lowestoft PowerPark will be able to offer this sector a base of operations covering office space, warehousing and a quay side for vessels used in OMM related to gas storage offshore.

16.3 Technical requirements and timelines

Economic Benefit:

The need to increase storage capacity in the UK through utilising parts of the SNS gas fields could provide good revenues for the regions ports and companies. In many respects it is a natural development for some of these companies' services as they will be working on infrastructure that is already in place in the SNS.

Energy security and the lack of gas storage in the UK are driving this sector with the SNS developing new storage facilities off the east coast of England. The location of the region to these gas storage sites will provide long term opportunities for Lowestoft and the region.

Timeline:

This sector is likely to start full operations around 2012 with short-term growth driven by energy security and future demand. Companies would initially require flexible office space and warehousing some 12-18 months before this date.

Requirements:

The following requirements are based upon a gas storage operation being set up in the PowerPark to provide O&M services.

- Less than one hectare of land
- 50 metres of non continuous, non-exclusive quay space
- Warehousing (>500m^2) easy quay side vessel access
- Engineering space
- Security
- Flexible office space
- Parking
- Staff area including wet rooms, dry rooms (will be used by O&M staff working offshore)

Skills Required:

- The skills required for the sector if it uses the SNS gas fields will be office, civil engineering and marine personnel.

Potential Job Creation:

- Potentially up to 200 direct jobs could ultimately be created at the PowerPark from this sector.
- This sector has the potential to provide local companies with further long term work in the SNS. In many respects it will be a natural development of these companies' services as they will be working on infrastructure that is already in place in the SNS.
- Travel time to the PowerPark will play an important part in assessing the sites accessibility to the regions workforce (Great Yarmouth, Lowestoft, Norwich, Bury St Edmonds and Ipswich).

Basis for estimates

- **Economic Benefit –** Based upon information published in public domain by Government and industry (Secondary).

  Some source examples:

  http://www.decc.gov.uk/

  http://www.thecrownestate.co.uk/offshore-gas-storage

- **Timeline –** Based upon DWL forecast and expertise knowledge/experience.
- **Job Skills –** Based on DWL expertise knowledge/experience and information in the public domain (Secondary).These figures will be affected by the client and type of service offered.
- **Potential Job Creation –** Based on DWL internal consultations. Will depend upon type and size of the facility and services offered.
- **Facilities –** Based upon DWL expertise knowledge/experience and covers an O&M from the PowerPark. The decision over the facilities will ultimately depend upon the operation offered at the facility. Further consultation/negotiations in the future are advised with Centrica and ENI who are operating Gas Storage facilities in the SNS.

16.4 SWOT Analysis

Strengths	Weaknesses
High • Physical proximity to Southern North Sea gas fields. • Long experience of offshore gas storage (Rough Field) • Centrica announced that it will develop the Baird field for gas storage • Local offshore support infrastructure good and long-established • Pipeline infrastructure to aging SNS gas fields already in place **Medium** • Offshore locations reduce safety concerns compared with these facilities onshore	**High** • Aging workforce – current workforce nearing retirement age • Not enough skilled, in particular engineering, labour in the region • Difficult to attract skilled labour to the region and sector **Medium** • Road infrastructure – no direct motorway, large vehicle access difficult **Low** • Port locations remote for office-based services – away from more attractive City locations
Opportunities	**Threats**
High • Development of the Southern North Sea Gas fields for storage by companies such as Centrica mean that these facilities will continue to require operations, maintenance and modifications from the region's companies that already involved in the offshore sector • Energy security concerns means that development of this sector will have long term benefits to the local job market **Medium** • Technology development from local businesses for this sector	**Medium** • Local opposition • Isle of Grain – import and storage terminal facilities operational on the east coast • Government policy changes • Environmental effects

17 Options Development & Appraisal

BVG Associates Ltd and DWL scored (1=low: 5 = high) each energy option against the agreed criteria and added a summary statement.

Each option is explored in more detail in the SWOT summary and sector overview. DWL has provided their scoring summary in Appendix 8.

Energy sectors that were agreed by 1st East to be too small for the entire PowerPark were not considered. These include wave, tidal, CCS and gas storage.

CRITERIA	Total project cost	Overall project deliverability	Value of Total project benefits	Timeframes for delivery of benefits	Dependencies on other activities or organisations	Scale of resource required to develop the project	Affordability, and ease of securing funding	Level of risk to the successful achievement of project outcomes	Project supports strategic priority areas	Level of difficulty anticipated in satisfying state aid requirements	Overall Score	
notes	Consider cost effectiveness.	Can it be delivered, what conditions would be needed and how likely are they?	What might the long term economic benefits be in terms of project 'outputs' and 'outcomes'	How long? consider the implications. Any missed opportunities.								
Scoring	small cost = high score	Certainty of delivery = high score	High value = high score	Quick = high scoring	many and significant = low scoring	small resource requirements = high score	highly affordable & funding available = high scoring	high risk = low score	geographic and sectorial. high strategic fit = high score	easy = high score		
Energy sector												
Offshore Wind Operations & Maintenace	5	5	4	2	4	4	3	2	4	3	36	Ideal fit in terms of job density / longetivity but would not fill entire space
Offshore Wind Project Construction	1	1	2	3	1	1	2	1	2	3	17	High risk from regional and national sites that are cheaper. Power Park is at limit of size constraints.
Offshore wind Foundation Manufacture	3	2	2	3	1	2	2	1	2	3	21	High risk since better sites available that are under single ownership.
Oil and Gas Decomm	3	4	4	2	4	2	2	1	2	3	27	High inevitability but high risk from cheaper European yards. Generally lower skill requirements.
Research and Prototype Development	1	1	5	2	2	2	4	1	3	4	25	by 2020 with only Research. High risk due to regional competition.
Nuclear	3	4	1	4	3	4	2	3	2	3	29	Port of Lowestoft options limited to receiving shipments.
Wind O&M / Research / Hybrid Mix (Oil & Gas)	5	4	5	4	5	5	4	5	5	4	46	Ideal fit with low risk and low funding requirements.
Oil & Gas/ Research / Hybrid Mix	3	3	4	4	3	5	4	4	4	4	38	O&G lowers the score due to the low skill set requirements and large space requirements.

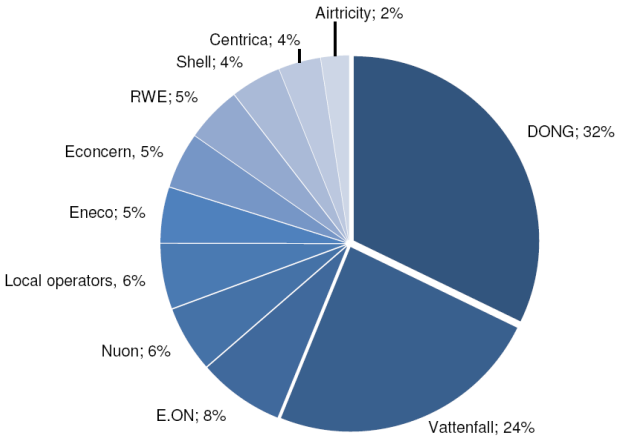
18 Offshore wind Overview

18.1 Industry Overview

18.1.1 Offshore Developers

Developers of offshore wind farms consist of utilities (UK and European) and smaller offshore project development companies. Some of the offshore market leaders are already active off the East of England coast with Round 1 & 2 projects, i.e. DONG (Danish utility), Airtricity (owned by Scottish & Southern Energy) and E.ON as well as some of the other players such as Centrica & Warwick Energy (UK energy generation). It is expected that the larger market players will be involved in the development of the Round 3 Norfolk zone off the Lowestoft coast.

The projected market share for 2012 is based on the capacity of offshore wind currently installed or contracted for installation by 2012. Airtricity's installation of Greater Gabbard, off the East of England coast, will significantly increase their market share by 2012.



18.2 Market Overview

18.2.1 UK Market Attractiveness:

The UK is a very attractive market for offshore wind since it has the world's largest installed offshore wind capacity. There are a number of factors that contribute to its attractiveness. These include the wind resource, government policies that contribute to making offshore wind more economically attractive (outlined in Section 4) and the planned projects portfolio.

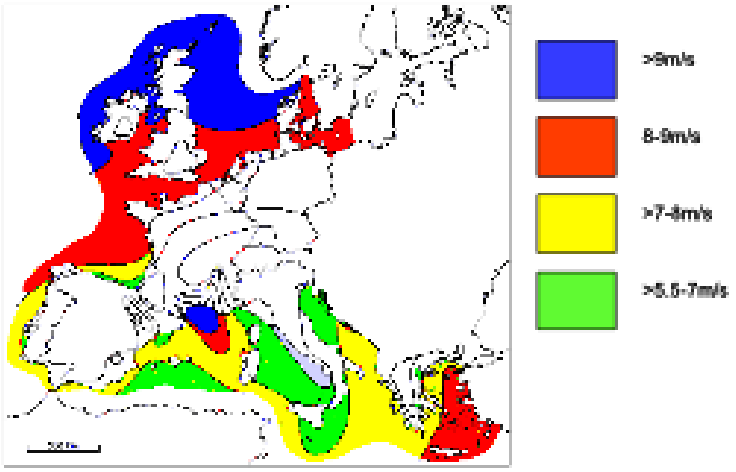


Figure 3 - UK's wind resource

As shown in the image above, the UK has good wind resource. In addition the sea bed around the UK is relatively shallow which also lends itself to offshore wind development. The depth of the water has a direct impact on the cost of developing an offshore wind farm.

18.2.2 East of England Offshore Wind Overview

13GW of offshore wind capacity is predicted to be installed off the East of England coast by 2020. This equates to an estimated 2,500 turbines. As well as the installation activity associated with these turbines there is the ongoing operations and maintenance industry that is required for the life of the turbines (circa 15 – 20 years).

Experience to date:
The regional activity to date includes the following wind farms:

Wind Farm	Installation Date	Construction Port
Scroby Sands	2004	Great Yarmouth & Lowestoft
Greater Gabbard	2009	Great Yarmouth
Gunfleet Sands	2009	Esbjerg (vessel transfer in Harwich harbour)
Sheringham Shoal	182 8/11	Decision not yet made – as of May 2009

Regional Offshore Wind Strategy
The Regional Spatial Strategy (RSS) was published last year and extends to 2021. The strategy is under review and currently includes Lowestoft as a special priority. The 2008-2031 Regional Economic Strategy (RES) identifies Great Yarmouth and Lowestoft as "the principal regeneration priority area for the region". One of the "Assets and Opportunities" identified is *"emerging economic catalysts in Great Yarmouth, with EastPort UK and offshore renewable energy in Lowestoft supported by OrbisEnergy"*

Currently there is not a single joined-up strategy for the region that all regional bodies are working towards in delivering an over-arching vision. However, EEDA, Renewables East (RE), EEEGR and 1st East have combined their efforts to promote PowerPark and will collectively market the offer through their business plans and strategies. RE's regional offshore wind strategy is to focus on offshore wind O&M as they believe this provides the long term jobs. EEDA believe that the region should not ignore the significant project construction capacity that is going to be required for Round 3, just off the East of England coast. Whilst O&M does provide long term jobs, research shows the longevity that is also expected in the project construction market. The region has a number of ports that could feature in the offshore wind industry. There is no strategy that outlines the overall proposition they offer to the industry, ensuring the region is playing to its strengths and looking at how their offering can be strengthened by a wider vision. This is particularly important for Lowestoft and Great Yarmouth being so close to each other. Ensuring they play

to their own strengths can enable them to have complimentary offerings, which combined, provide the region with the stronger proposition to the industry. The feedback from the industry is that they would like to see such a strategy.

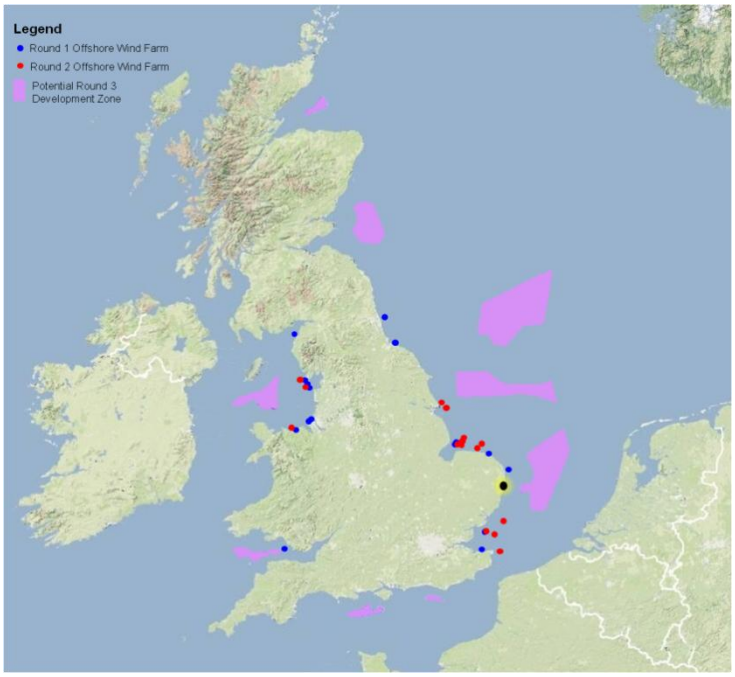


Figure 4– Lowestoft and surrounding offshore wind developments

19 Onshore Wind Overview

The UK is expected to install around 13 GW of onshore wind in the period to 2020, which will require some £14bn of capital expenditure.

Onshore wind power provides an increasingly economic source of energy, with significant worldwide growth for the last ten years. The industry has been made viable through economic subsidies which have enabled development to take place. For some countries, onshore wind power is both a key energy source and a major industry in its own right.

The onshore wind industry has seen year-on-year growth for the past 15 years – there are very few industries where such a growth rate has been seen to be sustained for so long.

Some early leaders are now beginning to slow such as Germany; likewise Denmark has installed very little onshore capacity in recent years. To balance this, activity is still strong in the massive Spanish market and significant new markets such as the US, Italy, France and UK have emerged. Together with rapid growth in Asia, prospects for continued high growth remain strong.

As of May 2009 the UK had over 3,000 MW of onshore wind capacity installed, much of which is in Scotland where growth has been extremely rapid. The East of England currently has 71 onshore turbines across 12 individual projects (As of December 2008).

Technology continues to evolve with turbine capacities and efficiencies increasing. Project sizes of 50 MW and above are now becoming common and in the US the largest projects are regularly several hundred megawatts in size.

The Eastern Region Wind Energy Group (ERWEG), a cluster of 24 automotive, aerospace and marine businesses across East Anglia, was set up 18 months ago by the Hethel Engineering Centre working alongside partners like EEEGR (Supply Chain Knowledge), aiming to secure a stake in the green energy industry which could create thousands of jobs in the region. In July 2009 ERWEG members contributed £100,000 for a feasibility study involving the creation of a business plan and research into other possible sources of investment.

The completion of the initial study is expected by the end of the year (2009) with the next phase involving these companies working together to create a pilot wind turbine to market their components, with the ultimate aim of establishing a supply chain within the region.

20 Marine Renewables (Tidal and Wave) Overview

20.1 Industry Overview

20.1.1 History and Context

The UK is an industry leader in the maturing market of tidal and wave energy systems. Marine renewables are split into 2 key sectors:

Wave energy technology has been developed since the mid 1970s, but with sporadic progress and success. This is due partly to government policy and R&D support being intermittently favourable, partly in response to variations in fuel prices, which sent positive signals to private investors at some times and negative signals at others.

Tidal stream energy technologies began to be developed during the 1990s after UK R&D programmes into tidal barrage schemes were discontinued.

To date, worldwide government R&D support for wave and tidal stream energy has been much less than other electricity generation and low carbon technologies, including other renewables.

The evidence the market that is immature is twofold.

- Low commercial application and generation of power – estimated at <1% of global Power generation currently.

- The high number of competing devices: Evidence shows 70+ competing devices in development. High numbers of prototype or pre-prototype devices indicates “Stage 3” or “Stage 5” development within the standard 7 stage New Product Development (NPD) Cycle. The NPD cycle consists of the 7 steps of Idea, Idea screening, Concept development, Business Analysis, Beta testing, Technical implantation and finally Commercialisation.

There are no definite commercial market share figures available due to the fact the industry is in its infancy and most companies are involved in Research and Development.

20.2 Market Overview

20.2.1 The UK Market Attractiveness

According to the World Wave and Tidal Market Report - “The UK is forecast to be the biggest market, and is expected to install 51 MW of the total capacity (60%) by 2013. The UK is so dominant due to three main factors. Firstly, the excellent wave and tidal resources that exist around the coastline; secondly, the market mechanisms and funding in place, which are comparatively strong and give more investor confidence than in other countries; and thirdly, the UK is home to a large number of wave & tidal device developers, including some of the early market leaders.”

20.2.2 East of England Overview

The tidal opportunity in Lowestoft is good according to the BERR (Dept of Business, Enterprise and Regulatory Reform.) The seabed is shallow and the current is very strong around the East of England coast. This makes the sub-region an ideal location for research and development. There is a Renewables East, strategy to develop an offshore marine test site.

Our research has shown other companies interested in a test site. These include Trident[9] and Addenergy[10].

21 Oil and Gas Overview

21.1 Upstream

Upstream

The upstream oil and gas sector is primarily concerned with the extraction of hydrocarbons from underground accumulations and the term 'upstream' in this context refers to the exploration and production sectors.

Exploration activity encompasses many disciplines including geosciences, seismic surveys and the drilling of exploration wells. 'Production' includes the construction of field development infrastructure such as wells, pipelines, platforms (if offshore) and operation of facilities through the life of the field. The upstream oil and gas business is a vast industry and in recent years high oil prices have resulted in a major upturn in the sector. Offshore exploration and production expenditure grew from just over $60 billion in 2001 to reach $92 billion in 2005. Projections from industry analysts Douglas-Westwood suggest that by 2010 the global industry will be worth some $120 billion.

The recent rapid growth in the industry has brought its own set of issues, including the availability of experienced personnel, the problems of an aging workforce, and availability of hardware such as drilling rigs and installation vessels. Ultimately the availability of resources such as personnel and hardware will put a limit on the speed of growth in the sector and the scarcity of such resources will determine the extent to which prices and day rates are pushed upwards. In the longer term, the consideration that oil and gas is a finite resource comes into play, and the decline in production from major producing countries will bring its own challenges and opportunities.

The UK is now considered a mature province for oil and gas production, however, whilst overall production is in decline there is still significant upstream activity occurring in the UK sector of the North Sea. The UK Offshore Operators Association estimates that some 365,000 people are employed in the sector, around 5% of which are jobs located in the East of England.

Downstream

The downstream oil and gas sector includes activities associated with refining of produced oil and gas and the marketing of the resulting products.

In the UK**,** refining and downstream activity supports 120,000 jobs and is responsible for £1 billion of exports. Historically, refining has been a low margin business worldwide, in the UK delivering a mere 3.9% return on investment over the period 2000-2004. Therefore, there has been a lack of investment in most developed markets, although the main foreign national oil producers have been investing in developing their downstream sectors. The 2005 hurricane damage to US refineries and resulting fuel shortages demonstrated the fragility of the security of supply situation and refining is now experiencing higher-than-normal margins.

Gas processing plants are located at terminals and take 'wet' gas and remove oil, water, other elements such as sulphur & carbon dioxide and natural gas liquids and output 'dry' gas to the pipeline systems. Gas processing is a major activity with 1,822 plants worldwide in 2005 and 19 under construction (an increase from 1,769 plants in 2004) representing a 1.1% increase in total processing capacity.

Bacton, on the Norfolk coast, is one of the largest gas terminal complexes in the UK. Gas lands onshore at the three producer terminals from the Southern North Sea and from the Shearwater Elgin Area Line (SEAL). It is then distributed to UK customers via the Transco terminal, or to Belgium via the Interconnector system. When in import mode (reverse flow), the Interconnector Bacton Terminal is used to import gas into the UK.

Mature Asset Management / Decommissioning

[9] http://www.tridentenergy.co.uk/news_and_media/media_documents/New%20Energy%20Focus%2030.04.09.pdf
[10] Mark Aspinall

The market for offshore field decommissioning is a subject of considerable complexity. It demands oil companies and contractors develop an understanding of many factors including the regulatory framework within which the decommissioning process has to operate (if only as each regulatory requirement contains business opportunities). The decommissioning process has five key stages:

1. Consideration of decommissioning implications during the initial project definition and field development.
2. Decommissioning consideration during annual review of asset performance through to the 'cessation of production' (COP) decision.
3. Preparing all necessary compliance documentation for decommissioning.
4. Execution of the decommissioning programme.
5. On-going monitoring and management of residual liabilities.

Although it is logical that the industry should focus on stage 4 – the actual decommissioning process, all phases generate business opportunities for the supply chain.

In the North Sea, a total of 444 fields have been developed, or are in the process of being developed, and within these 444 fields a total of 832 production facilities – either fixed and floating platforms or subsea completions – are either in production or in the process of development. The majority of pre-1980 structures are now beyond their original service life of typically 25 years, and are strongly reliant on robust processes to manage risks and assure structural integrity.

High oil & gas prices had delayed the abandonment and decommissioning of many fields, however, it is inevitable that a major decommissioning industry will evolve in the coming years. There are two possible bases of estimates of total removal costs in the North Sea based on present views of fields' year of cessation of production. The first, £15.5 billion, is for full removal of all offshore facilities including concrete gravity structures, whilst the second £12.5 billion, is for the minimum compliant cost. Based on the lower figure, it is projected that the UK will form the largest market at some £8.3 billion of which £6.3 billion is expected to be spent over the next decade. Norwegian market development will lag behind the UK and continue long after most of the UK sector has been decommissioned.

The physical removal of offshore structures will account for almost half the industries spend. The largest part of this is the costs of heavy lift vessels. The decommissioning and abandonment of wells is also a major activity and there is a major potential for those able to offer low cost approaches.

A number of dock areas and ship-yards are now used as decommissioning facilities for oil and gas platforms in the North Sea. In the UK a large area at the ABLE shipyard in Teesside, has been converted to a decommissioning facility (It has a 25 acre dry dock that can accommodate ships in the dry dock up to 366m long with an entrance to the dry dock of 122), while Aker Solutions and a number of local partners (Shetland Decommissioning Company, SBS Logistics and Onyx UK) are in the process of developing and expanding existing facilities at the Greenhead base near Lerwick on the Shetland Isles.

Douglas-Westwood expect the next five years to see the emergence of a sustained market for the decommissioning of fixed platforms, including North West Hutton, Miller, Don, Indefatigable and Total's initiation of removal activity at Frigg. Costs of this activity are likely to exceed $1 billion in the period to 2013.

Brownfield Development

Exploration and production technology has greatly improved since the first developments in the North Sea over 30 years ago. Operators are now assessing some previously shut-in developments (which may have only recovered less than 30% of the original oil in place) with a view to redeveloping the field and restarting production. Techniques such as extended reach horizontal drilling are enabling much higher overall recovery factors and advances in subsea processing and flow assurance techniques allow much longer subsea tiebacks.

An example of such a development is Tuscan's Ardmore, which was previously developed in 1975 by BHP as Argyll and subsequently decommissioned in 1992. The field has been redeveloped using a jack-up rig and is expected to reach production rates of around 40,000 bpd. Tuscan hopes to recover at least another 40 million barrels of oil from the 210 million originally in place. Such developments stand as a great example of what is still possible in the North Sea.

Pipelines
Pipelines are a fundamental transport mechanism in the oil and gas sector and a wide range of types are utilised including infield flow lines (which carry production from individual wells or deliver water, gas or chemicals subsea for injection purposes), risers (vertical sections of pipeline stretching between the seabed and the production facility on the surface), and export lines (large diameter lines used to export oil and gas from production centres).

It can be said without exaggeration that the emergence of subsea production technology has revolutionised the oil and gas industry's offshore activities. The subsea sector has developed at a remarkable pace in recent years enabling the economic development not just of fields on the continental shelf but also in the deeper waters further offshore. All subsea production systems require a pipeline network to bring production from the seabed well(s) back to their host facility – usually a fixed or a floating offshore platform - for processing. They also require control lines, or umbilicals, to monitor and operate the subsea hardware.

Around 10,000 km of offshore pipelines are installed each year worldwide, with the industry valued at around £11 billion per annum. As offshore upstream activity moves increasingly into deeper waters, new pipe lay techniques and equipment is required to cope with water depths of 2,500 metres and beyond. The oil and gas sector has begun to decommission the 35,000 km of pipelines on the UKCS.

Liquid Natural Gas
Liquefied Natural Gas (LNG) is created when natural gas (around 95% methane) is cooled to around -161°C at atmospheric pressure. When liquefied, the gas is reduced to 1/600th of its original volume, allowing it to be transported economically over very large distances in specially built tankers. Strong growth in gas demand, coupled with the fact that large reserves of gas are currently 'stranded' far away from the end markets, has resulted in much interest in the subject of gas liquefaction.

There is no doubt that the LNG market is set to see dramatic growth over the next five years, with annual expenditure set to reach over $23 billion by 2010. Global CAPEX on LNG facilities for the 2008-2012 period is expected to total nearly $76 billion, over three times the amount spent during the previous five-year period. Energy analysts Douglas-Westwood have forecast a total of 26 new LNG liquefaction trains offering some 115 mmtpa (million metric tonnes per annum) of additional output. Over 140 new carriers will be constructed to handle the additional cargoes and $35 billion will be allocated to the construction of new import terminals to receive the liquefied gas.

The UK has two import terminals currently operational at the Isle of Grain and South Hook in Milford Haven in Wales. A third, Dragon, is currently under construction and will become the second import terminal in Milford Haven.

22 Biomass Overview

Biomass energy from organic materials such as wood, crops and waste can be used to generate electricity and/or heat or in the production of liquid transportation fuels such as bioethanol or biodiesel.

Biofuels are the only short-term option to reduce reliance on oil for transportation fuel. The market is expanding rapidly, from a current £10 billion to reach about £24 billion in 2010. Major oil companies are developing their interests in the sector and private investment into companies active in biofuels has surged in the last year. The UK should see tremendous growth in the short-term as the EU directive on biofuels has set a target of 5.75% in 2010, an ambitious target as the EU missed its 2% in 2005

Combustion of biomass for power generation alone accounts for around 0.9% of world electricity production, primarily in Northern America and Western Europe. Main producers worldwide are the US, Brazil and Finland. Current global installed capacity growth is over 10% per annum. The main applications are medium-scale CHP plants where energy production is optimised through district heating and manageable quantities of supplies at short-distance from the power plant. Co-firing with coal is also taking-off. The market for power generation from biomass should reach around £1.6 billion in 2010 from £1.1 billion currently.

Biomass energy is heavily reliant on low cost sources of biomass – good infrastructure and short-distances are a prerequisite. Long term commitments are needed, both to the biofuel tax rebate and

renewable transport fuel obligation, as well as sensible regulation and planning rules that encourage renewable developments. Also needed are effective grant schemes throughout the supply chain and a sustainable return to farmers. The government's use of obligations has helped biomass for electricity and transport fuels, but has not offered the same incentives for biomass for heat. Further support to the ROC to lower the break-even period would enable the development of a small-scale wood-CHP fuel supply chain.

The East of England has very strong potential with much agricultural and forestry land for which biomass offers an opportunity for improved rural income. Three biomass plants currently operate in the region: Ely, which at 38 MW is the largest straw burning power station in the world; the 12.7 MW Eye power station which was the first poultry litter fuelled plant in the world; and the 38.5 MW Thetford power station which is the largest poultry litter fuelled plant in the world. All three plants are operated by Energy Power Resources.

23 Microgeneration Overview

Microgeneration incorporates a range of technologies (many renewable) which can provide a building with a proportion of its electricity and/or heating. Excess electricity can be sold to the National Grid.

There is currently little installed capacity in the UK. The potential, however, is considerable, with the latest DTI microgeneration review considering that micro-CHP alone could displace around a third of the total UK electricity consumption by 2030.

Following increasing gas and electricity prices, interest in micro-generation is growing despite their initially high capital cost. Microgeneration technologies are located at load-point, hence are far more efficient as a distributed generation source than traditional large-scale, central generation technology.

Micro-generation technologies can be deployed virtually anywhere and are easily displaceable or removable. As 'white-goods', microgeneration technologies are potentially mass-market products and selling strategies are emerging to reflect this with high street stores beginning to stock some units.

Micro-generation offers high employment creation particularly through commissioning and maintenance activities. Substantial numbers of personnel with plumbing, heating and electrical skills will be required if the sector is to fully develop.

The major technologies in the sector include:

Solar thermal – the most commonly installed type in the UK, solar thermal systems are usually installed on domestic properties to provide water heating. They are one of the most efficient and cost effective microgeneration technologies.

Solar Photovoltaic (PV) – Solar PV systems convert solar energy into electricity through the use of roof-mounted solar panels. Although costs are falling, PV is not as cost efficient as solar thermal systems.

Small-scale wind – Units are typically in the 1-2kW range and will usually provide a saving of 1/3 on electricity bills. Payback period for the system is approximately 5-7 years for a 1kW system. Excess electricity can be resold to the National Grid.

Ground source heat pumps (GSHP) – GSHP transfer heat from the ground into a building to provide space heating and can be used for pre-heating domestic hot water. A typical 8kW system costs £6,400-£9,600.

Micro-CHP – Micro Combined Heat and Power is a 'super boiler', which partly recycles the energy consumed for heating to generate electricity. The concept delivers huge benefits by reducing the amount of energy wasted. Combined thermal and electrical efficiency of a micro-CHP unit is over 90%. Micro-CHP is a high efficiency solution; it is not a renewable source of energy unless primary fuel is strictly made from renewable sources such as biomass.

24 Nuclear Energy Overview

24.1 Existing Infrastructure

There are currently nine operational nuclear reactors in the UK, of which one (Sizewell B) is located in the East of England. In total, nuclear power stations represented around 20% of the British electricity production in 2008 (18% UK, 2% Imported). By 2023 however, all nuclear power stations with the exception of Sizewell B will be closed, creating a significant gap in generating capacity. This problem will be exacerbated by the shut-down of most coal power stations during the period and rising cost of gas power.

Sizewell A, located on a 10 hectare site on the Suffolk coast, is an operational twin reactor Magnox power station, with a nominal capacity of 440 MW. On a typical day, the station supplies more than 10 million kWh of electricity – enough to serve the energy needs of a third of East Anglia. Sizewell A has now stopped operating and decommissioning has begun.

Sizewell B is a Pressurised Water Reactor (PWR) with a nominal capacity of 1,188 MW. It is capable of supplying over 1.5 million households – roughly the equivalent of the daily domestic needs of Suffolk and Norfolk. The station supplies 3% of the UK's entire electricity needs. The plant should reach its life limit in 2023 though extension could be granted provided that satisfactory performance and sustained safety of operation is warranted. According to British Energy, the plant is providing employment to 416 full time staff including 16 apprentices, all living within 25 miles of the plant.

Nuclear Decommissioning

In the UK, the Nuclear Decommissioning Authority (NDA) is responsible for the dismantling of former nuclear power stations. Currently, sixteen nuclear power stations are undergoing decommissioning. Sizewell A joined the list in 2006 as well as the eight other existing British reactors by 2023. The NDA estimated previously that the decommissioning cost for UK reactors would amount to £56 billion (annual spend £2.2 billion), but Sir Anthony Cleaver, the head of the authority, stated that the actual cost would be closer to £72 billion. Costs are most likely to escalate as better estimates can be made further in time.

The decommissioning business is therefore a very large opportunity for UK industry and the NDA is keen to develop a competitive framework to ensure both reduction of costs and the development of innovative technologies. Whilst the NDA directly interfaces only with Tier 1 contractors, typical sub-contracting levels are high, the NDA mentioning a 50-60% bracket for Sellafield, and 66% at Dounreay. Identification and liaison with Tier 1 contractors will be therefore paramount for developing business prospects in this field.

In addition, the International Atomic Energy Agency has estimated in a recent study that clean-up of the world's existing nuclear waste will cost as much as US$ 1 trillion over the next fifty years, with the bulk needed before 2040. Intense technology development in the field of robotics, SCADA, confined transport, heavy civil structures and of course nuclear engineering will be required. Primary target countries will be the USA, China, Russia, France and Japan in addition to the current Soviet Union Legacy program lead by the World Bank. Note that since around two hundred reactors in the world will need to be decommissioned in the next 20 years, the sector will provide the clean-up industry with a reliable turnover for at least half a century.

New Build Nuclear

The recent Energy Review has attracted much scrutiny as it has paved the way for new build nuclear. Consensus in the industry is that the proposed development of a new generation of reactors, aimed at replacing the current ageing population, will approximately translate into about ten new power stations being built by 2020. In order to ease the development of such new capacity, ease of the regulatory framework is likely to be implemented to fast-track projects. In order to overcome local opposition, the government aims at using the power conferred upon the 'States of Need', leaving the Government sole judge in the decision. As the industry cannot develop without government intervention indirect support is likely to be provided. The nuclear lobby is now pushing forward for a nuclear equivalent of the Renewable Obligation Certificate (ROC), although the carbon emissions linked to nuclear-fuel production will make it difficult.

The odds in favour of a reactor made in the UK are low given the fact that no such venture has been attempted since the 1980s. In addition, the industry would need a considerable amount of experienced staff which do not exist anymore and would take years to develop. A paper published by the Royal

Academy of Engineering states that from around 7,800 staff employed in nuclear generation in 1995, a little more than 4,000 remain. Without action, by 2020, this figure is likely to be smaller than 1,700.

In the longer term, the development of Fusion Power could become an important prospect for the East of England. Indeed the presence of Cambridge University has the required international aura to attract the attention of the ITER consortium for a fusion power materials research centre.

The ten proposed new power plants are likely to use a pressurized water reactor which, according the Materials Energy review 2008, was cited as the most widely used nuclear technology in the world, accounting for over 60% of the world's nuclear power stations. Two of the leading designs are the Areva NP European PWR (ERP) and the Westinghouse Advanced Passive PWR (AP1000TM) which are both being evaluated by the regulators for use in the UK

In March 2009 Areva invited UK companies to bid for up to 70% of the nuclear engineering components of new UK power stations by Areva, the French company which is the world's leading constructor of nuclear power plants.

Westinghouse has four AP1000TM reactors being constructed in China and orders for six plants in the USA. Around the world today around half of the operating nuclear power stations are based on Westinghouse technology.

The civil engineering and construction approach of these two design types are as follows:

- Westinghouse uses a modular construction approach which involves remote production of the structural modules prior to shipping to site for assembly
- Areva NP European PWR is built on site.

The Nuclear Industry Association (NIA) has estimated that around 1,400 jobs will be created at each site during the construction period for a new twin-unit nuclear power station, plus around 250 project management and technical support jobs. British Energy has stated that these new nuclear power plants will provide between 500-900 jobs per site for sixty years.

The UK's New Build program is valued at around £40 billion new with the East of England likely to host two of the proposed ten plants. French utilities company EDF, plan to build four new EPR reactors by 2025 and are looking to start construction at Sizewell C around 2013 with an operational year of 2017. Bradwell in the south of the region has also been earmarked for a new plant, but no date has been confirmed. Decommissioning has already begun at Sizewell A and Bradwell power plants and will be followed in 2035 by Sizewell B.

It should be noted that UK companies will be involved in the construction and fabrication work for the new build program so imports from abroad will be reduced to more specialised components.

25 Carbon Capture & Storage Overview

UK Policy Development:
In late June 2009, a new Energy Bill was proposed for the forthcoming session of Parliament.

The Bill would enable the Secretary of State for Energy and Climate Change to introduce a financial mechanism to fund up to four commercial-scale Carbon Capture and Storage (CCS) demonstration plants – the first of these could be operational by the middle of the next decade.

This follows the publication on 17th June of the Government's consultation document 'A framework for the development of clean coal' which sets out how the Government proposes to reconcile the need to curb emissions of carbon from future coal fired power stations with the need to maintain a secure diverse energy mix. The consultation also contains proposals for the detailed design of the financial support mechanism that will be introduced through the Energy Bill.

The Government are now working out a comprehensive strategy on energy and climate change to meet the UK's carbon budgets, aimed at cutting emissions by more than a third by 2020 and at least 80% by 2050. Central to this will be shifting our energy mix to low carbon – based around new nuclear power stations, a massive expansion of renewables and clean coal and gas technology such as CCS.

Capture:
The technology to reduce the emission of CO2 from the burning of carbon-based fuels exists. CCS involves a 3-step process: capturing the CO2 from power plants and other industrial sources; transporting the CO2 (usually via pipelines) to storage points; and storing the CO2 in geological sites such as depleted oil and gas fields.
There are three different types of carbon dioxide capture systems:

- Post-combustion - CO2 is separated from flue gas. The most common method is to scrub the flue gas with chemical solvents, which is an established industrial process
- Pre-combustion - (for use in Integrated Gasification Combined Cycle power stations) Involves reacting fuel with oxygen or air, to produce a gas consisting mainly of carbon monoxide and hydrogen. The carbon monoxide is reacted with steam to produce hydrogen and CO2, which is separated. The hydrogen is then burnt as the fuel
- Oxyfuel - Uses high purity oxygen in combustion resulting in high carbon dioxide concentrations in the gas stream and therefore its easier separation

The technology can be used on any combustion plant: gas power stations and other industrial plant that emit CO2 could be fitted with CCS.

Storage:
The United Kingdom has promising sites for the storage of CO2 underground. The depleted oil and gas fields in the UK continental shelf could, according to one 1996 study, store the whole UK CO2 output for 40 years.11 The regulatory framework to enable private sector investment in CCS was set out in the Energy Act 2008. Until recently, the funding debate has focussed largely on power stations and how to get demonstration plant built. This is only part of the problem, though. The infrastructure necessary for transporting the CO2 and injecting it under ground is expensive; CCS proposals put forward by the climate change secretary in April 2009 are for groups of power stations to share transport and storage infrastructure. The proposed 'clusters' are mainly on the eastern side of the UK, where generation infrastructure is in any case concentrated and in close proximity to proposed storage sites in the North Sea.[12]

The depleted oil and gas fields are the first sites to be considered for storage capacity because they are already equipped with infrastructure such as platforms and pipelines.

26 Gas Storage Overview

The UK has storage capacity of about 4% of average annual consumption, or about 14 days' worth. This compares to Germany's reserves equivalent to 21% of annual consumption and France's 24%. Therefore the UK, which imported about 40% of its gas last year, is more vulnerable to supply disruptions. As North Sea output declines, the UK is expected to import up to 80% of its gas by 2015.

Storage Methods: The UK's gas is transported around the country through a network of underground pipes, called the National Transmission System (NTS). It is used in our power stations to generate electricity and is sent to distribution networks to supply homes and businesses.

Distribution System – The amount of gas in the network of distribution pipelines (called line-pack) can be varied slightly to help meet day-to-day changes in demand by adjusting the pressure in the pipes. Large above ground storage tanks – Geometers – also store gas at low pressure to help meet variations in demand.

Liquified Natural Gas (LNG) – At certain points around the NTS, natural gas is cooled and compressed to a liquid. It is stored in large tanks above ground. These tanks must be kept cool all the time. The LNG can be turned back into gas by warming it up and is used to help meet the peak demands in winter. Liquefying natural gas is a very slow process so these facilities only supply gas on a few peak demand days each year. LNG can also be imported by ship and stored briefly at the port while it is re-gasified and put in the NTS.

[11] UK Energy Research Centre, Carbon Capture and Storage
[12] http://www.parliament.uk/commons/lib/research/briefings/snsc-05086.pdf

Depleted Fields – When old gas and oil fields reach the end of their lives, some are suitable for use as gas storage to help fulfil changes in demand. The rates of input and extraction of gas are generally quite low making this type of storage best suited for managing seasonal changes in demand.

Salt caverns – Purpose built underground salt caverns allow large quantities of gas to be stored. These facilities are very flexible as gas can be quickly and easily injected and removed from the caverns. The BGS (October, 2005) published an authoritative review of the possibilities of using salt caverns for UK storage but in reality salt caverns have to be created by leaching and are roughly twice as expensive to develop compared with utilising depleted fields.

Advantages of using depleted oil/gas fields as storage facilities are:

- **Depleted oil/gas fields offer low risk** as they have a proven hydrocarbon containment capability over geological time
- The North Sea has **significant storage capacity**
- Infrastructure already in place – wells, platforms, processing plant, pipelines, terminals (though requiring further investment).
- The skills and knowledge required to develop and operate such facilities are already available in the oil & gas industry.

Rough Gas Storage Facility (UK, SNS)
Centrica have long since proved with the Rough facilities (owned and operated by Centrica Storage Ltd) that it is possible to develop and operate a successful offshore gas storage business. Rough was an early (1960's) discovery some 18 miles off the Yorkshire coast, finding gas in homogenous, high quality Rotliegendes sandstone at a depth of about 2,750m: it was developed with two offshore platforms, installed in 1987 and 1983, and an onshore gas processing terminal at Easington. It was turned into a storage facility in 1983/4 with 340bcf 'cushion' gas (to maintain pressure in the reservoir), 100bcf storage capacity, and deliverability of 1.5bcf/day and average injection of 0.6bcf/day.

The Easington terminal processes the gas before it enters the National Transmission System, separating dry gas and a small amount of condensate from the production stream. Easington also withdraws gas from the National Transmission System during periods of low gas demand and sends it for re-injection into the Rough reservoir. Rough acts as a storage facility for gas shippers and suppliers – any company with a UK gas shipper licence can apply to purchase storage capacity at Rough.

New Developments
Baird Field – Centrica have taken a controlling interest in a project to develop the UK's second largest gas storage field at the depleted Baird field. It paid £25m to acquire a 70% interest from Perenco in the Baird project, Perenco retaining the remaining 30%.

Hewitt Field – Italian-based energy company Eni is transforming the Hewett field off Norfolk into an offshore gas storage project. Eni paid £210m to take control of the project, taking on Tullow Oil's 52% stake and increasing its own interest to 89%.

A recent East of England Development Agency report concluded that while the region does not have a high density of CO_2 sources compared to other neighbouring regions, its existing storage and energy sector put the region in a good position to supply this sector.

27 Training Facilities

Potential customers of the PowerPark do not list skills in their top 3 requirements. Location, capital expense and port facilities are more important to them. The energy sector often takes graduates or experienced engineers from other fields (including the armed forces) and retrains them on their bespoke equipment in order to bring them up to speed on their proprietary technical operations, Health and Safety (HSSE) procedures etc.

In spite of these reasons, we do see 2 options for HE/FE within the PowerPark:

- **Manufacturer / Developer Campus:**

  A manufacturer (Siemens / Vestas / Westinghouse etc) decides that the scale of the work being supported from the PowerPark justifies creating a bespoke training facility at the PowerPark. They would only do this if the cost of training people at their training facilities (Denmark / Seattle) became more expensive than creating their own local facility. We expect this would be funded by the manufacturer / developer. All commercial companies look for ways to reduce their capital expenditure (CAPEX) and would obviously welcome any public funding money - as long as there were no fundamental restrictions that impacted their commercial business model.

- **Local Further Education / Higher Education (FE/ HE) faculties:**

  Local FE /HE facilities include the University of East Anglia (UEA), University Campus of Suffolk (UCS), Lowestoft College and others. These facilities could place a small to medium sized campus on the PowerPark site in order to be close to the emerging energy sectors. The viability of this is being considered with some local FE/ HE facilities and the training providers. These viability actions include:
    - Creating a funding link to Bedford College.
    - Creating a generic Offshore Maintenance syllabus.
    - Creating an apprenticeship focusing on the Energy Sector – currently being funded by a broad spectrum of energy sectors.
    - Independently identify demand for a Post Graduate option within the energy sector.
    - Identify a business model to locate a campus within the PowerPark.

Linkages and mechanisms to capture and commercialise research and development requirements and opportunities and the implications of this in relation to the development of the PowerPark activities and facilities is another area where requirements are being considered discussions instigated by 1st East and should be investigated further in Phase2 Demand and Need work.

28 Bibliography

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    - submissions by various parties to the Examination in Public, the Panel Report and
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29 Appendix 1 – List of Interviewees

29.1 List of Interviewees –

ABP	Port Manager
AddEnergy	CEO
B9	Director
B9	MD
Bifab	Business Development
Bond Helicopters	Business Development
Centrica	O&M Manager
Eastport	Director
EEDA	Sustainable Development
EEDA	Renaisance Executive
EEEGR	CEO
EON	Head of Operations
Gamesa	Offshore
GE	Offshore
Gifford	Consultant
Lowestoft College	Assistant Principal Business Innovat
Lowestoft College	Vice Principal
Lowestoft College	Economic & Business Dev Manager
Lowestoft College	Principal
Nordex	Offshore
NWES	Director
SCC	Economic Development
SCC	Economic Development
SCC	Spatial Planning
SCC	Euro Economic development
Siemens	Manager
Skills for Energy	CEO
SLP	Operations Manager
Suzlon	Offshore
WAB	Managing Director
Warrick Energy	Director
WDC	Policy Manager
WDC	Head of Economic Development
WDC	Economic Development
WDC	Economic Development
Yorkshire Forward	Energy Cluster Manager

30 Appendix 2 - SWOT Detail for PowerPark in General

30.1 PowerPark and Port

Strengths

- For sea journeys - all operators have an obvious limit on number of hours worked per day per person for health and safety reasons. For this reason, distance from base to site needs to be as short as possible.
- Lowestoft port has good access with very few restrictions. [13]
- The port is in good condition and ABP are duty bound to accept all legal cargo.[14]
- The port has no restrictions on work hours - 24/7/365 all vessel access is allowed to and from port.
- There is low variation in tidal range – access is not restricted by tides.
- No restrictions on working height.
- Quay side warehouses and space exists. Operators do not want their warehouses to be placed at great distance from their quay side because of the:
  - Increase in travel time from the warehouse to the boat – through loading the vehicles and in getting from one end of port to the other. This leads to a reduction in available work hours by a crew.
  - Limits on physical objects as a result of vehicle size / weight restrictions
- Existing internal road network at port makes moving objects around easy. Potential customers do not need to build their own new roads.
- No competing cargo traffic. ABP is prepared to offer inner and outer harbour flexibility / variations to a prospective customer.
- ABP has existing pontoons in place and is prepared to add additional pontoons. Pontoons assist crew and heavy object transfers.
- An existing helicopter installation is within the harbour.[15] Airtricity will use the new operational base in Lowestoft to service the Greater Gabbard offshore wind farm, including the creation of 120 jobs. The helicopter landing pad is operated by Bond Air Services.[16]
- The fishing industry is much smaller then it was and there remain only 15-20[17] fishing vessels in the harbour[18]. This means less interference in vessel and port operations and more enthusiasm from ABP to expand into new opportunities.
- The port owner prefers regular scheduled vessel traffic since it is more profitable.

[13] ABP
[14] ABP - Marine Policy Document
[15] WDC / ABP
[16] UK Activity Report - 30th April 2008
[17] As of April 2009 - ABP
[18] ABP

- Based on discussions with local / public bodies there is the possibility of Infrastructure investment joint ventures or funding from EEDA, 1st East, WDC, DEFRA, and ABP - already in place at Lowestoft port.
- Some Lowestoft PowerPark facilities are at end of life. This is a positive because rebuilding to bespoke energy requirements could get financial help from either the port owner or public agencies.[19]
- Existing secure flexible office space[20] is available within the OrbisEnergy centre. For CAPEX reduction reasons potential customers prefer to lease existing flexible, secure office space rather than build their own new office space. Roads and warehouse space already in place.
- Mobile cranes, one 30.5-tonne capacity ship-to-shore crane and a range of forklift trucks.
- Reasonable land rents compared to other ports[21]
- Local staff support facilities (hotels and restaurants etc.) all ready exist.
- Norwich Airport has direct flights to Amsterdam, Aberdeen, Bergen and to Gas Platforms.[22]
- Bond Helicopters has an option for 3 helicopters places at the Norwich Airport.[23]
- The port does not require zoning amendments. The port area is zoned correctly already for B1, B2 and B8.[24]

B1 Business	(a) Offices other than in a use within Class A2 (Financial and Professional Services) (b) Research and Development – Laboratories, Studios (c) Light Industry	B8 (where no more than 235m^2)
B2 General Industry	General Industry (Other than Classified as in B1) The former 'Special Industrial' Use Classes, B3 – B7, are all now encompassed in the B2 Use Class	B1 or B8 (B8 limited to 235m^2)
B8 Storage or Distribution	Storage or Distribution Centres – Wholesale Warehouses, Distribution Centres and Repositories	B1 (where no more than 235m^2)

Figure 5 - Waveney District Council – 2009

Weaknesses

- The entire PowerPark is subject to flooding[25] which will complicate any large infrastructure investment.[26] We understand from 1st East have had positive discussions with the Environment Agency about the options to reduce the flood-risk spectre.
- The OrbisEnergy centre has restrictions on the size and type of company who can become resident within the OrbisEnergy centre.[27]
- The PowerPark is occupied and a potential customer might find it cheaper and quicker to develop an undeveloped site.

[19] WDC
[20] Site visit and OrbisEnergy
[21] *Office Market Analysis – OPEX costs to rent*
[22] Omniport
[23] Bond Helicopters
[24] WDC
[25] WDC
[26] SCC & WDC
[27] NWAS

- The ownership of land within the PowerPark is divided and could cause delays when trying to create large spaces.
- There are existing fishing and leisure vessel installations within the inner harbour. All of these would need to be suitably relocated.
- Existing residential concerns about noise and interference.
- Access to and within Lowestoft by road or aeroplane is difficult. Road access into and within Lowestoft is poor.[28] There are numerous traffic jams and single lane roads in and around Lowestoft. There is no direct motorway access to Lowestoft. Moving heavy and large objects on road in or to Lowestoft is impractical due to bridge restrictions, roundabouts and street furniture limitations.
- Lack of parking for private and commercial vehicles.
- There is no local airport. The closest airport at Norwich has no direct flights to London and no direct flights to Denmark.[29]

Opportunities

BVG Associates Ltd approached the benefit in **economic** and **employment** terms from 3 separate angles

A. Size of the opportunity based upon national and regional expectations. This factor is scaled based upon planned important local sites such as Norfolk Round 3[30] and the Round 3 zone of Hornsea (above Norfolk).

B. Evidence was gathered from existing offshore O&M operations to understand how many jobs will be created considering the required space and an estimate for local support / supply chain jobs.

C. Expectations of local spend from the WTM based upon industry known and internal breakdowns.

Additionally we looked at how attractive Lowestoft would be from the point of view of the WTM to reduce their CAPEX infrastructure investments spend with joint ventures / public money at Lowestoft.

For more detail see each SWOT appendix section.

Threats

- The important space required in Lowestoft could be reserved / bought by other companies before 2016. This will make Lowestoft site unviable for many sectors / customers.
- Great Yarmouth is a large site with more lay down space. This makes it more attractive for larger work. Great Yarmouth already has existing helicopters, supply chain and facilities in place.
- The historical relationship between the competing port owners of ABP and East Port means there are / could be duplication of facilities and services and ultimately reduce benefit to Lowestoft. Private port companies are competing for the lucrative work.[31]
- There is currently no champion who could get Lowestoft, Great Yarmouth, ABP, EastPort UK and landowners to work together and create a complimentary unified strategy to offer to the potential customers.

[28] WDC, SLP, B9
[29] Omniport
[30] See section on map and risk layout
[31] WDC & SCC

- There are other competing ports in the region with large amounts of space and enthusiastic port owners. These include:
  - Wells-next-the-sea
  - Humber
  - Grimsby
  - Other / undeveloped Brownfield or Greenfield sites

30.2 Council / local authorities / non elected bodies

Strengths

- Enthusiastic councils and local bodies[32]. This is fundamental in that it assists developers and others proceed with the zoning and planning permissions that must be completed prior to PowerPark customer development. [33]
- 1st East is a dedicated delivery body promoting regeneration and leading on the PowerPark
- Positive and helpful official strategy and policies:
  - Core Strategy (adopted Jan 2009.) Applicable policies include:
    - CS05 Lake Lothing and Outer Harbour Area Action Plan,
    - CS07 Employment,
    - CS08 Renewable Energy Cluster and
    - CS09 Knowledge Economy. Also related is CS03 flooding and Coastal Erosion.
  - Regional Space Strategy (RSS (Adopted may 2008)) with the most relevant policies being:
    - SS5 priority areas for regeneration,
    - SS9 the coast,
    - E1 job growth,
    - E2 provision of employment land,
    - E3 strategic employment sites,
    - E4 Clusters (refers energy cluster Norfolk/Suffolk Coast,
    - ENG1 Carbon dioxide and energy performance,
    - ENG2: renewable energy targets,
  - GYL1 Great Yarmouth and Lowestoft Key Centres for Development and Change (ref renewable energy cluster).

[32] WDC – Desi Reed
[33] Bond Helicopters had a very quick and easy approval process for their single helipad and helicopter hanger at Lowestoft Port.

30.3 Skills

Strengths

- Keen awareness to improve skills across region. The colleges and HE /FE facilities are aware and are training up young people to make up for the lack of skills.[34]Lowestoft Apprenticeship program covers sponsors from all energy sectors. Local Universities will offer specialist courses.

- Established oil and gas industry helps provide the similar skills. With the current economic climate people are more flexible and willing to move.

- Skills for energy: The Skills for Energy partnership brings together all of the key players from the private, public and academic sectors involved in skills development across the energy sector for the East of England. Its purpose is to identify, develop and deliver a programme of activity that will ensure that the skilled individuals needed by the energy industry over the coming years are available, suitably trained and can lead to long term careers in energy.

Weaknesses

- There are a finite number of skilled experienced people already employed and therefore recruiting skilled staff could be hard or have a negative impact on current and future decommissioning work for offshore oil and gas facilities.

- Many skilled people are retiring or taking more lucrative overseas work.

- Lowestoft has challenges in attracting the required technical people since Lowestoft is a remote location.

30.4 Offshore O&M Specific SWOT detail

30.4.1 Strengths

Port size

Lowestoft is suitable for the three possible Round 3 O&M operating requirements[35]. The three future methods of support involve a currently undecided mix of vessels, sea based platforms or helicopters.

- ABP agree planned O&M Operation's[36] criteria are achievable within existing port operations. [37]

- The port owner prefers scheduled traffic and this is fits in with planned Round 3 offshore wind O&M day to day vessel usage.

- ABP have the benefit of similar operations in port - Siemens and SLP are already located in the harbour.

- Existing facilities are appropriate: Most day to day O&M requirements can be satisfied with a forklift or a low weight crane.

30.4.2 Weaknesses

- The offshore wind industry offers lower wages than Oil and Gas.[38]

30.4.3 Opportunities

[34] Skills for Energy, 1st East, Lowestoft College
[35] Vestas, Siemens, Clipper, and GE – all agree.
[36] Vestas
[37] ABP
[38] Skills for Energy & SLP

1. **Number of Jobs**

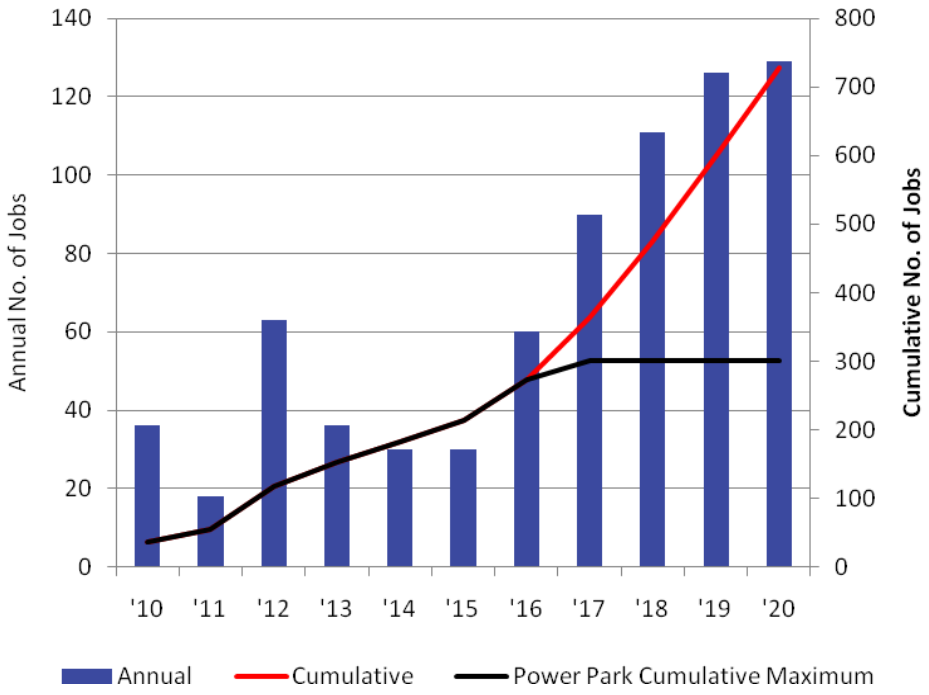

Figure 6: Potential number of East of England O&M jobs

Offshore wind O&M option offers the highest number of high value long term jobs with the smallest use of land. Vestas and Siemens use in excess of 95% people sourced locally. The figure of 300 direct jobs has been expanded to 400 for the calculations in the vision to accommodate the higher summer levels and the use of additional direct contractors.

The graph above indicates the expected number of direct staff required to provide O&M services to the offshore wind farms in the East of England region. The PowerPark cumulative maximum shows the expected maximum capacity of the PowerPark based upon the 150m quay space restriction.

Figures provided by Vestas and operators in the interviews show:

- An average of 30 direct staff per 100 turbines
- 4:1 indirect jobs to directly employed staff ratio.

Note: These numbers factor in the expected change of support model for the larger and more distant Round 3 wind farms. Not all of these jobs (particularly the indirect jobs) will be in the PowerPark, but many will be local to it. The summer staffing levels would be significantly higher - the average wind speeds are lower in summer so more proactive maintenance is scheduled.

2. **Market value**

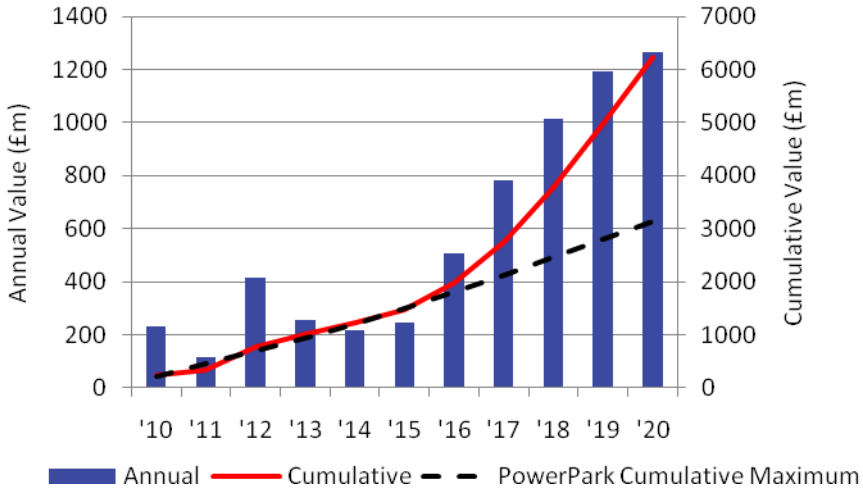

Figure 7 - East of England O&M port activities market value

The graph above shows the predicted value of the port related offshore wind O&M activities in the East of England region. The industry expects an offshore wind farm to spend about 20% of wind farm CAPEX on O&M and other OPEX costs. 30-35% of OPEX costs are port related costs such as berthing, fuel, lease, services and facilities. The estimate of average CAPEX spend to 2020 is of the order of £2.5M/MW. The PowerPark cumulative maximum shows the expected maximum capacity of the PowerPark based upon the 150m quay space restriction.

3. **Onshore Opportunity:**

There is a small opportunity for the PowerPark in the onshore wind market. If this market in the region grows then Lowestoft could be well placed. Asset managers prefer to use offshore teams in weather downtime to do onshore maintenance wherever possible. The East of England onshore market is still small as a result of resistance to planning consent decisions within Norfolk and Suffolk.[39]

4. **Others:**

- B9, SLP, Greater Gabbard and others might simultaneously grow a natural and separate O&M area of expertise in the Lowestoft port area that will pollinate and positively influence the PowerPark.

30.4.4 Threats

- Norfolk and Hornsea are large zones. They will be developed in sections. The first section developed could be closer to Great Yarmouth. This might result in the WTM locating the O&M base there.

- Due to the time delay other work or options on the site could start. This could include other industrial work that is incompatible with offshore O&M.

30.5 Project Construction Specific SWOT

30.5.1 Weaknesses

[39] SLP

- The proposed PowerPark - Port and quay side - is too small for project construction. The existing port can only just handle existing jack-up. The only available land that is large enough is on the other side of the bridge and out of the PowerPark area but there is a bridge restriction[40].

- Project construction does not bring a high number of high wage jobs over a long time - considering the amount of space required. The work is a very seasonal activity (WTM do not install during winter but may install foundations all year)

- Job density and diversity is low. The separation of technical skills is large. Management and many lower skilled people with little crossover.

- ABP is not too keen on the project construction revenue model for the Lowestoft site.[41]

30.5.2 Opportunities

1. Number of jobs

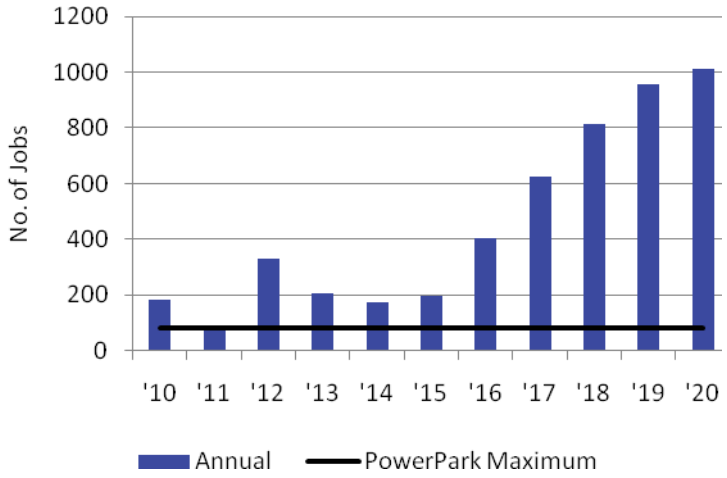

Figure 8 - East of England number of direct project construction jobs

The graph above shows the potential number of direct jobs created in the East of England area from offshore wind project construction activities. This is based on the requirements as stated.

Note: The PowerPark maximum is based on the assumption that 15 Hectares of space can be identified and developed for this use.

2. Market Value

[40] ABP
[41] ABP

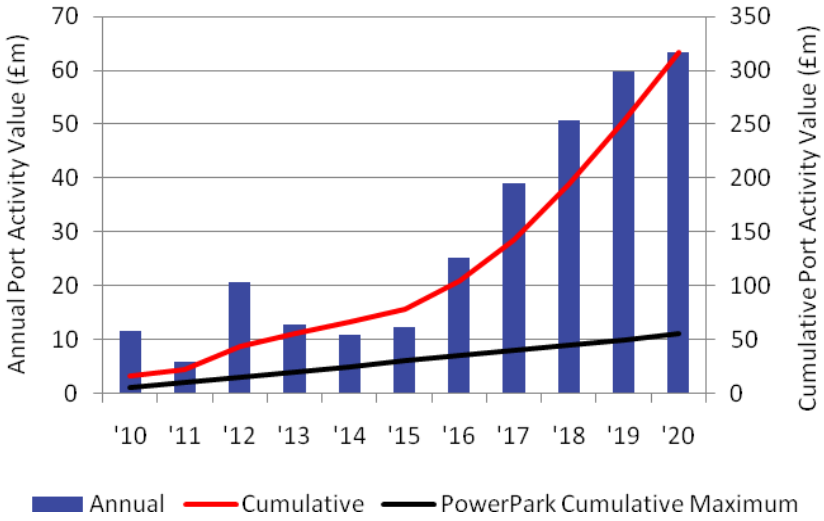

Figure 9 - East of England project construction port market value

The graph above shows the potential value to the East of England ports from the offshore wind project construction activities. This is based on the requirements as stated and assumes 1% of CAPEX is related to port activities, as assumed in DECC's Ports for Offshore Wind report. It excludes vessel costs and fuel which would increase this value.

Note: The PowerPark maximum is based on the assumption that 15 Hectares of space can be identified and developed for this use.

3. **Onshore Opportunity:**

If the port is being used to receive the turbines from the factory for the offshore wind farms, it is possible that the turbine manufacturers would want to use the port for importation of onshore turbines for any projects in the East of England area. The road infrastructure around Lowestoft may well rule this out.

30.5.3 Threats

- Undecided Project Construction Build Method: The Round 3 project construction model could take as yet undecided methods from other ports (even from continental Europe.) Innovative solutions from companies and continental European ports could reduce the benefits to the PowerPark.

- ABP prefers other options for the size-restricted site at Lowestoft.

- Councils and others will resist the idea since the employment opportunities are not high tech but tend to be lower skill type labour predominately.

30.6 Foundation Manufacture Specific SWOT Detail

30.6.1 Weaknesses

- The proposed PowerPark is potentially too small for the expected demand for large scale foundation manufacture. The water depth within the port is at the current limit of required vessels for foundation manufacture. The only available land that is large enough is on the other side of the bridge and out of the PowerPark area but there is a beam restriction due to the bridge.

- A deep harbour to sea trench / harbour deep hole is missing for the concrete foundation manufacture model.

- Foundation manufacture does not bring a high number of high wage jobs over a long time - considering the required storage space.
    - The job density per 100 turbines is very low.
    - Most jobs are low skill set compared to other offshore renewables.
    - The offshore wind industry offers lower wages then Oil and Gas.[42] Recruiting skilled staff could be hard or have impact on current and future decommissioning work for Offshore Oil and Gas facilities. It could reduce wages on average across the area.
- ABP prefers other options for the size-restricted site at Lowestoft.

30.6.2 Opportunities

1. Number of jobs

The number of jobs created by the foundation manufacturing market in the PowerPark could be as much as 350-500. This is based on the experiences of BiFab (steel) and Gifford (concrete design). A facility would require circa 10-15 Hectares of space. Concrete foundation is better for local job creation as all components are manufactured on site. Steel foundations could potentially have final assembly on site from prefabricated sub-assemblies.

2. Market value

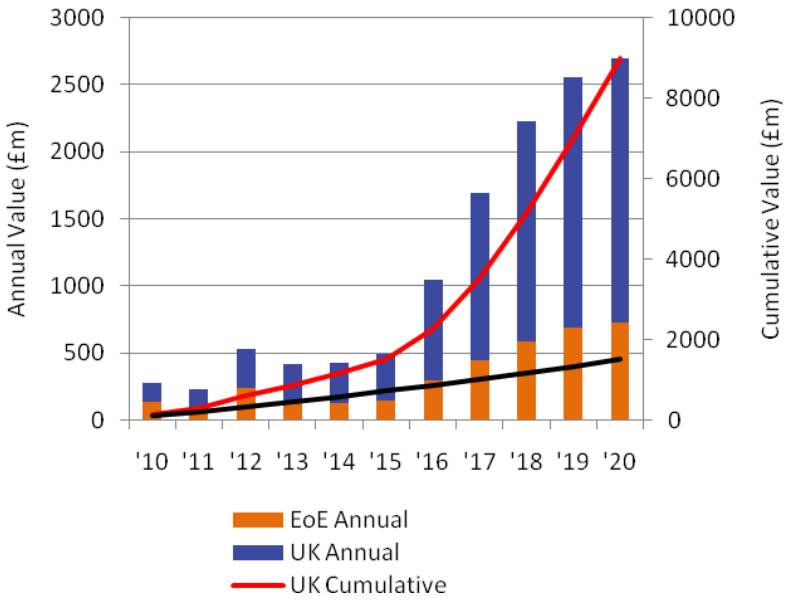

Figure 10 - UK foundation manufacture market value

Foundation manufacture is estimated to be about 11-12% of total CAPEX. Based on this percentage the graph above shows the potential UK market value. Foundation manufacture is not necessarily a regional activity. Steel foundations can be manufactured from anywhere in the UK or further afield and still be cost effective e.g. some European projects purchase monopiles from China. This may become less cost effective as foundations move to jackets in the deeper waters of Round 3. Concrete foundations are far more expensive to transport due to their weight so are more likely to be manufactured closer to the wind farm site.

Note: The PowerPark maximum market value is based on the assumption that the entire 10-15 Hectares of space is available for this use.

[42] Skills for Energy & SLP

Threats

- Requires more expensive facilities such as large warehouse spaces.
- ABP prefers other options for the size-restricted site at Lowestoft.
- The proposed manufacturing site could impact on the heritage, retail or other plans within the Waveney council.[43]
- Lowestoft is in direct competition with Great Yarmouth. The sites are very similar. Great Yarmouth is a larger site and has more lay down space which makes it more attractive for larger work. The historical relationship between the competing port owners of ABP and East Port means there are / could be duplication of facilities and services. Private port companies are competing for the lucrative work.[44]

30.7 Marine Renewables (Wave and Tidal) Specific SWOT detail

30.7.1 Weaknesses

- The Lowestoft location is remote and many companies would prefer to be located at existing research centres such as EMEC, Wavehub or Cambridge.
- Small numbers of very skilled jobs but might not be people with the skills available locally. The time to train these people up means we could have delays in sourcing the right staff or technical experts would be flown in for short amounts of time.

30.7.2 Opportunities

- Highest value longest term jobs with smallest land footprint: Data quality on salaries for technical R&D is variable but is assumed to be higher level than other energy sector general work.
- Intellectual property value created by innovative research could have long term benefits in terms of skills and value.

30.7.3 Threats

- It will be difficult to get industry leading R&D companies to relocate to Lowestoft considering Wavehub, EMEC and NaREC facilities already exist.
- Private port companies are competing for the lucrative work.[45]
- There is no champion who could get Lowestoft, Great Yarmouth, ABP, EastPort UK and landowners to work together and create a complimentary unified strategy to offer to the marine R&D teams.

[43] SCC
[44] WDC & SCC
[45] WDC & SCC

31 Appendix 4 – UK Renewables Policy Commitment

31.1 EU2020 target

In January 2008, the European Union Commission published the "20 20 by 2020" package. This includes proposals for reducing the EU's greenhouse gas emissions by 20% and increasing its proportion of final energy consumption from renewable sources to 20%. Both of these targets are to be achieved by 2020. In order to meet the EU renewable energy target each Member State will be given a national target to meet based on their existing renewable generation, their GDP and a flat-rate increase for all. The UK's proposed target is 15%.

In order to achieve this 15% target there has been a number of studies to understand the amount of renewable energy required from the various technologies. The following chart is taken from a study carried out by the UK Government in 2007 in support of the Energy White Paper (2007) and subsequent Renewable Energy Strategy consultation (June 2008). It shows the projected capacity generated from offshore wind in 2020 to be circa 14GW and wave/tidal to be circa 2GW.

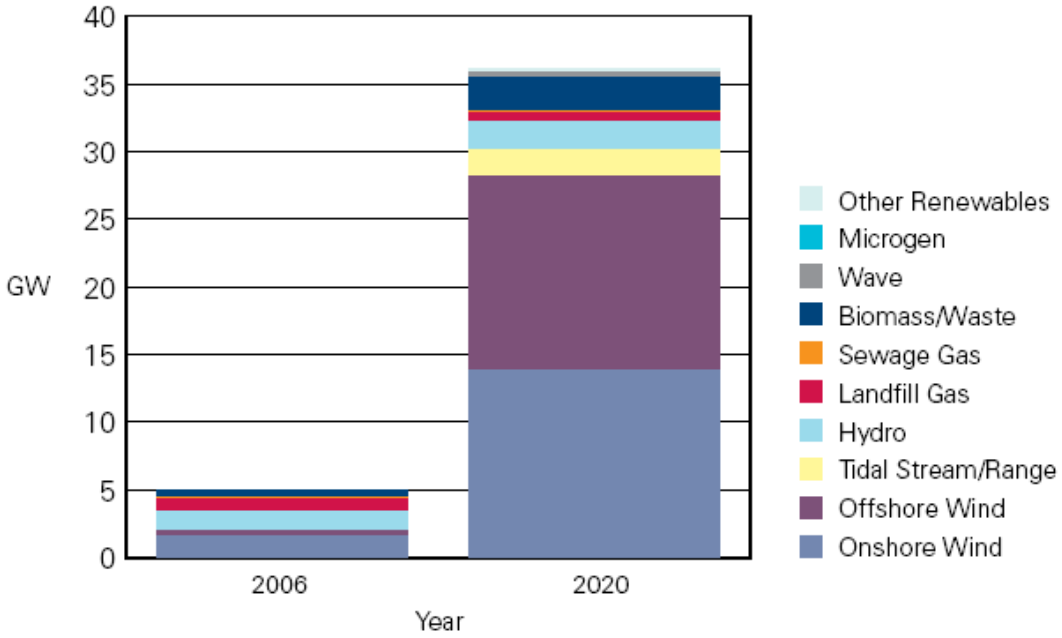

Figure 11 – Renewable electricity technologies between 2008 and projected to 2020 (RES 2009- based on Energy Trends 2009 & DECC Analysis 2009)

31.2 UK Policy Commitment

There are a number of UK policies and support mechanisms to encourage the development of offshore wind in the UK. The Energy Bill alongside the Planning and Climate Change Bills will ensure the UK's legislation underpins the long term delivery of renewable energy in the UK.

31.2.1 Renewables Obligation

The Renewables Obligation (RO) was introduced in 2002 and creates an obligation on electricity suppliers to source a rising percentage of electricity from renewable sources. The level of the Obligation rises annually from 6.7% in 2006/07 to 15.4% in 2015/16. Current commitment to the obligation runs until 2027. DECC are currently looking at extending the obligation timeframe.

31.2.2 Energy Bill

The Energy Bill contains the legislative provisions required to implement UK energy policy following the publication of the Energy Review 2006 and the Energy White Paper 2007. This policy is driven by the

two long-term energy challenges faced by the UK: tackling climate change by reducing carbon dioxide emissions, and ensuring secure, clean and affordable energy.

31.2.3 Planning Bill

The Planning Bill introduces a new system for approving major infrastructure of national importance, such as harbours and waste facilities and energy projects above 50 MW and replaces current consenting processes with a single more streamlined process led by The Infrastructure Planning Commission. As well as offshore renewable projects, infrastructure projects such as port developments to support offshore renewables will also benefit from this new streamlined process.

31.2.4 Climate Change Bill

The Climate Change Bill contains provisions that will set a legally binding target for reducing UK carbon dioxide emissions by at least 26 per cent by 2020 and at least 80 per cent by 2050, compared to 1990 levels.

31.2.5 Renewable Energy Strategy

The UK Renewable Energy Strategy Consultation (RES) has sought views on how to drive up the use of renewable energy in the UK, as part of the overall strategy for tackling climate change, and to meet the UK's share of the EU target to source 20% of the EU's energy from renewable sources by 2020. Responses to this consultation will help shape the UK Renewable Energy Strategy, which will be published in spring 2009, once the UK's share of the target has been agreed.

32 Appendix 5 – Detailed Market Overviews

32.1 Wind

32.1.1Global Wind Market

The global wind market (onshore & offshore) has grown at a rate of 25% year on year over the last five years. Apart from an expected small reduction in growth (circa 10%) in 2009 due to the current economic climate, the projected installed capacity over next 4-5 years does not show any sign of slow-down. 30% of the global installed capacity came from Europe in 2008.

32.1.2 Global Offshore Wind Market

Although offshore wind is currently a very small percentage of the total global wind market it is still an important and rapidly growing market (3.7% of the 2008 installed capacity in Europe was offshore, a slight increase from 2.4% in 2007).

The figure below shows the predicted growth of offshore wind globally and the significant capacity being installed in Europe. The projected capacity to be installed over the next 4-5 years demonstrates the significant shift in pace of the offshore market. This is driven by economic and commercial incentives from Northern European countries which are starting to introduce policy supporting offshore wind.

This figure also shows the significant market share that the UK has in global offshore wind (35% in 2007 and expected to be 40% in 2015). As of late 2008, the UK has the largest offshore wind capacity in the world. The step change increase in capacity in the UK around 2010 is due to developing Round 2 projects coming on-line.

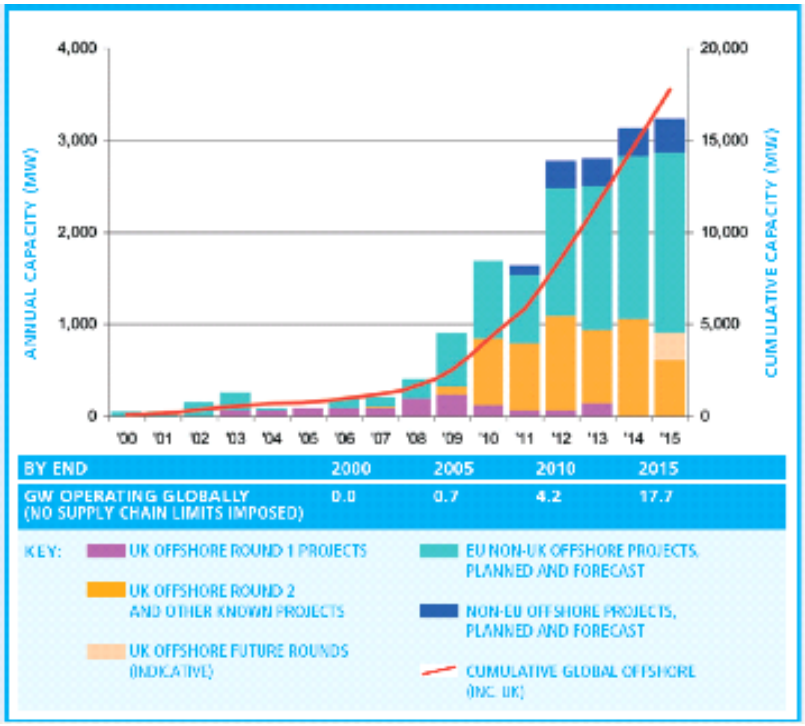

Figure 12 – Global offshore wind capacity
(BWEA Offshore Wind Moving Up a Gear, 2007)

32.1.3 European Offshore Wind Market

The projected European offshore installation capacity is presented below, using anticipated country-by country activity to 2015, combined with EWEA's estimate of total non-UK installation up to 2020. The UK's leading market share position is clearly visible and predicted to grow slightly between now and 2015 even with a significant increase in the planned installed capacity from markets such as Germany who plans to install 15GW of offshore wind by 2020 and 25GW by 2030.

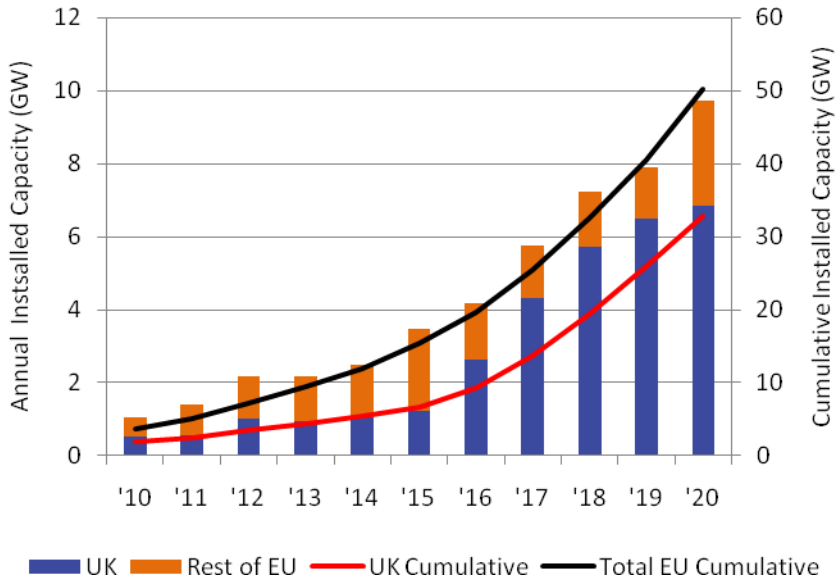

Figure 13 - Projected UK & European offshore installation to 2020

32.1.4 Current UK Offshore Wind Capacity

In the UK there have been two rounds of site awards, the first 'Round 1' being in 2001 (18 sites, 1.4 GW, circa 400 turbines) and the second 'Round 2' in 2003 (15 sites, 7.2 GW, circa 1800 turbines).

To date over 600MW (circa 200 turbines) of offshore wind has been installed in the UK, making it the largest offshore wind operator in the world. The figure below shows the steady progress of installation of these projects over the last 3 years.

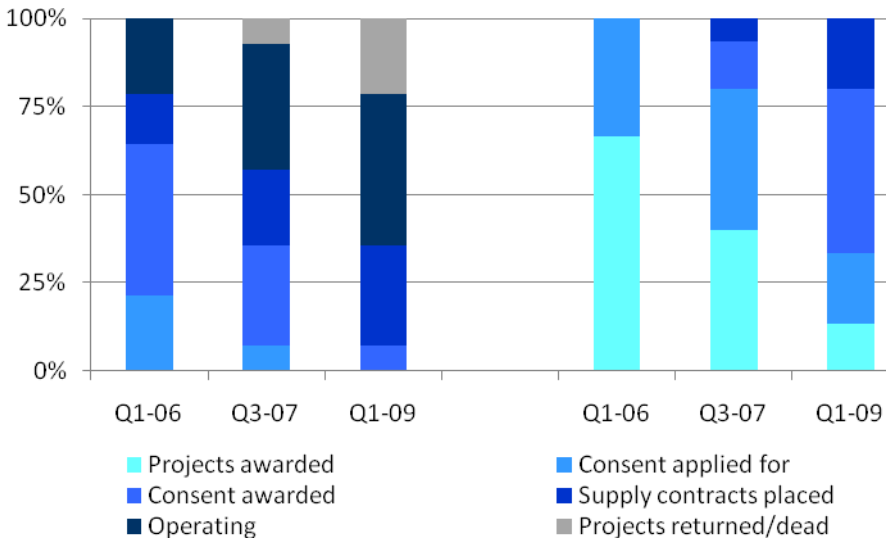

Figure 14- Round 1 & 2 installation status

32.1.5 Future UK Offshore Wind Capacity

In order to meet its commitment to the EU target of 20% renewable energy by 2020, the UK will need to generate 30 to 35% of its electricity from renewable sources. The largest contribution will be from wind, both onshore and offshore. In order to help achieve this The Crown Estate has declared intent to facilitate up to 33GW of offshore wind power generating capacity being brought on line in UK waters by 2020.

32.1.6 UK Market Attractiveness

In 2008, Renewable Energy World carried out a survey to identify the countries that offer the most opportunity for growth in wind power. The UK came second to the USA in both the short and longer term outlooks. The USA had a growth of 67% from 2007 to 2008 and the growth is set to continue under the new administration.

Survey results: "Which countries *(or regions) do you think offer the most opportunity for growth in wind power?"*

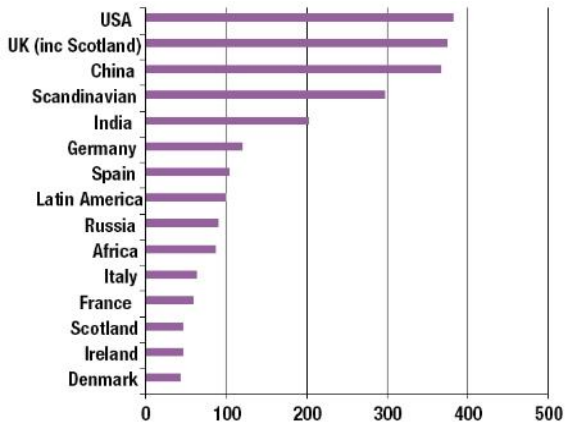

Figure 18– Renewable Energy World Survey Energy World Survey (now - 2015)

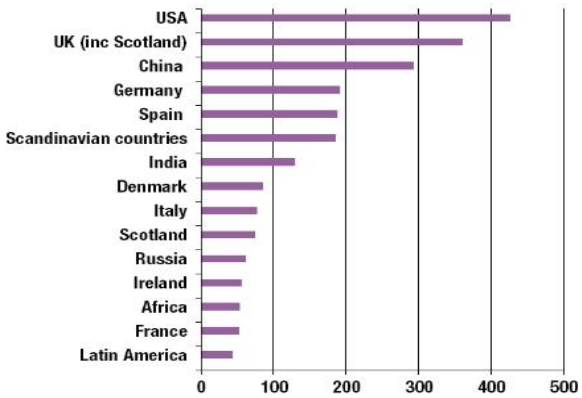

Figure 19 - Renewable (2015 – 2020)

32.1.7 Longevity of UK Offshore Wind Market

There is a lot of focus within the renewables industry on the EU 2020 targets and achieving the UK's ambition of 33GW installed offshore wind. The offshore wind industry in the UK is expected to be long lasting and not end after this delivery of Round 3 projects. For example The Crown Estate has begun looking at the viability and scope of a Round 4 offshore wind development.

As well as new areas of development, existing turbines will be re-powered with newer higher performing technology towards the end of their economic life (circa 20 years). This will deliver an ongoing installation portfolio and maintenance opportunities through to 2050 and beyond until the technology is replaced. The graph below shows an indicative market prediction using a conservative 22GW by 2020 (enough for the UK to reach its EU targets) and a suggestion for Round 4 with subsequent repowering of installed turbines at the end of the economic life. Although indicative it demonstrates the expected longevity of the UK offshore wind market.

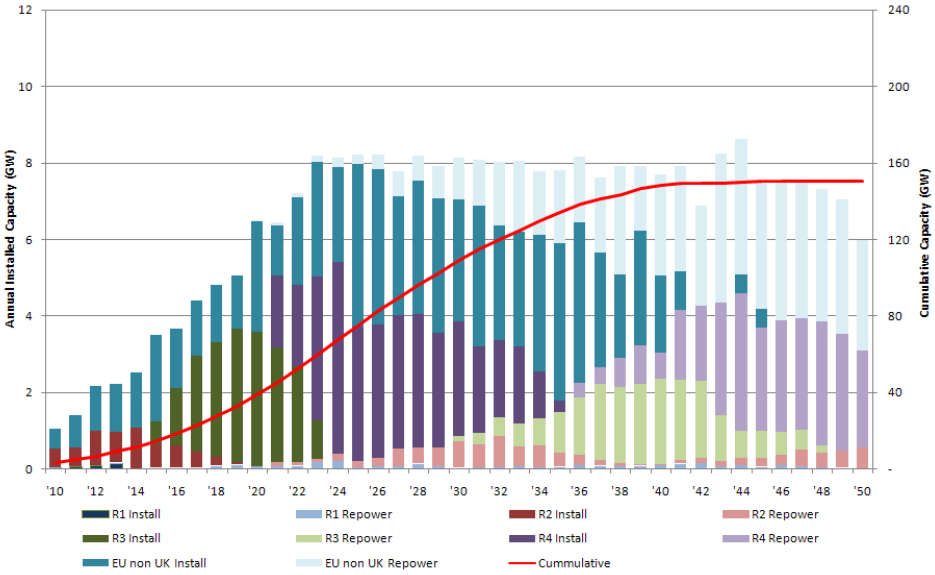

Figure 20: Indicative annual and cumulative offshore installation in UK and Europe to 2050, including anticipated Round 4 (BVG Associates Ltd indicative suggestion only) and repowering, based on target of 22GW in UK by 2020 and with ongoing installation across EU at 6-8GW per year.
The Crown Estate, May 2009

32.2 Marine

32.2.1 Global Market

The global marine market is currently very small compared to the wind market - but the graph below shows potential to grow.

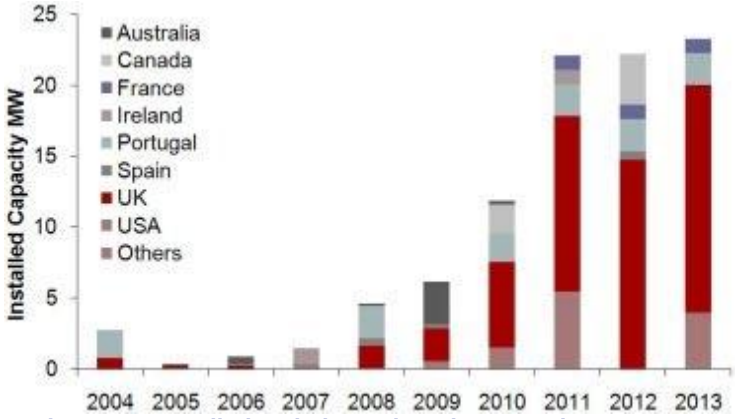

Figure 21: Installed and planned marine capacity DWL 2009

The report forecasts that 86MW of wave and tidal will be installed globally in the next five years

32.2.2 Wave Power Potential

Future Energy Solutions highlight that the global wave power potential has been estimated to be around 1000-10,000GW, which is the same order of magnitude as world electrical energy consumption. The best wave climates, with annual average power levels between 20-70 kW/m of wave front or higher, are found in the temperate zones (30-60 degrees latitude) where strong storms occur. However, the extent to which this will prove practical to harness will depend upon the successful development of both near shore and deep water technologies. Realistically this figure is likely to be far less based upon practical implementations.

32.2.3 Tidal Power Potential

The World Offshore Renewable Energy Report 2002-2007, released by the DTI, suggests that while 3000GW of tidal energy is estimated to be available, less than 3% is located in areas suitable for power generation. Tidal current energy resource is very site specific, optimum only where tidal range is amplified by factors such as shelving of the sea bottom, funnelling in estuaries and reflections by large peninsulas. However, tidal power has the distinct advantage of being highly predictable compared with some other forms of renewable energy which makes tidal energy development an attractive potential. The tidal option has grown at a rate of 25% year on year over the last 5 years. Apart from an expected small reduction in growth (circa 10%) in 2009 due to the current economic climate slowing down some projects, the projected installed capacity over next 4-5 years does not show any slow-down in the growth of the market.

32.2.4 Current UK Wave and Tidal Capacity

The UK does not have any major installed capacity due to the infancy of the market. Only MCT[46] exists plus a few temporary demonstrator projects at EMEC. The Pelamis wave device was tested here but deployed in Portugal and the Limpet device installed at Islay is a shoreline wave energy device so wouldn't contribute to the UK Tidal capacity defined here.

32.2.5 The UK's Target

In order to meet its commitment to the EU target of 20% renewable energy by 2020, the UK will need to generate 30 to 35% of its electricity from renewable sources. The UK practical offshore wave energy resource has been estimated at 2000MW[47]. New findings during the MEC suggest that the technical UK tidal stream resource is 6.8GW[48], which is about 10-15% of the known worldwide usable tidal stream resource. The UK practical near-shore and shoreline wave energy resources have been re-estimated at 3GW and 76MW, respectively.

Given these estimates the Carbon Trust consider wave and tidal stream energy to have the potential for bulk electricity supply. In total, they could supply between 15% and 20% of current UK electricity consumption; and offshore wave energy has the most potential for the UK.

Tidal stream energy could also make a reasonably large contribution, but the potential for near-shore and shoreline wave energy is niche.

The UK possesses some 35% of Europe's wave resource and 50% of its tidal stream resource. The BWEA, using data from the Carbon Trust's Marine Energy Challenge (MEC), estimates that 3GW of wave and tidal capacity could be installed in the UK by 2020. This capacity could generate approximately 8TWh of electricity a year, equivalent to 2.1% of UK electricity supply in that year. In the long term, marine renewable energy could meet 15% to 20% of current UK electricity demand, with 3% to 5% coming from tidal stream and the remainder from wave energy. The potential for growth in the UK is shown in image below.

[46] Marine Current Turbines at Strangford Lough in Northern Ireland.
[47] Alderney alone is planned to have 3000MW but might not count as UK
[48] Based on DTI availability TWh/year equates to number of hours * expected DTI availability for marine

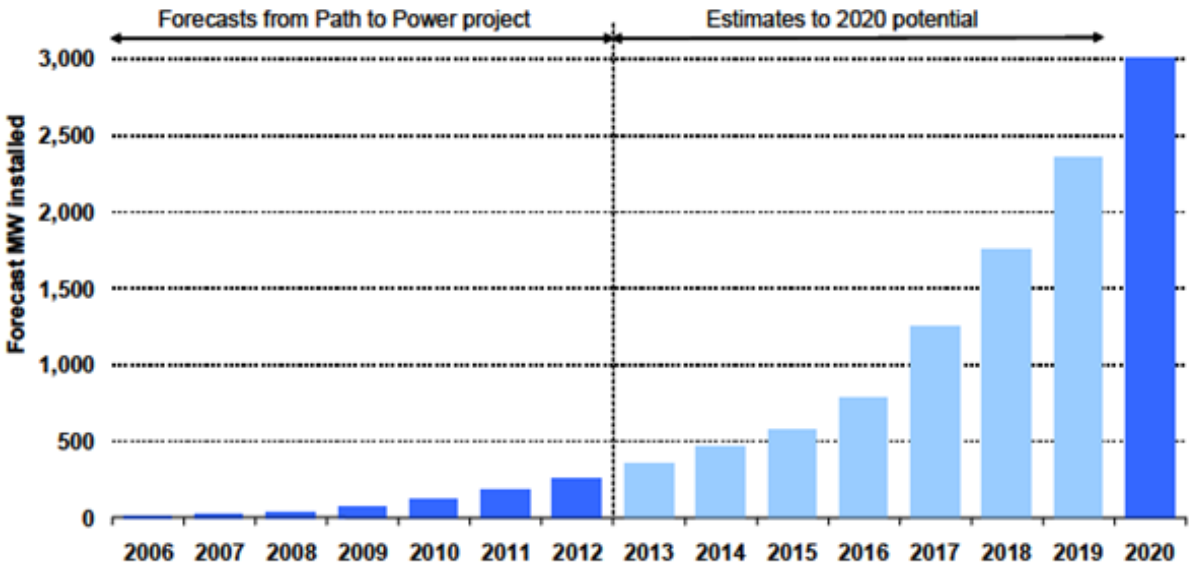

Figure 22: Projected UK marine installed MW
BWEA

The potential for this level of deployment gives wave and tidal energy a strategic importance in preserving multiple options to meet the UK's aspiration of supplying 20% of electricity from renewable sources in 2020 and intent to reduce carbon emissions by 60% in 2050. Although the industry is at an early stage, all indications suggest that it can deliver its potential. Along with the UK's outstanding wave and tidal resource, such confidence stems from the UK's existing world-leading base of marine renewables technology (which is attracting increasing interest from the private sector), research demonstrating the potential for technology cost reductions, and the UK's strong existing offshore skills.

33 Appendix 6 – Key Policy from Core Strategy

Relevant sections from key policy in the Core Strategy (2009. WDC

Policy CS05 - Lake Lothing and Outer Harbour Area Action Plan

An Area Action Plan for the Lake Lothing and Outer Harbour area of Lowestoft will be prepared focusing on employment-led regeneration. The objectives of this Plan will be to create:

- a flourishing local economy to provide wealth and at least 1000 jobs;
- employment and transport opportunities in the port, including greater use of the water;
- a high quality, well-designed, mixed use and sustainable built environment, that respects the existing qualities and character of the area, includes the integration of existing businesses wherever possible and makes maximum use of renewable energy technologies;
- a safe and healthy local environment with well designed public and green space;
- improved public access to the waterfront;
- sufficient size, scale and density and the right layout to support basic amenities in the neighbourhood and to minimise use of resources;
- good public transport and other transport infrastructure to reduce the need to travel, with a consequent reduction in congestion;
- buildings, both individually and collectively, that achieve a high standard of design and which can meet different needs over time and minimise the use of resources;
- a well integrated mix of in the region of 1500 decent homes of different types and tenures to support a range of household sizes, ages and incomes;
- good quality local public services including education, health, leisure and community facilities;
- an enhanced role for Lowestoft as a retail centre, including provision of around 21,000sqm of new (comparison) retail floorspace and associated leisure uses in an extension to the town centre in the Lake Lothing area;
- a diverse, vibrant and creative local culture that builds on the strong maritime heritage traditions;
- a better connection between the waterfront and the old industrial areas, the town centre and local communities;
- better connections between the communities north and south of Lake Lothing;
- a vibrant heart to the town for local people and visitors;
- development which is safe in terms of flood risk for its lifetime, and does not increase the risk of flooding elsewhere
- improved flood protection for the heart of Lowestoft;
- support for the tourism economy through the promotion of uses such as hotels, leisure and marina facilities;
  and
- links between the Broads and the seaside tourism areas.

Policy CS07 - Employment

Provision will be made to meet the East of England Plan job growth target of 5000 additional jobs in Waveney over the period 2001 to 2021. This will be partly achieved through the Site Specific Allocations, the Lake Lothing and Outer Harbour Area Action Plan and the Development Management Policies Documents. Approximately 60% of employment development (B1, B2, B8) over the plan period will be on previously developed land.

Employment sites will need to provide for a range of business needs in terms of size, location and quality. With the exception of surplus industrial land in the Lake Lothing area of Lowestoft, existing employment land will be protected, and subject to the take-up of existing planning permissions, additional land will be allocated, especially in Lowestoft, Beccles, Bungay and Halesworth.

In particular:

Lowestoft – The Lake Lothing and outer harbour area will be identified and developed as a strategic employment site through the Area Action Plan in support of port development, employment-led regeneration and economic diversification. A shift towards the provision of a range of sizes of light industrial and business units will be encouraged, including as part of mixed-use schemes.

Bungay – A site of up to 5 ha will be identified through the Site Specific Allocations DPD for a mix of small and medium sized units (B1, B2 and B8) but in particular for light industrial (B1).

New allocations and proposals for redevelopment will be in or adjacent to Lowestoft and the market towns, in accordance with the settlement hierarchy. The focus will be on developing sites within the towns, followed by extensions to existing employment areas. The preference will be to develop previously developed land before greenfield. The last resort will be new greenfield employment sites on the edge of the built-up areas. There should be good access to the transport network and public transport. Impact on adjacent uses should be minimised.

Outside the towns proposals to diversify the rural economy will be encouraged, particularly where they are located in or adjacent to the larger villages. The development should be of a scale and character appropriate to the location and there should be good access to the transport network and public transport. Farm diversification proposals will be supported where they can make a long-term contribution to sustaining the agricultural enterprise as a whole and where the proposal is consistent with its rural location.

In conjunction with the above approach, the District Council will work with partners to assess skills shortages in the District, to encourage inward investment and to provide business support.

Policy CS08 – Renewable Energy Cluster

A renewable energy cluster and 'power park' of around 8 ha will be promoted in the Lake Lothing and harbour area of central Lowestoft, especially focused on expanding existing development in the Ness Point and outer harbour area.

Policy CS09 – Knowledge Economy

Land will be identified in the Site Specific Allocations and the Lake Lothing Area Action Plan Documents to meet the future needs of the emerging knowledge economy. This will include educational facilities and their associated uses such as student accommodation. Priority will be given to brownfield sites with good access by public transport, walking and cycling, either in central (town centre or edge of centre) locations or well connected to existing educational / research establishments.

34 Appendix 7 – Lowestoft Site Overview

Lowestoft is Suffolk's second largest town and is divided in two by Lake Lothing. Lowestoft port is divided into an inner- and outer- harbour by a bascule bridge carrying the A12 through the town. Both north and south sides of the town contain a variety of business and residential areas, with the main shopping centre lying just to the north.

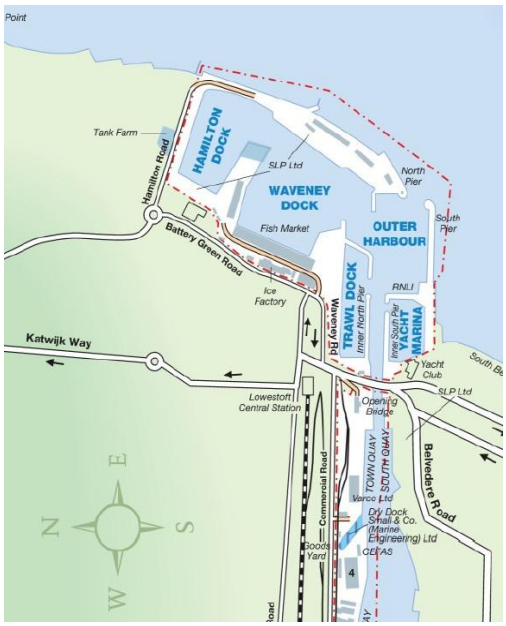

Figure 23: Existing Port and surrounds - ABP

There is a detailed land study underway with 1st East but our research indicates that the;

- Trawl dock is a “common user area” however Greater Gabbard Offshore Wind (GGOW) will have some priority berthing.
- Waveney Dock:
    - Land to the East is leased by SLP,
    - North West corner is fishing related,
    - South West corner will be GGOW.
- The Hamilton Peninsular:
    - Will be used by GGOW for approx. 2 years and may then become available.
    - The end of the peninsular has an oil pipeline which is currently not used but is leased – the berth space is used by others.
    - South pier is leased to WDC. However the pier is not in good condition.
- Hamilton dock:
    - There are existing inshore fishermen and 49 berths for leisure craft. There is not a lot of available space currently in outer harbour.

- The North side of the inner harbour has many uses, including a general cargo facility, silo complex, dry dock, slipway, DEFRA, SLP offices and storage (open and covered) for vessels and commodities.

- Areas exist to the West of the ABP estate on the North side of the harbour which are not owned by ABP- some support pleasure and small craft activities.

- Much of the land on the South of the harbour is not owned by ABP, the exceptions being an area near the bascule bridge, and the marina at School Road.

The proposed area of the Lowestoft PowerPark is shown in the figure below:

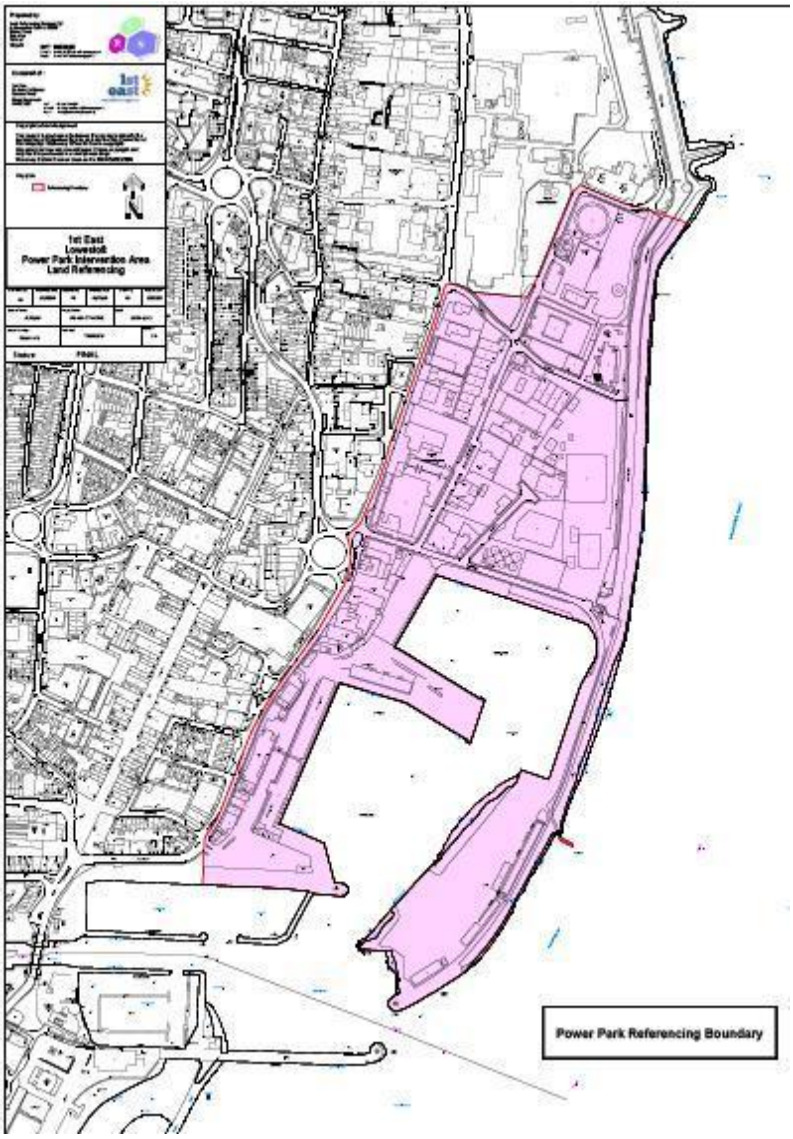

Figure 24: Proposed PowerPark and Power Park Extension Area

35 Appendix 8 – Options Criteria Summary

Oil&Gas Decommissioning

Total project cost	3	The ports current facilities will not require huge amounts of investment for it to facilitate a decommissioning operation. The main requirements are a quayside, land and good access to the North Sea fields.
Overall project deliverability	4	SLP already carry out EPC and EPIC contracting work for the oil & gas sector and would probably be able to handle some decommissioning work already.
Value of Total project benefits	4	The high score is a reflection of the £23bn value of the UKCS decommissioning sector that will take place in the North Sea over the next 40 years. The port is in close proximity to the SNS gas field's infrastructure and already has a history of servicing the industry.
Timeframes for delivery of benefits	2	This score is low reflecting the long term benefits of the sector. While some decommissioning has/is already taking place in the North Sea, we are unlikely to see an increase in this sector until after 2013. It has been argued that the decommissioning of the UKCS will take over 40 years due to plans to use them for gas storage and CCS.
Dependencies on other activities or organisations	4	Decommissioning is inevitable and part of a company's license agreement. It therefore scores highly.
Scale of resource required to develop the project	2	It would require all the resources the power park has to offer in terms of land and quayside to create a full-featured decommissioning facility.
Affordability, and ease of securing funding	2	Little or no funding available for this sector to set up a decommissioning operation.
Level of risk to the successful achievement of project outcomes	1	A sole decommissioning operation at the Power Park would be highly risky due to the size of these facilities in comparison to the ports and yards throughout Europe. The size of the docks and quay space will restrict its ability to deal with very large platform structures and vessels used to transport them onshore. Cheaper decommissioning services are likely to be found in continental Europe which may limit contract awards.

Project supports strategic priority areas	2	While a sole decommissioning operation would bring economic benefits to Lowestoft, the Power Park's size is better suited to offshore O&M services that better fit in with the services already provided by companies in and around Lowestoft.
Level of difficulty anticipated in satisfying state aid requirements	3	Non available to this sector as companies are legally responsible and set aside funds for this when field first developed.
Total Score & Summary	**27**	The Port of Lowestoft and the proposed power park would be able to support a decommissioning operation for SNS platforms and therefore scores quite highly due to its basic facility requirements, inevitability and low funding needs as well as SLP Engineering who already carry out EPC and EPIC contracting work at the port for the oil & gas and renewable sector. However, the size of these facilities in comparison to the ports and yards throughout Europe will affect the Power Park's ability to attract companies involved in offshore decommissioning. The size of the docks and quay space will restrict its ability to deal with very large platform structures and vessels used to transport them onshore. Cheaper decommissioning services are likely to be found in continental Europe which may limit contract awards.

Nuclear

Total project cost	3	The likely use of the port for only receiving shipments for the nuclear sector mean that projects costs will be low.
Overall project deliverability	4	The port already has the capability to receive the shipments relating to the nuclear sector and therefore scores highly.
Value of Total project benefits	1	Based on existing facilities, the region gains significant economic benefit from nuclear power, both in terms of stimulation of the regional economy and employment. However, the Power Park is not going to gain great value from this sector and therefore scores low.
Timeframes for delivery of benefits	4	The new build program is proposed to start at Sizewell C in 2013 and the port is already able to deal with nuclear related shipments (including radioactive deliveries or waste)
Dependencies on other activities or organisations	3	The new build program is now part of the UK's future energy generation mix and will therefore take place. The decommissioning of the regions current power plants is also underway and not dependant upon many other factors.
Scale of resource required to develop the project	4	Nuclear scores highly due to its low requirement for resources at the Power Park.
Affordability, and ease of securing funding	2	Little or no funding for infrastructure relating to the imports and exports for the nuclear sector.
Level of risk to the successful achievement of project outcomes	3	Scores quite high as the level of risk relating to this sector for the port are low.
Project supports strategic priority areas	2	The nuclear sector is key to the region's economy as a whole, however, there is no priority attached to it being situated within Lowestoft.
Level of difficulty anticipated in satisfying state aid requirements	3	Non available

Total Score & Summary	**29**	There is no evidence that would suggest that the nuclear new build program at Sizewell will use the Port of Lowestoft for anything more than receiving shipments. Nuclear scores highly in several categories as the function performed by the PowerPark is not cost-intensive and is low risk.

Oil&Gas/R&D/Hybrid Mix

Total project cost	3	While the costs relating to the oil & gas sector will be relatively low at the Power Park (Quayside access, Land for Offices/Warehousing and hard standing area), R&D will have high project costs due to the nature of the work and its requirements (Offices, test facilities and labs). The remaining hybrid mix covers the remaining sectors and their costs will vary. It is likely that while the O&G will utilise the majority of the quayside, certain areas could be used in a non-continuous capacity by other sectors spreading the costs.
Overall project deliverability	3	A medium score is applied to overall project deliverability based on the fact that oil & gas is highly likely to be delivered based on the ports current presence in the sector already. However, attracting R&D to the area and some of the hybrid mix sectors (Microgen, Biomass, Nuclear, and Onshore Wind) will be more difficult to deliver.
Value of Total project benefits	4	The score is high for value of project benefits because there will be short (Oil&Gas), medium (Hybrid Mix, Oil & Gas) and long term (Hybrid Mix, Oil & Gas, R&D) benefits from the sectors.
Timeframes for delivery of benefits	4	The oil & gas industry is the region's largest economic sector and is already delivering benefits to the port. The benefits from R&D will be seen in the long term, while it is likely that some of the hybrid mix will deliver benefits in the medium term.
Dependencies on other activities or organisations	3	The medium score is based on the oil & gas sectors low dependency on other activities and organisation while the hybrid and R&D sectors will be more dependant.
Scale of resource required to develop the project	5	This scores high because the best use of space involving a number of different sectors would be present in the Power Park.
Affordability, and ease of securing funding	4	The oil & gas sector is typically self funding while R&D and the hybrid mix that are renewables orientated will receive some government support as they will be related clean energy generation technology and development.
Level of risk to the successful achievement of project outcomes	4	The strong oil & gas sector means this mix scores high as the level of risk with the sector is low. In the medium to long term the oil & gas sector will be involved in decommissioning, CCS, gas storage and O&M. R&D is a long term investment and therefore high risk while the other hybrid sectors will be a medium risk. In terms of office space, there is availability elsewhere in the local area outside of Power Park. Power Park would need to offer specific advantages for locating there.
Project supports strategic priority areas	4	The score is high because a mix of sectors (Oil & Gas & Renewables O&M, R&D etc) is seen as a priority for the economy of Lowestoft and the wider region.

Level of difficulty anticipated in satisfying state aid requirements	4	This score is high due to the fact that the government provides support to the renewables sector while the oil & gas sector is self sufficient.
Total Score & Summary	**38**	The strength of the O&G sector in the short, medium and long term is the basis for this high score. While the high upfront costs and long timeframe for a return on the investment in R&D and other infant sectors must be considered, the O&G sector will continue to provide the regions economy with work relating to O&M, decommissioning, CCS and gas storage. The best hybrid for the Power Park will involve companies that can supply both the oil & gas and renewables offshore sectors. O&M for both offshore wind and oil & gas will provide long term benefits and could share certain facilities such as the quay and cranes.

Offshore WIND O&M

Total project cost	5	Scores highly since the ports current facilities will not require huge amounts of investment for it to facilitate an O&M operation. The main requirements are a quayside, land and good access to the North Sea Wind farms.
Overall project deliverability	5	Scores highly since it is inevitable as a result of absolute requirement of Round 3 offshore wind.
Value of Total project benefits	4	Scores highly since it will require good supply chain development and high skilled local people.
Timeframes for delivery of benefits	2	Full operations in 2015 or just before. So does not satisfy immediate job creation.
Dependencies on other activities or organisations	4	Inevitable but does require local and national political will to maintain renewables focus
Scale of resource required to develop the project	4	As a result of inevitability it is fairly easy to develop
Affordability, and ease of securing funding	3	medium - since inevitability but private sector will be prepared to pay for CAPEX investment
Level of risk to the successful achievement of project outcomes	2	Electricity price or economic depression can have impact of desirability of Wind as option
Project supports strategic priority areas	4	The area expected to be used is currently used for storing aggregate
Level of difficulty anticipated in satisfying state aid requirements	3	medium - since inevitability but private sector will be prepared to pay for CAPEX investment
Total Score & Summary	**36**	Opportunity could not fill entire PP at present but maybe component of hybrid

Offshore WIND Project construction

Total project cost	1	Scores medium since it does not require large amounts of investment in port facilities but it does require large amounts of land (either through moving people out or Compulsory land acquisition.)
Overall project deliverability	1	Difficult since it requires a large single space which would require existing tenants to move. This is unlikely to happen with the timeframes required.
Value of Total project benefits	2	Large amounts of space are being used without a correspondingly dense job density. Most benefits are lower skill.
Timeframes for delivery of benefits	3	Medium since it does need to happen sooner rather than later (in place by 2014)

Dependencies on other activities or organisations	1	There are far better competing facilities nationally (and even possibly internationally)
Scale of resource required to develop the project	1	It would require all the resources the power park has to offer in terms of land and quayside to create a full-featured decommissioning facility.
Affordability, and ease of securing funding	2	Difficult to justify since it requires flattening large amounts of space without the corresponding benefit in economics and jobs.
Level of risk to the successful achievement of project outcomes	1	Spatial requirements/ timeframes and competition make this almost impossible to realistically achieve
Project supports strategic priority areas	2	It does use the space but not to its highest possible potential
Level of difficulty anticipated in satisfying state aid requirements	3	Medium - but realistically low due to timeframes
Total Score & Summary	**17**	High risk from regional and national sites that are cheaper. Power Park is at limit of size constraints.

Offshore WIND Foundation Manufacture

Total project cost	3	Scores medium since it does not require large amounts of investment in port facilities but it does require large amounts of land (either through moving people out or Compulsory land acquisition.)
Overall project deliverability	2	Difficult since it requires a large single space which would require existing tenants to move. This is unlikely to happen with the timeframes required.
Value of Total project benefits	2	Large amounts of space are being used without a correspondingly dense job density. Most benefits are lower skill.
Timeframes for delivery of benefits	3	Medium since it does need to happen sooner rather than later (in place by 2014)
Dependencies on other activities or organisations	1	There are far better competing facilities nationally (and even possibly internationally)
Scale of resource required to develop the project	2	It would require all the resources the power park has to offer in terms of land and quayside to create a full-featured decommissioning facility.
Affordability, and ease of securing funding	2	Difficult to justify since it requires flattening large amounts of space without the corresponding benefit in economics and jobs.
Level of risk to the successful achievement of project outcomes	1	Spatial requirements/ timeframes and competition make this almost impossible to realistically achieve
Project supports strategic priority areas	2	It does use the space but not to its highest possible potential
Level of difficulty anticipated in satisfying state aid requirements	3	medium - but realistically low due to timeframes
Total Score & Summary	**21**	High risk since better sites available that are under single ownership.

Wind O&M / RND / Hybrid Mix (Oil&Gas)

Total project cost	5	Can start without a high capital investment
Overall project deliverability	4	The risk is mitigated by using various energy sectors that are optimum for job to space requirements and funding.
Value of Total project benefits	5	The score is high for value of project benefits because there will be short (Traditional marine), medium (O&M, Research) and long term (CCS and Gas storage) benefits from the sectors.

Timeframes for delivery of benefits	4	Some work can start now (attracting O&M) whereas other projects will grow organically and the risk is mitigated of creating a high empty facility.
Dependencies on other activities or organisations	5	Very low due to spread of energy sectors
Scale of resource required to develop the project	5	Very low initially but once main companies (Tier 1) customers are in place then the park should grow naturally with minimum effort.
Affordability, and ease of securing funding	4	Not much funding is required to start but as the park grows then the facilities that do require substantial funding (such as R&D) will be better placed to build a completing business case.
Level of risk to the successful achievement of project outcomes	5	Due to spread either the traditional marine market will grow or the renewable sector will grow. There are many synergies that will cross pollinate between the hybrid mix.
Project supports strategic priority areas	5	The empty areas within the defined park can be used first (as long as close to quay side) then some parts of the hybrid mix do not require large single spaces.
Level of difficulty anticipated in satisfying state aid requirements	4	Not much public funding required to initialise the work
Total Score & Summary	**46**	Ideal fit with low risk and low funding requirements.