Virginia Supply Chain and Job Creation Opportunity for Offshore Wind

Paliria Energy, Inc.

Virginia Energy and Environment Commission

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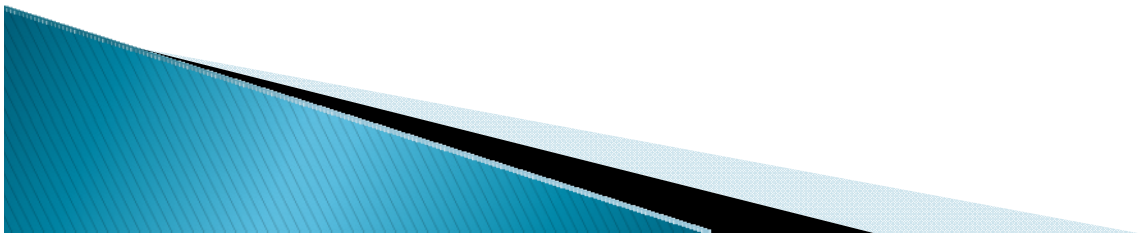
Paliria Building on VCERC Efforts

- Provided an economic impact assessment as well as framework for project cost and supply chain development.

- Paliria continues to work with the maritime industry members of the Virginia Offshore Wind (VOW) coalition in developing the critical supply chain and economic framework needed to move the industry forward.

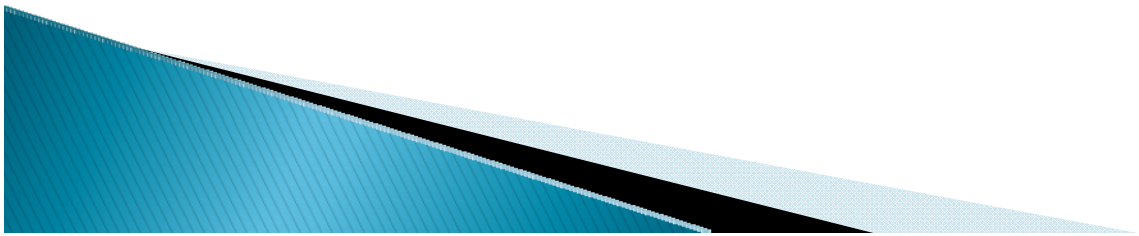
Relationship between Renewable and Conventional Energy

- Renewable sources must get to competitive cost levels with conventional energy sources – This is not bad news
- Critical Role of Production and Supply Chain
- Offshore wind is an infrastructure heavy endeavor and Human Capital is a critical part of the equation



Getting good Data – Across the Pond and Homegrown

- European data is important but direct inference is a bad Idea
- Understanding Strengths and Weaknesses
- Localizing the Estimates
- Scroby Sands Data By Douglas-Westwood, ODE



The range of activities that ports can undertake includes:

•Transport & delivery of major turbine components, foundations and cabling

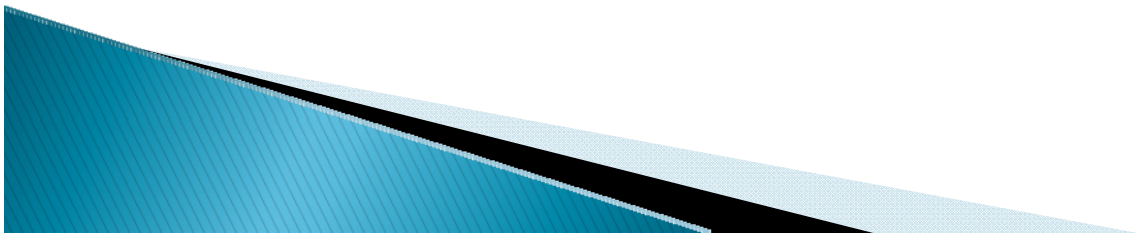
•Storage of major turbine components, foundations and cabling awaiting installation

•Pre-assembly work for some major components

•Vessel load-out: turbines, foundations and cables

•Daily logistics support of construction support

•Servicing – operations & maintenance.



The following requirements are desirable:

•Direct connection to water deep enough for seagoing vessels

•Berthing, dispatch and maneuvering facilities for large floating cranes and special ships

•Loading possibilities for all plant modules (foundations, nacelles, rotor, blades, towers, cable reels, etc.)

•Quaysides for final installation of wind energy plants directly within waters deep enough for seagoing vessels in order to make the take-over with adequate transport ships possible

•Quaysides for simultaneous ship dispatch, related to the installation and module delivery via
inland water-ways or sea-shipping

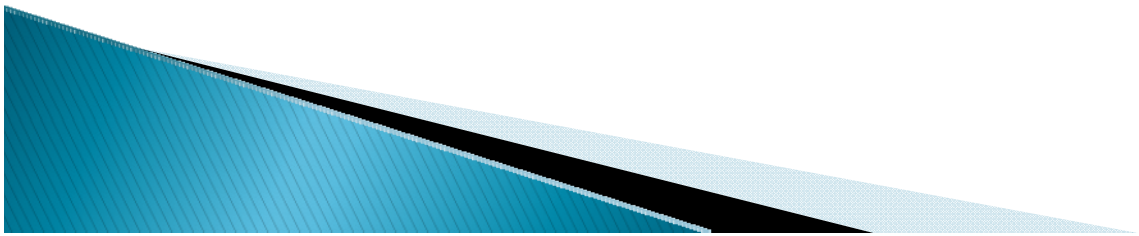


Table 4-5: Scroby Sands – Hours by Tier 1 Category

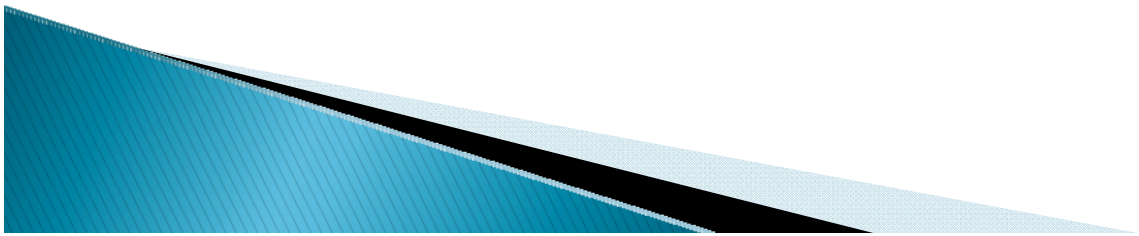
Hours	East of England	Other UK	Non UK	Total	UK %
Development Design	3,268	14,485	8,000	25,752	69%
Environmental Monitoring	2,860	277	0	3,137	100%
Insurance/Legal	400	1,633	0	2,033	100%
Surveys	2,479	119	0	2,598	100%
Project Management	35,875	50,250	4,375	90,500	95%
Detailed Design	4,500	3,758	19,375	27,633	30%
Procurement & Manufacture	200	94,019	39,261	133,479	71%
Transport & Delivery	400	1,500	4,500	6,400	30%
Onshore Pre-Assembly	24,281	8,422	4,847	37,549	87%
Onshore Installation	34,375	0	0	34,375	100%
Offshore Installation	5,400	16,560	49,500	71,460	31%
Commissioning	17,500	12,072	13,304	42,875	69%
Operations & Maintenance	124,160	10,715	28,855	163,730	82%
Other Misc. Costs	3,702	6,561	4,286	14,548	71%
Total	259,399	220,369	176,301	656,069	73%

Table 5-4: Scroby Sands – Hours

Hours	Total	East of England	Other UK	UK %
Procurement & Manufacture	133,479	200	94,019	71%
Project Management	90,500	35,875	50,250	95%
Offshore Installation	71,460	5,400	16,560	31%
Commissioning	42,875	17,500	12,072	69%
Onshore Pre-Assembly	37,549	24,281	8,422	87%
Onshore Installation	34,375	34,375	0	100%
Operations & Maintenance	163,730	124,160	10,715	82%
Detailed Design	27,633	4,500	3,758	30%
Development Design	25,752	3,268	14,485	69%
Other Misc. Costs	14,548	3,702	6,561	71%
Transport & Delivery	6,400	400	1,500	30%
Environmental Monitoring	3,137	2,860	277	100%
Surveys	2,598	2,479	119	100%
Insurance/Legal	2,033	400	1,633	100%
Total	656,069	259,399	220,369	73%

Table 5-5: Scroby Sands – Component Construction (£'000s)

£'000s	East of England	Other UK	Non UK	Total	UK%
Blades	125	0	6,325	6,450	2%
Cables	1,463	4,242	2,923	8,627	66%
Grid Interface	645	0	0	645	100%
Nacelles	994	1,875	19,306	22,175	13%
Piles	210	9,555	9,800	19,565	50%
Towers	0	4,425	350	4,775	93%
Indirect Costs	3,979	4,388	908	9,274	90%
Total	7,415	24,485	39,611	71,511	45%



	60 MW	500 MW	588 MW Base Case	588 MW Case A1	588 MW Case A2	588 MW Case B1
Development Design	25,753	73,118	73,118	73,118	73,118	73,118
Environmental Monitoring	3,137	8,250	8,250	8,250	8,250	8,250
Insurance/Legal	2,033	3,428	3,428	3,428	3,428	3,428
Surveys	2,598	7,500	9,923	9,923	9,923	9,923
Project Management	90,500	218,743	218,743	218,743	218,743	218,743
Detailed Design	27,633	149,284	149,284	149,284	149,284	149,284
Procurement & Manufacturing (no Local Content)	133,480	773,557	971,006	590,764	385,199	367,138
Procurement & Manufacturing (Local Monopile Content)				380,242		
Procurement & Manufacturing (Local Monopile & Tower Content)					585,807	
Procurement & Manufacturing (Local Monopile, Tower, & Nacelle Assembly Content)						603,868
Transport & Delivery	6,400	39,184	41,813	28,747	22,213	18,947
Onshore Pre-Assembly	37,550	204,813	252,324	252,324	252,324	252,324
Onshore Installation	34,375	423,801	501,686	501,686	501,686	501,686
Offshore Installation	71,460	417,207	526,430	526,430	526,430	526,430
Commissioning	42,876	236,552	294,609	294,609	294,609	294,609
Operations & Maintenance	163,730	539,770	952,154	952,154	952,154	952,154
Other Misc. Costs	14,549	104,226	104,226	104,226	104,226	104,226
Total	**656,074**	**3,199,433**	**4,106,995**	**4,093,928**	**4,087,395**	**4,084,128**

Estimated Impact of Off-Shore Wind Turbine Development - Base Case Scenario*

	Economic Impacts		
Year	Output (Mil $)**	Employment	Change in Average Annual Wage in HR***
2009	$41.3	417	$4.7
2010	$112.0	813	$17.25
2011	$138.5	1,086	$23.0

*Impacts have been estimated from REMI
**Dollar impacts are expressed in fixed terms (2000$s).
***Dollar impacts are expressed in nominal terms.

Heavy impact of component production in VA:

- Manufacturing job creation estimates derived from turbine and foundation manufacturers, Offshore wind industry, and matched against standard production job creation figures derived by the Bureau of Economic Analysis and the National Association of Manufacturers

- Standard BEA for 2009 – 2600 jobs per 1 billion in shipments

Cont.

- Combined estimates generally fall in the range of 3000 to 3500 production employees to sustain 500 to 600 MW build-out every two years.
- Initial investments will also include construction of three new facilities at 500 to 600 for two years.
- Positions are high paying construction and manufacturing jobs
- Add in vessel fabrication and maintenance and project O&M positions at 350 and 240 annually per 500 to 600 MW expansion

Potential Scope Varies Greatly –

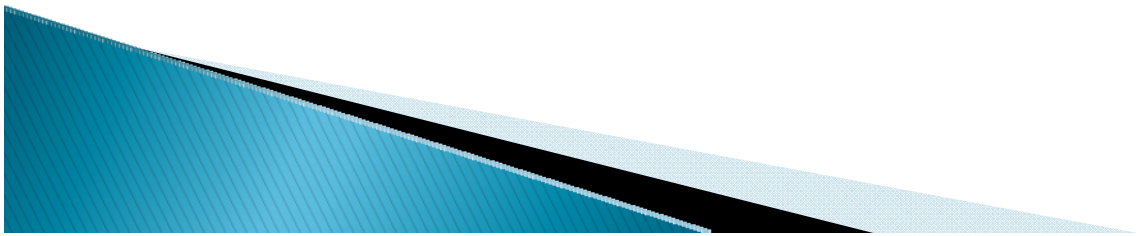
- Paliria estimates that Virginia providers would need to capture roughly one-third of the eastern US supply chain market, to sustain a 3000 to 5000 position level of annual employment.

- Most large-scale assembly and maritime opportunities would fall in the Hampton Roads region; however related production opportunities, including polymers and materials, electronic systems and transformers as well as drive train components are measurable throughout the state.

•Markets for utilization of large scale offshore wind energy infrastructure would not be limited to the eastern US markets.

•Further opportunities would include installation vessel shipbuilding and maintenance, component production for US terrestrial projects and potential entry for vessel and component supply into an increasingly open and burgeoning European offshore market.

•Creation of substantial supply chain infrastructure in the region coupled with aggressive entry into the broader market could generate 7,500 to 10,000 positions for Virginia annually in a growing sector.



And we are in a position to determine where we fit in the big picture –

- Further opportunities would include installation vessel shipbuilding and maintenance, component production for US terrestrial market and potential entry for vessel and component supply into an increasingly open and burgeoning European offshore market.
- Creation of substantial supply chain infrastructure in the region coupled with aggressive entry into the broader market could generate 7,500 to 10,000 positions for Virginia annually in a growing sector.

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