

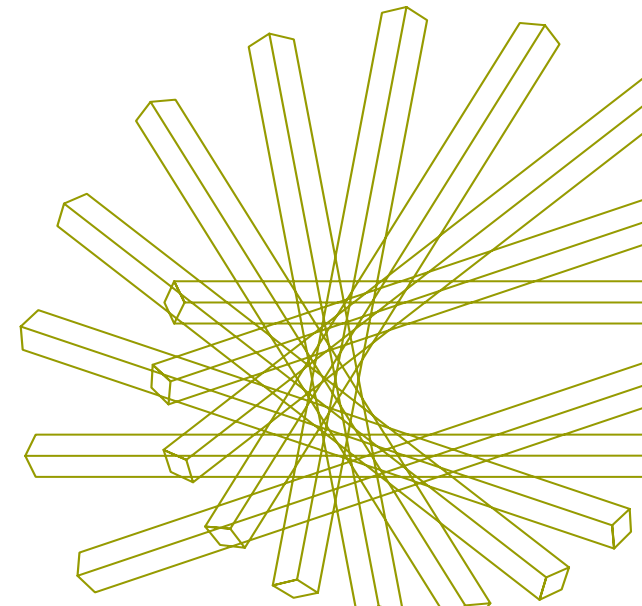


The Greater Gabbard Wind Farm

A Megaproject case study compiled by:

Naomi J. Brookes

February 2015





The Greater Gabbard Wind Farm



MEGAPROJECT Case Study

Case compiled by: Naomi Brookes

Contact details: n.j.brookes@leeds.ac.uk

Basic Project Information

Project Title	Greater Gabbard Wind Farm
Location	Off-shore of Suffolk, UK
Purpose	To produce electricity for the UK's National Grid from wind power
Scope ^{3,5}	All off-shore power generation and on-shore substation with connections to the National Grid
Contractual Framework ^{2,3,4,5}	Greater Gabbard Offshore Winds Ltd (GGOWL) is an equity joint venture (50% Scottish and Southern Energy 50% RWE Innology). Fluor has a fixed price \$1.8bn EPC contract for the Balance of Plant with GGWOL. <i>(N.B. The contractual framework has changed significantly during the lifetime of the project.)</i>
Relevant Physical Dimensions ^{1,5}	140 turbines, capacity of 500MW, expected output 1750 GWh/a, 23 km from land in a depth of water of 2.4 – 10m

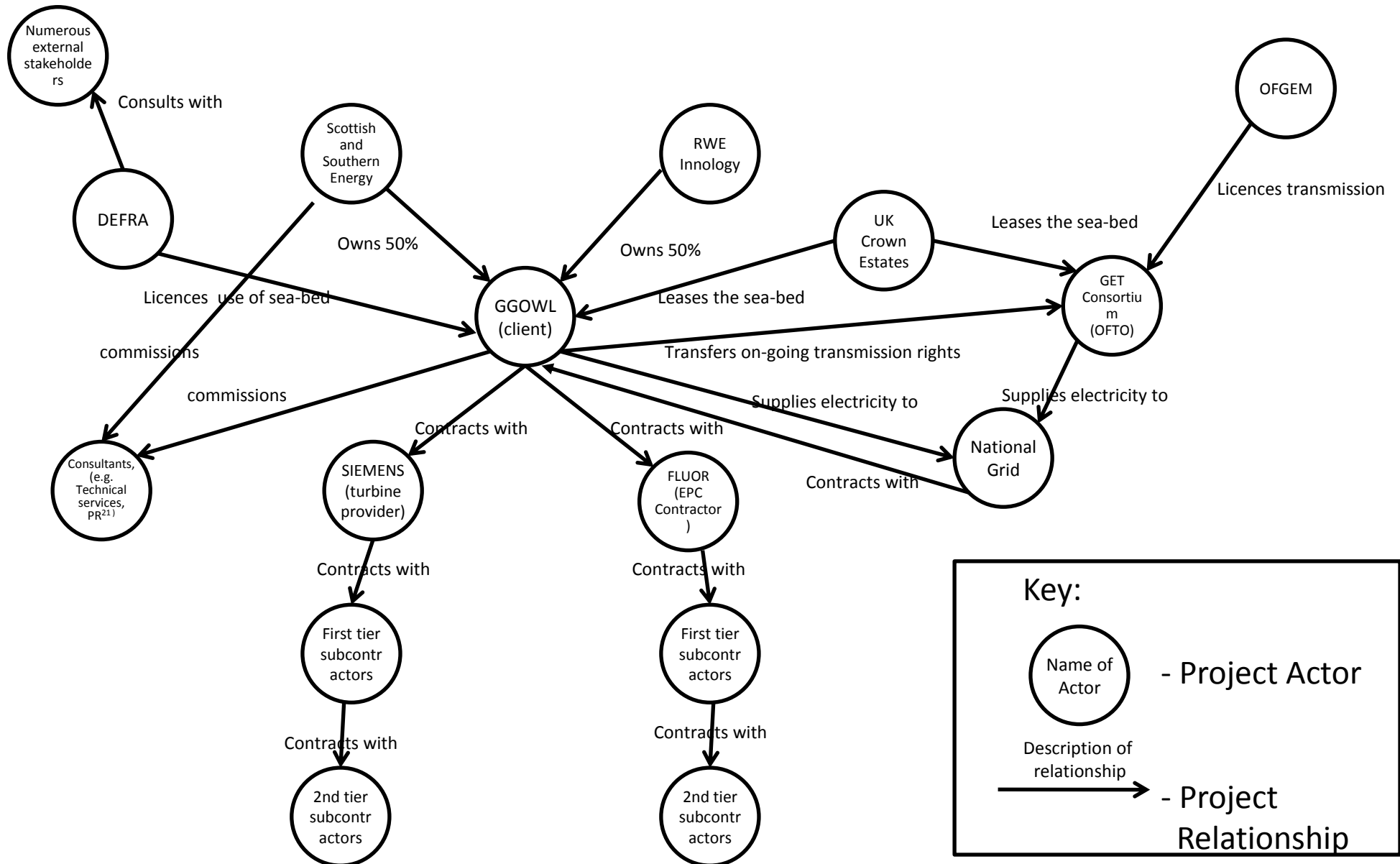
MEGAPROJECT Stakeholder Identification (Internal)

	Stakeholder Category	Case-Study	Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)	
Supply-Side	Client	Greater Gabbard Offshore Winds Ltd (GGOWL)		
	Financiers	n/a		
	Sponsors	n/a		
	Client's Customers	National Grid plc (through wholly owned subsidiary National Grid Energy Transmission plc) ¹⁷		
	Client's Owners	At the start of the project: Airtricity & Fluor. Currently: 50% Scottish and Southern Energy (SSE) and 50% RWE npower Renewables		
	Other internal supply-side categories (please specify)	Category	Case-Study	
		Off-shore Transmission Owner ^(6,7)	GET, (a consortium comprising Equitix, AMP Capital Investors and Balfour Beatty Capital) £315M high voltage transmission link	
OSTO Award Organisations ^(6,7)		OFGEM (Office of the Gas and Electricity Markets) UK authority established by Act of Parliament		
	Site-Owner	UK Crown Estates ⁹		
Demand Side <i>(NB for this case have details for ~100 contractors and professional service providers only included a sample here)</i>	Principal Contractors	Fluor is responsible for the EPC (engineer, procure and construct) of the Balance of Plant (BOP)		
		Siemens providing 140 3.6MW turbines (awarded by?) ⁸		
	First Tier Contractors	McNulty Offshore Construction of South Shields. McNulty will construct an offshore substation to be housed within a platform 25km off the Suffolk coast, connecting to an onshore substation at Sizewell (awarded by Siemens)		
		Subsea Protection Ltd. Concrete Fleximats (awarded by Fluor)		
		JDR Cables providing all underwater cabling (awarded by?)		
Professional Services Providers	Ramboll geotechnical surveying to GGWOL, METOC providing project control services to SSE/GGWOL, KBR providing project management consultancy service to SSE			
Other internal supply-side categories (please specify)	Category	Case-Study		

MEGAPROJECT Stakeholder Identification (External)

	Stakeholder Category	Case-Study		Comments (e.g. maturity, previous experiences of stakeholders, skills, influence on project)
Public	Regulatory Agencies	Off-shore Transmission Owner	GET, (a consortium comprising Equitix, AMP Capital Investors and Balfour Beatty Capital) £315M high voltage transmission link	
		Licence to deposit material on seafloor	DEFRA issues licence but confers with Department for Transport (DfT), Ministry of Defence (MoD); CEFAS for scientific advice on fisheries, benthos, sedimentary processes, hydrodynamics and coastal processes;	
			English Nature (EN), Countryside Council for Wales (CCW) and Joint Nature Conservation Committee (JNCC) for statutory advice on species and sites of nature conservation importance e.g. Special Protection Areas (SPA), Special Areas of Conservation (SAC), (Sites of Special Scientific Interest (SSSI), Marine Nature Reserves (MNR); Defra Sea Fisheries Inspectorate; Local Authority interests – for planning, amenity/leisure, environmental health; Port Authorities; The Crown Estate; Environment Agency – for water quality, migratory fish, coastal processes; Other interest groups and non-governmental organisations (NGO) e.g. National Federation of Fishermens Organisations, Royal Yachting Association etc.	
	Local Government	N/A - offshore		
	National Government	UK Government		
	Other internal supply-side categories (please specify)	Category	Case-study	
Private	Local residents	n/a - offshore		
	Local Landowners	n/a – offshore		
	Environmentalists	Greenpeace, Friends of the Earth		<i>Favourable attitude to windfarms</i>
	Conservationists	None apparent - offshore		
	Archaeologists	n/a - offshore		
	Other External Private stakeholders (please specify)	Category	Case study	<i>Environmental Impact Assessment produced by PSSC shows negligible or even beneficiary effect on all of these stakeholders</i>
	Private and non-human users of areas	English, Dutch and Belgian long beam fishing trawlers, Commercial Shipping, Birds, Fish, Marine Mammals		
		Tourist Boards		

MEGAPROJECT Stakeholder Relationship Maps



MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder
Greenpeace, Friends of the Earth	Highly Favourable ^{10, 12}	Ability to Lobby Government Organisations	Contributes to achieving their overall aims
National Federation of Fishermen's Organisations	Concerned about danger to livelihood ¹¹	Ability to Lobby Government Organisations specifically DEFRA in response to application to deposit items on sea-bed	Potentially substantively harmful
Tourism Boards	Worried about effects of tourism ¹²	General ability to lobby government organisations	Slight
Marine Flora and Fauna		None identified	PSCC survey identifies this as neutral or potentially beneficial
Royal Yachting Association	Concerned about navigational safety and loss of cruising routes but currently happy with levels of consultation ¹³	General ability to Lobby Government Organisations	Could lead to loss of some current areas of recreational sailing
Natural England	Concerned about damage to habitats but currently ^{happy} with levels of consultations - 14	Ability to Lobby Government Organisations specifically DEFRA in will consult with in connection with application to deposit items on sea-bed	Potentially makes it more difficult for organisation to reach its objectives of protecting England's natural environments
Port Authorities	See this as a commercial opportunity to provide industrial, technical and logistical support - 15	Limited to on-shore facility support	Could provide areas of commercial growth

MEGAPROJECT Project Management

Project Organisation

Client Project Team Size & Structure	Complex picture of project team dispersed in Airtricity/SSE, RWE, Fluor and Siemens alongside project management consultancies and changing throughout the lifecycle of the project. Plethora of supply chain interactions.
Contractor Project Team Size and Structure	
Sub-Contractor Project Team Involvement	

Project Tools and Techniques

Please ✓ if present, x if absent, leave blank if unknown

Life-Cycle Costing Approaches

Project Management Software

Lessons Learnt Transfers

Stakeholder Involvement

Relationship Management Tools

Team Building Tools

Building Information Modelling (BIM)

Project Knowledge Management Tools

Competency framework

Other Tools and Techniques or More Information

SSE employs a 'Large Capital Governance Framework' to insure that its projects are governed, developed, approved and executed in an effective manner. To assist in this, SSE has appointed KBR (a leading EPC company) as a Project Management partner to help maintain the processes, systems and skills needed to deliver large capital projects ²⁵

RWE is in the process of developing company wide approaches to project management systems and procedures ²⁸

Fluor has well-established formal project management systems and procedures. These form part of the OSR (operating system record) that prescribes all of the Organisations' processes and practices in Fluor. The OSR dictates that everyone should develop operating systems implementation plans which need to get signed off one of which looks at Project Management. OSRs get kept up-to-date by a subject manager who is responsible globally for their development. OSR are available on-line and are an integral part of day-to-day operation against which people are audited.

Siemens has longstanding formal initiative in project management. In 2000, it introduced the PM@Siemens initiative and in 2009 had its project management development programme accredited by the APM.

Project Processes

<p>Risk Management Processes ²⁹</p>	<p>Present (<i>describe below</i>) <input checked="" type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/></p> <p>Airtricity/SSE considered that they had undertaken significant risk mitigation actions through:</p> <ul style="list-style-type: none"> •Detailed and extensive soil investigation •Extensive site specific wind data •Conservative array spacing to minimise array losses. •Independent foundation design verification •Early input from O&M group (particularly for access design) •Use of proven technology backed up by service and warranty agreement. <p>They also considered that the joint development of the design with Fluor prior to contract award ensured that all sub-contracts were fully transparent and the cost and value of wrap known and understood. They considered that the project programme developed with adequate float (particularly vessels) and that the BOP wrap provided a hedge against key large-scale offshore risks</p>
<p>HR Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Procurement Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/></p> <p><i>See previous statement</i></p>
<p>Integration Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Scope Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Time Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Cost Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Quality management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>
<p>Communications Management Processes</p>	<p>Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input checked="" type="checkbox"/></p>

MEGAPROJECT Project Performance

Aspects of Performance Concerned with Doing the Project Right

	Original Targets and changes to targets	Actual Achievements Against Targets
Performance relating to time	<p>Original targets were for first power to be generated on Q4 2009 ,42 turbines to be installed by Feb 2010 and a further 98 by March 2011 which would also see the completion of the project.</p> <p>Changes: Oct 2010 - completion estimated at the end of 2011 April 2011 – completion estimated in the summer of 2012 Oct 2011 – completion estimated at the end of 2012</p>	<p>Oct 2010 – 30 turbines installed Dec 2010 – 53 turbines installed Oct 2011 – 115 turbines installed and 80% cables installed Sept 2012 –site fully operational</p> <p>First power achieved Dec 2010</p>
Performance relating to cost	Fixed price contract with Fluor for \$1.8bn (April 2008)	Q4 2010 – Fluor make provisions for losses of £340M
Performance related to specification	500MW output with an average output of 1895 GWhs	

Aspects of Performance Concerned with Doing the Right Project

Stakeholder	Original Aims of Project Involvement and Changes to these Aims	Achievement of these Aims
UK Government	Greater Gabbard will contribute 5% of the UK's 2010 renewable energy target of 10%. This target is raised to 20% by 2020 and 60% by 2050 ²²	Failure against 2010 target as not delivered on time. Unknown success of future targets
Airtricity	To develop a portfolio of projects to make it an attractive acquisition target ²³	Initial market capitalisation in 1997 was €625K sold for €2.2bn to SSE and Eon in 2008.
RWE	Creating a diverse portfolio of energy generating resources ²⁴	Should succeed as long as Gabbard meets generation targets
SSE	Creating an investment portfolio that delivers a significantly-enhanced asset base (consistent with returns greater than the cost of capital), additional fuel for energy in the form of renewables and additional cash flows and profits to support future dividend growth. ²⁵	Should succeed as long as Gabbard meets generation targets
Siemens		
Fluor	Profit on contract	Earnings on contract considerably less than expected

MEGAPROJECT Project Environment

Legal and Regulatory Environment

<p>Legal and Regulatory Project Environment (regionally, nationally and Europe wide)</p>	<p>The UK energy market is regulated by the Office of the Gas and Electricity Markets (OFGEM) ²⁶ and is responsible for the regulating monopolies in energy supply. It also helps to secure UK's energy supplies by promoting competitive gas and electricity markets - and regulating them so that there is adequate investment in the networks, and contributing to the drive to curb climate change and other work aimed at sustainable development.</p> <p>Planning regulations for large projects deemed to be of national importance have been changed under the 2007 planning reform bill with a particular stance towards easing the ability of nuclear and renewable powerplant to get planning permission. The EU has no formal authority for spatial planning.</p> <p>The European Commission Energy Directorate has an energy strategy "Energy 2020" which identifies the energy priorities for the period up to 2020, i.e. to reduce energy consumption, implement the internal market, develop infrastructure, improve technology, protect consumers and reinforce the external dimension of energy policy. These goals will be achieved through a series of legislative proposals.</p>
<p>Specific Legal and Regulatory events impacting on the project</p>	<p>Greater Gabbard Declared a Renewable Energy Zone (REZ) (The Renewable Energy Zone (Designation of Area) Order 2004, made under Section 84 of the Energy Act 2004) in relation to the United Kingdom's rights under Part V of the United Nations Convention on the Law of the Sea 1982 for the economic exploitation and exploration of its exclusive economic zone under the Convention for the Production of Energy from the Water, Currents and Winds (Article 56, UNCLOS).</p> <p>In relation to consenting and related matters, the Energy Act has extended the Section 36 consenting regime under the Electricity Act 1989 to the REZ, enabled a navigation extinguishment declaration to be made in relation to a Section 36 consent inside territorial waters, and provided a new regime for the declaration of safety zones inside territorial waters and the REZ. Statutory Consents required for the proposed Greater Gabbard Offshore Wind Farm project are as follows</p> <p>Section 36 Electricity Act 1989 (construction and operation of the wind turbines, offshore transformer stations and met masts; granted by DTI)</p> <p>Section 5 Food and Environment Protection Act 1985 (installation of foundations of offshore structures, rock armouring, scour protection etc; granted by DEFRA)</p> <p>Section 34 Coast Protection Act 1949 (obstruction to navigation works; granted by DEFRA)</p> <p>Section 36A Electricity Act 1989 (navigation extinguishment declaration; granted by DTI)</p> <p>Section 95 Energy Act 2004 (Safety Zones; granted by DTI)</p> <p>Section 57 Town and Country Planning Act 1990 (planning permission for onshore sub-station and cables; granted by Suffolk Coastal District Council)</p> <p>Section 37 Electricity Act 1989 (overhead electric lines from sub-station to neighbouring existing 400 kV power line; granted by DTI)</p>

Economic Environment

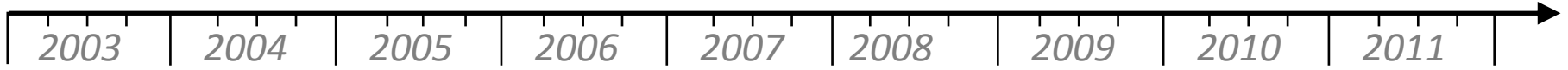
<p>Economic Project Environment</p>	<p>Late 2000 recessions (beginning December 2007)</p>
<p>Specific Economic Events impacting on the project</p>	<p>None identified</p>

Political Environment

<p>Political Project Environment</p>	<p>Growing interest in 'green' politics as evidenced by the election of the UK's first Green MP in the 2010 election.</p>
<p>Specific Political Events impacting on the project</p>	<p>None Identified</p>

MEGAPROJECT Project Key Events and Activities Timeline

TIME

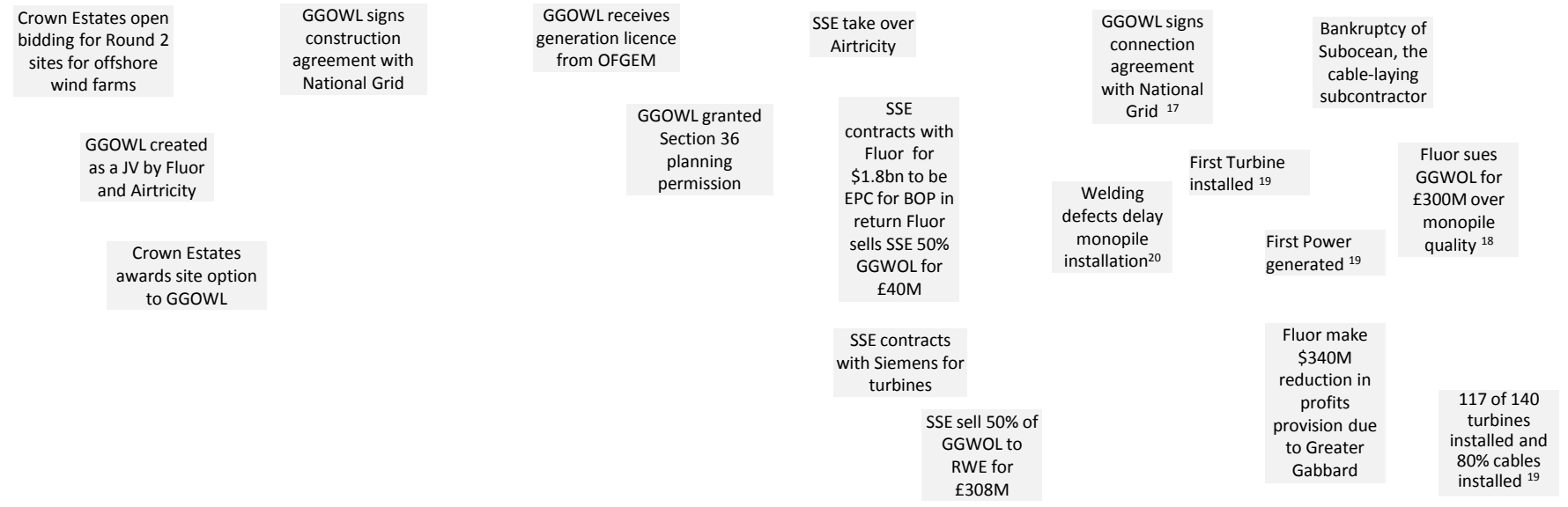


SITE IDENTIFICATION & DEVELOPMENT ¹⁷

DESIGN & PROCUREMENT ¹⁷

CONSTRUCTION & OPERATION ¹⁷

EVENTS IN THE PROJECT



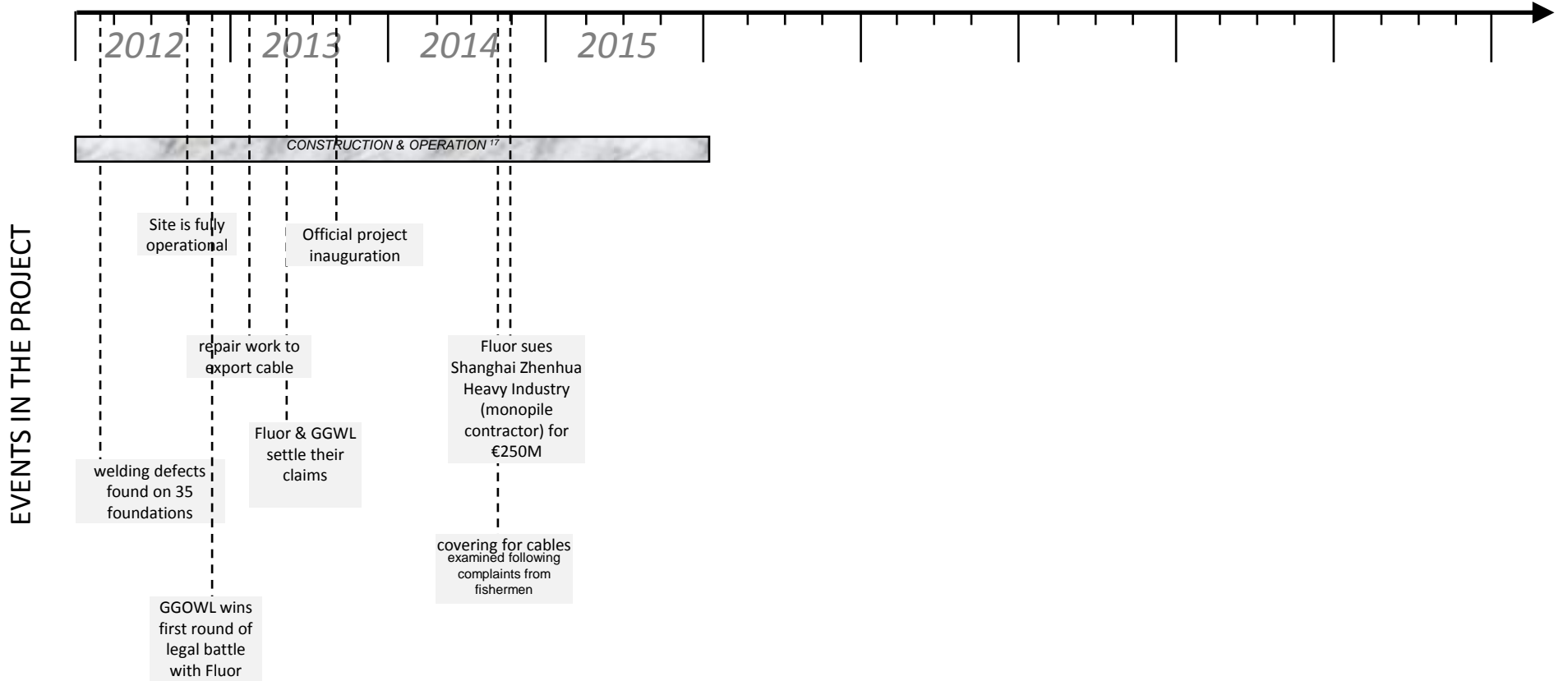
EVENTS IN THE ENVIRONMENT

Passing of UK Energy Act enables creation of REZ for Greater Gabbard site

EU Directive gives UK target to generate 15% of energy from renewables

MEGAPROJECT Project Key Events and Activities Timeline

TIME



EVENTS IN THE PROJECT

EVENTS IN THE ENVIRONMENT

for all references on this page, please contact author

- 1- Case Study: European Offshore Wind Farms- A Survey to analyse Experiences and Lessons Learnt by Developers of Offshore Wind Farms from www.offshore-power.net
- 2 - <http://www.rwe.com/web/cms/en/310134/rwe-innogy/sites/wind-offshore/under-construction/the-proposal/>
- 3 - <http://www.fluor.com/projects/Pages/ProjectInfoPage.aspx?PrjID=64>
- 4 - <http://www.offshorewind.biz/2010/10/19/fluor-announces-that-cost-escalation-on-offshore-wind-project-will-impact-third-quarter-results-usa/>
- 5- <http://www.sse.com/GreaterGabbard/ProjectInformation/>
- 6 - <http://www.businessgreen.com/bg/news/1805171/renewables-grid-competition-sparks-investor-gold-rush>
- 7 - <http://www.businessgreen.com/bg/news/2074046/balfour-beatty-consortium-bags-gbp317m-gabbard-grid-link>
- 8 - http://www.siemens.com/press/en/pressrelease/?press=/en/pr_cc/2007/09_sep/pg200709075_1463099.htm
- 9 - <http://www.thecrownestate.co.uk/energy/offshore-wind-energy/>
- 10 - <http://www.greenpeace.org.uk/media/press-releases/switch-on-for-uks-first-offshore-wind-farm>
- 11- <http://www.bbc.co.uk/news/uk-england-humber-12354185>
- 12 - <http://news.bbc.co.uk/1/hi/wales/1261882.stm>
- 13 - <http://www.rya.org.uk/cruising/current-issues/Pages/Round3windzonesdevelopersstartscoping.aspx>
- 14 - http://www.naturalengland.org.uk/about_us/news/2010/080110a.aspx
- 15 - <http://www.renewableenergyfocus.com/view/20715/comment-pna-ports-getting-ready-for-offshore-wind/>
- 16 - GREATER GABBARD OFFSHORE WIND FARM NON-TECHNICAL SUMMARY October 2005 publ by PMSS
- 17 - Gabbard *The World's Largest Offshore Wind Farm In Construction* Presentation to IET Dublin -December 7th 2010 by Séamus Mc Cabe
- 18 - <http://www.windpowermonthly.com/channel/environment/news/1096453/Greater-Gabbard-monopile-row-continues/>
- 19 - <http://www.4coffshore.com/windfarms/greater-gabbard-united-kingdom-uk05.html>
- 20 - <http://www.offshore247.com/news/art.aspx?id=14850>
- 21 - http://www.3gc.co.uk/communication.php?content_id=21044
- 22 - <http://www.power-technology.com/projects/greatergabbardoffsho/>
- 23 - <http://www.businessandfinance.ie/index.jsp?p=643&n=329&a=2237>
- 24 - <http://www.theenergyevent.com/Energy11/uploads/1.Beckers.Volker.Insight.10.40.pdf>
- 25 - SSE ANNUAL Report 2011
- 26 - <http://www.ofgem.gov.uk/About%20us/Pages/AboutUsPage.aspx>
- 27 - http://en.wikipedia.org/wiki/Late-2000s_recession
- 28 - Meeting held to discuss this in February 2011
- 29 - Presentation by Jim Smith Director Offshore Airtricity 2008
- 30 - <http://www.s0larpower.net/subocean-goes-bankrupt-purchased-by-technip/>