

Who owns the wind, owns the future

Why we need public ownership
of offshore wind in the UK

Introduction

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Offshore wind is an important industry for the UK's future – both for the low carbon transition, job creation and our economic future. Indeed so important is the future of renewables to our economic and physical health that Labour pledged in its manifesto to ensure that 60 per cent of the UK's energy comes from zero-carbon or renewable sources by 2030.

Development and support of offshore wind and other renewable technologies will play a crucial role in implementing this mission and indeed our wider ambitious industrial strategy.

With the energy sector being dominated by just a few major players it is clear that diversifying ownership within the sector is much needed if we are to deliver a just and rapid transition. This is why Labour proposed taking energy back into public ownership through the creation of publicly owned, locally accountable energy companies and co-operatives to rival existing private energy suppliers to deliver renewable energy and affordability for consumers.

The picture regarding Offshore wind ownership is however opaque to say the least. In July 2017 I asked the Government to confirm how much of the UK offshore wind sector was owned by UK investors and companies. Sadly they declined to provide any statistics but this report now provides a thoughtful analysis of the current breakdown of ownership – and a selection of ideas for policy makers to consider in relation to what future diversification of ownership in the sector could look like.



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Executive Summary



Labour & Offshore Wind

Offshore wind is going to play a central role in the UK's energy and industrial future in the 21st century. We have one of the richest offshore wind resources in the world. Turbine installation will continue apace, heading for 30, 40 or 50 GW in the next two decades.

Labour needs a stronger vision for the sector – one that delivers public benefit as well as rapid transition. The 2017 election manifesto committed to "Funding further public investment in renewable generation through capital investment" in its 2017 manifesto.

This report lays out what this can look like for offshore wind, to ensure we

- Speed up deployment of offshore wind
- Capture the value it creates for the British public, including residents, firms and workers
- Revitalise UK industry
- Minimise costs to energy consumers

Models of public offshore wind

21st century public ownership of wind means a diversity of institutional forms, accountable to local residents, able to support and shape local economies, deliver energy justice and accelerate the transition.

We recommend that devolved governments, councils and central government co-operate to set up the most appropriate entities to invest into, develop, build and/or maintain offshore wind farms. This will involve participating in joint ventures with one another, regional co-operatives, public or private companies.

This report recommends four particular examples that would make use of geographical resources and existing expertise that Labour can champion:

- Scottish Wind
- Energy for Londoners
- Wind of the North
- Floating Cornwall

Existing public ownership of offshore wind

This report reveals the first breakdown of the UK's offshore wind by country and ownership status:

Out of 10.4 GW of offshore wind (operating and under construction)

51.2% of UK offshore wind is publicly-owned

0.07% is owned by UK public entities

7.3% is owned by UK entities (excl GIB)

92.7% is owned by non-UK entities

Why public?

Publicly-owned offshore wind can accelerate construction and deliver

Local jobs and greater value retention within communities and regions

Using procurement to support local companies and local hiring throughout the sector, and guide supply chains.

A just transition for workers and communities

Placing de-industrialising cities at the centre of the transition, with a leading role in building our future. Ensuring employment pathways exist for high-carbon workforces, and that all those working in the clean economy have safe, well-paid and unionised jobs.

Institutions for driving industrial strategy

Britain needs sustainable reindustrialisation, and public offshore wind can provide institutions to shape local and regional economies.

More revenues for public good

Decades of revenues from our wind resource can flow back to the public – preventing a repeat of the North Sea oil debacle

Greater public capacity

Years of cuts have hollowed out public-sector expertise – but the private sector isn't leading the clean energy drive as rapidly as necessary. We need to find routes to rebuild capacity and expertise in public entities.

Offshore wind at a lower cost to British public

The public sector can build new clean infrastructure cheaper and more efficiently than the private sector.

The top 5 owners of UK offshore wind are

- 1 DONG** (Public – Denmark)
3280 MW – 31.5%
- 2 ScottishPower-Iberdrola** (Private – Spain)
909 MW – 8.7%
- 3 EON** (Private – Germany)
852 MW – 8.2%
- 4 Innogy** (Private – Germany)
669 MW – 6.4%
- 5 Vattenfall** (Public – Sweden)
608 MW – 5.9%

The current top 7 public owners are

- 1 DONG** (Denmark)
3,280 MW
- 2 Vattenfall** (Sweden)
608 MW
- 3 Statoil** (Norway)
290 MW
- 4 Masdar** (United Arab Emirates)
274 MW
- 5 Statkraft** (Norway)
247 MW
- 6 Stadtwerke München** (Germany)
173 MW
- 7 Caisse de dépôt et placement du Québec** (Canada)
157 MW

1 Offshore Wind is the Future

Wind is one of Britain's greatest natural resources. It shaped our history, enabling the growth of ports, industry and trading fleets in the era of sail-based travel. Britain harnessed the winds off our coasts in the past, and we can do so again.

Offshore wind is going to play a central role in the UK's energy and industrial future in the 21st century.

We already generate more energy from offshore wind than any other country, and have over 40% of Europe's total installation¹. 5.4% of our electricity consumption was powered by offshore wind in 2016. This is expected to double by 2021². Since 2010, over £9.5bn has been invested in the sector here, taking us to 5.1 GW of installed capacity. A further £18bn is due to be invested by 2021 to pass 10GW. Offshore wind is now the sixth biggest infrastructure programme in the UK³.

But this is just the beginning.

It's hard to comprehend the scale of offshore wind expansion we will see around the UK over the next thirty years. All around the UK, initially in the shallow North Sea, and eventually in the deeper waters off Cornwall and North-West Scotland. The Offshore Valuation Group estimate that the UK's offshore wind potential could power the UK's electricity demand six times over⁴.

Everybody agrees that we should be installing more and larger turbines over the next 15 years. Even the Conservatives support doubling capacity from 10 to 20 GW in the decade from 2020 to 2030⁵. A 2015 DECC report argues that we can instead triple the 2020 figure in the same period – building 30GW of offshore capacity, enough to meet 35% of UK electricity demand⁶.

And Jeremy Corbyn's 2016 leadership manifesto was more ambitious – aiming for 47 GW of offshore wind by 2030⁷. Our 2017 general election manifesto didn't have any specifics on offshore wind, but the overall target of 60% of heat and power to be sourced from low-carbon and renewable sources by 2030 will rely on high figures for offshore wind⁸.

Given the scale of the challenge of climate change, we need to be aiming very high. As we decarbonise and switch away from fossil fuels, our electricity demand looks set to increase. Even with increased energy efficiency and demand reduction, the electrification shift away from petrol-powered vehicles, gas-heated homes and



fossil-burning industry means electricity consumption could increase several times over.

A powerful offshore wind industry has the potential to revitalise ports and coastal communities, creating economies of scale that enable other industries to flourish alongside. It can bring industrial activity and jobs to towns and cities often seen as “post-industrial”, helping deliver a just transition.

But as a Labour Party committed to both a rapid climate transition and social justice, we need to beware cheerleading a sector just because there has been rapid deployment. The urgency to scale up renewable energy and infrastructure must not lead to private multinationals profiteering off local energy wealth. We must not repeat the mistakes made with North Sea oil, as compared to Norway's development⁹.

Offshore wind is a natural resource – belonging to the nation and the people – that is being harvested. Are we seeing the infrastructure, the jobs and the public benefit that we should be on course for?

With UK wind an enormous resource that will shape our future, we must take care that the public doesn't lose out. The benefits of the transition should reside with the public. We need to ensure that the offshore wind revolution delivers the local, regional and national benefits that a 21st century Labour Party would expect it to do.

¹ <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2016.pdf>

² BEIS Energy Trends 2017; Offshore Renewable Energy Catapult <https://ore.catapult.org.uk/press-release/offshore-wind-target-become-lowest-cost-large-scale-clean-energy-source/>

³ <https://ore.catapult.org.uk/press-release/offshore-wind-target-become-lowest-cost-large-scale-clean-energy-source/>

⁴ <http://publicinterest.org.uk/offshore/>

⁵ <https://www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy>

⁶ https://c.yimcdn.com/sites/www.renewableuk.com/resource/resmgr/Publications/Reports/UK_Offshore_Content_Report_N.pdf

⁷ Environment & Energy – Jeremy Corbyn Winning Values – 2016 https://d3n8a8pro7vhmx.cloudfront.net/corbynstays/pages/425/attachments/original/1473247004/Environment_Energy_Final.pdf?1473247004

⁸ Richer Britain, Richer Lives – Labour's Industrial Strategy http://www.labour.org.uk/page/-/PDFs/ONLINE%209756_17%20Richer%20Britain%2C%20Richer%20Lives%20%2AD%20Labour%29B9s%20Industrial%20Strate...pdf

⁹ Energy beyond Neoliberalism, Platform and Lawrence & Wishart https://www.lwbooks.co.uk/sites/default/files/s59_08platform.pdf

2 Who owns the wind, owns the future

In July 2017, Labour's Shadow Secretary for Business, Energy and Industrial Strategy, Rebecca Long-Bailey asked the government "what proportion of the UK's offshore wind sector is owned by UK investors and companies". Richard Harrington MP, Parliamentary Under Secretary of State at the Department for Business, Energy and Industrial Strategy, responded with a dodge, claiming that "We do not hold specific information on UK ownership given the breadth of the sector".¹⁰

This report offers the first analysis of country and ownership-status of UK offshore wind¹¹. For a summary of the existing analysis of the supply chain, see Appendix 1.

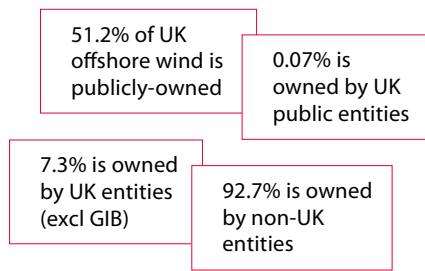
The UK has 5.1 GW of installed offshore wind, and 5.3 GW under construction. This is predominantly owned by large foreign firms – both private and public. Appendix 2 analyses ownership status of all offshore wind farms operating and under construction in the UK.

Public entities own over 51.2% (5.3 GW) of UK installed and under-construction wind. Predominantly private entities own 48.8% (5.1 GW).

The 9 largest public owners are foreign, including Danish wind company DONG, Swedish power company Vattenfall, Norwegian Statkraft and Munich's municipal energy company. DONG alone owns 31.5% of all UK offshore wind.

The only British public sector institution owning any offshore wind is the Offshore Renewable Energy Catapult, which owns a single 7 MW turbine as a demonstration facility¹². This is equivalent to 0.07% of the UK's offshore wind farms.

The Green Investment Bank owned 498 MW in offshore turbines – 314.3 MW that are operating and 184 MW under construction. This made up almost 5% of UK offshore wind – an impressive achievement for a public company founded in 2012 and initially with no borrowing powers. However, the GIB has now been privatised and sold to a consortium led by Australian private bank Macquarie, and renamed the Green Investment Group¹³.



Ownership is also overwhelmingly by foreign companies – 92.7%.

Post-GIB-privatisation, only 7.3% of offshore wind (764 MW out of 10.4GW) will be owned by five UK entities: Big Six companies Centrica (135 MW) and SSE (580 MW), investment firms M&G (20 MW) and Greencoat UK Wind (22.5 MW), and the Catapult demonstration (7 MW).

In comparison, Danish firms own 34.7%, German companies 18.3% and Spanish firms 8.7%. The top 5 owners are DONG (Denmark), ScottishPower-Iberdrola (Spain), EON (Germany), Innogy (Germany), Vattenfall (Sweden).

0.07% of the UK's offshore wind – one single wind turbine – is owned by UK public entities

The lack of UK public ownership and control in offshore wind is undermining:

the ability to create domestic and regional supply chains, and deliver the maximum value-added and local jobs benefits

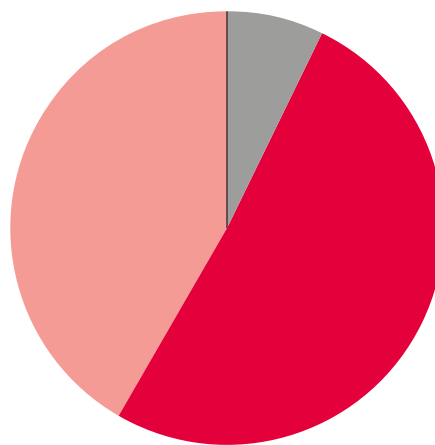
the longterm UK benefit from revenues once turbines are operational

the perceived public benefit from harvesting natural resources

attempts to boost domestic expertise, R & D and innovation capacity

potential to export components & expertise – and hence our balance of trade.

Breakdown of ownership types of UK offshore wind



● UK public: 7 MW 0.07%
 ● UK private: 757 MW 7.27%
 ● Rest of World public: 5324 MW 51.16%
 ● Rest of World private: 4318 MW 41.5%

¹⁰ <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-question/Commons/2017-07-12/4643/>

¹¹ This report does not analyse ownership of offshore transmission assets.

¹² <https://ore.catapult.org.uk/press-release/levenmouth-turbine-offers-unrivalled-opportunity-for-renewable-energy-rd/>

¹³ <http://www.insider.co.uk/news/green-investment-bank-23bn-sale-11008112>

All companies owning over 100 MW of UK offshore wind

1	DONG Public	COUNTRY Denmark	CAPACITY (GW) 3280	% OF UK OFFSHORE WIND 31.52%
2	ScottishPower/Iberdrola Private	COUNTRY Spain	CAPACITY (GW) 909	% OF UK OFFSHORE WIND 8.73%
3	EON Private	COUNTRY Germany	CAPACITY (GW) 852	% OF UK OFFSHORE WIND 8.19%
4	Innogy Private	COUNTRY Germany	CAPACITY (GW) 669	% OF UK OFFSHORE WIND 6.43%
5	Vattenfall Public	COUNTRY Sweden	CAPACITY (GW) 608	% OF UK OFFSHORE WIND 5.85%
6	SSE Private	COUNTRY UK	CAPACITY (GW) 580	% OF UK OFFSHORE WIND 5.57%
7	Green Investment Group Private	COUNTRY Australia	CAPACITY (GW) 498	% OF UK OFFSHORE WIND 4.79%
8	Statoil Public	COUNTRY Norway	CAPACITY (GW) 290	% OF UK OFFSHORE WIND 2.79%
9	Masdar Public	COUNTRY UAE	CAPACITY (GW) 274	% OF UK OFFSHORE WIND 2.63%
10	Macquarie Private	COUNTRY Australia	CAPACITY (GW) 257	% OF UK OFFSHORE WIND 2.47%
11	Statkraft Public	COUNTRY Norway	CAPACITY (GW) 247	% OF UK OFFSHORE WIND 2.38%
12	Siemens Private	COUNTRY Germany	CAPACITY (GW) 209	% OF UK OFFSHORE WIND 2.01%
13	Copenhagen Infrastructure Private	COUNTRY Denmark	CAPACITY (GW) 206	% OF UK OFFSHORE WIND 1.98%
14	Stadtwerke München Public	COUNTRY Germany	CAPACITY (GW) 173	% OF UK OFFSHORE WIND 1.66%
15	Caisse de dépôt et placement du Québec Public	COUNTRY Canada	CAPACITY (GW) 158	% OF UK OFFSHORE WIND 1.51%
16	SDIC (Red Rock) Public	COUNTRY China	CAPACITY (GW) 147	% OF UK OFFSHORE WIND 1.41%
17	Centrica Private	COUNTRY UK	CAPACITY (GW) 135	% OF UK OFFSHORE WIND 1.30%
18	Sumitomo Private	COUNTRY Japan	CAPACITY (GW) 114	% OF UK OFFSHORE WIND 1.09%

UK public pension investments in offshore wind

At least five UK local authority pension funds have invested into the Green Investment Bank's Offshore Wind Fund¹⁴. This includes £80 million from the Strathclyde Pension Fund¹⁵. With the privatisation of the Green Investment Bank, these will be the only existing investment into offshore wind by UK public entities. These investments provide a good revenue stream for local government pension-holders, and are a step towards moving pension wealth from fossil fuels towards the clean economy.

However, by investing into the GIB's Offshore Wind Fund, the local authority pension funds are not direct owners of specific farms, but investors into a financial product tied to some of the GIB's 498 GW of offshore wind.

Combined with the hands-off approach of LGPS pension funds, this means they can't enable a more joined up industrial strategy, or public procurement directed at boosting productivity and jobs. By themselves, more of these investments will be stuck within a primarily neoliberal investment model, that doesn't democratise the economy.

¹⁴ <http://www.greeninvestmentbank.com/news-and-insights/2017/world-s-first-offshore-wind-fund-manager-powers-through-1bn-target/>

¹⁵ <http://www.offshorewind.biz/2016/09/08/strathclyde-pension-fund-to-invest-gbp-80-million-in-uk-offshore-wind/>

3 Models of public offshore wind for the UK

21st century public ownership means a diversity of institutional forms, democratically accountable to local residents, able to support and shape local economies, deliver energy justice and accelerate the transition.

We recommend that devolved governments, councils and central government co-operate to set up the most appropriate entities to invest into, develop, build and/or maintain offshore wind farms. This will involve participating in joint ventures with one another, regional co-operatives, public or private companies – see below for key considerations.

We're highlighting four particular examples that would make use of geographical resources and existing expertise that Labour can champion. None of these could be set up overnight. However, by initially making equity investments and gradually building up expertise and capacity, they can become key players in our energy future. It took the Green Investment Bank only four years from launch to become a key player, providing £1.3 billion in patient capital that crowded in billions more. There are key lessons to learn from the GIB experience – including how to prevent privatisation in the future.



Green Port Hull/Siemens

Scottish Wind

- A Scottish national offshore wind company, owned by the Scottish Government.
- Supplying electricity to residents in Scotland
- Offering cheap electricity to industrial users when the wind is blowing
- Pioneering wind farms in deeper water, including off the West coast.
- Playing a key role in supporting innovation and research, including floating wind and technology needed for stormy weather

Energy for Londoners

- Owned by the GLA, building on existing plans by Sadiq Khan
- Demonstrating climate leadership as the capital
- Setting ambitious targets to generate as much electricity as London's residents consume
- Learning from Stadtwerke München, Munich's municipal energy company
- Investing in offshore wind across the UK

Wind of the North

- Jointly-owned by cities and councils from Newcastle to Liverpool
- Making use of existing skills, expertise and synergies of port cities, industrial towns, tech centres.
- Placing the North at the heart of the low-carbon transition
- Enabling regional industrial strategy and greater public procurement action

Floating Cornwall

- Owned by Cornwall council
- Focused on floating wind technology development
- Unlike fixed wind in shallow waters, floating wind turbines can be deployed in deeper water.
- The largest single resource area for floating wind in the UK lies off Cornwall and south west of the Severn estuary.¹⁶

¹⁶ <http://publicinterest.org.uk/offshore/>

Key considerations for the institutional form of publicly-owned energy include:

A Scale

UK public participation in offshore wind can be set up at different geographic and political scales. Ownership can be tied to local councils or combined authorities, regional consortia, devolved governments, or the UK government.

Public ownership of solar power by county and city councils is increasingly common. For example, Swindon Council and Cambridgeshire County Council built 4.8MW and 12 MW solar farms, issuing bonds and taking out loans to finance them.¹⁷

Offshore turbines are far larger pieces of infrastructure – but that doesn't mean that participation is restricted to national state-owned enterprises or multinationals.

City councils have repeatedly shown leadership – including in pushing new technological developments. In the UK, Aberdeen City Council was an active participant and driver – through its Aberdeen Renewable Energy Group – in developing the 92.4 MW Aberdeen Demonstration, an 11 turbine project. The 25% stake eventually was sold to Vattenfall in 2016¹⁸. German cities – even those far from the sea – are demonstrating their potential to shape offshore wind. Entega, the municipal energy utility for Darmstadt (150,000 inhabitants), owns 24.9% of Global Tech 1, a 400 MW installation off Northwest Germany¹⁹. Munich – a city of almost 1.5 million – sees offshore wind as a key component in its plans to be powered by

Munich is one of the largest operators of offshore wind in Europe

100% renewable energy by 2025.

On a larger scale, small coastal countries like Denmark and Norway own significant offshore farms through DONG and Statoil, and Sweden through Vattenfall. While independent countries, Denmark and Norway have populations very similar to Scotland, with GDP on a similar order of magnitude.

B Active or Passive / Operator or Partner

Should the institution build, operate and maintain new wind farms itself, or focus primarily on making investments alongside more active partners?

Some publicly-owned companies are very active builders and operators. EnBW (owned by the German region of Baden-Württemberg) and Stadtwerke München (Munich's city utility) were the 3rd and 4th largest installers of new offshore wind across all of Europe in 2015, each with 9.5% of all new installations²⁰. The Danish DONG and Swedish Vattenfall are more

active in UK waters, ranking 1st and 4th for operational wind farms.

Norway's experience with offshore oil demonstrates two approaches to state engagement with energy resources. Statoil (67% owned by the state) is the largest operator on the Norwegian continental shelf, with 70% of total extraction²¹. But the state also owns a third of oil and gas reserves in the country through its State Direct Financial Interest, which allows comparatively hands-off means of holding minority shares in fields²².

Public investors in wind can also be more passive – focused primarily on revenue generation. The Quebec public

pension fund CDPQ is a 25% owner of the London Array, with trade-union run pension funds from Sweden and the Netherlands owning 25% of wind farms Walney I & II, and 49% of Ormonde.

The Green Investment Bank itself lent financial expertise, providing and sourcing investment to help catalyse development, without taking on operator responsibilities, for the 314 MW of operational capacity it controls.

Public entities can initially focus on passive investments, to build up their portfolio, financial oversight and understanding of the sector, before exploring more active operations.

C Supply

Should the institution also sell electricity to residents? Municipal energy companies like Robin Hood Energy or Bristol Energy supply their customers locally and nationally with electricity and gas. The Scottish and Welsh governments have both been consulting on whether to set up public supply companies.

Public offshore wind could be tied to an existing or a new supply company, but this isn't necessary.

Existing private and public investors include Big 6 corporations with millions of UK customers (e.g. SSE and Centrica/British Gas), foreign municipal utilities with customers abroad but not in the UK (e.g. Stadtwerke München), and companies with no supply operations at all (e.g. Statoil, Marubeni). Councils that built solar farms (e.g. Cornwall, Swindon, Cambridgeshire) did this to generate revenues for frontline services, without any supply operations.

¹⁷ https://www.solarpowerportal.co.uk/news/swindon_borough_council_to_launch_second_community_solar_bond_offer
<http://www.room151.co.uk/treasury/cambridgeshire-solar-farm-to-generate-1m-revenue-per-year/>

¹⁸ <https://corporate.vattenfall.co.uk/about-vattenfall/news-and-media/press-releases/2016/green-light-for-innovative-offshore-wind-farm/>

¹⁹ <https://www.entega.de/global-tech/>

²⁰ <https://www.ewea.org/fileadmin/files/library/publications/statistics/EWEA-European-Offshore-Statistics-2015.pdf>

²¹ <https://www.statoil.com/en/what-we-do/fields-and-platforms.html>

²² <https://www.petoro.no/petoro-annual-report/2016-/front-page>

4 Benefits of public ownership of offshore wind

Creating public ownership in the offshore wind sector is comparatively easy, as most installations and infrastructure haven't been built yet. Publicly-owned companies can build the future, without needing to deal with the questions of compensation that arise with nationalisation.

Benefits include:

A Local jobs and value retention within communities and regions

The 2017 general election party manifesto made a commitment to use procurement to boost decent jobs and local businesses.

Measures listed in Labour's Industrial Strategy include to "use public procurement to nurture local, responsible suppliers with the potential to fill identified gaps in private sector supply chains" and "We will also encourage public bodies to support local jobs and businesses with local employment and content requirements by extending the rights of local authorities in left-behind areas to require local suppliers and jobs in

public contracts."²³

To use the procurement lever within the offshore wind sector, we need public bodies operating within the sector. Even if participating in a farm as a non-operating partner, public companies can set requirements on local content, job creation and supporting SMEs. By sourcing content from a UK supply chain where possible, it will create economies of scale that enable local businesses to expand, and encourage and crowd in further private and foreign public investment.

It is often argued that the government's hands are tied, and that local content requirements are contrary to international and EU trade rules.

However, EU procurement rules

allow social clauses covering the provision of skills and the addressing of long-term unemployment, which would apply to those areas of industrial decline in which the offshore wind supply chain should be expanded²⁴.

Greater local content also increases tax revenues – reducing the burden of subsidies. Subsidies for UK offshore wind are cost-benefit neutral with a strike price of £105 and 30% UK content – a level which is already achieved²⁵.

Public companies can set requirements on local content, job creation and supporting SMEs

B Institutions for driving industrial strategy

Procurement is not the only lever to create local jobs or retain value locally. The ability of the public sector to shape the supply chain is highlighted in a recommendation of a 2014 government review of the UK offshore wind supply chain²⁶. Several respondents – most of whom were from the private sector – had suggested that the Green Investment Bank ought to take a role in investing directly into the supply chain for offshore wind.

The report recommended that "The Government should consider expanding the GIB's State Aid remit so that it can support the supply chain to encourage further benefits for the UK in terms of jobs and investment." The report argued that the Green Investment Bank, launched only two years earlier, had built up a good sense of the industry and was well-placed to understand the requirements of supply companies and offer financial solutions to accelerate their growth – especially those companies that lacked a track record²⁷.

Public institutions can become industrial strategy actors by participating in the broad offshore wind sector, learning lessons from our neighbours in Europe. Compared to continental ports, British ports have struggled to win contracts for turbine deployment into the North Sea. In order to be able to compete for and win big wind turbine deployment contracts, the ports may need upgrading. The lead time between a Final Investment Decision and first offshore works on a wind farm is typically 12-18 months, meaning that necessary large upgrades have to begin without firm commitments from the installer in order for a port to actually be ready. And private investors in the UK don't want to make this upfront investment to upgrade infrastructure.

In Bremerhaven, these issues were avoided by the regional government investing €180 million of public money in the development of deep water, heavy-lift staging quayside based on the logic of capturing long-term value for its local economy²⁸.

²³ Richer Britain, Richer Lives – Labour's Industrial Strategy http://www.labour.org.uk/page/-/PDFs/ONLINE%209756_17%20Richer%20Britain%2C%20Richer%20Lives%20%2AD%20Labour%2B9s%20Industrial%20strate...pdf

²⁴ <http://urbact.eu/social-clauses-public-procurement-procedures>

²⁵ The Economic Value of Offshore Wind: Benefits to the UK of supporting the Industry <https://ore.catapult.org.uk/download/24232/>

²⁶ <https://www.thecrownestate.co.uk/media/389763/owic-uk-offshore-wind-supply-chain-review-opportunities-barriers.pdf>

²⁷ <https://www.thecrownestate.co.uk/media/389763/owic-uk-offshore-wind-supply-chain-review-opportunities-barriers.pdf>

²⁸ Strategic review of UK east coast staging and construction facilities, BVGA Associates for the Offshore Wind Industry Council, August 2016 <https://ore.catapult.org.uk/wp-content/uploads/2016/08/BVGA-17004-Report-r2-final.pdf>

C A Just Transition for workers and communities

As fossil fuels are phased and priced out of our lives, workers and communities relying on polluting industries may lose their livelihoods. The experience of Thatcher's coal mine shutdown must not be repeated – to this day, coalfield communities experience some of the worst levels of deprivation²⁹.

Creating a just transition to a clean economy means workers receiving both skills and new employment, and communities accessing economic activity and infrastructure renewal. While the private sector can be incentivised and subsidised to provide some elements of the transition, public institutions are often better placed to ensure that it delivers appropriate public goods.

Public offshore wind companies can place de-industrialising cities at the centre of a low-carbon transition, giving them a leading role in building our future. Offshore wind is already breathing life back into ports like Grimsby, but more stimulus and direction is needed.

Many of the regions that have potential for more wind off their coastline are currently facing industrial decline, deprivation or limited job opportunities. England's highest proportions of the workforce lacking good quality jobs are in Greater Lincolnshire (27%), Humber (26%) and Cumbria (24%)³⁰. These regions, and other parts of the North-east, North-West,

Scotland and Cornwall will see many more turbines installed in the coming decades.

Public institutions can guide the transition, ensuring employment pathways exist for workforces moving from dirty to clean energy, and that communities can see that they have a future in the new economy. Unite branch representatives from energy utilities and DNOs supported a campaign for a municipal energy company for London³¹ specifically because they saw how a London public energy company could help deliver a just transition away from fossil-fuel dependent multinationals.

Public companies can also use procurement measures to help shape new clean-energy supply chains. For example, there is already a strong overlap in skillsets between supply companies servicing offshore oil & gas and offshore wind. A 2014 report published by the Department for Business, Innovation & Skills compared the supply chain needed for offshore wind to existing expertise and skills in supply chains for oil and gas³². Out of the 20 elements required for the offshore wind supply chain (such as cables and substations), the report identifies existing synergies with the Oil & Gas supply chain and offshore wind to be "High" for 15, "Medium" for 4 and "Low" for 1. This means that for 15 out of 20 elements of the supply chain, there is existing expertise in the UK oil industry that has already been applied to wind. For a further 4, there is significant expertise, but it hasn't been applied to wind yet.

In only 4 years, the GIB became one of the most active players in UK offshore wind, investing over £1.3 billion

Those working in the new economy should have decent jobs. That means safe, well-paid and unionised jobs, with permanent contracts.

The offshore wind sector currently has much too low union density, creating dangerous working conditions, especially offshore. Without strong policy guidance combined with bottom-up mobilisation, shifts to renewable energy can lead to more precarious jobs. The *Energiewende* in Germany has created 400,000 jobs in renewable energy – but most of these are more precarious and less unionised than the 50,000 remaining coal jobs³³. "Green jobs" in themselves are not a panacea. The climate transition must not be used as a means to undermine organised labour, but instead deliver a positive social transformation.

D Revenues for public good

Public ownership can deliver significant revenues to public exchequers – at a local, regional and national level.

As cuts and future transfer of business rates hits home, local government need solutions to pay for frontline services. Even councils run by Conservatives are increasingly recognising the benefits of investing into clean energy infrastructure to generate new sources of income.

When launching the Swindon solar bond in 2016, the Conservative cabinet member for transport and sustainability announced "All councils need to find new and innovative ways to fund the vital work

that they do for their communities, and Swindon now has a template which other local authorities can follow. Embracing renewables will help Swindon Borough Council raise £1m more in business rates and rent by 2020, which means £1m more every year which can be spent on important local services."³⁴

Offshore wind appears to deliver solid returns over a long period – there is a reason why pension funds including AMF (Sweden), PensionDanmark (Denmark), PKA (Denmark), PGGM (Netherlands), Caisse de dépôt et placement du Québec (Canada) have bought ownership stakes in UK offshore wind, and 5 local government pension funds invested into the GIB's Offshore Wind Fund.

²⁹ <https://www.coalfields-regen.org.uk/wp-content/uploads/2013/06/Coalfields-Deprivation-in-Scotland2013.pdf>

³⁰ <https://www.jrf.org.uk/report/jrf-response-industrial-strategy-green-paper>

³¹ [Switchedonlondon.org.uk](http://switchedonlondon.org.uk)

³² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277798/bis-14-578-offshore-wind-supply-chain-capabilities-and-opportunities.pdf

³³ <http://www.rosalux-nyc.org/germanys-energiewende/>

³⁴ <https://www.localgov.co.uk/Council-solar-bonds-sell-out-one-month-early/40979>

E Greater public capacity

The public sector has a shortage of capacity and expertise on the low-carbon transition. This is a frequent reason cited for dependence on the private sector to act.

However, the private sector isn't delivering the rapid and just transition that we need. Moreover, the Green Investment Bank demonstrated that public institutions can build up expertise rapidly. Between its establishment in 2012 and 2016, the GIB became one of the most active players in UK offshore wind, investing over £1.3 billion and controlling 498 MW of installed or under construction capacity. In four years, it became the 7th largest owner of UK offshore wind, and the youngest

institution in the Top 10.

New public companies wouldn't need to have all expertise on board from the start. They could begin initially as investors, participating in public-public-partnerships with existing operators like DONG or Stadtwerke München, and gradually build up the capacity to operator and be more active.

A key function of public sector engagement in wind – as with state-owned oil companies in other countries – would be to improve the state's bargaining potential and regulatory process. By acting as the 'eyes and ears' of government within the offshore industry, a national energy company would make available considerable insider information.³⁵

Public investment in offshore

wind would also give the UK public a stake in the low-carbon transition – something which is currently lacking. Energy co-operatives where members invest in an installation (like Brixton Energy and Westmill Solar Cooperative) allow an element of "citizen energy", but this is restricted to those with the means to participate. The publicly-owned energy we propose can relate to existing regional identities and attachment, helping establish industrial pride and belief in common ownership – belief that the people can own the future.

Public investment in offshore wind would give the UK public a stake in the low-carbon transition

F Electricity at a lower cost to British public

The industry has been going through a period of rapid cost reduction, asking for progressively less state subsidy in the UK through the Contracts for Difference subsidy auctions. Public companies are at the forefront of this. DONG set a record in July 2016 with its 350 MW Borssele I and II Farms in the Netherlands with a low subsidy of €72.70/MWh – partly helped by the low cost of capital it could access³⁶. By November 2016, Vattenfall had won a bid to build a 600 MW project off Denmark with a subsidy of €49.9/MWh³⁷. But by May 2017, DONG and EnBW had both won bids in Germany at €0/MWh – the first subsidy-free sites to be built³⁸.

That public companies are leading the way should not be surprising – the public sector is generally more efficient than private companies³⁹.

Public companies also have the benefit of accessing a lower cost of capital and borrowing at far cheaper rates than private companies⁴⁰. In capital-intensive businesses like energy – especially where new infrastructure is required like offshore wind – this gives public companies the leading edge. DONG's UK country chairman Brent Cheshire explicitly cited this as a reason for the company's success: "You didn't have to worry about balance sheet risk."⁴¹

Modelling work conducted by Frontier Economics for IPPR showed that public ownership of offshore wind could

substantially lower the cost of projects by reducing the associated level of risk and accessing cheaper capital. Illustrative figures from Frontier Economics' modelling showed that public ownership during the construction phase of an offshore wind park could reduce the overall lifetime costs of capital by 0.1–0.2%. Continued public ownership during the operation of the wind farm could reduce these costs by 0.4–0.6%⁴².

Frontier Economics' calculations show that that full public ownership through construction and operation could generate savings for consumers of £3.4 – 5.1 billion (in 2012 prices) between 2015 and 2035 with an offshore wind programme reaching 30.3 GW⁴³. This does not take account the profits that would accrue from the operation of these schemes to the taxpayer.

As recognised in Labour's industrial strategy, public investment into renewable generation "will remove an increasing amount from energy bills over time".⁴⁴

³⁵ Vickers, J. and G. Yarrow, *Privatisation: An Economic Analysis*, MIT Press 1988

³⁶ <https://www.ft.com/content/18b0f2b6-42db-11e6-b22f-79eb4891c97d>

³⁷ <https://corporate.vattenfall.com/press-and-media/press-releases/2016/vattenfall-wins-tender-to-build-the-largest-wind-farm-in-the-nordics/>

³⁸ <http://www.windpowermonthly.com/article/1431441/dong-enbw-break-records-subsidy-free-german-bids>

³⁹ <http://weownit.org.uk/sites/default/files/downloads/Better-In-Public-Hands-Why-We-Need-A-Public-Service-Users-Bill.pdf>

⁴⁰ <http://www.psiur.org/sites/default/files/2016-04-E-UK-public.pdf>

⁴¹ <https://www.ft.com/content/99150262-d368-11e6-b06b-680c49b4b4c0>

⁴² When the Levy Breaks, IPPR, June 2015 https://www.ippr.org/files/publications/pdf/when-the-levy-breaks_Jun2015.pdf#43

⁴³ When the Levy Breaks, IPPR, June 2015 https://www.ippr.org/files/publications/pdf/when-the-levy-breaks_Jun2015.pdf The 30.3 GW figure comes from National Grid's 2014 'Going Green' scenario. Actual installations could be greater. <http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/Future-Energy-Scenarios/>

⁴⁴ Richer Britain, Richer Lives – Labour's Industrial Strategy http://www.labour.org.uk/page/-/PDFs/ONLINE%209756_17%20Richer%20Britain%2C%20Richer%20Lives%20%2AD%20Labour%2C%20B9s%20Industrial%20strate...pdf

Appendix 1 Failures in the supply chain: Boosting UK content

Given the scale of existing installations and the future offshore wind market, and that Britain is regularly touted as a world-leading offshore wind industry, wind farm parts and services (content) sourced from a UK supply chain should be much higher.

The new Siemens turbine blade factory in Hull is creating 1,000 jobs. Last year employment in the sector stood at around 6,800 full-time employees, according to the TUC⁴⁵. Consultants BVG reference 13,000 jobs already created by offshore wind. But the number of jobs should rise significantly. Many of the engineering skills and experience needed to scale up offshore wind already exist in the UK – not least in the shrinking offshore oil sector and its supply chain.

While the Siemens factory in Hull is a success, in reality Siemens builds factories to assemble wind turbine blades in every significant market, as building the blades locally is cheaper than shipping them. Aalborg in Denmark is the development factory, where new products are created. Assembly factories also exist in China, Canada and the USA, with plans for more in Morocco, India and Egypt⁴⁶. There was talk of the Hull plant possibly exporting, although this was put on hold with Brexit⁴⁷.

Figures estimated by the Offshore Renewable Energy Catapult in March show UK offshore wind projects currently being installed and operated as having 32% UK content⁴⁸. This figure is potentially an overestimation, as the analysis counts UK subsidiaries of multinational companies as “UK content”, and does not take into account sub-contracting.

32% is widely considered far too low, with 50% UK content being set as a minimum expectation by 2020 by the Contracts for Difference subsidy auction for offshore wind. In comparison, UK supply chain provides for only 5% of the European offshore wind market⁴⁹.

A report commissioned by DECC and the Crown Estate analyses UK content by different stages within a project’s life-cycle⁵⁰. According to this analysis, comparably high UK content was achieved in operation and maintenance, and in planning and initial development.

However, a devastatingly low 18% of manufacturing and construction was sourced from within the UK. Manufacturing and construction is the key stage for building a stronger industrial base,



Belfast Harbour

innovating new technology and creating jobs.

The biggest gaps currently are in turbine and foundation supply. For the 576 MW Gwynt y Mor farm off the north coast of Wales, four key contracts for turbine and foundation supply and installation totalled 70% of the total construction cost, and all went to overseas firms. Neither turbines nor foundations could be supplied within the UK.

Half of all construction value comes from turbine manufacture, and the UK has a dismal record at capturing this⁵¹. Nacelles (the covering that houses the generating components of a turbine) are a large cost element, so future investment in a nacelle assembly site would increase UK supply chain value significantly by 2030.

Foreign companies operating in UK offshore wind recognise the need to increase local jobs and components, especially as they are receiving public subsidies – but action remains too slow.

The lack of public companies is limiting our levers to effect change.

A devastatingly low 18% of manufacturing and construction was sourced from within the UK

⁴⁵ “Powering Ahead: How UK industry can match Europe’s environmental leaders”, TUC, 2016 https://www.tuc.org.uk/sites/default/files/Powering_Ahead_Report.pdf

⁴⁶ “Powering Ahead: How UK industry can match Europe’s environmental leaders”, TUC, 2016 https://www.tuc.org.uk/sites/default/files/Powering_Ahead_Report.pdf

⁴⁷ <https://www.theguardian.com/environment/2016/jun/28/siemens-freezes-new-uk-wind-power-investment-following-brexit-vote>

⁴⁸ SP-0012 – The Economic Value of Offshore Wind.pdf – available at <https://ore.catapult.org.uk/download/24232/#>

⁴⁹ SP-0012 – The Economic Value of Offshore Wind.pdf – available at <https://ore.catapult.org.uk/download/24232/#>

⁵⁰ https://cymcdn.com/sites/www.renewableuk.com/resource/resmgr/Publications/Reports/UK_Offshore_Content_Report_N.pdf

⁵¹ <http://regeneris.co.uk/latest/blog/entry/turbine-manufacturers-are-the-key-for-offshore-wind-sector-growth>

Appendix 2 Data & Methodology

Data for the size of the 41 UK offshore wind farms (operational and under construction) was sourced from the Crown Estate's annual Offshore Wind Operational Report: January – December 2016, as was data for ownership of 29 operational wind farms⁵².

Data for ownership of 12 wind farms under construction was sourced from the 4C Offshore database, cross-referenced with individual company pages⁵³. Data on national and public ownership status

was sourced from company pages. Companies with 50% or higher public ownership were classified as publicly owned – for example, DONG is 50.1% owned by the Danish state⁵⁴.

Trade union-run pension funds like the Swedish AMF⁵⁵ and Dutch cooperative PGGM⁵⁶ were not classified as public, but the Quebec public pension fund was, as it is property of the state and accountable to the Quebec National Assembly⁵⁷.

⁵² https://www.thecrownestate.co.uk/media/1050888/operationalwindreport2017_final.pdf

⁵³ <http://www.4coffshore.com/>

⁵⁴ <http://www.dongenergy.com/en/media/the-ipo-of-dong-energy>

⁵⁵ <https://www.amf.se/in-english/>

⁵⁶ <https://www.pggm.nl/english/who-we-are/>

⁵⁷ <http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/C-2>

Ownership of UK's 29 operational offshore wind farms

Wind farm	Capacity	Owners	% owned	MW owned	Country	Public?
Barrow	90	DONG	100.00%	90	Denmark	Public
Blyth Offshore	4	E.ON	100.00%	4	Germany	
Burbo Bank	90	DONG	100.00%	90	Denmark	Public
Greater Gabbard	504	Innogy	50.00%	252	Germany	
		SSE	50.00%	252	UK	
Gunfleet Sands Demo	12	DONG	100.00%	12	Denmark	Public
Gunfleet Sands I	108	DONG	50.10%	54	Denmark	Public
		Development Bank of Japan	24.95%	27	Japan	Public
		Marubeni	24.95%	27	Japan	
Gunfleet Sands II	65	DONG	50.10%	33	Denmark	Public
		Development Bank of Japan	24.95%	16	Japan	Public
		Marubeni	24.95%	16	Japan	
Gwynt y Môr	576	Siemens	10.00%	58	Germany	
		GIB	10.00%	58	Australia	
		Innogy	50.00%	288	Germany	
		Stadtwerke München	30.00%	173	Germany	Public
Humber Gateway	219	E.ON	100.00%	219	Germany	
Inner Dowsing	97	GIB	61.00%	59	Australia	
		Blackrock	39.00%	38	USA	
Kentish Flats	90	Vattenfall	100.00%	90	Sweden	Public
Kentish Flats extension	50	Vattenfall	100.00%	50	Sweden	Public
Levenmouth Demo	7	ORE Catapult	100.00%	7	UK	Public
Lincs	270	Centrica	50.00%	135	UK	
		DONG	25.00%	68	Denmark	Public
		Siemens	25.00%	68	Germany	
London Array (Phase 1)	630	DONG	25.00%	158	Denmark	Public
		Caisse dépôt & placement Québec	25.00%	158	Canada	Public
		E.ON	30.00%	189	Germany	
		Masdar	20.00%	126	United Arab Emirates	Public

Ownership of UK's 29 operational offshore wind farms (continued)

Wind farm	Capacity	Owners	% owned	MW owned	Country	Public?
Lynn	97	GIB Blackrock	61.00% 39.00%	59 38	Australia USA	
North Hoyle	60	JP Morgan M&G	66.70% 33.30%	40 20	USA UK	
Ormonde	150	AMF Vattenfall	49.00% 51.00%	74 77	Sweden Sweden	Public
Rhyl Flats	90	Innogy Greencoat UK Wind GIB	50.10% 24.95% 24.95%	45 22 22	Germany UK Australia	
Robin Rigg East	90	E.ON	100.00%	90	Germany	
Robin Rigg West	90	E.ON	100.00%	90	Germany	
Scroby Sands	60	E.ON	100.00%	60	Germany	
Sheringham Shoal	317	Statkraft Statoil GIB	40.00% 40.00% 20.00%	127 127 63	Norway Norway Australia	Public Public
Teeside	62	EDF Renewables	100.00%	62	France	Public
Thanet	300	Vattenfall	100.00%	300	Sweden	Public
Walney 1	184	DONG SSE PGGM & Ampère Equity Fund	50.10% 25.10% 24.80%	92 46 46	Denmark UK Netherlands	Public
Walney 2	184	DONG SSE PGGM & Ampère Equity Fund	50.10% 25.10% 24.80%	92 46 46	Denmark UK Netherlands	Public
West of Duddon Sands	389	DONG Scottish Power	50.00% 50.00%	195 195	Denmark Spain	Public
Westernmost Rough	210	DONG Marubeni GIB	50.00% 25.00% 25.00%	105 53 53	Denmark Japan Australia	Public

Totals operational (in MW)	5095
UK private (MW)	522
UK public (MW)	7
ROW private (MW)	2247
ROW public (MW)	2319

Ownership of UK's 12 offshore wind farms under construction

Wind farm	Capacity	Owners	% owned	MW owned	Country	Public?
Aberdeen Demonstration	92	Vattenfall	100.00%	92	Sweden	Public
Beatrice	588	SSE	40.00%	235	UK	Public
		Copenhagen Infrastructure Partners	35.00%	206	Denmark	
		Red Rock Power Limited (SDIC)	25.00%	147	China	
Blyth Demonstration Phase 1	42	EDF	100.00%	42	France	Public
Burbo Bank Extension	258	DONG	50.00%	129	Denmark	Public
		Kirkbi	25.00%	65	Denmark	
		PKA	25.00%	65	Denmark	
Dudgeon	402	Statoil	35.00%	141	Norway	Public
		Statkraft	30.00%	121	Norway	Public
		Masdar	35.00%	141	United Arab Emirates	Public
East Anglia ONE	714	ScottishPower	100.00%	714	Spain	
Gallopier	336	Siemens	25.00%	84	Germany	
		Innogy	25.00%	84	Germany	
		GIB	25.00%	84	Australia	
		Sumitomo	12.50%	42	Japan	
		Macquarie	12.50%	42	Australia	
Hornsea Project 1	1218	DONG	100.00%	1218	Denmark	Public
Hywind 2 Demo (Buchan Deep)	30	Statoil	75.00%	23	Norway	Public
		Masdar	25.00%	8	United Arab Emirates	Public
Race Bank	573	DONG	50.00%	287	Denmark	Public
		Macquarie	37.50%	215	Australia	
		Sumitomo	12.50%	72	Japan	
Rampion	400	EON	50.10%	200	Germany	
		Enbridge	24.90%	100	Canada	
		GIB	25.00%	100	Australia	
Walney Extension	659	DONG	100.00%	659	Denmark	Public

Totals operational (in MW)	5312
UK private (MW)	235
UK public (MW)	0
ROW private (MW)	2071
ROW public (MW)	3005

Appendix 3 Publicly-owned Offshore Wind Case studies

DONG

DONG is 50.1% owned by the Danish state. It was founded as the state oil & gas company in 1972. Over the past decade it has become increasingly focused on renewables, and is now the world's largest offshore wind farm company⁵⁸, having installed a quarter of global capacity. It is preparing to sell off its remaining oil & gas extraction business. It was part-privatised after 2014, with an 18% holding owned by Goldman Sachs.

DONG is upfront about its advantages as a public company, with a government owner happy for it to plough money into a very new type of energy generation: "You didn't have to worry about balance sheet risk" – DONG UK country chairman Brent Cheshire⁵⁹.

Europe installed capacity: 2,043 MW (1st in Europe with 16.2% of total)⁶⁰

Stadtwerke München

Munich's publicly-run city utility – providing electricity and water to 1.5 million people, as well as running public transport and swimming pools. Munich has plans to be powered by 100% renewable electricity by 2025, and already generates as much as its domestic residents consume. Recognising the limits of generation within the city, Stadtwerke München invests in and operates renewable energy generation across Europe.

Unlike many German municipal utilities, Munich's was never handed over to private companies, so didn't need to be remunicipalised – giving it a strong starting position in the climate transition⁶⁴. The public company pays an annual dividend of €100 million to the city.

Europe installed capacity: 530 MW (5th in Europe, with 4.2% of total)⁶⁵

Dong is now the world's largest offshore wind farm company, having installed a quarter of global capacity

Vattenfall

Swedish power company established in 1909, wholly owned by the Swedish state and built on hydro power. Later expanded in Europe with heavy investment into coal and nuclear. Also supplies energy in Germany and Netherlands, and is launching a supply business in the UK⁶¹. Vattenfall faced heavy criticism over its coal mines and power stations in Germany until selling them⁶².

Europe installed capacity: 1,088 MW (2nd in Europe with 8.6% of total)⁶³

UK Green Investment Bank

The Green Investment Bank – founded in 2012 – has played an important role providing the patient capital that makes this happen – investing £1.3 billion into projects with a total capacity of 2.9 GW – of which the GIB owns 498.3 MW. These interventions have been essential in driving significant growth, as developers did not have or were unwilling to provide the capital required to build and hold these assets.

The 2015 Conservative government set about privatising the bank, approving the sale to Australian bank Macquarie, despite heavy public criticism⁶⁶.

Europe installed capacity: 314 MW (9th in Europe, with 2.5% of total)⁶⁷

⁵⁸ <https://www.ft.com/content/99150262-d368-11e6-b06b-680c49b4b4c0>

⁵⁹ <https://www.ft.com/content/99150262-d368-11e6-b06b-680c49b4b4c0>

⁶⁰ <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2016.pdf>

⁶¹ <https://corporate.vattenfall.co.uk/projects/isupplyenergy/>

⁶² <https://corporateeurope.org/climate-and-energy/2016/06/ende-gelaende-vs-vattenfall> <http://www.dw.com/en/vattenfall-confirms-sale-of-german-lignite-assets-as-activists-call-for-coal-exit/a-19195752>

⁶³ <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2016.pdf>

⁶⁴ <https://www.econstor.eu/bitstream/10419/166542/1/cesifo-forum-v14-y2013-i3-p03-05.pdf>

⁶⁵ <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2016.pdf>

⁶⁶ <https://www.theguardian.com/environment/2017/apr/20/green-investment-bank-sell-off-dubbed-a-disaster-by-critics>

⁶⁷ <https://windeurope.org/wp-content/uploads/files/about-wind/statistics/WindEurope-Annual-Offshore-Statistics-2016.pdf>

