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Template for Value Framework

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Introduction

- The values framework was created to support Innovate UK to understand the value of Offshore Wind to the UK across the life cycle of offshore wind, and according to different ideas of value.
- The framework is particularly useful to energy technologies as this is what it was designed for, but could be used for other industries with some adaptation
- This document provides a guide written by the research team on how a similar exercise could be replicated with reflections on sources, tools and challenges
- Its primary audience is internal to Innovate UK but can also be used with external researchers/consultants

How to use the framework

Step 1: Understand the purpose of the evidence review

Step 2: Tailor the indicators accordingly using each box in the framework.

Step 3: Seek out the evidence base for your indicators (adjustments are likely and gaps are inevitable)

Step 4: Interpret the overall picture from the framework

Stage 1: Purpose of the Evidence Review

- Setting a clear research question will determine the success of the exercise.
- The framework is well suited to questions that are related to how different types of value is created, captured, or flows throughout the life of a technology or industry
- Depending on the project need, different weightings or focus could be applied to the framework (i.e. by value or by stage) but all values and stages should be shown consideration
- At this point underlying assumptions should be set

Stage 2: Choosing Indicators

- The next step is to fill the overall framework with indicators related to each stage and value
- Indicators can be qualitative or quantitative, they are suggestions of performance. Indicators might be similar to measures if they are quantitative, based on an outcome and provide an exact value for something
- For each box a minimum of 2 and a maximum of 6 indicators is suggested
- Some indicators will likely be similar across technologies / industries (e.g. GVA, patents, exports etc) where as some may be technology or industry specific (e.g. offshore wind & bird collisions)
- In many technologies, the decommissioning stage might be the hardest to fill, but its important to think about the evidence that could be gathered to understand what value might be available at that stage

Value Creation Framework

	Development & Installation	Operation	Decommissioning
Financial £ value flows			
Innovation R&D & IP			
Energy & Environmental Climate & nature			
Community & Wellbeing People & places			

Stage 3: Gathering Evidence – the process

- Each value of the framework is split into its own table (see slides X to X) which includes your original indicators copied over, followed by a row for data, another for limitations, and box for initial points of interest
- Measures can cover inputs, outputs and outcomes that speak to an indicator
- The relationship between gathering evidence and creating indicators can be iterative; looking for evidence can often highlight other relevant indicators – adding indicators at this stage is encouraged
- Where evidence is not available, we suggest not deleting the indicator, rather acknowledging the gap – you never know when a friendly researcher might fill the evidence gap!

Gathering Evidence – In practice

- There is no quick way of gathering measures and evidence to feed into the review
- General chat bot generative AIs may be tempting, and help with some basic starting points but can often lead down hallucinated traps or circulate conversations
- Mostly this involves a lot of googling and cross checking between sources

Overview of types of sources

Source	Reliability	Availability	Regularity	Neutrality	Scale
National Government Statistics	High	High	High	High	Often national and subnation
International Governance Bodies	High	Mid	High	High	Often national
Industry Bodies	Mid	Mid	Mid	Low	Often national Sometimes project basis
Academic Literature	High	Low	Low	High	Scales vary from the global to case study but aim for wider applicability
Consultancy Reports	Mid/Low	Low	Low	Low	Wide variety of scales
Company Sources	Mid/Low	Low	Low	Low	Typically at a project scale

Where LLMs can help

- Gemini Notebook: Allows you to upload data and request answers using your sources. It supplies references for you to check the sources of answers.
- Google Scholar Lab: Allows you to search the academic literature based on a research question and provides short summaries of papers.
- Elicit: Allows searching of mostly open source academic papers and provides research summaries with sources.
- Any ‘typical’ GPT (depending on subscription): Can be useful to request a cross check of figures included for any errors

UK

	Development & Installation	Operation	Decommissioning
Financial £ value flows			
Data sources & availability			
Limitations			

Points of interest:

UK

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Points of interest:

Stage 4: Interpretation

- As the framework doesn't rely on figures that can be aggregated to a number for each value at each stage, interpretation is a qualitative exercise of viewing the findings in their context
- However key insights recorded during data collection can be helpful to draw out interpretations of the data
- For offshore wind, a country comparison was useful to draw out insights
- Returning at this point to the research question can be helpful to begin to interpret the evidence base
- Share your findings and ask for evidence that surprises or notice where people ask questions – these are often the most interesting inisghts

Top Tips

- Check reports and academic papers for associated materials – this can give you extra data sources to work with, or allow you to follow the trail back to the original data
- If an academic paper isn't open access, email the authors, they will be delighted to share it with you
- Check institutional subscriptions such as Beauhurst

Limitations

- The framework will be challenging to use on technologies/industries which do not have an established life cycle structure
- Data can appear standardised for comparison, but reading into measures is important to understand the basis of the data, its true interpretation, and its limitations
- In our example, much of the data is predicted rather than actual outcomes data

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Example: Offshore Wind

Value Creation Framework

	Development & Installation	Operation	Decommissioning
Financial £ value flows	— Development Expenditure (DEVEX) — Capital Expenditure (CAPEX) — Local content — Private investment	— Operating Expenditure (OPEX) — Gross Value Added (GVA) — Local content — Levelised cost of energy (LCOE) — Reduction in the cost of energy — Exports of technology	— Decommissioning Expenditure — Local content
Innovation R&D & IP	— Gov spend on R&D — Demonstrators — BERD — Patent applications	— Patents granted — Spinouts — Continued R&D spend — Licenses	— Circular innovations — New applications
Energy & Environmental Climate & nature	— Construction emissions — New installations (by number/energy generated) — Species richness — Construction sound levels	— Energy generated — Emission reductions — Installed capacity — Behavioural changes (Physical barriers, Electromagnetic fields, Collisions, Food web alterations, invasive species)	— Rates of repowering & life extensions — Waste & materials — Net zero contribution — Seabed restoration — Biodiversity legacy
Community & Wellbeing People & places	— Employment created — Community support/engagement — Disruption to local economy (fishing & tourism)	— Community funds — Ownership models — Diversity and inclusion in workforce — Skills gaps	— Employment transition — Local economic legacy — Port & coastal impact

UK

	Development & Installation	Operation	Decommissioning
Financial £ value flows	— DEVEX — CAPEX — Local content — Private investment	— OPEX — GVA — Local content — Levelised cost of energy (LCOE) — Reduction in the cost of energy — Exports of technology	— Decommissioning CAPEX — Local content
Data sources & availability	— DEVEX : £216/kW average (Arup, 2025) — CAPEX: £2,823/kW average(Arup, 2025) — Local content: 80% DEVEX; 12% CAPEX (BVG Associates, 2021) — Private investment: £3.4bn (UK Government, 2026)	— OPEX: £46.5k/MW/a average (Arup, 2025) — GVA: £2-3 bn / GW installed (Offshore Wind Growth Plan, 2024) — Local Content: 81% OPEX (BVG Associates, 2021) — LCOE: £88.5/MWh for 2023 real figures (Arup, 2025) — Reduction in the cost of energy: £38 per MWh amounts to a price cut of 31% (Ralston, 2026)	— Decommissioning CAPEX: £86k/MW (Arup, 2025); £426million/GW for fixed, £450 million/GW gross for floating (Guides to Floating and Fixed Offshore Wind); £132.8 and £229 million, excluding contingency costs for 500MW estimated (Adedipe & Shafiee, 2021) — Local content: 30% DECEX — The cost of decommissioning 37 offshore wind farms could be between £1.3 billion (€1.4 billion) and £3.6 billion (€4.1 billion). (Spyroudi, 2021)
Limitations	— Data sources are predominantly UK based — Often consultancy based — Years vary and stats might not be repeated — Some issues with transparency	— Actual reported figures vs projected figures	— Actual reported figures vs projected figures

Points of interest:

- CAPEX is the biggest known expenditure in the lifecycle, but the lowest point of local content
- Floating wind is seen as having more potential for local content capture than fixed (BVG Associates, 2021; Tait et al., 2023)
- Aim for local content to be 60% by 2030 (Offshore Wind Sector Deal)

UK

	Development & Installation	Operation	Decommissioning
Innovation R&D & IP	— Gov spend on R&D — Demonstrators — BERD — Patent applications	— Patents granted — Spinouts — Continued R&D spend — Licenses	— Circular innovations — New applications
Data sources & availability	-Gov spend on Demonstrators: £4.545m in 2024 (IEA, 2026) - Gov spend on R&D: £3.073m (IEA, 2026) - Total gov RD&D: £7.618m (IEA, 2026)	- 10 patents grants related to offshore wind in 2022 (EPO & IRENA, 2023) - GtR+ has little evidence of UK Offshore Wind spinouts (similar to our Beauhurst data) - UK and Ireland Innovation Hub: £500,000 (Bould, Orsted, n/d)	- First UK Offshore Wind REPM turbine recovery project completed (Innovate UK, 2026) - RWE using recyclable blades in Sofia Offshore Wind Farm (RWE, n/d), which were developed by Siemens Gamesa factory in Hull (Murphy, 2025) - Reblade's bladeboard (Reblade, n/d)

Limitations	- BERD reported at the SIC level or at the detailed product group level.
	  - SIC too broad (and problematically reported
	  - Closest in detailed product group is "Electricity, gas and water supply; waste management"
	- IEA report private R&D in Austria, Portugal, Czech Republic and Italy
		- Spinout register has company name, but no specific subdivisions beyond academic discipline
		- GtR+ has little evidence of UK Offshore Wind spinouts
		- Patent lags
		- Not offshore wind specific
			Data is project by project rather than aggregated
			Very early in decommissioning timelines

Points of interest:

- Government spend on R&D in Offshore Wind is clear, but the match funding provided by private R&D is not easily found
- Little evidence of spinouts but we found that spinouts are positively associated with private equity (last project)
- Circular economy principles are clearly being considered in the decommissioning stage (caveat on that in the next slide)

UK

	Development & Installation	Operation	Decommissioning
Energy & Environmental Climate & nature	— Construction emissions — New installations (by number/energy generated) — Species richness — Construction sound levels	— Energy generated — Emission reductions — Installed capacity — Behavioural changes — Physical barriers — Electromagnetic fields — Collisions — Food web alterations — Attraction of invasive species	— Rates of repowering & life extensions — Waste & materials — Net zero contribution — Seabed restoration — Biodiversity legacy

Data sources & availability	- Construction emissions: estimated between 23,432-63,763Mt CO2e 2019-2054 (Allan et al., 2020)
	- New installations:
	  - 1,049MW new offshore wind energy capacity in 2025 (Crown Estate, 2025; Wind Europe, 2026)
	  - Four projects, all planned as floating offshore wind developments in Scotland, submitted offshore planning applications; total 4.3 GW of capacity (Renewables UK, 2026)
	- Biodiversity: 45 wind farms, it was found that abundance of benthic species increased in 38% in the first 2 years following construction, compared to 15% where abundance decreased and 45% with neutral change. (Mather, 2021) – based on 2012-2013 data
		- GWh generated: 16.5GW grid connected offshore wind capacity & 52 TWh generated in 2025 (Crown Estate, 2025).
		- Emission reductions: Offshore wind displaced an estimated 20.8 million tonnes of CO_2 in 2025 (Crown Estate, 2025)
			- Recycling turbines can save at least 35% of embodied carbon emissions equivalent per kWh compared to new manufacturing (Spyroudi, 2021)
			- 1.5GW of offshore wind will need to be decommissioned by 2030 globally and 13GW by 2040 (Spyroudi, 2021)
			- Possible to recycle 85-90% of materials in wind turbines but lessons from onshore suggest this is harder in practice (Spyroudi, 2021)
			- turbines contributes 50% to the carbon emissions of primary materials used
			  - Steel turbines emit more
			  - Fibre glass are harder to recycle (Spyroudi, 2021)
			- 17 MW decommissioned in 2025 (WindEurope, 2026)
			- 80 MW repowered in 2025 (WindEurope, 2026)

Limitations	-Data on biodiversity can be challenging to find, and there are widely acknowledged data gaps - Complex to distil down into handful of metrics	- Estimated figures	- No actual reported recycling figures - Decommissioning and powered are onshore & offshore combined

Points of interest:

- Wind turbines *can* be recycled, the extent to which they are is currently unclear
- No centralised reporting of biodiversity/habitat monitoring data

UK

	Development & Installation	Operation	Decommissioning
Community & Wellbeing People & places	— Employment created — Community support/engagement — Disruption to local economy (fishing & tourism)	— Community funds — Ownership models — Diversity and inclusion in workforce — Skills gaps	— Employment transition — Local economic legacy — Port & coastal impact

Data sources & availability	- Total employment: 39,898 employment 2025
	  - 24 % increase from 2023 (Renewables UK, 2025)
	- Fishermen are adversely impacted by displacement from offshore wind farms; small vessels more affected. No standardised compensation (Szostek et al., 2025)
		- Community funds: Much less established/ formalised than onshore, with no 'best practice' rate per MW, generally lower than onshore wind (Glasson, 2020)
		- Project Collette is early stage attempt to build community offshore wind near Cumbria (Green Finance Community Hub, 2025)
		- Ownership of offshore wind farm during operational and development stage:
		  - Utility 55%
		  - Financial investor 26%
		  - Oil & Gas 11%
		  - Corporate or state owned (Crown Estate, 2024)
		- DEI:
		  - Women make up 21.9% of the workforce
		  - Ethnic minorities make up 7.2% (Crown Estate, 2025)
		- Wind Turbine Technician remains the most in-demand role, with an average shortfall of over 11,000 technicians annually—despite a projected need of 17,300 (Wind Industry Skills, 2025)	

Limitations	- Projected figures based on submitted employment records - Impact on tourism using quantitative measures is an identified research gap (Glasson et al., 2021)	- Wind skills reported across offshore and onshore	- Very little evidence of local economic impacts from decommissioning

Points of interest:

- For offshore wind there are challenges in identifying the 'community' relevant to the site
- Best practice and more data exists for onshore, but offshore is slower to follow

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Thank you

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