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DEM-AWE

Route-to-Market for Airborne Wind Energy in Northwest Europe

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Executive summary

The DEM-AWE project, supported by the European Commission through the Interreg North-West Europe (NWE) programme, explores the market introduction of an innovative energy solution: the Kite-powered Battery Energy Storage System (K-BESS)[1]. Based on Airborne Wind Energy (AWE) technology, K-BESS offers a sustainable alternative to diesel generators, with the potential to serve temporary or remote locations that lack reliable grid access. By combining clean wind energy generation with on-site storage, K-BESS offers a mobile, clean and flexible alternative to diesel generators, especially suited for remote or off-grid areas.

This Route-to-Market report outlines a strategic pathway for commercializing the K-BESS technology in Northwest Europe. It identifies the most promising initial applications, quantifies market potential across selected countries, and outlines a realistic strategy for commercialization aligned with technological development, policy frameworks, and on-the-ground energy challenges. The goal is to facilitate the transition from demonstration to deployment, while laying the groundwork for future scaling of AWE technologies toward mass-market applications.

The report focuses on three primary entry markets where K-BESS can deliver immediate value: infrastructure construction sites, quarries, and remote islands. These sectors are characterized by high diesel reliance, limited grid access, and increasing regulatory pressure to decarbonize. The analysis concentrates on five countries: the Netherlands, Germany, France, Ireland, and the United Kingdom, and targets market/country couples with best commercial attractiveness. The report evaluates market conditions using a consistent methodology, combining top-down market data with bottom-up stakeholder insights and GIS-based spatial analysis.

Number of K-BESS		NLD	GE	FR	IRE	UK
Infrastructure construction market	2025	14	31	20		22
	2030	60	115	93		46
Quarries market	2025		34	5		
	2030		70	10		
Islands market	2025	27			1	1
	2030	47			9	4

Grey cells: the potential has not been quantified due to less promising market conditions

Table 1: Results of the market study – number of K-BESS commercialized in 2025 and 2030

Findings show that the infrastructure construction sector holds the largest near-term opportunity, driven by electrification trends and strong policy incentives, especially in countries like the Netherlands and Germany. Quarries, particularly in Germany and France, also present significant potential due to their energy intensity and rural locations. Islands offer a strategic but more niche opportunity, especially where diesel dependence remains high and renewable integration is a priority.

1 The term “K-BESS” is used throughout this report as a working name for the Kitepower system – which is taken as a reference for this study. The final commercial name of the product may change as the technology and branding evolve.

By 2030, the market could realistically absorb over 450 K-BESS units across these sectors. As the technology matures and regulatory environments evolve, the Levelized Cost of Electricity (LCoE) for K-BESS is expected to become increasingly competitive, strengthening its position as a viable alternative to diesel-based systems.

In addition to market-specific findings, the report also emphasizes the importance of aligning K-BESS commercialization with broader AWE development. K-BESS represents not only a viable near-term product but also a critical stepping stone toward the long-term vision of grid-connected kite farms. It offers a practical means to validate core AWE technology, build stakeholder trust, and create early revenue streams that support further R&D and industrial scaling.

This report concludes with strategic recommendations, emphasizing the importance of pilot deployments, early partnerships with forward-thinking construction and energy stakeholders, and regulatory engagement. K-BESS is positioned not only as a stepping-stone toward broader AWE adoption but also as a market-ready solution capable of accelerating the energy transition in sectors that are traditionally hard to decarbonize.

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1 Objectives of the document

The DEM-AWE project is a collaborative project that aims to demonstrate a new application of Airborne Wind Energy (AWE), much closer to the market: the Kite-powered Battery Energy Storage System (K-BESS)[2] in North-West Europe (NWE). K-BESS is a precursory use-case that will help to diversify renewables and their penetration into first access markets for AWE. The DEM-AWE project is co-funded by the European Commission through the Interreg North-West Europe (NWE) programme.

The demonstration is carried out over 18 months by Kitepower (NL) with a K-BESS pre-commercial demonstrator (30kW) sized for its capability to charge a 400-kWh battery in roughly 10 hours[3], with the utility RWE in Bangor Erris, Ireland, and Dura Vermeer, a Dutch construction company involved in a large infrastructure project as user partners. With the operational experience gained and feedback from relevant stakeholders, a reliable new solution would be produced.

This report elaborates a detailed plan on how the K-BESS systems can be introduced and deployed in the most promising markets, previously identified in the D1.2.1a Market entry study analysis. The results of the market-entry use-case demonstration, Kitepower's general commercialization plan, and the GIS models' results have been merged into this Route-to-Market report that will act as an action plan for K-BESS deployment in the NWE regions and beyond.

The report builds on the learnings from the MegaAWE project in terms of large, utility-scale deployment of AWE to develop a roadmap on how K-BESS systems will pave the way for the deployment of grid-connected, larger AWE systems.

This Route-to-Market report serves as a detailed roadmap for the commercialization of K-BESS systems post-project completion. The public version of this report provides insights into market sizing, valuation, and growth potential to guide business development efforts effectively.

[2] The term "K-BESS" is used throughout this report as a working name for the Kitepower system – which is taken as a reference for this study. The final commercial name of the product may change as the technology and branding evolve.

[3] This considers that the battery will be re-charged in most cases from about 20% to 80%.

2 Entry markets overview

K-BESS is a solution to produce and store emission-free electricity to replace diesel generators in remote locations with limited or no grid connection. The entry markets for this technology have been previously identified in D1.2.1 Market study report. By focusing on the most promising entry markets for K-BESS, a realistic overview of the potential of each market is proposed. The goal is to create a comprehensive understanding of the potential of K-BESS in the selected markets.

2.1 Entry markets in Northwest Europe

AWE needs to focus on entry-markets where the cost of energy is high and where there is a clear and immediate added value. The key market features for K-BESS are to target temporary locations, portability, double use of land.

The D1.2.1a Market study report led to the identification of several potential entry markets:

- Construction
- Islands
- Farms
- Post disaster response
- Festivals
- Army base camp
- Refugee camps
- Remote industrial sites (quarries, factories)

The entry markets identified were sorted based on 6 criteria:

- Market relevance in Northwest Europe countries
- Grid connection: markets with limited or no grid access often use diesel generators to produce electricity, and have higher energy costs with which K-BESS could compete on the short term
- Space availability: markets in remote areas, with sites potentially located in large areas, are likely to be able to host a K-BESS system
- Incentives for decarbonization: some markets have regulatory frameworks incentivizing decarbonization and electrification
- Use period: projects should last for over 6 months, to be able to obtain concrete positive results with the K-BESS system, while the K-BESS technology is gaining reliability.

The analysis on the relevance of the potential entry-markets is presented in the table below.

	Relevant market in NWE	Off-grid / with limited grid access	Space availability	Incentives for decarbonization	Use period	Relevance as an entry market
Construction sites	Yes	Yes for remote infrastructure construction sites	Yes for remote infrastructure construction sites	Yes	> 6 months	Relevant for remote infrastructure construction sites
Islands	Yes	Yes	Yes	Yes	> 6 months	Relevant for off-grid islands / with limited grid access
Agriculture	Yes	No	Yes	No	> 6 months	Not relevant
Post-disaster response	No	Yes	No	No	< 6 months	Not relevant
Festivals	Yes	Yes	Yes	No	< 6 months	Not relevant
Army base camp	No	Yes	Variable	No	> 6 months	Not relevant
Refugee camps	No	Yes	Variable	No	> 6 months	Not relevant
Small scale industrial sites	Yes	No	Yes	Yes	> 6 months	Not relevant
Quarries	Yes	Yes	Yes	Yes	> 6 months	Relevant for off-grid quarries / with limited grid access

Table 2: Prioritization of entry markets

Based on the above table, three specific entry markets have been identified representing the highest potential:

- Infrastructure construction sites;
- Islands;
- Quarries.

The remainder of the report will focus on these three entry markets.

2.2 Market prioritization by country

Each of the three markets have been analysed across five Northwest European countries: the Netherlands, France, Germany, Ireland as well as the United Kingdom (UK) as it is geographically close to Northwest Europe and was found to be a promising country for some markets.

Given the high number of market/country couple, the following qualitative criteria have been established to create a framework for deciding whether to analyse a market within a country. If a country does not meet the criteria for a given market, that sector will be excluded from further analysis. To be considered, a given country should not present any “Low” value.

1. Infrastructure Construction Sector:
    a. Energy Demand: Do construction projects have significant temporary or intermittent energy needs, where K-BESS can provide a solution?
    b. Regulatory Alignment: Are there incentives, policies, or funding available for the use of renewable energy instead of diesel on construction sites?
    c. Remote Infrastructure Projects: Is there substantial demand for rural infrastructure projects and is the sector expected to grow?
2. Islands Sector:
    a. Energy Storage Need: Do islands face challenges with off-grid energy supply? Is there a need for energy storage to support renewable energy sources?
    b. Regulatory Alignment: Are there incentives, policies, or funding available for renewable energy and storage systems on islands?
    c. Energy Demand Profile: Is the island's energy demand high enough to justify deploying a K-BESS system?
3. Quarries Sector:
    a. Market size: is the extractive industry in quarries a large market in the country?
    b. Regulatory Pressure: Is there increasing regulatory pressure for quarries to reduce emissions and adopt cleaner technologies?

The results of the market prioritization of each country are shown in Table 3 below:

	Netherlands	Germany	France	Ireland	UK
INFRASTRUCTURE CONSTRUCTION					
Energy Demand	High	High	High	High	High
Regulatory Alignment	High	Medium	Medium	Low	Medium
Remote Projects	Medium	High	High	Medium	Medium
QUARRIES					
Market size	Low	High	High	Low	Low
Regulatory alignment	Unknown	Medium	Medium	Unknown	Unknown
ISLANDS					
Energy Storage Need	High	Low	High	High	High
Regulatory Alignment	High	Low	Medium	Medium	High
Energy Demand Profile	Medium	Low	Low	Medium	Medium

Table 3: Prioritization of Countries

Based on this evaluation, the following markets are of interest:

- Infrastructure construction market in NL, DE and FR
- Quarries in NL and DE
- Islands in NL, FR, IE and UK

3 Infrastructure construction market

The industry of construction companies, especially those involved in infrastructure projects, is particularly interesting because of the high need of electricity they face. This section takes all civil engineering projects into account such as major highways, transportation systems, communication networks, water, electric, and sewage systems. As presented in the D1.2.1a Market Study, those projects offer the advantage of often being remote, which often results that there is enough space to deploy a system, and they experience a high need of energy for their machinery.

Every country has set his own rules and incentives to encourage initiatives. This section will be divided into the Netherlands, France, Germany and the United Kingdom to get a correct and comprehensive overview. Ireland is not considered since the preliminary analysis (see Table 3) showed that there are not regulatory incentives to change practices. The country thus scores Low.

Companies in this industry face a huge need of energy to complete their projects. Fossil fuels remain the main energy source on construction sites to power machinery and trucks – however, electricity is increasingly being used to power some machinery like cranes and site facilities. Moreover, one of the actions that companies put in place to reduce their emissions is to switch to electric vehicles to transport personnel. This increases the need of electricity on sites.

Depending on the country and the grid availability on the exact location, companies may not always receive enough electricity supply to sustain those needs. To meet their electricity need, they often rely on diesel generators, or batteries loaded further away. The cost of this can be high among other disadvantages, such as long distances between charging point and construction site.

The summary of the results of the market sizing and analysis led in this section is presented in the table below.

		NLD	DE	FR	UK
LCoE (€/kWh)	2025	1.25	0.66	0.50	0.66
	2030	0.70	0.77	0.70	0.71
Serviceable Available Market (SAM) (GWh)	2025	35	254	164	111
	2030	149	574	464	230
Number of K-BESS systems (units)	2025	14	31	20	22
	2030	60	115	93	46

Table 4: TAM SAM SOM and LCoE results, infrastructure construction market

3.1 Methodology

For each country in scope, the following research was done on:

- the use of electricity and of diesel gensets on construction sites;
- the regulatory framework for decarbonization and electrification of the industry;
- the cost of off grid electricity on a construction site;
- the average space availability on construction sites to host K-BESS systems, and average windiness in the country.

To effectively size the different markets both in 2025 and 2030, a calculation (TAM-SAM-SOM) is made. The TAM, SAM, SOM are defined as follow:

- **Total Available Market (TAM)**: the total energy from (fossil) fuels in infrastructure construction sites (MWh). Grid electricity is excluded from the TAM, since a K-BESS system isn't expected to compete with grid electricity prices. The focus is therefore put on fossil fuels, used directly in machinery or used in generators for electricity production. The TAM is estimated based on energy declarations in the annual report of large sector companies, then extrapolated to a national level.

- **Serviceable Available Market (SAM)**: the share electricity (excl. grid electricity) among the total energy mix, used on locations suitable for AWE deployment (MWh).
  Three key parameters are used to deduce the SAM from the TAM: electricity share, windiness and space availability. They are detailed in the paragraph below.
- **Serviceable Obtainable Market (SOM)**: the share of the SAM that could be captured by K-BESS systems. Considering K-BESS system of 250 MWh / year, like the Falcon soon-to-be commercialized by Kitepower, the SOM can be translated in a specific number of K-BESS units commercialized over a year.

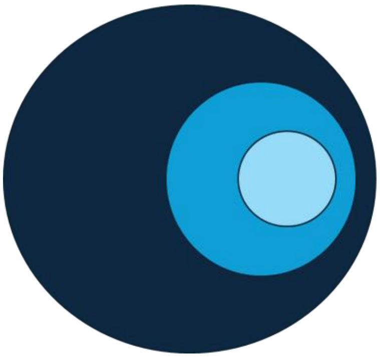

Figure 1: TAM, SAM, SOM for infrastructure construction market

The three parameters for the SAM are determined as follows. Each country specific value is explained in the paragraph dedicated to the country.

- **The electricity share** represents the share of off-grid electricity used on a project. This parameter has been evaluated either based on construction companies feedback, or through bibliography and annual report publication. When no data was available for a given country, the electricity share of a country with a similar construction sector context (regulatory, electrification trend, etc.) was used. In 2030, it is assumed that the electricity share will increase in countries where an electrification trend is noticed, pushed by a regulatory or economic context.
- **Windiness** represents the share of the overall market area with sufficient wind (> 7,5 m/s at 100m altitude). Each country is evaluated individually by determining the percentage of total land mass that has an average wind speed above 7.5 meters/second at an altitude of 100 m. This information is extracted from the Global Wind Atlas. The windiness is assumed to remain stable in 2030.
- **Space availability (SA)** represents the share of the projects in sparsely populated areas having enough space to deploy the kite.

  The Netherlands are used as a baseline to evaluate space availability. Over 30 different infrastructure job sites have been evaluated through the interviews with construction companies in the Netherlands, based on actual infrastructure projects of potential clients. Using the square root of the fraction of population density (PD), this value is then extrapolated to the other countries as given in the following formula. The space availability is assumed to remain stable in 2030.

$$SA_X = SA_{NLD} \cdot \sqrt{\frac{PD_{NLD}}{PD_X}}$$

with:

- SA_x is the space availability in each country
- SA_{NDL} is the space availability in the Netherlands
- PD_{NDL} is the population density in the Netherlands
- PD_x is the population density in each country

- **The market penetration** is estimated based on the industry context in each country, the regulatory framework, as well as the commercial leads and feedback that Kitepower has in the country. Diesel remains the most used electricity source in all countries in 2025, with a small market penetration for the K-BESS as an emergent technology deployed by early adopters. The market penetration will increase in 2030 with proofs of the technology efficiency and relevance, as well as the improved reliability of the technology.

	Netherlands		Germany		France		United Kingdom	
Year	2025	2030	2025	2030	2025	2030	2025	2030
Electricity share	20 %	80 %	11 %	22 %	11 %	30 %	11 %	22 %
Windiness	80 %	80 %	32 %	32 %	26 %	26 %	84 %	84 %
Space availability	25 %	25 %	37 %	37 %	53 %	53 %	45 %	45 %
Market penetration	10 %	10 %	3 %	5 %	3 %	5 %	5 %	5 %

Table 5: Overview of the SAM and SOM parameters for each country, construction market

3.2 The Netherlands

To determine the market size and the corresponding electricity price (Levelized Cost of Electricity, LCoE), a market study has been conducted in The Netherlands. Over 20 different contracting companies have been interviewed to determine the percentages for the SAM calculations.

Sector overview

The infrastructure sector in The Netherlands has a value of around €18 billion, representing 2.6 % of the Dutch economy. In the long term, the demand for ground, road and water works is huge. Old infrastructure needs to be replaced; energy transition calls for extension of the power grid and extra cabling and increasing climate risks require adjustments such as additional dyke reinforcement (ING, 2023). The future of the infrastructure industry is expected to remain stable with an increase of around 1 % in 2025 (ING, 2025). The government is engaged in continuously invest in the infrastructure of the country, both in rural and urban areas.

Regulatory framework

In the Netherlands, remote infrastructure construction sites – such as dykes - are often located near Natura 2000 protected areas. Natura 2000 areas are protected spaces where strong regulations apply to respect the existing biodiversity, accounting for 9 % of the country's space. In those areas, strict measures apply since 2019 for deposition of NOx. The future emissions are calculated in-beforehand, and permits are only granted if there is no harmful impact on nature (Rijksoverheid, 2019). This regulation to reduce the NOx emissions increases the pressure to use electrical (zero-emission) machinery as diesel generators and fossil fuelled machinery cannot comply with the new emission free regulations.

At the same time, connection to the electricity grid is becoming increasingly difficult to obtain in remote areas and due to net congestion, a big, temporary connection for construction isn't granted. Even when contractors manage to get a connection, it often comes too late and undersized. Contractors thus struggle with getting clean methods of electricity generation on their job sites.

More generally, all construction sites – not only those close to Natura 2000 areas - are concerned by the regulation on emission standard update (SEB), which is causing a phased transition to stricter emission limits. The regulation reaches a critical point in 2028 with a zero-emission requirement for stationary generators below 560 kW. This will create a widespread and urgent need for sustainable energy solutions across the entire construction sector.

Case study

From January to August 2025, Dura Vermeer, a leading construction company in the Netherlands, is the beta test partner to a project at one of their construction sites. The company is reinforcing almost 19 km of dyke. The use of K-BESS is to charge a buffer battery, which will serve as a charging station for electric construction machinery, like tractors, cranes, and excavators. The machines can drive up to the system, exchange their depleted battery for a fully charged one left behind during a previous visit, ensuring continuous operation on-site. At the moment, as alternative to the K-BESS, Dura Vermeer relies on a charging site called Watthub up to 12 km from location or swap batteries. This complicates the logistics of the project as the electric machinery can't drive to the charging point themselves and requires a good organisation. Deploying a K-BESS on-site offers a direct solution to real pain-point.

Cost of electricity

As an alternative to diesel generators to bring electricity to job sites, contractors are today using green hydrogen or battery swap systems, where batteries are charged in grid connected locations far away from the job sites. These alternatives are not cost effective and yield to a high on-site renewable electricity price of €1.25 /kWh in 2024, according to the interviewed Dutch construction companies.

Since only the projects close to Natura 2000 areas need to comply with these strict regulations in 2025, contractors are accepting these high prices. Market research shows that in the years to come; more contractors will adopt theses emission free alternatives in preparation of the zero-emission requirements in 2028. Interviewed project managers and sustainability coordinators of infrastructure companies in the Netherlands say the expected LCoE for the sector by 2028 would be around €0.60-€0.80 per kWh because of the growing competition on this market.

The assumption is made that the values in terms of market size and cost of electricity for 2025 and 2030 are the same as 2024 and 2028, respectively.

Market sizing

Making a bottom-up calculation to determine the market size of the Dutch infrastructure construction sector based on the annual report of the Koninklijke BAM Groep shows that the SAM is around 35 GWh/year in 2024 and expected to grow to 149 GWh/year in 2030. This huge increase is mainly due to the substantial electrification of on-site equipment.

This has been calculated based on an estimation of 80% windiness and 25% site availability. In 2025, a 20 % electricity share is considered. The percentage of electricity share for the Dutch construction market has been established through conducted 26 interviews with construction companies. This share is expected to increase up to 80 % in 2030.

For the TAM, a small market increase of 1 % is considered for each year. Moreover, a realistic SOM percentage has been chosen because the company can leverage its Dutch identity and various contacts.

The table below summarizes the results of the Dutch market sizing. It is estimated that 14 units could be deployed in 2025 and up to 60 in 2030.

	Koninklijke BAM Groep		Dutch infra construction sector	
Year	**2025**	**2030**	**2025**	**2030**
TAM (MWh)	39,583	42,018	875,319	929,169
SAM (MWh)	1,583	6,723	35,013	148,667
SOM (MWh)	158	672	3,501	14,867
# of K-BESS systems	**1**	**3**	**14**	**60**

Table 6: Dutch infrastructure construction market sizing

3.3 Germany

Sector overview

The German Infrastructure Construction revenue was estimated to be around €67 billion in 2024 based on data from the German building sector (Das Deutsche Baugewerbe, 2024). This corresponds to about 42 % of the total construction sector revenue of €159 billion (Das Deutsche Baugewerbe, 2024). Large infrastructure companies in Germany that are active in projects in rural areas are e.g. Hochtief AG, STRABAG AG or Max Bögl Bauservice GmbH & Co. KG.

The German construction sector is expected to grow from 2026 onwards, driven by large public investments in infrastructure and defence. Even before the formation of a new government after the February 2025 elections, parliament voted by a two-thirds majority to create a twelve-year, €500 billion extra-budgetary fund for infrastructure (Die Bundesregierung, 2025). This significant expansion of government investment, which is exempt from the German debt brake and is not part of the annual budget deficit, is expected to lead to additional public spending of about 1.5 to 2.0 percent of GDP per year over the next decade (Construction Briefing, 2025).

Regulatory frameworks

An interesting law is the Fuel Emission Trading Act (BEHG), introduced in 2021 as part of the Energiewende. This law regulates the sale of emission allowances (CO2 certificates) to companies placing fossil fuels on the market. In 2025, the price of an emission allowance is €55 per tonne CO2, while it was only €25 in 2021. In other words, in 2025, the cost is €15-17 cents higher per litre than without the law. Even if the initial cost is for the responsible party, it has a direct impact on the cost for the end user. Construction companies are thus incentivized to lower their diesel use and find greener solutions (Construction Briefing, 2025).

Apart from this law, Germany is engaged in supporting green initiatives through different funds. The most important one is the above-mentioned fund, from which 1/5th is explicitly earmarked for climate action and is therefore directly transferred to the Climate and Transformation Fund. Moreover, the whole fund has as objective to reach climate neutrality for infrastructure in 2045 (Clean Energy Wire, 2025). Other smaller examples can also be cited such as the ‘Future of Building’ and EnOB. Initiatives of the Federal Ministry for Environment and Building and the Federal Ministry of Economics and Technology respectively. They support research initiatives focussing on solutions related to climate change and innovative systems for buildings and energy supply (European Commission, s.d.).

Moreover, initiatives also raise from the construction sector itself with companies engaged in contributing to climate neutrality. We see that 52 % of infrastructure companies have invested in measures to improve energy efficiency in 2024 and they invested 17 % of their investment to energy efficiency. With a national average of 48 % and 11 % respectively, infrastructure firms are taking more effective measures (EIB, 2024).

Cost of electricity

When a closer look is taken at diesel prices, a huge increase is noticed between 2020 and 2025. In the first year mentioned, the average price per liter was €1.107 (Statista, 2023), while it was €1.629 (myLPG, 2025) on 02/07/2025. This increase cannot be attributed solely to BEHG, which accounted for an increase of 17 cents, highlighting the volatility of the market. Moreover, the prices of the emission allowances regulated by the BEHG will be set by auctions.

Since regulation pressure continuously increases and emission allowances will decrease accordingly, the price is expected to grow in the future. All end consumers will be impacted by the price increase.

However, for large diesel users, the impact will be the highest. For the forecast calculations, a 2 % inflation rate has been taken into account, as well as a 10 eurocent increase linked to BEHG. This is based on the same increase from 2020 to 2025.

	Value	Comments
Consumption	0.4 L/kWh	
O&M cost	€0.01 /kWh	
Diesel cost (€/L) 2025	€1.629 /L	
Diesel cost (€/L) 2030	€1.909 /L	2% inflation rate + 10 cent for BEHG
Cost of Electricity 2025	€0.66 /kWh	
Cost of Electricity 2030	€0.77 /kWh	

Table 7: Cost of electricity calculation, construction market, Germany

Market sizing

The energy consumption in the German construction sector was 217 PJ in 2022 which equals some 60 TWh (Bau Industrie, 2022). Applying the above-mentioned share of 42 % of the infrastructure segment and a 77 % share of diesel and other fossil fuels, this leads to 19.56 TWh. This value is used for the TAM. To obtain a reasonable SOM, the windy share is based on the findings of the Wind Atlas. 32 % of the average wind speed is above 7.5 m/s at 100 m. Finding no specific information, the taken electricity share is the same as for the United Kingdom. The site availability has been calculated based on the formula, leading to 37%. Finally, the SOM assumption is that 3 % of the market can be captured in 2025 and this increases to 5 % in 2030.

The TAM SAM SOM calculations deliver following results.

	German infra construction sector	
Year	**2024**	**2030**
TAM (MWh)	19,558,069	22,025,563
SAM (MWh)	254,724	573,722
SOM (MWh)	7,642	28,686
# of K-BESS systems	**31**	**115**

Table 8: German infrastructure construction market sizing

3.4 France

Sector overview

The infrastructure construction sector is an important industry in France, driven by public investment and projects linked to ecological transition. In 2024, the sector's total turnover reached approximately €49.4 billion, according to the French National Federation of Public Works (FNTP).

The major national companies of the sector are Vinci (and its subsidiary Eurovia), Bouygues TP, Eiffage, Colas. The main contracting authorities are the State, local authorities, SNCF Réseau, RATP, and Voies Navigables de France.

The construction of infrastructure in France represents 3.5 % of the national emissions, among which 20 % is related to the energy of site machinery (NGE, 2024). Fossil fuels remain the main energy source in the industry, representing 95 % of the energy in the infrastructure construction sector (Commissariat général au développement durable, 2017), which makes it a key industry for decarbonization.

Regulatory framework

The electrification of construction site is slowly taking place in France, caused by both the regulatory and economic context (Travail Sécurité, 2024).

In the context of the National Low Carbon Strategy, a decarbonization roadmap for infrastructure construction sector has been developed, aiming at reducing of 40 % their CO2 emissions by 2040 (compared to 1990) and reaching carbon neutrality by 2050 (NGE, 2024). Electrification of construction sites has been identified as one of the important elements in the roadmap, with actions such as switching combustion engines to electric engines for machinery and switching to electric vehicles for light vehicles (FNTP, 2021). On the other hand, the electricity supply of construction sites has been identified as a major hurdle to tackle.

Although there are no legal obligations to totally switch to electricity on construction sites, electrification is on its way in densely populated areas, where some "emission free areas" (called ZFE, "Zone à Faibles Emissions") apply and where construction sites need to minimize noise pollution.

Furthermore, at a national level, the diesel particle emission exposure limit has been raised to stringent levels: 0.05 mg/m^3 from 2021 in outdoor sites, and from 2026 for underground sites (Legifrance, 2021) – which can be very challenging to achieve with diesel machinery.

In parallel, some fiscal incentives (Ministère de la transition écologique, 2025) have been put in place for construction companies to rent or invest in less polluting machines, offering a solution to finance electric machinery which remain more expensive than traditional diesel ones.

Finally, call for tenders are starting to include criteria on carbon footprint of contractors, which pushes construction companies to take steps to reduce carbon footprint – for example through electrification – in order to remain competitive.

This trend is being confirmed on the electric machinery manufacturer side, who foresee a rise from 5 % of their 2024 sales related to electric construction site machinery, towards 22 % in 2030 and 66 % in 2040 (Travail Sécurité, 2024).

Cost of electricity

The electrification trend is also a solution to the tax increase on off-road diesel that recently took place. Until 2024, off-road diesel – which is used for all mobile machinery in construction sites as well as fixed gensets – benefitted from a tax advantage (called "TICPE"), which has now been cancelled: the benefit will progressively be suppressed and increase of +5.99 cts/year from January 2024 to

January 2030 (FNTP, 2025). This will have a big impact on the industry and the cost on construction sites.

Remote infrastructure construction sites use diesel generators to produce electricity, which is being estimated based on the hypothesis below.

	Value	Comment
Consumption (Blue Diamond Machinery, s.d.)	0.4 L/kWh	25% efficiency ratio
Maintenance and logistics (Toromont Power Systems, 2025)	€0.01 /kWh	
Off-road diesel cost (T1 2025)	€1.2 /L	
Off-road diesel cost (2030)	€1.7 /L	Includes the rise of €0.40 /L of taxes and 2 % inflation rate

Table 9: Cost of electricity calculation, construction market, France

The costs of electricity produced by generators is thus estimated to be:

- €0.5 /kWh in 2025
- €0.7 /kWh in 2030

NB: the cost of diesel is highly dependent on the geopolitical context. For instance, in March 2022, it had reached €2 /L after the start of the Ukraine war. Average values are considered here.

Market Sizing

Few companies disclose their detailed energy consumption. Vinci, the biggest sector company, was the only one amongst the top 4 companies to share its energy mix in their annual report. The TAM-SAM-SOM calculation thus extrapolates on this information.

The French construction sector is expected to rise by 3.9 % from 2025 to 2030 (NMSC, 2025). The TAM is assumed to grow proportionally.

For the SAM calculation, a 26 % of windiness has been found on the Global Wind Atlas. Site availability was set at 53% by extrapolating the Dutch data, which is the most robust information since it is based on over 20 interviews with construction companies. The electricity share in 2025 was set to 11%, based on the information found for the UK, since the two markets show similarities and that no information was found for France. The electricity share is expected to grow up by 2030, driven by the electrification of the machinery, the rising cost of diesel and the net zero target for the industry in 2050. Therefore the 2030 electricity share was set to 30 %.

For the SOM, a low market penetration of 3 % is taken in 2025, both because the market remains conservative at the moment and because the French market is more complicated to penetrate for a Dutch company like Kitepower than the Dutch or UK markets (language, university collaborations, etc.). However, in 2030, this share is expected to increase up to 5 %. The table below summarizes the results of the French market sizing. It is estimated that 20 units could be deployed in 2025 and up to 93 in 2030.

	Vinci (infrastructure only)		French infra construction sector	
Year	**2025**	**2030**	**2025**	**2030**
TAM (MWh)	2,092,269	2,173,867	10,798,186	11,219,315
SAM (MWh)	31,715	89,868	163,679	463,806
SOM (MWh)	951	4,493	4,910	23,190
# of K-BESS	**4**	**18**	**20**	**93**

Table 10: French infrastructure construction market sizing

3.5 United Kingdom

Sector overview

The infrastructure sector is valued around €16 billion representing around 0.6 % of the GDP of the United Kingdom. Various studies forecasting this industry, expect a modest growth between 1.6 % and 3.3 % from now to 2028 (PWC, 2025 ; Office for National Statistics, 2023), partially driven by investments of the government in the coming 10 years (Infrastructure and Projects Authority, 2024). Rural areas are home to large infrastructure projects, especially in the energy-sector, and they also benefit from extra support to become connected and accessible to the main cities (CITB, 2025). Those areas currently face connection difficulties, making it harsh for construction companies to obtain (enough) grid connection.

Regulatory framework

To achieve the UK net zero Target in 2050, the country has set a national intermediary milestone of a reduction of 78 % in emissions by 2035 (with respect to 1990). However, progress in carbon reduction and electrification of the construction industry solely relies on industry or company-based initiatives.

The industry, through the Construction Leadership Council (CLC) has created a framework called CO_2nstruction zero, guiding the companies in this sector to achieve this goal.

Part of this framework is the Zero Diesel Site Route Map (Construction Leadership Council, 2023), encouraging companies to reduce the diesel use by 78 % in 2035. Interesting actions are rolled out in this Route Map creating opportunities for the deployment of K-BESS in this sector:

- Action 20 - Industry to develop a commitment for companies to phase out diesel generators on site.
- Action 22 - Industry to support existing work ongoing to look at on-site generation and roll out the learnings.

Several companies, such as Balfour Beatty and Murphy Group, have started to reduce their emissions. This is done by switching to biofuel, hydrogen, or electrification. The use of biofuel instead of electricity to meet the targets may hurdle the opportunities for AWE, since they continue to rely on fuel-based machinery rather than switching to electrified vehicles. Even if the only legal targets are the Net Zero in 2050 and the Sixth Carbon Budget in 2035, a switch is occurring in this industry, supported by strategies emerging from the industry itself.

Cost of electricity

An economic pressure towards electrification rose since 2023, date at which vehicles on construction sites were forbidden to use off-road diesel in the United Kingdom. The cost of fuel for constructors has experienced an important increase (more than 4 times more per litre), encouraging the industry to switch to other energy sources (CIC, 2023) (HM Revenue and Customs, 2024).

Remote infrastructure construction sites use diesel generators to produce electricity, which is being estimated based on the hypothesis below.

	Value	Comments
Consumption	0.4 L/kWh	
O&M cost	€0.01 /kWh	
Diesel cost (€/L) 2025	€1.6 /L	
Diesel cost (€/L) 2030	€1.76 /L	Includes a 2% inflation rate
Cost of Electricity 2025	€0.66 /kWh	
Cost of Electricity 2030	€0.71 /kWh	

Table 11: Cost of electricity calculation, construction market, UK

The cost of electricity produced by diesel generators in 2025 is estimated around €0.66 /kWh. In 2030, it is estimated to be of €0.71 /kWh. However, the cost of €0.66 /kWh does not include logistic and transportation cost to transport the diesel to the adequate location. The actual on-site electricity cost is therefore most probably higher than represented here but the additional costs are deemed negligible and outside the scope of this report.

Market sizing

The bottom-up approach was based on the extrapolation of the energy use of a construction company to the whole country. Balfour Beatty, one of the major construction company active in the UK that discloses detailed information about its energy use has been used for these calculations (Balfour Beatty, 2024). Based on the energy consumption of Balfour Beatty, the estimated TAM for the total market is 2,632,890 MWh in 2025.

Industry forecasts predict a 3.8 % CAGR in 2030 (GlobeNewswire, 2025), which is used to estimate the 2030 TAM.

The calculation of the SAM is based on a thorough estimation of the wind availability in the country. 84 % of the country has an average wind speed of above 7.5 m/s. The electricity share has been estimated based on the data provided by Balfour Beatty, which was 11 % in 2024. This share is expected to increase by 2030. However, without financial incentives, the electricity share will not drastically improve by 2030. It is assumed that the electricity share will double. Finally, the site availability is estimated by considering that 85 % of the United Kingdom is rural area, from which 37.5% is protected. This gives roughly 45 % of land where a kite could be deployed.

Finally, to estimate the SOM, a conservative 5 % market penetration is considered both in 2025 and 2030. The 2025 market penetration is higher than France because there are existing commercial relations between Kitepower and the UK.

The table below summarizes the results of the English market sizing. It is estimated that 22 units could be deployed in 2025 and up to 46 in 2030.

	Balfour Beatty		UK infra construction sector	
Year	2025	2030	2025	2030
TAM (MWh)	157,973	163,976	2,632,890	2,732,940
SAM (MWh)	6,661	13,827	111,010	230,457
SOM (MWh)	333	691	5,551	11,523
# of K-BESS systems	**1**	**3**	**22**	**46**

Table 12: UK infrastructure construction market sizing

4 Quarries market

Aggregate extraction is an important industry in Northwest Europe. It includes gravel for construction works, broken natural stones and carbonate rocks.

Aggregate extraction is an energy-intensive activity, which is mostly located in rural areas with limited grid-access. Quarry operations therefore mostly rely on diesel for machinery, but an electrification trend is on the way.

As quarries are mostly located in rural and remote areas, they present the interest of offering good space availability for K-BESS implantation.

Aggregates are heavy products: a quarry therefore produces aggregates intended for use close to the extraction site, generally within a radius of 30 to 50 km. Mobile quarries can be temporarily set up close by large infrastructure projects such as railways or roads, offering an interesting opportunity for a mobile system as K-BESS.

The main aggregate producing countries in Europe are:

- Germany: 577 Mtons of aggregate and 2,728 extraction sites (Aggregates Business, 2024)
- France: 344 Mtons of aggregate (2024) and 2,995 sites (Ministère aménagement du territoire et transition écologique, 2024)
- UK: 168 Mtons of aggregates (Mineral Products Association, 2022)

The market study will focus on the two main aggregate extracting countries, where the potentials for K-BESS deployment are the best: France and Germany.

The summary of the results of the market sizing and analysis led in this section is presented in the table below.

		DE	FR
LCoE (€/kWh)	2025	0.66	0.50
	2030	0.77	0.70
Serviceable Available Market (SAM) (GWh)	2025	285	42
	2030	351	52
Number of K-BESS systems (units)	2025	34	5
	2030	70	10

Table 13: TAM SAM SOM and LCoE results, quarries market

4.1 Methodology

A TAM SAM SOM approach is used to size the accessible market among the quarry sector.

- The TAM is defined as the total energy use in quarries[4].
- The SAM is the total electricity use in quarries, both on and off grid, in areas fitted for K-BESS. Three parameters – defined in the paragraph below – are used to estimate the SAM: electricity share, windiness and space availability.

[4] Grid electricity is included here, unlike the construction market. Indeed quarries are long term installations, for which on-site renewable electricity production for self-consumption is growing to replace diesel but also grid electricity and its highly fluctuating costs.

- The SOM represents the market penetration of the K-BESS technology. The K-BESS system considered here is a Falcon by Kitepower (250 MWh/year). The SOM can be translated in a specific number of Falcon units commercialized over a year.

Germany and France are analysed simultaneously.
To estimate the SAM, three parameters are determined as follows:

- **Electricity share:** the electricity share in quarry operations was found through bibliography research. It is assumed to be the same for France and Germany.
- **Windiness:** each country is evaluated individually by determining the percentage of total land mass that has an average wind speed above 7.5 meters/second at an altitude of 100m. This information is extracted from the Global Wind Atlas.
- **Space availability**: the space availability was evaluated based on the results of the French and German GIS model. The figure below illustrates how quarries (represented by the small dark orange zones) were selected.
    - Green zones represent possible AWE deployment zones from the GIS study.
    - Quarries which have a deployment zone within a 2 km buffer zone (light orange circle) are selected. These selected quarries are represented with the green circle.
    - Space availability for a country is then calculated by dividing the number of selected quarries by the total number of quarries in the country.

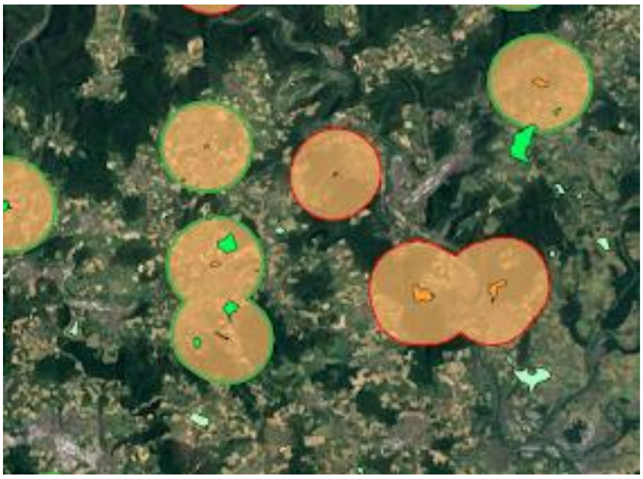

Figure 2: GIS model for space availability calculation for quarries

- **Market share:** K-BESS is mainly competing with diesel but also other renewable electricity sources like solar energy.

	Germany		France	
Year	**2025**	**2030**	**2025**	**2030**
Electricity share	37 %	45 %	37 %	45 %
Windiness	32 %	32 %	24 %	24 %
Space availability	58 %	58 %	19 %	19 %
Market penetration	3 %	5 %	3 %	5 %

Table 14: Overview of the SOM parameters for each country, quarries market

4.2 France and Germany

Sector overview

Aggregates are used in the construction industry to produce concrete, asphalt or ballast for railways. For example, in France, concrete production represents 20 % of aggregate use, road construction represents 55 % and asphalt 11 % (Lafarge, 2025). Therefore, aggregate industry is highly dependent on the construction industry.

Globally, the bulk aggregates market is set to grow at a steady pace of 6% in 2024, driven by Asia-Pacific. This dynamic can be explained by a number of key factors, such as growing urbanization, the increase in the world's population, and technological advances in construction.

At national level, in France, the situation is not as positive. After several years of falling production and consumption, with 2024 being the worst production year in the last 40 years, 2025 should be the year of stabilization, thanks to big infrastructure projects like the Bordeaux – Toulouse high speed railway (Koncrete, 2024).

Similarly in Germany, the German Federal Statistical Office showing that building materials production fell by 16.7 % in 2023 – but sector recovery should soon come from infrastructure projects such as north-south power lines for green energy supply, LNG (liquified natural gas) terminals, industrial buildings such as EV (electric vehicle) battery plants, and semiconductor plant projects (Aggregates Business, 2024).

Regulatory framework

Geopolitical context has had a high impact on the extracting industry. A trend towards electrification of machinery and renewable energy on-site energy production is emerging to lower operation costs, pushed by regulations:

- The low carbon material requirements in the construction sector (RE2020) in France sets constraints on the carbon footprint of materials used in buildings. As aggregates are a key component of concrete, one of the main constituents of buildings, the RE2020 pushes a low carbon aggregate demand and indirectly influences the aggregate extraction operations.
- The Green Industry law in France mandates 81 % reduction in industrial emissions by 2050 compared to 2015 levels – including the extractive industry.
- €2.2 billion German state aid scheme aimed at decarbonising industrial production processes. This initiative is part of Germany's efforts to transition towards a net-zero economy and aligns with the European Union's Green Deal Industrial Plan.

Overall, all major extraction companies are taking the lead by announcing a net zero carbon trajectory by 2050, such as Holcim, Cemex ("Roadmap for Future in Action") or Heidelberg Materials ("Building a Net Zero Future").

To reduce costs and emissions, examples of quarries turning to electricity and on-site electricity production are becoming increasingly common. In the Jaumont quarry, France, NGE operates only machines (L'Usine Nouvelle, 2025). In the quarry of Eigenrieden, Strabag has invested in an electric-powered stationary processing plant, autonomously operated haul trucks, and in-house photovoltaic system (Strabag, 2024).

Cost of electricity

The cost of off grid electricity for quarries is assumed to be the same than for the construction market, as it is produced in similar conditions (diesel generators).

In France, the costs of electricity produced by generators is thus estimated to be:

- €0.50 /kWh in 2025

- €0.70 /kWh in 2030

In Germany, it is estimated that companies currently pay around €0.66 /kWh assuming €1.66 /L diesel and a yield of 2.5 kWh electricity per liter of diesel (see calculation above for construction companies)

Market sizing

The energy input to produce 1 tonne of aggregate (Région Auvergne-Rhône-Alpes, 2021) (ADEME, 2004) is estimated between 16.6 kWh/ton (soft rocks) and 18.2 kWh/ton (hard rock).

The share of external transport (i.e. transport of the finished product outside of the quarry) in the total energy of aggregate production has been removed (58 % of total energy use).

The energy use is estimated between 7 to 8 kWh/ton of aggregate.

France and Germany extract different shares of hard and soft rock: France is mainly producing hard rocks (64 % of total aggregate production), while Germany is mainly producing soft rocks (54 % of total aggregate production).

Therefore, the energy consumption per ton of extracted aggregate is estimated to 7.4 kWh/ton in France and 7.3 kWh/ton in Germany. The total available market is estimated of 2,546,316 MWh in France and 4,201,206 MWh in Germany.

Considering:

- An average electricity share of 37 % in 2025- based on a study of the energy mix of 3 different French quarries (Région Auvergne-Rhône-Alpes, 2021) – which rises up to 45 % in 2030 based on the regulatory context;
- A stagnating aggregate production in France and Germany;
- A windiness of 24 % in France and 32 % in Germany;
- A space availability of 58 % in Germany and 19 % in France
- A conservative 3 % market penetration in 2025 and 5 % market penetration in 2030;

The number of K-BESS systems that could be commercialized is presented in the table below.

	Germany		France	
Year	**2025**	**2030**	**2025**	**2030**
TAM (MWh)	4,201,206	4,201,206	2,546,316	2,546,316
SAM (MWh)	42,418	52,250	284,856	350,885
SOM (MWh)	1,273	2,613	8,546	17,544
# of K-BESS systems	5	10	**34**	**70**

Table 15: Quarries (GE &FR) market sizing

The conservative market estimate are thus some tens of K-BESS systems. It is quite realistic to capture this potential if it is possible to convince a few large operators to deploy several AWE systems on a few of their main sites. Also mid-size operators could – at favourable locations – deploy several AWE systems while small operators may at best use one kite.

5 Islands market

Islands represent a very interesting entry market for Airborne Wind Energy due to their typically windy locations, which offer strong potential for energy generation. Many islands remain off-grid or have only limited access to electricity, largely because of the technical challenges and high costs associated with connecting them to national grids. While larger islands or those situated near the mainland are sometimes linked via submarine cables, this is often not feasible for smaller or more remote islands. Even grid-connected islands can face challenges such as unreliable power supply and frequent blackouts, especially following storms or severe weather. As a result, many islands continue to rely heavily on fossil fuels for their energy needs.

The European Commission is supporting the shift of islands towards renewable energy and decarbonization with its initiative "Clean Energy for EU Islands" (European Commission, 2025). The goal is to develop key recommendations and guidance to support the integration of increased renewable energy production and storage, while ensuring system stability and security of supply. Since 2017, a yearly forum is organised where different stakeholders can meet and partner up. This initiative shows the growing interest in renewable energy and self-sufficiency on islands.

Various islands have a low population; however, they attract a lot of tourists during summer months. This creates a major discrepancy in energy need through the year and comes with increased challenges of supplying demand. Smart organisations, energy storage solutions and easy-to-setup technologies may thus be required to respond to those fluctuations.

After the description of the used methodology and the analysis of the cost of electricity, this section will thus be divided into The Netherlands, Ireland and the United Kingdom. Germany and France are not investigated in detail:

The Germany islands are all grid-connected and the country is continuously improving the reliability of this connection (Next, 2018)

France has been left out because it has very few off-grid islands, with an energy consumption too low to be an interesting market for a K-BESS.

Due to a lack of available data, the cost of electricity is analysed for all islands and is not linked to each specific country. Except for inflation adjustment, the cost is assumed to remain stable.

This analysis shows that islands can be very interesting to deploy K-BESS systems on. However, the number of systems sold remains very low. Therefore, looking into islands of other countries, especially those engaged in "30 for 2030" or even "Clean Energy for EU Islands" could be an interesting next step.

		NLD	IRE	UK
LCoE (€/kWh)	2025	0.14 – 0.20		
	2030	0.15 – 0.22		
Serviceable Available Market (SAM) (GWh)	2025	198	3	6
	2030	577	29	9
Number of K-BESS systems (units)	2025	27	1	1
	2030	47	9	4

Table 16: TAM SAM SOM and LCoE results, islands market

5.1 Methodology

The goal is to define whether a country is a potential entry-market for the deployment of K-BESS on its islands. An in-depth analysis has been conducted to make substantiated recommendations. The bottom-up approach was preferred for this analysis because of the low number of potential islands in North-West Europe. This approach is expected to deliver precise information.

The TAM is defined as the total energy consumption (MWh). For every suitable island, the energy consumption was looked at with an emphasis on the electricity part. Various islands are engaged in generating clean energy (European Commission, 2025), finding adequate information was hence possible for most of them.

The SAM is defined as the electricity share of the TAM, in areas windy enough to install a K-BESS (>7.5 m/s. All the NWE islands that were studied have an average wind speed of above 7.5 m/s. Space availability was considered by estimating the maximum number of kites that could be deployed on each island, and setting it as a market limit. The maximum number of device for large islands (Texel, Inishturk and Inishmore) was estimated based on the results of the GIS study. The methodology is thus different from other markets where a percentage linked to the space availability was used to calculate the SAM.

An example is given on the figure below where the AWE deployment zones are shown (with the green surroundings) identified on the Texel island through the GIS study. A triangulation calculation is made to calculate de number of devices that could be fitted within those zones.

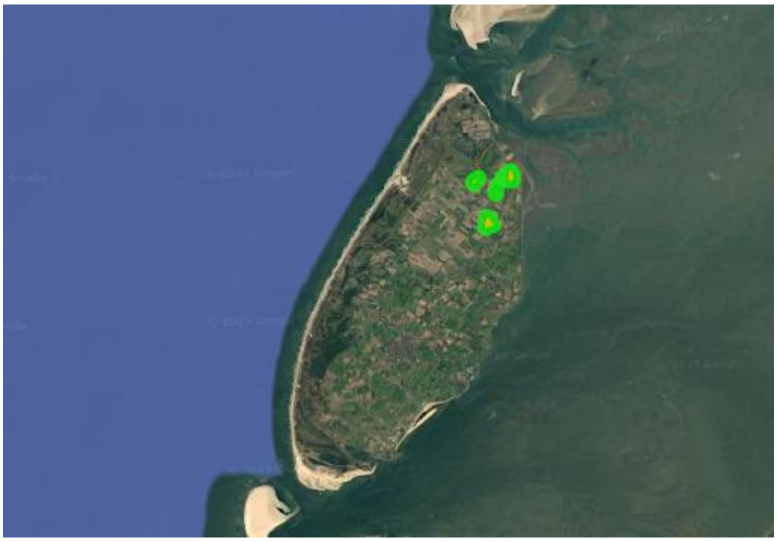

Figure 3: GIS model for space availability calculation for islands (example of Texel Island)

For the SOM, the assumption is that 5 % of the market can be addressed in 2025 and 10 % in 2030. This number has been compared with the maximum number of K-BESS that could be installed on an island, and the lowest number of the two has been retained. The biggest fluctuations in SOM between 2025 and 2030 come from the increase in electricity share reflecting the willingness of islands to rely on green energy. The TAM-SAM-SOM calculations are made for each country distinctively.

	NLD		IRE		UK	
Year	**2025**	**2030**	**2025**	**2030**	**2025**	**2030**
Electricity share	27 %	100%	9 %	80 %	48%	70%
Windiness	100 %	100 %	100 %	100 %	100%	100%
Market penetration	5 %	10 %	5 %	10 %	5%	10%

Table 17: Overview of the SOM parameters for each country, islands market

5.2 Cost of electricity

Specific information has been found for the Irish islands of Inishmore and Inishmaan (Aran Islands Energy, 2018), where the cost of electricity in 2017 was 0.14 €/kWh, while the island of Eigg reported a cost of 0.20 €/kWh in 2010 (Ashden, 2010). The initial investment cost in the energy production infrastructures has not been considered in those costs, neither has the potential O&M cost (which is often around a few eurocents per kWh).

No specific information could be found for the other islands. However, diesel prices have increased a lot due to the raising geopolitical tensions. For islands solely relying on diesel generators as source of electricity, this may become very challenging. Another challenging part is the reliance of supply as well as the high O&M costs in case of complications or failure.

5.3 The Netherlands

Sector overview

In The Netherlands, an impressive change is occurring. Although the Dutch islands (called the Wadden Islands) are nowadays connected to the grid, they all (Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog) have the intention of becoming self-sufficient in their electricity need by 2026 (Energy.nl, 2024). Even if this target will not be reached by then, the goal will still be pursued. Moreover, those islands are willing to invest in green energy. At the same time, major parts of the islands are included in the Natura 2000 areas. While this represents a hurdle in 2025, since K-BESS cannot yet be deployed in those areas, it is estimated not to be a problem from 2030 on, because the technology causes little to no harm. Finally, the population is considerable with its 24,713 inhabitants. Addressing these islands represents a huge potential for K-BESS.

Market sizing

As seen in the sector overview, there is a substantial community on the Wadden Islands. The TAM is thus relatively high. We expect the TAM to stay stable in the next 5 years, with no major increase of energy demand nor large population variations. The energy and electricity use could easily be found in online reports (Regionale Klimaatmonitor, 2023).

The average electricity share for 2023 was 27.5 %, which was kept as the electricity share for 2025. With the islands aiming to become self-sufficient in the coming years, the electricity share that could be addressed by the K-BESS is set at the full 100%. It is recommended to follow the developments closely and adjust this number if the electricity share is not following the growth path. The TAM is impressive, but the deployment of kites is restricted by Natura 2000 in 2025 and the surface of the islands in general. Vlieland is for example almost totally incorporated in the Natura 2000 zone, making it with the currently tricky to deploy kites on this island. For Texel, a thorough GIS analysis has been done while the other smaller islands have been estimated. In total, it is estimated that the 5 islands together can host 27 systems in 2025. In 2030, this increases up to 47 systems since it will be possible to deploy systems in more areas.

	Wadden Islands	
Year	**2025**	**2030**
TAM (MWh)	720,854	720,854
SAM (MWh)	198,214	576,683
SOM (MWh)	9,911	577
# of K-BESS systems	**27**	**47**

Table 18: Dutch islands market sizing

5.4 Ireland

Sector overview

Ireland has 83 islands from which only 23 were retained for a first analysis because these islands are inhabited. Most islands are connected to the mainland through underwater connection cables. Eight potential interesting islands for the deployment of K-BESS are Inishmore, Inishmaan, Inisheer, Inishturk, Inishbofin, Clare Island, Tory Island, and Cape Clear Island from which Inishmore is by far the biggest, with its 700 inhabitants.

Even if some islands are connected, they aren't necessarily directly tied to the mainland. Some islands are solely connected to another island. This is for example the case for the Arann Islands where a cable connects Inishmore to the mainland, while Inishmaan and Inisheer are only linked to Inishmore. This complicates the supply, since bottlenecks more easily occur. Moreover, some cables are too small or old, leading to limited supply (CLEAN ENERGY FOR EU ISLANDS , 2019). Even if the Irish islands have a low population, they still represent an interesting entry-market for K-BESS since the use-case is very promising. The deployment of a kite can effectively solve the problems they are facing and therefore be valuable for both parties. Moreover, because some islands are connected to each other, a future step could be to investigate the connection of kites to the grid to supply demand for different isles.

Market sizing

Half of the considered Irish islands disclosed detailed energy and electricity consumption. From this data, an average of 2.79 MWh per inhabitant of Irish islands per year was calculated – which makes sense in comparison to the average electricity consumption per inhabitant in 2023 of 4.2 MWh in Ireland (Cassidy, s.d.). The total TAM was then calculated based on each island population. It was assumed that the TAM would remain stable in 2030, just like in the Netherlands.

Based on available data, the islands have an electricity share of 9 %. In 2030, an optimistic 80% has been used for estimations. This is because 5 of the 8 islands are engaged in "30 renewable islands for 2030" aiming to achieve complete energy independence through 100% renewable sources by 2030. There are also 5 islands that are incorporated in the Natura 2000, explaining why it might be challenging for future deployment.

	Irish Islands	
Year	**2025**	**2030**
TAM (MWh)	36,578	36,578
SAM (MWh)	3,308	29,262
SOM (MWh)	165	293
# of K-BESS systems	**1**	**9**

Table 19: Irish islands market sizing

5.5 United Kingdom

Sector overview

In the United Kingdom, ten inhabited islands have been identified based on the lack of a direct connection to the national electricity grid. Of these, six are officially part of the EU Clean Energy for EU Islands initiative. Some islands typically rely on a mix of electricity generation sources, often combining renewable energy – such as solar photovoltaic (PV), wind and hydropower – with diesel generators. In some cases, diesel serves only as a backup, accounting for less than 10% of the total generation. In others, it remains the primary or sole source of electricity.

Tackling the islands with a high reliance on diesel generators represents the biggest potential for the deployment of K-BESS. However, several islands face problems with grid congestion. To electrify heating or add renewable energy sources, the microgrid needs to be expanded. Nowadays, heating often relies on diesel, coal, heating oil and gas amongst others. Based on those criteria, 3 islands stand out. Lundy, situated in the middle of the Bristol Channel only relies on diesel generators. They are planning to incorporate renewable energy opening applications in Summer of 2025 (The Landmark Trust, 2025). Fula and Rum are interesting because they rely for 60% on diesel generators. Fula still has available grid capacity but also relies for 30% on wind. Rum does not have wind power yet, but the grid is actually already full.

Another very interesting case could be the Scilly Islands, a group of 5 islands. In 2016, research has been conducted showing interest in installing 1 MW of wind power (Hitachi, Council of the Isles of Scilly, 2016). Possible options mentioned then were one big system or the combination of 2 systems of 250 kW and 5 of 100 kW. No updates have been found online since, as of writing this report.

Most of the off-grid islands have very small populations. Moreover, islands that already use renewable energy typically operate systems around 50 kW in size. A single 100 kW system would likely be oversized and not well suited to their specific needs. Exploring opportunities for shared systems across interconnected islands – where one installation could meet the collective demand – could be a promising next step. Alternatively, conducting an analysis on the feasibility of deploying a 30 kW system may offer a more appropriately scaled solution. An interesting next step could be to look also into islands connected to the mainland electricity grid, but who are facing complications in reliability and supply. They could be interested in a system that can be easily and quickly set up to rely on when it proves challenging to connect to the mainland grid.

Market sizing

In the TAM calculation, the energy use linked to transport to and from the island has been removed. This being the fuel used is marine diesel and kerosene when aviation is possible. Because this information was not considered in every source, the choice was to take it out to obtain a coherent electricity share across all islands.

There are no islands engaged in the “30 for 2030” program. The assumption is thus made that in 2030, only 70% of the energy will be electricity, because there is no key milestone to be met by then. With 47.8% of electricity share, which is relatively high, the market is not planned to increase a lot in 2030. However, this share is an average which masks the discrepancies between the islands. As mentioned, some islands will experience a bigger grow in electricity share.

Regarding space availability, there is no issue to deploy the number of systems on the considered islands. A market penetration of 5 % was considered in 2025, and 10 % in 2030.

	UK Islands	
Year	**2025**	**2030**
TAM (kWh)	13,002	13,002
SAM (kWh)	6,223	9,101
SOM (kWh)	311	910
# of K-BESS systems	**1**	**4**

Table 20: UK islands market sizing

6 AWE mass market

In this section, the potential of connecting kites directly to the grid will be analysed. Several kites would be set next to each other on one location creating a kite farm. The use case is different to connecting one kite system to one battery. One can imagine a wind turbine park with kites.

Since the K-BESS is expected to reach full development towards the end of the decennia, thorough investigation on the potential of this grid-connected, mass market, is considered outside the scope of this route-to-market report. However, it is still important to address key developments across multiple countries that have been the topic of this research.

6.1 Germany

Germany is the first country worldwide to have incorporated Airborne Wind in its legislation. AWE was introduced as a new technology into the EEG (Renewable Energy Sources Act) in April 2024.

The EEG regulates, amongst other topics, the financial help granted by the government to support the generation of renewable energy. AWE benefits from a fixed payment of currently €11.39 cents per kilowatt hour fed into the grid. The tariff may slightly vary in future years since it is recalculated every year based on the results of wind auctions. The tariff is available for the first 50 MW of AWE to be installed in the country after which a re-evaluation will take place.

The inclusion of AWE in the EEG was supported not only by the governing coalition at that time (social democrats, greens, liberals) but also by the opposition (Christian democrats). In April 2025, the newly elected government (Christian and social democrats) reaffirmed this support by stating in the coalition agreement that the government will “strengthen innovative energy technologies like AWE”.

Both the national awareness of this innovative technology and the remuneration make Germany a potentially interesting entry-market for grid connected AWE system and farms. However, the current tariff is too low to be cost covering. Therefore, additional co-funding in combination with favourable financing conditions are required to make AWE projects viable.

Apart from that, the topic of airspace integration of AWE systems has not been defined on the federal level as of today, i.e. currently the civil aviation authorities of the “Länder”, the Federal Aviation Agency (LBA) and the Ministry of Transport (BMV) can have different views and apply different regulations (e.g. obstacle vs. unmanned aerial systems). The sector has approached the BMV for an exchange on the matter.

The overall potential for AWE in Germany is significant as the recent GIS-analysis has shown: around 4000 potential sites at 850m tether length, and more than 22,000 sites at 435m tether length, leading to several dozen Gigawatts of AWE capacity.

6.2 Ireland

Ireland has set a net-zero ambition by 2050. To do so, they have put several incentives in place to grant financial support to interesting initiatives, such as tax reductions for companies using green energy and grants for communities willing to set a clean project.

The GIS model for AWE development in Ireland | DEM-AWE study identified a large potential of with nearly 6,000 sites and up to 24,000 devices, supporting several GW of AWE capacity. Counties Mayo, Donegal, and Kerry emerged as high-potential areas due to favourable geography and low population density.

Ireland has already a support scheme which covers the capacity range of pre-commercial AWE systems: The SRSS Small-Scale Renewable Electricity Generation (SRESS) scheme provides tariffs of up to €150 /MWh for solar projects and up to €90/MWh for (conventional) wind projects.

SRESS Renewable Energy Communities Tariff Rates

Small Scale Solar PV (1 MW or under)	Small Scale Solar PV (greater than 1 and up to 6MW)	Wind (<6 MW)
€150/MWh	€140/MWh	€90/MWh

SRESS SMEs Tariff Rates

Small Scale Solar PV (1MW or under)	Small Scale Solar PV (greater than 1 and up to 6MW)	Wind (<6 MW)
€130/MWh	€120/MWh	€80/MWh

Table 21: Small-scale Renewable Electricity Generation scheme tariffs

At this stage, eligible technologies are only solar and (conventional) wind energy. However, it is stated that *"as the scheme progresses, the possibility of expanding the range of tariffs to include other technologies will be considered."*

Moreover, the scheme may be changed towards an "All Categories Tariff Support" from 2026 onwards. The website states: *"It is intended that all categories of applicant, including Renewable Self-Consumers from 50kW to 1MW, will be supported via a Feed in Tariff post-2025. It is proposed that the final decision on this will be taken after up-to-date analysis in 2025."*

This offers an opportunity for AWE to get recognised in the analysis and subsequently for the new scheme. Therefore, the AWE sector has started to bring the need for an AWE-specific tariff from 2026 onwards to the political level (SEAI, then DECC).

In addition to demonstrated potential for AWE in Ireland (mainly through the GIS study), several potential projects (ideally even with energy communities or SMEs) could be identified. In combination with an AWE-specific tariff, these would allow the first AWE projects to be economically viable.

6.3 Offshore

So far, only the onshore, grid connected potential of AWE has been investigated. To maximize the potential of the technology, future research needs to be conducted to offshore deployment where the wind resource is genuinely stronger and more stable. Recycling the foundations of current wind turbines or installation on top of floating pontoons illustrate how easily the technology can be deployed once it reaches full autonomy and has proven substantial maintenance intervals.

7 Unlocking AWE technology potential

After evaluating the potential of different sectors and countries, the technology roadmap of the K-BESS is investigated. In this roadmap presented in section 7.1, the different development milestones are laid out with the impact they have on the estimated productivity and Levelized Cost of Electricity (LCoE) of the technology. This roadmap must be aligned with the targeted market needs, and the technology LCoE has to be competitive with the market energy price to enable market access. Section 8.2 focuses on commercialization strategies for each market, to ensure optimal market adaptation to the specific needs of each market.

7.1 Technology roadmap

The technology roadmap of the K-BESS system is based on Kitepower's vision of its technology development. As the system is developed, different attributes are improved or added to enable the system to increase its energy production and/or to drive down the cost.

The roadmap associates Kitepower's planned developments with the product sales needed to achieve it, as well as the resulting LCoE.

Both the roadmap and the LCoE are specific to the Kitepower technology and are confidential and cannot be disclosed in this public version of the report.

7.2 Commercialization strategy

In this section, different business models are presented: Energy as a Service (EaaS), rental model, and selling model. For each market, the most relevant business models is recommended. Recommendations are mainly based on both deployment duration for a given market, and current business models in place in this market.

Energy as a Service – Construction

Choosing for an Energy as a Service (EaaS) subscription offers a wide range of advantages for infrastructure construction companies. It is completely in line with the current habits of the industry, ensuring optimal market adaptation. Contractors need easy and reliable energy access, and they are therefore willing to pay more for hassle free and guaranteed electricity supply. Construction companies would pay a kWh price like they are already used to do when charging on the grid.

Offering an EaaS subscription is a good answer to the industry needs. The CAPEX costs continue to rely on the energy supplier, limiting the financial risk for the construction companies. Since the technology is still innovative, reducing the first-step engagement by reducing the upfront cost will enable more construction companies to go for it. Also, the limited duration of the project makes it less attractive to make high investment costs. Choosing a low CAPEX but higher OPEX is often preferable.

To conclude, the limited duration of the projects, the absence of upfront costs but the high energy need create a perfect case for K-BESS to be commercialized through an Energy as a Service subscription.

Rentals – Quarries

While construction projects typically last for 1–2 years, quarries operate in the same location for at least 5–10 years. A rental model offers the perfect solution between Energy as a Service and Purchase agreements. On the one hand, quarry operators tend to accept higher upfront costs, resulting in lower electricity prices over time. On the other hand, these upfront costs will remain lower than in a purchase agreement. Given that this industry already faces huge upfront expenses for heavy machinery, reducing initial costs is a substantial benefit. Meanwhile, this solution offers to the technology developer an ideal position, in which financial and technology is shared with the customer.

Overall, the rental model offers the perfect solution to longer duration projects like quarries, as well as their need of lower upfront costs.

Direct Sales – Islands

Finally, islands offer a completely different but very interesting use-case. Islands are home to remote communities with long term energy needs. Higher upfront costs can be considered since they will be amortized over a long period of time and subsidies might be available for the energy transition of islands. The system could be sold either to an independent power producer (IPP) or a utility which would operate the system, as it is already the case with diesel generators. They will locally control the system and potentially adapt it to their changing needs (for instance during the tourist season). In the meantime, this minimizes the ongoing effort for the technology developer, given the challenging accessibility of islands.

8 Roadmap for K-BESS commercialization

In this section, the final roadmap for the commercialization of the K-BESS is outlined, based on the key findings of the market study, the TAM SAM SOM analysis and market electricity prices. All markets and countries have been ranked based on their respective electricity prices and market sizes, to target the most prominent markets first and formulate recommendations.

8.1 Market overview

Table 22 gives a ranked overview of all analysed sectors and countries for 2025. What stands out is that the Dutch construction market has a very high market price, almost double of the runner up. The islands sector scores very low in the ranking across all the countries as the market price is still dominated by the electricity grid price. The total number of K-BESS that can be deployed across all sectors is 155 systems.

2025				
Rank	Sector	Country	SOM (# K-BESS)	Market Price (€/kWh)
1	Construction	Netherlands	14	1.25
2	Quarries	Germany	34	0.66
3	Construction	Germany	31	0.66
4	Construction	United Kingdom	22	0.66
5	Construction	France	20	0.50
6	Quarries	France	5	0.50
7	Islands	Netherlands	27	0.17
8	Islands	Ireland	1	0.17
9	Islands	United Kingdom	1	0.17

Table 22: Sector and country ranking 2025, ranked by Market Price and SOM

The ranked overview for 2030 is given in Table 23. Germany's construction sector now has taken over the Dutch construction sector as number one as its market price is expected to rise over the coming years while the Dutch's is expected to fall. All SOMs are expected to increase with respect to 2025, growing to 454 systems in 2030, which is an increase of almost 200%. This is due to the growing regulations and incentives to adopt emission-free technologies. The islands sector remains the lowest scoring sector in the table although a serious increase in the number of systems can be observed.

2030				
Rank	Sector	Country	SOM (# K-BESS)	Market Price (€/kWh)
1	Construction	Germany	115	0.77
2	Quarries	Germany	70	0.77
3	Construction	United Kingdom	46	0.71
4	Construction	France	93	0.70
5	Construction	Netherlands	60	0.70
6	Quarries	France	10	0.70
7	Islands	Netherlands	47	0.19
8	Islands	Ireland	9	0.19
9	Islands	United Kingdom	4	0.19

Table 23: Sector and country ranking 2030, ranked by Market Price and SOM

8.2 Route-to-Market strategy

This section combines the market analysis presented above with Kitepower's projected cumulative sales and LCoE. Kitepower will first address markets with the highest market price, that enables them to fulfil the expected sales of K-BESS of their technology roadmap.

The strategy conclusions are confidential.

9 Conclusions and recommendations

9.1 Address the three most relevant entry markets identified

Based on the research in this report, three key markets/country couples have been identified. Addressing those will enable Kitepower to gain market presence and recognition, facilitating further expansion. The three markets have been selected based on two features (size and price) but also non-tangible value. The detailed roadmap conclusions are confidential.

9.2 Create commercial traction thanks to successful pilots

Penetrating a market with an innovative product is not easy. In the Netherlands, the new regulations oblige companies to reduce their emissions on construction sites. They thus must look for adequate solutions. The K-BESS is a solution that exactly addresses this regulatory requirements. Dura Vermeer, a Dutch construction company, saw the potential of the solution and launched a pilot with Kitepower, communicating widely their initiative.

This successful pilot project can now be leveraged by Kitepower to increase trust and engage other early adopters. Once the first movers deploy K-BESS systmes, others will follow. This will consistently facilitate the market entry in the Dutch Construction sector for Kitepower. This market presence will then be leveraged in the German Construction industry.

9.3 Explore projects beyond Northwest Europe

This market study focused on Northwest European countries, because these are the most accessible markets for the Dutch technology developer Kitepower and because it enabled the best market understanding within each consortium member`s own country.

However, K-BESS can be a solution for markets at a larger geographical scale. The D1.2.1. Market study report showed a great potential for minigrids in Asia or Africa (18,900 minigrids planned in India and 2,700 in Nigeria (ESMAP, 2022)). Similarly, for micrograds, projections forecast a doubling market size in 2029 compared to USD 37bn in 2024, notably in Americas and South-East Asia (MarketsandMarkets, 2024).

Even if NEW islands did not come out of the report as the most promising markets, , this is not a worldwide case. Many islands remain off-grid or with limited infrastructure. They are needing to obtain substantial energy supply and storage solutions. The D1.2.1 Market study report showed great potential for islands especially in Oceania. Also, Indonesia, The Philippines, Africa and Americas have been cited.

Opportunities for the deployment of K-BESS expand further away than Northwest Europe. Future research and exploration may outline this more in-depth.

9.4 Prepare for mass market with kite farms

Overall, the potential of the entry markets, even the most promising ones, remains limited. Penetrating the mass market would open up massive opportunities for Kitepower. Still, tackling the recommended entry-markets remains necessary. It enables the optimisation of the kite technology, so that it reaches the required maturity and competitive LCoE levels, allowing a profitable deployment of kite farms.

The development of kite farms represents AWE technology developer's mass market. Deploying large amounts of kites connected to the grid completely changes the paradigm, going from renting a few systems to selling tens or hundreds of systems at a time.

To date, relevant countries to build a kite farm are Ireland and Germany. Ireland is particularly interesting in terms of strong winds and available sites – according to the GIS study. Moreover, there currently exists a support scheme (SRESS) for wind generated energy. Even if AWE is not specifically mentioned in it yet, it might become eligible if political support can be secured. Germany, on the other hand, has already recognised AWE in its legislation making the entry much easier. The country offers a remuneration of currently 11.39 eurocent per kWh fed into the grid, perfectly aligned with the kite farm use case.

10 Bibliography

ADEME. (2004). *Etude du fonctionnement énergétique de carrières de granulat en Midi-Pyrénées .* Récupéré sur http://www.bibliotheque-unpg.fr/bibli/IMPACTS_INDUSTRIELS/NRI-E1-04-R.pdf

Aggregates Business. (2024). *An evolving German aggregates sector*. Récupéré sur aggbusiness.com: https://www.aggbusiness.com/an-evolving-sector/

Aran Islands Energy. (2018). *Energy Master Plan.* Récupéré sur https://www.aranislandsenergycoop.ie/wp-content/uploads/2021/06/Energy-Masterplan.pdf

Ashden. (2010). *Isle of Eigg Heritage Trust / Islanders doing it for themselves*. Récupéré sur ashden.org: https://ashden.org/awards/winners/isle-of-eigg-heritage-trust/

Balfour Beatty. (2024). *Annual Report.* Récupéré sur https://www.balfourbeatty.com/media/yx0pn423/balfour-beatty-annual-report-and-accounts-2024.pdf

Bau Industrie. (2022). *Bauwirtschaft im Zahlenbild*. Récupéré sur bauindustrie.de: https://www.bauindustrie.de/zahlen-fakten/publikationen/bauwirtschaft-im-zahlenbild/energieverbrauch-im-baugewerbe?utm

Blue Diamond Machinery. (s.d.). *Diesel Generator Fuel Consumption Guide*. Récupéré sur bluedm.com: https://www.bluedm.com.au/blog/diesel-generator-fuel-consumption-guide-/

Cassidy, D. (s.d.). *What is the national average energy consumption?* Récupéré sur bonkers.ie: https://www.bonkers.ie/guides/gas-electricity/national-average-energy-consumption/

CIC. (2023). *Diesel to disappear from most construction sites by 2035 under new plan*. Récupéré sur cic.org.uk: https://www.cic.org.uk/news/diesel-to-disappear-from-most-construction-sites-by-2035-under-new-plan

CITB. (2025). *Construction Workforce Outlook*. Récupéré sur citb.co.uk: https://www.citb.co.uk/cwo/index.html

CLEAN ENERGY FOR EU ISLANDS . (2019). *Clean Energy Transition Agenda - Aran islands.* Récupéré sur https://clean-energy-islands.ec.europa.eu/system/files/2021-11/CETA_AranIslands_Oct2019_FULL.pdf

Clean Energy Wire. (2025). *Q&A: Germany's new €500 bln fund - What's in it for climate and energy?* Récupéré sur cleanenergywire.org: https://www.cleanenergywire.org/factsheets/qa-germanys-eu500-bln-infrastructure-fund-whats-it-climate-and-energy#four

Commissariat général au développement durable. (2017). *Les produits pétroliers, principale énergie dans le secteur de la construction .* Récupéré sur https://www.statistiques.developpement-durable.gouv.fr/media/573/download?inline

Construction Briefing. (2025). *Baumarktausblick 2025: Deutschland*. Récupéré sur construtionbriefing.com: https://www.constructionbriefing.com/de/news/baumarktausblick-2025-deutschland/8061531.article?zephr_sso_ott=Yg6e08

Construction Leadership Council. (2023). *Zero diesel sites route map.* Récupéré sur https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2023/06/Zero-Diesel-Route-Map-June-2023.pdf

Das Deutsche Baugewerbe. (2024). *Baukonjunktur 2024 / 2025*. Récupéré sur zdb.de: https://www.zdb.de/meldungen/baukonjunktur-2024-2025

Die Bundesregierung. (2025). *Investitionsoffensive für das ganze Land*. Récupéré sur Bundesregierung.de: https://www.bundesregierung.de/breg-de/aktuelles/sondervermoegen-2356240

EIB. (2024). *EIB INVESTMENT SURVEY 2024 GERMANY.* Récupéré sur https://www.eib.org/files/documents/lucalli/20240238_econ_eibis_2024_germany_en.pdf

Energy.nl. (2024). *Energie uit water in en rondom het Waddengebied*. Récupéré sur energy.nl: https://energy.nl/publications/energie-uit-water-waddengebied/

ESMAP. (2022). *Mini Grids for Half a Billion People | Market Outlook and Handbook for Decision Makers*. Récupéré sur ESMAP: https://www.esmap.org/mini_grids_for_half_a_billion_people_the_report

European Commission. (2025). *Clean energy vision to clean energy action*. Récupéré sur clean-energy-islands.ec.europa.eu: https://clean-energy-islands.ec.europa.eu/

European Commission. (s.d.). *European construction sector observatory*. Récupéré sur single-market-economy.ec.europa.eu: https://single-market-economy.ec.europa.eu/sectors/construction/observatory_en

FNTP. (2021). *Les travaux publics s'engagent pour le climat.* Récupéré sur https://acteurspourlaplanete.fntp.fr/wp-content/uploads/2021/10/aplp-manifesto-102021.pdf

FNTP. (2023). *L'activité du secteur en chiffres*. Récupéré sur fntp.fr: https://www.fntp.fr/lactivite-du-secteur-en-chiffres/

FNTP. (2025). *Foire aux questions sur le GNR – Gazole non routier* . Récupéré sur fntp.fr: https://www.fntp.fr/gnr-gazole-non-routier/

GlobeNewswire. (2025). *United Kingdom Construction Industry Report 2025*. Récupéré sur GlobeNewswire.com: https://www.globenewswire.com/news-release/2025/05/19/3083757/28124/en/United-Kingdom-Construction-Industry-Report-2025-High-Speed-Rail-and-Renewable-Energy-Drive-UK-s-Infrastructure-Growth-3-8-Compound-Annual-Growth-Forecast-During-2025-2029.html

Hitachi, Council of the Isles of Scilly. (2016). *Energy Infrastructure Plan for the Isles of Scilly.* Récupéré sur https://www.scilly.gov.uk/sites/default/files/IoS_Infrastructure%20Plan_FINAL_IoS.pdf

HM Revenue and Customs. (2024). *Using rebated fuels in vehicles and machines (Excise Notice 75)*. Récupéré sur gov.uk: https://www.gov.uk/guidance/using-rebated-fuels-in-vehicles-and-machines-excise-notice-75#vehicles-that-may-use-red-diesel

Infrastructure and Projects Authority. (2024). *Analysis of the National Infrastructure and Construction Pipeline 2023*. Récupéré sur gov.uk: https://www.gov.uk/government/publications/national-infrastructure-and-construction-pipeline-2023/analysis-of-the-national-infrastructure-and-construction-pipeline-2023-html

ING. (2023). *Infrasector in de knel, maar groeikansen bieden perspectief*. Récupéré sur ing.nl: https://www.ing.nl/zakelijk/sector/building-and-construction/infrasector-in-de-knel#:~:text=Nederlandse%20infrasector%20relatief%20groot&text=Dit%20is%2014%25%20van%20de,uit%20de%20aanleg%20van%20wegen

ING. (2025). *Bouwproductie herstelt in 2025 na kortstondige dip in 2024*. Récupéré sur ing.nl: https://www.ing.nl/zakelijk/sector/building-and-construction/outlook-bouw

Koncrete. (2024). *Les tendances du marché des granulats en France : perspectives pour 2025*. Récupéré sur koncrete.fr: https://www.koncrete.fr/blog/tendances-marche-granulats-france-2025?srsltid=AfmBOoosrTWnTkDpeAU11ePQKH1QobElsq2Q55PUB_d1jeT4rHO4Qv2c

Lafarge. (2025). *Histoire des granulats*. Récupéré sur lafarge.fr: https://www.lafarge.fr/histoire-des-granulats

Legifrance. (2021). *Arrêté du 3 mai 2021 fixant des valeurs limites d'exposition professionnelle indicatives pour certains agents chimiques*. Récupéré sur legifrance.gouv.fr: https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043482584

L'Usine Nouvelle. (2025). *Les carrières entament leur transition électrique*. Récupéré sur usinenouvelle.com: https://www.usinenouvelle.com/article/les-carrieres-entament-leur-transition-electrique.N2223206

Market Research Future. (2024). *Germany Infrastructure Construction Market Overview*. Récupéré sur marketresearchfuture.com: https://www.marketresearchfuture.com/reports/germany-infrastructure-construction-market-48036

MarketsandMarkets. (2024). *Microgrid Market Summary*. Récupéré sur MarketsandMarkets.com: https://www.marketsandmarkets.com/Market-Reports/micro-grid-electronics-market-917.html#:~:text=Overview,18.5%25%20between%202024%20to%202029.

Mineral Products Association. (2022). *Construction aggregates supply in Great Britain.* Récupéré sur https://www.mineralproducts.org/MPA/media/root/Publications/2024/50529-Recycled-and-Secondary-Aggregates-Brochure-(2022)-V4_FINAL.pdf

Ministère aménagement du territoire et transition écologique. (2024). *Les sites d'extraction de matières minérales et énergétiques en France*. Récupéré sur statistiques.developpement-durable.gouv.fr: https://www.statistiques.developpement-durable.gouv.fr/les-sites-dextraction-de-matieres-minerales-et-energetiques-en-france-pres-de-3-000-carrieres-123

Ministère de la transition écologique. (2025). *Investissez dans des engins non routiers moins polluants*. Récupéré sur mission-transition-ecologique.beta.gouv.fr: https://mission-transition-ecologique.beta.gouv.fr/aides-entreprise/engins-moins-polluants

myLPG. (2025). *Chart of fuel prices in Germany*. Récupéré sur myLPG.eu: https://www.mylpg.eu/stations/germany/prices/

Next. (2018). *Erneuerbare Energien: Mehr als reif für die Insel – Teil 2*. Récupéré sur next-kraftwerke.de: https://www.next-kraftwerke.de/energie-blog/virtuelle-kraftwerke-inseln

NGE. (2024). *La trajectoire bas carbone des travaux publics*. Récupéré sur Bétons: https://www.nge.fr/app/uploads/2025/03/La-trajectoire-bas-carbone-des-travaux-publics.pdf

NMSC. (2025). *France Construction Market*. Récupéré sur nextmsc.com: https://www.nextmsc.com/report/france-construction-market#:~:text=The%20France%20Construction%20Market%20size,3.9%25%20from%202025%20to%202030

Office for National Statistics. (2023). *Construction statistics, Great Britain: 2023*. Récupéré sur ons.gov.uk: https://www.ons.gov.uk/businessindustryandtrade/constructionindustry/articles/constructionstatistics/2023

PWC. (2025). *PwC Construction and Houselbuilding Outlook*. Récupéré sur https://www.pwc.co.uk/industries/documents/construction-and-housebuilding-outlook-h1-2025.pdf,

Région Auvergne-Rhône-Alpes. (2021). *Schéma Régional des Carrières de la région Auvergne-Rhône-Alpes.* Récupéré sur https://www.auvergne-rhone-alpes.developpement-durable.gouv.fr/IMG/pdf/ees_src_aura_032021.pdf

Regionale Klimaatmonitor. (2023). *Verbruiksvormen en sectoren*. Récupéré sur klimaatmonitor.databank.nl: https://klimaatmonitor.databank.nl/dashboard/rapport-energieverbruik/1--verbruiksvormen-en-sectoren

Rijksoverheid. (2019). *Programma Aanpak Stikstof: achtergrond en inhoud*. Récupéré sur rijksoverheid.nl: https://web.archive.org/web/20190926081350/https:/www.rijksoverheid.nl/onderwerpen/aanpak-stikstof/programma-aanpak-stikstof-achtergrond-en-inhoud

SEB. (s.d.). *Routekaart Schoonen Emissieloos Bouwen.* Récupéré sur https://open.overheid.nl/documenten/dpc-30e6b717aaaee3d0e093857ce512c2474e7953f2/pdf

Statista. (2023). *Breakdown of the average motor fuel price at the pump in Germany in 2020*. Récupéré sur statista.com: https://www.statista.com/statistics/1300183/germany-fuel-pump-price-breakdown/

Statista. (2025). *Umsatz* im Tiefbau in Deutschland in den Jahren 1995 bis 2024*. Récupéré sur de.statista.com: https://de.statista.com/statistik/daten/studie/251664/umfrage/umsatz-im-tiefbau-in-deutschland/#:~:text=Tiefbau%20%2D%20Baugewerblicher%20Umsatz%20in%20Deutschland%20bis%202024&text=Im%20Jahr%202024%20erwirtschaftete%20der,von%20rund%2057%20Milliarden%20E

Strabag. (2024). *Eigenrieden Quarry: Climate neutrality in the extraction of raw materials*. Récupéré sur work-on-progress.strabag.com: https://work-on-progress.strabag.com/en/carbon-emissions/decarbonization/climate-neutral-quarry

The Landmark Trust. (2025). *Lundy Renewable Energy Project*. Récupéré sur landmarktrust.org.uk: https://www.landmarktrust.org.uk/lundyisland/discovering-lundy/renewable-energy-project/#:~:text=energy%20on%20Lundy?-,Situated%20in%20the%20middle%20of%20the%20Bristol%20Channel%2C%20Lundy%20is,160%2C000%20litres%20of%20fuel%20annually

Toromont Power Systems. (2025). *Maintenance*. Récupéré sur toromontpowersystems.com: https://www.toromontpowersystems.com/electric-power/products/chp/maintenance

Travail Sécurité. (2024). *Les engins de chantier passent à l'électrique*. Récupéré sur Travail Sécurité: https://www.travail-et-securite.fr/ts/855/EME/les-engins-de-chantier-passent-a-l-electrique.html