

▶ **Request for Exemption: AQUIND  
Interconnector**

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## 4 Project description

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### 4.1 Introduction

This section of the Request for Exemption:

- ▶ Introduces the AQUIND project promoters.
- ▶ Provides a technical description of the Project.
- ▶ Summarises the project ownership and commercial arrangements, including the proposed financing structure and the supply chain strategy.
- ▶ Sets out the project plan and timelines.

### 4.2 AQUIND Interconnector project developers

AQUIND Interconnector is being promoted by AQUIND SAS (France) and AQUIND Limited (UK) and their 100% holding company AQUIND Energy Sarl in Luxembourg – referred to throughout this document as “AQUIND”. AQUIND has been actively working with a range of parties to develop the Project since 2014 and is supported throughout by a delivery focussed and committed project team. AQUIND is not affiliated with any other business involved in production, transmission, distribution or sales of either electricity or gas in any of the Member States or states – members of the European Economic Area (“EEA”). The development of AQUIND Interconnector is the sole business of AQUIND.

The project team has previous experience in the energy sector, including oil and gas and offshore engineering, construction and procurement. AQUIND has selected a group of experienced specialist advisors to assist its core management team including consultant engineers (WSP), economic and policy advisors (Baringa, FTI), legal advisors (Herbert Smith Freehills), network/system modelling advisors (Consentec and Tractebel), and planning and land experts both in England (WSP, Natural Power) and France (Arcadis, Natural Power).

### 4.3 Technical description

This section sets out a summary of the technical specification and planned connection locations of AQUIND Interconnector in both GB and France, along with the rationale behind the choice of technology, the map of the planned route, as well as information on the technical losses and project lifetime.

AQUIND has undertaken detailed technical analysis to ensure the project is technically feasible. This has included extensive engagement with the national TSOs, NGET and RTE, to ensure appropriate sizing and location of the connections to the national transmission systems. Throughout the project, AQUIND has been advised by leading technical advisors. A full technical overview of the project and key technical decisions has been provided in *Exhibit 8*, and is summarised in this section of the Request for Exemption.

Figure 4-1 Overview and key components of AQUIND Interconnector

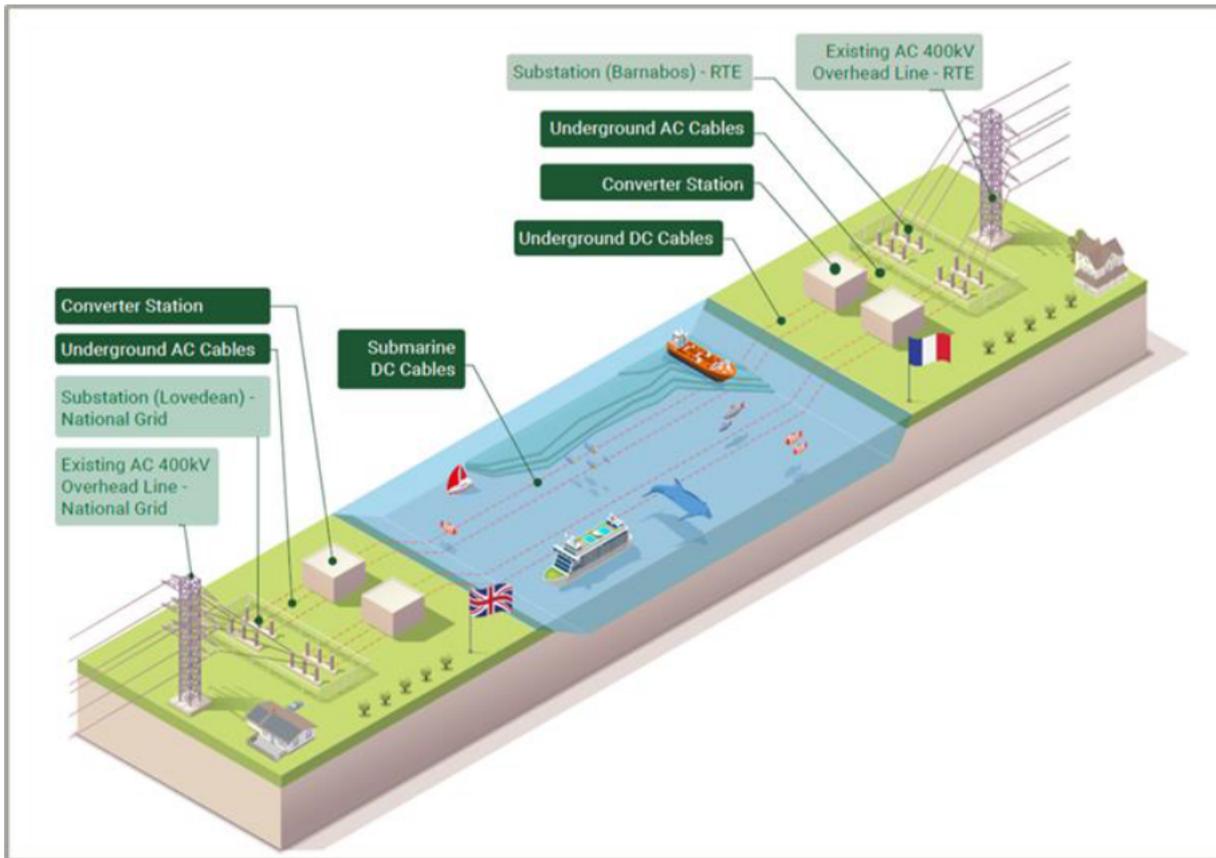


Table 4-1 summarises the key technical characteristics (both onshore and offshore) of AQUIND Interconnector.

Table 4-1 Summary of AQUIND project characteristics

Project characteristic	
<b>Transmission cables</b>	<ul style="list-style-type: none"> <li>▶ Capacity: 2,000 MW (net of losses)</li> <li>▶ Configuration: two independent symmetrical monopole HVDC links</li> <li>▶ DC voltage: 320kV</li> <li>▶ AC voltage: 400kV in both France and GB</li> <li>▶ Technology: XLPE</li> </ul>
<b>Routing</b>	<ul style="list-style-type: none"> <li>▶ Approximate submarine HVDC cable route: 182km (landfalls at Eastney and Pourville)</li> <li>▶ Approximate HVDC cable route in France: 36km (landfall to converter stations)</li> <li>▶ Approximate HVDC cable route in the UK: 20km (landfall to converter stations)</li> <li>▶ Approximate HVAC cable route: &lt;3km (converter stations to TSO substations at Lovedean and Barnabos).<sup>1</sup></li> </ul>

<sup>1</sup> The HVAC cable from AQUIND Converter Station (G.RUE) to the RTE switching station Barnabos ( $\leq 2$  km) will be installed and maintained by RTE. This is because the French Energy Code, Articles L. 121-4 and L. 321-6, entrust the development, construction and operation of interconnectors solely with RTE.

<b>Converter stations</b>	<ul style="list-style-type: none"> <li>▶ Two converter stations (GB and France), access road to each, and ancillary infrastructure</li> <li>▶ Rating: 2,075 MW</li> <li>▶ Technology: VSC (Voltage Source Converter)</li> </ul>
<b>System availability</b>	▶ Based on the dual monopole topology of the scheme and associated length of DC and AC cables the system availability is expected to be 98%. Further information can be found in Exhibit 8 – AQUIND Feasibility Opinion.
<b>Additional features</b>	<ul style="list-style-type: none"> <li>▶ Telecommunications: Fibre optic data transmission cables (one per circuit) and ancillary infrastructure at the converter stations and the landfall (GB and France)</li> <li>▶ Lifetime: assumed lifetime of 25 years (technical lifetime &gt;40 years)</li> </ul>

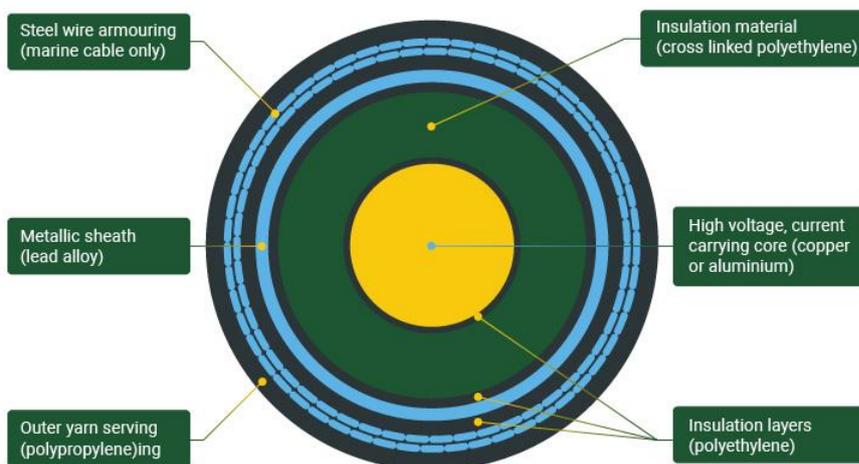
### 4.3.1 Cables

#### 4.3.1.1 Cable description

Both the AC and DC cables will be polymerically insulated using cross linked polyethylene (XLPE) with either copper or aluminium.

XLPE cables are the leading high voltage cable technology. They are solid-type cables that do not contain gases like gas insulated cables or liquids like mass impregnated cables. This means that there is no risk of leaking such gases or liquids into the environment. It is generally recognised that XLPE cables are inert to the environment and this technology has the least environmental impact among commercially available high voltage cable technologies.

**Figure 4-2 AQUIND Interconnector XLPE cable**

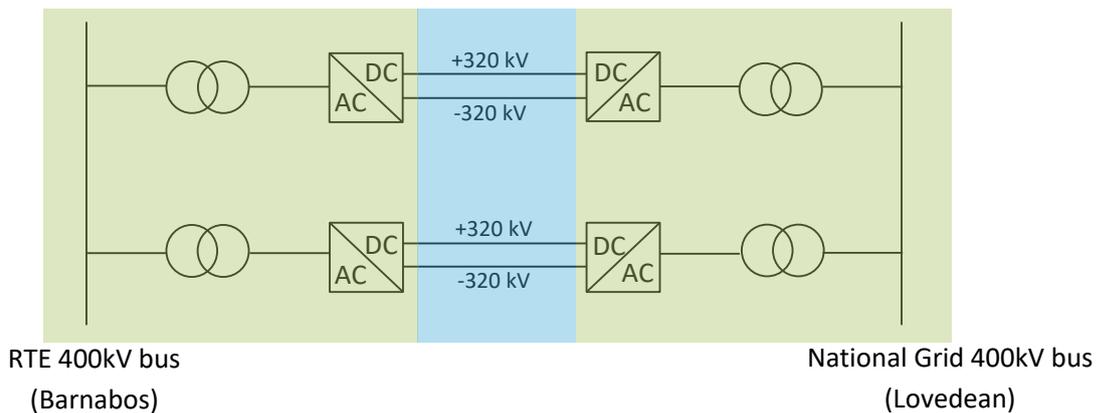


#### 4.3.1.2 Choice of cable capacity and configuration

AQUIND Interconnector will comprise two independent symmetrical monopole HVDC links (“poles”), as shown in Figure 4-3 below. This is to ensure that no single fault results in a complete loss of the capacity. The two symmetrical monopoles will be fully self-sufficient in terms of control systems, protection systems, auxiliary power supplies and cooling systems providing redundancy to the system.

Each pole will have the export capacity of 1037.5MW and the import capacity of around 1000MW, net of transmission and conversions losses, which are described in more detail in Section 4.3.4. Such an arrangement provides at least 50% power availability under all credible scenarios, as the two poles are designed to be completely electrically independent, with no overlapping equipment or services. Throughout this document, the Project’s capacity is referred to as 2000MW.

**Figure 4-3 AQUIND symmetrical monopole design**



The selection of the project capacity was made based on the market assessment together with technological and grid constraints appraisal in France and the UK. There are limitations imposed by the national TSOs based on the size of any individual block of power that the AC network can accommodate should there be a sudden loss of that power. These are defined as infeed-loss limits. For AQUIND the limiting factor is the island GB transmission system, which can withstand a 1320MW power loss on a routine basis (up to several time per year), and up to 1800MW loss on a less frequent basis.<sup>2</sup> The limitations on the larger continental synchronous grid are much higher.

During the feasibility phase in 2015 AQUIND considered the option to build a 1320MW monopole, or two 1320MW monopoles or an 1800MW bi-pole. Early discussions with manufacturers indicated challenges with this cable size, suggesting that each of these solutions would require cutting edge and untested designs to achieve the required transmitted power and DC voltage. The only currently operational interconnector between GB and France (IFA) also has a capacity of 2,000MW, which includes 2 sets of 2 cables (bi-poles) of 500 MW each.

AQUIND Interconnector ultimately selected a twin symmetrical monopole configuration over a bi-pole due to better supply chain readiness and the present technology level. A detailed assessment of the technology choice is provided in Exhibit 8 of this Request for Exemption (AQUIND Feasibility Opinion).

#### **4.3.1.3 Choice of cable voltage**

AQUIND has selected a DC voltage of 320kV, which, at the time of the decision, represents ‘state of the art’ VSC technology. It also represents the highest commercially available voltage for XLPE cables. All major manufacturers of HVDC equipment had projects in construction or operation of this power/voltage class and were therefore comfortable to support the AQUIND scheme at this level.

<sup>2</sup> These limits are defined in National Grid Electricity Transmission Security and Quality of Supply Standard, (SQSS), Issue 2.2, dated 5th March 2012. This defines normal infeed loss risk as 1320MW and infrequent infeed loss risk as 1800MW. Both limits became active in April 2014.

#### 4.3.1.4 Cable route

Underground HVDC cables will connect each converter station to the coast, between which a submarine HVDC cable will run from Eastney in Portsmouth, Southern England, to Pourville in Normandie. The converter stations will be connected to their respective substations by HVAC cables. The breakdown of the cable route is set out in Table 4-2.

Table 4-2 Breakdown of cable route

Route	Approximate Cable Route Length	Cable type
Barnabos 400kV switching station to French converter station	<2 km	AC
French Converter station to Pourville	36 km	DC
Submarine cable	182 km	DC
Eastney to UK converter station	20 km	DC
Converter station to NG 400 kV sub-station	<1 km	AC
<b>Total</b>	<b>240km</b>	

The planned route for AQUIND Interconnector is shown in Figure 4

Figure 4-4 Indicative cable route



AQUIND carried out detailed environmental impact assessments of all elements of the cable route, which are now under consideration by the National Planning Inspectorate in the UK and relevant authorities in Normandy. The following subsections set out the approach to installing the subsea and terrestrial cables.

#### **4.3.1.5 Marine Cable installation**

The design and installation of marine cables is not only focussed on delivering the required power but also on reducing the risk of damage from the sea environment and anchors. To reduce environmental risks, XLPE technology has been selected. To reduce the risk of physical damage the marine cables are designed with steel wire armour surrounding the internal parts of the cable.

Further risk mitigation measures include burying the cable within trenches excavated into the sea floor. Where the cable cannot be buried due to trenches not being able to be excavated, the cable will require protection with the installation of concrete mattresses or rock placement over the cables.

Cable installation will be undertaken by purpose-built vessels which carry many kilometres of cable. The cable is stored on the vessel within a carousel which unreels the cables for laying onto the sea floor. Remotely operated underwater vehicles (ROV) then install the cable into excavated trenches, or if trenching is not possible, cover the cables with protective concrete mattresses or rock.<sup>3</sup>

In 2017-2018, a specialist marine survey company MMT undertook, on behalf of AQUIND, an offshore geophysical and geotechnical survey campaign that confirmed feasibility of the proposed marine cable route. The conclusions of the report have been previously made available to CRE and Ofgem.

#### **4.3.1.6 Terrestrial cable installation**

A cable supplier selected by AQUIND via a competitive tendering process will be responsible for the installation of terrestrial DC cables which will run between the converter stations and the landing point. AQUIND will aim, where possible, to install terrestrial DC cables within roads or on road verge in order to avoid and/or minimise environmental impact. At the landing points and other locations where required, the Horizontal Direct Drilling technique will be utilised.

In GB, for the AC connection between the converter and Lovedean substation, there will be two AC cables circuits, each comprising three cables. Consequently, these cables will require a wider corridor than the DC cable and will mostly be installed through private lands. The AC cable route length will be minimised as far as practicable. In GB, design, installation and maintenance of the AC cables will be performed by the National Grid at the cost to the Project Promoter.

In France, design, installation and maintenance of the AC cables will be performed by RTE at the cost of the Project Promoter.

### **4.3.2 Converter stations**

#### **4.3.2.1 Choice of HVDC technology and converter stations**

AQUIND Interconnector will use Voltage Sourced Converter HVDC technology to connect the French and GB transmission systems.

HVDC technology provides a number of advantages compared to AC technology. It has much lower cable losses over a long distance and requires fewer cables for an equivalent power.

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<sup>3</sup> Cable damage during installation might call for expensive and time-consuming repair operations, during which the damaged pole(s) will be unavailable to the market. Once installed typical hazards to cables may be man-made (such as damage from fishing gear, ships anchors, dredging and dumping activity, impact of existing or new cables and pipelines, military activity or oil and gas exploration or production activities, etc) or natural such as erosion and sedimentation, hard substrates, sediment mobility and high current regimes.

However, as both transmission networks use conventional Alternating Current (AC) technology, the Project will require the construction of two HVDC converter stations in order to convert AC to DC and vice-versa at the remote ends. One converter station will be in England, within 1km of National Grid's Lovedean substation, and the second will be in France, less than 2km from RTE's Barnabos switching station.

#### **4.3.2.2 Choice of VSC technology**

There are two commonly used variants of HVDC technology: Line Commutate Converter (LCC) and Voltage Source Converter (VSC) technology. AQUIND Interconnector has chosen the VSC technology, due to a number of technical advantages over LCC, including lower harmonic emissions, black start capability and a reduction in the site footprint requirement. The VSC technology typically allows very rapid change of flow and direction as well as reactive power, which is valuable to system operators when managing grid stability. VSC is also currently the preferred HVDC technology for applications in Europe.

VSC technology will enable AQUIND Interconnector to provide voltage control, frequency control and black start capability services to both National Grid and RTE. Provision of these ancillary services can help strengthen the quality and security of supply of both networks.

AQUIND does not anticipate that revenues arising from the provision of ancillary services will be material in the context of its overall revenues from AQUIND Interconnector. AQUIND is in discussions with National Grid and RTE in relation to mandatory and commercial ancillary services the TSOs might require, and the future commercial arrangements for providing such services.

AQUIND previously sought views from National Grid and RTE on the most recent valuation of the benefits that AQUIND is expected to provide from an ancillary services perspective, but neither of the two TSOs were able to provide any quantitative estimates of the potential value of ancillary services.

A detailed assessment of the technology choice is provided in Exhibit 8 of this exemption Request (AQUIND Feasibility Opinion).

### **4.3.3 Sub-station connections**

#### **4.3.3.1 Grid connection**

Due to the large connection size of 2075MW, AQUIND Interconnector will connect at the highest available voltage level, which is 400kV in both countries.

In France, AQUIND signed a technical and financial connection proposal (*Proposition Technique et financière* or "PTF") with RTE on 06 March 2017 for a connection to the Public Transmission Network with a maximum import capacity of 2000MW and a maximum export capacity of 2075MW. The PTF is conditional on the grant of an exemption (as requested in this document) and no alternative grid connection route for independent non-RTE interconnectors currently exists in France.

In GB, AQUIND accepted National Grid Electricity Transmission's "non-firm" 2000MW connection offer for either import or export scenarios in June 2016. In March 2018 AQUIND signed a Modification Offer with National Grid to adjust the total UK export capacity to 2075MW to ensure that the transmission loss adjusted import capacity of the interconnector is the same in both directions.

National Grid will undertake connection works at their Lovedean substation, including building two new bays for AQUIND and reinforcement works within the Transmission system. National Grid will also

build two AC cable circuits between Lovedean substation and AQUIND converter station and will carry out operation and maintenance support of the GB AC connection throughout the project life. The cost of these works as well as the operational and maintenance costs in respect of the GB AC connection will be paid by AQUIND.

AQUIND is in the process of discussing a further modification to its connection agreement to take into the proposal of the National Grid to carry out the construction works in respect of the GB AC connection.

During the non-firm offer period National Grid may curtail AQUIND Interconnector due to planned and unplanned outages in certain parts of the grid without financial compensation. The curtailment of AQUIND in GB due to the planned outages can only occur between April and September and the level of curtailment will be known once such outages are scheduled by the National Grid. Based on historical average circuit date and the estimated time circuits may be out of service due to non-scheduled outages (faults) National Grid has calculated the probability of forced outages of AQUIND Interconnector due to unplanned faults to be **0.1 hours per year which is around 0.1% per year**. National Grid may perform further assessments of the probability of forced outages as part of their routine procedures.

#### **4.3.3.2 Barnabos Substation**

Following feasibility studies conducted by RTE in 2016 and initial landfall/cable route desktop studies, Barnabos 400 kV switching station was identified as the preferred point of connection to the French transmission network. Other connection locations (Penly substation, Le Havre substation, new substation on Havre – Rougemontier) were discounted because of constraints on the surrounding electrical network, technical and environmental constraints, and considerably longer DC cable route options.

As a result, AQUIND will connect into the Barnabos 400 kV substation in Haute Normandie. RTE will construct two new 400 kV bays to accommodate connections from the French AQUIND converter station.

- ▶ In March 2017, AQUIND signed a Technical and Financial Proposal (PTF) with RTE for the connection to Barnabos switching station.
- ▶ In July 2018, WSP completed initial converter station optioneering report which identified land opposite Barnabos switching station as a preferred location for the converter station.

The connections will be made using relatively short lengths of AC underground cables. RTE will construct these cables (which will terminate inside the AQUIND converter station), as well as connection bus bars at AQUIND's substation, and carry out all necessary works and improvements at Barnabos substation. The costs of this work will be paid by AQUIND. No wider reinforcements of the French grid are envisaged by RTE to accommodate the connection.

#### **4.3.3.3 Lovedean Substation**

The choice of the connection point in GB has been informed by a bespoke feasibility study produced in 2015 by the GB TSO, National Grid Electricity Transmission ("NGET"). This study identified potential connection locations to the GB electricity transmission grid as well as the associated constraints and cost. NGET identified only two practically possible connection locations out of the assessed existing 400 kV substations on the South Coast of England – Lovedean and Bramley. Following a further assessment, National Grid's cost-benefit analysis showed that the most optimal scenario was for an interconnector with a capacity of 2,000MW connecting to Lovedean substation. It demonstrated that

from a cost perspective and to utilise efficiently available connection points on the South Coast of England, a connection at a higher capacity is preferred. This formed the basis for the formal Connection and Infrastructure Options Note, that identified Lovedean as the preferred connection option.

In April 2016, AQUIND conducted a preliminary Converter Station site identification exercise. Potential Converter Station site locations were identified by placing the existing Lovedean substation at the centre of an optioneering exercise. In 2017 AQUIND conducted further detailed assessments to ensure the technical viability of siting the Converter Station in or around the proposed Converter Station Area. Based on this analysis, two suitable locations were identified: South-west of Lovedean substation (Option A) and West of Lovedean substation and between the existing 400 kV overhead line circuits (Option B). In H2 2017, AQUIND conducted a desktop study to inform the environmental constraints for both options and consulted with the Local Planning Authorities. In 2018, based on the analysis and assessment undertaken for both Converter Station options and following the input from the LPAs, Option B was identified as the preferred option.

To accommodate the full capacity of the Interconnector under all conditions mandated by the Security and Quality of Supply Standards (SQSS), National Grid must undertake reinforcement works within the 400 kV AC network. Until these reinforcement works are completed in Q4 2029, the connection offer is considered “non-firm”, meaning the System Operator can constrain AQUIND Interconnector with no compensatory payments. The frequency, duration and severity of constraints will be subject to a number of variables over which AQUIND has no control, such as the level of generation on the system and outages on transmission circuits.

#### **4.3.4 Technical Losses**

The transmission losses in the underground cables and submarine cables will depend on the route length, the conductor material used and the cross-sectional area of the conductor. We have, however, prepared estimates of the transmission losses that we anticipate will occur in full power scenarios on AQUIND Interconnector. These are shown in Table 4-3 and are based on: (i) the fact that VSC converter station losses are typically 1.0% of their rating; and (ii) the current AQUIND Interconnector specifications.

The overall scheme loss is expected to be 75.3 MW, rounded to 75MW. This represents total losses of approximately 3.6%.

**Table 4-3 Technical line losses**

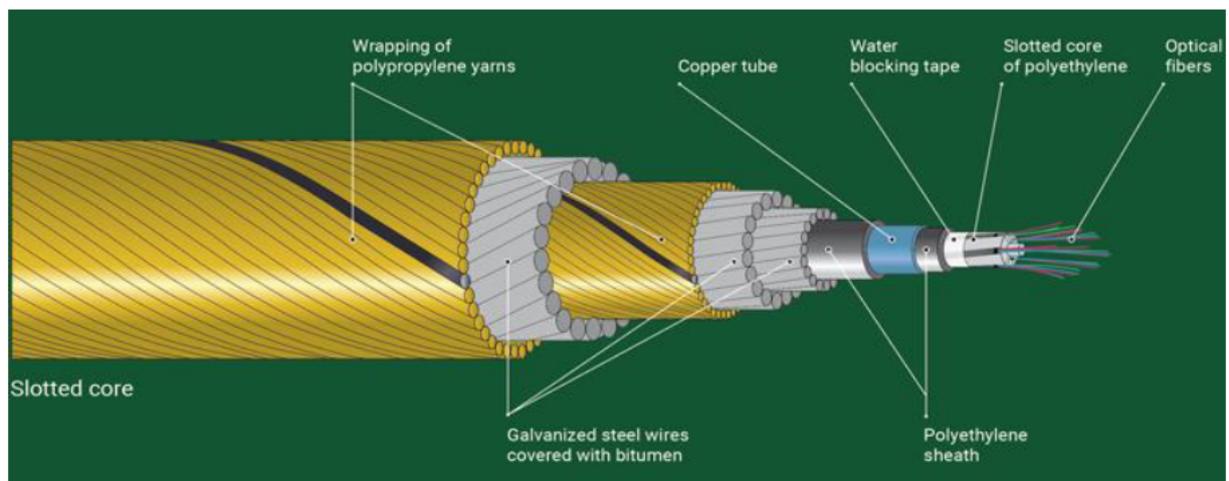
Component	Loss (MW)
Converter Station	20.75
DC Marine Cables	13.2
French DC Cables	1.9
GB DC Cables	1.4
French AC Cables	0.2
GB AC Cables	0.2
<b>Total losses scheme</b>	<b>75.3 MW</b>
<b>Loss per pole</b>	<b>37.65 MW</b>

### 4.3.5 Inclusion of data cable

As part of the Project, AQUIND will be deploying fibre optic infrastructure for protection and monitoring purposes. A fibre optic data transmission cable will be installed in a trench alongside and at the same time with each of the two power cable pairs both offshore and onshore. The spare data transmission capacity of such cables may be used to transfer data of third parties, providing further connectivity between France and England.

Up to ■■■ “dark” fibres in each of the two data transmission cables may be available for third-party access enabling the high data transfer rates of up to ■■■ Gbps per fibre pair. The AQUIND fibre optic transmission link offers a shorter route than some of the existing systems, ensuring the low latency time of approximately ■■■ ms. The system will be capable of connecting the French and English shores without the need for amplification by subsea repeaters.

**Figure 4-5 AQUIND Interconnector data cable**



Installation in the same trench as the power cables and alongside them, together with separation of the two cable systems, ensures consistent protection against fishing and anchor damage as well as natural hazards.

## 4.4 Ownership and commercial arrangements

This section of the Request for Exemption explains the ownership structure of the Project and the proposed operating arrangements. We note that the future operating arrangements will be further developed as the project progresses. AQUIND will keep the NRAs informed of any developments.

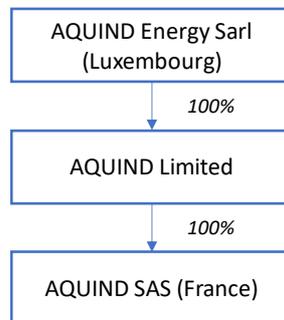
### 4.4.1 Ownership and shareholding

#### 4.4.1.1 Project promoters

AQUIND Interconnector is promoted by:

- ▶ AQUIND SAS, société par actions simplifiée, created in accordance with the laws of France with registration R.C.S. number 808 503 940 and registered address at 72 rue de Lessard 76100 Rouen and;
- ▶ AQUIND Limited, a limited liability company under the laws of England and Wales with company number 06681477 and the registered address at OGN House, Hadrian Way, Wallsend, NE28 6HL; and
- ▶ AQUIND Energy Sarl, Société à responsabilité limitée, created in accordance with the laws of Luxembourg with registration number B229924 and registered address at 26 boulevard de Kockelscheuer, 1821 Luxembourg.

**Figure 4-6 AQUIND Interconnector ownership structure**



No entities or people involved in the AQUIND company group structure have control over any energy generator, producer or supplier.

#### 4.4.1.2 Future equity holdings

AQUIND shareholders may consider investing in other assets in the electricity industry in the UK or France in the future (for example, electricity storage, renewable power generation or marginal balancing plant).

AQUIND anticipates seeking further equity investment as part of its financing strategy in the future. AQUIND is currently discussing an equity investment potentially including an entity that holds some generation assets interest in the UK, French or other European markets. If these investments go ahead, AQUIND would seek to be compliant with the relevant unbundling regulations and in particular with

the provisions regarding the “control over an undertaking performing any of the functions of generation or supply”.<sup>4</sup>

Further information on AQUIND's proposed approach is identified in Section 4.5.

## 4.5 AQUIND Financing structure

This section sets out AQUIND’s indicative financing plan (Section 4.5.1), followed by a description of the planned commissioning date (Section 4.5.2).

### 4.5.1 AQUIND Indicative financing plan

AQUIND Interconnector is the sole business of AQUIND. For these purposes, AQUIND can be considered a project entity.

AQUIND’s financing strategy is to attract funds to invest in AQUIND Interconnector on a project-finance basis. Our analysis shows that AQUIND Interconnector can be an attractive business proposition for project-finance providers, subject to AQUIND being granted appropriate regulatory regimes, including an Exemption as requested in this Request for Exemption.

AQUIND is being financed at the development stage by private investments. This is the riskiest part of financing and it is very hard to attract outside investors. Up to the present moment, nearly [REDACTED] have been invested by AQUIND and its shareholders in the development stage of the Project.

AQUIND will seek further equity funding and non-recourse project financing from wider pools of potential investors for the construction stage of the Project. The target combination of debt and equity will be determined through the ongoing discussions around the most efficient investment approach with potential investors while the Exemption is assessed, but in any case project debt is unlikely to be less than 50%.

A summary of the indicative financing plan is set out in Table 4-4.

Table 4-4 Indicative financing plan

Source of financing	Financial contribution
AQUIND’s own resources	<ul style="list-style-type: none"> <li>▶ [REDACTED] m to date; plus</li> <li>▶ [REDACTED] until FID</li> </ul>
Project finance	<ul style="list-style-type: none"> <li>▶ [REDACTED]</li> <li>▶ Expected [REDACTED] % of capex</li> </ul>
Other sources (equity investors)	<ul style="list-style-type: none"> <li>▶ Expected [REDACTED] % of capex</li> </ul>

The final approach to the financing strategy depends on the details of the regulatory arrangement with the NRAs, including the form and duration of the Exemption.

The combination of investors may include:

- ▶ Equity providers:

[REDACTED]  
[REDACTED]  
[REDACTED]

<sup>4</sup> Directive 2009/72/EC, Article 9.

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- ▶ Non-recourse finance providers:
  - [REDACTED]
  - [REDACTED]

AQUIND is engaging with various types of the potential investors, at this stage primarily equity providers, including specialised investment funds, corporate investors, EPCI contractors and high net worth individuals. These discussions are covered by mutual confidentiality requirements.

Taking into account that a typical ticket size for banks in such project finance deals is around € [REDACTED] million, AQUIND expects there would be a syndicate of lenders. While there are not many examples of fully private interconnectors, recent offshore wind transactions suggest that AQUIND should expect that term loans would be for at least [REDACTED] years.<sup>5</sup> AQUIND may opt for a share of shorter- or longer-term loans subject to future refinancing after a certain period of time. A precise loan strategy will be determined through further engagement with debt providers and equity investors, based on the final regulatory regime applicable in the UK and in France, including the form and the duration of the Exemption.

Recent transactions involving offshore wind farms also show that if it is possible to confirm a business case for a project, then it is also possible to attract investors such as infrastructure funds, pension funds and sovereign funds who have a longer investment horizon than private investors. In offshore wind it has been achieved through a direct tariff support by Government.

Without the flexibility provided by the exemptions requested in this Request for Exemption, AQUIND Interconnector will not be able to attract non-recourse debt finance or equity. Furthermore, if particularly onerous conditions are imposed as part of the exemption, the lender's margin, and therefore the cost of the project, will increase. This may make it non-viable for AQUIND to proceed. AQUIND is not in a position to finance the Project on "balance sheet" as national TSOs and utilities may be in a position to do.

AQUIND, with its advisors, has prepared a financial model to simulate the expected cash-flows based on a set of economic assumptions outlined in Exhibit 1. The financial model is provided in Exhibit 3.

[REDACTED]

As AQUIND is unable to operate an interconnector in France without an exemption, the exemption length will be linked to the expected debt repayment period, incorporating at least 5 years additional

<sup>5</sup> Page 30 of "Where's the money coming from? Financing offshore wind farms" European Wind Energy Association, November 2013.

headroom. The exemption is therefore required for a period of time that exceeds the term of the non-recourse debt by a safe margin. It would ensure that the project is able to address the following risks:

- ▶ Actual terms and conditions of financing – given uncertainties affecting exchange and interest rates, which stem from Brexit and other political and macro-economic factors, AQUIND will be able to finalise its financing package at the point of Final Investment Decision. At this stage, AQUIND requires an appropriate amount of flexibility to make prospective investors comfortable.
- ▶ Market conditions as discussed in this Request for Exemption.
- ▶ Programme and cost risks of the project as discussed in this Request for Exemption.

#### 4.5.2 AQUIND commissioning date and project cost breakdown

AQUIND is working with technical advisors, WSP, to plan all project milestones through the planning, construction and commissioning phases of the project. This complex planning exercise takes into account a range of contingencies that may arise during the programme. Based on this analysis, AQUIND will be ready to commission in Q2 2024.

For a project of this size and cost, it is not unusual for unexpected events to delay the projected commissioning date. A number of the possible reasons for such a delay are outside of AQUIND’s control – for example, unforeseen planning challenges or weather conditions delaying offshore works. At this early stage of the project, it is not possible to identify an accurate specific commissioning date for the project.

As an exempt investor with no financial support, any project delay will increase the project cost and delay revenue recovery. AQUIND, and its shareholder, are therefore strongly incentivised to minimise project delays. Rather than setting the start of the exemption period at this stage, AQUIND requests that the exemption start date is aligned with the actual full commissioning date of the project.

In order to give the NRAs clear sight of project progress, AQUIND will provide NRAs with appropriate updates.

Table 4-5 provides a detailed breakdown of costs based on the latest procurement and technical information.

**Table 4-5 AQUIND indicative project cost breakdown**

Capex	Assumptions	Cost (Real €m 2018)					
		2015-19	2020	2021	2022	2023	2024
Cables	Cost for equipment and installation. <i>Excludes type tests/prequalification tests, tax, customs charges.</i> ...of which █% Marine (DC): 4 cables with total length of 728km. ...of which █% Underground (DC): 4 HVDC cables with total length of 224km. ...of which: █% Fibre optic cables and other costs	█	█	█	█	█	█

Capex	Assumptions	Cost (Real €m 2018)					
France connection works	Cost for RTE construction works, including AC cables, and studies required to connect asset at Barnabos. Excludes VAT.	[REDACTED]					
GB connection works	Construction works, including AC cables, and studies required to connect asset at Lovedean. Excludes VAT.	█	█	█	█	█	█
Converter stations	2 x VSC HVDC converter stations for each monopole (4 in total).	█	█	█	█	█	█
Owner's costs	Owner's project management, engineering and supervision costs	█	█	█	█	█	█
	CAR insurance	█	█	█	█	█	█
<b>Total CAPEX (2021-2024)</b>		█					
<b>Total DEVEX (2015-2021)</b>		█					
<b>Total CAPEX and DEVEX costs (used in the CBA), 2015-2024</b>		<b>1,426</b>					

## 4.6 Supply chain strategy

This section sets out the supply chain strategy that AQUIND will implement to deliver the Interconnector. The main contract lots that AQUIND is planning to procure are set out in Section 4.6.1. Section 4.6.2 describes the competitive tender process for the construction contracts and Section 4.6.3 summarises AQUIND's approach to managing the interfaces among relevant contractors.

### 4.6.1 Contract lots

AQUIND will use a single open procurement process for the Project and is currently planning to award up to three Engineering, Procurement, Construction and Installation ("EPCI") contracts as outlined below:

- ▶ **EPCI Lot 1 (converter stations):** the design, building, installation, commissioning, operation and maintenance of the converter stations at both Lovedean and Barnabos
- ▶ [REDACTED]
- ▶ **EPCI Lot 2 (HVDC Cables (Marine and Land) and Fibre Optic Cables and Equipment):** the design, manufacturing, installation, commissioning and maintenance of the HVDC Sub Marine and Land Cable and the Fibre Optic Cable – Poles No 1 and 2. An invitation to the prequalified suppliers to put in place necessary arrangements for consortiums or subcontracting has been made.
- ▶ **EPCI Lot 3 (Optional – Lots 1 and 2 combined):** the design, building, installation, commissioning, operation and maintenance of the converter stations at both Lovedean and Barnabos and Poles 1 and 2.

The current conditions of the HVDC industry and the nature of interconnector projects are such that it is unlikely that there will be a single contractor, who would undertake delivering Lot 3. An agreement with National Grid to perform the design, manufacture, maintenance and commissioning of the HVAC cable connection from the converter station to Lovedean substation has recently been achieved. A separate design and engineering contract may be signed with each supplier to be triggered prior to the main contract taking effect.

#### 4.6.2 Tender process and next steps

As set out in detail in Exhibit 11, development of AQUIND Interconnector creates a range of market and commercial risks, including cost increases and overrun, implementation/programme delays and design changes. As part of our strategy to mitigate these risks, AQUIND will be putting in place a competitive tender process to deliver a comprehensive set of contracts that will allocate risks to the most appropriate parties. The context and the detailed plan for the tender process are set out in the following paragraphs.

The costs for the construction stage are based on the quotes elicited from prospective suppliers. To date, AQUIND has formally engaged with suppliers as follows:

- ▶ [REDACTED]
- ▶ [REDACTED]

The responses from the supply chain have been discussed at meetings with respective suppliers and also reviewed by AQUIND’s advisors. The content of such responses is confidential, but the information provided by the suppliers has been used to calculate the expected capital costs of the Project. As a result of this engagement the procurement and lot structure strategy have been confirmed. AQUIND published the contract notice that started the procurement process on 3 June 2019 in OJEU.<sup>6</sup>

Following the pre-qualification stage, commenced in July 2019, AQUIND pre-qualified 5 potential converter station suppliers and 6 potential cable suppliers in October 2019. The prequalified suppliers were updated on the project’s progress in January – February 2020 in a series of meetings.

The next steps of this tender process will include:

- ▶ preparation of the terms and conditions of the contract - ongoing,
- ▶ preparation of attachments to ITT with all technical information - ongoing;
- ▶ invitation to tender;
- ▶ review and assessment of tender submissions; and
- ▶ negotiations with potential suppliers of the Best and Final Offer.

The EPCI Terms and Conditions are planned to be structured to facilitate project finance and will be based upon fixed cost and schedule parameters with liquidated damages to guard against non-

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<sup>6</sup> Link available [here](#).

delivery. Where cost certainty cannot be achieved in the EPCI market for specific items, such as commodity price changes, labour costs changes, legislation changes, adverse unforeseen offshore weather and subsoil conditions, a limited number of instances of engineering changes and other construction risks, as appropriate, AQUIND will aim for these additional costs to be incorporated into the eligible project costs for both the GB and French regulatory settlements for the Project. The contracts are proposed to be in line with the FIDIC Silver/Yellow book.<sup>7</sup>

Construction will begin promptly after Financial Close with total construction cost estimated at approx. €1,426 million. The construction programme will be informed by the EPC engagement and is expected to be c.3 years with a target commissioning date in Q2 2024.

In all activities above, AQUIND's team will be supported by the relevant external advisors, including on procurement, engineering, legal and commercial aspects of the tender process.

We consider that the process described above will enable AQUIND to select the contractors that would be responsible for delivering the project in a competitive and transparent manner and thus secure the best value for the GB and French network users, as well as the investors of the project.

### **4.6.3 Approach to interface management**

It will be the contractor's responsibility to ensure the design, construction and commissioning of the converter stations and cables meets the AQUIND technical specification outlined as well as the parameters established under the EPCI contract. They will also be responsible for appointing and managing Tier 2 civil contractors.

AQUIND and the Owner's Engineer will monitor compliance with the EPC contract(s). They will review deliverables, programme and cost as well as identify associated risk and reporting on agreed Key Performance Indicators.

However, based on the analysis in the previous sections, we anticipate that there will be two or more suppliers delivering different parts of the Project, and the interfaces between them will need to be managed. For each interface, we will consider the party best placed to manage it – whether this is one of the suppliers or AQUIND. In general, we consider that contractors delivering two or more packages would seek to internalise the interface risks and this would be reflected in a higher cost. Conversely, if AQUIND were to manage the interface risks themselves, this could reduce the cost of individual supply lots.

AQUIND will put in place suitable arrangements to manage the interface risks appropriately. At this stage, we anticipate that this would require:

- ▶ a project management team to sequence and align a timely delivery of different elements of the project;
- ▶ an engineering team, to address technical interface issues such as physical dimensioning and electro-engineering issues;
- ▶ a technical and legal team to manage issues arising if competitors were required to collaborate (and potentially share commercially sensitive information); and
- ▶ an external engagement team to support AQUIND's public relations throughout the construction of the project.

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<sup>7</sup> EPC/Turnkey Contract 2nd Ed (2017 Silver Book) and Plant and Design-Build Contract 2nd Ed (2017 Yellow Book).

## 4.7 Project plan and timeline to operation

AQUIND have been working with a range of parties to develop the Interconnector proposition presented in this Request for Exemption. Along with the national TSOs and NRAs, this has also included technical, economic and legal consultants to advise on all aspects of the project.

### 4.7.1 Key milestones reached by AQUIND

AQUIND Interconnector has been in development since April 2014. Key progress to date includes:

- ▶ A range of **feasibility studies** have been completed and AQUIND **consulted widely** on the project in accordance with the TEN-E Regulation.
- ▶ A **connection offer** from National Grid was signed in June 2016.
- ▶ A *Proposition Technique et Financière (PTF)* was signed by AQUIND in March 2017.
- ▶ AQUIND reached a major project milestone in September 2016 with Ofgem granting AQUIND a **GB Electricity Interconnector licence**.
- ▶ AQUIND is also recognised in Europe having been listed in **ENTSO-E's Ten Year Network Development Plan (TYNDP)** 2016 and 2018, and has also been identified as a **Project of Common Interest (PCI)** on the Third PCI List. AQUIND has been included in TYNDP 2020 (Project number 247).
- ▶ AQUIND has been designated as a **Nationally Significant Infrastructure Project** in the UK in July 2018, and submitted an application for the **Development Consent Order** in November 2019, which was accepted for examination in December 2019.
- ▶ AQUIND has ensured continued engagement with the NRAs and the TSOs in GB and France, and maintained regular contact with the **supply chain**. As part of this, AQUIND engaged with prospective suppliers and initiated an **OJEU tender process** for the Engineering, Procurement, Construction and Installation of the interconnector.
- ▶ Converter station locations, landfalls and cable routes have been identified. This has included detailed marine geophysical and geotechnical surveys of the total length of the marine cable route and ground investigation surveys in France and the UK.
- ▶ AQUIND continues investor engagement.

The key milestones for the project, including those agreed in the GB with the National Grid as part of the connection agreement, are set out in the AQUIND delivery programme, which is included in detail in Exhibit 11 – “Programme plan and programme risks”. The connection procedures in both GB and France provide for modification procedures, including the timing of the connection that might be subject to changes due to various circumstances.

### 4.7.2 Consents and licences

A project of AQUIND's size, spanning two jurisdictions, requires an extensive planning schedule with a number of necessary consents and licence. Exhibit 9 provides a summary of the required consents and licences.

## 4.8 Operating arrangements

This section sets out initial arrangement with respect to capacity allocation and market reporting and transparency.

### 4.8.1 Transparency and reporting obligations

AQUIND recognises the importance of timely and transparent reporting requirements. For all capacity, AQUIND will ensure reporting of all auction timetables and auction results to ensure compliance with European and national transparency requirements. The detailed provisions for reporting will be set out in the AQUIND Access Rules. These will be subject to NRA approval and align with equivalent product rules on the GB-France border.

AQUIND will publish all results for the allocation of all capacity auctions as soon as practicable after the auction has taken place. The information will comply fully with the requirements the relevant legislation and, as a minimum, will include:

- ▶ Names of registered winning bidders
- ▶ The marginal auction clearing price
- ▶ Total capacity demanded
- ▶ Total capacity awarded

This public information will be in addition to information regarding auction results provided directly to winning bidders in the relevant auction. AQUIND anticipates that this information will be made available through the procured auction trading system. The specific details of the trading system will be developed and shared with NRAs in due course.

#### 4.8.1.1 *Secondary trading*

Secondary trading offers market participants a route to re-sell capacity awarded through the multi-year auctions. AQUIND proposes to facilitate secondary trading to ensure that unused capacity is re-allocated. This principle will be supported by the UIOSI rules that will force capacity holders to recycle capacity if it is not nominated for delivery by the Day-ahead stage. These functions and processes will be formalised through the procurement and design of the AQUIND auction platform.

#### 4.8.1.2 *European Network Code compliance*

AQUIND will ensure full compliance with the market related European Network Codes and subsequent Regulations (Forward Capacity Allocation and Capacity Allocation and Congestion Management) for all capacity. In this respect, AQUIND will not be any different to other regulated GB-France interconnectors.

### 4.8.2 Transparency

AQUIND will put in place data and transparency processes to provide relevant information to NRAs, TSOs, market participants and the market, as required under relevant legislation. The requirements for this data provision will come from a number of sources, not limited to the Transparency Regulation 543/2013, European Network Codes, and any additional requirements proposed by the NRAs through the exemption decision or otherwise.

AQUIND will put in place communication procedures that take into account the format, frequency and recipients of each data items. These procedures will include:

- ▶ Information sent directly to the NRAs
- ▶ Information sent directly to other relevant organisations
- ▶ Information sent directly to AQUIND capacity holders
- ▶ Information made available on the AQUIND public website (public).

The precise mechanisms will be developed through the construction phase of the project as the project developers prepare for operation. For information required during the construction phase of the project, AQUIND will engage bilaterally with the national TSOs and NRAs as required to provide regular updates on the construction progress, to be agreed with the NRAs as part of this Request for Exemption.