NOVA SCHOOL OF SCIENCE & TECHNOLOGY

DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING OF NOVA School of Science and Technology | FCT NOVA
AND DEPARTMENT OF HUMANITIES AND MANAGEMENT OF ESCOLA NAVAL

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BSc in Deck and Bridge Operations

Nexus Agenda WP8: Project Procurement Plan for Retrofitting of harbour service boat for full electric propulsion

MASTER IN MARITIME LOGISTICS

Universidade NOVA de Lisboa / Escola Naval

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To my family and friends who have helped me throughout this journey.

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"*Nothing in life is to be feared; it is only to be understood.*" (Marie Curie).

ABSTRACT

This report provides an analysis of the procurement effort and process regarding a project for retrofitting a harbour service boat with full electric propulsion, part of the *NEXUS Agenda*, more specifically *Work Package 8 (WP8)*, Task 8.7.1., with the main goal of promoting a Green Transition. The project's objective is to demonstrate the feasibility of replacing conventional service vessels with carbon-free alternatives. Given its technical complexity, APS opted for a public tender process. However, a tender issued earlier in 2024 was cancelled due to the invalidity of both proposals, leading APS to reorganize and plan a new tender this same year.
The report relies primarily on procurement documents, meetings, and the guidelines of the PMBOK Guide, a global standard for project management. Nonetheless, since the public tender must comply with both international and national legal requirements, the structure of the procurement documents diverges in part from the PMBOK's recommendations. As the PMBOK Guide suggests flexibility, this report was adapted and the information organized to better align with these guidelines while making the connections with the right procurement terms. Additionally, it shall be noted that most of the information was translated from Portuguese to English.

Keywords: Carbon-free alternatives; Electric Propulsion; Green Transition; NEXUS Agenda; Procurement Project.

RESUMO

Este trabalho providencia uma análise do projeto de aquisição, através de concurso público, para a Reabilitação da lancha de serviço portuário com propulsão totalmente elétrica, parte da *Agenda NEXUS*, mais especificamente a tarefa 8.7.1 do *Work Package 8*, e tem como objetivo principal promover uma transição energética verde. O objetivo do projeto é demonstrar a viabilidade de substituição de embarcações de serviço convencionais por alternativas de zero emissões. Dada a sua complexidade técnica, a APS optou por um processo de concurso público. No entanto, um concurso lançado no início de 2024 foi cancelado devido à invalidade de ambas as propostas, levando a APS a reorganizar-se e a planear um novo concurso no mesmo ano.

Este trabalho baseia-se principalmente em documentos de aquisição, reuniões e nas orientações do Guia PMBOK, uma norma global para a gestão de projetos. No entanto, uma vez que o concurso público deve cumprir os requisitos legais internacionais e nacionais, a estrutura dos documentos do concurso diverge em parte das recomendações do PMBOK. Uma vez que o PMBOK sugere flexibilidade, será feita uma adaptação e organização da informação para ter um melhor alinhamento com estas diretrizes, enquanto se fará as ligações com os termos de aquisição corretos. Além disso, é de notar que a maior parte da informação será traduzida do português para o inglês.

Palavras chave: ….

Agenda NEXUS; Alternativas Zero-Emissões; Projeto de Aquisições; Propulsão elétrica; Transição Energética.

CONTENTS

List of Figures

List of Tables

GLOSSARY

5G	5G is the fifth generation of wireless communication technology, delivering faster speeds, low latency, and the ability to connect more devices simultaneously. It supports innovations such as autonomous vehicles, smart cities, and augmented reality, while enhancing network efficiency and enabling advanced applications in various industries (IBM, n.d.).
AC (Alternating Current)	This type of electrical current alternates directions on a periodic basis. Most households and businesses use alternating current (AC) power because it is more efficient at transporting electricity long distances.
ASTM AISI 316	High-grade, corrosion-resistant alloy, well-known for its resistance to pitting and corrosion in chloride conditions such as saltwater
Beam	The width of a vessel at its broadest point, usually measured at the middle of the. It is a crucial ship design parameter since it influences the vessel's stability, speed, and cargo capacity.
CAPEX	It refers to the funds used by a company to purchase, improve, or maintain physical assets such as land, buildings, machinery, and equipment. CAPEX is often associated with long-term investments and is recorded on a company's balance sheet as an asset.
CE marking	The CE marking is a certification label that indicates a product conforms to the health, safety, and environmental protection standards required for sale within the European Economic Area (EEA)

DC (Direct Current)	This kind of electrical current has a continuous flow of electricity in one direction. DC electricity is produced, for example, by batteries. A DC system maintains a constant voltage.
DC/AC converters or inverters	Devices that convert DC (Direct Current), generally from a battery or solar panel to AC (Alternating Current), which is required by most electrical systems and appliances.
Depth	(also known as *ponta*l in Portuguese) is the vertical distance between a ship's keel and upper deck. It basically determines how "tall" the vessel is from the bottom to the main deck.
EU (European Union)	The European Union (EU) is a political and economic partnership of 27 countries aimed at fostering peace, stability, and cooperation. It began after World War II to promote economic interdependence and has evolved into a union addressing areas like trade, climate, justice, and human rights. The EU enables free movement within its single market, uses the euro in 19 countries, and upholds democratic values, equality, and the rule of law, providing shared rights and freedoms for its citizens (© European Union, 2022).
Firm fixed price (FFP).	Is a type of contract, in the category of Fixed-price contracts, used in procurement. A vast majority of purchasing organizations choose it since the price of the items is fixed and not subject to change unless the nature of the activity changes (PMBOK, 2017).
HVAC - Heating, Ventilation, and Air Conditioning	Temperature, humidity, and air quality control systems in buildings, vehicles, or vessels.

I.P. - Public Institute	A public institute is a legal public entity with its own rights and obligations, created to fulfil specific administrative goals. It operates independently and is not tied to population or territory. Most are part of the indirect State administration, which includes autonomous entities overseen by the State. The framework for public institutes is defined by Law No. 3/2004, and they can take the form of personalized services, public foundations, or public establishments, existing at state, regional, or local levels (República Portuguesa, n.d.).
Knot	Nautical mile per hour
Request for information (RFI)	An RFI is used to request more information from suppliers regarding the goods and services to be obtained (PMBOK, 2017).
Request for quotation (RFQ)	An RFQ is used to gather information on how bidders can meet requirements and estimate costs (PMBOK, 2017).
S.A. - *Sociedade Anónima*	A *sociedade anónima* (public limited company) is a type of corporation where capital is divided into easily transferable shares, and each shareholder's liability is limited to the value of the shares they subscribe to. It requires a minimum of five shareholders (individuals or entities) unless formed by a single shareholder that is itself a corporation. Contributions in the form of labour are not allowed. The minimum share capital is €50,000, divided into shares of equal nominal value, and only the company's assets are liable for its debts. The company name must include "*sociedade anónima*" or "S.A." (© República Portuguesa, 2024).

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ACRONYMS

5G	Fifth Generation of Wireless Communication Technology
A	Ampere
AC	Alternating Current
AIS	Automatic Identification System
AISI	American Iron and Steel Institute
APS	*Administração dos Portos de Sines e do Algarve S.A.* Port of Sines Administration
ASTM	American Society for Testing and Materials
ASTM AISI 316	Specific grade of stainless steel
BOOT	Build-Own-Operate-Transfer
CAPEX	*Capital Expenditures*
CCP	*Código dos Contratos Públicos* Public Contracts Code
CE	*Conformité Européenne* European Conformity
DB	Design-Build
DBB	Design-Bid-Build
DC	Direct Current
DGRM	*Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos* General Directorate of Natural Resources, Security and Maritime Services
DHPC	Dynamic Host Configuration Protocol

DSC	Digital Selective Calling
EEA	European Economic Area
EMS	Energy Management System
ESPD	European Single Procurement Document (ESPD) *Documento Europeu Único de Contratação Pública (DEUCP)*
EU	European Union
FFP	Firm fixed price
GPS	Global Positioning System
HVAC	Heating, Ventilation, and Air Conditioning
I.P.	*Instituto Público* Public Institute
IPTM, I.P.	*Instituto Portuário e dos Transportes Marítimos, I.P.* Institute of Ports and Maritime Transport
IRR	Internal Rate of Return
IT	Information Technology
km/h	kilometres per hour
LED	Light Emitting Diode
m^3/h	Cubic meters per hour
MOB	Man Overboard
NM	Nautical Mile(s)
O&M	Operations and Maintenance
PCI	*Proteção Contra Incêndios* Fire Protection
PCS	Power Conversion System
PMBOK	Project Management Body of Knowledge
RCBE	*Registo Central de Beneficiário Efetivo* Central Register of Beneficial Ownership
RFI	Request for Information
RFP	Requests for Proposal

RFQ	Request for Quotation
S.A.	Sociedade anónima
SoC	State of Charge
SOLAS	International Convention for the Safety of Life at Sea.
SOW	Statement of Work
TS	Transformer Station
UV	Ultraviolet
V	Volts
VAT	Value-Added Tax
VHF	Very High Frequency
Wh/kg	Watt-hours per kilogram
WP	Work Package

1

INTRODUCTION

Project procurement is the process of obtaining goods, services, or works from external sources to support the successful implementation of a project. It starts with determining the resources or services needed, and then it moves on to creating a procurement plan that includes budgets, schedules, and purchase strategies. Sourcing is the following stage, in which prospective suppliers are asked to submit bids or proposals. After receiving the proposals, these are reviewed using predetermined standards, resulting in the identification of the best vendors. After that, contracts are worked out and signed with the selected vendors. The contracting entity then makes sure that the conditions are met, and then contracts are closed when procurement is finished. If the procurement process is managed well, strong relationships with the suppliers (or contractors) will be maintained, the risks will be reduced ensuring the resources are delivered on time, within budget and with the agreed standards and specifications (ProjectManager.com, Inc., 2024), (Bakkah Learning, 2024), (2006-2024 Wrike, Inc., 2024).

This report focuses on the procurement project for retrofitting the harbour service boat with full electric propulsion. The project is part of the NEXUS Agenda, specifically under Work Package 8 (WP8), Sub-Task 8.7.1, which aims to advance the energy transition, often referred to as the *Green Transition*. The primary objective of this sub-task is to demonstrate the feasibility of replacing conventional service vessels with carbon-free alternatives.

Given the complexity and technical demands of this ambitious project, which requires significant time and expertise, APS has opted to pursue the procurement through a public tender process. It is also noteworthy that earlier in 2024, APS initiated a public tender for the same project. However, due to the invalidity of both submitted proposals, APS decided to

cancel the tender, regroup, and reorganize, with the intention of issuing a new tender later in the year.

This report is grounded primarily in the analysis of procurement documents, including public tender documents, meeting notes, and the principles outlined in the Project Management Body of Knowledge (PMBOK) Guide, which is globally recognized as a standard for project management methodology. While the PMBOK Guide provides a structured framework for project procurement, the specific requirements of this public tender necessitated alignment with national legal frameworks. As a result, the structure and organization of the procurement documents diverged in certain respects from PMBOK recommendations. However, the inherent flexibility of the PMBOK framework allowed for adaptation to the unique demands of this project.

The methodology employed in this report involved a detailed review and translation of the tender documents, originally prepared in Portuguese, to ensure clarity and accessibility for an English-speaking audience. During this process, relevant information was systematically aligned with PMBOK terminology and guidelines to facilitate understanding and to provide coherence with established project management standards.

One significant methodological challenge identified was the dispersion of related information across multiple clauses and documents. To address this, the author employed a synthesis approach, compiling and reorganizing fragmented details into cohesive sections. This method was chosen to enhance the readability and comprehensibility of the procurement process, providing a clearer narrative for the reader.

Finally, as this initiative is part of the broader NEXUS agenda and developed by APS in Sines, the following section will provide additional context about the NEXUS agenda and the operational scope of the harbour.

1.1 Contextualization - The Sines Harbour

The construction of the Port of Sines began in 1973, and its first regulation of its management and expansion was defined by Decree-Law nº 508/77, of December 14th. APS was established as a public institution with financial and administrative autonomy as well as legal identity. Its responsibility at the time was to oversee and run the only existing terminal, an Oil Terminal, which is now the Liquid Bulk Terminal. Its duties include developing, maintaining, and economically exploiting the Port of Sines; creating studies and plans for land-

based and maritime works, as well as port equipment, to be submitted for government approval; and building, acquiring, managing, and overseeing land-based and maritime operations and projects, as well as land-based and floating port equipment. Its mission also involves making sure that activities under its control are coordinated, supervised, and regulated all without interfering with the legal obligations placed on other organizations. The Decree-Law No. 337/98 changed the Port of Sines Administration status into a public limited corporation in 1998, transforming it into a structure specifically designed to issue concessions to private operators, along with the other four major port administrations in the country (Lisbon, Setúbal, Leixões, and Aveiro). APS was therefore established. Decree-Law No. 44/2014, which went into effect in March 2014, established the order for the transfer of the commercial ports of Faro and Portimão to APS. Established as an S.A. (*Sociedade Anónima*- Public limited company), APS stands for Administration of the Ports of Sines and the Algarve. It was given direct port jurisdiction over the land, river, and maritime areas required for the commercial ports of Faro and Portimão. These areas were previously under IPTM, I.P.'s *(Instituto Portuário e dos Transportes Marítimos, Instituto Público)* jurisdiction. The transfer of jurisdictional functions for the two commercial ports was also included, along with the assets, personnel, and financial resources assigned to them (APS, 2024).

1.2 Nexus Agenda

The NEXUS Agenda is a consortium of 35 organizations that aims to advance the digital and ecological transformation in the transportation and logistics industry. It is led by the Administration of the Ports of Sines and the Algarve. With an emphasis on open data, artificial intelligence, 5G (Fifth Generation of Wireless Communication Technology), cybersecurity, and predictive models for energy resource management, the program aims to build 28 cutting-edge goods and services. With a 59-million-euro total incentive, the project is anticipated to satisfy EU (European Union) targets under the European Green Deal, produce 56 million euros in export volumes, and create 1,000 employments (APS, 2022).

1.2.1 Work Package 8: Green and Energy Solutions for Ports and Logistics

The NEXUS agenda's Core Innovation area will focus on services, products, and technology that have a significant impact on the goals of the Green Transition. Technologies that support the Dual Transition (Green and Digital) will receive special attention.

This WP will concentrate on: (NEXUS, 2023)

- National Industrial Cluster: Developing a cluster for onshore and nearshore power supply systems and a hub for digital energy management solutions.
- Green Port Management Tools: Creating tools for planning and managing ports with models and predictive algorithms for energy resources and carbon offset, using data from various sources.
- Zero-Emission Marine Equipment: Developing advanced zero-emission tugboat and pilot systems, incorporating innovations in ship design, construction, propulsion, charging systems, and digital twins.

1.2.1.1 Task 8.7: Pilot Boat, service boat and harbour tugboat

With the help of this project, it will be possible to convert service boats from diesel to complete electric power, proving that carbon-free port service vessel upgrades are possible. The main goals consist of: (NEXUS, 2023)

- Designing streamlined hull forms optimized for electric propulsion and battery systems.
- Developing and implementing new low-carbon structural composite materials for building a new pilot boat hull.
- Designing and building of a brand-new, fully electric harbour tug with hull extensions that are optimized to increase thrust (bollard pull).
- Building a new port tug and pilot boat to showcase the new technologies in a fully functional setting.
- Predictive models will be used to improve operation and lower the carbon footprint of the 100% electric boats by implementing a medium-level digital twin for the commissioning, designing, operating, and preventive maintenance of the three naval units.

1.2.1.1.1 Sub-task 8.7.1: retrofitting of harbour service boat for full electric propulsion and integration of digital twin

The goal of this project is to convert a 16-meter service boat with twin diesel engines to a fully electric propulsion system, to show that replacing current service vessels with carbon-free alternatives is feasible. Important elements consist of combining communications, Navionics, safety systems, and power systems into a digital twin model that communicates with port infrastructure. Future unmanned service boats will be made possible by cybersecurity research and development that tests the strength and future defences of these systems. Integration of onboard equipment (such as pumps, valves, electrical boards, and navigational devices) into a single, project-specific, two-way communication platform (NEXUS, 2023).

2

THEORETICAL FRAMEWORK

The PMBOK project procurement principles, which are typically one of the global standards and best practices, will serve as the primary foundation for this report, with some references to national laws also included.

A Project Procurement Plan is a document that describes how the procurement processes will be managed during the project, according to the PMBOK Guide. It comprises, but it is not mandatory or limited to the following aspects and is a crucial part of the project management plan.

The **procurement management plan** outlines the key steps for acquiring goods and services in a project, including the type of bidding process (international, national, or local) and how it aligns with the project schedule and funding. It can also coordinate procurement with other project areas, establishes timelines, specifies roles and responsibilities, and outlines contract management metrics. The plan addresses legal considerations, payment currency, and risk management measures like performance bonds or insurance. Additionally, it may include prequalified sellers and vary in detail based on the project's specific needs (PMBOK, 2017).

Once the make-or-buy analysis is done and the choice to procure externally has been taken, a **procurement strategy** is necessary to identify the project delivery method, contract type, and how the procurement process will continue through its phases. The project's nature influences the delivery method. Common construction choices can include turnkey, design-build (DB), design-bid-build (DBB), and build-own-operate-transfer (BOOT). Contract types vary depending on the project and financial systems and can be lump-sum, fixed-price, cost-plus, target cost or others. Fixed-price contracts are ideal for well-defined, stable projects, while cost-plus contracts are appropriate for changing or uncertain projects. Incentive-based contracts can be used to align the goals of buyers and sellers (PMBOK, 2017).

Bid documents are used to solicit proposals from possible sellers, with terminology such as "bid," "tender," or "quotation" used when price is the most significant consideration, and "proposal" when a technical capability or approach is more important. Terminology may differ based on the industry and region. These documents can take several forms, such as *requests for information* (RFI), *requests for quotation* (RFQ), or *requests for proposal* (RFP), depending on the project's requirements. An RFI is intended to get more information from sellers, whereas an RFQ directs on more technical information on how vendors can meet the requirements asked, and an RFP addresses more complex project issues that demand a more intricate solution. The procurement documents are expected to draw clear and full responses from sellers, and include the scope of work, response instructions, and any contractual information that may be required. They should be thorough enough to guarantee consistent responses while leaving room for sellers to provide alternative options. To provide a balanced and effective evaluation process, the documents' complexity should correspond to the procurement's worth and risks (PMBOK, 2017).

The **statement of work (SOW)** for each procurement is based on the project's scope baseline and specifies the portion of the project scope covered by the contract. It gives enough information for prospective vendors to determine whether they can supply the desired items, services, or outcomes. The SOW usually comprises specifications, quantity, quality standards, performance data, timeframe, and location of work, which vary depending on the nature of the procurement and the buyer's requirements. The SOW should be clear, simple, and complete, and it can contain any additional services such as reporting or post-project support. It can be amended throughout the procurement process until it is incorporated into the contract (PMBOK, 2017).

The buyer's goal in establishing **evaluation criteria** is to choose a proposal that provides the highest quality services. These criteria may include expertise, pricing, delivery dates, technical expertise, applicable experience, staff qualifications, financial stability, and management experience. For multinational initiatives, local content, such as national staff participation, may be considered. These criteria are often included in a weighted scoring system—whether numerical, color-coded, or descriptive that ranks bids or proposals to determine which one is best for contract negotiations (PMBOK, 2017).

A **make-or-buy analysis** assesses whether certain tasks should be undertaken internally by the project team or outsourced to external contractors (PMBOK, 2017).

For big purchases, the purchasing organization or contracting entity may opt to produce its own **independent cost estimate** or to ask for an external expert estimator to establish a

standard for evaluating proposals. Large disparities between cost estimates may indicate that the procurement SOW was unclear or incomplete, or that possible suppliers misunderstood or did not completely meet the SOW needs (PMBOK, 2017).

A decision to procure goods, services, or resources may lead to the need for a **change request**. Similarly, other procurement planning decisions can also generate additional change requests. Changes to the project management plan, its subsidiary plans, or other components might involve modification requests that impact procurement activities (PMBOK, 2017).

As a result of this approach, several **project documentations** may require **updating**. The lessons learned register will include insights into rules, compliance, data collection, analysis, and source selection. The milestone list should be revised to include crucial dates when sellers are anticipated to produce their outputs. Updates to the requirements documents may contain technical and legal standards that sellers must comply with, such as health, safety, security, and intellectual property rights. The requirements traceability matrix will be updated to ensure that product requirements are linked to deliverables that meet them. Furthermore, the risk register is updated to reflect the individual risks associated with each approved seller, taking into consideration variables such as the seller's organization, contract duration, and external environment (PMBOK, 2017).

The Project Procurement Plan makes sure that all procurement processes are organized and effective, and that they are in line with the goals of the project.

As APS is a S.A. with the state as its sole shareholder, the national law (*Decrre-Law n. º 18/2008 of January 29th , henceforth CCP (Código dos Contratos Públicos*)), also known as CCP (Public Contracts Code), must also serve as guidelines for project procurement.

The procurement management planning includes a set of key concepts as mapped in Figure 1.

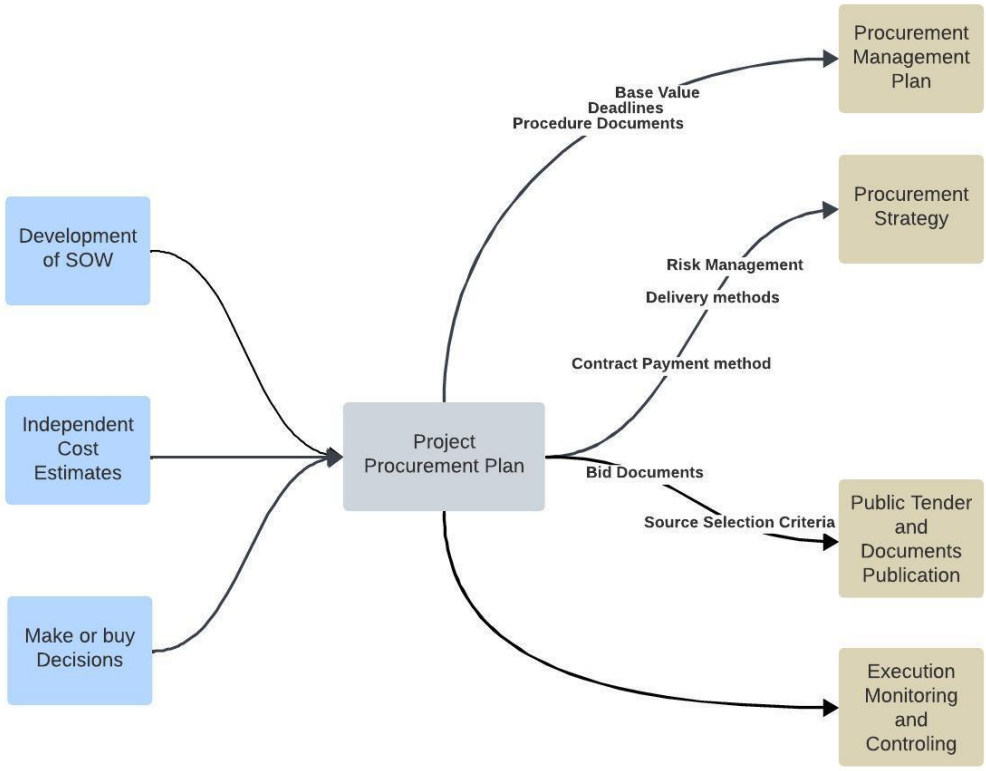

Figure 1 - Project Procurement Plan: Flow Diagram

Source: own creation using Lucid Chart, based on PMBOK Guide

3

PROJECT PROCUREMENT PLAN: RETROFITTING OF HARBOUR SERVICE BOAT FOR FULL ELECTRIC PROPULSION

APS is authorized to execute Work Package 8 as part of the NEXUS Innovation Pact, focused on advancing green and digital transitions in transport, logistics, and mobility. This initiative includes the "Rehabilitation of the Porto Covo Boat - Zero Emissions" project, which is part of the application submitted to the Mobilizing Agendas for Business Innovation program.

3.1 Procurement Management Plan

Procurement management planning includes a set of key ideas, shown in Figure 1 in the previous section. These ideas help guide how procurement is handled, making sure the processes, strategies, and rules are clear and aligned with both the project's goals and the organization's standards.

3.1.1 Consultation and provision of procedure documents

This procurement process will Involve a public tender. The documents associated with the procedure include:

- Volume 1 – Procedure program
- Volume 2 – Specifications
    - Part I – General clauses
    - Part II – Technical clauses

The entire set of the public procurement documents can be found on the Vision Vortal Public Procurement Electronic Platform, which can be accessed via the website Vision | Vortal, starting from the day the announcement is published in the *Diário da República* (2.ª *série* N.º137) and the Official Journal of the European Union (429902-2024 - Concurso - TED (europa.eu). Free registration is required to access the previously mentioned electronic platform, which allows the downloading and viewing of procedure documents along with the sending and receiving of documents that make up the application and proposals in compliance with CCP provisions (APS: Programa do procedimento, 2024).

3.1.2 Visits to the Vessel

Interested parties can inspect the vessel and prepare their proposals until the deadline for proposal submissions. The vessel is available for visits at the Administration of the Ports of Sines and Algarve (APS) facilities by appointment for 15 days from the announcement date. Visits must be requested at least five days in advance via the approved electronic platform, with full identity of the representatives present. Visits are scheduled in the order of requests, on dates and times determined by APS, and overseen by APS employees. The visit date will have no impact on deadlines established by the procurement procedure or the CCP, including those for clarification requests or proposal submissions (APS: Programa do procedimento, 2024).

3.1.3 Legal Type of Company Association for Sellers

Groups of companies can participate in the tender without needing a formal legal association. However, members of a group cannot compete individually or join other groups in the same tender. All members of a group share joint responsibility for maintaining the proposal's validity. If the group is awarded the contract, they must legally form a consortium with joint liability before signing the contract. This goes in accordance with Decree-Law No. 231/81, of July 28 (Decree Law nr. 231/81, of July 28, 1981), (APS: Programa do procedimento, 2024).

3.1.4 Deadline and form of Proposals

Proposals and related papers must be submitted through the Vortal Public Procurement Electronic Platform under the provisions of article 62 of CCP. The submission deadline is 23:59 on the 40th day after publication in the *Diário da República*. Since the

publication date was July 17, the deadline will be August 24). All documents must be electronically signed using qualified electronic signature certificates. The submission of alternative proposals by bidders is not permitted (APS: Programa do procedimento, 2024).

3.1.4.1 Documents Supporting the Proposal

The proposal consists of the documents provided for in Article 57 of the CCP, namely:

a) ESPD - European Single Procurement Document.
b) Bidder's Declaration: Acceptance of the tender specifications, prepared according to Annex I of the CCP.
c) Bidder's Declaration: Total price proposal and execution period, prepared in accordance with the in-Appendix A.1. of this Report, excluding VAT (Value-Added Tax).
d) Bidder's Declaration: Indication of partial prices of the works as per point 3.1.4.2 of this report.
e) Justification Document: Explanation for presenting an abnormally low price, if applicable.
f) Work Plan: As defined in Article 361 of the CCP, including a bar chart illustrating the sequence and partial deadlines for each type of work, specifying the resources to be used.
g) Descriptive Report: General design and arrangement of the vessel, including detailed justification for the propulsion system and its integration with the existing electric charger.
h) Technical Specifications and Catalogues: For the equipment to be installed as specified in the tender specifications.
i) Proposed Warranty Periods.
j) Proposed Delivery Time: Not exceeding 270 consecutive days.
k) All Documents Requested: In the Technical Clauses of the Tender Specifications.
l) Any Other Documents: Considered essential by the bidder to clarify the proposal's attributes.

All documents must be written in Portuguese, as per Article 58 of the CCP. The absence of one or more documents listed in items a) to k) will result in the exclusion of the proposal according to Article 146, paragraph 2, item n) of the CCP, (APS: Programa do procedimento, 2024).

3.1.4.2 Technical Documentation to Be Submitted with The Proposal

With their proposal, bidders must submit the following documentation:

a. Work plan.
b. Repair time.
c. Proposed general arrangement.
d. Warranty period for modifications and new equipment.
e. Technical documentation for the proposed equipment and accessories.
f. Diagrams (single-line diagrams, electrical schematics of panels with respective protections) and electrical balances.
g. Technical personnel involved in the work.
a. List of unit prices.

To improve the evaluation of the proposal and measurement records, the contractor must give unit prices for the items listed in Table 1, in the terms of reference (APS: Cláusulas Técnicas, 2024)

:

Table 1 - List of Unit Prices

Part of SOW	Unit Prices	Part of SOW	Unit Prices
Under-water hull		Battery system location	
Upper Hull / Sides		Remote connection	
Deck, Bow, Well, and wheelhouse		Sewage, bilge, and fire systems	
Chain Locker		Forced and natural ventilation	
Control and command room		Alarm systems	
Pump room		Lighting	
Engine room		Air conditioning system	
Propulsion system		Freshwater system	
Generator		Greywater system	
Electrical connection point		Painting	
Electrical network design		Training	
Communication and navigation equipment		Tests and trials	

3.1.5 Base Value

The base value of the work is €750,000 (seven hundred and fifty thousand euros), and any proposal exceeding this amount will be excluded (APS: Programa do procedimento, 2024).

APS assumes to pay said value for the performance of the Contract's specifications and other duties, including VAT at the current legal rate. The said price includes all costs, charges, and expenses not expressly assigned to APS, including all expenses of the contractor with its personnel, i.e. salaries, mandatory social security contributions, work accident insurance or other necessary insurances, and all other mandatory social expenses, as well as accommodation, food, and travel expenses for human resources, and expenses for the acquisition, transportation, storage, and maintenance of equipment, materials, and products (APS: Cláusulas Gerais, 2024).

3.1.6 Duties and responsibilities of the project group and other parties

3.1.6.1 Contracting authority

Any clarifications necessary to the appropriate understanding and interpretation of the tender documents will be provided by the *Tender Committee* (APS: Programa do procedimento, 2024).

APS will nominate a technician to manage this contract This contract manager will oversee the contract execution, as provided in Article 290-A of the CCP. Any questions the contractor has regarding the interpretation of the procurement documents should be presented to this Contract Manager. Upon the complete and final acceptance of the equipment, in accordance with the warranty period provided by the contractor, the performance bond guaranteeing contract fulfilment will be refunde. (APS: Cláusulas Gerais, 2024).

3.1.6.2 Bidder/Contractor

According to Article 65 of Decree-Law No. 18/2008 of January 29, the bidder is required to keep the proposal valid for a period of 66 working days. Since the deadline for the proposals was August 24, the bidders must keep the proposal valid until November 27 (APS: Cláusulas Gerais, 2024).

This party will be responsible for the expenses related to the preparation of the proposal and any potential variations. The contractor (if awarded the project), in the form of a cash deposit, state-guaranteed securities, a bank guarantee, or a surety bond, following the

specified models, must provide a performance bond worth 5% of the contract price within 10 days of being notified of the award (Appendix A.2 and A.3), (APS: Programa do procedimento, 2024).

The delivery of the equipment to the APS facilities in agreement with the technical specifications outlined in the SOW, including the provision and supply of all necessary means for that, including material, human and technical resources, and equipment, will also be the responsibility of the contractor. In addition to those responsibilities they will be responsible for any fees concerning to the usage of patents, licenses, registered trademarks, and any associated costs and payments, including legal fees, if the contracting company is sued for infringement during the contract (APS: Cláusulas Gerais, 2024).

3.1.6.3 Duty of Confidentiality, Data Protection and Information Security

The awardee/contractor must keep confidentiality concerning all information related to the contract and comply with APS's Information Security Management System (SGCI - *Sistema de Gestão da Segurança da Informação*) policies and report any breaches of confidentiality or security promptly to the designated email. That information should only be used for the purpose of the contract's execution. Information that is publicly available or legally required to be disclosed, can be excluded from this obligation. The contractor needs to obtain consent from employees to share their personal information with APS for processing aimed to various purposes, to comply with legal obligations during the contract. Both parties, as their employees, must uphold confidentiality even after their roles end (APS: Cláusulas Gerais, 2024).

3.1.7 After the Proposal

3.1.7.1 Submission and selecting of the best proposal

All bidders will get the preliminary proposal analysis report through the electronic platform, and they will have at least five days to respond in writing, with the option of a preliminary-hearing conference and will get simultaneous notification of the award decision and the final evaluation report. The chosen bidder will be notified by the Contracting Authority to provide necessary papers (mentioned next in point 3.7.1.) within ten (10) days of receiving the award notification (APS: Programa do procedimento, 2024).

As the contract must be formalized in writing, the draft contract will be approved by APS at the same time as the award decision, in accordance with paragraphs 1, 3, and 4 of Article 98 of the CCP. After the awardee accepts the draft contract, as per Article 101 of the CCP, APS

will notify them of the time and place for signing the contract (APS: Programa do procedimento, 2024).

After the proposal review phase formalities, APS will award the contract to the top-ranked proposal (APS: Cláusulas Gerais, 2024).

3.1.7.2 Documents to be submitted by the bidder in case of award

The awardee/contractor must submit, within ten days of the contract award notification, the following documentation:

a) A declaration according to the template in Annex II of the CCP.
b) Verification that they do not fall under the conditions listed in items b), d), e), and i) of Article 55 of the CCP, compliant with Article 83-A of the CCP.
c) Access code to the permanent certificate of the Commercial Registry, or a copy of the commercial registration registry or amendments to the articles of incorporation or equivalent document, which contains shipbuilding and repair activities. For foreign bidders, a certificate of registration in one of the registries mentioned in Annex XI of Directive No. 2017/24/EU of the European Parliament and Council of February 26. If their home country is not included in this annex, the certificate must be replaced by a sworn statement, notarized or issued by a judicial or administrative authority, declaring that they are authorized to execute the contracted services according to the laws of their home country.
d) Proof of the declaration obligation in the Central Register of Beneficial Ownership (*Registo Central de Beneficiário Efetivo* (RCBE)), or submission of an access code to it.

Foreign-language documents need a certified translation, except for technical equipment documentation, which is accepted in English. The contractor must present these documents through the Electronic Public Procurement Platform. In alternative, consent can be given for the information to be accessed online, if the content is in Portuguese. If irregularities are found, a 10-day period will be granted for corrections. All bidders will be notified of the document submission (APS: Programa do procedimento, 2024), (Decree Law nr. 18/2008, of January 29, 2008).

3.1.7.3 The Contract

The execution of the contract must follow its clauses, the CCP, and all applicable laws, specifically those related to social security, health and safety at work, and liability and all applicable regulations, like those concerning the supply of goods. According to article 96 of

the CCP, some documents are integrated in the contract, like corrections of errors or omissions in the specifications (if accepted), clarifications or amendments, the original contract specifications, the awarded proposal, and any clarifications provided by the awardee. By the end of the maximum execution time, 270 days (including Saturdays, Sundays and holydays), the equipment specified in the procurement process (the retrofitted pilot boat), must be delivered, operational, and accompanied by all necessary certifications and documentation. The contract will be in effect until all services are provided in compliance with the terms and conditions listed in the SOW. Any accessary obligations that persist after the contract expires must still be completed (APS: Cláusulas Gerais, 2024).

3.1.7.4 Risk Management

The PMBOK suggests that the procurement management strategy should include some risk management in the procurement process. The tender or procurement documents include certain risk management strategies even though they don't directly address those issues by "name". Some good examples are the requirement to pay a performance bond, and the possibilities (under some specific circumstances) for both parties to terminate the contract.

The contractor (if awarded the project) must provide a performance bond worth 5% of the contract price within 10 days of being notified of the award. Once the equipment has been fully and finally accepted, and the warranty period provided by the awardee has passed, the performance bond guaranteeing contract fulfilment will be returned. In addition, APS (the contracting authority) asserts that all outcomes of the contracted work are its property, including any related intellectual and industrial property rights. These rights include patents, registered trademarks, service marks, copyrights, and any other rights related to APS's proprietary information (APS: Cláusulas Gerais, 2024).

If there are delays by the contractor's fault, APS can impose a fine corresponding to 2‰ of the contractual price, for every day of delay with, with a maximum limit of 20% of the contractual price. on the other side, if APS is in fulfilling its payment obligations, the contractor is entitled to late payment interest on the amount due at the rate legally fixed for that purpose for the period corresponding to the delay (APS: Cláusulas Gerais, 2024).

3.2 Procurement Strategy

3.2.1 Delivery method

Since the tender documents require the bidder/contractors to design the project, submit a proposal, and then build the vessel/boat, this delivery method falls under the DBB category according to the PMBOK Guidelines. This strategy divides the project into three discrete phases: design, bidding, and building. In the design phase, the contractor creates detailed designs to comply with the SOW. In the bid phase, the contractor makes a proposal that includes all the information such as cost estimates and specific dates. Lastly, during the build phase, the contractor will rebuild the vessel/boat following the approved design. This organized method ensures that the project follows a clear plan, reducing the risk of deviations and cost overruns (PMBOK, 2017).

3.2.2 Contract and Payments

Besides the technical expertise and requirements of this procurement, the price was defined as one of the main selection criteria. The type of contract to be celebrated falls in the category of Fixed-Price Contracts, more specifically a Firm fixed price (FFP). (PMBOK, 2017). The payment of the base price will be made as follows (APS: Cláusulas Gerais, 2024):

- After the written contract is signed, the awardee is entitled to receive an advance payment of 20% of the awarded amount. The advance will be repaid by deducting 20% from future invoices.
- For payments related to the following progress reports, 5% will be deducted from the invoice amount as a reinforcement of the performance bond.
- There will be three progress reports. The first will take place three months after signing the contract, with the following reports every three months. The fourth and final report will be conducted in Sines at the time of provisional acceptance.
- The payments will be made within 30 days of reception of the invoice at APS, based on the total work completed, calculated according to the unit price list and verified through an inspection report conducted for this purpose.

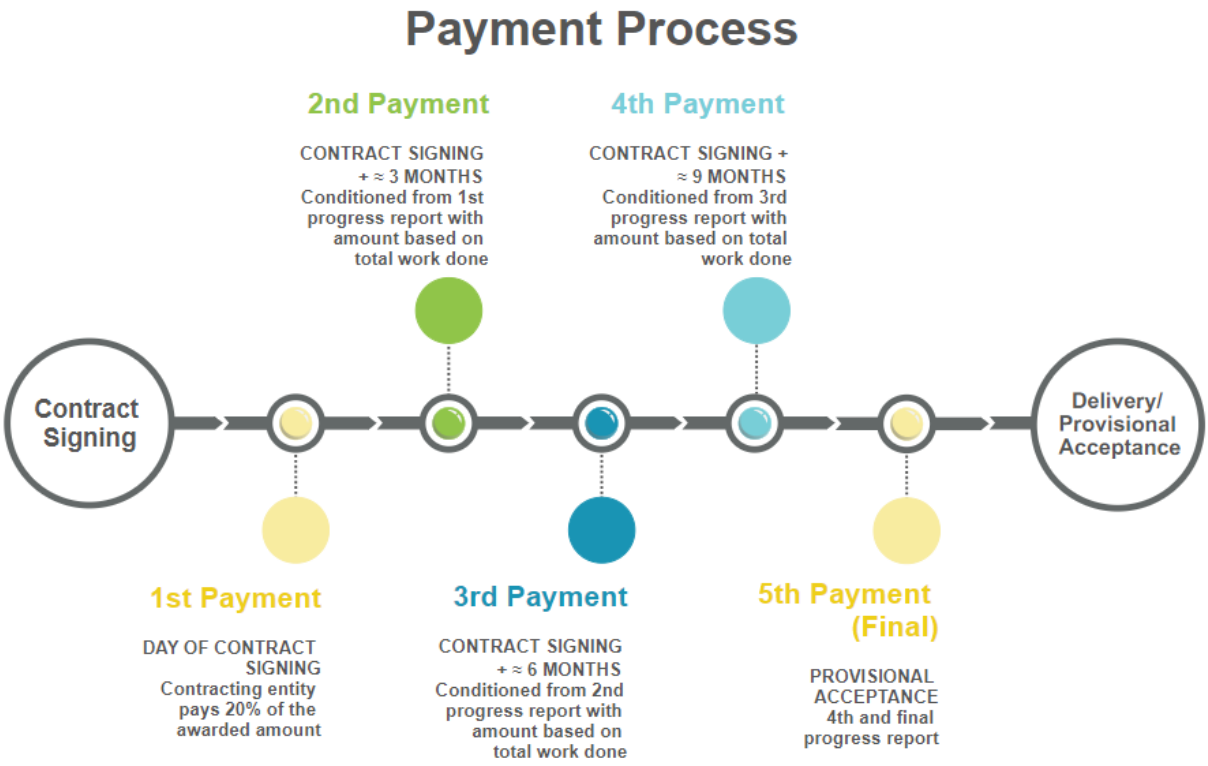

Figure 2 - Non-specific timeline for payments regarding the build

Source: Own creation using SmartDraw

3.3 Bid Documents

The necessary clarifications for the proper understanding and interpretation of the tender documents will be provided by the Tender Committee. Competitors can request clarifications via the Vortal platform within the first third of the proposal submission period (by July 29). The clarifications will be provided in writing and made available on the Vortal platform by the end of the second third of the submission period (by August 11). Copies of the clarifications will be attached to the Procedure Documents, and interested parties will be notified and given access on the Vortal platform. If clarifications are not provided on time, the proposal submission deadline will be extended by at least the delay period. Clarifications are part of the Procedure Documents and take precedence in case of discrepancies (APS: Programa do procedimento, 2024).

Although the tender documents do not use the procurement terms referred to in the PMBOK, these clarification requests can be equivalent to an RFI.

Competitors must submit a list of errors and omissions via the Vortal platform within the first third of the proposal submission period. These will be addressed by the end of the second third of the period. If not addressed in time, the submission deadline will be extended. Lists of errors and omissions will be available on the Vortal platform, and all interested parties will be notified. Decisions on these errors and omissions will also be made available on the platform. If fundamental changes to the Procedure Documents are required, the submission deadline will be extended accordingly (APS: Programa do procedimento, 2024).

Again, as the tender documents do not use the procurement terms referred to in the PMBOK, these clarification requests can be equivalent to an RFQ or RFP.

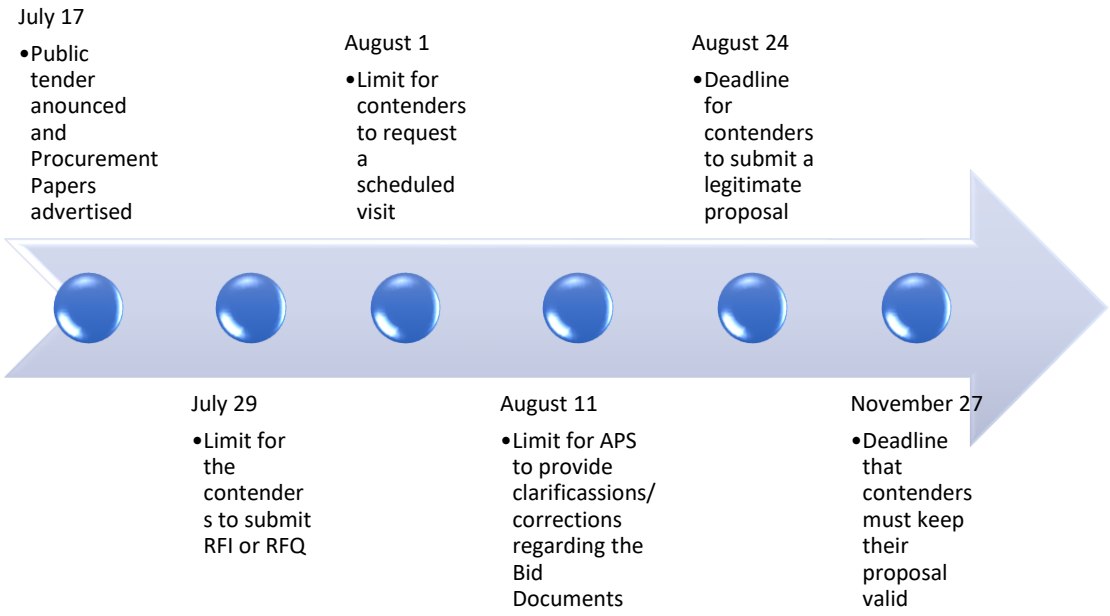

Figure 3 - Basic timeline for Request and Submission of Proposal

Source: own creation using *Microsoft Word SmartArt*

3.4 Statement of Work (SOW) for Procurement

This subchapter is based on the document published for the procurement process "Volume II 2 – Specification, Part II – Technical clauses (*Concurso Público VOLUME 2 - Caderno de Encargos PARTE II - Cláusulas Técnicas.* (07 / 2024), Reabilitação da Lancha *PORTO COVO* - Zero Emissões).

The restructuring of the vessel will consist of three main and distinct phases: the restoration of the vessel (which includes the repair and/or replacement of the current systems/equipment that make up the vessel, in areas such as the hull, sides, storeroom, etc.); the conversion of the boat's propulsion system to electric (which includes the supply, installation, and commissioning of electric motors, batteries, cabling, protections, connection boxes, DC/AC converters Auxiliary equipment for safety, air conditioning, and fire extinguishers will also be included; and the primary systems will be updated and reconverted (sewage, alarms, lighting, ventilation, and water systems).

The contractor must keep in mind the following main objectives:

- Restore and repair the *Porto Covo* vessel both internally and externally.
- Decommission the current internal combustion propulsion system. To decarbonize the vessel and achieve a "zero emissions" system, install an electric propulsion system that is fully compatible with the existing electric charger.
- Create a design to integrate the necessary equipment to meet the vessel's energy requirements.
- When picking system components, it is best to stick with well-proven technologies that exhibit predictable behaviour. This is why these criteria exclude experimental electric motors, sodium-ion or metal-air batteries, and other equipment in the early stages of technological development.
- Guarantee an intricate restructure of the vessel, including material supply, repair, and commissioning of the vessel.
- Create a demonstrative effect for other institutions and consumers in ports, by applying an electric energy storage system with the conversion of a vessel, aiming to reduce or eliminate the consumption of energy from fossil fuels.

A more thorough and detailed account of the technical requirements can be found in Appendix B for readers seeking a deeper understanding.

3.4.1 Preliminary Project and Project

The contractor will be responsible for developing the technical engineering and naval architecture project, detailing the supply of electrical equipment (motor, battery, inverters), structural modifications, and electrical systems and circuits, and will be responsible for the system design, equipment supply, installation, and services provided. The system must be commissioned and approved by a certifying entity.

A project schedule, from start to finish, must be presented, including:

- Start and end dates of the work
- Estimated dates for material replacement and arrangement
- Estimated painting dates for components
- Estimated date for dismantling of current propulsion elements
- Carrying out the final modification project of the vessel
- Equipment supply and installation dates
- Exterior painting date
- Commissioning test date
- Training and inspection dates

A modification project meeting the specifications required for certification must be created, including general arrangement plans, stability booklet, interior designs, and space layouts. The contractor will provide all necessary documents for approval, including physical and digital copies for the owner and certifying entity. The project must be executed with the collaboration of a naval engineer and an electrical engineer specialized in power systems.

3.4.2 Electrical design and equipment approved by classification societies

The contractor must prepare an electrical project (diagrams and electrical balances) showing the consumption and usage factors for each equipment, considering the different operational scenarios: day and night sailing and/or manoeuvring, and submit said electrical project for approval by a recognized classification society. All equipment supplied must have "Type Approval" from a recognized classification society.

3.4.3 Place of work execution

The contractor must specify the chosen location in their proposal and can choose were, either at the owner’s facilities or another location. If the work is done at the owner’s facilities, a warehouse will be provided.

3.4.4 Overview of Testing, Approvals, and Certification

The contractor has the responsibility of carrying out diverse tests on the vessel and its apparatus, in addition to guaranteeing that the vessel has the appropriate documentation and certification in compliance with the SOLAS (International Convention for the Safety of Life at Sea) convention and current laws. Sea trials, testing, and inspections are among the important stages that APS representatives will supervise.

3.4.5 Equipment and Onboard System Tests

3.4.5.1 Equipment Tests

Testing is a critical stage in the procurement and quality auditing processes, as it is the stage where compliance to requirements is verified and validate. The purpose of these tests is to confirm that the vessel's main equipment is in good working order and complies with regulations. The following equipment must be tested by the contractor:

Table 2 - Equipment Tests

Type of Equipment	Description
Anchoring Equipment	Functionality and reliability of anchor systems
Navigation and Communication	Operational effectiveness of navigation systems
Propulsion Equipment	Performance and adequacy of propulsion systems
Deck Equipment	Functionality of deck machinery and systems
Watertightness	Test windows, watertight doors, and hatches
Lighting Equipment	Proper functionality of the vessel's lighting

3.4.5.2 Onboard System Tests

To guarantee performance and safety, a variety of onboard systems also need to go through extensive testing. Among the systems up for testing are:

- Sewage System
- General Fire-fighting service
- External Fire-fighting system
- Freshwater system
- Ventilation and air conditioning system
- Electric system
- Lighting system.

3.4.6 Sea Trials and Certification Inspections

3.4.6.1 Sea trials

Sea trials will be carried out to confirm the vessel's speed, range, and manoeuvrability. The contractor is responsible for supplying all essential materials, consumables, and staff for these trials. Representatives from APS will be observing and monitoring these trials.

3.4.6.2 Certification and Approval Documentation

The contractor must submit all required documentation (i.e. drawings, schematics, plans, and descriptive reports) for approval by the certifying entity and to assure that the vessel satisfies current legal requirements and SOLAS convention regulations.

3.4.7 Dismantling, Assembly, and Inspections

During the repair and/or remodelling process, the contractor will dismantle and reassemble all components. APS will have ongoing access to the work sites to ensure contract compliance. Inspections by certifying agencies will also be the contractor's responsibility, and they will be accompanied by APS personnel.

3.4.8 Final Repair Dossier

After completing the vessel's repair and before provisional acceptance, the contractor must submit a "Final Repair Dossier" to APS for approval. This dossier should include numerous documentations, technical blueprints, and reports to guarantee that the vessel complies with all relevant standards and regulations. The required contents are as follows:

Table 3 - Documents to include in the Final Repair Dossier

Category	Details
Required Plans and Diagrams	- General Arrangement - Lighthouse Plan (Navigation Lights) - Stability Plan - Sewage and Fire Piping Diagrams - Electrical Schematics and Panels - Propulsion and Steering System Diagrams - Alarm List and Remote-Control Systems - Draught Plan - Electrical Balance - Firefighting Plan - Implementation Plans for New Equipment - Descriptive Reports for New Equipment
Additional Documentation	- Equipment Inventory (characteristics, specifications, CE certification, warranties) - Instruction Manuals for new equipment - Maintenance and Lubrication Plans for new equipment - Suppliers and Representatives List - Spare Parts List - Certificate of Seaworthiness

3.4.9 Vessel Delivery

The delivery of the vessel will be considered complete once the following conditions are met:

- ✓ **Final Repair Dossier Submission:** All required documents listed in the Final Repair Dossier must be submitted and approved.
- ✓ **Crew Training**: The crew must be fully trained on the operation of all naval systems and newly installed equipment.
- ✓ **Provisional Acceptance:** The provisional acceptance form must be signed to indicate the formal completion of the vessel's delivery.

3.5 Source Selection Criteria

This section deals with the selection criteria, describing which factors are taken into account, and the scoring approach.

3.5.1 Factors for overall selection criteria

The selection criteria is the most economically advantageous proposal, in accordance with point a) of paragraph 1 of article 74 of the CCP, taking into account the weighting of the following evaluation variables listed in Table 4 (APS: Programa do procedimento, 2024).

Table 4 - Weighting percentage of factors for the selection of proposals

Factors	Weighting (%)
F1 - Price	50
F2 - Quality and Technical Merit of the Proposal	25
F3 - Experience in Similar Projects	25
Total	**100**

3.5.2 Scoring of Factor 1 - Price

The score of Factor F1 - Price, a quantitative and independent element, will be obtained using the following formula for F1:

$$F1 = (1 - (Pp/Pb)) \times 100$$

Where:

$Pp = Value\ of\ the\ Proposal\ under\ Analysis$

$Pb = Base\ Price$

Before using this process, each bidder's Unit Price List will be reviewed and the final cost corrected for any inaccuracies. If the proposal price is 50% less than the base price, it is called an excessively low offer. Bidders must include in their proposal a paper offering clarifications supporting the unusually low price (APS: Programa do procedimento, 2024).

3.5.3 Scoring of Factor 2 - Technical Merit of the Proposal

Factor F2, which evaluates the Technical Merit of the Proposal, will be scored based on the technical materials provided. This includes diagrams, layouts, schematics, and equipment features. The evaluation will consider the descriptive report and all supporting documents like the work plan, labour and equipment schedules, and other relevant papers. The proposal must detail the technical characteristics of the equipment to be installed and explain how they will meet the specified operational and performance levels. Additionally, a justification for the installation design, considering the vessel's autonomy and minimum speed, must be included. The scoring for F2 will be as detailed In Table 5 (APS: Programa do procedimento, 2024):

Table 5 - Assessment, evaluation and scoring of Factor 2

Assessment	Points	Evaluation
Very Favourable	50	Proposals should include very complete descriptive reports demonstrating good knowledge of the execution methods, detailed equipment catalogues, and a well-planned work schedule. The proposal should be completely consistent with the technical solution, agreed-upon timeframe with APS, and technical specifications. Proposals should contain equipment reliability certificates, greater efficiency values for specific systems (batteries, converters, motors), and an economic analysis with evidence for calculating the Internal Rate of Return (IRR).
Favourable	40	Proposals demonstrating solid knowledge of execution methods and presenting a well-structured work plan in accordance with the technical solution and specifications.
Slightly Favourable	25	Proposals that lack sufficient clarity, have omissions in execution techniques, or do not meet technical requirements.
Unfavourable	0	Proposals that do not fulfil technical requirements or give non-project-specific solutions.

3.5.4 Scoring of Factor 3 - Experience in Similar Projects

The scoring for Factor F3 - Experience in Similar Projects will be based on the project's technicians' qualifications and experience with similar projects. The criteria are as detailed In Table 6 (APS: Programa do procedimento, 2024):

Table 6 - Scoring of Factor 3

Experience of Technicians	Points
At least two qualified technicians with experience in new electric vessel projects and conversions of similar characteristics	50
At least two qualified technicians with experience in new electric vessel projects	40
At least two qualified technicians with experience in similar projects	30
At least two qualified technicians without experience in similar projects	10

3.5.5 Final Score

The overall score (CF) for each proposal is determined by combining the evaluation factors according to this weighted formula:

$$CF = 0.5 \times F1 + 0.25 \times F2 + 0.25 \times F3$$

Scores will be rounded to three decimal places. If there is a tie in the overall score, the proposal with the lowest price will take precedence (APS: Programa do procedimento, 2024).

3.5.6 Tiebreaker criteria

The lowest-priced proposal will be preferred. If there is still a tie, the decision will be reached by drawing in front of the interested parties. Everyone present will sign a record of the drawings. The jury will contact the bidders at least two working days before the draw, specifying the date, time, and place (APS: Programa do procedimento, 2024).

3.6 Independent Cost Estimates

The technical development of the project for the requalification of the *Porto Covo* boat was primarily carried out by one of the partner companies in the NEXUS consortium. This development was somewhat handed over to this company because APS, despite having qualified employees, doesn't have ones with this type of expertise and not enough of them to develop this project in a timely manner. Although this project was produced by a third party, APS staff were always involved in the process to provide feedback on the direction to pursue as well as the vessel's requirements and criteria.

In addition to this technological development, APS chose to recruit another partner to provide technical support for this project. A company to advise and provide an unbiased

technical opinion during the development and procurement process. The service provision includes:

- Technical support for the decision to install an electrochemical storage system on the vessel, specifically: configuration design and integration with the existing electrical system; simulation of battery system use (charging and discharging), ensuring the electrical consumption needs of the *Porto Covo* boat, with an estimated calculation of technical-economic indicators (CAPEX (Capital Expenditures), payback time, levelized cost of electricity).
- Support for the design of the technical annex to the bidding document for inviting firms, which includes national and international quality, inspection, and monitoring requirements, as well as certification.
- Definition of system operating conditions, including auxiliary and gas detection systems.
- Definition of technical specifications for the tender document for electrochemical energy storage technology: power and useful energy (year 0 to year n), key indicators (degradation rates - standby, calendar, cyclic -, State of Health, charge-discharge cycle efficiency, etc.), Power-Energy-SoC (State of Charge) curves, power derating curves, HVAC/PCI(*Proteção Contra Incendios*) integration definitions, PCS(Power Conversion System)/EMS technology integration definitions, key indicator monitoring definitions, O&M (Operations and Maintenance) needs, and spare parts to be supplied.
- Support in defining the acceptance/performance test protocol for the battery system and auxiliaries.
- Definition of warranty periods and extensions to be required, definition of penalties for non-compliance; support in defining merit criteria for proposal evaluation.
- Support in the technical analysis of competing proposals and decision project.
- Technical support during the pre-hearing phase of competitors.
- Monitoring of the work and technical visits.

With all this external support and advice, APS was able to get a very clear idea of what an appropriate budget for such an undertaking would be. The decided budget was €750.000.

3.7 Make-or-Buy Decisions

It was concluded that procurement for the transformation of the *Porto Covo* was the best course of action because APS lacked the technical and personnel resources required to complete this task on its own. So, the Board of Directors of APS made the decision to enter a contract.

3.8 Change Requests and Updates to Project Documents

Any necessary changes to the contract, during its execution or extension, will be subject to prior agreement between the parties and will only be considered valid after being put in writing (APS: Cláusulas Gerais, 2024).

If either party is unable to perform under the terms of the contract because of unforeseeable events or *force majeure*, such as widespread strikes or other unrelated collective labour disputes, they will not be held responsible. When claiming unanticipated events or *force majeure*, the party must notify the other party, explain the situation, and state when it is anticipated that the condition would be restored (APS: Cláusulas Gerais, 2024).

4

EXECUTION, MONITORING AND CONTROLLING

After the publishing of the procurement and tender documents, there was a RFI after July 29. As mentioned in the previous chapter, in this procurement effort the period to request clarification and/or more information, was within the first third of the proposal submission period.

Therefore, this request for clarification was made beyond the time frame set by law. Nevertheless, the Evaluation Committee chose to reply to these delayed requests for clarification, making it clear that doing so does not mean that the time for submitting ideas will be extended.

At the end of the submission period, there was only two proposals.

Since one of these two proposals simply included the "Bidder's Declaration: Total price proposal and execution period," it ought to be immediately rejected. There was no additional documentation included with this proposal.

The other proposal was complete and apparently fulfilled all the requirements. At the time to turn in this present report, this procurement process was in the phase of analysing the valid proposal and developing the preliminary report to submit for approval to the Board of Directors, to then notify the contestants and awardee, and proceed with the other formalities to finally begin the execution phase.

5
CONCLUSIONS

With the development of this report, there were several challenges faced. The first one was to select the proper information that wasn't confidential. After that, the main challenge was to translate and reorganize the information to better suit a possible approach to the PMBOK Guidelines, hoping to achieve a comprehensive overview of the procurement process and public tender process for the retrofitting of the harbour service boat *Porto Covo* with full electric propulsion.

Even considering that this process had to obey to some national legislation, such as the CCP, and therefore the materials of the documents weren’t organized in the same way as the PMBOK Guidelines; this being a flexible project management framework, it is hoped that this reorganization and translation achieved the goal to deliver some clarity about the project, not forgetting the alignment to the procurement

A notable example of the reorganization undertaken in this project is the treatment of the performance bond, which was originally referenced across multiple clauses in two separate tender documents. Consolidating the details regarding the bond, including its payment terms and conditions for its return, into a single document or a limited number of cohesive clauses would significantly enhance clarity and accessibility for stakeholders. Similarly, the provisions related to the payment of fines in the event of delays serve as an additional mechanism to ensure compliance and accountability.

While neither the performance bond nor the fines were explicitly framed as risk management measures in the original documents, their roles in mitigating risks become evident when analysed through the lens of the PMBOK framework. The performance bond helps to safeguard against non-performance or default by providing a financial guarantee, while the fines act as a deterrent to delays and encourage timely delivery. These measures collectively reflect a proactive approach to managing risks, underscoring the utility of the

PMBOK framework in identifying and contextualizing such provisions within a structured project management methodology.

The timeframe established for the tender process warrants further consideration. Given the dual scope of the tender, encompassing both national and international participants, the deadline for proposal submission may be regarded as particularly constrained. This limitation is especially pronounced for international contenders, who were required to first translate the original tender documents to fully comprehend the requirements and subsequently translate their proposal documents into Portuguese to ensure compliance with submission criteria. Such time constraints could have posed significant challenges to international participation, potentially impacting the diversity and competitiveness of the proposals received.

As mentioned before, there was a previous attempt to procurement with a public tender that was cancelled mainly because there were no valid proposals. After that, APS regrouped and developed new tender/procurement documents this time, much more refined and specific so that there was less space for doubts and omissions so that the contenders could develop better and valid proposals. Everything Indicates that the valid proposal submitted this last time has every condition to be accepted. Hence, it is possible to state that this time around the public tender and, by consequence, the procurement process is on the road to being successful and therefore, the adjustments that APS made to the tender documents were effective.

Assuming this process continues to be successful, APS is one step closer contributing to meeting some goals of the NEXUS Agenda regarding energy solutions for ports, showing it's possible to replace conventional service vessels with carbon-free alternatives. If this materializes, the port of Sines can be one of the first ports in Portugal, to have a service boat of this kind with fully electric propulsion.

REFERENCES

© República Portuguesa. (2024). *Sociedade anónima - constituição*. Retrieved December 26, 2024, from Portal de serviços públicos da República Portuguesa - gov.pt: https://www2.gov.pt/inicio/espaco-empresa/balcao-do-empreendedor/sociedade-anonima-constituicao

2006-2024 Wrike, Inc. (2024). *What Is Project Procurement Management?* Retrieved August 2024, from Wrike: https://www.wrike.com/project-management-guide/faq/what-is-project-procurement-management/

A guide to the project management body of knowledge (PMBOK) / Project Management Institute. (Sixth Edition ed.). (2017). Pennsylvania, USA: Project Management Institute, Inc.

APS. (2022). *Agenda NEXUS é um dos projetos vencedores das Agendas Mobilizadoras do PRR*. Retrieved August 2024, from APS - Administração dos Portos de Sines e do Algarve, S. A.: https://www.apsinesalgarve.pt/noticias/2022/agenda-nexus-%C3%A9-um-dos-projetos-vencedores-das-agendas-mobilizadoras-do-prr/

APS. (2024). *História da APS*. Retrieved August 2024, from APS - Administração dos Portos de Sines e do Algarve, S. A.: https://www.apsinesalgarve.pt/aps/hist%C3%B3ria-da-aps/

APS: Cláusulas Gerais. (2024, July). Concusro público: Reabilitação da Lancha PORTO COVO - Zero Emissões. *VOLUME 2 - Caderno de Encargos PARTE I - Cláusulas Gerais*.

APS: Cláusulas Técnicas. (2024, July). Concusro público: Reabilitação da Lancha PORTO COVO - Zero Emissões. *VOLUME 2 - Caderno de Encargos PARTE II - Cláusulas Técnicas*.

APS: Programa do procedimento. (2024, July). Concusro público: Reabilitação da Lancha PORTO COVO - Zero Emissões. *VOLUME 1 - Programa do procedimento*.

AVISO N.º 02/C05-i01. (2022, January 31). *Aviso n.º 02/C05-i01/2022*. Retrieved from Direção-Geral das Atividades Económicas: https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Incentivos-Financiamento/Documentos-Incentivos/ConcursoPropostasFinaisC5i0131jan2022.aspx

Bakkah Learning. (2024). *Project Management Procurement: Examples, Process, Plan, and Benefits*. Retrieved August 2024, from Bakkah Learning: https://bakkah.com/knowledge-center/project-management-procurement

Decree Law nr. 18/2008, of January 29. (2008). *Código dos Contratos Públicos [Public Procurement Code] (CCP), Diário da República n.º 20/2008, Série I.* Retrieved from Diário da República Eletrónico: https://files.diariodarepublica.pt/1s/2008/01/02000/0075300852.pdf

Decree Law nr. 231/81, of July 28. (1981). *Código Comercial [Commercial Code], Diário da República n.º171/1981, Série I.* Retrieved from Diário da República Eletrónico: https://files.diariodarepublica.pt/1s/1981/07/17100/19281934.pdf

NEXUS. (2023, June). INNOVATION PACT DIGITAL AND GREEN TRANSITION: TRANSPORTS, LOGISTICS AND MOBILITY. *Work Package description: WP 8 – Green and Energy Solutions for Ports and Logistics*.

ProjectManager.com, Inc. (2024). *Project Procurement Management: A Quick Guide*. Retrieved August 2024, from ProjectManager: https://www.projectmanager.com/blog/project-procurement-management-quick-guide

República Portuguesa. (n.d.). *Lexionário / Instituto público*. Retrieved August 2024, from Diário da República: https://diariodarepublica.pt/dr/lexionario/termo/instituto-publico

A

APPENDIX A

A.1 A Price and Timeline Proposal Template

MODELO DE PROPOSTA DE PREÇO E PRAZO

1. ... (nome, número de documento de identificação e morada), na qualidade de representante legal de ... (firma, número de identificação fiscal e sede ou, no caso de agrupamento concorrente, firmas, números de identificação fiscal e sedes), depois de ter tomado conhecimento do objeto do procedimento por Ajuste Direto com Consulta para adjudicação do contrato "[Código do processo] – OMP.PR.24.XXX – REABILITAÇÃO DA LANCHA *PORTO COVO* – ZERO EMISSÕES" a que se refere o anúncio datado de ..., obriga-se a executar todos os trabalhos que constituem essa empreitada, de harmonia com o Caderno de Encargos, no prazo total de ... (em algarismos e por extenso) dias de calendário, pela quantia de ... € (em algarismos e por extenso), que não inclui o imposto sobre o valor acrescentado, conforme a lista de preços unitários apensa a esta proposta e que dela faz parte integrante.
2.À quantia supramencionada acrescerá o imposto sobre o valor acrescentado à taxa legal em vigor.
3.Esta proposta mantém-se válida pelo prazo de 66 dias.
4.Mais declara que renuncia a foro especial e se submete, em tudo o que respeita à execução do seu contrato, ao que se achar prescrito na legislação portuguesa em vigor.
Data, ...de ..... de .....

Assinatura,

_____

A.2 Model of Bank Guarantee

MODELO DE GARANTIA BANCÁRIA

O Banco .....(1) ..... com sede em ....., matriculado na Conservatória do Registo Comercial de ....., com o capital social de € .....,.., presta a favor de ....., garantia autónoma, à primeira solicitação, no valor de € .....,.., correspondente a ....% (percentagem), destinado a garantir o bom e integral cumprimento das obrigações que ....(2)....., assumirá no contrato que com ela a ....(3) ....., vai outorgar e que tem por objeto o fornecimento de ".....(4) .....", regulado nos termos da legislação aplicável.

O Banco obriga-se a pagar aquela quantia à primeira solicitação da .....(3) .... sem que esta tenha de justificar o pedido e sem que o primeiro possa invocar em seu benefício quaisquer meios de defesa relacionados com o contrato atrás identificado ou com o cumprimento das obrigações que .....(2) .... assume com a celebração do respetivo contrato.

O Banco deve pagar aquela quantia no dia seguinte ao do pedido, findo o qual, sem que o pagamento seja realizado, contar-se-ão juros moratórios à taxa mais elevada praticada pelo Banco para as operações ativas, sem prejuízo de execução imediata da dívida assumida por este.

A presente garantia bancária autónoma não pode em qualquer circunstância ser denunciada, mantendo-se em vigor até à sua extinção, nos termos previstos na legislação aplicável.

Data .....

Assinaturas .....

(1) -A garantia bancária deverá ser passada por um Banco ou outra instituição de crédito bancário legalmente autorizado;

(2) -Identificação do Adjudicatário;

(3) -Identificação oficial da entidade adjudicante;

(4) -Dar a designação oficial do procedimento.

A.3 Surety Bond

A companhia de seguros ....., com sede em ....., matriculada na Conservatória do Registo Comercial de ....., com o capital social de € .....,00, presta a favor de .....(1) ..... e ao abrigo de contrato de seguro-caução celebrado com ..... (tomador do seguro), garantia à primeira solicitação, no valor de € .....,00, correspondente a ...% (percentagem), destinada a garantir o bom e integral cumprimento das obrigações que .....(2) ..... assumirá no contrato que com ela a .....(1) ..... vai outorgar e que tem por objeto ao fornecimento de " ....(3) .....", regulado nos termos da legislação aplicável.

A companhia de seguros obriga-se a pagar aquela quantia nos cinco dias úteis seguintes à primeira solicitação da .....(1) ..... sem que esta tenha de justificar o pedido e sem que a primeira possa invocar em seu benefício quaisquer meios de defesa relacionados com o contrato atrás identificado ou com o cumprimento das obrigações que .....(2) ..... assume com a celebração do respetivo contrato.

A companhia de seguros não pode opor à .....(1) ..... quaisquer exceções relativas ao contrato de seguro-caução celebrado entre esta e o tomador do seguro.

A presente garantia, à primeira solicitação, não pode em qualquer circunstância ser revogada ou denunciada, mantendo-se em vigor até à sua extinção ou cancelamento, nos termos previstos na legislação aplicável.

Data .....

Assinaturas .....

(1) -Identificação oficial da entidade adjudicante;

(2) -Identificação oficial do Adjudicatário;

(3) -Dar a designação oficial do procedimento.

B

APPENDIX B

B.1 Statement of Work (SOW) for Procurement - Technical Details

This appendix is based on the document published for the procurement process "Volume II 2 – Specification, Part II – Technical clauses (Concurso Público VOLUME 2 - Caderno de Encargos PARTE II - Cláusulas Técnicas. (07 / 2024), Reabilitação da Lancha PORTO COVO - Zero Emissões), and aims to give the reader a more detailed perspective of the technical aspects of this project of reconversion.

B.1.1 Vessel *Porto Covo* Description

The nautical vessel *Porto Covo* is a vessel converted into a Maritime Security and Command Post with a local area of operation. Its main characteristics are described as follows:

- Port of registration: Sines
- Identification set: SN 111 AL (to be updated with the DGRM - *Direção-Geral de Recursos Naturais, Segurança e Serviços Marítimos*)
- Area of navigation: local
- Place of construction: Italy
- Builder: Gant – Mancini Craft snc
- Year of construction: 1989
- Gross tonnage: 35.56 tons
- Net tonnage: 10.67 tons
- Overall length: 15.86 m

- Length between perpendiculars: 14.34 m
- Beam: 5.20 m
- Depth: 2.45 m
- Hull material: Fiberglass-reinforced polyurethane
- Maximum number of people on board: 12

The *Porto Covo* vessel lacks technical documentation provided by the manufacturer. There is a scaled arrangement of images taken from a three-dimensional survey of the vessel.

Figure 4 - Vessel *Porto Covo*

B.1.2 Description of work - Technical Requirements

The contractor's proposed general arrangement must be approved by APS and the certifying entity (DGRM) for vessel structural modifications due to new equipment installation and safety regulations. The work will be divided into three major phases:

1. Restoration of the vessel
2. Conversion of its propulsion system
3. Update and reconversion of primary systems.

B.1.2.1 Technical requirements relating to supplies and services for the internal and external restoration of the vessel

The technical requirements focus on restoring and maintaining the vessel's hull, deck, and internal systems. Underwater hull tasks include addressing osmosis, repainting, and repairing components like propellers, rudders, and hydraulic systems, along with testing pumps and motors. On the upper hull and deck, work involves repairing portholes, ladders, and platforms, reupholstering cushions, and proposing insulation improvements for the wheelhouse. Safety is enhanced with non-slip deck paint and updated vessel markings.

Internally, the chain locker will be treated with corrosion protection, and the windlass serviced. In the control room, functionality is preserved with potential electrical upgrades. The pump room tasks include repairing the cooling and fire systems, while the engine room will undergo a complete equipment removal for cleaning, painting, and inspection. New fuel tanks may be installed if needed. These efforts aim to ensure the vessel's functionality, safety, and compliance.

Table 7 - Technical Requirements for Hull, Upper Hull, Deck, and Associated Systems

Section	Component	Tasks	Additional Notes
Underwater hull (*Obras Vivas*)	Osmosis	Inspect for osmosis and eliminate if found.	-
	Painting	Apply paint according to the approved scheme.	Painting scheme to be presented for approval.
	Propellers	Repair existing propellers: strip, straighten, polish, balance, and perform dimensional checks.	If new propellers aren't installed during new engine assembly.
	Water Intakes	Clean and beneficiate saltwater intake grates.	-
	Rudder System	Replace bushings, sleeves, and rudders (2 each).	-

Section	Component	Tasks	Additional Notes
	Cathodic Protection	Supply and replace cathodic protection.	-
	Hydraulic Systems	Repair port/starboard flaps, beneficiate hydraulic jacks, replace distributor and hydraulic hoses.	-
	Pump Testing	Test hydraulic pumps, motors, and associated electrical systems. Repair, if necessary, followed by a final test.	Includes remote control and signalling on the control panel.
Upper Hull / Sides (*Obras Mortas*)	Osmosis	Inspect for osmosis and eliminate if found.	-
	Portholes	Dismantle 14 portholes, replace sealing rubbers, repair hinges, polish metals, and reassemble. Perform watertightness tests.	-
	Bathing Platforms	Repair 2 platforms, supply/install stainless steel (ASTM AISI 316)* supports, treat and varnish wood.	-
	Access Ladder	Service the access ladder, polish metals, treat and varnish wood.	Ladder next to the port-side platform.
	Boarding Ladder	Service Besenzoni boarding ladder, replace hydraulic seals and hoses, test system. Repair and perform final tests if necessary.	Stainless steel hoses (ASTM AISI 316) [Specific grade of stainless steel].
	Upper Hull Painting	Paint upper hull per the accepted scheme.	-
	Vessel Markings	Paint the name, registration number (after requesting update from DGRM), and draft marks.	As per applicable legislation.
Deck, Bow, Well, and wheelhouse	Fiberglass	Spot repair and inspect for osmosis.	Eliminate deficiencies if found.
	Engine Hatch	Replace the sealing rubber and fastening screws of the engine hatch.	-
	Railing	Repair railing, supply a bow support, and polish railing and other stainless steel on deck.	-
	Seals	Provide/replace sealing rubbers for portholes, rope lockers, and chain lockers.	-
	Rub Rail	Repair the rub rail around the entire vessel.	-
	Hinges and Locks	Service all hinges and locks on the existing portholes.	-
	Cushions	Remove, reupholster, and reinstall cushions and seatbacks at the helm and control room.	Material must be waterproof and UV (Ultraviolet)-resistant.
	Seals (Glazing)	Replace seals between the windshield and radar arch, perform watertightness tests, and polish stainless steel.	-

Section	Component	Tasks	Additional Notes
	Wheelhouse Insulation	Present a project for insulating the helm, including structure installation to increase covered area.	To be approved by the contractor and certifying authority (DGRM).
	Stretcher Installation	Allocate space for a dry stretcher and supply the stretcher.	-
	Deck Painting	Develop and apply non-slip deck painting scheme.	-

Table 8 - Technical Requirements for Chain Locker, Control Room, Pump Room, and Engine Room

Section	Component	Tasks
Chain Locker	Chain Removal	Remove the chain and apply two coats of coal tar epoxy (150 microns dry thickness).
	Painting	Degrease and paint the locker and grating.
	Windlass	Service and test the windlass.
Control and Command Room	-	Maintain functionality of existing workstations, keep monitor and existing 220-230 V outlets. Increase outlets if necessary. Due to the new electrical system, the addition of outlets may be needed for better functionality.
	-	Evaluate if modifications to the communication console are needed due to compartment interventions.
Pump Room	Degreasing and Painting	Degrease the framework and gratings and paint them.
	Pump and Motor	Remove the pump and motor for workshop repairs.
	Piping	Replace piping and saltwater intake valve for engine cooling system.
	Fire System	Service the water intake valve for the external fire-fighting system.
	Fire Valves	Dismantle, service, and reassemble the fire system isolation valves.
	Fire Monitor	Dismantle, repair, and reassemble the external fire monitor and test it.
	Ventilation	Service and test the fan.
Engine Room	Equipment Removal	Remove all equipment from the engine room (engines, generator, compressor, and accessories).
	Degreasing and Painting	Degrease and paint the engine room.
	Fuel Tanks	If necessary, eliminate fuel tanks and provide a new tank for the generator and fire pump.

B.1.2.2 Technical requirements relating to supplies and services for the conversion of the propulsion system

B.1.2.2.1 Propulsion System

To achieve almost zero emissions, the *Porto Covo* boat's internal combustion engines will be replaced out with electric motors run on a battery system. To work with the present charging infrastructure, a new electrical system has been designed. To satisfy range and

performance requirements, the motor and battery must be adjusted to retain the necessary service speed while guaranteeing appropriate battery sizing, load distribution, and navigability.

B.1.2.2.2 Generic description of the configuration of systems to be installed

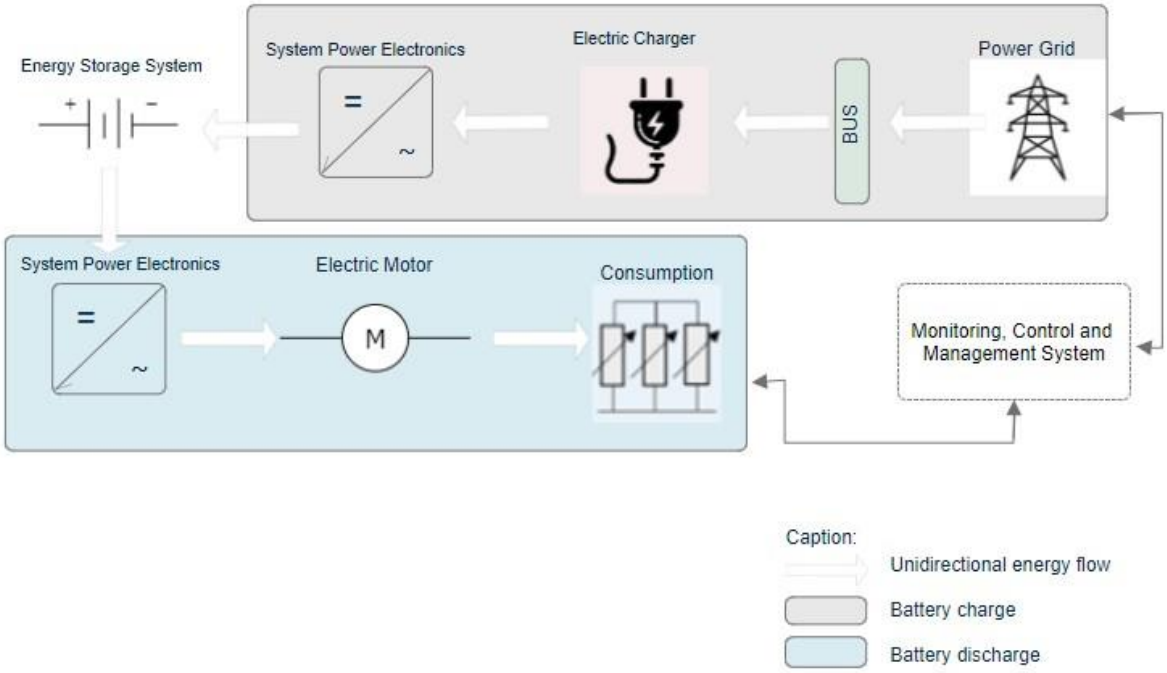

Figure 5 - Simplified configuration typology diagram for the electric Systems.

Source: Adapted from (APS: Cláusulas Técnicas, 2024)

The port's electrical system is three-phase and connected to the medium voltage power grid via a local Transformer Station (TS). In figure 4 above, the electric charger and the TS (power grid) are pre-existing.The onshore electric charger is also three-phase. The "zero emissions" system for the vessel includes battery storage and can have one or multiple inverters for different transformations (DC-DC, DC-AC, AC-DC). It also requires measurement, monitoring equipment, and auxiliary services for proper operation.

The conversion project and its respective electrical diagrams must be presented in the proposal. The proposal must include:

a) Design of the new electric propulsion system: sizing calculations for the equipment to be supplied and installed (such as motor, battery, cabling, inverters, meters, energy management system, necessary DC and AC panels, electrical protections, monitoring and control system) – specifying the motor's nominal power, the battery's energy capacity, nominal power, and autonomy; inverters; cabling; meters, etc.

b) Single-line electrical diagram of the connection of the equipment and interconnection with the existing electric charging station.
c) Supply and installation of the equipment.
d) Acquisition of the equipment described in the proposal and project.
e) Description of the installation timeline for the electric propulsion system on the vessel.

The battery groups must ensure a minimum autonomy of two consecutive hours, without intermediate charging, at a service speed of 12 knots (approximately 22.2 km/h) and must reach a maximum speed of 18 knots (33.3 km/h).

The contractor should install additional racks, allowing for a future increase in the vessel's autonomy to a minimum of 4 hours at a service speed of 12 knots and a maximum speed of 18 knots. This factor must be considered in the stability documentation.

B.1.2.2.3 Main Requirements

Table 9 - Propulsion System Main Requirements

Component	Description
Propulsion System	Two alternating current (AC) electric motors. The contractor must calculate the motors' service power to meet the specified requirements.
Motor Characteristics	Motors must be suitable for the intended use and follow the specified characteristics.
Inverters	AC-DC inverters must be supplied and installed with a minimum operating power equal to the motors' service power.
Additional Equipment	- Busbar panels -Grounding system boxes - Cabling - Other essential materials
Motor Start and Regulation	Motors must be equipped with appropriate starting and regulation devices. These can be combined with protective devices that comply with applicable rules.
Propulsion Shaft Alignment	If the existing propulsion shafts are not replaced, their alignment must be checked, and dimensional control performed. A report must be submitted.

Table 10 - Main Requirements for the batteries and battery systems

Category	Details
Battery Technology	Lithium-ion technology, selected by the contractor based on energy/power density, depth of discharge, response time, lifespan, self-discharge, safety, environmental parameters, toxicity, recyclability.
Discharge Power	Must match the electrical consumption of the two electric motors, regardless of the battery's state of charge.

Category	Details
Charging Power	Must comply with the existing electric charger, regardless of the battery's state of charge.
Energy Capacity	Minimum autonomy of 2 hours at 12 knots (22.2 km/h).
Degradation Rate	Annual degradation of usable energy capacity ≤ 1.5% over 5 years of continuous operation.
Efficiency	Minimum 90% round trip efficiency at a depth of discharge ≤ 80%, ensuring at least 6,000 cycles (End of Life Threshold).
Operating Voltage	Must be compatible with the voltage range of the electric motor and electric charger. If a voltage converter is needed, it must be included.
Energy Density	Must be greater than 100 Wh/kg.
Battery Design Considerations	- Active protection against electrical arcs and short circuits. - Fire resistance maximization. - Pressure relief systems for explosion. - Maintenance access (cell/rack replacement). - Sensors for gas and liquid spill detection (if liquid-cooled), and fire detection/extinguishing systems.
Battery Management System (BMS)	- Ensures safe operation and communication with motor inverter, sensors, and auxiliary systems (e.g., thermal control). - Must ensure electrical and communication protocol compatibility. - Must control battery temperature to ensure no more than 5ºC difference between cells.
Energy Management System (EMS)	- Integrated EMS ensures real-time safe operation of batteries. - Interfaces with inverters, BMS, and real-time measurable parameters. - Provides real-time monitoring of electrical consumption, battery charge, and autonomy via display.
Control System	Decentralized system with control from the command bridge, interfacing with: - Inverter control systems. - Battery management and monitoring. - Motor inverter control software.
Battery Sizing	Contractor must perform battery and motor system sizing calculations, simulating one complete charge and discharge cycle.
Warranties	- 3-year warranty on batteries under normal operation. - Performance warranty: energy capacity curves over time. - Availability warranty: percentage system availability. - Technical support during the warranty period.

Table 11 - Technical Documentation Requirements

Item	Details
Certified Equipment	Only proposals with certified equipment will be considered.
Derating Curves	Must include derating curves for batteries and inverters (vs. temperature, DC voltage, current).
Declaration of Conformity	Manufacturer's declaration that the product complies with applicable regulations.
Technical Documentation	Includes product information to support the declaration of conformity.

Item	Details
Digital Battery Passport	Required for industrial batteries > 2 kWh and electric vehicle batteries.
Manuals	Operation and maintenance manuals must be provided in portuguese.

Table 12 - Battery System Labels and Documentation

Item	Details
CE* Marking	Product complies with relevant regulations.
Traceability Information	Includes model, serial number, and manufacturer details.
Product Information	Details such as manufacturing location, date, energy capacity, chemistry, weight, etc.
QR Code	Provides access to the battery's digital passport.

* *Conformité Européenne*

Table 13 - Applicable Standards

Standard	Description
EN IEC 62485-5	Applies to stationary secondary batteries (including lithium-ion). Describes protective measures against risks in normal and failure conditions.
EN IEC 62619	Safety requirements and tests for secondary lithium-ion cells and batteries in industrial applications.
Excluded Standards	**EN 60086-4, EN 62133, EN 61960** - These standards apply to primary or hand-carried batteries but are not relevant for the secondary batteries required here.

Table 14 - Auxiliary Systems Requirements

Item	Details
Cooling/ HVAC* System	Applies to stationary secondary batteries (including lithium-ion). Describes protective measures against risks in normal and failure conditions.
Ventilation Requirements	Battery installation site must be ventilated (natural or mechanical). Formula: **TR = 0.05 x N x I**, where TR is the fresh air renewal rate (m^3/h), N is the number of battery elements, and I is the max current (A).
Alarm System	Mechanical ventilation stoppage must trigger an alarm and potentially cut power to the charging device.

* Heating, Ventilation, and Air Conditioning

Table 15 - Fire Safety Systems

Item	Details
Fire Detection and Suppression	Must cover the propulsion system and new electrical and battery systems.
Integration	Integrated with the vessel's command and monitoring systems for real-time information.

Table 16 - Additional Equipment Requirements

Item	Details
Seawater Cooling Intake	If not needed for the new electric motor, the old intake and associated piping/valves should be removed.
Starter Batteries for Generator Sets	Can be installed in the same area as the generator group if ventilation is continuous.
Scalability	The battery system must be scalable to allow increased autonomy of the vessel.
Dimensions, Power, Quantities	Must be calculated by the contractor and included in the proposal.

Table 17 - Location of Inverters and Monitoring Systems

Item	Details
Inverter Panels and Monitoring Systems	Must be located inside the vessel, in a safe location.
System Protection	The system must protect against overload, under-discharge, overcurrent, short circuits, and excessive temperature.

B.1.2.2.4 Other Requirements Regarding Essential Equipment

Table 18 - Generator Requirements

Requirement	Details
Existing Generator	Diesel engine with electric start, supports air conditioning, stove, and TV.
Evaluation	Contractor must decide to maintain or eliminate the generator.
If maintained	a) Remove and repair the generator.
	b) Supply and replace saltwater cooling intake valve and piping.
	c) Reinstall the generator.
	d) Conduct operational tests with APS oversight.

Table 19 - Electrical Connection Point

Requirement	Details
Charging Method	Via charger at docking pier.
Charger Specifications	Brand: ZINUS, Model: Compact ZPP215, Power: 230-690V AC, two sockets.
Energy Meters	Must be installed at connection points to the charger.

Table 20 - Electrical Power Grid Project

Requirement	Details
Replacement	Complete replacement of the existing electrical power grid.
Project Details	To be described in a detailed electrical project by a certified engineer.
Approval	Project must be submitted to DGRM for approval, notifying APS.

Table 21 - Communication and Navigation Equipment

Equipment	Specifications
Loudspeaker System	New system to be installed.
Radar System	32 NM (nautical miles) range, minimum 10" screen.
GPS*[1] System	Minimum 8" screen, with electronic charts.
AIS*[2]	Class B system.
Speed Log & Sonar	Digital with bronze transducer, multisensor.
VHF*[3] Radios	Two units with DSC/MOB*[4], programmed for APS channels.
Aeronautical Band VHF	Installed on communications console.
Civil Protection Band VHF	Installed on communications console.
Note: All equipment to be approved by APS and certifying authority.	

*[1]GPS: Global Positioning System *[2]AIS: Automatic Identification System *[3]VHF: Very High Frequency.

*[4] DSC: Digital Selective Calling; MOB: Man Overboard

Table 22 - Battery System Location and Remote Connection

Requirement	Details
Battery Compartment	Complete replacement of the existing electrical power grid.
Safety Requirements	To be described in a detailed electrical project by a certified engineer.
Remote Connection	Project must be submitted to DGRM for approval, notifying APS.
IT* Infrastructure	Installation of IT system, internet access, and DHCP* server required.

*IT: Information Technology; DHCP: Dynamic Host Configuration Protocol

B.1.2.3 Technical requirements related to the supply and service for the remodelling of primary systems

Table 23 -Technical requirements related to the supply and service for the remodelling of primary systems

Section / System	Details
Sewage, Bilge, and Fire System	- Disassemble entire system (pipes, valves, pumps) - Inspect/service mechanical, manual, and submersible pumps - Inspect/service all system valves - Replace pipes and adapt to new layout - Replace submersible electric pumps and flood alarm sensors - Test/repair high-water level alarm system - Present new layout plan considering new compartment layout.
Forced and Natural Ventilation	- Complete repair of all forced and natural ventilation systems for all compartments - Adjust to the new layout of spaces
Alarm Systems	- Full repair of all alarm systems - Adjust to the new spaces - Repair fire detection installation and alarm panel
Lighting	- Repair entire lighting system (interior and exterior) - Replace luminaires with LEDs (Light Emitting Diode) - Disassemble, service, replace, reassemble, and test telescopic mast and long-range projectors with LED ones - Replace navigation lights with LED lights, controlled by combined switches/automatic breakers from the bridge control panel - Replace long-range projectors with LED ones
Air Conditioning System	- Dismantle existing system - Supply and install new system (pumps, manual controls, piping, etc.)
Freshwater System	- Repair/upgrade entire system, adjusting to new layout - Includes pumps, hydrophore, and associated systems
Greywater System	- Repair/upgrade entire system - Suction/clean greywater tank - Service waste pump, intermediate, suction, and discharge valves - Service kitchen sink and washbasin faucets - Inspect piping and adjust to new layout
Painting	- Present painting scheme for approval - Gelcoat-covered hull with waterproof coating, antifouling copper-clad finish - Topsides with gelcoat in selected colours, UV-resistant high-gloss polyurethane finish - Waterline painted with 3 coats of *boot* topping - Engine and pump rooms with self-extinguishing topcoat finish - Deck with non-slip finish - Name, draft marks, registration painted as per legislation - Colour scheme: o Hull below waterline: Black o Hull above waterline: Black o Exposed decks: White, non-slip (Ral 9001) o Exterior superstructure: White (Ral 9001) o Exterior wood: Existing colour