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## 1 Introduction/ Background

AEB is planning to develop a Post Combustion Carbon Capture plant. The intent is to capture 480,000 tonnes of CO<sub>2</sub> annually from its flue gases. The captured CO<sub>2</sub> shall be transported, injected and stored in a depleted gas field in the North Sea. For AEB this project is important as the capture and storage of CO<sub>2</sub> guarantees continuity for its operations. Without this project, the increasing cost for CO<sub>2</sub> emission will jeopardize AEB's profitability.

## 2 Objective and scope of this document

This document describes the Scope of Work for the Main Contractor and their associated roles and responsibilities. It covers the period in which the project commences from Stage Gate 2 and typically award of this contract, up to closure for Stage Gate 3, which means the fully delivered FEL3 scope as per the scope described in this document. This documents also describes the relationship between the three parties (Main Contractor, PMC and Client team), and serves as the Terms of Reference for Client and Main Contractor.

## 3 Project Overview

AEB is exploring opportunities to lower its CO<sub>2</sub> emissions and contribute to circularity. AEB has applied for an SDE++ subsidy which was granted in 2022. The subsidy covers the capture and storage of a total of 7,200,000 ton CO<sub>2</sub> in 15 years, starting in 2028.

To meet the afore mentioned capture and storage requirements, AEB is developing a Post Combustion Capture plant (PCC) with a capacity of approximately 480,000 ton CO<sub>2</sub>/year.

Figure-1 shows the proposed location of the PCC (red marked). Flue gas will be derived from both the AEC and HRC flue gas stack.



Figure - 1 Location CO<sub>2</sub> capture plant

For transport and storage, AEB aims to enter contracts with a chain of potential partners.

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## 4 Project Objectives

The main objective of the project is to ensure continuity of AEB;

- By realizing CO<sub>2</sub> capture and storage within a predetermined time/money/quality/safety
- With CO<sub>2</sub> reduction, we help our customers to become greener and contribute to circularity.

The objective is to deliver the facility to Operations beginning 2028 (after commissioning), with respect to the schedules of the transport and storage parties. As a direct consequence of this target, construction (and Detail Design) will have to start in the third quarter of 2025. This requires FEL3 to finish in Q1 2025, allowing enough time for approvals and FID. The plan is to commence with FEL3 in Q2 2024.

The technology shall at least be at readiness level 8, considering the technology (amine scrubbing) at TRL9, but the application (WtE) and size of the plant are relatively new (flue gases), which reduces the technical readiness level slightly.

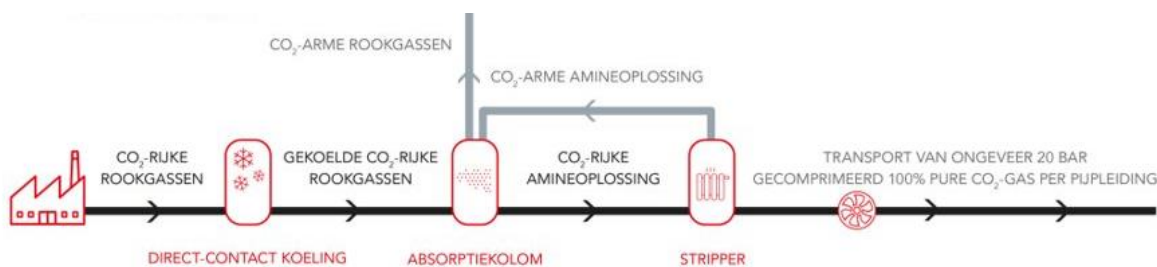
The plant shall be designed in such a way that construction on site is limited to the shortest possible period. This could be achieved by modularized designs, prefabrication, skids etcetera. Tie-ins shall be planned as efficiently as possible, which means these designs shall be ready for implementation during planned maintenance shutdowns.

The plant design shall be fit for purpose and use, and although this is simply applying logic, no gold plating is allowed.

## 5 General process description

Flue gases from the six waste incinerator lines will be collected from six tie-in points to a trunk line and routed to the PCC plant. The PCC plant consists of several subunits, such as Pre-Treatment, CO<sub>2</sub> Absorption, Regeneration, Raw CO<sub>2</sub> Purification and Raw CO<sub>2</sub> Compression and Drying. The gaseous CO<sub>2</sub> Product will be sent to the downstream pipeline up to the injection point (pipeline is out of scope).

A simple Block Flow Diagram of the PCC plant is shown in the figure below.



The amine-based post-combustion CO<sub>2</sub> capture process consists of the following process steps:

**Flue Gas Extraction:** Flue gases are generated from the incineration of waste materials in a waste-to-energy (WtE) facility. The WtE facility consists of six separate waste incineration lines. All flue gases pass state-of-art flue gas cleaning systems and meet the flue gas emission limit values in the environmental permit of AEB Amsterdam. Six tie-ins with open-close valves enable the extraction of flue gasses from the various incineration lines and are transported by means of a common truckline towards the PCC plant.

**Flue Gas Pre-Treatment:** Before entering the carbon capture system, the flue gases may undergo pre-treatment to remove particulate matter, sulfur compounds, and other impurities. This helps to protect the equipment and enhance the efficiency of the carbon capture process.

**Flue Gas Cooling:** The pre-treated flue gases are cooled to a temperature suitable for the subsequent absorption process. Cooling may also help to condense water vapor present in the flue gases.

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**CO2 absorption:** The cooled flue gases are introduced into an absorption column or tower, where they come into contact with a liquid amine solution. The amine solution selectively captures CO2 from the flue gases, forming a loaded or rich amine solution.

**CO2 regeneration:** The rich amine solution is heated to release the captured CO2 through a process called stripping. The regenerated or lean amine solution is then cooled for reuse in the absorption unit.

**CO2 conditioning:** The concentrated gaseous CO2 stream, separated during the regeneration process, is now available for further handling. This stream must be compressed, and impurities must be removed to meet the specs of the offtaker of the gaseous CO2.

**Byproduct Handling:** Depending on the specific amine used, there may be some byproducts or impurities in the process. These need to be managed appropriately, and treatment steps may be included in the overall process design.

**Continuous Operation:** The entire process operates continuously to capture CO2 emissions from the waste incineration flue gases while maintaining the efficiency of the amine solution through regeneration, recirculation and reclaiming.

## 6 Overall Project Scope

A high-level project scope description is provided below. It covers PCC and its implementation in an existing WtE facility, procurement, supply chain and project management items.

The project is considered a brown field project. Although most works are centralized on an existing empty plot, there are a considerable number of interfaces with the existing plant. This requires the design team to emphasize the importance of safety in design and execution.

### 6.1 Project scope development

The project utilizes the Front-End Loading (FEL) methodology:

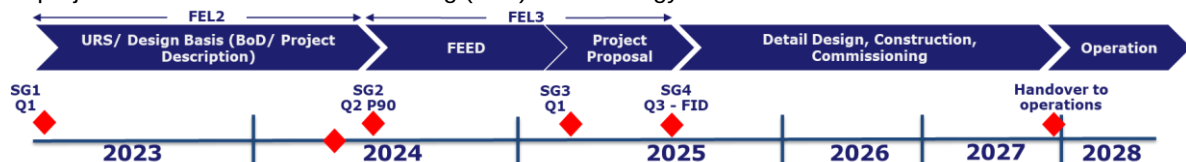


Figure 1 Front End Loading

FEL 1 has been closed. During this phase the business case has been developed and scope determined for FEL 2. At the start of FEL 2 a URS was developed and agreed upon. Subsequently the URS served as input for the BoD which has also been formally signed and will now be the starting point for the FEED during FEL 3. For more details see the paragraphs below.

All project deliverables, technical documentation and business case validation has led to a full suite of documents to be presented at stage gate 2. Stage gate 2 is planned for Q1 2024.

### 6.2 User Requirement Specification

The basis for the scope is stated in the User Requirement Specification (URS). It was developed based on the pre-FEED study and thereafter further developed by AEB SME's and the Aurora project team. It served as the basis for the Basis of Design (BoD).

### 6.3 FEL 2 (Basis of Design)

The development of the BoD was done by an external engineering contractor in close collaboration with the Aurora project team. After development of the BoD a review was conducted by AEB's subject matter experts finalizing the BoD. The BoD is a conceptual design and serves as the basis for the FEED.

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## 6.4 FEL 3 (FEED + Project Proposal)

FEL 3 comprises of two main deliverables, the FEED and a Project Proposal. The FEED is a further development of the BoD, with the objective to decide on key elements, such as materials selection, sizes, equipment and layout. Subsequently the FEED package gives directions to the Detail Design. The FEED package serves as input for estimating, scheduling and the other items that are part of the Project Proposal. The FEED covers more than half of the projects' schedule for FEL 3.

During the remainder of this schedule, the Project Proposal shall be developed. The project proposal comprises of the Execution plan, Risk management, Schedule development, Estimating, contract preparation and all other deliverables that support the main objective of this phase, being a well-informed FID.

## 6.5 Construction

After development of the FEED and after a positive FID, the construction contract shall be awarded. This phase consists of the detailed design, construction, start-up and handover of the PCC. The exact scope for this phase is developed during FEL3.

## 6.6 Ramp up and Production

After Detail Design, Commissioning and Handover, the plant shall go into operations. This phase starts with the ramp up and ends at a stable operating plant. The requirements for this phase shall be further developed during FEL 3.

## 7 FEL3 Scope

FEL 3 comprises of two main deliverables, the FEED and a Project Proposal. The FEED is a further development of the BoD, with the objective of deciding on key elements, such as materials selection, sizes, equipment and layout. Subsequently the FEED package gives directions to the Detail Design. The FEED package serves as input for estimating, scheduling and the other items that are part of the Project Proposal. The FEED covers more than half of the projects' schedule for FEL 3.

During the remainder of this schedule, the Project Proposal shall be developed. The project proposal comprises of the Execution plan, Risk management, Schedule development, Estimating, contract preparation and all other deliverables that support the main objective of this phase; a well-informed FID.

The main deliverables and their objectives for this phase are the following:

1. FEED: Develop the design up to a level where all design parameters are clear, with the objective to have a clearly defined basic design that serves as the starting point for detail design.
2. Project proposal: Prepare a Project Proposal, based on the FEED, with the objective to have a clear understanding of Capex / Opex as input for the Business Case and also for awarding a contract for the construction phase.
3. Transport and storage contracts: Ensure costs/ requirements are clear as they are input for the business case.
4. Business Case: Update the business case, and all underlying information, up to a level where a well-informed FID can be taken.

Refer to the FEL 3 Scope of Work for more details (ref. 1: AUR\_PMO\_SOW\_001).

The FEL 3 Scope of Work describes all work and associated deliverables for FEL3. It covers the FEED and the Project Proposal, including procurement/ contracting, supply chain and project management items. The FEED ends with stage gate 3, FEL3 (FEED and Project Proposal) ends with stage gate 4 (FID).

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## 8 FEL3 Organisational outlook

The full project scope of the project will be executed by an Integrated Project Team (IPT, 'Bouwteam'). The IPT comprises of three main parties, Client team, Main Contractor and the PMC. Herewith the overall roles of the three parties:

**Client team:** The client teams' main role is to ensure the scopes are executed in compliance with contractual agreements between parties.

**Main Contractor:** The Main Contractor is responsible for executing the actual projects' scope as per their Scope of Work.

**PMC:** Responsible for the adherence to the Scope of Work by the Main Contractor and overseeing and managing the total FEL3 projects' scope from a technical and managerial perspective, including all interfaces.

The client team consists of two (2) groups; The core team and the wider AEB team members.

The core team composition:

- Project manager
- Project Engineering manager
- Technologist/ SME ISBL
- Technologist/ SME OSBL
- Contract Manager
- Permitting SME
- Finance representative
- Operations liaison/ C&SU manager
- Market SME
- Admin support
- Project Director

AEB has several departments in a functional organisation setting that occasionally the IPT will have to liaise with:

- Risk & Performance
- Maintenance
- Operations
- Site management & Logistics
- Safety, Health, Environmental and Quality
- Legal
- Finance
- Project board
- Advisory board

From a project governance perspective, a project board and an Advisory board have been established.

## 9 Objectives for Main Contractor

During this phase of the project (FEL3) the Main Contractor shall deliver the following main artefacts:

- FEED (Front End Engineering Design) and all its associated documentation.
- Requisitions main equipment (10pcs)
- Project Proposal (overall project)
- Schedules
- Proposal (quote for next phase)

The role of the Main Contractor is to deliver the aforementioned documents in close collaboration with the IPT. The Main Contractor ensures the FEED is fit for purpose, taking into consideration all tie-in points, interfaces, environmental permit and their technical requirements.

It is assumed that at least the following roles/ functions shall be part of the Main Contractors'-team (dedicated, but not necessarily full time):

|                                                                                   |                                          |                 |  |                       |                                                                                                                                                                            |    |
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- Project manager
- Safety (role)
- Engineering services for the FEED
- Project Controls
- QA/QC
- Cost engineering
- Construction management/ engineering
- Commissioning engineering
- Procurement

The key resources shall be available during office hours (0900 – 1600 CET). It is not unlikely that some of the key members, depending on the phase of the project, are located within the AEB project team on site.

The mobilisation period starts at award and is assumed to be maximum four (4) weeks.

## 10 Tasks and Deliverables

### 10.1 General

The following chapters highlight the minimal requirements, tasks and deliverables. This is not to be considered an extensive list. It is assumed that the contractor understands the specifics of the requirements and will add/ amend wherever deemed necessary.

### 10.2 Validation Basis of Design

The Basis of Design is based on a typical MEA- amine scrubbing technology. During the bidding stage, the Main Contractor shall propose their solution, which could be based on MEA or any other (proprietary) amine solvent. The Main Contractor shall validate the Basis of Design on the following items:

- Suitability with their proposed technology
- Completeness and readiness for use as basis for the FEED

During this validation the Main Contractor will maintain a list of items that require additional information and/or work to get to the right level of a BoD. The items on this list will be discussed with the client and the PMC. Prior to implementing/ commencing the works, the Client shall agree on the changes.

It is assumed that the BoD will not be updated, as the BoD and the list with items shall be sufficient to serve as basis for the FEED. It is assumed that during the tender, the Main Contractor has done an initial screening of the BoD, hence most works have been identified. The validation may take maximum up to six weeks after award. FEED works can start during this assessment, as long as this does not initiate rework. After the validation of the BoD, the Main Contractor will take ownership of the BoD and the approved changes.

### 10.3 Front End Engineering Design

The technical solution, provided by the Main Contractor, shall meet the requirements as per the BoD including the proposed solution and its benefits and all suggested and agreed improvements during the development of the FEED. A 3D-model shall be prepared, and serves as the backbone for the full design. It is assumed that the FEED shall progress in three (3) review cycles, 30, 60 and 90%. These are the secondary milestones for the FEED, primary would be the final FEED package.

The name of these packages could be interpreted as a progress level. For the avoidance of doubt, it is not to be interpreted as such. '30%' in this case means nothing more than a package that is submitted at roughly 30% of the full duration of the FEED. The following paragraphs provide the Main Contractor with a description per package and what deliverables shall be at least available at the specific packages:

#### 10.3.1 30% Package

The 30% package will provide the IPT with the documents to agree on the basics of the design, such as technology implementation and general plot arrangements. It allows the team to proceed with required safety studies (Hazop etc), Plot development, TCF preparations and compliance towards the environmental permit application. Typical deliverables are, but not limited to:

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- 1/3 3D model (review). Would contain high level buildings, piping (4" and above), interfaces with existing plant, main equipment, cable traces.
- Process Flow Diagrams
- Heat & Mass balance
- Process description
- Preliminary plot plan
- P&ID's shall be 90% ready
- Cause & Effect schedule
- Preliminary Control philosophy
- Preliminary Equipment list
- Long lead assessment
- Preliminary One-line diagrams

### 10.3.2 60% Package

The 60% package will be an update of the 30% package (no intermediate updates required unless a document or package is not accepted). Furthermore, this package will contain anything that is required for final decision-making processes, with the objective to finalise the details in the 90% package. During the development of the 60% package the 2/3 3D model review will be organised with the aim to be able to finalise the 3D model, ready for review at the 60% package issue. Typical deliverables are, but not limited to:

- 3D model.
- Updated Process description
- Plot plan
- Final P&ID's
- Final Cause & Effect schedule
- Process control drawings and final control philosophy
- Instrument drawings
- Civil drawings
- Piping arrangement drawings
- Electrical drawings
- Equipment list
- Preliminary requisitions
- Preliminary MTO and Bulk MTO
- Draft TCF (Temporary Construction Facility)

### 10.3.3 90% Package

The 90% package is considered to be the final FEED. '90%' in this regard means a package that is ready to be published for review, assuming minor rework after the review. Incorporating the comments after review shall result in a 'Issue for Approval'.

## 10.4 Studies and Value Engineering

The following studies and Value Engineering items have been identified during FEL2. The IPT will collaboratively decide which of these shall be conducted and if additional studies/items should be added. The below listed studies and Value Engineering serve as the basis for the works to be executed by the Main Contractor and shall be part of the tender. Additional items may be proposed if deemed necessary.

### 10.4.1 Studies

The following list of studies is not an exhaustive list, but are the studies identified during FEL2.

1. Soil investigation
2. Underground radar mapping
3. 3D laser scan 10 pos.
4. CFD modelling
5. Logistics study
6. DCC wastewater/ FGCTP:
  - o Review identified wastewater treatment options (discharge to harbour)

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- Investigate options to reuse flue gas condensate as process water (demin vs industry water quality)
  - Review sample strategy FGC as input for design FGCTP
- 7. Cooling water Feasibility study
  - Possibility for blocking cooling water pumps 11/ 21 so two channels stay available for cooling water supply
- 8. Instrument air
  - Assess best alternative for new instrument air compressor (stand alone or part of AEB compressor park)
- 9. Heat integration
  - FEED/ Use of residual heat in condensate pre heating and / or district heating
  - FEED/ Use of medium/ low temperature heat (e.g. heat pump)
- 10. Steam supply
  - Investigate possibility of using lower pressure steam, e.g. 3,2 bara instead of 4 bara

#### 10.4.2 Value Engineering

The following Value Improving practices shall be conducted during the FEED development process. The Main Contractor shall propose a schedule for these VIP's, in such a manner that timing and prerequisites are aligned with the objective to gain as much as possible from these practices. The Main Contractor is encouraged to suggest other value engineering practices, even reducing the list, if this would add value to the project. If the Main Contractor wants to deviate from this list, then this shall be part of the proposal with a substantiation.

1. Lessons Learned capture workshop  
This consists of two parts, at the start of the FEED and at the end of FEL3.  
A lot of lessons learned have been captured from the company, but in the first session the IPT shall add their share. At the end of FEL3 the team will capture all learnings and reflect on the initial list of lessons learned and the effectiveness of implementation by the team.
2. Custom Standards & Specifications  
Assess Standards & Specs to ensure the correct set has been identified as part of the project. The full set shall not diminish the project minimal specification, but shall also not increase unnecessarily the project costs.
3. Technology Selection  
The aim is to ensure the right technology has been selected.
4. Design to Capacity  
Ensure the capacity of the to be designed facility is at the right level of the business requirements.
5. Waste Minimization & Management  
Managing, reducing and/or eliminating waste streams.
6. Process Simplification  
Workshop with the objective to ensure the most simplified process has been chosen, without affecting project objectives and systems specifications.
7. Constructability  
Identify best construction methods with the objective to reduce construction time, schedule and unnecessary works that can be eliminated. It also identifies if construction is possible as designed, and when timed right, the design can be construction driven. This includes potential works defined as per chapter 10.6.
8. Energy Optimization  
Study to optimise energy consumption.
9. Reliability, Availability and Maintainability study
10. Predictive Maintenance study  
Identify critical elements, assessed against project objectives and analyse the most appropriate maintenance philosophy that maximises project outcome for the business.
11. Life cycle Engineering Information Management  
Identify sources, critical data, storage requirements, accessibility. All with the objective to ensure data becomes information that is useful, maintainable and accessible to the business.

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## 10.5 Requisitions

Based on the equipment list and the long lead items assessment, the Main Contractor shall propose a list of items for which requisitions will have to be developed. This list will be reviewed by PMC and Client team for approval. It is assumed that for 10 main pieces of equipment and/ or services requisitions will have to be developed. These requisitions will be ready to be released for quotations in case procurement of these items will have to be novated in order to maintain the schedule. This might only involve detail design, to improve the lead time of these items.

## 10.6 Pre-FID - works

Based on project schedule requirements and AEB's overall shutdown schedule, some works might require to be developed up to Detail Design during FEL3, with the objective to execute these potential works prior to FID or as soon as FID has been taken. Although these works are not part of the scope, the Main Contractor shall execute these works as additional scope.

## 10.7 Project Proposal

The project proposal serves as the summary and substantiation of the FEED, project plan and all other deliverables and comprises of the Execution plan, technical details (FEED), Risk management, Schedule development, Estimating, contract preparation and all other deliverables that support the main objective of this phase, being a well-informed FID.

### 10.7.1 Project Proposal outline

For more details on what the project proposal shall at least consist of, refer to att.1 Project Proposal Contents. For some of the items in the attachment, this chapter (chapter 10) provides specific details.

The *Project Proposal* is NOT to be confused with the Proposal (quote) by the Main Contractor for the next phase (Engineering, Procurement and Construction); Project Proposal serves as the basis for the Proposal (Quote).

### 10.7.2 Project Proposal submission

The FEED shall be delivered in three review cycles as per the aforementioned. It is important to note that the Project Proposal shall be delivered in line with the FEED cycles. Herewith the expectations:

1. Templates  
At 30% FEED, the templates for the Project Proposal shall be issued. The objective of these templates is to agree on the contents and how it is presented.
2. Drafts (IFC)  
At 90% FEED, the drafts shall be delivered, Issued for Comments (first drafts). The IPT shall review on completeness and provide feedback and direction.
3. Final package for review (IFR)  
Once the FEED is completed, the Project Proposal will be finalised and Issued for Review.
4. Final Deliverables (IFA)  
This package shall contain all required documents at a level where the documents are considered to be completed.

## 10.8 Project Governance requirements

The scope shall be executed according FEL-methodology. Project management methodology/ by industry most accepted (best) practices shall be implemented (based on PMI/IPMA or equivalent).

## 10.9 Project Execution Plan and Schedule

PMC will prepare a project execution plan for FEL3, including a level 4 schedule, based on a document control list and Work breakdown structure.

PMC is responsible for completeness, consistency and the right level of detail enabling full control of the schedule, forecasting and reporting progress, but this does not dismiss the Main Contractors' responsibility to deliver their timely input to the Project Execution Plan and the schedule and the quality of its contents. The scope delivered by the Main Contractor (as per this SoW) will be planned by the Main Contractor and embedded in an overall schedule.

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## 10.10 Vendor/ Contractor selection and preparation

Several (sub-)contracts will be entered. For these contracts, Scopes of Work will have to be produced by the Main Contractor. PMC will review these contracts on completeness and correctness. The following contracts are expected to be developed (not limited to):

- Laser scanning
- Underground radar mapping
- Geotechnical reports
- Soil investigation
- CFD modelling (Computational Fluid Dynamics)

(Sub-)contracts shall be prepared and submitted for approval to the client after review by PMC. Without prior approval by the client, the Main Contractor shall not enter into contracts. In case the FEED is prepared by a 3<sup>rd</sup> party, as part of the proposal, this is not considered as a subcontract in regard to this paragraph.

## 10.11 Interface management

Initially, three parties are identified; Main Contractor, PMC and client team. The intent of an IPT (Bouwteam) is to collaboratively develop the FEED and the Project Proposal, with the objective to deliver these against the right level of detail and quality, in an efficient and effective manner. This will require all parties to communicate effectively and accept direct communication between disciplines.

The following specific interfaces require coordination or attention (specific roles and responsibilities per interface are states as required):

### 10.11.1 Main Contractor

The Main Contractor will potentially have some subcontracts for their part of the scope - apart from the contractor for the civil part of the work. The most likely subcontract will be the FEED contractor. There will be potential Main Contractors that have their own engineering capabilities. In case of a Main Contractor that subcontracts the FEED, the interfaces between Main Contractor and this FEED subcontractor are full responsibility of the Main Contractor, as well as other subcontracts.

RFI/Queries from these subcontractors are therefore full responsibility of the Main Contractor, although the engineers will most likely communicate with the PMC directly, as these would be part of the IPT. The PMC shall manage the communication between the Main Contractor and the client team.

### 10.11.2 PMC and Client

The Main Contractor and the PMC shall communicate with the client team daily (see organisational outlook). Whenever required, PMC will organize communication with and information from/to departments within the wider AEB.

From a project governance perspective, a project board (PB) and an Advisory board (AB) have been established. Communication with PB is full and sole responsibility of the client team. For the AB the PMC might be requested to support and/or attend the monthly session.

Other interfaces are:

- Omgevingsdienst (OD – permits): Communication would normally be through the client team, but on occasion the PMC could be requested to attend meetings or support for the environmental permit(s) and later for the construction permit.
- Municipality of Amsterdam: Regular meetings and issuance of documentation are managed by the client team. The PMC could be requested to support preparation and/or attending meetings.
- Other external parties are managed by the client team.
- Project board
- Advisory board

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## 10.12 Design Integrity

The *design integrity* is the sole responsibility of the Main Contractor, even when the FEED is subcontracted by Main Contractor. Eventually the full IPT carries the responsibility for the design, hence this is a combined effort by all parties involved. Specific responsibilities are listed below:

- Main Contractor/ FEED: Responsible and accountable for the design and its integrity.
- PMC: Responsible for following safety in design principles and assuring all have been applied as per best industry practices.
- Client: Assuring all required data has been made available and the right authorities have been consulted within AEB and beyond, if required.

## 10.13 Quality Assurance and Control

The Main Contractor will utilize their own QA/QC systems, which includes their own procedures, tools and systems to ensure the project is executed in a robust and smooth manner.

Although the Main Contractor is responsible for correct implementation of comments, responses to clarifications and design errors, the PMC is responsible for the process and management of these comments via comments reconciliation and management practices.

Once the FEED and the associated scopes are developed, the PMC shall conduct a PDRI-review (or equivalent). The score depends on the system used, but should indicate that the package is complete, fit for use and purpose, and at the right level of detail to develop a Class 1 or 2 estimate (AACE).

## 10.14 Documentation management

The PMC is responsible for document management. This entails coordinating, storing, filing and distribution of all project and technical documentation for the full project. It is assumed that document distribution of information between Main Contractor and client are also managed through this same route.

The PMC shall use their tools, systems and procedures to manage and facilitate this process. All contributors shall be granted access to this system.

Configuration management is the responsibility of the Main Contractor, but the PMC shall ensure that all changes are implemented on all documents when required. The PMC shall maintain a list of changes with the objective to track these changes and proof of correct implementation.

The PMC shall extract (or develop) a Document Control List (DCL) from its system. This DCL shall contain all forecasted deliverables and serve as the basis of document distribution and progress reporting.

It is very likely that a FEED (sub) contractor will have its own document and configuration management system. If this is a live system (works are executed directly into this system) where reviews can be conducted within the system, this system shall be used for the development of the FEED package. Reviewers will have to be granted access to this system. The Main Contractor is responsible for the management of this system. If the Main Contractor chooses to use this system, a workflow shall be part of the proposal package (tender), but to be agreed within 4 weeks after award.

The Main Contractor shall develop a Deliverables list, consisting of all documents to be delivered (as part of the proposal for this SoW). This list shall serve as the basis for the Document Control List.

## 10.15 Commissioning & Start-up preparation

Start-up preparation entails the initial start-up planning, with respect to the overall project plan, and whatever is required for a smooth start up.

The Main Contractor is responsible for the development of the commissioning plans, handbook and (turn over-) systems. The PMC will support this development but is mainly tasked with the reviews. During FEL3 this only entails the preparation of the documents and systems. Details will follow during Detail Design.

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## 10.16 Progress management & Reporting

The PMC is responsible for the overall coordination, progress and reporting. Reporting covers the full IPT, which includes the Main Contractor, subcontracts, services and the PMC.

The Main Contractor shall provide input for the reports, and shares a responsibility on timely issuance of their part of the works. All related artefacts shall be updated on a regular basis, whereas this frequency is determined by the need and logic, and in close collaboration with the PMC (and client team). Below are the minimal requirements and their frequency of updating/ publishing.

### 10.16.1 Resource plan

A resource plan shall be developed and maintained throughout FEL3. The resource plan shall cover the full FEL 3 phase and contain at least the following items:

- All Main Contractors resources
- Manhours per resource
- (Sub-) contracts
- Services
- Actuals (hours)
- Estimate to complete plotted over time

The resource plan shall be published for use after agreement with the client within the mobilisation period. After agreement, the resource plan shall be updated at least bi-weekly and issued monthly as part of the month report.

### 10.16.2 Schedule

The Main Contractor shall develop and maintain a schedule for all their works, activities and deliverables during FEL3. The schedule will be at a level 3 or 4 (depending on definition: Not necessarily resource loaded). The schedule shall be developed in Primavera, and published for use after agreement with the client within the mobilisation period. The schedule shall be updated at least bi-weekly, and published monthly as part of the month report.

### 10.16.3 Earned Value Management

The DCL and the schedule serve as the basis for Earned Value Management. How this is exactly implemented shall be discussed during mobilisation. Actual manhours are to be derived from weekly approved timesheets. The PMC shall propose their approach, which shall at least contain the following metrics, to be delivered by the Main Contractor for their works:

- Cost performance indicators
- Schedule performance indicators
- Engineering efficiency
- Team performance
- Budgeted manhours
- Estimated To Complete (Manhours)
- Estimate At Completion (Manhours)
- Approved changes

### 10.16.4 Cost control

The submitted proposal (tender) shall serve as the control budget. This control budget, schedule, resource plan and progress measurement shall be the basis for cost reporting.

### 10.16.5 Change management

Any changes to this Scope of Work are subject to change management. In addition, changes to the approved and agreed schedule and the DCL shall be discussed and agreed prior to commencing the associated works. Only approved changes shall be added to the project artefacts. Overruns that cannot be explained shall also be captured as changes.

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## 10.16.6 Reporting

The PMC shall propose a reporting procedure, but the following are the minimal requirements. The Main Contractor will deliver the required information on a timely manner that serves the below:

1. Weekly highlight report (published every Tuesday before COB):
  - a. Achieved last week
  - b. Actuals (hours)
  - c. Planned coming week
  - d. Main concerns and risk
  - e. Timesheets
2. Monthly report (within 5 working days in the consecutive month):
  - a. Achieved last Period
  - b. Actuals (hours)
  - c. Planned coming Period
  - d. Main concerns and risk
  - e. Schedule analyses (incl. CPM/CPA) and recovery
  - f. Manhour histograms and s-curve
  - g. EVM report
  - h. Cost analyses and recovery
  - i. Changes
  - j. Risks & concerns
  - k. Presentation that captures the above (shall be used for all meetings in the subject period)

Both reports shall be issued for approval (via the PMC) to the client team - project manager. The approval or rejection shall follow within 48 hours.

## 10.16.7 Meetings

The following meetings are minimal required:

1. Within 4 weeks after award, a kick off meeting shall be held. This meeting will be arranged by the Main Contractor and shall cover general topics but also the FEED activities.
2. Weekly progress meetings: attendance by all that are working on activities within the discussed period (Project engineer and key disciplines for FEED). This is a short meeting (maximal 1 hour) to share any issues that may arise and impacting safety, progress, cost or quality. In this meeting an action and decision register shall be updated and maintained by the PMC.
3. Monthly progress meetings: Full IPT attendance. The PMC presents the presentation that was issued with the monthly report.
4. Financial meeting: Project management of all parties to attend, and present their status and forecast.
5. Technical meetings: weekly, but only if required.

The PMC shall draft Terms of References (ToR) for all meetings listed (excluding the Kick off meeting). These ToR shall be concise, clear and fit for purpose. These are simple documents that trigger preparation and clearly set the requirements for the meetings. The PMC shall manage, coordinate and minute these meetings.

## 10.17 Estimating preparation, budgeting and reviews

The PMC shall develop the management cost estimate. The Main Contractor shall support this effort and deliver data whereas required. This cost estimate serves as a counter estimate and preparation for FID. This estimate consists of the full capex estimate from FID until full acceptance by AEB-operations, and the Opex costs including identified potential future reinvestments. This estimate shall be based on an accepted FEED. It is expected that for the main equipment requisitions will be produced by the Main Contractor (10pcs).

## 10.18 Regulatory requirements

A construction permit will have to be obtained. The PMC shall prepare this permit application in close coordination with the Main Contractor (sizes, weights, plot plan, schedule etc) and the client team. The PMC is responsible for timely application and completeness of the package.

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## 11 Abbreviations

|       |                                                     |
|-------|-----------------------------------------------------|
| AACE  | Association fir the Advancement of Cost Engineering |
| AEB   | Company                                             |
| AEC   | Afval Energie Centrale                              |
| BoD   | Basis of Design                                     |
| Capex | Capital Expenditure                                 |
| CE    | Cost Estimate                                       |
| CO2   | Carbon dioxide                                      |
| COB   | Close of Business                                   |
| CPA   | Critical Path Analyses                              |
| CPM   | Critical Path Method                                |
| DCL   | Document Control List                               |
| EVM   | Earned Value Management                             |
| FEED  | Front End Engineering Development                   |
| FEL   | Front End Loading                                   |
| FID   | Final Investment Decision                           |
| HRC   | Hoog Rendement Centrale                             |
| HSE   | Health, Safety and Environment                      |
| IFC   | Issued for Comments                                 |
| IFR   | Issued for Review                                   |
| IFA   | Issued for Approval                                 |
| IFU   | Issued for Use                                      |
| IFI   | Issued for Information                              |
| IPT   | Integrated Project Team                             |
| ISBL  | Inside Battery Limits                               |
| OD    | Omgevingsdienst                                     |
| Opex  | Operational Expenditure                             |
| OSBL  | Outside Battery Limits                              |
| PCC   | Post Combustion Capture                             |
| PMC   | Project Management Consultant                       |
| Q     | Quarter                                             |
| RFI   | Request For Information                             |
| RFSU  | Ready For Start Up                                  |
| SME   | Subject Matter Expert                               |
| SOW   | Scope of Work                                       |
| ToR   | Terms of Reference                                  |
| URS   | User Requirements Specification                     |
| VOWD  | Value of Work Done                                  |
| WtE   | Waste to Energy                                     |

## 12 References

ref. 1: AUR\_PMO\_SOW\_001

|                                                                                   |                                          |                 |                        |    |                                                                                     |
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## Att. 1: Project Proposal Contents

### Technical

- Project Summary  
Description of the project and its background. The intent of this section is to give the reader a high level of understanding of the project, such as main objectives, location, limitations, risk and opportunities, technical solutions, decisions etc.
- Project Description;
- Plant layout and location;
- Process description, design basis and performance specification;
- Equipment list with equipment capacity, size, datasheet, tag number, etc;
- Major materials and equipment list;
- Major mechanical, electrical, and utility requirements (type and quantity);
- Drawing index and drawings (A clear index of all drawings that define the scope of the project);
- Listing of Mandatory standards;
- Site survey, topography and soil data (Geotechnical Investigation);
- Demolition and modifications to existing facilities/plants;
- Operating variables;
- Corrosion control;
- Impact on and interface with other related projects and/or existing facilities;
- Compliance with Environmental Impact Assessment and Permit application;
- Facilities' security, fire protection & safety provisions;
- Control systems (including SCADA) provided with Control System Block Diagram or System Architecture, instrument index, instrument cable routing and I/O count breakdown;
- Process & utilities system definition and turnover sequence;
- Piping, electrical and control system tie-ins, hot tap/stoppole operations plan and shutdown needs;
- Studies and Assessments (see Section 3.2.6);
- Site Investigation Report;
- Pre-commissioning and Mechanical Completion Plan;
- Commissioning and Start-up Plan;
- List of items exceeding (over-specification) BoD and or Permit application requirements;
- Compliance with security and control of Engineering Data requirements (AEB standard);
- Compliance with Value Assurance Plan and Value Improving Practices;
- Implementation of Modularization requirements per Modular Design Assessment (MDA);
- Scope changes (deviation from BoD);
- List and substantiate any changes that are a deviation from the BoD. In this instance, also any design(s) that exceed the requirements as per the BoD (as per par. 10.2);
- Communication requirements;
- List specific requirements for communication equipment, if applicable;
- Security and Safety requirements;
- List specific requirements, if applicable;
- Minimal Viable Business case/ Over-specification report and recommendations;

### Project Execution Plan

- Project Summary (see above);
- Project Quality Plan;
- Strategy for the project's compliance with Project Quality Plan requirements;
- Risk management plan;
- Engineering management plan;
- Information protection and security plan;
- Transition and Close out requirements;
- Schedule management plan and overall schedule;
- Communications, including government approvals, if required;
- Drawing and Tag-management: Requesting/returning of drawings/tag numbers;
- Identifying Operating Instructions for New Facilities and Project Records requirements;

|                                                                                   |                                          |                 |  |                        |                                                                                                                                                                           |    |
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- Training requirements;
- Temporary and permanent on-plot and off-plot facilities;
- Construction management plan (incl. logistics and interfaces wit operations);
- Estimating plan;
- Materials and equipment selection and requirements;
- List of identified materials and equipment, and their lead times. Long lead items and materials assessment study report and recommendations;
- List of identified critical spares;
- Startup spares;
- List of identified startup spares;