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BIDDING FOR ESA CONTRACTS: THE ESSENTIAL GUIDE

Information, pointers, case study, tips & links to further reading to help you compile a successful European Space Agency (ESA) bid

→ PECS

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Produced by KI Bid Consulting for the Bulgarian Space Cluster

Target audience

This Guide to the Essentials of Bidding into ESA is written for businesses wishing to win European Space Agency (ESA) work. You may have already submitted one or more bids directly to ESA or into an ESA programme via another organisation and wish to improve your score. Or you may be new to bidding for ESA funding. This Guide is aimed at bidders who have very little or no ESA experience. It may also be applicable to academic institutions, though that is not its primary focus. It is not aimed at organisations who are mature at winning ESA work.

Objective of this Guide

The aim of this Guide is to provide you with the knowledge and understanding to be able to submit a winning proposal for ESA funding. It is intentionally structured as one document (a '**hub'** of information) to create a consolidated repository of all the key points. Reading each section should give you a good understanding of what to do and what is expected, but if you want to dive deeper into a particular topic, look out for links to external information and points of contact throughout the document. A glossary of terms is also included and can be helpful if you are not familiar with ESA.

It is structured in 3 sections:

1. About ESA & ESA funding
2. About the ITT
3. How to write your bid

Annexes:

1. Typical ESA mission phases and key milestones
2. Frequently asked questions – provides links to sections in the document
3. Glossary
4. ESA example ITT and case study

Throughout the document you will see call out boxes. Grey and blue coloured ones provide key information or helpful tips, yellow ones provide links to further information.

NAVIGATING THIS DOCUMENT:

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This issue of the Guide has been updated for the Bulgarian Space Cluster, with help from Liubomir Baburov and Irina Gancheva.

Disclaimer

Please note that this Guide has been prepared by KI Bid Consulting for the Bulgarian Space Cluster. Its aim is to provide helpful guidance to organisations wishing to bid for ESA contracts - it is not official ESA guidance, and its contents have not been validated by ESA. Please be reminded that it is generic in its nature, and bidders must always refer to the ESA tender pack for specific requirements and instructions about their bid. The ESA tender documentation always takes precedence over any information given in this Guide.

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0 Introduction

Countries wishing to become ESA Member States go through the following stages:

- European Cooperating States (ECS)
- Associate Members (AM)
- New Member States (NMS)

Bulgaria is an ESA European Cooperating State (referred to as ECS, or PECS). Countries at this stage each have a funding scheme dedicated to raising national technology capabilities (referred to as a Plan for European Cooperating States, or PECS). ESA funding is specifically targeting identified national technology capabilities, and therefore countries on the PECS framework respond to the country-specific PECS Calls. The mandatory or optional programmes tendered by ESA are typically not available to PECS countries. This is further described in section 1.4.1.

Typically, your application for ESA funding will be in response to a PECS call for Bulgarian organisations. These PECS calls are issued on ESA's tendering platform (ESA STAR) and require you to respond to a Call for Proposals. Section 3 of this Guide focuses on writing your bid response and includes tips and examples to help you create your bid.

A **glossary** is provided in Annex 5. If you are new to ESA work, this can be a helpful starting point for understanding the many acronyms.

Frequently Asked Questions have been compiled in Annex 2. These cross-reference to the relevant section in the Guide.

> One recurring theme you will see throughout this Guide is that, regardless of whether you are bidding directly to ESA or via another organisation, it is vital that you read the tender documents carefully. They contain everything you need to do, and non-compliance could lead to early elimination of your bid.

Throughout the document, key information and tips have been highlighted in blue and grey call out boxes (as above). Helpful links for further information are highlighted in yellow call out boxes.

Please note: even though there is a distinction between Invitation to Tender, Request for Proposal, Request for Quotation and Call for Proposals, **the term 'ITT' or 'tender' is used throughout this Guide as a general term for any tender or call.** This is done for ease of reading.

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Part 1 – About ESA

This section provides an overview of the ESA procurement process, a brief description of key funding lines and particular points to note when applying for funding. It will help you answer the following questions:

- What is particular about bidding into ESA?
- What funding channels are there and which one(s) should I choose?
- Am I eligible to bid into ESA?

1.1 Mindset of bidding into ESA

You may be used to bidding into commercial and institutional customers across various industries or sectors. Whilst the bidding processes you will have followed will have similarities with the ESA process, it is important to understand the ESA way of bidding, as it differs in a few key ways.
Moreover, getting into an 'ESA mindset' when writing your bid will help you focus on the key points. The typical defining elements of an ESA tender are:

ESA has a very formal procurement process

Transparency is key

The budget is usually set by ESA

ESA is an intelligent customer

- **ESA has a very formal and prescriptive procurement process:** ESA is a large, intergovernmental organisation, acting on behalf of its 23 Member States. It is bound by its founding Treaty (the Convention) and by the set of rules and regulations emanating from it. These rules and regulations have been agreed with all Member States, and are 'non-negotiable' on individual bids. Acceptance of key clauses is a pre-requisite for acceptance of the bid into the review process (termed Key Acceptance Factors). As such, the ESA bidding process is very formal and all aspects are formally documented in the Contracting Regulations (formerly called Procurement Regulations). Tender documents are very prescriptive, evaluation criteria are clearly set out and tender evaluations follow a very clearly defined process.

- **Transparency is to be demonstrated throughout the procurement process**. The fundamental principles guiding ESA's activities are: *technical quality and fair and reasonable costings, transparency and fairness, open competition, and balancing the work share for Member States* (so individual Member States get back what they invest). As such, bidders are required to provide a high level of detail in their proposals, pricing is very detailed and provided on ESA's pricing templates, evaluation is done in a very formal manner through a formal Tender Evaluation Process and communication is restricted during the bid phase to formal clarification questions. Larger programmes will have requirements for work to be performed in certain countries (referred to as geographical return). Moreover, on larger programmes through a process referred to as Best Practices Procurement, ESA can contractually impose the tendering requirement it has to follow onto the Prime contractor – meaning that the Prime must run their procurement campaign in the same way ESA would.

- **ESA's tender documentation usually defines a budget for the scope of work**. In the vast majority of tenders (apart from those relating to a mission), the indicated budget will be a maximum, do-not-exceed figure (and one of the Key Acceptance Factors). This means that the budget is a hard limit and non-negotiable. If your bid exceeds this budget, it is likely that your submission will not be admitted for evaluation.

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- **ESA is an intelligent customer**, and all elements of the bid will be reviewed in great detail and by multiple people. If something is not consistent or incorrect, it will be picked up by the evaluation process. Note that ESA's Tender Evaluation Boards (TEB) are made up of experts who evaluate the bid against the evaluation criteria they themselves set and they can only take into account what is written in the proposal (see box to the right). ESA expects bidders to demonstrate understanding, apply critical thinking and problem solving to arrive at the best outcome – not just for the technical/engineering elements but also for the project management, procurement, quality, financial and contractual elements. A tailored response is required for each bid, demonstrating (and building confidence in the reviewers' minds) that the bidder has understood the objectives and is seeking to provide the best solution.

> **As a bidder, checking the consistency across your bid is key.** The reviewers can only assess what is written, and in the case of inconsistency, they will not know which part of your proposal is correct, resulting in a comment of 'unclear' from the TEB and most likely a poor score.

1.2 Eligibility – who can receive funding from ESA?

To answer the question of whether you are eligible to apply for funding for a given opportunity, you need to consider two elements: **general eligibility** for you as a business and **bid-specific eligibility**.

1.2.1 General eligibility

ESA sets out some general requirements which must be met in order to submit a tender and ultimately be awarded a contract by ESA. This applies whether you are bidding directly into ESA or via another company. In summary:

> The full list of **ESA's general eligibility criteria** can be found in the Contracting Regulations, here:
> esa-star Publication
> ESA/REG/001, rev. 6 (Jan 2025), Part III Article 12

- You must be part of a Member State, an Associate Member State or part of the PECS framework. This means meeting the ESA eligibility criteria for nationality as set out in the Contracting Regulations (see yellow box). These cover location of registered office, location of decision making centres, location of research centres and territory on which the work is carried out. As you go through the 'light' and 'full' registration processes, you will need to answer questions on your company structure to determine these answers. If you are unsure about categorising your entity's nationality, please contact the Bulgarian Space Cluster for help.
- *Please note:* ***if you have offices or facilities in different countries****, you will need to register each one separately on ESA STAR. For example, if you are headquartered in Bulgaria, but have an office in Spain, and as part of a bid you are preparing, you plan to carry out work in both countries, you will need to register the Spanish and Bulgarian entities separately. The Spanish and Bulgarian entities will have two different ESA identification codes (called ESA bidder codes), and for the purposes of the bid and project will be treated as separate entities.*
- You must have the necessary professional and technical qualifications and competences, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, and the personnel, to do the work.

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- You must be registered on the ESA STAR online portal. A 'light' registration[1] is sufficient in the bid phase, but 'full' registration must be completed prior to contract award. Registration involves completing an online questionnaire, and updating the information every 12 months.
- You must comply with ESA's requirements around bankruptcy, misconduct, criminal activity, etc. Follow the link in the yellow call out box for the full list.

1.2.2 Bid-specific eligibility

Bulgarian businesses are eligible to submit proposals in response to PECS (Plan for European Cooperating States) calls for Bulgaria (see section 1.4). These take the form of Calls for Proposals (CfP) and can be found on ESA STAR. They are exclusively for Bulgarian companies, including SMEs, academic and research organisations. They can also include non-Bulgarian subcontractor participation, with a limited budget not exceeding 20% of the total price.

1.3 Small and Medium-sized Enterprise (SME) – Criteria and benefits within ESA

If you think you are an SME, it is worth registering as such with ESA, as there are certain benefits you could be eligible for.

To check whether you meet the criteria of an SME: the definition of an SME as recommended by the European Commission is used, the definition of which is here: EUR-Lex - 32003H0361 - EN - EUR-Lex and summarised in the table below:

Company category	Staff headcount	Turnover or Balance sheet total
Medium-sized	< 250	≤ 43 million Euros
Small	< 50	≤ 10 million Euros
Micro	< 10	≤ 2 million Euros

Figure 1 - Categorisation criteria for SME

(taken from EUR-Lex - 32003H0361 - EN - EUR-Lex)

1.3.1 Benefits of registering as an SME

If you are an SME, visit the ESA SME Portal, which contains information on industry days, programmes of interest to SMEs, training material and other useful information relevant to SMEs.

Additionally, if you are validated as an SME, you could benefit from special SME tendering and payment conditions. For example, SMEs are eligible for up to 35% of the contract value as an advanced payment option. Details of specific SME benefits will be detailed in the tender documentation. See the links in the yellow call out box for further details.

For further information on how ESA supports SMEs:

ESA SME Portal:

ESA - Small and Medium Sized Enterprises

SME Helpdesk - SME-Office@esa.int

ESA - SME Office

[1] Registration is through an online questionnaire. Light registration is sufficient to create a bidder reference number in the bid phase, but the full questionnaire will need to be completed and approved before a contract can be placed. See section 2.4.1a) for more information about 'Registering on ESA STAR'.

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1.4 Which funding channels are there and which should I apply for?

This section is divided into two parts. The first part discusses PECS opportunities, which are specific opportunities open to Bulgarian organisations (as Bulgaria is part of the PECS framework).

The second part discusses other ESA funding lines, which are not open to PECS countries, but for completeness, it is important to be aware of them. More details on these can be found in Annex 3.

1.4.1 PECS (Plan for European Cooperating States)

The Plan for European Cooperating States (PECS) is designed to prepare countries to join ESA as Associate Members and later, pending review, as Full Member States. This is done by having a country-specific funding scheme dedicated to raising technology capabilities. At the time of writing, 3 countries are part of the PECS framework: Bulgaria, Malta and Croatia.

Typically, countries are under the PECS Charter for at least 5 years (but this varies between countries), enabling a country to increase its knowledge of ESA and develop its space industry, thus improving its chances of winning contracts in the future. At the end of the PECS period the progress of the country's industry is assessed, and a decision is taken by ESA and the respective country on becoming an Associate Member.

Further reading:

ESA PECS

Under PECS, a country contributes 1.4 M€/year to ESA (with an option to increase this), the majority of which is returned to the country in the form of contracts to industry as part of Competitive Calls for Proposals published on ESA STAR several times a year.

To find available opportunities, log onto ESA STAR (you will need to register first), and search for PECS opportunities for Bulgaria. It is a good idea to discuss your technology with your Industrial Coordinator or the Bulgarian Space Cluster before applying for ESA funding.

a) Including other businesses in your project team

One of the key focus areas ESA looks for on PECS applications is the inclusion of businesses from Full Member States and Associate Member States in the team. Whilst the prime (lead) must be from the PECS country (in this case Bulgaria), businesses from other Member or Associate Member States can participate in the project with up to 20% of the total price. This is encouraged by ESA as it is a key part of the preparation activities to becoming an Associate Member and helps businesses build an international supply chain network.

Typically, an international subcontractor on your PECS bid could participate in the following ways:

- Customer role: defining requirements, participating in reviews, performing customer level tests
- Partner role: performing a part of the work (that does not generate IPR), working on a joint project
- Consultant role: providing review help and advice / PA / QA mentoring
- Testing role: performing some of the testing

b) Joining another PECS / AM team as a subcontractor

Additionally, you can be a subcontractor on other country's PECS calls as well as calls for Associate Member States (referred to as RPA calls). Check ESA STAR for these opportunities, and if you have suitable technology, reach out to these countries through your Industrial Coordinator or the Bulgarian Space Cluster.

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1.4.2 Other ESA funding lines

ESA has many programmes and funding lines, but these are only available to Full Member and Associate Member States. Countries on the PECS framework have country-specific funding schemes dedicated to raising technology capabilities. These can be found on ESA STAR – search for PECS Bulgaria.

Whilst the non-PECS funding lines are not available to PECS countries, it is important to understand some key points about ESA funding lines, for context. These are described in a) and b) below, and further in Annex 3.

Sometimes ESA manages programmes in collaboration with the European Commission, such the Copernicus, Galileo and IRIS^2 programmes. Bulgarian businesses may wish to tender for work on these programmes, which are open to all EU Member States (thus including Bulgaria and other PECS countries). However, programmes such as these will have specific requirements regarding their bid content and presentation. This is not covered in this Guide, but should you wish to find out more, reach out to the Bulgarian Space Cluster.

a) Mandatory and optional programmes

There are 2 types of programmes within ESA – mandatory and optional programmes. **Mandatory programmes** are those which Full Member States must participate in, and their contribution is calculated based on their Gross National Product (which means ESA can plan ahead as the funding and participation is guaranteed). The amount of workshare each Member State receives back is a factor of how much they invested (see geographical return). Mandatory programmes are only open to Full Member States.

Optional programmes are ones that Full Member and Associate Member States can opt in to, and work share is limited to those participating states. The contribution is set by the country, and can be higher or lower than the normal GNP % used for mandatory programmes. Each country decides on its participation in optional programmes – it is determined by the technical and industrial interest of the country.

b) Different types of funding lines

ESA has many different funding lines, and they target different things. Some are geared towards R&D activities, some towards missions. The fundamentals of ESA's procurement process apply to all programmes, however, the specific processes for a particular funding line may be slightly different.

Some funding lines have a two-stage process, where an outline proposal is submitted first, followed by a full proposal. Typically, the outline proposal will be submitted via a different platform to the full proposal.

Each funding line sits within an overarching ESA Directorate.

Further information on these funding lines in include in Annex 3.

Please remember that Bulgarian business can only apply for funding:

- For PECS Bulgaria calls
- As a subcontractor for other PECS or Associate Member calls
- Or for tenders funded by EU programmes, though these are not discussed in detail in this Guide.

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1.4.3 Intended ITTs

These are published under ESA STAR Publication, and show planned procurements under Open Competition and Calls for Proposal. See section Intended ITTs for further information.

1.4.4 Where can I find out more?

- Liaise with the Bulgarian Space Cluster team to discuss your plans.
- Check ESA STAR – search for PECS Bulgaria – for available open calls.

1.5 Bulgarian Space Cluster: where can I get help?

1.5.1 Bulgarian Space Cluster and ESA

The Bulgarian Space Cluster is a bridge between research, start-ups and industry. It sources funding paths, runs matchmaking events, and provides actionable guidance so Bulgarian companies can scale in space markets.

Whilst the Bulgarian National Delegation sits within the Ministry of Innovation and Digital Transformation, the Bulgarian Space Cluster is an independent network formed by Bulgarian space companies and does not represent either ESA or the National Delegation.

1.5.2 Bulgarian Space Cluster - where can I get help?

The Bulgarian Space Cluster organises outreach events, industry days (focusing on upcoming PECS Calls for Proposal) and workshops. To find out more and get involved, see the links in the call out box.

Reach out and stay in touch with the Bulgarian Space Cluster:

Sign up to the newsletter

Follow on LinkedIn

Visit the website: www.spacecluster.bg

Get in touch at: hi@spacecluster.bg

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2 Part 2 – The ESA Procurement Process & ITT

This section gives an overview of the ESA procurement process, the ESA STAR platform and what to expect in a typical tender document from ESA or a Prime.
It will help you answer:

- Where do I see upcoming and current ITTs?
- How do I download them?
- What do I need to look for in the ITT documents?
- What if I have a clarification question?
- What is the OSIP platform and when do I use it?

This section applies in most part to countries on the PECS framework. Where PECS processes differ, this has been highlighted below.

2.1 Key steps in the ESA procurement process

ESA has a very well-defined procurement process. The simplified flow chart below shows the fundamentals of the procurement process, with key elements described in further detail below. Please note that this is a simplified version which has been generalised across all types of programme. Whilst the procurement process across the various funding lines and types of opportunity broadly follows the same steps, there are, however, differences specific to certain programmes. The exact process to be followed is described in the tender documentation to which you are responding.

Note: the term ITT (in this context) refers to any type of tender, including Calls for Proposals.

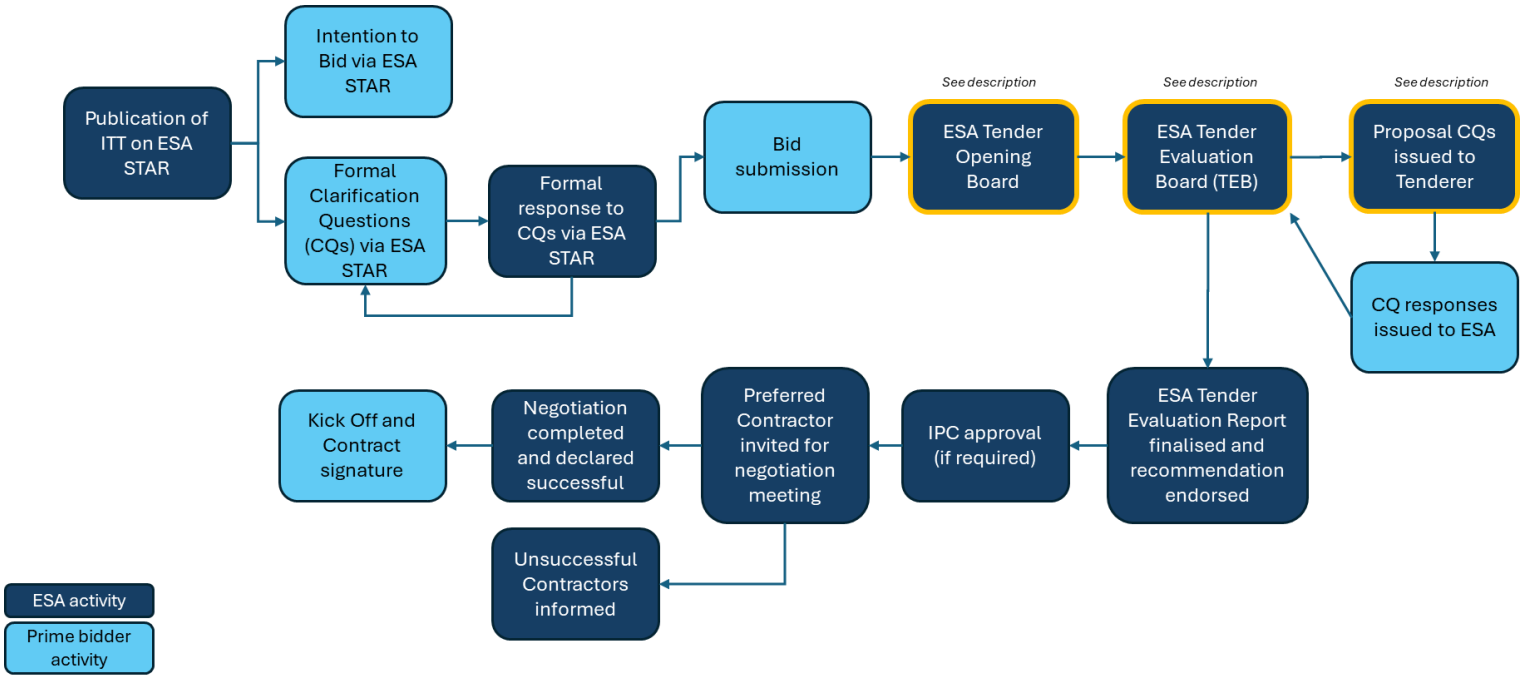


Figure 2 - Overview of ESA's procurement process

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2.1.1 Tender Opening Board (TOB)

After the closing date and time stated in the ITT, the tenders are opened by the Tender Opening Board.

This is ESA's formal procedure for opening the tenders received and carrying out initial validation checks.

Typically, the TOB checks that the tenders were received before the closing date and time indicated in the ITT (or extension if granted). However, other Key Acceptance Factors (KAF) may have been defined in the tender documentation and are verified by the TOB. KAFs are clearly indicated in the ITT cover letter or Contract Conditions. During the validation checks performed by the TOB, the detailed proposal remains locked. Successful tenders will go through to the next step in the process (TEB), unsuccessful bidders will be notified.

> Note that ESA ITTs have a deadline for submission via ESA STAR. After this time, the portal will no longer be open and it is not possible to submit your bid.
>
> **Don't leave your bid submission to the last minute!**

Where no tenders have been received, or all tenders received have been ruled non-admissible, ESA will decide whether to re-issue the ITT, either unchanged or amended, or cancel the procurement.

Where only one tender has been received, ESA can choose to either re-issue or cancel the ITT; or continue with the procurement under a non-competitive process. The latter is typically chosen if it is considered that the same outcome would occur again if the tender were repeated, or on grounds of extreme urgency.

2.1.2 Tender Evaluation Board (TEB)

Ahead of ITT release, all members of the TEB agree the Statement of Work (SOW), Cover Letter, evaluation criteria, weighting factors and timings for the TEB.

The Tender Evaluation Board initially checks that the tenders admitted for evaluation by the Tender Opening Board are complete and include all bid deliverables as required in the conditions of tender.

If a key bid deliverable is found to be missing, the TEB should reject the bid from further evaluation. To avoid this, ensure you read the ITT and include all requested documentation.

If all is found to be in order, the TEB will proceed to evaluate each tender in line with the evaluation criteria defined in the ITT.

> Bids are scored against the evaluation criteria set out in the ITT, not against other bids.

All bids are reviewed independently by all members of the TEB. They then meet to discuss and agree comments and scores. Note that bids are scored against the evaluation criteria set out in the ITT, not against other bids.

As a general rule, you must score at least 40 in every criterion to move to the next stage (weighted scores) – see example below. Be sure to read the Cover Letter of your opportunity, as this sets out the evaluation criteria and weighting factors, and may include bid-specific minimum marks or thresholds, if they apply.

The price and geo-return are not marked (see note on costings below).

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a) Typical evaluation criteria & weighted marks

Each tender will include the evaluation criteria and weighting applicable to it. This is agreed by the TEB before the ITT is issued. As a guideline, the following table shows what criteria you may expect and likely weighting for each (total weighting will add up to 100%):

The ITT will contain a scoring table with, typically, 2-8 evaluation criteria (with 3-5 being the norm). An example is shown below, but the specific evaluation criteria will be set out in the ITT.

Evaluation criteria	Typical weighting range
Background and experience of the company(ies) and staff related to the particular field concerned. Includes adequacy of facilities	10-20%
Understanding of the requirements and objectives and discussion of problem areas	15-30%
Quality and suitability of proposed programme of work, adequacy of engineering approach	20-35%
Adequacy of management, costing and planning for the execution of the work	15-20%
Compliance with administrative tender conditions and acceptance of contract conditions	10%

Table 1 - Example evaluation criteria and weighting

These criteria may vary from one ITT to another. Evaluation criteria are established and published for each ITT. Weighting factors are attributed against each of the evaluation criteria including in some specific cases non-competitive tendering procedures (RFQ) and are specified in the ITT.

A note on costings: the costings are reviewed, not the price. The costings have to be fair and reasonable. This means that a bidder from country A could be more expensive, but have a fairer and more reasonable costing than a bidder from country B, who is cheaper but the costings are less fair and reasonable. In this case, the bidder from country A would score a higher mark, assuming that both bidders comply with the allocated budget.

For non-mission related procurements, a recommendation is made based on the weighted scores to determine the successful bidder, as shown below:

Example:

ESA Marking:

100 Perfect

90 Excellent

75 Very good

60 Good

50 Fair

40 Barely acceptable

<40 Below acceptability

Example1:

WF: 15,25,30,20,10

Criteria 1: Fair, U 50, W 7.5
Criteria 2: Good, U 60, W 15
Criteria 3: Good, U 60, W 18
Criteria 4: Barely Acceptable, U 40, W 8
Criteria 5: Excellent, U 90, W 9

Total: 57.5

Example2:

WF: 15,25,30,20,10

Criteria 1: Excellent, U 90, W 0
Criteria 2: Below Acceptable, U **30**, W 0
Criteria 3: Good, U 60, W 0
Criteria 4: Barely Acceptable, U 40, W 0
Criteria 5: Excellent, U 90, W 0

Total: 0

Example 1 shows the weighting factors at the top and the weighted score for each criterion. In this example, each criterion has scored over 40, therefore the weightings are applied.

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Example 2 shows that criteria 2 has scored less than 40 and therefore no weightings are applied, and the score is 0 (formally, no weighted factors are applied and no overall mark is given).

A note on mission-related procurements: for missions, a final recommendation for awarding the contract is made based on the total weighted mark, price and when applicable the industrial policy measures and/or the geographical return requirements established in the ITT. For missions, therefore, the whole offering is considered, meaning that the resulting contract may not necessarily be attributed to the Tenderer having received the highest overall weighted mark.

b) TEB outcome

Once the weighted marks have been allocated, the final recommendation is made for awarding the contract and the main points for negotiation with the recommended tenderer prior to contract are drawn up.

In some instances, the TEB's recommendation needs to be ratified by the Industrial Policy Committee (which is the meeting between all national delegates to ESA) ahead of an announcement to bidders. This could add additional time before the result is announced.

If the TEB finds that no tender is acceptable, or no tender has obtained the minimum overall weighted mark of 60 (see call out box on the right), the TEB may recommend that the ITT be re-issued or cancelled.

For PECS Calls for Proposal, the technical evaluation and ranking by the TEB may be followed by a programmatic review involving ESA and the national authorities. Final selection may take account of the TEB results, available budget, the objectives of the call and national programmatic priorities.

> Some CfP evaluation criteria set out a minimum overall score to be achieved before contract award can be recommended. This is typically around 60. Note, this is not to be confused with the minimum score of 40 per criterion mentioned above.
>
> **Aim to score at least 40 in each category, with at least 60 overall.**

c) Composition of TEB

The composition of the TEB will vary depending on the procurement, value, etc. Typically, small tenders under 100k Euros will be evaluated by the Technical Officer and Contracts Officer. Larger bids (such as missions), Calls for Ideas or Calls for Proposals may have larger TEBs.

Note that the composition follows rules to ensure independence. TEB members sign non-disclosure agreements and non-interest forms as a prerequisite to participating in the TEB. They only see your tender documents through the ESA STAR platform and the documents are deleted from ESA STAR if an entity is not selected for negotiation.



Figure 3 – Summary of bid documentation management by TEB

The TEB follows strict rules to ensure independence and unsuccessful bids are deleted from ESA STAR

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A TEB is made up of ESA subject matter experts in the areas of project management, technical, PA/QA, finance, legal, etc., as required. TEB members (and the chairperson) will include people from outside the project, not just the project team to ensure independence and a wider perspective is maintained.

No Member States sit on the TEB panel and hence cannot influence or change the TEB outcome once a decision has been made.

d) Clarifications during the TEB

A situation could arise where the TEB requires clarifications in order to admit or evaluate a tender. If this occurs, the clarification questions will be formal, in writing and from the Contracts Officer. This should be rare.

2.1.3 Negotiations

Once the TEB's recommendation has been ratified (if necessary), an invitation to negotiate is sent to the company.

The timeframe for negotiations will vary for each procurement. However, it is largely driven by the company's response time – i.e. how quickly you respond to the invitation to negotiate, how quickly the negotiation meeting can be scheduled, how quickly the negotiation points can be resolved and how quickly any subsequent negotiation meetings can be arranged.

Negotiations could be an hour's phone call, or several meetings lasting a whole day each time. Upon successful completion of the negotiations, minutes are issued, to be signed by both parties, and these can form part of the contract.

Upon successful negotiations, a contract is placed. By this point, you must have completed your full registration in ESA STAR.

As a rule of thumb, 30 calendar days between the start and end of negotiations is a good starting point, but if both parties are well prepared, it could be as short as a few days.

In some cases, negotiations with the preferred bidder are not successful. In this case, ESA can choose to either engage in negotiations with the next-highest ranked bidder, or re-issue the ITT or cease the procurement.

In some instances, if a contract needs to start before all points of the contract have been fully negotiated, ESA may authorise the start of activities through a formal Preliminary Authorisation to Proceed (PATP) (usually for a given period of time and/or financial value). This typically applies only to large, time-critical contracts and is relatively rare.

2.1.4 Informing unsuccessful bidders & feedback

A regret letter is issued to the unsuccessful bidders. Exactly when will depend on the ITT - it may be once the preferred bidder has been invited for negotiations, but for some funding lines it could be later. This could be a written statement or an oral debrief; however, unsuccessful bidders can request an oral debriefing explaining the reasons why their tender was not successful.

> It is highly recommended that you seek an oral de-briefing session with ESA if your bid was not successful. **Following the regret letter, you have only 10 calendar days to request a debrief session.**

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The oral session allows you to gain a valuable insight into the relative position of your proposal compared to others, can highlight the key elements that lost points to be fixed for next time, and the overall perception of your bid. Moreover, it allows you to ask questions about your proposal to help you understand your scoring and how and why it may have been understood differently to what you intended.

2.1.5 Appeal

If you wish to raise a procedural breach, you can do so within 5 days of the de-brief. However, you cannot appeal the decision taken, you can only appeal on the grounds that the process was not followed correctly.

2.2 Competitive and non-competitive tendering

2.2.1 Calls for Proposals

Most of the PECS calls will be let as Calls for Proposals. **PECS opportunities are limited to bidders from within the PECS country**, for example, PECS Bulgaria calls are only open to businesses from Bulgaria. However, they are competitive within the country and any business or academic institution from Bulgaria can apply (there may be specific legal entities permitted for some CfPs). Note that bidders do not compete with one another on these calls. Instead, each proposal is evaluated against the CfP criteria and recommended for funding if it scores above the required threshold.

Calls for Proposals are 'open calls' for bidders to submit tenders at their own initiative without responding to a specific set of requirements issued by ESA. This means that bidders define their own technical objectives, baseline and product or service requirements, whilst complying with the programmatic, contractual, activity-type and TRL conditions of the call.

The individual Calls for Proposals specify the types of activity they will support, such as:

- Research and Preparatory Activity
- Product or Service Development (for Flight, Ground Segment or Downstream Applications)
- Space Science Activities
- Space (downstream) Applications.
- Education Activities

Typically, Calls for Proposals fall into three categories:

The key differences between an ITT/RFP and a Call for Proposals:

ITT/RFP – ESA defines requirements the bidder is expected to be compliant to.

Call for Proposals: the bidder defines their own requirements, in line with the conditions of the CfP.

a) Standard Call for Proposals

Bidders can submit proposals at their own initiative, at any time, throughout the duration of the specific Call for Proposals. Each proposal received is evaluated one by one as and when they are received.

b) Fixed Call for Proposals

Bidders are asked to submit proposals at their own initiative by a defined closing date. The proposals are evaluated together after the closing date. **This is typical for PECS Calls for Proposals.**

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c) Open Call for Proposals

Bidders can submit proposals at their own initiative, at any time throughout the duration of the specific Call for Proposals. Evaluations are done in batches in line with pre-determined deadlines at regular intervals.

An example bid response for a Call for Proposals can be found in section 3.4 Example bid – Call for Proposals.

In addition to Calls for Proposals, ESA runs competitive and non-competitive procurement processes. These are not applicable to countries under the PECS framework, as PECS calls are typically let as CfP. However, for context, bidders should be aware of the following:

2.2.2 Competitive tendering

Competitive tendering is the default procurement process, as set out by the ESA contracting regulations. The 'normal' procedure for placing contracts under competition is called open competition:

a) Open Competition

This is the normal procedure for placing of contracts. Open to all Member States or Associate Member States or Participating States (in case of optional programmes).

Under some circumstances, competition may be limited to certain bidders, this is called:

b) Restricted Competition

Limited to certain bidders. For example, situations where there are limited suppliers of the required product or service; or limited to a particular country due to geographical return requirements for that mission. Other criteria exist which could restrict competition, and the justification for this form of tendering must be approved by ESA's Industrial Policy Committee (IPC) ahead of the bid being released.

Typically, at least three tenderers should be invited for restricted competition where possible.

2.2.3 Non-competitive tendering

A tender may be issued as direct negotiation (DN), meaning it only goes to one bidder. As with restricted competition, the IPC must approve the justification for selecting this procurement method. For example, a DN could be used if only one source for the supplies or services exists; or where additional scope is being added to a previous contract and it would not make sense to tender the new elements of work; or in cases of extreme urgency.

2.3 Special clauses for non-primes and SMEs ('C-clauses')

ESA has defined clauses to foster competitiveness for non-primes and SMEs (called C-clauses). **This is not relevant to countries under the PECS framework, but included for context.**

Non-primes are defined as all companies with the exception of the Large System Integrators (LSI) such as Airbus Defence and Space and Thales Alenia Space.

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2.4 ESA STAR

If you are bidding directly into ESA for an opportunity, you will need to download the tender, as well as submit your bid response on ESA STAR. ESA STAR is ESA's online **S**ystem for **T**endering **A**nd **R**egistration (ESA STAR). During the bid phase, clarification questions and requests for extension are submitted through ESA STAR.

ESA STAR can be accessed via:

ESA STAR

If you are bidding into ESA but not directly, i.e. via another company, the Prime will have to use ESA STAR, and you will most likely email your proposal to that company for them to integrate into their offer. However, even if you are not using ESA STAR yourself, you still need to be registered.

ESA STAR has various sub-sections, each serving a different purpose. You will not need to use all of them during the bid phase. Below is an overview of the ones you will need to access during the bid phase:

2.4.1 Overview of ESA STAR

The home page has 8 options, each serving a different purpose:



Figure 4 - Screenshot of ESA STAR home page

a) Registering on ESA STAR

ESA STAR Registration: as described in section 1.2.1, registration on ESA STAR is a pre-requisite for all entities wishing to do business with ESA (even if you are bidding as part of another company's bid). Only registered (and validated) entities can access tendering documents in the non-public part of ESA STAR Publication, express interest in ITTs, submit requests for clarifications on open ITTs and submit tenders.

If you meet the criteria of an SME, you should register as such to receive the benefits available.

To register, go to: esa-star Doing and select the 'ESA STAR Registration' box.

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Follow the on-screen instructions for 'Register your entity' and then 'New registration' on the menu on the left. You will have several screens such as this one to complete:

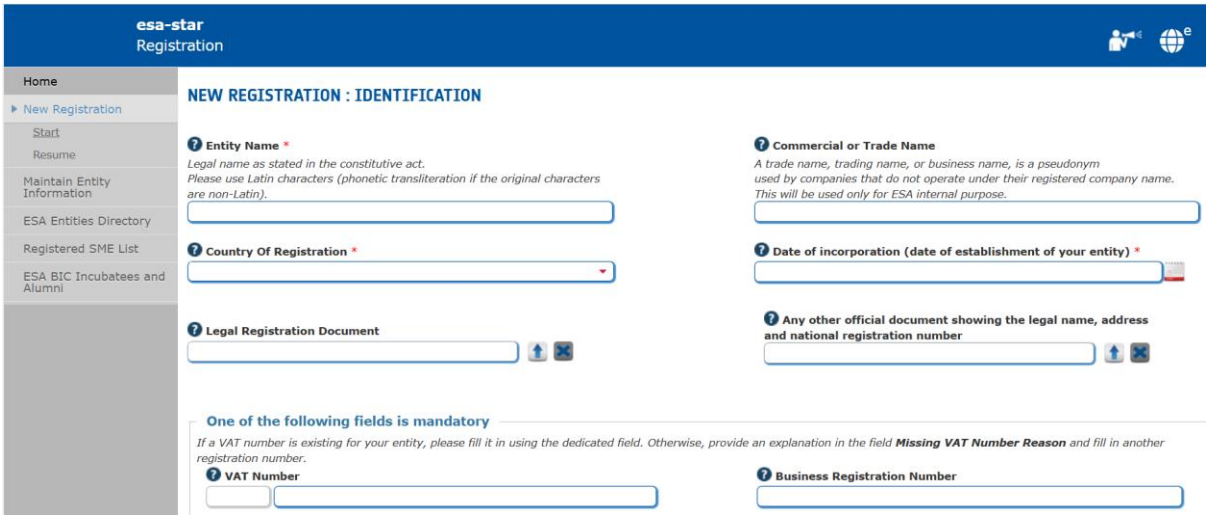


Figure 5 - Screenshot of ESA STAR new registration online form

Note that as part of your registration, you will need to name people in your organisation and assign roles to them, for example Bid Manager and Entity Administrator (see call out box on the right). Each role has a different function within ESA STAR. You will need to name someone in your business as "Bid Manager", even if that is not their job title in your business.

When you register, you will receive an email about every new announcement that goes onto ESA STAR (many per day). You may wish to auto-forward ESA STAR emails to a separate folder.

Note that you will be required to update your entity information every 12 months in order to keep your registration current. If it is not updated, you may not be able to sign a new contract with ESA. The ESA STAR system will remind you when the updates are required.

A guide is available, providing a step-by-step walk through of the registration process:

ESA STAR Registration Training Material

The "Bid Manager" role in ESA STAR allows the creation of the Bidder Restricted Area and submission of the bid. This is needed to submit a bid on ESA STAR.

The "Entity Administrator" role is needed to complete the registration updates every 12 months and add or remove users.

Other roles include ESA-P users for managing invoicing once on contract.

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b) ESA STAR Publication

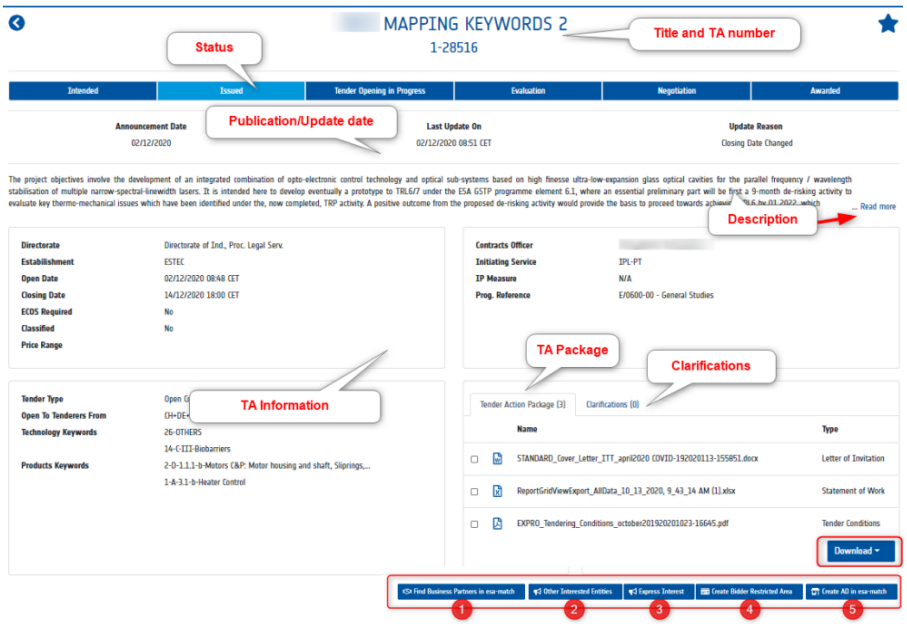
ESA STAR Publication: This section contains open ITTs and calls for proposal issued by ESA and competitive ITTs published by other entities under ESA Best Practices Procurement. You can also find intended ITTs, as well as reference documentation (policies, PSS form templates, etc.), news and announcements.

When you arrive in ESA STAR Publications, you can either browse categories, or search for a specific tender.



Figure 6 - Screenshot of ESA STAR Publications page

The details for a specific tender are displayed like this [TA = Tender Action]:



Detail of a Tender Action:

1 – Go to ESA-Match module to find a potential consortium

2 – Displays the list of submitted Expressions of Interest

3 – Allows you to express interest See esa-star Publication Help - manual "Expression of Interest"

4 – If you wish to submit an offer you have to create a Bidder Restricted Area in ESA-Star Tendering module

5 – Allows you to create an ad in ESA-Match Marketspace (open competition only)

Figure 7 - Screenshot of specific tender page in ESA STAR Publications

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Training videos on how to use ESA STAR Publications and the non-ESA tender actions can be found here:

esa-star Publication

c) ESA STAR Tendering

ESA STAR Tendering: This section covers the bidding process. Once the ITT has been found (in Publication), you will need to select 'Create Bidder Restricted Area' (see box 4 on in figure 11). This sets up a dedicated work area in ESA STAR Tendering. This work area is specific to an ITT, and is where you can submit clarification questions and extension requests and upload and submit your offer to ESA. Note that you will need to create a separate Bidder Restricted Area for each tender you wish to submit.

d) ESA STAR Match

ESA Match: This part of ESA STAR is a networking feature allowing you to reach out to other entities in Europe. Its aim is to support businesses, especially SMEs in facilitating partnering, teaming and cooperation. By registering on ESA STAR you automatically create an ESA Match profile, which is visible to other registered entities and ESA. You have the option to add to your profile pages to be more specific about what you are seeking.

Further information can be found here, including FAQs: Matchmaking - ESA Commercialisation Gateway

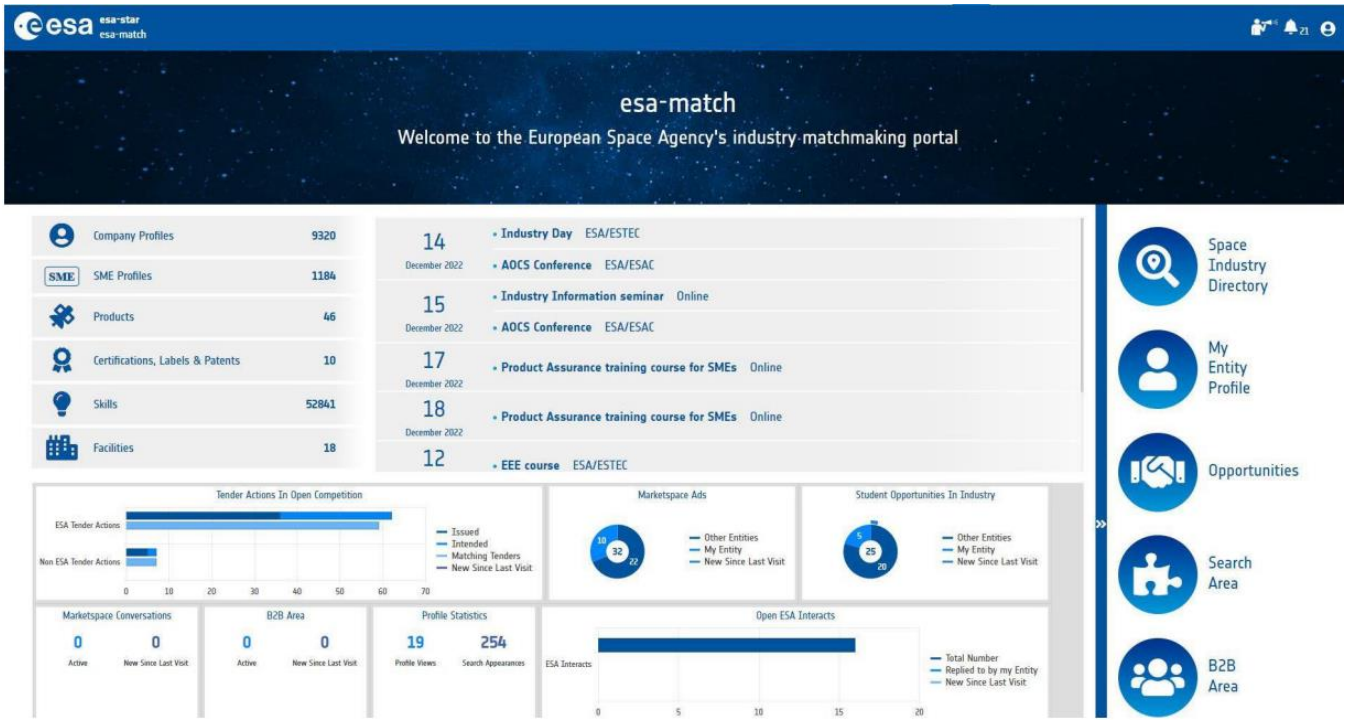


Figure 8 - Screenshot of ESA STAR Match functionality

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e) Other ESA STAR functions – not required in the bid phase

The other sections on the ESA STAR portal will only be relevant once you are on contract with ESA:

ESA-P: this is ESA's financial tool used to manage payment milestones, invoicing, etc.

ESA CCD: Contract Closure Documentation.

ESA ASTRA: the audit portal used to support cost and price evaluations and negotiations.

2.4.2 Expression of Interest to bid on ESA STAR

If you are intending to bid for an ESA opportunity as Prime (i.e. directly into ESA), you will need to express your interest to bid by selecting the Express Interest button as shown in box 3 in figure 7. If you have not yet registered on ESA STAR, the Expression of Interest should be submitted in writing to the Contracts Officer for the bid in question (the Contracts Officer is listed in the tender Cover Letter).

If you are bidding into another company, they will express interest as Prime – you do not need to do so.

Note that you can express interest to bid only as a sub-contractor on ESA STAR. This is not essential, but may help identify others to partner with.

2.4.3 Asking clarification questions in ESA STAR

Once the ITT is live, communication is only via formal routes – any questions or extension requests must go through ESA STAR.

The response will appear in the Clarifications section of the specific tender under ESA STAR Publications. Note that the clarification question (anonymised) and ESA response will be visible to all bidders (not just to you). Keep this in mind when considering your questions.

Note that the ITT documentation will tell you until which point you may ask questions and request extensions – typically this is 2 weeks before the closing date, but check the ITT documentation. After this point, it is no longer possible to ask CQs or request extensions.

2.4.4 Intended ITTs

These are published under ESA STAR Publication, and show planned procurements under Open Competition and Call for Proposals.

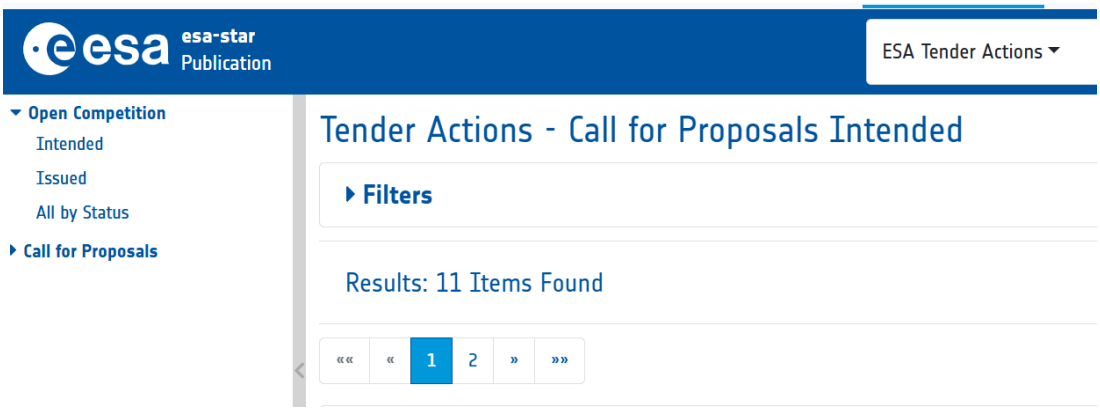


Figure 9 - Screenshot of ESA STAR Publication (select 'intended' or 'issued' on the left)

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Intended ITTs are those which ESA intends to publish in future, and include an abstract and summary of the opportunity, as well as some of the key procurement parameters such as the price range, whether it will be in open competition or another procurement route, which countries are eligible to bid, etc. Intended ITTs can be found on ESA STAR though there is no specific timeframe regarding how far in advance of ITT publication the intended ITT is shown. **It is a good idea to keep an eye on these upcoming tenders, so that you can engage early either directly with ESA or with other businesses and start planning your bid.** If you wish to use the ESA STAR Match function, doing so whilst ITTs are at the intended stage gives more time to find a potential partner.

Making this most of the intended ITT phase is key to maximising your chances of success. During this phase you can start discussions with other companies to build your team/consortium, agree provisional work share and discuss with ESA and the Bulgarian Space Cluster (once the ITT is released communication with ESA is restricted to formal clarification questions).

Using the filter function: to help you identify opportunities for Bulgaria, you can use the filter function within ESA STAR to show only those intended and open tenders open to Bulgarian organisations:

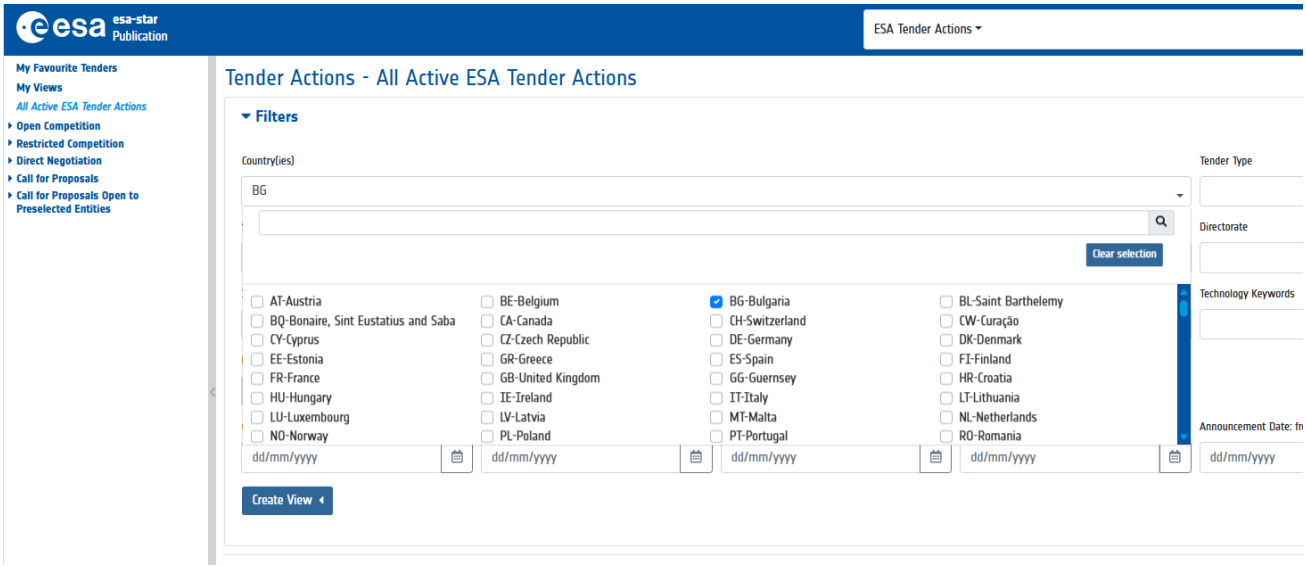


Figure 10 - Screenshot of ESA STAR Publication filtering function – you can select BG to limit your search to opportunities open to Bulgarian businesses

2.4.5 ITTs from Primes – using ESA STAR

This section does not apply to bidders from countries on the PECS framework.

Primes running procurements through ESA's Best Practices Procurement process use ESA STAR to publicise their ITTs. All non-ESA ITTs are under a section called 'Non-ESA Tender Actions', within ESA STAR Publications – as shown in figure 14 below.

They are grouped into Issued and Intended.

As with ESA ITTs, it is a good idea to keep an eye on upcoming ITTs originating from industry. Attending industry days is also a helpful way to identify potential opportunities.

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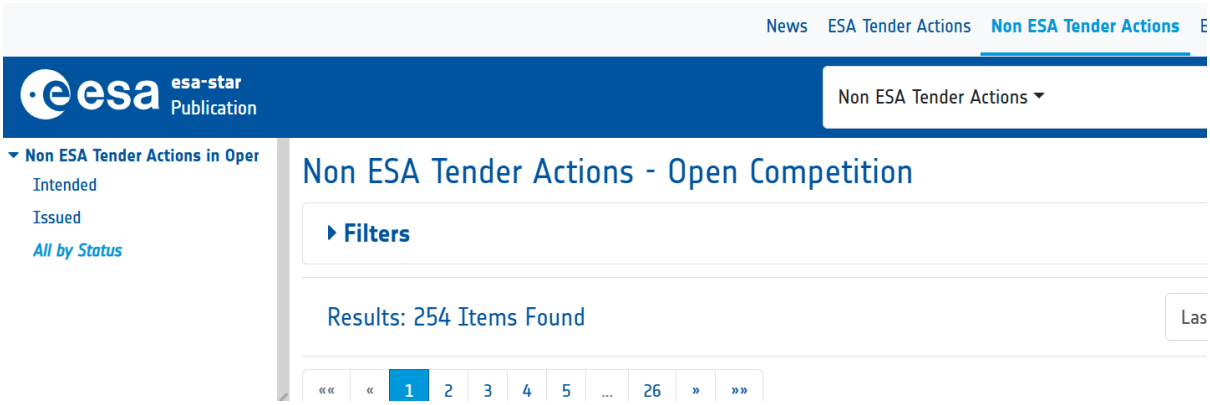


Figure 11 - Screenshot of ESA STAR Publication non-ESA area

2.4.6 The Open Space Innovation Platform (OSIP)

This is an ESA platform aimed at collecting ideas for early technology development. It is typically used for the Discovery and Preparation programme, but other programmes can use it too.

It is a separate tool to ESA STAR, and if you wish to submit an idea onto OSIP, you will need to register.

Typically, the OSIP platform is used to collect ideas against either specific campaign or channels. Campaigns search for solutions to specific questions and typically have a well-defined, relatively short timeline. Channels seek ideas and collaboration on more general topics and have a more open timeframe.

You can register on the OSIP platform here: Self Registration

Further information can be found here:

ESA - The Open Space Innovation Platform (OSIP)

Open Space Innovation Platform - OSIP - Start

Once you have submitted your idea, a community discussion phase may help you to develop and improve it before it is evaluated by a team of experts. Authors behind the best ideas will be invited to prepare a more detailed proposal. Following another round of evaluation, the most novel, applicable and achievable proposals will be offered funding, typically through one of three paths: research at PhD or post-doctoral level co-funded by ESA and a host university, early technology development activities, or system studies.

2.4.7 Downloading the tender

The tender documents can be found under ESA STAR Publication, as shown in figure 7. You can download them from there.

Be sure to check regularly for clarification questions, as these will appear in this section.

If you are a registered user on ESA STAR you will receive email updates about any new announcements.

2.5 Deciphering a typical ITT or Call for Proposals

The earlier part of this section described how to find the tender documents and how to download them from ESA STAR. This part assumes you have completed the above successfully (or if you are not bidding directly into ESA, have obtained the tender documents from another company) and now have tender documents to

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which you wish to respond. This part will look at the key documents and what to look out for. The fundamentals discussed in this section are intended to cover most ITTs and Calls for Proposal, and the points below will apply to the majority of bids, though you may notice a difference in the presentation of documents for specific tenders. **The key points relevant to Calls for Proposal have been highlighted.**

Some key points to note:

- The **standard bidding time period** for a Call for Proposals is around 4 weeks. If you have subcontractors as part of your offer, you will need to start engaging with them before the CfP is released, as 4 weeks is not a long time if you need to obtain supplier inputs. **Late submissions will result in elimination**.
- Tenders are submitted in response to an ITT or Call for Proposals initiated by ESA. For Calls for Proposals no Statement of Work is issued – the tenderer defines their own scope of work in line with the Call priorities. (Note: for ITTs, the objectives and requirements are given by ESA and the bidder is expected to demonstrate their understanding of them).
- **Each tender includes a maximum budget**. Regarding the budget, this is the maximum (not-to-exceed) available and you should prepare your costings based on the solution you are offering. ESA will then review your offer in line with the scoring criteria and whether the costings seem fair and reasonable for the scope of work offered. Avoid presenting your price at the exact budget shown in the ITT.
- Once the tender is live, **only formal communication with ESA (through ESA STAR) is permitted**. Note that any clarification questions and their responses are made visible to all bidders. If you are bidding into another entity (and not directly to ESA), you may communicate freely throughout the bid phase with your direct customer.
- The tender will tell you if there is a page limit and this can be found in the Cover Letter for your specific opportunity. For PECS Calls for Proposal, the page limit is typically set at a maximum of 25 pages. This is a hard limit and any pages above this limit will not be read.
- The evaluation criteria are clearly set out in the tender documentation, typically in the Cover Letter, and a contract will only be signed to start the work upon TEB approval.
- If you are bidding with others (either as sub-contractors to you, or you are a sub-contractor to another entity), the same information is requested of all bidders as it is of the lead (prime) bidder. For example, work package descriptions, schedule, WBS, company heritage, key personnel and CVs, PSS forms… will be required for all levels of the supply chain.
- **The whole process, from tender release to contract signature for PECS opportunities is approximately 8 months.**
- Proposal templates are provided for CfP bids and some other proposal types. Be sure to complete these following the instructions in the tender. Do not amend headings or numberings, complete the sections required and delete the instructions before submitting your bid.

> Note that ESA is an international organisation and English will be most people's second language. When reading the ITT, there may be ambiguities resulting from language – bear this in mind.
>
> The same applies when writing your response – consider using clear, simple, unambiguous language.

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- The ESA Tender Conditions are issued with the CfP. The new Contracting Regulations, which came into effect in January 2025 have replaced the previous General Conditions of Tender (GCT) and Special Conditions of Tender (SCT). Each ITT is now issued with one set of Contracting Conditions.

As every procurement will have its own tender documents, the below is a generalisation of the typical documents to expect and what to look out for within them:

2.5.1 Cover Letter

The Cover Letter is the first document you should read, as it sets out much of the key information.

In particular, look out for:

> To successfully compile an ESA bid requires time, resources and diligence

- **Eligibility requirements** – be sure to check that you are responding to a bid on the PECS framework for Bulgaria.
- Instructions on **registering** as a bidder on ESA STAR. See previous section for details. Once the CfP is released on ESA STAR, communication with ESA is through formal routes only. This means through clarification questions on ESA STAR (to be submitted by the lead bidder). However, if you are not the lead bidder, you can continue to have open discussions with you customer during this time.
- **Each tender includes a maximum budget**. This is the maximum (not-to-exceed) available and you should prepare your costings based on the solution you are offering. ESA will then review your offer in line with the scoring criteria and whether the costings seem fair and reasonable for the scope of work offered. Avoid presenting your price at the exact budget shown in the ITT.
- The **type of price** and the **currency** in which the tender is to be expressed. Note, ESA expects bidders to provide a price in Euros and carry their own foreign exchange rate risk. The price type is important to note as different price types may include or exclude elements such as inflation, meaning your ultimate end price differs. Note the maximum declared profit margin permitted (typically around 8% - check the tender documents).
- Formal conditions of **submission**: date and time of delivery of the tender. This is not to be missed as late submissions will not be accepted and your bid will not be read. If you are bidding into another entity, clarify with them exactly when your part of the bid needs to be submitted, as it will be before the ESA closing date.

  Extensions: note that for open ITTs, bidders can request extensions to the submission date through the Clarification Questions section within the ESA STAR Tendering area. If you are requesting an extension, it must be accompanied by a meaningful justification as to why the extension is needed. Should the extension be granted by ESA, this will be reflected by the release of a Clarification Question (response) on the ESA STAR Publications portal (where the original tender information is). For PECS Calls for Proposal, it is unlikely that an extension will be granted by ESA.
- **Key Acceptance Factors** - these represent formal requirements and failure to comply could result in the non-admissibility of the tender for evaluation. For example, Calls for Proposal like to see end customers included in the consortium to help define requirements.
- Evaluation criteria.

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- The name of the responsible Contracts Officer.
- Validity period for your proposal.
- Template declaration proformas to be completed.

2.5.2 Statement of Work (SOW)

Calls for Proposal do not include a Statement of Work – instead, the CfP template indicates what you should describe in your technical response. Therefore, **this section 2.5.2 is not relevant to PECS Calls for Proposal**. However, it has been included for completeness.

The SOW contains a full description of the objectives to be fulfilled, the work to be performed and the resultant deliverables of the activity. It is written by the ESA Technical Officer who will be running the activity and is reviewed and approved by the members of the TEB who will be assessing the proposals. You should read it carefully and critically as it could contain mistakes or omissions. [Moreover, if you have suggestions of a different or modified approach to the one set out by the TO, demonstrate this in your response].

Look out for the following when reading the SOW:

a) Introduction

The introduction is not to be 'glossed over'. It contains some important information, especially the Applicable Documents, the Background and vitally, the Objectives.

b) Applicable Documents (ADs)

You will need to read the ADs listed in the bid. Adding an AD implies that you are expected to be compliant with any requirements listed therein. They are a quick and short way of avoiding needing to re-write requirements. In your proposal, be sure to also address the requirements in the ADs.

c) Reference Documents (RDs)

These are optional for you to read. They are included because the author of the SOW thinks they may have useful or interesting information for you or give you more background on some of the statements made or requirements set in the SOW.

d) Objective(s) of the activity

These are the most important few sentences of the SOW. They tell you what has to be achieved by the activity. Study them carefully and pull out all the key points. The objectives should guide your trade-offs and 'outrank' everything else in the SOW.

e) Work logic

This section provides an overview of the work to be performed, the flow of the work and the key events and reviews to be incorporated. The TO may have put in a flow chart for you. This tells you how they have pictured the work flow such that you can better understand the Task Descriptions and how they fit together.

It is not mandatory to follow the prescribed work logic, if you have a more efficient way of achieving the objectives, you should propose it. Ensure any deviations are justified and explained.

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f) Tasks

For each task in the work logic, there will be a description given. This will have varying amounts of detail but should highlight the key trade-offs, key analyses, key reviews and main blocks of work that the Technical Officer considers should be included. The bidder will have to fill in the rest of the details and to critically review and assess this. Any deviation from the description should be highlighted and justified. Note that the task description should be considered as the minimum to be covered. The outputs cover hardware, software and documentation and should match the deliverables table given later in the SOW.

g) Preliminary Requirements (may be in an annex to the SOW or as an Applicable Document)

Preliminary Requirements - this is the second most important part of the SOW. These are typically found as an annex to the SOW, but could be hidden under Applicable Documents in some instances.

The technical requirements describe what has to be designed or produced in order to meet the objectives.

The preliminary requirements are useful in helping you understand the objectives, especially if the objectives are vague. Typically, the preliminary requirements are not fully complete, not prioritised or ranked and may be contradictory. However, they provide an insight into the TO's view of how the work should be done. As a minimum the key validation method will be proposed, which drives the model philosophy. It is your role as bidder to assess the requirements in the proposal and critically comment on them. If requirements are contradictory, it is your role to identify the key ones, highlight the inconsistencies and propose a way forward. A requirements matrix is essential in the proposal.

2.5.3 Managerial and programmatic requirements (Tender Conditions/SOW)

These could be wrapped into the ESA Draft Contract for CfPs, or be part of the SOW for other types of procurement.

a) Management

There should be one single person empowered to make all the decisions and be responsible for ensuring the success of the activity. This person in an ESA project is your Project Manager.

b) Access

This means that ESA can ask to see anything related to or used in the execution of the work for the activity – irrespective of whether it is a formal deliverable or not.

c) Reporting

This section tells you that:

- You need to provide prompt minutes after every meeting
- Your planning needs to be kept up to date and presented as a Gantt chart
- You must provide a monthly progress report and this section tells you what to include
- You must notify ESA immediate of any problems arising
- You must deliver what you promised, minimum 2 weeks prior to a meeting.

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d) Deliverable items

This gives the full details of all the deliverable documents, software and hardware that is included under the contract. It should also include details on the minimum contents expected or minimum scope of the hardware/ software and the delivery means. Note that the contents of the deliverables sometimes help to actually scope the work expected under the task description and can be helpful in understanding what the TO had in mind when viewed together with the objectives and requirements.

e) Schedule and milestones

This section sets out the maximum duration expected, the milestones expected and the reviews to be held. Take these into account when you plan your response. Your response should align to the ITT, but if you need to differ in any area, provide justification.

2.5.4 Draft Contract

> ESA's GCCs are a set of terms which have been agreed by all ESA Member States. **They are non-negotiable, and by signing the Cover Letter as part of your submission, you are effectively accepting them**.

Calls for Proposal procurements include a self-contained draft contract, which is included in the tender pack. It is laid out so that you can fill in the gaps during the bid phase, thus making it a quicker process to complete if you are selected for negotiation.

A note on ESA's terms and conditions: the GCCs are a set of terms which have been agreed by all ESA Member States. **They are non-negotiable, and by signing the cover letter as part of your submission, you are effectively accepting them**. Some elements can be amended during negotiations, for example, agreeing a milestone payment plan. In order to help you understand what the terms mean, it is a good idea to read the GCC, but bear in mind that ESA is an international organisation (including various different legal systems amongst its Member States), that is aiming to foster and develop work within its Member States, not hinder it. In order to better understand the nuances behind clauses in the GCC, discuss with the Contracts Officer indicated on the ITT (if you have one in mind), or more broadly, reach out to the Bulgarian Space Cluster for an initial discussion.

2.5.5 Bidding as part of the supply chain for an ESA contract (not directly to ESA)

> The Prime bidder should tailor the ESA ITT pack to you – so you have a very clear view of the scope you are responsible for delivering and the bid documents expected from you.

If you are bidding into another organisation as part of an ESA programme, ideally, you will receive an ITT tailored to your work from your direct customer (i.e. the company you are bidding into). **This should only show elements relevant to you and clearly set out what you need to provide.** For example, the SOW and technical specification should be for your element of work, the Applicable Documents should be tailored so that only ones that are relevant to you are included. However, at times Primes will share the ESA ITT with their supply chain, asking individual bidders to 'pick out' the relevant parts. This makes it difficult, as interpretations may differ and it adds to your bid workload and timeline as you have to read and digest potentially irrelevant material. **As you discuss with your customer exactly what the scope of your offer is, and what you need to deliver as part of the bid (and in what format), encourage them to document it in a specific ITT to you – it will make your response much cleaner and simpler.** Note that even though the technical and programmatic

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elements should be tailored to you, the contractual aspects are likely to be unchanged, as ESA will expect all bidders in the supply chain to agree to the contractual terms.

Typically, the same information will be required by ESA for the whole supply chain. You can expect the key bid deliverables from the ITT to be flowed down to you – such as company heritage, key personnel, CVs, PSS forms, Work Breakdown Structure, Work Package Descriptions, schedule, etc. The key difference will be the scope of each one – your elements should only reflect the work you are responsible for.

3 Part 3 - Preparing & Submitting your Bid

This section goes through the steps you need to work through to put together a bid response. Key points are highlighted that will help you maximise your score. **It is structured around a typical Call for Proposals layout and gives you examples of what to include.**

It will help you answer:

- What do I include in my bid?
- Can I be non-compliant to a requirement?
- What do I do if I cannot meet the budget?
- Who should be on my bid team?
- What do I do if I have a clarification question mid-way through?
- How do I ask for an extension?
- What are PSS forms and how do I complete them?
- How many pages should my bid be?
- How do I get high marks?

Arriving at this point in this Guide, you have now obtained an ITT or CfP to which you wish to respond (either directly from ESA or from a Prime), and have read and digested its contents. This section will go through how to prepare your bid response, pulling out key factors to maximise your score.

Through this section, reference is made to a non-space example bid (developing a coffee machine) to demonstrate the structure, layout and style of a typical ESA bid. Where extracts from the example bid are used, these are highlighted with an orange border. The full example ITT and bid are attached as an annex to this Guide.

3.1 Recap – preparing for the bid

As a reminder, the following activities should be complete by this point in the bid process:

a) Registering in ESA STAR

As part of the Cover Letter, you will be required to submit your ESA Entity Code and that of each of your subcontractors.

It is your responsibility to complete at least a 'light' registration in ESA STAR ahead of bid submission and to ensure that any subcontractors are also registered. Registering in ESA will give you your entity code. It is

> Where possible, **it is advisable to carry out the activities listed in this section as early as possible**. It is not always necessary to wait for the ITT to be issued.

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a good idea to do this in good time, as your application may take time to be approved.

b) Engaging with the Bulgarian Space Cluster and ESA before the CfP is released

It is a good idea to engage with the ESA Technical Officer ahead of tender release to discuss the proposal and your ideas.

Similarly, it is a good idea to engage with the Bulgarian Space Cluster to discuss your idea and seek guidance of the ESA CfP process. Additionally, the Industrial Coordinator is well placed to help you find potential collaborators for your project.

3.2 Setting up the teams to deliver the bid & future project

When preparing your bid, it is likely that you will need to think in terms of two teams. The first is the team to deliver the future project, if your bid is successful, and will be outlined in the proposal's Organisational Breakdown Structure (OBS). It will include any sub-contractors you may have, as well as the future project manager, technical lead, etc.

The second team is the team who will be writing the proposal documentation, doing your internal estimates, producing the financials, etc.

If you are a small organisation, or are bidding for a very small contract, it is possible that the individuals across both teams will be the same. However, you may have individuals only involved in bid writing or project delivery, who will therefore only be part of one of the teams.

Future project team – the team who will deliver the work if you are successful. This team will be shown on the OBS and includes your supply chain.

Bid writing team – the team who will deliver the bid. They may (or may not) be involved in the subsequent delivery of the project.

3.2.1 The industrial team (for the future project)

To determine who you need in your industrial team, consider the following:

- Are you able to do all the work in-house? Or do you need expertise you do not have?
- Even if you can do it all in-house, does it make sense to collaborate for other reasons?
- Does the ITT specify a particular collaboration? Partnering with academia or any other requirements on collaboration?
- Are there geo-return constraints on your bid, i.e. you need to find a supplier from a particular Member State to be eligible to bid?

It is a good idea to define your industrial team as soon as possible – ideally before the tender is released. 4 weeks for a CfP is not a long period of time if you are starting from scratch with your supply chain.

You will need to identify who to work with, create a tailored tender pack for them, await their response, possibly iterate / negotiate and then integrate into your bid. If the team can be identified and discussions around workshare and share of budget can be started ahead of ITT release, this will help.

You may already have an idea of who to collaborate with, if not, consider:

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- Using the ESA Match functionality to find potential collaborators
- Attend industry days hosted by the Bulgaria Space Cluster focusing on PECS opportunities
- Attend conferences related to your area of activity
- Discuss with the Bulgarian Space Cluster, relevant to the programme you are interested in.

> Discussing and clarifying these points early will avoid nugatory work, duplication or needing to ask for things at the last minute. It will also ensure the supplier is able to price their workshare correctly, with a full understanding of what they will need to do.

Once you have identified suitable collaborators, the Work Breakdown Structure (WBS) is a useful tool to define workshare. Consider Work Package Descriptions (WPD) (including deliverables) and schedule when defining workshare (see WBS and WPD).

Aim to have clear WPDs agreed with any subcontractors early in the planning phase, along with an expected budget. Consider the following:

- **Focus on responsibilities.** For documentation deliverables, who is responsible? Are subcontractors producing a whole document, or inputting sections to a document you are responsible for? Consider what you will be happy to accept and ensure that is clearly stated in your acceptance criteria to your subcontractor.
- **Which meetings are you asking your supply chain to attend during the project phase**? If any, define whether in person or remotely.
- **When is the supplier work required in the context of the overall project?** If it is not required throughout, consider what makes sense as their start and end milestone to avoid unnecessary cost.
- **Be clear on what you need them to deliver for the bid.** Typically, as a minimum, on a small bid this would be a signed cover letter, WPDs, heritage information, key personnel and CV and PSS forms. The list of bid deliverables should be clearly defined in your Cover Letter to your subcontractor.
- **Are they registered on ESA STAR?** They will need at least a light-registration in the bid phase.

If you are not bidding directly to ESA, the above principles apply, but the Prime leading the bid will drive this.

If you have no supply chain element to your part of the bid (i.e. all your work is in-house), it makes your bid response quicker and easier.

a) Subcontractors vs Suppliers – an ESA definition

For ESA programmes, the distinction between a subcontractor and a supplier is very important. If you are bidding into ESA as a Prime, you will need to determine whether your supply chain (if you have one) fall into the subcontractor or supplier category. This decision should be made as early as possible to allow subcontractors sufficient time to respond.

The key differences are highlighted below. Note the impact on the bid deliverables (and timescales) of subcontractors.

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i. Subcontractors

- **Subcontractors should receive a full ESA-style ITT pack from the Prime** – with a tailored flow down of the Prime level ITT requirements and contract conditions. If you are the Prime, you will need to prepare this.
- **In turn, they are required to submit a full ESA-style proposal to the Prime**, typically including PSS forms, compliance statements, including compliance to the ESA contract, company background information, CVs, schedule, etc.
- **Where there are gaps between the subcontractor proposal and what the Prime is offering**, this must be addressed in the bid with mitigation plans and/or justifications as these gaps will be visible to ESA.

Defining a subcontractor: as a rule of thumb, a subcontractor is defined as:

Either having a workshare > 100k Euros (though exemptions apply)

Or having significant IP involvement

Or being designated as a Work Package Manager

There are exceptions to this, for example, hiring environmental testing facilities.

- **This is particularly relevant for Terms and Conditions** – ESA has visibility of the subcontractor management through the Prime, and will need to approve subcontractor payments, contract change notices and damages/penalties (at subcontractor level) – therefore the Prime must flow down the terms of the ESA contract to a subcontractor.
- **The content from the subcontractor's proposal will be incorporated into the Prime's proposal** and forms part of the total offering, which will be reviewed and scored by ESA. Therefore, if, for example, a subcontractor has omitted certain information, or there are inconsistencies between what the Prime has written and what the subcontractor has written, the scores received for the offer as a whole will reflect this.
- **Subcontractor elements of the proposal can be challenged or negotiated by ESA**, and ESA can participate in subcontractor level negotiations.
- **Subcontractors count towards the Prime bid's geo-return**. If you have a subcontractor from another country, their price will be allocated as geo-return to that country. This is important if you have a geo-return constraint on your bid.
- Subcontractors are afforded rights of **ownership and exploitation in any IP** they generate with the ESA funding.

ii. Suppliers / Other Direct Cost Elements

Procurements which do not meet the subcontractor categorisation described above can be managed in a simplified way.

These are termed Other Direct Cost Elements, and the PSS A2 form splits these procurements into various categories:

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3.1	Raw materials
3.2	Mechanical parts
3.3	Semi-finished products
3.4	Electrical & electronic components
3.5	HIREL parts
	a) procured by company
	b) procured by third party
3.6	External Major Products
3.7	External Services
3.8	Transport and Insurances
3.9	Travel and Subsistence
3.10	Miscellaneous

You will need to align the supplier costs to the correct category on the PSS form. It is a good idea to think about which category costs will fall into early in the bid process.

Supplier procurements can be managed by the Prime's internal procurement processes. The proposals received from suppliers do not need to be included as part of the Prime's bid submission. However, note that your solution needs to be fully described. For example, if you are dependent on a supplier (for example, a test provider categorised as 'external services'), ensure you include their facilities in your facilities description, detail the schedule (any dependencies, schedule contingencies, etc.), highlight any risks from this facility to your programme, discuss relevant key personnel if applicable.

In contrast, if you are procuring low value off-the-shelf components, you do not need to go into detail about the supply chain – beyond reassuring the reviewer that the components are properly costed, adequate for purpose and readily available.

iii. A note on geographical return

The cost for external suppliers where they are not subcontractors typically falls under the cost of the entity procuring those elements. For example, a prime contractor is procuring an off-the-shelf component – these costs will fall under the prime contractor's costs and will therefore count towards the prime's geographic return, even if the items being procured are from a different country to the prime.

Where costs are considered subcontracts, these must be considered as generating georeturn for the country in which the work is being performed, and this would typically be declared in your tender response.

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b) Key points for managing your supply chain in the bid phase

Key points for managing your supply chain in the bid phase:

- Identify early whether you are able to perform all the work in-house, and if it is advantageous to do so.
- If not, decide whether you wish to Prime the opportunity, or be part of another entity's bid. This will depend on the work to be done, your capabilities and expertise compared to that of others, the relative size of work packages and any specific clauses in the bid that would favour one approach over another (see C-clauses).
- If you decide to prime, and need to involve others, engage in discussions early (ideally ahead of ITT release) to give you maximum time to prepare your bid. 4 weeks is not long enough if you are starting from scratch!
- Ensure there are no unexplained gaps in your offering. In your proposal, explain how the whole solution will be delivered and describe where and why you are using subcontractors / suppliers. Justify any gaps along with a plan of action.
- Be clear on your definition of your supply chain – defining them correctly early will be key to delivering a clear bid.
- If you have subcontractors, tailor the requirements from the ESA ITT to be suitable to flow down to your subcontractor. The clearer the requirements are defined to the subcontractor, the better the proposal and the better the basis for starting work on the project. Vague or ambiguous requirements may lead to gaps in your proposal, additional risk being added to the subcontractor's price and ultimately reflect poorly in your ESA score.
- Check that the offer you receive from your subcontractor matches your ITT, for example, the price type is the one you requested, does their schedule match yours, have they completed their WPDs in sufficient detail (you will need to include them in your proposal), have they included CVs for key personnel, are all the elements you will need to include in your bid completed (KAF, signed PSS forms, signed Cover Letter, etc.). The checklist suggested in section 3.4.3 applies equally to your subcontractor proposal evaluation.
- Address any missing or incorrect elements with your supply chain during the bid phase to ensure your consortium bid can achieve the best possible score.

c) Using a country that is not an ESA Member State

The target is to use organisations from within ESA's Member States (and participating states in optional programmes or where geo-return is a factor). However, should you find that using an entity that is not an ESA Member State is the only option, this entity can be part of the offer as long as they are in a country being party to the World Trade Organisation (WTO) Government Procurement Agreement (GPA). However, you must provide justification why the work cannot be performed within Europe and the work share should be small.

3.2.2 Your bid team

The second team you need to form is the team to deliver the bid. SMEs are unlikely to have roles dedicated to bidding, so team members are most likely to bid for the work and have a role in the subsequent project.

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For a small EXPRO bid, as a minimum you will need the following roles (note: a role is different to a job title, and several roles could be performed by the same individual):

- **Bid Manager**. Overall responsibility for delivering a compliant bid. Drives the bid team to deliver the necessary inputs. Collates (and writes) much of the proposal.
- **Technical lead**. Responsible for defining the solution. Writes the technical section, completes the technical compliance matrices.
- **Financial lead.** Responsible for costings and producing PSS forms.
- **Contract lead.** Must sign the Cover Letter and review the contractual conditions of the ITT.
- Point(s) of contact for each subcontractor (and in some cases supplier) supporting your bid.
- (On larger bids you may start introducing additional roles, such as Quality Manager, Proposal Manager, Supply Chain/Procurement Manager, etc.)

When you have identified your bid team, it is a good idea to run through the roles and responsibilities for each member to avoid any gaps or overlaps.

3.2.3 Communication with ESA during the bid phase

Once the ITT is issued, all communication with ESA must be through one of the two formal channels:

- Clarification Questions (CQs) and requests for extension via ESA STAR
- Issues to do with the ESA STAR platform via the ESA STAR IT helpdesk.

No direct communication with the Contracts (CO) or Technical Officers (TO) is permitted once the ITT has been issued.

Until the ITT is issued, however, you can have open discussions with ESA, and it is a good idea to make use of this.

3.3 Defining your solution

The step of defining what you will offer is often an iterative process, which can start ahead of the tender release (depending on how much you know about the opportunity). The solution should be thought of as the complete offering, encompassing technical, programmatic, industrial and contractual elements.

For Calls for Proposal no formal requirements are issued by ESA, it is up to you to define your solution and your own set of requirements. It is important to define a clear baseline early in the process to allow consistency across all elements of the bid. Moreover, the sooner you can agree the baseline, the more time you can focus on maturing your offering.

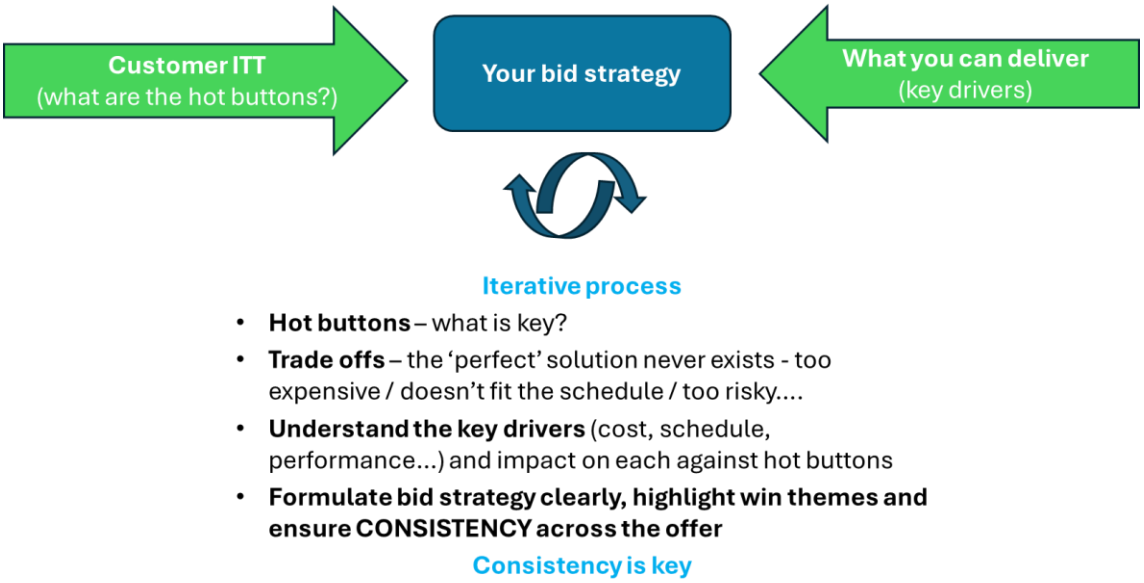
Note: a baseline which changes throughout the bid process is likely to cause inconsistencies with supply chain elements, costings, schedule, compliance, etc.

> The clearer an understanding you have of what is required and what will score points, the better able you will be to define your solution towards this goal.

When developing your solution, consider:

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- **What you are offering and how this supports the Bulgarian space strategy –** how does it align to the technology capability areas Bulgaria wants to develop?
- **Ensure you read the whole tender** – technical and non-technical; and be sure to understand what the Key Acceptance Factors are for your bid.
- **Hot buttons** – linked to the above. These are the points that ESA and the Bulgarian National Delegation really care about. Could be technical or programmatic and will shape your bid strategy.
- **What you can offer within the budget**, and how changes in your offer will impact on compliance, cost, schedule, etc. i.e. **your cost drivers**. You may look at trade-offs as part of this to determine the best strategy for your baseline.
- **Your supply chain** and their cost drivers.
- **The evaluation criteria.**



Arriving at a solution is an iterative process. You may need several workshops with your bid team to determine the best way forward. Where the scope of work is not defined, e.g. a Call for Proposals, you will need to carefully define your offering to align with the spirit of the call and create a proposal that provides value for money for ESA and the Bulgarian National Delegation.

Note that if your bid has a maximum budget, you must scope your project to meet this budget.

Tools that are helpful when defining your solution (see section 3.4.4 for more details on each one):

- Work logic
- Draft WBS and WPDs
- Draft schedule
- Draft deliverables list
- Draft compliance matrix, at least against key requirements (if your bid has requirements – if it is a Call for Proposals, this won't apply)
- OBS

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- Draft PSS forms (or PBF)

3.4 Writing your bid

A lot of work goes into the bid before you arrive at the stage of writing your bid response. The aim of this section is to give you some tips about writing, based on common pitfalls to help you avoid losing points unnecessarily.

3.4.1 Length of tender documents

Keep the tender as short as possible – make it easy for the reviewer. Write concisely and avoid unnecessary details that will not score you any points. Plan how you will use your page limit, keeping the evaluation criteria in mind. For example, if the technical section (objectives, definition of requirements, quality of engineering approach and discussion of problem areas) is worth 40% of the score, work out how many of the available pages you should allocate.

Typically, **Calls for Proposal will have a 25-page limit** (though check your specific CfP). ESA will only evaluate what is in the 25 pages of the proposal (anything from page 26 onwards will not be read). Therefore, use the 25 pages wisely to tell the reviewers what they need to know in order to award marks. However, note that some elements are not included in the page count, such as the Cover Letter, PSS forms and annexes (see the CfP cover letter for details).

For PECS calls, it can be a good idea to include company presentations or brochures as an annex, showcasing the capabilities of your organisation. However, within your bid (under the section "Background of the Company(ies)"), you should focus only on specific, relevant examples to demonstrate your credibility for the work to be performed as part of that project.

> Calls for Proposal and other types of tender (e.g. EXPRO bids) include a proposal template that you are required to complete. This is provided as part of the tender pack. Be sure to complete the template, don't restructure or renumber the headings and remember to delete the instructions before you submit.

> The tender should be written in a precise and concise manner. Note that no extra marks are awarded for unnecessary length or needlessly detailed descriptions.

For information: other types of tender (not CfP), should have the following page count:

- <50 pages for a bid below 200k Euros
- <75 pages for a bid above 200k Euros

3.4.2 Structure of the bid

If you are responding to a PECS Call for Proposals, the CfP pack includes a template to be completed. This section contains some common points which are relevant to all proposals, including CfP. For more specific examples, section 3.4.4 gives a more in-depth case-study, providing the basic elements to be included in a Call for Proposals and highlighting how to present key elements of the bid. However, note the 25 page limit for CfPs – meaning some elements will need to be reduced to fit the page count. **Always read the tender documentation carefully, and take note of the points in the proposal template, as they will tell you how to structure your bid and what to include.**

A typical CfP bid response will have the following contents – with 3 documents to be uploaded to ESA STAR:

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- Cover Letter – signed by you.
- One Proposal Document containing all sections of your bid, including the Cover Letter, Proposal, finance forms and any annexes.
- A separate document containing CVs for key personnel. This is uploaded into a separate section within your ESA STAR submission folder, to ensure personal data is controlled.

Be sure to read the tender requirements for your CfP to ensure you structure your bid submission in the correct way.

It is a good idea to log onto ESA STAR's Bidder Restricted Area early in the process to understand how the upload will need to be done.

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3.4.3 Top tips for writing an ESA proposal

Consider these points when writing your ESA proposal:

- The TEB members can only score what is written in the Proposal – don't assume any knowledge. **If in doubt, spell it out!**
- **Be clear what you are offering.** Explain what the product / technology / service does and why it matters, in simple terms.
- **Use the state-of-the-art section** in the technical part to explain how your offering enhances what is already available across Europe.
- **Explain how your offering is competitive.** How does it differ / compare to others on the market and provide information about competitors.
- **Including an end customer in your consortium** is a good idea if you can, as it gives credibility to your idea. Some CfP or tenders require this.
- **Clearly define the objectives and scope of the work to be undertaken with the funding.** Be realistic – explain what you will do on this project. If you mention future developments, make it clear these are not in scope.
- **Clearly define who will do the work, who is responsible for what and what the deliverables are for each company in the team.**
- Make it easy for the reviewer to award marks – write in a **precise and concise** manner. Note that no extra marks are awarded for unnecessary length or needlessly detailed descriptions.
- **Consistency is key** – the ESA TEB members will check everything. Make sure you run through the checklist of common mistakes to avoid lost points due to inconsistencies.
- **Use diagrams** where appropriate – a diagram can be worth 1000 words.
- Have the **evaluation criteria in mind**. Always consider whether what you are writing is relevant to the opportunity in question. If it is not, don't include it. This is particularly relevant where you have a page limit, e.g. a Call for Proposals.
- If you use **AI**, use it in moderation and be sure to **check the output**.
- ESA is an international organisation and English will be most people's second language. When writing your response, **use unambiguous, simple, clear language**. Avoid colloquialisms and complex sentence structures which could be difficult to understand or prone to ambiguity.

A checklist is included in the next section – use this to check your proposal and avoid common pitfalls

a) Checklist and common pitfalls to avoid

The following checklists are intended to help you avoid common mistakes. They are grouped by key section of the bid.

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i. Cover Letter & annexes

For information to look out for in the Cover Letter and how to interpret it, see section 2.5.1

- ☐ Ensure your Cover Letter is a **separate document** so that it can be uploaded to the correct section on ESA STAR.
- ☐ **Budget**: have you complied with the maximum budget for the tender (indicated in the Cover Letter)?
- ☐ The **type of price:** have you provided the price in the correct format? (FFP/FP+V/Ceiling Price, ROM, etc.)?
- ☐ Where it is FP+V have you stated the **economic conditions** of the month and year on which your price is based?
- ☐ **Currency**: is your price in Euros and have you shown the exchange rate used?
- ☐ **Validity period** for your proposal: does this match what is requested in the tender?
- ☐ **Closing date:** are you within the closing date (plus any extensions given) for the tender? If the closing date has passed, and no extension was granted, you will not be able to upload your proposal onto ESA STAR.
- ☐ **Annexes**: have you included all the declaration proformas to be completed?
- ☐ **Have you signed the cover letter**? The cover letter must be signed – and by signing it, you are accepting the contract conditions.
- ☐ **Is the proposal a resubmission**? If so, declare it as such as indicated in the proposal template.

ii. Background and experience

An example can be found in here

- ☐ Have you included information on relevant experience? Be specific and cite experiences that directly support the work you are proposing to do on this contract.
- ☐ Have you made it clear which facilities are going to be used to perform the work under this contract?
- ☐ Where there are gaps, have you explained how you plan to acquire the relevant experience or facilities for this project (e.g. subcontract, etc.)?
- ☐ Is the information you have included relevant to this project? Don't include generic 'brochure' information that is not relevant.
- ☐ Have you demonstrated your understanding of the state of the art, the market, other key players or work done in Europe?

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iii. Technical – objectives & requirements

An example can be found here

- ☐ Have you clearly explained the objectives of the project?
- ☐ Are your objectives and scope clearly defined, and realistic for the budget / schedule of the project?
- ☐ Have you included clear technical requirements (i.e. have you covered the key points / are the requirements quantified and verifiable / do they match the market need)?
- ☐ Is it clear what you are proposing? Have you explained what the product / technology / service does and why is matters? (Good idea to ask someone else to read the bid).
- ☐ Have you used the state-of-the-art section in the technical part to explain how your offering enhances what is available?
- ☐ Have you explained how your offering is competitive? How does it differ / compare to others on the market and have you included information about competitors?
- ☐ If you are proposing an offering at TRL 3 or above, have you included an end user in your team?
- ☐ **Have you clearly defined the objectives and scope of the work to be undertaken with the funding?** Be realistic – explain what you will do on this project. If you mention future developments, make it clear these are not in scope.
- ☐ Have you identified key problem areas and discussed potential solutions?
- ☐ Have you checked that you have included all required sections or documents as required in the tender?

iv. Implementation – programme of work & engineering approach

An example can be found here

- ☐ Have you described the engineering approach (i.e. have you described the baseline concept, have you justified any deviation from proposed reviews, have you included a first iteration of testing or validation)?
- ☐ Have you checked for consistency across the flow charts, WBS, WPD, schedule and the accompanying narrative for each one?
- ☐ Have you included a separate Work Package Description (WPD) for every WP in the WBS?
- ☐ For every WPD, have you included sufficient detail to understand the full scope of work? (i.e. sufficient and clear inputs, activities and outputs)?

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- ☐ Have you included the WPD in the main proposal? They should not be in an annex.
- ☐ Have you checked for consistency across the WPD (outputs) and the project deliverables?
- ☐ Have you used the PSS A20 template form as a basis for your WPD? Ensure you include a work package manager, a start and end event and responsible organisation in the header (using the template will ensure you don't miss anything).
- ☐ Is your WBS clear and logical and includes an appropriate number of work packages? See here for section on WBS.
- ☐ Have you colour coded your WBS to clearly show which entity is responsible for which work package (if you have more than one entity involved in your project)?
- ☐ Have you put together a risk register?

v. Management, planning & costing

An example can be found here

- ☐ Have you described how you will manage the project (i.e. monitoring the activity, how you will manage sub-contractors, how and who will manage the project)?
- ☐ Have you included a Gantt chart schedule?
- ☐ Does the Gantt chart show sufficient detail to understand the project (without being too detailed)?
- ☐ Have you shown dependencies on the Gantt chart?
- ☐ Gantt chart – avoid too many tasks in parallel or too long tasks that are difficult to track.
- ☐ Ensure alignment between the WBS and WPD and the Gantt chart.
- ☐ Have you included a narrative explaining the Gantt chart, the critical path, the constraints, the schedule contingency you have included and the key schedule drivers?
- ☐ Have you reviewed your costings for credibility (i.e. do the hours match the scope of work in the WPDs)?
- ☐ Are any procurements you are undertaking appropriate – i.e. have you explained why they are needed (they should be clearly labelled on the WBS, WPD and Gantt)? If they are subcontractors, do you have a proposal from them for their scope of work? Including PSS forms.
- ☐ If you are undertaking travel, have you included a travel plan (i.e. detailing which meetings you will be attending in person, where, with how many people and how long for)? Ensure you check flight costs and a per diem rate and include a credible figure for the destination.

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- ☐ Does the travel plan in the proposal match the PSS A-2 Exhibit B travel plan?
- ☐ Deliverables: have you included all deliverables in this section? Check for consistency with the outputs of the WPDs.
- ☐ Have you included, as a minimum, all the deliverables requested in the SOW?

Finance forms / PSS forms:

- ☐ When you have completed your PSS forms, does the management portion look reasonable? (i.e. not excessively high (>12%) or very low (<5%) with regard to total hours)?
- ☐ Have all costs been included in the PSS forms? Travel costs, labour hours, any procurements, subcontractors, material purchases, etc.?
- ☐ PSS forms: have you included PSS forms for your organisation (if you are prime) and any subcontractors you may have? (one set of PSS forms per entity)
- ☐ PSS forms: are all PSS forms signed?

CVs:

- ☐ Ensure your CVs are in a separate document so that they can be uploaded to the correct section of ESA STAR (designed to protect personal data).
- ☐ Have you included a CV for every person listed under your 'key personnel' section?
- ☐ Have you drawn out the person's relevant (to this project) experience?

vi. Contractual volume and compliance with tender conditions

- ☐ Have you signed the key documents – Cover Letter and PSS forms? By signing the Cover Letter you are accepting the draft contract – ensure you don't contradict this elsewhere.
- ☐ Are you compliant with the tender conditions (i.e. all the points requested in the Cover Letter, for example, using the proposal template, number of pages, etc.)
- ☐ Are all sections of the proposal requested in the ITT included? If you have no content to add within one section, include the section anyway and say why it does not apply.
- ☐ Have you included a milestone payment plan? Check for consistency with milestones listed in the Gantt chart, work logic, major reviews and travel plan.
- ☐ Have you completed the (B)IPR section (typically a table template to complete)? For your IPR and any supplier IPR you may be using. Avoid a confusing IPR picture – i.e. be clear if you are declaring anything, and who owns what.

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☐ Are you compliant to all Key Acceptance Factors set out in the tender documentation? If not, it is possible that your bid will not pass the TOB and be eliminated from the review process.

3.4.4 Example bid

This section takes you through an example bid based on an ESA case study. **This section includes the elements you would expect to include in a typical Call for Proposals, though the order of the different elements may differ depending on the call. What to include and in which section will be set out in the CfP template that you will need to complete. Remember to adapt the content shown below to fit your page limit.**

Be sure to read your tender carefully to make sure you address all the required points for your specific bid. This Guide alone is not sufficient to respond to a tender.

The next part of this section explains what you should include in your bid and provides some tips and guidance on how to maximise your scoring.

[The examples cited in this section are taken from material presented as a case study by ESA as part of a Bid Writing Workshop. The example is for the design and build of a coffee machine – a simple, non-space example allowing the principles to be demonstrated. The ESA ITT and example response can be found at the end of this Guide.]

a) Using the template provided with the tender

Most Calls for Proposals and other tender opportunities (such as EXPRO) include a proposal template, which you need to complete. The case study (which is included at the end of this Guide) is based on an EXPRO bid, but this section has been re-arranged to show the typical order of information required for a CfP. Always refer to the proposal template for your specific bid. Remember that if you have a 25 page limit, you may need to adapt some of the bid artefacts described below to fit the page limit.

Proposal templates include red font paragraphs for your information. They are helpful pointers telling you what to include. They should be deleted before submission.

No change in the structure, title heading, margins or font are allowed.

For a typical CfP, you will most likely need to submit 3 separate files:

- Cover Letter.
- Detailed / Full Proposal template including any annexes and PSS forms – save these together as one document.
- CVs – these should be uploaded into a separate section on ESA STAR in order to protect personal data.

The next sections will go through each of the required sections and artefacts to be created as part of your bid, with explanations and notes how to maximise your score. Extracts from the example bid are shown to demonstrate key points, these have an orange box around them. Helpful tips are shown in coloured boxes. The full example ITT and response are included as attachments to this Guide.

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b) Part 1 – Technical and Application – specific to a Call for Proposals

Note that this section has been prepared for a Call for Proposals response – where there are no requirements set by ESA. The example in the case study, however, is for a response to an ITT with detailed technical requirements. If you would like to see an example technical response to a Statement of Work, this can be found in Annex 4.

i. Introduction and Scope

Provide the background and rationale for what you are proposing to do. Keep it concise (no more than half a page) but ensure it is clear and provides sufficient context for the reviewer to understand your development.

ii. Technical Objectives

In a Call for Proposals, the objectives are **not** set, like they would be in an ITT. It is your responsibility to define the objectives. The objective is what you hope to achieve with the proposal (i.e. the end goal) and the key constraints or conditions under which that should be met. Everything you propose to do should be derivable from this statement.

> *"'…this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to Earth"*
>
> – this was the objective stated for a 24-Billion-dollar project.

Objectives should:

1. Be **short** (1 to 3 sentences)
2. Be **clear and verifiable**
3. Contain the **core essence** of what should be achieved

Objectives should not:

1. Describe the work to be done, the workflow or how to do it
2. Describe the nice to haves/options
3. Be overly long and descriptive

In 'Application' part of the Proposal you should justify why this is a good objective and how it fits the programmatic constraints.

iii. Requirements

Unlike with an ITT, the requirements in a Call for Proposals are not defined by ESA. It is up to you to define the requirements for your project. They are the key measurable features that the product or the work must meet in order to be declared successful and should take into account what the end user needs and considers important.

Requirements:

- Are clear, verifiable, quantitative and measurable.
- Tell you what needs to be achieved/realised.
- When measured, tell you whether the objectives were achieved.

Note: requirements are not the facilities, tools, experience or personnel that you need to perform the work.

If you are not in a position to properly define a full set of clear, well formulated requirements then consider:

either looking at a preparatory activity

or including an activity (as a work package) focused on requirement definition.

An example of well and poorly formulated requirements from the case study is shown below:

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Well formulated requirements:
- The coffee shall be served at a temperature between 85 and 90˚C.
- The coffee shall be delivered to the customer within 4 minutes of being ordered.
- The coffee shall be dispensed in 200ml +/- 10ml servings.
- The customer shall receive a biscuit with each coffee, included in the price of the coffee

Poorly formulated requirements:
- The coffee has to be a good temperature
- The coffee must be served quickly
- The coffee shall have big serving sizes
- We want people to have biscuits with their coffee

Not a requirement at all in this sense:
- We need to buy a kettle and coffee cups
- We need to hire someone to make the coffee
- We should do a trade off on what biscuits to give
- We shall get a coffee sellers license

iv. Technology Readiness Level

A definition of TRL can be found in the Glossary. In this section, indicate and substantiate the current level of the technology. Note that the type of activity proposed has to be compatible with the start and end TRL indicated in the Cover Letter of the CfP.

v. Engineering Approach

This section is expected to be the bulk of the Proposal.

State of the Art

- Provide a brief overview of "state of the art".
- Explain why you chose your proposed baseline instead of others, what benefit does it have over the others?
- Show you know your competitors and their products.

HBM Examples

What alternatives exist/ What is the state of the art?

The current state of the art in coffee production is the Caffeine Blaster 100 as used by Star Clucks – the market leader in this area. The Caffeine Blaster 100 can prepare 10 different types of coffee and can prepare 2 cups simultaneously.

The Caffeine Blaster 200 is currently in development and scheduled to be released in 6 months. The CB200 can prepare 12 different coffee types and 4 simultaneous beverages. Other coffee production machines are the protected property of the provider (e.g. Lotsa Coffee) and not for sale to competitors.

What evidence is there it will work?

A breadboard has already been built and has demonstrated the proof of concept of Patent # 1234 thereby ensuring that this is a low-risk approach.

Technical Steps

- Present and discuss in detail the scientific/technical steps to achieve the set objectives.
- This needs to correspond to the Work Flow Logic.
- This is the text description and justification of the flow chart and the Work Breakdown Structure.

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Proposed Work Logic

[Example proposal pages 14-15]

The work logic is usually presented as a flow chart, showing the logical flow of work, the reviews and the dependencies. It is intended to show the order in which the work needs to be performed (i.e. the logic), and is a good starting point for building the WBS and the schedule.

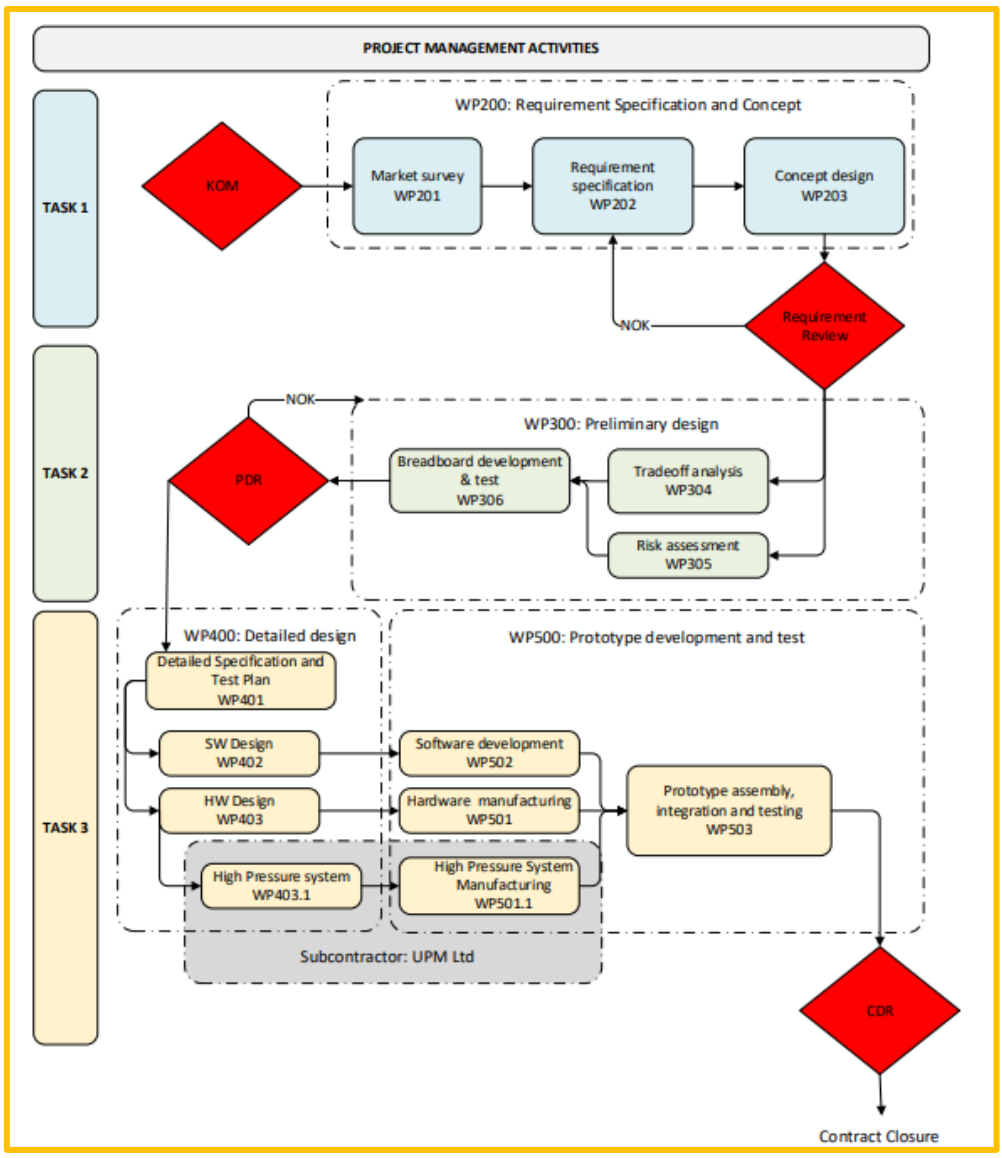
Consider the following points when creating a work logic:

- What are the key stages/steps in the work?
- What is the purpose of each step?
- What will be done in each step?
- How will each step be assessed, controlled, reviewed or validated?
- How does each step relate to the others?
- If there are subcontractors: how is the work split between companies?
- What are the key trade-offs? What are the key decision points?

If you are unsure which reviews to include, see Annex 1 for a summary of the key reviews by phase.

Full details can be found in ECSS-M-ST-10C (Chapter 4,5 and Annex A)

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In the work logic show:

- The reviews and decision points
- Ensure consistency with the WBS and Gantt chart
- Clearly highlight subcontractor work
- Ensure dependencies are clear

Any deviation from the work logic show in the SOW should be justified. You do not have to copy the flow in the SOW (it may be wrong or incomplete) but you do have to justify why you deviate. This shows you understand the work.

Implementation aspects

Present a first iteration of the baseline design or concept. A diagram can be helpful. An example from the case study is shown below:

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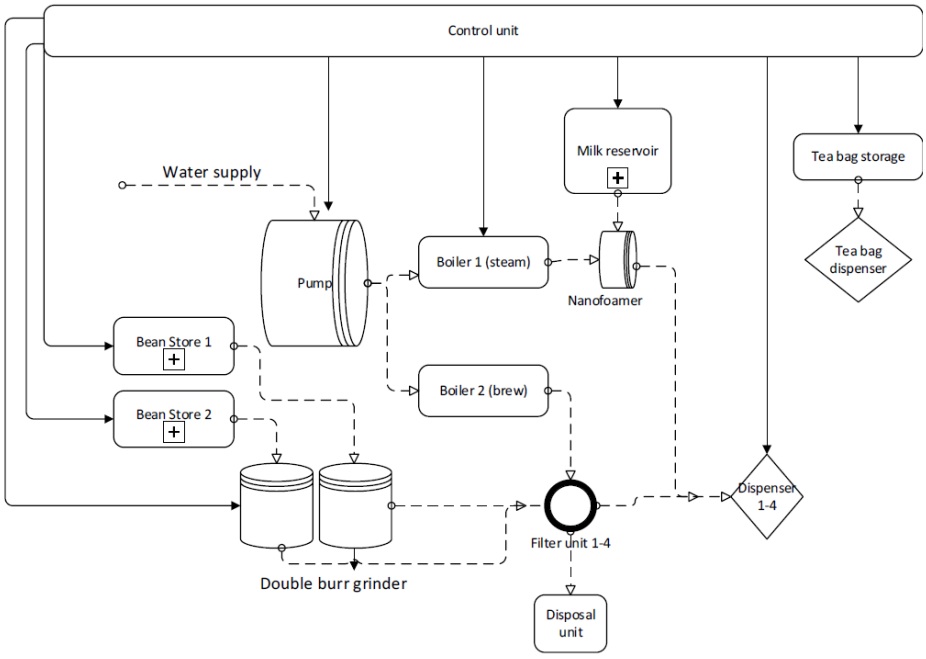


Figure 1. Functional Diagram of CM2000

Consider these points:

- What is your baseline design/concept?
- How will the work be done? What methodologies will be used, what key analyses and simulations will be done?
- What is minimum testing and verification that will be done?
- Is the scope and 'depth' of work sufficiently clear?

vi. Technical Feasibility, Problem Areas and Development Risk

[Example proposal page 11]

This is a key section to demonstrate your understanding. Correct identification of risks and potential problems shows you understand the work you are proposing and can manage it properly. The TEB will be assessing that the level of risk is adequately identified and that your proposed approach is credible.

The problem areas and risks discussions are intended to cover primarily technical issues (and programmatic where there is a key dependency/timeliness issue).

You should address problem areas and risks that may arise during the work and cannot be pre-emptively resolved prior to the start of work.

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When describing the problem areas or risks, think about the following:

- Consider all possible sources of problems / risks on your project, for example:
  - Risks linked to new or innovative technical solutions or technology developments
  - Inadequate, unstable or unclear requirements
  - Level of definition and stability of external interfaces
  - Adequacy, availability and quality of resources, facilities and tools
  - Short time scales
  - High cost items and work packages
  - Industrial organisation
- What is the potential **impact** if the problem/risk arises?
- **Prevention**: What actions will you take to minimise the risk of it becoming a reality?
- **Mitigation**: What will you do if the worst case happens, how will you ensure the project can continue (can it?)?
- **Avoid manpower and management issues** (e.g. risk of a member of staff leaving the company)
- ***If you are aware of potential risks that could arise during your project, it is best to mention them and discuss the impact they may have.*** ESA values transparency, and highlighting potential risks helps to demonstrate that you understand the topic and are actively seeking to mitigate potential future problems. It is never a good strategy to try and "hide" risks by not mentioning them.

For each risk you should provide a brief description, along with your assessment whether the risk occurrence and the impact is high, medium or low and the mitigation activities to reduce the risk occurring. If you are including mitigation activities in your baseline, be sure to state this and ensure that they are included in your baseline cost.

An example of a risk table is shown below:



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HBM Example:

Problem	Description	Impact	Mitigation	Prevention
Nanofoamer cannot produce bubbles of less than 30microns at the set power limits.	Creation of bubbles less than 30microns, might increase power consumption exponentially. Nanofoamer power consumption of above 1000W would significantly increase running costs of the unit.	Low	Relax the requirement to 40microns or 50% efficiency.	Design replaceable foam inducer head for the foamer unit with an option to size up to 40micron bubbles. Early testing of the nanofoamer.

Bad Examples:

"We don't have someone who is an expert in nanofoamers and are not sure to be able to hire someone."
"The project might be late"

Common, useless one:

"A key person might leave – we would hire a new key person"

vii. Trade-offs

[Example proposal pages 12-13]

Discuss the trade-offs made between competing concepts to arrive at the proposed baseline/solution.

Identify further (lower level) trade-off analyses anticipated to be carried out at later stages of the development (foreseen to influence design, cost, schedule, etc., or as a preventative measure to address some problem areas identified).

This discussion substantiates and provides justification for the technical choices made for the baseline design.

An example is shown below:

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A high level trade-off between a super-automated high pressure system based on our patented software process and a semi-automated high pressure system has been carried out as part of the proposal. The following parameters were considered:

Efficiency (preparation time and throughput)
Semi-automatic HBMs require an operator for manual milk frothing and bean granularity setting. Super–automation decreases the time of any bean-based beverage production by 60% (5 +/- 2sec) by simultaneous milk frothing during coffee brewing and a further 10% by simultaneous dispense. Further, software controlled bean grind settings negate the need for manual adjustment, further decreasing total preparation time.
Semi-Auto: 0
Super-Auto: ++

Running cost
The increase in efficiency does incur higher power consumption than semi-automatic units due to additional electric components. However, such cost is offset by the lower cost of operation of super-automatic HBMs (training, safety and salary of the operator will not be required).
Semi-Auto: 0
Super-Auto: +

Variety
Due to the manual bean granularity setting with limited options, differential caffeine content is not offered in most semi-automatic HBM units. Super-automation can integrate this innovation seamlessly in conjunction with a high performance burr grinder, offering at least 2-fold more coffee variety to the customer.
Semi-Auto: -
Super-Auto: ++

Risk
The use of super-automation negates the operational and health and safety risks commonly

viii. Prospect For Exploitation and Use

This is very strongly linked to the objectives and the requirements (in particular the user requirements).

- Who will use the technology developed?
- What will they use it for?
- Why is it needed?
- What are the competing technologies/methods?
- Why could this be better?
- Is there a valid business case for continuing after this activity?
- Does it match the programmatic constraints of the call?
- Some CfP will ask you for a business case, where you will need to describe the planned commercial sales, target customers and expected potential revenues. If preparing a business case, be realistic in your estimations, cite your sources and explain your logic and assumptions.

ix. Technical Implementation / Programme of Work

This part is concerned with the delivery of the work. You will need to describe the logical flow of the work, the reviews and the dependencies.

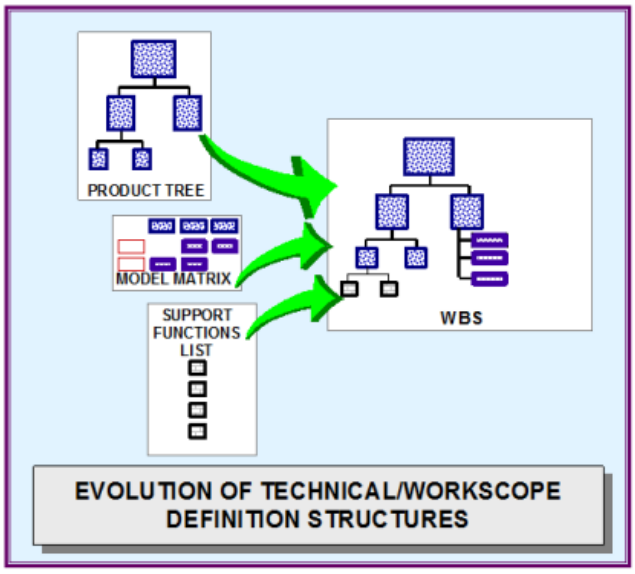
Work Breakdown Structure (WBS)

[Example proposal pages 16-17]

The WBS is a fundamental artefact used to structure your project. How you define your WBS will determine the future management and monitoring of the project. Having a clear, logical and well thought-out WBS is

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key to building your project, defining your project organisation, building your costings and presenting the project to ESA.



The WBS is a culmination of the Product Tree (or Product Breakdown Structure), the model matrix and the support functions needed for the project. These should be developed first to ensure a coherent WBS.

The WBS consists of Work Packages (WP).

> It is important to build a good WBS, as this is the foundation of the project and many subsequent artefacts are built on the same structure.

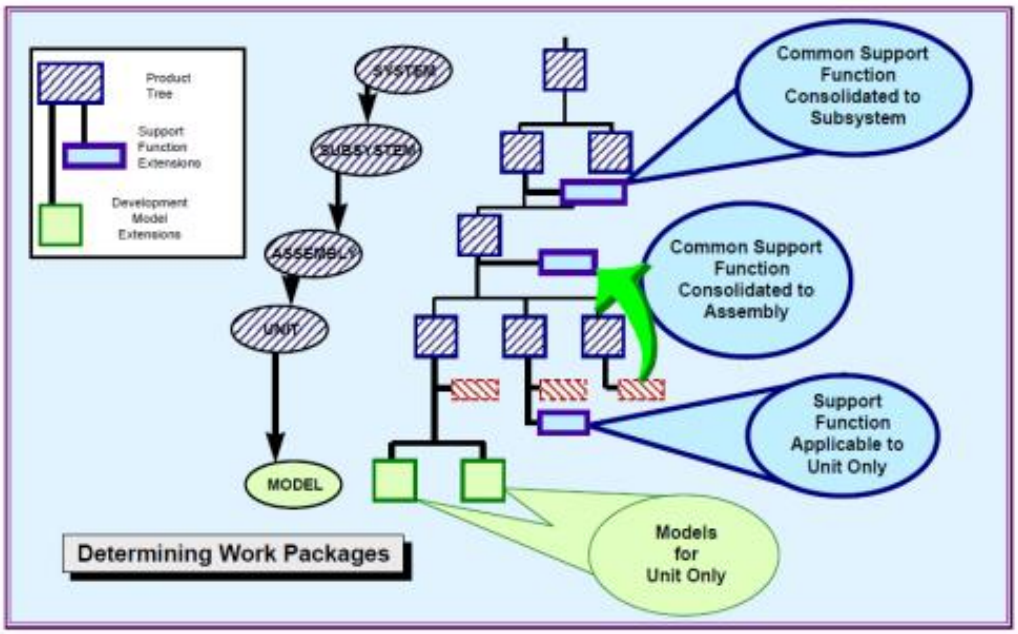
You choose how to structure your WBS and the level of WP that is appropriate for the project. Work packages should be defined in sufficient detail to allow adequate control to be exercised during the project phase.

Structuring your WBS

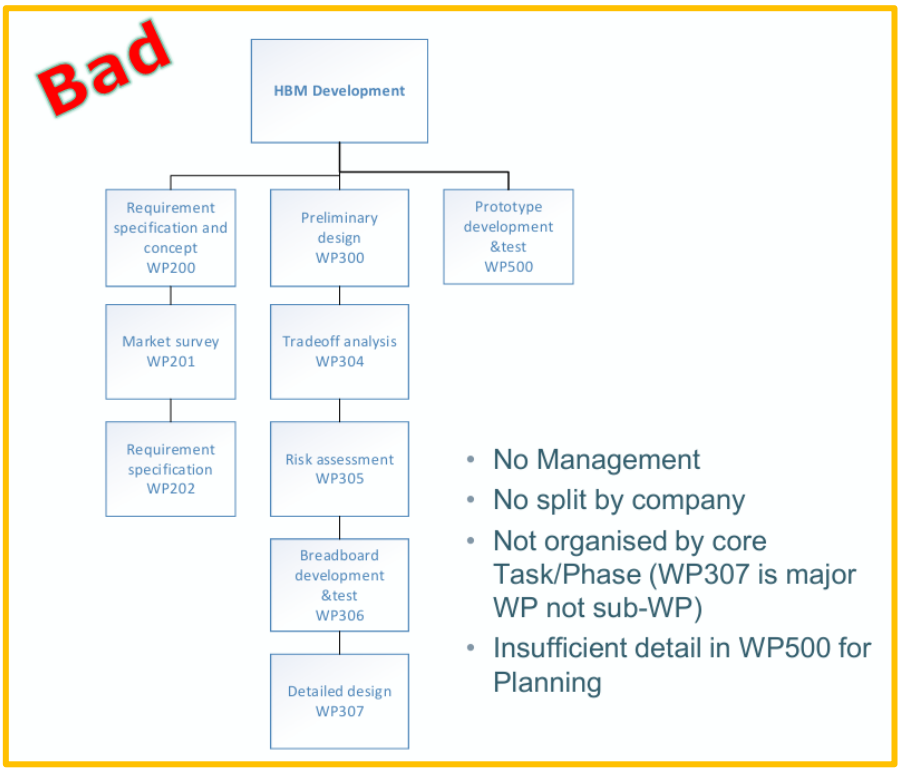
The structure of the WBS is up to you, but consider:

- If your project spans several phases (see Annex 1), the WBS will need to be broken down by phase. For example, one WBS for phase A and one WBS for phase B.
- Use the work logic as a starting point - logically structure the main Work Packages following the main tasks of the work flow. If possible, have a review at the end of major work packages.
- Consider supporting functions in the WBS, and at what level they are most appropriate. They can be at any level, but must not be duplicated.
- Include a WP for management activities.
- Ensure each company has separate (sub)work packages.
- Colour code the WBS to show work packages belonging to different organisations clearly.
- Ensure all tasks in one work package 'belong together'.
- If you have different models in your project (e.g. Engineering Model, Qualification Model, Proto Flight Model…), work related to manufacturing, assembly, integration and test (MAIT) should be shown against the models. Engineering work should be shown in connection with its Product Tree element (i.e. at system, sub-system or unit level).
- A work package should typically be between 50k and 500k Euros, though the amounts could be higher if necessary and justifiable. Where values are less than 50k Euros, the work packages should be rolled up to a higher level, or very large work packages should be broken down into smaller ones. This avoids huge WPs that are hard to manage or too long, and tiny ones that would take up disproportionate time to manage.

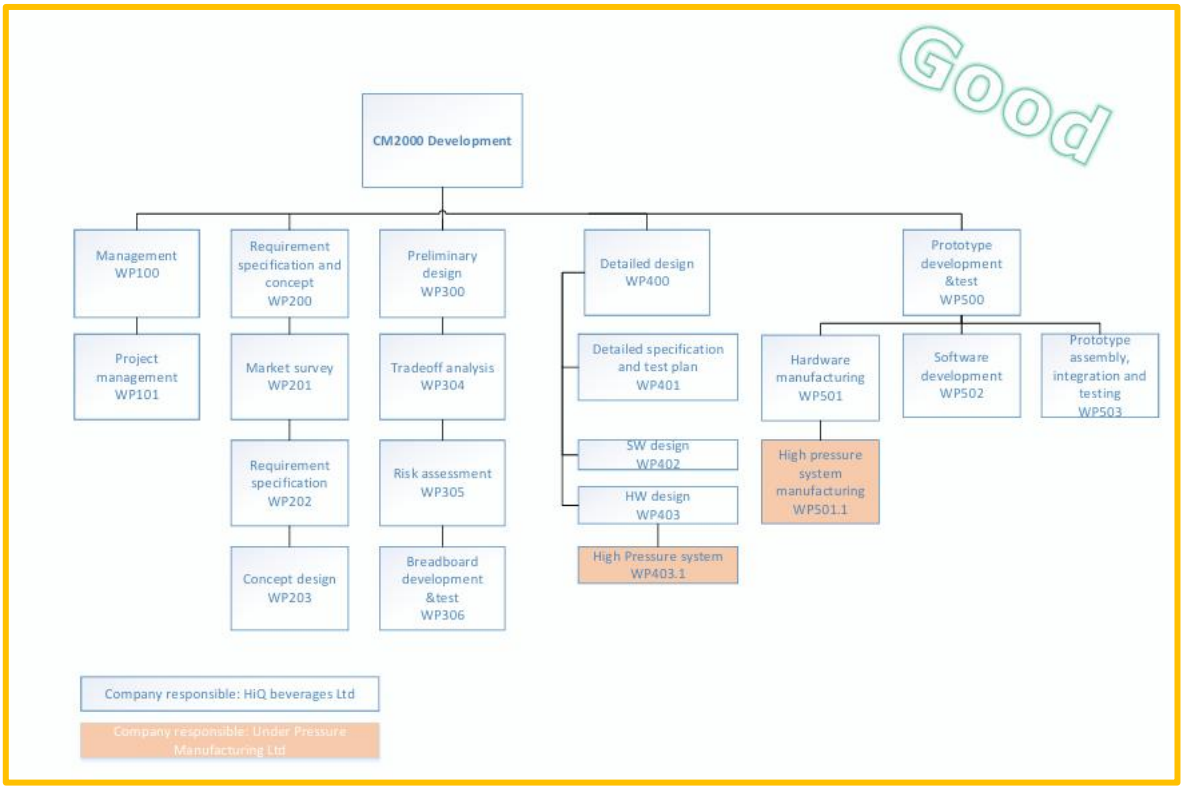
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The ESA coffee case study gives an example of a good and a bad WBS.



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Example of a good WBS from the case study. Note that the 'good' WBS intentionally combines 3 styles – all are acceptable, but choose one and be consistent.

This is considered good because:

- It shows a clear split by company and management of the subcontractor is implied. Colour coding is helpful (don't forget to include the legend)
- WP400 is clearly significant, but is supported by sub-work packages
- WP500: sub-work packages give a fair indication of the core tasks and credible planning
- Lines are clear (no spaghetti WBS)

Work Package Descriptions

[Example proposal page 17]

The WPDs form the detailed description of the work that will be performed. They provide the detailed scope of the work and deliverables, showing inputs, activities and outputs for each work package.

You will need to include one WPD for each WP in the WBS (one per smallest element in the WBS, no need to include WPD for 'header' work packages).

Aim to keep the WP to 1 page for ease of reading.

The WPDs provide the basis for costing the activities.

They must be consistent with the WBS, schedule and work logic.

A template (PSS A20 form) can be used for the WPDs.

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Essential data to be included:

- Work Package title
- WP manager
- Company
- Start and end dates (T0+) and/or event (PDR, CDR, etc.). Avoid using actual dates.
- Inputs
- Description of work (i.e. activities)
- Outputs (each WP will result in a number of deliverables, ensure consistency with the deliverables list, including identifiable numbering per deliverable e.g. Technical Note TN1))

Tips

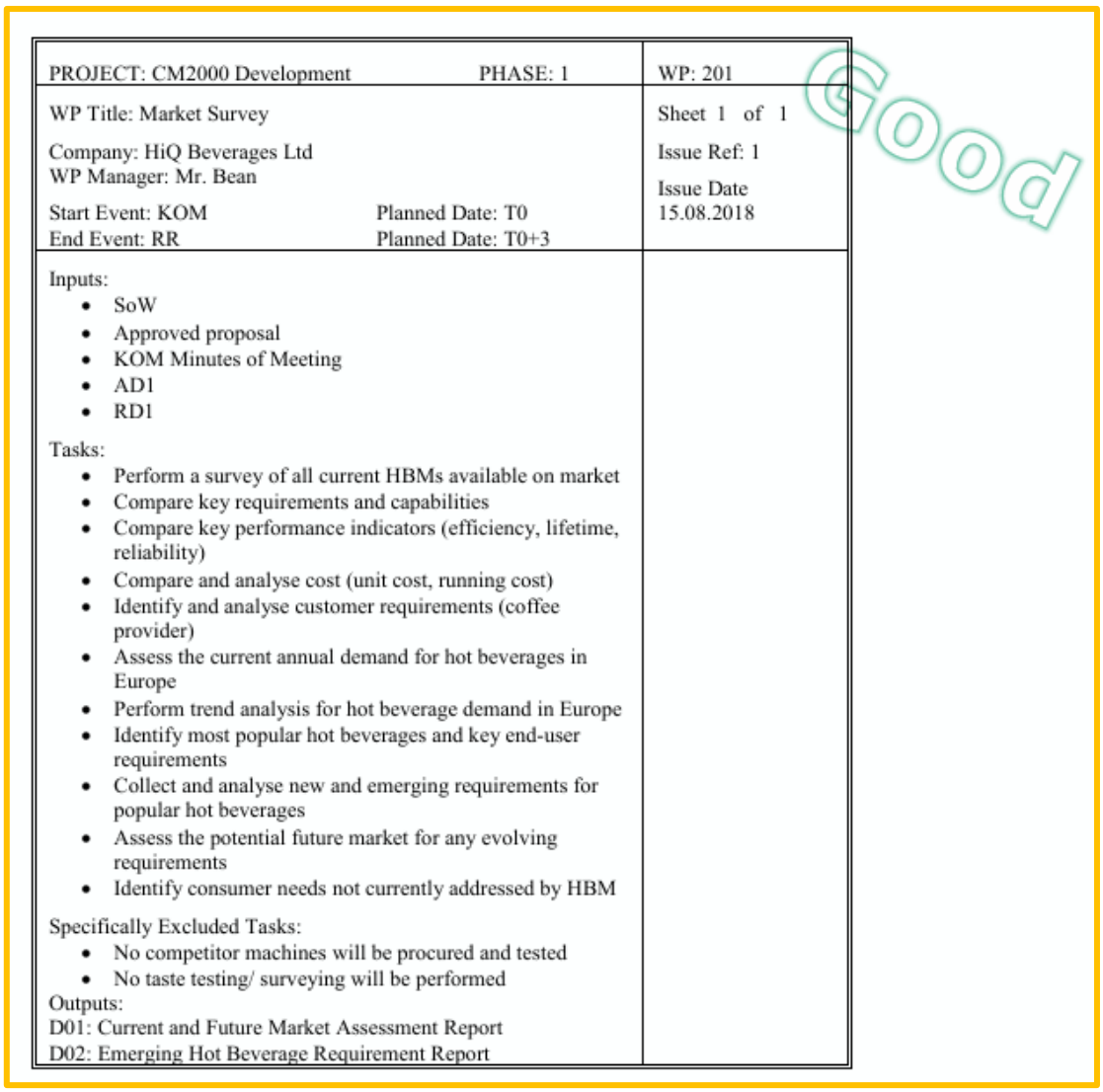
- Cross-check that the WPM is listed as key personnel and CV is included.
- Avoid task descriptions that are too high level or open to interpretation, for example "platform design".
- Make sure the milestones align with the schedule.
- Assume the reviewer will have their own view of what can 'reasonably' be assumed to be included in the work package. If you are excluding things that could reasonably be assumed to be included, specifically list these. (Note, in the absence of any other definition, the reviewer will assume that the relevant ECSS standard will apply, which may be more onerous than you had intended – so be clear what you are including and what is out of scope).

A poor WPD is shown below. Note it is at too high a level, too open to interpretation, the scope is not defined, the deliverables are not defined, the company is missing, there are no inputs, actual dates are used rather than T0+…, and it does not link to any reviews.

PROJECT: CM2000 Development PHASE: 1	WP: 200
WP Title: Requirement Specification and Concept WP Manager: Mr. Bean Start Event: KOM Planned Date: 1st April 2018 End Event: End of project Planned Date: 1st April 2019	Sheet 1 of 1
Tasks: • Do market survey • Write Requirement Specification Outputs: Technical Note	

An example of a good WPD is shown below.

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PROJECT: CM2000 Development	PHASE: 1	WP: 201
WP Title: Market Survey Company: HiQ Beverages Ltd WP Manager: Mr. Bean Start Event: KOM End Event: RR	Planned Date: T0 Planned Date: T0+3	Sheet 1 of 1 Issue Ref: 1 Issue Date 15.08.2018

Inputs:
- SoW
- Approved proposal
- KOM Minutes of Meeting
- AD1
- RD1

Tasks:
- Perform a survey of all current HBMs available on market
- Compare key requirements and capabilities
- Compare key performance indicators (efficiency, lifetime, reliability)
- Compare and analyse cost (unit cost, running cost)
- Identify and analyse customer requirements (coffee provider)
- Assess the current annual demand for hot beverages in Europe
- Perform trend analysis for hot beverage demand in Europe
- Identify most popular hot beverages and key end-user requirements
- Collect and analyse new and emerging requirements for popular hot beverages
- Assess the potential future market for any evolving requirements
- Identify consumer needs not currently addressed by HBM

Specifically Excluded Tasks:
- No competitor machines will be procured and tested
- No taste testing/ surveying will be performed

Outputs:
D01: Current and Future Market Assessment Report
D02: Emerging Hot Beverage Requirement Report

x. Background of the Company(ies)

To help the reviewer, it is important to write this section as concisely as possible, describing **relevant** background, experience and facilities. Avoid filling this section with every achievement your company has made, if it isn't directly relevant to the project. Additionally, avoid inserting your company brochure here and asking the reviewer to pick out relevant parts. Be specific in the elements you include in this section of the bid, but for PECS Calls for Proposal, you could include presentations or brochures as an annex.

Consider including:

- Overview of company: (size, age, years of experience and general heritage)
- Number of employees, turnover, ownership
- Relevant experience that the proposed project team has for the performance of the work
- Key relevant customers
- Key facilities (relevant to this project)

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You will need to include information for you and your subcontractors.

xi. Facilities

Facilities are the things needed in order to complete the work proposed.

You need to identify what you need for the proposed work and whether you have it, or, if you do not have it, how you propose to gain access to it.

Example facilities:

- Test equipment
- Specialist design and analysis software
- Specialist computing facilities
- Specialist manufacturing facilities

> It is a good idea to be upfront and identify any missing background, experience or facilities yourself, along with your plans to secure them.

The following would not be considered facilities:

- Your building and address
- Your car park
- Your desks and office furniture
- Standard computers, office software and printers

An example from the case study is shown below:

1.4.4 Background of the company(ies)

Prime contractor: HiQ Beverages Ltd

HiQ Beverages is one of the leading process innovators ion Eastern Europe in beverage production software and machinery. Founded in 1990, the company has more than 20 years of experience in specialized beverage production systems and over 10 years of experience in automation software.

We specialize in full automation software for liquid mixing and dispension, for which we hold multiple patents (Patent #1234, Patent#5566).
We are dedicated to research, development and manufacturing of small to medium scale beverage handling and production units to customers worldwide. Our products are in accordance with international quality standards and we have ISO-9001 certification since 2007.

HiQ Beverages Ltd customers include market leading soft drink producers (Not-A-Cola Company, Sipsy Co).

HiQ Beverages Ltd operates on Unix-based OS with internal servers and has the full software licenses (RoboQ, EXent 5.0, SinTouch) required for the foreseen work.
HiQ Beverages has a full mechanical workshop, in-house pressure test chamber and a lifetest facility. See Annex for details.

Subcontractor: Under Pressure Manufacturing Ltd (UPM)

UPM has 30 years of experience in the design and manufacturing of high pressure systems and ancillary components (valves, fittings, tubing) to the highest quality standards.

UPM is ISO 9001 certified company and a preferred supplier within diverse markets such as tooling (waterjet cutting and cleaning, pneumatic tools), oil and gas, chemical and petrochemical, and food and beverage industry.

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Describe any missing background, experience or facilities in your proposal. For example, you may need access to a cleanroom for your project. If you do not have one, you may either already have included a cleanroom provider in your team, in which case you would mention their facilities in this section. If you have not selected one, but plan to use one of several, give the reviewer confidence that you will be able to find one that meets the requirements and that this does not present a risk to the project.

A note on relevant experience

It can be difficult to define the relevant experience, especially if you are a small organisation and want to show ESA what you can do. However, consider this example from the case study and try and apply it to your situation:

- **Directly relevant** experience for a coffee maker: having made coffee before for themselves or having made multiple types of coffee in a café.
- **Partially relevant** experience for a coffee maker: having made other (non-coffee) hot beverages, having worked in a café where coffee was made, but not actually making the coffee.
- **Non-relevant experience** for a coffee maker: cleaning the café, playing football, driving a car.

Ensure you remain within the page limit.

c) Part 2 Management Part

i. Team organisation and personnel

Proposed team

This and the next 2 sections are setting out who is in your project team and why they have been selected, how you will manage the team on a day-to-day basis and to give confidence that you have robust processes in place should the project not go as planned. Be clear who is in the project team and ensure you include your supply chain. It is a good idea to include a rationale for the split of work between Prime and subcontractors (if any), providing a justification for the subcontractor and a brief note on how you have selected them.

It is a good idea to introduce the project team with a narrative, for example:

> 2.1.1 Proposed team
>
> The project team is led by the prime contractor HiQ Beverages Ltd, with Under Pressure Manufacturing Ltd as a subcontractor. The subcontractor is required due to their extensive expertise and heritage in high pressure systems design and manufacturing and will be responsible for the design of all the high pressure components of the CM2000. Such expertise is not available within HiQ Beverages Ltd. at this stage.

Overall team composition & key personnel

In the narrative, identify the key people on the project, what they are responsible for and why they are key. See note about key personnel below.

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2.1.1.1 Overall team composition, key personnel

The team consists of 10 people, 4 of which are considered key due to their expertise significant contribution to the key project tasks.

The project manager is Mr. Bean from HiQ Beverages Ltd. Mr. Bean will be the main contact point with ESA as well as the subcontractor and supplier, and will oversee all management tasks and contractual aspects of the project, including sub-contractor management, scheduling, project control and risk management.

Software lead engineer D.U. Code is responsible for developing the main software architecture and proposed modifications to Patent#1234, as well as integration with hardware and co-verification.

Hardware team lead V. Hard oversees the full design, manufacturing and assembly of the full unit.

Component lead engineer A. Rabica is responsible for the design, manufacturing, testing and integration of the high pressure system. A. Rabica further represents the subcontractor UPM Ltd in all contractual matters of the project.

Please refer to section 2.1.2 for the CVs of all key personnel. Please refer to Figure 4 for full team composition with non-key personnel. Key personnel and participants from prime and subcontractor are highlighted accordingly.

Knowing who to allocate as key personnel. Key personnel is a specific term used to refer to someone in the project team playing a leading role in the activity, OR providing irreplaceable experience and expertise. Note: anyone assigned as a Work Package Manager should be a key person. Key personnel should typically be proposed to one level below the Study or Project Manager.

Key personnel need to be identified as such in the narrative, in the OBS and shown in the table with their % time allocation indicated (see below).

Notes:

1. Anyone contributing **<10%** of their time is being used very inefficiently and is by definition not playing a leading role (unless due to unique expertise).
2. If someone is claimed to be a Key Person because they have irreplaceable experience and expertise – **explain the role** they play, what this is and how it will be exploited.
3. A high number of claimed Key Personnel does not make the proposal stronger. Demonstrated good and **effective use of people** with the right background and with clear roles is better.

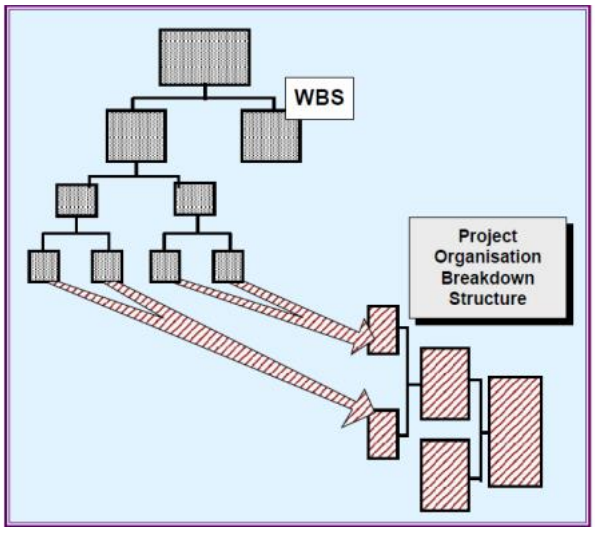
Note: Declaring key personnel is a commitment to ESA that those individuals will deliver the project, and those individuals may have contributed to your offer being selected. If you need to change a key member of the team between bid submission and contract award, you must notify ESA of this, providing justification and a suitable alternative. If no suitable alternative can be found, ESA may choose to not place the contract with your business. If you are on contract and need to change a key person, this is typically managed through the contract change process.

If you are a small team and bidding for several ESA opportunities at the same time, beware of putting the same individuals forward as key personnel each time – ESA will pick up on over-commitment of individuals.

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Project team OBS

Identification of responsibility for all items of work is essential. This facilitates correction of problems and aids in establishing correct channels of communication. The Project Organisation Breakdown Structure (OBS) depicts the proposed project organisation, as opposed to your company organisational structure, which depicts the functional aspects of the company. It shows the key personnel to be deployed on the work, who will also be identified in the contract, and the assigned responsible parties for each Work Package in the WBS.

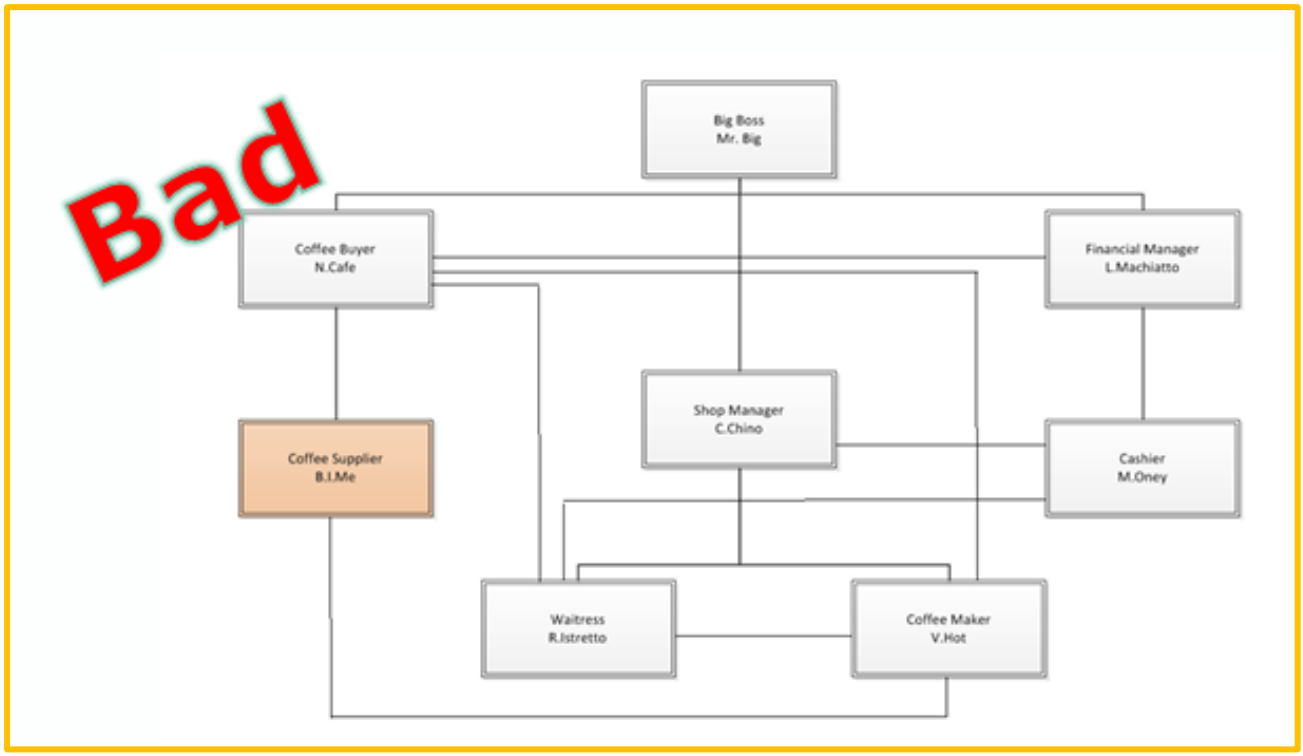


The project OBS shows the reporting lines and responsibility/delegation within the project.

This shows the reporting lines within the team. It should be shown as an organigramme for the project team, with the project manager at the top. Subcontractors should feature on this too, where they are part of the team, and have one formal point of contact into your organisation.

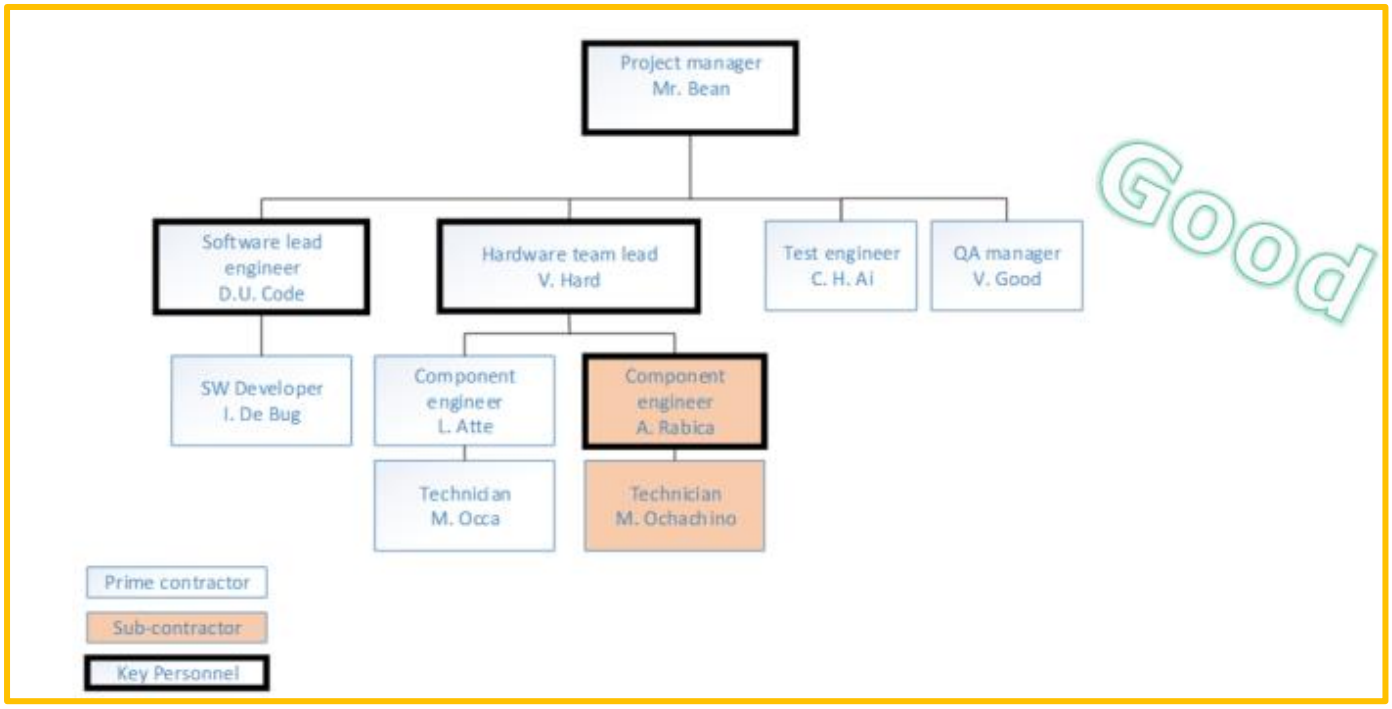
Example of a bad OBS:

Here the reporting lines are not clear, the supplier has two points of contact, the project manager is not mentioned and it is not clear who is a key person.



A good OBS shows the project manager at the top, with clear lines showing their direct team. The key personnel are highlighted and it is clear where they sit in the project hierarchy. It also shows non-key personnel, to give an overall understanding of the whole project team.

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The OBS should be accompanied with a narrative explaining the roles, such as this example from the case study:

> 2.1.1.2 Reporting lines within the team
>
> The project manager is responsible for all key decision making aspects of the project, communication with ESA and any problem resolution or contractual aspects with the subcontractor.
>
> All members of the project team are foreseen to attend the internal review meetings.
>
> The Lead HW and SW engineers as well as the test engineer report to the PM on all key or decision-making aspects of the project with cost, compliance, scheduling or risk implications.
>
> The lead hardware and software engineers are responsible of the timely execution and performance of their subordinates as defined by Figure 4. The Subcontractor Component lead engineer reports to the lead mechanical engineer for all aspects of the project. Urgent aspects affecting the duration, cost or contractual issues arising from the subcontractor, brought up outside of regular review meetings, will be communicated to the lead mechanical engineer who will report to the PM.

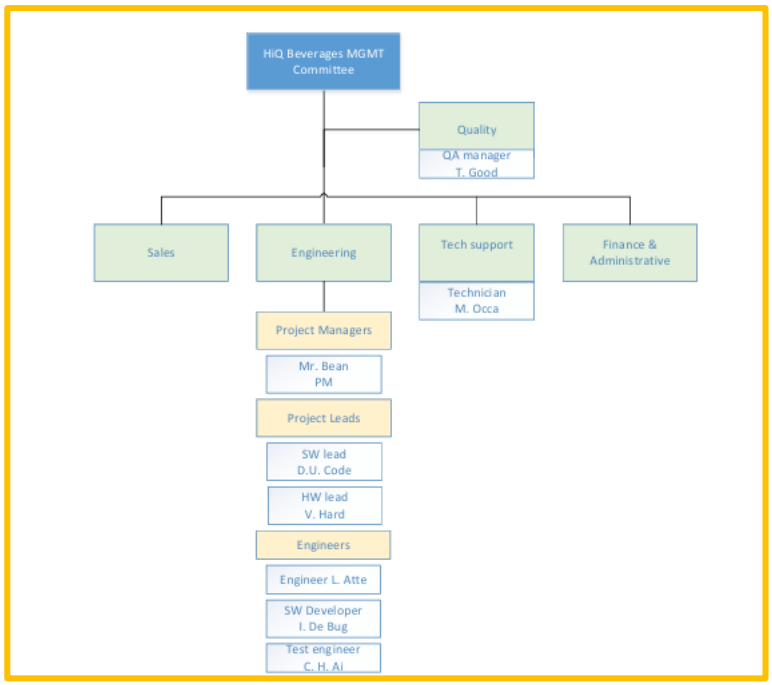
ii. Company organisational structure

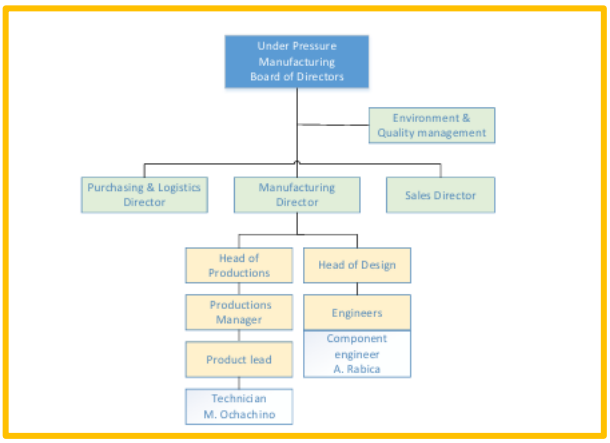
The company organisation structure is not always requested in all bids. If it is, it should be provided in addition to the OBS to show the position of each team member within your business' structure. This is intended to show reporting lines and authority of the team within the company.

You will need to include this for any subcontractors too.

The narrative should describe your company policy for project management and communication, including the PM's access to the company management hierarchy for resolution of conflicts. In cases where you have suppliers or subcontractors, present the management plan and procedures to demonstrate how you will manage their contributions to the project (e.g. progress meetings, reports, supplier reviews, etc.).

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An example is shown here from the case study. The diagram on the left shows the Prime's organisational structure, the diagram on the right shows the subcontractor's structure.

Time dedication for key personnel

This section shows the time (as a % of the total available hours) that the key personnel are expected to work on the project, split by work package. The idea is to give the reviewer an indication of whether the time allocation looks credible to do the work as set out in the WPD.

A table such as the one below should be included, showing the key personnel, split by work package. The figures in the table under each WP are % of allocation (not hours). The total number of hours for key personnel may well be slightly lower than the total number of hours for the project, as other members of staff (not key personnel) may also be working on this project.

Some ITTs also request that non-key personnel are shown in this table. Be sure to read the ITT carefully, as it will tell you whether you need to include one line in the table for all non-key personnel, with their total hours combined, or whether you need to split out the individuals, their roles and hours allocated – in the same way as for key personnel.

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Key Personnel	WP100 Management	WP200 Requirement Specification and Concept	WP300 Preliminary design	WP400 Detailed design	WP500 Prototype development and test	Total hours	% of total working time
Project manager Mr. Bean	57	23	12	8		530	33
SW lead engineer D.U.Code		12	7	41	40	760	42
HW team lead V. Hard		12	16	48	24	660	37
Component engineer A. Rabica				67	33	240	13
TOTAL						**2190**	

Percentage working time is reasonable for their activities?

Note the 13% would likely be picked up and questioned by the TEB

Distribution of work is seen. Is it logical? Does it match the key persons role? Is it consistent with the PSS forms?

Total number of hours is for the key persons. It is not expected to be the same as the total hours for the project but difference must be explained in the proposal.

If project manager hours don't match the project management role, it needs to be explained

iii. Curricula Vitae

CVs are important as they allow the reviewers to assess the suitability of the key people who will be carrying out the work. CVs need only be included for key personnel.

Having briefly introduced the key personnel and their relevant experience in the section above, a full CV for each key personnel should be included in a separate document. Note: when uploading your bid to ESA STAR, the CVs are uploaded into a separate file within the bidder area (for data protection).

The full CV should include as a minimum:

- Relevant work experience
- Brief description of the person's present role and responsibilities
- Proposed role on the project
- Person's position in the organisation

An example of the relevant experience from the case study is shown below. Note that this is not the full CV:

Dean Umberto Code (Software lead engineer)

Relevant experience:

2014- ...: Software Developer, HiQ Beverages, Estonia

- Software quality monitoring in C++ and SQL in Unix and Linux environments
- Develop automation scripts to test storage appliances in Python and C/C++
- Development of base framework with Java, JSP, Struts, CSS, HTML, JavaScript, Oracle, and MS SQL Server

2008 – 2014: Automation Engineer, Smartest Vacuum Cleaners GmbH, Germany

- Design, development and testing of microcontroller-based embedded systems in Raspberry Pi Platforms using automata-based programming for building smart home appliances.
- Design of protocol stacks for SoC HW/SW Interfaces

2007-2008; Junior Software Developer, Robocop Technologies OÜ, Estonia

- Basic function design in LISP and HDL
- Schematic capture and PCB layout software Design with sensors, encoders, SPI, I2C, CAN and EtherCAT devices

Education:

2005-2007: MSc Technical University Of Matrix, Automation Engineering

2001-2005: BSc Technical University Of Matrix, Computer Science & Mechatronics

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iv. Management of subcontractor(s)

In cases where you have suppliers or subcontractors, present the management plan and procedure to demonstrate how you will manage their contributions to the project (e.g. progress meetings, reports, supplier reviews, etc.).

v. Planning

This section shows that you can organise your work, have put together a logical structure which you can monitor, as well as communicating the key dates and schedule drivers. This section should consist of a narrative, accompanying Gantt chart, milestones table and meeting and travel plan.

Gantt chart

The Gantt chart shows you can organise your work, provides a tool to monitor the work, to communicate key dates and to show what drives the schedule.

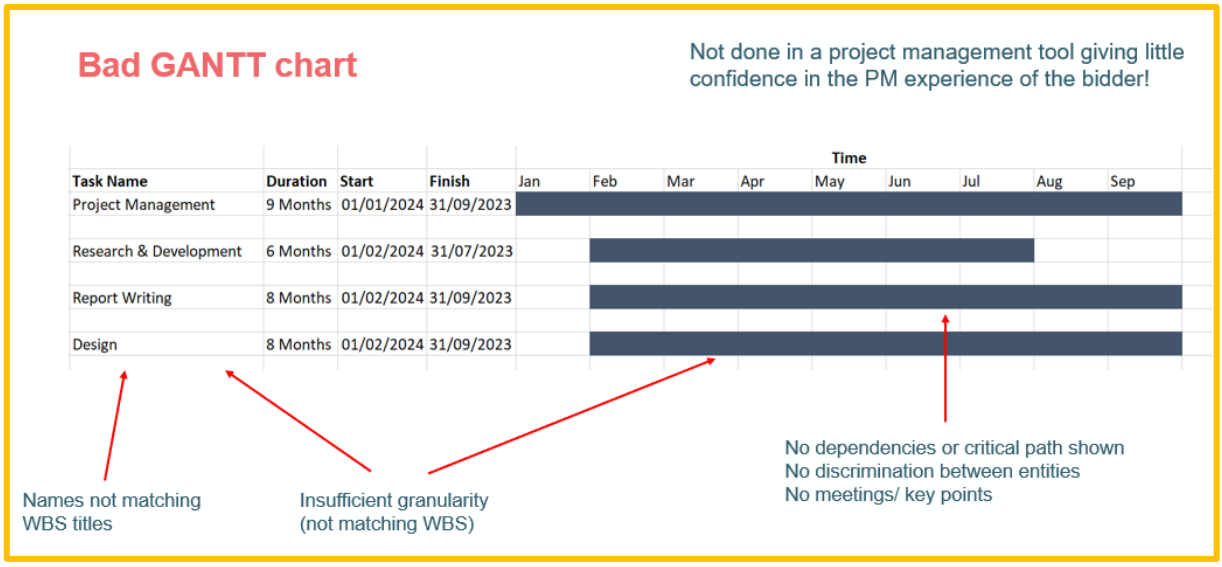
Key tips for creating a Gantt chart:

- It should **link clearly** to WBS and Work Logic flow chart
- It should show **milestones**, **reviews** and **key deliverables**
- It should show the key **dependencies** between tasks (i.e. linked tasks – avoid tasks floating unconnected)
- Include to a **'sensible' level** (not too much, not too little) – if the Gantt is too large to fit onto a portrait A4 page, add a summary version and add the full Gantt as an annex
- Identify the **critical path** and provide a narrative around it
- Included a **narrative** with the schedule, explaining the key reviews and for example where activities happen in parallel, key dependencies, any float in your schedule
- Where you have procurements, consider showing **procurement lead times**, especially if they are long and highlight latest ordering dates
- The Gantt chart should be prepared in a **suitable project management tool**, typically Microsoft Project, or similar. Avoid using Microsoft Excel to produce Gantt charts – it is ill suited to this and will not give a favourable view of your business' project management processes.

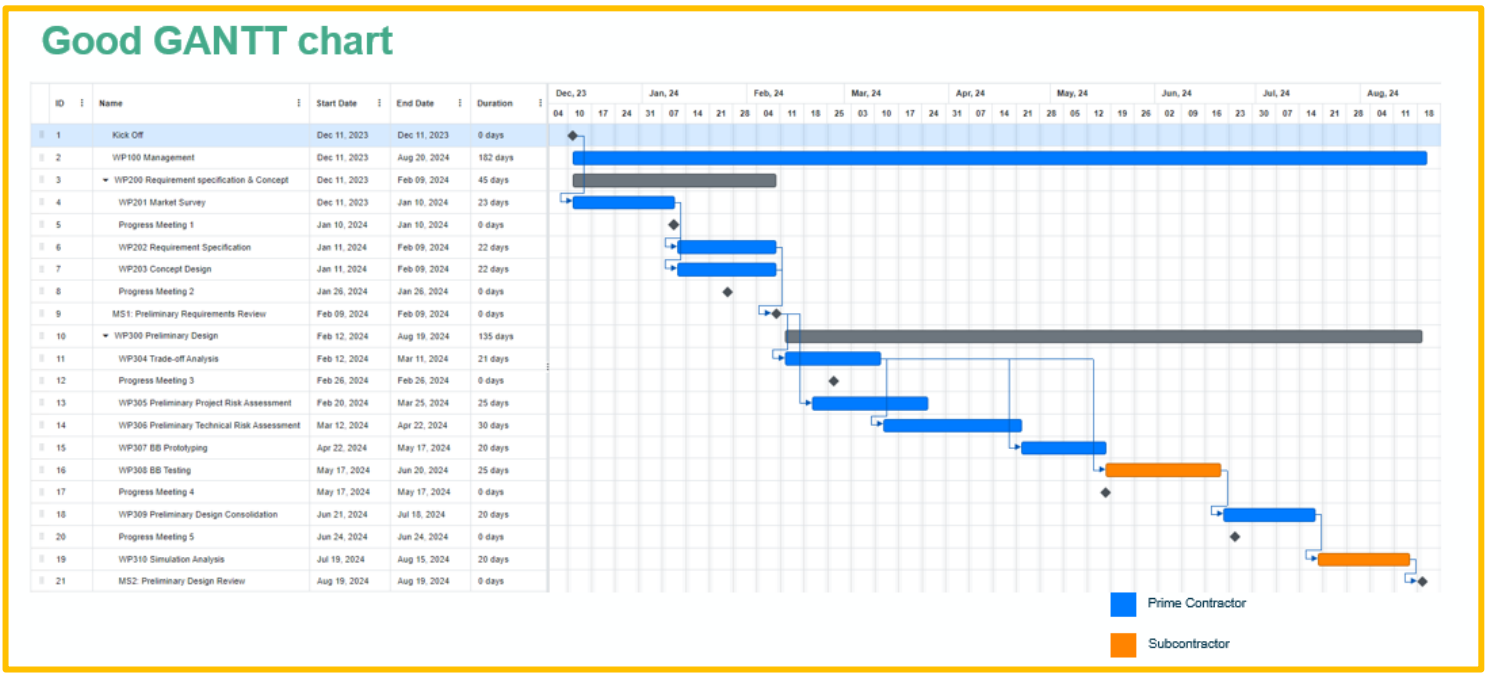
[See page 26 of example proposal]

An example of a poorly created Gantt chart is shown below. It is not done in a project management tool, raising questions as to the maturity of your organisation's project management. Names are not aligned with the WBS, there is no colour coding between entities and activities are very long and show no dependencies.

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In contract, the example below shows linked activities, with shorter duration tasks, colour coded by entity.



It is important to analyse the schedule, pull out schedule drivers and show that you understand the planning. Avoid regurgitating the schedule from the ITT. However, ensure you justify any deviations from the proposed schedule in the ITT and explain the impact (if any) on the project.

The narrative should highlight:

- The **duration of the programme** and major technical milestones
- Planning **assumptions** (e.g. envisaged starting date, holidays, etc.)
- Identification and discussion of **critical path** activities and key dependencies (if any)
- Discussion of any schedule **contingency**
- Major technical **milestones**
- **Meetings** / video-conferences

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- Ensure the **narrative is consistent** with the Gantt chart and milestones table and travel plan
- If you are deviating from the SOW, provide a **justification** for this

An example from the case study is shown below:

> 2.2.1 Proposed schedule and milestones
>
> In case of positive evaluation, the envisaged start date is the in the 1st quarter of 2020, with 1st of January used as a baseline in this proposal. While in the SoW a total duration of up to 24 months is allowed, it is clear from the objectives that the activity needs to be completed within 18 months and we have therefore planned the work to be compliant with this. The proposed development is therefore scheduled for completion within 18-months. Thus, the envisaged closing date of the project is the 1st of July, 2021. Based on our proposed schedule, the foreseen timeline of the reviews as outlined in SoW Section 4, are proposed to be adjusted to:
>
> Requirements Review: KO+2Months
> Preliminary Design Review: KO+7Months
> Critical Design Review: KO+18Months
>
> WP200 (Requirement Specification and Concept; sub-workpackages WP201, WP202, WP203), is initiated following KOM and is planned to be concluded within 2 months, upon Requirements Review.
>
> WP300 (Preliminary Design; sub-workpackages WP304, WP305, WP306) is planned to start following the Requirements Review and is planned to be concluded within 5 months, upon Preliminary Design Review.

Meeting and travel plan

Include a meeting and travel plan in this section.

Include:

- All meetings with ESA (e.g. progress meetings – note these may be via telecon)
- All reviews, both internal and with ESA (e.g. Requirements Reviews, Design Review….)
- All meetings with sub-contractors or potential customers (e.g. progress meetings, requirements definition meetings, etc.)
- Travel to facilities (e.g. to test houses)
- Highlight the location of the meeting in the meetings table (e.g. virtual, or at ESA premises).

Do not include:

- Meetings or travel not directly needed for progression of the activity (e.g. conferences)
- Ad-hoc meetings to resolve problems (e.g. supply problems)

An example from the case study:

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Meeting	WP or Milestone	Purpose	Attendees	Date	Location
KoM	MS1	Kick-Off Meeting	ESA, HiQ	To	Teleconference
Progress meeting #1	MS1	Results and conclusions of market survey	HiQ	To + 4w	HiQ, Lithuania
Progress meeting #2	MS1	Progress assessment of requirement specification and concept design	HiQ	To + 6w	HiQ, Lithuania
RR	MS1	Requirements Review	ESA, HiQ	To + 2mo	HiQ, Lithuania
Progress meeting #3	MS2	Review of trade-off analysis, consolidation for breaboard development and test plan	HiQ	To + 4mo	HiQ, Lithuania
Progress meeting #4	MS2	Breadboard development progress	HiQ	To + 5mo	HiQ, Lithuania
PDR	MS2	Preliminary Design Review	ESA, HiQ	To + 7mo	HiQ, Lithuania
Co-engineering meetings (8)	MS2	HW and SW consolidation for detailed design	HiQ, UPM	To + 7mo (4weeks)	HiQ, Lithuania; telecoference
Progress meeting #5	MS3	Progress of design activities	HiQ, UPM	To + 9mo	UPM, Latvia
Internal review #3	MS3	Detailed design review and prototype devepment planning	HiQ, UPM	To + 13mo	HiQ, Lithuania
Progress meeting #7	MS3	Prototype development and test progress	HiQ, UPM	To + 15mo	Teleconference
Critical performance testing	MS3	Test at ASTM F2990 Certified Commercial Coffee Brewers Testing Facility	HiQ, UPM	To + 16mo	Brewzone, Italy
Internal review #4	MS3	Prototype development and test results review	HiQ, UPM	To + 18mo	Teleconference
CDR	MS3	Critical Design Review	ESA, HiQ, UMP	To + 18mo	HiQ, Lithuania
Final Review	MS3	Final Presentation of Project Outcome	ESA, HiQ	To + 18mo	ESTEC, ESA, Netherlands

Ensure this is consistent with the travel plan you are presenting in PSS-A2 Exhibit B. Also ensure consistency between the costings you have assumed for the travel (number of participants, number of days, location) and Exhibit B.

Milestones should be consistent across the Gantt, work logic, WPDs, meetings and travel plan as well as the payment milestones set out in the financial section.

For further information about typical project phases for an ESA project, or which reviews to include, see Annex 1.

vi. Deliverable Items

It is important that your list of deliverable items is accurate and complete. Ensure that it matches the outputs of the WPDs.

Deliverable items are grouped into Documentation, Hardware and Software. To avoid ambiguity at a later point, include sufficient explanation to explain the scope of the deliverable.

Tip – clearly define your deliverables, especially documentation. It is a good idea to include a table of contents and an indication of the level of detail you will include to avoid ambiguity. In the absence of any other definition, the reviewer will assume that the relevant ECSS standard will apply, which may be more onerous than you had intended – so be clear what you are including and what is out of scope

Be sure to address the deliverables required in your tender (if any) and explain any deviations. It is reasonable to suggest modifications as long as you can justify them.

Include any other deliverables – hardware, software, models, data, test reports, etc. State what you will deliver, when and in what format.

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No.	Title	Milestone	Contents/ Notes
D1a	Requirements Specification	RR	As described in SoW
D1b	Current and Future Market Assessment Report	RR	Assessment of Current competitor. Assessment of competitor specifications and prices. Assessment of evolution of HBM machines
D1c	Emerging Hot Beverage Requirement Report	RR	Assessment of beverage types currently on offer, assessment of sales per type and evolution of these year by year from 2000 to 2017.
D2	Conceptual Design Document	RR	As described in SoW

It is a good idea to include a narrative to explain any additional points regarding your deliverable items, such as seen in this example:

1.1.1 Non-conformances / limitations / additions regarding deliverable items

As can be seen in Tables 5 and 6, a number of changes and additions to the required deliverables from the SoW are proposed.

a) As part of the market survey in WP200 two documents are produced that are used as inputs to the Requirement Specification (D1). These will also be delivered.
b) While all of the details requested for the Design Reports will be delivered, it is more practical and efficient for this to be delivered split across multiple documents that reflect the different elements of the design and the split of work between companies. A summary will still be included in the high level document but as a result deliverables D4b and D4c have been added. The same logic has been applied to the Test Plan (D6).
c) The VCD (D10) we consider needs to also be delivered at the PDR. This has been added.

d) Part 3 – Financial part

i. Price Quotation for the Contemplated Contract

The financial part of the proposal is evaluated in detail. ESA will challenge the number of hours and the cost allocation to verify that the costs are true and credible.

The reviewers will have a view of how long an activity typically takes and what a reasonable cost for a procurement is. If your estimates vary significantly from what is expected, this will raise questions.

Therefore, provide as much evidence and justification as possible in your proposal. You can do this through identifying cost drivers, highlighting particular requirements which are driving the cost, include quotations from suppliers and subcontractors, consider obtaining more than one quote, if possible, to give credibility to the cost.

Typically, the financial proposal will include the sections below, with the detailed cost breakdown provided in the PSS forms. The signed PSS forms form part of the financial submission.

ii. Price type

Price types vary between tenders, and even within a tender ESA could seek different price types for different phases of work.

Ensure your offer is made using the correct price type, as requested in the tender.

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See the Glossary for definitions of different price types.

iii. Currency and exchange rate

ESA expects pricing to be in Euros and for the bidder to carry the exchange rate risk. Note that ESA typically excludes entering into negotiations about amending a binding quote due to national currency fluctuations. You should clearly specify the exchange rate used (and the source) as well as any other costs (such as hedging, forward buying etc.) in the proposal (as a minimum on the PSS A2 form).

iv. Rates

Rates to be used are the most recent industrial rates agreed between your entity and ESA. If this has not yet been done, your normal rates should be used.

v. Value Added Tax (VAT) & duties

Be sure to read the provision in the draft contract relating to VAT.

The tender typically specifies that your price should be quoted without VAT & duties. Any VAT that is payable will need to be included on your invoices, but this will not come into effect until you are on contract. For the bid phase, in most cases, include your price without VAT.

Typically, the Prime contractor (holding the contract directly with ESA) will be exempt from VAT, and will receive a VAT exemption certificate from ESA. Note that this VAT exemption does not apply to subcontractors.

If you consider that you need to include VAT, other taxes or duties, the following information should be provided in a dedicated section of the financial proposal:

- Applicable rates;
- Corresponding estimated total tax or customs duty amount; and
- Reason why it is believed that exemption from tax or customs duties cannot be obtained.

In this case, provide your price without VAT and duties, but include them as a separate cost element in your financial proposal.

Check the draft contract for the delivery terms (if you are delivering hardware) and ensure that you have factored in the applicable costs in your estimations.

vi. Royalties and licence fees

If royalties and/or licence fees apply to your offer:

- Clearly identify them in your Proposal, with the financial basis for their calculation, method of application and total amount.
- Provide a justification for why they are needed and the benefit they bring to the work to be performed (i.e. not applied as a consequence of a general agreement or commitment to a third party).
- Ensure they are applied only to the part of the effort that is directly related to the subject matter of the licence or royalty agreement.

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vii. Detailed Price Breakdown – PSS forms

These are ESA's finance forms. They are a standard tool, used for all ESA ITTs and therefore allow costs to be presented and evaluated fairly and consistently.

There are several PSS forms (A1, A2, A4, A6, A8, A10, A15, A20, A40, A45), though the most commonly required PSS forms for EXPRO bids are shown below (but check the ITT to ensure you include all required forms):

- PSS A1 Company Cost Rates and Overheads
- PSS A2 Company Price Breakdown Form
- PSS A2 Exhibit A – Other Cost Element Details (if applicable)
- PSS A2 Exhibit B – Travel and subsistence plan
- PSS A8 Manpower & Price Summary per WP

PSS form templates can be downloaded from ESA STAR > Publications > Reference Documents

An ESA central email address is also available for clarifications regarding PSS forms: pss@esa.int

viii. A move towards ECOS and PBFs

PSS forms are gradually being replaced by ECOS and Price Breakdown Forms (PBF), which are very similar on content, but display the information in a slightly different way. As of mid-2026, ESA mandated the use of ECOS for all tenders, so you will see a requirement for ECOS as new tenders are launched. As this is currently being rolled out by ESA, this version of the Guide does not include detailed information on ECOS or PBFs. However, the fundamentals of costing remain unchanged from the information contained within this Guide. Be sure to check your tender as to which type of financial forms are required – PSS or ECOS/PBF.

Some key points to note about PSS forms:

- The PSS forms **must be signed** and are typically submitted in **PDF format**.
- The PSS forms have a column for **national currency** (GBP) and **Euros**. Both must be filled in, and you must indicate the exchange rate used.
- The **profit line must be filled in**. For non-profit organisations, no profit can be accepted. For other organisation, the profit is limited to the amount defined in the ITT (typically ~8% of total company cost – but check the ITT).
- **Subcontractors** are not considered an own company cost, and being already inclusive of profit **are shown separately on line 13 of the PSS A2**.
- Overheads on procurement and labour rates are intended to cover admin costs and general office supplies and overheads.

Example PSS forms (A1, A2, A8 + exhibits A and B) are shown below, taken from the case study:

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PSS A1 - Company Cost Rates and Overheads

The PSS A1 presents the labour cost per category (split by resource type, e.g. project manager, mechanical engineering, systems engineer, etc.).

No names of individuals are included, only their labour category.

One hourly rate per labour cost category is shown.

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PSS-A1 form

COMPANY RATES AND OVERHEADS	FORM No. PSS A1	Page no. 1 of 1	Issue 5
		COMPANY NAME: HiQ Beverages Ltd; Lithuania	
RFQ/ITT no.:	18.187.04		
PROPOSAL no.:	1	Name and title: Mr. Bean	
ECONOMIC CONDITIONS:	2023		
NATIONAL CURRENCY (NC):	EUR	Signature:	
VALIDITY 6 months	From 01.01.2023 to 31.06.2023		
ESA Audit agreement reference / date	N/A		

Agreed by

Status (x when applicable)

1. LABOUR

Direct labour cost centres or categories Code and Name		Basic Hourly Rate (NC)	Direct Overhead (% or Rate in NC)	Gross Hourly Rate (NC)
	Project Manager	32.70	20	39.24
	Senior Engineer	48.20	20	57.84
	Junior Engineer	30.60	20	36.72
	Technician	23.70	15	27.26
	QA Manager	40.60	20	48.72

2. INTERNAL SPECIAL FACILITIES

Facility Code and Name		Type of Unit	UNIT RATE (NC)
	Pressure testing chamber	Day	1000

3. OTHER COST ELEMENTS

Standard ESA type		According to normal company type	OVERHEAD %
3.1	Raw materials		5
3.2	Mechanical parts		5
3.3	Semi-finished products		10
3.4	Electric & electronic components		10
3.5	Hirel parts		10
	a) procured by company		5
	b) procured by 3rd party		10
3.6	External major products		10
3.7	External services		15
3.8	Transport, insurance		10
3.9	Travels		10
3.10	Miscellaneous		10

GENERAL EXPENSES

According to ESA type	According to normal company type	Applicable on cost element no.	OVERHEAD %
5. General & Administration expenses		1	8.0
6. Research & Development expenses			0
7. Other (specify)			

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PSS A2 - Company Price Breakdown Form

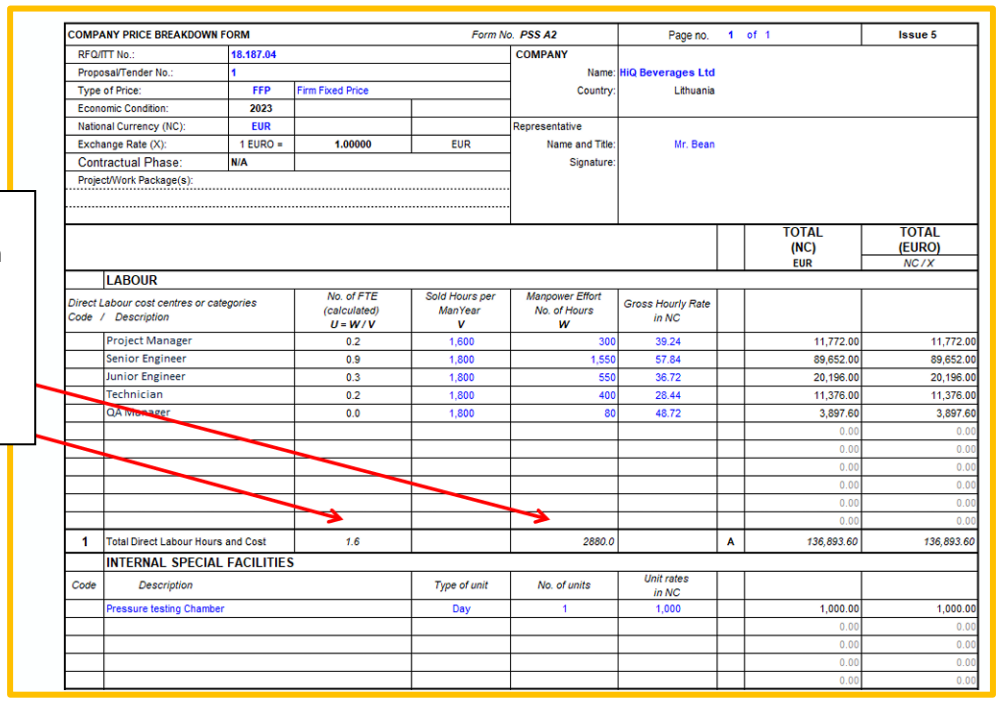
The PSS A2 provides a full view of the costs allocated to the activity.

It includes subcontractors, if applicable.

It has exhibits – see below.

The first half of the PSS A2 is shown below. This contains the total hours by resource type, adding up to the total hours for the project and the equivalent FTE (Full Time Equivalent) figure. The reviewers will check this is credible for the work proposed.

The reviewers will check the total number of hours and total FTE to ensure they seem reasonable for the duration and scope of the work. Also, they will check that they match the time allocation of the key personnel, as described here.



COMPANY PRICE BREAKDOWN FORM				Form No. PSS A2		Page no. 1 of 1		Issue 5
RFQ/ITT No.:	18.187.04			COMPANY				
Proposal/Tender No.:	1			Name:	HiQ Beverages Ltd			
Type of Price:	FFP	Firm Fixed Price		Country:	Lithuania			
Economic Condition:	2023							
National Currency (NC):	EUR			Representative				
Exchange Rate (X):	1 EURO =	1.00000	EUR	Name and Title:	Mr. Bean			
Contractual Phase:	N/A			Signature:				
Project/Work Package(s):								

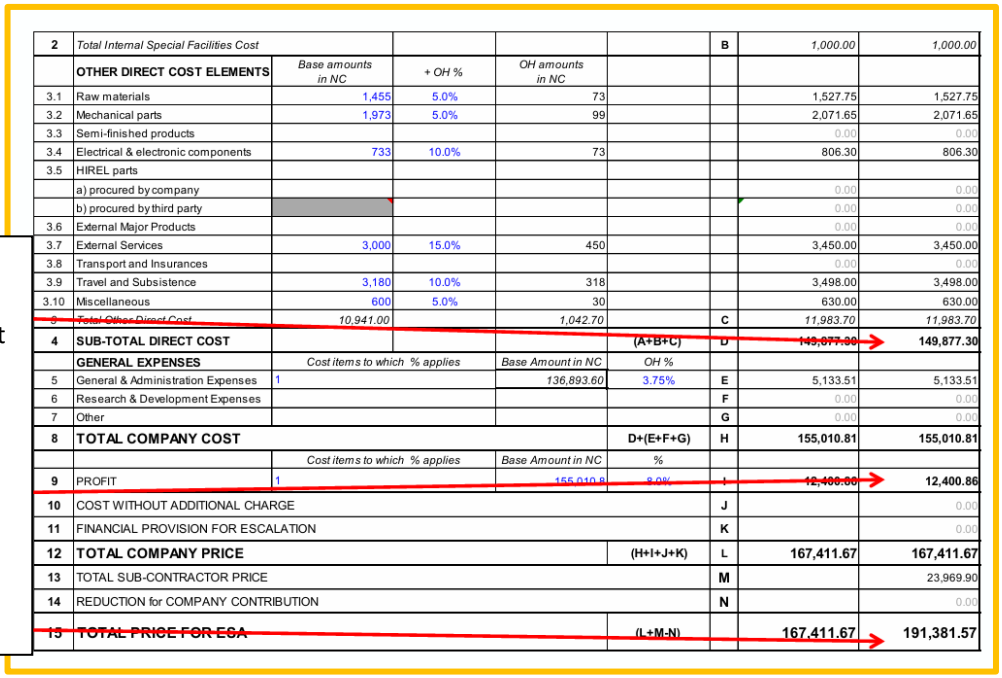
							TOTAL (NC) EUR	TOTAL (EURO) NC / X
	LABOUR							
Direct Labour cost centres or categories Code / Description		No. of FTE (calculated) U = W / V	Sold Hours per ManYear V	Manpower Effort No. of Hours W	Gross Hourly Rate in NC			
	Project Manager	0.2	1,600	300	39.24		11,772.00	11,772.00
	Senior Engineer	0.9	1,800	1,550	57.84		89,652.00	89,652.00
	Junior Engineer	0.3	1,800	550	36.72		20,196.00	20,196.00
	Technician	0.2	1,800	400	28.44		11,376.00	11,376.00
	QA Manager	0.0	1,800	80	48.72		3,897.60	3,897.60
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
1	Total Direct Labour Hours and Cost	1.6		2880.0		A	136,893.60	136,893.60
	INTERNAL SPECIAL FACILITIES							
Code	Description		Type of unit	No. of units	Unit rates in NC			
	Pressure testing Chamber		Day	1	1,000		1,000.00	1,000.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00

The second half of the PSS A2 is shown below. This shows all other (i.e. non-labour) costs, and which category they fall into.

All other direct costs are shown in section 3. The reviewers will check that the total looks reasonable. This is further broken out in the Exhibit A.

The profit is shown and will be checked against the allowable rate stated in the ITT (typically ~8%).

The total budget is shown for the project. This should be lower than the budget indicated in the ITT.



2	Total Internal Special Facilities Cost					B	1,000.00	1,000.00
	OTHER DIRECT COST ELEMENTS	Base amounts in NC	+ OH %	OH amounts in NC				
3.1	Raw materials	1,455	5.0%	73			1,527.75	1,527.75
3.2	Mechanical parts	1,973	5.0%	99			2,071.65	2,071.65
3.3	Semi-finished products						0.00	0.00
3.4	Electrical & electronic components	733	10.0%	73			806.30	806.30
3.5	HIREL parts							
	a) procured by company						0.00	0.00
	b) procured by third party						0.00	0.00
3.6	External Major Products						0.00	0.00
3.7	External Services	3,000	15.0%	450			3,450.00	3,450.00
3.8	Transport and Insurances						0.00	0.00
3.9	Travel and Subsistence	3,180	10.0%	318			3,498.00	3,498.00
3.10	Miscellaneous	600	5.0%	30			630.00	630.00
3	Total Other Direct Cost	10,941.00		1,042.70		C	11,983.70	11,983.70
4	SUB-TOTAL DIRECT COST				(A+B+C)	D	149,877.30	149,877.30
	GENERAL EXPENSES	Cost items to which % applies		Base Amount in NC	OH %			
5	General & Administration Expenses	1		136,893.60	3.75%	E	5,133.51	5,133.51
6	Research & Development Expenses					F	0.00	0.00
7	Other					G	0.00	0.00
8	TOTAL COMPANY COST				D+(E+F+G)	H	155,010.81	155,010.81
		Cost items to which % applies		Base Amount in NC	%			
9	PROFIT	1		155,010.8	8.0%	I	12,400.86	12,400.86
10	COST WITHOUT ADDITIONAL CHARGE					J		0.00
11	FINANCIAL PROVISION FOR ESCALATION					K		0.00
12	TOTAL COMPANY PRICE				(H+I+J+K)	L	167,411.67	167,411.67
13	TOTAL SUB-CONTRACTOR PRICE					M		23,969.90
14	REDUCTION for COMPANY CONTRIBUTION					N		0.00
15	TOTAL PRICE FOR ESA				(L+M-N)		167,411.67	191,381.57

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Co-funded activities

If your activity is co-funded, the PSSA2, Exhibit A and Exhibit B and PSSA8 should present the total cost of the activity including the co-funded amount. No profit can be charged on co-funded activity. The amount co-funded by you cannot include any additional co-financing from other public R&D or other public programmes. The difference between the total cost of the activity and the total price of the contract is the amount to be funded by you.

PSS A2 Exhibit A – Other Cost Element Details (if applicable)

Exhibit A provides a breakdown of the "Other Direct Cost" elements shown on the PSS A2.

The reviewer will check:

Bought in items:

- Are they justified by the scope of work?
- Not representing infrastructure?
- Not representing normal work items, but rather items needed for this project?
- Sufficiently identified?
- Is their cost reasonable?

External services:

- Are they clearly described?
- Are they needed? And justified in the proposal
- Do they represent value for money?
- Are they referenced in the proposal?

COMPANY PRICE BREAKDOWN FORM — **EXHIBIT "A" TO PSS A2** — Issue 5

Page No. 1 — No. of Pages 1

RFQ/ITT No.: 18.187.04	COMPANY NAME: **HiQ Beverages Ltd**
Proposal/Tender No.: 1	Name and Title: **Mr. Bean**
National Currency: EUR	
Contractual Phase N/A	Signature
Applicable to PSS-A2 elements: 3.1-3.4 - 3.6 - 3.7 - 3.10 - 10	
Project / Work Pac CM2000 Development; WP300, WP400, WP500	

Cost El. No.	ITEM DESCRIPTION	Type of Price	Purchase Currency	Purchase Amount	Exchange rate 1 NC =	Amount in NC
3.1	Raw Materials: Copper, Stainless Steel for component manufacturing	FFP	EUR	1,455.00	1.00000	1,455.00
3.2	Mechanical Parts: Soldering support equipment, mechanical seals, slides, hinges, toggle clamps	FFP	EUR	1,973.00	1.00000	1,973.00
3.4	Electrical & electronic components: resistors, capacitors, LEDs, transistors, etc	FFP	EUR	733.00	1.00000	733.00
3.7	External Test Facility: ASTM f2990 Certified Commercial Coffee Brewers Testing Facility at Brewzone, Italy	FFP	EUR	3,000.00	1.00000	3,000.00
3.9	Travel and Subsistence: Meeting with Subco, testing travel to Italy (see Exb. B)	FFP	FFP	3,180.00	1.00000	3,180.00
3.10	Miscellaneous: raw food material for testing (coffee, cocoa beans, tea, syrups, milk)	FFP	FFP	600.00	1.00000	600.00

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PSS A2 Exhibit B – Travel and subsistence plan

Exhibit B provides a breakdown of the proposed travel. This should match the meeting and travel plan you have included in the Implementation part.

The reviewer will check:

- Consistency with the implementation proposal
- Are all meetings justified?
- Does the number of people attending seem reasonable and match the scope of the meeting?
- Are the flight costs reasonable?
- Are the number of days for the trip reasonable (i.e. you may need an overnight if the flight times are early/late)?
- Is the subsistence reasonable – considering the destination?

TRAVEL PLAN AND COST DETAIL — **EXHIBIT "B" TO PSS-A2** — Issue 1

RFQ/ITT No.:	18.187.04	Project:	CM2000 Development
Proposal/Tender No.:	1	Company:	HiQ Beverages Ltd
Contractual Phase	N/A		
Economic Condition:	2023	Type of Price:	FFP
National Currency (NC)*:	EUR	Exchange (X): 1 EURO =	1 EUR

WP Reference Number	WP Title	Purpose/Event	Departure	Destination	Nr. of Trips	Avg.People per Trip	Travel Cost p.p. (NC)	B / E	Avg.Days per Trip	Subsistence Cost p.d. (NC)	A / R	Total Cost (NC)	Total Cost (EURO)
WP400	Detailed Design	Progress meeting #5	Vilnius, Lithuania	Riga, Latvia	1	2	100	E	2	120	R	680	680
WP500	Prototype Development and Test	Critical Performance test at ASTM F2990 Certified Commercial Coffee Brewers Testing Facility		Brewzone, Italy	1	2	300	E	2	150	R	1,200	1,200
WP500	Prototype Development and Test	Final Presentation of Project Outcome		Noordwijk, Netherlands	1	2	250	E	2	200		1,300	1,300
Total Cost, WBS level 1 (equal to the item 3.9 of PSS-A2)												**3,180**	**3,180**

Meetings:
- Matching meeting plan?
- All clearly justified?

 # People:
- Matched to scope of meeting?

Travels:
- Flight costs reasonable?
- #days reasonable?
- Subsistence reasonable? (often too low)

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PSS A8 Manpower & Price Summary per WP

The PSS A8 shows the costs and hours broken down per work package. It is important to check for consistency between the A8 and the WBS and WPDs.

The reviewers will evaluate whether there is too much or too little effort allocated to each work package.

- Do the hours shown here match the scope of work outlined in the WPD?
- Are the hours spread reasonable?
- Do the management hours look reasonable for managing this activity?
- Is the procurement activity in the correct WP?

COMPANY MANPOWER AND PRICE SUMMARY PER WP — Form no. **PSS A8** — Page X of Y — Issue 5

ITT/RFQ:	18.187.04									Price Type:	FFP			
Proposal/Tender No.:	1									Economic Conditions:	2023			
Company Name:	HiQ Beverages Ltd									National Currency (NC):	EUR			
Contractual Phase:	N/A									Exchange Rate: 1 EUR =		1		
WBS-Level (Number and Title):	1	Workpackage												

WP Title		Management	Requirement Specification and concept	Preliminary Design	Detailed Design	Prototype Development & Test								
WP Number		100	200	300	400	500								Total WBS-Level
Labour Hours per category	Hours													
Project Manager	#	300												300
Senior engineer	#		190	140	680	540								1,550
Junior Engineer	#		50	100	100	300								550
Technician	#			120	40	240								400
QA Manager	#			10	10	60								80
...	#													
...	#													
...	#													
Total Labour Hours	#	300	240	370	830	1,140								2,880
1. Total Labour Cost	NC	11,772.00	12,825.60	15,669.60	44,628.00	51,998.40								136,893.60
2. Internal Special Facilities Cost	NC					1,000.00								
3.1-3.4 Material Costs	NC			1,933.00		2,472.70								4,405.70
3.5 High Rel Parts Costs	NC													
3.6 External Major Products Cost	NC													
3.7 External Services Cost	NC					3,450.00								3,000.00
3.8 Transport/Insurance Cost	NC													
3.9 Travel and Subsistence Cost	NC				780.00	2,718.00								3,498.00
3.10 Miscellaneous Cost	NC					630.00								630.00
3. Total Other Costs (sum of above 3.x)	NC	0.00	0.00	1,933.00	780.00	9,270.70								11,983.70
4. Sub-Total Direct Cost	NC	11,772.00	12,825.60	17,602.60	45,408.00	62,269.10								149,877.30
5.- 7. General expenses	NC	441.45	480.96	587.61	1,673.55	1,949.94								5,133.51
8. Sub-Total Company Cost	NC	12,213.45	13,306.56	18,190.21	47,081.55	64,219.04								155,010.81
9. Profit Fee	NC	977.08	1,064.52	1,455.22	3,766.52	5,137.52								12,400.86
10. Cost without additional charge	NC													
11. Financial Provision for escalation	NC													
12. Total Company Price	NC	13,190.53	14,371.08	19,645.43	50,848.07	69,356.56								167,411.67
	EURO													
13. Total Sub-Contractors Price	NC				12,943.80	11,026.10								23,969.90
	EURO													
14. Reduction for Company contribution	NC													
15. Total Price for ESA	NC													
	EURO	13,190.53	14,371.08	19,645.43	63,791.87	80,382.66								191,381.57

If more than 12 WPs are to be reported, then duplicate the form as necessary, do not add columns.
If Labour Categories require more lines, please add as necessary.

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ix. Cost to Completion

A cost to completion is often requested in the Calls for Proposal. Typically, this would involve identifying each of the main development steps/activities that may be needed after completion of this programme of work to progress the work to a higher TRL. It is useful as an indication of the further investment foreseen to make the product or service market ready.

This information is intended to be for information only and not binding – but remember that by stating a figure, you are setting expectations, so be sure to carefully look at your cost build up and list your assumptions and exclusions.

x. Milestone Payment Plan (MPP)

The MPP defines much how much is paid, when and what the conditions for payment are.

Payment milestones should be linked to the achievement of defined schedule milestones. They should be SMART (Specific, Measurable, Achievable, Relevant and Time-bound) events in the programme and should be linked clearly to a WP. For example, satisfactory completion of Design Reviews, satisfactory completion of tests, hardware deliveries, etc.

Progress reports are not sufficient to make payments.

The proposed milestones should reflect the economic reality of the project, not merely aim to reflect the expenditure profile of the bidder. The final payment milestone should nominally not be less than 10% of the contract price, but check each individual ITT to ensure the correct percentage.

The MPP should cover the total contract value. Any options should have their own payment plan.

An example from the case study is shown below:

Milestone (MS) Description	Schedule Date	Payments from ESA to (Prime) Contractor (in Euro)	Country (ISO code)
Progress (MS 1): Upon successful completion of the RR and successful review and acceptance of deliverables D1a, D1b, D1c, D2 and D3.	To + 2 months	75,000	LT
Progress (MS 2): Upon successful completion of the PDR and successful review and acceptance of deliverables D4a-c, D5, D6a-b, D7.	To + 7 months	74,570	
Final Settlement (MS 3): Upon successful completion of the CDR and the Agency's acceptance of all deliverable items due under the Contract and the Contractor's fulfilment of all other contractual obligations including submission of the Contract Closure Documentation.	To +18 months	41,812	
TOTAL		191,382	

Advance payments

Advance payments can be proposed, to be paid at contract signature. These are not granted automatically, but should be proposed upon demonstration of the need for early investments, procurement of long lead items, etc. This advance payment is off-set against a subsequent milestone (nominally the 1st payment, but can be off-set against later milestones, if justified).

If you are classified as an SME, you are entitled to an advance payment of 35% of the contract. You will need to state your SME status as part of your offer (included in the proforma table as an annex to the Cover Letter).

An example of advance payment request is shown below:

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Prime (P)	Company Name	ESA Entity Code (at contract signature)	Country (ISO code)	Advance Payment (in Euro)	Offset against	Offset by Euro	Condition for release of the Advance Payment
P	HiQ Beverages Ltd		LT	66,984	MS 1	66,984	Upon signature of the Contract by both Parties

MPP for subcontractors

It is a good idea to include the payment milestone plan for subcontractor, if you have any. This helps the reviewer understand your offer.

An example for the case study is shown below:

For Information purposes only :
Amounts in Euro for Contractor and Sub-contractor(s)

Milestone	Prime Contractor HiQ Beverages Ltd	*Insert Country (ISO code)* **LT**	Sub-contractor A Under Pressure Manufacturing Ltd	*Insert Country (ISO code)* **LV**
Advance	61,984		5,000	
MS-1	8,016		0	
MS-2	55,600		18,970	
Final 1	41,812		0	
TOTAL	167,412		23,970	

e) Part 4 – Contract Conditions

The draft contract is included in the CfP and full compliance is expected by ESA. Note: by signing the Cover Letter you are accepting the terms and conditions set out in the draft contract.

i. Intellectual Property Rights

Background IPR

Most bids include a BIPR template to be completed. Ensure that the BIPR you are declaring is directly relevant to the contract and describe which deliverables it is included in and how it affects it and ESA's rights associated to it. A clear reference/identification to the affected deliverables should be provided, as defined in the SOW.

Background IPR (these cumulative conditions have to be met for item to count as BIPR):

- Intellectual Property existing before the ITT
- Is relevant and used for the work of the ITT
- Had no ESA financial aid to develop
- Must be listed / able to be evidenced (e.g. patent, notebook or other means)
- Is delivered to ESA to enable it to use, operate, copy, distribute and sublicense the deliverable items due under the contract
- Is duly identified as such in the contract

An example from the case study is shown below:

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Exact name of BIPR Item	Owner	Description	Patent # or Ref. / Issue / Revision / Version #	Contract / Funding Details under which the IPR was created	Date of creation of the version of the BIPR listed here	Licence	Affected deliverable with comments	Protected Format (Y/N)
Software controlled super-automation	HiQ Beverages Ltd	Intelligent multi- functional and configurable precision control of hot beverage machines	Patent #1234	Self funded	1st April 2000	N/A	D4b -Software Preliminary Design. This document will be marked company confidential and distribution is limited to the ESA TO only.	N

Foreground IPR

Foreground IP is expected to be generated from any technology development. Where this is funded through an ESA contract, the IP (nominally) remains vested in the company, but ESA has a right to use it.

Third party IPR

If a third party is including BIPR in their offer to you, this must flow through into your offer to ESA.

Foreground IPR:

- Intellectual Property developed during the activity
- IP (nominally) remains vested in the company
- ESA has rights to use it
- Shall not affect the rights on the deliverables

ii. Import and Export Licenses

The proposal template will typically suggest several statements for you to choose from. This section is about declaring whether there are import or export restrictions and licences required.

In the proposal template you will see statement similar to this to choose from:

[OPTION1]

The Tenderer declares that no items subject to import or export control will be used in the execution of this activity.

[OPTION2]

The Tenderer declares that the following items, subject to import or export control will be used in the execution of this activity:

Item	Control Type and Country of Origin	Deliverable affected	Comment

f) Cover letter

The Cover Letter is part of your binding offer and the tender documents will prescribe what should be included.

Make sure you have included all the required annexes.

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Typically, there are at least 2 annexes to the Cover Letter:

- **Project team and price breakdown information** – a table asking for details about all organisations participating in the bid, their ESA entity code, price type etc. The table typically looks like this:

	Prime contractor	Subcontractor 1…
Economic Operator Complete Name and Legal Nature		
SME (yes or no)		
Large Space Integrator (yes or no)		
ESA Entity Code (10000xxxxx) (corresponds to ESA-P vendor code)		
ESA Business Unit Code (80000xxxxx)		
Country (ISO code)		
Price type		

- **Contact details, representatives**

A table showing the main contact person who will receive communication related to the tender, the people responsible for technical management and contractual management of any resulting contract.

If the proposal has Key Acceptance Factors, these will be detailed in a separate annex and should be appended to the cover letter.

The cover letter must be signed.

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3.4.5 Outline proposals

Some opportunities require the submission of an 'outline proposal' prior to the submission of a 'full proposal'. Note that these are not submitted formally via ESA STAR, but rather via the OSIP platform, or another platform as stated in the tender documentation. If the outline proposal is approved, the subsequent ITT will be released and is to be submitted through ESA STAR. Ensure you are clear what you need to submit onto which platform – this is detailed in the tender documentation.

3.5 Finalising your proposal

3.5.1 Your own protective markings of tender documents

You can add company-internal protective marking to the tender documents, however, avoid "restricted, confidential, secret or top secret" as these could cause confusion with ESA classifications. Note that the standard non-disclosure protection measures set out in the ESA regulations apply, irrespective of the marking you apply to the tender documents.

3.5.2 Proposal template submissions

You must not amend the structure, title, margins or font of the provided proposal template.

When preparing your offer for submission on ESA STAR, separate the Cover Letter from the proposal template and upload it separately.

The proposal template with its annexes (including PSS forms) should be submitted as one single file.

CVs should be separated from the proposal and uploaded into the CV folder on ESA STAR.

3.5.3 Submitting your bid onto ESA STAR

Most bids will be submitted via ESA STAR, if you are bidding directly to ESA. See section 3.4.5 if you are submitting an early phase idea or outline proposal, which would follow a different route. If you are bidding into another organisation, you will likely submit your bid electronically for them to incorporate into their offer.

As soon as you decide to bid, create a Restricted Bidder Area (in ESA STAR Publications), which is the area under ESA STAR Tendering where you will submit your proposal. It is a good idea to check access well ahead of the deadline.

The Restricted Bidder Area is specific to your bid, and you will see the sections under which you need to upload particular documents. For example, a section for the technical proposal, one for CVs, one for the Cover Letter. Read the tender carefully as it will tell you how to group your bid submissions. You will also be able to see how to split your documents from the layout on the portal.

As part of the bid submission process in the Bidder Restricted Area on ESA STAR, **you will be required to make mandatory declarations for "Declaration of Compliance" and "Key Acceptance Factors".**

The Bidder Restricted Area in ESA STAR only allows the submission of one tender. **If you have other bids you are responding to, each should have their own Bidder Restricted Area.**

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Your bid should be submitted as a standard PDF. Do not include any password protection or animations.

In some cases, specific deliverables can be submitted in other formats (e.g. Gantt chart, or in some cases, PSS forms).

Maximum file size is 250MB per file.

It is a good idea to test the system ahead of submission day, to ensure you have no software issues or any other problems that may delay your submission. Upload a draft or a blank document to try it out – you can upload and recall dummy documents as many times as you like before the final submission deadline but **do not press the SUBMIT button until you are ready to submit your offer**. Nothing is submitted to ESA until you press the SUBMIT button. Once you have done this, you can no longer amend your submission.

> If you are having trouble uploading your tender onto ESA STAR and are likely to miss the deadline, log a call with the ESA STAR service desk as soon as you can (before the deadline).

However, if you are experiencing technical difficulties with ESA STAR close to the deadline (but still in advance of it), you should log a call with the ESA IT service desk as quickly as possible. If you miss the deadline, but it can be proven that you contacted the help desk before the deadline, and that there was a verifiable fault with ESA STAR, your bid may still be accepted. You should not contact the Contracts Officer directly. Details of ESA's IT service desk can be found on ESA STAR, and in the tender pack, which will detail the exact procedure to be followed in case of technical issues.

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Annex 1 – ESA mission phases and key milestones

The life-cycle of space projects is typically divided into 7 phases, as shown and described below. Each phase includes end milestones in the form of project review(s), the outcome of which determines readiness for the project to move forward to the next phase. Additionally, configuration baselines are established on conclusion of major activities or reviews.

- Phase 0 - Mission analysis/needs identification
- Phase A - Feasibility
- Phase B - Preliminary Definition
- Phase C - Detailed Definition
- Phase D - Qualification and Production
- Phase E – Utilization
- Phase F – Disposal

For further information on project reviews see ECSS-M-ST-10C

For further information on configuration baselines, see ECSS-M-ST-40

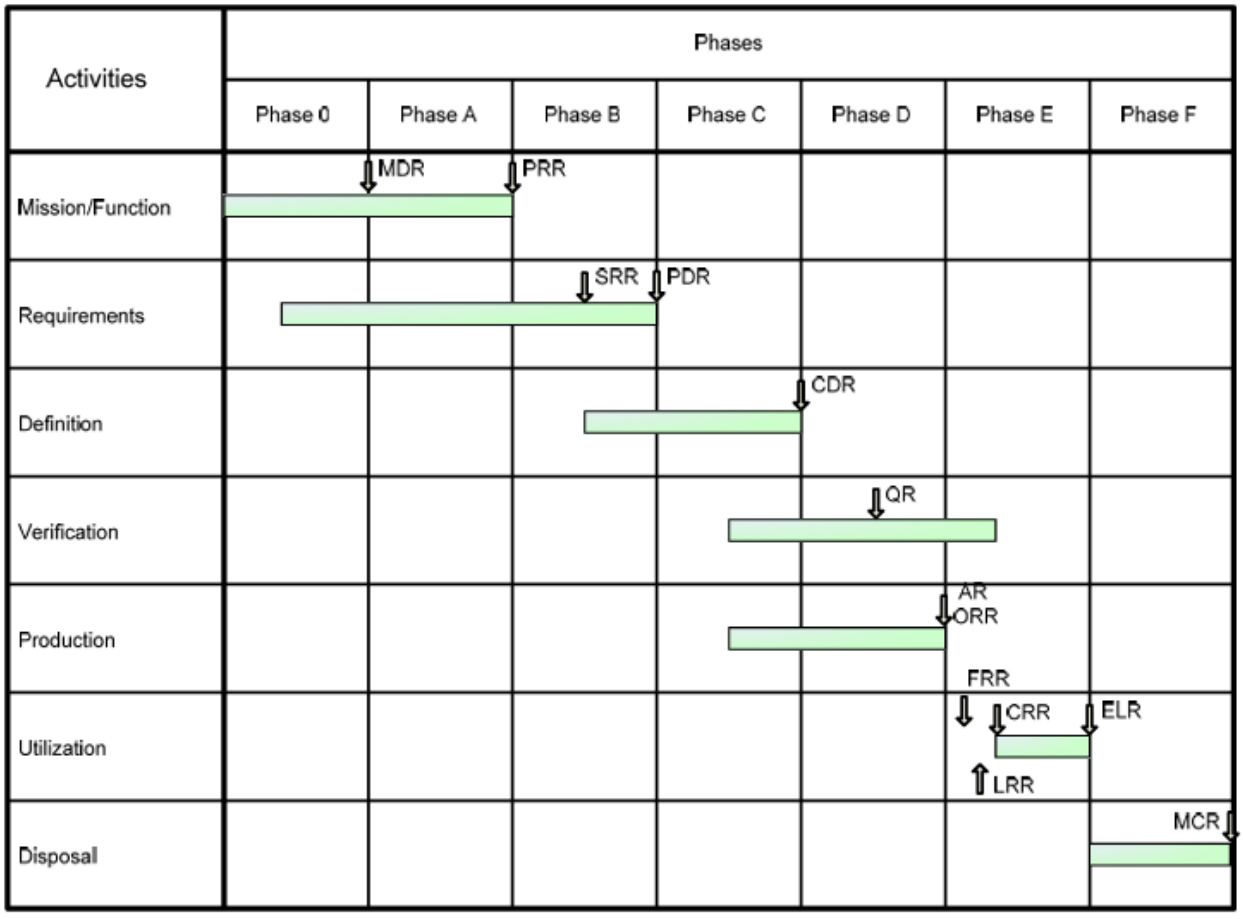


Figure 12 - Space project phases showing major reviews

The reviews and acronyms are explained below

Source: ECSS-M-ST-10C

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Phase 0

Objectives: identify possible mission concepts and develop a preliminary technical requirements specification and preliminary programmatic aspects. Ends with the **Mission Definition Review (MDR).** The outcome of this review is used to judge the readiness of the project to move into phase A.

Phase A (Feasibility)

Objectives: Assess the technical and programmatic feasibility of the possible concepts by identifying constraints relating to implementation, costs, schedules, organisation, operations, maintenance, production and disposal. Also to identify critical technologies and propose pre-development activities. The **Preliminary Requirements Review (PRR)** is held at the end of phase A.

Note: you will typically be asked to deliver a ROM (Rough Order of Magnitude) price for later phases as a deliverable at the end of the phase A study. This is to enable ESA to evaluate likely mission costs and set budgets.

Phase B (Preliminary Definition)

During this phase the system study and system design is progressively developed to include sub-system, assembly and equipment sub-contractors, so that the complete industrial structure is fully established by the end of phase B. To do this, trade-off studies are performed to select the preferred system concept, together with the preferred technical solution. The verification programme and model philosophy are determined and the product tree and work breakdown structure, as well as risk register and project management, engineering and product assurance plans are defined.

Two reviews are associated with phase B:

- The **System Requirements Review (SRR)** is held during the course of phase B.
- The **Preliminary Design Review (PDR)** is held at the end of phase B.

Note: you will typically be asked to deliver a ROM (Rough Order of Magnitude) price for later phases as a deliverable during phase B – possibly at SRR and at PDR. This is to enable ESA to evaluate likely mission costs and set budgets.

Sub-phases: phase B1 and B2

Phase B is commonly (but not always) split into 2 sub-phases: **phase B1**, **up to System Requirements Review (SRR)** and **B2, up to PDR.** Often, a contract for the study phase is placed encompassing phases A and B1. After phase B1, a bid for the full mission (phases B2, C, D and E) would be developed as a competitive procurement.

Parallel contracts for study phases

Note: for large missions ESA often places **parallel contracts for phases A and B1** (the same contract awarded to 2 or 3 consortia), with a selection made following the bid at the end of phase B1.

For information: this can be further complicated if several candidate missions are being funded through phase A/B1. For example, ESA may choose to place parallel contracts for phase A/B1 where the mission hasn't been selected yet. For example, there may be 3 candidate missions at phase A, with 2 parallel contracts for each of the candidate missions, so 6 contracts in total. At some point during the phase A/B1, a

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mission selection review will take place, which will choose 1 mission to proceed. As a potential bidder on these programmes (typically via another Prime), it is important to understand the context to properly evaluate your probability of winning work.

Phases C & D

Phases C and D comprise all activities to be performed in order to develop and qualify the space and ground segments and their products.

Phase C (Detailed Definition)

The scope and type of tasks undertaken during this phase are driven by the model philosophy, as well as the verification approach adopted.

During phase C the detailed design definition of the system at all levels in the customer supplier chain is completed.

The **Critical Design Review (CDR)** is held at the end of phase C. This releases the final design.

Phase D (Qualification and Production)

During phase D, qualification testing and verification activities are completed.

Flight hardware & software (and associated ground support hardware & software) is manufactured, assembled and tested.

Three project reviews are associated with phase D:

- The **Qualification Review (QR)** is held during the course of phase D.
- The **Acceptance Review (AR)** is held at the end of the phase. The outcome of this review is used to judge the readiness of the product for delivery.
- The **Operational Readiness Review (ORR)** is held at the end of the phase.

Phase E

Phase E comprises all activities to be performed in order to launch, commission, utilise, and maintain the orbital elements of the space segment and utilise and maintain the associated ground segment.

Four project reviews as associated with phase E:

- The **Flight Readiness Review (FRR)** is held prior to launch.
- The **Launch Readiness Review (LRR)** is held immediately prior to launch.
- The **Commissioning Result Review (CRR)** is held after completion of the on-orbit commissioning activities.
- The **End-of-Life Review (ELR)** is held at the completion of the mission.

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Phase F

Phase F comprises all activities to be performed in order to safely dispose of all products launched into space as well as the ground segment.

The **Mission Close-out Review (MCR)** is held at the end of phase F.

How the bidding timeline reflects the project phases

A project could be a single project phase, a sequential grouping of phases or sub-phases. How the contract is split will depend on factors such as funding availability, schedule, risk and competitive tendering. Irrespective of the approach used for contracting purposes, all space projects essentially follow the classic project phases in sequence and include all of the major objectives and key milestones of each phase.

In terms of bidding, this typically means that for long programmes, which stretch over several ministerial cycles (3-year funding approval by ESA's Ministerial Council), ESA may not have the funding for the entire mission approved. As such, during the bid phase, the Prime Contractors are typically asked to provide fixed-price offers for the near-term work, with ceiling price contracts (to be converted into fixed-price contracts at a later date) for the remaining phases, subject to Ministerial approval.

The "V-model" approach to reviews

With the exception of the MDR which normally involves only the project initiator and the top-level customer, all other project reviews up to and including the AR are typically carried out by all project actors down to the lowest level supplier.

From the PRR to the PDR, the sequence of the reviews is "top down", starting with the top-level customer and their top-level supplier, and continuing down the customer-supplier chain to the lowest level supplier.

From the CDR to the AR, the sequence of reviews is reversed to "bottom up", starting with the lowest level supplier and its customer and continuing up through the supply chain to the first level supplier and the top-level customer. This "V-model" is illustrated below.

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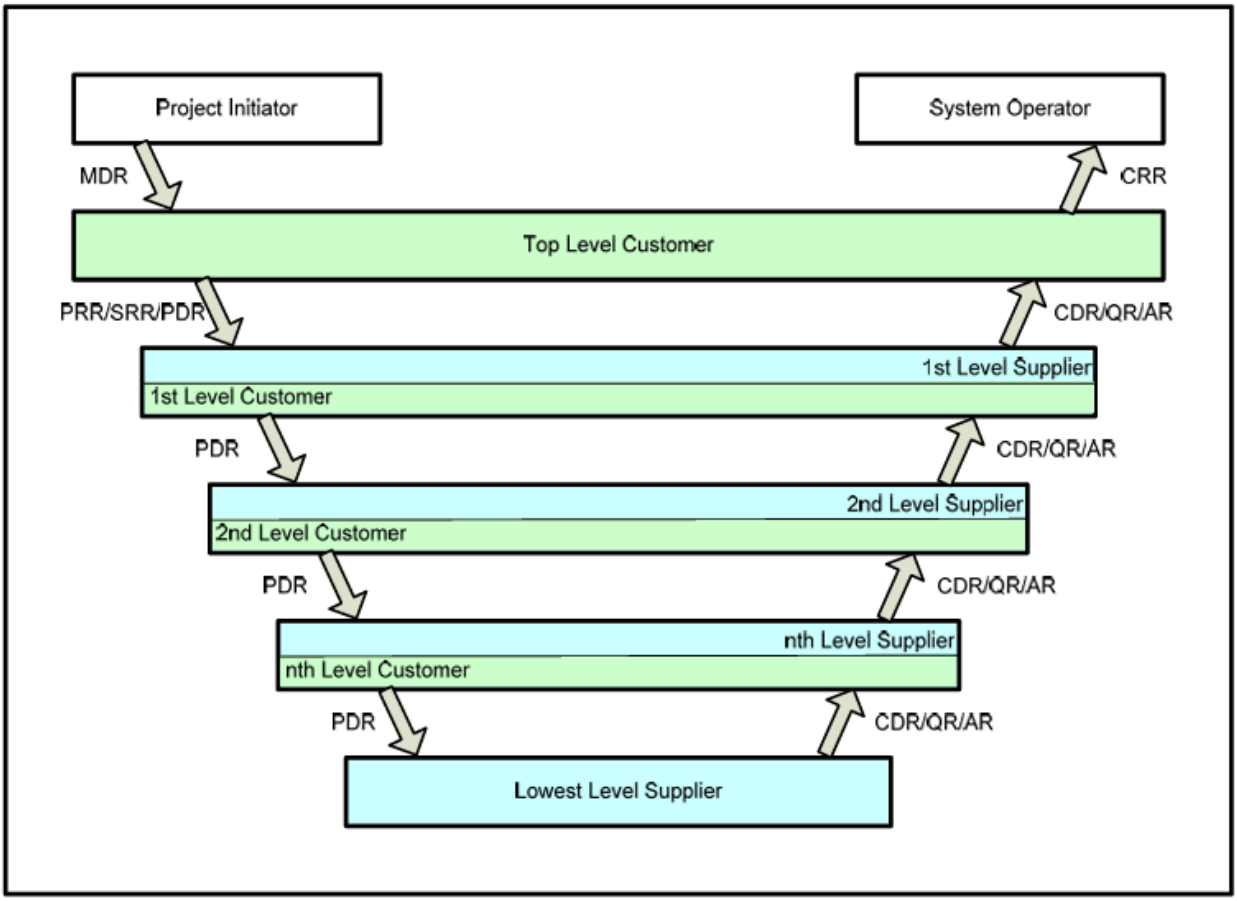


Figure 13 – The "V-model" approach to reviews

Source: ECSS-M-ST-10C

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Annex 2 – Frequently asked questions

This section includes some common questions and links directly to the relevant sections in this Guide.

General questions about bidding into ESA

How is bidding into ESA any different to other customers?

Am I eligible to apply for funding?

What funding channels are there? Which one(s) can I apply for?

I am an SME – what do I do?

How is my bid evaluated?

How does ESA score proposals?

Do I have to register to submit a bid? *Yes, using the ESA STAR tool. The link provides further details.*

Is the budget mentioned in the ITT flexible?

What is ESA STAR?

How do I obtain feedback on my bid from ESA?

I've been invited to negotiations, what does this mean?

What is open competition?

I'm bidding into another company, not directly to ESA. What is the process?

When and how should I engage with the Bulgarian Space Cluster?

When and how should I engage with ESA?

Responding to an ITT

What level of technical detail is required?

This depends on the tender you are responding to. For a Call for Proposals, see this section.

What format is required?

This depends on the tender you are responding to. An example has been provided in this Guide - For Call for Proposals response see this section.

What are the average ITT timescales?

The standard bidding time period is 42 calendar days (about 6 weeks) for a standard procurement. For EXPRO bids it is 28 calendar days. ***Calls for Proposals are typically around 4 weeks****. Larger procurements have longer. If you have subcontractors as part of your offer, you will need to start engaging with them before the ITT is released, as 28 days is not a long time if you need to obtain supplier inputs. If you are a subcontractor to a Prime, the Prime should advise when they require your bid inputs by – it will be in advance of the ESA closing date. Late submissions to ESA will result in elimination.*

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What are PSS forms and how do I complete them?

How do I upload my bid onto ESA STAR?

What happens if I miss the deadline?

It is not possible to submit a bid via ESA STAR after the closing date and time.

Do I have to be compliant to all the requirements? You do not need to be fully compliant with all the technical and managerial requirements, as long as you can provide a justification and impact of non-compliance. You are, however, expected to be fully compliant with the Key Acceptance Factors and contractual terms.

What's the purpose of each of the tender documents? Do I need to read them all?

What are the phases of an ESA mission (A/B/C/D/E)?

What are the types of price conditions and contracts that ESA consider?

What is a CCN?

There are a lot of acronyms – where can I get help with these?

Try the Glossary in this Guide as a starting point

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Annex 3 – ESA funding lines

ESA Directorates and funding lines

This section is for information – **these funding lines are not open to countries on the PECS framework**, but become available as countries become Associate Member and Full Member States. Note that optional programmes are only open to the countries who subscribe to them – each country can choose which optional programmes to support.

Each funding line sits within an overarching Directorate. To help you navigate, the 11 Directorates are defined below:

TEC - Technology, Engineering and Quality

SCI – Science

HRE – Human and Robotic Exploration

RNC – Resilience, Navigation and Connectivity, including Connectivity & Secure Communications

EOP – Earth Observation

OPS - Operations

STS – Space Transportation

CIC – Commercialisation, Industry and Competitiveness

CFO – Controlling, Finance and Operational Procurement

RES – Resources and Services

SLE - Strategy, Legal and External Affairs (no relevant funding lines)

This next section provides a brief overview of each funding line mentioned above. Note that the information is intended as an overview / starting point to help you identify the ones most suited to your business. It is not an in-depth guide to each funding line, and some funding lines will have nuances not mentioned below. Follow the links to the web pages for further information.

a) TEC - Technology, Engineering & Quality

ESA's Directorate of Technology, Engineering and Quality is responsible for the technology developments necessary to implement ESA's programmes.

It oversees a set of R&D programmes aimed at sourcing innovation beyond the immediate market horizon while also serving to de-risk the innovation process for industry.

Further information about the TEC Directorate Technology Programmes can be found here:

ESA - About Directorate Technology Programmes

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i. Discovery & Preparation Technology Development (DPTD)

Discovery is at the start of ESA's innovation pipeline and targets entities which are not yet involved in space activities and this programme is particularly suited to innovative SMEs. It funds research, studies and early technology development activities in all areas of space technology and research.	
Preparation supports New Space missions and programmes. It allows ESA to identify and mature the best concepts for future missions. It conceives a first coherent outline via the Concurrent Design Facility then supports industrial pre-phase A and phase A studies through open competitive tenders for industry.	
TRL focus:	Low TRL
Funding status:	Some fully funded, some co-funded
Procurement method:	Initial ideas submitted through the OSIP platform
Where to find further information:	ESA - Discovery and Preparation ESA - The Open Space Innovation Platform (OSIP)

ii. Technology Development Element (TDE)

The Technology Development Element (TDE) is there to investigate blue-sky thinking in-line with ESA's objectives. TDE is the only ESA technology programme covering all application domains and supporting all of ESA's fields of activity across the entire spectrum of technical disciplines. It tests the suitability of cutting-edge ideas for space applications. It supports the development of generic technologies, either of use to multiple missions or advanced basic technologies of common interest to all applications (e.g. in the field of components, software, power generation, satellite propulsion). TDE is a mandatory programme organised according to technology domains based in turn on application areas, i.e. Earth Observation, Space Science, Exploration, Space Transportation, Telecommunication and Navigation.	
TRL focus (at the end of the activity):	Up to 3-4
Funding status:	Usually fully funded
Procurement method:	Open Competitive, (DN exceptional cases) ITTs are issued continuously throughout the year on ESA's ESA-star website
Where to find further information:	ESA - About the Technology Development Element programme (TDE)

iii. General Support Technology Programme (GSTP)

Through the optional General Support Technology Programme (GSTP) ESA, Participating States and Industry work together to convert promising engineering concepts into a broad spectrum of useable products. The programme takes leading-edge technologies that are not ready to be sent into space and then develops them to be used in future missions. It covers all technology disciplines and applications except Telecommunications (covered by ARTES). Technology developments are usually industry nominated. GSTP performs its activities under three distinct elements:

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Element 1 – Develop Element 2 - Make Element 3 – Fly (small missions)	
TRL focus (at the end of the activity):	5 and above (though different elements address different TRLs)
Funding status:	Element 1 – usually fully funded; El 2 & 3 – 50% match funding required
Procurement method:	Optional Programme Element 1 – open competition Elements 2 & 3 – permanent open call Typically require an outline proposal followed by full proposal **Letter of support required**
Where to find further information:	Information about the general GSTP can be found here: ESA - About the General Support Technology Programme (GSTP)

b) SCI - Science

The Directorate of Science is built around two major pillars, the Science Programme and Core Technology Programme. Both are mandatory.

The Science Programme develops and operates scientific space missions in areas of Astronomy, Solar System Science and Fundamental Physics.

The Core Technology Programme compliments the Science Programme by providing advance preparation of the critical enabling technologies required for successful mission development.

Further information about the Science Directorate programmes can be found here:

ESA - Science directorate

i. Science Core Technology Programme (CTP)

CTP's objective is to ensure early and effective preparation of ESA's future science missions by advance preparation of the critical enabling technologies required for successful mission development. Whilst the initial stages of new technology development, leading up to experimental verification, are pursued through ESA's Basic Technological Development Programme (TDE), the CTP exists to take these new technologies and apply them to the specific technical requirements of future science missions. CTP funded activity carries them to higher stages of technological maturity, up to full-scale engineering models fully tested in relevant environmental conditions, ready for inclusion in the definition stage of the mission.	
TRL focus:	1-9
Funding status:	Fully funded
Procurement method:	Open competition throughout the year on ESA STAR
Where to find further information:	ESA - Science Core Technology Programme

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c) HRE - Human & Robotic Exploration

E3P (European Exploration Envelope Programme) is ESA's main tool for turning the ESA Space Exploration Strategy into reality, building upon current human and robotic exploration capabilities, and laying the foundation for future activities involving humans in low Earth orbit (LEO), activities in lunar and Martian orbit, and further on the surface of Moon and Mars.

Further information about the HRE Directorate programmes can be found here:

ESA - Human and Robotic Exploration

i. E3P - European Exploration Envelope Programme & ExPerRT

E3P is an optional programme managed by the Human and Robotic Exploration (HRE) directorate. The Terrae Novae E3P goals are to secure Europe's central role in global space exploration, deliver new results in both basic and applied science, and offer a compelling vision of global endeavour, enriching society and inspiring the next generations. The programme structures its main activities around four cornerstone exploration campaigns:

1. Humans in low Earth orbit
2. Humans beyond low Earth orbit
3. Lunar robotic exploration
4. Mars robotic exploration

These are supported by two transversal activity areas, **SciSpacE** (Science in Space Environment) and **ExPeRT** (Exploration, Preparation, Research and Technology).
The ExPeRT area is created to integrate all activities needed to prepare for and initiate new human and robotic exploration missions. It does this by integrating, coordinating, and managing the development of studies and technologies for future exploration missions to low Earth orbit, Moon and Mars destinations.

The SciSpacE funding line white papers represents the scientific communities' aspirations for research that could be potentially addressed in the coming decade. As such, they provide a reference for definition of priorities for community-driven research taking advantage of the platforms and opportunities in the programme. This provides an important input to the overall ESA Human and Robotic Exploration *Terrae Novae* research strategy.

TRL focus:	3-6
Funding status:	Usually fully funded
Procurement method:	Open competition
Where to find further information:	ESA - Human Spaceflight and Robotic Exploration Programmes ESA - ExPeRT Exploration Preparation Research and Technology ESA - The SciSpacE White Papers Additionally, E3P provides several entry points such as the Commercial Partnership Initiative, the Business Space Growth Network (BSGN) and the European Space Resources Innovation Centre (ESRIC), in order to foster

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	research and innovative concepts towards enhancing the know-how and capability of European industry.

d) RNC – including CSC – Connectivity and Secure Communications

Further information about the CSC Directorate programmes can be found here:

ESA CSC: Connectivity & Secure Communications

ESA's Connectivity and Secure Communications Directorate is responsible for co-ordinating, shaping and supporting innovation in satellite telecommunications and for the promotion of applications that involve the combined use of space-based systems.

i. ARTES Programme

Businesses located within ESA's Member States involved in the satcom industry - whether small or large, new or experienced can submit proposals via the various elements of the ARTES programme. Every ARTES programme line includes a funding framework and follows certain criteria that must be met by satcom companies wishing to participate. ARTES offers varying degrees of support to projects with different levels of operational and commercial maturity. **ARTES Core Competitiveness** provides support throughout the technology development process; from the initial idea to a fully-fledged product, system or service. The programme provides the funding, multi-disciplinary expertise, business knowledge, opportunities for small and medium enterprises and for international consortia, and contacts needed to turn the concept into reality. ARTES Core Competitiveness combines two previously independent ARTES elements: ARTES Competitiveness & Growth (industry initiative) and ARTES Advanced Technology (ESA initiative).	
TRL focus:	3-9
Funding status:	Usually part funded
Procurement method:	Outline proposal prior to submission of full proposal. Needs supporting business case. **Letter of Support is required.**
Where to find further information:	ESA - About ARTES ARTES Core Competitiveness programme

ii. Moonlight

ESA's Moonlight programme aims to lead Europe in enabling connectivity from the lunar surface by creating a constellation of satellites for satellite communications around the Moon. The Moonlight programme is a joint initiative between ESA's Directorate of Connectivity and Secure Communications, the Directorate of Navigation and the Directorate of Human and Robotic Exploration.	
TRL focus:	3-9

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Funding status:	ESA will **fully fund** (100%) projects in the early stages of innovative technologies development where there is a perceived high commercial and/or technical risk. ESA will **partly fund** (up to 75%*) projects related to new technologies or techniques where the end product has a clear market potential. ESA will **partly fund** (up to 50%*) projects related to the integration and demonstration of activities based on existing technologies that are tailored to pre-operational products, systems and applications with identified market opportunities. *For SMEs, the funding could be higher.
Procurement method:	Open competition
Where to find further information:	ESA Moonlight | ESA CSC

e) RNC including NAV – Navigation

The Navigation Directorate delivers the positioning, navigation and timings services of the European satellite navigation system Galileo and the augmentation system EGNOS, while also exploring future applications of navigation technologies for science and daily life.

Further information about the NAV Directorate programmes can be found here:

ESA - Satellite navigation

i. NAVISP – Navigation Innovation and Support Programme

NAVISP supports European industry in succeeding in the highly competitive and rapidly-evolving global market for satellite navigation, and more broadly PNT (Precision, Navigation and Timing) technologies and services. The programme is structured according to three Elements: Element 1 – Innovation in satellite navigation Element 2 – Competitiveness Element 3 - Support to Member States	
TRL focus:	1-8
Funding status:	Element 1 & 3 – fully funded Element 2 – co-funding required
Procurement method:	Element 1 – open competition + letter of support Element 2 & 3 – permanent open call – initial ideas through OSIP + letter of support **Letter of Support is required**
Where to find further information:	NAVISP

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f) EOP – Earth Observation

The Earth Observation Directorate encompasses all EO activities – from weather forecasting, answering Earth-science questions, providing essential information to improve agricultural practices, maritime safety, helping provide information in disaster zones and all manner of every day applications.

Further information about the EO Directorate programmes can be found here:

ESA - ESA for Earth

i. Future EO

Future EO is the flagship Earth Observation (EO) programme that funds end-to-end capability across the EO portfolio. It develops the foundations of European EO systems and capabilities over the next decades. It covers all aspects of Earth Observation including system and architecture studies, instrument pre-development, mission development and operations and the stimulation of innovative Earth science and EO application developments. It is the foundation for all other EO activities as well as funding the Earth Explorer science missions and Scouts research missions. The EO Science for Society element in the Future EO programme provides a flexible structure to support rapid developments addressing priority interests and emerging opportunities for novel use of EO within the scientific community, national, regional and international public sector institutions and private sector operators. In particular, EO Science for Society is working to advance Earth science, pioneer new applications and strengthen the competitiveness of downstream industry, building on the latest tools such as collaborative platforms.	
TRL focus:	1-9
Funding status:	Usually part funded
Procurement method:	Open competition
Where to find further information:	Future EO EO Science for Society ESA - Introducing FutureEO

ii. InCubed

InCubed stands for 'Investing in Industrial Innovation' and is a Public Private Partnership co-funding programme run by the ESA Φ-lab. InCubed focuses on developing innovative and commercially viable products and services that generate or exploit the value of Earth observation imagery and datasets. The programme has a very wide scope and can be used to co-fund anything from building satellites to ground applications and everything between or to develop new EO business models. Entities can apply at any time for different levels of co-funding depending on the type of activity.	
TRL focus:	4 and above
Funding status:	Part funded
Procurement method:	An idea is pitched via the OSIP platform > idea pitch go/no go > first proposal submitted via OSIP platform > Proposal go no/go > Letter of Support obtained from National Delegation > detailed proposal via ESA STAR **Letter of support is required.**

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Where to find further information:	InCubed How to apply | InCubed Additional application information | InCubed ESA Φ-lab

g) OPS – Operations

OPS teams control spacecraft in orbit, manage the global tracking station network, and design and build the systems on the ground that support missions in space. The Space Safety programme also sits within this Directorate.

Further information about the OPS Directorate programmes can be found here:

ESA - Operations

i. S2P – Space Safety Programme

ESA's Space Safety Programme is dedicated to the protection of Europe and its economies from disruption to this critical infrastructure and fostering new commercial opportunities in the European space sector.	
TRL focus:	1-8
Funding status:	Element 1 & 3 – fully funded Element 2 – co-funding required
Procurement method:	Element 1 – open competition + Letter of Support Element 2 & 3 – permanent open call – initial ideas through OSIP + Letter of Support **Letter of Support is required**
Where to find further information:	ESA - Space Safety ESA - Space Safety Programme at 2022 Ministerial Council

h) STS – Space Transportation

STS ensures European autonomy in accessing and using space in a safe and secure environment, by consolidating and protecting its infrastructures.

Further information about the STS Directorate programmes can be found here:

ESA - Space Transportation

i. BOOST!

Boost! – ESA's Commercial Space Transportation Services and Support to Member States Programme is managed by the Directorate of Space Transportation. The programme provides a flexible programmatic framework to stimulate, encourage, and support the development, deployment, and use of new European commercial space transportation services under private leadership and responsibility.

The programme consists of three elements, each with its own objective:
Boost! 1, Commercial Space Transportation Services Element: to provide support that is flexible and tailored to the needs of European economic operators pursuing privately-led developments for commercially viable new space transportation services.

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Boost! 2, Support to Participating States Element: in meeting the demand of ESA Member States to provide them with assistance in the implementation of national space transportation objectives in the field of spaceports infrastructure and related services. **Boost! 3, Space Transportation Services Procurement Element**: co-funding European launch services on a competitive basis for the purpose of demonstrating and qualifying in orbit technologies or sub-systems on-board ready-to-fly IOD/IOV satellite(s).	
TRL focus:	All
Funding status:	Element 1 – co-funded
Procurement method:	Element 1 – permanent open call through ESA STAR (search for Boost!): outline proposal > full proposal **Letter of Support is required** Element 2 – requests for support should be submitted directly to ESA by participating states only Element 3 – specific call followed by open competition
Where to find further information:	ESA - Boost! overview Element 1 - Open Space Innovation Platform - OSIP - Channel: Boost! - Commercial Space Transportation Services ESA - Boost! frequently asked questions

i) CIC – Commercialisation, Industry & Competitiveness

Further information about the CIC Directorate programmes can be found here:

ESA Commercialisation Gateway

The CIC Directorate focuses on talent, access to capital and fast innovation. It provides several services for startups, space companies, non-space companies, aspiring entrepreneurs, institutions, and investors.

i. Access

ACCESS is a new ESA programme, approved at the 2025 Council of Ministers. It brings together two existing ESA programmes - ScaleUp and BASS (Business Applications and Space Solutions). ACCESS is designed to accelerate the commercialisation and competitiveness of European industry in the space and non-space sectors. It offers support to all types and sizes of companies, ranging from start-ups to established players, across multiple sectors.

ii. Scale Up

ScaleUp offers technical, financial and business support for entrepreneurs and established businesses in the space and non-space sectors. It is available to companies at every stage of their commercialisation journey – from start-ups through to more established businesses wishing to scale. It consists of the following five components:

- **ESA Phi-LabNET:** A network of innovative labs fostering collaboration between ESA, industry and researchers to bridge disruptive research with emerging commercial needs. The network facilitates research into groundbreaking science and technology developments that have high commercial potential, offering co-funding and technical

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assistance to explore new business concepts. Specific funding opportunities are issued regularly on the Phi-Lab websites (follow link and select UK). • **ESA Business Incubation Centres (BICs):** ESA BICs form the largest business incubation network in Europe. The key objective is to help entrepreneurs translate their space-based ideas into commercially successful businesses. They offer a wide range of business support services to nurture and grow space-related start-ups. In the UK, ESA BIC is managed through the Science and Technology Facilities Council (STFC). • **ESA Technology Brokers:** ESA Technology Brokers help companies adapt terrestrial technologies for use in space applications, as well as identifying uses for space technologies in non-space environments. TWI is the ESA Technology Broker for the UK. • **ESA Business Accelerators:** Specialised centres supporting more mature companies in scaling their businesses and accessing financing. Currently, the only operating ESA Business Accelerator is located in Munich, Germany. • **ESA Marketplace:** An initiative aimed at helping companies acquire customers at initial stages to gain market traction.	
TRL focus:	All – though individual elements may have specific requirements
Funding status:	Usually part funded
Procurement method:	Initial ideas via OSIP, then through ESA STAR Open competition
Where to find further information:	The ACCESS programme | ESA ACCESS

iii. BASS – Business Applications and Space Solutions

ESA BASS is the go-to place for business ideas involving space in all areas of society and economy. Its mission is to support entrepreneurs in Europe in the development of business using satellite applications and space technology. It provides funding opportunities, technical and business expertise, provides connections with potential customers, investors and partners, and allows you to leverage the ESA brand.	
TRL focus:	All
Funding status:	Usually part funded
Procurement method:	Open competition + permanent open calls
Where to find further information:	More information is available here: Business Applications Or via the BASS Ambassadors

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Participating in large-scale missions

In addition to applying for funding directly through ESA via one of the technology development funding lines, you may wish to bid for work packages on a large-scale mission, for example within the Science, HRE or EO programmes. **For smaller businesses in particular, being part of a larger consortium can be a good way of securing longer term work, increasing your international network and having a role on large programmes. Additionally, Prime contractors will be looking for companies from across ESA's Member States to satisfy the geo-return requirements of the programme.**

If you are bidding as a subcontractor, it is likely that you will be responding to a tender let by the Prime contractor for the mission (or one of their subcontractors). The bid process in this case follows the same fundamentals as set out in this Guide, but your ITT will come from another entity, rather than ESA. Depending on the scale of your workshare, the bid deliverables may be more onerous than for smaller contracts. As with all ITTs, ensure you read the ITT carefully and align your deliverables to what is required in each specific case.

Note that a Prime contractor may be running a Best Practices Procurement campaign if they are already under contract with ESA. This does not substantially affect your bid, but it is important to be aware of the context in which you are bidding. Most notably, if you are responding to a Best Practices Procurement, this will be run through ESA STAR (the non-ESA part).

To find out about participating in such missions, industry days, either hosted by ESA or by the Primes are useful. Additionally, keep an eye on the Intended ITTs list on ESA STAR (including the non-ESA section).

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Annex 4 – Technical part for ITT response (not applicable to Calls for Proposal)

This section is an alternative to section 3.4.4b). For tenders which include a Statement of Work, and requirements, this section addresses how to respond. For Calls for Proposals, the tender does not typically contain requirements from ESA, beyond the constraints of the Call. It is up to the bidder to define the technical requirements and baseline, while complying with the Call. Section 3.4.4 sets out the points to note when responding to a CfP. The below is for information.

The technical part of the bid describes the proposed technical approach in meeting the requirements, demonstrates understanding of the requirements, identifying critical or challenging requirements and proposed trade-offs. The expected compliance against requirements is demonstrated here (usually as a table). Where you have a baseline and options, these are discussed here.

> The scoring is aligned to you demonstrating your knowledge and expertise in assessing, critically reviewing and supplementing the requirements. Not all requirements are equal – some will be essentials, others nice-to-have, and ESA expects you to show your knowledge by identifying these. If an error has crept into the requirements, call it out and show your understanding.

i. Technical requirements

You must demonstrate that you have read and understand the requirements and objectives set out in the ITT, and show your expected compliance (of your solution) to the technical requirements. This is done in 2 ways:

- A **concise functional analysis of the technical requirements** – where you discuss the key driving requirements and explain why you have selected those, highlight any missing requirements (if any) and how they will be addressed, and state how you will arrive at a consolidated set of agreed requirements during the course of the work. An example from the case study is shown below, and an example narrative can be found on page 2 of the case study.
- A **compliance matrix** - compliance to the technical specification requirements is usually presented in a table, accompanied by a narrative.

> Your compliance options are **C = Compliant, NC = Non-Compliant, PC = Partially Compliant**
>
> Any PC or NC must have a justification. Write a brief justification in the table (as shown below) and use the narrative section to discuss in greater detail, if necessary. You can refer to other sections of the proposal to support the point you are making, but avoid cross-referencing with no justification in the table (e.g. avoid saying non-compliant, see section xyz).

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Example from the case study:

1.1.1.1 Proposed consolidation of the RFP/ITT requirements

No.	Req.	C	Est.	Discussion
RCM1	The HBM shall be capable to produce at least 15 beverages per minute with one operator.	**C**	24/min 10sec max	This requirement is key to ensuring the competitiveness of the customer. It will be possible to prepare 4 beverages simultaneously giving 24/min. However, a single beverage cannot be guaranteed to be made in 6 seconds while being compliant with RCM10. Some beverages (e.g. Cappuccino) will take up to 10 seconds.
RCM2	The HBM shall be capable to produce at least 10 different beverage types including variations of: Coffee Tea Hot Chocolate	**C**	15 types of coffee, 3 types of tea, 2 types of hot chocolate	Key design driver affecting the need for dedicated storage and dispense units for the different beverages. In order to comply with RCM1, a dedicated boiler for simultaneous milk frothing must be included in the design. The unit shall provide the necessary components (hot water and a tea bag) and will not produce ready-to-drink tea beverages.
RCM3	The HBM shall be capable of producing at least 5,000 beverages between refills (minimum of 2000 for any one variant).	**NC**	1000 bean based beverages of all variants. 500 tea beverages.	Key design driver affecting the size of dedicated storage units. This requirement means the HBM has to have the capability to be connected to a water supply network. Given that the optimal amount of coffee per cup requires 15cm3 of beans, the maximum sized storage unit still compliant with RCM5 and RCM6, would produce 1000 bean-based beverages (coffee or cocoa). Similarly, the amount of tea bags stored can be maximum 500.

To make it easy for the reviewer, it is a good idea to create a separate table to the one above summarising all requirements you are proposing a modification to plus any new ones you are adding. This makes it very clear which ones are not just a straightforward “C”. An example is shown below:

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1.1.1.2 Suggested modifications to the requirements

After careful review and assessment we propose a number of modifications to the requirements for consideration by ESA.

No.	Req.	Justification/Modification
RCM 4	The HBM shall be more reliable than the current market leading machines.	It is suggested to modify this requirement to a comparable system-level reliability with current models on the market, with a MTBF (Mean Time Between Failures) number. Higher reliability than market leading machines cannot be guaranteed as reliability figures are not published for competitors' products.
RCM5	The HBM shall be able to be carried and installed by 2 people without special lifting equipment or tools.	It is suggested to modify this to allow special tools for the installation under the condition that they are included in the recurring price of the unit. This will allow significantly more flexibility in the design of the unit.
RCM10	The HBM shall produce tastier beverages than the competitors.	As stated the requirement is subjective and not possible to demonstrate objectively. It is suggested to modify this to correspond to the requirements for standard Italian Espresso Coffee Certification (certificate of product conformity Csqa n. 214: 24 September 1999, DTP 008 Ed.1). Such modification has implications for the pressure system design.
New 1	The HBM shall be compliant with the EU hot water handling safety standards listed in EU/HotWater-safety/001 v2	Compliance with this standard is mandatory to be able to sell the unit in the EU but is not listed in the requirements, it is suggested to add this requirement.

Table 2: Suggested Modifications to the Technical Requirements

If you modify or add requirements, make sure they are well formulated, see below:

Well formulated requirements:
- The coffee shall be served at a temperature between 85 and 90˚C.
- The coffee shall be delivered to the customer within 4 minutes of being ordered.
- The coffee shall be dispensed in 200ml +/- 10ml servings.
- The customer shall receive a biscuit with each coffee, included in the price of the coffee

Poorly formulated requirements:
- The coffee has to be a good temperature
- The coffee must be served quickly
- The coffee shall have big serving sizes
- We want people to have biscuits with their coffee

Not a requirement at all in this sense:
- We need to buy a kettle and coffee cups
- We need to hire someone to make the coffee
- We should do a trade off on what biscuits to give
- We shall get a coffee sellers license

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ii. First iteration

[Example proposal pages 9-11]

The purpose is to gain an insight into how the bidder thinks, how they understand the problem and to check they have the same understanding as the Technical Officer.

It is also used to help check the scope of the work.

If testing is needed, it is always a good idea to include a first high-level iteration of the test plan/test flow – whether asked or not.

Typically, EXPRO bids will have the tasks which are to have a first iteration listed in the proposal template.

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Annex 5 – GLOSSARY – Acronyms & definitions

Some common terms and definitions are included in the Glossary below. If you can't find a term, try the ECSS glossary: Glossary | European Cooperation for Space Standardization

Acronym / Term	Definition & further explanation
A	
AD - Applicable Documents	Documentation included in a tender pack. The requirements listed within the ADs are applicable to the tender. See also Reference Documents (RDs).
AR – Acceptance Review	See project phases section in Annex 1.
ARTES	One of the ESA funding lines – Advanced Research in Telecommunication Systems.
Associate Member State	See Member State
B	
BASS – Business Applications and Space Solutions	One of the ESA funding lines within Commercialisation, Industry and Competitiveness Directorate. See here.
Best Practices Procurement	ESA wants to ensure transparency and fairness across its procurements, at all levels, particularly between Prime contractors and their subcontractors (and further down the supply chain). Best Practices Procurement gives ESA the right to contractually impose the tendering requirements they have to follow on their Prime contractors, when these are selecting their industrial consortium. Best practices campaigns are typically run by Primes or subcontractors responsible for sizeable subsystems to select their supply chain. As an SME you may well be bidding into a larger entity as part of their best practices campaign. The fundamentals of best practices procurement are: • ESA is given full visibility in the ITT/RFQ preparation, evaluation process and selection of tenders, including the right to perform an audit of the overall procedure • The procurement to be conducted under best practices will be included in the Intended ITT section of ESA STAR (under external entities) – this provides a summary description of the intended ITT and indicative budget Best Practices campaigns are typically carried out once the Prime is on contract (typically during phase B2).
BSC	Bulgarian Space Cluster
C	
C-clauses	Clauses limiting the types of entities eligible to bid for a contract. C1 – limited to non-primes C2 – a significant participation of non-primes (including SMEs) is requested C3 – limited to SMEs and R&D organisations C4 – subject to the SME subcontracting clause
CDR – Critical Design Review	See project phases section in Annex 1.
Ceiling price (see also Price Types)	The maximum (do not exceed) price for a scope of work. Ceiling price offers are typically converted into fixed price contracts during the project execution phase (for example, during a bid for phase A/B, the bidder is asked to provide a ceiling price for phases C/D. The price for phases C/D would be converted to firm price during the phase A/B project). Further definitions can be found in ESA/REG/002, rev. 3 Annex II
CFI – Customer Furnished Items	Items which are provided by the Customer to you as part of the project. These should be defined in the bid (and subsequent contract), along with their value (or excluded cost if you are not paying for them), their place and time of delivery and what to do with the CFI after their use.
CfP - Call for Proposals	Calls issued by ESA to which industry can respond at their own initiative – i.e. not responding to a formal set of requirements from ESA. ESA labelling: CFP/4-… Standard CfP

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	CFP/5-… Fixed CfP CFP/6-… Open CfP See here for an example CfP.
CO – Contracts Officer	Each tender has an assigned Contracts Officer.
Consortium / Consortia	In ESA contracts, any industrial organisation is called a consortium (plural, consortia).
Contract Changes (CCN)	Contract Changes (CN) or Contract Change Notices (CCN) **Class A changes**: are those that change contractual requirements or that result from failure of ESA in its undertaking to fulfil the contract. Class A agreed changes will lead to adjusted price. **Class B changes**: are all other changes and their cost and contractual consequences are borne by the Contractor. Either ESA or the Contractor can request a change. Typically, the Contractor completes a Contract Change Request form, which, once signed by both parties, enters into force.
Convention (ESA)	ESA Convention was signed in 1980 to establish the European Space Agency in order to setup a single European space organisation to increase the efficiency of the total of European space efforts and to define a European space programme for exclusively peaceful purposes. The Convention contains 26 Articles and 5 annexes.
Cost reimbursement price (see also Price Types)	Cost plus fixed fee contract: provides for the payment of a fixed fee to the contractor. Cost plus incentive fee contract: provides for the payment of a target fee which is to be paid to the contractor upon completion of targets specified in the contract. Time and materials contract: price is determined based on hourly rates, material and supply costs. Further definitions can be found in ESA/REG/002, rev. 3 Annex II
Council – ESA Ministerial Council	(See article XI of the ESA Convention) The Council is ESA's governing body and provides the basic policy guidelines within which ESA develops the European space programme. Each Member State is represented on the Council and has one vote, regardless of its size or financial contribution.
CQ – Clarification Question	Can arise from either the bidder or ESA during the bid or negotiation phases.
CRR – Commissioning Result Review	See project phases section in Annex 1.
CTP – Core Technology Programme	One of the ESA funding lines within the Science Directorate. See here.
D	
Directorate	Departments within ESA – see here.
Director General (ESA)	(See article XII of the ESA Convention) ESA is headed by a Director General. The Director General is the Chief Executive Officer of ESA and its legal representative. The Director General takes measures to implement programmes, to execute ESA policy and reports to the Council.
DPTD – Discovery and Preparation Technology Development	One of the ESA funding lines within the Technology, Engineering and Quality Directorate. See here.
DN – Direct Negotiation	A non-competitive procurement method, where an RFP/RFQ is issued to only one bidder.
E	
E3P – European Exploration Envelope Programme	One of the ESA funding lines within Human and Robotic Exploration Directorate. See here.
ECOS	ESA Costing Software – is a software tool used for providing a breakdown of costs, initially provided by the bidder during the bid phase. It provides ESA with a detailed view of the costs included in the project, split by work package, cost type, time. It typically includes all the costs included in the proposal, even if not all prices being quoted are firm prices. **As of mid-2026, ESA has mandated ECOS for all tenders, so as this requirement is phased in, bidders will be expected to populate the ECOS financial reporting file alongside the bid.** This is an online tool, which integrates with subcontractors submissions, and is submitted electronically to ESA. Be aware that using ECOS requires the user to have had some training on how to use the tool, and completing ECOS can be time consuming, especially for the first time. Moreover, the structure in ECOS (nodes) needs to be aligned with the Prime bidder, as any subcontractors' ECOS submissions

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	will be automatically incorporated into the ECOS of the next tier up – right up to the Prime bidder. It is advisable to agree the ECOS structure (and hence your WBS) at the beginning of the bid, to avoid the need to re-work your WBS and costings late in the bid process.
ECSS – European Cooperation for Space Standardization	These are the set of standards which describe the processes to be followed for European space activities. It was borne out of confusion from various different standards and requirements used by different space agencies across Europe. The ECSS was developed by space agencies across Europe, ESA and industry to define a common way of working across: • Project management requirements • Requirements for design, development, manufacturing, verification and operational space systems and their constituent parts • Technical requirements for assemblies, equipment, subsystems and systems used for space missions • Interface requirements for information relating to space systems and activities and transmitted between organisations. Further information and the ECSS standards documents can be found here: Standards | European Cooperation for Space Standardization
ELR – End-of-Life Review	See project phases section in Annex 1.
EO – Earth Observation	An ESA Directorate, see here.
EOI – Expression of Interest	Indication of wishing to bid for a potential opportunity. Can apply to intended ITTs and issued ITTs.
ESA	European Space Agency
ESA STAR	ESA's online System for Tendering And Registration. Online portal where ESA uploads tender documents, where bidders submit responses, ask clarification questions and track the progress of their bid submission. Accessed through: esa-star Doing
ESA STAR IT Helpdesk	You can contact esait Service Desk from Monday to Friday from 8:00 to 18:00 CET at: esait Service Desk - ESA Corporate Applications: 80700 (option 2) External lines: +39 06 941 80700 E-mail: esait.Service.Desk@esa.int
EXPRO – Express Procurement	EXPRO is ESA's express procurement procedure used for low to medium value, low risk procurements. This process is designed to minimise time-to contract through a series of simplifications with respect to the standard process, the applicable tendering conditions and the applicable contract conditions. The main difference is that the General Clauses and Conditions (GCC) do not apply to an EXPRO procurement. The EXPRO contract is self-contained. EXPRO bids are typically up to ~2 million Euros.
F	
FFP – Firm Fixed Price (see also Price Types)	The price of the contract is not subject to adjustment or revision, even if the actual costs incurred are different to those set out in the contract. From a bidder's perspective, this means that the inflation rate is anticipated at the moment of contract signature through a financial provision for escalation. Industry bears the risk related to inflation. Note that the inflation rate to be used should be within the range given for each country. ESA will check that your inflation calculations are within these limits. Contact the Bulgarian Space Cluster for further information about which inflation rates to use. Further definitions can be found in ESA/REG/002, rev. 3 Annex II
FP+V – Firm Price with Variation (see also Price Types)	A portion of the price is adjusted throughout the execution of the contract to reflect inflation, via a price variation formula. ESA bears the risk related to inflation. Further definitions can be found in ESA/REG/002, rev. 3 Annex II
FRR – Flight Readiness Review	See project phases section in Annex 1.
Fixed Unit Price (see also Price Types)	Used when the quantity of the supplies or services cannot be precisely determined at the time of signing the contract. A unit price is established, which is then multiplied by the number of items. Further definitions can be found in ESA/REG/002, rev. 3 Annex II
G	

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GCC – General Clauses and Conditions	The terms under which an ESA contract is let. Latest version can be found here: esa-star Publication
GCT – General Conditions of Tender	As of January 2025 these have been superseded by the ESA Contracting Conditions. Previously, the General Conditions of Tender for ESA Contracts (GCT) would be tailored for each bid through the Special Conditions of Tender (SCT) document, detailing which elements of the GCT may be modified or amended.
Geographical return (geo-return)	The ESA Convention outlines the principle that ESA should ensure fair participation among its Member States, considering their financial contributions. This involves awarding contracts to industry or academia within a Member State in proportion to the amount that that Member State has invested in ESA, with a deduction to cover overhead costs. This is known as geo-return. Geo-return calculations are very complex, as they look not only at specific missions, but at wider programmes, portfolios and across funding lines over time. For example, it could be that a country is *over*-returned on programme X but *under*-returned on programme Y. One of the roles of each country's National Delegation is to balance the country's geo-return across all activities.
GSTP – General Support Technology Programme	One of the ESA funding lines within the Technology, Engineering and Quality Directorate. See section here.
H	
Harmonisation or Technology Harmonisation	See Technology Harmonisation
I	
Industrial Policy (ESA)	This key point in the ESA Convention seeks equitable participation of all Member States in line with their financial contribution. See also geographical return. Preference is given to businesses from participating Member States.
IPC – Industrial Policy Committee (ESA)	A subordinate body of the Council (see Council above) that prepares decisions and recommendations concerning industrial policy and procurement matters throughout the whole programmatic and regulatory spectrum and that is itself involved in the conduct of those activities.
ITT - Invitation to Tender	ITT generally refers to a competitive and binding offer. Typically used for competitive tender. ESA labelling: Open competition: AO/1-… Restricted competition: AO/2-…
K	
KAF - Key Acceptance Factor	These represent formal requirements and failure to comply could result in the non-admissibility of the tender for evaluation. For example, they may stipulate a particular geographical return, include C-clauses or require a particular consortium build up (certain Calls for Proposal like to see end customers included in the consortium to help define requirements).
L	
LOS – Letter of Support	Some optional programmes require a Letter of Support from the country's National Delegation, showing their commitment to that programme and company. However, this does not apply to countries on the PECS framework.
LRR – Launch Readiness Review	See project phases section in Annex 1.
Large System Integrators (also Major System Integrators)	Currently Airbus Defence and Space SAS, Airbus DS GmbH, Airbus Defence and Space Limited, Thales Alenia Space France, Thales Alenia Space Italia Spa, OHB Systems AG. Some procurements exclude LSIs from bidding.
M	
Major System Integrators	See LSI
Mandatory programme	There are 2 types of programmes within ESA – mandatory and optional programmes. Mandatory programmes are those which Member States must participate in, and their contribution is calculated based on their Gross National Product (which means ESA can plan ahead as the funding and participation is guaranteed). The amount of workshare each Member State receives back is a factor of how much they invested (see geographical return).
MCR – Mission Closeout Review	See project phases section in Annex 1.

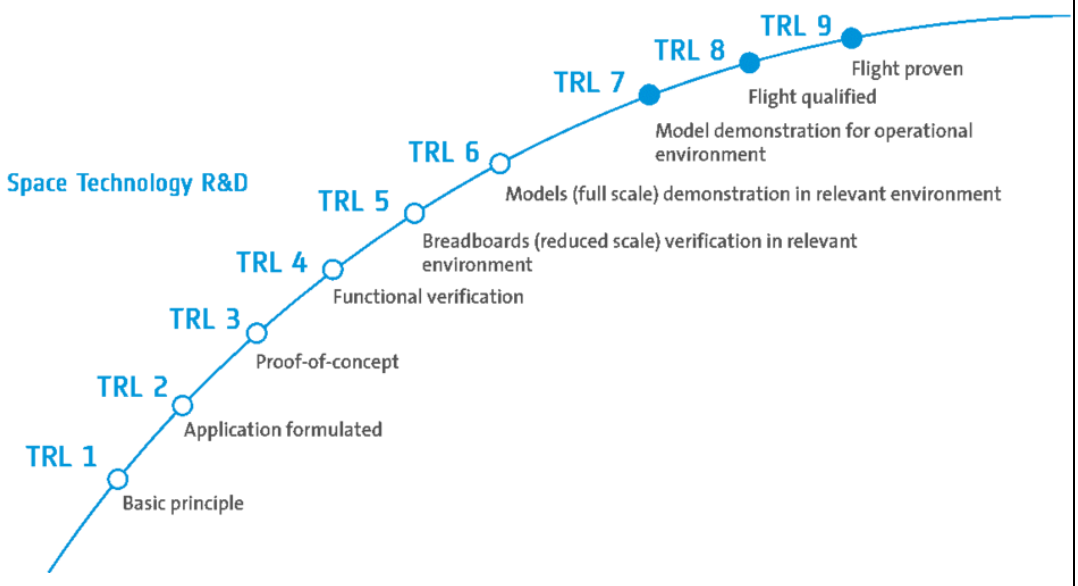
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MDR – Mission Definition Review	See project phases section in Annex 1.
Member State (ESA)	Member States of ESA are the States who are party to the Convention either because they have signed it or because they have acceded to it. There are currently 23 Member States. 10 founding countries (1975): Belgium, Germany, Denmark, France, UK, Italy, Netherlands, Sweden, Switzerland, Spain. Other Member States: Norway, Finland, Estonia, Poland, Czech Republic, Hungary, Slovenia, Austria, Romania, Greece, Luxemburg, Ireland, Portugal, Canada. *Associate Member States: Slovakia, Latvia, Lithuania, Cyprus* *Cooperating States: Bulgaria, Croatia, Malta*
Model Matrix	The Model Matrix describes the applicability of models for each element of the Product Tree, and their utilisation. Hardware models are typically: **Breadboard Model (BBM) and Engineering Models (EM)** – partial, cheap test models **Engineering Qualification Model (EQM)** - model, which fully reflects the design of the flight model except for the parts standard, used for functional performance and EMC verification and possibly for qualification **Structural Thermal Model (STM)** – structurally and thermally representative model of the flight model that combines the objectives of the structural model and the thermal model **Qualification Model (QM)** – model, which fully reflects all aspects of the flight model design, used for complete functional and environmental qualification testing **Protoflight Model (PFM)** – flight model on which a partial or complete protoflight qualification test campaign is performed before flight **Flight Model (FM)** – end product that is intended for flight **Flight Spare (FS)** - spare flight model that could be used in place of the flight model
N	
NAVISP – Navigation Innovation and Support Programme	One of the ESA funding lines within the Navigation Directorate. See here.
Non-primes	All companies and organisation with the exception of the Large (Major) System Integrators.
O	
Optional programme	See 'Mandatory programme'. There are 2 types of programmes within ESA – mandatory and optional programmes. Optional programmes are ones that individual Member States can opt in to, and work share is limited to those participating states. The contribution is set by the country, and can be higher or lower than the normal GDP % used for mandatory programmes. Each country decides on its participation in optional programmes – it is determined by the technical and industrial interest of the country.
ORR – Operational Readiness Review	See project phases section in Annex 1.
OSIP – Open Space Innovation Platform	This is an ESA platform aimed at collecting ideas for early technology development. It is typically used for the Discovery and Preparation programme, but other programmes can use it too. Further information can be found here: ESA - The Open Space Innovation Platform (OSIP)
P	
PATP – Preliminary Authorisation to Proceed	In some cases, ESA may wish to start a contract before all points of the contract have been fully negotiated. In this case, ESA may authorise the start of activities through a formal Preliminary Authorisation to Proceed (PATP) (usually for a given period of time and/or financial value).
PDR – Preliminary Design Review	See project phases section in Annex 1.

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PECS	Plan for European Cooperating States. See section 1.4.1
Price types	Annex II to the GCC defines 3 price types: a) Fixed price: - Firm fixed price (FFP) - Fixed price with price variation (FP+V) - Fixed unit price b) Ceiling price to be converted into fixed price c) Cost reimbursement price - Cost-plus fixed fee - Cost-plus-incentive fee - Time and material Further definitions can be found in ESA/REG/002, rev. 3 Annex II
Prime Contractor	Economic operator who is under contract to ESA. See also Subcontractor and Supplier
Product Tree	Product Tree depicts a product-oriented breakdown of the project into successive levels of detail, down to the configuration items.
PRR – Preliminary Requirements Review	See project phases section in Annex 1.
PSS Forms	ESA Procedures Specifications and Standards. These are the ESA costing forms. See here.
Q	
QR – Qualification Review	See project phases section in Annex 1.
R	
R&D – Research & Development	
RD – Reference Documents	List of documentation included in a tender. These do not form part of the requirements – they are for information purposes only.
RFI - Request for Information	Typically refers to a non-committing input for information purposes only.
RFP / RFQ - Request for Proposal or Request for Quotation	Typically refers to a non-competitive offer – direct negotiation. ESA labelling: RFQ/3-… / RFP/3-… RFQ typically refers to the standard procedure, RFP refers to an EXPRO bidding procedure
Rider	A rider is an amendment to the contract. It is typically used to modify the clauses of the contract.
ROM – Rough Order of Magnitude	Price type used for budgetary purposes.
RPA – Requesting Party Activities	Requesting Party Activities. This is a type of funding call used for country-specific activities to build technological capability. These calls are specific to the country and are typically open competition (though limited to organisations from the country). For example, RPA calls are common in Associate Member States, but could be used in other contexts too.
S	
SCT – Special Conditions of Tender	As of January 2025 the SCT has been superseded by the ESA Contracting Conditions. Previously, the SCT was issued with every tender, and defined how the GCT was to be applied.
SME – Small and Medium Enterprises	For a definition see section 1.3.
SOW – Statement of Work	Part of the tender pack. See section 2.5.2 for details.
SRR – System Requirements Review	See project phases section in Annex 1.
Subcontractor and Supplier	Economic operator who is under contract to a Contractor of ESA to provide supplies or services in support of a contract placed by ESA. For a distinction between these two terms, see section 3.2.1a).
Subsystem	A major part of a system which itself has the characteristics of a system, usually consisting of several components. The subsystem represents the next level of detail in comparison to a system.

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System	A functionally self-contained combination of hardware and/or software products, which represent the technological building blocks required to provide a service. The system, in its turn, can consist of a number of subsystems and components.
System Requirement	A detailed statement (often defined by the system designer) about what a system shall do in order to provide the service according to the Service Requirements, including details on how well this shall be done and any constraints or boundary conditions.
T	
TDE – Technology Development Element	One of the ESA funding lines within the Technology, Engineering and Quality Directorate. See here.
TEB – Tender Evaluation Board	Formal part of the ESA procurement process. This is a formally appointed group charged with reviewing and scoring tenders.
Technology Harmonisation	Technology Harmonisation within ESA is a process and team, responsible for agreeing European Space Technology Roadmaps. These joint Roadmaps aim at optimising public funding and guiding developments to ensure the right technology is at the right level of maturity at the right time. The Harmonisation process involves over 1,000 European stakeholders, including ESA, national agencies and organisations, the European Commission, the European Defence Agency, and Space Entities (industry, R&D organisations, academia and associations). Space technologies are currently grouped into 48 topics, with each topic reviewed in a ~4 yearly cycle. Further reading here: Harmonisation
Tender Action	Term used by ESA to refer to an individual opportunity. ESA STAR refers to individual bids as Tender Actions.
TO – Technical Officer	Each tender has an assigned Technical Officer.
TOB – Tender Opening Board	Formal part of the ESA procurement process. This is the first step, tasked with formally checking submitted tenders against an initial set of validation criteria. If successful, the tender will pass to the TEB for review.
TRL – Technology Readiness Level	The technical maturity of instruments and spacecraft sub-systems with respect to a specific space application are classified according to a "Technology Readiness Level" (TRL) on a scale of 1 to 9. ESA uses the ISO standard 16290 Space systems – Definition of the Technology Readiness Levels (TRLs) and their criteria assessment.  Further definitions can be found here: ESA Science & Technology - Technology Readiness Level (TRL) The full ECSS standard relating to TRL definitions can be found here:

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	ECSS-E-AS-11C – Adoption Notice of ISO 16290, Space systems – Definition of the Technology Readiness Levels (TRLs) and their criteria of assessment (1 October 2014) | European Cooperation for Space Standardization
U	
V	
Validation	Process to obtain confirmation that a system/service does what it is required to do. The user has a key role in this process.
Verification	Process to obtain confirmation that a system/service has been implemented according to the System/Service Requirements. This is usually done through a verification method.

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The next section contains the ESA example ITT and case study bid response referred to in part 3 of this Guide.

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DOCUMENT

Statement of Work
ESA Express Procurement [Plus] - [EXPRO] [EXPRO+]

Development of Next Generation Hot Beverage Production Unit

Note that this is an example SoW for training purposes only.

A number of mistakes and inconsistencies have been purposefully added to illustrate how to handle such things in a proposal or to emphasis and stress areas of the training.

Anything appearing in a text box like this is an additional training note – not part of the document

Prepared by **NMS TEAM**
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Distribution

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1 INTRODUCTION

1.1 Scope of the Document

This document describes the activity to be executed and the deliverables required by the European Space Agency in relation to **Development of Next Generation Hot Beverage Production Unit**

It will be part of the Contract and shall serve as an applicable document throughout the execution of the work.

1.2 Applicable and Reference Documents

1.2.1 Applicable Documents (ADs)

The following documents, listed in order of precedence, contain requirements applicable to the activity:
[AD1]: Pressure test safety standard v.1 (available from www.pressuretestingRus.com)

1.2.2 Reference Documents (RDs)

The following documents can be consulted by the Contractor as they contain relevant information:
[RD1]: A survey of coffee machines past and present, Cocoa bean press, ISBN 12345678

1.3 Acronyms and Abbreviations

KOM:	Kick-off Meeting
SoW:	Statement of Work
HBM:	Hot Beverage Maker
RR:	Requirement Review
PDR:	Preliminary Design Review
CDR:	Critical Design Review

1.4 Background and Objective(s)

1.4.1 Background

The prevelance of coffee shop big name chains (e.g. Star Clucks), with their custom hot beverage machines have made it difficult for independent and private companies to compete. This is largely due to the unavailability of high end, high efficiency, reliable and flexible hot beverage production units on the market. There exists therefore a clear market opportunity which needs to be filled. There is a perceived opportunity to spin out space experience in high pressure

systems, high reliability systems and autonomous systems into this market. From a preliminary assessment of RD1, it is clear that such technologies could lead to a revolutionary breakthrough in HBM technology that, if available on the open market, would revolutionise the coffee shop industry, see a resurgence in privately owned coffee shops and bring a large socio-economic benefit. The installation of such machines in ESA premises is expected to also boost productivity and efficiency of workers in the space industry.

1.4.2 Objective(s) of the Activity

The objective of this activity is to develop, to the point of being able to be supplied as an off the shelf product, a new generation of hot beverage maker fulfilling the requirements given in Annex B and thereby bringing efficiency improvements to Coffee Shops worldwide. In order to capture the market, the Hot Beverage Maker shall be available for commercial sale in less than 18 months.

2 WORK TO BE PERFORMED

2.1 Work Logic

The work is organised as follows:

- Task 1: Requirement detailed assessment and refinement
- Requirement Review (RR)
- Task 2: Preliminary design and breadboard demonstration
- Preliminary Design Review (PDR)
- Task 3: Final Design and validation
- Critical Design Review (CDR)

The following major reviews shall be held:

- RR at the end of Task 1 at the Contractors premises.
  The purpose of the RR shall be to review and agree the Contractors proposed changes and additions to the baseline requirements presented in Annex B and to agree a baseline conceptual design as the input to Task 2.

- PDR at the end of Task 2 at the Contractors premises.
  The purpose of the PDR shall be to review the baseline design and the breadboard demonstrator test results for completeness and for compliance with the agreed requirements.

- CDR at the end of Task 3 at the Contractors premises.
  The purpose of the CDR shall be to review the final design and prototype test results for completeness, correctness and compliance with the requirements. Any changes proposed to aid production manufacture shall be proposed by the Contractor and agreed.

2.2 Tasks

2.2.1 Task 1: Requirement detailed assessment and refinement

- Input

Statement of Work
Proposal

- Task description

Starting from the information given in RD1, the Contractor shall perform the following tasks:

- survey the capabilities of current HBMs and shall also survey the popularity, demand and appeal for different hot beverages throughout Europe.

- Based on the lessons learnt from these investigations and the Contractors knowledge of the design, manufacture and test of commercial machinery, the Contractor shall expand and complete the requirements presented in Annex B to a full, and justified, requirement specification. This shall be discussed and agreed at the Requirements Review.
- The Contractor shall also develop a conceptual high level design of the new HBM capable of meeting those requirements. The conceptual design shall identify all key aspects and sub-systems of the HBM and the requirements driving them. It shall be presented at block diagram level for each subsystem and be sufficient to show how the driving requirements can be met.
- Additionally, the Contractor shall produce and submit for approval a proposed Test Plan for the Breadboard to be produced in Task 2. This shall cover all key requirements, trade offs and risks that should be validated or supported by early testing.

- Output

D1 – Requirements Specification
D2 – Conceptual Design Document
D3 – Breadboard Test Plan

2.2.2 Task 2: Preliminary design and breadboard demonstration

- Input

Minutes of the Requirement Review
Requirements Specification
Conceptual Design Document

- Task description
  - Based on the conclusions of the Requirement Review at the end of Task 1, the Contractor shall proceed with the preliminary design of each aspect of the HBM. The design shall be documented thoroughly along with the analysis performed to support it and the trade-offs performed to arrive at it.
  - A Breadboard will be designed and manufactured sufficiently representative to be able to address the de-risking tests identified in the test plan. The differences between the Breadboard and the envisaged final design shall be highlighted along with the impact this may have on the representivity of the performed tests.
  - The Breadboard shall be tested in line with the agreed Test Plan and the results documented in Test Report which shall also include the lessons learnt from the testing and the resulting recommended design changes or trade-off closures.
  - Finally, a detailed test plan for the Prototype shall be produced that covers all of the requirements identified as needing verification by test in the Requirements Specification.

- Output

D4 – Preliminary Design Report

D5 – Breadboard description
D6 – Prototype Test Plan
D7 – Breadboard Test Report
HW1 - Breadboard

2.2.3 Task 3: Final Design and validation

- Input

Minutes of PDR
Preliminary Design Report

- Task description

  - Taking the lessons learnt from the Breadboard testing and the inputs of the PDR, the Contractor shall proceed to perform the detailed design and analysis of the HBM. A prototype of the final design shall be manufactured and tested according the to agreed Prototype Test Plan. The Prototype shall be fully representative of the final product.
  - During the manufacture and assembly, a detailed log of issues and points for improvement shall be made such that the production models may be manufactured more efficiently.
  - After the testing, a full list of proposed design modifications shall be produced, documented and justified.
  - The design, proposed changes and test results shall be reviewed at the Critical Design review at the end of the task.

  - Output

D8 – Detailed Design Report
D9 – Prototype Test Report
D10 – Verification Control Document
D11 – Proposed Design Changes Document
HW2 - Prototype

3 REQUIREMENTS FOR MANAGEMENT, REPORTING, MEETINGS AND DELIVERABLES

The following are the requirements for Management, Reporting, Meetings and Deliverables applicable to the present activity.

3.1 Management

3.1.1 General

The Contractor shall implement effective and economical management for the project.

His nominated Project Manager shall be responsible for the management and execution of the work to be performed and, in the case of a consortium, for the coordination and control of the consortium's work.

3.1.2 Communications

All communications to the Agency, affecting technical terms and conditions of the activity, shall be addressed in writing to the Agency's representatives nominated in the Contract.

3.2 Access

During the course of the Contract the Agency shall be afforded free access to any plan, procedure, specification or other documentation relevant to the programme of work.

3.3 Reporting

3.3.1 Minutes of Meeting

The Contractor is responsible for the preparation and distribution of Minutes of Meetings held in connection with the Contract. Electronic versions shall be issued and distributed to all participants, to the Agency's Technical Officer and to the Agency's Contracts Officer, not later than ten (10) days after the meeting concerned.

The minutes shall clearly identify all agreements made and actions accepted at the meeting.

3.3.2 Bar-chart Schedule

The Contractor shall be responsible for maintaining the bar-chart for work carried out under the Contract, as agreed at the kick-off meeting.

The Contractor shall present an up-to-date chart for review at all subsequent meetings, indicating the current status of the contract activity (WP's completed, documents delivered, etc.).

3.3.3 Progress Reports

Every month, the Contractor shall provide a Progress Report in electronic format to the Agency's representatives, covering the activities carried out under the Contract. This report shall refer to the current activities shown on the latest issued bar-chart and shall give:

- Action items completed during the reporting period;
- Description of progress: actual vs schedule, milestones and events accomplished;
- Reasons for slippages and/or problem areas, if any, and corrective actions planned and/or taken, with revised completion date per activity;
- Events anticipated during the next reporting period (e.g. milestones reached);
- Milestone payment status.

3.3.4 Problem Notification

The Contractor shall notify the Agency's representatives (Technical Officer and Contracts Officer) of any problem likely to have a major effect on the time schedule of the work or to significantly impact the scope of the work to be performed.

3.3.5 Technical Documentation

As they become available and not later than the dates in the delivery plan, the Contractor shall submit for the Agency's approval Technical Notes, Task/WP Reports, etc.

Technical documentation to be discussed at a meeting with the Agency shall be submitted electronically two weeks prior to the meeting.

Technical documents from Subcontractors shall be submitted to the Agency only after review and acceptance by the Contractor and shall be passed to the Agency via the Contractor's formal interface to the Agency.

3.4 Meetings

The kick-off meeting shall take place by video- or tele-conference.

Progress Meetings shall be held at approximately 2-monthly intervals, by video- or teleconference.

The final presentation shall take place at the Agency's premises.

Additional meetings may be requested either by the Agency or the Contractor.

With due notice to the Contractor the Agency reserves the right to invite Third Parties to meetings to facilitate information exchange.

For each meeting the Contractor shall propose an agenda in electronic form and shall compile and distribute hand-outs of any presentation given at the meeting.

3.5 Deliverable Items

In addition to the documents to be delivered according to section 3.3 here above, the following documentation and other deliverable items shall also be deliverable.

All documentation deliverables mentioned hereunder (including all their constituent parts) shall also be delivered in electronic form in a format agreed by the Agency (PDF format, the native format and in other exchange formats where relevant).

All the documentation shall be delivered on computer readable media (e.g. CD-ROM, DVD-ROM, Memory stick) as agreed.

The draft version of the documentation shall be sent to the Agency's Technical Officer in electronic format not later than two weeks before the documentation is to be presented. The final version shall be provided in a number of copies specified hereunder.

All documents shall bear the title, ESA contract number, deliverable number, date, status (draft), version and/or revision number. The information shall be repeated consistently in the header or footer of every page.

Documentation

Doc ID	Title	Milestone	No. of copies/format to be delivered to	e-copy to DMS (*)
(*) DMS (Data Management System) address: **dmscontracts@tec-prisma.estec.esa.int**. Please note that all finalised (i.e. reviewed and approved by ESA in their final version) documents resulting from a technology contract shall be electronically sent by the Contractor to D/TEC's Data Management System (DMS) using the e-mail address dmscontracts@tec-prisma.estec.esa.int. This applies not only to the final documentation such as the Final Report or Summary Report but to all approved output documents (TNs, Progress Reports, etc.). For all documents, see definitions on next page				
D1	Requirements Specification	RR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D2	Conceptual Design Document	RR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D3	Breadboard Test Plan	RR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D4	Preliminary Design Report	PDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D5	Breadboard description	PDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D6	Prototype Test Plan	PDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D7	Breadboard Test Report	PDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D8	Detailed Design Report	CDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No

D9	Prototype Test Report	CDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D10	Verification Control Document	CDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
D11	Proposed Design Changes Document	CDR	Electronic - pdf and original (WORD) file to be delivered to the ESA Technical Officer	No
TDP	Technical Data Package	Final Review	1 paper copy / 2 CDs to ESA Technical Officer	yes
FR	Final Report	Final Review	1 paper copy / 2 CDs to be delivered to the ESA Technical Officer, 1 electronic copy to be delivered to the ESA Contracts Officer. In addition to the above, 1 paper copy and 1 copy on CD-ROM shall be sent to the ESA Information and Documentation Centre – ESTEC Library, Postbus 299, 2200 AG Noordwijk, The Netherlands	yes
FP	Final Presentation	Final Review	1 electronic copy to be delivered to the ESA Technical Officer	No
CCD	Contract Closure Documentation	Contract Closure	Signed electronic copy to be delivered to the ESA Technical Officer with copy to the ESA Contracts Officer	yes

(**) Definitions of Deliverable Documents

- D1 – Requirements Specification

The Requirements Specification shall contain the full set of high level technical requirements to be met by the HBM. Each requirement shall be numbered and shall include the validation method and a justification/ reasoning for the requirement.

- D2 – Conceptual Design Document

The Conceptual Design Document shall outline the conceptual design of the HBM including all key features and a provisional layout, provisional MMIF and concept of operation. The key design drivers shall be highlighted and the key trade offs identified and discussed.

- D3 – Breadboard Test Plan

The Breadboard Test Plan shall include the test flow and a description of each test. Each test description shall include the test set up, the purpose/ goal of the test and the pass/fail criteria. The Breadboard Test Plan shall contain all of the key tests needed to validate the concept and de-risk the further design work.

- D4 – Preliminary Design Report

The Preliminary Design Report shall detail the design and design justification of the HBM and each of its sub-systems. In particular the Mechanical Design, the Electrical Design, the Software Design, the Man-Machine Interface and operational concept and the water and pressure system design shall be covered.

- D5 – Breadboard description

The Breadboard Description shall describe and justify the design of the Breadboard model, highlighting the differences between it and the expected final design and the limitations on its representivity.

- D6 – Prototype Test Plan

The Prototype Test Plan shall include the test flow and a description of each test. Each test description shall include the test set up, the purpose/ goal of the test and the pass/fail criteria. The Prototype testing shall cover all of the requirements designated as to be validated by test.

- D7 – Breadboard Test Report

The Breadboard Test Report shall include a report, assessment and discussion on each of the test results with conclusions and recommendations. The report shall include as annexes the 'as-run' redlined test procedures.

- D8 – Detailed Design Report

The Detailed Design Report shall detail the design and design justification of the HBM and each of its sub-systems, expanding on the detail and depth provided in the Preliminary Design Report. In particular the Mechanical Design, the Electrical Design, the Software Design, the Man-Machine Interface and operational concept and the water and pressure system design shall be covered as well as a recurring cost assessment. Analyses on the safety and reliability aspects shall be included as well as any other analyses needed to demonstrate the agreed requirements.

- D9 – Prototype Test Report

The Prototype Test Report shall include a report, assessment and discussion on each of the test results with conclusions and recommendations. The report shall include as annexes the 'as-run' redlined test procedures. The report shall cover all aspects of the testing as detailed in the Test Plan (e.g. software, safety, functional, performance, taste testing etc.)

- D10 – Verification Control Document

The VCD shall, for each requirement, provide the reference to the validation evidence (e.g. which section of which document) and the latest predicted/ measured actual value achieved pertaining to the requirement.

- D11 – Proposed Design Changes Document

The document shall detail each of the proposed changes to be made between the prototype and the final production model. This shall take full account of the lessons learnt from the prototype manufacture and test. Each change shall be described in detail and justified.

- TDP TECHNICAL DATA PACKAGE
  The Technical Data Package consists of the final versions of all approved technical documents.

- FR FINAL REPORT
  The Final Report shall provide a complete description of all the work done during the study and shall be self-standing, not requiring to be read in conjunction with reports previously issued. It shall cover the whole scope of the study, i.e. a comprehensive introduction of the context, a description of the programme of work and report on the activities performed and the main results achieved.

  The Final Report is a mandatory deliverable, due upon completion of the work performed under the Contract. For the avoidance of doubt, "completion of the work performed under the Contract" shall mean the finalisation of a series of tasks as defined in a self-contained Statement of Work.

- FP FINAL PRESENTATION
  The Final Presentation shall provide a complete description of all the work done during the study and shall be self-standing, in powerpoint format and suitable for a 1.5hr presentation. It shall cover the whole scope of the study, i.e. a comprehensive introduction of the context, a description of the programme of work and report on the activities performed and the main results achieved as well as an overview of the Contractor.

- CCD CONTRACT CLOSURE DOCUMENTATION
  The Contract Closure Documentation is a mandatory deliverable, due at the end of the contract. The contents of the Contract Closure Documentation shall conform to the layout provided in Annex A hereto.

Other Deliverables (Hardware, Software, Models, Data, Algorithms, etc.)

Item Identifier	Title	Milestone	Quantity to be delivered	Format / Remarks	Deliver to
SW1	HBM Software	End Task 4	1	Source code	Ms. C.O.FEE (TEC-TEA)
HW1	HBM Breadboard	End of Task 3	1	None	Ms. C.O.FEE (TEC-TEA)
HW2	HBM Prototype	End of Task 3	1	None	Ms. C.O.FEE (TEC-TEA)

4 SCHEDULE AND MILESTONES

4.1 Duration

The duration of the work shall not exceed **24 months** from kick-off to the end of the activity (delivery of Final Report and Hardware and Software).

4.2 Milestones

The following milestones shall apply:

- PDR
- FP

4.3 Reviews

The following reviews shall be held:

- RR
- PDR
- CDR

4.3.1 Requirements Review

- Time: KO + 2 Months
- Location: Contractor premises
- Description: The purpose of the RR shall be to review and agree the Contractors proposed changes and additions to the baseline requirements presented in Annex B and to agree a baseline conceptual design as the input to Task 2.
- Output: Requirements Specification, Breadboard Test Plan

4.3.2 Preliminary Design Review

- Time: KO + 12 Months
- Location: Contractor premises
- Description: The purpose of the PDR shall be to review the baseline design and the breadboard demonstrator test results for completeness and for compliance with the agreed requirements.
- Output: Agreed Design, Prototype Test Plan, Breadboard

4.3.3 Critical Design Review

- Time: KO + 24 Months
- Location: Contractor premises

- Description: The purpose of the CDR shall be to review the final design and prototype test results for completeness, correctness and compliance with the requirements. Any changes proposed to aid production manufacture shall be proposed by the Contractor and agreed.
- Output: Agreed Final Design and changes, Prototype

ANNEX A. LAYOUT FOR CONTRACT CLOSURE DOCUMENTATION
(v2016-01)

Contract Closure Documentation
For
ESA Contract Nr. 4000XXXXXX/17/XX/XXX
[Title of Activity],
hereinafter referred as the "Contract"

Section 1 – Parties, Contract Duration and Financial Information

Contractor		[CONTRACTOR NAME AND COUNTRY]
Subcontractor(s) *(state if not applicable)*		[NAME AND COUNTRY]
Contract Duration *(insert the dates agreed for kick-off and end of contract)*		**From**: **To**:
Total Contract Price (*including all CCNs, Work Orders, Call of Orders*) and Total Contract Value *(in case of co-funding; state if not applicable)*		**EUR** EUR
Broken down as follows:	**Original Contract Price** and original Contract Value (*in case of co-funding; state if not applicable*)	**XXX EUR (XXX EUR)** EUR
	CCN x to n **Work Order x to n** **Call-Off Order x to n**	**EUR** in total **EUR** in total **EUR** in total

Section 2 – Recapitulation of Deliverable Items

2.1 Items deliverable under the Contract

If any of the columns do not apply to the item in question, please indicate "n/a".

Table 2.1.1 - Items deliverable according to the Statement of Work and Article 2 of the Contract

Type	Ref. No.	Name / Title	Description	Replacement Value (EUR)/ Other	Location ([1])	Property of	Rights granted / Specific IPR Conditions ([2])
Documentation							
Hardware							
Software			*(Delivery in Object code / Source code?)*				
Other							

[1] *In case the item is not delivered to ESA, please indicate the location of the deliverable and the reason for non-delivery (e.g. loan agreement, waiver, future delivery, etc.)*
[2] *e.g. IPR constraints, deliverable containing proprietary background information (see also Table 2.1.3 below)*

Table 2.1.2 – Items deliverable under Article 7 of the Contract (*if applicable*)

The Contractor, after agreement with the Agency with respect to the disposal/transfer of inventory items/fixed assets under the Contract, shall submit the Inventory/Fixed Asset Record as attachment to the CCD. For each item/fixed asset, the information as requested by Appendix 3 to the Contract shall be provided in the Record.

Table 2.1.3 – Customer Furnished Items and Items made available by the Agency

[Option 1]
There was no Customer Furnished Items or Items made available by the Agency.

[Option 2]
Any Customer Furnished Items and/or Items made available by the Agency to the Contractor and/or its Subcontractor(s) under the Contract, are listed in the following List of Customer Furnished Items and Items made available by the Agency. The following tables certify which of the items have been returned to the Agency and which of the items remain in the custody of the Contractor, and/or a Sub-Contractor(s) and/or a Third Party for further ESA work or for other purposes.

Customer Furnished Items

				ESA DECISION		
Item Name	ESA Inventory Number	Location	Insurance Value	Confirmation of Receipt	Deliver to ESA or to another entity	Leave at (Sub-) Contractor's Disposal under a loan agreement

Items made available by the Agency

Item Name	ESA Inventory Number	Location	Replacement Value	Deliver to ESA or to another entity	Leave at (Sub-) Contractor's Disposal under a loan agreement

Table 2.1.4 - Background information used and delivered under the Contract (see Article 6.3 of the Contract)

The following background information has been incorporated in the deliverable(s):

Proprietary Information (*title, description*)	**Owner** (*Contractor / Subcontractor(s)/ Third Party -ies*)	**Affected deliverable** (*which documents, hardware, software, etc.*)	**Description impact on ESA's rights to the deliverable ([3])**	**Other comments**

Section 3 – Statement on Intellectual Property Rights generated under the Contract

[OPTION 1: NO INVENTION]
In accordance with the provisions of the above Contract, ... [Company] hereby certifies both on its own behalf and that of its consortium/Sub-Contractor(s), that no Intellectual Property Right(s) has(ve) been registered in the course of or resulting from work undertaken for the purpose of this Contract.**[END OPTION 1]**

[OPTION 2: INVENTION]
In accordance with the provisions of the above Contract, ... [Company] hereby certifies both on its own behalf and that of its consortium/Sub-Contractor(s) that the following Intellectual Property Right(s) has(ve) been registered in the course of or resulting from work undertaken for the purpose of this Contract:

.....

The Agency's rights on such Registered Intellectual Property Rights shall be in accordance with the above Contract.**[END OPTION 2]**

[3] *if not explicitly stated otherwise, the contractual stipulations shall prevail in case of conflict with the description provided in this table*

Section 4 – Output from / Achievements under the Contract

4.1 Technology Readiness Level (TRL)

Indicate the TRL of the technology developed under the Contract using the classification given below (for additional information on definitions, please refer to ECSS-E-AS-11C):

Initial TRL	Planned TRL as activity outcome	Actual TRL at end of activity

1	Basic principles observed and reported
2	Technology concept and/ or application formulated
3	Analytical and experimental critical function and/ or characteristic proof of concept
4	Component and /or breadboard validation in laboratory environment
5	Component and /or breadboard critical function verification in a relevant environment
6	Model demonstrating the critical functions of the element in a relevant environment
7	Model demonstrating the element performance for the operational environment
8	Actual system completed and accepted for flight 'flight qualified'
9	Actual system 'flight proven' through successful mission operations

Note: The TRL shall be assessed by ESA. The Agency's responsible Technical Officer shall verify TRLs 1-4 while TRLs 5-9 shall be assessed through an ESA-internal formal procedure.

4.2 Achievements and Technology Domain

.....
Provide a concise description (max 200 words) of the achievements of the Contract and its explicit outcome (including main performances achieved): please refer to the final documentation (e.g. Final Report).

Please indicate the Technology Domain (TD 1 to 25) of the development (*please tick off*):

	1	On-Board Data Systems		14	Life & Physical Sciences
	2	Space System Software		15	Mechanisms & Tribology
	3	Spacecraft Electrical Power		16	Optics
	4	Spacecraft Environment & Effects		17	Optoelectronics
	5	Space System Control		18	Aerothermodynamics
	6	RF Payload and Systems		19	Propulsion
	7	Electromagnetic Technologies and Techniques		20	Structures & Pyrotechnics
	8	System Design & Verification		21	Thermal
	9	Mission Operations and Ground Data Systems		22	Environmental Control Life Support
	10	Flight Dynamics and GNSS		23	EEE Components and Quality
	11	Space Debris		24	Materials and Processes
	12	Ground Station System & Networking		25	Quality, Dependability and Safety
	13	Automation, Telepresence & Robotics			

4.3 Application of the Output/Achievements

Please tick off as appropriate:

☐ Possible use in programme:

.....
Please indicate the service domain (see table) relevant to a possible application

	1	Earth Observation
	2	Science
	3	Human Spaceflight and Exploration
	4	Space Transportation
	5	Telecommunications
	6	Navigation
	7	Generic Technologies and Techniques
	8	Security
	9	Robotic Exploration

☐ Actual use in programme:

.....
Please describe the specific programme and application or mission for which the output of this Contract is or will be used.

4.4 Further Steps/Expected Duration

Please tick off as appropriate:

☐ No further development envisaged.

☐ Further development needed:

.....
Please describe further development activities needed, if any, to reach TRL 5/6 including an estimate of the expected duration and cost.

4.5 Potential Non-Space Applications

.....
Describe any potential non-space applications or products that may benefit from the technology that has been developed. Emphasize potential markets and customers where known.

.....
Describe the principle features of technology that would be required in a technology demonstrator for any identified non-space application. Include an estimate of the resources in time and money that would be required.

The above statements provided in the various sections of this Annex A "Layout for Contract Closure Documentation" for ESA Contract No. **4000xxxxxx/17/XX/xx *[insert the corresponding contract number]*** have been made after due verifications. The Contractor furthermore certifies that all its obligations with regard to Fixed Assets, if any, have been fulfilled. If required by ESA, an updated version shall be provided for incorporating amendments requested by ESA.	
Name of Contractor: *[insert contractor name]*	
Authorised signatory: *[insert Authorised signatory full name]*	*[signature of the Authorised signatory*]
Date: [insert date]	

ANNEX B. PRELIMINARY REQUIREMENTS

Req Num	Requirement	Notes	Validation Method
RCM1	The HBM shall be capable to produce at least 15 beverages per minute with one operator.	The time to produce any one beverage shall be no longer than 6 seconds.	Test
RCM2	The HBM shall be capable to produce at least 10 different beverage types including variations of: Coffee Tea Hot Chocolate	The variants will be agreed at the Requirements review but should include at least the most popular variations (e.g. cappuccino, latte). Significantly more than 10 variants would be highly beneficial if not affecting RCM3,6 or 7 Each beverage should be able to be offered in multiple sizes.	Analysis and Test
RCM3	The HBM shall be capable of producing at least 5,000 beverages between refills.	Minimum of 2000 for any one variant	Analysis and Test
RCM4	The HBM shall be more reliable than the current market leading machines.	See RD1 for assessment of current market leading machines	Analysis
RCM5	The HBM shall be able to be carried and installed by 2 people without special lifting equipment or tools.		Analysis
RCM6	The HBM shall have a recurring cost of less than 2,000 Euros		Analysis
RCM7	The running costs of the HBM (excluding the salary of the operator) shall be less than 0.2 Euro per beverage.	This shall assume re-useable cups	Analysis
RCM8	The HBM shall be compatible with a standard 240v power supply.		Analysis and Test
RCM9	The HBM shall be finished in Blue and Chrome and have the Brand Name ‘Coffee Master 2000’ prominently displayed on the front side.		Inspection
RCM10	The HBM shall produce tastier beverages than the competitors.		Test
RCM11	The HBM shall be compliant with the pressure test and safety requirements of AD1		Test

DISCLAIMER

Note that this is an example proposal for training purposes only.

This proposal is an example only – it is not a perfect template of how to write a proposal, rather a tool for illustrating a number of training points. It responds to a training SoW that was produced with a number of purposeful errors, mistakes and inconsistencies so that elements of the training can be demonstrated, emphasised or stressed.

Due to its nature, the proposal is not fully complete, in a number of sections an example of how to complete the section is given rather than the full section. For example, Work Package Descriptions, CVs etc.

Anything appearing in a text box like this is an additional training note – not part of the document.

Use of such text boxes to highlight key elements to the reviewer can be useful for ESA proposals but please do not do this for ESA ITTs, as different conditions/proposal template might apply.

DETAILED PROPOSAL: Development of Next Generation Hot beverage Production Unit

1) TECHNICAL PART

This proposal is a response to the ESA RFP/1-9999/17/CO/FFF/EE "Development of Next Generation Hot Beverage Production Unit" by HiQ Beverages Ltd, who will act as the lead contractor, with Under Pressure Manufacturing Ltd as the subcontractor. This proposal addresses the objectives, requirements and foreseen tasks for the development of a Next Generation Hot Beverage Maker for the European Market. A baseline programme of work is presented which is cost compliant with the ESA SoW. In accordance with the work defined by the SoW, we propose to develop a fully automated Hot Beverage Maker up to and including a prototype fully representative of the final product. It is highlighted that the scope of work described in the Statement of Work (SoW) – which ends at CDR - falls short of the tasks needed to reach a market-ready Hot Beverage Production Unit as indicated in the objectives. It is therefore understood that this is an end goal and the remaining tasks to fully achieve the objective would be the subject of a later activity. The work proposed herein therefore replies and is compliant to the prescribed technical development and scope of work described in the SoW while compressing the timescale of this development such that a market ready product could be achieved as rapidly as possible.

1.1 TECHNICAL REQUIREMENTS AND OBJECTIVES:

1.1.1 Concise functional analysis of the technical requirements

The initial set of technical requirements given in Annex B of the SoW have been assessed in detail. From this initial assessment, requirements RCM1 and RCM7 are considered to be key to achieving the set objectives, defining the expected output (efficiency) and the cost (competitiveness) of the hot beverage production unit.

The key design drivers are considered to be RCM2,3,4,6 and 11, as the design trade-offs to address these will have the largest influence on the main elements of the unit. These requirements influence the size and number of storage tanks for liquids and solids (RCM2, 3), the required performance of the pump and boiler (RCM2,6,11) as well as the dispenser, control panel and software of the unit (RCM2). Consideration of materials and COTS components for increased reliability and optimal cost is required for compliance with RCM4 and 6. In particular the strong restriction on parts cost and quality imposed by RCM6 (recurring cost) may have an adverse affect on the reliability demands of RCM4 which will have to be carefully considered during the initial design and trade off work.

RCM3 (refills) implies that the hot beverage maker must be connected to a water system independent of the unit as other solutions would lead to solutions unable to meet RCM 5 (installation) or RCM6 (recurring cost). Further, considering the minimum mass and dry volume of coffee for an optimal caffeinated drink, while remaining compliant with RCM5 and RCM6, the requirement for total output of beverages between refills is recommended to be decreased, this is discussed further in section 1.1.1.2.

RCM4 (Reliability) means a full reliability assessment on system level must be carried out, including best practices (tasks, methods, tools, analysis, and tests), as well as consolidation with customer requirements and assessment of the performance of current market leaders. Subsequent development of proper lower-level requirements is critical. Increasing reliability comes at the cost of more expensive parts which may be critical considering the strong restriction on recurring cost

given by RCM6. Thus, full compliance with RCM4 cannot be guaranteed at this stage of development and 'best practices' approach may be preferred and should be discussed.

For full compliance with RCM10, we further propose adherence to the Certified Italian Espresso Coffee quality requirements, shown to significantly influence consumer preference (EU Multinational Coffee Cohort Study ISBN 978-3-16-148410-0; further discussed in section 1.1.4). These quality requirements and their implication on the design and program of work are further outlined in section 1.1.1.2 and considered an important prerequisite to achieve RCM10 and are therefore taken into consideration in the baseline design.

It is further suggested to be compliant with the new EU hot water handling safety standards (issued EU-STT n. 214: 24 July 2018) listed in EU/HotWater-safety/001 v2. Compliance with this standard is now essential for any unit offered for sale within the EU.

While this represents our first iteration and interpretation of the requirements, a final consolidation of requirements will be performed during Task 1 and agreed with ESA at the Requirements Review.

1.1.1.1 Proposed consolidation of the RFP/ITT requirements

No.	Req.	C	Est.	Discussion
RCM1	The HBM shall be capable to produce at least 15 beverages per minute with one operator.	**C**	24/min 10sec max	This requirement is key to ensuring the competitiveness of the customer. It will be possible to prepare 4 beverages simultaneously giving 24/min. However, a single beverage cannot be guaranteed to be made in 6 seconds while being compliant with RCM10. Some beverages (e.g. Cappuccino) will take up to 10 seconds.
RCM2	The HBM shall be capable to produce at least 10 different beverage types including variations of: Coffee Tea Hot Chocolate	**C**	15 types of coffee, 3 types of tea, 2 types of hot chocolate	Key design driver affecting the need for dedicated storage and dispense units for the different beverages. In order to comply with RCM1, a dedicated boiler for simultaneous milk frothing must be included in the design. The unit shall provide the necessary components (hot water and a tea bag) and will not produce ready-to-drink tea beverages.
RCM3	The HBM shall be capable of producing at least 5,000 beverages between refills (minimum of 2000 for any one variant).	**NC**	1000 bean based beverages of all variants. 500 tea beverages.	Key design driver affecting the size of dedicated storage units. This requirement means the HBM has to have the capability to be connected to a water supply network. Given that the optimal amount of coffee per cup requires 15cm3 of beans, the maximum sized storage unit still compliant with RCM5 and RCM6, would produce 1000 bean-based beverages (coffee or cocoa). Similarly, the amount of tea bags stored can be maximum 500.

RCM4	The HBM shall be more reliable than the current market leading machines.	**PC**	N/A	Accurate estimates of a (probabilistic) reliability of the unit within the set development time, are available only very late in the development. Most accurate estimates can only be guaranteed after extensive in-service use. It is suggested to modify the requirement. Please refer to section 1.1.1.2.
RCM5	The HBM shall be able to be carried and installed by 2 people without special lifting equipment or tools.	**C**	N/A	Our baseline design is compliant but it is suggested to modify this requirement. Please refer to section 1.1.1.2.
RCM6	The HBM shall have a recurring cost of less than 2,000 Euros	**C**	Preliminary cost estimation 1700 (+/- 300) EUR	Note that this is dependent on the RCM4.
RCM7	The running costs of the HBM (excluding the salary of the operator) shall be less than 0.2 Euro per beverage.	**C**	<0.2 Euro	This requirement is key to ensuring the competitiveness of the customer.
RCM8	The HBM shall be compatible with a standard 240v power supply.	**C**	240V	No major design impact.
RCM9	The HBM shall be finished in Blue and Chrome and have the Brand Name 'Coffee Master 2000' prominently displayed on the front side.	**C**	N/A	No major design impact.
RCM10	The HBM shall produce tastier beverages than the competitors.	**C**	N/A	Assumed compliant upon further specification of the requirement. It is advised to further refine the requirement according to the Certified Italian Espresso Coffee quality requirements to ensure customer satisfaction. Please refer to section 1.1.1.2.
RCM11	The HBM shall be compliant with the pressure test and safety requirements of AD1	**C**	N/A	Design implication for high pressure component.

Table 1: Technical Requirements Compliance

1.1.1.2 Suggested modifications to the requirements

After careful review and assessment we propose a number of modifications to the requirements for consideration by ESA.

No.	Req.	Justification/Modification
RCM 4	The HBM shall be more reliable than the current market leading machines.	It is suggested to modify this requirement to a comparable system-level reliability with current models on the market, with a MTBF (Mean Time Between Failures) number. Higher reliability than market leading machines cannot be guaranteed as reliability figures are not published for competitors' products.
RCM5	The HBM shall be able to be carried and installed by 2 people without special lifting equipment or tools.	It is suggested to modify this to allow special tools for the installation under the condition that they are included in the recurring price of the unit. This will allow significantly more flexibility in the design of the unit.
RCM10	The HBM shall produce tastier beverages than the competitors.	As stated the requirement is subjective and not possible to demonstrate objectively. It is suggested to modify this to correspond to the requirements for standard Italian Espresso Coffee Certification (certificate of product conformity Csqa n. 214: 24 September 1999, DTP 008 Ed.1). Such modification has implications for the pressure system design.
New 1	The HBM shall be compliant with the EU hot water handling safety standards listed in EU/HotWater-safety/001 v2	Compliance with this standard is mandatory to be able to sell the unit in the EU but is not listed in the requirements, it is suggested to add this requirement.

Table 2: Suggested Modifications to the Technical Requirements

1.1.2 Understanding of the main technical objectives of the ITT

Hot beverage production has experienced a revolution in the last 10 years, where the demand for a billion cups of coffee brewed daily worldwide (ref) has increased the market dominance of big coffee maker chains largely due to the large output and easy operability of the custom coffee machines, often unavailable for smaller companies. However, recent increase in consumer awareness and demand for ever-increasing variety in choice and quality provides an opportunity for the resurgence of high-quality coffee providers and creates the need for new and competitive solutions for the production of hot beverages. Further, technological advances in high pressure systems and autonomous systems could offer significant improvements in hot beverage production, while addressing such consumer needs. In order to fulfil the key objectives defined in the SoW, the main design improvements shall therefore exploit, in an innovative manner, the known parameters and procedures defining the quality of the hot beverage, utilizing recent technological improvements in conjunction with COTS components, where feasible. This approach allows for a rapid development of a competitive and reliable next generation hot beverage maker with improved efficiency which will be able to compete with or improve on those used by the currently dominant large coffee shop chains. The availability of such a product will help to save the increasingly under pressure independent retailers.

Utilization of high pressure systems in semi-automated coffee machines have become the flagship mechanism for efficient and profitable hot beverage production. However, such systems require operational training and compliance to strict safety regulations. The usage of super-automation in high pressure systems, capable of full end-to-end process from solid preparation (coffee and cocoa bean grinding), temperature control of multiple liquids (water, milk), solid-liquid extraction (coffee brewing) and simultaneous dispense of multiple liquid sources, can circumvent the need for machine operators and improve the efficiency, safety and profitability of hot beverage providers.

The needs of the end-user (coffee drinker), such as timeliness, quality and variety further define the key factors that should be considered for a competitive design improvement of the hot beverage maker. Most complex and technically demanding beverage to produce is considered to be coffee (ref), which should be the key focus.
Thus, key improvement areas are considered in the following:

Quality
Physical-mechanical factors that influence the quality of coffee (solely considering the solid-liquid extraction) are pressure, temperature and percolation time. Temperature and pressure for a certified quality Italian Coffee are standardized (ref) and thus largely preferred by the average user (ref), however, percolation time can be further exploited via a more precise control of the grind size (i.e. pore size) of the coffee beans. This shall be considered in the proposed design.

Variety
The demand for a variety of different hot beverage types requires a flexible design solution capable of accommodating various methods for the production of different hot beverages. Innovative design approach with programmable grinding efficiency resulting in variable granularity of beans enables easy customization of caffeine content and cocoa strength. Incorporation of an automated nanofoam dispenser further increases the available hot beverage variety by 3-fold. Such approach provides a flexible, yet simple solution to address customer needs.

Efficiency
Efficiency in hot beverage production is partially restricted by the constraints of the required physical parameters (temperature, pressure and brew time) that define hot beverage quality. One approach to address this is by increasing the total output quantity (e.g 4-nozzle dispenser) for an improved global efficiency of the hot beverage maker. The efficiency also has a direct bearing on the recurring cost per beverage which is a further key element for achieving the objectives.

For a commercially competitive development, such design improvements should be realized in a timely manner using, where feasible, COTS components and previously established manufacturing processes, allowing for a swift market entry with a competitive price.

1.1.3 Proposed approach to reach the main technical objectives of the RFP/ITT

As a first step, we intend to carry out an exhaustive market review to determine the exact performance factors of available hot beverage makers and consumer needs. A preliminary assessment has been carried out during the writing of this proposal and is discussed in Section 1.1.4. This forms the inputs to the basis of the proposed baseline design. In response to our findings the requirements shall be updated and completed and agreed with ESA during a requirements review at the completion of Task 1. The agreed updated requirements will be taken into account and reflected in the updates to the proposed baseline design during Task 2.

Baseline design

Preparation of a standard pressurized coffee brew or espresso coffee (EC) requires the grinding of coffee beans, pressure generation with a volumetric pump and heat exchanger (or boiler) for reaching the precisely regulated required temperature needed to facilitate the ideal percolation of a pre-determined (per beverage type) amount of hot water through a ground coffee cake in an optimally short time. Standard EC machines are semi-automatic, with the required manual insertion of the ground coffee and manual frothing and dispense of milk. Our solution fully automates the entire process thereby saving time and money while increasing beverage quality and flexibility.

In order to achieve the objectives, we aim to develop Coffee Master 2000 hot beverage production unit. The Coffee Master 2000 will be based on our Patent #1234 for software controlled super-automation process of coffee machines, which uses high pressure steam and fully automatic end user programmable software settings to enable the optimal and rapid production of more than 5 types and variations of hot beverage.
It is capable of producing 4 ready-to-consume beverages simultaneously without the need of a dedicated operator. A breadboard has already been built and has demonstrated the proof of concept of Patent # 1234 thereby ensuring that this is a low-risk approach.

The following key adaptions will be further incorporated to achieve the objectives:

i. Heavy duty programmable double burr grinder to control granularity of the beans (coffee or cocoa), enabling further control of caffeine levels and increasing the beverage variety up to 2-fold. This further affects percolation speed and thus can decrease total brewing time by 15%.
ii. Dual-superboiler system for the simultaneous dispense of hot beverages utilizing both water or milk reservoirs, as required, increasing the potential beverage variety another 2-fold.
iii. Nanofoamer capable of producing milk foam with bubble size of less than 20microns.

A functional diagram of the CM2000 is given in Fig 1.

The CM2000 process flow is as follows:

- The user requests a drink using the control panel button with options for hot beverages and desired volume. This includes a large number of pre-set options enabling one touch ordering as well as full customizability.
- The machine will automatically estimate the amount of beans required for the drink. The beans will be ground to the required granularity according to the requested drink.
- If the requested beverage is tea: hot water and selected tea variety will be dispensed in tea bag form directly into the cup.
- Ground beans will be directed to a filter unit where pressurized and temperature controlled water will be used to extract the beverage. Percolation time is also set and controlled.
- During brewing, a dedicated steam boiler will be used to produce milk nanofoam, which shall be simultaneously dispensed with the hot beverage at a volume determined by software according to the type of drink requested by the user. Syrups may also be added directly to either the cup or the milk/ foam.
- Utilized ground solid cake is automatically dispensed and filter unit rinsed.

State of the Art

The current state of the art in commercially available coffee machines is based on the following technologies:

- Volumetric pump (exit water pressure 9 ± 1 bar)

- Boiler (heating element 1000-2000W) with heat exchanger
- Blade grinder (manual setting for two modes of granularity)
- Simultaneous double dispense nozzle

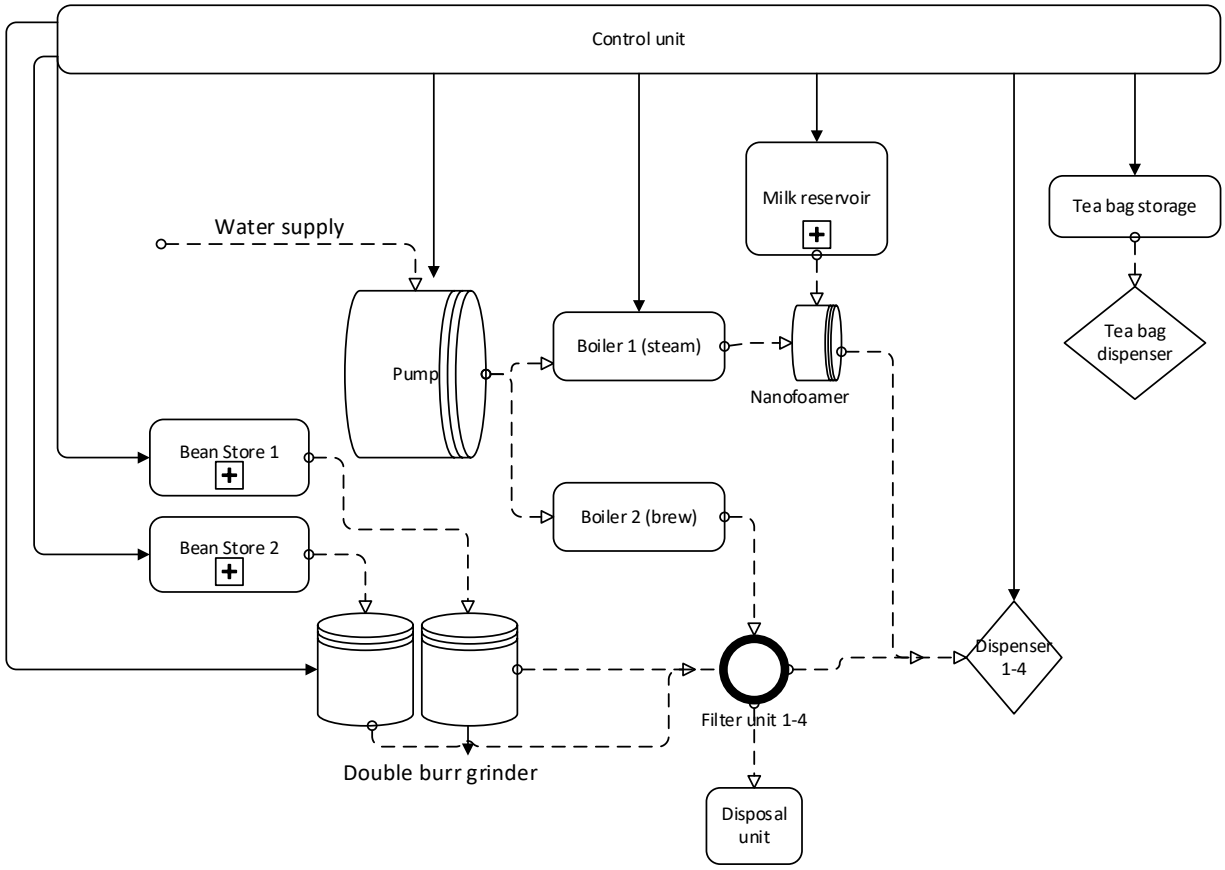


Figure 1. Functional Diagram of CM2000

The state of the art model commercially available today is the Caffeine Blaster 100 as used by Star Clucks – the market leader in this area. The Caffeine Blaster 100 can prepare 10 different types of coffee and can prepare 2 cups simultaneously with 1 operator.

The Caffeine Blaster 200 is currently in development and scheduled to be released in 6 months. The CB200 can prepare 12 different coffee types and 4 simultaneous beverages with 1 operator. Other coffee production machines are the protected property of the provider (e.g. Lotsa Coffee) and not for sale to competitors**.**

The CB 100 and 200 require an operator with specialized training, thus increasing the operational cost of the unit. Further the CB models are based on single blade grinder and do not offer the innovative regulation of caffeine content in the beverage, and thus fail to address recent market trends (see section 1.1.4). Our chosen baseline utilizes the concept of super-automation, negating the need of an operator. Further, programmable double burr grinder can provide variable granularity and thus controlled caffeine extraction from the beans, allowing for fully customized control of the total amount of desirable bioactive compounds in coffee. Additionally, the novel approach of a dedicated cocoa bean grinder further responds to recent market demand for wholesome, unprocessed products. We propose to also incorporate an automatic nanofoamer for milk frothing, currently not incorporated in the commercially available state of the art technology. The nanofoamer provides higher reliability, higher throughput and a finer quality of foam than

traditional methods. The total throughput of the proposed baseline design of our proposed CM2000 design exceeds the performance of CB200 by up to 20% through our patented super-automation technology and offers 25% more product variety to the customer.

1.1.4 First Iteration of Task 1: Requirement detailed assessment and refinement

Market survey

A detailed market survey will be carried during Task 1 out to assess the aspects below, a first iteration of this is given in the following sections.

a) Capabilities and performance parameters of HBMs available at the market. This shall include information on cost (recurring, maintenance and running costs), reliability analysis (full assessment of continuous operation of 10 000 hours, including Mean Time Between Failures, Mean Time To Repair etc), efficiency analysis.
b) Current market demand and trends for different hot beverages, including, but not limited to end-user preferences for caffeine content, aroma, milk foam etc.

Our preliminary assessment of the existing market leading HBM capabilities has identified the average capabilities of HBM to address the standard EC requirements, providing maximally up to 2 cups within 20 seconds (+10 sec depending on requested beverage). Key performance drivers have been identified as boiler setup (single/double/heat exchange) and bean grinder efficiency (average efficiency 60%). These factors have been taken into consideration for our baseline design and will be iterated further upon completion of full market analysis.

Coffee is composed of over 1800 different chemical components [ref]. Due to the complex chemistry, identification of correlations between physical parameters of the extracted solutes and the perceived quality of the coffee beverage is a nontrivial matter and largely up to personal preference. The brewing process is considered to affect overall coffee quality via three parameters: pressure, time, and turbulence during the extraction. Additional factors, such as grind uniformity and milk foam density, are further defined by HBM design. Thus, identification of consumer preferences and behaviour are pivotal for the production of a competitive HBM. Studies of recent consumer trends (ref) have uncovered a new varied preference in total caffeine content of coffee (50-250mg, 50mg increments preferred). Our preliminary assessment has further identified a clear preference towards drinks containing coffee constituents (organic acids, Maillard products and heterocycles) at 6 to 10 percent by mass. The amount of bioactive compounds in coffee is a function of the granularity of the beans, which can be achieved with a burr grinder with fine control settings.

The consumer preference for milk density has increased by 200% in the last 10 years, with nanofoam being the most recent development, however a dedicated nanofoamer has not been yet incorporated into HBMs and milk foaming remains a manual task.

The aroma plays and important role in sensory flavour perception, as well as directing consumer behaviour and preferences. The particular aroma of EC can be attributed to the presence of surface foam, which traps the volatilized aromas and doses their emission into the atmosphere (ref). The generation of such foam has been shown to be dependent on the extraction temperature of EC, with optimal temperature regarded as 92 C (ref), corresponding to Certified Italian Espresso Coffee requirements.

The global demand for hot cocoa based drinks has remained stable over the last 10 years, but consumption has increased for bean-based fresh cocoa and reduced for ready-powder cocoa (ref). Similar trends can be seen for tea, where granulated tea consumption has reduced by 70% and organic teabag and loose tea consumption has doubled.

Based on these preliminary investigations, we aim to tailor the HBM corresponding to the Certified Italian Espresso Coffee requirements, further incorporating a custom burr grinder to address different caffeine levels and a milk nanofoamer. Given the market trends, hot cocoa beverage shall be offered from bean form and tea varieties can be provided as regular tea bags dispensed by the HBM. In order to remain adaptable to what are rapidly changing market tastes, the ability for full automation and full customisability of each pre-programmed beverages is considered key and is included in our design.

Requirement Specification
Based on the lessons learnt from the detailed market survey and analysis to be performed during Task 1, the preliminary requirements provided in Annex B and iterated in this proposal, will be further refined and complemented with additional requirements (if applicable) for the full development of CM2000. A full requirement specification will be produced, subject to acceptance by ESA at the Requirements Review.

Conceptual design
The high level conceptual design for the HBM will be revised and updated addressing the final completed requirement specification. A preliminary trade-off analyses will be performed and key subsystems identified for the HBM in the form of a functional block diagram. The high level concept will be presented at the Requirements Review along with the requirement specification, as foreseen in the SoW.

Test Plan
As part of Task 1, a preliminary breadboard test plan for functional performance will be defined according to the SoW, requirement specification, trade-off analysis and risk assessment. Given our proposed baseline design, the following non-exhaustive list of tests are considered as minimum for prototype testing:

Functional testing
Electrical testing (IEC 60530 Standard)
Performance testing (as outlined in ASTM F2990 Standard Test Method for Commercial Coffee Brewers, Book of Standards Volume: 15.12) including but not limited to:
- Pressure testing
- Temperature testing
- Heating up and cycling time, water flow testing
Environmental testing

It is considered that CE-testing will be required for marketing within Europe, but this is considered out of scope for the present SoW, as the prescribed development will be completed by prototype phase.

<u>First Iterations of Tasks 2 and 3:</u>

Task 2 covers the preliminary design of the HBM, based on the conceptual design presented here (Section 1.1.3) as updated during Task 1. This task shall include a preliminary performance assessment and trade-off analysis, breadboard definition, component selection and breadboarding, followed by breadboard testing and analysis. Based on these results, necessary design changes will be proposed, trade-offs finalized and any identified new problem or risk areas addressed and reviewed at the Preliminary Design Review.

Thereafter, a prototype test plan will be developed and a prototype of the final design shall be manufactured and tested during the detailed design phase.

Experience from and lessons learnt during procurement, manufacturing, and assembly, as well as

during the test campaign will be collected and relevant documentation and procedures updated. Final consolidation of proposed changes shall be reviewed by the end of task 3 at the CDR.

1.2 POTENTIAL PROBLEM AREAS:

1.2.1 Identification of the main problem(s) or problem area(s) likely to be encountered in performing the activity

Note that there are two ways to address 1.2.1 and 1.2.2, either in full text form in which case 1.2.1 will number the problems and risk areas and describe and discuss each one. Section 1.2.2 will then do similar for the solutions/ mitigation and prevention actions. Or – as we have done here – to address both aspects in tabular form in 1.2.1 and just refer to it in 1.2.2. Which is better depends on the issues and amount of discussion and explanation needed and the page limits (i.e. size of contract).

Problem	Short description	Impact	Mitigation	Prevention
Incompatibility of the pre-existing super-automation software with the new hardware	Patent #1234 covers the main functionalities (estimation and control of bean/water volume, pressure, temperature, pump). Additional functionalities such as fine control of burr grinder and nanofoamer need to be incorporated.	High	Early testing on representative hardware (BB). Software rebuild and increased resource allocation for BB to Prototype phase.	Our patented software has been built using modular programming principles for the foreseeable adaptions in mind. Rigorous unit-testing during development is foreseen prior to integration. Comprehensive integration plan and testing. Regular system-level functional testing and analysis.
Manufacturing quality of double burr grinder blades	Consistent component quality for the accurate estimation of bean granularity is essential	Medium	Swop suppliers according to prevention measures.	Identification of multiple high-end producer of stainless steel products with minimally ISO 9001 system certification. Detailed supplier assessment and audit.
Nanofoamer cannot produce bubbles of less than 30microns at the set power limits.	Creation of bubbles less than 30microns, might increase power consumption exponentially. Nanofoamer power consumption of above 1000W would significantly increase running costs of the unit.	Low	Relax the requirement to 40microns or 50% efficiency.	Design replaceable foam inducer head for the foamer unit with an option to size up to 40micron bubbles. Early testing of the nanofoamer.

Table 3: Potential Problem and Risk Areas

1.2.2 Proposed solutions to the problems identified

See section 1.2.1

1.2.3 Proposed trade-off analyses and identification of possible limitations or non-compliances

All possible limitations or non-compliances have been identified and discussed in Table 1.

A high level trade-off between a super-automated high pressure system based on our patented software process and a semi-automated high pressure system has been carried out as part of the proposal. The following parameters were considered:

Efficiency (preparation time and throughput)
Semi-automatic HBMs require an operator for manual milk frothing and bean granularity setting. Super–automation decreases the time of any bean-based beverage production by 60% (5 +/- 2sec) by simultaneous milk frothing during coffee brewing and a further 10% by simultaneous dispense. Further, software controlled bean grind settings negate the need for manual adjustment, further decreasing total preparation time.
Semi-Auto: 0
Super-Auto: ++

Running cost
The increase in efficiency does incur higher power consumption than semi-automatic units due to additional electric components. However, such cost is offset by the lower cost of operation of super-automatic HBMs (training, safety and salary of the operator will not be required).
Semi-Auto: 0
Super-Auto: +

Variety
Due to the manual bean granularity setting with limited options, differential caffeine content is not offered in most semi-automatic HBM units. Super-automation can integrate this innovation seamlessly in conjunction with a high performance burr grinder, offering at least 2-fold more coffee variety to the customer.
Semi-Auto: -
Super-Auto: ++

Risk
The use of super-automation negates the operational and health and safety risks commonly reported for semi-automated units. However, the dedicated software adaption does incur higher development risks and potential software security risks during operation.
Semi-Auto: +
Super-Auto: -

Recurring Cost
The software component of super-automation system will inflate the recurring cost of the HBM unit (10-15%) due to patented technology.
Semi-Auto: +
Super-Auto: -

On the basis of our high-level trade-off, the proposed baseline design (Section 1.1.3) utilises our patented super-automation processes with additional modifications to allow for increased efficiency while responding to the preliminary market assessment (Section 1.1.4)

During the conceptual design in Task 1 the following key trade-offs need to be performed:

- Nanofoamer foam size with regard to power consumption, and

throughput.
- Burr grinder material selection (stainless steel, carbon steel, ceramic) with regards to durability, predicted lifetime and cost.
- Pump selection (vibratory vs. rotary). Parameters to be considered:
    - Materials: availability, sterility, durability
    - Power consumption (in startup/standby modes)
    - Lifespan
    - Pressure generation and stability
    - Performance metrics (speed, noise)

Detailed subsystem-level trade-off analyses will be carried out and further iterated as a result of Task 2 testing activities.

1.3 TECHNICAL IMPLEMENTATION / PROGRAMME OF WORK

1.3.1 Proposed Work Logic

The proposed work logic follows the rationale of the Statement of Work. The project is to be initiated at the Kick-off Meeting, and three major reviews are to be held over the course of the project.

Figure 2 depicts the detailed work flow, where the Tasks defined by the SoW are indicated on the left. The corresponding major workpackage, grouped as individual subworkpackages, have been indicated with a matching color scheme. The major milestones have been indicated in red. Work to be performed by the subcontractor has been separated as lower level subworkpackages and indicated with a grey shaded area.

The purpose of the Requirements Review shall be to review and agree the proposed changes and additions to the baseline requirements presented in Annex B and iterated in the present proposal (Table 1 and 2). First iteration of the baseline conceptual design has been presented in section 1.1.3, which shall be further iterated and agreed at the Requirements Review as the input to Task 2.

Detailed trade-off analysis and risk assessment shall be carried out following the Requirements Review on the basis of the requirement specification and agreed conceptual design. Breadboard will be developed and tested according to the breadboard test plan agreed at the Requirements Review. The purpose of the Preliminary Design Review shall be to review the baseline design and the breadboard demonstrator test results for completeness and for compliance with the agreed requirements. Detailed specification and prototype test plan shall be agreed at the PDR as the input to Task 3.

Hardware and software design activities will run in parallel as part of the detailed design phase. The necessary design of the subcontracted hardware component will be performed as a sub-workpackage to hardware design and the produced pressure system shall be incorporated into the prototype during integration and assembly stage. Preliminary functional and subsystem tests shall be performed already during the development phase and comprehensive prototype testing will be performed prior to the Critical Design Review. The purpose of the CDR shall be to review the final design and prototype test results for completeness, correctness and compliance with the requirements.
Experience from and lessons learnt during procurement, manufacturing, and assembly, as well as during the test campaign will be collected and relevant changes to aid future production will be proposed and agreed at the CDR.

The contract shall be considered closed following the successful CDR, and the delivery and acceptance of all final documentation.

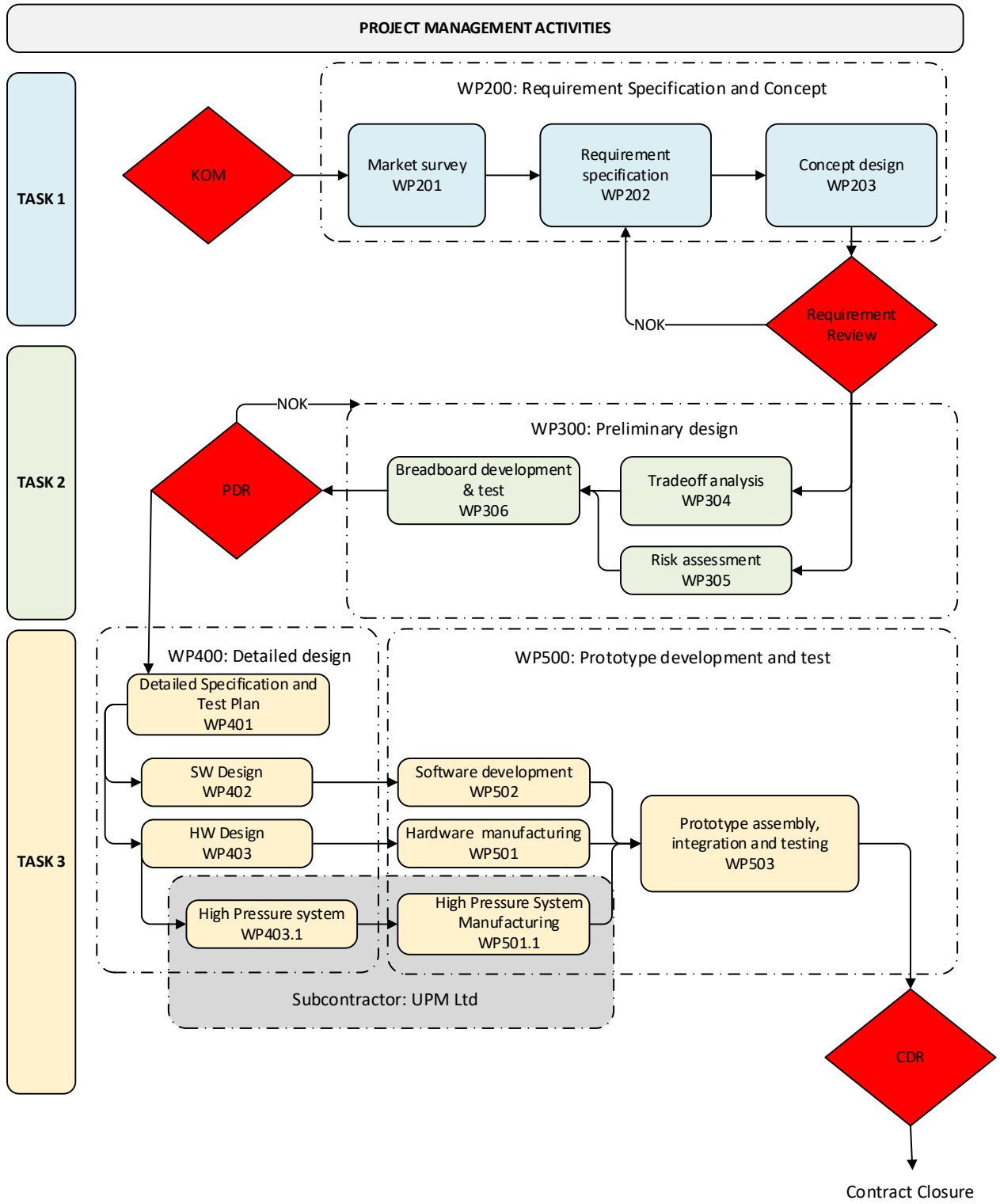


Figure 2. Work Flow Logic

1.3.2 Contents of the proposed work

1.3.2.1 Work Breakdown Structure (WBS)

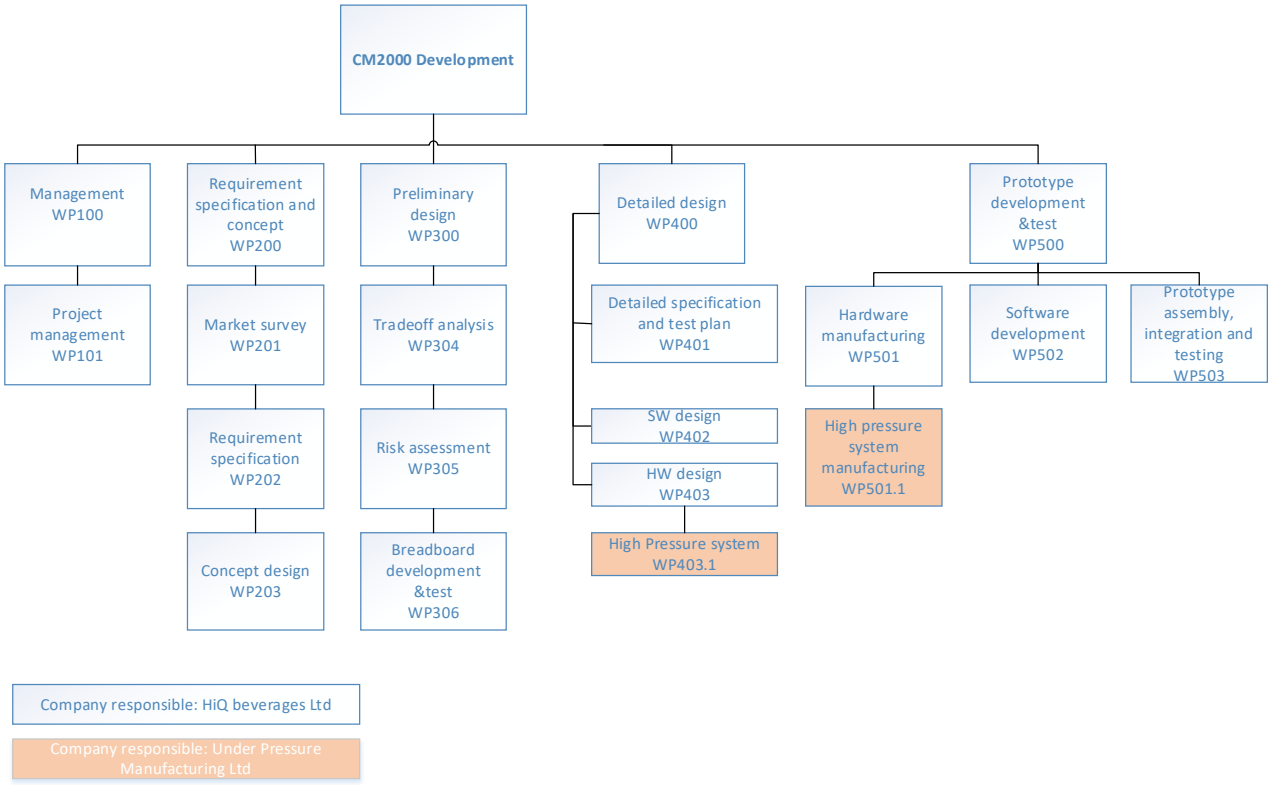


Figure 3. WBS

Company responsible for WP403.1 (High Pressure system design) andWP501.1 (High Pressure system design and manufacturing): Under Pressure Manufacturing Ltd

All other work packages under this activity are under the responsibility of HiQ Beverages Ltd.

Note that here we have purposefully included 3 different styles of presentation of the WBS in one diagram for illustrative purposes. Please stick to just one style for your WBS.

1.3.2.2 Work Package Description (WPD)

PROJECT: CM2000 Development	PHASE: 1	WP: 201
WP Title: Market Survey Company: HiQ Beverages Ltd WP Manager: Mr. Bean Start Event: KOM End Event: RR	Planned Date: T0 Planned Date: T0+3	Sheet 1 of 1 Issue Ref: 1 Issue Date 15.08.2018
Inputs: • SoW • Approved proposal • KOM Minutes of Meeting • AD1 • RD1 Tasks: • Perform a survey of all current HBMs available on market • Compare key requirements and capabilities • Compare key performance indicators (efficiency, lifetime, reliability) • Compare and analyse cost (unit cost, running cost) • Identify and analyse customer requirements (coffee provider) • Assess the current annual demand for hot beverages in Europe • Perform trend analysis for hot beverage demand in Europe • Identify most popular hot beverages and key end-user requirements • Collect and analyse new and emerging requirements for popular hot beverages • Assess the potential future market for any evolving requirements • Identify consumer needs not currently addressed by HBM Specifically Excluded Tasks: • No competitor machines will be procured and tested • No taste testing/ surveying will be performed Outputs: D01: Current and Future Market Assessment Report D02: Emerging Hot Beverage Requirement Report		

Note that we have only included one example WPD – the proposal should include all WPD and these should be at the same level as the WBS (i.e. 1 per smallest element of the WBS). Try to keep each WPD to 1 page for readability

1.4 BACKGROUND:

1.4.1 Existing own concepts/products relevant to the activity and/or to be used

Our current patented coffee brewing process utilizing super-automation will be used. Refer to section 4.

1.4.2 Third Party's concepts/products relevant to the activity and/or to be used

There will be no Third Party concepts/products to be used in the activity.

1.4.3 Other technical achievements relevant to the activity and/or to be used

Refer to Section 4.

1.4.4 Background of the company(ies)

Prime contractor: HiQ Beverages Ltd

HiQ Beverages is one of the leading process innovators ion Eastern Europe in beverage production software and machinery. Founded in 1990, the company has more than 20 years of experience in specialized beverage production systems and over 10 years of experience in automation software.

We specialize in full automation software for liquid mixing and dispension, for which we hold multiple patents (Patent #1234, Patent#5566).
We are dedicated to research, development and manufacturing of small to medium scale beverage handling and production units to customers worldwide. Our products are in accordance with international quality standards and we have ISO-9001 certification since 2007.

HiQ Beverages Ltd customers include market leading soft drink producers (Not-A-Cola Company, Sipsy Co).

HiQ Beverages Ltd operates on Unix-based OS with internal servers and has the full software licenses (RoboQ, EXent 5.0, SinTouch) required for the foreseen work.
HiQ Beverages has a full mechanical workshop, in-house pressure test chamber and a lifetest facility. See Annex for details.

Subcontractor: Under Pressure Manufacturing Ltd (UPM)

UPM has 30 years of experience in the design and manufacturing of high pressure systems and ancillary components (valves, fittings, tubing) to the highest quality standards.

UPM is ISO 9001 certified company and a preferred supplier within diverse markets such as tooling (waterjet cutting and cleaning, pneumatic tools), oil and gas, chemical and petrochemical, and food and beverage industry.

1.5. TECHNICAL RESERVATIONS – TECHNICAL COMPLIANCE:

1.5.1 Reservations

No reservations are given to the requirements beyond those discussed in detail in Section 1.1.1.1

1.5.2 Technical Compliance Matrix (Statement of Work / Technical Requirements)

REQUIREMENT	COMPLIANT (Y/N/P)	REMARKS
1. Introduction	Y	Title
1.1 Scope of the Document	Y	Information only – noted
1.2 Applicable and Reference Documents	Y	Compliant with listed Ads
1.3 Acronyms and Abbreviations	Y	Information only – noted
1.4 Background and Objectives	P	Partially compliant with objectives (full compliance with scope)
2. Work to be Performed	Y	Title
2.1 Work Logic	Y	See section 1.3.1
2.2 Tasks	Y	See section 1.3
Annex B	P	See dedicated compliance table 1 in section 1.1.1.1

Table 4: Technical Compliance to SoW

2) IMPLEMENTATION PART

2.1 TEAM ORGANISATION AND PERSONNEL

2.1.1 Proposed team

The project team is led by the prime contractor HiQ Beverages Ltd, with Under Pressure Manufacturing Ltd as a subcontractor. The subcontractor is required due to their extensive expertise and heritage in high pressure systems design and manufacturing and will be responsible for the design of all the high pressure components of the CM2000. Such expertise is not available within HiQ Beverages Ltd. at this stage.

2.1.1.1 Overall team composition, key personnel

The team consists of 10 people, 4 of which are considered key due to their expertise significant contribution to the key project tasks.

The project manager is Mr. Bean from HiQ Beverages Ltd. Mr. Bean will be the main contact point with ESA as well as the subcontractor and supplier, and will oversee all management tasks and contractual aspects of the project, including sub-contractor management, scheduling, project control and risk management.

Software lead engineer D.U. Code is responsible for developing the main software architecture and proposed modifications to Patent#1234, as well as integration with hardware and co-verification.

Hardware team lead V. Hard oversees the full design, manufacturing and assembly of the full unit.

Component lead engineer A. Rabica is responsible for the design, manufacturing, testing and integration of the high pressure system. A. Rabica further represents the subcontractor UPM Ltd in all contractual matters of the project.

Please refer to section 2.1.2 for the CVs of all key personnel. Please refer to Figure 4 for full team composition with non-key personnel. Key personnel and participants from prime and subcontractor are highlighted accordingly.

2.1.1.2 Reporting lines within the team

The project manager is responsible for all key decision making aspects of the project, communication with ESA and any problem resolution or contractual aspects with the subcontractor.

All members of the project team are foreseen to attend the internal review meetings.

The Lead HW and SW engineers as well as the test engineer report to the
PM on all key or decision-making aspects of the project with cost, compliance, scheduling or risk implications.

The lead hardware and software engineers are responsible of the timely execution and performance of their subordinates as defined by Figure 4. The Subcontractor Component lead engineer reports to the lead mechanical engineer for all aspects of the project. Urgent aspects affecting the duration, cost or contractual issues arising from the subcontractor, brought up outside of regular review meetings, will be communicated to the lead mechanical engineer who will report to the PM.

Please refer to Figure 4 for an overview diagram of the reporting lines within the team.

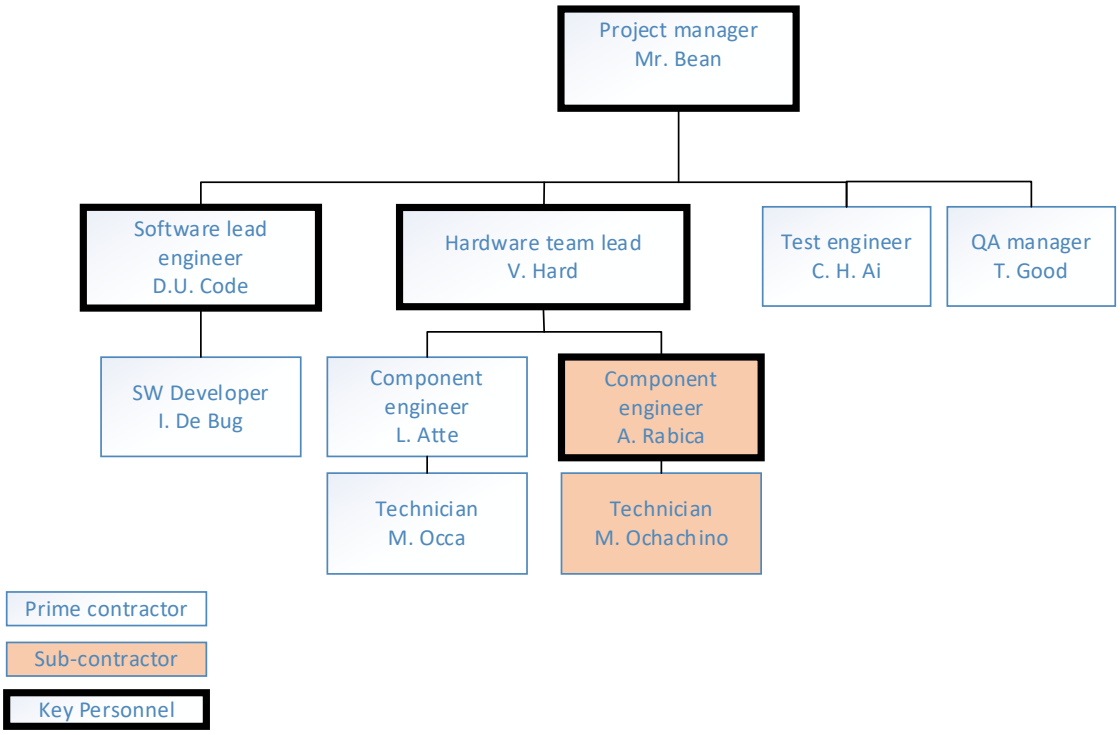


Figure 4. *Project team composition and reporting lines within the team*

2.1.1.3 Position of each of the team members within his/her own company's (or institute's) structure.

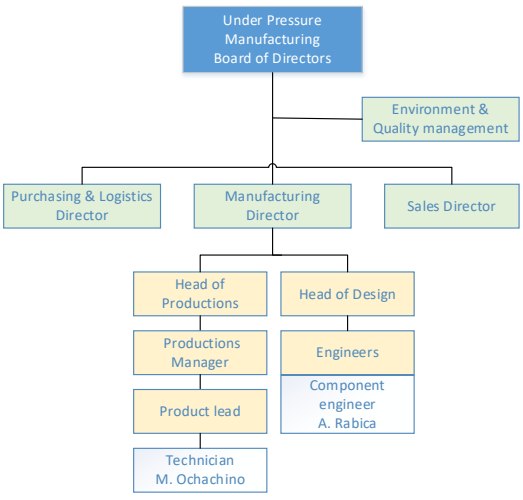


Figure 5. *Position of subcontractor project team members within Under Pressure manufacturing Ltd.*

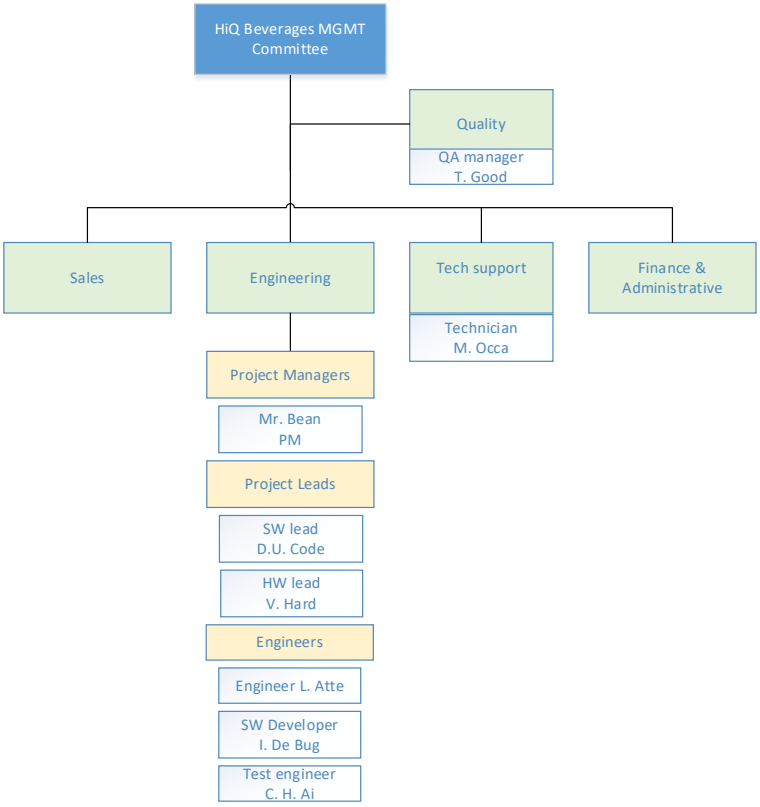


Figure 6. *Position of prime contractor project team members within HiQ Beverages Ltd.*

2.1.1.4 Time dedication of key personnel

Key Personnel	WP100 Management	WP200 Requirement Specification and Concept	WP300 Preliminary design	WP400 Detailed design	WP500 Prototype development and test	Total hours	% of total working time
Project manager Mr. Bean	57	23	12	8		530	33
SW lead engineer D.U.Code		12	7	41	40	760	42
HW team lead V. Hard		12	16	48	24	660	37
Component engineer A. Rabica				67	33	240	13
TOTAL						**2190**	

Figure 7. *Time dedication (%) of key personnel*

2.1.2 Curricula Vitae

Given below is the resume of the most relevant experience of each key person for the proposed activity. Full CVs are provided in Annex 3.

Dean Umberto Code (Software lead engineer)
Relevant experience:
2014- …: Software Developer, HiQ Beverages, Lithuania

- Software quality monitoring in C++ and SQL in Unix and Linux environments
- Develop automation scripts to test storage appliances in Python and C/C++
- Development of base framework with Java, JSP, Struts, CSS, HTML, JavaScript,

Oracle, and MS SQL Server

2008 – 2014: Automation Engineer, Smartest Vacuum Cleaners GmbH, Germany

- Design, development and testing of microcontroller-based embedded systems in Raspberry Pi Platforms using automata-based programming for building smart home appliances.
- Design of protocol stacks for SoC HW/SW Interfaces

2007-2008; Junior Software Developer, Robocop Technologies, Lithuania

- Basic function design in LISP and HDL
- Schematic capture and PCB layout software Design with sensors, encoders, SPI, I2C, CAN and EtherCAT devices

Education:

2005-2007: MSc Technical University Of Matrix, Automation Engineering

2001-2005: BSc Technical University Of Matrix, Computer Science & Mechatronics

Patents:

Code, D.U., "Multi-Layer De-bugger Algorithm" European Patent, No. 00099851

Note that we have only included one example CV to illustrate the level of detail and tailoring to the specific relevant experience needed – A CV should be included for each key person.

2.1.3 Rationale of the proposed industrial organisation

Under Pressure Manufacturing Ltd is the leading expert in Eastern Europe for high pressure system design and manufacturing. UPM Ltd and HiQ Beverages have previous successful industrial partnerships, leading to off-the-shelf products, currently sold across Europe and South-East Asia (Fully Automated Soda Tap – FAST; High-pressure Infusion Tea – HI-Tea). UMP Ltd offers specialized expertise, which is considered essential for the success of this project, that complements the specific competencies of HiQ Beverages.

2.2 PLANNING

2.2.1 Proposed schedule and milestones

In case of positive evaluation, the envisaged start date is the in the 1st quarter of 2020, with 1st of January used as a baseline in this proposal. While in the SoW a total duration of up to 24 months is allowed, it is clear from the objectives that the activity needs to be completed within 18 months and we have therefore planned the work to be compliant with this. The proposed development is therefore scheduled for completion within 18-months. Thus, the envisaged closing date of the project is the 1st of July, 2021. Based on our proposed schedule, the foreseen timeline of the reviews as outlined in SoW Section 4, are proposed to be adjusted to:

Requirements Review: KO+2Months
Preliminary Design Review: KO+7Months
Critical Design Review: KO+18Months

WP200 (Requirement Specification and Concept; sub-workpackages WP201, WP202, WP203), is initiated following KOM and is planned to be concluded within 2 months, upon Requirements Review.

WP300 (Preliminary Design; sub-workpackages WP304, WP305, WP306) is planned to start following the Requirements Review and is planned to be concluded within 5 months, upon Preliminary Design Review.

WP400 (Detailed design; sub-workpackages WP401, WP402, WP403, WP403.1) is planned to start following the Preliminary Design review and detailed design of the full system is planned to be concluded within 5 months. HW and SW design is planned as a co-engineering activity for 4-weeks. During the rest of the design phase regular meetings between all project team members, including the subcontractor, are held weekly.

Preparatory activities of WP500 (Prototype Development & Test; sub-workpackages WP501, WP501.1, WP502, WP503) are planned to start after PDR, to ensure component selection and procurement does not delay prototype development. The core activities of WP500 are planned to start at T0+11, ending with CDR at T0+18.

Public holidays are taken into account in the proposed schedule.

Project management actions (WP100) will span over the full duration of the activity. The schedule takes further into consideration delays arising from schedule coordination for the technical reviews (availability of key personnel and ESA representatives) and possible iterations arising from RR and PDR.

The major meetings foreseen are presented in Table 2.

Meeting	WP or Milestone	Purpose	Attendees	Date	Location
KoM	MS1	Kick-Off Meeting	ESA, HiQ	To	Teleconference
Progress meeting #1	MS1	Results and conclusions of market survey	HiQ	To + 4w	HiQ, Lithuania
Progress meeting #2	MS1	Progress assessment of requirement specification and concept design	HiQ	To + 6w	HiQ, Lithuania
RR	MS1	Requirements Review	ESA, HiQ	To + 2mo	HiQ, Lithuania
Progress meeting #3	MS2	Review of trade-off analysis, consolidation for breaboard development and test plan	HiQ	To + 4mo	HiQ, Lithuania
Progress meeting #4	MS2	Breadboard development progress	HiQ	To + 5mo	HiQ, Lithuania
PDR	MS2	Preliminary Design Review	ESA, HiQ	To + 7mo	HiQ, Lithuania
Co-engineering meetings (8)	MS2	HW and SW consolidation for detailed design	HiQ, UPM	To + 7mo (4weeks)	HiQ, Lithuania; telecoference
Progress meeting #5	MS3	Progress of design activities	HiQ, UPM	To + 9mo	UPM, Latvia
Internal review #3	MS3	Detailed design review and prototype devepment planning	HiQ, UPM	To + 13mo	HiQ, Lithuania
Progress meeting #7	MS3	Prototype development and test progress	HiQ, UPM	To + 15mo	Teleconference
Critical performance testing	MS3	Test at ASTM F2990 Certified Commercial Coffee Brewers Testing Facility	HiQ, UPM	To + 16mo	Brewzone, Italy
Internal review #4	MS3	Prototype development and test results review	HiQ, UPM	To + 18mo	Teleconference
CDR	MS3	Critical Design Review	ESA, HiQ, UMP	To + 18mo	HiQ, Lithuania
Final Review	MS3	Final Presentation of Project Outcome	ESA, HiQ	To + 18mo	ESTEC, ESA, Netherlands

Table 5: Meeting and Travel Plan

2.2.2 Bar chart

See Figure 8 for the GANTT chart of the project. The major milestones are indicated in red, workpackages corresponding to tasks 1 and 2 as defined by the SoW are indicated in blue and green, respectively, and further correspond to the work flow diagram (Figure 2).

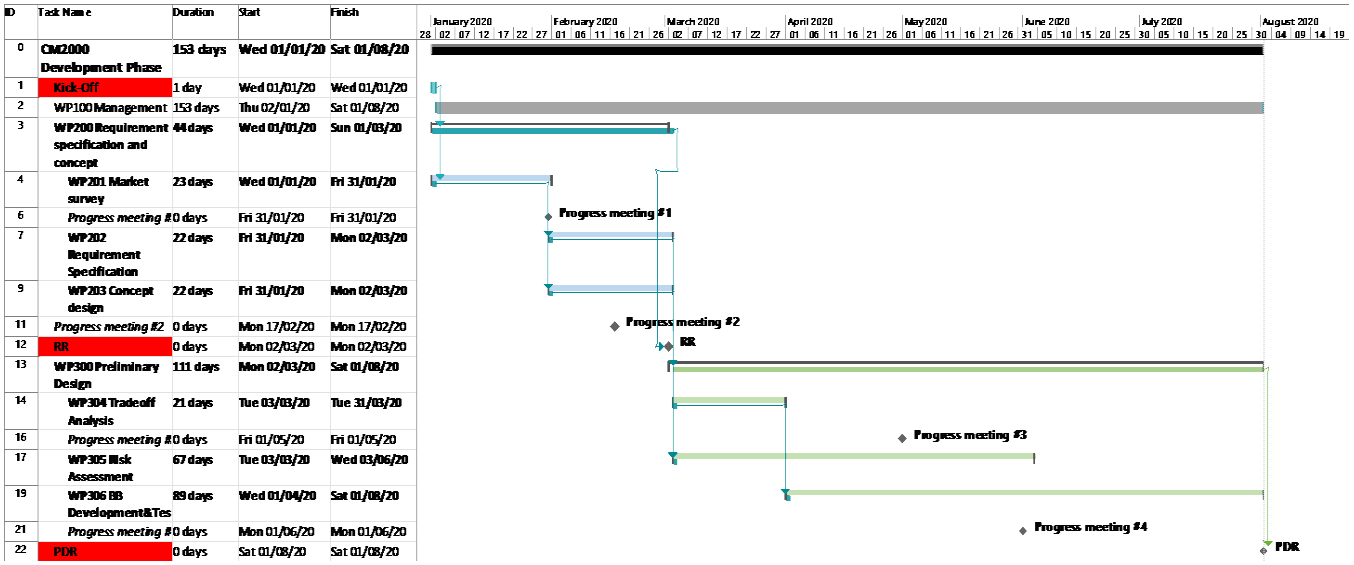


Figure 8. GANTT Chart

Note that we have only included the GANTT chart up to the PDR for ease of illustration. The full planning should be presented. If this makes the chart unreadable, consider splitting the planning over two charts (collapsed summary and full)

2.3 LIST OF DELIVERABLE ITEMS – SPECIFICATION OF ANY NON-CONFORMANCE

2.3.1 Deliverable Items

We confirm full compliance with all deliverable items defined in the Statement of Work Section 3.5 with the exceptions and deviations listed in section 2.3.2 below. Our proposed full list of deliverable documents is given in Table 5 and other deliverables are listed in Table 6.

No.	Title	Milestone	Contents/ Notes
D1a	Requirements Specification	RR	As described in SoW
D1b	Current and Future Market Assessment Report	RR	Assessment of Current competitor. Assessment of competitor specifications and prices. Assessment of evolution of HBM machines
D1c	Emerging Hot Beverage Requirement Report	RR	Assessment of beverage types currently on offer, assessment of sales per type and evolution of these year by year from 2000 to 2017.
D2	Conceptual Design Document	RR	As described in SoW

D3	Breadboard Test Plan	RR	As described in SoW
D4a	Preliminary Design Report	PDR	As described in SoW
D4b	Preliminary Software Design	PDR	Specific test plan and test flow for the software with purpose and method for each test
D4c	Preliminary Pressure System Design	PDR	Specific test plan and test flow with test levels and pass fail criteria for the Pressure system. Reference to facilities will be made.
D5	Breadboard description	PDR	As described in SoW
D6a	Prototype Test Plan	PDR	As described in SoW
D6b	Prototype Software Test Plan	PDR	Detailed software test plan as supplement to the complete D6a
D7	Breadboard Test Report	PDR	As described in SoW
D8	Detailed Design Report	CDR	As described in SoW
D9	Prototype Test Report(s)	CDR	A summary report will be delivered and will include individual test reports for the different elements (s/w, pressure system) and tests (functional, electrical) as annexes
D10	Verification Control Document	PDR, CDR	As described in SoW
D11	Proposed Design Changes Document	CDR	As described in SoW
TDP	Technical Data Package	Final Review	As described in SoW. Delivered on Memory Stick
FR	Final Report	Final Review	As described in SoW
FP	Final Presentation	Final Review	As described in SoW. Assumed 2 hr duration covering all aspects of the activity
CCD	Contract Closure Documentation	Contract Closure	As described in SoW

Table 6: Deliverable Documentation

Item Identifier	**Title**	**Milestone**	**Qty**	**Format / Remarks**
SW1	HBM Software	CDR	1	Only object code will be delivered.

HW1	HBM Breadboard	PDR	1	We would like to request a loan agreement for this item so that it can continue to be used for further development and debugging of the product.
HW2	HBM Prototype	CDR	1	Consumables (coffee, tea etc) will not be delivered with the unit.

Table 7: Hardware and Software deliverables

2.3.2Non-conformances / limitations / additions regarding deliverable items

As can be seen in Tables 5 and 6, a number of changes and additions to the required deliverables from the SoW are proposed.

a) As part of the market survey in WP200 two documents are produced that are used as inputs to the Requirement Specification (D1). These will also be delivered.
b) While all of the details requested for the Design Reports will be delivered, it is more practical and efficient for this to be delivered split across multiple documents that reflect the different elements of the design and the split of work between companies. A summary will still be included in the high level document but as a result deliverables D4b and D4c have been added. The same logic has been applied to the Test Plan (D6).
c) The VCD (D10) we consider needs to also be delivered at the PDR. This has been added.
d) Due to the high level of company IPR in the software we are unwilling to supply source code. We will supply the software in object code embedded in the Prototype. ESA are invited perform an inspection and review of the source code but only at our premises.

2.4 MANAGEMENT AND ADMINISTRATIVE COMPLIANCE MATRIX

We confirm full compliance to the management and administrative requirements and conditions as detailed in the table below.

REQUIREMENT	C	REMARKS
3.1 General	Y	Title
3.1.1 General	Y	The nominate Project Manager has full decision authority for this activity.
3.1.2 Communications	Y	Understood and agreed
3.2 Access	Y	Understood and agreed, access will be given on site only to non-deliverable items and documents
3.3 Reporting	Y	Title
3.3.1 Minutes of Meeting	Y	Understood and agreed, company procedures state MoM shall be issued within 5 days.
3.3.2 Bar-chart schedule	Y	Understood and agreed. The latest bar chart schedule in form of GANTT chart will be presented at each meeting and with each progress report.

3.3.3 Reporting	Y	Understood and agreed. Monthly progress reports will be delivered and shall correspond to the template and detail level requested by ESA.
3.3.4 Problem Notification	Y	Understood and agreed. Best efforts will be made to ensure such notification is within 72 hours of such an event or problem occurring.
3.3.5 Technical Documentation	Y	Understood and agreed
3.4 Meetings	Y	Understood and agreed. Progress meetings will be every 2 months.
3.5 Deliverable Items	Y	See section 2.3.1
4. Schedule and Milestones	Y	See Figure 8 – Gantt chart
4.1 Duration	Y	See section 2.2
4.2 Milestones	Y	See section 2.2
Annex A	Y	Information only - noted

Table 8: Management and Administrative Compliance Matrix

3) FINANCIAL PART

3.1 PRICE QUOTATION FOR THE CONTEMPLATED CONTRACT:

The total price for the activities detailed in this proposal is a Firm Fixed Price of 191,381.57 €

The above given Firm Fixed price is based on 2018 Economic Conditions

3.2 SUB-CONTRACTING PLAN

We include the use of one sub-contractor for this activity, the details of which are given below:

- Subcontractor: Under Pressure Manufacturing Ltd (UPM)
- Country: Latvia (LV)
- Tasks Assigned: WP403.1 and WP503.1 – the design, manufacture and test of the high pressure sub-system element of the HBM. See section 1.3 for details.
- Place of execution of the assigned tasks: UPM premises, Riga, Latvia
- The total value of the sub-contract is a Firm Fixed Price of 23,969.90 Euro, which is 12.5% of the total proposal price.

3.3 DETAILED PRICE BREAKDOWN

3.3.1 PSS costing forms:

See Annex 1 for all PSS forms.

3.3.2 Milestone Payment Plan

See table 8 and 9.

Milestone (MS) Description	Schedule Date	Payments from ESA to (Prime) Contractor (in Euro)	Country (ISO code)
Progress (MS 1): Upon successful completion of the RR and successful review and acceptance of deliverables D1a, D1b, D1c, D2 and D3.	To + 2 months	75,000	LT
Progress (MS 2): Upon successful completion of the PDR and successful review and acceptance of deliverables D4a-c, D5, D6a-b, D7.	To + 7 months	74,570	
Final Settlement (MS 3): Upon successful completion of the CDR and the Agency's acceptance of all deliverable items due under the Contract and the Contractor's fulfilment of all other contractual obligations including submission of the Contract Closure Documentation.	To +18 months	41,812	
TOTAL		191,382	

Table 9: Milestone Payment Plan

Prime (P)	Company Name	ESA Entity Code (at contract signature)	Country (ISO code)	Advance Payment (in Euro)	Offset against	Offset by Euro	Condition for release of the Advance Payment
P	HiQ Beverages Ltd		LT	66,984	MS 1	66,984	Upon signature of the Contract by both Parties

Table 10: Advance payment

For information purposes only:

For Information purposes only : Amounts in Euro for Contractor and Sub-contractor(s)				
Milestone	**Prime Contractor** HiQ Beverages Ltd	***Insert Country (ISO code)*** **LT**	**Sub-contractor A** Under Pressure Manufacturing Ltd	***Insert Country (ISO code)*** **LV**
Advance	61,984		5,000	
MS-1	8,016		0	
MS-2	55,600		18,970	
Final 1	41,812		0	
TOTAL	167,412		23,970	

Table 11: Payment breakdown

3.3.3 Travel and subsistence plan

Costs incurring from co-engineering meetings with the subcontractor, internal review meeting of the detailed design and travels to the test facility in Italy are detailed in PSSA2 Exhibit B.

4) CONTRACT CONDITIONS PART :

4.1 BACKGROUND INTELLECTUAL PROPERTY RIGHTS

The following BIPR will be used in the course of this activity and will affect the deliverables listed below.

Exact name of BIPR Item	Owner	Description	Patent # or Ref. / Issue / Revision / Version #	Contract / Funding Details under which the IPR was created	Date of creation of the version of the BIPR listed here	Licence	Affected deliverable with comments	Protected Format (Y/N)
Software controlled super-automation	HiQ Beverages Ltd	Intelligent multi-functional and configurable precision control of hot beverage machines	Patent #1234	Self funded	1st April 2000	N/A	D4b -Software Preliminary Design. This document will be marked company confidential and distribution is limited to the ESA TO only.	N

Table 12: Background IPR

4.2 SPECIFICATION OF ALL INPUTS TO ENTER INTO THE BLANKS EXISTING IN THE DRAFT CONTRACT

This element has not been included in the example proposal

4.3 OTHER REMARKS ON THE DRAFT CONTRACT

None

ATTACHMENTS:

ANNEX 1: Signed PSS-A2 form
Signed PSS-A1 form
Signed PSS-A8 form
Signed PSS-A15.1 form

ANNEX 2: DESCRIPTION OF TENDERER'S FACILITIES FOR THE EXECUTION OF THE WORK

For the example proposal the facilities description has been included only in the summary form in the Company Background

ANNEX 3: DETAILED CVs

ANNEX 1:

*For the example proposal only the PSSA1, A2 and A8 forms for the Prime have been included and they have not been signed. In your proposal include **all** PSS forms (inc. those of the sub-contractor) and make sure all are **signed.***

PSS-A2 form

COMPANY PRICE BREAKDOWN FORM				Form No. PSS A2	Page no. 1 of 1	Issue 5
RFQ/ITT No.:	18.187.04			COMPANY		
Proposal/Tender No.:	1			Name:	HiQ Beverages Ltd	
Type of Price:	FFP	Firm Fixed Price		Country:	Lithuania	
Economic Condition:	2023					
National Currency (NC):	EUR			Representative		
Exchange Rate (X):	1 EURO =	1.00000	EUR	Name and Title:	Mr. Bean	
Contractual Phase:	N/A			Signature:		
Project/Work Package(s):						

							TOTAL (NC) EUR	TOTAL (EURO) NC / X
	LABOUR							
Direct Labour cost centres or categories Code / Description		*No. of FTE (calculated) U = W / V*	*Sold Hours per ManYear V*	*Manpower Effort No. of Hours W*	*Gross Hourly Rate in NC*			
	Project Manager	0.2	1,600	300	39.24		11,772.00	11,772.00
	Senior Engineer	0.9	1,800	1,550	57.84		89,652.00	89,652.00
	Junior Engineer	0.3	1,800	550	36.72		20,196.00	20,196.00
	Technician	0.2	1,800	400	28.44		11,376.00	11,376.00
	QA Manager	0.0	1,800	80	48.72		3,897.60	3,897.60
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
1	Total Direct Labour Hours and Cost	*1.6*		*2880.0*		A	*136,893.60*	*136,893.60*
	INTERNAL SPECIAL FACILITIES							
Code	*Description*		*Type of unit*	*No. of units*	*Unit rates in NC*			
	Pressure testing Chamber		Day	1	1,000		1,000.00	1,000.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
							0.00	0.00
2	*Total Internal Special Facilities Cost*					B	*1,000.00*	*1,000.00*
	OTHER DIRECT COST ELEMENTS	*Base amounts in NC*	*+ OH %*	*OH amounts in NC*				
3.1	Raw materials	1,455	5.0%	73			1,527.75	1,527.75
3.2	Mechanical parts	1,973	5.0%	99			2,071.65	2,071.65
3.3	Semi-finished products						0.00	0.00
3.4	Electrical & electronic components	733	10.0%	73			806.30	806.30
3.5	HIREL parts							
	a) procured by company						0.00	0.00
	b) procured by third party						0.00	0.00
3.6	External Major Products						0.00	0.00
3.7	External Services	3,000	15.0%	450			3,450.00	3,450.00
3.8	Transport and Insurances						0.00	0.00
3.9	Travel and Subsistence	3,180	10.0%	318			3,498.00	3,498.00
3.10	Miscellaneous	600	5.0%	30			630.00	630.00
3	*Total Other Direct Cost*	*10,941.00*		*1,042.70*		C	*11,983.70*	*11,983.70*
4	**SUB-TOTAL DIRECT COST**				(A+B+C)	D	149,877.30	149,877.30
	GENERAL EXPENSES	*Cost items to which % applies*		*Base Amount in NC*	*OH %*			
5	General & Administration Expenses	1		*136,893.60*	3.75%	E	5,133.51	5,133.51
6	Research & Development Expenses					F	0.00	0.00
7	Other					G	0.00	0.00
8	**TOTAL COMPANY COST**				D+(E+F+G)	H	155,010.81	155,010.81
		Cost items to which % applies		*Base Amount in NC*	*%*			
9	PROFIT	1		155,010.8	8.0%	I	12,400.86	12,400.86
10	COST WITHOUT ADDITIONAL CHARGE					J		0.00
11	FINANCIAL PROVISION FOR ESCALATION					K		0.00
12	**TOTAL COMPANY PRICE**				(H+I+J+K)	L	167,411.67	167,411.67
13	TOTAL SUB-CONTRACTOR PRICE					M		23,969.90
14	REDUCTION for COMPANY CONTRIBUTION					N		0.00
15	**TOTAL PRICE FOR ESA**				(L+M-N)		167,411.67	191,381.57

COMPANY PRICE BREAKDOWN FORM		EXHIBIT "A" TO PSS A2				Issue 5
		Page No. 1		No. of Pages 1		
RFQ/ITT No.:	18.187.04	COMPANY NAME: **HiQ Beverages Ltd**				
Proposal/Tender No.:	1	Name and Title: **Mr. Bean**				
National Currency:	EUR					
Contractual Phase	N/A	Signature				
Applicable to PSS-A2 elements: 3.1-3.4 - 3.6 - 3.7 - 3.10 - 10						
Project / Work Pa(	**CM2000 Development; WP300, WP400, WP500**					

Cost El. No.	ITEM DESCRIPTION	Type of Price	Purchase Currency	Purchase Amount	Exchange rate 1 NC =	Amount in NC
3.1	Raw Materials: Copper, Stainless Steel for component manufacturing	FFP	EUR	1,455.00	1.00000	1,455.00
3.2	Mechanical Parts: Soldering support equipment, mechanical seals, slides, hinges, toggle clamps	FFP	EUR	1,973.00	1.00000	1,973.00
3.4	Electrical & electronic components: resistors, capacitors, LEDs, transistors, etc	FFP	EUR	733.00	1.00000	733.00
3.7	External Test Facility: ASTM f2990 Certified Commercial Coffee Brewers Testing Facility at Brewzone, Italy	FFP	EUR	3,000.00	1.00000	3,000.00
3.9	Travel and Subsistence: Meeting with Subco, testing travel to Italy (see Exb. B)	FFP	FFP	3,180.00	1.00000	3,180.00
3.10	Miscellaneous: raw food material for testing (coffee, cocoa beans, tea, syrups, milk)	FFP	FFP	600.00	1.00000	600.00

TRAVEL PLAN AND COST DETAIL		EXHIBIT "B" TO PSS-A2											Issue 1
RFQ/ITT No.:	18.187.04							Project:	**CM2000 Development**				
Proposal/Tender No.:	1							Company:	**HiQ Beverages Ltd**				
Contractual Phase	N/A												
Economic Condition:	2023							Type of Price:	FFP				
National Currency (NC)*:	**EUR**							Exchange (X): 1 EURO =	1 EUR				

WP Reference Number	WP Title	Purpose/Event	Departure	Destination	Nr. of Trips	Avg.People per Trip	Travel Cost p.p. (NC)	B / E	Avg.Days per Trip	Subsistence Cost p.d. (NC)	A / R	Total Cost (NC)	Total Cost (EURO)
WP400	Detailed Design	Progress meeting #5	Vilnius, Lithuania	Riga, Latvia	1	2	100	E	2	120	R	680	680
WP500	Prototype Development and Test	Critical Performance test at ASTM F2990 Certified Commercial Coffee Brewers Testing Facility	Vilnius, Lithuania	Brewzone, Italy	1	2	300	E	2	150	R	1,200	1,200
WP500	Prototype Development and Test	Final Presentation of Project Outcome	Vilnius, Lithuania	Noordwijk, Netherlands	1	2	250	E	2	200		1,300	1,300
Total Cost, WBS level 1 (equal to the item 3.9 of PSS-A2)												**3,180**	**3,180**

PSS-A1 form

COMPANY RATES AND OVERHEADS	FORM No. **PSS A1**	Page no. 1 of 1	Issue 5
		COMPANY NAME: HiQ Beverages Ltd; Lithuania	
RFQ/ITT no.:	18.187.04		
PROPOSAL no.:	1	Name and title: Mr. Bean	
ECONOMIC CONDITIONS:	2023		
NATIONAL CURRENCY (NC):	EUR	Signature:	
VALIDITY 6 months	From. 01.01.2023 to 31.06.2023		
ESA Audit agreement reference / date	N/A		

					Agreed by				
					Status (x when applicable)				

1. LABOUR

Direct labour cost centres or categories Code and Name		*Basic Hourly Rate (NC)*	*Direct Overhead (% or Rate in NC)*	*Gross Hourly Rate (NC)*
	Project Manager	32.70	20	39.24
	Senior Engineer	48.20	20	57.84
	Junior Engineer	30.60	20	36.72
	Technician	23.70	15	27.26
	QA Manager	40.60	20	48.72

2. INTERNAL SPECIAL FACILITIES

Facility Code and Name		*Type of Unit*	*UNIT RATE (NC)*
	Pressure testing chamber	Day	1000

3. OTHER COST ELEMENTS

Standard ESA type		*According to normal company type*	*OVERHEAD %*
3.1	Raw materials		5
3.2	Mechanical parts		5
3.3	Semi-finished products		10
3.4	Electric & electronic components		10
3.5	Hirel parts		10
	a) procured by company		5
	b) procured by 3rd party		10
3.6	External major products		10
3.7	External services		15
3.8	Transport, insurance		10
3.9	Travels		10
3.10	Miscellaneous		10

GENERAL EXPENSES

According to ESA type	*According to normal company type*	*Applicable on cost element no.*	*OVERHEAD %*
5. General & Administration expenses		1	8.0
6. Research & Development expenses			0
7. Other (specify)			

PSS-A8 form

COMPANY MANPOWER AND PRICE SUMMARY PER WP Form no. **PSS A8** Page X of Y Issue 5

ITT/RFQ:	18.187.04	Price Type:	FFP
Proposal/Tender No.:	1	Economic Conditions:	2023
Company Name:	HiQ Beverages Ltd	National Currency (NC):	EUR
Contractual Phase:	N/A	Exchange Rate: 1 EUR =	1
WBS-Level (Number and Title):	1 Workpackage		

WP Title		Management	Requirement Specification and concept	Preliminary Design	Detailed Design	Prototype Development & Test									
WP Number		100	200	300	400	500									Total WBS-Level
Labour Hours per category	Hours														
Project Manager	#	300													300
Senior engineer	#		190	140	680	540									1,550
Junior Engineer	#		50	100	100	300									550
Technician	#			120	40	240									400
QA Manager	#			10	10	60									80
…	#														
…	#														
…	#														
Total Labour Hours	#	300	240	370	830	1,140									2,880
1. Total Labour Cost	NC	11,772.00	12,825.60	15,669.60	44,628.00	51,998.40									136,893.60
2. Internal Special Facilities Cost	NC					1,000.00									
3.1-3.4 Material Costs	NC			1,933.00		2,472.70									4,405.70
3.5 High Rel Parts Costs	NC														
3.6 External Major Products Cost	NC														
3.7 External Services Cost	NC					3,450.00									3,000.00
3.8 Transport/Insurance Cost	NC														
3.9 Travel and Subsistence Cost	NC				780.00	2,718.00									3,498.00
3.10 Miscellaneous Cost	NC					630.00									630.00
3. Total Other Costs (sum of above 3.x)	NC	0.00	0.00	1,933.00	780.00	9,270.70									11,983.70
4. Sub-Total Direct Cost	NC	11,772.00	12,825.60	17,602.60	45,408.00	62,269.10									149,877.30
5.- 7. General expenses	NC	441.45	480.96	587.61	1,673.55	1,949.94									5,133.51
8. Sub-Total Company Cost	NC	12,213.45	13,306.56	18,190.21	47,081.55	64,219.04									155,010.81
9. Profit Fee	NC	977.08	1,064.52	1,455.22	3,766.52	5,137.52									12,400.86
10. Cost without additional charge	NC														
11. Financial Provision for escalation	NC														
12. Total Company Price	NC	13,190.53	14,371.08	19,645.43	50,848.07	69,356.56									167,411.67
	EURO														
13. Total Sub-Contractors Price	NC				12,943.80	11,026.10									23,969.90
	EURO														
14. Reduction for Company contribution	NC														
15. Total Price for ESA	NC														
	EURO	13,190.53	14,371.08	19,645.43	63,791.87	80,382.66									191,381.57

If more than 12 WPs are to be reported, then duplicate the form as necessary, do not add columns.
If Labour Categories require more lines, please add as necessary.