

## Scope of Work

### Technical Work Package for DEC embedded control Software Development Life

#### Cycle for class of small gas turbines

**1. Objective:**

The objective of this requirement is to procure technical work package services to carry out the activities pertaining to DO-178B Level-A process implementation for safety critical embedded control Software Development Life Cycle (SDLC) of ATGG DEC embedded control Software.

The entire set of activities shall be carried out by the technical work package team for design and development of embedded software along with the configuration management activities.

**2. Pre-bid information**

**2.1. Pre-Qualification Criteria**

The **Industry Partner** shall comply with the following Pre-Qualification criteria. Non-compliance with these shall make the Industry Partner liable for rejection. The Industry Partner shall submit documentary proofs for the same, as part of the technical bid.

2.1.1 The Industry Partner shall have core competence in the area of **safety critical airborne software design and development** as per **DO-178B level A** guidelines for preceding 6 years (i.e., between 2018-2023) at the time of submission of Techno Commercial Bid. Industry Partner should have executed design and development of such software projects for reputed organizations like DRDO/ISRO/NAL. Copies of the related supply orders shall be enclosed with the technical proposal. The scope of work of the executed orders if required shall be shared at the technical evaluation stage.

2.1.2 The Industry Partner should be AS 9100 or SEI CMM Level 3 (or above) certified. Copy of valid certificates to this effect should be submitted along with the tender documents. Non-submission of the same would lead to rejection of such proposal.

2.1.3 The Industry Partner's technical domain experts (to be deputed for this work package service) shall possess the following:

- (a) B.Tech/B.E in Computer Science.
- (b) More than 3 years experience in designing and developing critical airborne software with all phases of SDLC activities.
- (c) Familiarity with C language, MISRA C coding standard, DO 178B guidelines.
- (d) Experience in end-to-end usage of SDLC tools like LDRA tool suite, ASTREE etc.
- (e) Documentation experience in airborne safety critical certification as per DO-178B guidelines.
- (f) Experience in using Software Configuration Management tools - Bazaar, IBM Workflow Manager, IBM Rational Team Concert.

2.1.4 The Industry Partner shall provide an undertaking along with techno commercial bid for the following :

- (a) Deputed technical domain experts possess the experience, mandatory skill set and qualification as per section 2.1.3
- (b) The technical domain experts shall continue their services throughout the duration of contract.

2.1.5 The Industry Partner shall provide bio-data of at least 6 technical domain experts who will be scrutinised for their technical competence at a later stage.

2.1.6 The Industry Partner shall have at least one functioning office in Bangalore with technical expertise team for coordination, liaisoning and other communication

2.1.7 The Industry partner has to maintain at least 3 Technical Domain Experts in GTRE throughout the term of the contract.

## 2.2. Contract Management and Exit Clause

The terms and conditions shall be adhered to during the execution of this contract

### 2.2.1 Deputation of Industry Partner's technical experts

Before the Industry Partner's Technical Domain Experts are deputed to GTRE,

- (a) GTRE shall conduct interview of the technical domain experts (**only for technical domain experts proposed in Section 2.1.5 by the Industry Partner**) to be deputed to GTRE for these services
- (b) GTRE shall verify the credentials, experience profile and remunerations of such technical experts

### 2.2.2 Exit Clause

If the Industry Partner is not able to provide services as per the expected quality and time frame for any particular milestone, GTRE will short close the contract. Payment will be made only for the completed milestones and **NO PAYMENT** will be made for incomplete milestone service.

## 3 Product details and specification:

### 3.1 Quantity Specification

The Industry Partner shall provide technical services as per the table below:

Sl. No.	Name of Service	Quantity of Service	Specification
1.	Technical Work Package for DEC embedded control Software Development Life Cycle for class of small gas turbines	01 (One)	Scope as per Section 3.2



### 3.2 Technical Work Package details/ requirements

To cater to the activities pertaining to DO-178B Level-A process implementation for safety critical embedded control Software Development Life Cycle (SDLC) of ATGG DEC, Technical work package for the following services is required.

Sl. No.	Service Requirement	Activities/Services Description
1)	<b>Planning Phase activities for DEC embedded control software</b>	<b>Technical domain experts</b> shall carry out <b>Software Planning</b> related activities. Following are the deliverables that need to be prepared, reviewed and released during the planning phase: <ul style="list-style-type: none"><li>- Planning documents and standards</li><li>- Risk assessment and risk mitigation plan</li><li>- Configuration items identification of artefacts</li><li>- SCM Records updation</li></ul>
2)	<b>Requirement Phase activities for DEC embedded control software</b>	<b>Technical domain experts</b> shall carry out <b>Software Requirement</b> related activities. Following are the deliverables that need to be prepared, reviewed and released during the requirement phase: <ul style="list-style-type: none"><li>- Detailed SRS/ SRD document</li><li>- Configuration items identification of artefacts</li><li>- SCM Records updation</li></ul>
3)	<b>Design Phase activities for DEC embedded control software</b>	<b>Technical domain experts</b> shall carry out <b>Software Design</b> related activities. Following are the deliverables that need to be prepared, reviewed and released during the design phase: <ul style="list-style-type: none"><li>- High Level Design specification document</li><li>- Detailed Design document</li><li>- Configuration items identification of artefacts</li><li>- SCM Records updation</li></ul>
4)	<b>Development (Coding) Phase activities for DEC embedded control software</b>	<b>Technical domain experts</b> shall carry out <b>Coding Phase</b> related activities. Following are the deliverables that need to be prepared, reviewed and released during the coding phase: <ul style="list-style-type: none"><li>- Source code generation in C language</li><li>- Configuration items identification of artefacts</li><li>- SCM Records updation</li><li>- Source code review as per SDP</li><li>- Perform designer level Code Walk through and generate report</li><li>- Perform Source Code compliance and generate report</li><li>- Establish forward as well as backward traceability and generate traceability report</li><li>- Static analysis reports</li><li>- Control coupling and data coupling reports</li><li>- Metrics report</li><li>- Run time analysis report</li><li>- Stack analysis report</li><li>- Any other static analysis report as required for certification</li></ul>

Sl. No.	Service Requirement	Activities/Services Description
5)	<b>Perform Software Integration and Testing activities for the Engineering Release of DEC embedded control Software</b>	<p><b>Technical domain experts</b> shall integrate the source code and produce the <b>Executable Object Code (EOC)</b>. Following are the deliverables that need to be prepared, executed and reviewed during the integration phase.</p> <ul style="list-style-type: none"> <li>- Executable Object Code (EOC) generation</li> <li>- Configuration items identification of EOC</li> <li>- Software designer level test plan</li> <li>- Software test cases and procedures</li> <li>- CSU test report</li> <li>- Software test reports</li> <li>- Testing related review documents</li> <li>- Traceability report</li> <li>- CSCI Integration test report</li> <li>- Configuration items identification of testing artefacts</li> <li>- Problem reporting, change control, change review and configuration status accounting</li> <li>- Review feedback reports</li> <li>- Modification to necessary artifacts</li> <li>- Baselines and traceability establishment</li> <li>- Preparation of Certification Reviews including required checklists</li> <li>- Software Life Cycle Environment Configuration Index (SLECI)</li> <li>- Software Configuration Index (SCI)</li> <li>- Software accomplishment summary (SAS)</li> <li>- Configuration items identification of baseline artefacts</li> <li>- Configuration items identification of certification artefacts</li> <li>- SCM Records</li> </ul>

#### 4 Scope of work of Industry Partner:

The following shall be the Industry Partner's scope of Work:

- (a) All the technical Services as mentioned in para 3.2 shall be supplied by the Industry Partner at GTRE (or at GTRE identified location)
- (b) It is estimated that at least 03 (Three) technical domain experts shall be required to complete these activities in 15 Months
- (c) The technical experts deputed to GTRE by the Industry Partner shall have minimum experience in Para 2.1.3
- (d) Industry Partner shall provide necessary Identification Documents (e.g. Aadhar, PAN etc) of its technical domain experts deputed for this service, to GTRE for arranging necessary security and administrative permissions at GTRE.
- (e) Industry Partner's technical domain experts deputed for this service, shall abide by all applicable rules and regulations (including safety and access restrictions, if any), at GTRE.
- (f) Industry Partner shall be responsible for boarding and lodging, medical and other such requirements, if any, of its technical experts, who are deputed to GTRE from out station.
- (g) In case any (or more) of the Industry Partner's technical domain experts deputed for this service are absent for more than three days, the Industry Partner shall compensate by deputing additional experts/additional hours, so that the tasks are completed in time.

(h) Though GTRE follows five day work per week, on urgent or need basis, the technical experts may be required to work on Saturday/ Sunday/ Holidays too as per project requirements.

**4.1 Inspection and testing:**

NIL

**4.2 Installation and commissioning:**

NIL

**4.3 Training:**

NIL

**5 Scope of work of GTRE:**

- 5.1. The work space, systems, software tools and necessary documents / templates and other relevant data for carrying out the activities shall be provided by GTRE.
- 5.2. Entire set of activities shall be carried out at GTRE premises and GTRE teams shall review and provide feedback on the tasks being carried out by the Industry Partner's technical domain experts and monitor the progress of work on a weekly basis.
- 5.3. GTRE shall provide following inputs at various phases to execute the activities of Work package

SI No.	Phases	Inputs provided by GTRE
1.	Planning Phase	<ul style="list-style-type: none"> <li>• System Requirement Specifications Document / Functional Requirement Document</li> <li>• Interface Requirements Document</li> <li>• Safety Assessment Document</li> <li>• Templates for Planning phase documents</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> </ul>
2.	Requirement phase	<ul style="list-style-type: none"> <li>• Device driver documents</li> <li>• Hardware specific / BSP documents</li> <li>• Template for SRD</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> </ul>
3.	Design phase	<ul style="list-style-type: none"> <li>• Interface Control Document</li> <li>• Template for SDD</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> </ul>
4.	Coding phase	<ul style="list-style-type: none"> <li>• Compiler setup(IDE) and associated tools</li> <li>• Basic usage guidelines for IDE and compiler</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> </ul>

5.	Software integration and testing (Designer Level)	<ul style="list-style-type: none"> <li>• Test setup and associated tools</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> <li>• Black box, white box, grey box testing tools setup</li> <li>• Review feedbacks from IV&amp;V team, SQA team and other stakeholders</li> </ul>
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5.4. GTRE will issue appropriate service completion certificate on the completion of milestones

**6. Deliverables by the Industry Partner:**

**6.1. Hardware/ software deliverables:**

NIL

**6.2. Service deliverables:**

Sl. No.	Name of Service	Quantity of Service	Specification
1.	Technical Work Package for DEC Core Application Software Development Life Cycle for class of small gas turbines	01 (One)	Scope as per Section 3.2

**6.3. Documents:**

6.3.1 The Industry Partner shall provide soft copies of all the documents / reports/ artifacts and source code for Technical Work Package as mentioned below:

Time	Phases	Deliverables	Milestone Payment
T0 + 90 days (Milestone 1)	Planning Phase	<ul style="list-style-type: none"> <li>• SDLC Planning document</li> <li>• Risk assessment and risk mitigation plan</li> </ul>	20%
T0 + 180 days (Milestone 2)	Requirement Phase	<ul style="list-style-type: none"> <li>• Detailed SRS document</li> </ul>	20%
T0 + 270 days (Milestone 3)	Design Phase	<ul style="list-style-type: none"> <li>• High Level Design document</li> <li>• Detailed Design document</li> </ul>	20%
T0 + 360 days (Milestone 4)	Coding Phase	<ul style="list-style-type: none"> <li>• Source code</li> <li>• Code walk through report</li> <li>• Source Code compliance report</li> <li>• Traceability report</li> <li>• Static analysis reports</li> <li>• Control coupling and data coupling reports</li> <li>• Metrics report</li> <li>• Run time analysis report</li> <li>• Stack analysis report</li> </ul>	20%

  
Signature of SPC

  
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Time	Phases	Deliverables	Milestone Payment
T0 + 450 days (Milestone 5)	Software Testing and Integration Phase	<ul style="list-style-type: none"> <li>• Executable Object Code</li> <li>• Integration test report</li> <li>• Software designer level test plan</li> <li>• Software test cases and procedures</li> <li>• CSU test report</li> <li>• Software test reports</li> <li>• Review documents for Testing</li> <li>• Traceability report</li> <li>• CSCI Integration test report</li> <li>• Review feedback reports</li> <li>• Modification reports</li> <li>• Baselines and traceability reports</li> <li>• Certification Reviews reports and checklists</li> <li>• Software Life Cycle Environment Configuration Index (SLECI) report</li> <li>• Software Configuration Index (SCI)</li> <li>• Software accomplishment summary (SAS)</li> <li>• SCM Records</li> </ul>	20%

**7. Inspection and acceptance criteria:**

All documents / reports/ artifacts and source code submitted will be reviewed weekly by GTRE team and the necessary modifications shall be carried out by the Industry Partner’s expert. In addition, deliverables identified in each milestone will be reviewed by GTRE for technical compliance prior to processing of payment.

**8. Warranty:**

NIL

**9. Delivery schedule:**

The Industry Partner shall carry out the activities as mentioned in the scope of work and shall generate the deliverables as per section 6. The Industry Partner shall deploy its technical domain experts at GTRE within 15 days of acceptance of order to start the work. The entire set of activities shall be completed within a span of **450 days**.

**10. Payment terms and Exit Clause:**

Milestones based Part payment shall be done as per the schedule given in Annexure-A.

**11. General terms and conditions:**

**11.1.** The technical domain experts will be scrutinized for their technical competence (through conducting either test or interview or both) at GTRE prior to the deployment.

- 11.2. The technical domain experts shall demonstrate consistent performance throughout the tenure & shall comply strictly with the scope of work within the time frame.
- 11.3. Technical domain experts may suitably be replaced if they are not found to be technically competent.
- 11.4. Any feedback from GTRE regarding proper implementation of DO-178 B/C process shall be under the domain of the Industry Partner's scope of work. Any other document required for compliance of DO-178B/C standard shall be done by technical domain experts without any additional cost.
- 11.5. Industry Partner shall sign an NDA in the standard and government agreed format with G.T.R.E.
- 11.6. The technical domain experts shall abide by the rules and regulations of GTRE including the working hours. During the project duration, the team members shall exclusively handle GTRE's project only.
- 11.7. The technical domain experts shall co-operate with the internal teams during the entire project.

**12. Documents to be submitted along with quotation:**

- 12.1. Industry Partner must provide a compliance matrix to all the points given in the scope of work including annexure by signing with company's seal indicating that all points in the scope of work has been read, understood and hence complied by the Industry Partner.
- 12.2. Industry Partner shall provide documentary evidence/ proof for supporting Section 2.1.1, 2.1.2, and 2.1.6
- 12.3. The Industry Partner shall provide Bio-data of at least 6 technical domain experts who will be scrutinised for their technical competence at a later stage (as per Section 2.1.3 and Section 2.1.5).
- 12.4. The Industry Partner shall provide an undertaking to support Section 2.1.4

**Annexure -A**  
**Milestones for activities of Work package 1**

The complete set of activities is spread across **450 days**. The activities which are supposed to complete in every milestone from the starting of the services (T0) is shown in the table below. The percentage of work load during the period is also indicated. Payment to the Industry Partner shall be based on the completion of each milestone.

Time	Industry Partner Responsibilities		Milestone Payment
	Phases	Deliverables	
T0 + 90 days (Milestone 1)	Planning Phase	<ul style="list-style-type: none"> <li>• SDLC Planning document</li> <li>• Risk assessment and risk mitigation plan</li> </ul>	20%
T0 + 180 days (Milestone 2)	Requirement Phase	<ul style="list-style-type: none"> <li>• Detailed SRS document</li> </ul>	20%
T0 + 270 days (Milestone 3)	Design Phase	<ul style="list-style-type: none"> <li>• High Level Design document</li> <li>• Detailed Design document</li> </ul>	20%
T0 + 360 days (Milestone 4)	Coding Phase	<ul style="list-style-type: none"> <li>• Source code</li> <li>• Code walk through report</li> <li>• Source Code compliance report</li> <li>• Traceability report</li> <li>• Static analysis reports</li> <li>• Control coupling and data coupling reports</li> <li>• Metrics report</li> <li>• Run time analysis report</li> <li>• Stack analysis report</li> </ul>	20%
T0 + 450 days (Milestone 5)	Software Testing and Integration Phase	<ul style="list-style-type: none"> <li>• Executable Object Code</li> <li>• Integration test report</li> <li>• Software designer level test plan</li> <li>• Software test cases and procedures</li> <li>• CSU test report</li> <li>• Software test reports</li> <li>• Review documents for Testing</li> <li>• Traceability report</li> <li>• CSCI Integration test report</li> <li>• Review feedback reports</li> <li>• Modification reports</li> <li>• Baselines and traceability reports</li> <li>• Certification Reviews reports and checklists</li> <li>• Software Life Cycle Environment Configuration Index (SLECI) report</li> <li>• Software Configuration Index (SCI)</li> <li>• Software accomplishment summary (SAS)</li> <li>• SCM Records</li> </ul>	20%