

# Annexure I

The respondent shall have significant experience in design, fabrication, assembly, integration and maintenance of secondary drive systems like Hexapod or equivalent. The respondent shall also have ample experience in the development, implementation and control of the systems like secondary drive preferably using open source architect such as Linux. It will be beneficial to highlight projects that went beyond product delivery and that also involved onsite integration & verification and subsequent support.

To highlight the above requirements, contractor shall provide details of past and present projects that have similar technical and/or programmatic characteristics to this project. The ideal response will cover system engineering, development, system integration and support. Contractor shall describe in detail the role played by them in each of these efforts. For each of the efforts identify which aspects were similar to this project. Describe the outcome of each of these efforts in terms of technical performance, schedule and budget. Include an organizational chart if available as well as details such as duration, schedule, budget, geographical characteristics, number of organizations involved, and number of interfaces.

If possible, provide relevant documents (in brief) like design documents, user manuals, and requirement interface documents, error budgets, training manuals or any other technical documents that may support the claims made by the contractor.

## **Contractor's technical competencies :**

Telescope refurbishment task requires a set of core developer skills. These core technical competencies are:

- Experience in design, fabrication, assembly, integration and maintenance of secondary drive system of telescopes with primary aperture bigger than or equal to 1m.
- Experience in integrating Hexapod or equivalent secondary drive system with the Telescope Control System (TCS).
- Experience in Object Oriented (OO) based software development
- Experience using open source based software development
- Experience with scripting
- Experience with C or C++
- Experience in developing multi-threaded, scalable, distributed applications
- Experience with Linux and Real Time Operating System (RTOS)
- Experience in utilizing open source messaging systems
- Experience in executing similar projects in an efficient manner
- Experience in understanding and maintaining external and internal Interface Control systems
- Experience with a rigorous design review process

Contractor shall provide details (in no more than five pages) that show compliance, where possible, with the competencies listed above. If compliant, the response shall include a short description of how the technical skill was used, the duration of experience and if the associated

people are available to be assigned to this work. Where non-compliant, there should be a description of how these competencies will be covered. System engineering should encompass

- Requirement definition
- Interface definition
- Budgeting (error, timing, performance)
- System architecture and design
- Hazard analysis
- Compliance documents
- Verification and Validation plans and processes
- Formal change control and configuration management processes
- Formal Review Processes
- Risk management

### **Contractor's project management capabilities : Insight**

The contractor shall have demonstrated experience in project management of similar nature. This includes development, maintenance, and use of schedules, budgets, resource allocation, and risk management. The contractor shall also have a history and mature processes for supporting and integrating into large, projects. The contractor must be able to assign a Project Manager who is expected to have

- experience in managing projects of similar size and complexity.
- excellent interpersonal and communication skills.

The contractor will be required to develop & maintain Schedules, Budgets, Staffing Plans, Interface Control Documents, Hazard and Failure Mode Analysis, Software Design Documents, Assembly Integration and Verification Plans, Operations Concept Definition Documents, Quality Assurance Plans, Compliance Matrices, Risk Registers with risk mitigation plans and more. Formal reviews for the various phases will also need to be supported.

### **Contractor's response:**

Provide a description (in not more than 5 pages) of how the respondent handles SOW Project Management for efforts of size similar to this project. Include a description of tools and processes used for requirements management, estimation, scheduling, resource allocation, budget, risk management, and brainstorming. Documentation should indicate not only how these work products are created but also how they are maintained. Also include a list of tools and processes used. Provide a description of the respondent's knowledge of Earned Value Management (EVM) and provide examples of where they had used EVM in the past or present. Provide one or more past examples of how the contractor's team integrated into a customer's team creating one seamless team. Describe the engagement model(s) that the contractor has used in the past. Describe any tools used to enable integration of geographically dispersed teams.

## **Contractor's ability to appropriately staff the telescope refurbishment effort :**

The senior technical staff member(s) that are assigned to this project should have a minimum of eight years of experience in the development and delivery of complex distributed software control systems or successfully completed two or more projects of similar nature. Technical staff assigned to this project should be a good match to the technical competencies listed above and have experience with rigorous system engineering processes. Leads should have good communication skills, motivation, experience with the formal review process, and knowledge of the complete design, development, deployment, and support software life cycle processes.

As mentioned under technical competencies having a person with good system engineering skills will be crucial for meeting the technical needs and also for providing the capability to acquire the necessary domain experience. Response should include an identification of who will assume the system-engineering role and describe past system engineering experience. Specific experience in the development of domain expertise should be highlighted.

Provide following details (no more than 6 pages)

Response should include (provide details in no more than 6 pages) an identification of who will assume the project management role and describe past project management experience for projects sized similar to this. Include a list and brief biography of other staff members that would be working on this project as the effort matures and grows, or identify the key posts that will be involved with the first phase of this project and in subsequent phase(s). Describe the role that each of these individuals in the corresponding post will play in this effort and highlight any reporting structure. Provide a minimum required qualification for each of these posts, including technical and programmatic capabilities (if such manpower exists with the company/organisation, provide resume, their compliance to technical competencies, past relevant experience, years with company, percentage of time available to work on this project in this phase and future phases). Include distinct sections for the design, fabrication, onsite integration and test and subsequent support tasks.

## **Contractor's domain experience and ability to acquire further expertise : Insight**

The domain competencies:

In a more general sense the full set of domain competencies to successfully complete this project include:

- Developing an understanding of the system wide capabilities of the engineering groups and an understanding of sub-system interfaces and functionality
- Developing a basic understanding of how Astronomical Optical Observatories work
- Understanding astrometric conversions
- Understanding acquisition, nodding, dithering and guiding
- Understanding telescope pointing models including analysis and fitting
- Understanding CCD Camera Control
- A general understanding of control loops, kinematics, command shaping and trajectory control.

Contractor should provide (in no more than 3 pages) prior experience with successfully utilizing third party and vendor provided support libraries and frameworks even if they are not telescope related.

Contractor should provide prior experience with SLALIB, TCSpk, TPK or TPOINT or equivalent astrometric calculation software, PLC and motion control. Contractor should describe past experience in engaging with domain experts, for the purpose of bridging knowledge gaps, either internally or externally to their organization on a consultancy or contract basis.

**Contractor's proposed plan to complete the first phase:**

The contractor should provide point of contact and communication norms. The contractor should also provide schedule with the milestones, staffing and schedule connectivity, for the completion of the first phase. The staffing details at the site is required as it needs special permission from Government of India.

Contractor to provide an engagement plan that supports the orientation, meetings and progress updates. This plan should cover the expected travel, regular meetings and expected reporting if significant issues arise such as schedule slip or significant overrun.

**Contractor's estimated price for the first Phase**

Contractor shall provide a total price for the Phase-1. This will include labor costs (rates \* hours), travel expenses, taxes and any other expenditure. The travel information should cover the full travel policy and include:

- Who is responsible for arranging travel?
- Which flight class is used for the travel?
- What the Lodging rates are?
- What per diem is paid by the contractor?
- How is travel time charged; does contractor pay differently for weekends and Holidays, etc.?

Please note that the details of travel policy are requested only to understand the estimated price and to understand future travel costs. Contractor shall be responsible for all the travel expenses and include these in the commercial bid to be submitted for the Phase-1.