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SECOND TARGET STATION (STS) PROJECT

Acquisition Strategy for the Moderator Reflector Assembly

Jim Janney

3/18/2024

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

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Approvals

Acquisition Strategy for the Moderator Reflector Assembly		ISSUE DATE: 3/18/2024
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	Signature / Date					
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Moderator Reflector Assembly Task Leader	Jim Janney					
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Neutron Production Systems Group Leader	Daniel Lyngh					
	Daniel Lyngh Digitally signed by Daniel Lyngh Date: 2024.03.19 12:19:24 -04'00'					
Target Systems Level 2 Manager	Peter Rosenblad					
	Peter Rosenblad Digitally signed by Peter Rosenblad Date: 2024.03.18 22:18:26 -04'00'					

Revision	Description
00	Initial Release

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1. PURPOSE

This document describes the acquisition strategy for the Moderator Reflector Assembly. The intent of this document is to show that the acquisition strategy if reasonable for purchasing of the Moderator Reflector Assembly.

2. SCOPE

The scope of this document is the acquisition strategy of the Moderator Reflector Assembly from part machining through final assembly.

3. ACRONYMS AND DEFINITIONS

MRA Moderator Reflector Assembly
SSC Structure, System or Component
STS Second Target Station

4. REFERENCES

4.1 DOCUMENTS APPLICABLE TO THE ACQUISITION OF THE MRA

Ref	Document Title	Document Number
[1]	Moderator Reflector Assembly Fabrication Strategy	S03040000-MFP10000

5. ACQUISITION STRATEGY

5.1 GENERAL STRATEGY

The Moderator Reflector Assembly (MRA) will be acquired in a series of design to print subcontracts with an estimated value of $4 million, as seen in Figure 5.1. The acquisition of the MRA will be broken into many subtasks due to the diverse nature of the capabilities required to build an MRA, as seen in the MRA Fabrication Strategy [1]. The expected duration of MRA procurements is slightly over 2.5 years. Due to the high risk nature of the MRA fabrication and history of delays with similar procurements, the first MRA procurement will start immediately once STS Subproject 2 is approved to begin procurements.

Moderator Reflector Assembly (MRA)		790	16-Jun-26 08:00	07-Aug-29 17:00	855	$4,026,232
Moderator Reflector Assembly		790	16-Jun-26 08:00	07-Aug-29 17:00	855	$4,026,232
Procurement/Fabrication		790	16-Jun-26 08:00	07-Aug-29 17:00	855	$4,026,232
TEMP - ORIGINAL CD1 Tasks		665	14-Dec-26 08:00	07-Aug-29 17:00	855	$4,026,232
TEMP - ORIGINAL CD1 Tasks		665	14-Dec-26 08:00	07-Aug-29 17:00	855	$4,026,232
TS04IPL491	IPL> Start Moderator Reflector Assembly Fabrication	0	14-Dec-26 08:00		822	$0
TS048150	Manufacturing Oversight - MRA	665	14-Dec-26 08:00	07-Aug-29 17:00	855	$0
TS043520	Manufacture Moderators - MRA	375	14-Dec-26 08:00	12-Jun-28 17:00	822	$1,153,855
TS043521	Manufacture Berylium - MRA	250	15-Jun-27 08:00	12-Jun-28 17:00	822	$1,000,756
TS043524	Manufacture Reflector Components - MRA	125	13-Dec-27 08:00	12-Jun-28 17:00	822	$253,829
TS043527	Assemble Reflector Structure and moderators - MRA	125	13-Jun-28 08:00	08-Dec-28 17:00	822	$133,589
TS043525	Manufacture Backbone - MRA	250	13-Dec-27 08:00	08-Dec-28 17:00	822	$258,871
TS043522	Manufacture Piping - MRA	250	13-Dec-27 08:00	08-Dec-28 17:00	822	$571,557
TS043523	Manufacture Shield Block - MRA	188	14-Mar-28 08:00	08-Dec-28 17:00	822	$223,766
TS043528	Final MRA Assembly - MRA	125	11-Dec-28 08:00	11-Jun-29 17:00	822	$430,008
TS043530	Conduct Receipt and Acceptance - MRA	40	12-Jun-29 08:00	07-Aug-29 17:00	822	$0
TS04IPL540	IPL> Complete Moderator Reflector Assembly Fabrication	0		07-Aug-29 17:00	855	$0

Figure 1. MRA Procurement Subtask List

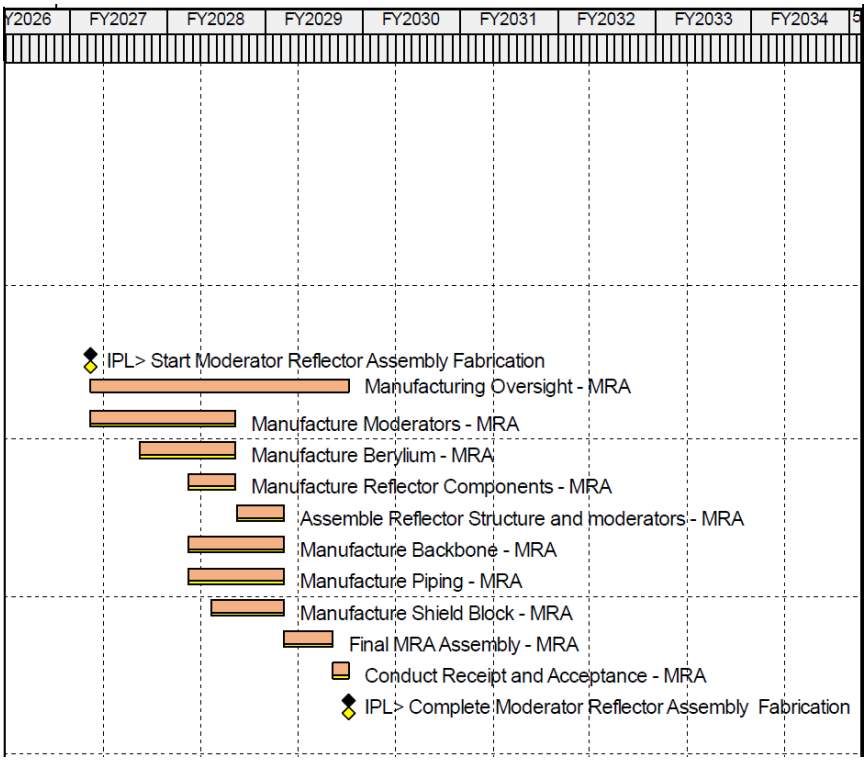

Figure 2. MRA Procurement Subtask Gantt Chart.

5.2 MODERATOR FABRICATION

The moderator fabrication involves high precision complex machining and subsequent electron beam welding of small aluminum components. These two capabilities are not generally available from the same vendor, so the moderator fabrication will utilize a vendor with high precision complex machining capabilities and project management capabilities to manage a sub tier electron beam welding vendor. In order to allow for extensive manufacturing oversight, a vendor local to Oak Ridge is preferred. Due to the critical nature of the welding, all weld inspection will be performed at ORNL.

5.3 BERYLLIUM FABRICATION

The beryllium fabrication options are extremely limited due to limited producers and limited machine shops capable of dealing with the hazards of machining beryllium. The only domestic source of beryllium material is Materion. Materion also is well integrated with vendors capable of machining the beryllium shapes required for the MRA. In order to reduce risk, the beryllium fabrication will utilize Materion as the vendor for the finished beryllium product. This strategy will require a sole source procurement and additional time must be allocated for placement of the contract.

5.4 REFLECTOR PART MACHINING

The reflector part machining requires high precision complex machining of small aluminum components. This capability is readily available; however, it would be convenient to utilize the same vendor as the moderator fabrication.

5.5 REFLECTOR VESSEL ASSEMBLY

The reflector vessel assembly involves integrating the components produced in the moderator fabrication, beryllium fabrication, and reflector part machining into welded reflector vessels. The vendor must have precision assembly and high quality aluminum welding capabilities, as well as the ability to manage a sub tier electron beam welding vendor. The completed assemblies weigh only 40 kg, so no heavy lifting capability is required. To allow for extensive manufacturing oversight, a vendor local to Oak Ridge is preferred. Due to the critical nature of the welding, all weld inspection will be performed at ORNL.

5.6 BACKBONE FABRICATION

The backbone fabrication is substantially less complex than the moderator and reflector fabrication, but requires extensive deep hole drilling, CNC milling, and stainless steel welding. The components to be fabricated are relatively small, with approximate dimensions of 600 x 400 x 225 mm or less and mass of 200 kg or less. Vendors with all of these capabilities in house are preferred for this fabrication.

5.7 PIPING FABRICATION

The MRA piping fabrication is relatively straightforward other than the hydrogen transfer line, which requires invar tubing surrounded by a vacuum jacket. The vendor for the piping fabrication should be experienced in fabrication for cryogenic applications and have welding and helium leak checking capabilities in house.

5.8 SHIELDING FABRICATION

The MRA shield block requires the same capabilities as the backbone fabrication, but with less complexity and a larger size – approximately 600 x 400 x 700 mm and mass of 1000 kg.

5.9 FINAL ASSEMBLY

The final assembly of the MRA will require precision assembly, welding, and helium leak checking capabilities in order to integrate the above components into a completed MRA, as well as the ability to manage a sub tier electron beam welding vendor. The total mass of the assembly is approximately 1500 kg, so no heavy lifting is required. To allow for extensive manufacturing oversight, a vendor local to Oak Ridge is preferred. The assembly of the upper piping may be deferred until the assembly is on site in order to reduce the risk of shipping damage.