



Development Upgrades of the
Atacama Large Millimeter/submillimeter Array (ALMA)

FY2023

**CALL FOR STUDY PROPOSALS
INSTRUCTIONS**

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I.0 ALMA DEVELOPMENT PROGRAM

I.1 APPLICABLE DOCUMENTS

Document	Doc. No.
ALMA Development Roadmap	AEDM 2018-017-O
Principles of the ALMA Development Program	AEDM 2020-005-O
ALMA Development Projects Implementation Plan	ALMA-10.04.00.00-0025-A-PLA

All documents can be found on the Call's [webpage](#).

I.2 PROGRAM DEFINITION

The Atacama Large Millimeter/submillimeter Array (ALMA) is an international astronomy facility collaboratively operated by Europe, North America, and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC), and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) in Taiwan and the Korea Astronomy and Space Science Institute (KASI) in South Korea.

ALMA Operations are led on behalf of Europe by ESO, on behalf of North America by the NRAO, which is managed by Associated Universities, Inc. (AUI), and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the ALMA Observatory. The JAO coordinates the ALMA Development Program, its goal being to effectively manage the technological evolution of the ALMA facility. Periodically, solicitations (“calls”) are issued by each of the international partners to identify and fund development initiatives (“upgrades”) which will enhance the performance of the ALMA facility. The implementation of ALMA upgrades will be assigned on a competitive basis.

Upgrade priorities are science-driven, and are established by the collective input from the ALMA Science Advisory Committee (ASAC), the ALMA Management Team (AMT), and their respective subcommittees and integrated teams. Upgrades typically progress through three successive phases of development, and correspond to an increasing level of technology readiness. The principal phases are:

- a. studies (including scientific justification, specification, and outline costing),
- b. prototype/pre-production project, and
- c. full production and implementation project.

The North American (NA) ALMA Development Program typically funds conceptual studies (hereafter referred to as “Studies”) every year. Prototype/pre-production and full production initiatives (hereafter referred to as “Projects”) are typically funded every 2-3 years. Principal Investigators (PIs) and funded Co-Investigators (Co-Is) for NA ALMA Development projects or studies must have as their primary affiliation a US or Canadian institution (unfunded or in-kind contributions can be provided by anyone).

Applicants may answer this Call by requesting full (or partial) support to conduct a Study. NRAO/AUI will oversee this process on behalf of the NA ALMA Development Program. This document, together with the accompanying *Study Proposal Template*, and the Call’s [webpage](#), provide all information required to prepare and submit a Study Proposal.

Topics of particular interest to the NA ALMA Development Program (based on the ALMA Development Roadmap) are:

- Larger bandwidths and improved receiver sensitivity: enabling gains in speed
- Longer Baselines: enabling qualitatively new science
- Improvements to the ALMA Archive: enabling gains in usability and impact for the Observatory
- Improved instrumental sensitivity: through increased collecting area
- Increasing wide field mapping speed: enabling greater mapping efficiency

While Proposers are encouraged to align their interests with these goals, they should not be construed as hard constraints. Particularly for studies, novel ideas for new or enhanced scientific capabilities are welcome.

1.3 CURRENT PROGRAM STATUS

The NA ALMA Development Program [webpage](#) contains an archive of previously completed Projects and Studies.

2.0 CALL FOR PROPOSALS

2.1 PROPOSAL SCHEDULE SUMMARY

Project Milestone	Date	Section
Release of Call for Proposals	9 May 2022	2.2
Informational Meeting	7 June 2022	2.4
Deadline for Mandatory Notice of Intent	14 June 2022	2.5
Deadline for Submission of Proposer's Questions	7 July 2022	2.4
Deadline for Proposal Submission	12 July 2022	2.6
Notification of Initial Outcome	Mid-November 2022	6.3
Proposal Start Date	1 January 2023	2.2

2.2 CALL RELEASE

The release date for this Call for Proposals is **May 9, 2022**. The period of performance for funded proposals will run from the award date **January 1, 2023** and are for 1 year. All information and any updates pertaining to this Call for Study Proposals can be found at this [webpage](#). **In order to facilitate rapid distribution of proposals to reviewers, submission of a Notice of Intent by 14, June 2022 is Mandatory.**

2.3 QUESTIONS PERTAINING TO THE CALL FOR PROPOSALS

An informational meeting will be held in virtually via Zoom[®] on **June 7, 2022** at 2:00 pm Eastern Time. Any interested parties will be required to register on the Coordination Meeting's webpage in order to participate by close of business on **June 3, 2022**.

Please submit questions concerning the Call for Proposals, including any request for documentation referred to in this document, to the NA ALMA Development Program at almadevelopment@nrao.edu by **July 7, 2022**.

Questions shall, where possible, make reference to the specific section(s) of the solicitation document requiring clarification. When answering, NRAO will forward replies, together with the questions received, to all Proposers who have submitted a Notice of Intent. Replies will also be posted to the "Frequently Asked Questions" which can be accessed on the Call's [webpage](#).

2.4 NOTICE OF INTENT

Prospective Proposers are required to submit a Notice of Intent (NOI) no later than **June 14, 2022**. The NOI is to be submitted online using the submission form on the Call's [webpage](#).

Submitting an NOI will ensure that Proposers are included in the mailing list for replies to Proposers' questions, aid in selection of panel reviewers, and other correspondence related to this Call for Proposals. A Proposer's NOI is non-binding. Please be sure to include at least one person from each collaborating institution in the NOI, so that relevant conflicts of interest can be avoided for the review panel.

2.5 PROPOSAL DEADLINE

The submission deadline (closing date) is **July 12, 2022**. Proposals received after the deadline may be rejected, at NRAO's sole discretion. Requests to postpone the deadline will not be considered unless express permission from NA ALMA Director.

2.6 ELIGIBILITY

PIs and funded Co-Is for NA ALMA Development proposals must have as their primary affiliation a US or Canadian institution (unfunded or in-kind contributions can be provided by anyone, but must be clearly identified as such). The Principal Investigator need not be an astronomer.

2.7 EXPECTATIONS

Investigators need to be aware of the capabilities of the Array and of the opportunities for upgrading ALMA. Independent Reviewers will be instructed to take these opportunities into account when ranking proposals.

2.8 FUNDING

A study proposal can be for any amount up to \$200K USD. A total of up to \$600K USD is expected to be available for funding this Call's proposals (subject to continued funding). Multiple proposals or no proposals may ultimately be funded; it is up the sole discretion of NRAO/NSF on how many proposals are funded. Applicants may contribute funds from independent sources, combine them with solicited proposal funds, and thereby pursue more aggressive goals.

2.9 AMENDMENTS TO PROPOSAL CALL

NRAO reserves the right to issue amendments to the present Call for Proposals at any time prior to one week before the Deadline for the submission of Proposals (**July 7, 2022**). Any such amendment will be communicated to all Prospective Proposers that have submitted an NOI.

2.10 VALIDITY DATE OF PROPOSALS

A proposal submitted to this Call shall bind the Proposer to the contractual terms, conditions,

and total cost presented therein; i.e., no amendments to the Proposal within the period proposed will be accepted without the express consent by NRAO.

2.11 CLARIFICATION OF PROPOSALS

NRAO reserves the right to ask Proposers for clarifications of their Proposal(s) during the evaluation period through electronic mail. Proposer responses must be received within three (3) business days of dispatch of the request, if no other period is stated.

2.12 AMENDMENT, WITHDRAWAL, OR RESUBMISSION OF PROPOSALS

Requests for amendment, withdrawal, or resubmission of the Proposal will be granted if the Proposer can complete the associated action before the Deadline.

2.13 INTELLECTUAL PROPERTY MANAGEMENT

Confidentiality of NRAO Information – Release of confidential ALMA documentation and drawings may be requested by the Proposer and will be contingent upon execution of a *Mutual Non-Disclosure Agreement*.

Confidentiality of Proposer Information – Proposers may wish, in connection with work contemplated under the Proposal, to disclose confidential information to NRAO personnel. To protect the confidentiality of such information, a Proposer may ask NRAO to enter into a *Mutual Non-Disclosure Agreement*. However, a close-out report must be submitted suitable for public distribution, see Section 8.

Intellectual Property (IP) Rights – Proposers' IP rights pertaining to technical data, copyrightable material, patents, and utilization of subject inventions are subject to the terms of the NRAO's standard *Subrecipient Agreement* and any negotiated amendments thereto.

3.0 VIABILITY OF PROPOSALS

3.1 PROPOSALS TYPES

Projects focus on the delivery of tangible improvements to ALMA for a particular aim with defined deliverables to ALMA. They will either be Large or Small and are, depending on their size, subject to different approval processes. Studies are aimed at facilitating or assessing the viability of possible Projects.

Currently, Large Projects are those with estimated overall costs of more than \$250K USD; Small Projects and Studies are those with estimated costs below or equal to the above amount.

3.2 PROPOSAL CATEGORIES

The NA ALMA Development Program seeks to maintain a portfolio of proposals that balances development of:

- a. advanced techniques – for example, advanced data processing/analysis tools, advanced calibration methods, or innovative observing modes;

- b. advanced hardware – for example, advanced receiver cartridge components, cryogenic cooling apparatus, or test and measurement equipment; and
- c. advanced software – for example, advanced user interfaces, data reduction and analysis routines, or data imaging routines.

This Call does not emphasize, or prefer, one category over another but emphasizes studies aligned with the ALMA Development Roadmap.

3.3 PROPOSAL CONTENT

Viable proposals will define an approach, or approaches, to new or enhanced scientific capabilities of the ALMA Observatory. The manner of approach may be direct (by enabling new science) or indirect (e.g., by improving operations reliability, efficiency, or calibration accuracy). The Call does not identify specific science cases to be addressed, nor does it include a set of technical specifications. These topics must form part of the proposal itself. Potential proposals may vary enormously in terms of scientific gain, technical maturity, difficulty, cost, and timescale. Varying levels of detail will therefore be appropriate for the proposal.

4.0 PREPARATION OF PROPOSALS

The Proposal shall be composed using the template available at the Call's [webpage](#). Proposals that do not make use of, or conform to the format and conventions of this template will not be considered. The NA ALMA Development Program Manager is available throughout preparation phase to answer questions with regards to the use of the template.

Even if financial support is not requested for the proposal, financial data (contributions in-kind) must be included in order to assess all Proposals fairly in the context of the ALMA Development Plan.

5.0 SUBMITTAL OF PROPOSALS

The completed Proposal (with signatures), in PDF format, is required to be submitted online at the Call's [webpage](#).

6.0 EVALUATION OF PROPOSALS

6.1 SUMMARY OF PROPOSAL EVALUATION PROCESS

Initial evaluation will be conducted by a committee of non-NRAO reviewers with the technical input of disinterested persons familiar with ALMA technical matters. The membership of the Review Committee will be determined by NRAO management, with the consent of the NSF. Members of these groups who are involved in competing proposals will be recused from judging their own, or closely related, proposals. Figures 1 and 2 provide a brief overview of the evaluation processes for each of the proposal types.

NRAO staff will not respond to questions about proposals or proposal status during the evaluation and selection period. NRAO reserves the right to eliminate from the evaluation any Proposer contravening this provision.

6.2 SUMMARY OF APPROVALS PROCESS

Studies are ranked by the Independent Review Panel and the rankings are presented to the NA ALMA Director for consideration. A recommendation that accounts for available funding is then forwarded to the NSF ALMA Program Officer for final approval.

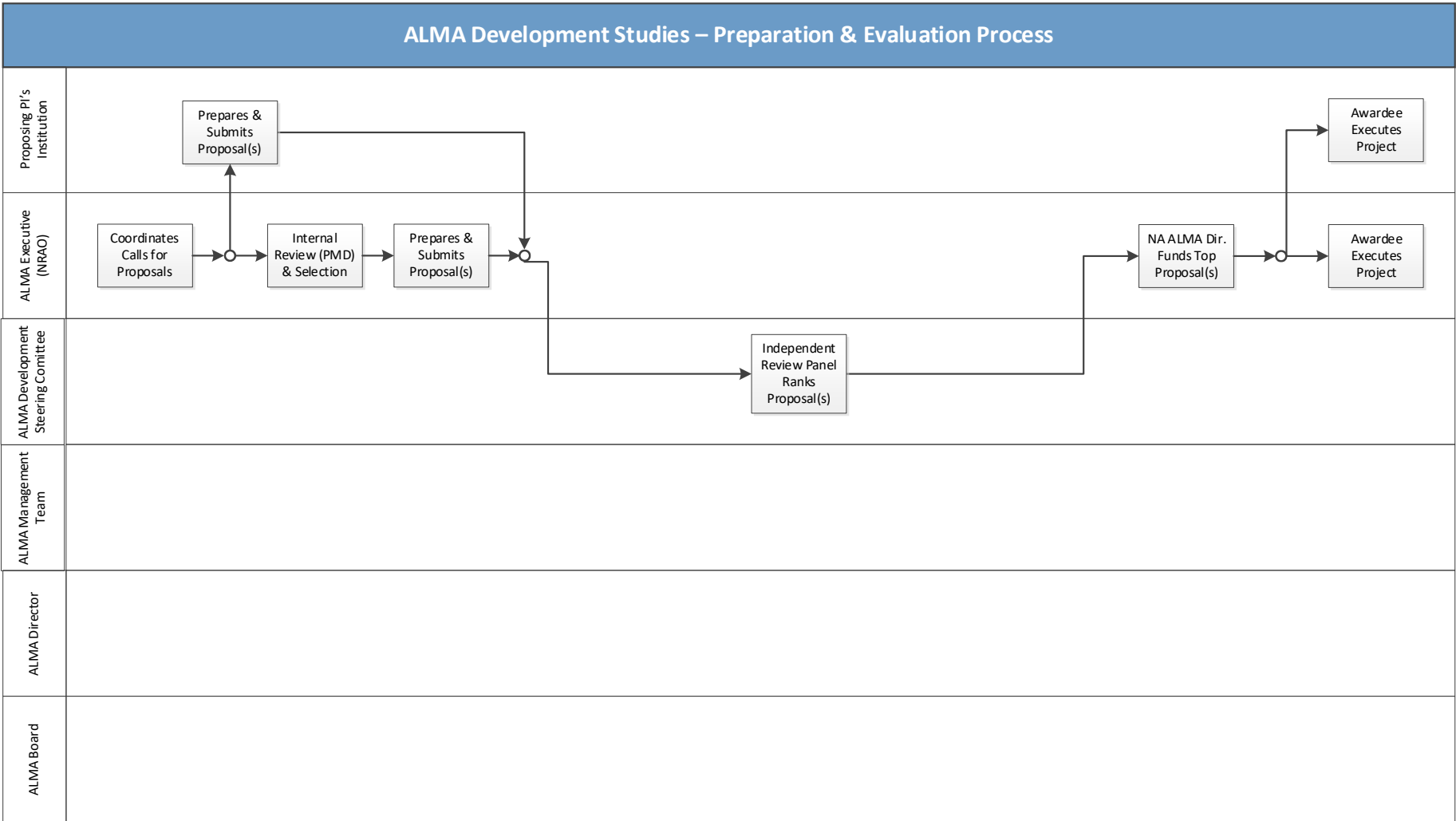


Figure 1: ALMA Development Studies – Preparation & Evaluation Process

6.3 EVALUATION BY INDEPENDENT REVIEW PANEL

The review panel will consist of highly qualified members of the astronomical community who were proposed by the ALMA North American Science Advisory Committee (ANASAC) membership, who had been members of ANASAC in the past, or who had expertise in areas covered by proposals. None of the review panel members will be affiliated with the NRAO to avoid conflict of interest. They will have expertise in science, software, and various hardware components including mm-wave instrumentation. A goal in the identification and recruitment of panel members is to capture the diversity of the community including reviewers from members of the NA ALMA Operations Partnership. Summaries of the titles, investigators, and affiliations of the proposers will be circulated among the reviewers to determine conflicts of interest which may not be apparent. Proposals will be assigned to reviewers for whom no conflict of interest is determined. The membership proposed for the Independent Review Panels is sent to NSF for consent before empanelment. The NA ALMA Development Program Office reviews, endorses (with or without modification) the recommendations of the independent review panel, and makes final recommendations to the NA ALMA Executive Office. The ranked list of proposals recommended for funding will be forwarded to the NA ALMA Executive for approval. Although this list will closely follow the recommendations of the panel, long term goals and objectives of the NA ALMA Executive will help shape the final approved list. The approved ranked list of proposals recommended for funding will be forwarded to NSF for consent.

Proposals will be judged using an evaluation matrix (or “scorecard”) based on the following criteria, which is listed in no specific order:

- alignment with the ALMA Development Roadmap;
- strength of the scientific case for the proposed ALMA upgrade concept;
- quality of the upgrade conceptual design;
- technology readiness;
- strength of the consortium organization (if applicable);
- qualifications of key personnel;
- technical expertise, past experience, and technical facilities in the Institutes taking part in the proposal;
- assessed level of risk inherent in the proposed design (the aim is to support a range of upgrades that balances risk across the entire portfolio);
- strength of the scientific team supporting the proposal;
- the proposal’s broader impacts;
- level of support guaranteed by collaborating institutions (if applicable); and
- budgeted cost of the proposal.

6.4 RESULTS AND NOTIFICATION OF AWARD AGREEMENT

Proposers will be informed, in writing, of the result of the Call for Proposals no later than **mid-November, 2022**. Rejection decisions cannot be appealed, and NRAO will not enter into correspondence on decision rationale.

7.0 CONTRACTUAL REQUIREMENTS

7.1 FEDERAL FUNDING ACCOUNTABILITY AND TRANSPARENCY ACT COMPLIANCE

Each successful Proposer (hereafter referred to as the “Offerer”) will be a subrecipient to Federal Award number AST-1519126, entitled “Management and Operation of the National Radio Astronomy Observatory (NRAO)”, a Cooperative Agreement awarded to AUI by the NSF for the period April 1, 2016 to September 30, 2026. The Federal Award is identified under Code of Federal Domestic Assistance (CFDA) number 47.049, Mathematical and Physical Sciences, for R&D.

Subrecipients awarded \$25,000 USD or more will be required to complete a *Federal Funding Accountability and Transparency Act (FFATA) Subrecipient Profile Questionnaire* so NRAO can report subaward information to the FFATA Subrecipient Reporting System (FSRS) website, in accordance with the FFATA Act of 2006, the associated 2008 amendment, and the OMB Memorandum dated August 27, 2010.

7.2 TERMS AND CONDITIONS

The principal institution associated with each selected Proposal will be required to engage with the NRAO by means of a *Subrecipient Agreement*. This Agreement is subject to the current and future NSF Cooperative Agreement Financial & Administrative Terms and Conditions (CA-FATC) and as such, requires Subrecipients to follow the Federal laws, regulations, and provisions of the Federal Award. Subrecipients will also be bound by supplemental requirements imposed by the NRAO (and negotiated amendments thereto).

7.3 REPRESENTATIONS AND CERTIFICATIONS

The principal institution associated with each selected Proposal will be required to complete a *Representations & Certifications Form*. The completed form will represent and certify that the information provided (topics listed below) is current, accurate, and complete:

- labor surplus area status;
- type of business organization;
- Taxpayer Identification Number (TIN);
- Regular Dealer-Manufacturer classification;
- business size and type classification;
- Standard Industrial Classification (SIC) code; and
- compliance with other, miscellaneous Federal Acquisition Regulations.

The completed form becomes a part of the Purchase Order.

7.4 PURCHASE ORDERS

A single Purchase Order (PO) will be issued for each selected proposal. The PO number will be the subaward number and should be referenced on all invoices. NRAO will reimburse the Offerer based on invoices submitted not more often than monthly for allowable costs. The Offerer shall commit to perform the Statement of Work (approved Proposal) in accordance with first-class trade practices and within the prescribed time limits. Requests for no-cost extensions will be considered on a case-by-case basis.

8.0 DELIVERABLES

The precise deliverables will vary between proposals, depending on such factors as:

- scientific justification: specific (e.g., a new receiver band) or generic (e.g., a calibration technique applicable to all observations);
- whether the proposal is hardware or software oriented;
- technology readiness level (maturity);
- scope and scale of the proposal; and
- cost.

In all cases, intermediate Progress Reports and a Closeout Report are required. The Purchase Order will clearly define the associated deliverables and delivery schedule.

8.1 PROGRESS REPORTS

Monthly feedback is required from the PI in order for NRAO to fulfill its management responsibilities, and to fulfill its obligations to the NSF Program Manager. There is no required format for this feedback; however, it must be in writing and at a minimum address cost, scope, and schedule performance as well as address ongoing risks. One possible format is a simple slide, commonly known as a “4-Square”. Each quadrant of a 4-Square Progress Report addresses a specific aspect of performance (Figure 3). A 4-square PowerPoint template is available from the ALMA Development Program Manager.

Cost Performance: <i>actuals versus budget & explanation of variance(s).</i>	Scope Performance: <i>any technical issue(s) impeding progress.</i>
Schedule Performance: <i>work accomplished versus work planned (% complete).</i>	Risk Management: <i>threats to success and mitigating action plan.</i>

Figure 3: “4-Square” Progress Report Format example

8.2 CLOSEOUT REPORT

A Closeout Report is required at the end of the proposal. The PI is expected to produce documentation that will enable evaluation of scientific and technical specifications, technology readiness level, implementation timeline (assuming follow-on funding), and approximate implementation costs. The closeout report will be published on the NA ALMA Development webpages, and may also be considered for publication in the ALMA Memo Series.

The Closeout Report shall include, at an appropriate level of detail and as applicable (this list is not all-inclusive):

- a discussion of relevant findings;
- quantitative analysis of the key scientific drivers of the proposed upgrade, whether specific or generic, supported by simulations (where possible) and including comparisons with baseline ALMA capabilities;
- a proposed Technical Specification;
- test data against proposed requirements;
- a discussion of interfaces with the current configuration of the ALMA system and, if relevant, any new requirements;
- a proposed Consortium structure for the detailed design and implementation of the upgrade, with information on the expertise and facilities at the different member institutes or industrial partners;
- a proposed follow-on proposal schedule (prototype/pre-production or production); and
- Identification of technical and programmatic (schedule and cost) risks and a recommended risk mitigation plan of follow-on work.

Additional elements may be appropriate depending on the type and scope of the upgrade.