



JRFB Working Group on Science Framework Proposal Requirements and Assessments: Report and Recommendations to the JRFB

Working Group

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Introduction

The *JOIDES Resolution* Facility Board (JRFB) tasked the JRFB Working Group on Science Framework Proposal Requirements and Assessments (WG-SFP) to consider requirements and review processes for proposals that would use a proposed U.S. globally ranging, non-riser drilling platform to address the 2050 Science Framework. See Attachment A. The WG-SFP met seven times between December 2020 and May 2021 to discuss the various aspects of the 2050 Science Framework and develop recommendations for a new proposal system.

Overall, the WG-SFP concluded that the current proposal submission and evaluation system contributed significantly to the scientific strength and international success of IODP. The WG-SFP encourages the next phase of scientific ocean drilling to continue

to implement a single, unified proposal and site characterization review system when evaluating proposals for any drilling platform that uses the 2050 Science Framework as a guiding document. Such an approach leverages limited funding while providing strong stewardship of the scientific objectives. Furthermore, the WG-SFP strongly endorses establishing an entity with a similar function as the current SEP to (1) simultaneously evaluate science goals, site survey data, and operational feasibility (e.g., cost category, success criteria, and risk mitigation) of proposals; (2) nurture proposals through multiple development stages; and (3) place limits on the number of possible revisions to proposals. An entity such as the current EPSP will also be needed to conduct site-by-site reviews of proposed or scheduled expeditions from the point-of-view of safety and environmental protection.

The WG-SFP recommends additions and modifications to the current proposal system to address new aspects of the 2050 Science Framework, as well as a potentially new funding environment and management structure. These additions are outlined below. The WG-SFP particularly notes that the recommendations in this report are intended to aid in the evaluation of viable proposals and not discourage participation nor be overly burdensome. Proponents will need to be educated in how to respond to new requirements and about the crucial aspect of interaction with the ship operator during all steps of the proposal process. Although the WG-SFP was setup to evaluate the process for drilling proposals for a proposed U.S. globally ranging, non-riser drilling platform, it is acknowledged that significant parts of the 2050 Science Framework would require use of other or multiple platforms. The WG-SFP hopes that the recommendations here could be applicable to and used with some adaptation for other platforms.

Addressing the 2050 Science Framework

Science in the next phase of scientific ocean drilling should be guided by the 2050 Science Framework. Proposals that support Flagship Initiative goals and proposals that support Strategic Objective goals would have the same requirements, except that proposals that support Flagship Initiative goals should also link to objectives and strategies outlined by that initiative's most recent workshop report (see Flagship Initiatives below). All proposal submissions will provide important information to support the Enabling Element: Broader Impacts and Outreach (see Science Communications below). While the Enabling Element: Technology Development and Big Data Analytics is also important, data management plans are not necessary for individual proposals. Instead, a facility-wide data management plan should be developed that includes post-expedition data.

The current Proposal Database System (PDB) asks proponents to identify specific challenges of the Science Plan addressed by their proposal (through a list of checkboxes) and to state in the proposal text the relationship of their scientific objectives to the Science Plan. The WG-SFP recommends a similar approach of checkboxes and proposal text for how proposals address the Strategic Objectives and/or Flagship Initiatives, and Enabling Elements of the 2050 Science Framework.

Proponents of Flagship Initiative proposals should also include which specific Flagship Initiative workshop report their proposal relates to.

Flagship Initiatives

Flagship Initiatives are an innovative aspect of the 2050 Science Framework that brings new opportunities for scientific achievement through multi-expedition collaboration and long-term planning. The WG-SFP recommends that each Flagship Initiative should define its own structure that includes a leadership team consisting of co-chairs; one co-chair should be an early mid-career researcher. The leadership team would convene periodic workshops to organize themselves, establish facilitating or coordinating committees as needed, and strive to involve broad community participation. An initial workshop would develop a workshop report (see details below) that would become a guiding document for proposals that address the Flagship Initiative. The leadership committee and workshop organizers would need to ensure that new proponent groups are encouraged to participate, that results are synthesized across years, and that data are shared with all scientists interested in contributing to Flagship Initiative goals. Flagship Initiatives should also have a succession plan for their leadership (i.e., how leadership will be selected and rotated).

Funding for Flagship Initiative workshops is expected to come from PMOs and/or other sources. PMOs and international partners will need to discuss the specifics of how Flagship Initiative workshops will develop and be selected and ensure wide participation. The resulting workshop reports would serve as the overarching guiding document that drives the development of future drilling proposals. The WG-SFP recommends that only one workshop report serve as a Flagship Initiative guiding document at a time. Therefore, if multiple workshops occur, then those teams should work together to create a single report for the Flagship Initiative. A higher-level group, similar to the current IODP Forum, might also be needed to help participants maintain viable scope in this area or resolve conflicts.

When evaluating proposals submitted to address a Flagship Initiative, a review panel would consider the details of the workshop report guidance in addition to the standard review criteria. Flexibility for new ideas and concepts would remain important. To aid in proposal evaluation, each workshop report should be required to contain the following elements, in any order:

- primary science objectives, goals, and hypotheses
- scientific milestones
- operational scenarios to optimize expedition time
- risks to obtaining objectives and potential mitigating strategies with operator input
- critical steps in obtaining science goals (milestones) and minimum and full success criteria
- data, samples, and models needed to achieve objectives
- tools and drilling technology needed to obtain the data and samples
- science communication opportunities and broader impacts

- data sharing plan across expeditions and, ideally, directly related site characterization studies
- workshop participant list (with the Flagship Initiative guidelines encouraging diversity, a range of career stages, and broad participation scientifically and internationally)
- leadership team plan (the leadership team should consist of co-chairs, with one co-chair being an early mid-career researcher; and the guidelines should encourage three-to-five-year terms, staggered rotations, and succession planning)

Guidance should be provided on how to address each of the above required elements of the workshop report, but the directions should not be overly prescriptive. The workshop report guidelines should allow for innovation and customized approaches. Many of the required elements of the workshop report also require input from the ship operator(s), necessitating their involvement in planning at the workshop stage. Flagship Initiatives could also develop an overall strategy for science communications related to their goals; individual proposals that arise from the workshops could cite that strategy.

The WG-SFP expects that Flagship Initiative workshops will be as inclusive as a possible – conveners should consider mechanisms to encourage remote participation and for soliciting and incorporating community feedback into the workshop report.

Flagship Initiative workshop reports would be submitted to a central science support office that (1) confirms that the report meets the report requirements and (2) posts the report online for additional community feedback. This process could work similar to how the 2050 Science Framework was vetted by the community. An entity like the current SEP would not review the reports, only use the reports when evaluating related proposals. The workshop leadership committee would be responsible for the report being updated following community feedback and a revised version returned to the central science support office.

Workshops should be held periodically to update the report as expeditions are completed and as the science evolves. Frequency of the updates would depend on progress made for the specific Flagship Initiative but might be every 5-10 years.

Science Communication

The WG-SFP members agree that every 2050 Science Framework proposal should address the Enabling Element: Broader Impacts and Outreach. To achieve this goal, the WG-SFP recommends requiring a “Science Communication Plain Language Summary” in every proposal that address the 2050 Science Framework and that the section prompt should state, “Using simple terms, describe in 500 words or less your proposed research and its broader impacts in a way that can be understood by a general audience.” In addition, the following questions should be asked of proponents submitting full proposals that would help build on past experience and knowledge; these questions would not be part of the proposal’s word count.

- Does this proposal build on previous scientific ocean drilling legs/expeditions from which a wider communications narrative could be built? If so, please provide the leg/expedition number(s).
- Do articles or media about this research already exist in the popular press or general interest literature? If so, please provide references (with links, if available).

The Science Communication Plain Language Summary presents an opportunity for proponents to highlight unique aspects of their proposed research or expedition plan, and it assures that proponents are thinking about communications early in the planning process by providing necessary information for the next steps (e.g., the development of a specific expedition communications plan). The section is not intended to include specific outreach activities; the summary would, instead, be available for PMOs, funders, operators and/or others as they develop education, outreach, and communication activities.

The Science Communication Plain Language Summary should be placed in the front of future proposals, as it is meant to provide a non-technical summary of the proposal's research and societal impacts. The Science Communication Plain Language Summary should be evaluated during the standard proposal review process, with proponents receiving feedback and advice on how to improve their summary (e.g., speaking with communication specialists at the PMOs).

The WG-SFP further recommends that the JRFB consider adding this section to the current IODP proposal requirements and that the drillship operator consider adding a similar science communication plain language summary to each expedition's prospectus.

The WG-SFP feels that an overarching communication plan would greatly enhance the next phase of scientific ocean drilling by allowing proponents and co-chiefs to see how their research could fit into overall communication goals. Proponents would then work with communication experts at the PMOs and operators, as appropriate, to determine how their expedition's science story plugs into the central communication strategy; these conversations would mostly occur after an expedition is scheduled. In addition, these summaries would collectively be highly valuable for the community to use when evaluating progress of the program(s) against the 2050 Science Framework and identifying key highlights and their impacts from the drilling program(s).

The WG-SFP strongly encourages the PMOs and/or other organizations with science communication expertise to collaboratively develop an overarching science communication plan. The PMOs could also provide standard communication material that could easily be used directly or adapted for individual expeditions – e.g., key communication messages about the facility or general science themes (e.g., climate, hazards); infographics about expedition operations or general science themes; facility information about drilling operations or engineering.

Cost Categories, Success Criteria, and Risk Analysis

The topics of cost, success, and risk are closely related to each other (e.g., likelihood of success depends on risk, steps to mitigate risk will affect cost). The next phase of scientific ocean drilling will need to balance implementing requirements in these areas with keeping the proposal process open to new proponents.

The WG-SFP agreed that proponents should discuss their success criteria with benchmark steps, scientific and operational risks, and mitigation strategies from the pre-proposal stage onwards by answering the following prompts:

- Define your minimum criteria for achieving both scientific and operational success.
- What are the primary risks to not achieving your scientific and operational success?
- What factors in your proposal (e.g., operational and scientific alternate sites) mitigate these risks?

Outlining these elements, in particular risks and potential mitigation strategies, will require proponents to communicate with the operator(s) at an early stage of the proposal writing process. The WG-SFP also acknowledged that while it is important to define success criteria before an expedition, unexpected discoveries could also define an expedition's success. These discoveries need to be captured in post-expedition reports and promoted by a future scientific ocean drilling program/facility.

An important way to mitigate risk is through operational and scientific alternate sites. The proposal guidelines should carefully define these terms. The WG-SFP offers the following definition for alternate sites:

An operational alternate site offers an alternative location where similar scientific objectives of the primary site can be achieved. The site data should be interpreted so that it's clear the site can act as an alternate to the primary site. It should be sufficiently far from the primary site such that the same operational problems would be unlikely or less likely to occur. Ideally the operational alternate site would offer a lower probability of operational problems than the primary site (e.g., shallower target depths or differing sea ice conditions), providing the opportunity to meet similar objectives if problems are encountered at the primary site. Additional alternate sites should also be proposed in the event that additional operational time becomes available.

A scientific alternate site offers an alternate location for cases where an underlying assumption of the primary site proves incorrect, such as stratigraphic intervals being different than anticipated in lithology or age such that expedition goals are not served, errors in depth estimates to targets (based on seismic velocities) result in untenable drilling times, or engineering requirements to obtain

a scientific objective cannot be met (e.g., inability to re-enter a previous scientific drilling hole in order to deepen it or an observatory installation encounters challenges at the primary site).

The proposal guidelines should provide examples of common operational and scientific risk factors (e.g., weather, core recovery issues, sites in an EEZ, seafloor, subseafloor or oceanographic hazards to drilling, unexpected stratigraphy or age, incorrect target depths, engineering challenges) and common mitigation strategies to help proponents consider these issues. Discussions with the operator to understand these factors will continue to be crucial.

Costs are tightly integrated with a proponents' success criteria and the risks associated with a drilling plan. While some implementation costs are fixed, there are variable costs related to scheduling decisions and the exact supplies and hardware needed for specific drilling plans. It is important for the ship operator to understand potential costs of a proposal early for budget planning purposes and for discussing operational realities with proponents.

The WG-SFP recommends that proponents be required to interact with the ship operator in developing operational scenarios based on their success criteria and risks. Each proposal submission deadline would have a preceding deadline for contacting the ship operator. Based on the discussions, the ship operator would provide the proponent with a cost category for two scenarios representing a range of success criteria and risk for full proposals. The proposal submission forms would ask proponents for these two cost categories (e.g., through checkboxes) when submitting full proposals.

Review Criteria

The WG-SFP recommends basing the evaluation process for the proposals that address the 2050 Science Framework on the IODP Proposal Evaluation Overview (<https://iodp.org/top-resources/program-documents/policies-and-guidelines/695-iodp-proposal-evaluation-overview-july-2020/file>). See Attachment B.

The WG-SFP acknowledges that the current document is written for proposals that will be solely implemented by IODP. As the review criteria are adjusted for proposals that address the 2050 Science Framework, considerations and/or procedures might also need to be developed for proposals that have additional funding partners or that are implemented by multiple facilities. These considerations are likely particularly relevant to proposals addressing the Enabling Elements: Land to Sea and Terrestrial to Extraterrestrial.

The WG-SFP also agrees that a watchdog focused only on science communications would not be necessary for evaluating the science communications plain language summary section of future proposals. There will be enough expertise on an evaluation panel and/or from observers and liaisons in the room to evaluate this aspect, as well as the other new sections in the proposals.

RFI Responses

The WG-SFP discussed the responses submitted by April 30 to the JRFB's Request for Information (RFI). The WG-SFP was impressed by the number of responses, and they were pleased to see a range of disciplines, countries/consortia, and platforms represented.

The WG-SFP noted that the approach in many of the RFI responses reflects the current IODP structure and methods of operations. It will take time to shift the community toward thinking in terms of a new operational model and proposal structure. As the next phase of scientific ocean drilling comes into focus, the WG-SFP expects that additional ideas related to the new aspects of the 2050 Science Framework (e.g., Diagnosing Ocean Health, Big Data Analytics, multi-expedition projects) will emerge.

The RFI responses illustrate again that long-term planning is critical for the success of the next phase of scientific ocean drilling. Many of the RFI responses require significant post-drilling borehole operations (e.g., installation of instruments) that have financial consequences, and a future program will need to consider where in the review process a holistic view of the costs should be captured and evaluated. Proponents should be encouraged to be ambitious but also realistic. Should post-expedition costs be captured in the drilling proposal? These decisions will depend on the overall financial model, but they could also present opportunities for new funding partners.

With respect to the new review criteria developed by the working group, the RFI responses confirmed that cost and risk are indeed important requirements for proposals that address the 2050 Science Framework. While the WG-SFP has not proposed major changes to the proposal submission and evaluation system, proponents and evaluation committees will need to embrace new ideas. The proposal guidelines don't necessarily need significant changes, but the mindset of the community and reviewers will need to broaden.

The WG-SFP found the RFI responses valuable in providing a current snapshot of where interest lies, and they encourage the JRFB to continue collecting responses from the community. PMOs could also continue to promote RFI submissions, including responses that build more explicitly on archived data, take an applied science approach, are on topics within the Science Framework not yet covered, or are completely outside of the box. Proponents with proposals in the IODP system should also be encouraged to submit RFI responses.

Forum Structure

The WG-SFP further discussed how a stronger Forum (or similar entity) would benefit future scientific ocean drilling facilities, particular in a diverse funding scenario. For example, the Forum could review and assess the international progress in achieving goals of the 2050 Science Framework, provide advice for how to increase the impact of

the science, and potentially aid to prioritization or discussions within 2050 Science Framework components.

Next Steps

The WG-SFP recommends the following next steps for developing a proposal requirements and submission process. Some of these items can begin soon, while others will need to wait until the structure of the next phase of scientific ocean drilling is known.

- Write specific guidelines for proposal submissions.
- Determine how/if proposals from IODP will transition to a future scientific ocean drilling facility.
- Update the Sample, Data, and Obligations Policy & Implementation Guidelines, and include how to enforce non-compliance issues.
- Update the Proposal Database System in accordance with new procedures and requirements.
- Determine how to approach guidelines for proposals with additional funding partners or that will be implemented by multiple platforms or programs (e.g., with ICDP).

Attachment A: Statement of Task: JRFB Working Group on Science Framework Proposal Requirements and Assessments

The 2050 Science Framework for scientific ocean drilling represents a new and innovative approach for conducting science using offshore drilling platforms. The JRFB has requested a working group be established to consider requirements and review processes for proposals that would use a proposed U.S. global ranging, non-riser drilling platform to address the 2050 Science Framework. The working group shall not consider the requirements and review processes for proposals for other platforms. The working group should build on the firm foundation that proposals are PI-led and community-driven, and should look at ways to broaden our community, with the expectation that the regional focus of the facility will continue. Specifically, the working group should focus on innovative ways for requesting, formulating, and reviewing proposals to address the 2050 Science Framework that include, but are not limited to:

- Different proposal categories/criteria (Strategic Objective, Flagship Initiative, Enabling Elements).
- Proposals involving other agencies and industry, including partnerships.
- Inclusion of success definition criteria (maximum and minimum with a gradational descope in between, if possible). [Important for implementation.]
- Risk analysis criteria for estimating the likelihood of success of achieving the minimum and maximum science goals.
- Site planning in terms of re-entry, monitoring, casing, site survey data, etc.
- Formal inclusion of JRFSO cost categories as part of the proposal.
- Promotion of the science (education and outreach).
- Criteria for proposal assessment.
- Integrate the data from the RFI.

The working group will comprise of approximately eight members and have a chair who will coordinate meetings and the meeting agenda. The composition of the working group will include the SEP co-chairs and U.S. community members that represent the diversity of the community and who will bring a variety of perspectives to developing the new proposal process. Ex-officio members are to provide context details about expedition implementation as the new guidelines are developed and will include the IODP Forum and JRFB Chairs, representatives from the CIB, EFB, NSF, the SSO, and the JRFSO.

Timeline: The Chair of the working group will deliver a report at the 2021 JRFB meeting that will highlight recommendations for requesting proposals to address the 2050 Science Framework.

Attachment B: Proposal Evaluation Overview

Review Procedures

Science Questions:

- Are the scientific questions/hypotheses being addressed exciting and of sufficiently wide interest to justify the requested resources?
- Will the proposal significantly advance one or more goals of the 2050 Science Framework?
- For Flagship Initiative proposals, will the proposal also significantly advance one or more goals of the relevant Flagship Initiative workshop report?

Site Questions:

- Based on the data that are presented, can we be reasonably assured that the proponents can achieve their objectives?
- Given the data, are the proposed drill sites in the right locations and to the right depth to achieve the scientific objectives?

Operational Plan Questions:

- Is the drilling plan optimized for the number of site proposed?
- Is the coring and logging (and/or other downhole measurements, monitoring) plan appropriate?
- Are there sufficient alternate sites (at least one per primary site and considering both science alternates and operational alternate needs)?
- Have success criteria with benchmark steps, scientific and operational risks, and mitigation strategies been discussed?

Communication Questions:

- Would the proposal engage new communities or other science programs into the drilling program?
- Has the proposal considered the broader impacts of the research?

Proposal External Review Criteria

When [add entity as appropriate] deems the proposal ready to send out for external review, the following questions are asked of the external reviewers:

- Assess the overall scientific importance and broader impacts of the proposed project and its likely impact on our understanding of Earth history or Earth processes.
- Evaluate the specific scientific hypotheses behind the proposal.

- Judge the appropriateness of the study area for testing the identified scientific hypotheses.
- Judge the likelihood of success in achieving the stated scientific objectives through the proposed drilling strategy and risk mitigation strategies.
- Comment on the qualifications, range of expertise, and level of experience of the proponents.

Proposal Ratings

Following external review, [add entity as appropriate] evaluates the proposal and makes a recommended rating as follows:

Excellent proposal: The proposal addresses science considered of very wide importance. It tackles new and exciting scientific problems, or it will take novel approaches to existing problems that remain unresolved/controversial. The proposal has strong potential for new discoveries and breakthroughs and most likely will open new avenues of research. It should be drilled.

In addition:

- The science proposed is very well developed and very clearly explained.
- The science proposed has very clear links to one or more aspects of the 2050 Science Framework.
- The scientific drilling and research plan is excellent and carefully planned, with testable hypotheses.
- The operational plan is very well developed, risks have been carefully considered and mitigation plans incorporated, and the plan is extremely likely to be successful.
- The expedition(s) will likely be regarded as a major achievement of scientific ocean drilling and will enhance the reputation of scientific ocean drilling.
- The expected scientific and technical achievements will enable broad-ranging science communications about the results.

Very Good proposal: The proposal addresses science considered of probable wide importance. It will significantly advance existing scientific problems. Compared to 'Excellent' proposals, 'Very Good' proposals have reduced potential for major new discoveries but will produce datasets to address globally important scientific problems. It should be drilled if possible.

In addition:

- The science proposed is well developed and quite clearly explained.
- The science proposed has clear links to one or more aspects of the 2050 Science Framework.
- The scientific drilling and research plan is very good and carefully planned, with testable hypotheses.

- The operational plan is well developed and achievable, risks and mitigation strategies have been carefully considered, and the plan is very likely to be successful.
- The expected scientific achievements should enable significant science communications about the results.

Good proposal: The proposal has potential for producing good scientific results. The scientific problems to be addressed are important, but potentially more regional in nature. Compared to 'Excellent' and 'Very Good' proposals, 'Good' proposals address more mature scientific problems with limited potential for major new discoveries, but they are still likely to produce important datasets and result in important refinements of existing scientific concepts. It should be seriously considered for drilling if it can be incorporated into long-term efforts and platform schedules.

In addition:

- The science proposed is developed well.
- The science proposed has links to the 2050 Science Framework.
- The scientific drilling and research plan is good.
- The operational plan is developed with risks considered and is likely to result in a successful expedition.
- The expected scientific achievements should enable good science communications about the results.

Proposals that do not meet the criteria for a Good, Very Good, or Excellent rating should be declined.