WHITE PAPER

Best Practices for Writing a Successful Grant Proposal for HPC Cluster Funding

Prepared by

advanced clustering technologies, inc.

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Introduction

Why should I trust advice about grant proposal writing that is being provided by a vendor who builds the very same high performance computing solutions that I am proposing to buy?

It's a fair question. And the answer is quite simple: Experience. For more than 20 years, Advanced Clustering Technologies has been providing quotes and guidance to customers who are embarking on the same grant proposal journey on which you now find yourself.

We have seen it all: the good, the bad and the ugly among proposals; winning proposals and losing proposals; grant writing successes and failures; institutions that get critical equipment funding and those that do not.

From that first-hand experience, we have consulted with our customers to learn what works and what doesn't when it comes to grant proposal writing so that we can advise future grant seekers.

This white paper is a result of that years-long effort, and we provide it to you now in the hope that through this white paper, you will find a blueprint for the kind of grant proposal that secures your needed funding.

The principles outlined in this white paper were designed specifically for two grant programs offered by the National Science Foundation: the Major Research Instrumentation (MRI) program and the Campus Cyberinfrastructure (CC) program, but the principles apply to best practices for most of the grant programs that exist for the purpose of funding HPC projects.

Grants for HPC projects remain competitive and difficult to obtain. In 2011, it was reported that 30% of MRI grant proposals were funded. In Nov. 2020, budget limitations saw that number dwindle down to 20%.

This white paper is intended to give you a comprehensive list of steps you can take to give your grant proposal the greatest chance for success.

We wish you all success in your pursuit of grant funding, and we are here to help any way that we can.

- Kyle Sheumaker
President and CTO
Advanced Clustering Technologies

Getting Started

If you are considering the possibility of applying for a grant from the NSF, it is a good idea to take a look at recent projects that received funding. You can do a search at **https://nsf.gov/awardsearch/** and look for keywords that would be part of your proposal. That way you might find successful proposals similar to what you would write.

Here, as an example, are some of the high performance computing projects that were funded recently by the NSF MRI grant program:

- Acquisition of a Massive Database to Accelerate Data Science Discovery
- Development of a Next-Generation Modular Ion-Trap Quantum Computer
- Acquisition of High Performance Computing System for Interdisciplinary Research and Teaching
- Acquisition of an HPC Cluster for Science and Engineering Research
- Acquisition of a Hybrid HPC Cluster for Computational Modeling
- Acquisition of Cutting-Edge GPU and MPI Nodes

We also recommend that you check within your own institution to find out if you can obtain grant templates or samples of previous grant applications that have been submitted.

These can be helpful to you but please be aware that MRI grant proposals are much more complex than the standard grant application. Often a template will not be a good starting point for your MRI proposal. You will need to follow the MRI solicitation guidelines to the letter.

Taking these steps will get you started down the right path, but before you get too involved in the writing of a proposal, you first need to take the steps outlined on the next few pages of this white paper, beginning with a determination as to whether or not your project meets the eligibility requirements of the grant program you are planning to undertake.

Learn about the Grant Programs

The NSF offers two grant programs that offer funding for high performance computing equipment. They are:

Campus Cyberinfrastructure (CC) program

Supports two program areas for up to 2 years:

- Data Storage awards supported up to $500,000
- Regional Computing awards supported up to $1,000,000
  Read the full solicitation.
- Review examples of Campus CI plans provided by CC* program awardees here to see examples of winning proposals.

Major Research Instrumentation (MRI) program

This program has two tracks:

- Track 1: request funds greater than or equal to $100,0001 and less than $1,000,000.
- Track 2: request funds greater than or equal to $1,000,000 up to and including $4,000,000
  Make sure you read the full solicitation.
- You might find it helpful to review the NSF site here to see MRI proposals that received funding in the past.

You should read the solicitations for each of these programs to gain a full understanding of the programs, including eligibility requirements for each.

You will find the links for each program's solicitation on this page.

Your greatest chance for success comes in complying with all of the requirements of the program's guidelines for your proposal.

Checklist for Your MRI Proposal

1. Cover sheet:

__ Title that is concise and conveys purpose of the proposal

__ Identify a single PI and up to four co-PIs

2. Project summary (no more than one page in length):

__ Overview

__ Statement on intellectual merit of proposed activity

__ Statement on broader impacts of proposed activity

3. Project description (maximum length is 15 pages with charts):

3a. __ Instrument location and type

__ Justification for submission as Development proposal (only required for development proposals) address these:

- __ How will the end result of the effort be a stable shared-use research instrument, rather than technology development, a device, a product or a technique/protocol?
- __ What significant new capabilities, not available in an instrument provided by a vendor, will the new instrument provide?
- __ Does the instrument development effort build capacity for instrument development activities within an MRI submission-eligible organization(s)? In what way does the instrument development require design and development work that must be undertaken or has been undertaken in- house, rather than through readily available/published designs found in the literature?
- __ To what extent does the instrument development require/benefit from a team of scientists. Engineers, and technicians that bring a variety of skills to the project?

Checklist for Your MRI Proposal

__ For what activities does the instrument development require a significant number of person-hours, more so than simple "assembly" of purchased parts? To what extent does the instrument development require timeframes for completion that are longer than are required for plug-and-play or assembled instruments?

__ Does the instrument development require the use of a machine shop or a testbed to fabricate/test unique components?

__ Does the instrument development effort involve risks in achieving the required specifications, and what is the risk mitigation plan?

3b. __ **Research activities to be enabled.**

The degree to which the planned uses of the proposed instrumentation constitute exciting, ground-breaking and/or transformative research is a significant factor in the merit review evaluation of MRI proposals. In this section describe the specific research program(s) and research training activities that will be enabled and that drive the request for the desired equipment.

3c. __ **Description of the Research Instrument and Needs**

(Suggested length: up to 2 pages for instrument acquisition; up to 5 pages for instrument development).

3d. __ **Broader impacts** (including impact on research and training infrastructure)

3e. __ **Management Plan** (suggested length: up to 2 pages for instrument acquisition; up to 5 pages for instrument development)

Checklist for Your MRI Proposal

4. __ **References Cited** (following standard PAPPG guidelines)

5. __ **Biographical Sketches** (biographical sketches of the PI and any Co-PI(s) as well as any designated Senior Personnel)

6. __ **Budget and Budget Justification** (Total project cost should be clearly stated in the budget justification, which must not exceed five pages, and must be itemized in table form using the following template.)

__ **Budgets for Acquisition Proposals** (at least 70% of the Total Project Cost must consist of items that can be included on the Equipment line of the NSF budget form)

7. __ **Current and Pending Support for PIs**

8. __ **Facilities, Equipment, and other Resources**

9. __ **Special Information and Supplementary Documents**

9a. __ For each organization receiving funds, provide on institutional letterhead from each sponsored projects office, the following statement classifying the organization(s) as either non-Ph.D.-granting, Ph.D.-granting, or non-degree-granting (as defined in Section IV). Statements must follow only the format indicated at the top of the next page:

Checklist for Your MRI Proposal

To: NSF MRI Coordinator
By signing below I certify that _____(organization)_____ is classified as _____(select one: non-Ph.D.-granting /Ph.D.-granting /non-degree- granting)_____ as defined in Section IV of the MRI solicitation.
Signed: _____ Print Name:_____
Title of Signatory:_____
_____
Date: _____

10. __ Data Management plan (no more than two pages)

11. __ Postdoctoral mentoring plan (when applicable)

12. __ Single Copy Documents
Required:
a. Collaborators & Other Affiliations (COA) Information.
Encouraged:
b. List of suggested reviewers

Additionally, each proposal must contain this statement(s). No other letter(s)/statement(s) classifying or describing the institution type(s) will be permitted:
b. __ For all proposals: Include a letter documenting the performing institution's commitment to ensuring successful operations and maintenance over the expected lifetime of the instrument. This letter (two-page maximum) must also list the MRI awards made to the organization with a start date in the previous five calendar years

and briefly describe the status of the instrumentation obtained from each award.

c. __ When applicable: A letter (one-page maximum) documenting the organization's commitment for cost sharing, if applicable, must be included.

d. __ When applicable: Proposals that include subawards (except for development proposals with subawards to institutions that do not exceed 20% of the total amount requested from NSF) must include a statement from each subawardee's sponsored projects office acknowledging that this proposal is included as part of the subawardee institution's submission limit. Otherwise, an organization may exceed its submission limit, with the result that the proposal including the subaward may be returned without review.

e. __ When applicable: If a proposed effort involves a private sector partner or other organization serving as a partner (as opposed to an individual(s)), or a large formalized collaboration (e.g., through a memorandum of understanding or other legal document), a letter (one page maximum) confirming their 12 participation must be included. In particular, proposals involving large formalized collaborations are encouraged to have the collaboration utilize this letter to document the role, importance and priority of the requested instrument in the overall efforts being undertaken by the collaboration.

f. __ When applicable: If the proposal involves organizations other than the performing organization, list all partners.

g. __ When applicable: Proposals for the acquisition or development of

an instrument to be located at an organization other than the performing organization must provide a (one-page maximum) supplementary document stating the host organization's commitment to house the instrument. For the purposes of this solicitation, use of instruments at NSF's Antarctic facilities is considered to be field deployment and a supplementary document from the host facility is not required.

h. __ For all proposals. Inclusion of representative, itemized vendor quotes is required for all MRI proposals. Although a proposal might reference and have a quote(s) for a specific make and model, the proposer is reminded that his/her organization's approved procurement processes must be utilized in the event of an award to establish the appropriate item(s) to be purchased and that applicable procurement standards for institutions of higher education and other non-profit organizations are described in 2 CFR 215.40-48.

You are also encouraged, but not required, to include:
a. Statements from individuals, on institutional letterhead, confirming substantive collaboration efforts and/or usage of the instrument may be submitted, but they must follow only the format indicated below:

By signing below I acknowledge that I am listed as a collaborator and/or major user of the instrument on this MRI proposal, entitled "_____(proposal title)_____," with _____(PI name)_____ as the Principal Investigator. I agree to undertake the tasks assigned to me, as described in the proposal, and I commit to provide or make available the resources therein designated to me.

Checklist for Your MRI Proposal

Signed: _____

Print Name:_____

Date: _____

Institution:_____

The proposal body itself should describe the nature and need for a collaboration, and/or describe the major users and their need for the instrument. Statements of collaboration beyond that specified above, including letters of support/endorsement, are not allowed. Each statement must be signed by the designated collaborator or user. PI requests to collaborators for these statements should be made well in advance of the proposal submission deadline since, if they are to be included, they must be included at the time of the proposal submission.

This checklist does not contain all instructions but exists to ensure you include all required statements and information. Please refer to the full solicitation for complete details for each section.

Checklist for Your CC Proposal

For Program Area One: Data Storage

If you are applying for the Data Storage program, your proposal is required to:

- __ address scientific and engineering projects and their research and education storage needs, describing project-specific scenarios for scientific data generation, storage, and management.
- __ address features, capabilities, and software platforms representing the proposed storage resources and services.
- __ address plans to manage the resource, data sets, and usage while ensuring adherence to FAIR principles and equitable access.
- __ include a summary table of the science drivers and their data storage environments.
- __ describe the platform architecture and open-source software/platform.
- __ describe an open source-based approach to storage system monitoring, measurement, management, and instrumentation.
- __ include a sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to storage resources.
- __ describe how the data storage system is connected via high performance network connectivity, including a network topology showing how the system is connected to the campus network.
- __ include complete itemized vendor quotes with the budget.
- __ describe the storage system as a shared resource intra-campus and inter-campus via interoperability with a national and federated data sharing fabric, with 20% or more of the disk/storage space committed to extramural scientific uses.

Checklist for Your CC Proposal

- __ deploy the system "on premise" which may include placement at an off-campus data center with a pre-existing role in campus research computing and storage.
- __ document a data management approach and plan, included as a supplementary document of no more than 3 pages.
- __ include a Campus CI plan as a Supplementary Document, limited to no more than 5 pages (see Section II. Program-wide Criteria above for more information).
- __ have titles that begin with "CC* Data Storage:" followed by the title of the project.
- __ be submitted by an Institution of Higher Education.

This checklist does not contain all instructions but exists to ensure you include all required statements and information. Please refer to the full solicitation for complete details for each section.

Checklist for Your CC Proposal

For Program Area Two: Regional Computing

If you are applying for the Regional Computing program, your proposal is required to address:

- __ scientific and engineering projects and their research and education computing needs, describing project-specific scenarios for scientific computing tied to the proposed computing resources;
- __ features, capabilities, and software platforms representing the proposed computing resources; and
- __ scientific computing codes expected to run on the resources.

Your project description must include:

- __ A summary table of the science drivers and their computing environments—these requirements should be specified in clear terms reflecting a specific understanding of the required computing resources and environment, for example, CPU/GPU type, compute job profile parameter ranges, core count ranges per job, times to completion or as part of a composition or scientific workflow profile;
- __ The platform architecture specifying cluster components, including compute node type and count, per-node memory, interconnect fabric, storage, and open-source software/platform;
- __ An open source-based approach to cluster monitoring, measurement, management, and instrumentation;
- __ A sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to computational resources; A High-Performance Network Connectivity and Specification—see below for more details; and
- __ A description of the cluster as an Inter-campus - see below for more details.

Checklist for Your CC Proposal

Your proposal for regional computing is required to:

- __ address scientific and engineering projects and their research and education computing needs, describing project-specific scenarios for scientific computing tied to the proposed computing resources.
- __ address features, capabilities, and software platforms representing the proposed computing resources.
- __ address scientific computing codes expected to run on the resources.
- __ include a summary table of the science drivers and their computing environments. These requirements should be specified in clear terms reflecting a specific understanding of the required computing resources and environment (for example, CPU/GPU type, compute job profile parameter ranges, core count ranges per job, times to completion), or as part of a composition or scientific workflow profile.
- __ describe the platform architecture specifying cluster components, including compute node type and count, per-node memory, interconnect fabric, storage, and open-source software/platform.
- __ describe an open source-based approach to cluster monitoring, measurement, management, and instrumentation.
- __ describe a sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to computational resources. describe how the cluster is connected via high-performance network connectivity, including a network topology showing how the cluster is connected to the campus network.
- __ provide a description of the cluster as a shared resource intra-campus and inter-campus, with 20% or more of the cycles

Checklist for Your CC Proposal

committed to extramural scientific uses.

- __ include complete itemized vendor quotes with the budget.
- __ include a Campus CI plan as a Supplementary Document, limited to no more than 5 pages (see Section II. Program-wide Criteria above for more information).
- __ be submitted by Institutions of Higher Education or Non--profit, Non-academic Organizations.
- __ have titles that begin with "CC* Regional Computing:" followed by the title of the project.

This checklist does not contain all instructions but exists to ensure you include all required statements and information. Please refer to the full solicitation for complete details for each section.

One Step at a Time

Understanding the grant funding programs that are available is the first step, but there are many others that must be undertaken before your proposal will be ready for submission. On the following pages, we offer advice for each step in the process as gleaned from our customers who have succeeded in winning grant funding in the past.

Determine Your Eligibility

Now that you have familiarized yourself with the two main vehicles for NSF grant funding and the specific requirements of each, it's time you determine your eligibility to apply. There are three types of MRI-eligible organizations:

1) Institutions of Higher Education

- - Ph.D.-granting institutions (awarded more than 20 Ph.D or D.Sc. degrees in combined two previous academic years)
- - Non-Ph.D.-granting institutions (awarded fewer than 20 or fewer Ph.D./D.Sc. degrees during the combined previous two academic years)
- - Non-degree-granting organizations (do not award Associate's, Bachelor's, Master's degrees or Ph.Ds. or Ds.Sc. or institutions that award all degrees outside of NSF-supported fields)

2) Not-for-Profit, Non-Degree-Granting Domestic U.S. Organizations

- 501(c)(3) tax status
- Must have an independent, permanent administrative organization (e.g., an office of sponsored research) in the United States
- May include science centers, museums, research labs, observatories or similar organizations

3) Legally Incorporated, Not-for-Profit Consortia

- Includes two or more eligible organizations
- 501(c)(3) tax status
- Must have an independent administrative structure (e.g., an office of sponsored research) in the United States

Make sure you are reading the solicitation for the most current year. Rules and guidelines may change from year to year.

Make Use of NSF Resources

You are able to submit proposals for review in advance of the final submission deadline, and our customers have found this to be a very helpful part of the process. Rather than submitting a proposal and later learning that key points are missing, it is much better to get that information in time to act on it. We highly recommend that you make use of these opportunities to get input from NSF representatives early on in the grant writing process.

Understand Cost Sharing Requirements

Cost-sharing requirements vary depending on your institution's classification.

Ph.D.-granting institutions and non-degree-granting organizations are required to cost-share 30% of the total project cost (which is different than 30% of the amount being requested in your proposal). Non-degree-granting organizations are exempt from cost sharing requirements.

You must have your institution's commitment to cost sharing in writing. It's important to note that any manufacturer or vendor discounts you are offered may not be designated as cost sharing.

Do Not Exceed Submission Limits

After you determine your eligibility, you need to find out how many applications your institution will be submitting in the MRI competition you want to enter. Why is this necessary? A single organization or institution may only submit a total of three applications during any given MRI competition – at least one of which must be for instrument acquisition.

You want to make sure your institution doesn't exceed the limit. If you were to send three MRI proposals, the NSF can return all of the without review or comment.

Cover your bases by checking with your research office to ask about policies for handling limited competitions. Then check the NSF site's search function (https://nsf.gov/awardsearch/) for active and expired awards from your institution.

Determining How Much Funding to Request

Never ask for more funding than is required. Nor should you lowball your request. It is highly recommended that after you have taken all of the steps described in this white paper, you take the quote from your HPC vendor and request the amount of funding that is needed to purchase your new HPC cluster. Nothing more, nothing less.

Consider limiting your grant proposal to an amount of less than $1 million. Proposals that exceed $1 million face increased competition from the many applications for expensive lab equipment. It is highly recommended that you limit your MRI funding request, especially if this is your first, to less than $1 million.

Casting a Vision for Your Proposed HPC Cluster

Your most important job as grant writer is to cast a vision for your project that inspires the NSF to award you the funds you seek. At the outset of your proposal, say why your project is important. Be able to back it up. You should also give the worst-case scenario: what happens if you don't win the grant? What happens to the project and those who would rely on the cluster?

Make sure the science being supported by your cluster is compelling. Describing good science is the backbone of your proposal. An interdisciplinary panel will be reviewing your proposal. Write accordingly.

Defining Your Instrument

- What is the role of the HPC cluster?
- Why is the cluster needed?
- What similar clusters are already available?
- How will the cluster attract researchers?
- Who will benefit from using this HPC cluster?
- How will researchers access the cluster?

As with any academic writing, include a strong list of supporting references and cite publications. Share data about the strong current funding for the scientific research you are proposing. If you can't show that, your proposal will be found wanting.

Broad Impact: What is the Big Picture Benefit?

At the heart of the NSF's mission is to fund research projects that will have a broad impact on the world. Your proposal needs to include that big picture view. Make sure you discuss the societal benefits of your proposed HPC cluster.

Making the case for the benefits of the many research projects that will be supported by your cluster is a great start. You can also demonstrate a broader impact by working with campus diversity programs to ensure everyone has access to your cluster.

How will your HPC cluster affect training education on campus and in the community? Talk about how the cluster will attract researchers, students and minorities from around the world.

Show how the cluster will improve research. What effect will the cluster have on STEM research?

We understand it can be challenging to conjure up a broader impact. Check out these examples on the NSF site for inspiration: https://www.nsf.gov/od/oia/special/broaderimpacts/

Give Your Cluster a Name (and a Few Heroes)

Give your cluster a name, and use it often. Make the name something that relates to your institution or organization for added effect. For example, if your university is in Dallas, Texas, consider naming your HPC cluster "Tex" or "Big D."

Provide a list of research projects that will make use of your HPC cluster. Highlight the biggest "hero" projects first – and include the most interesting details. You can devote an entire page to each of the hero projects if it's necessary to make the case for each. List all of the other research projects as well along with a brief summary of what makes each important. Talk about how much time/memory/bandwidth each project will require of the resource.

You're going to need to prove that the HPC cluster will be full all of the time – or even oversubscribed. Otherwise, it won't appear to be necessary.

Don't Forget to Share Your Proposed New Toys

NSF wants you to share. In fact, it requires that you do. Shared use of your cluster is vital to the success of your proposal.

Make sure you talk to researchers on your campus and at neighboring institutions to build a list of potential users for your cluster. Don't stop there. Graduate and undergraduate students also make nice additions to your cluster user base. The more, the merrier.

Get Institutional Support – and Get It In Writing

You'll need a letter from your institution stating that it will operate and maintain the cluster during and after the grant period.

Make sure the letter lists all MRI awards your institution has won in the last five years along with a summary of each and the status of the instrumentation from each award. Past successes, and continued use and value, go a long way toward demonstrating the validity of your current proposal.

Avoid mentioning any dollar figures here, which should be part of the proposal where you talk about the physical facilities that will be home to your proposed cluster.

Your HPC Equipment Proposal

You will need to be specific about the HPC equipment you will need, and you will also need to justify the technology you want to acquire. Many grant writers at the university level begin by consulting with on-campus IT staff, but we recommend you include at least one specific vendor quote. This is a service that Advanced Clustering is happy to provide.

Questions for Your HPC Vendor

- How many CPU core hours will you need?
- How much storage will you need?
- How much bandwidth will you need?
- Have you benchmarked your code?
- How will performance be enhanced?
- Will software be optimized?

Vendors deal with many HPC users and customers and use that experience to create the most common and useful configurations. They also work with other grant applicants and have learned what kinds of proposals get funded. They also have access to current market pricing and discounts and can also help you tailor a system that meets the specific needs of your project. Allow several weeks in your grant writing timeline to work with the vendor on your HPC cluster quote.

The NSF expects you to justify the need for the technologies you select. You can't just say you want a GPU cluster without making a clear case for why it is needed. By the same token, you're not going to be granted funding for 600TB of storage without explaining why so much storage is needed.

When including information about the HPC cluster you're proposing, remember that details matter. Core hours need to come from real data. The committee needs to see that you know the specifics of the cluster solution being sought and the practical uses for it.

If the proposal is for a new type of technology (for example, the latest NVIDIA GPUs or Intel Xeon processors), be able to talk about who will port the code to the new platform. What kind of speedup is expected on the new platform?

Be able to address the storage requirements of your proposed HPC cluster. How much storage will you need? If you need live storage, what is the maximum amount of storage at a time that will be needed for this project? If you need archival storage, what is the total amount of storage needed over the lifetime of the cluster?

Ask for help from your HPC vendor in making these determinations.

More Questions for Your HPC Vendor

There are other topics to cover with your HPC vendor as well:
What is the typical size of each dataset to be transferred?
Where will such datasets originate?
To where are you transferring them?
Why do such datasets need to be transferred between these endpoints?
What is the time window for transferring each such dataset?
Why does each such dataset need to be transferred during that specific time window?
How often do you expect to have such a data transfer need?

Get Physical Requirements on Paper, Too

One of the reasons we recommend you spend a good deal of time talking with your HPC vendor is to ensure your HPC consultants have all of the details about your proposed cluster. That includes the physical details. Where will your cluster be located? How much floor space, A/C, power and UPS is currently available.

Your HPC vendor will compare this against what will be needed so you can be aware of any shortfalls. You will need to talk about how you will meet any of these shortfalls, which cannot be covered by MRI funding.

This is where you need institutional support. You will need a letter of support from your institution that addresses their commitment to provide anything you need (space, A/C, power, UPS, etc.) to support the HPC cluster.

Data Matters, So How Will You Manage It?

Settling on your instrument management plan will take some time. You will also be required to share your plan for the management of all the data that will be produced by your proposed instrument.

You will need to talk about the types of data, samples, physical collections, software, curriculum materials, etc. that will be involved. What standards will you set for data formatting and content?

How will you protect privacy, confidentiality, security and intellectual property rights? How will data be archived? How will you preserve access to the archived data?

Define Your Management Plan

You are required to include a detailed management plan for your instrument as part of your proposal. Start by describing the facility where the instrument will reside. Describe how the instrument fits into the overall campus infrastructure.

Designate a project leader who will oversee all aspects of instrument management. A tenured faculty member is preferred. You should also identify a faculty advisory committee and talk about how long they are willing to serve (preferably for the duration of the project). Discuss who will help with day-to-day operations of the instrument.

Who will have access to the cluster, and who will manage all operators? When decisions need to be made about the equipment and its management, describe who will be involved and what procedures will be followed to determine the best courses of action. We also recommend you include a plan for sustainability. In other words, when the grant ends, what will you do with the equipment involved?

Checklist: Your Management Plan

- Where will the instrument reside?
- Who will have access to the cluster?
- Who will operate the equipment?
- How will the instrument be maintained?
- How will time be allocated for users?
- What will cluster operations cost?
- What will cluster maintenance cost?
- How much downtime do you anticipate?

Warranties and Service

Also make sure your HPC vendor includes warranty and maintenance costs and considerations for a minimum of three years.

Work with the vendor to get the most reasonable price possible. Ask a technology expert to review all cluster and HPC equipment descriptions to ensure you haven't missed anything important.

Keep in mind that proposals for smaller clusters at undergraduate-serving institutions are well-received by the NSF and fall into a different category of competition.

Institutions (especially smaller ones) often lack IT support and have a greater need of vendor support even after the cluster is delivered. These clusters are going to need consultative, high-touch vendor support versus a vendor that solely provides hardware with no ongoing support.

Learning From Others

We are sharing this feedback that one of our customers received upon submitting an MRI proposal so that you can benefit from reading the reviewers' comments about the strengths and weaknesses of the proposal.

Strengths

- Much detail about how the new infrastructure will be integrated into the existing system and the process of integrating its use into the university.
- Great description of cyber-infrastructure plan.
- Nice description of how the use of tools can reduce barriers to entry for novice users. Open source tools will be important to project success.
- Broad impacts are clearly defined for this project. Exposing undergraduate and high school students to computational research and tools develops the necessary pipeline for future research scientists as well as computing professionals.
- The proposed system represents a novel approach to HPC leveraging on demand for interaction and positions it alongside familiar campus technology resources such as email.
- The project leverages many external advisors, including local, regional, and national contacts, to ensure smooth deployment.

Strengths (continued)

- Project includes a high degree of engagement with activities to be disseminated at the campus level via posters at an established research and scholarly activity fair.

Weaknesses

- Platform architecture specifying HPC cluster components needs to be clearly described.
- Proposal lacks a statement about how the university will handle hardware upgrades once manufacturer warranties vanish.
- The work of talking to research computing providers in the state to ensure the proposed system addresses the actual need has not been done in advance, and this proposal is made weak by this failure to define the actual need.
- Proposer needs more focus on scientific use cases, the number of which will underscore the size of the instrument being requested. The types of equipment needed should be clearly identified in the use case summary. Is the plan to teach the courses using GPUs or CPUs? How much time is needed?

Weaknesses (continued)

- Where is the project plan with milestones and a plan to assess success needs? The proposal needs more information about how the system will be set up over the installation period provided by the vendor. Will the vendor be working directly with the datacenter team? Are there letters of collaboration to support this work?

- The proposal states that the PI will have only a few hours per year release time for research. This in no way equals the amount of time that must be devoted to the the maintenance and support of an HPC cluster that supports multiple courses and students. You need to identify the person or persons who will be providing backup technical support when the PI is unavailable.

- This proposal lacks references that would have added weight to the validity of what is being requested here.

- More detail is needed about the physical location where this resource would be placed. Where would it be? Is there adequate power? What about cooling?

- The proposal makes several references to a vendor quote, but the quote was not provided.

Produced By Advanced Clustering Technologies

Advanced Clustering offers customized, turn-key high performance computing clusters, servers, storage solutions and workstations to customers in the fields of aerospace, climate, defense, education, energy, engineering, finance, government, life sciences, etc. With more than 16 years of experience developing HPC solutions for universities, government agencies and industry, Advanced Clustering has advised many customers on writing successful grant proposals for HPC purchases. Learn more at advancedclustering.com.

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