# NOνA Draft Risk Management plan
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**NOνA**

**Project Risk Management Plan**

**Approved by:**

_____ Date: _____

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For the U.S. Department of Energy

**NOνA Project Risk Management Plan**
**Change Log**

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# NOνA RISK MANAGEMENT PLAN


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# 1. INTRODUCTION

A "risk" is an event that has the potential to cause an unwanted change in the project. A risk is also

- a definable event;
- with a probability of occurrence; and
- with a consequence or "impact" if it occurs.

Risks can affect the schedule, cost, scope (what the project finally has in it) or technical success (all requirements met) of the project.

A measure of the severity of risk is **Severity = Probability x Impact.**

In the Project Management world, risk differs from "uncertainty". Uncertainty reflects normal fluctuations of events in the project – for example, we may only have an expected range for the cost of a planned procurement. Uncertainty is supposed to be covered by "contingency." For risks, we have a "mitigation plan." A mitigation plan either lowers the probability or the impact or reduces the severity to an acceptable level.

Risk Management includes

1. Identification
2. Analysis
3. Planning (of mitigation)
4. Execution
5. Evaluation

This document describes the Risk Management Plan (RMP) for the NOνA project. This RMP provides a structured and integrated process for identifying, evaluating, tracking, abating, and managing project risks in terms of three risk categories: cost, schedule, and technical performance. The management and mitigation of Environment, Safety, and Health (ES&H) risks are very important. These risks have been identified in the NOνA Preliminary Hazards Analysis Report, and they are managed through Integrated Safety Management. Therefore this RMP does not focus on assurance of safety and environmental protection.

The technical risks facing the NOνA Project are no greater than those facing other HEP projects, and as in them, risks that are identified will be managed as early as possible to assure that they do not derail the timely completion of the project or stress its budget in unexpected ways.

Because contingency is one of the major resources available to deal with problems arising during project execution, the management of cost, schedule and technical risks and the management of contingency are closely linked. Proactive risk identification and mitigation can therefore reduce pressure on contingency, by reducing the probability of unpleasant surprises that could require contingency to resolve.

## 2. RESPONSIBILITIES

The NOνA Project Manager has responsibility for managing contingency, consistent with the change control process and thresholds described in the PEP. The objectives are to maintain contingency commensurate with project risks through project completion and to ensure that the full project scope is achieved on schedule.

The NOνA Project Manager is responsible for:

- Developing the NOνA Risk Management approach
- Executing the risk mitigation strategy
- Scheduling periodic reviews of project risks
- Assuring that the risk analyses results are appropriately documented, tracked, and closed in the NOνA Project Risk registry
- Approving, modifying, or assisting in risk abatement strategies
- Chairing the Risk Management Board

The NOνA Level 2 managers are responsible for:

- Performing a risk analysis including identification of potential risks to the technical, cost, and schedule success of their WBS system; determining their likelihood of occurring; and estimating their potential impact on the project. This analysis is performed down to WBS level 3
- Developing and executing risk mitigation strategies for their Level 2 system
- Informing the NOνA Project Manager about the significant risks and the status of risk mitigation strategies in their WBS system

The NOνA Risk Management Board (RMB) (consisting of Project Managers, Level 2 Managers and Project Engineers) is responsible for:

- Reviewing and recommending approval or modification of risk analyses and risk mitigation strategies, as requested by the Project Manager
- Assisting in the development of risk abatement strategies as needed.

## 3. THE RISK MANAGEMENT PROCESS

The NOνA Risk Management approach consists of a five step process: (1) identifying potential project risk, (2) analyzing project risk, (3) planning risk abatement strategies (4) executing risk abatement strategies and (5) monitoring the results of and revising risk abatement strategies.

### 3.1 STEP 1: IDENTIFYING PROJECT RISK.

Using a graded approach, the NOνA Risk Management process begins with the Level 2 WBS managers evaluating potential risk for each technical equipment item and subsystem that exceeds $100K, is on or near the critical path, or that poses a particular technical challenge. This analysis is performed down through Level 3. A table of common risk areas has been included in Section 6 as a tool to assist NOνA Level 2 managers in identifying areas of project risk. In addition, the Project Manager can identify project risks that may not have been identified in any of the subproject risk analyses.

### 3.2 STEP 2: ANALYZING PROJECT RISK.

NOνA project risks are analyzed by considering their likelihood or probability of occurring together with the impact to the project's technical performance, cost, and/or schedule baselines. Probability is assessed qualitatively in Table 2 as **Low, Moderate,** and **High**.

Impact relates to the potential consequence of the threat on cost, schedule, and/or the technical baselines. Each impact will be evaluated on these three aspects using the criteria and thresholds in Table 1. The highest (worst) impact determines the overall impact rating for the threat.

Based on the combination of probability and impact, risks are classified as high, moderate or low in accordance with the categorization provided in Table 2. Probability percentages in Table 2 are meant as qualitative guides, not as absolute thresholds.

**Table 1: Impact Assessment Matrix**

| Impact / Risk Area | Low | Moderate | High |
|---|---|---|---|
| Cost | ≤ $100K | ≤$250K | >$250K |
| Schedule | Delays Level 3 milestone or Project critical path by < 3 month | Delays Level 3 milestone or Project critical path by < 6 months | Delays level 3 milestone or Project critical path by >6 months |
| Technical | Negligible, if any, degradation. | Significant technical degradation. | Technical performance effectively useless for attaining physics objectives. |

**Table 2: Risk Classification Matrix**

| | Impact | | |
|---|---|---|---|
| **Probability** | **Low** | **Moderate** | **High** |
| **High (p > 75%)** | Low | Moderate | High |
| **Moderate (25% < p < 75%)** | Low | Moderate | High |
| **Low (p < 25% )** | Low | Low | Moderate |

### 3.3 STEP 3: PLANNING RISK ABATEMENT STRATEGIES.

NOνA Level 2 managers are responsible for developing appropriate risk abatement strategies to accept or mitigate project risk. Note that some risks might be recognized too late for mitigation, or that time may run out for risk mitigation. Tables of common risk areas and abatement strategies have been included in Section 6 as a tool to assist in addressing project risks.

If a Level 2 manager identifies any risk item that is classified as moderate or high risk, then the risk analysis must be reported to the Project Manager in documented form using the Risk Accounting Form (NOvA-doc-497) shown at the end of this document. Low-risk items may be documented at the discretion of the Level 2 manager. The Risk Accounting Form describes how the risk was classified, and includes the analysis of risk level described in section 3.2, along with the risk abatement strategy preferred by the Level 2 manager. The strategy could propose simply to accept the risk and deal with it, if it materializes.

Upon receiving the documented risk notice, the Project Manager will be responsible for accepting or rejecting the risk level and mitigation strategy being reported by the Level 2 manager and for deciding if the risk would benefit from additional review by the Risk Management Board. The Risk Management Board will provide an objective and independent review of risk analyses and risk abatement strategies reported by Level 2 manager, and recommend approval or modification of risk analyses and/or abatement strategies. The Project Manager serves as the chairman of the Risk Management Board and is responsible for setting the agenda.

### 3.4 STEP 4: EXECUTING RISK ABATEMENT STRATEGIES.

The Level 2 manager is responsible for performing the work consistent with the plan for mitigating risk, and for keeping the Project Manager informed of the status of the work, including its risk status. The status of all Moderate and High risk items will be maintained in the NOνA Risk Registry and updated as appropriate.

### 3.5 STEP 5: MONITORING AND REVISING RISK ABATEMENT STRATEGIES.

Level 2 managers and NOνA project management will monitor the performance of work vis-à-vis risk, evaluate the success of risk mitigation strategies, and address project risk issues on a continuing basis. Work plans and mitigation strategies will be adjusted continuously to take advantage of lessons learned and maximize the probability for successful project completion.

## 4. RISK ABATEMENT STRATEGIES FOR DIFFERENT RISK TYPES

The three identified Risk types, Cost, Schedule, and Technical, all have different mitigation strategies that can be used to reduce or eliminate their impact or probability of occurrence. In the following sections, the general outline for each case is discussed.

### 4.1 TECHNICAL RISK

Preparation of clear and concise specifications, judicious determination of subcontractor responsibility and approval of proposed lower tier sub-subcontractors, and implementation of QA provisions will minimize technical risk. Projects have been designed to further minimize technical risk by exploiting previous experience to the greatest extent possible, and minimizing exposure to single vendor failures.

Making deliberately conservative design choices, where possible, and carrying out extensive detector R&D where new technologies are involved has minimized technical risk throughout the Project. Use of commercial off-the-shelf components in the data acquisition system, reduction in component variety, and common integrated circuit technologies wherever possible will reduce risk. In all cases, the expertise of personnel involved in the design and implementation of similar systems have been exploited to the fullest possible extent. Moreover, institutional commitments have been carefully crafted within the subprojects in order to help ensure timely and successful completion of the Project.

### 4.2 COST RISK

Use of fixed-price subcontracts and competition will be maximized to reduce cost risk. The Project is also making a major effort to understand how the cost of large ticket items that will not be delivered for several years are tied to the cost of crude oil, exchange rate fluctuations, the producer price index or any other relevant index. This will allow a more precise determination of contingency on the elements that drive the cost of the project.

### 4.3 SCHEDULE RISK

Schedule risk will be minimized via:

- Aggressive R&D, including bench testing and time and motion studies,
- Realistic planning,
- Verification of subcontractor's credit and capacity during evaluation,
- Close surveillance of subcontractor performance,
- Advance expediting, and
- Incremental awards to multiple subcontractors when necessary to assure total quantity or required delivery.

Incentive subcontracts, such as fixed-price with incentive, will be considered when a reasonably firm basis for pricing does not exist or the nature of the requirement is such that the subcontractor's assumption of a degree of cost risk will provide a positive profit incentive for effective cost and/or schedule control and performance.

In addition, the Project will be tracked monthly, with schedule changes carefully monitored and approved through a change control process overseen by a combination of the Project Manager, the Laboratory Directorate, and the DOE.

## 5. RISK MANAGEMENT TOOLS AND PRACTICES

### 5.1 RISK MANAGEMENT DATABASE:

Risk assignments are associated to specific WBS entries down to Level 3. The WBS number will also serve as the Risk Index. Risk information, including the probability and impact assessments and brief summaries of mitigation strategies, are stored in the Risk database.

### 5.2 RISK "WATCHLIST":

The Project management will maintain a list of all activities assigned a risk severity of high or moderate in the Risk Registry. The list will include the status of the WBS activity, key risk-related dates, and the status of the various risk mitigation strategies. It will be used to identify the most important and/or timely risk items.

### 5.3 INTEGRATION OF RISK MANAGEMENT WITH OTHER ACTIVITIES:

Risk management is a line activity in NOνA and, as such, will be a normal part of many activities and meetings. The NOνA Risk Management Board will meet regularly to discuss risk issues. NOνA Collaboration meetings will also regularly include reports from Level 2 managers that will address risk-related issues.

## 6. RISK MANAGEMENT TOOLS

**Table 3: Common Risk Areas**

| Project Risk Areas | Significant risks |
|---|---|
| **Facilities and Equipment** | • Major equipment development<br>• Inadequate planning for long lead items and vendor support. |
| **Design** | • Design relies on immature technologies or "exotic" materials to achieve performance objectives.<br>• Design not cost effective. |
| **Requirements** | • Operational requirements not properly established or vaguely stated.<br>• Software requirements not properly established or vaguely stated.<br>• Requirements are not stable. |
| **Testing/Evaluation/ Simulation** | • Test planning not initiated early in program (Initiation Phase).<br>• Testing does not address the ultimate operating environment.<br>• Test procedures don't address all major performance specifications.<br>• Facilities not available to accomplish specific tests, especially system-level tests.<br>• Insufficient time to test thoroughly.<br>• Project lacks proper tools and modeling and simulation capability to assess alternatives. |
| **Schedule** | • Funding profile not stable from budget cycle to budget cycle.<br>• Schedule does not reflect realistic acquisition planning.<br>• Schedule objectives not realistic and attainable.<br>• Resources not available to meet schedule. |
| **Supplier Capabilities** | • Restricted number of available vendors.<br>• Restricted production capacity. |
| **Cost** | • Realistic cost objectives not established early.<br>• Funding profile does not match acquisition strategy.<br>• Fluctuations in exchange rates and cost of raw materials. |
| **Technology** | • Project depends on unproven technology for success with no alternatives.<br>• Project success depends on achieving advances in state-of-the-art technology.<br>• Potential advances in technology will result in less than optimal cost-effective system or make system components obsolete.<br>• Technology has not been demonstrated in required operating environment.<br>• Technology relies on complex hardware, software, or integration design. |
| **Management** | • Acquisition strategy does not give adequate consideration to various essential elements, e.g., mission need, test and evaluation, technology, etc.<br>• Subordinate strategies and plans are not developed in a timely manner or based on the acquisition strategy.<br>• Proper mix (experience, skills, stability) of people not assigned to the project.<br>• Effective risk assessments not performed or results not understood and acted upon. |

**Table 4: Common Risk Abatement Strategies**

| NOνA Project Risk Category | | | |
|---|---|---|---|
| **Project Impact** | High | Moderate | Low |
| **Cost** | • Closely monitor cost and spending<br>• Consider implementing phased procurements<br>• Obtain Multiple bottoms-up independent cost estimates<br>• Perform Value Management Vendor visits | • Closely monitor cost and spending<br>• Obtain at least two bottoms-up independent cost estimates | • Monitor cost, schedule and spending |
| **Schedule** | • Increase lead time substantially by initiating procurements 6-8 weeks early<br>• Vendor visits and oversight | • Increase lead time by initiating procurements 2-4 weeks early<br>• Vendor visits and oversight<br>• Add additional vendors | • Monitor cost, schedule and spending |
| **Performance** | • Perform major redesign<br>• Increase prototype cycles<br>• Evaluate alternate technology<br>• Request additional process control steps during fabrication<br>• Define extensive QA/acceptance testing<br>• Increase lead time/increase testing cycles | • Moderate redesign as required<br>• Define QA/acceptance testing<br>• Increase prototype acceptance tests | • QA/acceptance testing. |

## 7. RISK ACCOUNTING FORM

The form for reporting risk items and describing mitigation plans appears below.

| | | |
|---|---|---|
|  | NOνA Project Office<br><br>**RISK ACCOUNTING FORM** | WBS Number:<br>Identified by:<br>Date:<br>Rev. Date |

**Statement of Risk (with context):**

**Risk Type (Cost, Schedule, Technical):**

**Risk Impact (Low, Moderate, High):**

**Probability of Occurrence (%, Low, Moderate, High – from Table 2 of NOνA Risk Management Plan)**

**Severity of Risk (Low, Moderate, High - From Table 2 of NOνA Risk Management Plan):**

**Other WBS items impacted by this risk item:**

**Mitigation Strategy (Different strategies to mitigate this risk. When must it be mitigated?):**