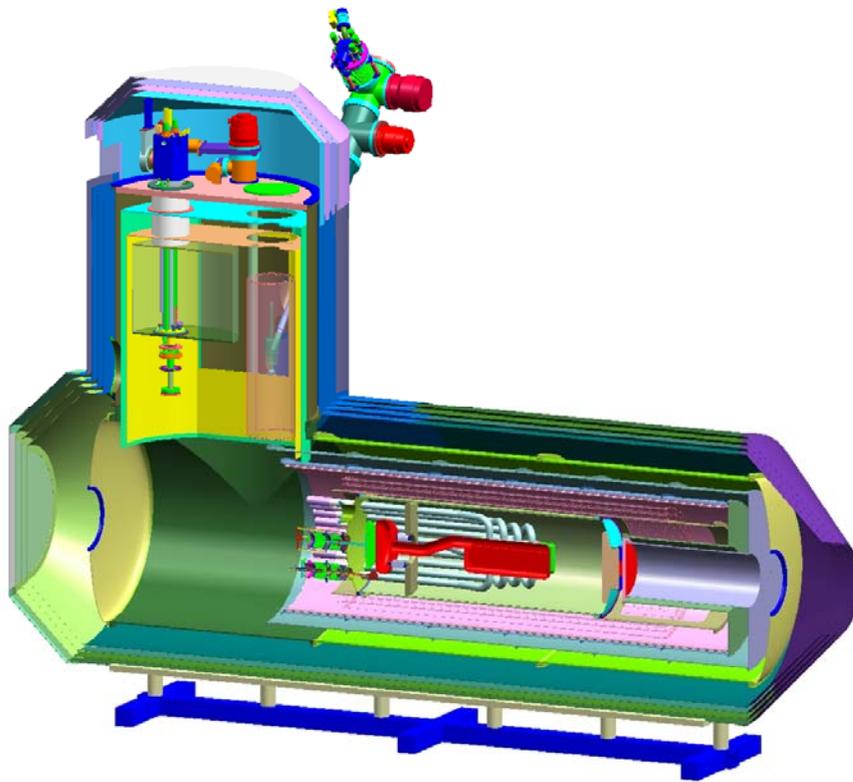
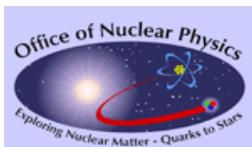


Preliminary Risk Management Plan for the Electric Dipole Moment (EDM) of the Neutron Project



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1. Introduction

1. The EDM Project uses a formal, systematic process for the management of risk. Risk management is a core process within the overall project management process to achieve scope, schedule and cost results. These processes are compliant with the intent of DOE Order 413.3 and recognized best practices.
2. The purpose of this document is to describe the risk management approaches and processes used on the EDM Project. The document describes “what” the risk management process is, and “how” it is to be implemented.
3. Following CD-0 approval, an EDM Project risk management and mitigation was initiated. This involved development of the project risk process, dissemination of risk process instructions to the EDM project team, initial identification of risks and mitigation strategies, and development of the Project Risk Log.
4. At the point of the CD-1 approval presentation, the EDM Project risk process will have been well exercised. Appendix A provides an extract of the EDM Project Risk Log. The most current Project Risk Log is available in the EDM Project Office.

2. Concept

1. The review of possible risks to the project considers both the near-term time horizon and all remaining phases of the project. The DOE and EDM project office recognize risks as dynamic and ever changing as the project progresses. However, the anticipation of risk in advance enables the management and mitigation of many risks. The actionable philosophy is to anticipate risks before they become issues or events with negative consequences, and thereby prevent and minimize risk to the degree possible. It is also recognized that some risks may have to be accepted as a “risk of doing business”. Risks nonetheless can be subjected to a defined management and decision process.
2. That process for EDM begins with an active involvement of the DOE (HQ. and Site Office) and the EDM Project Office as stewards of the risk process. Both DOE and the EDM Project Office, as well as the entire Collaboration, actively seek to identify for discussion and appropriate action any potential event, circumstance, prior experience, stakeholder expectation, schedule, budget, funding or contingency exigency, or management decision at any level that may represent a risk to the project. Following discussion(s), the EDM Project Manager will direct, where merited, that the risk be recorded on the Project Risk Log, and appropriate actions initiated.

3. Risk Relationship to Other Business Processes

3.1 Risk Management and Contingency Relationship

The EDM project links risk and contingency, by using risk (technical, schedule and cost) to develop the appropriate levels of project cost and schedule contingency. To accomplish this, the EDM Project conducts a risk analysis of each activity in the project schedule and applies a weighted risk factor to determine an appropriate cost and schedule contingency for that activity. These values are rolled-up through the Work Breakdown Structure (WBS) to determine a total Work Package and total project cost and schedule contingency. Following CD-0, the EDM Project Office initiated an analysis of all EDM project schedule activities using this approach and generated the EDM Project cost and schedule contingency. Please see the Contingency Section of the PPEP for a full discussion of this process.

3.2 Risk and Baseline Change Control Relationship

Changes to the EDM Project scope, schedule and cost baseline (as defined in the PPEP) will be managed through a formal change management process. All proposed internal and external changes will be formally evaluated for their impact and risk to the project, as part of the approval process. Proposed baseline changes may be merited to mitigate risk(s). Correspondingly, the EDM Project Office will evaluate proposed changes to fully understand the potential risk consequence, either positive or negative. Externally directed changes will

also be evaluated for risk consequence. Any risk emanating from proposed or authorized project baseline changes will be managed through the EDM Project risk management process.

4. Roles and Responsibilities

4.1 The DOE Federal Project Director

The DOE Federal Project Director oversees the project risk environment and statuses the project risk management activities. Of particular interest are the risks rated “High” overall and any risk that may negatively impact the project scope, schedule or cost baseline.

4.2 EDM Project Manager

The EDM Project Manager has overall responsibility for project risk management and for implementation of the risk management process and plan. Responsibilities of this position are to:

- Develop and manage the overall Risk Management approach
- Keeps the DOE informed of risk status
- Use project risk data as a management tool within the EDM Project Team and with members of the Collaboration
- Be the primary manager responsible for “project-level” risks, in that these risks may affect the project as a whole.
- Ensure the risk analysis results are documented and risk mitigation plans are brought to closure
- Actively participate in the project’s risk management analysis, such as determination of mitigation plans, especially with interfacing risks between subsystems
- Designate a “risk process owner” who collects and maintains project risk information
- Direct the maintenance of the Project Risk Log

4.3 Subsystem Managers

- For their assigned areas of the WBS, serve as the “risk owner”
- Perform risk analysis including identifying potential vulnerabilities and risks, assessing the risk(s) likelihood of occurrence and impact on the project, and determining the overall risk rating
- Ensure that risks are recorded within Work Packages at the activity level.
- Develop risk mitigation strategies
- Keep the Project Manager informed of risk status
- Execute mitigation strategies to accomplish risk reducing activities
- Oversee the risk management activities of the Work Package Managers.

5. Risk Management Process

Project risk management consists of a fundamental five-step process:

1. Risk Identification
2. Risk Analysis
3. Risk Strategy
4. Risk Mitigation
5. Risk disposition, tracking, and reporting

The specific sub-processes for each of the five step risk process are described below.

5.1 Risk Identification

This is an assigned responsibility of the EDM Project Office and the Subsystem Managers, although risks are solicited from anyone associated with the project. Project risks may be “project-wide” or be isolated to one or more areas of the project WBS. The development of the preliminary baseline identified risks at the total project, subsystem/work package and activity levels.

Risks may be of many types, including but not limited to: technical (scientific, research, or engineering), schedule/time, budget/cost, funding, resource availability, procurement, integration, performance variances, proposed changes, and many other types (e.g., political, economic, etc.), and may be of a source internal or external to the project. Risks may be at the “project-level” (generally affecting the entire project) or at any sub-level of the project.

Meetings between the DOE and the EDM Project Manager, as well as planning activities, project status meetings, various technical meetings and project reviews (internal and external) serve as standing mechanisms for identifying project risks.

5.2 Risk Analysis

Consists of determining the likelihood of the identified risk actually occurring, assessing the impact if it does occur, and then assigning an overall rating to the risk. These functions are initially accomplished by the responsible Subsystem Manager, or the assigned risk owner; the EDM Project Office will make a final determination on risk likelihood following discussion with all involved members of the project team.

5.3 Risk Strategy

This step involves selecting a response strategy (accept, avoid, control, or transfer) appropriate for the risk. These functions are initially accomplished by the responsible Subsystem Manager, or the assigned risk owner; the EDM Project Office will make a final determination on risk likelihood following discussion with all involved members of the project team.

5.4 Risk Mitigation

Mitigation strategies are those planned actions that will be taken to prevent a risk from occurring, or to reduce or otherwise lessen the severity of the risk to the project should the risk occur. Executing mitigation strategies is accomplished by the “risk owner” assigned by the EDM Project Office, following approval of a plan by the EDM Project Office.

5.5 Risk Disposition, Tracking, and Reporting

Risk reporting and tracking is accomplished for the project on a continuous basis by the EDM Project Office as based on risk management activities conducted by the EDM Project Office and from the input of the Subsystem Managers/risk owners.

All identified risks are entered on the Project Risk Log, a recording mechanism maintained and administered by the EDM Project Office. It is the key means to record and consolidate the programmatic, technical, schedule cost and other project related risks, associated project mitigation strategies and the status of those strategies. The value of the Project Risk Log is to provide DOE and the EDM Project Office risk visibility, and a management tool to track, manage and record the disposition of project risks.

The monthly internal project status meeting, to include subsystem managers and other key project team members from the Project Office and Collaboration, will be used to:

- * Review all high-level risks
- * Identify new actual or potential risks
- * Assign and disposition mitigation actions.

The Project Manager will schedule a meeting quarterly to discuss risk status with the DOE Federal Project Director. Key risk information will also be included in the monthly report to the DOE. In addition, the Project Manager will inform the project senior/executive sponsors of the high-level project risks, the selected strategy and disposition, identify the potential impacts and request support as may be necessary.

6. Risk Assessment Methodology

6.1 Methodology

The EDM Project employs an established risk methodology for consistency and quality in the risk management process, as represented by the *risk assessment matrix* shown below. The y-axis determination (Likelihood of occurrence) is first made for an identified risk, followed by the x-axis (Impact/Consequence). The table then yields an “overall risk rating”. This overall rating is initially reviewed and validated as the “best fit” by the person identifying the risk, and then presented to the Project office for their review. Adjustments may be made based on an initial “fact finding” period. The risk is then expeditiously entered into the Project Risk Log. Later adjustments in the overall risk rating may be made, up or down, depending on governing events and/or the relative success of applied mitigation strategies.

The EDM Project *risk assessment matrix* is shown below.

Table 6-1. Risk Assessment Matrix

Likelihood of Occurrence	Baseline Impact/Consequence		
	Low	Medium	High
Very likely	Medium risk	High risk	High risk
Likely	Low risk	Medium risk	High risk
Unlikely	Low risk	Low risk	Medium risk

The guidelines for use of the EDM Project *risk assessment matrix* are given below.

6.2 Determining Likelihood

Risks will be categorized as “Very Likely”, “Likely”, or “Unlikely” depending on their likelihood of occurrence. Generally, a risk that is Very Likely to occur is one that has a probability of 50% or greater. A risk that is “Likely” to occur is one that has a probability between 20%–50%. A risk that has less than a 20% chance of occurring is categorized as “Unlikely”. It should be noted that even “Unlikely” to occur risks may still happen! The probabilities are summarized in the following table.

Table 6-2. Occurrence Likelihood Probability Matrix

Likelihood Rating		
Very Likely to Occur	Likely to Occur	Unlikely to Occur
>50%		
	20%–40%	
		<20%

6.3 Determining Impact

Risks can also have varying impacts/consequences on a project. If a risk occurs, a negative consequence usually results. That consequence will typically adversely effect the technical accomplishment, result in a schedule or milestone slip, and/or cause a cost increase. The degree of the consequence is what is measured in this step. The following table applies in making the determination of the impact to the Project.

Table 6-3. Risk Impact Determination Matrix

Consequence Category	Definition		
	Cost: Impact on project contingency	Schedule: Impact on project schedule	Technical: Impact on performance
Low Impact (LI)	There is minimal potential for change in Capital or life-cycle cost (i.e., <5% or \$100K).	The effects of this change would only be felt by activities not near the Critical Path, and the impacts are mitigated below Level 3 milestones.	Minor degradation, performance falls below upper end of goal; CD-4 can still be met.
Moderate Impact (MI)	There is a potential for a change in Capital or life-cycle cost between 5% and 10% or \$100K and \$200K.	Activities on the Critical Path and DOE Milestones are not affected, but activities near the Critical Path or Level 2 or 3 milestones could be affected.	Moderate performance shortfall, but work-arounds available; performance might impact CD-4 if not mitigated.
High Impact (HI)	There is a potential for a >10% of a technical systems allocation budget or \$200K cost change (i.e., either increase or decrease) in the Capital or life-cycle cost of an individual subsystem.	There could be significant impact to the baseline schedule, i.e., <ul style="list-style-type: none"> ▪ >10% of the time allocated to an activity on the Critical Path, ▪ more than a one-month delay in delivery of an item near the project's Critical Path, or ▪ any impact to the project's Critical Path or a DOE Milestone (Level 0 or 1). 	CD-4 will not be met (essential performance parameter not met); if alternatives exist, the project has difficulty accepting the alternative; or no alternatives exist.

6.4 Overall Risk Rating

A risk's probability must be weighed against its potential impact in order to effectively gauge the measures necessary for dealing with that risk. A risk that has a high probability of occurrence can have a negligible impact upon the project. Conversely, a low probability risk can have a devastating impact upon the project's technical accomplishment, schedule or cost. Consequently, each EDM project risk will be assigned an overall risk rating as high, medium or low based on the X and Y axis intersection point of the risk assessment matrix. The management actions to be taken correspond to the overall risk rating.

- **High Risks.** Require close DOE monitoring and active on-going involvement of the EDM Project manager and the assigned Subsystem Manager. These risks also require the identification of a mitigation strategy (recorded on the risk log), and regular review at project management meetings. Frequent high-level visibility of these risks is required. Elimination and/or mitigation of risks rated as "High" overall is a priority.
- **Medium (Moderate) Risks.** Require regular periodic assessment and action by the Subsystem Manager (or Project Manager if a Project-level type risk), as appropriate to reduce the chance of these risks occurring or escalating. Although not usually of the severity of "High" risks, the risks with an overall categorization

of “Medium” can still have, in some cases, a high impact to the project if they occur. “Medium” risks will also be reviewed at the project status meetings as a management control mechanism.

- **Low Risks.** Risks with an overall categorization will be monitored by the Subsystem Manager and any escalation reported to the Project Manager.

7. Risk Strategy

The EDM Project Office, in consultation with the Project Team, selects one of four basic strategies for the handling of each recorded risk. The selected strategy conveys the overall approach selected by management based on all available information. The four recognized strategies are:

7.1 Risk Acceptance

Formal recognition of a risk situation and a corresponding formal management decision to accept the risk without undertaking directed actions to control or mitigate it. Acceptance of risk most often applies to risks rated “Low” overall, or for situations that are beyond the ability of man to control.

7.2 Risk Avoidance

Actions taken to eliminate the root cause or causative factors of the risk, or to otherwise select a course of action that replaces a higher level risk with a lower level alternative. This is the most desirable strategy, when conditions permit.

7.3 Risk Control

Actions taken to reduce the severity of the risk through mitigation and thereby reduce risk likelihood or impact and as well as the overall level of risk to the project. Most risk management action is of this type owing to the core nature of risk as a fundamental reality of conducting projects.

7.4 Risk Transfer

Collateral actions taken by the project office to move the risk to another part of the project by reconfiguring systems or requirements, as a means of reducing the overall risk to the project.

8. Risk Management Validation

The EDM Project Office is involved in all aspects of risk management and has special responsibility for project-level risks and risks that cross WBS elements. The EDM Project Office also ensures that a risk has the proper management visibility for management and mitigation purposes. As one means to accomplish these responsibilities, the Project Office provides independent validation of all risks and trends risks over time to effect positive closure. These activities occur following the initial assessment of an identified risk, and the determination of the initial overall risk rating. In this way, the Project Office can better understand the risk in terms of its relative importance to the project and to other risks. The DOE Federal Project Director also serves an important function in risk management by actively reviewing project risks and querying the project office on status and planned management actions.