Document Front Sheet

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LOWER CHURCHILL PROJECT

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LOWER CHURCHILL PROJECT

Lower Churchill Project

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Risk Management Plan
(Muskrat Fall Generation & Island Link – Land Portion)

SLI Document No.: **505573-0000-39RA-I-0001-01**
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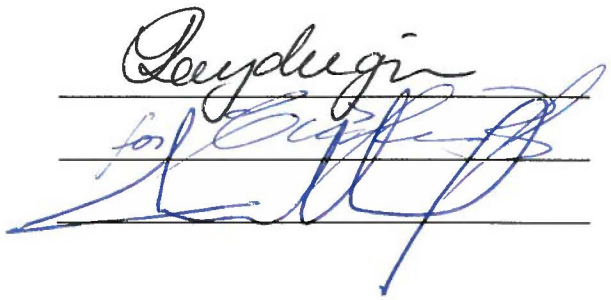

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REVISION LIST

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1 PURPOSE

This Project Risk Management Plan is one of several key management plans under the umbrella of *Project Execution Plan* (LCP-SN-CD-0000-PM-PL-0002-01) that detail how the Muskrat Falls Generation and Island Link – Land Portion (Components 1, 3 and 4) Sub-Projects of the Nalcor Energy-Lower Churchill Project (NE-LCP or the Project) will be managed in order to achieve stated goals and objectives. This Management Plan provides:

- Overall risk approach / philosophy adopted by NE-LCP for the Project;
- Overall risk approach adopted by the EPCM Consultant for the Sub-Projects
- Roles and responsibilities of both NE-LCP and the EPCM Consultant as it relates to risk management;
- Key interfaces for risk management activities between NE-LCP and the EPCM Consultant; and
- Risk management process used on the Project.

2 SCOPE

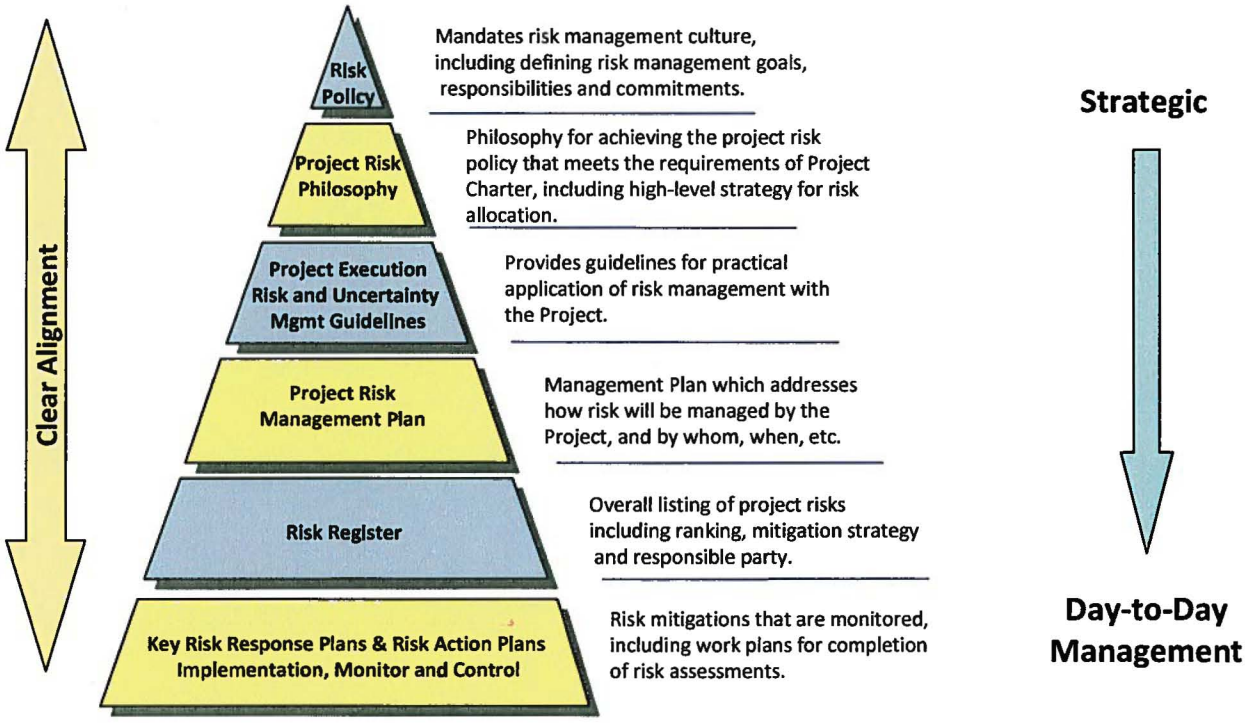
This *Project Risk Management Plan* is a key component of the NE-LCP Risk Management Program illustrated in Figure 1. Together these documents provide the core direction as to how risk management will be conducted within the Project.

This Management Plan is applicable during the planning and execution of Phase 1 of the Sub-Projects, including the following project elements:

- Muskrat Falls Hydroelectric Facility
- Labrador – Island Link Transmission Link
- Support to Nalcor Energy at the Lower Churchill Project level

This *Project Risk Management Plan* addresses all project risks, however does not specifically address the completion of specific health, safety and environmental risk assessments (e.g. hazard operability reviews "HAZOPs", or process hazard analysis). While general project risks will be evaluated in accordance to these criteria, details of specific risks assessments related these to items are contained in their respective management plans.

Figure 1: NE-LCP Risk Management Program



3 DEFINITIONS

Allowance — Costs added to the base estimate, based on experience, to cover foreseen but not fully defined elements.

Base Estimate — Reflects most likely costs for known and defined scope associated with project's specifications and execution plan.

Decision Gates — A Decision Gate is a predefined moment in time where the Gatekeeper has to make appropriate decisions whether to move to the next stage, make a temporary hold or to terminate the project. The option to recycle to the current stage is considered an undesirable option unless caused by changes in business conditions.

Escalation — Provision for changes in price levels driven by economic conditions. Includes inflation.

Estimate Contingency — Provision made for variations to the basis of an estimate of time or cost that are likely to occur, that cannot be specifically identified at the time the estimate is prepared but, experience shows, will likely occur. Contingency does not cover scope changes outside the Sub-Project parameters, events such as strikes or natural disasters, escalation or foreign currency impact.

Key Risks — A risk selected to be overseen by the Risk Resolution Team or LCP Executive Committee due to the risk's complex nature and high profile.

Pareto's Principle — Also known as the 80-20 rule, states that, for many events, roughly 80% of the effects come from 20% of the causes. Application to risk management suggests that 80% of the risk exposure comes from 20% of the project's risk.

Project Change — A deviation which represents a change or departure from the Project baseline scope, estimate, schedule, intended plant quality, HSE targets, project policy, or execution plan that causes an addition or reduction to the Original Control Budget or baseline Project Control Schedule including correction for scope / estimate omissions, or change in execution approach.

Project Change Notice — A mechanism used to facilitate the processing of Project Changes.

Project Management Team — The Project Management Team (PMT) is led by the Project Director and is made up of project leaders and key functional representatives. The PMT meets periodically, to identify issues that may affect cost and schedule and to determine how such issues should be resolved.

Project Scope	A concise and accurate description of the end products or deliverables to be expected from the project and that meet specified requirements as agreed between the Project stakeholders. It represents the combination of all project goals and tasks, and the resources and activities required to accomplish them.
Project Team	Personnel assembled to develop and execute a project from planning through start-up. The Project Team (PT) is dedicated to managing the overall project including significant focus on monitoring and controlling the EPCM Consultant's and contractor's performance in execution of the work.
Risk	An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.
Risk Brokering	The process of allocating project risks to various providers (of technology, engineered equipment, engineering & construction services, insurance, and financing) such that each provider's levels of cost and risk are optimized.
Risk Action Plan	Action plan prepared to address all non-Key Risks identified in the Sub-Project Risk Register.
Risk Frame	Form used to document Key Risk details, unmitigated risk exposure, risk response / resolution strategy, and status.
Risk Register	A database or register of the identified project risks.
Risk Response Plan	Management strategy and action list prepared for Key Risks.
Risk Resolution Team	Multi-functional group, acting as a resource to the Nalcor Energy Project Director, who select the highest priority risks (can include identification of that risk) for management, based upon defined criteria and assist Risk Owners with the development of response plans.
Sub-Project	Sub-division of LCP Projects contained in the Work Breakdown into Components to assist with the planning, executing and controlling of the work.
Strategic Risk	Identified background risks that are outside of the controllable scope of the project team, typically pertaining to external issues such as enterprise-level issues, governance, financial markets, stakeholders, hyperinflation, and regulatory approvals. Managing these risks requires significant effort and influence by the Gatekeeper with external stakeholders. Strategic risk is also referred to as the risk of failure the general execution plan.
Strategic Risk Exposure	Probabilistic impact of Strategic Risks that is quantified. Covered by

Management Reserve.

Tactical Risk

Refers to risks associated with the base capital cost estimate as a result of uncertainties with the four components of the estimate: (1) project definition and scope omission, (2) construction methodology and schedule, (3) performance factors, and (4) price. It excludes price escalation.

4 ABBREVIATIONS AND ACRONYMS

EPCM	Engineering, Procurement and Construction Management
FEL	Front End Loading
HAZID	Hazard Identification Review
HAZOP	Hazard Operability Review
HSE	Health, Safety and Environment
LACTI	Leads, Accountable, Consulted, Technical and Informed Chart
LCP	Lower Churchill Project
MoC	Management of Change
NE-LCP	Nalcor Energy – Lower Churchill Project
PCN	Project Change Notice
PMT	Project Management Team
PT	Project Team
RFI	Request for Inquiry
RFP	Request for Purchasing
SDRL	Supplier Document Requirements List
SLI	SNC-Lavalin International
WBS	Work Breakdown Structure

5 REFERENCE DOCUMENTS AND/OR ASSOCIATED FORMS

MSD-RI-001 rev. B1	Project Risk Management Policy
LCP-PT-MD-0000-RI-PL-0001-01 rev. A1	Project Risk Management Plan
LCP-SN-CD-0000-HS-PL-0001-01	Project Health and Safety Management Plan (SLI # 505573-0000-68RA-I-0001)
LCP-SN-CD-0000-RI-PR-0001-01 rev A1	LCP Risk Management Requirements for Contractors and Suppliers (SLI # 505573-0000-39RA-I-0002)
LCP-PT-MD-0000-RP-0002-01	LCP Risk Ranking Matrix

6 RESPONSIBILITIES

Nalcor Project Director

- Chairs the Risk Resolution Team and accountable for implementation of the Project Risk Management Plan.
- Approves Risk Response Plans for Key Risks and subsequent updates, or seeks approval of Risk Response Plan (as required) from LCP Executive Committee.

Nalcor Project Manager(s) or Scope Manager (reports to Project Director)

- Responsible for implementation of the Project Risk Management Plan within their Sub-Project.
- Management of risk within their Sub-Project or area of responsibility.

Risk Owner

- Can be any individual within the Project.
- Develops the Risk Response Plan for Key Risks or Risk Action Plan for other project risks.
- Spearheading the implementation of the Risk Response Plan.
- Advising the Sub-Project Risk Coordinator and Sub-Project Project Manager of any implementation issues with Risk Response Plan.
- Take action to adjust mitigation efforts as appropriate for Risk Response Plan.

LCP Risk Resolution Team

- Multi-functional group, acting as a resource to the Nalcor Project Director, who select the highest priority risks (can include identification of that risk) for management based upon defined criteria and assists Risk Owners with the development of Risk Response Plans, including assistance with the assistance of optimal risk brokering.
- Monitors the implementation status of Risk Response Plans.

LCP Executive Committee

- Approves the selected list of highest priority risks made by the LCP Risk Resolution Team.
- Approves selective Risk Response Plans (as required due to their delegation of authority or nature of the risk).
- Making decisions on risk mitigation trade-offs (corporate / project trade-offs).
- Removing roadblocks to enable Risk Response Plans to be implemented.

Nalcor Risk Coordinator	• Interfaces with EPCM Consultant's Risk Manager to participate in EPCM Consultant's risk activities.
Risk Advisor (Westney)	• Provides process expertise and specialized tools for conducting risk assessments. • Assists with the assessment of financial exposure of Strategic Risks. • Participates on Risk Resolution Team reoccurring meetings. • Acts as independent risk broker.
EPCM Consultant's General Project Manager	• Ensure that EPCM Consultant provides EPCM services consistent with Nalcor's Risk Philosophy and this Risk Management Plan. • Participate on Risk Resolution Team. • Review Risk Action Plans for potential Project Changes.
LCP Risk Resolution Team	• Multi-functional group, acting as a resource to the Nalcor Project Director, who select the highest priority risks (can include identification of that risk) for management based upon defined criteria and assists Risk Owners with the development of Risk Response Plans, including assistance with the assistance of optimal risk brokering. • Monitors the implementation status of Risk Response Plans.
LCP Executive Committee	• Approves the selected list of highest priority risks made by the LCP Risk Resolution Team. • Approves selective Risk Response Plans (as required due to their delegation of authority or nature of the risk). • Making decisions on risk mitigation trade-offs (corporate / project trade-offs). • Removing roadblocks to enable Risk Response Plans to be implemented.
EPCM Consultant's Risk Manager	• The EPCM Consultant's Risk Manager reports directly to the EPCM Consultant's General Project Manager and works closely with and is in constant communications with both the EPCM Consultant's team and Nalcor for the management of risk.

- Responsible for implementation of the EPCM Consultant's risk management plan.
- Establishing a working interface with NE-LCP Risk Coordinator.
- Informing NE-LCP Risk Coordinator of overall Sub-Project risk status.
- Organizes and consolidates the Sub-Project Risk Register by category.
- Leads the preliminary risk ranking on the Sub-Project Risk Register.
- Facilitates discussions to identify the Risk Owners for each risk.
- Facilitate the identification of the Key Risks.
- Ensures Risk Response Plan is prepared for Key Risks in a consistent fashion (for risks within EPCM Consultant's scope).
- Reviews Risk Response Plans for Project Change considerations and Project Changes for risk considerations (as required).
- Monitors the status of Risk Response Plan implementation (i.e. collecting updates) – must be in touch with all risk owners – eye on the ball.
- Produces Risk Response Plan status reports.
- Ensures Risk Action Plans are developed and implemented (for risks within EPCM Consultant's scope).
- Coordinating with Risk Owners to develop and implement Risk Action Plans.
- Provide updated risk listing to procurement or package engineer for contracting strategy preparation and subsequent commercial negotiations.

The Project Risk Manager should have the ability to stand back from the details of the project and "look at the forest and not the individual trees", always on the lookout for the abnormal, anticipating surprise events, identifying causal relationships between seemingly random events, connecting a tree on one side of the forest with one on the other side where no intuitive connection exists and generally thinking "outside of the box".

Supply Chain

- Responsible for development of contracting and procurement plans that consider risk inventory for the package.
- Risk brokering during the negotiation of the commercial terms of the package with the contractor or supplier.

7 RISK MANAGEMENT PHILOSOPHY

Nalcor Energy's *Risk Management Policy* for the Lower Churchill Project (document *Project Risk Management Policy* - MSD-RI-001 rev. B1), as shown in Figure 2, makes a strong commitment towards identifying and management all project risks. With consideration of this Policy Statement, the Project's risk management program described in the *Project Management Plan* (LCP-PT-MD-0000-RI-PL-0001-01) is structured to encapsulate the following beliefs held by NE-LCP:

- Proactive risk awareness and management is a key enabler of "flawless execution."
- Predictability of outcome will be vastly improved when achievable objectives are first established. A full understanding of project risks early in the project's lifecycle will provide the greatest opportunity to complete the necessary work required to fully understand these risks (i.e. Risk-Driven Front End Loading) from which achievable objectives will be established.
- Quality decision making will be facilitated through a comprehensive understanding of project risks and how they can be managed with least impact on the Project. Such risk-informed decision making, illustrated in Figure 3, will be a standard for the Project.
- Consistent with Pareto's Principle, we believe a few, select, complex risk (15 – 20) will provide the greatest exposure for the Project. These Key Risks will be subject of heavy focus by Nalcor's Project Management Team and the Risk Resolution Team.
- Many risks are multi-dimensional and complex requiring creative solutions. Cost effectively managing risks will require risks to be allocated to various stakeholders who are best positioned to manage them through Risk Brokering. This process of Risk Allocating will be featured significantly through the procurement process for the project's supply and construction contracts.
- Risk management is an on-going, continual looped process as the project progresses through the Gateway Phases (i.e. Plan-Do-Check-Act process).

Consistent with practice up to Decision Gate 2, the Project will continue to use the Risk Resolution Team (see Figure 4) to support the development and validation of Risk Response Plans, however its membership will be adjusted to reflect the progression of the Project.

Figure 2: Project Risk Management Policy Statement

HYDRO THE POWER OF COMMITMENT

Lower Churchill Project

Risk Management Policy

The Lower Churchill Project Management Team is committed to planning and executing the Lower Churchill Project in such a way as to minimize the potential negative effects of risks and to maximize opportunities. We will serve the needs of all our internal and external customers, stakeholders and our shareholder by tangibly demonstrating this commitment through compliance with our Risk Management System and by making continual improvement an integral part of our activities.

Our Philosophy

- Proactive risk management is fundamental to achieving the Lower Churchill Project's objectives.
- All participants in the Lower Churchill Project are responsible for identifying & mitigating risk and identifying & developing opportunities.
- Empowerment comes through strong leadership and involvement of all personnel.

Our Goals

- Create a culture that supports proactive project risk management that is viewed by all Team Members as an enabler to successfully achieve the Lower Churchill Project's objectives.
- Identify, assess, respond to and manage all key risks and uncertainties.
- Allocate project risk to the party who can most efficiently and effectively manage the risk.
- Improve decision-making by thoroughly understanding project risks and uncertainties.

Our Commitments

- We will ensure this Policy is known and clearly understood by all persons associated with the Lower Churchill Project.
- We will work to identify, assess, respond to and manage all key project risks and opportunities consistent with guidelines and tools advocated by this Policy.
- We are committed to managing project risks and opportunities from the following perspectives: occupational health and safety, environmental, technical, schedule, cost, operational reliability/quality, and reputation/image.

This Policy Statement supports and complements other policies within the Lower Churchill Project Integrated Management System. This Policy Statement is not intended to replace or duplicate Newfoundland and Labrador Hydro Corporate risk management policies with respect to market and financial loss risk mitigation activities.

Endorsed by:

Vice-President Lower Churchill Project	Date	Project Manager Lower Churchill Project	Date	Strategic Planning Lead Lower Churchill Project	Date
	20 Dec 07		18 Dec 07		18 Dec '07

Figure 3: Risk-informed Decision Making Approach

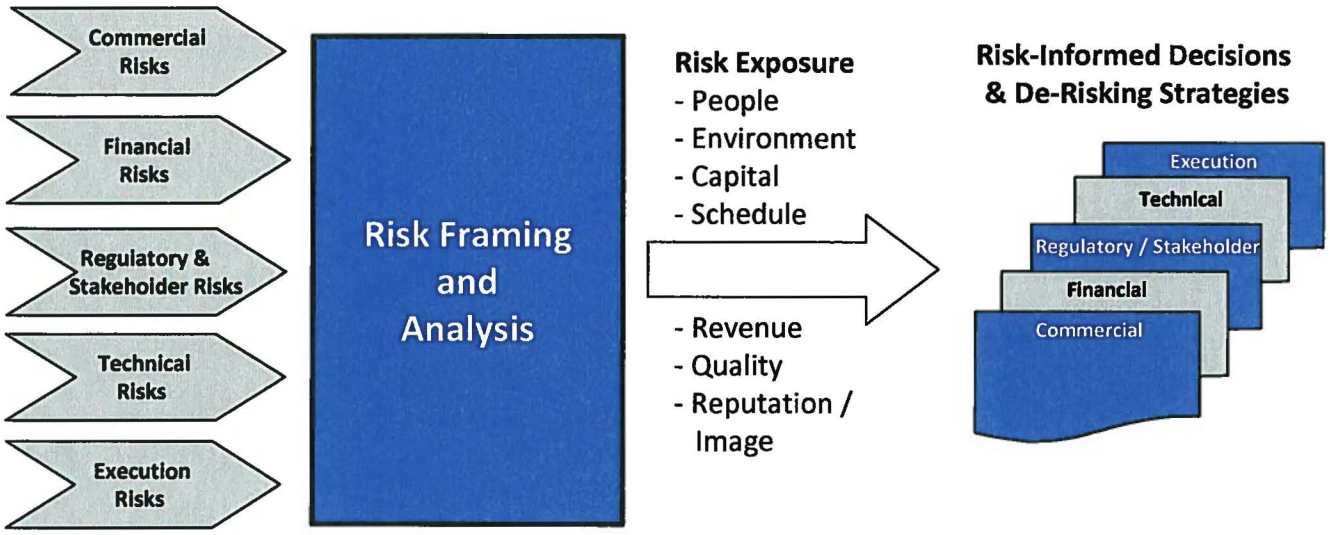
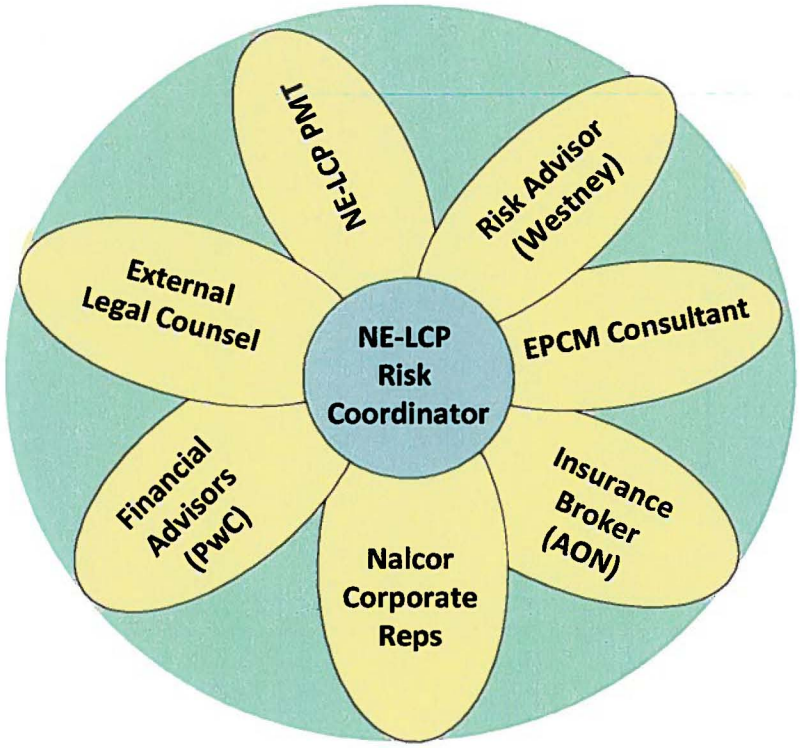


Figure 4: Risk Resolution Team Post Decision Gate 2



8 OVERVIEW OF RISK MANAGEMENT PROCESS

8.1 RISK MANAGEMENT PROCESS CYCLE

The risk management process used to effectively manage risks during the planning and execution stages of the Nalcor Energy – Lower Churchill Project is depicted in Figure 5. This risk management process is comprised of four main steps which combine to form an ongoing cycle.

Figure 5: Illustration of Risk Management Process Cycle

Step 1 – Identify and Organize Risks

All risks are captured on Sub-Project Risk Registers. The risks are then organized by major activity and type of risk; this organization facilitates both efficiency and effectiveness in the handling of the risks.

Step 2 – Assess (Analyze) and Prioritize Risks

Each risk is given a "first-cut" priority ranking which is a function of the risk's likelihood (probability of occurrence) of occurrence and its potential consequence. Each risk may also be assessed for its inherent manageability. From there, the more complex and higher profile risks (Key Risks) are selected to be overseen by the Risk Resolution Team. Risk Assessments are performed to

evaluate both the individual and collective impacts of risks on the project, and to provide insight into the value of possible risk mitigations.

Step 3 – Address (Mitigate) Risks

Each Key Risk is managed using a Response Plan which is developed using a Nalcor Key Risk Frame (Attachment B1 – Strategic Risk Frame Template of Nalcor Energy Project Risk Management Plan/ LCP-PT-MD-0000-RI-PL-0001). The Response Plan will detail the recommended strategy for managing the risk (i.e., avoidance, mitigation, allocation, or acceptance). The majority of risks is not elevated to Key Risk status and is managed using Mitigation and Action Plans which are specified on the Sub-Project Risk Registers. Each risk's Risk Owner is responsible for leading the development and implementation of that risk's Response Plan Mitigation Plan or Action Plan.

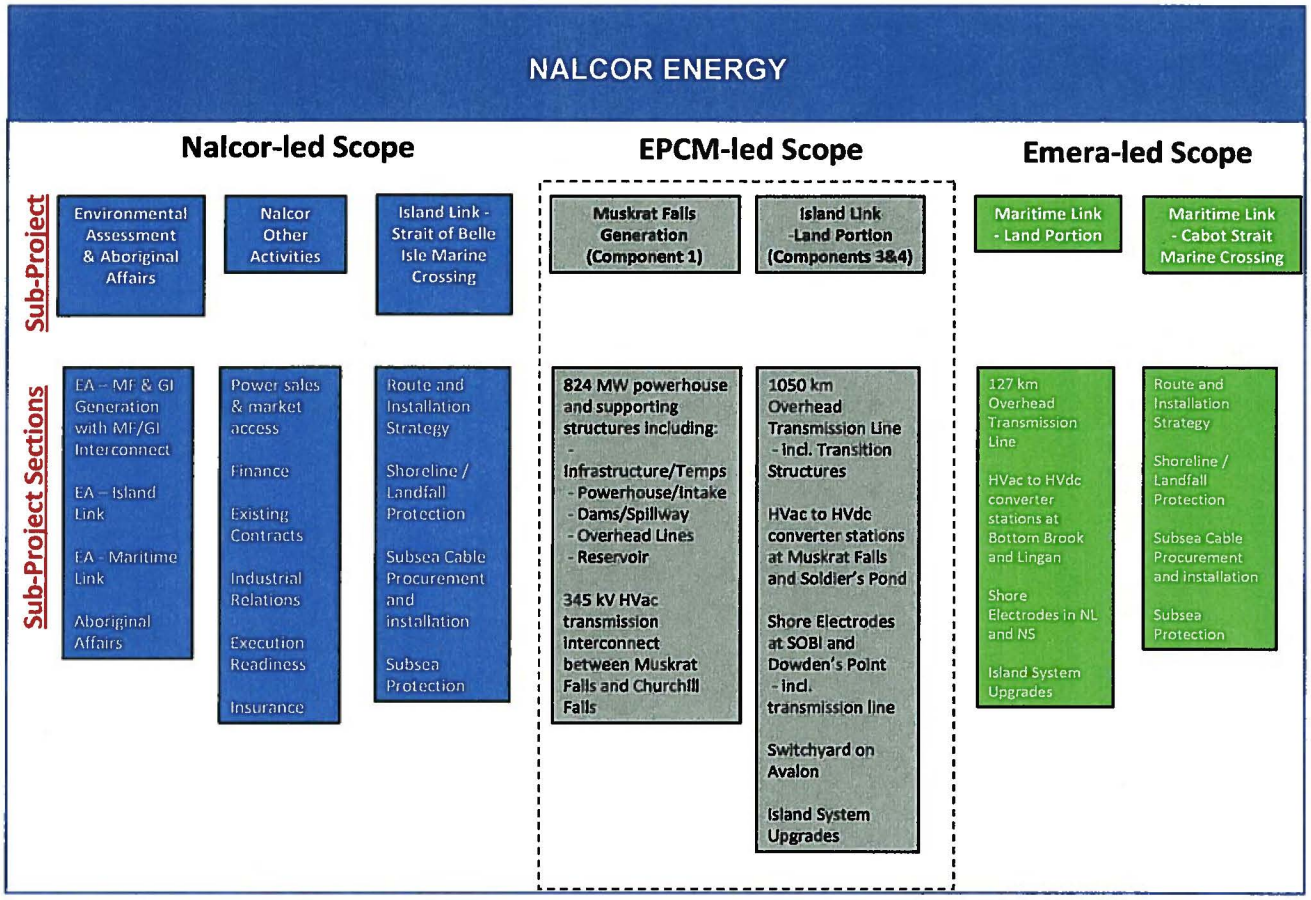
Step 4 – Monitor and Control Risks

The Response Plans, Mitigation Plans and Action Plans are reviewed on a regular basis and are adjusted as conditions warrant to promote optimal outcomes. The frequency of reviews ranges from monthly to quarterly depending on the organizational entity involved in the review and the severity of the risk.

8.2 SCOPE OF NE-LCP'S AND EPCM CONSULTANT'S RESPONSIBILITIES

Figure 6 (below) shows the division of responsibilities between NE-LCP and the EPCM Consultant for Phase I of the Lower Churchill Project. The overall project is divided into sub-project areas; these sub-project areas are used as the basis for designating the Sub-Project Risk Registers used in the Risk Management Process.

Figure 6: Depiction of Risk Register Responsibilities



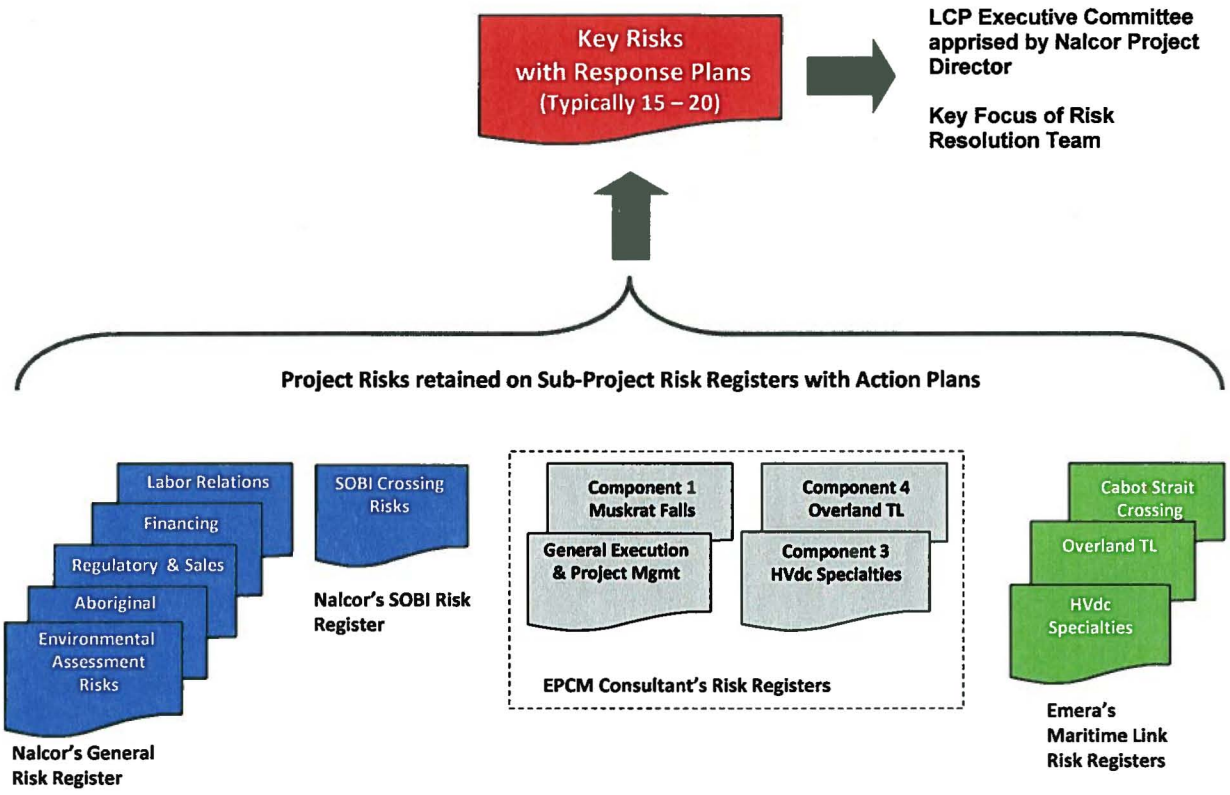
NE-LCP has overall responsibility for risk management. In support of this it has assigned the EPCM Consultant to oversee Sub-Project Risk Registers pertaining to: the SOBI Marine Crossing; and General Project Risks (including issues related to overall project execution, Environmental Assessment, Aboriginal Affairs, Financing, Regulatory, Power Sales, and Labor Relations).

The EPCM Consultant will oversee Sub-Project Risk Registers pertaining to: Muskrat Falls Generation (Component 1), HVdc Specialties (Component 3), Overland Transmission (Component 4), and General Execution of Project Management within its area of responsibility.

8.3 FLOW OF RISKS FROM SUB-PROJECT RISK REGISTERS TO LIST OF KEY RISKS

Figure 7 (below) portrays the flow of project risks from the Sub-Project Risk Registers to the List of Key Risks which are overseen by the Risk Resolution Team / LCP Executive Committee.

Figure 7: Flow of Project Risks from Sub-Project Risk Registers



8.4 DIVISION OF NE-LCP'S AND EPCM CONSULTANT'S RESPONSIBILITIES IN RISK MANAGEMENT PROCESS

Table 1 (below) depicts the various responsibilities that NE-LCP and EPCM Consultant have throughout the Risk Management Process.

CORE ACTIVITY	RESPONSIBILITY ASSIGNMENT		INTERACTION NOTES
	Nalcor Energy	EPCM Consultant	
Identifying and Organizing Risks			
Initial population risk register			
For Nalcor-led Sub-Project risks	R		EPCM Consultant to participate upon request
For EPCM Consultant-led Sub-Project risks		R	Nalcor to participate
Organizing risks by category			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	Nalcor to provide guidance as required
Identifying risk owners			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	Nalcor to provide input as required
Assessing and Prioritizing Risks			
Conduct preliminary rankings for Nalcor-led Sub-Project risks			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	Nalcor to participate
Develop list of Key Risks to be overseen by Risk Resolution Team	R		EPCM Consultant to provide input
Determine schedule for cost and time risk workshops			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks	R		Nalcor is responsible for informing EPCM
Determine schedule for health, safety and environmental risk assessments			E.g. HAZIDs, HAZOPs, PHAs
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	
Conduct cost and time risk assessments			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks	R		EPCM Consultant will participate
Conduct health, safety and environmental risk assessments			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	
Addressing Risks			
Develop and approve Response Plans for Key Risks	R		EPCM Consultant to provide input into Response Plan
Implement Response Plans for Key Risks	R		EPCM Consultant to provide implementation support
Develop and approve Actions Plans for Project Risks			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	Nalcor to provide input into Action Plans and approve if its triggers a Project Change
Implement Action Plans for Project Risks			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	
Address Risks through the Procurement Process			
For Nalcor-led Sub-Projects	R		
For EPCM Consultant-led Sub-Projects		R	Nalcor to provide input as required
Secure Project Insurance Program	R		EPCM Consultant to provide support to the placement of the Project's insurance program.
Monitoring and Controlling Risks			
Review and adjust Response Plans for Key Risks	R		EPCM Consultant to provide input as applicable
Review and adjust Actions Plans for Project Risks			
For Nalcor-led Sub-Project risks	R		
For EPCM Consultant-led Sub-Project risks		R	EPCM Consultant to provide regular status reports

The EPCM Consultant will use its corporate standard risk procedure, Corporate Project Risk Management Procedure 2225, and software, MOINS - RISC - LESS to manage and report Sub-Project risks. Risks identified by Nalcor as Key Risks will be reported using a Response Plan which is developed using a Nalcor Key Risk Frame (Attachment B1 – Strategic Risk Frame Template of Nalcor Energy Project Risk Management Plan/ LCP-PT-MD-0000-RI-PL-0001). The EPCM Consultant provides required inputs.

8.4.1 SNC-Lavalin and LCP Risk Management Procedures

This Risk Management Plan is based on the SNC-Lavalin Procedure 2225. The Procedure 2225 embodies the process to be followed for the effective management of risk. It is consistent with ISO 31000 and describes the detailed steps which must be undertaken throughout the project life-cycle to indentify, manage and finally retire risk. It defines the roles of the various participants in the risk management process as well as the events and timing and depth of risk reviews. This Risk Management Plan should be used in conjunction with Procedure "LCP Risk Management Requirements for Contractors and Suppliers"/ NE-LCP # LCP-SN-CD-0000-RI-PR-0001-01; SLI # 505573-0000-39RA-I-0002 (based on SNC-Lavalin Procedure 2226, "Risk Management Requirements for Suppliers" and Procedure 2227, "Risk Management Requirements for Site Contractors") to manage risk not only with the EPCM Consultant's scope of work but where necessary the full length and breadth a Capital Project.

8.4.2 SNC-Lavalin Risk Management Software

SNC-Lavalin uses a database approach to capture risk and generate risk registers. Experience shows that over the full life-cycle of a project a database approach is less labour intensive and therefore less prone to human error than to traditional spreadsheet approaches.

SNC-Lavalin has developed a comprehensive and proprietary suite of risk templates, called MOINS - RISC - LESS, that run on the Dyadem International Limited enterprise risk management platform, called Stature. This is the Enterprise version of the software used to support the Dyadem suite of risk management tools that include PHA Pro7, Smart MoC, FMEA and others.

MOINS - RISC - LESS supports all phases of risk management, in accordance with SNC-Lavalin Project Execution Risk Management Procedure (Document Number 2225), including: Identification, Analysis and Prioritization, Mitigation and Action tracking.

MOINS - RISC - LESS can support Qualitative risk analysis, Quantitative risk analysis and supports Residual Risk analysis using Monte Carlo techniques.

MOINS - RISC - LESS also supports a number of exportable report formats including MS Word and MS Excel and HTML. Reports can be customized to meet specific Client and project

reporting requirements. Example reports available from MOINS - RISC - LESS are provided below.

Being a relational web-based database, MOINS - RISC - LESS features several interfaces for input and output of risk information. These interfaces support all steps of project risk management introduced in Section 8.1.

There are three main database objects in MOINS - RISC - LESS that have 'one-to-many' relations:

- Risk
- Mitigation
- Action

As a matter of fact, a risk may have several mitigations. Similarly, any mitigation may have more than one action. (Each mitigation is supposed to represent one of four major risk addressing strategies - Avoid, Mitigate, Transfer and Accept - not just one of them.).

Following three main interfaces/ tables are used to manage these three main database objects, namely,

- Risk Report
- Mitigation Worksheet
- Action Log

Risk Report represents information collected about project risks including risk titles, descriptions, risk's status, assessments before and after addressing, etc.

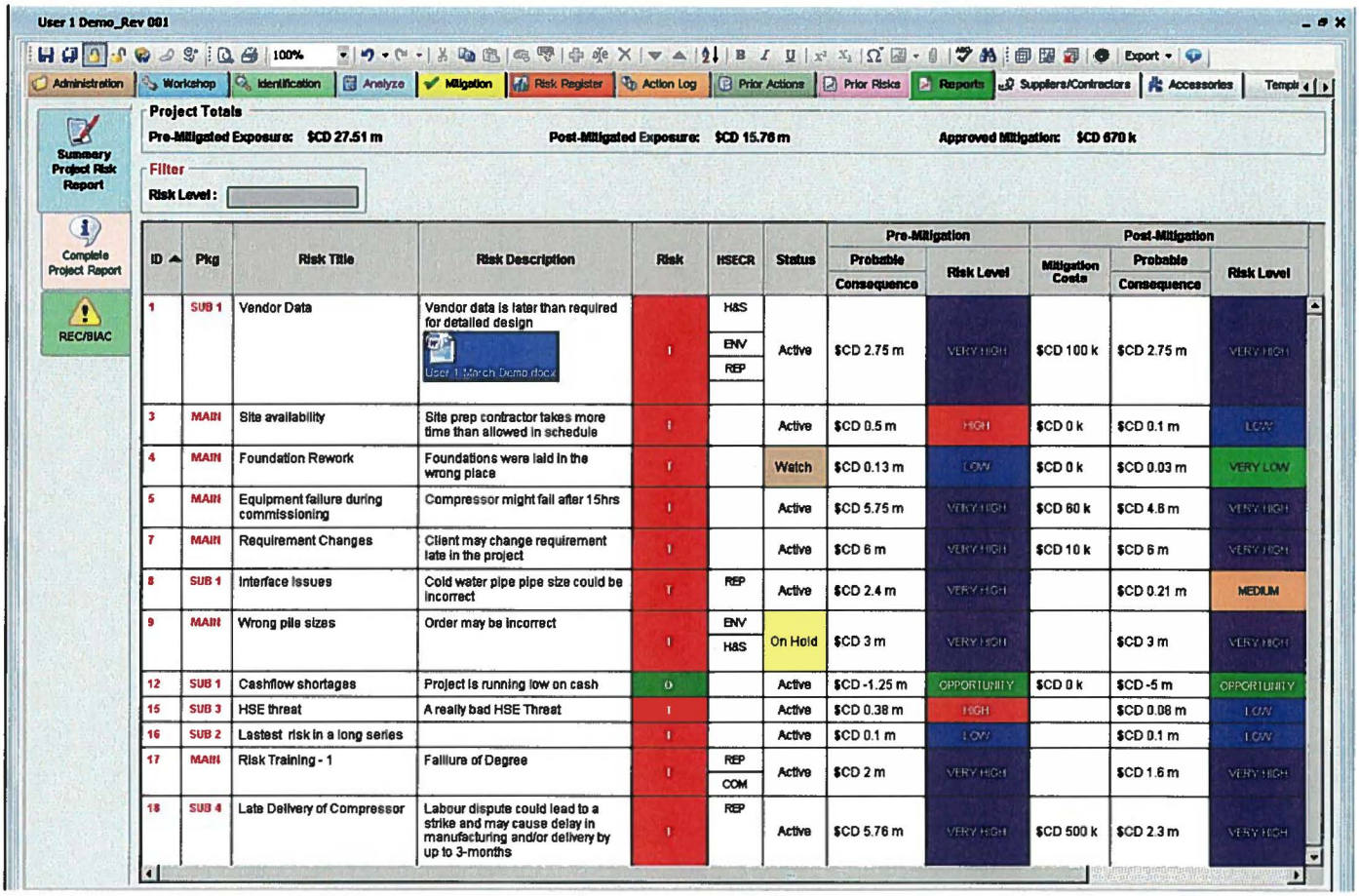
Mitigation Worksheet that uses mitigation numbering related to risk numbering keeps information about mitigations put forward for each particular risk.

Action Log further details addressing of risks through introduction of actions. Similarly, numbering related to risks and mitigations is used.

All three interfaces are supported by drop-down menus that help assign corresponding values related to impact levels, probabilities, status, owners, etc., of risks as well as status, owners, due dates, etc., of mitigations and actions.

Figures 8 – 10 represent samples of the three interfaces introduced above.

Figure 8. Sample Risk Report



ID	Pkg	Risk Title	Risk Description	Risk	HSECR	Status	Pre-Mitigation Probable Consequence	Pre-Mitigation Risk Level	Post-Mitigation Mitigation Costs	Post-Mitigation Probable Consequence	Post-Mitigation Risk Level
1	SUB 1	Vendor Data	Vendor data is later than required for detailed design	1	H&S, ENV, REP	Active	$CD 2.75 m	VERY HIGH	$CD 100 k	$CD 2.75 m	VERY HIGH
3	MAIN	Site availability	Site prep contractor takes more time than allowed in schedule	1		Active	$CD 0.5 m	HIGH	$CD 0 k	$CD 0.1 m	LOW
4	MAIN	Foundation Rework	Foundations were laid in the wrong place	1		Watch	$CD 0.13 m	LOW	$CD 0 k	$CD 0.03 m	VERY LOW
5	MAIN	Equipment failure during commissioning	Compressor might fail after 15hrs	1		Active	$CD 5.75 m	VERY HIGH	$CD 60 k	$CD 4.8 m	VERY HIGH
7	MAIN	Requirement Changes	Client may change requirement late in the project	1		Active	$CD 6 m	VERY HIGH	$CD 10 k	$CD 6 m	VERY HIGH
8	SUB 1	Interface Issues	Cold water pipe pipe size could be incorrect	1	REP	Active	$CD 2.4 m	VERY HIGH		$CD 0.21 m	MEDIUM
9	MAIN	Wrong pile sizes	Order may be incorrect	1	ENV, H&S	On Hold	$CD 3 m	VERY HIGH		$CD 3 m	VERY HIGH
12	SUB 1	Cashflow shortages	Project is running low on cash	0		Active	$CD -1.25 m	OPPORTUNITY	$CD 0 k	$CD -5 m	OPPORTUNITY
15	SUB 3	HSE threat	A really bad HSE Threat	1		Active	$CD 0.38 m	HIGH		$CD 0.08 m	LOW
16	SUB 2	Lastest risk in a long series		1		Active	$CD 0.1 m	LOW		$CD 0.1 m	LOW
17	MAIN	Risk Training - 1	Failiure of Degree	1	REP, COM	Active	$CD 2 m	VERY HIGH		$CD 1.6 m	VERY HIGH
18	SUB 4	Late Delivery of Compressor	Labour dispute could lead to a strike and may cause delay in manufacturing and/or delivery by up to 3-months	1	REP	Active	$CD 5.76 m	VERY HIGH	$CD 500 k	$CD 2.3 m	VERY HIGH

Figure 9. Sample Mitigation Worksheet

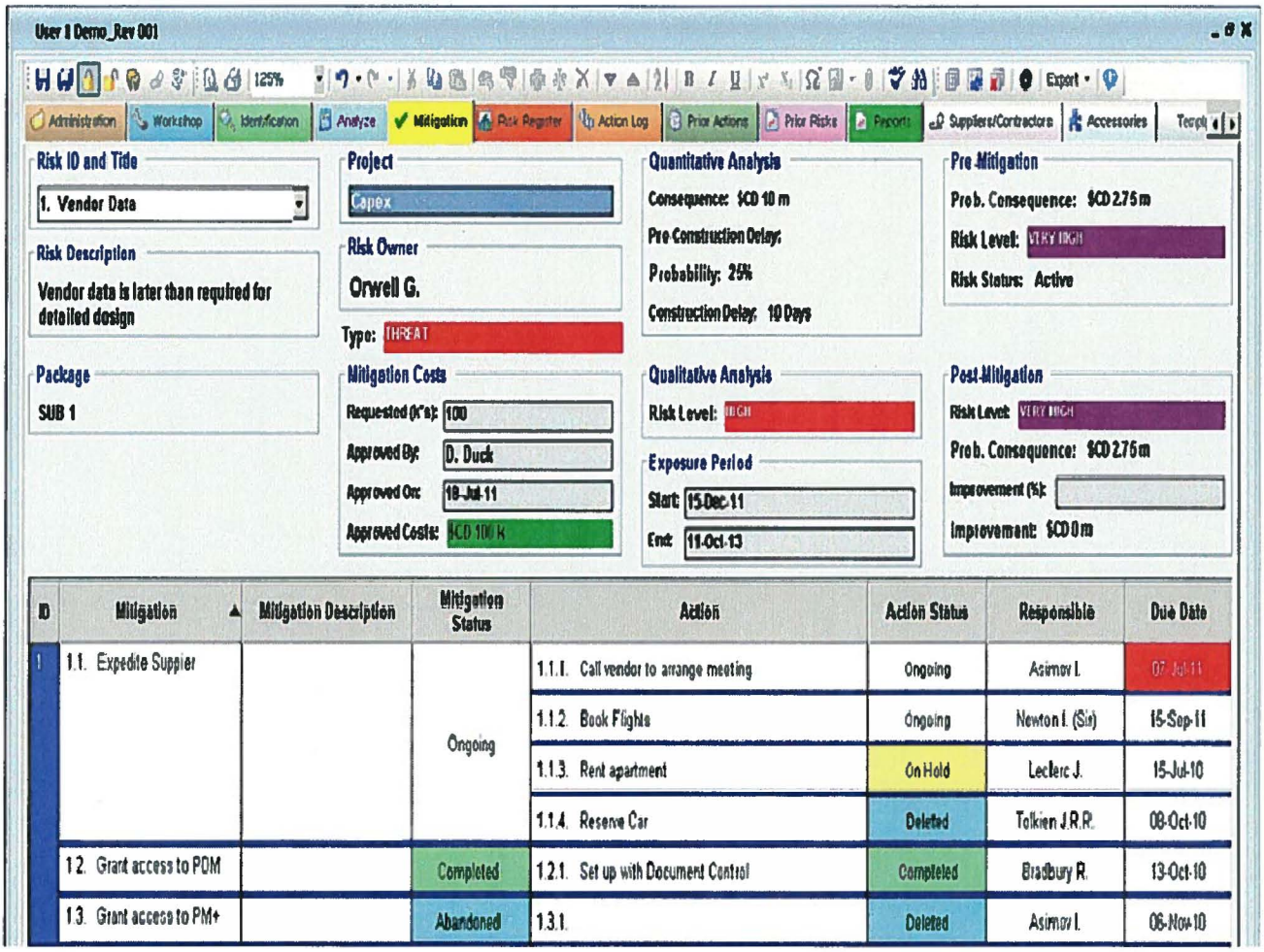
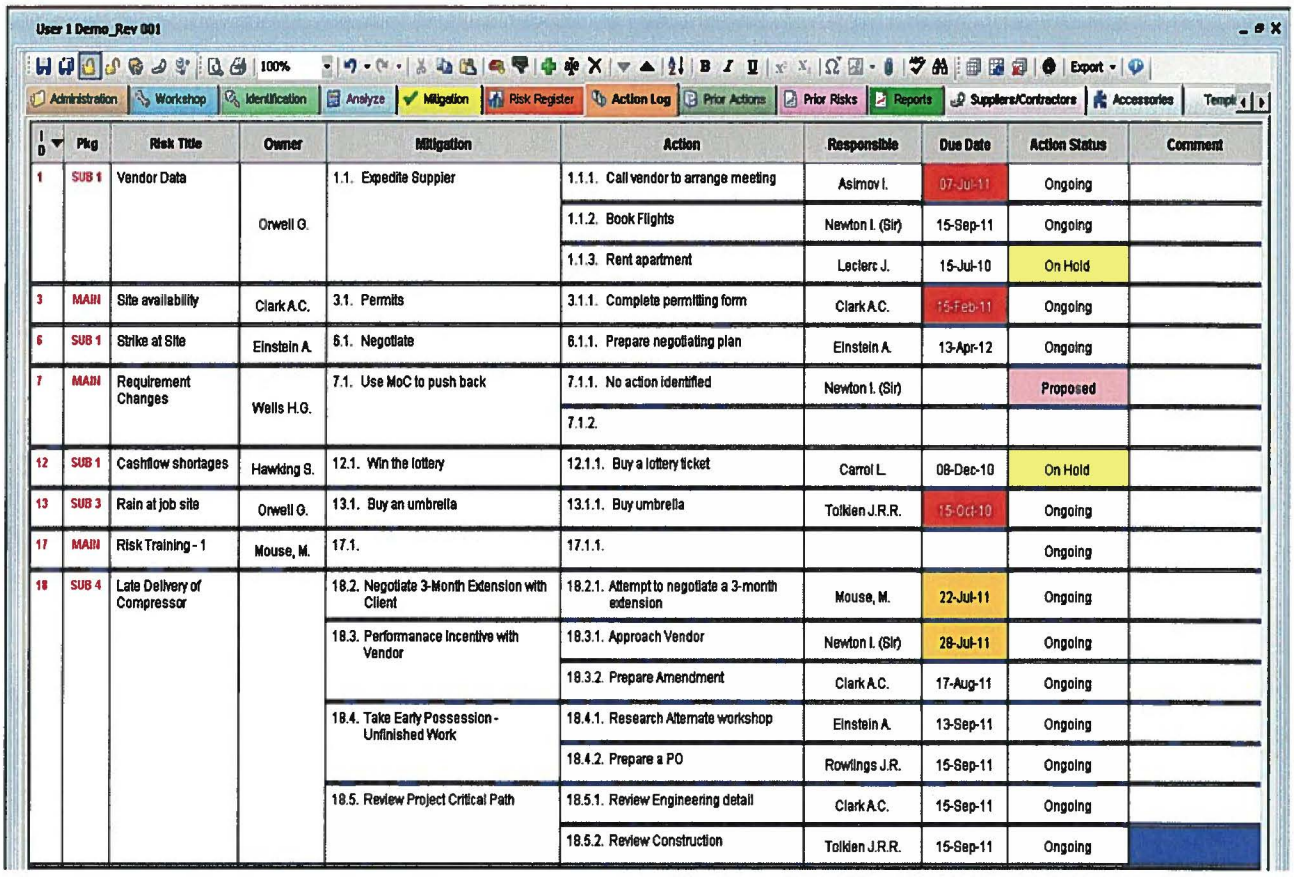


Figure 10. Sample Action Log



ID	Pkg	Risk Title	Owner	Mitigation	Action	Responsible	Due Date	Action Status	Comment
1	SUB 1	Vendor Data	Orwell G.	1.1. Expedite Supplier	1.1.1. Call vendor to arrange meeting	Asimov I.	07-Jul-11	Ongoing	
					1.1.2. Book Flights	Newton I. (Sir)	15-Sep-11	Ongoing	
					1.1.3. Rent apartment	Leclerc J.	15-Jul-10	On Hold	
3	MAIN	Site availability	Clark A.C.	3.1. Permits	3.1.1. Complete permitting form	Clark A.C.	15-Feb-11	Ongoing	
6	SUB 1	Strike at Site	Einstein A.	6.1. Negotiate	6.1.1. Prepare negotiating plan	Einstein A.	13-Apr-12	Ongoing	
7	MAIN	Requirement Changes	Wells H.G.	7.1. Use MoC to push back	7.1.1. No action identified	Newton I. (Sir)		Proposed	
					7.1.2.				
12	SUB 1	Cashflow shortages	Hawking S.	12.1. Win the lottery	12.1.1. Buy a lottery ticket	Carrol L.	08-Dec-10	On Hold	
13	SUB 3	Rain at job site	Orwell G.	13.1. Buy an umbrella	13.1.1. Buy umbrella	Tolkien J.R.R.	15-Oct-10	Ongoing	
17	MAIN	Risk Training - 1	Mouse, M.	17.1.	17.1.1.			Ongoing	
18	SUB 4	Late Delivery of Compressor		18.2. Negotiate 3-Month Extension with Client	18.2.1. Attempt to negotiate a 3-month extension	Mouse, M.	22-Jul-11	Ongoing	
				18.3. Performanace Incentive with Vendor	18.3.1. Approach Vendor	Newton I. (Sir)	28-Jul-11	Ongoing	
					18.3.2. Prepare Amendment	Clark A.C.	17-Aug-11	Ongoing	
				18.4. Take Early Possession - Unfinished Work	18.4.1. Research Alternate workshop	Einstein A.	13-Sep-11	Ongoing	
					18.4.2. Prepare a PO	Rowlings J.R.	15-Sep-11	Ongoing	
				18.5. Review Project Critical Path	18.5.1. Review Engineering detail	Clark A.C.	15-Sep-11	Ongoing	
					18.5.2. Review Construction	Tolkien J.R.R.	15-Sep-11	Ongoing	

9 IDENTIFYING AND ORGANIZING RISKS

9.1 INITIAL RISK IDENTIFICATION

All project risks associated with Phase 1 of the Lower Churchill Project will be placed on a Sub-Project Risk Register. As portrayed in Figure 6, the EPCM Consultant will have the responsibility for overseeing Sub-Project Risk Registers pertaining to: Muskrat Falls Generation (Component 1), HVdc Specialties (Component 3), Overland Transmission (Component 4), and General Execution of Project Management.

To assist with the initial population of a Sub-Project Risk Register, the EPCM Consultant Risk Manager will create a preliminary list of the risks which pertain to that particular Sub-Project. A workshop can then be held, (in accordance with Appendix A, Risk Identification Meeting Guidelines, of Procedure 2225 (SNC-Lavalin Corporate Project Risk Management), with broad participation from multiple disciplines, to further develop the list of risks for the Risk Register. This workshop will be facilitated by the EPCM Consultant's Risk Manager.

Risk identifications meetings will be conducted throughout the project. At the beginning of the project these meetings may cover the complete scope and duration of the project while others may be significantly more limited. As a minimum a risk identification meeting will be held:

- Within one month of the commencement of a major project phase to identify risks associated with the total scope of the project. The first meeting will also be used to transfer to project team all risks identified prior to the assembly of the particular project team.
- During the development of Contract Strategies for each risk critical individual package (Section 11.3).
- At any time that the EPCM Consultant's General Project Manager, or EPCM Consultant's Risk Manager, decides that a portion of the work is about to reach a level of maturity or completeness that it would be beneficial to identify risks associated with its execution.

Risk Identification and the review of risks shall also be an agenda item, as part of Risk Management in general, for the following meetings:

- Co-ordination Meetings between EPCM Consultant and the Client
- Internal project meetings
- Progress Reviews between EPCM Consultant and its partners, subcontractors and suppliers
- Project Review meetings with EPCM Consultant Senior Management

The EPCM Consultant's Risk Manager has primary responsibility for developing a schedule for Risk Identification meetings.

9.2 ORGANIZING RISKS BY CATEGORY

Organizing the risks on the Sub-Project Risk Registers is critical to the risks being efficiently and effectively managed. The EPCM Consultant's Risk Manager will have primary responsibility for organizing risks on the Sub-Project Risk Register.

Initially, it may be helpful to group risks by major activity or physical component of the Work Breakdown Structure. Risks should be further organized by type of risk. The following twelve categories of risk (Risk Break-down Structure) are used on the Sub-Project Risk Register:

- Commercial
- Commissioning & Start-up
- Completeness
- Construction
- Environmental
- External
- Health, Safety & Security (HSS)
- Interface
- Organizational / Enterprise
- Operations
- Regulatory
- Technical

After this level of organization has taken place, the list of risks should be reviewed to see what consolidation/elimination is appropriate.

Finally, to assist future risk assessments, a determination should be made for each risk as to whether it is a tactical risk or a strategic risk. In general, if the Sub-Project team has the authority to address a risk, it is a tactical risk; if a level of the organization above the Sub-Project team is required to address a risk, then it is a strategic risk.

9.3 IDENTIFYING RISK OWNERS

The EPCM Consultant's Risk Manager, in conjunction with the EPCM Consultant's General Project Manager, will assign a Risk Owner for each risk. This assignment may be made during the workshop discussion at the time the risk is placed on the Risk Register. Once the assignment has been made it is important that the EPCM Consultant's Risk Manager confirm with the Risk Owner that he/she understands and accepts the responsibilities associated with being the Risk Owner.

9.4 UPDATING RISK REGISTERS BASED UPON GATHERED INTELLIGENCE

The EPCM Consultant's Risk Manager will update or add risks to the Sub-Project Risk Registers based on discussions in management meetings, information gathered from Risk Assessments and Analyses, or other new intelligence.

10 ANALYZING (ASSESSING) AND PRIORITIZING RISKS

10.1 DETERMINING PRELIMINARY RISK LEVELS

The EPCM Consultant's Risk Manager and other members of the Sub-Project team, as appropriate, will assess the consequence, probability of occurrence, manageability (if applicable) and the potential consequence(s) of each risk on the Sub-Project Risk Register. There are six categories used for consideration of potential impacts on Project Objectives:

- People (Occupational Health and Safety)
- Environmental (Physical)
- Capital Cost
- First Power Target Date
- Product Quality (Availability, Reliability, and Performance)
- Reputation / Image

Each risk's impact/ consequence, probability of occurrence and inherent manageability combined with its potential consequence(s) produces a first-cut priority risk level for the risk in accordance with Appendix 1 – Project Risk Ranking Matrix. Procedure 2225 (SNC-Lavalin Corporate Project Risk Management) provides additional details on this rating process.

10.2 RISK ANALYSIS (ASSESSMENTS)

After preliminary risk levels have been established a more in depth analysis takes place. NE-LCP has primary responsibility for this activity and the EPCM Consultant supports it providing required inputs.

This analysis is intended to arrive at a financial evaluation of the risk which can then be included in the overall Sub-Project exposure. Risks are analyzed prior to the application of addressing efforts to establish the exposure of the project on a "business as usual basis" ("as-is"). This analysis will also identify which risks are strategic, which are tactical and which are time critical.

Risk analysis will also be performed once an addressing plan for a risk has been prepared to gauge the potential effectiveness of the plan. So that decisions can be made in determining the level of resources which should be applied to a particular risk to reduce its potential impact ("to-be") to the Sub-Project.

Individual risks will be analyzed at an appropriate time in the life-cycle of the risk. Collectively the risk analyses will be reviewed at periodic risk reviews. The EPCM Consultant's Risk Manager has primary responsibility for developing a schedule for risk review meetings.

11 MITIGATING (ADDRESSING) RISK

11.1 DEVELOPING AND IMPLEMENTING RESPONSE PLANS TO ADDRESS KEY RISKS OVERSEEN BY RISK RESOLUTION TEAM

NE-LCP has primary responsibility for determining what characterizes a Key Risk and developing the Response Plan, and the EPCM Consultant supports it through providing required inputs. The Risk Owner for each Key Risk has the primary responsibility for developing the Response Plan for that risk.

The Response Plan will detail the recommended strategy for managing the risk (i.e., avoidance, mitigation, allocation, or acceptance). The Risk Owner will consult with the EPCM Consultant's Risk Manager and members of the Risk Resolution Team as appropriate when developing the Response Plan. Findings from Risk Assessments should also be used to help shape the Response Plans. Nalcor Key Risk Frames are used to structure the Response Plans.

The NE-LCP Project Director will approve each Response Plan or, when required, seek higher-level approval for the Response Plan. The Risk Owner for each Key Risk will be responsible for leading the implementation of the Response Plan.

11.2 DEVELOPING AND IMPLEMENTING ACTIONS PLANS TO ADDRESS PROJECT RISKS ON SUB-PROJECT RISK REGISTERS

The vast majority of risks are not elevated to Key Risk status, and they continue to reside on the Sub-Project Risk Registers; Mitigation Plans are used to manage these Project Risks. The Risk Owner for each Project Risk has the responsibility for developing that risk's Mitiagtion and Action Plan, within *MOINS* - ***RISC*** - *LESS*. The Risk Owner will be responsible for consulting the EPCM Consultant's Risk Manager and other resources as appropriate in developing the Action Plan.

The Risk Owner for each Project Risk will be responsible for leading the implementation of the Action Plan.

11.3 ADDRESSING RISKS THROUGH THE PROCUREMENT PROCESS

Another important aspect of the Project's Risk Management Philosophy is effectively using the procurement process to address risks during the development of contract strategies for each risk critical individual work package (Section 11.3.1). Overall package risk management workflow for risk critical packages is introduced by Figure 11. The rest of the Section 11.3 is devoted to high level description of the workflow. Five phases of the workflow (RFI Preparation, RFP Preparation, Bidding/ Negotiation/ Risk Brokering, Contract Preparations, Risk Monitoring) separated by corresponding milestones are introduced by Figure 11.

11.3.1 Package Risk Review in RFI Preparation Phase

EPCM Consultant's Package Administrator, Engineer and Risk Manager and NE-LCP Area Manager define risk criticality of a package and conclude on eligibility for package risk management (Figure 11).

For instance, small packages related to supply of standard off-shelf products or standardized works not on project schedule's critical path usually have low criticality (non-critical) and do not require package risk management.

However, as a rule, **all packages of value more than $5M CAD should be considered critical** and eligible for risk management (Figure 11).

In addition, some packages of value less than $5M CAD do require risk management if they satisfy to one or more of the following criteria,

<u>in case of supply and service providing packages:</u>

- proximity to the project schedule critical path,
- a lack of maturity of technical or other requirements,
- represents an unusually high degree of technical development,
- concerns exist regarding the robustness of the supplier's/ provider's Quality Management System,
- requires unusual design and/or manufacturing processes,
- a lack of NE-LCP or EPCM Consultant prior or positive experience with the supplier/ provider,
- concerns regarding any sub-vendors to the supplier/ provider,
- criticality of the supplier/ provider to the overall success of the project,
- any other relevant considerations;

<u>in case of construction packages:</u>

- the work is on or close to the critical path,
- the workforce will be a high percentage of the site workforce or will contain a large percentage of people new to the industry,
- the work will be undertaken in a heavily congested area,
- the work involves a high level of contractor design,
- the work involves new construction techniques,
- any other relevant considerations.

If a package is not considered risk critical and eligible for package risk management, corresponding decision is documented by the EPCM Consultant's Risk Manager. All possible project risks associated with the package are considered low ('green', Appendix 1) and accepted.

The EPCM Consultant's Risk Manager will work with the Area Managers, the Package Administrators, Package Engineers, Contracts Coordinators and representatives of NE-LCP to develop a Package Risk Inventory for each risk critical

package. Namely, three - five weeks prior to RFI issue date of a risk critical package a risk review to identify risks associated with the total package scope should be held.

The General Package Risk Inventory prepared by the EPCM Consultant's Risk Manager should include risk definition, a risk owner and general recommendations on addressing each risk.

11.3.2 Package Review in RFP Preparation Phase

Representatives of Engineering, Safety, QA, Procurement, Permitting, etc. assigned as package risk owners, should develop detail addressing actions for each identified risk. Changes may be recommended to the package scopes or decisions may be made on risk addressing that should be negotiated and written into the package Contract's or purchase order's terms and conditions.

The information of the Package Risk Inventory along with the proposed addressing should be collected in the Package Purchasing Plan and returned to the EPCM Consultant's Risk Manager to prepare a Package Risk Questionnaire.

A Package Risk Questionnaire normally contains both standard risk questions and package specific ones depending on risks exposure. (Appendices 2 and 3 contain sample risk questions.). It becomes part of the RFP as an Exhibit along with request to provide package Risk Management Plan (including Risk Register) according to item A04 of SDRL. Risk Management Plan requirements are introduced in Sections 11.3.5 and 11.3.6.

Information about package risks (Package Risk Inventory) should be collected in *MOINS* - ***RISC*** - *LESS* in an individual package folder. This should include names of risk owners, assessment of risks before addressing, proposed addressing as well as assessmenet after addressing. All package risks that are believed to have high ('red') and medium ('yellow') level after addressing (Appendix 1) should be reflected in the Package Risk Questionnaire.

11.3.3 Bidding, Negotiation and Risk Brokering

Selection of Suppliers, Contractors or Service Providers will be made on a risk informed basis for all risk critical packages.

Upon receiving the RFP responses, the Package Risk Questionnaire responses along with package Risk Management Plans (including bidder's Risk Registers) become a basis for development of Bidder's Ranking Template to rank bidders and develop their short list.

In addition, during the bid clarification process EPCM Consultant and NE-LCP procurement, engineering and risk personnel will collect risk information. The additionally collected risk information should be also used for evaluation of bidders. A risk review will be held to compare the risk exposure of awarding a particular package to each contender using the Ranking Template.

The next step of the process is most critical for the package risk management. It is focused on negotiations with short listed bidders in order to allocate risks to the potential contractors where deemed best for the Project (risk brokering). The EPCM Consultant's Risk Manager and the NE-LCP Project Risk Coordinator should work with the Contract Coordinator to facilitate any required risk brokering reviews and approvals.

As a result of this phase, the Contract award recommendation will be issued based on most optimal negotiated risk brokering approach. Corresponding risk addressing obligations of the recommended bidder should be included to the package Contract. The General Package Risk Inventory should be updated to reflect corresponding residual medium and high risks as negotiated. If required, additional vendor specific medium and high risks should be identified and added to the Inventory.

11.3.4 Contract Preparation

The updated Package Risk Inventory should be reviewed with a selected supplier, service provider or contractor. Corresponding addressing actions should be reviewed and included to the Contract. Similarly, the reporting requirement for selected list of high and medium residual risks should become part of the Contract. All these package and supplier/ service provider/ contractor specific risks that are believed to have high or medium level after addressing should be added to the project Risk Register in *MOINS* - ***RISC*** - *LESS* . Otherwise (low level after addressing) they should stay in the package Risk Register.

11.3.5 Contractor' and Supplier's Risk Management Processes and Risk Monitoring

To the maximum extent possible and as necessary, contractors and suppliers will be integrated into EPCM Consultant's risk management activities. The degree of the involvement depends on a type of the package contract (fixed price, unit price, reimbursable) and phase of procurement process (package contract pre-award vs. post-award).

As during the pre-award phases the main goal of the package risk management is to collect risk information and evaluate bidders, there are following risk requirements for bidders pre-award:

- to answer all questions of the Package Risk Questionnaire;
- to provide a package Risk Management Plan (including Risk Register) according to item A04 of SDRL.

As the main goal of the package risk management post-award is risk addressing, monitoring and reporting a selected contractor/ supplier (the bid winner) should provide following documents post-award:

- updated Risk Management Plan (agreed upon during Contract negotiation) according to item A04 of SDRL;
- Monthly Report (including recent package Risk Register) according to item A03 of SDRL.

A Procedure "LCP Risk Management Requirements for Contractors and Suppliers" (NE-LCP # LCP-SN-CD-0000-RI-PR-0001-01; SLI # 505573-0000-39RA-I-0002) puts forward general instructions on structure of the Risk Management Plan, Risk Register and Monthly Risk Report. However, particular content of these documents should be negotiated and stipulated by the Contract in the Contract's Coordination Procedure that defines particular content of the Risk Management Plan and, hence,

- requirement to implement a formal risk management process,
- list of risks that are subject to Monthly Reporting,
- types and frequency of package risk reviews.

In case of reimbursable types of contracts, as a rule, a supplier/ provider will be required to implement a formal risk management process based on agreed Risk Management Plan. Corresponding audit could be part of the requirement. Representatives of the Lower Churchill Project could attend the internal risk review meetings, etc.

In case of fixed price or unit price types of contracts, as a rule, the full implementation of the risk management process is recommended. Usually, representatives of the Lower Churchill Project do not attend internal risk reviews, etc.

However, a minimal requirement for any type of contracts is to include to the Monthly Reporting all risks that are believed to be of high ('red') and medium ('yellow') level after addressing according to a package Risk Ranking Matrix recommended by the Procedure "LCP Risk Management Requirements for Contractors and Suppliers"(NE-LCP # LCP-SN-CD-0000-RI-PR-0001-01; SLI # 505573-0000-39RA-I-0002).

11.3.6 Package Residual Risks

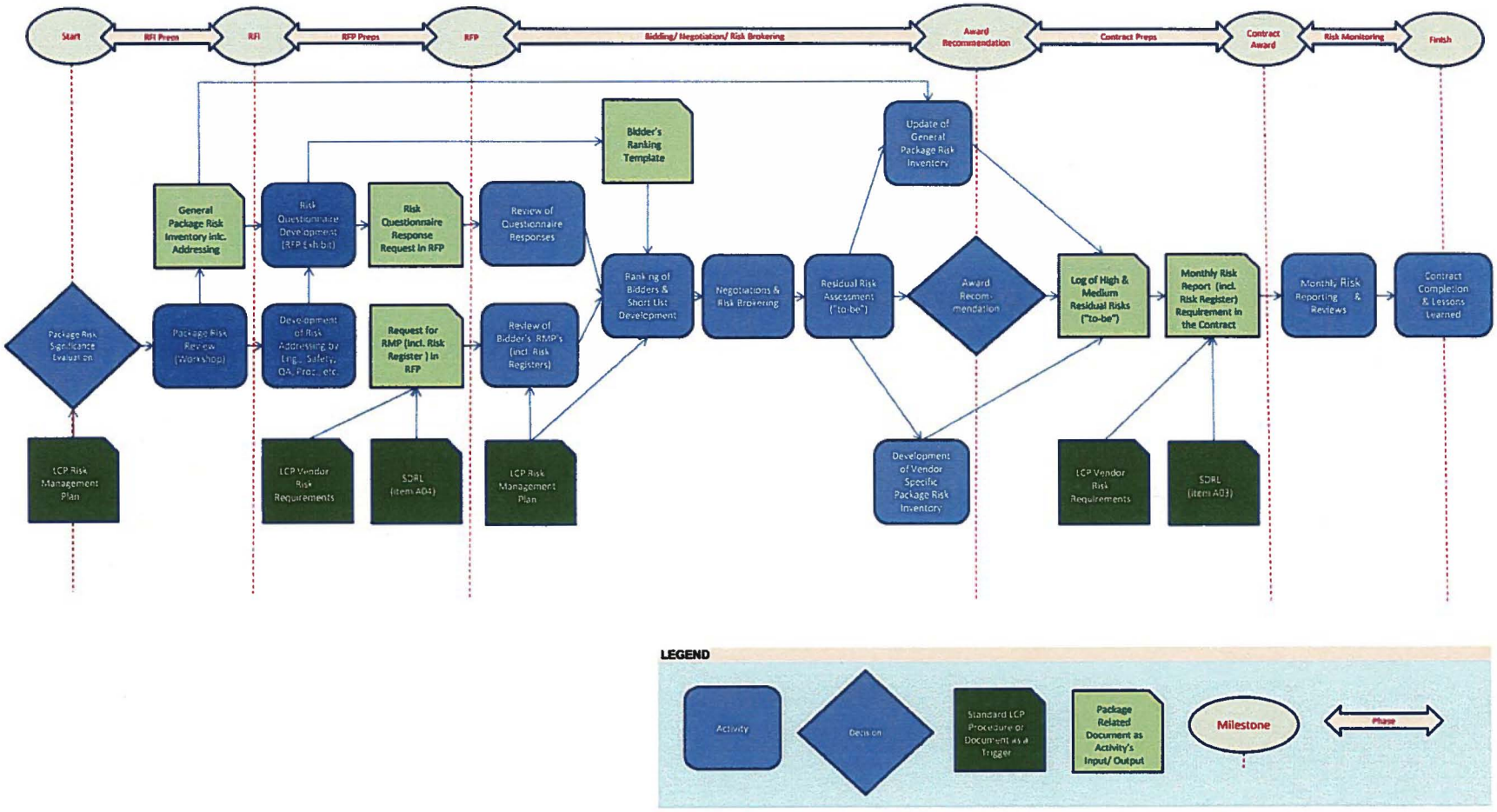
As mentioned in Sections 11.3.1, all package risks are kept in individual package folders of MOINS - RISC - LESS . Any package risk that has medium ("yellow") or high ("red") level after addressing according to Appendix 1 should be included to the Project Risk Register in MOINS - RISC - LESS. It should be monitored and reviewed along with other Project risks. Information received from suppliers/ contractors as part of Monthly Risk Reporting should be used for assessment of the residual risks. In addition, information about quality assurance activities or issues, monitoring major milestones, etc. should be also used for assessment of the residual package and Project risk exposure.

Upon completion of a package the package risks that reside both in package and Project Risk Registers should be retired. Information about package risk management process at large (issues, successes, failures) and about particular risks that materialized should become an input to the Lessons Learned process.

11.4 PROJECT INSURANCE PROCUREMENT

The Insurance Advisor (broker) will act as the technical advisor during the procurement of the Project's insurance program, which entails a thorough understanding of the Project and its associated risks discovered throughout the application of this Management Plan.

Figure 11. Package Risk Management Workflow



12 MONITORING AND CONTROLLING RISK

12.1 MONITORING AND ADJUSTING RESPONSE PLANS FOR KEY RISKS OVERSEEN BY RISK RESOLUTION TEAM

The Risk Owner for each Key Risk will be responsible for providing a monthly update on the status of the Response Plan to the NE-LCP Risk Coordinator.

Response Plans may be adjusted based on feedback from the NE-LCP Risk Coordinator and the Risk Resolution Team.

The NE-LCP Project Director will approve any adjustments to a Response Plan or, when required, seek higher-level approval for the adjustment.

12.2 MONITORING AND ADJUSTING ACTIONS PLANS FOR PROJECT RISKS ON SUB-PROJECT RISK REGISTERS

The Risk Owner for each Project Risk will be responsible for providing a monthly update on the status of the Mitigation and Action Plans to the EPCM Consultant's General Project Manager. All updates of Mitigation and Action Plans are captured in the Sub-Project Risk Registers using *MOINS* - ***RISC*** - *LESS*. The EPCM Consultant's Risk Manager will prepare a Mitigation and Action Plan Status Report which will be provided to the NE-LCP Project Risk Coordinator and other team members on a monthly basis (Attachment B.3 – Monthly Key Risk Status Report of NE-LCP Energy Project Risk Management Plan/ NE-LCP # LCP-PT-MD-0000-RI-PL-0001).

Mitigation and Action Plans may be adjusted based on feedback. The applicable EPCM Consltant's General Project Manager (or delegate) will approve each Mitigation and Action Plan adjustment.

12.3 RISK REVIEWS

Risk Reviews are the formal process by which risks shall be reviewed by the EPCM Consultant's Projects General Manager, which will also include participation of the NE-LCP Risk Coordinator. They comprise; the systematic review of all active Risks, the effectiveness to which they are being managed; decisions with respect to Mitigation Strategies and any budget required for their implementation. Project Risks will be reviewed periodically by the EPMC Consultant's General Project Manager with a frequency dependant on the Risk Level from the Risk Ranking Matrix included in Appendix 1.

12.3.1 Risk Reviews vs. Risk Level

Risk reviews shall be conducted for the various risk levels as follows:

Risk Level	Review Frequency
High	Bi-Weekly
Medium	Monthly
Low	Bi-Monthly

As an alternative to formal risk reviews, risks may be addresses as part of regular Project/ Component management meetings. The EPCM Consultant's Risk Manager should issue bi-weekly risk reports to facilitate easier and effective updates of high risks.

12.3.2 Risk Reviews at Site

In general risks associated with the site activities will be managed in the same way as other Project execution risks (Section 12.3.1). Site Risk Reviews will be held monthly.

13 HEALTH, SAFETY AND ENVIRONMENTAL RISK ASSESSMENTS

As deemed required, focused health, safety and environmental risk assessments (e.g. HAZIDs, HAZOPs, etc.) will be undertaken. Details on the process for undertaking these specific risk assessments can be found in EPCM Consultant's Project Health and Safety Management Plan/ SLI # 505573-0000-68RA-I-0001-PA.

13.1 HAZARD IDENTIFICATION, RISK MANAGEMENT AND CONTROLS

EPCM Consultant's safety management approach is risk-based, systematic, and responsive to the dynamic nature of risks. This is accomplished by performing comprehensive risk assessments to ensure all hazards are identified, assessed, and evaluated to effectively eliminate and/or control risk levels. To ensure success:

- All work environments containing hazards shall be assessed;
- A risk assessment tool shall be utilized and associated documentation shall be retained;
- Risk assessments shall be performed regularly and in a timely manner by qualified personnel and with sufficient management representation;
- Risk assessments shall be conducted whenever changes occur to the scope of work or identified hazard. At a minimum, risk assessments shall be conducted at the following stages:
  - Proposals
  - Early stages of new projects
  - Detailed design of current projects
  - Critical decision points in current projects
  - Non-standard operations
  - Following modifications
  - Active office or facility (new or existing)
  - Vendor site inspections
  - Travel
- Risk assessments for repetitive and continuous work shall be reviewed at specified intervals with management involvement (i.e. project work in an office environment).

Following the risk assessment, corrective measures shall be taken to ensure that hazards are appropriately evaluated and controlled to levels as low as reasonably practicable (ALARP).

A follow-up of the risk assessment action items shall be performed to ensure corrective measures are effective and sustainable. Training shall be provided when necessary.

13.2 PROJECT HSE RISK REGISTER

An active Risk Register will be maintained during each phase of the Project's operations to catalogue the significant risks and their control methods. Those who best understand the risks are to participate in facilitated meetings to prepare a ranked list of the current and anticipated risks. This shall be generated and stored using the Risk Management Tool.

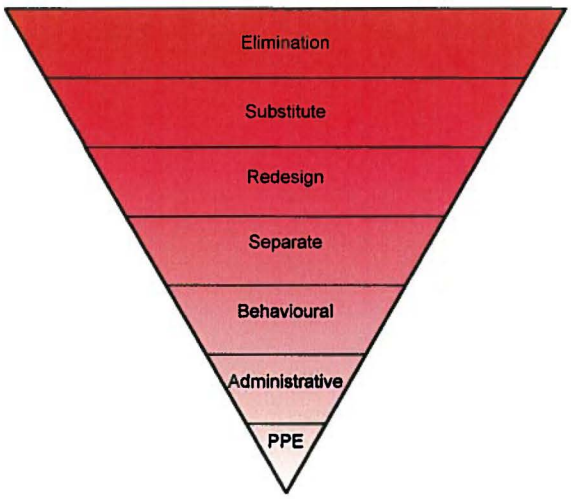
The Risk Register allows proper resource allocation to manage the risks. At the beginning of the Project only high level risks are identified and prioritized to coincide with the Project schedule. As the Project or operation advances, more specific risks are identified and detailed controls are implemented to manage them.

13.3 TASK SAFETY ANALYSIS (TSA)

A Task Safety Analysis (TSA) shall be conducted for work activities identified in the Project Risk Register which require further detailed evaluation and where the work activity shall be repeated on the Project. The TSA is a comprehensive hazard

13.4 HAZARD ELIMINATION AND CONTROL

If a hazard cannot be eliminated, the hierarchy of controls (listed in the preferred order to mitigate hazards and control risk levels) is:



- Elimination: Complete elimination of a hazard.
- Substitute: Replace higher risks with lower ones.
- Redesign: Redesign the equipment or work processes.
- Separate: Isolate the hazard by guarding or enclosing it.
- Behavioral: Identify individual and collective behaviors to control hazards faced by workers.
- Administrative: Limit exposure to hazardous conditions or energies by procedural means (i.e. training).
- Personal Protective Equipment (PPE): Use appropriate and properly fitted PPE where other controls are not practical.

A number of these options may be considered and applied individually or in combination to ensure that exposure to hazards is ALARP. If a hazard cannot be eliminated or mitigated effectively, all personnel involved shall be informed of the hazard and are given the necessary precautions to avoid any incidents.

13.5 CRITICAL RISK CONTROL PROTOCOLS

All Project personnel shall obey the Critical Risk Control Protocols. These non-negotiable practices are designed to mitigate or eliminate seven high risk hazards that have historically resulted in fatalities and significant events.

14 MANAGEMENT OF CHANGE

14.1 CHANGE MANAGEMENT

Risk Management will be included in the Management of Change process. For major changes of scope a risk assessment will be performed to gain insight into the Project risk profile should the change be incorporated such that a risk informed decision may be made.

14.2 VALUE ENGINEERING CHANGES AND ENGINEERING DECISIONS

Risk Management will also be included in the value engineering process so that the relative risk profile of the Project prior to the change being implemented can be compared with the risk profile of the Project should the change be made. In this way risk informed engineering decisions may be made. Some details of the method are described in Section 18.1.

Risk Management will also be involved at any time when an engineering or construction preferred option must be selected from a number of candidate solutions. In this case each option should be reviewed to identify possible risks and a master list of risks which the options could experience prepared. All options are then assessed in terms of Consequence and Probability for all of the identified risks on the master list. The resulting risk profile can then be described by the relative numbers of High, Medium and Low risks for each option. Experience has shown that the technical comparison between such options is often very close and the associated risk profile can become the deciding factor.

15 MANAGEMENT OF INTERFACES

15.1 MANAGEMENT OF INTERNAL INTERFACES

Risk Management will be included in analysis and development of hard and soft interfaces. A risk assessment of key interfaces among Sub-Projects/ Components and Project disciplines will be performed to gain insight into the Project risk profile. Adequate organizational actions should be developed to address key internal interface risks.

15.2 MANAGEMENT OF EXTERNAL INTERFACES

In addition to management of internal interfaces, corresponding interfaces with contractors and suppliers as well as with their subcontractors should be monitored. This should be supported by the procurement process and risk brokering (Section 11.3).

16 TRAINING AND AWARENESS

Both the NE-LCP Project Director and the EPCM Consultant's General Project Manager are responsible for creating an environment where Project stakeholders are encouraged to actively search out risks of all types, so that they can be dealt with as early as possible with the minimum impact and cost to the Project and Project personnel.

Training of specific individuals in aspects of risk management will be based on a needs analysis.

Risk awareness training will be provided to the combined NE-LCP and EPCM Consultant project management teams plus any additionally invited project team members with 3 months of the execution of the contract.

Risk awareness training will be also available quarterly throughout the contract to those individuals newly exposed to risk management or in need refresher training.

17 ADDITIONAL EPCM CONSULTANT'S SUPPORT TO NE-LCP

If and as when required the EPCM Consultant's personnel will support the NE-LCP Project Risk Coordinator if the following areas:

- Risk Resolution Team activities
- Risk management activities outside of the scope of the EPCM Consultant's scope of work but which have an impact on the scope or the risk of the EPCM Consultant's work.
- Residual risk estimates to support NE-LCP's decisions with respect to the Project cost and schedule contingencies and reserves.

18 ADDITIONAL PROJECT RISK MANAGEMENT METHODS AND TECHNIQUES

The risk management framework introduced above in this document represents the core of the LCP risk management system. Its results may be used as inputs to five additional risk-based decision techniques to be used *ad hoc*. Detail procedures on their applications will be developed as soon as there is a need to use them. Below these methods are introduced at higher level.

18.1 SCORING METHOD FOR RISK-BASED SELECTION OF SCOPE OPTIONS

It is not unusual that several engineering options are considered when developing Project scope. Besides engineering criteria option's risk exposure should be taken into account to find optimal option. This method could be used to define value engineering changes and support corresponding engineering decisions.

Although Risk Registers for each viable option should be developed, considered should be only risks that are unique for each option ('risk differentiators'). Ranking scores should be calculated for each risk, which is a product of impact score and probability score defined by the LCP Risk Ranking Matrix of Appendix 1. In case, a risk has impact on more than one Project objectives, weighted sum of corresponding impact ranking scores could be used to represent the total risk score.

The sums of all risk scores for each option may be used to compare option's risk exposures. In case of opportunities, their scores should be subtracted from the option's scores.

Obviously, the option with lowest ranking score should be considered as preferable.

Although this method is straightforward and easy to use, it doesn't provide monetary assessment of option's risked costs. Same time it takes in to account impacts on all six Project objectives reflected in the LCP Risk Ranking Matrix (Appendix 1).

18.2 DECISION TREE METHOD FOR COST-RISK-BASED SELECTION OF SCOPE OPTIONS

The option selection may be represented graphically as a 'decision tree' that has a 'root' (major decision to be done), 'major branches' (major options to consider and compare) and 'secondary branches' and 'leaves' (risks attributed to each option to be considered).

The risks identified for each option are used to define the 'secondary branches' and 'leaves'. Each risk may be represented by expected value (probable consequence) which is a product of risk probability and cost impact (defined in monetary values). Several options may be

evaluated as routes from the 'root' to each terminal 'leaf'. The 'root' to 'leaves' sums of all expected values are to provide assessments of risked costs for each option. This information may be used for comparison of options and decision making.

18.3 PROBABILISTIC RISK ANALYSIS

Probabilistic cost or schedule risk analysis allows represent Project costs or completion dates as distributions as opposed to one-point numbers. Integrated cost & schedule risk analysis may be undertaken to define Project cost distributions that takes into account schedule driven costs. (The probabilistic cost risk analyses or integrated cost & schedule risk analyses for several options may be used as most advanced method of cost-risk-based selection of scope options in value engineering.)

The cost or schedule risk contingencies could be established at any confidence level using the distributions. The contingency criteria should be defined by either corresponding corporate procedure or decision of LCP leadership team. Sensitivity analysis that is part of probabilistic risk analysis provides additional information on most sensitive risks as well as supports decision making on effective contingency allocation.

18.4 MACRO-ECONOMIC ANALYSIS TO DEFINE PURCHASING TIME

Available forecasts of micro-economic indices (time series) for major types of materials and equipment may be used for decision making on most favourable time of purchasing. Corresponding information from Global Insight, CERA, etc. may be taken into account to identify periods of lower pricing.

18.5 MACRO-ECONOMIC ANALYSIS TO DEFINE COST ESCALATION CONTINGENCY

Project base estimate developed for a base period as well as Project's cash outflow ('spending profile') could be combined and represented as weighted composite indices using the micro-economic forecasts introduced in previous Section. As a result, amended cash flow may be compared with the base estimate so that the difference may be treated as additional contingency of special type to address expected cost escalation.

APPENDIX 1 PROJECT RISK RANKING MATRIX

Risk Ranking Score = (Impact Score) x (Probability Score)	Risk Level Colour Code	Low	Medium	High

		IMPACT				
		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Extreme (5)
PROBABILITY	>90% Almost Certain (5)	5	10	15	20	25
	50% - 90% Likely (4)	4	8	12	16	20
	1% - 50% Possible (3)	3	6	9	12	15
	0.1% - 1% Low (2)	2	4	6	8	10
	< 0.1% Rare (1)	1	2	3	4	5
PROJECT OBJECTIVES	**Capital Cost, $M**	**< 0.1**	**0.1 - 1**	**1 -- 10**	**10 - 100**	**>100**
	Schedule, Mos (First Power Target Date)	**< 0.25**	**0.25 - 1**	**1 -- 3**	**3 -- 12**	**>12**
	Product Quality (Availability, Reliability, Performance)	Potential degradation of element performance, system level not affected.	Decrease in system performance, however still above requirement.	Decrease in system performance eliminates all design and operating margins.	Decrease is system performance that substantially affects performance objectives.	System requirement is not achieved, safety objectives are not achievable. System or element is effectively useless.
	People (Health & Safety)	Minor impact on personnel. First aid only. No lost time.	Potential to cause medical treatment of personnel. Lost time incident.	Injury to personnel that does not result in some permanent disability. Multiple lost time incidents outside established targets.	Serious personal injury resulting in permanent disability. Total lost time well outside established targets to the point where operations are temporarily suspended.	Potential to cause single or multiple fatalities.
	Environmental (Physical)	Slight Effect: e.g. Non-reportable spill or release contained within the immediate work area, negligible financial consequences, no lasting effect.	Minor Effect: e.g. Sufficiently large contamination or discharge to damage environment, but no lasting effect. Single breach of statutory or prescribed limit or single complaint.	Localized Effect: e.g. limited discharges affecting the local area and damaging the environment. Repeated breaches of statutory/regulatory limit or multiple complaints.	Major Effect: e.g. Severe environmental damage. The company is required to take extensive measures to restore the damaged environment. Regulatory restriction or enforcement action probable.	Massive Effect: e.g. Persistent severe environmental damage or severe impact extending over a large area resulting in major financial implications for the Project. Direct impact on public with prosecution possible.
	Reputation/ Image	No or very minor media attention. Little or no loss in stakeholder trust/commitment.	Some unfavourable media attention. Some loss in stakeholder trust/commitment which can easily be rebuilt.	Local media coverage only. Some loss in stakeholder trust/commitment that will require commitment to rebuild.	Local and possibly national media coverage. A loss in stakeholder trust/commitment that it is doubtful whether it can be rebuilt.	National and international media coverage. An irreparable loss in stakeholder trust/commitment.

APPENDIX 2 RISK MANAGEMENT QUESTIONNAIRE FOR SUPPLIERS

Package Risk Questionnaire (Section 11.3.1) should be included to RFP in a form of Exhibit "Risk Management Questionnaire for Suppliers". It is to contain general risk questions as well as package and supplier specific questions. The list below represents typical sample standard questions and statements that may be amended depending on the nature of a package and overall expected risk exposure (Section 11.3.1). However, all package and supplier specific risks of high ('red') or medium ("yellow') level after addressing should be reflected in the Questionnaire.

- Does your company have a risk management system in place for the proposed type of agreement? (Yes/No)
  - If yes, when was it implemented?
  - If yes, provide a description of the risk management process in place, and the tools to support it.
  - If yes, describe key roles and responsibilities of your personnel in risk management, and advise on types and frequency of risk review meetings.
- Provide samples of a risk management plan and a risk register that your company uses for this type of agreements.
- Provide a list of top 10 risks, which, in your view, could impact the timely delivery of the scope of work as specified in the agreement.
  - What risk addressing plans does your company intend to put in place to either reduce the probability that these risks could occur or to minimize the consequences, should they happen.
- Does your company have a loss control program and/or disaster recovery plan in place, including contingency plans for completing orders in a timely manner in case of failure of major production equipment, strikes, property damage, production delays, product losses, natural disasters, etc.?
  - If yes, provide a high level overview of the loss control program.
- Are your company's sub-suppliers or sub-contractors actively involved in your risk management activities? (Yes/No)
  - If yes, describe their level of involvement e.g. what kind of inputs they provide and any risk management systems they have in place.
  - If no, list your company's sub-suppliers or sub-contractors that are not involved in your risk management activities and don't have a risk management system in place.
- Provide historical records of successful on-time delivery performance in the last five (5) years for materials of similar nature to the scope of work.

- Provide report, including the root causes, of all unsuccessful deliveries in the last five (5) years for materials of similar nature to the scope of work.
    - What are the lessons learned?
    - What measures has your company implemented to improve on-time delivery performance in the last 3 years?
- Provide a discussion of the critical path (including equipment or material supplied by third parties) and controls which will be used to ensure on time delivery.
- Put forward a clear description of any new technology, manufacturing techniques or design, manufacturing or test software, which will be used to complete the scope of work and what risk mitigations measures are available should the new technology or techniques fail to meet expectations.
- Share any concerns that your company has with the design process, manufacturing process or quality management system of any sub-contractor or sub-vendor and what plans will be put in place to manage any associated risks.
- Share any negative experiences that the your company has had with any proposed sub-contractor or sub-vendor and what plans your company intends to put in place to ensure that these will not happen during the proposed work.
- Come up with a discussion of any area of the proposed work which is new to your company and what plans will be put in place to manage any associated risks.
- Put forward a statement regarding any concerns with any reliability, availability or maintainability requirements of the work.
- Provide a description of any capital equipment which must be purchased by your company (or sub-supplier) to implement the work as well as its approximate cost and intended purchase date.
- Provide a discussion on Canadian certification of equipment purchased outside of Canada.
- Does your company have a production workload forecast for all major facilities (yours and sub-vendors') involved in the fulfilment of the proposed work? Provide forecasts of shop loadings for the period of time that the contemplated work will be performed by your company and your sub-vendors'. The forecast shall include all current work contracts, the proposed work and any other works that have been proposed to other potential clients. (It should be represented as percentage of total production capacity on monthly basis.)
- Bring up a listing of skills which are considered to be critical to the success of the project as well as the available number of people employed in these skills at the facility which the work will be performed as well as the average turn-over of those skills at the facility which will perform the work.

- Identify, by name key personnel who will be involved in desk and field expediting, QA/QC monitoring, inspection and testing.
- Put forward a listing of the critical components or materials required to complete the work and what plans your company intends to put in place to ensure that your company receives the products in a timeframe consistent with your company's schedule commitments. Include a statement of the overall market current conditions and trends for the listed components or materials.
- Provide a statement concerning your company's (or sub-supplier's) strike and lockout history and any labour agreement which will expire during the term of the proposed work.
- By sub-contractor or sub-vendor provide details of desk expediting, field expediting, QA/QC monitoring and inspections as detailed in the package inspection and test plan and whether these activities will be performed by your company's own personnel or by third party personnel (in the case of third party personnel the selection criteria for the company/personnel performing the activities shall be provided) and in which country the personnel will be located. Include the estimated number of hours required for each of the above activities by sub-contractor or sub-vendor.
- Provide a description of responsibilities (your company vs. sub-suppliers/ sub-vendors) on logistics, including *ex-works* testing prior to shipment, transportation, customs clearance and on-site testing upon delivery.
- Provide confirmation that your organisation has understood and will conform to the requirements for the Monthly Risk Report.
- Put forward a statement that notwithstanding any of the above representations the successful bidder is ultimately responsible for diligent, efficient, consistent and effective management of all of its internal scope, the scope of their sub-contractors and sub-vendors and any sub-sub-contractors or sub-sub-vendors.

APPENDIX 3 RISK MANAGEMENT QUESTIONNAIRE FOR CONTRACTORS

Package Risk Questionnaire (Section 11.3.1) should be included to RFP in a form of Exhibit "Risk Management Questionnaire for Contractors". It is to contain general risk questions as well as package and contractor specific questions. The list below represents typical sample standard questions and statements that may be amended depending on the nature of a package and overall expected risk exposure (Section 11.3.1). However, all package and contractor specific risks of high ('red') or medium ("yellow') level after addressing should be reflected in the Questionnaire.

- Does your company have a risk management system in place for the proposed type of agreement? (Yes/No)
  - If yes, when was it implemented?
  - If yes, provide a description of the risk management process in place, and the tools to support it.
  - If yes, describe key roles and responsibilities of your personnel in risk management, and advise on types and frequency of risk review meetings.
- Provide samples of a risk management plan and a risk register that your company uses for this type of agreement.
- Provide a list of top 10 risks, which, in your view, could impact the timely delivery of the scope of work as specified in the proposed agreement.
  - What risk addressing plans does your company intend to put in place to either reduce the probability that these risks could occur or to minimize the consequences, should they happen.
- Does your company have a loss control program and/or disaster recovery plan in place, including contingency plans for completing works in a timely manner in case of failure of major construction equipment, strikes, property damage, materials and equipment delivery delays, equipment losses, natural disasters, etc.?
  - If yes, provide a high level overview of the loss control program.
- Are your company's sub-suppliers or sub-contractors actively involved in your risk management activities? (Yes/No)
  - If yes, describe their level of involvement e.g. what kind of inputs they provide and any risk management systems they have in place.
  - If no, list your company's sub-suppliers or sub-contractors that are not involved in your risk management activities and don't have a risk management system in place.
- Provide historical records of successful on-time construction completion in the last five (5) years for works of similar nature to the scope of work.

- Provide report, including the root causes, of all late construction completion in the last five (5) years for works of similar nature to the scope of work.
  - What are the lessons learned?
  - What measures has your company implemented to improve performance in the last 3 years?
- Provide a discussion of the critical path (including equipment or material supplied by third parties) and controls which will be used to ensure on time execution.
- Put forward a clear description of any new technology, equipment or construction techniques which will be used to complete the scope of work and what risk mitigation measures are available should the new technology, equipment or techniques fail to meet expectations.
- Share any concerns that your company has with the construction techniques, processes or quality management system of any sub-contractor or supplier and what plans will be put in place to manage any associated risks.
- Share any negative experiences that your company has had with any proposed sub-contractor or supplier and what plans your company intends to put in place to ensure that these will not happen during the proposed work.
- Provide a discussion of any area of the proposed work which is new to your company and what plans will be put in place to manage any associated risks.
- Put forward a statement regarding the adequacy of any design material supplied to your company as part of the tendering process.
- Come up with a description of any capital equipment which must be purchased by your company (or a sub-contractor) to implement the work as well as its approximate cost and intended purchase date.
- Provide an analysis/ forecast of the loading of major construction equipment of your company and sub-contractor's for the duration of the proposed contract. This will include the total number of units, the number of these units expected to be used for work for other clients during the timeframe of the proposed work, the number of units to be used to execute the proposed work.
- Describe any major construction equipment which will be rented and the proposed source and duration of the rental.
- Bring up a discussion of the major logistical issues associated with movement of equipment within the site and to and from the site and what plans your company intends to put in place to ensure that these will not impede the execution of the proposed work.
- Bring up a discussion of the major logistical issues associated with the accommodations of personnel and movement of personnel within the site and

to/from the site and what plans your company intends to put in place to ensure that these will not impede the execution of the proposed work.

- Provide a high level description of the health, safety & environmental (HSE) risk management system used by your company to identify and address the HSE risks.
- Put forward a listing of skills which are considered to be critical to the success of the project as well as the available number of people employed in these skills at the business unit which will perform the work as well as the average turn-over of those skills.
- A statement concerning your company's (or sub-contractor's) strike and lockout history and any labour agreement which will expire during the term of the proposed work.
- Provide confirmation that your organisation has understood and will conform to the requirements for the Monthly Risk Report.
- Put forward a statement that notwithstanding any of the above representations the successful bidder is ultimately responsible for diligent, efficient, consistent and effective management of all of its internal scope, the scope of their sub-contractors and sub-suppliers and any sub-sub-contractors or sub-sub-suppliers.