Filed: 2013-09-27
EB-2013-0321
Ex. F2-3-3
Attachment 1 Tab 10

Severe Accident Management Guidance Implementation 10 - 62449 (OM&A)
Developmental Business Case Summary N - BCS - 09013 - 10000 - R000

Name / Title / Phone	Location	Action	Signature	Date
Nick Ivanoff Fukushima Project – Support 702-5107	P82-2	Prepare BCS		March 9, 2012
Elizabeth Lopez Director Fukushima Project 702-5070	P82-2	Submit BCS		9 MAR/12
Randy Leavitt VP Nuclear Finance 702-5177	P82-3	Approve BCS		March 29, 2012
Mark Elliott Senior Vice President and CNE 702-5418	P82-5	Concur with BCS		March 2/2012
Fred Dermarkar Director, Fukushima Project 702-5066	P82-6	Approve BCS	ACTING FOR FRED D.	29 MAR/12
Carolyn Sicard Nuclear Investment Management 702-4082	P82-3B6.2	Return for Distribution		

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1/ RECOMMENDATION:

We recommend a **Developmental** Release of an **initial $0.621** Million **OM&A** to fund **Preliminary Engineering** for this project. Approval of this request will bring the total to date funding to **$0.621** Million including a contingency of [redacted] Million. The total project is estimated to cost **$25.4** Million with an estimated completion date of 12/31/2015

The Business Objective of this **Regulatory** project is to improve the Severe Accident Management Program at OPGN and to ensure that the related CNSC Fukushima Action Items are completed.

While the OPG Nuclear Fleet has already implemented a Severe Accident Management Program, OPG Management has decided to further enhance the capability to respond to a Severe Accident by addressing improvement areas identified during initial implementation, by staging emergency kits to facilitate response, by incorporating the use of new portable Emergency Mitigating Equipment (EME) where possible, and by undertaking assessments to ensure adequacy of response given the lessons learned from the Fukushima Daiichi Nuclear Power Plant accident.

$000's (Incl contingency)	Type	LTD Dec 2010	2011	2012	2013	2014	2015	2016	Later	Total
Currently Released	None									-
Adj to Current Release	Adjustments									-
Requested Now	Develop			621						621
Future Funding Req'd	Full			5,700	12,140	3,650	3,250			24,740
Total Project Costs		-	-	6,321	12,140	3,650	3,250	-	-	25,361
Non Project Costs										
Grand Total		-	-	6,321	12,140	3,650	3,250	-	-	25,361
Investment Type Regulatory		**Class** OM&A		**NPV** (17,044)			**IRR** N/A		**Discounted Payback** N/A	

Submitted By: (Date) 9 MAR/12.

Elizabeth Lopez
Director, Fukushima Support

Approved for Development Release only; this approval does not endorse the $25.4m total expenditure, although this will be used as a placeholder. Significant reductions are expected through the challenge process. PLeavitt

(OAR Element 1.2 Project not in Budget)

Financial Approval By: (Date) March 29, 2012

Randy Leavitt
VP Nuclear Finance

Line Approval By: (Date) FOR FD 29 MAR 2012

Fred Dermarkar
Director, Fukushima Project

2/ BACKGROUND & ISSUES:

As a result of the nuclear accident at the Fukushima Daiichi Nuclear Power Plant on March 11, 2011, OPGN expedited the implementation of its Severe Accident Management Guidance (SAMG) Program which had been partially established in 2010. The goal of the SAMG program is to establish a means of precluding large uncontrolled releases of radioactivity to the environment subsequent to a severe reactor accident, which is a subset of beyond design basis events.

Phase 1 of the implementation was completed in 2010 and focused initially on providing SAMG within the Emergency Response Organization (ERO). Phase 2 of the implementation plan included issuance of detailed site level proceduralized guidelines; these were completed by July 26, 2011 at both the Darlington and Pickering Nuclear Power Plants. By year end 2011, additional activities associated with Phase 2, including ERO procedure revisions and training of certified staff, were completed.

During Phase 2 implementation, a number of improvement opportunities were identified in SAMG. These included procedural issues, strategy issues, and the need to provide emergency equipment in the field to support the Enabling Instructions. While these issues do not invalidate the use of the guidelines, they must be addressed to ensure timely and effective execution of SAMG should the need arise. Therefore, the need for a further implementation phase (i.e. Phase 3) has been identified. The primary focus of SAMG Phase 3 implementation will be to better prepare for field execution by refining and validating existing guidelines and by training and conducting drills. Additionally, in support of SAMG Improvements, several engineering assessments will be performed as part of Phase 3. These assessments may result in design changes and/or requirements to revise SAMG procedures. In Phase 3, the deliverable for these assessments will include detailed assessment reports and recommendations which will be used to define the scope of all remaining work. Subsequently, a fourth and final phase of SAMG implementation will be required to address the final improvement requirements and complete the project. The scope of Phase 4 will be defined in Q2 2013 when the assessments are completed.

In February 2012, the CNSC issued a number of Fukushima Action Items to OPG. This project includes SAMG Phase 3 and Phase 4; it encompasses all of the work required to improve the SAMG program and complete the actions committed to the CNSC.

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3/ ALTERNATIVES & ECONOMIC ANALYSIS:

$000's	Base Case	Alt 1 (Recommended)		Alt 2
		Full Cost	Incremental Cost	
Total Revenue	0	0	0	0
Total OM&A	0	(25,361)	(25,361)	N/A
Provision	0	0	0	0
Capital Expenditures	0	0	0	0
Present Value (PV)	0	(17,044)	(17,044)	N/A
Net Present Value (NPV)	N/A	(17,044)	(17,044)	N/A
IRR%	N/A	N/A	N/A	N/A
Discounted Payback (Yrs)	N/A	N/A	N/A	N/A

Base Case: × *Not Recommended* - **Do Nothing**

This project is required to address several CNSC Fukushima Action Items and is in response to the CNSC Task Force Report Recommendations for improvements as a result of the lessons learned after the Fukushima Nuclear Power Plant Accident. As such, the Do Nothing option is not a viable alternative.

Alternative 1: ✓ *Recommended* - **SAMG Implementation Improvements**

Initial assessments of the required improvements include addressing and correcting items on the gap lists documented during Phase 2 SAMG implementation, staging of Emergency Kits, updating SAMG documents, and performing assessments committed to in the CNSC Fukushima Action Items. Emergency Mitigating Equipment (purchased under Projects 13-49229/49159 and 16-31508) may somewhat offset the scope of SAMG Phase 3 however this needs to be assessed. A Developmental Release is recommended to fully define the scope and cost of the improvements required, a Partial Release and Full Release will follow.

Alternative 2: × *Not Recommended* - **SAMG Implementation Improvements (do more)**

SAMG did not originally include the Emergency Mitigation Equipment (EME) which has been recently procured as a result of the Fukushima accident. Completion of SAMG as originally intended included actions which are no longer beneficial when credit is taken for the new EME (i.e. they now become additional or redundant). It is not recommended to implement all gaps associated with earlier implementation of SAMG until an assessment is made which includes crediting the use EME for Severe Accident mitigation.

4/ THE PROPOSAL

The deliverables for this Developmental Release are as follows:

- Complete the preliminary assessments and engineering necessary to define the scope for a partial funding release to implement the proposed improvements to the Severe Accident Management Guidance (SAMG) Program, Phase 3. These assessments include the following improvement areas:
    - reconcile the documented gaps identified during Phase 2 SAMG implementation,
    - stage equipment kits in the field to support deployment during an emergency,
    - conduct training, validation, and drills using the new procedures and equipment
    - update the SAMG Technical Basis Documents
    - revise SAMG documents where appropriate, to include the use of Emergency Mitigating Equipment (e.g. portable pumps and generators) in severe accident situations.
- Complete the preliminary assessments to define the scope of engineering work for a partial funding release required to address improvement areas identified in CNSC Fukushima Action Items. These include assessments of:
    - Equipment and instrument survivability subsequent to Beyond Design Basis Accidents
    - Required strategies for Hydrogen mitigation
    - Required strategies for Containment venting
    - Impact of Shield Tank relief capacity on Containment performance and SAMG strategies
    - Potential impact of SAMG strategies on IFB loss of cooling and inventory makeup accidents
    - Options and SAMG strategies with regard to multi-unit severe accidents
- Prepare and obtain approval of a **Partial Release BCS,** expected July 2012.

Future Partial Release:

- Funding for the Partial Release will cover Phase 3 of the SAMG Implementation Improvement Project. Completion of Phase 3 is anticipated to be December 31, 2013.
- Scope of Phase 3 will be as defined in detail and described under the Developmental Release mentioned above.
- The Phase 3 deliverables will include recommendations, based on engineering assessments, that will be used to develop the scope for improvements and/or modifications that may be required in the final Phase of the project.

Future Full Release:

- Funding for the Full Release will cover the 4th and final phase of this project.
- Phase 4 SAMG scope will include updates to SAMG documents and implementation of recommendations based on assessments and engineering completed during Phase 3. It will also include updates to SAMG to incorporate equipment procured and plant modification made under the final phase of the Emergency Mitigation Equipment Project.

- Scope of the Full Release will be developed in 2013 and Phase 4 completion is expected by the end of 2015 (plant modification work requiring outages may extend beyond this date)

5/ QUALITATIVE FACTORS

The initial qualitative factor gained by proceeding with the project will be to proactively meet OPG commitments to the CNSC to circumvent a regulatory Order. It also demonstrates to the public and our peers, that OPG is applying lessons learned from the Fukushima event in a timely manner. Enhancements to SAMG will address vulnerabilities which currently exist and will improve OPG preparedness to deal with a severe emergency.

6/ RISKS ANALYSIS (See Attachment D for details)

Low 1 to 3	Medium 4 to 9	High 10 to 25

Probability \ Impact	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

Risk Description	Mitigating Activities	Mitigation	Specific Cont'ncy $000's	Probability X Impact: Finance	Schedule	Quality	Corporate Reputation	Regulatory	Health & Safety	Environmental	Nuclear Safety	Risk Rating (1 to 25)
OPG Engineering and Management resources may be unavailable to do the work or reviews in the required timeframe	Use OPG resources to review engineering estimates and provide oversight of work. Consider external OPG-experienced Project Management, Engineering, and Certified Staff where possible. Consider COG Joint Project with industry partners	Before		9	9			2			2	9
		After		3	3			1			1	3
Increased scope due to legacy issues and background information in COG SAMG Documentation Package	Use external previously experienced OPG Engineering and Reactor Safety Staff to assist and provide specific contingency for external engineering support	Before	30	12	12			2			2	12
		After		2	2			1			1	2
Delays to development of scope and scope variations due to need to align with CANDU industry partners	Use membership on COG SAMG Working Group, CANDU Industry Team, and possible COG Joint Project to minimize.	Before		12	12			2			2	12
		After		4	4			1			1	4

7/ POST IMPLEMENTATION REVIEW

Note: PIR N/A for Developmental Release

Type of PIR:	Targeted Final AFS Date:	Targeted PIR Approval Date	PIR Responsibility (Sponsor Title)
Simplified	31-Dec-15	1-Apr-16	Director Fukushima Project

	Measurable Parameter	Current Baseline	Targeted Result	How will it be measured?	Who will measure Person / Group?
1.					
2.					
3.					
4.					
5.					

APPENDIX "A' GLOSSARY (acronyms, codes, technical terms)

CNSC – Canadian Nuclear Safety Commission
OM&A – Operations, Maintenance and Administration
BDBE – Beyond Design Basis Event
EME – Emergency Mitigating Equipment
COG – CANDU Owners Group
ERO – Emergency Response Organization
EP – Emergency Preparedness
SAMG – Severe Accident Management Guidance

APPENDIX "B" Comparison of Total Project Estimates

$ 000's — This Appendix compares the Total Project Estimate for each BCS

Total Project Estimate (by Year incl Contingency)

BCS Type	Class	Mth	Yr	2012	2013	2014	2015	2016	2017	2018	Later	Total Project Est
Developmental	OM&A	Mar	2012	6,321	12,140	3,650	3,250					25,361
												0
												0
												0
												0
												0
LTD Spent												0
LTD Spent												0
LTD Spent												0

Comments:

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APPENDIX "C" FINANCIAL MODEL – ASSUMPTIONS

Financial Assumptions:

Discount Rate:	7%	Cost Escalation (Yr)	0%	SR&D Opportunity	Yes
Progress Payments	No	Foreign Currency	No	Retainer Fee	No
Depreciation Rate (Capital)	N/A	PST	No	Interest Rate (Capital)	OM&A N/A
Revenue Rate	N/A	Leasing	No	Indexed Priced Contract	No

Comments:

Project Cost Estimate:

Design Complete:	Up to ~ 40%	Fixed Price Contract	No	3rd Party Estimate	No
Quality of Estimate	Budget +30% to -15%	OPEX used	Yes	Lessons Learned	Yes
Similar Projects	Nothing Similar	Budgetary Quote	No	First Unit Actual Used	N/A
Firm Vendor Proposal	No	Cost Sharing	No	Competitive Bid	No
Reviewed by Sponsor	Yes	Fee for Service	No	Contracts in place	No

Comments:

Rationale for Capital Cost Classification:

Generation Plan Assumptions:

Station	Unit	EOL or Refurb	MW	Planned Outages for Project Work						
Pickering A	1	Jun-20	515							
	4	Jun-20	515							
Pickering B	5	Nov-18	516							
	6	Nov-18	516							
	7	Jun-20	516							
	8	Jun-20	516							
Darlington	1	Sep-16	878							
	2	Feb-18	878							
	3	Sep-19	878							
	4	Jan-21	878							

Comments:
No outage work anticipated at this time however as scope is developed, may be identified later

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ATTACHMENT "A" PROJECT COST SUMMARY

$ 000's OM&A		LTD Dec 2010	2011	2012	2013	2014	2015	2016	Later	Total
Accounting Basis	Project Mgmnt & Support			841	1,300	600	600			3,341
	Engineering			3,650	6,440	2,500	2,100			14,690
	Procurement	[redacted]								
	Construction									
	Other									-
										-
										-
										-
	Interest (Capital Project)									-
	Project Costs									
	General Contingency									
	Specific Contingency									
	Project Costs	-	-	6,321	12,140	3,650	3,250	-	-	25,361

$ 000's OM&A			LTD Dec 2010	2011	2012	2013	2014	2015	2016	Later	Total
Funding Basis	Current Release	Project Costs	[redacted]								
		Contingency									
		Total									
	Adj to Current Release	Project Costs									
		Contingency									
		Total									
	This Release	Project Costs									
		Contingency									
		Total									
	TTD Released	Project Costs									
		Contingency									
		Total									
	Future Releases	Project Costs									
		Contingency									
		Total									
	Project Funding										
	Contingency Funding										
	Total Funding		-	-	6,321	12,140	3,650	3,250	-	-	25,361

Budget	2011 - 2015 Business Plan									-
	Variance to Budget	0	0	5,691	10,940	3,100	2,700	0	0	22,431
Other	Removal Costs (above)									-
	Inventory W / O									-
	Spare Parts in Invent									-

Reviewed by:	(Date)	Approved by:	(Date)
Nick Ivanoff Project Manager	March 9, 2012	Elizabeth Lopez Strat V Manager	9 MAR 2012

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ATTACHMENT "B" PROJECT VARIANCE ANALYSIS

	$ 000's	LTD N/A N/A	Total Project Last BCS N/A N/A	Total Project This BCS Mar N/A	Variance	Comments
Scores Basis	Project Mgmnt & Support			3,341	3,341	N/A, first release
	Engineering			14,690	14,690	N/A, first release
	Procurement			1,700	1,700	N/A, first release
	Construction	[redacted]				N/A, first release
	Other					
					-	
					-	
					-	
					-	
	Interest (Capital Project Only)	[redacted]				
	Project Costs (Scores Basis)					**N/A, first release**
	General Contingency					**N/A, first release**
	Specific Contingency					N/A, first release
	Project Costs (Scores Basis)	-	-	**25,361**	**25,361**	N/A, first release

Other	**Removal Costs included above**				-	
	Inventory to be written off				-	
	Spare Parts in Inventory				-	

Comments:

This is the first release; therefore, no variance analysis is required.

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ATTACHMENT "C" SCHEDULE

Key Milestones

Completion Date	Description
31-Jul-12	Partial BCS - Funds approved for release
30-Jun-13	Scope developed for Phase 4 of SAMG
31-Dec-13	SAMG Phase 3 complete and Full Release approved for Phase 4 SAMG
31-Dec-15	SAMG fully implemented (Phase 3 and 4), Project complete
Click here to enter a date.	
Click here to enter a date.	
Click here to enter a date.	
Click here to enter a date.	
Click here to enter a date.	
Click here to enter a date.	
Click here to enter a date.	

A Project Execution Plan (PEP) will be approved by 31-Aug-12

In Service Declarations: (Capital only)

Date	Description	$000's	% In Service (= 100%)
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			
Click here to enter a date.			

Comments:

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Attachment "D" Risk Probabilities Chart

Likelihood	Improbable	Unlikely	Possible	Likely	Probable
Probability	<= 1 in 100	About 1 in 100	About 1 in 10	About 1 in 5	>= 3 in 4
Rank	1	2	3	4	5

Risk Impact Chart

Impact Rating	Financial	Project Schedule 12 month	Quality	Corporate Reputation	Regulatory / Legal	Health & Safety	Environment	Nuclear Safety
5	>80% of Total Project $	> 90 day delay	Significant, unacceptable non-conformance requiring extensive rework	National and international adverse coverage or impacts	Non-compliance with potential for significant implications for personnel, potentially large damages or Criminal Charges OR Potential loss of operating licenses	Potential for fatality(s)	Spill or release causing immediate and extended impact with off-site impacts, e.g.:Clean-up costs > $15MCat. A spill (>55 pts)	Loss or serious degradation of a safety system
4	30% - 80% of Total Project $	30 - 90 day delay	Unacceptable non-conformance requiring some rework, but not major	Long-term local or national impact	Legislative non-compliance with potential for fines, charges, and damages ORMajor degradation of reputation with regulatory bodies	Potential for life-threatening critical injury or permanent total disability, including occupational disease	Exceedances resulting in charges or Director's OrderCat. A spill (45 - 55 pts)Public complaints with OPG implications Explosion and/or major fire	Reduced effectiveness of a safety system
3	15% - 30% of Total Project $	10 - 30 day delay	Non-conformance bordering design tolerances, potential to require rework	Major local impact or minor national impact.Minor local damage	Systematic non-compliance with potential for finesORPotential to cause strained relationship with regulator, increased surveillance and/or regulations	Potential for less serious critical injuries (e.g. fractures), permanent partial disabilities and temporary total disabilities of a significant nature	Cat. B spillsEmission in exceedance of regulatory or legal limitsField orders or AMP'sPublic complaints with OPG implicationsDanger to health, life, or property	Reduced effectiveness of redundant safety system components
2	5% - 15% of Total Project $	3 - 10 day delay	Acceptable non-conformance, within design tolerances, no rework required	Complaints from local officials / politicians	Systematic non-compliance with impacts to project scheduleORPossibility of regulatory / legal implications	Potential for less serious temporary disabilities and injuries requiring off-site medical attention other than first-aid. Complete recovery by worker.	Cat. C spills - reportableAdministrative infractionsPublic Complaints with plant level implications	Impact on a safety support or safety related system
1	<5% of Total Project $	< 3 day delay	Minimal impact on qualityRoutine non-conformance, can be easily dispositioned	Complaints from local public	Isolated non-complianceORRoutine approval / notification	No medical attention beyond first aid, no impairment to worker or complete recovery of worker	Administrative, non-reportable eventsCat. C spills non-reportable and spills resulting from Acts of God	