From: Murray, Valerie <valerie.murray@snclavalin.com>
Sent: Friday, May 10, 2013 4:17 PM
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Subject: C3- CD0502 EPC Implementation Plan for ac Substations
Attachments: 505573-4000-40ER-4001_PA.pdf

Good afternoon,

Please process the attached for internal coordination review. Original to follow.

At this time we are also requesting a Nalcor File Number. This document is the outcome of DCN 164.

Document Number	Rev. No.	
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Lower Churchill Project

EPC Implementation Plan for ac Substations

SLI Document No. 505573-4000-40ER-4001

Nalcor Reference No.

Date: 10-May-2013

Prepared by: Mohamad Makky/Robin Skinner

Checked by: Satish Sud

Checked by: Serge Guerette / Trina Troke

Approved by: Darren Debourke

REVISION LIST

Revision					Remarks
N°	By	Check	Appr.	Date	
PA	MM/RS	SS/SG/TT	DD	10-May-2013	

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1 OBJECTIVE

A change of contracting strategy was requested by NALCOR via letter No. L010-S011-200-170331-00202 dated November 7, 2012 wherein an EPC approach was adopted in the execution of ac switchyards (CD0502). An assessment of the implementation plan was carried-out as initiated by DCN-0064. This report describes the related changes in the engineering deliverables, non-deliverables, capital costs and baseline schedule in relation with the following package strategy under Component 3 EPCM team;

Package Description	Strategy or Scope change
CD0501 – Converters and Cable Transition Compounds	• No change
CD0502 – AC Substations and Synchronous Condensers	• Changed into EPC lump sum, remove synchronous condenser Civil Works and step-up transformers installation from scope
CD0503 – Construction of Earthworks at various sites	• No change
CD0508 – Supply and Install of Electrodes sites	• No change
CD0534 – Supply and Install Synchronous Condensers	• Revised to include Civil Works and step-up transformer installation
PD0505 – Supply Switchyard Equipment AC Substations	• Transferred to EPC package CD0502
PD0537 – Supply of Transformers	• No change

This presentation starts with a review of the EPC cost premiums versus the EPCM baseline and then presents offsetting amounts consisting of engineering, supply chain services and site management originally planned to be provided by the LCP integrated team under the EPCM scenario.

2 CHANGE IN CAPITAL COST

The estimated capital cost of the ac switchyards is $222,855,765 (PD0505 + CD0502) excluding synchronous condensers civil works (CD0534) but factoring in recent cost trends such as power transformer installation at Soldiers Pond to be by the CD0534 contractor. Power transformers (supply) is another package (PD0537).

The following can be expected under an EPC scenario:

1. EPC contractor will take a profit on the equipment they buy (the PD505 equipment)
2. EPC contractor will apply a bid risk premium on the civil and electrical installation amount because it's not engineered at time of bid (the original CD 502 contract)
3. EPC contractor will apply a bid risk premium on the PD505 equipment over and above the profit margin because it will not be specified completely at the time of bid (it will be specified at the performance level at time of bid but not with the benefit of detailed engineering).
4. EPC contractor charges at cost its engineering, procurement, project and site management costs.
5. EPC contractor will add overhead and profit margins on items 2 through 4 above. This analysis assumes the contractor will not stack the markup (profit on profit margin) for competitive reasons.

A more detailed analysis of each of the above items follows, and the cost implications are outlined in Table 2:

Equipment Profit Margin	Profit margins can vary by contractor's financial objectives and risks associated with carrying the warranty. The profit margin assumption does not factor potential discounted prices available to the contractor (also not factored into the DG3 estimate) due to volume purchasing power (a potential benefit of EPC approach). A margin of 6% relative to the DG3 estimate is used in the analysis.
EPC Bid Risk Premium	In the EPC model the contractor is required to quote lump sum for equipment, materials and labour before the detailed engineering is complete (and hence final quantities). Bid risk premium covers bid errors and omissions and inter package design development. In addition, bid risk also covers risk on

	securing resources to execute the project and subsequent financial burden to be recovered. Accordingly the combination of these factors can range considerably depending on the contractor's estimating confidence and how much they are able to lock in subcontractor pricing. A range of 5% to 15% of the baseline capital cost both the CD502 and the PD505 packages can be expected. 10% was selected for the analysis.
EPC Detailed Engineering	The DG3 estimate assumed SLI would carry out the detailed engineering, this effort transfers to the EPC contractor. The value of the transfer is estimated be $5.1 million (see Section 3), which is the value of the SLI engineering offset (that is to say, it assumes SLI and the contractor would perform with the same productivity).
EPC Site Management	The DG3 estimate assumed LCP forces (integrated team) carrying out all QA/QC, surveillance and site management operations for the integration of the PD505 component in the field, this effort transfers to the EPC contractor at an estimate of $7.8 million (see Section 3), which is the value of the site management offset (that is to say, it assumes LCP forces and the contractor would perform with the same productivity)
EPC Supply Chain Services	It is expected that procurement management along with project services, logistics, transport etc. (i.e. supply chain services), shall be carried by the Contractor. A range of at least 6% to a maximum of 10% of the original capital cost of the PD505 package of 84.5 million is anticipated. 8% was selected for the analysis for a total of $6.8 million. This is offset by the amount LCP would have spent for the same services utilizing LCP forces; this analysis assumes the same productivity therefore same cost.

EPC Overhead and Profit	Overhead and profit margins on the incremental capital cost is to be expected (the capital cost increase being that of the EPC services noted above and the value of the bid risk premium). The profit adjustment is not included in the initial capital cost estimate, therefore a potential 10 to 20% of the increment depending on the confidence or desire of the contractor to win the job (i.e. high desire, lower markup). 15% was selected for the analysis

Table 2 - Change in Capital Cost of AC Switchyards

Item	Item	Budget Basis	Percent	Cost
Original PD0505 Capital Cost				$84,469,004
Current CD0502 Capital Cost with Trends [1]				$134,211,499
Additional budget transfer to CD534 [2]				($1,369,471)
Original Cost under EPCM approach	**A**			**$217,311,032**
EPC Purchased Equipment Profit Margin	B	$84,469,004	6%	$5,068,140
EPC Bid Risk (Contractor Contingency)	C	$217,311,032	10%	$21,731,103
EPC Detailed Engineering	D	estimated [3]	2%	$5,138,103
EPC Site Management	E	estimated [3]	4%	$7,779,948
EPC Supply Chain services	F	$84,469,004	8%	$6,757,520
Additional EPC Costs (Sum C to F)	**G**			**$46,474,815**
EPC Profit (on item G minus B)	**H**		**15%**	**$6,211,001**
New Cost under EPC approach (A + G + H)				**269,996,848**
Increase in Capital Cost before SLI Cost Offset				52,685,816
EPC Premium before LCP Cost Offset				24.2%
LCP Cost Offsets				
EPC Services (D+E+F)				($19,675,571)
EPC Premium				33,010,245
Net EPC Premium				17.6%

[1] From April 24, 2013 cost report

[2] Power Transformer Installation

[3] Estimated based on manhour assessment in Section 3, the percent is calculated based on that estimate

3 OFFSETING COSTS FROM SLI SCOPE

In reference to Attachment A and B, the remaining hours to be transferred to the EPC contractor for detailed engineering and construction management are based on a revised staffing plan as follows:

- Detailed Engineering 40,903 hours
- Construction Management[1] 61,940 hours
- Supply Chain Services estimated as a percent, 8%

The cost impact for EPCM services would result in the following changes:

- Engineering Reduction 5,138,103 $
- Site Management Reduction (inc. expenses) 7,779,948 $
- Supply Chain Services Reduction 6,757,520 $
- **EPCM Cost Reduction** **19,675,571 $**

4 OVERAL COST IMPACT

The EPC approach will increase the capital cost by a net value of $33 million or 15.2% by the assumptions provided in the preceding sections. This is derived from a gross capital cost impact of $52.7 million minus the savings in the cost of LCP operations (engineering, supply chain and site management) of $19.7 million)

5 ASSUMPTIONS TO IMPACT BASELINE SCHEDULE

The initial EPCM baseline schedule specifies the completion of RFI by November 19, 2013, the release of RFP by January 7, 2014, the award of construction contract by September 30, 2014 and the latest mechanical completion by September 9, 2016 including static commissioning.

[1] Primarily SLI but referred to as LCP forces (integrated team) in Section 2.

The delay risks related to schedule will be more adverse in case of EPC strategy due to the fact that engineering and procurement will be done at later stages and will be driven solely by the EPC Contractor as compared to the original strategy that assumed the early purchase of major equipment.

The typical EPC schedule scenario for one ac switchyard is outlined below. The expected mechanical completion date is December 2016 subject to the fulfillment of the following assumptions:

(1) Accommodation camp at Churchill Falls available in spring 2014.

(2) Earthworks completed before fall 2014.

(3) Power transformers delivered at site before end of 2015.

(4) RFI for EPC contract released by end of May 2013, RFP mid June 2013.

(5) Procurement of EPC contract completed in no more than eleven (11) months.

(6) Long lead items supplied and delivered in no more than twelve (12) months.

(7) Civil works starts no later than five (5) months after EPC award.

(8) Civil works are not affected by seasons (winter works are allowed).

(9) EPC contract completed within thirty two (32) months.

6 CONCLUSION

The new EPC approach will minimize to great extent the interfaces related to Switchyards and the risks associated with that. However, there will be a premium to be added to the budget and some risks related to time schedule.

In the proposed EPC approach the commitment package PD0505 should be integrated in the new EPC commitment package CD0502 to avoid interfaces. The new RFI deliverables for CD0502 have been approved through DCN-0125 and are under implementation within the project systems.

A complete assessment of C3 manpower load needs to be carried-out once this EPC strategy and the new integrated organization chart are in place in order to evaluate the requirements of approval for the EPC engineering deliverables to be submitted by Contractor and to define the engineering requirements outside St. John's office.

A schedule workshop should be organized to agree on the revised baseline schedule before it is implemented in Primavera in replacement of the current plan. This workshop will require the participation of engineering, procurement and construction people as well as project control.

APPENDIX A

Summary Technical Deliverables

APPENDIX B

Man-hours Construction Support

APPENDIX C

EPC Baseline Schedule