From:	Chausse, Luc
To:	DarrenDebourke@nalcorenergy.com
Cc:	Sud, Satish; Makky, Mohamad; jasonkean@nalcorenergy.com; ronpower@nalcorenergy.com; Bechard, Normand
Subject:	AC Substations - Optimal Contract Approach - Decision Support (DRAFT)
Date:	Friday, September 14, 2012 4:20:17 PM
Attachments:	image001.jpg PowerAdvocate-Point-Wise.pdf Memo SLI Contracting Strategy C3.pdf

Darren,

As you requested, we have analyzed the report.

Please find attached our memorandum summarizing our observations and a point wise table of our comments to the Power Advocate report.

Look forward to discuss this further at your convenience.

Regards

Luc

From: DarrenDebourke@nalcorenergy.com [mailto:DarrenDebourke@nalcorenergy.com]
Sent: 7 septembre 2012 15:11
To: Chausse, Luc; Makky, Mohamad
Cc: Sud, Satish; RKaushik@nalcorenergy.com
Subject: AC Substations - Optimal Contract Approach - Decision Support (DRAFT)

Gentlemen,

Please see attached 'Draft' report entitled "AC Substations - Optimal Contract Approach - Decision Support". This report has been prepared by Power Advocate (Independent 3rd party) to review and advise on the best strategy to ensure successful delivery of this scope - taking into considering the magnitude of the LCP project, challenges ahead, etc.

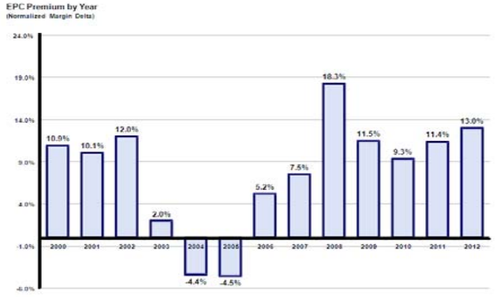
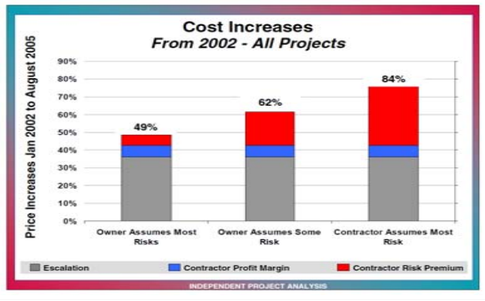
I request you take a look at the report (please keep an open mind) and for us to convene early next week, i.e. Monday afternoon to discuss and come to an agreement on the way forward - again with the key focus on what strategy gives us the best opportunity for success.

If you have any questions - let me know.

Have a nice weekend.

Thanks,

Darren DeBourke, P.Eng.
Project Manager (Consultant)
HVdc Specialities and Switchyards
Nalcor Energy - Lower Churchill Project
t. **709 570-5970** f. **709-754-0787**
e. **DarrenDebourke@nalcorenergy.com**

Excerpts from Power Advocate's Report		SNC-Lavalin Comments
I.	**Purpose and Background** The purpose of this assessment is to provide decision support to the Lower Churchill project team around the optimal contracting approach for the AC substations – in particular whether to use the EpCM approach currently in place for most work packages or to use an EPC approach that is currently contemplated for a small set of work packages. Nalcor's existing plan to build the AC substations relies heavily upon its EpCM Contractor. The EpCM Contractor will be responsible for the engineering and design of all three AC substations, and all efforts associated with the procurement of several major contracting packages including, but not limited to: • Package No. CD0503 - Construction of Earthworks at Various Power Distribution Sites • Package No. PD0505 - Supply of Switchyard Equipment, AC Substations at CF, MF and SP • Package No. PD0537 - Supply of Power Transformers, AC Substations at CF, MF and SP • Package No. CD0502 - Construction of AC Substations and Synchronous Condensers Facilities After successfully procuring the major materials and services, the EpCM Contractor will be responsible for managing and coordinating all construction activities including material management and logistics. Given the recommendation made in the Strategy Risk Assessment and some early project challenges managing interfaces under the EpCM approach, Nalcor is considering whether to add certain packages to the list of packages suitable for execution under an EPC approach and this paper is designed to offer support for the AC substation work packages.	For purpose of clarity, PD505 will comprise only the long lead HVac equipment for which delivery and competitiveness need to be secured. Other material and equipment that don't represent a risk for the performance of the substations works will be supplied by the CD502 Contractor. Only the long lead items procured under PD505 will be managed by the EPCM Engineer. CD502 will be awarded to a single General Contractor that will appoint and manage the different subcontractors such that EPCM Engineer will not be managing the interfaces between the subcontractors. Early project challenges managing interfaces can be attributed to growing pains. Lesson learnt from this will be used fo the main AC Substations.
II.	**Executive Summary** Although the decision to use an EpCM model for the Lower Churchill Project is well supported and is consistent with the most common contracting approach that PowerAdvocate has seen used on large transmission projects, further opportunity may exist in carving out the Churchill Falls, Muskrat Falls, and Soldiers Pond AC substations. Currently, the LCP Master Package Dictionary identifies nine packages to be executed on an EPC, fixed price basis. For those packages the rationale for the approach is: • The scope of supply is well understood with a selection of competent contractors available; • Work scope is well suited to experienced suppliers which typically execute this work on an EPC lump sum basis; • The package can be isolated from other segments of the project for both engineering and construction work allowing scope of supply limits and interfaces to be identified and managed; • Interfaces are minimized; and • A similar strategy has previously been successfully used on comparable projects. The same rationale applies to the AC substations. Given the existing market conditions, Nalcor's advanced planning, key characteristics of the AC substations, an analysis of the advantages and disadvantages of both the EpCM and EPC approaches in the context of Nalcor's project objectives, project execution plan and project execution challenges, and concerns associated with the risk of managing critical interfaces, it is prudent to adopt EPC, fixed price approach for the AC substations.	EPC was adopted for the supply of HVdc Converters since the only three worldwide suppliers are proprietary of their HVdc power electronic valve technology and application. This is not applicable to HVac Substations. With respect to the "risk of managing critical interfaces", most critical interfaces resides on proper definition of scope of works and limits of the different subcontractors which lies on the Main Contractors shoulders as per current contracting strategy. The critical external interfaces are between different packages and external stakeholders and those tracked in the Project Interface Management Register. The critical internal interfaces (Intra-package) will be managed by the "General Contractor" responsible for civil and electromechanical works.
III.	**EPC Project Premium and Recent Trends** Utilizing PowerAdvocate's data and experience, an estimate depicting the trend of the "premium" typically paid for executing a capital project on an EPC, fixed price basis has been developed. For the purposes of this analysis, EPC premium is defined as the delta between the actual cost to engineer, procure and construct the project using a "multiple contract" approach and the additional fees incurred through a fixed price, EPC contract. Trends and percentages have been adjusted and normalized. As shown in the chart below, the early part of the decade featured a boom cycle in capital investment in the energy industry, and the corresponding margins were indicative of the higher fee structures charged in a period of declining commodity prices. The trough in 2004 and 2005 can be traced, in large measure, to the decline in new power projects and the corresponding inclination of EPC contractors to reduce their premiums for those projects. However, the trajectory of premiums from 2006 through 2008 illustrates how these contractors successfully shifted part of the burden of commodity price escalation to the owners, while charging higher fees. The drop after 2008 corresponds to the economic crisis, where once again, new projects and the corresponding premiums drastically declined. In 2010 premiums began to recover, as activity in the capital construction market started to rebound.  	The extent of extra premium to be paid in case of going EPC is related mainly to the transfer of full risks related to engineering and schedule. Comparing the extra costs to be incrurred to the benefit expected will not favor going in this direction. In fact, if project premium has started to recover this implies that market is now favorable to Contractors. T&D and generation projects effectively vary in terms of market, complexity and specific risks i.e. conclusions on generation are not necessarily applicable to T&D and vice versa However, there is no clear definition of what is Project premium. The following graph from IPA, provides a helpful indication of Contractors mark-up for various contract strategies.: 

Excerpts from Power Advocate's Report		SNC-Lavalin Comments
III.	The data used to develop this EPC premium analysis has been drawn from a variety of sources and represents a sample of capital project types. Project types include: generation, environmental or back end technology, electric transmission, and AC substations. It is important to note that the project type is an important factor in the equation as the supply and demand for these markets often differs. Although the analysis shown above depicts an EPC premium of thirteen percent corresponding to the present year, opportunities may exist to pay lower premiums for the AC substations of Lower Churchill Project. Recent experience and data specific to AC substations suggest that Nalcor may be able to secure an EPC contractor for a premium of eight to twelve percent. This EPC premium is aligned with the findings of a recent IPA report, where it stated that risk premiums for large "international" projects are ten to fifteen percent of the base estimate.	EPC Contractor will mark-up their offer with the following: - EPC Corporate Overhead (3 to 4%) - EPC Management and Indirect Costs - EPC Contingencies Margin for Construction works - EPC Contingencies Margin for equipment and material - EPC Contingencies Margin for Engineering - EPC Contingencies Margin related to other risks such as labour market, environment, etc - EPC Net Profit Margin (8 to 15%)
IV.	**Key Characteristics of a Project Suited for an EPC, Fixed Price Approach** • The scope of work is the largest single factor to be considered during the contracting approach selection process for a given project. A project with a well defined scope of work and minimal uncertainty is better suited for a fixed price contract structure whereas projects with substantial unknowns and ill defined work scopes often need to be executed on a cost reimbursable basis by default. The working area is a primary component of the work scope and it too drives contract selection. • A simple understanding of the function(s) a substation must perform is enough for most firms to fully design it, and with a design an experienced electrical construction contractor can develop a bottom – up estimate on what it would cost for it to construct it. For these reasons it is often feasible to bid greenfield substation projects on a fixed price basis. • whether it has internal constraints that will impede project schedule. The question is posed to address a variety of constraints, but internal resource constraints should be a primary focal point. When addressing internal resources it is not only the quantity, but the qualifications as well. • whether it believes that combining the engineering and construction scopes is in the best interest of the project. Notable benefits include: reduced interface management responsibilities and relative risks for the Owner, and collaborative constructability reviews. • whether or not it will elect to procure the major material for the project. Common factors influencing this choice include an Owner's buying power (or lack thereof), existing long term relationships, Owner's aversion to risk, and current market conditions.	• The current contracting strategy is built around creating well defined scope and eliminating uncertainties so that each package is managed with minimum risks involved. Going to EPC directly at will involve great deal of risks related to scope of work and associated uncertainty • A simple understanding of the functions of substation is not enough to account for the challenges involved in LCP AC Substations. The matter is largely associated with the overall project schedule constraints, risks and interfaces. • The challenges related to Owner's internal constraints are not restricted to AC switchyards but rather project wide and must be addressed separately. Moreover, EPCM Engineer has appointed and mobilized skilled resources related to AC switchyard which will ameliorate this any potential issues arising from such challenges (if any). • With the present strategy the responsibility of interfaces between Contractors lies with the General Contractor. Also, interfaces are managed and monitored comprehensively by the deployed EPCM various Interface Management entities. Constructability reviews will be carried during engineering works stage involving experts from construction field. Collaborative Constructability review will also be carried out with the Contractor as well. • As for factor influencing the choice: o Buying power: There is no doubt about Nalcor buying power. CFLCo. recent contracts for refurbishing the Hydro Plant substation equipment is certainly a good example. o Existing long term relationship: Nalcor has been dealing on a long term basis with these suppliers. o Owners aversion to risk: EPCM Engineer has appointed and mobilized skilled staff to properly manage the potential risks. o Current market conditions: Early procurement of long lead equipment constitutes an optimum measure to benefit or mitigate the current market conditions.
V.	**Benefits and Disadvantages of the EPC and EpCM Contracting Approaches** While the EpCM model for the Lower Churchill Project remains a reasonable and prudent overarching contract strategy, Nalcor has experienced some challenges in practice with the management of the contract package interfaces and is constrained as to procurement and construction management resources **Benefits of the EpCM Approach:**	Future constraints on procurement resources comes mainly from the Hydro Plant and transmission lines as per the package breakdown shown below: On-going Contracts for construction power and telecommunication will be completed in 2012 and are not included above. The present strategy does not represent more constraint on the construction management resources than if it would be for an EPC contract. Again, with the present contracting strategy, responsibility of critical interfaces between subcontractors lies on General Contractor shoulders. **Benefits of the EpCM Approach:** Current Contracting Strategy picks up the benefits of the EPCM approach and mitigate the disadvantages.

	Construction/EPC/Supply	Material/Equipment supply	Services
Hydro Plant	21	7	8
DC Specialties	7	2	1
Transmission lines	7	27	12

Excerpts from Power Advocate's Report		SNC-Lavalin Comments
V.	**Disadvantages of the EpCM Approach:** • No single point of contact - multiple interface points requires more comprehensive analysis of potential risks/gaps and development of risk mitigation techniques • Requires closer focus on commercial terms to identify and address potential cost and schedule impacts of poor performance by owner or by one supplier/contractor on another supplier/contractor • Greater owner oversight needed which may lead to schedule delays and/or increased cost due to duplication of resources • Having multiple contractors can result in more complex disputes as contractors may try to pin blame on others (the so-called “finger pointing risk”) • If performed sequentially, up-front engineering may not get the benefit of a constructability assessment from a construction contractor, unless the program manager (or an EpCM contractor) has such responsibility and capabilities • Breaking construction into multiple segments or scopes: o may result in multiple interface points; o may require additional internal resources to manage scope overlap and contractor coordination; and o may introduce competition among multiple contractors for the same labor resources, thus driving up labor costs **Benefits of the EPC Approach:** • Can be provide Owner’s with the ability to take a “hands off” approach to the project • Owner’s only responsibility is contract management of a single Contractor • Significantly reduces the strain on engineering, procurement and construction management resources; • The EPC contractor manages its subcontractors and remains the single point of contact with full contractual responsibility to the Owner • Owner has no responsibility associated with interface management • Contracts can generally be structured to include performance guarantees and liquidated damages as deemed necessary by the Owner • Often times, projects proceed ahead of schedule as EPC contractors aim to optimize design, maximize profit, and proactively manage interface issues • Owner may opt to focus on high profile duties such as environmental and regulatory affairs, permitting, site acquisition, and public relations thereby reducing the risks posed to the EPC contractor • Risk is consolidated into one entity • No internal resource increases required, except as necessary for Contract Management • Beyond what is stipulated in the contract, Owner bears no risk associated with major material procurement • Contractor is responsible for all purchases, relative escalation provisions and material management and coordination • Substantial reduction in the number of contract package interfaces to be managed and coordinated by Nalcor and its EpCM Contractor **Disadvantages to EPC Contracts:** There is a premium associated with the benefits described above in Section III. • Often, Owner is only capable of providing limited input into the design of the project • Owner will have minimal control over the project • If EPC Contractor has performance issues, changing companies likely will result in costly delays to schedule and budget • Otherwise capable contractors may not have the appetite to take on risk levels above a certain threshold	**Disadvantages of the EpCM Approach:** • With the present strategy the single point of contact will be with the single LS Contractor. No multiple contacts. • Management tools are in place to cater for all of these requirements • In current strategy there will no additional requirements needed • There will be no multiple contracts for Ac switchyards construction • Constructability Reviews will be done by EPCm Engineer during engineering phase • Construction will NOT be broken into separate contracts o Not applicable. The General Contractor will manage the interfaces within a contract. Contractor coordination within a contract is handled by the general contractor and should not require additional internal resources. o Not applicable. There will be no scope overlap within the package o Not applicable. Scarcity of labour could affect costs rather than competition within a contract. **Benefits of the EPC Approach:** The perceived benefits which are realizeable have already been integrated into the current contracting strategy. • Owner’s “Hands off” and “reduction of strain” does not relieve the Owner from insuring technical compliance of works and compensate for Contractors lack of competencies namely at engineering level • As per current strategy for CD502, the General Contractor manages the subcontractors and is responsible of interfaces between them. So that Owner manages one contractor. • Owner’s “Hands off” and “reduction of strain” does not relieve the Owner from insuring technical compliance of works and compensate for Contractors lack of competencies namely at engineering level. Tasks are no different than that for an EPCM. • As per current strategy for CD502, the General Contractor manages the subcontractors and is responsible of interfaces between them. • In the current contracting strategy, Intra-package Interfaces will be handled by General Contractor and inter-packages and external stakeholders interfaces will be handled by EPCM (and this will be the case regardless of contracting strategy). • Applicable within the current strategy • As for optimization of design, EPC Contractor main motivation is to reduce cost not optimize the design. Owner has to be extremely vigilant to insure compliance and fight to limit claims. • The Owner with the help of EPCM Engineer has already undertaken its high profile duties such as environmental, regulatory affairs, etc without consideration for the contracting strategy • With the present contracting strategy, risks are also consolidated into one entity which is the General Contractor considering that early purchasing of long lead equipment by the EPCM Engineer will secure the timely supply of the equipment. • As mentioned above, the burden on procurement department comes from other components of the project. As for Substation construction contract, there won’t be interface between subcontractors to be managed by Nalcor or the EPCM Engineer. Contract Management could require a significant amount of resources including engineering resources to manage the EPC contract. • Given the nature of AC switchyards and the engineering capability and expertise of EPCm + NALCOR, risks associated with major equipment are minimal • With the current strategy, escalation on long lead equipment will have been taken care early in the process. Contractor will mainly be concerned by escalation of construction material and labour. • With the current strategy, EPCm has to manage long lead equipment purchase only PD0537 & PD0505. **Disadvantages to EPC Contracts:** • EPC premium would depend on the Bidders perception of the risk as mentioned above.Developing packages for EPC will lead to Nalcor has provided substantial input into the design of the project. • Owner minimal control could certainly be a problem especially where third parties are involved namely in Soldiers Pond where the new Substation will be embedded into the existing network, and potential system upgrades will be necessary as coordination with NL Hydro progresses. Also, potential issues will arise with CFLCo. as the Churchill Falls Substation is extended. • If there is a performance issue with the EPC contractor it could lead to costly delays and have a large impact on the schedule and budget.

Excerpts from Power Advocate's Report		SNC-Lavalin Comments
VI.	**Steps to Ensure Success for Each Contracting Approach** **Maximizing the Benefits of an EpCM Approach:** • Develop a mechanism to allocate risk between the Owner and EpCM contractor o Hold EpCM Contractor accountable for developing an estimate of the number of hours required for both Stage 2 and Stage 3 o Make it a top priority to find agreement and reach conclusion of this issue • Capitalize on window to complete all front end engineering and design activities by ensuring proper allocation of EpCM resources • Prior to issuing bids for earthworks and AC substation construction: o Obtain all necessary regulatory approvals o Finalize outstanding land acquisitions required for each of the AC substations o Secure required environmental permits o Contract with geotechnical firm to investigate subsurface conditions at each of the project locations o Ensure the scopes of work are thoroughly completed and well defined • Analyze EpCM performance on preliminary work activities to identify critical shortcoming and adjust resourcing plan as required • Purchase all major materials and services on Nalcor paper to minimize likelihood of significant mark-ups **Minimizing the Disadvantages of an EpCM Approach:** • Ensure all long lead time procurement items are identified and that sourcing schedules are adequate to ensure timely delivery • Communicate with EpCM Contractor frequently to identify and analyze potential risks and gaps • Hold EpCM Contractor accountable for its central role in project success and demand proactive development of risk mitigation techniques • Require the EpCM Contractor to submit regular project status reports in addition to standard cost and schedule reports to help gage need for additional Owner oversight • Clearly identify and address potential cost and schedule impacts of poor performance by all parties involved • Ensure EpCM Contractor facilitates constructability assessments by supplying qualified personnel or engaging a qualified third party • Minimize the number of critical interfaces requiring coordination by the EpCM Contractor through strategic structuring of contract packages • Establish processes to govern the coordination of activities directly with other project participants to ensure that critical information is exchanged effectively, consider looking into formal interface management software • Consider assigning contract package interface managers for all contract packages, and make the interface manager the point person for all things related to interface with that contract package **Maximizing the Benefits of an EPC Approach:** o Ensure conceptual engineering is complete and SOW is well defined	**Maximizing the Benefits of an EpCM Approach:** • The level of effort is under Owner's full control as mobilization of personnel in the Project office is approved on a case by case basis • Estimate of number of hours has been agreed with Owner for both deliverables and non-deliverables. Any change must be justified and accepted by Owner. • EPCM resources are allocated for front end engineering • The level of effort is under Owner's full control as mobilization of personnel in the Project office is approved on a case by case basis • Process for obatining any necessary regulatory approval through Owner is well engaged • Process for land acquisition permits is well engaged • Process for environmental permits is well engaged • Performance of geothechnical investigation is mostly completed • Scope of works for CD502 will be thoroughly completed and well defined • EPCM resources plan have been adjusted and mobilization is mostly completed • As per current contracting strategy, going early on the market to procure long lead equipment allows securing the schedule and optimize the cost by obtaining competitive prices from suppliers that wants to secure future shop loading **Minimizing the Disadvantages of an EpCM Approach:** Disadvantages implied have already been addressed and integrated. • As mentioned above, long lead equipment has been identified and early procurement is engaged • As the Owner and the EPCM Engineer share the same office space, there is constant communication on potential risks and gaps, accountability of EPCM for Project success, reporting on Project status and identification of performance issues and impact. • It is already implemented. • Extensive and comprehensive reporting system using leading edge techniques is adopted by EPCM Engineer for this project. • Related terms and conditions will be included in each contract. • Constructability reviews will be organized by the EPCM Engineer • With current CD502 strategy, there is no responsibility of the Owner or EPCM Engineer for the interfaces between Contractors and its subcontractors • A formal Project interface management Process has already been implemented by the EPCM Engineer and responsibles designated **Maximizing the Benefits of an EPC Approach:** • Technical specifications and comprehenisve conceptual design must be preprared prior to send RFP to Contractors in order to make sure the AC Switchyards to be quoted will fit within LCP project and NALCOR future requirements. Otherwise, many kinds of critical risks will arise.
VII.	**AC Substation Case Studies** **Case study 1** **Challenges** The substation engineering department had limited experience with the extra high voltage levels associated with the project. There were no existing design or construction specifications to highlight the Owner's basic requirements and the effort associated with developing these specifications was grossly underestimated. The miscalculation caused troubling delays and when procurement processes could wait no longer the group was only able to provide a partial bid package to support the Request for Proposal (RFP) processes. Internal resources responsible for obtaining the required environmental permits ran into unexpected challenges specific to the site location that they had not previously encountered. **Lessons Learned** The importance of communication between the internal departments of the PMO and ensuring that key project stakeholders remain informed and aware of all potential threats and project road blocks. The value of detailed regular reporting cannot be stressed enough; in this case study it was internal, but in Nalcor's case it applies to the EpCM Contractor. Non compliance with reporting requirements should be seen as a red flag.	**Case study 1** **Challenges** EPCM Engineer has mobilized skilled staff in HVac substation to prepare complete and detailed specifications for supply and construction. EPCM expertise in this domain is very profound This is not relevant to this case Dedicated environmental permitting procedures and resources are deployed by EPCM **Lessons Learned** Measures are taken to optimize communication between EPCM, NALCOR, vendors and contractors Effective reporting system is in place

	Excerpts from Power Advocate's Report	SNC-Lavalin Comments
VII.	**Case study 2** **Challenges** loss of knowledge, experience, and manpower at the Owner side **Lessons Learned** Owners must reserve contingency for projects constructed in regions with notable weather restrictions because as demonstrated here, even when all parties are interfacing like a well oiled machine events outside of anyone's control can hinder project success metrics. This case study also sheds light on the importance of selecting a contract structure that is commensurate with project risks. Generally speaking, more contingency must be reserved for an EpCM approach than for and EPC approach. **Case study 3** **Lessons Learned** Lessons learned from this project include the importance of detailing all Owner requirements during the bid phase and understanding the impact of not adhering to the approved DOR. This case study also demonstrates that, despite some of challenges associated with adopting a different contracting approach, the EPC, fixed price approach is viable for AC substation projects. Lessons learned from this project include the importance of detailing all Owner requirements during the bid phase and understanding the impact of not adhering to the approved DOR. This case study also demonstrates that, despite some of challenges associated with adopting a different contracting approach, the EPC, fixed price approach is viable for AC substation projects.	**Case study 2** **Lessons Learned** Since Owner relies on EPCM Engineer competent staff, the Owner does not need any internal resources for the purpose of this project. Currently selected strategy accounts for the risks involved **Case study 3** **Lessons Learned** The importance of detailing all Owner requirements for all phases is considered, and integratrion, interfaces and risks management tools are in place EPCM resources have been adjusted purposely to handle the workload of this Project.
VIII.	**Lessons Learned from North American Utility** • The EPC contract approach is viable for substation projects • Major EPC contractors are structured to perform and manage this type of work effectively • A clearly defined scope of work and division of responsibilities is integral to project success • Care must be taken to structure the EPC agreement effectively in an effort to avoid unseen costs • The time it takes to qualify suppliers must be taken into consideration	• The current contracting strategy is more suitable for LCP AC Switchyards given the project specific requirements vis-à-vis interfaces, risks and schedule constraints • There are some considerations to be noted such as major EPC Contractors relies on their local organization that constitutes loss/profit centre for local projects. Local organizations may not have on board the skilled resources to properly manage a project of this magnitude if they have not been performing similar projects at the same time. • The scope of work, intregration and inter-package interfaces, intra-package engineering coordination and risk inventories of all work packages of component 3 is well managed and documented. • Time to qualify suppliers is well accounted for.
IX.	**Recommendation on Optimal Contracting Approach for AC Substations** The Churchill Falls, the Muskrat Falls, and the Soldiers Pond AC substations all appear to be strong candidates for the EPC, fixed price approach. Conceptual / preliminary engineering and design has been performed for each of the facilities. Given the confined nature of the substation sites it is assumed that geotechnical studies have been or will be performed to determine the subsurface soil conditions and that any ROW acquisition or permitting processes are complete or in progress and on schedule. The two substations at MF and SP have additional complexities as they are closely tied to the AC/DC converter stations that will be constructed adjacent thereto. Ultimately, there does not appear to be a predecessor activity that can negatively impact or change the fundamental requirements of the AC substations. The scopes of work associated with these substations are understood by a strong selection of capable contractors with significant experience in executing these projects on an EPC, fixed price basis. Based on the foregoing data and analysis, an EPC, fixed price contract approach for the AC substations is recommended. While there will be a premium associated with adopting this approach, it will be a small price to pay in exchange for reducing the risks associated with managing the critical interfaces currently defined by the Overarching Contract Strategy and the LCP Master Package Dictionary. As articulated above in Section III., the EPC premium for an AC substation project is likely somewhere between eight and twelve percent. PowerAdvocate likens this premium to an insurance policy that would protect against much more substantial costs in the event poor interface management were to cause downstream delays. Interfaces will still require attention in an EPC, fixed price approach, but efforts will be pale in comparison to those required to manage the interfaces associated with the current packaging strategies for the AC substations. PowerAdvocate understands the importance of the need for consistent technology and workmanship at the two converter stations and recommends that Nalcor invite the qualified converter station bidders to submit a bundled proposal that also includes the construction of the AC substations. These contractors should be well positioned to offer a compelling solution given that they will already be mobilized to perform work at adjacent sites. In addition, PowerAdvocate recommends sourcing the AC substations on an EPC, fixed price basis to a broader group of electrical contractors that may not have the qualifications to handle the converter stations, but are more than qualified to perform the AC substation work. This recommendation will shed some light on whether those proposing a bundled solution are presenting a compelling offer and will allow Nalcor to make a more informed contract award. In addition, conducting the bids this way will significantly reduce the burden of Nalcor's procurement resources as the number of associated packages will be greatly reduced. One of Nalcor's project objectives is to balance cost certainty and absolute cost as efficiently as possible. Adopting an EPC, fixed price approach supports this objective because the risk premium can be competitively managed and bundling of the AC substations with the converter stations will likely reveal additional cost benefits. Nalcor's Project Execution Plan references the concept of ***Flawless Execution***, stating it "requires a comprehensive understanding of risk-critical areas for the Project and an early focus on these activities in order to successfully shape the execution approach that will drive the expectant outcomes." The window to change the contracting approach for the AC substations is closing quickly, and the time to focus on that decision is now.	Given the associated overall project schedule constraints, risks and interfaces involved at CF, MF and SOP substations, the current contracting stragety is the only optimum solution that perfectly balances the costs and benefits. Premium is most likely to be far more than 8 to 12% as explained in our comments above noting the risks involved in design and schedule. There will be no incentive in going EPC regarding managing interfaces since with the current contracting strategy the interfaces are also managed by the Contractors but the advantage of having external interfaces well accounted for when preparing the various contract packages with grace of the Interface Management tools deployed on this project by the EPCM Engineer. • Combining Converters and Substations would result in a Contract nearing $800M which represents a major risk for the Project in case of failure of the Contractor. Burden on Nalcor procurement comes essentially from the other components of the Project as demonstrated above. Currently adopted contracting strategy calls for Lump Sum contract for CD0502 and keeping engineering and procurement of long lead items to be managed through other packages PD0505 and PD0537 to ensure meeting project objectives as explained above. It worth emphasizing on the following issues again: 1- NALCOR involvement is inevitable regardless of the contracting strategy to be adoped for CD0502 2- Procurement Load is also inevitable regardless of the contracting strategy to be adoped for CD0502, and the benefits of keeping separate packages for that outweight by far clubbing them into CD0502 3- Performing Detailed Engineering by EPCM according to current schedule will ensure meeting project schedule and cost targets and will help properly leveraging and managing the risks and interfaces. • NALCOR's project objectives are best fulfilled by following the current contracting strategy since it accounts for the advantages of EPCM and Lump Sum contracts. • The present contracting strategy allows for flawless execution.

SNC-LAVALIN INC.
350 Torbay Road
St. John's, Newfoundland & Labrador
Canada A1A 4E1
Telephone: (709) 752-3461
Fax: (709) 752-3480

MEMORANDUM

TO:	Darren Debourke NALCOR	**Date:**	14-Sept-2012
C.C.:	R.Power, N.Béchard, J.Kean		
FROM:	L. Chaussé/M.Makky	**Ref.:**	Power Advocate report
Subject:	Lower Churchill Project AC Substations Optimal Contract Approach		

1- OBJECTIVE

Power Advocate has submitted a report intended to recommend an Optimal Contract Approach for the three HVac Substations of the Project.

Power Advocate recommends that the Substations be built on an EPC Contract basis.

The objective of this memorandum is to analyze the Power Advocate report and provide the rationale for the selection of the strategy that is best suited for LCP project by addressing most of Power Advocate's recommendations and best industry practices.

2- CURRENT CONTRACTING STRATEGY

The current strategy for AC Switchyards consists of contracting the Earthworks on Lump Sum (LS) basis at an early stage (CD0503), performing detailed engineering for switchyard, procurement of long lead equipment in due time (PD0505 and PD0537) and contracting Civil and Electromechanical Installation works on a LS basis (CD502).

The present contracting approach is based on addressing the following challenges

- Secure the delivery of long lead equipment (HVac equipment of substations) for 2014 by engaging the procurement of those equipment as early as possible in 2012 in order to optimize the competitiveness (benefit from manufacturers wishing to load their factory in advance) and guarantee a delivery date with a reasonable planning margin. Engineering level of effort for tendering long lead equipment is relatively small to allow for RFP in 2012.

- Perform the earthworks early in 2013 and set-up a camp by the end of 2013 to allow the Construction to commence early in 2014 without delay.

- Prepare the design and tendering documents in 2013 for the construction to commence in early 2014: one single General Contractor performing all civil and electromechanical works under a lump sum Contract.

To meet the LCP overall project schedule, the AC Switchyards works are planned as follow:

- Commissioning and energization of the CF and MF substations when the 315kV T/L are completed in August 2015. This will secure the supply of power to Happy Valley/Goose Bay as well as for the Construction of the Hydro Plant and the accommodation camp.

- Energization of SP Substation in 2015 will have to be scheduled with NLH Operation for the winter of 2015 as the most appropriate time of the year considering that SP Substation will be interposed in critical lines feeding St-John's. This will allow readiness of Soldiers Pond Substation for September 2016 partial power transfer to Newfoundland.

- Commissioning and energization of the Converters and Transition Compounds by September 2016 once the submarine cables and HVdc line are ready to be energized. The intent is to allow for a partial power transfer (450MW) from Churchill Falls to NL network for winter 2016-17 in order to avoid Holyrood power plant from operating.

- Full power transfer when MF power Plant is ready at the end of 2017 early 2018. The full power transfer will have to be planned judiciously with NLH Operation at the most appropriate time of the year.

3- POWER ADVOCATE'S RECOMMENDATIONS

We have included in the appendix a table with our observations and remarks on the corresponding sections of Power Advocate report.

The main reasons not to concur with the EPC approach for the LCP Project are:

- Given the level of effort required to prepare for tendering, RFP will be postponed to middle of 2013. The bidders will have to perform basic design and inquire for equipment prices which would need at least 4 to 5 months to comfortably estimate their costs and calculate their prices. This would bring us to the end of 2013 for bid submittals and probably 4 to 6 months more for award. This would not allow the Contractor to order long lead equipment in a timely manner to meet the time schedule.

- The EPCM Engineer has practically completed the deployment of skilled staff with extensive experience with HV Substations in the Project office

- Considering the present strategy with early procurement of long lead equipment and competency and experience of present EPCM staff deployed in the Project office, any risk related to procurement and detailed engineering are well mitigated.

- Main area of risk related to the Construction material, labour and interfaces between sub-contractors will remain with the LS Contractor as for an EPC.

- The present contract strategy provides the lowest cost approach

With reference to Power Advocate report recommendations to maximize EPCM approach, we confirm that the recommendations have already been applied or engaged thanks to Nalcor initiatives and EPCM Engineer actions:

- The level of effort is under Owner's full control as mobilization of personnel in the Project office is approved on a case by case basis.

- Estimate of number of hours has been agreed with Owner for both deliverables and non-deliverables. Any change must be justified and accepted by Owner.

- EPCM resources are allocated for front end engineering

- Process for land acquisition and environmental permits is well engaged and performance of geothechnical investigation is mostly completed

- Scope of works for CD502 will be completed and well defined

- EPCM resources plan has been adjusted and mobilization is mostly completed

- As per current contracting strategy, going in 2012 on the market to procure long lead equipment allows securing the schedule and optimizing the cost by obtaining competitive prices from suppliers and securing medium term shop loading for delivery in 2014. Therefore, long lead equipment has been identified and early procurement is engaged

- As the Owner and the EPCM Engineer share the same office space, there is constant communication on potential risks and gaps, accountability of EPCM for project success, reporting on project status and identification of performance issues and impact.

- Constructability reviews will be organized by the EPCM Engineer.

- With current CD502 strategy, there is no responsibility of the Owner or EPCM Engineer for the interfaces between Contractors and its subcontractors.

- A formal Project interface management process has already been implemented by the EPCM Engineer and responsibles designated

In addition to the above, report recommendations to benefit from EPC approach were also taken into considerations for the LS Construction Contract:

- Process has already been engaged for regulatory approvals, land acquisition, environmental permits, geptechnical survey, etc to minimize risk and unnecessary contingencies

- With the current contracting strategy, the Contractor does not need to manage external contract package interfaces.

- Critical milestones will also be used to establish the liquidated damages, and performance guarantee.

- Bid prices will include the escalation provision for construction material and labour considering the dates of the baseline time schedule. Reference will be made to standard formulae and indices from official Canadian publications for any adjustment that may be required.

- Bidders will go through a prequalification process.

- There will be a single point of contact with the LS Contractor.

- With the present contract strategy, the Owner retains the risks that are more cost effective.

- LS Contractor will have to submit regular project status report.

4- Conclusion

We strongly recommend staying with the present contracting strategy given the combined Nalcor and EPCM Engineer capacities and skills. All conditions have been created to provide the best opportunity for the feasibility of an early delivery of the LCP HVac Transmission system LTA.

Moreover, this strategy allows integrating the Soldiers Pond 230kV Substation which is a prerequisite to the transfer of power from Churchil Falls into the Newfoundland Grid in September 2016 through the LITL, at the appropriate time of the year (winter 2015) defined by the Newfoundland Grid Operator.

The current approach is the most cost-effective and minimizes the risks for the Project.