

## QUARTERLY REPORT

**PROJECT:** HVDC TRANSMISSION SYSTEM FOR RURAL ALASKAN APPLICATIONS, PHASE II – PROTOTYPING AND TESTING

**UAF CONTRACT:** UAF 10-0055

**CONTRACTOR:** POLARCONSULT ALASKA, INC.

**REPORTING PERIOD:** OCTOBER 1, 2010 – DECEMBER 31, 2010

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### PROJECT OVERVIEW

- The project is progressing smoothly. No problems have been encountered.
- Billed expenses to date are \$782,142.38 (36% of the \$2,175,500 project budget). All costs are from Denali Commission funds.

### PROJECT SCHEDULE AND MILESTONES

Polarconsult has worked with ACEP to revise the schedule for several project tasks. These revisions reflect project progress to date, and also provide additional time to consult with Manitoba on key task items. Major schedule changes are summarized below. A revised Gantt Chart for the project is attached to this report.

- Change Task 2.1 (HVDC converter spec) completion from 10/15/10 to 3/31/11.
- Change Task 3.2 (OH system conceptual design) completion from 12/1/10 to 6/30/11.

### SUMMARY OF PROJECT ACTIVITIES, STATUS, ACCOMPLISHMENTS

#### *CURRENT QUARTER – Q4 2010*

#### *Task 1 (Project Management, SAG, Code Issues, Phase III Site Selection)*

- On-going informal communication has occurred with SAG members on various aspects of project. Correspondence has occurred with AVEC on converter specifications and control requirements with village grids; with UAF/UAA faculty on polygonal cracking parameters; and with GVEA on foundation experience on their Healy-Fairbanks intertie structures.
- Polarconsult issued a white paper to the SAG requesting input on goals and sites for the phase III demonstration project. This will be a discussion topic at the upcoming SAG meeting on January 14, 2011.

#### *Task 2 (HVDC Converter Development)*

- Polarconsult received two sets of comments from Manitoba on PPS' draft converter specification. A variety of useful comments were provided – no critical technical issues were identified. Manitoba's comments were forwarded to PPS for review and draft response. PPS' response to Manitoba's comments, and the converter specification will both be finalized in the next quarter (Q1 2011).
- PPS has completed design of the power electronics and is selecting/designing components. Some power train components are on order and/or have been received.

The control architecture is finalized and hardware is under design / procurement. Thermal modeling and design for passive cooling is completed. The high-frequency power transformer and harmonic filter inductors are on order. Mechanical and tank components will be on order in Q1 2011. Converter assembly is scheduled to begin in Q2 2011.

- Development of the HVDC converter test plan is in progress, and will be issued by PPS for review by PCA and Dr. Weis in January 2011.
- No progress this quarter on converter testing and reporting.

### ***Task 3 (Overhead Transmission System Design)***

- The overhead system conceptual design effort is making progress, however a schedule extension is required to complete. Soliciting and receiving all data from manufacturers is taking longer than expected, and this task is now expected to be completed in Q2 2011.
- Polarconsult has asked several manufacturers (of poles, insulators, and foundation components) to submit preliminary supply proposals for the overhead HVDC system. As appropriate, responses may include existing product lines that will meet the application and/or customized products developed for this application. Customized products may include one-time tooling and development charges, but it is expected these costs will be recouped in construction savings stemming from the optimized component designs. This tradeoff will be analyzed once data are received from manufacturers.
- Polarconsult is still working to identify a specialist on HVDC grounding grids. We have identified candidates but none has committed to participating in the project yet.

### ***Task 4 (Secondary Development Activities)***

Polarconsult is currently preparing work plans for secondary project activities. These work plans will propose Phase II budget, scope, and schedule amendments to advance these secondary activities. The plans will be submitted to ACEP for review and approval in January 2011. Current status of the three major activities is summarized below:

- 4.1 – Construction and maintenance equipment. Polarconsult met with owner/operators of prospective construction equipment in the 4<sup>th</sup> quarter to review equipment functionality and suitability for intertie construction. As the intertie conceptual design is finalized, this information will be used to make recommendations on suitable construction and maintenance equipment and methods. Logistics and environmental factors remain key considerations in this effort.
- 4.2 – Submarine cables. Polarconsult is preparing a submarine cable performance specification and expects to submit this to manufactures in Q1 2011 to obtain costs for tooling and manufacture of the cable, and manufacturer recommendations on

any special testing required before the cable is placed into commercial service. Polarconsult expects to receive information from manufactures back and determine if any additional Phase II work is warranted by the end of Q1 2011.

- 4.3 – Overland Cables. Polarconsult has compiled existing information to quantify the polygonal cracking problem, and is developing a test plan to evaluate proposed installation methods and cable designs to solve this problem. This test plan will be a part of the Work Plan that will be submitted to ACEP in January 2011.

***Task 5 (Economic Analysis and Final Report)***

Cost data on various components are being collected as appropriate. No economic analyses have been started at this time.

***NEXT QUARTER – Q1 2011***

- Task 1.1: On-going management.
- Task 1.2: Hold 2<sup>nd</sup> SAG meeting, manage SAG work groups.
- Task 1.3: Work with Manitoba ADOL, and stakeholders to develop approval process, coordinate efforts with ACEP and Denali Commission.
- Task 1.4: Collect input on candidate projects from SAG, analyze and make recommendations.
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- Task 2.1: Finalize HVDC converter specification with PPS.
- Task 2.2: Continue HVDC converter design and development (PPS).
- Task 2.3: Finalize HVDC converter test plan (PPS with Dr. Weis).
- Task 2.4: No activity planned for next quarter (PPS has scheduled to start Q2 2011).
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- Task 3.1: Define test site requirements, identify test site as appropriate.
- Task 3.2: Finish conceptual design of overhead system.
- Task 3.3: Retain consultant for SWER grounding system concept design, define any test needs.
- Task 3.4: Start field tests for overland cable (after ACEP's approval of test plans).
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- Tasks 4.1-4.3: Issue reports describing work necessary on secondary design activities. Issue recommended scope, budget, and schedule amendments to allow for advancement of secondary design activities for ACEP's consideration.
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- Task 5.1: No activity planned for next quarter.
- Task 5.2: No activity planned for next quarter.

HVDC TRANSMISSION SYSTEM FOR RURAL ALASKAN APPLICATIONS - PHASE II PROTOTYPING AND TESTING - SCHEDULE AMENDMENT #2 (1/15/11)

ID	Task Name	Start	Finish	Qtr 1, 2010			Qtr 2, 2010			Qtr 3, 2010			Qtr 4, 2010			Qtr 1, 2011			Qtr 2, 2011			Qtr 3, 2011			Qtr 4, 2011		
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
1	<b>1.0 PROJECT MGMT, SCOPING AND STAKEHOLDER PROCE</b>	1/1/10	8/26/11																								
2	1.1 Project Management	1/1/10	8/26/11																								
3	<b>1.2 Stakeholders Advisory Group (SAG)</b>	1/1/10	7/15/11																								
4	Assist ACEP to Organize Group	1/1/10	4/23/10																								
5	Meeting #1	4/28/10	4/28/10	◆ 4/28																							
6	Meeting #2	1/14/11	1/14/11	◆ 1/14																							
7	Meeting #3	7/15/11	7/15/11	◆ 7/15																							
8	1.3 Address Electric Code Issues	5/3/10	2/28/11																								
9	1.4 Phase III Project Selection	3/1/10	3/1/11																								
10	<b>2.0 CONVERTER DEVELOPMENT</b>	4/8/10	6/16/11																								
11	2.1 Develop Converter Standards and Specifications	4/23/10	3/31/11																								
12	2.2 Converter Design / Development	4/8/10	12/22/10																								
13	<b>2.3 Converter Test Plan</b>	7/8/10	8/23/10																								
18	<b>2.4 Converter Testing and Test Results</b>	12/23/10	6/16/11																								
21	<b>3.0 TRANSMISSION DEVELOPMENT</b>	5/3/10	11/1/11																								
22	3.1 Procure Cold Regions Test Site	11/1/10	5/1/11																								
23	<b>3.2 Overhead System Conceptual Design</b>	5/3/10	6/29/11																								
27	3.3 Earth Return Grounding System	8/2/10	6/8/11																								
28	3.4 Overhead System Testing	6/30/11	11/1/11																								
29	<b>4.0 OPT. TRANSMISSION DEVELOPMENT</b>	11/1/10	7/8/11																								
30	Develop/Approve Work Plan for Task 4 Activities	11/1/10	12/1/10																								
31	4.1 Construction and Maintenance Equipment and Methods	12/3/10	7/8/11																								
32	4.2 Submarine Cable Development	12/3/10	7/8/11																								
33	4.3 Overland Cable System Development	12/3/10	7/8/11																								
34	<b>5.0 SYSTEM ECONOMICS AND REPORTING</b>	4/4/11	8/26/11																								
35	5.1 Economic Evaluations	5/2/11	6/27/11																								
36	<b>5.2 Draft Final Report</b>	4/4/11	8/26/11																								
40	<b>PROJECT MANAGEMENT</b>	4/1/10	10/3/11																								
41	Quarterly Report #1	4/1/10	4/1/10	◆ 4/1																							
42	Quarterly Report #2	7/1/10	7/1/10	◆ 7/1																							
43	Quarterly Report #3	10/1/10	10/1/10	◆ 10/1																							
44	Quarterly Report #4	1/3/11	1/3/11	◆ 1/3																							
45	Quarterly Report #5	4/1/11	4/1/11	◆ 4/1																							
46	Quarterly Report #6	7/1/11	7/1/11	◆ 7/1																							
47	Quarterly Report #7 - FINAL PROGRESS REPORT	10/3/11	10/3/11	◆ 10/3																							