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ENGINEERS • PLANNERS • ENVIRONMENTAL CONSULTANTS

QUARTERLY REPORT

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

UAF CONTRACT: UAF 10-0055, MODIFICATION #1

CONTRACTOR: POLARCONSULT ALASKA, INC.

REPORTING PERIOD: APRIL 1, 2011 – JUNE 30, 2011

PROJECT OVERVIEW

- The project is progressing in a normal manner, consistent with and in accordance to general project management expectations. No problems have been identified that would prevent overall project success.
- As of June 30, 2011, grant funds totaling \$1,508,956.23 (69% of the \$2,175,500 project budget) have been received by Polarconsult. All grant payments are from Denali Commission funds.

PROJECT SCHEDULE AND MILESTONES

Polarconsult has worked with ACEP to revise the scope, schedule and budget for several project tasks as called for under the project statement of services. These revisions were formalized as Modification No. 1 to the Contract Documents on June 21, 2011.

SUMMARY OF PROJECT ACTIVITIES, STATUS, AND ACCOMPLISHMENTS

CURRENT QUARTER – Q2 2011

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

- Informal communication between SAG members and Polarconsult has occurred on various aspects of project. Correspondence has occurred with UAF faculty and Golden Valley Electric Association (GVEA) on foundation design issues; and with Copper Valley Electric Association (CVEA) on potential sites for Phase II foundation testing in the Glennallen area.
- Polarconsult and ACEP have established that the 3rd SAG meeting will take place in Juneau during the Rural Energy Conference being held September 27 – 29, 2011. The date, time and venue will be selected in July 2011. Polarconsult has requested that representatives of Princeton Power Systems, Inc. (PPS) and Manitoba High-Voltage Research Centre (MHRC) attend the conference and SAG Meeting.
- Per Polarconsult's directive, MHRC prepared and issued a report discussing code and safety issues relating to single-wire earth return (SWER) circuits in April 2011. The report was in direct response to questions asked by the Department of Labor regarding the safety of HVDC SWER circuits.

Task 2 (HVDC Converter Development)

- Polarconsult received the finalized converter specification (revision 1.0, April 20, 2011) from PPS for final review and approval. The specification incorporated Manitoba and Polarconsult comments. Polarconsult has reviewed the final specification and identified minor issues that will be resolved with PPS in Q3 2011.
- PPS completed the following items this quarter: completed parts procurement for the two 500 kW units; received and tested at full voltage the 1st of 16 high voltage stage printed circuit boards (PCBs), received and tested the fiber optic base and expander PCBs.
- PPS has released the remaining 15 high voltage stage PCBs for production, and is assembling the tank status PCBs and other peripheral PCBs. The trigger PCBs that will drive the high voltage stack boards are being manufactured.
- PPS is continuing with Design Failure Mode Effects Analysis (DFMEA). MHRC and PPS are coordinating directly on technical review and assessment of converter function.
- Per Polarconsult's directive, MHRC issued a report on integration and implementation considerations for multi-terminal HVDC networks using the PPS converters.

Task 3 (Overhead Transmission System Design)

- Polarconsult has fiberglass poles and foundation materials under procurement for installation at the test site. Both are expected to arrive in Alaska in August. Polarconsult has requested cost estimates for manufacturing production-scale quantities of these materials. Our assessment of design alternatives for overhead structures continues.
- Polarconsult has investigated sites for testing cold regions power pole foundation designs in the Glennallen and Fairbanks areas. The 'Farmer's Loop Road Test Site' owned by the U.S. Army Corps of Engineers' Cold Regions Research and Engineering Laboratory (CRREL) in Fairbanks has been identified as the preferred location for testing. This site is preferred because Fairbanks has better logistics and support capabilities than Glennallen, and is also nearby ACEP and UAF, which will simplify long-term monitoring of the foundations. The CRREL site also has well-characterized thermal and soil profiles reducing uncertainty in the site's suitability for this project. Polarconsult is currently working with CRREL to secure agreements for access to the site. Installation of foundation materials is expected to occur in August or September 2011.

Task 4 (Secondary Development Activities)

Current status of the three major activities is summarized below:

- 4.1 – Construction and maintenance equipment. Polarconsult has identified existing equipment and tools that can be adapted to facilitate construction and maintenance of the overhead system.
- 4.2 – Submarine cables. Polarconsult is currently developing a performance specification for submarine cable suitable for the HVDC technology.
- 4.3 – Overland Cables. Polarconsult continues to develop plans for cable test assemblies. Quotes have been obtained for manufacture of testing apparatus.

Task 5 (Economic Analysis and Final Report)

Cost related information on relevant components are being collected. No economic analyses have been started at this time.

NEXT QUARTER – Q3 2011

- Task 1.1: On-going management.
- Task 1.2: The 3rd SAG meeting will be held in Juneau in late September during the Alaska Rural Energy Conference (September 27 – 29th). Time, date and venue will be determined and announced in July. Continuing informal correspondence with SAG members.
- Task 1.3: Continued coordination with MHRC to address any further questions from the Alaska Department of Labor on ground return and safety issues.
- Task 1.4: Completed.
- Task 2.1: Incorporate final PCA comments on the final converter specification.
- Task 2.2: Complete sub-assembly testing and assembly of converters. Perform low voltage (open air) testing of converter, then perform full voltage (in oil) testing of converter.
- Task 2.3: Complete testing of subassemblies. Finalize HVDC converter test plan (PPS with Dr. Weis). Commission high voltage test lab for full voltage testing of converters.
- Task 2.4: Testing is scheduled to begin in mid-August and be completed by October.
- Task 3.1: Finalize agreement with CRREL for the use of their permafrost test site on Farmers' Loop Road in Fairbanks. Site access is expected in August.
- Task 3.2: Finish conceptual design of overhead system.
- Task 3.3: Document findings, incorporate to final report.
- Task 3.4: Installation of the relevant transmission components at the CRREL test site.
- Tasks 4.1-4.3: Issue final test plan for buried cable testing for ACEP approval in early August, followed by the test program activities.
- Task 5.1: Begin economic analysis of intertie configurations by developing cost estimates.
- Task 5.2: Issue draft outline of study to ACEP for review in late August or early September.