UAF 11-0017
NENANA, ALASKA HYDROKINETIC RivGen™ POWER SYSTEM

PROGRESS REPORT: 3Q2011

SEPTEMBER 15, 2011

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UAF 11-0017: NENANA, ALASKA HYDROKINETIC RivGen™ POWER SYSTEM

Progress Report: FY 2011, 3rd Quarter
Submitted: September 15, 2011

1. Total Project Funding

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denali Commission</td>
<td>$830,325</td>
</tr>
<tr>
<td>ORPC Alaska</td>
<td>$1,128,449</td>
</tr>
</tbody>
</table>

2. Updated schedule and milestone information as identified in the Project Work Plan

Project Deliverables

- Alaska Hydrokinetic Energy Research Center (AHERC) foundation and debris diversion
  literature surveys, data collection and final reports:

  Foundation Study Deliverables
  AHERC is no longer performing a foundation study for the Project. ORPC Alaska, LLC (ORPC) is utilizing third party engineering resources to complete the design.

  Debris Study Deliverables
  The final report on the debris study was submitted to ORPC on April 14, 2011 and may be provided upon request.

- ORPC environmental and site characterization data collection for Project design and Federal Energy Regulatory Commission (FERC) draft pilot license application:

  No additional site characterization work has been completed.

- Prototype bottom support frame and Debris Detection System fabricated, deployed, tested, and retrieved at Nenana site:

  The prototype bottom support frame fabrication was completed in early August 2011. Fabrication of two anchors was also completed, and the prototype Debris Detection System was mounted to one of the anchors. Due to concerns about the potential difficulty of removing the bottom support frame from the sedimentation on the river bottom and the escalated costs associated with retrieval should the bottom support frame be imbedded in sediment, it was decided to forgo the bottom support frame testing at Nenana this fall. One anchor, however, is still scheduled for deployment on September 13, 2011, and it will include the Debris Detection System, which will undergo a week of testing and calibration during this deployment to validate the system. This anchor test will also provide data to better inform sedimentation concerns at the Nenana site. ORPC is currently investigating alternative bottom support frame testing locations with lesser sedimentation concerns, including sites in Maine and Alaska.
• Additional field work required for FERC final pilot license application:

The University of Alaska Fairbanks School of Fisheries conducted two weeks of pre-deployment fish studies during August 15 – 28, 2011 (Figure 1).

Figure 1. UAF researchers engaged in fish study.

• FERC Final Pilot License Application

ORPC met with Golden Valley Electric Association (GVEA) on several occasions and convened two meetings with FERC to discuss the licensing of the Project. It has been decided that the most economic and facilitated path forward at this time will be to install the initial phases of the Project under the parameters of an exemption under the precedent of the Verdant Declaratory Order. In order to do this, the initial power from the Project will be donated to GVEA rather than sold. These early Project phases will inform the decision of whether licensing the Project will prove economical.
• RivGen™ turbine generator unit (TGU) built and tested at Eastport, Maine test site:

The RivGen™ generator is under construction; initial RivGen™ turbine designs have been sent to manufactures for bid; the design parameters for the RivGen™ power electronics are being finalized, and all other TGU components are scheduled to be completed, assembled, and ready for testing by February 1, 2012.

• Final Report on Nenana site characterization work and foundation system and Debris Detection System performance:

No work to report.

• Final performance report on RivGen™ TGU test in Maine submitted to Alaska Center for Energy and Power (ACEP):

No work to report.

• A revised Scope of Work, budget and timeline will be submitted in September 2011.

Timeline

• AHERC foundation and debris diversion literature surveys, data collection and final reports completed December 31, 2010 (now anticipated December 31, 2011):

<table>
<thead>
<tr>
<th>Foundation Study Timeline</th>
<th>Description</th>
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<tbody>
<tr>
<td>November 2010 - December 2011</td>
<td>The foundation study has been removed from the AHERC scope of work due to the loss of key faculty performing the work. It will no longer be performed as part of this Project.</td>
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<table>
<thead>
<tr>
<th>Debris Study Timeline</th>
<th>Description</th>
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<tbody>
<tr>
<td>November 2010 - December 2010</td>
<td>Review literature and existing debris mitigation technology and engineering.</td>
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<tr>
<td>December 2010 - January 2011</td>
<td>Provide ORPC with results from literature review of existing debris mitigation methods to help their design of a preliminary mitigation system. Provide preliminary concept designs for debris detection grate system.</td>
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<tr>
<td>November 2010 - April 2011</td>
<td>Design methods and equipment to measure debris statistics in conjunction with the foundation design study.</td>
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<tr>
<td>January 2011 - September 2011</td>
<td>Consult with ORPC on Debris Detection System during construction and installation.</td>
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<tr>
<td>September 2011</td>
<td>Calibrate Debris Detection System.</td>
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<tr>
<td>October 2011 - December 2011</td>
<td>Analyze data from the measurement program and</td>
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approach, and provide ORPC with guidance on design of a prototype Debris Mitigation Device.

May- September 2012
Operate Debris Detection System to collect data on debris in Tanana River; submit debris report to ORPC.

• ORPC environmental and site characterization data collection for Project design and FERC draft license application completed by October 1, 2010:

   October 10, 2010
   TerraSond geophysical field work completed.

   January 6, 2011
   Final report on geophysical work submitted to ORPC.

• Prototype bottom support frame and Debris Detection System fabricated, deployed, tested and retrieved at Project site, July – September 2011:

   March 1, 2011
   PND Engineers, Inc. selected to design bottom support frame.

   May 1, 2011
   Conceptual design selected.

   June 7, 2011
   Design drawings completed for review.

   June 13, 2011
   Permits for bottom support frame testing submitted to Alaska Department of Natural Resources, United States Army Corps of Engineers, and Alaska Department of Fish and Game.

   August 12, 2011
   Completed anchor system shipped to Nenana.

   August 16, 2011
   Bottom support frame assembly completed.

   August 25, 2011
   Debris Detection System fabrication and assembly completed.

   September 13 – 22, 2011
   Anchor and Debris Detection System deployed, tested, and retrieved.

   November 30, 2011
   Bottom support frame quality check performed to ensure its fabrication is to spec. Location for bottom support frame systems testing selected.

   April 31, 2012
   Bottom support frame systems testing complete at test site. Bottom support frame prepared to accept TGU for RivGen™ device testing.

• Additional field work required for FERC final pilot license application completed by October 31, 2011:

   March 31, 2011
   Meeting with Agencies to scope Project’s Fish Study.
June 7, 2011  Fish Study plan finalized between ORPC and UAF.

August 15 – Sept 1 2011  Fish Study performed.

May 15 – August 15, 2012  Fish Study performed.

- TGU fabricated and tested at Eastport, Maine test site:
  
  February 1, 2012  TGU fabrication and assembly complete.

  March 1, 2012  TGU testing in Eastport, Maine complete.

- FERC final pilot license application submitted, or Verdant exemption qualification confirmed:
  
  January 31, 2012  FERC strategy and necessary permitting timeline defined.

- RivGen™ TGU built and tested at Eastport Maine test site
  
  March 1, 2012  Eastport testing complete.

- Final Report on Nenana site characterization work, bottom support frame and anchoring system, and Debris Detection System performance submitted to ACEP:
  

- Final performance report on RivGen™ TGU test in Maine submitted to ACEP:
  

3. **Narrative Summary**

**RivGen™ Bottom support frame and Debris Detection System**

Following the completion of the final design for the bottom support frame and anchor system, Marsh Creek, under contract to ORPC, began fabricating the bottom support frame and two prototype anchors. Marsh Creek hired a subcontractor Van Weld North to complete the fabrication on schedule. Fabrication of the bottom support frame and anchors was completed by August 16, 2011 (See Figures 2 and 3). As the bottom support frame was nearing completion, initial cost estimates of the testing at Nenana, which was also intended to be subcontracted to Marsh Creek, came in well beyond the budgeted amounts. The high estimates were due in large part to the oversized crane needed to account for uncertainties in retrieval loads. After several meetings discussing alternatives methods for retrieving the bottom support frame, ORPC and Marsh Creek concluded that due to the potential for large sediment loads at Nenana a large crane would be required for safe operations. Because of this, the most reasonable way of bringing the initial bottom support frame testing costs within budget will be to test it at an alternate location without large sediment concerns. ORPC is currently investigating several options for this testing, including sites
in both Alaska and Maine, and intends to finalize a decision on the bottom support frame testing by November 2011.

*Figure 2. Entire bottom support frame under fabrication in early August 2011.*
Figure 3. Completed section of bottom support frame in late August 2011.

While the Debris Detection System was undergoing prototype design, fabrication, and modification at Jon’s Machine Shop in Fairbanks, instrumentation was ordered. In addition, ORPC oversaw the assembly of the completed Debris Detection System and the installation of the System onto one of the prototype anchors (Figure 4). This system was ready for deployment on August 26, 2011, but due to concerns about deployment, this was delayed until September 13, 2011. Once deployed, AHERC will perform validation testing and calibration of the Debris Detection System until September 20, 2011, at which time it will be removed from the river for winter storage.
As part of the Debris Detection System deployment, the anchor will also undergo an initial deployment, retrieval, and pull tests. Additionally, testing the anchor’s retrievability after one week of deployment will provide the first quantifiable results that are necessary to inform sedimentation concerns for later phases of the Project.

**AHERC Debris Detection and Fish Study**

Due to delays in the deployment of the Debris Detection System, AHERC will be unable to collect rigorous data on debris loads in the Tanana River this 2011 season. AHERC will, however, calibrate the system over the week of its deployment, so that the system is validated and ready for a full season of deployment in 2012.

The UAF Fish Study, directed by Dr. Andy Seitz, began on August 15, 2011. This was later than scheduled due to delays in permitting, equipment acquisition, and field tests of the fyke net system. While operational, the fishing method proved effective and fishing efforts continued through August 30, 2011. UAF will continue this study in 2012 in order to complete a full season of pre-deployment data at the Project site.
RivGen™ TGU

Design of the RivGen™ TGU continues in preparation for testing in Eastport, Maine. Initial designs for the TGU components have either been finalized or are nearing completion. Fabrication of the generator is underway and is expected to be completed in November 2011. The initial turbine design is complete and has been sent out for fabrication bids. Vendors for the power electronics are also being selected as the power electronics design criteria have been established. Additional components are being designed and the TGU fabrication and assembly is scheduled to be completed in January 2012 with TGU testing in Eastport to begin in February 2012.

4. Before and After Pictures

See Figures 1-4.

Total Project Expenditures for the Project as of the end of the Reporting Period

Total Project expenditures as of the end of 3Q2011 include the following:

<table>
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<tr>
<th>Denali Funds</th>
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<tr>
<th>ORPC Alaska Share</th>
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<td>$605,238.87</td>
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Total Expenditures to Date: $871,267.79

Modified Budget

Based on the more accurate quotes received for the Project over the past months and the addition of necessary line items for Project completion, as well as the omission of debris diversion system construction, several changes to the original Project budget have been made. This new budget and the revised Project scope will be submitted in September 2011.