North Dakota Renewable Energy Program
Status Report

Recipient: Packet Digital LLC
Contract Number: R-040-051
Report for time period of: September 1, 2020 - October 31, 2020

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Description of Project
Packet Digital LLC, Nishati, and the U.S. Naval Research Laboratory (NRL) are collaborating to develop and commercialize transportable solar power generation modules capable of delivering up to 1kW, when set up in parallel, for remote military installations, emergency shelters and camps. The end product will eliminate the fuel requirement and noise and will reduce the life cycle cost of standard electromechanical power generation.

Project Tasks
Please describe the progress on all project tasks achieved during the reporting period:

Objective 1: Refine PSG1 electronic design to simplify manufacturing and assembly process -- Progress was already reported in interim 2 report.
   ● Task 1 – Refine the electronic board designs to reduce the amount of wiring and interconnect needed.
   ● Task 2 – Assemble the electronics and perform laboratory tests to verify functionality.

Objective 2: Refine PSG1 custom enclosure -- Progress was already reported in interim 5 report.
   ● Task 1 – Refine overall enclosure design to make the assembly process easier and less expensive.
   ● Task 2 – Add more protection features to better withstand the MIL-STD tests.
   ● Task 3 – Survey and evaluate plastic injection mold options for the front panel.
Objective 3: Design modification of PSG-C1000 to make it lighter -- Progress was already reported in interim 2 report.
- Task 1 – Survey and evaluate economical options for lighter energy storage that will work for PSG-C1000.
- Task 2 – Modify current PSG-C1000 electronic design to support the selected new energy storage.

Objective 4: System integration and field test -- Progress was already reported in interim 5 report.
- Task 1 – Electronic assembly into the custom enclosure and integration with solar panel.
- Task 2 – Conduct field test.

Objective 5: FCC compliance testing -- Some of the progress was already reported in interim 5.
Below are additional updates:
- Task 1 – Identify FCC accredited testing laboratory to work with and proceed with the testing -- Progress was already reported in interim 2 report.
- Task 2 – Contingency plan, in the event that FCC test fails, Packet Digital will perform design refinement and re-test
  - FCC retesting was done in the fourth week of September 2020 at the NCEE Labs in Lincoln, Nebraska.
  - There was a significant improvement in terms of the electromagnetic emission as compared to the previous revision. Collaboration with the lab provided improvement opportunities and these are being explored, in terms of the Electromagnetic Interference (EMI).

Objective 6: MIL-STD testing and certification -- Progress was already reported in interim 6.
- Task 1 – Identify MIL-STD accredited testing laboratory to work with
- Task 2 – Build four identical systems and proceed with the testing.
- Task 3 – Contingency plan, in the event that any of the MIL-STD tests fail, Packet Digital will perform the necessary design reinforcement and re-test.

Objective 7: Looking into potential new design to support further hybridization with gasoline/diesel power generator
- Task 1 – Perform market survey to investigate the potential market demand for such a hybrid system.
  - Market survey for hybrid solar and diesel power generators has been completed.
- Task 2 – Perform initial design architecture, capturing general functionalities of the hybrid system.
  - The work on top level design architecture is ongoing and it will be attached to the appendix upon completion.

**Deliverables**
Please describe the progress on project deliverables, as stated in your contract, achieved during the reporting period:
- Report on the improvement in electronic design to simplify manufacturing and assembly process -- Already reported in interim 2 report.
● Report on the improvement in custom enclosure to simplify manufacturing and assembly process -- **Already reported in interim 3 report.**

● Report on the weight reduction of PSG-C1000 inverter module -- **Already reported in interim 2 report.**

● Report on the FCC and MIL-STD compliance of the product -- **Some of the progress was already reported in interim 6.** Below are additional updates:
  ○ From the FCC test and evaluation, the latest revision of PSG1 has substantial improvements in the electromagnetic emission as compared to the first revision in Phase I and further improvements are planned.
  ○ The product was designed with military customers in mind and our market analysis and traction with customers has been military customers, hence the target market is for military use. Requirements are being discussed and evaluated with our customer. We are planning to evaluate radio frequency (RF) absorbing material to get more insight for EMI improvements.

**Additional Information**
- Two systems have been delivered to the US Marine Corp and our undervaluation.
- We are currently working with our partner Nishati for a parallel system operation, test, and demonstration prepared for an existing customer who supports multiple DoD organizations. Several potential improvements such as better load sharing between the two systems and better load handling mechanism have been identified and will be implemented to facilitate the unique use case of this customer.
- We delivered a system to Nishati in early October to be integrated into their existing system for parallel system testing in the field.

**Budget**

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<th>Project Associated Expense</th>
<th>NDIC Share</th>
<th>NRL Share</th>
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1 Direct personnel costs plus indirect overhead and G&A
2 Direct materials costs plus G&A

**Expenditures**
Expenditures for the project to date are shown in the table below. Supporting documentation is provided as a separate attachment.

### EXPENDITURES FOR INTERIM 7 REPORTING PERIOD ONLY

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<th>Project Expense</th>
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### CUMULATIVE EXPENDITURES

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