Final Technical Report

Federal Agency to which Report is submitted: DOE EERE – Wind & Water Power Program

Recipient: Northern Power Systems
Award Number: DE-EE0004413
Project Title: Commercialization of an Advanced Gearless Midsize Wind Turbine
Project Period: September 2010 – December 2013

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Report Frequency: N/A

Working Partners: None

Cost-Sharing Partners: None

DOE Project Team: DOE HQ Program Manager – Jose Zayas
DOE Field Contract Officer – Pamela Brodie
DOE Field Contract Specialist – Laura Merrick
DOE Field Project Officer – Nick Johnson
DOE/NAVARRO Project Monitor – Shaun Jensen

Signature of Submitting Official: _____
(electronic signature is acceptable)

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Program Manager

EXECUTIVE SUMMARY

The objective of this project is the development and eventual commercialization of a Gearless Wind Turbine of rated power 450 kW. While the product was to be based on existing technology, a significant amount of new engineering effort was expected to be required to ensure maximum efficiency and realistic placement within the market. Expected benefits included positive impact on green job creation in over 15 states as well as strengthen the U.S. domestic capacity for turbine engineering.

Project Goals:

1. Develop a Project Plan, to provide a realistic schedule for development of the turbine, a Business Plan for the commercialization of the turbine, and a Certification Plan to ensure the eventual certification of the turbine to a recognized standard.
2. Develop the Preliminary Manufacturing Drawings and Specifications required to provide a level of confidence in the design sufficient for the ordering of long-lead components.
3. Develop the Final Manufacturing Drawings and Specifications that are required to order all remaining components in the Turbine Assembly, develop tooling required for manufacturing, develop documentation required for installation, operation, and maintenance, and develop the supply chain and manufacturing capability.
4. Procure, assemble and test a 450 kW Gearless Wind Turbine.
5. Develop a detailed plan for scale-up of manufacturing, including design changes for manufacturing and plans for higher-volume production.
6. Submit a final report on the development of the 450 kW Gearless Wind Turbine.

Planned Project Tasks:

1a. Project Plan - Budget Period 1
1b. Project Plan - Budget Period 2
1c. Phase II Application
2. Critical Design Review
3. Final Design Review
4. Supply Chain Development
5. Procurement, Assembly, Test of Prototype
6. Design for Mfg & Commercial Scale-up
7. Final Report

With the 450kW, we wanted to create an offering decidedly bigger that our current 100kW offering yet still have it be siteable in smaller quantities (1-3 units) for the community space rather than the MW scale wind farms.

Preliminary design phase trade studies resulted in a turbine configuration for a stall design, 50M tower, 450kW generator with a 50m rotor diameter. The supply chain and manufacturing data for this configuration however did not result in a lower cost of energy as expected with a larger

turbine. To address the economics, our approach was to maintain the rotor size and tower height but reduce the power rating, allowing us to maintain tip height restrictions of community wind sites, hence the reduction to a 250kW configuration.

With further research and planning, we determined that the human and capital resources required to successfully launch this platform, even with DOE funding commitment, would have ultimately required unrealistic sales volumes to justify the investment. The turbine economics were further challenged by the thriving solar market at the time.

In the end, we were unsuccessful in convincing our Board of Directors of the merits of continued investment in the larger turbine platform. As a result, we advised DOE that a business case could no longer justify proceeding with the investment in the larger turbine platform. NPS proposed to refocus the project scope to developing a new platform that could serve as a common chassis for the NPS 100 & NPS 60 in EU and US markets. This proposal was rejected by DOE and formal Notice of Non-Compliance was issued to NPS.

PRODUCTS / DELIVERABLES

Products / Deliverables:

No deliverables were completed in the reporting period.

Patents:

No patent applications have been submitted at this time as a result of the project.

PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

Individuals: Gina Akley, Dave Buley, Chris Connor, Dan Costin, Eric Garvin, Derek Heidelmeier, James Jennings, Kiran Kumar, Chris McKay, Dustin Rand.

Organizations: No organizations contributed in the period of this report.

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Any findings, opinions, and conclusions or recommendations expressed in this report are those of the author(s) and do not necessarily reflect the views of the Department of Energy.