



U.S. Department of Energy Categorical Exclusion Determination Form



Program or Field Office: Office of Energy Efficiency and Renewable Energy:
Phase III Xlerator Program

Funding Opportunity Number DE-FOA-0000397

Applicant Name: Princeton Power Systems, Inc

Location: Princeton, NJ

Project Title Distributed Generation Transformer for MW-scale Wind
Turbines using AC-link

Proposed Action or Project Description American Recovery and Reinvestment Act: ☐

The drive train, including generator, power converter, step-up transformer, and cabling, represents a large portion of the cost, weight, and inefficiencies in modern megawatt (MW)-scale wind turbines. The size and weight of the electronics is a hindrance to improved towers, foundations, and transmission efficiencies for onshore and offshore wind power. Finally, additional converter functionality is required to provide grid support functions such as load-leveling and energy capture during low-voltage events. Using commercially available switches, Princeton Power Systems, Inc., proposes to develop a 1.5MW AC-AC converter that transforms "wild AC" from the generator at 700 Vac into conditioned AC power at 13.8 kVac, in a package with power density of 2.5 MW/m³ and peak efficiency of 97.5%. The technology provides conditioning and voltage transformation in one step and an integrated terminal for connecting energy storage. The critical technologies, AC-link, nanocrystalline transformers, and high-voltage switch stacks, have been demonstrated in related US military projects and proven feasible for distributed generation applications in Phase I of this program. In Phase I, Princeton Power Systems, Inc., proved the feasibility of using AC-link to increase transmission efficiency, significantly decrease the size of the power conversion system, and eliminate the large transformers in hydropower systems. In the space-constrained water environment, Princeton Power Systems, Inc., proved the feasibility of using silicon carbide devices to further reduce size, increase operating voltage, and increase conversion efficiency. In Phase III, Princeton Power Systems, Inc., proposes to adapt the AC-link converter designed in Phase I to wind power applications, which will use silicon-based switches that are more appropriate for a Phase III effort. Silicon devices are more readily available in low-cost, efficient packages; the power density of the system will be slightly less, but the benefit will be the ability to commercialize the technology in offshore and onshore wind applications more quickly. The transformer windings, third port, and related controls to integrate energy storage will be added to the design, and a 750 kW prototype will be developed and tested.

Conditions: None

Categorical Exclusion(s) Applied: B3.6, B5.1

*-For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, see Subpart D of 10 CFR 10.21

This action would not: threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including DOE and/or Executive Orders; require siting, construction, or major expansion of waste storage, disposal, recovery, or treatment facilities, but may include such categorically excluded facilities; disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; or adversely affect environmentally sensitive resources (including but not limited to those listed in paragraph B.(4)) of Appendix B to Subpart D of 10 CFR 1021). Furthermore, there are no extraordinary circumstances related to this action that may affect the significance of the environmental effects of the action; this action is not "connected" to other actions with potentially significant impacts, is not related to other proposed actions with cumulatively significant impacts, and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211.

Based on my review of information conveyed to me and in my possession (or attached) concerning the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.



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ORO NEPA Compliance Officer

James L. Elmore

Date Determined:

9/17/2010