



Horizon 2020  
European Union Funding  
for Research & Innovation

# SUPERCONDUCTING DIRECT DRIVE TECHNOLOGY FOR NEXT GENERATION WIND TURBINES:

*A FRESH BREEZE IN RENEWABLES*

**Bonn, May 8, 2015** – ECO 5, the engineering consultant for efficient power applications, announced today a 2.3 m€ contract under which it will contribute to the design and engineering of world's first superconductive generator for a commercial scale wind turbine. This so-called EcoSwing generator is intended to retrofit an existing permanent magnet generator in one of the most modern on-shore +3 MW wind turbines, owned and operated by Envision Energy.

Carsten Bührer, Managing Director of ECO 5, explained on the background "This project is a logical extension of development work performed for Envision since 2011. Since the wind power market is calling for the next step in light-weight and competitive generators, we are working on a truly exciting subject. Our particular goal is to make superconductive generators the lowest cost drive trains on the market."

The EcoSwing generator is the first full size direct drive superconductive generator for a wind turbine and promises a step change in generator development. Most direct advantage of the EcoSwing generator is a foreseen weight saving of more than 40% compared to conventional direct drive generators. For the entire nacelle this results in 25% less weight, and of course proportionally less material usage. A particularly welcomed side effect is that the EcoSwing technology uses close to no rare-earth—a commodity of scarce supply and price fluctuations.

Anders Rebsdorf, CEO of Envision's Global Innovation Centre, commented "After years of research, superconductivity has finally matured to a level where it can be considered for test and demonstration on a full-sized wind turbine. The EcoSwing DD generator will be one of the most ambitious superconductive systems in terms of torque density, and we are proud to spearhead this important milestone project."

*The EU-funded EcoSwing project aims at demonstrating world's first superconducting low-cost and lightweight wind turbine drive-train—demonstrated on a large-scale wind turbine.*

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The consortium composed of members from industry and science thus anticipates that EcoSwing drive-train will result in a competitive solution compared to direct drive or geared solution.

Carsten Bührer added on the ECO 5 plans “We will use our extensive experience in industrially applied superconductivity to realize EcoSwing. This work will cover CAD design and engineering, along with 3D finite element analysis for integrated electromagnetic, mechanical, and thermal designs. We will use own software for the cryogenic and vacuum system design, and we will contribute to the materials testing and qualification.”

EcoSwing obviously addresses multidisciplinary aspects of Research and Development and will advance industrial superconductivity, cryogenics, and power conversion. To address technology implementation, the consortium will carry-out risk studies and assess regulatory aspects. After thorough ground-based testing in a certified laboratory the EcoSwing generator is planned to operate for over one year on a large scale modern wind turbine in Denmark with also scheduled maintenance to be demonstrated.

*“EcoSwing has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 656024.” “Herein we reflect only the author’s view. The Commission is not responsible for any use that may be made of the information it contains.”*

#### **About the EcoSwing Project Organization**

The total budget for the project is 13.8 m€, with 10.5 m€ contributed under the EU’s Horizon 2020 Programme. Envision Energy (Denmark) Aps will coordinate the project and provide the test site. ECO 5 GmbH as an established engineering house in superconductivity will provide the core design. Jeumont Electric SAS will utilize its experience in all types of rotary machines to manufacture the stator. Delta Energy Systems GmbH will take care of a high quality power converter and provision of communication and protection electronics. Thewa Dünnsschicht GmbH as one of the world leading players in superconductivity will deliver the superconductive wire and will manufacture further into coils. Sumitomo Cryogenics of Europe, Ltd will supply the cryogenic equipment. Germanischer Lloyd Industrial Services GmbH is entrusted with pre-certification issues. Universiteit Twente will assemble the superconductive rotor. Finally, the Fraunhofer Institute for Wind Energy and Energy System Technology (IWES) will run a ground-based test prior to installation on an Envision wind turbine.



### About Superconductivity

Superconductors are capable of conducting electricity without resistance. They are thus highly complementary to energy efficient technologies as a substitute to copper. In comparison to copper they can carry 100x times the current density, making electrical machinery compact and lightweight. Vastly reduced material usage contributes to making this technology highly competitive to conventional machinery.

### About ECO 5

The ECO 5 team provides engineering services in development and simulation of high-efficiency electric power systems and facilities. We focus on generators for wind, hydro and wave power plants. Beyond rotating machines, we offer core competencies in inductive metal heating and energy-efficient fault current limiters for high-voltage power grids. Our engineers provide specialised expertise in industrial applications of superconductors as well as copper and permanent magnet-based solutions.

We support customer projects from analytical and material technological development to comprehensive electromagnetic, mechanical and thermodynamical 3-D simulation to CAD-based mechanical design and prototype construction. In addition to this we provide expert knowledge in cryo technology, system safety and intellectual property situation analysis.

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