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Wind Turbine Development

Press Release

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The Increasingly Competitive U.S. Wind Industry

The U.S. Department of Energy (DOE) has announced a new partnership with Zond Systems, Inc., of Tehachapi, California. The partnership is the first to be announced under DOE's new Value-Engineered Turbine (VET) project. The VET project is expected to lower the cost of manufacturing wind turbines and give the U.S. wind industry a competitive boost.

DOE's Value-Engineered Turbine Project

The subcontract with Zond is the first of three that DOE will issue under the VET project, which is designed to help the U.S. wind industry meet the near-term, world-wide demand for reliable, cost-effective wind turbines. DOE is currently negotiating with two other companies to develop two other turbines.

U.S. wind energy companies like Zond have substantial experience with current wind technology. For example, Zond operates more than 2500 wind turbines with a combined rated capacity of 260 MW. Under the VET project, participating companies will work to improve existing technology and bring down the cost of manufacturing conventional turbines.

The VET partnership will use the principals of value engineering to develop new wind turbines. The philosophy of value engineering is to remove unnecessary costs from the design of the turbine while ensuring that its quality, performance, and reliability are maintained. Thus, the turbine designers working on the VET project will pursue low-risk, incremental improvements to the design.

The participating companies will design new turbines similar to those they are already familiar with, and which have a proven operating record in the field. They are confident these new turbines can be quickly developed through this design process. Zond, for example, is already testing the prototype of its new 500-kW turbine, the Z-40.

Zond Systems, Inc.'s Z-40 Wind Turbine

DOE's agreement with Zond consists of a \$2.8-million subcontract that is shared between the two partners. DOE is contributing \$1 million of the total, and Zond is contributing the rest. Under this agreement, Zond already the second largest producer of wind-generated electricity in the world, will develop, manufacture, and test the Z-40 prototype, and report the results. When testing is complete, Zond will release the Z-40 for commercial production. Zond plans to begin building its first wind power plant consisting of Z-40 turbines by the end of 1994.

The VET subcontract gives Zond access to engineering expertise at DOE's National Renewable Energy Laboratory (NREL) in Golden, Colorado. NREL will provide technical review and will conduct blade strength, fatigue, and modal testing at its facility located at Rocky Flats.

Zond Systems Z-40 Wind Turbine

Zond's New Z-40 Wind Turbine— High Performance, Reliable, Cost Effective

Zond has utilized extensive experience gained in manufacturing wind turbine components and through the operation and maintenance of their wind power plants to develop a 500 kW wind turbine, the Z-40. The Z-40 configuration is based on the most successful and widely utilized wind turbine configuration; horizontal axis, 3-blades, upwind rotor. In developing the Z-40, Zond has taken this proven configuration and incorporated incremental design enhancements to increase cost effectiveness and improve reliability of the turbine.

Zond's Z-40 wind turbine has a larger rated capacity than any U.S. manufactured turbine. This larger size is attractive to many utilities; a multi-megawatt power plant will consist of fewer turbines to site, install and maintain.

Zond employed several innovative technical elements in the design of the new Z-40. For example, the Z-40 is equipped with new blades developed from NREL's advanced airfoils. One of the important characteristics of the rotor airfoils is that they are resistant to the detrimental effects on turbine performance of surface roughness degradation. This results in a reduced level of maintenance required in washing the blades to maintain optimum performance. Zond's innovative rotor design utilizes both passive and active aerodynamic control for optimization of power and torque, as well as for providing a reliable and effective overspeed control in high winds.

The Z-40 design also includes an integrated drive train that combines the gearbox, main shaft and yaw system—minimizing the number of turbine parts as well as reducing installation and maintenance costs. The integrated drive train was developed specifically for the Z-40 and is optimized for wind turbine applications. The high mechanical efficiency of the gearbox is reflected by low levels of noise emission, vibration and temperature rise during operation. The integrated drive train is designed to transmit all static and dynamic loads directly to the tower. It provides structural support for the generator, the hydraulic system and the entire nacelle. All elements of the drive train are designed to minimize wear, resist fatigue and provide reduced maintenance requirements. Zond has incorporated many user friendly attributes into the design of the Z-40 as a result of focus group meetings conducted to obtain input from Operations and Maintenance personnel.

Z-40 Design Philosophy:

- Performance
- Reliability
- Ease of Installation
- Serviceability
- Cost Effective

The Z-40 will utilize an advanced version of Zond's Winteligence multi-microprocessor controller. Zond's controllers are modular, reliable and easy to service.

The Z-40 is available on 30m, 40m, or 50m towers to allow for optimization of the turbine's performance to the wind characteristics of each specific site. Both tubular and lattice towers are available. Each tower has its own advantages; the lattice tower is the most economical, while the tubular tower offers protection to maintenance workers servicing the turbine in adverse weather conditions. Both tower configura-

tions together with the turbine have been designed to withstand loads associated with winds up to 150 mph. The Z-40 was designed to International Electrotechnical Commission (IEC) Code Class I standards, the most severe wind condition class.

The Z-40 turbine is an integral part of Zond's future wind projects. Zond is currently developing hundreds of megawatts of Z-40 based projects throughout North and South America, Europe, and Asia. It is anticipated that the first wind power plant comprised of Z-40 turbines will be operational by the end of 1994.

Company Profile

Since its formation in 1980, Zond Systems has been a pioneer and leading developer in the wind power industry. Zond's Victory Garden Power Station, located on the ridgelines bordering the Mojave Desert, was the first commercial wind facility to deliver power to Southern California Edison Company. Zond has constructed and currently operates over 2,500 wind turbine generators in the three major wind areas of California, and Hawaii, comprising over 260 megawatts of capacity. In 1993, turbines operated by Zond generated nearly 600 million kilowatt hours of electricity, sufficient to supply the residential needs of 300,000 people, making Zond the second largest producer of wind generated electricity in the world. Its wind facilities routinely operate with an average of 97% availability.

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