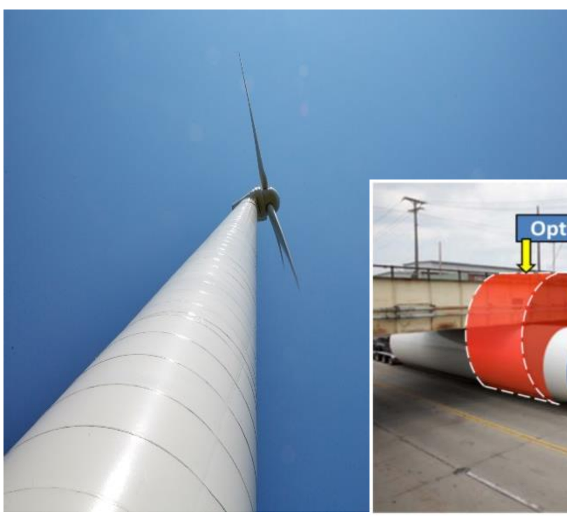
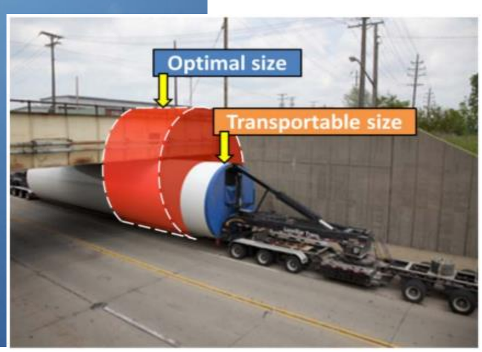
Tall Wind Demonstration

Georgia Power Company ("Georgia Power" or the "Company") continues to evaluate wind resources where they may prove economical for customers. Wind energy is a renewable resource that is complementary to solar due to its availability overnight and during winter mornings. The current wind potential for standard 80-meter hub height wind turbines in Georgia is uneconomical. However, as referenced in the 2016 IRP, the U.S. Department of Energy ("DOE") and the National Renewable Energy Laboratory ("NREL") developed several studies supporting the utilization of taller wind turbines with larger rotors to achieve a capacity factor greater than 30% in the Southeast. To further study the potential for higher hub height wind resources in Georgia and validate the site-specific locations identified by NREL as "High Wind Potential," the Commission authorized Georgia Power to commence a High Wind demonstration project in the 2016 IRP. The results of this study validated the model-based wind maps presented by NREL and concluded that this data could be leveraged to potentially develop economical wind resources in Georgia at hub heights of 120 meters or greater.





Recent advancements in turbine and tower technology have allowed for increases in both turbine rotor diameter and hub height. These increases lead to an overall larger capacity factor and energy capacity per turbine, which increases the cost effectiveness of these generators. The primary constraint related to constructing wind turbines at heights of 120 meters or greater is the transportation of the tower from the manufacturing facility to the site. The Company has continued to research and evaluate potential technologies for tall wind tower construction and has identified a potential solution to help overcome these transportation limits.

Georgia Power proposes a demonstration project to develop two wind turbines, up to four MW each, with a hub height between 140 – 165 meters. The proposed towers will utilize an innovative spiral weld technology that employs on-site fabrication techniques. This project is designed to demonstrate the economic and technical feasibility of tall wind in Georgia as well as validating the in-field construction techniques required for the spiral weld technology at higher hub heights. The Company plans to team with the spiral weld technology company to leverage DOE funding awarded to the technology vendor for the further development and demonstration of this innovative spiral weld tower technology. Additional background materials and technical details are provided in the following sections.

Technology Background

In-Field Tower Fabrication with Automated Spiral Welding

Taller wind turbines can capture significantly more energy because they are able to access the stronger, steadier winds available at higher heights. If these heights could be reached with a low-cost tower technology, it would significantly expand wind deployment, bringing low-cost wind energy into all regions of the U.S., including historically low wind-speed regions such as the Southeast. However, traditional tower designs cannot cost-effectively scale up to the required heights due to size constraints associated with road and rail transportation. A 2015 DOE report identified this as one of the most critical bottlenecks affecting the wind industry.[1] Keystone Tower Systems ("KTS") has overcome this issue with an innovative manufacturing technique that enables on-site production of large diameter, welded tubular steel wind turbine towers. On-site production enables towers to surpass the 4.3-meter diameter transportation limit, allowing turbine hub heights up to 165m to be more cost effective.

KTS has adapted spiral welding – a highly automated, proven process for in-factory and in-field production of cylindrical pipe and pilings – to accommodate the tapered diameter, variable wall thickness, and high manufacturing quality required for wind turbine towers. Spiral welding combines all the production steps for making large diameter steel tubes into one process, greatly reducing the labor, footprint and time required to produce steel shells. A single machine completes the joining, rolling, fit-up, welding and severing of a tower section resulting in continuous production of steel tower shells. This results in a high through-put, compact system that can be operated in the field with the potential to construct and install "tall" towers at a cost 35-40% less than conventional techniques. The cost savings are achieved through lower labor costs due to

[1] Enabling Wind Power Nationwide, U.S. Department of Energy (May 2015) *available at* https://www.energy.gov/sites/prod/files/2015/05/f22/Enabling-Wind-Power-Nationwide_18MAY2015_FINAL.pdf.

increased automation, higher quality and less rework from improved fit-up, ability to use lower priced coiled steel, material savings due to thinner walls enabled by larger diameters, and transportation cost savings. A schematic of the in-field fabrication process is provided below.

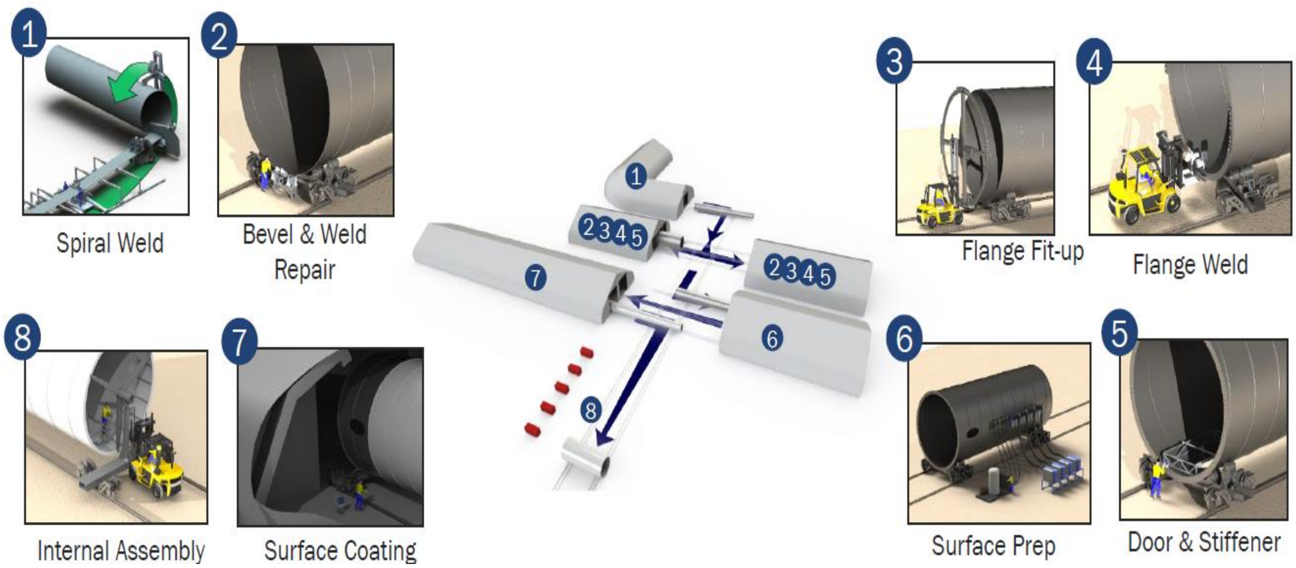


Figure 1 In-Field Tower Fabrication with Spiral Weld

Tower-Mounted Erection System

Today, high-capacity cranes exist that can install wind towers and turbines as high as 165m in hub height. However, these specialty cranes can be very costly, and constructing even taller wind turbines will require new technology. The Company proposes to use a new tower-mounted erection technology, which is currently under development by Liftra ApS, for tower and turbine installation.

Liftra is an international provider of specialty lifting, transport, and logistics solutions for the wind industry. They currently design, manufacture, sell, and operate numerous systems for wind component transportation and installation, including a series of self-hoisting cranes that enable replacement of major components (e.g. gearboxes, generators, etc.) without the need for conventional cranes. Liftra is currently developing a tower mounted solution for erecting tall turbines. In the first part of the proposed project, the Company will work with Liftra to ensure compatibility between Liftra's system and KTS's towers. This will include agreeing on the location and capacity of attachment points, ensuring that the tower is designed to handle erection-related loading cases, and agreeing on lifting limits, such as the maximum tower section length and weight. In the second part of the project, Liftra will install the turbines and upper tower sections at the demonstration project using its innovative technology.

Figure 2 Liftra's Innovative Erection System

Figure 2 shows a conceptual design for Liftra's erection system. As the figure shows, the system comprises a small crane that uses the erected tower sections as a support. At least one base section is first erected using a standard crane. In the case of KTS' on-site towers, the lower two sections will be installed, as shown in Figure 2. Then, the erection system is mounted to the flange of the lowest section. From this position, the crane then climbs to the top flange of the next tower section to begin installing the next section. As shown, the crane unit first raises a hoist block and attaches it to the top of the tower section it is about to climb; it then hoists itself up, and re-attaches to the topmost flange. Once attached, it acts essentially as a standard crane to lift the next tower section into place. When that section is secured, the crane unit continues to climb. After all tower sections have been installed, the same system is used to lift and install the turbine nacelle and blades. Upper tower sections are limited to 70 tons to minimize the required capacity of the tower mounted crane, while base sections can be up to 120 tons. This tower-mounted erection system is substantially smaller and lower cost than an equivalent free-standing crane, able to fit onto three flatbed trucks for shipping, compared with greater than 50 truckloads to mobilize a large crawler crane. A single specialty vehicle can be used to transport it between pads at the project site. This enables not only lower cost shipping to the site, but faster and lower cost movement between turbines at a given wind farm. In addition, this system scales to any height because it is mounted on the tower itself, it is not limited by the need for a massive, free-standing support structure

Technical Scope and Estimated Timeline

The total project performance period has been estimated at 36 months with expected operation commencing in 2025. Work will be divided, with a go/no-go decision to construction after the first 18 months. The overall project is divided into two periods: (1) Planning phase and (2) Construction phase. In the first period, the project team will perform all the work necessary to prepare the proposed demonstration project for construction and to prove that its construction should be move forward. The Planning Phase includes the following work:

- Develop front-end engineering design ("FEED"), land, interconnection, wildlife studies, and all applicable permits for the project.
- Receive firm construction bids and firm pricing for the wind turbines.
- Work with the original equipment manufacturer ("OEM") to create a complete design for an on-site spiral welded tower, including shell geometry, flange and door details, internals, and coating specifications.
- Update of KTS' DNVGL[2] Design Basis Certification and obtain OEM Turbine Specific Tower Certification.
- Create full plans, including models for custom parts, component specifications, operational procedures, deployment/tear down plans, cost estimates and labor requirements for an on-site tower spiral welding facility.
- Test on-site manufacturing equipment prior to shipping to project site.

At the close of the first phase, the project team will present the project evaluation and accompanying materials to the Georgia Public Service Commission ("PSC") to secure final project construction approval.

[2] Det Norske Veritas ("DNV") Germanischer Lloyd ("GL")

Once construction is approved, the project will move on to the Construction Phase. In the second project period, construction activities will include the following:

- Prepare site and foundation for installation
- Deploy on-site tower production facilities and production of tall towers
- Install Turbine
- Connect to grid and start of power production

Expected Project Outcomes

The expected outcome of the project is to prove the technical and economic viability of spiral towers that can efficiently scale to any height. This will be accomplished through the design, certification, manufacture, and installation of two towers that are approximately twice the height of the average tower currently installed in the US. In addition, the Company will demonstrate all other aspects of project development and construction needed to fully utilize this technology, including large diameter foundations, tower mounted crane erection, and high hub-height project permitting in a representative site in Georgia.

The project will also show the performance capabilities of low-specific power turbines on tall towers can deliver capacity factors equivalent or exceeding the average of the current turbine fleet, which are typically installed outside of Georgia. Demonstrating this performance is an important step in showing that advances in wind technology enable it to be a significant contributor to future power generation in Georgia. This demonstration aims to provide the technical and economic proof that the wind industry needs to unlock broad adoption in commercial projects for the Southeast.

Project Cost

The projected costs for this project are estimated between $12-20 million with the potential to leverage $5 million in funding that KTS has been awarded from the DOE. Additional leverage and support from turbine and other vendors will be explored, as appropriate.