Loftsome Bridge WTW
Wind Energy Scheme

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Like most other water companies Yorkshire Waters energy costs have increased significantly over the past few years increasing Yorkshire Water operating costs and providing an ongoing challenge to manage these costs and their impact on the region. Renewable energy generation provides an attractive approach to both reducing financial costs and reducing carbon emissions. The £4 million Loftsome Bridge Wind Energy Scheme provides base load power to the treatment facilities while during periods of high wind and low site demand has the capability to export excess energy to the grid.

Loftsome Bridge WTW *Photo courtesy of Peter Smith Photography*

Yorkshire Water is the regions biggest private investor in the environment, but ironically also one of the region's biggest consumers of electricity.

Yorkshire Water believe that selectively investing in alternative, sustainable sources of energy is a responsible proposition given the context of fluctuating energy prices, un-certainty over long-term security of supply and the requirement for companies to reduce carbon emissions. The Loftsome Bridge wind turbines are part of a carefully considered programme of investment in renewable energy which will help Yorkshire Water to achieve their target to generate 10% of their energy from renewable energy sources by 2010.

A detailed feasibility study carried out by Technical Consultant Arup looked at a number of options for turbine type, size, location, generating potential and procurement and determined that the best possible solution for the site was to provide the following;

- Two Nordex 1.3MW turbine units
- 90m in height
- Located at two opposite corners of the existing impounding reservoir
- Generating up to 4.9GWh per annum

Framework contractors Laing O'Rourke were appointed for the design and construction of the Wind Turbine scheme whilst Arup continued to provide Consultancy and Project Management services.

The erection of the wind turbines is the culmination of a four year investment from Yorkshire Water at the site. The process started with the completion of a screening study in 2004 followed by feasibility studies, site investigations, consultations, environmental studies, a planning submission and culminating in the constructions works.

The Scheme

Each of the two turbines is a 1.3MW N60 turbine supplied by Nordex with a hub height of 60m and 30m blade length. Each turbine generates power at 690V which is stepped up to 11kV via a transformer located adjacent to the turbine bases. The turbines connect

directly into the sites existing 11kV ring main via two new ring main units. This approach allows the most efficient use of the renewable energy as transmissions losses are greatly reduced when the generated energy is utilised at source. In addition, the installation also includes the facility to export any surplus energy directly to the grid.

The component parts of the turbines were delivered to site in several 30 metre sections and once on site a three-day erection process was completed with the help of a 500 tonne crane and a 200 tonne crane.

The annual generation from the turbines is 4.9GWh which equates to around 35% of the annual on site power requirement. By using the electricity generated by the turbines at this site, Yorkshire Water will be reducing its carbon emissions by around 2,100 tonnes every year.

Technical Challenges and Solutions

During the design of the Loftsome Bridge installation the team faced a number of technical and non technical challenges. Due to the collaborative efforts of the entire team these were successfully addressed and the project continued.

Loftsome Bridge is a highly congested site and there was little room to install two wind turbines within the existing known site services. In addition to Yorkshire Waters intrinsic services, National Grid power lines also run along the rear of the site further limiting the available space for a turbine installation. Via a detailed records investigation two locations were selected for the proposed turbines and subsequently planning permission was granted on these two locations by Selby District Council.

The Wind Turbine market is limited for single/twin turbine applications with many manufacturers preferring to tender for larger projects employing several wind turbines. With the collaborative ethos the team adopted from the outset they built a relationship with Nordex, the turbine manufacturer, during the feasibility period and maintained this throughout the scheme until planning was granted. Due to this relationship, Nordex were happy to supply Yorkshire Water with two wind turbines for the Loftsome Bridge site.

The proposed development was also within the consultation zone for a military airbase. Initial contact with the Defence Estates revealed that the MoD proposed to object to a development at this site. Along with a MoD specialist, the project team held a series of discussions with Defence Estates and provided technical assurance that a development at this site with a maximum tip height of 90m would not cause a significant problem on the base's radar system. Subsequently the MoD objection was withdrawn.

Prior to construction a radar site investigation also revealed that two raw water mains running alongside an existing reservoir and in close proximity to the proposed turbine location were not in the location identified by the As-Built drawings. In order to overcome this, the team revised the foundation design to produce a smaller footprint that could withstand the turbine loads without damaging both the reservoir foundations and the raw water mains.

The site is supplied by a section of Distribution Network Operator (DNO) overhead line with other customers supplied from this main feeder to the site. Due to the configuration and natural loading of the network the DNO were hesitant to provide Yorkshire Water with a generation connection agreement. The project team met several times with the DNO to develop a solution that would allow the connection of 2.6MW of generation to their network. An inter-tripping scheme was ultimately approved and installed to provide security and protection of the DNO network. Should a fault occur on the DNO's network a signal would be sent to the site to trip the wind turbines electrical breaker. As a result a full connection agreement with export provisions was granted to Yorkshire Water.

Innovation

The powering on of the new turbines represents the completion of the first embedded wind turbine on any water or waste water treatment works within the UK. The wind turbines are fully integrated into the existing site PLC and SCADA systems via fiber optic links. Via a linked real time Power and Chemical scheme Yorkshire Water are now able to determine the cost of the treated water per ML at the site.

Local Community Interaction and Visitors Centre

Throughout the scheme Yorkshire Water actively engaged with the local community and ran a competition to name the two new wind turbines at Loftsome Bridge. Year Five pupils from Howden Junior School competed to name the turbines at the site with the public voting for their favorite name.

Following the announcement of the winning names of “Turby” and “Windy Miller” pupils also put their artistic skills to use by designing a sign which was recreated and placed at Loftsome Bridge when the wind turbines were officially opened with the help of then Minister for the Environment the Rt. Hon. Phil Woolas MP. Local stakeholders and customers were invited to the opening and the event was attended by over 100 people providing a successful end to a successful and unique project.

The key project participants on the project were Yorkshire Water Services (the client), Laing O'Rourke (principle contractor/designers), Arup (technical consultant) and Turner & Townsend (commercial consultant).

Note: ***The editor & Publishers thank Mike Ward, Special Projects Manager with Yorkshire Water Services Limited, Steve Saunders, NEC Project Manager with Arup and Russell Carr, Project Engineer with Arup for providing the above article.***■

“Windy Miller” ***Photo courtesy of Arup***