Investigation Report for the Collapse of a Nordex Wind Turbine at Screggagh Wind Farm

Case reference: IV201501-0015

Date and time of incident: 2nd January 2015 at approximately 8.55 pm

Site / incident address: Screggagh Wind Farm
Ecclesville Road
Fintona
County Tyrone
Northern Ireland

Equipment involved: Nordex N80 R60 TaT Beta IEC 1a Wind Turbine
Serial No. 81512

Investigating Inspector(s): Kevin Neeson and John Wright

Date of Report: August 2015

Author: Kevin Neeson

Executive Summary

This report details the findings and conclusions of the investigation into the collapse of a Nordex N80 R60 TaT Beta IEC 1a Wind Turbine. On 2nd January 2015, WTG3 (Wind Turbine Generator Number 3) at Screggagh Wind Farm, County Tyrone, went into an over-speed condition.

[redacted]

As part of the investigation, HSENI carried out a number of site visits and held discussions with the manufacturer of the wind turbine and the owner of Screggagh Wind Farm. The root cause of the failure of the turbine was identified.

[redacted]

Additional safety measures have been put in place to prevent a reoccurrence of the incident. [redacted]

Introduction

On 3rd January 2015 at approximately 4.50pm, HSENI's Out of Hours (OOH) Service received a telephone call from a member of the public [redacted] reporting a wind turbine collapse near Ecclesville Road, Fintona, County Tyrone. The member of the public also alleged that there was debris from the stricken turbine strewn across a public road.

The OOH Inspector, [redacted], spoke with [redacted] and confirmed that the incident had occurred at Screggagh Wind Farm. [redacted] then ascertained contact details for the site owner and wind turbine manufacturer. He spoke with [redacted] of DW Consultancy Ltd, a parent company of Screggagh Wind Farm Ltd (the wind farm operator) via telephone. He also spoke with [redacted] Head of Quality and HSE, from Nordex (the wind turbine manufacturer), via telephone.

They confirmed that the wind turbine had collapsed on 2/1/2015 and that there were no injuries to employees or members of the public. They also stated that the debris had been limited to the confines of the wind farm site and that steps had been taken to secure the incident scene with fencing erected and security staff on duty. The other remaining wind turbines at the site had been shut down as a precautionary measure.

[redacted] He stated that the incident site had been secured with fencing and that there was 24 hour security on duty. He also submitted an NI2508 form to HSENI online with the following description of the incident:

[redacted]

[redacted]

Background

Screggagh Wind Farm is operated by Screggagh Wind Farm Ltd. The parent company of Screggagh Wind Farm Ltd is DW Consultancy Ltd. The wind farm consists of 8 x Nordex N80 R60 TaT Beta IEC 1a wind turbines and was commissioned in 2011. This particular wind turbine has a rotor diameter of 80 metres and a hub height of 60 metres with a nominal power of 2.5 Megawatts.

[redacted]

Wind turbines harness the wind's energy to create electricity. The wind turns the blades and as they rotate they are used to drive the turbine of the generator, which creates an electrical current. The lifespan of a wind turbine is typically 20 years. The turbine involved in the incident had been in operation for almost 4 years. Each wind turbine has 3 blades. Each blade has a pitch converter which forms part of the wind turbine pitch control system for controlling the pitch of the blades and hence the speed of rotation.

Wind turbine pitch control systems can change incidence of rotor blades in a wind power generation system based on real-time wind speed for the purpose of adjusting output power, achieving higher utilization efficiency of wind power and providing protection for rotor blades. When wind speed is not higher than the rated speed, the blade incidence stay near the angle 0°

(highest power point), which is similar to that of a generator with constant pitch, generating an output power that changes along with wind speed. When wind speed is higher than the rated speed, the pitch control mechanism changes blade incidence so that the output power of generator is within the allowed range.

[redacted]

[redacted]

[redacted]

However, attempts to bring the wind turbine under control ultimately failed. This eventually led to one of the blades of the turbine fracturing, which in turn led to WTG 3 collapsing due to a massive imbalance. The approximate wind speed at the time of incident was 9 to 10 m/s, moderate and well within the wind turbines' operating capabilities. There are 3 landowners on the wind farm site.

Observations

On 8/1/2015, I visited Screggagh Wind farm with my HSENI colleague, Mr. John Wright and met with the following persons:

[redacted]

A security firm, LAS Security Ltd, had been engaged to secure the site. Upon our arrival there were 3 security guards on duty, one at the entrance gate to the wind farm, one patrolling the public road (Ecclesville Road) and one at the collapsed wind turbine. A fence had been erected around the collapsed wind turbine. It was confirmed that this had been erected by 4pm on 3/1/2015. The incident had invited a lot of interest from the general public and the media. Hence they decided to erect a fence to protect members of the public, etc. from any potential health and safety risks posed from the collapsed wind turbine and prevent access.

[redacted]

[redacted]

[redacted]

It was confirmed that personnel did not approach the turbine whilst it was in an over-speed condition and that landowners had been notified to warn them of the situation. Following the collapse of WTG 3, it was electrically isolated and the Northern Ireland Fire & Rescue Service (NIFRS) attended the scene in case of a fire on the night of the incident. It was established that there was no fire risk and hence they left the scene. The Northern Ireland Environment

Agency (NIEA) was also notified in case of pollution arising from fluids within the wind turbine.

None of the other wind turbines at the wind farm site were damaged in the incident. There is approximately 400 to 500 metres between each wind turbine (approx. 7.5 times the rotor diameter). Wind turbines are generally separated by at least 4 times the rotor diameter to minimise turbulence.

I took photographs of the collapsed turbine. At the time of visit, there was no evidence of debris on the public road (Ecclesville Road). The majority of the structure appeared to have collapsed and stayed near where it had stood. There was a section of blade approximately 267 metres from WTG 3 that had blown up towards the top of the mountainside (away from Ecclesville Road), approximately 10 to 12 ft long and weighing approximately 10 kg. [redacted]

[redacted]

Screggagh Wind Farm Ltd confirmed that the wind farm would not be restarted until they had conducted a thorough investigation to establish the cause of the incident and implement any remedial actions as determined by the investigation to ensure safe operation.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

The wind farm owner, Screggagh Wind Farm Ltd (DW Consultancy Ltd) contracted DNV GL to review the incident [redacted] DNV GL is an international certification body and classification society operating in more than 100 countries with main expertise in technical assurance, research, certification, and risk management to the maritime, oil and gas and energy industries.

[redacted] DNV GL reviewed the test results and were satisfied that all of the wind turbines passed all tests conducted. The wind turbines at Screggagh Wind Farm were restarted on 14th February 2015.

However whilst the investigation continued to analyse the mechanism by which the fault was introduced, based on the information obtained up to this point, HSENI was satisfied that [redacted] had taken reasonable steps to identify the cause of the failure and implement corrective actions to prevent a reoccurrence. There was no justification for HSENI to prohibit the remaining 7 wind turbines restarting.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]

HSENI also requested a copy of the latest DNV GL report from Screggagh Wind Farm (DW Consultancy Ltd) which reviewed the incident [redacted]

[redacted]

[redacted]

Conclusion

From the information obtained HSENI is satisfied that [redacted] has taken reasonable steps to identify the cause of the failure and implement corrective actions. [redacted]

[redacted]

Some comfort can be taken from the fact that of the 1600 turbines of this type in the field worldwide that have been in operation for upward of 10 years, this has been the only fault of this kind. 45 of these turbines operate in NI. Research published in 2013 by the Health and Safety Executive (HSE) in Great Britain, states that the risks of fatality from similar wind turbines are low, relative to other societal risk commonly experienced. It also confirms that the collapse of the tower and rotor system is also a very rare occurrence for modern wind turbines.

When the fault occurred at Screggagh wind farm, allowing it was not readily foreseen that the wind turbine would collapse, the technicians on the ground took the correct action by not approaching the wind turbine. Given the remoteness of the location, the risk of injury to any person when the wind turbine did collapse was extremely low.

Given the research already undertaken, the remote location of the turbines on Screggagh Wind Farm and that of other similar wind farms in Northern Ireland, HSENI still considers the risk to the public to remain low, relative to other societal risks commonly experienced.

[redacted]

[redacted]

[redacted]

Recommendations

The following recommendations are made with regard to the respective parties involved in this incident:

[redacted]

2. Screggagh Wind Farm Ltd to update their site emergency plan and document procedures for notifying landowners / relevant parties when safety issues at the wind farm could affect persons not in their employment. HSENI have already conducted a follow up visit to Screggagh Wind Farm in respect of this matter.

HSENI will continue with follow up work to ensure that the lessons learnt from this incident are applied within the wind industry to protect members of the public and employees in the event of a similar instance as well as ensuring that the ‘permanent’ solution is applied.