CMD 25-H2.32A

Date: 2025-05-28

Supplementary Information

Presentation from Paul Sedran

In the matter of the

Ontario Power Generation Inc.

Application to renew power reactor operating licence for the Darlington Nuclear Generating Station

Commission Public Hearing Part-2

June 24-26, 2025

Renseignements supplémentaires

Présentation de Paul Sedran

À l'égard d'

Ontario Power Generation Inc.

Demande concernant le renouvellement du permis d'exploitation d'un réacteur de puissance pour la centrale nucléaire de Darlington

Audience publique de la Commission Partie-2

24-26 juin 2025

Document ID: DAMZHJW66V33-166150894-1575

Review of Fuel Channel Integrity and Comparison of Severe Accidents in a Darlington Reactor and for a Net Zero Vestas V80 Wind Turbine for the Darlington Relicensing Application

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May 8th, 2025

Presentation Contents

1. Introduction – Components of the presentation
2. Review of Darlington Fuel Channel Integrity
3. Response to CMD-24-H23 on the relative safety of Wind Turbines and the Darlington Nuclear Generating Station (DNGS)
4. Conclusions

1. Introduction – Components of the Review

1. OPG's Application for Renewal of the Darlington Nuclear Generating Station Power Reactor Operating Licence was reviewed from the perspective of Fuel Channel Integrity
2. In response to CMD-24-H23 by K.C. Johnson, a brief and simplified comparative assessment of Darlington Reactor safety vs that for a particular Wind Turbine was performed.

2. Review of Darlington Fuel Channel Integrity

- Original DNGS Fuel Channel Design Life = 210 kEFPH, New FCs will operate to 235 kEFPH – Achievable since:

- Bruce B FC Operating Life has been extended to 300 kEFPH

- OPG OPEX and CANDU 6 inspections indicate greater resistance to degradation than current fitness-for-service assessments

- Metallurgical Improvements in New PT Material
  - Lower Impurity Content for improved fracture toughness
  - Grain Size Refinement for lower Deformation Rates

- Unforeseen problems will be detected through PIP and FC Health Monitoring

3. Comparative Safety Assessment

3.1 Consequences of the Worst-Case Accident for a Darlington Reactor (SBO with Operator Inaction Resulting in Radioactive Materials Release)

Probability of a Station Blackout = $1x10^{-7}$ events per year

Probability of Operator Inaction = 1 event in 117.6 reactor years of operation = 0.008 events per year

Probability of a Worst-Case Accident = $0.008 \times 1x10^{-7}$
= $8.50x10^{-10}$ events per year

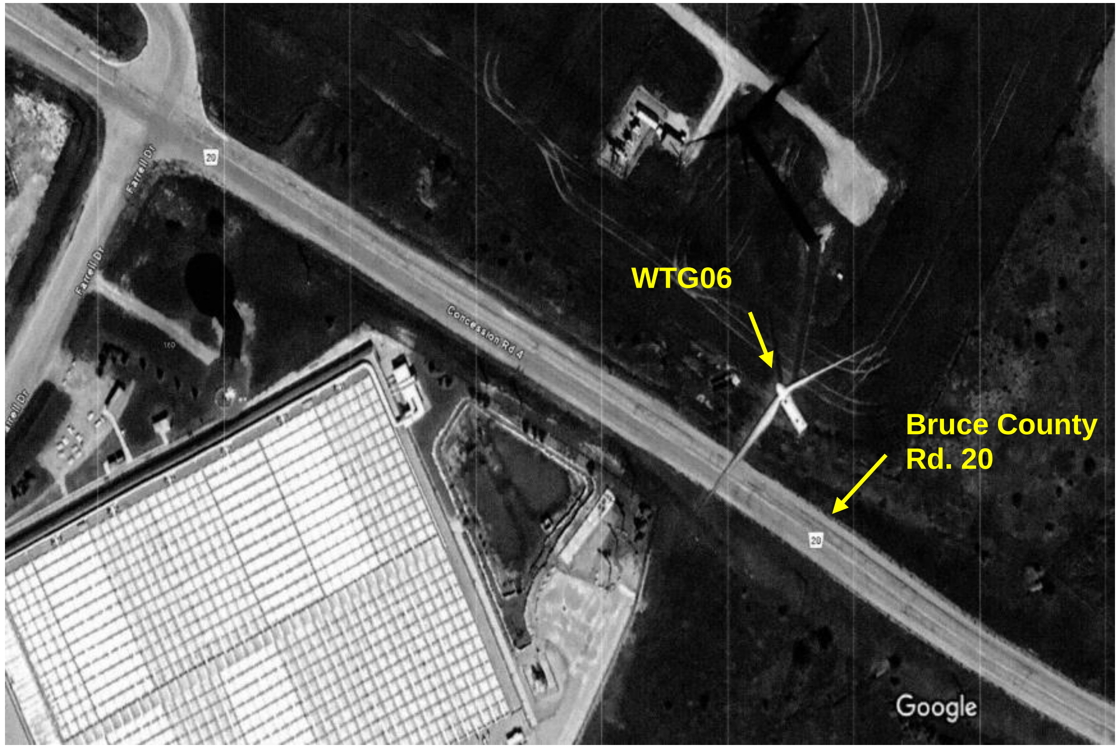
Impact on Health - 1.35×10^{-6} fatalities per year from childhood leukemia, within a 77 km radius of DNGS, assuming no evacuation

3. Comparative Safety Assessment

3.2 Consequences of the Worst-Case Accident for a Particular Wind Turbine

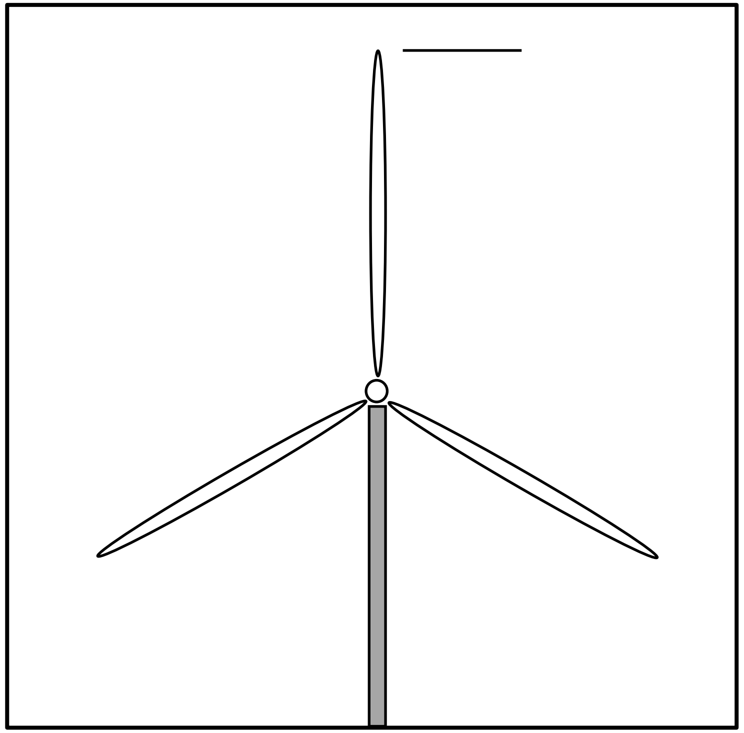
Subject Wind Turbine – Vestas V80 1.8 MW Wind Turbine, Unit WTG06 at the Bruce Net Zero Site, Tiverton ON

Worst-Case Accident – Blade Failure with a probability of 0.016 failures/y

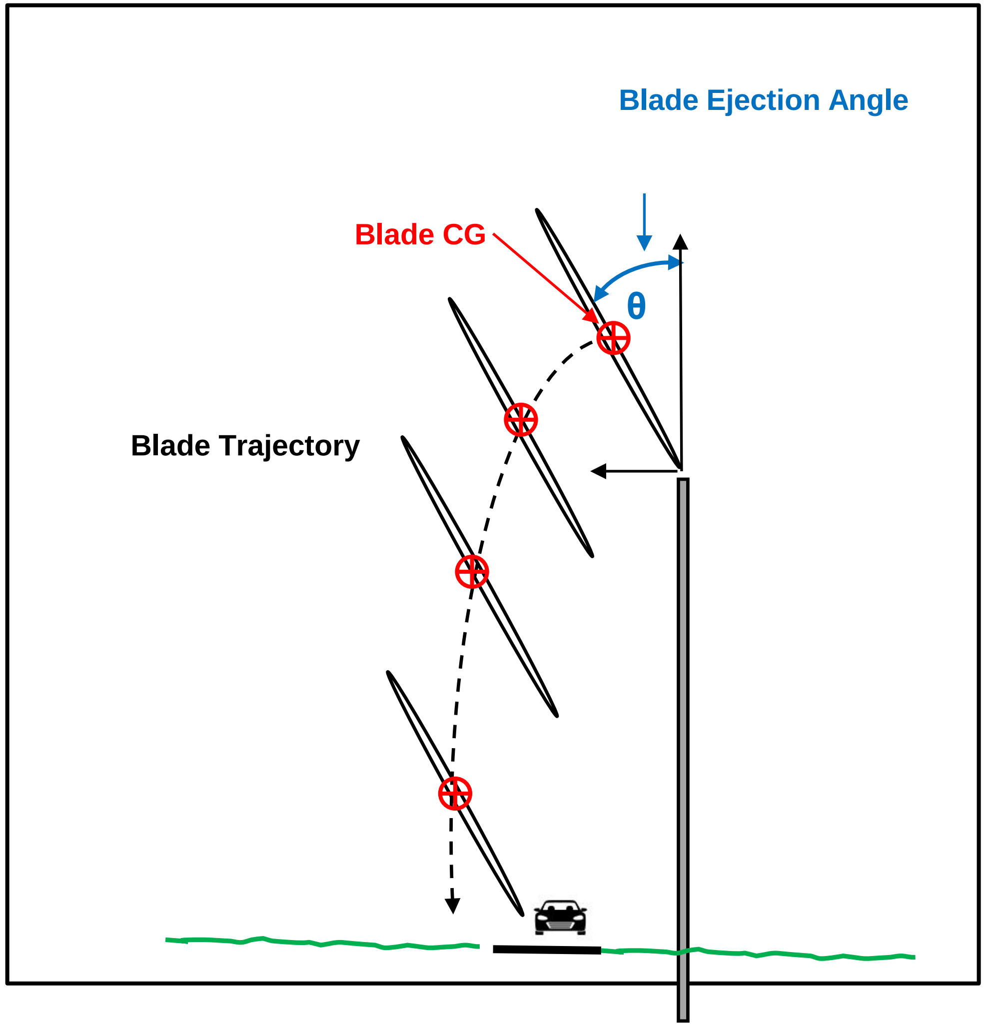


3.2 Consequences of the Worst-Case Accident for WTG06

Configuration of the Vestas V80 1.8 MW Wind Turbine

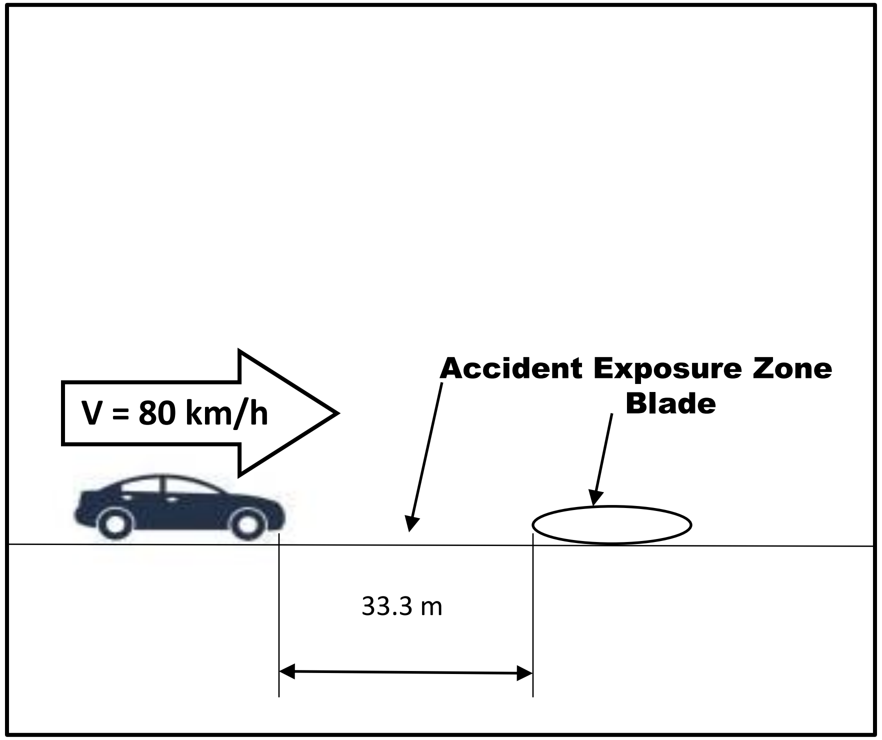


Blade Ejection for the Vestas V80 1.8 MW Wind Turbine

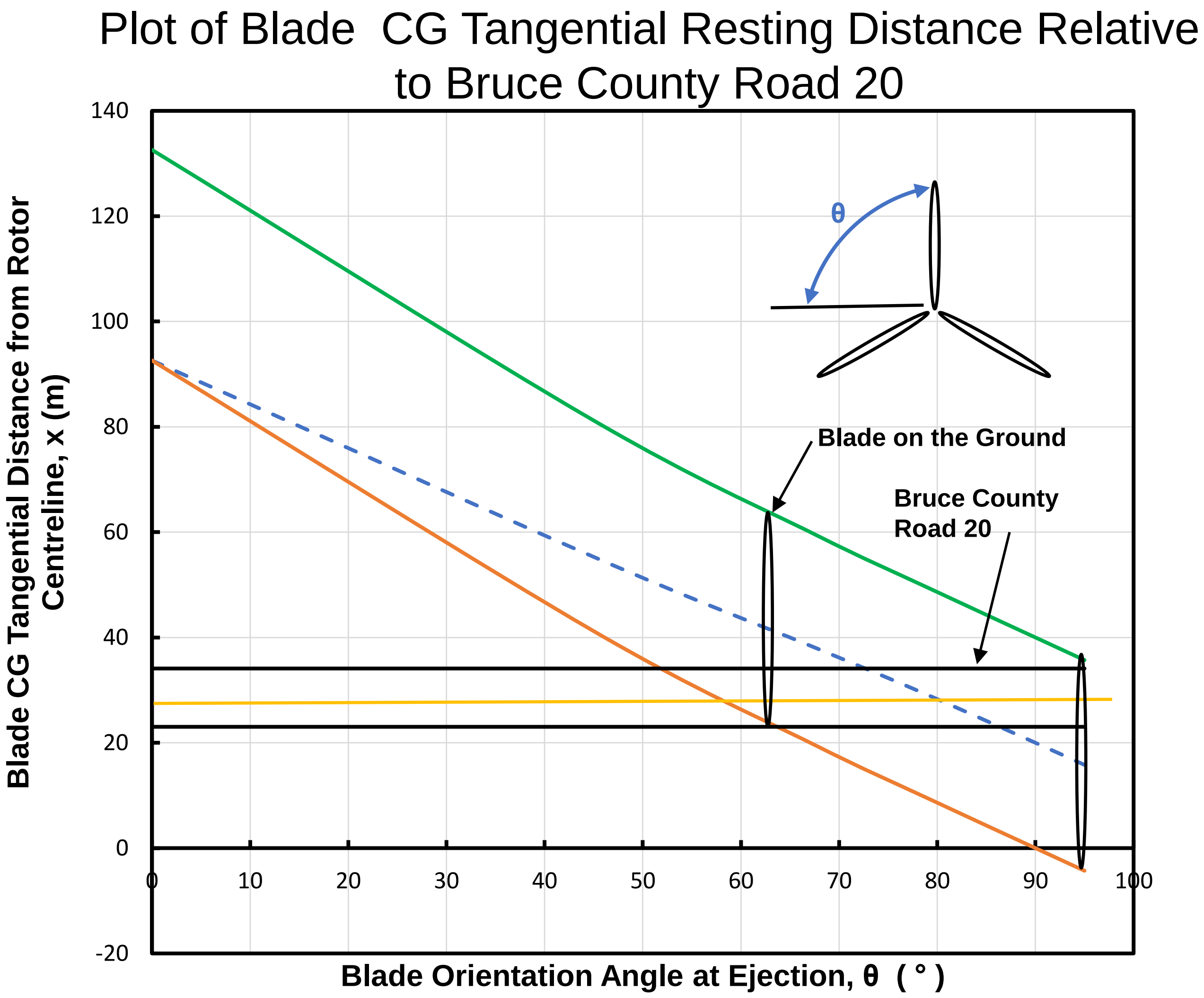


3.2 Consequences of the Worst-Case Accident for WTG06

Scenario for a Worst-Case Accident For WTG06



3.2 Consequences of the Worst-Case Accident for WTG06



3.2 Consequences of the Worst-Case Accident for WTG06

Probability of a Worst-Case Accident

$P_{WCA} = P_{Failure} \times P_{Angle} \times P_{Exposure}$

Where P_{WCA} - Probability of the Worst-Case Accident

$P_{Failure}$ - Probability of a Blade failure

P_{Angle} - Probability of the Blade being ejected at the angle required for it to land on the road

$P_{Exposure}$ - Probability of a vehicle driving towards the Wind Turbine, being exposed to a frontal collision with a Blade by being within 33.3 m of the Blade when it falls.

For $P_{Failure}$ = 0.016 events per year
P_{Angle} = 0.089 events per failure
$P_{Exposure}$ = 0.069 events per year,
P_{WCA} = 9.98 x 10^{-5} events per year – gives 9.98 x 10^{-5} fatalities per year

3. Conclusions

1. The probability of a Worst-Case Accident in one of the DNGS reactors is a small fraction (0.00001) of that for a Worst-Case Accident in WTG06, located adjacent to Bruce County Road 20.

2. The predicted consequences of the Worst-Case Accidents for a Darlington Reactor and for WTG06, expressed as fatalities per year, compare as follows:

   Darlington Reactor WCA – 1.35×10^{-6} fatalities per year

   WTG06 WCA – 9.98×10^{-5} fatalities per year.

3. Although the assessment is highly limited, it refutes the blanket statement the CANDU reactor is unsafe in comparison with Wind Turbines.

Acknowledgements
Thanks to the following OPG staff who met with the author and provided comments on the submission:

A. Bhardwaj, K. Carew. S. Lowe, D. Kakuzhyil, L. Hamilton.