



## **Mont Sainte-Marguerite**

**Impacts of Curtailment as an Operational  
Mitigation Measure to address Bat Mortalities**

# CANADIAN ASSETS

# 1.8 GW

## CANADIAN ASSET BASE

QC | ON | MB | BC

1.2 GW  
347 MW  
647 MW

OPERATIONAL  
IN CONSTRUCTION  
IN MATURE DEVELOPMENT



● Operating portfolio

○ Contracted pipeline

## WHAT WE KNOW

### **Feathering...**

blades below cut-in speed is effective

### **Increased...**

raised generator cut-in speeds work

### **Weather variables...**

contribute positively (rain, low temps, high winds, barometer, wind turbulence)

# OPERATIONAL BEST PRACTICES

# NORTH AMERICAN CURTAILMENT STUDIES

**Table 1. Results from publicly-available curtailment effectiveness studies.**

Study Name	Normal Cut-in Speed (m/s)	Treatment Cut-in Speed (m/s)	Mean Percent Reduction in Mortality	Mean Percent Reduction in Bat Mortality Per Cut-in Speed	Source
Fowler Ridge, IN 2011	3.5	4.5	57		Good et al. 2012
Anonymous Project (AN01), USFWS Region 3	3.5	4.5	47	51	Arnett et al. 2013
Wolfe Island, Lake Ontario	4.0	4.5	48		Stantec Ltd. 2011
Casselman, PA 2008	3.5	5.0	82		Arnett et al. 2010
Casselman, PA 2009	3.5	5.0	72		Arnett et al. 2010
Fowler Ridge, IN 2010 <sup>b</sup>	3.5	5.0	50	64	Good et al. 2011
Criterion, MD 2012 <sup>c</sup>	4.0	5.0	62		Young et al. 2013
Pinnacle, WV 2013	3.0	5.0	54		Hein et al. 2014
Bull Hill, ME 2013	3.0	5.0	33	33	Stantec 2014
Summerview, AB	3.5	5.5	60		Baerwald et al. 2009
Fowler Ridge, IN 2011	4.0	5.5	73		Good et al. 2012
Anonymous Project (AN01), USFWS Region 3	3.5	5.5	72	66	Arnett et al. 2013
Wolfe Island, Lake Ontario	4.0	5.5	60		Stantec Ltd. 2011
Sheffield, VT <sup>d</sup>	4.0	6.0	60	60	Arnett et al. 2013
Casselman, PA 2008	3.5	6.5	82		Arnett et al. 2010
Casselman, PA 2009	3.5	6.5	72	77	Arnett et al. 2010
Fowler Ridge, IN 2010 <sup>b</sup>	3.5	6.5	78		Good et al. 2011
Pinnacle, WV 2013	3.0	6.5	76		Hein et al. 2014
	3.5	6.9	73 <sup>e</sup>		
Beech Ridge, WV	3.5	6.9	73 <sup>f</sup>	89	Tidhar et al. 2013
	3.5	6.9	89 <sup>g</sup>		

<sup>b</sup> Study did not include feathering below cut-in speed.

<sup>c</sup> Percent reduction is based on comparison to the previous year's results from mortality monitoring, since there were no control turbines during the year the study was implemented.

<sup>d</sup> Raised cut-in speeds were applied only when temperatures were above 49° F (9.5° C).

<sup>e</sup> Percent reduction based on comparison to the Eastern North America regional average of bat mortality.

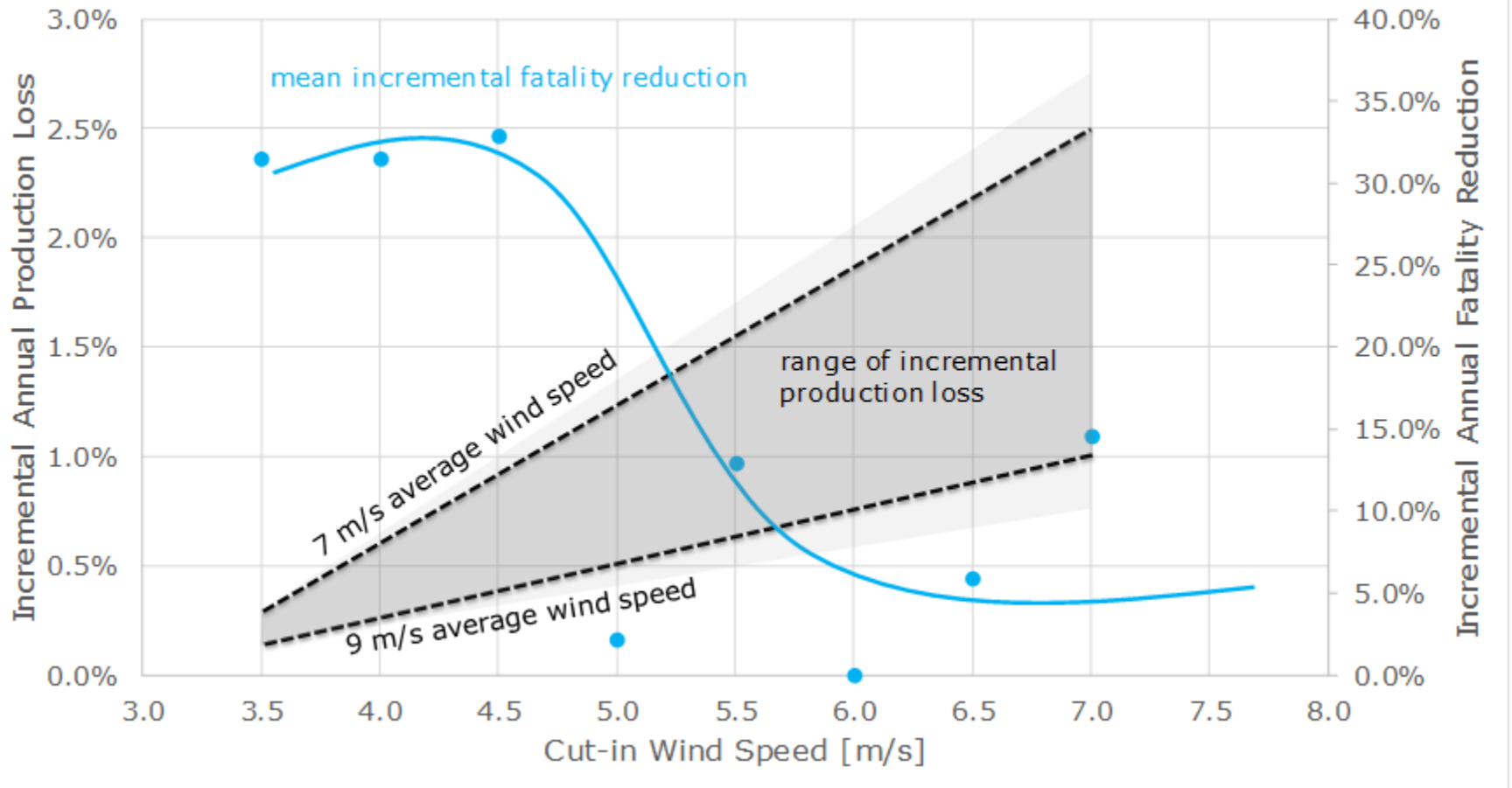
<sup>f</sup> There were no control turbines at the Beech Ridge project – all turbines were feathered below 6.9 m/s wind speeds. Percent reduction based on comparison to the Northeast and Appalachian regional average of bat mortality.

<sup>g</sup> Percent reduction based on comparison to average bat mortality at two other West Virginia projects, likely most relevant to what impacts could have been at the site in the absence of feathering.

**21** curtailment effectiveness studies

from across North America testing cut-in speeds of 4.5 m/s to 6.9 m/s

# Balancing Energy Loss and Fatality Reductions – Celebrate the CANWEA Bat Review Document!



# MSM Bat Intervention Plan

December 2017 - Hired DNV-GL to lead Pattern's negotiations with industry team led by AQPER (Invenergy, EDF, and other industry partners) concerning the "Bat Intervention Plan", a mitigation plan to address impacts to bats during Operations

Jan/Feb 2018 - Weekly meetings with MFFP (Quebec wildlife agency).

Feb 22 – MFFP accepted to:

- Reduce the duration of the Intervention plan. It went from 137 days to 80 days (June 24th to September 10th). It is a significant gain here.
- Remove the Big Brown Bat fatalities from the list as it does not have a status. We will not include those fatalities in our calculation. This species corresponds to approximately 20% of fatalities on wind farm in QC and should be found at MSM.
- Remove completely the Step 2 – Curtailment at 6.5 m/s when you exceed the 5 bats per 10 days. The main economic risk is gone with the removal of this step 2. Our graph worked.
- Adjust the Step 1 (now the only step – curtailment at 4.5 m/s) for the size of the project. The new number per 10 days will be 4 or 5 (initial number was 2). Ultimately we settled on 5.

March 1, 2018 – Post-construction mortality monitoring began.

April 2018 –Updated intervention plan with MDDELCC.



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