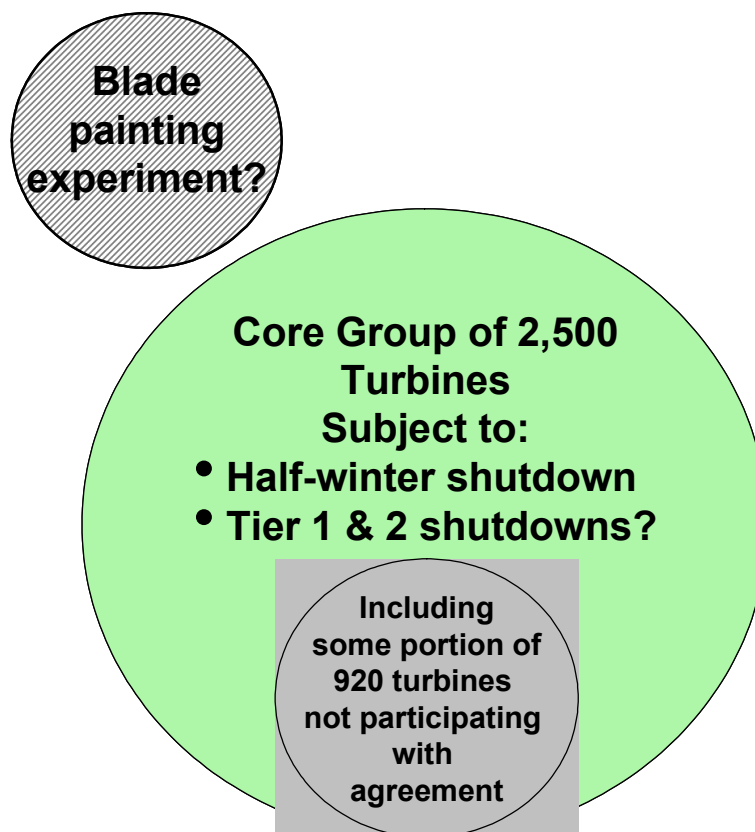


ESTIMATED EFFECTS OF PROPOSED MEASURES TO BE APPLIED TO 2,500 WIND TURBINES IN THE APWRA FATALITY MONITORING PLAN

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The following diagram summarizes the extent of the mitigation measures likely to be implemented among the 2500 wind turbines to be monitored to estimate the effectiveness of the mortality reduction measures. The blade painting experiment remains uncertain due to a patent issue, although a smaller experiment might be implemented among some of the 920 wind turbines owned by a company not participating with the settlement. If the larger blade painting study is implemented, the SRC has yet to agree whether it will be implemented within the monitoring sample of 2500 turbines or peripheral to the sample as shown in the diagram below.

If additional mitigation measures are implemented, the SRC has yet to decide how the affected turbines will be incorporated into the monitoring program, or whether they will be treated peripherally to the monitoring sample. Electric distribution pole retrofits cannot be considered because they have no bearing on turbine collision-caused mortality. Ceasing rodent control also cannot be considered because the SRC does not know whether landowners continued with rodent control, and the SRC will have no power over the landowners' decisions on this matter. According to recent information from the Parties to the settlement, the Companies will not remove artificial rock piles or derelict turbines or derelict towers. It does not appear additional mortality reduction measures will be implemented until 2010.



Assuming the extent of the avian mortality reduction measures is accurately portrayed in the diagram, the following assessment estimates the effectiveness of the measures. To arrive at point estimates of percent fatality reduction gained by shutting down turbines in tiers 1 & 2 in Group C of Smallwood and Spiegel (June 1, 2005), the following steps were taken:

$$F_{-C} = ((F_{4074} - F_C) \div F_{4074}) \times F_{APWRA}$$

$$F_{-C,-W} = F_{-C} - \left(F_{-C} \times 0.146 \times \text{Winter} \frac{\text{Observed}}{\text{Expected}} \right)$$

$$\text{Percent fatality reduction} = (F_{APWRA} - F_{-C,-W}) \div F_{APWRA} \times 100\% .$$

F_{-C} is the estimated annual fatalities in the APWRA after turbines in Group C tiers 1 through 2 are shut down, where the fatalities documented at these turbines, F_C , are subtracted from the fatalities among the 4,074 turbines used in Smallwood and Spiegel's exercise, or F_{4074} , and where this difference is used to calculate the proportion of the APWRA's fatalities that would remain after shutdown. For this exercise, the annual fatalities were those composing the upper end of the uncertainty range reported in Smallwood and Thelander (2004). I used these because these are the values the Parties used. This approach did not factor in relative abundance of birds.

$F_{-C,-W}$ is the estimated annual fatalities remaining in the APWRA after turbines in Group C tiers 1 & 2 are shutdown and after the remaining turbines are shut down during half the winter. The value 0.146 is the proportion of the year comprising half the winter, and the ratio of observed to expected chi-square values represent the number of fatalities in the winter as a multiple of the number expected of a uniform distribution of fatalities throughout the year.

The results are as follows.

Species	F_{APWRA}	$F_{4,074}$	F_C	Obs ÷ Exp in winter	F_{-C}	$F_{-C,-W}$	Fatality reduction due to shutdown of selective turbines and all remaining turbines during half the winter
Golden eagle	116.5	87.4	14	1	97.8	83.6	28.3%
Red-tailed hawk	300.4	225.3	27	1.35	264.4	212.3	29.3%
American kestrel	333.1	249.8	27	1.61	297.1	227.3	31.8%
Burrowing owl	380.2	285.2	16	1.2	358.9	296.0	22.1%
Pooled 4 raptors	1130.2	847.7	84	1.3	1018.2	825.0	27.0%
All raptors	1300	975	124	1.27	1134.7	924.3	28.9%
All birds	4721.3	3541.0	200	1.15	4454.6	3706.7	21.5%

Thus, assuming the half-winter turbine shutdown is continued beyond the winter of 2007/2008, and assuming all Tier 1 & 2 turbines are actually shutdown permanently, then the measures might achieve a 27% reduction in the mortality of the 4 pooled raptor species. It remains unlikely the 50% mortality reduction target will be achieved using these measures. It is unlikely it will be achieved by performing experiments on turbines peripheral to the monitoring sample.