This Technical Note provides further information on points raised by NatureScot regarding the assessment of collision risk to common scoter (*Melanitta nigra*), a qualifying species of the West Inverness-shire Lochs Special Protection Area (SPA). NatureScot's comments were conveyed in a letter (dated 09 February 2023) to the Scottish Government in response to the Skye Reinforcement Project Section 37 application (ECU Reference: ECU00003395).

In its response NatureScot advised,

"In relation to collision risk to common scoters, to enable us to carry out this appraisal the following information is required: Further information on the implications of the increased height of the new overhead line, and the efficacy of line marking in reducing the potential collision risk for common scoters which may fly at night."

This Section (Section 5) of the Proposed Development would consist of a replacement steel lattice tower Overhead Line (OHL) for its entirety, approximately 24 km in length, from Loch Quoich Dam to a new cable sealing end compound near Loch Lundie. The new 132 kV OHL would use a steel lattice tower, the height of which would vary depending on topography, but would typically be in the region of 27 m to 33 m in height. The new OHL in this Section would replace the existing 132 kV steel lattice OHL between Loch Quoich Dam and Kingie, and the 132 kV wood pole OHL between Kingie and Aberchalder (itself a replacement for the previous 132 kV steel lattice OHL), which would be dismantled once the Proposed Development has been constructed and energised. The Proposed Development within this Section broadly follows the route of the existing OHLs, however there would be an average increase in height from the existing steel lattice OHL of 7.7 m (*n* = 75, -0.8 – 16.2 m) (**Appendix 1**).

Line marking remains the most common and practical form of wire collision mitigation worldwide, and research shows that it can reduce bird collisions by up to 94% (evidence reviewed in Prinsen *et al*., 2012[1]). Therefore, it is proposed that line marking the earth wire along the length of two parts of the OHL within this Section will be undertaken between Towers BF279 to BF306 inclusive and between Towers BF327 to BF337 inclusive. The average increase in height of the OHL between Towers BF279 to BF306 is 7.4 m (*n* = 28, -0.8 – 15.4 m) and the average increase in height of the OHL between Towers BF327 to BF337 is 6.8 m (*n* = 11, 2.3 – 12.4 m) (**Appendix 1**).

Studies and literary reviews from across the world have shown that marking power lines leads to significant reductions in collision rates or dangerous flight behaviour (i.e., approaching close to

[1] Prinsen, H.A.M., Smallie, J.J., Boere, G.C. & Píres, N. (Compilers). (2012). Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region. AEWA Conservation Guidelines No. 14, CMS Technical Series No. 29, AEWA Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany.

power lines)[2]. Therefore, during daylight hours, by increasing a power line's visibility through marking with Bird Flight Diverters (BFDs), irrespective of a change in power line height, and in the knowledge that common scoter have relatively high diurnal visual acuity (*sensu* Martin & Banks, 2023)[3] then scoters will react to these visual cues and reduce the risk of collision.

The BFDs being proposed would be highly reflective, refracting sunlight and providing a "sparkle effect" visible to birds. Furthermore, the proposed BFDs would be luminescent, enabling them to emit visible light after dusk, and in low light or fog conditions, when birds are most vulnerable. Therefore, if scoters move between lochs in darkness, the same visual cues as to the presence of the OHL will be realised and common scoter will employ the same avoiding action as during daylight hours. In a study in the Netherlands, Hartman *et al*. (2010)[4] found a significant reduction of 80% in the nocturnal collisions of mallard (*Anas platyrhynchos*) and wigeon (*Anas penelope*) on a four kilometre long stretch of power line fitted with bird flight diverters, through bird-rich grassland polders. In addition, common scoters tend not to fly during particularly dark conditions at night, or in poor visibility weather conditions during the day (Anon 2006[5]; Petersen *et al*., 2006[6]; Kuvlesky *et al*., 2007[7]) which reduces the risk of collision further.

BFDs currently under consideration by the Applicant include the FireFly HW Bird Diverter (see https://pr-tech.com/product/firefly-hw-bird-diverter/) or a spiral type of diverter (e.g. see https://preformed.com/energy/distribution/wildlife-protection/bird-flight-diverter). We believe with some confidence that a reflective / luminous BFD can be installed, and the Applicant is working with suppliers to determine the most appropriate BFD. The Applicant can confirm however that reflective / luminous BFDs are available for a 132 kV OHL.

In conclusion, the increase in power line height will be mitigated through the use of reflective, luminescent BFDs between Towers BF279 to BF306 inclusive and between Towers BF327 to BF337 inclusive, spaced at 5 m intervals. Worldwide, the use of BFDs on power lines has been shown to significantly reduce collision risk, including in a nocturnal setting. The proposed BFDs will reduce the likelihood of an already extremely small risk of collision to common scoter and the effect of collision risk will not impinge the Conservation Objectives of the West Inverness-shire Lochs SPA.

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[2] Galis, Marek & Ševčík, Michal. (2019). Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. Raptor Journal. 13. 45-59. 10.2478/srj-2019-0005. This research looks at diurnal reaction distances which suggests birds react at distances of >5m and safely pass powerlines. After installation of flight diverters, there was a lower proportion of reaction distance observations in the closest distance category (i.e. up to 5 m). Conversely, proportions in the more distant categories (6–25 m) and (>25 m) were dominant, indicating that birds reacted further from lines after diverters were installed.

[3] Martin, G.R. & Banks, A.N. (2023). Marine birds: Vision-based wind turbine collision mitigation. Global Ecology and Conservation, Volume 42,

[4] Hartman, J.C., Gyimesi, A. & Prinsen, H.A.M. 2010. Are bird flaps effective wire markers in a high tension power line? – Field study of collision victims and flight movements at a marked 150 kV power line (In Dutch). Report nr. 10-082, Bureau Waardenburg bv, Culemborg.

[5] Anon. (2006). Danish Offshore Wind: Key Environmental Issues. DONG Energy, Vattenfall, The Danish Energy Authority, The Danish Forest and Nature Agency, Copenhagen.

[6] Petersen, I.K., Christensen, T.K., Kahlert, J., Desholm, M. & Fox, A.D. (2006). Final results of bird studies at the offshore wind farms at Nysted and Horns Rev, Denmark. NERI Report. National Environmental Research Institute, Ministry of the Environment, Denmark.

[7] Kuvlesky, M.P., Brennan, L.A., Morrison, M.L., Boydston, K.K., Ballard, B.M. & Bryant, F.C. (2007). Wind energy development and wildlife conservation: challenges and opportunities. Journal of Wildlife Management 71: 2487-2498.

I trust the information provided is now sufficient to allow NatureScot to complete its appraisal.

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July 2023

Appendix 1:

Skye 132kV - New Proposed Line Route Tower Height Comparison Against Existing FQ Route Tower Heights

Proposed line and existing line on same route
Proposed line within 200mtrs of existing line route
Proposed line over 200mtrs away from existing line route

Proposed Line Tower Number	Tower Height (mtrs)	Comment	Proposed Line Position	Existing Line Tower Number	Tower Height (mtrs)	Comment	Height Difference (mtrs)
BF263	34.3	Angle / Downleads	c.75m North of Existing	FQ1	30.3	Angle / Downleads	4.0
BF264	32.4	Angle	c.75m North of Existing	FQ2	21		11.4
BF265	30.1		c.75m North of Existing	FQ3	21		9.1
BF266	30.1		c.75m North of Existing	FQ4	21		9.1
BF267	30.1		c.75m North of Existing	FQ5	20	Angle	10.1
BF268	30.1		c.150m North of Existing	FQ6	21		9.1
BF269	26.3	Angle	c.200m North of Existing	FQ7	21		5.3
BF270	27.1		c. 250m North of Exisitng	FQ8	27		0.1
BF271	30.1		c. 300m North of Exisitng	FQ9	21		9.1
BF272	27.1		c. 350m North of Exisitng	FQ10	21		6.1
BF273	26.3	Angle	c. 400m North of Exisitng	FQ11	27		-0.7
BF274	30.1		c. 470m North of Exisitng	FQ12	20	Angle	10.1
BF275	27.1		c. 550m North of Exisitng	FQ13	24		3.1
BF276	30.1		c. 450m North of Exisitng	FQ14	21		9.1
BF277	30.1		c. 350m North of Exisitng	FQ15	21		9.1
BF278	30.1		c. 200m North of Exisitng	FQ16	21		9.1
BF279	29.3	Angle	c. 50m North of Exisitng	FQ17	24		5.3
BF280	32.4		On exisitng route	FQ18	20	Angle	12.4
BF281	36.2		On exisitng route	FQ19	24		12.2
BF282	33.2		On exisitng route	FQ20	27		6.2
BF283	30.1		On exisitng route	FQ21	27		3.1
BF284	29.3	Angle	On exisitng route	n/a			
BF285	29.3	Angle	c. 120m North of Exisitng	FQ22	20	Angle	9.3
BF286	26.3	Angle	c. 170m North of Exisitng	n/a			
BF287	23.2	Angle	c. 110m North of Exisitng	FQ23	24		-0.8
BF288	26.3	Angle	On exisitng route	FQ24	24		2.3
BF289	33.2		On exisitng route	FQ25	21		12.2
BF290	30.1		On exisitng route	FQ26	24		6.1
BF291	24		On exisitng route	FQ27	21		3.0
BF292	29.3		On exisitng route	FQ28	20		9.3
BF293	30.1		On exisitng route	FQ29	21		9.1
BF294	26.3	Angle	On exisitng route	FQ30	20	Angle	6.3
BF295	33.2		On exisitng route	FQ31	24		9.2
BF296	30.1		On exisitng route	FQ32	21		9.1
BF297	29.3	Angle	On exisitng route	FQ33	20	Angle	9.3
BF298	33.2		On exisitng route	FQ34	27		6.2
BF299	27.1		On exisitng route	FQ35	21		6.1
BF300	23.2	Angle	On exisitng route	FQ36	20	Angle	3.2
BF301	36.2		On exisitng route	FQ37	27		9.2
BF302	30.1		On exisitng route	FQ38	21		9.1
BF303	30.1		On exisitng route	FQ39	24		6.1
BF304	30.1		On exisitng route	FQ40	21		9.1
BF305	24		On exisitng route	FQ41	21		3.0
BF306	35.4	Angle	On exisitng route	FQ42	20	Angle	15.4
BF307	33.2		On exisitng route	FQ43	21		12.2
BF308	33.2		On exisitng route	FQ44	21		12.2
BF309	36.2		On exisitng route	FQ45	27		9.2
BF310	30.1		On exisitng route	FQ46	24		6.1
BF311	33.2		On exisitng route	FQ47	24		9.2
BF312	29.3	Angle	On exisitng route	FQ48	20	Angle	9.3
BF313	27.1		On exisitng route	FQ49	21		6.1
BF314	30.1		On exisitng route	FQ50	21		9.1
BF315	32.4	Angle	On exisitng route	FQ51	24		8.4
BF316	36.2		c. 110m South of Exisitng	FQ52	20	Angle	16.2
BF317	32.4	Angle	c. 130m South of Exisitng	FQ53	27		5.4
BF318	33.2		c. 90m South of Exisitng	FQ54	21		12.2
BF319	26.3	Angle	On exisitng route	FQ55	21		5.3
BF320	33.2		On exisitng route	FQ56	21		12.2
BF321	24		On exisitng route	FQ57	21		3.0
BF322	26.3	Angle	On exisitng route	FQ58	27		-0.7
BF323	33.2		On exisitng route	FQ59	21		12.2
BF324	32.4		On exisitng route	FQ60	20		12.4
BF325	29.3	Angle	On exisitng route	FQ61	20	Angle	9.3
BF326	33.2		On exisitng route	FQ62	21		12.2
BF327	33.2		On exisitng route	FQ63	24		9.2
BF328	30.1		On exisitng route	FQ64	21		9.1
BF329	29.3		On exisitng route	FQ65	27		2.3
BF330	27.1		On exisitng route	FQ66	21		6.1
BF331	27.1		On exisitng route	FQ67	21		6.1
BF332	26.3	Angle	On exisitng route	FQ68	20	Angle	6.3
BF333	30.1		On exisitng route	FQ69	21		9.1
BF334	33.2		On exisitng route	FQ70	24		9.2
BF335	24		On exisitng route	FQ71	21		3.0
BF336	32.4	Angle	On exisitng route	FQ72	20		12.4
BF337	26.3	Terminal	On exisitng route	FQ73	24	Angle / Downleads	2.3

Summary

Comparison height difference along all towers (mtrs) - All colours

Average	7.7
Max	16.2
Min	-0.8
Median	9.1
Mode	9.1

Comparison height difference along existing online build route only (mtrs) - Only GREEN towers

Average	7.7
Max	15.4
Min	-0.7
Median	9.1
Mode	12.2