12 March 2020

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the applications submitted by Vineyard Wind, LLC (Vineyard Wind) and Atlantic Shores Offshore Wind, LLC (Atlantic Shores) under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA). Both companies are seeking authorization to take small numbers of marine mammals by harassment incidental to high-resolution geophysical (HRG) surveys off the northeast United States. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 12 February 2020 notices (85 Fed. Reg. 7952 for Vineyard Wind and 85 Fed. Reg. 7926 for Atlantic Shores) requesting comments on its proposals to issue the authorizations, subject to certain conditions.

Background

Vineyard Wind is proposing to conduct HRG surveys to characterize lease areas[1] off Massachusetts and along potential submarine export cable route corridors to landfall locations in Massachusetts, Rhode Island, Connecticut, and New York, in support of an offshore wind development project. The surveys would occur year-round during day and night and would involve the use of up to eight vessels, with no more than three operating concurrently, resulting in an estimated maximum of 736 vessel days. Sound-generating equipment proposed for use includes sub-bottom profilers (SBPs)[2], ultra-short baseline and global acoustic positioning systems, multibeam echosounders, and side-scan sonar.

Atlantic Shores is proposing to conduct HRG surveys to characterize a lease area[3] off New York and New Jersey and along potential submarine export cable route corridors to a landfall location in New York or New Jersey. The surveys would occur year-round during day and night for a maximum of 350 vessel days. Surveys would involve the use of up to three vessels, with only one vessel operating in both the lease area and the export cable route corridor at a time. Sound-

[1] Bureau of Ocean Energy Management (BOEM) lease numbers OCS-A 0501 and OCS-A 0522.
[2] Including parametric, chirp, sparker, and boomer types.
[3] BOEM lease number OCS-A 0499.

generating equipment proposed for use includes sub-bottom profilers (SBPs)[2], single-beam echosounders, and side-scan sonar.

NMFS preliminarily has determined that the proposed activities could cause Level B harassment of small numbers of 14 and 15[4] marine mammal species by Vineyard Wind and Atlantic Shores, respectively. It also anticipates that any impact on the affected species and stocks would be negligible. NMFS does not anticipate any take of marine mammals by death or serious injury and believes that the potential for disturbance will be at the least practicable level because of the proposed mitigation measures. The proposed mitigation, monitoring, and reporting measures include—

- for Vineyard Wind, conducting survey activities in the Cape Cod Bay and Off Race Point Seasonal Management Areas (SMAs) only during the months of August and September[5];
- using protected species observers to monitor the exclusion zones[6] and Level B harassment zones for 30 minutes before, during, and for 30 minutes after the HRG surveys;
- using standard pre-clearance, ramp-up, delay, and shut-down procedures;
- using shut-down procedures if a species for which authorization has not been granted, or a species for which authorization has been granted but the authorized number of takes is met, approaches or is observed within the Level B harassment zone;
- using passive acoustic monitoring (PAM) and night-vision equipment to detect marine mammals during night-time operations and/or low visibility[7];
- using standard vessel strike avoidance procedures and monitoring[8] the NMFS North Atlantic right whale reporting systems during all survey activities;
- reporting injured and dead marine mammals to the Office of Protected Resources and the New England/Mid-Atlantic Stranding Coordinator[9]; and
- submitting a draft and final report to NMFS.

Appropriateness of Level A and B harassment zones

Background—The Commission has commented on the inappropriateness of Level A and B harassment zones associated with multiple HRG surveys in the past (e.g., see its 18 October 2019[10],

[4] The Summary of Request section of the Atlantic Shores' *Federal Register* notice indicated 12 marine mammal species could be taken by Level B harassment (85 Fed. Reg. 7927); while Table 7 of the *Federal Register* notice and Table 1 of the draft authorization indicated that 15 marine mammal species could be taken.
[5] There are no seasonal restrictions for Atlantic Shores.
[6] 500 m for North Atlantic right whales and 100 m for all other marine mammals.
[7] The requirement for Vineyard and Atlantic Shores to use night-vision equipment was included in the draft authorizations but was not specified in the preamble of either *Federal Register* notice.
[8] NMFS included this standard measure in the preamble for Atlantic Shores but not Vineyard. However, it was included in the draft authorizations for both projects.
[9] Neither the preamble nor the draft authorization for Vineyard would require the vessel operator to cease operations if project activities result in an injury or mortality of a marine mammal. The preamble for Atlantic Shores would require the vessel operator to cease operations only in the event that project activities result in an injury (Level A harassment).
[10] For Skipjack Offshore Energy, LLC's (Skipjack) proposed HRG survey activities.

23 August 2019[11], 6 July 2018[12], and 13 June 2018[13] letters). NMFS had allowed action proponents to use incorrect Level A harassment thresholds[14], which resulted in overestimated Level A harassment zones. NMFS also had prohibited action proponents from using in-situ measurements of Level B harassment zones and required them to use Level B harassment zones calculated from source levels obtained either from manufacturer specifications or from Crocker and Fratantonio (2016), which resulted in overestimated Level B harassment zones. In only one instance were the operating frequency (or frequencies) and beamwidth considered in those calculations. Despite the Commission's previous comments and recommendations, the Level A and B harassment zones have been overestimated again but to a greater degree than in previous authorizations. Some of the previous inaccuracies were included in Vineyard Wind's and Atlantic Shores' applications, as well as additional issues that are summarized herein.

Parameters for estimating Level A and B harassment zones—JASCO Applied Sciences (USA) Inc. (JASCO) estimated the Level A and B harassment zones for both Vineyard Wind and Atlantic Shores (see Appendices A and B, respectively, in both applications). JASCO incorporated the operating frequency (or frequencies) and the beamwidth of each source in its estimation of Level A and B harassment zones[15]. To account for seawater absorption, JASCO calculated the relevant absorption coefficient based on the absorption equation from Ainslie (2010)[16] and the operating frequency[17] of each source for Level A and B harassment in both applications. The Commission concurs with that approach.

JASCO included the basic equation[18] that accounts for the source beamwidth for estimating Level B harassment zones (see equation B-4 in Appendix B of Vineyard's application[19]), but did not include the equation for estimating the Level A harassment zones (Appendix A in both applications). The Commission can only assume that JASCO used the same equation to estimate both types of harassment zones for both applications. JASCO also indicated that it considered the beamwidth[20] for sources with beamwidths less than or equal to 90°[21] when it estimated both Level A and B harassment zones for Vineyard Wind and Atlantic Shores (see Appendices A and B in both applications). For narrow-beam sources (beamwidths ≤ 35°), JASCO estimated out-of-beam source levels using various equations and assumptions (see Appendices A and B in both applications). For intermediate-beam sources (beamwidths from 36–90°), JASCO interpolated the correction factor used to estimate out-of-beam source levels based on the results from narrow-beam and broad-beam sources (see Figures A-1 and B-1 in Vineyard Wind's application and Figure 1 in Appendices A and B of Atlantic Shores' application). JASCO indicated that it calculated *separate impact ranges* using the

[11] For Ørsted Wind Power LLC's (Ørsted) proposed HRG survey activities.
[12] For Dominion Energy Virginia's (Dominion) proposed HRG activities.
[13] For Ørsted/Bay State Wind's proposed HRG survey activities.
[14] The impulsive rather than non-impulsive thresholds were used to estimate the Level A harassment zones for parametric and chirp SBPs, which are non-impulsive sources.
[15] And assumed 20logR propagation loss.
[16] Discarding the boric acid term.
[17] Or the lowest operating frequency, if a range of frequencies is emitted by the source.
[18] Additional beamwidth-related equations and parameters were included in Appendix A and B of both applications. Ainslie (2010) was referenced for only some of those but appear to be the basis for those that were unreferenced.
[19] That equation was omitted from Appendix B of Atlantic Shores' application as well.
[20] Or the largest beamwidth, if a range of beamwidths can be emitted by the source.
[21] For sources with beamwidths greater than 90°, the source was considered omnidirectional and termed broad-beam.

in-beam source level at the angle corresponding to the −3-dB half-width[22] and the out-of-beam source level (e.g., Table 5 on 85 Fed. Reg. 7968 for Vineyard Wind[23]) in the horizontal direction and then selected the higher of the two *sound levels* for assessing the impact distance (Appendix A of Vineyard Wind's application)[24].

The Commission has multiple concerns with JASCO's approach for incorporating beamwidths. First, JASCO did not specify why it did not use beam patterns and resulting gain provided in Crocker and Fratantonio (2016) for some of the sources. Second, JASCO did not justify its assumption that a beamwidth greater than 90° would be considered omnidirectional, or 180°, for what it termed broad-beam sources. The Commission cannot locate where Ainslie (2010) included such an assumption. For Atlantic Shores, the Level B harassment zone would be 54 m rather than 71 m for the Teledyne Benthos Chirp III if JASCO had incorporated the actual beamwidth of 100° rather than assuming it was 180°. Similarly, the Level B harassment zone would be 42 m rather than 56 m for the Applied Acoustics S-Boom if JASCO had incorporated the actual beamwidth of 98°. In addition, JASCO appears to have characterized the beamwidth of the Applied Acoustics AA251 boomer incorrectly as 180° rather than 75° based on Crocker and Fratantonio (2016, Table 4). Third, for narrow-beam and intermediate-beam sources, JASCO did not justify why the unshaded circular transducer equation from Ainslie (2010) did not apply to sources with beamwidth greater than 35°, as Ainslie (2010) did not include that limitation. Specifically, Crocker and Fratantonio (2016) noted that the first side lobe is 18 dB less than the main lobe (i.e., the −3-dB half-width) for the Applied Acoustics AA251 boomer. Using JASCO's interpolated correction factor, the out-of-beam source level would be only about −5 dB (Figure A-1 and B-1 in Vineyard Wind's application), which is 13 dB greater than the actual value reported by Crocker and Fratantonio (2016). This point reinforces the fact that JASCO should have incorporated actual values for the beam patterns and resulting gain rather than relying on theoretical assumptions. The Commission recommends that NMFS (1) incorporate the actual beamwidth of 75° rather than 180° for the Applied Acoustics AA251 boomer for Vineyard Wind and the actual beamwidth of 100° rather than 180° for the Teledyne Benthos Chirp III and 98° rather than 180° for the Applied Acoustics S-Boom for Atlantic Shores and (2) re-estimate the Level A and B harassment zones accordingly.

Fourth, JASCO did not provide any of the correction factors for out-of-beam source levels in Atlantic Shores' application. Thus, it is difficult to ascertain what out-of-beam source levels were used by JASCO. However, based on estimating the correction factors from Figure 1 in Appendix B in Atlantic Shores' application[25] and using the various source levels, beamwidths, and operating frequencies provided in that Appendix, it appears that the out-of-beam source level approach[26] was

[22] At the reported beamwidth(s).
[23] Neither Atlantic Shores' application nor NMFS's *Federal Register* notice provided the out-of-beam source levels.
[24] In Appendix B of Vineyard's application and Appendices A and B of Atlantic Shores' application, JASCO indicated that separate *sound levels* were calculated using the in-beam source level at the angle corresponding to the -3-dB half-width and the out-of-beam source level in the horizontal direction. The higher of the two *sound levels* was then selected for assessing impact distance.
[25] Which is the same as Figure 1 in Appendix A for estimating Level A harassment zones.
[26] The Commission further notes that the Level B harassment zones for the Edgetech 2000-DSS and Edgetech 216 should be 2 m rather than 4 m and the Applied Acoustics S-Boom triple plate should be 91 m rather than 97 m for Atlantic Shores. Those zones were estimated incorrectly based on the parameters stipulated in Table 2 of the *Federal Register* notice and Tables 2 and 4 in Appendix B of Atlantic Shores' application.

only used for the Innomar SES-2000 Medium-100 parametric SBP when estimating Level B harassment zones[27]. This was the case for Vineyard Wind as well, although not explicitly stated. The Commission is not convinced that JASCO's method for estimating out-of-beam source levels is appropriate for a parametric SBP, as it did not yield accurate results for the Applied Acoustics AA251 boomer[28]. More importantly, parametric SBPs (and sonars) are intended to generate narrow, nearly side lobe-free beams of lower frequency sound[29] through the interaction of high-frequency sound—they are not meant to have prominent side lobes. Although the beam pattern of the Innomar SES-2000 Medium-100 parametric SBP has yet to be measured, sound levels have been measured in the field. Subacoustech (2018) estimated that the sound levels were 133 dB re 1 µPa at 100 m, which obviously was an out-of-beam sound level based on the 2° beamwidth of the source. Subacoustech (2018) further specified that the Level B harassment zone was less than 10 m and the source level was estimated to be 187 dB re 1 µPa at 1 m. That source level is much less than JASCO's estimated out-of-beam source level of 204.7 dB re 1 µPa at 1 m[30]. Based on the in-situ out-of-beam source level and 20logR[31], the Level B harassment zone would be 21 m rather than 116 m, as specified for both Vineyard Wind and Atlantic Shores. NMFS would not accept in-situ measurements for previous authorizations, because they potentially were not collected within the main beam of the source. That should not be an issue for the Innomar SES-2000 Medium-100 parametric SBP given that JASCO's intent was to use the out-of-beam source level to inform the extents of the harassment zones. Given that parametric SBPs are meant to generate narrow, nearly side lobe-free beams of sound, it is not surprising that the lateral leakage of sound or 'out-of-beam' source levels are so much less[32] than the reported in-beam source levels. If NMFS intends to use out-of-beam source levels, the Commission recommends that NMFS use the out-of-beam source level of 187 dB re 1 µPa at 1 m from Subacoustech (2018) for the Innomar SES-2000 Medium-100 parametric SBP and re-estimate the Level A and B harassment zones accordingly for both Vineyard Wind and Atlantic Shores. Otherwise, NMFS should use the in-beam source level and beamwidth to revise the harassment zones[33] accordingly for the parametric SBP.

Fifth and building on the fourth point, JASCO mischaracterized how it determined whether to use in-beam or out-of-beam source levels in all of the Appendices for both applications. JASCO in fact calculated *separate impact ranges* using the in-beam source level at the angle corresponding to the

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[27] It is impossible to ascertain whether out-of-beam source levels were used to estimate the Level A harassment zones in Appendix A of either application. This issue is discussed in a subsequent section herein.
[28] As noted previously herein.
[29] i.e., difference-frequency signals.
[30] This is not surprising given that the out-of-beam source level was based on the manufacturer's specified source level of 241 dB re 1 µPa at 1 m—manufacturer's specified source levels are widely known to be overestimates.
[31] And an operating frequency of 85 kHz.
[32] Qu et al. (2018) found that the source level at the operating frequency was 38 dB greater than at the difference frequencies, while Browning et al. (2009) indicated that the sound levels at the operating frequency can be 40 to more than 50 dB greater than at the difference frequencies. Qu et al. (2018) also determined that the beamwidths at the difference frequencies were slightly greater than at the operating frequency (4° at 10 kHz compared to 2.6° at 300 kHz). Browning et al. (2009) described the same trend with the beamwidths at the difference frequencies ranging up to 7.2° at 2 kHz, while the beamwidth was only 1.8° at the operating frequency of approximately 100 kHz. In either case, assuming a beamwidth of 180° would be conservative.
[33] Considering the Commission's fifth point, the Level B harassment zone would be less than 4 m for Vineyard and less than 1 m for Atlantic Shores. The operating frequency (and difference frequencies) has no effect on the extent of the Level B harassment zone in waters as shallow as where Vineyard (200 m) and Atlantic Shores (40 m) would be operating.

−3-dB half-width and the out-of-beam source level in the horizontal direction and then selected the greater of the two *ranges*. The beamwidth equation incorporates slant range[34] and beamwidth, not actual *source levels*. Sixth, the beamwidth equation that JASCO used did not account for water depth. The beamwidth equation is based on a simple application of the Pythagorean theorem. As such, the full extent of the slant range cannot be achieved when it is clipped by the seafloor. For example, for Atlantic Shores, the slant range of the Kongsberg EA 400 single-beam echosounder is 644 m[35] with a presumed water depth of 620 m, which would result in a Level B harassment zone of 172 m based on a beamwidth of 31°. However, the maximum water depth in the Atlantic Shores' project area is only 40 m (85 Fed. Reg. 7928 and Figure 1-1 in the application), which would result in a Level B harassment zone of only 11 m. Similar results are evident for boomers as well. NMFS had considered water depth in previously-issued authorizations involving HRG surveys (e.g., 84 Fed. Reg. 52482). Although it is not clear why NMFS did not use the same approach for Vineyard Wind and Atlantic Shores, it is clear that the harassment zones for single-beam echosounders and shallow-penetration SBPs[36] have been vastly overestimated based on this particular issue alone and based on previous authorizations (e.g., 84 Fed. Reg. 52480 and 66167) for the same or similar equipment. The Commission recommends that NMFS incorporate water depth when considering the beamwidth for all sources, including in this instance single-beam echosounders, shallow-penetration SBPs, and boomers, for both Vineyard Wind and Atlantic Shores. The Level A and B harassment zones for Vineyard Wind and Atlantic Shores should be revised accordingly.

In-situ measurements and standardized methods—In addition to the various beamwidth issues, the Commission again notes that in-situ measurements of the same sources conducted off the east coast of the United States during previous HRG surveys indicate that the Level B harassment zones are in fact quite small, 27 m or less (e.g., Gardline 2016, Subacoustech 2018), for the remaining sources—sparkers and boomers. In response to the Commission's 23 August 2019 letter recommending that NMFS use in-situ measurements, NMFS indicated that discrepancies between in-situ measurements and data from Crocker and Fratantonio (2016) likely were due to the beam pattern of many HRG sources and the fact that measurements likely were taken outside the main lobe of the source (84 Fed. Reg. 52465). The Commission agrees that that issue may exist for some sources, but it does not exist for sparkers[37] and is unlikely an issue for boomers[38] that produce the largest Level B harassment zones for Vineyard Wind and Atlantic Shores.

A previously perceived issue with in-situ measurements from a sparker may have resulted from the hydrophone clipping the data in the nearfield, which was discussed by Gardline (2016). Gardline used a high sound pressure level hydrophone to capture the nearfield measurements[39]. Figure D.1 in Gardline (2016)[40] shows that the measured sound levels at approximately 140 m were

[34] Which is based on the source level and operating frequency, or absorption coefficient.
[35] Based on an in-beam source level of 222.8 dB re 1 µPa at 1 m and the lowest operating frequency of 38 kHz.
[36] Which are denoted as shallow SBPs in Table 1 of the *Federal Register* notice for Vineyard and denoted as just SBPs in Table 2 in the *Federal Register* notice for Atlantic Shores.
[37] With beamwidths of 180°.
[38] With beamwidths ranging from 80 to 180° (Table 1 on 85 Fed. Reg. 7954 for Vineyard and Table 2 on 85 Fed. Reg. 7928 for Atlantic Shores).
[39] Which were used to inform the waveform and to validate the near-field digital signal processing scaling implemented by Gardline (2016; see section 2.3.2).
[40] Figure 3.3 in Gardline (2016) and Figure 1 in Gardline (2017) show similar results as well.

approximately 140 dB re 1 μPa or less and were not affected by hydrophone clipping. The Level B harassment zones were estimated to be 27 m or less for the Geo Spark with 600 and 800 tips; Vineyard Wind plans to use only the 400 tip[41]. Furthermore, Subacoustech (2018) measured a mean sound level of 141.2 dB re 1 μPa and maximum sound level of 150.7 dB re 1 μPa at 60.5 m for the Applied Acoustics Dura-Spark, which resulted in an estimated Level B harassment zone of 19 m. That is less than JASCO's estimate of 372 m for Atlantic Shores. Similar results are evident for the Applied Acoustics S-boom triple plate in which the Level B harassment zones were estimated to be less than 20 m (Marine Acoustics Inc. (MAI) 2018, RPS 2018) rather than up to 97 m as estimated for Atlantic Shores. The Commission is not convinced that any of the HRG sources that Vineyard Wind and Atlantic Shores plans to use would result in actual Level B harassment zones greater than 50 m, let alone 100 m.

As the Commission has stated previously, many of the issues[42] could be minimized with proper methodological requirements and signal processing standards. To ensure that in-situ data are collected and analyzed appropriately, the Commission again recommends that NMFS and BOEM expedite efforts to develop and finalize, in the next six months, methodological and signal processing standards for HRG sources. Those standards should be used by action proponents that conduct HRG surveys and that either choose to conduct in-situ measurements to inform an authorization application or are required to conduct measurements to fulfill a lease condition set forth by BOEM. NMFS did not provide a detailed response regarding the Commission's previous recommendation[43] as required under section 202(d) of the MMPA. It merely stated that it would evaluate the need for and appropriate development of guidance and tools (84 Fed. Reg. 66159). The Commission explicitly requests a detailed response to this recommendation if NMFS does not follow or adopt it.

Other assumptions regarding Level A and B harassment zones—NMFS allowed both Vineyard Wind and Atlantic Shores to use the wrong Level A harassment thresholds for single-beam echosounders, shallow-penetration SBPs[44], and underwater positioning pingers as it has for previous authorizations. In this instance, JASCO indicated that it assumed that sources that operate with a repetition rate greater than 10 Hz were considered non-impulsive and sources with a repetition rate equal to or less than 10 Hz were considered impulsive sources (see Appendix A in both applications). For Vineyard Wind's authorization, NMFS did state that it does not agree with JASCO's source classification, that the use of a 10-Hz repetition rate criterion would be precedent setting, and that the criterion needed further evaluation (85 Fed. Reg. 7968). However, for Atlantic Shores' authorization, NMFS merely stated that it did not necessarily agree with that step in JASCO's modeling assessment (85 Fed. Reg. 7941–2). In both instances, NMFS acknowledged that the Level A harassment zones were more conservative based on using the impulsive rather than non-impulsive thresholds and chose to use zones that were based on the wrong thresholds anyway.

[41] Which should result in smaller zones.
[42] Including contractors having difficulty obtaining adequate on-axis measurements of the signals and georeferencing the source relative to the hydrophone, the hydrophone clipping the sound, and signal processing issues.
[43] Or multiple other recommendations that are discussed in subsequent sections herein.
[44] Except the Innomar SES-2000 Medium-100 parametric SBP. Vineyard incorrectly noted in the Federal Register notice that the impulsive threshold was used for all HRG sources, which was an error. The non-impulsive threshold was used for the parametric SBP, see Table A-4 in Vineyard's application.

NMFS (2018) specifically defined impulsive sources as those that produce sounds that are typically transient, brief (less than 1 second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay (American National Standards Institute (ANSI) 1986, National Institute for Occupational Safety and Health (NIOSH) 1998, ANSI 2005). Single-beam echosounders, shallow-penetration SBPs, and underwater positioning pingers emit (1) regularly-timed pulses that are not transient, (2) narrow-band not broad-band sound, and (3) sound that lacks a high peak pressure and both a rapid rise time and decay. NMFS (2018) included no criteria associated with repetition rate in its definitions of impulsive and non-impulsive sources. JASCO again has not justified its assumption that sources with a repetition rate greater than 10 Hz are the only sources for which the non-impulsive thresholds should be used. This approach would apply not only to HRG sources that have long been considered non-impulsive sources[45], but it also would apply to sources such as low-, mid-, and high-frequency active sonar used by the Navy.

Furthermore, use of the impulsive thresholds[46] for non-impulsive sources results in completely unrealistic Level A harassment zones. JASCO estimated that the Level A harassment zones for the single-beam echosounders were 213–220 m[47], while the Level B harassment zones were estimated to be 172–173 m. Those trends are not possible for moving sound sources and could only result from use of the wrong threshold.

Although the impulsive threshold is more conservative than the non-impulsive threshold, allowing action proponents to choose arbitrarily which thresholds to use undermines the intent of the acoustic thresholds, does not represent best available science, and is in fact precedent-setting. Therefore, the Commission again recommends that NMFS (1) prohibit Vineyard Wind, Atlantic Shores, and other action proponents from using the impulsive Level A harassment thresholds for estimating the extents of the Level A harassment zones for non-impulsive sources (i.e., echosounders, shallow-penetration SBPs, pingers, etc.) and (2) require action proponents to use the correct Level A harassment thresholds in all future applications.

In addition, JASCO's method for estimating the Level A harassment zones is not transparent and cannot be replicated for either action proponent. For Vineyard Wind, JASCO indicated that it added a 0.5-dB correction 'to the energy source level because the 90 percent energy pulse duration usually used to evaluate the source level contains only 90 percent of the pulse energy' (see step 1 in section A.1 of Vineyard Wind's application). JASCO indicated that the 0.5-dB correction ensures that all of the energy in the pulse is included. This step was omitted from Appendix A in the Atlantic Shores' application—it is unclear if JASCO implemented the same step for Atlantic Shores. It is unclear why this step is necessary if JASCO is using source levels based on sound exposure levels (SELs; see step 3 in section A.1 of Vineyard Wind's application). It also is unclear why a standard 0.5-dB correction would be used for source levels that range from 178 to 241 dB re 1 µPa at 1 m. It seems that the correction factor would be relative to the underlying source level. More concerning is JASCO's closest point of approach (CPA) method for estimating the extents of the Level A harassment zones (see steps 2 to 5 in section A.1 of Vineyard Wind's application, which are the same as in section 1 of Appendix A in Atlantic Shores' application). It is unclear how the SELs for each survey line were combined, or why they were combined, how the

[45] Including multibeam echosounders.
[46] Which are 13 to 18 dB greater than the non-impulsive thresholds depending on the functional hearing group.
[47] These have previously been less than 10 m or non-existent.

curves of weighted SELs were produced, and what assumption(s) determined the CPA for each functional hearing group.

Moreover, JASCO indicated that both in-beam and out-of-beam source levels were included in step 3 of its modeling approach for Atlantic Shores. Appendix A in Vineyard Wind's application did not include the same statement—it is unclear if JASCO implemented the same approach for Vineyard Wind. Given that out-of-beam considerations only seemed to apply to the Innomar SES-2000 Medium-100 parametric SBP for the Level B harassment zones, presumably it was used to estimate the Level A harassment zones for Vineyard Wind as well. JASCO estimated the Level A harassment zone to be 60 m for high-frequency (HF) cetaceans for both Vineyard Wind and Atlantic Shores and noted in Appendix A of Vineyard Wind's application that it was similar to the 75-m zone estimated using Bellhop for Bay State Wind's authorization in 2018. Bay State Wind had originally estimated the Level A harassment zone using the impulsive rather than non-impulsive threshold, which resulted in the 75-m Level A harassment zone for HF cetaceans. However, NMFS adjusted the 75-m zone to less than 5 m for HF cetaceans in the final authorization (Table 3; 83 Fed. Reg. 36550). It is unclear how JASCO's Level A harassment zone for HF cetaceans that used a reduced out-of-beam source level is an order of magnitude greater than Bay State Wind's Level A harassment zone that used a source level more than 38 dB higher.

NMFS's currently-available user spreadsheet does not incorporate either the operating frequency or beamwidth of the source, which led JASCO to develop its own method. NMFS is revising an updated version of the user spreadsheet that incorporates those parameters. The spreadsheet provides users the ability to estimate Level B harassment zones as well. The Commission previously stated that such a tool is essential for action proponents proposing to conduct HRG surveys. As such, the Commission recommends that NMFS (1) re-estimate all of the Level A and B harassment zones for both Vineyard Wind and Atlantic Shores using its user spreadsheet that incorporates the operating frequency and beamwidth and (2) provide the spreadsheet to all action proponents that conduct HRG surveys, post it on NMFS's website, and require all action proponents to use it for all future HRG-related authorizations. A similar recommendation was included in previous Commission letters, the last of which elicited the same response that NMFS would the need for and appropriate development of guidance and tools (84 Fed. Reg. 66159). It is apparent that the tools are necessary not only for action proponents but for NMFS analysts to ensure that the estimated Level A and B harassment zones are correct, which has clearly been an issue for both Vineyard Wind and Atlantic Shores.

Finally on the topic of harassment zones, JASCO estimated a second set of Level B harassment zones. JASCO indicated that it adjusted the source levels based on the pulse duration and a 100-msec integration time as recommended by the Consortium for Ocean Leadership (COL; 2018). COL (2018) provided recommendations for common approaches and methods for collecting passive acoustic data and processing ocean ambient sound data. It is unclear how those objectives relate to the integration time of the marine mammal ear. COL (2018) noted as a best practice measure for measuring ambient sound to use an averaging time of 100 msec for comparability across studies, but provided no reference for the 100-msec integration time. NMFS did not mention this matter at all in the *Federal Register* notice for Atlantic Shores, but did discuss it in the notice for Vineyard Wind.

NMFS stated that it is known that integration time varies and depends on a multitude of factors, including frequency, repetition rate, bandwidth, and species (85 Fed. Reg. 7968). NMFS also indicated that it agrees that integration time is an important factor to consider but that using a single number to encompass all sound sources and species seems like a potential oversimplification (85 Fed. Reg. 7968). Therefore, NMFS ultimately used pulse duration only to estimate Level B harassment zones (85 Fed. Reg. 7968). The Commission agrees that integration time is important but also agrees that a single 100-msec value is not reflective of all species and sound sources. Integration time varies from 0.5 msec to greater than 5,000 msec for various marine mammal species and from 14 to more than 3,600 msec for a single species alone (see Table 3 in Erbe et al. (2016)). As such, the Commission supports NMFS in prohibiting Vineyard Wind and Atlantic Shores from incorporating integration time.

However, NMFS incorrectly reiterated JASCO's assertion that *pulse duration* was used to estimate the Level B harassment zones in the *Federal Register* notice for Vineyard Wind (85 Fed. Reg. 7968; see Appendix B in Atlantic Shore's application as well). JASCO indicated that it used *both the pulse duration* and 100-msec averaged source levels to compute *two* different Level B harassment zones for each source (see Appendix B in both applications). In fact, JASCO did no such thing. JASCO appears to have used the pulse duration[48], the presumed 100-msec integration time, *and* the repetition rate[49] to yield an adjusted sound pressure level root-mean-square (SPL_{rms}) source level and resulting Level B harassment zone. Although JASCO did not include the equation or assumptions used to derive the adjusted source levels in Appendix B of either application, this appears to be the case[50]. Contrary to Appendix B and the *Federal Register* notice, JASCO did not account for the pulse duration (or repetition rate) in its estimation of the Level B harassment zones when just the SPL_{rms}-based source level was used. The Commission recommends that NMFS (1) continue to prohibit action proponents, including Vineyard Wind and Atlantic Shores, from using a 100-msec integration time to adjust the SPL_{rms}-based source levels when estimating the Level B harassment zones, (2) ensure that the *Federal Register* notice for the final authorizations for Vineyard Wind and Atlantic Shores do not incorrectly state that pulse duration was considered in the estimation of the Level B harassment zones, and (3) require action proponents to omit any related discussions regarding integration time from all future applications to avoid unnecessary confusion and errors in future *Federal Register* notices.

[48] 10log(T) is added to a reported source level, where T is the pulse duration in seconds when normalizing the source level to 1 sec. If JASCO assumed that the source level is normalized to 100 msec, the equation presumably would be 10log(T/100), where T is the pulse duration in msec. Since many of the pulse durations for HRG sources are less than 100 msec, the correction will be a negative number (e.g., for a 10-msec pulse, the correction is -10 dB).

[49] To account for the number of pulses that are emitted, 10log(N) is added to the reported source level as well, where N is the number of pulses in 100 msec (e.g., for 4 pulses, 6 dB is added).

[50] Had JASCO only used the pulse duration of 2 msec and presumed 100-msec integration time, the adjusted source level for the Innomar SES-2000 Medium-100 parametric SBP would have been 224 rather than 230 dB re 1 μPa at 1 m.

HRG surveys in general

Many of the HRG sources[51] are considered *de minimus* sources[52] by NMFS in other incidental harassment authorizations and rulemakings. Thus, it is unclear why those sources are considered in HRG-related authorizations. The Commission again recommends that NMFS evaluate the impacts of sound sources consistently across all action proponents and deem sources *de minimus* in a consistent manner for all proposed incidental harassment authorizations and rulemakings. This has the potential to reduce burdens on both action proponents and NMFS.

In addition, Vineyard Wind and Atlantic Shores are required by BOEM to implement shut-down procedures at 500 m for North Atlantic right whales and 200 m for other cetaceans and pinnipeds, based on conditions stipulated in Addendum C of their leases. For the proposed authorizations, NMFS would require Vineyard Wind and Atlantic Shores to implement a 500-m exclusion zone for North Atlantic right whales and a 100-m exclusion zone for all other marine mammals. Those zones are greater than in-situ measured and/or re-estimated Level B harassment zones based on the recommendations included herein. As NMFS seeks to streamline and improve the efficiency of its authorization processes, the Commission again recommends that NMFS consider whether, in such situations involving HRG surveys[53], incidental harassment authorizations are necessary given the small size of the Level B harassment zones, the proposed shut-down requirements, and the added protection afforded by the lease-stipulated exclusion zones. Specifically, NMFS should evaluate whether taking needs to be authorized for those sources that *are not* considered *de minimus*[51], including sparkers and boomers, *and* for which implementation of the various mitigation measures should be sufficient to avoid Level B harassment takes. NMFS did not specifically address the Commission's recommendation in its most recent 18 October 2019 letter regarding this matter. The Commission expects that NMFS will do so for this letter.

Proposed takes by Level B harassment

The estimated Level B harassment takes for North Atlantic right whales in Table 7 of the *Federal Register* notice for Vineyard Wind were 30.32. However, NMFS proposed to authorize only 10 Level B harassment takes of right whales. No explanation was provided in the preamble regarding why the take estimate was reduced by two-thirds, when the reduction in takes of right whales for Atlantic Shores was 50 percent, with the explanation that it was to account for mitigation. The Commission recommends that NMFS provide justification for reducing the number of Level B harassment takes for North Atlantic right whales for Vineyard Wind or include up to 30 Level B harassment takes in the final authorization.

The proposed Level B harassment take of sei whales should have been rounded up to four whales in Table 7 of the *Federal Register* notice for Vineyard Wind, consistent with Table 1 of the

[51] NMFS mischaracterized the Commission's previous recommendations involving HRG surveys that *all* HRG sources should be considered *de minimus* (84 Fed. Reg. 66159). Some are considered *de minimus*, while others are not. However, the impacts of those sources would be mitigated based on the implementation of shut-down requirements and lease-stipulated exclusion zones.
[52] Defined as sources that have low source levels, narrow beams, downward-directed transmission, short pulse lengths, frequencies outside known marine mammal hearing ranges, or some combination of those factors (84 Fed. Reg. 37244).
[53] And until it revises its 160-dB re 1 μPa threshold for intermittent, non-impulsive sources.

draft incidental harassment authorization. In addition, the proposed Level B harassment take of sei whales should have been increased to at least two animals in Table 7 of the *Federal Register* notice for Atlantic Shores and Table 1 of the final authorization to account for mean group size[54]. The Commission recommends that NMFS authorize up to (1) four Level B harassment takes of sei whales for Vineyard Wind consistent with Table 1 in the draft authorization and (2) two Level B harassment takes of sei whales for Atlantic Shores based on group size.

Similarly, the proposed Level B harassment takes of Risso's dolphins should have been increased to 30 in Table 7 of the *Federal Register* notice for Atlantic Shores and Table 1 of the final authorization to account for mean group size, as proposed in Table 7-2 of Atlantic Shores' application, and as was done for Vineyard Wind's and previous authorizations for HRG surveys in the Atlantic Outer Continental Shelf region (see e.g., 84 Fed. Reg. 84 Fed. Reg. 66156 and 84 Fed. Reg. 52464. The Commission recommends that NMFS authorize up to 30 Level B harassment takes of Risso's dolphins for Atlantic Shores based on group size.

Mitigation, monitoring, and reporting measures

As noted herein, the proposed authorizations appear to represent a change in NMFS's longstanding requirement that action proponents report an unauthorized injury or mortality to NMFS *and* cease operations until they have consulted with NMFS. That requirement has been in each authorization issued to date by NMFS for HRG surveys in the Atlantic Outer Continental Shelf region (e.g., see 84 Fed. Reg. 66173 and the associated incidental harassment authorization[55]). Neither the preamble nor the draft authorization for Vineyard Wind would require the vessel operator to cease operations if project activities result in an unauthorized injury or mortality of a marine mammal. The preamble for Atlantic Shores would require the vessel operator to cease operations only in the event that project activities result in an injury by Level A harassment, but not in the event of an unauthorized project-related mortality, such as one caused by a vessel strike[56]. It is critical that project activities that result in an unauthorized injury or mortality of a marine mammal be halted immediately and reported to NMFS so that the circumstances of the taking can be reviewed by NMFS and additional measures can be taken as necessary to minimize the likelihood of additional prohibited takes. The Commission recommends that NMFS require Vineyard Wind and Atlantic Shores to report as soon as possible *and* cease project activities immediately in the event of an unauthorized injury or mortality of a marine mammal from a vessel strike until NMFS's Office of Protected Resources and the New England/Mid-Atlantic Regional Stranding Coordinator determine whether additional measures are necessary to minimize the potential for additional unauthorized takes.

Proposed one-year authorization renewals

NMFS has indicated that it may issue a one-year incidental harassment authorization renewal for this and other future authorizations if various criteria are met and after an expedited public comment period of 15 days. The Commission and various other entities (e.g., 84 Fed. Reg. 31035

[54] Consistent with the approach for other species; https://www.fisheries.noaa.gov/species/sei-whale.
[55] https://www.fisheries.noaa.gov/webdam/download/99623135.
[56] Additionally, the requirement to cease operations in the event of an unauthorized take by Level A harassment was not included in the draft authorization for Atlantic Shores.

and 52466) have asserted that the renewal process is inconsistent with the statutory requirements under section 101(a)(5)(D) of the MMPA. As such, the Commission recommends that NMFS refrain from issuing renewals for any authorization and instead use its abbreviated *Federal Register* notice process. That process is similarly expeditious and fulfills NMFS's intent to maximize efficiencies.

Over the past few years, NMFS has told the Commission that a renewal would be issued as a one-time opportunity, after which time a new authorization application would be required. NMFS also has included such verbiage in its response to comments regarding renewals. Specifically, NMFS indicated that it had modified the language for future proposed incidental harassment authorizations to clarify that all authorizations, including renewal authorizations, are valid for no more than one year and that the agency will consider *only one renewal* for a project at this time (e.g., 84 Fed Reg. 36892 from 30 July 2019). However, NMFS has yet to stipulate that the agency will consider *only one renewal* or that a renewal is a *one-time opportunity* in any *Federal Register* notice requesting comments on the possibility of a renewal, on its webpage detailing the renewal process[57], or in any draft or final authorization that includes a term and condition for a renewal (including section 8 of Vineyard Wind's and Atlantic Shores' draft authorizations).

In response to the Commission's 29 November 2019 letter recommending that NMFS stipulate those specifics in the relevant documents and on its webpage, NMFS indicated that, in the 'summary' portion of its notices, it requests comments on a possible *one-year renewal* that could be issued under certain circumstances and if all requirements are met (84 Fed. Reg. 68131). However, neither the notices nor the webpage or final authorizations state that *one-year renewals* are *one-time opportunities*. NMFS also indicated that, for notices involving proposed renewals, it has not included an option of an additional renewal (84 Fed. Reg. 68131). Absent specifics regarding one-year renewals being a one-time opportunity in the *Federal Register* notices, on NMFS's webpage, and more importantly as a term and condition in its draft and final authorizations, NMFS appears to knowingly allow that door to remain open. If NMFS chooses to continue proposing to issue renewals, the Commission recommends that it (1) stipulate that a renewal is a *one-time opportunity* (a) in all *Federal Register* notices requesting comments on the possibility of a renewal, (b) on its webpage detailing the renewal process, and (c) in all draft and final authorizations that include a term and condition for a renewal and, (2) if NMFS refuses to stipulate a renewal being a one-time opportunity, explain why it will not do so in its *Federal Register* notices, on its webpage, and in all draft and final authorizations.

Ongoing inadequacy of responses to Commission recommendations

The Commission has indicated, both herein and in its formal letters[58], that NMFS has not been responding adequately to its recommendations. The MMPA requires that, if an agency does not implement the Commission's recommendations, the agency explain why it has not done so. Specifically, section 202(d) of the MMPA requires that NMFS respond within 120 days after receipt of Commission recommendations and if any recommendations are not followed or adopted, a

[57] https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-harassment-authorization-renewals
[58] See its 21 January 2020 letter on the National Science Foundation's (NSF) geophysical survey in the Amundsen Sea as just one example.

detailed explanation of the reasons why those recommendations were not followed or adopted must be provided. As noted herein for previous HRG surveys, either NMFS did not provide a detailed response explaining why it did not follow the Commission's recommendations[59] or the responses were sorely insufficient[60]. For other recent authorizations[61], NMFS omitted Commission recommendations outright[62], did not respond to certain recommendations[63], indicated it would consult with the Commission on recommendations that it had not addressed therein or in previous responses[64], and incorrectly specified and responded to the Commission's recommendations[65]. This

[59] As was the case for the Commission's recommendation regarding whether an authorization was necessary given the size of the Level B harassment zones and the required mitigation and lease-stipulated measures. NMFS combined that recommendation with two other recommendations regarding implementing a 50-m Level B harassment zone based on in-situ measurements and consistently deeming sound sources *de minimus* for all proposed authorizations and rulemakings (84 Fed. Reg. 66159). It addressed the latter two recommendations in its response but not the recommendation regarding whether an authorization was necessary given the size of the Level B harassment zones and implementation of the required measures.

[60] As was the case for the Commission's recommendations regarding expediting efforts to develop and finalize methodological and signal processing standards for HRG sources and providing a simple spreadsheet that includes beamwidth and source frequency to action proponents when it provides them with its guidance regarding sound propagation modeling for HRG sources. NMFS merely stated that it appreciated the Commission's interest in those issues and that it would evaluate the need for and appropriate development of guidance and tools (84 Fed Reg. 66159).

[61] e.g., NMFS's response to Commission comments on NSF's survey in the Amundsen Sea (85 Fed. Reg. 5619) and Lamont-Doherty Earth Observatory's (LDEO) survey in the Gulf of Alaska (84 Fed. Reg. 27246).

[62] As was the case for the Commission's recommendation regarding more thoroughly evaluating applications and *Federal Register* notices prior to submitting them to the *Federal Register* for public comment, based on errors, inconsistencies, and omissions in applications and *Federal Register* notices involving LDEP and other NSF-funded and -affiliated surveys (84 Fed. Reg. 27246).

[63] As was the case for the Commission's recommendation regarding ensuring that NSF keeps a running tally of total Level B harassment takes based on both observed and extrapolated takes. NMFS again combined that recommendation with the recommendation to extrapolate Level B harassment takes to the unobserved portions of the Level B harassment zone and noted that the *reporting requirement* to extrapolate takes was included in the authorization (85 Fed. Reg. 5622). NMFS did not, however, include the words 'running tally' in its response or otherwise address the Commission's recommendation on this matter.

[64] As was the case for the Commission's recommendations regarding (1) explaining why NMFS believes that sound channels with downward refraction, as well as seafloor reflections, are not likely to occur during the geophysical survey, (2) specifying the degree to which both of those parameters would affect the estimation (or underestimation) of Level B harassment zones in deep and intermediate-depth water, (3) explaining why NMFS believes that NSF's model and other 'modeling' approaches provide more accurate, realistic, and appropriate Level A and B harassment zones than approaches favored by the Commission, particularly for deep and intermediate-depth water, and (4) explaining, if NSF's model and other 'modeling' approaches are considered best available science, why other action proponents that conduct seismic surveys are not implementing similar methods, particularly given their simplicity. NMFS yet again combined those recommendations with other modeling-specific recommendations, indicated that it had previously responded to the Commission's comments on NSF's modeling approach (e.g., 84 Fed. Reg. 60059, 84 Fed. Reg. 54849, 84 Fed. Reg. 35073) when in fact it has never responded to those specific recommendations as noted in the Commission's 18 October 2019 and previous letters, and stated that it would engage separately with the Commission about the issues (85 Fed Reg. 5622). It has been over a month and NMFS has yet to contact the Commission about the matter. Regardless, NMFS is statutorily obligated to provide the Commission with detailed responses, in addition to any informal engagement on the matter.

[65] As was the case for the Commission's recommendation regarding (1) stipulating that a renewal is a *one-time opportunity* (a) in all *Federal Register* notices requesting comments on the possibility of a renewal, (b) on its webpage detailing the renewal process, and (c) in all draft and final authorizations that include a term and condition for a renewal and, (2) if NMFS refuses to stipulate a renewal being a one-time opportunity, justifying why it will not do so in its *Federal Register* notices, on its webpage, and in all draft and final authorizations. NMFS responded that it disagreed with the Commission's recommendations, as stated in its previous comment responses relating to other actions, which it

lack of direct responses leads one to conclude that NMFS has inadequate justification to support its decisions not to follow the Commission's recommendations. Regardless, responses must be provided. The Commission recommends that, *for all authorizations and rulemakings*, NMFS provide separate, detailed explanations for not following or adopting any Commission recommendation, as required by section 202(d) of the MMPA.

Please contact me if you have questions regarding the Commission's recommendations.

Sincerely,

Peter O. Thomas, Ph.D.,
Executive Director

cc: Stan Labak, BOEM

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