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**UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
AIR TRAFFIC AIRSPACE BRANCH**

In the Matter of the Petition for Discretionary Case Nos. 2009-WTE-332-OE through
Review Pursuant to 14 C.F.R. § 77.37 by 2009-WTE-461-OE
Town of Barnstable, Massachusetts

**THE TOWN OF BARNSTABLE'S
PETITION FOR DISCRETIONARY REVIEW UNDER 14 C.F.R. § 77.37 OF
CASE NOS. 2009-WTE-332-OE THROUGH 2009-WTE-461-OE**

INTRODUCTION

The Town of Barnstable, Massachusetts (Town or Petitioner), the owner and operator of Barnstable Municipal Airport (Airport or HYA), submits this Petition for Discretionary Review pursuant to 14 C.F.R. § 77.37 requesting that the Federal Aviation Administration (FAA) reverse the 130 individual Determinations of No Hazard to Air Navigation in FAA Aeronautical Study Nos. 2009 WTE-332-OE through 2009 WTW-461-OE issued on May 17, 2010 (2010 Determinations) in connection with the proposal by Cape Wind Associates to construct 130 wind energy turbines (Turbines) on or near Horseshoe Shoal in Nantucket Sound (the Cape Wind Project or the Project). Because Petitioner is filing new facts with this Petition, FAA may also, or in the alternative, treat this Petition as a petition pursuant to 14 C.F.R. § 77.39(b).

For the reasons set forth in the supporting memorandum, affidavits and other material filed with this Petition for Discretionary Review (collectively, the Petition), the 2010 Determinations must be reversed pursuant to 14 C.F.R. Part 77 and FAA Order No. 7400.2G because the Cape Wind Project would create a substantial adverse effect on aviation by, *inter alia*, (1) requiring a significant volume of visual flight rule (VFR) operations to change their regular course or altitude; (2) affecting existing instrument flight rule (IFR) operations; (3)

impairing the operation of existing FAA radar facilities; and (4) derogating airport capacity/efficiency. This Petition is filed within 30 days of the issuance of the 2010 Determinations.

SUMMARY OF ARGUMENT

The Cape Wind Project consists of 130 Turbines, each approximately 440 feet tall, to be located in a 25 square mile area of Nantucket Sound known as Horseshoe Shoal. Each Turbine is approximately the height of a 40-story building, and the entire Cape Wind Project area is approximately the size of Manhattan. The Cape Wind Project is proposed to be located in the middle of a heavily-trafficked flight corridor. Approximately 400,000 annual operations take place over, in and near the Project area, including a substantial number of regularly-occurring operations that take place within 500 feet of the proposed Turbines. In addition, the Cape Wind Project is in line-of-sight of three FAA radar facilities.

Pursuant to FAA's procedures and standards under 49 U.S.C. § 44718 and Title 14, Part 77 of the Code of Federal Regulations (Part 77 Regulations), the FAA's Obstruction Evaluation Service (OES) was required to find that the Cape Wind Project is a hazard to air navigation because the evidence before OES demonstrates conclusively that the Cape Wind Project would have a substantial adverse effect by: (1) forcing a significant volume of aeronautical operations to change their regular course and/or altitude; (2) requiring changes to existing VFR and IFR routes; (3) limiting the capacity and efficiency of HYA and other airports near the Cape Wind Project; and (4) interfering with the operation of existing FAA radar facilities.¹

¹ For example, the Town of Barnstable has identified substantial aeronautical objections to the proposed Cape Wind Project in a series of letters sent to FAA. *See* Exhibit 1 (08/07/07 Griffin Letter); Exhibit 2 (07/08/08 Airports Letter); Exhibit 3 (11/26/08 Santos Letter); Exhibit 4 (03/04/09 Santos Letter); Exhibit 5 (03/17/09 Santos Letter); Exhibit 6 (03/20/09 McLaughlin Letter); Exhibit 7 (05/14/10 Airports Letter).

In addition, OES failed to follow its own procedures and regulations for reviewing aeronautical studies and issuing determinations of hazard/no hazard for proposed new structures by: (1) failing to convene a meeting with interested parties; (2) failing to fully examine the cumulative effects of the Cape Wind Project; (3) failing to comply with its own procedures regarding marking and lighting requirements; and (4) issuing Determinations of No Hazard for a period of two years instead of the required 18 months. These procedures, embodied in the regulations at 14 C.F.R. Part 77 and FAA's binding² Order 7400.2G (Procedures for Handling Airspace Matters), are critical to guaranteeing that FAA satisfies its statutory mandate to ensure safety in air commerce, and the efficient use and preservation of the navigable airspace, and airport traffic capacity at public-use airports. 49 U.S.C. § 44718(a). OES also failed to comply with the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370(d).

Finally, when FAA improperly issues a Determination of No Hazard (DNH) under Part 77, its action is certain to have a cascading effect on other regulatory agencies, such as the Department of Interior, which will necessarily rely upon and act on the FAA's determination of whether or not a proposed structure will create safety hazards. As the Department of Interior stated in its April 28, 2010 Record of Decision "[Cape Wind Associates] could not begin construction until "[Cape Wind Associates'] receipt of the FAA's final determination on whether a hazard exists and compliance with any resulting mitigation measures." Exhibit 47 (Minerals Management Service Record of Decision) at 24.

PROCEDURAL HISTORY

1. On April 9, 2003, OES issued Determinations of No Hazard for Aeronautical Studies Nos. 2002-ANE-982-OE through 2002-ANE-1111-OE for 130 wind turbines to be constructed on Horseshoe Shoal. The turbines under review were proposed to be 426 feet above mean sea level (AMSL). These Determinations were set to expire on October 9, 2004. See Exhibit 8 (April 2003 determinations).

² *BFI Waste Sys. v. FAA*, 293 F.3d 527, 529 (D.C. Cir. 2002) (FAA Order 7400.2 is "binding").

2. On July 21, 2003, OES issued Determinations of No Hazard for Aeronautical Studies Nos. 2002-ANE-1200-OE through 2002-ANE-1291-OE for a separate proposal to construct 92 wind turbines on Handkerchief Shoal. The turbines under review were proposed to be 426 feet AMSL. These determinations were set to expire on January 21, 2005. Exhibit 9 (July 2003 Determinations).
3. On May 17, 2004, OES issued Determinations of No Hazard for Aeronautical Studies Nos. 2004-ANE-330-OE through 2004-ANE-459-OE for a proposal to construct 130 wind turbines in a third location. The turbines under review were proposed to be 417 feet AMSL. Exhibit 10 (2004 Determinations).
4. On October 5, 2004, OES issued an extension for the April 2003 Determinations. Exhibit 11 (2004 Extension).
5. In August 2005, OES affirmed the extension of the April 2003 Determinations in response to its receipt of two petitions for discretionary review. The Notice of Affirmation informed the public that the Determinations of No Hazard for Aeronautical Studies Nos. 2002-ANE-982-OE through 2002-ANE-1111-OE would be extended through February 2, 2007. The 2005 Affirmation recognized the potential for interference with existing radars and indicated that: “[i]f our future studies reveal that wind turbines adversely affect the operability of radar, we will amend our policy.” Exhibit 12 (2005 Affirmation).
6. On April 25, 2007, OES issued a public notice regarding new Aeronautical Studies Nos. 2006-ANE-1078-OE through 2006-ANE-1207-OE (referencing prior studies 2002-ANE-982-OE through 2002-ANE-1111-OE) for the Cape Wind Project. Exhibit 13 (2007 Circularization).
7. On January 15, 2009, OES terminated Aeronautical Studies No. 2006-ANE-1078-OE through 2006-ANE-1207-OE, indicating that OES’ prior notice regarding these studies was now stale, that new information changed the basis of the original notice, and that the new information required agency action because the proposals “now exceed the standards of 14 CFR part 77, and there is the potential for physical and/or electromagnetic interference to the radar systems used by the FAA.” The 2009 Termination also informed the public that OES would be completing new studies for all wind turbines in the Cape Wind Project under new Aeronautical Studies Nos. 2009-WTE-332-OE through 2009-WTE-461-OE. Exhibit 14 (2009 Termination).
8. On February 13, 2009, OES issued Notices of Presumed Hazard for Aeronautical Studies Nos. 2009-WTE-332-OE through 2009-WTE-461-OE on the grounds that initial findings described the wind turbines as exceeding obstruction standards and/or having an adverse physical or electromagnetic interference effect upon navigable airspace or air navigation facilities. *See* Exhibit 15 (2009 Notice of Presumed Hazard). On the same date, OES circularized public notice of the new aeronautical studies to all known aviation interests and non-aviation interests, advising that to be eligible for consideration, comments must be received on or before March 22, 2009. *See* Exhibit 16 (2009 Circularization).

9. On March 3, 2009, OES completed a radar analysis report for the Cape Wind Project entitled “*Impact Study of 130 Offshore Wind Turbines In Nantucket Sound*” (2009 OES Radar Report). The 2009 OES Radar Report concluded that the Cape Wind Project would cause adverse effects to existing FAA radars in Nantucket Sound. *See* Exhibit 17 (2009 OES Radar Report).

10. On March 19, 2009, the OES extended the public comment period until April 30, 2010. *See* Exhibit 18 (1009 Circularization Extension). Aviation interests, including the three airports nearest the Cape Wind Project (HYA, Nantucket Memorial Airport (ACK) and Martha’s Vineyard Airport (MVY)), the Alliance to Protect Nantucket Sound, the Airline Owners and Pilots Association (AOPA), local pilots and others, submitted extensive comments, including technical reports, setting forth their substantial concerns with the impact of the Cape Wind Project on aviation over and near Nantucket Sound.

11. On May 14, 2010, the three Cape and Island Airports – HYA, ACK and MVY – filed a letter identifying new facts and arguments not yet considered by OES and requesting OES to issue Determinations of Hazard for the Cape Wind Project. Exhibit 7 (05/14/10 Airports Letter).

12. On May 17, 2010, OES issued 130 Determinations of No Hazard for the Cape Wind Project. The 2010 Determinations indicated that OES had received 14 letters of objection in response to the circularization and that the comment letters had raised concerns about radar impacts, the effect on VFR operations, and environmental noise impacts. Exhibit 19 (2010 Determinations). On the same date, OES made public its February 2010 Study, “*Falmouth ASR-8 Cape Wind Project Radar Baseline Report, Surveillance Engineering Study: Testing the FMH ASR-8 to Predict the Effects of the Cape Wind Wind Turbine Project.*” *See* Exhibit 44 (2010 OES Radar Report).

ARGUMENT

I. REGULATORY FRAMEWORK

The manifest purpose of the Part 77 process is to *avoid* construction of any structures that would conflict with the safe and efficient use of the national airspace. 49 U.S.C. § 44718(a) (agency’s mandate is the “*preservation*” of the navigable airspace) (emphasis added). Because the national airspace is a limited resource, FAA itself recognizes that its first consideration must be to protect that resource:

The national airspace is a limited national resource that Congress has charged the [FAA] to administer in the public interest as necessary to ensure . . . its efficient use. . . . [W]hile a sincere effort shall be made to negotiate equitable solutions to

conflicts over the use of airspace for nonaviation purposes, *preservation of the navigable airspace for aviation shall be the primary emphasis.*

Order 7400.2G at ¶ 1-2-1 (emphasis added). This duty is expressed as a presumption that a proposed construction will be altered to accommodate existing flight patterns:

There are many conflicting demands being placed on the use of the navigable airspace. However, when conflicts arise concerning a structure being studied, the FAA emphasizes the need for conserving the navigable airspace for aircraft; preserving the integrity of the national airspace system; and protecting air navigation facilities from . . . encroachments that would preclude normal operation.

In the case of . . . a conflicting demand for the airspace by a proposed construction or alteration, the first consideration should be given to altering the proposal.

Order 7400.2G at ¶ 6-3-1 (emphasis added).

Therefore, under both FAA's statutory mandate *and its own binding Order*, OES must give first priority to protection of the airspace. A proposed structure that would interfere with the current use of the airspace must be modified and/or found to be a hazard. Accordingly, OES must engage in sufficient review *before a project is built* to ensure that the proposed structure will not create an irreversible conflict with current or future planned uses of the national airspace. As the U.S. Court of Appeals for the Fifth Circuit has previously noted:

To wait until after the [structures] are built to evaluate the FAA's decision-making process on the problem would, of course, be sheer foolishness. It is the [structures] in the first instance that raise the threat to air safety, and it is those [structures] that create the necessity to modify the operational procedures.

...

Certainly, the regulatory purpose of the safety provisions administered by the FAA contemplates that administrative evaluation of the effect of a proposed structure on air navigation come before, not after, the structure has been built. Any other construction of the Administrator's power to determine the hazardous effects of a proposed structure would undermine the prophylactic design of the administrator's regulatory scheme.

...

Thus, from the standpoint of effectuating Congressional intent, it is the Administrator's approval of the project in the first instance that becomes the all-important step in the process.

Air Line Pilots' Ass'n Int'l v. FAA, 446 F.2d 236, 242 (5th Cir. 1971).

In order to meet this statutory and regulatory obligation, OES is required to perform an aeronautical study to ensure that a proposed structure does not pose a hazard to current aeronautical activities. Pursuant to 49 U.S.C. § 44718(b)(1), the aeronautical study *must* consider, *inter alia*: (1) the impact on arrival, departure and en route procedures for aircraft operating under either VFR or IFR; (2) the impact on existing public-use airports and aeronautical facilities; (3) interference with existing or proposed air navigation facilities; and (4) the effect on airport capacity.

Under FAA's standards, a proposed structure will have an "adverse aeronautical effect" if it is found to have physical or electromagnetic radiation effect on the operation of air navigation facilities or if it would:

- (a) Require a change to an existing or planned IFR minimum flight altitude, a published or special instrument procedure, or an IFR departure procedure for a public-use procedure.
- (b) Require a VFR operation to change its regular course or altitude. . . .
- ...
- (d) Derogate airport capacity/efficiency.
- (e) Affect future VFR and/or IFR operations as indicated by plans on file.

Order 7400.2G at ¶ 6-3-3. Further, a proposed structure would have a *substantial* adverse effect if it causes electromagnetic interference to the operation of an air navigation facility or the signal used by aircraft or if there would be a combination of adverse effect and a significant volume of aeronautical operations. Order 7400.2G at ¶ 6-3-5. If the evidence demonstrates that a structure would have a substantial adverse effect, OES has no discretion: it must issue a Determination of Hazard. Order 7400.2G at ¶ 7-1-3(e).

Under FAA regulations defining minimum safe altitudes, aircraft must maintain:

An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

14 C.F.R. § 91.119(c). Because the Cape Wind Project area is currently open water, aircraft may operate at altitudes below 500 feet above sea level (ASL) (unless they fly over a vessel or person). Construction of the Cape Wind Project would raise the minimum operating altitude over the Project to approximately 940 feet in order to provide a 500 foot altitude above the 440-foot Turbines. Therefore, and as detailed further below, OES has a duty to issue Determinations of Hazard for each Turbine in the Cape Wind Project because, individually and collectively, the structures will create a substantial adverse effect on air navigation.

II. FAA IS OBLIGATED TO ISSUE DETERMINATIONS OF HAZARD FOR THE 130 TURBINES

A. The Cape Wind Project Is A Hazard Because Of Its Impacts On VFR Operations.

1. The Turbines will have a substantial adverse effect on VFR operations.

Under FAA's binding Order, a proposed structure would have a substantial adverse effect if there is a combination of adverse effect and a significant volume of aeronautical operations. Order 7400.2G at ¶ 6-3-5. In turn, a "significant volume" is defined as anything more than one aeronautical operation per day no matter the type of operation. Order 7400.2G at ¶ 6-3-4. The record before OES clearly establishes that a "substantial" number of regularly occurring VFR operations would be forced to change course and/or altitude if the Project were built. *See, e.g.*, Exhibit 3 (11/26/08 Santos Letter) (referencing a "substantial" amount of low-altitude VFR traffic over the proposed project footprint and concluding that based on a review of flight data, 22 low altitude flights would have been affected on July 3, 2008, and 14 flights would have been affected on July 14, 2007); Exhibit 22 (11/12/08 Parker Letter) ("There are over 400,000 flights per year in the area with two-thirds concentrated in the summer season and much of it operating

at low altitudes under VFR”); Exhibit 20 (05/30/07 LaForge Letter) (There are over 100,000 commercial flights annually in the affected corridors and over 50% of these flights operate under VFR); Exhibit 21 at ¶¶ 10, 11, 13, 17, 20 (LaForge Affidavit) (routine operations at and near 500 feet ASL or lower). Local operators routinely use VFR flight corridors between 500 – 1000 feet ASL that would be affected by the Project. *Id.* at ¶¶ 13-14. Under FAA’s procedures, therefore, the Cape Wind Project would create a substantial adverse effect to VFR operations, and OES is obligated to issue Determinations of Hazard for each Turbine.

OES clearly recognizes that this standard has been met. For example, in the 2010 Determinations, OES states that the record before it established that there would be “compression of flight as [VFR traffic] moves from lower altitude strata to higher altitudes to avoid the Turbines” and that VFR traffic will have to circumnavigate the Turbines during the “frequent periods of marginal VFR weather experienced in this area.” Exhibit 19 (2010 Determinations) at p. 5. In turn, OES formally concluded that “some aircraft operating under [VFR] may have to alter their altitude or route of flight” Exhibit 19 (2010 Determinations) at p. 7. This conclusion alone establishes that the proposed Turbines will create “adverse effects” to VFR operations. Order 7400.2G at ¶ 6-3-3(b) (defining an adverse effect to include any proposed structure that would require a VFR operation to “change its regular course or altitude”). Accordingly, OES cannot avoid its obligation to issue Determinations of Hazard.

2. Additional impacts on VFR operations further warrant issuance of Determinations of Hazard.

OES also has before it clear evidence of a variety of other ways in which the Cape Wind Project would seriously affect VFR operations. First, Nantucket Sound frequently experiences periods of low ceilings and low visibility due to fog and clouds. Exhibit 22 (11/12/08 Parker Letter); Exhibit 23 (NOAA Climatological Table for Nantucket Sound); Exhibit 21 at ¶ 16

(LaForge Affidavit); Exhibit 45 at ¶ 20 (Breault Affidavit). Because VFR pilots must stay below the ceiling, they often fly at or below 500 feet ASL. Exhibit 21 at ¶¶ 10, 11, 17 (LaForge Affidavit). This would no longer be possible over the 25 square mile Cape Wind Project in marginal weather conditions, during which times VFR traffic will be forced to use “other than direct” routings, which would increase travel time, distance and fuel burn. Exhibit 2 (07/08/08 Airports Letter); Exhibit 21 at ¶ 24 (LaForge Affidavit); Exhibit 45 at ¶ 23 (Breault Affidavit).

Second, even in good weather, the Turbines would force low-altitude, established VFR operations to fly at a minimum of 940 feet ASL to avoid the Turbines, which would compress the air traffic with commercial commuter planes and would push VFR traffic into IFR corridors. Exhibit 3 (11/26/08 Santos Letter); Exhibit 4 (03/04/09 Santos Letter); Exhibit 5 (03/17/09 Santos Letter); Exhibit 20 (05/30/07 LaForge Letter). These IFR corridors are already crowded and subject to often lengthy delays in poor weather. Exhibit 21 at ¶ 28 (LaForge Affidavit). Compressing more traffic in and near these corridors would only increase delays and the complexity of air traffic management.

Third, the Cape Wind Project would affect initial arrivals into, and second segment departures from, HYA. For example, VFR flights departing off of Runway 24 at ACK typically turn right over Nantucket Island and then head north, directly skimming the proposed Cape Wind Project site. If the Turbines were constructed, pilots on this path approaching HYA may have to divert their descent appropriately to ensure sufficient obstacle clearance. Conversely, operations departing HYA may need to increase their departure climb gradients to avoid the eastern edge of the Cape Wind Project. Exhibit 21 at ¶ 32 (LaForge Affidavit).

Finally, the presence of the Turbines would add significant risk to existing “collision avoidance” practices in the area. For decades, because of the high volume of air traffic between

the mainland and the islands of Nantucket and Martha's Vineyard, local operators have followed a voluntary practice of using designated VFR altitudes of 1000 feet ASL and 2000 feet ASL southbound and 500 feet ASL and 1500 ASL northbound. *Id.* at ¶ 14. This has proven to be very successful in providing air traffic dispersion to assist in collision avoidance. Historically, when the weather is "Marginal VFR" in the region due to lower cloud ceilings or poor visibility, pilots continue to fly these routes under VFR at altitudes between 500 feet and 1500 feet ASL. Without the Turbines in place, this is practical and safe. Exhibit 20 (05/30/07 LaForge Letter). If the Cape Wind Project is built, however, VFR pilots will face real problems in marginal VFR conditions when faced with the inherently conflicting obligations to descend to avoid the clouds, but also to remain 500 feet above the 440-foot tall Turbines. Exhibit 24 (04/14/09 LaForge Letter); Exhibit 21 at ¶ 20 (LaForge Affidavit).

This is a particularly critical concern in Nantucket Sound, which is an area of known marginal visibility particularly during peak summer months, averaging 22 days of fog each month and overcast over 40% of the time. Exhibit 2 (07/08/08 Airports Letter); Exhibit 23 (NOAA Climatological Table for Nantucket Sound); Exhibit 21 at ¶ 16 (LaForge Affidavit); Exhibit 45 at ¶ 20 (Breault Affidavit). Moreover, weather conditions in Nantucket Sound can change abruptly, often forcing pilots to descend rapidly to get under the clouds, creating a clear risk of collision with the wind turbine generators. Exhibit 7 (05/14/10 Airports Letter); Exhibit 21 at ¶ 20 (LaForge Affidavit).

Ultimately, in order to avoid the new obstacles, VFR pilots will have to change either their horizontal or vertical position in order to avoid the entire Project area. Pilots' ability to execute collision avoidance maneuvers are already compromised in the constricted airspace in Nantucket Sound. By further compressing traffic into less airspace, this problem will be only

further compounded. Exhibit 24 (04/14/09 LaForge Letter); Exhibit 21 at ¶ 21 (LaForge Affidavit). This is precisely the scenario that Congress sought to protect against when it first introduced the underlying legislation creating the Part 77 program. *See, e.g.*, CONG. REC. 29555 (daily ed. Oct. 28, 1987) (statement of Sen. Chiles, sponsor of the amendment to require the FAA to address the construction of structures and to conduct aeronautical studies, noting that tall structures are not only dangers to aircraft in the obvious way that aircraft could collide with them but also because as more tall structures are constructed, air traffic is crowded into smaller airspace, thus increasing the chance of accidents).

3. OES' rationale for concluding that the Turbines are not hazards is not consistent with FAA's binding Order.

a. The fact that the Turbines are not obstructions is not dispositive.

OES dismisses the substantial evidence of impacts to VFR operations by relying on the faulty proposition that there cannot be an “adverse effect” because the Turbines are not “obstructions.” Exhibit 19 (2010 Determinations) at p. 7. OES correctly restates the rule that a structure is considered to have an adverse effect if it “first exceeds a Part 77 obstruction standard and/or is found to have a physical or electromagnetic radiation effect on the operation of air navigation facilities.” Exhibit 19 (2010 Determinations) at p. 5; *see also* Order 7400.2G ¶ 6-3-3. However, the converse is not also true; *i.e.*, it is not automatically the case that a structure that is *not* an obstruction *cannot* create adverse effects. FAA's Order plainly provides a separate avenue for finding adverse effects: when a proposed or existing structure would require a VFR operation to change its regular flight course or altitude. Order 7400.2G ¶ 6-3-3(b). Regardless of their height, the Turbines are hazards because they will cause a significant number of VFR operations to change their regular flight course or altitude. The question of whether or not the Turbines are also obstructions is immaterial.

b. The 500-foot threshold is irrelevant in this case.

OES also takes the position that the impacts of the Cape Wind Project to VFR operations cannot constitute adverse effects, based on the rule that a structure is a hazard to VFR en route operations if its height is greater than 500 feet above the surface at the site and it is located within 2 statute miles of any regularly used VFR route. *See* Exhibit 19 (2010 Determinations) at p. 7 (*citing* Order 7400.2G ¶ 6-3-8(c)(1)). Once again, OES errs in assuming that this paragraph also implies the converse: *i.e.*, that a structure within 2 statute miles of a VFR route but less than 500 feet tall *cannot* be a hazard. OES further errs in focusing on the 500-foot threshold because VFR aircraft are clearly permitted to operate *below* 500 feet AGL when operating over open water. *See* 14 C.F.R. § 91.119(c) (minimum safe altitudes); Order 7400.2G ¶ 6-3-8(b)(1)(b) (flight over open water).

In fact, the paragraph on which OES relies expressly identifies other ways in which a structure could impose adverse effects – *regardless of whether or not the structure is more than 500 feet tall*. For example, Paragraph 6-3-8 also provides the following:

- “Proposed or existing structures potentially have the greatest impact in those areas where VFR operations are conducted when ceiling and/or visibility conditions are at or near VFR weather minimums. Any structure that would interfere with a significant volume of low altitude flights by actually excluding or restricting VFR operations in a specific area would have a substantial adverse effect and may be considered a hazard to air navigation.” Order 7400.2G ¶ 6-3-8(b)(2).
- “Evaluation of obstructions located within VFR routes must recognize that pilots may, and sometimes do, operate below the floor of controlled airspace during low ceilings and 1-mile flight visibility. When operating in these weather conditions and using pilotage navigation, these flights must remain within 1 mile of the identifiable landmark to maintain visual reference. Even if made more conspicuous by the installation of high intensity white obstruction lights, a structure placed in this location could be a hazard to air navigation because after sighting it, the pilot may not have the opportunity to safely circumnavigate or overfly the structure.” Order 7400.2G ¶ 6-3-8(c)(2).

Given these clear mandates, the fact that aircraft are permitted to operated below 500 feet ASL in the Cape Wind Project area, the frequent periods of marginal VFR weather in the Nantucket Sound, and the substantial volume of low-flying VFR traffic in the area, OES was obligated to: (1) examine impacts of the Cape Wind Project on VFR operations, irrespective of the height of the Turbines; and (2) conclude that the Turbines constitute a hazard to air navigation.

B. The Cape Wind Project Is A Hazard Because Of Its Impacts To IFR Operations.

OES also had before it substantial evidence of impacts to IFR operations. As the three Cape and Island Airports explained in their May 14, 2010 letter to OES, there are two low-altitude airways (Victor airways) over or adjacent to the proposed Project: V-141 and V-146. IFR traffic only uses cardinal altitudes starting with 2000 feet and rising in 1000 foot increments. The current minimum obstacle clearance (MOC) altitude is 1200 feet plus 300 feet above the highest obstacle. With the proposed wind turbines at 440 feet ASL, the new MOC altitude would be 1940 feet (1200 feet + 440 feet + 300 feet), leaving only a 60 foot margin between the MOC and the lowest IFR altitude. Exhibit 7 (05/14/10 Airports Letter). This will force the rerouting of aircraft into narrow, concentrated flight corridors, reduce air traffic dispersion horizontally and vertically, push more VFR aircraft into or very close to IFR corridors, and reduce altitude separation for opposite direction traffic. In addition, this compression will tend to overload an already overburdened IFR system and would directly impact IFR operations. Exhibit 20 (05/30/07 LaForge Letter); Exhibit 21 (LaForge Affidavit).

The evidence before FAA identifies a total of 400,000 total operations over the Cape Wind Project Area, as many as half of which are IFR operations. Exhibit 22 (11/12/08 Parker

Letter).³ Clearly, a “substantial” number of IFR flights would be adversely affected. Order 7400.2G at ¶¶ 6-3-4 & 6-3-5. Because of the substantial adverse impact to IFR operations, OES is therefore obligated to issue Determinations of Hazard for the Cape Wind Project.

Moreover, during IFR conditions, FAA air traffic control (ATC) already imposes increased separation requirements of approximately 3 nautical miles (nmi), which causes delays in departures from HYA, MVY and ACK. When conditions are more severe, and ATC workload is higher, ATC imposes more significant separation requirements, *e.g.*, 5 nmi or more. For example, on Memorial Day weekend 2010, ATC imposed a 10 mile in-trail separation requirement. As a result, Island Airlines’ commercial operations between HYA and ACK ran approximately 3 hours late and the airline lost approximately 20% of its bookings to the ferry. Exhibit 21 at ¶ 28 (LaForge Affidavit). If the Cape Wind Project were built, it would increase inefficiencies in an already complicated airspace by compressing more traffic into the limited flight corridors. This would certainly contribute to increased delays and flight cancellations during IFR conditions, which would translate directly to substantial adverse effects to IFR operations. Exhibit 21 at ¶ 29 (LaForge Affidavit).

Finally, the Cape Wind Project would interfere with search and rescue missions in the Project area. It has been necessary in the past to conduct search and rescue missions in the Project area. Exhibit 45 at ¶¶ 29 (Breault Affidavit). Because search and rescue helicopters frequently conduct their searches below 500 feet ASL, and further must be able to maneuver to get to the victim, the Cape Wind Project would effectively close the Project area to search and rescue missions. *Id.* at ¶¶ 28-30.

³ See also, Exhibit 25 (2009 ATADS Tower Operations Standard Report) (indicating a total of 24,044 IFR Operations at HYA, 16,797 IFR operations at MVY and 40,926 IFR operations at ACK in 2009). Note that these figures represent tower counts only, and therefore do not reflect all operations over the Cape Wind Project Area.

C. The Cape Wind Project Is A Hazard Because Of Its Impacts To Existing FAA Radars.

1. The Turbines will have a substantial adverse effect on air navigation facilities.

It is well established that wind turbines can, and do, pose serious threats to radar performance.⁴ FAA acknowledges this problem generally,⁵ and OES has acknowledged that those general problems will occur if the Cape Wind Project is built:

Wind turbines can obstruct the beam of the radar and block out a portion of the coverage volume. Wind Turbines can also reflect or distort the beam, causing false targets and speed jumps. Wind turbines present special problems for primary radar (search). Since radar returns from wind turbine blades share many characteristics with returns from aircraft, the radar processor treats them as if they are from aircraft. The results are primary clutter displaced on the [air traffic controller (ATC)] console, and aircraft returns being obscured by wind turbine returns.

Exhibit 17 (2009 OES Radar Report).

In this case, because the Turbines would be in direct line-of-sight (LOS) of the three primary FAA radars in the area surrounding Nantucket Sound, namely the long range Air Route Surveillance Radar (ARSR-4) at North Truro Airport (QEA), the Air Surveillance Radar-8

⁴ See, e.g., Exhibit 26 (European Organisation for the Safety of Air Navigation, "Guidelines on How to Assess the Potential Impact of Wind Turbines on Surveillance Sensors," 2009); Exhibit 27 (Eli Brookner, "Deleterious Effects of Cape Cod Wind Farm on Nearby Air-Traffic Control/Defense Radars," 2008); Exhibit 28 (Radio Advisory Board of Canada and Canadian Wind Energy Association, "Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines on Radiocommunication, Radar and Seismoacoustic Systems," 2007); Exhibit 29 (Department of Defense, "Report to the Congressional Defense Committees: The Effect of Windmill Farms on Military Readiness," 2006, hereinafter referred to as 2006 DOD Report); Exhibit 30 (Royal Air Force Air Warfare Centre, "The Effects of Wind Turbine Farms on Air Defence Radars," 2005); Exhibit 31 (Royal Air Force Air Warfare Centre, "Further Evidence of the Effects of Wind Turbine Farms on Ad Radar," 2005); Exhibit 32 (Royal Air Force Air Warfare Centre, "The Effects of Wind Turbine Farms on ATC Radar," 2005); Exhibit 33 (Gavin Poupart, "Wind Farms Impact on Radar Aviation Interests – Final Report," 2003); Exhibit 34 (M.M. Butler and D.A. Johnson, "Feasibility of Mitigating the Effects of Windfarms on Primary Radar," 2003); Exhibit 35 (D.F. Bacon, "Fixed-link wind-turbine exclusion zone method," 2002).

⁵ See, e.g., Exhibit 36 (National Telecommunications and Information Administrative (NTIA) Technical Report TR-08-454) (identifying potential adverse effects and outlines methodologies for FAA to determine whether air traffic control (ATC) radars are adequately protected from interference from wind turbines); Exhibit 37 (FAA Determination of Hazard for Aeronautical Study No. 2005-ANE-995-OE) (proposed wind energy project determined to be a hazard to Logan International Airport); *Clark County v. FAA*, 522 F.3d 437 (D.C. Cir. 2008) (vacating FAA determination of no hazard for proposed wind energy project because "the only evidence in the record demonstrated that the wind turbines would exceed FAA obstruction standards and would interfere with radar systems at the new airport"); Exhibit 38 (2008 Markus PowerPoint); Exhibit 39 (2008 Kingsmore PowerPoint).

(ASR-8) at Otis Airfield (FMH), and the ASR-9 at ACK, there is no question that they would create adverse impacts. Exhibit 29 (2006 DOD Report) (recognizing that the only mitigations that exist at present to *completely* preclude any adverse impacts on radars are limited to those methods that avoid locating the wind turbines in radar line of sight of such radars). The 2009 OES Radar Report predicted that the Turbines would have multiple adverse impacts, including:

- The Turbines will cause “clutter”. If the Turbines are constructed, air traffic controllers will experience excessive clutter. Excessive clutter can be a distraction to air traffic controllers, and excessive clutter makes the task of tracking aircraft without transponders across the Project difficult. The ASR-8 at FMH will be “very susceptible” to wind turbine clutter. The ASR-9 at ACK has a much greater capacity to deal with moving clutter than the ASR-8. While air traffic controllers will see much less clutter from the ASR-9, OES predicts that there will be a decrease in search PD by 10 – 20%, most likely closer to 10% over the Project due to the wind turbines directly, and to detection thresholds being raised as a result of the geocensor function of the 9PAC-II. Exhibit 17 (2009 OES Radar Report) at pp. iv, 24-26.
- The Turbines will cause reduced Probability of Detection. The ASR-9 will not be able to detect targets above a Turbine if the blades are rotating fast enough with a sufficient component of radial motion toward the radar. More significantly, if the blades are moving with a large radial component with respect to the radar, detection for the ASR-8 over each Turbine will approach zero. Exhibit 17 (2009 OES Radar Report) at 11-12.
- The Turbines will cause shadowing. There is a “strong likelihood” for fading of beacon radar up to 2 nautical miles and primary radar up to 3 nmi behind the Turbines below an altitude of 600 feet. For a single wind turbine 10 nmi from the radar, FAA’s model predicted “severe impacts” below 500 feet to beacon for ½ mile behind the wind turbine and up to 3 nmi for the search. The model predicted moderate impacts to beacon for 1.5 nmi behind the wind turbine, and up to 5 nmi for search. Exhibit 17 (2009 OES Radar Report) at pp. iii, 15.
- The Turbines will cause reduced tracking for primary-only aircraft (i.e., aircraft without transponders). As OES concluded: “With the current configuration of the Cape TRACON automation systems, air traffic controllers are confined to using the ASR-8 exclusively for all approaches into HYA, MVY, FMH. The ASR-9 is used exclusively for all approaches into ACK. Currently there is no flexibility to use the ASR-9 and the ASR-8 where each offers the best coverage. This will be a disadvantage when tracking primary-only aircraft over, or behind, the [Turbines].” Exhibit 17 (2009 OES Radar Report) at p. iv.
- The Turbines may cause track seduction. As OES noted in its 2009 Report: “Since echoes from the Turbine blades could meet target detection requirements of the ASR-9 processor, it is possible that the ASR-9 tracker would update the positions of tracked aircraft with wind turbine clutter. This would most likely occur if an aircraft without a transponder were obscured by [Turbine] clutter or was missed due to excessive detection thresholds. In this

case, it would be possible for the tracker to get off course and track wind turbine clutter in a direction away from the path of the actual aircraft. Were this to occur, the real aircraft would be dropped from the track list and could not be displayed again until being detected for 3 out of 7 consecutive scans. Since the ASR-9 tracker will not initiate a track in a range, azimuth bin where clutter counts are high, the aircraft might not reacquire until after passing over the boundary of the [Cape Wind Project].” Exhibit 17 (2009 OES Radar Report) at p. 30.

OES has also received a substantial amount of evidence from outside parties indicating the degree of impacts to FAA radars that would be caused if the Turbines were constructed. *E.g.*, Exhibit 22 (11/12/08 Parker Letter w/ Exhibits); Exhibit 27 (Eli Brookner, “*Deleterious Effects of Cape Cod Wind Farm on Nearby Air-Traffic Control/Defense Radars,*” 2008).

The 2010 Determinations do not provide any analysis or evidence indicating that the Turbines would not interfere with the radars in these ways. Indeed, OES acknowledges that such interference *would* occur. *E.g.*, Exhibit 19 (2010 Determinations) at p. 5. Instead, OES relies on a series of mitigation measures it hopes will reduce the interference to the ASR-8 at FMH to levels OES considers acceptable. As detailed below, OES’ conclusions lack support and turn Part 77 on its head by basing the Determinations of No Hazard on mitigation measures, the effectiveness of which can only be known *after* the structures are built. OES’ tiered approach to mitigation underscores that OES understands that its mitigation measures may not work. Moreover, OES’ proposed mitigation addresses *only* the clutter impacts to the ASR-8 and leaves entirely unaddressed the many other adverse effects to radar that OES identified in its 2009 Radar Report.

2. OES’ recommended mitigation for the ASR-8 is insufficient.

a. The TDX-2000 is not guaranteed to mitigate the known adverse effects.

The TDX-2000 will not be sufficient to eliminate the effects to the ASR-8 for the conditions in Nantucket Sound. First, as documented by Dr. Eli Brookner in his report “*Issues with the Proposed Solutions to the Problems Posed to Air Traffic Control by the Proposed Cape*

Wind Project,” and by Robert Varani *et al.* in the memorandum entitled “*Cape Wind Turbine Project FAA Radar Analysis Review*” the TDX-2000 post-processor will not work under saturation conditions, under very low Probability of Detection, or if the clutter were not sufficiently rejected. Accordingly, it will not be effective in eliminating adverse effects due to LOS radar interference in Nantucket Sound. Exhibit 40 (April 2009 Brookner Report); Exhibit 41 (2010 ARTS Memorandum); *see also* Exhibit 42 (2010 Brookner/Picard Report).

Second, as the 2009 OES Radar Report recognizes, in the worst case scenario, if a target aircraft were dropped, the ASR-8 would not be able to reacquire the target for up to 20 seconds *after* clearing the 25 square mile Cape Wind Project. Exhibit 17 (2009 OES Radar Report) at 25. Given the complicated airspace and the substantial number of daily operations in the Cape Wind Project area, particularly in the summer months, losing aircraft for this amount of time is an unacceptable risk not just over the project footprint, but also for approximately an additional 1 mile radius from the present limits of the footprint for an aircraft travelling at 110 knots. Exhibit 42 (04/29/09 Parker Letter).

Finally, as detailed in the June 2010 Report, entitled “*Comments on Falmouth ASR-8 Cape Wind Project Radar Baseline Report, Surveillance Engineering Study: Testing the FMH ASR-8 to Predict the Effects of the Cape Wind Wind Turbine Project,*” when conducting the simulation of the TDX-2000, OES overestimated the degree to which the TDX-2000 can mitigate adverse effects to the ASR-8. Exhibit 43 (2010 Brookner/Picard Report). For example:

- OES’ 2010 Radar Report used a Lear Jet 60 for its simulations. This aircraft is larger than many of the aircraft that typically frequent the Cape Wind Project area. The smaller aircraft will have a much lower probability of detection than the Lear 60 Jet. Therefore, the relatively good results obtained in OES’ 2010 simulation may not be observed under real world conditions for smaller aircraft such as a Piper Cub.
- While the actual tower cross section is about 29 to 36 dbsm, OES only used a 7 dbsm cross section in its simulation reports because, in their words, “the air controller participating in the

test found a higher value unacceptable to him.” However, the degrading effects of the Turbines may have been much worse if the actual tower signal level of 36 dbsm had been used in the simulation, rather than the 7 dbsm signal level that OES used.

- The tower main lobe clutter returns will overlap in the East-West azimuth direction. As a result, there will be no space between the main lobe clutter returns in the East-West direction. An aircraft flying in this direction over the line of Towers at a range of 13 nmi will always be above the main beam clutter and as a result may not be displayed on the radarscope because the clutter map setting will need to be so high that it will reject the aircraft echo. This is especially true for small aircraft like the Piper Cub. Therefore, if this type of aircraft were flying without a transponder over the Turbines, it would not be seen by air traffic controllers, and in marginal VFR conditions, may also not be seen by other aircraft in the area, which would increase the risks of collision.
- Small aircraft travelling in a North-South direction over the Turbines may not be seen because of the lack of space between the main clutter returns in the clutter map. The TDX-2000 would not be able to mitigate this risk because of the manner in which it processes the video signal, which occurs *after* small aircraft echoes have been rejected by the clutter map high threshold and/or MTI filter.
- The residual signal from the cross section of the actual Turbine towers themselves may raise the threshold in the region of the Turbines and contribute to the masking of weak echoes.
- No consideration was given in OES’ simulation to the clutter produced by the side lobes of the antenna as they pass over the Turbines.
- OES has not justified its use of the fixed value of 28 db to correct for the difference in the wind tower echo in the low and high beam. In reality, this number will depend on factors such as target height and range and the wind tower depression angle.
- Tilting the beam in order to mitigate the effects of clutter (as proposed by the 2010 OES Radar Report) would raise the gain of the beam for low-flying targets and, in turn, *reduce* the probability of detection for small aircraft flying low over and/or beyond the Turbines.

b. The ASR-11 also may not resolve the known hazards.

Replacing the existing ASR-8 with an ASR-11 is an equally uncertain mitigation measure. The ASR-11 has never been studied for the particular conditions in Nantucket Sound, and there is no empirical basis to conclude that the ASR-11 would effectively mitigate the radar interference issues OES has identified. As explained in the 2010 ARTS Memorandum, the ASR-11 is specified for airports with lower traffic density. At higher density levels, however, the

ASR-11 does not perform as well. Thus, there is no certainty that the ASR-11 could adequately mitigate adverse effects caused by the Cape Wind Turbines given the traffic levels near the Cape Wind Project. Exhibit 41 (2010 ARTS Memorandum).

For example, although an ASR-11 upgrade was employed at Travis Air Force Base, it was not initially acceptable, and the lowest radar beam had to be lifted up from the typical elevation of 2.8 to 3.0 degrees to 3.9 degrees to reduce the return from the turbines that saturated the radar receiver. In so doing, however, sensitivity was reduced over the wind turbines and at farther ranges at low elevations, which created a greater likelihood of losing smaller aircraft at lower elevations. While that “fix” solved the problem of radar returns from the wind project at issue in that case, it did so at the cost of reducing the ability of the radar to detect smaller aircraft at lower altitudes. *E.g.*, Exhibit 43 (2010 Brookner/Picard Report). Because of the significant volume of low-altitude, small aircraft traffic and a high percentage of low ceiling, and poor visibility weather conditions in the Nantucket Sound, the same “fix” of tilting the radar to mitigate against the adverse effects on radar facilities caused by the Cape Wind Turbines would come at an unacceptably high cost. Exhibit 40 (April 2009 Brookner Report).

Ultimately, as the 2010 ARTS Memorandum points out, each radar site is unique and it is difficult to reach general conclusions without site-specific analysis. OES failed to conduct any examination of the prospective ability of an ASR-11 to mitigate the demonstrated adverse effects to the ASR-8 at FMH. Thus, OES cannot rely on the ASR-11 as an acceptable mitigation for the Cape Wind Project.

c. OES’ “wait and see” approach is contrary to Part 77 and Order 7400.2G.

Ultimately, the 2010 Determinations concede that the proposed mitigation for the ASR-8 *may not work*. Although OES states that the addition of a TDX-2000 to the ASR-8 “will” resolve any unwanted target issues, it also provides that if the TDX-2000 is deemed

unsatisfactory, an upgrade to an ASR-11 would be necessary. Indeed, the risk that the TDX-2000 “fix” may fail is so substantial that OES is requiring Cape Wind to fund a \$15,000,000 escrow account to cover the cost of acquiring and installing the ASR-11. OES further acknowledges that even the ASR-11 upgrade may not be sufficient and provides that “as a last resort” FAA can revise the Cape TRACON airspace and procedures to restrict air traffic in the wind turbine area to only aircraft with beacon responders. Exhibit 19 (2010 Determinations) at 6; Exhibit 44 (2010 OES Radar Report) at 15.

This approach violates FAA’s clear procedures and guidelines. If the TDX-2000 processor is unsuccessful at mitigating the known adverse effects – *which OES admits is a possibility* – then the already-constructed Turbines will be hazards, at least until an ASR-11 can be installed and made operational. Moreover, if the ASR-11 is not effective, the Turbines will continue to be hazards, to which OES’ only response is to ban all aircraft not equipped with a transponder. Because a significant volume of aircraft operating in the area are not equipped with transponders, *see* Exhibit 45 at ¶ 16 (Breault Affidavit), OES’ “last resort” would mandate the rerouting of existing operations that the Part 77 process is intended to avoid.

FAA’s procedures are quite clear: “a structure would have a substantial adverse effect if it causes electromagnetic interference to the operation of an air navigation facility” Order 7400.2G ¶ 6-3-5. If the Turbines are constructed but the TDX-2000 does not work, there would be a residual substantial adverse effect to the existing FAA radars. Moreover, if the ASR-11 is installed but does not work, there would also be a substantial adverse effect. Finally, if OES follows through with OES’ proposal to restrict air traffic in the Cape Wind Project area to only aircraft with beacon transponders, there would still be a substantial adverse effect as defined by FAA’s Order 7400.2G at ¶¶ 6-3-3, 6-3-4 & 6-3-5 (requiring a significant number of VFR

operations to change their regular course is a substantial adverse effect). Under *any* of these scenarios OES is required to issue Determinations of Hazard.

The issue of critical concern to the Town and the Airport is that OES is willing to allow the hazards to be built and *then* determine how to minimize the existing safety problem, even if that means restricting access to the airspace. Exactly how this would work in practice remains unclear. For example:

- When and how would FAA make decisions regarding the effectiveness of each phased mitigation approach?
- What is the expected time to design, procure, install and test each alternative and how will FAA handle existing traffic after the Turbines are built but before the proposed mitigation has been validated?
- What criteria would be used to make such decisions?
- What are FAA's standards for "acceptable" mitigation?
- What would be the impact on operations in the area while FAA makes those decisions?

These uncertainties contradict the clear intent of the Part 77 program, which requires OES to ensure that safety considerations are met *before*, not after, a new structure is built. *E.g., Air Line Pilots' Ass'n v. FAA*, 446 F.2d at 242; *Clark County v. FAA*, 522 F.3d 437, 443 (D.C. Cir. 2008) (vacating Determinations of No Hazard for proposed wind energy facility where FAA decided to defer the question of potential adverse effects to radar facilities until after the wind turbines were built).

Ultimately, unless OES can identify a mitigation measure that it can *demonstrate* is certain to be effective under the real world weather, fleet mix and air traffic conditions in Nantucket Sound *before the Cape Wind Project is built*, it must issue Determinations of Hazard. At this point, the only guaranteed way to avoid the acknowledged LOS interference is to avoid locating wind turbines in radar LOS. Exhibit 29 (2006 DOD Report) at 4. Because the only way

to avoid placing the Cape Wind Project in radar LOS is to not build the Project, OES is obligated to issue Determinations of Hazard for each of the Turbines.

d. The mitigation equipment may not be available.

OES has predicated its Determinations of No Hazard on a tiered-mitigation proposal based on specific equipment. But OES has not demonstrated that the necessary equipment is even available. As indicated in the 2010 ARTS Memorandum, equipment such as the TDX and ASR-11 are typically procured by FAA for a specific site. As a result, a TDX-2000 or ASR-11 unit may not be available for use at FMH. Similarly, provisions must be made to assure a supply of replacement parts. Prior to issuing the Determinations, OES must, at a minimum, ensure that its proposed solution is not only effective, but also feasible. Absent available equipment, of course, OES' mitigation cannot work. Thus, FAA must first demonstrate that a specific TDX-2000 and ASR-11 are available for this Project and that such equipment can be properly maintained after installation.

3. OES has identified no solution for other demonstrated adverse effects to radar.

a. OES has proposed no mitigation for known impacts to the ASR-9.

In the 2009 Radar Report, OES stated that the ASR-9 at ACK had LOS to the entire Cape Wind Project and that the ASR-9 will not be able to detect targets above a Turbine if the blades are rotating fast enough with a sufficient component of radial motion toward the radar. The 2009 Radar Report then found that because the ASR-9 has post-processing functions (*e.g.*, the 9PAC-II), during sustained winds when the blades have a high degree of radial motion toward the radar, the dynamic geocensor function of the ASR-9 will raise detection thresholds over the Project high enough to decrease the probability of detection by as much as 10 to 20%. Exhibit 17 (2009 OES Radar Report) at pp. 8, 11-12, 26. The 2009 Report also concludes that detection directly

over each Turbine will approach 0% probability of detection. Exhibit 17 (2009 OES Radar Report) at p. 12.

OES concludes that this loss in probability of detection is insignificant. However, a probability of detection of less than 80% is, *by FAA's own admission*, unacceptable. Exhibit 17 (2009 FAA Radar Report) at p. 11. Given the agency's admission that probability of detection for the ASR-9 may drop a full 20%, it is not at all apparent that OES can conclude without further, detailed study that impacts to the ASR-9 are acceptable. Such an analysis is particularly critical because the probabilities of detection noted in OES' 2009 Radar Report are just averages. As already demonstrated in the Record before OES, the average probability of detection is irrelevant: what matters is the probability of detection in the instant when it is needed to ensure safety. Moreover, FAA's analogy to Palm Springs Airport (PSP) and its argument that probability of detection over Nantucket Sound would exceed that at PSP is unavailing. The flight patterns, elevation of towers, and single approach features at PSP in no way resemble the conditions in the Nantucket Sound or at the Cape and Island Airports. Exhibit 42 (04/29/09 Parker Letter).

b. OES has proposed no mitigation for known shadowing effects.

The OES 2009 Radar Report identifies the possibility for shadowing impacts behind the Turbines and predicts that:

Fading will result in beacon misses below 600' within 2 nmi behind the wind farm. Traffic patterns for the area suggest that aircraft do not fly below 600' in the vicinity of the proposed wind farm. This fading could occasionally result in missed replies below 1,000' over Nantucket for the FMH ATCBI-5 and below 1,000' over Otis for ACK Mode S. Mathematical models and empirical evidence suggest that such occurrences will be infrequent and will not impact air traffic operations. If it were to have an impact, it would only be when ACK Mode S or FMH ATCBI-5 is out of service.

Exhibit 17 (2009 OES Radar Report) at 34. Thus, OES recognizes that there *could* be impacts to flights below 1000 feet MSL, and that there *would* be impacts (albeit infrequent) when the ACK Mode S or FMH ATCBI-5 is out of service.

First, evidence from operators in the area shows that there *are* operations below 600 feet ASL. Exhibit 21 at ¶¶ 10, 11, 13, 17 (LaForge Affidavit) (noting operations below 500 feet ASL). *See also* Exhibit 42 (04/29/09 Parker Letter) (showing radar tracks of substantial volume of low altitude operations). OES improperly relied on its own inferences about traffic patterns without verifying its assumptions. Accordingly, the shadowing effects *will* have an impact on current operations.

Second, the impacts OES does acknowledge, even if “infrequent,” may indeed be significant. For example, as already noted above, OES’ 2009 Radar Report predicts that the FMH ASR-8 would see a significant amount of traffic at an altitude where shadowing is possible. This is critical because when the ACK ASR-9/Mode S is completely out of service, FMH is used for approach control into Nantucket. Parts of the approaches to Nantucket are right behind the proposed Turbines from the perspective of FMH and therefore would be directly impacted. Exhibit 17 (2009 OES Radar Report) at pp. iii, 15.

In the Determinations of No Hazard, OES dismisses these potential impacts on the theory that a “significant” number of aircraft would not be affected. However, this conclusion is misleading. OES has evidence before it that the vast majority (nearly 90%) of flights over Nantucket Sound are at or below 1500 feet MSL. Exhibit 42 (04/29/09 Parker Letter). Moreover, OES itself recognizes that the vertical extent of shadowing is predicted to be up to 1500 feet MSL at the range of Nantucket and most significant effects would occur below 900 feet over Nantucket. As noted above, parts of the approaches to Nantucket are directly behind,

and would be shadowed by, the Turbines, from the perspective of FMH. Thus, for example, when the ACK ASR-9 is out of service, all operations below 1500 feet, *including all approaches to ACK*, would be directly compromised. Without question, this would constitute a hazard to air navigation.

c. OES may have underestimated impacts to the ARSR at QEA.

FAA recognizes that the Turbines will be within LOS of the Air Route Surveillance Radar (ARSR) at QEA, but concludes that this will not create significant effects. As noted in the 2010 ARTS Memorandum, however,

The decision not to treat the QEA as rigorously as the two terminal radar facilities appears somewhat misguided in that this system does have line of sight (even at approximately 32 nautical miles) to the wind turbines (at least the top 100 to 150 ft – where the blades are turning) and will be subjected to the clutter and possible interference with ATCRBS communications over this area. The ARTCC automation system tracking software predicts aircraft location for at least the next antenna rotation. In doing so it calculates the velocity (speed) of the aircraft. As a result of a missing reply (scan) the speed calculation can increase quite dramatically causing an erroneous predicted location, and resulting in a “collision alert” at the controller’s position.

Exhibit 41 (2010 ARTS Memorandum). OES should have examined in more detail the potential adverse impacts to air navigation caused by impairment to this facility. Absent such examination, OES cannot conclude that the Turbines would not create hazards.

4. OES did not adequately take into account the weather conditions in Nantucket Sound when concluding that impacts would not be significant.

FAA never analyzed the potential implications of local temperature inversions that can “duct” the radiated energy closer to the earth surface. The effect of such weather events is to intensify reflected energy, and to cause more returns, at higher intensity, which, in turn, increases the clutter on the controllers’ display. This weather condition is very likely to occur in the summer months in Nantucket Sound – at precisely the same time when the area experiences higher levels of traffic. This will further complicate air traffic controllers’ ability to manage

traffic in the area. Exhibit 41 (2010 ARTS Memorandum); Exhibit 46 (09/02/08 Brookner Report, rev'd 06/13/10). As a result, FAA should have analyzed this effect before presuming that the known interference with radar would not rise to the level of "significant."

5. OES' proposed mitigation does not even satisfy its own recommendations.

The 2009 OES Radar Report made several recommendations to minimize adverse effects to existing FAA radars from the Cape Wind Project. Exhibit 17 (2009 OES Radar Report) at p. iv. However, as noted below, OES failed to follow its own recommendations in issuing the 2010 Determinations.

- The 2009 Report recommended that in addition to installing a TDX-2000 for the ASR-8 at FMH, the ARTS-2E associated with the ASR-8 should be modified to accept a digital input (estimated cost to be determined). *This recommendation was not included as a mitigation condition in the 2010 Determinations.*
- The 2009 Report recommended that the Displays at the Cape TRACON should be upgraded to digital displays (estimated cost to be determined). *This recommendation was not included as a mitigation condition in the 2010 Determinations.*
- The 2009 Report recommended that common ARTS does not allow a sensor mosaic, but there may be upgrades or alternatives to the current configuration to increase the flexibility of the ARTS-2E. The Common AETS Program Office and Common ARTS National Ops Support group should be consulted to determine if there are any upgrades or alternatives to the current configuration of the automation systems at the Cape TRACON. Any cost associated with these upgrades should be considered during negotiations with the wind power provider. *It is not apparent that OES consulted with the relevant parties prior to issuing the 2010 Determinations.*
- The 2009 Report recommended that FAA Tech Ops should ensure that there are no performance problems with the ASR-8 or the ASR-9 prior to installation of any wind turbines. *This recommendation was not included as a mitigation condition in the 2010 Determinations and OES' 2010 Radar Study clearly does not satisfy this recommendation. First, the 2010 Radar Report clearly does not establish any process to "ensure" the lack of performance problems prior to installation. Second, OES' tiered mitigation plan is designed to "ensure" effectiveness only after installation. Third, the 2010 Radar Report only addresses the ASR-8. It does not examine performance problems with the ASR-9.*

D. The Cape Wind Project Is A Hazard Because Of Its Impacts To Airport Capacity/Efficiency.

As noted above, the Cape Wind Project would force existing VFR traffic to change regularly-used routes to avoid the Turbines, which, in turn would compress VFR traffic into already crowded IFR corridors. In poor weather, when ATC requires increased spacing between aircraft, aircraft in the area already experience significant delays. For example, during Memorial Day weekend 2010, low visibility led ATC to impose a 10 nmi separation between aircraft resulting in lengthy delays and many cancelled flights. By increasing the number of aircraft operating in and near the IFR corridors, the Cape Wind Project would have the effect of increasing delays and cancellations by decreasing the effective capacity of the already crowded airspace in low visibility. Moreover, degraded radar performance due to the Cape Wind Project would further reduce the effective capacity of the IFR corridors by requiring greater separation to offset the reduced radar performance. In addition to the impact on both IFR and VFR operations, this would have the further effect of reducing the effective capacity of the three Cape and Island airports by forcing different aircraft types with different speeds into a single corridor with in-trail spacing requirements, limiting airfield capacity to the capacity of the ATC system. Exhibit 7 (05/14/10 Airports Letter); Exhibit 21 (LaForge Affidavit). The result would be increased cancellations and extremely long delays. Exhibit 3 (11/26/08 Santos Letter); Exhibit 21 at ¶¶ 28, 29, 33 (LaForge Affidavit); Exhibit 45 at ¶ 25 (Breault Affidavit). This would have a substantial adverse effect on airport capacity/efficiency, Exhibit 45 at ¶¶ 25-27 (Breault Affidavit), which, by itself is an independent basis upon which FAA must issue Determinations of Hazard. Order 7400.2G at ¶ 6-3-3(d).

III. OES ERRED BY FAILING TO FOLLOW ITS ESTABLISHED PROCEDURES AND REGULATIONS

A. OES Failed To Convene A Meeting With Interested Parties.

OES failed to “[c]onvene a meeting with all interested persons for the purpose of gathering all facts relevant to the effect of the proposed construction or alteration on the safe and efficient use of the navigable airspace.” 14 C.F.R. § 77.35(b)(4). *See also* H.R. CONF. REP. NO. 100-484 at 85 *reprinted in* 1987 U.S.C.C.A.N at 2660 (“The FAA should coordinate such [aeronautical] evaluations with state and local aviation officials”). This case presents precisely the scenario in which the need for such meetings was critical. OES had evidence that the Turbines would be located in direct line-of-sight of existing radars and would adversely affect those radars. It also had evidence that a substantial amount of VFR traffic would be impacted. Moreover, it received multiple letters from myriad aviation interests – including airports, pilots and airlines – demonstrating profound concern with the proposed Turbines. Those letters further reflected a number of uniquely local concerns, including Nantucket Sound weather conditions, local fleet mix, search and air rescue needs and local IFR and VFR procedures that interact with the Cape Wind Project in ways not obvious to an outsider. Had these parties been invited to be actively involved in the process, they could have supplied OES with detailed comments and recommendations regarding the adverse effects to air navigation in the region. Instead, OES effectively ignored those local facts and concerns and thereby failed to grasp the substantial hazard the Project will create. Following its own procedures (as well as its own substantive rules as discussed above) would have prevented OES from failing to see how the Project would be a hazard to air navigation.

The fact that OES met with airport officials in July 2008 does not cure this error. OES bears the burden of obtaining all relevant aeronautical information before issuing a

Determination, and the meeting requirement is an important way to ensure that OES meets this burden. OES' 2008 meeting, however, was held at the airports' request, not at OES' request, and it did not appear that OES considered the meeting a substantive part of its investigation. Moreover, the July 2008 meeting was held *before* OES initiated the current aeronautical studies or issued its Determination of Presumed Hazard in February, 2009, and therefore cannot be considered to have met the requirements of Section 77.35(b)(4) with respect to the 2009 Notice of Presumed Hazard. To the Petitioner's knowledge, OES has not met with any interested aeronautical parties since it first circularized the most recent aeronautical studies in February 2009.

B. OES Provided No Evidence Showing That It Adequately Examined The Potential Cumulative Effects Of The Cape Wind Project.

When preparing an aeronautical study, OES has a statutory duty to examine the cumulative impacts resulting from the proposed construction or alteration of a structure when combined with the impact of other existing or proposed structures. 49 U.S.C. § 44718(b)(1)(E); *see also* Order 7400.2G ¶¶ 6-3-2(a)(4) & 7-1-4(b)(5). The 2010 Determinations of No Hazard contain a single, conclusory statement: "The cumulative impact of the proposed structure, when combined with other proposed and existing structures is not considered to be significant." Exhibit 19 (2010 Determinations) at p. 7. There is no explanation of what, if anything, the agency considered in order to reach this conclusion. This is a clear violation of the principles of administrative law. *See, Alvarado Community Hosp. v. Shalala*, 155 F.3d 1115, 1122 (9th Cir. 1998) (failure to consider the factors expressly identified in the controlling statute and guidance is a violation of the Administrative Procedures Act).

C. OES Has Not Complied With Its Own Lighting/Marking Requirements.

FAA's Order is quite clear. If an aeronautical study has disclosed that marking and/or lighting are necessary for aviation safety, OES must include a *specific* marking/lighting recommendation as a condition of the determination. Order 7400.2G ¶ 7-1-4(3). In this case, OES made marking/lighting a condition of the Determinations of No Hazard, and indicated that the Turbines shall be marked and lighted with a "med-dual system" in accordance with FAA Advisory Circular 70/7460-1 K Change 2.

It is not at all evident, however, whether OES has met its duty to ensure that the lighting plan will be in accordance with FAA's Advisory Circular 70/7460-1. *See* Order 7400.2G ¶ 7-1-4(3)(b) (requiring that recommended marking and/or lighting be in accordance with Advisory Circular 70/7460-1). For example, Advisory Circular 70/7460-1 recognizes that "[w]here obstruction lights may distract operators of vessels in the proximity of a navigable waterway, the sponsor must coordinate with the commandant, U.S. Coast Guard, to avoid interference with marine navigation." Advisory Circular 70/7460-1 at ¶ 49(a). There is no mention in the 2010 Determinations of this obligation. Moreover, the Advisory Circular also recognizes that: "Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design." Advisory Circular 70/7460-1 at ¶ 80. Despite these specific requirements, however, OES has provided only the most cursory of information regarding lighting obligations: "As a condition . . . the structure is . . . lighted in accordance with FAA Advisory Circular 70/7460-1 K Change 2, Obstruction Marking and Lighting, a med-dual system – Chapters 4,8(M-Dual),&12." Exhibit 19 (2010 Determinations) at p. 1. Ultimately, it is impossible to tell whether OES properly considered the extenuating circumstances of this project (*e.g.*, the spacing and layout of the Turbines, the weather patterns, the terrain features, and the implications to

marine navigation) in order to reach an appropriate lighting recommendation, consistent with its regulatory obligations.

D. OES Has No Authority To Grant Determinations Of No Hazard For Two Years.

FAA's regulations impose an express 18-month limit on the duration of any determination: "Unless it is otherwise extended, revised, or terminated, each final determination of no hazard . . . expires 18 months after its effective date" 14 C.F.R. § 77.39(a); *see also* Order 7400.2G at ¶ 7-1-4 (a)(5)(a)(1) ("In the case of determinations involving petition rights, the expiration shall be 18 months from the final date of the determination"). Contrary to these established rules, OES issued Determinations of No Hazard for a period of two years for each of the Turbines. Even assuming, *arguendo*, that the Determinations of No Hazard should stand, they must be limited to an 18-month duration period.

E. FAA Must Analyze The Likely Environmental Effects Of Its Determination Pursuant To NEPA Before Making Its Determination.

The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4370(d), requires federal agencies to analyze the environmental impacts of proposed major federal actions. 42 U.S.C. § 4332. Such environmental review is mandatory in order to assure that environmental issues are fully considered in connection with federal decisionmaking. The CEQ regulations define "major Federal action" to "includ[e] actions with effects that may be major and which are potentially subject to Federal control and responsibility." 40 C.F.R. § 1508.18. "Effects" is defined to "include: (a) Direct effects, which are caused by the action and occur at the same time and place," and "(b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." *Id.* at § 1508.8. In assessing whether a federal action is a "major Federal action" within the meaning of NEPA,

there should be “a reasonably close causal relationship” between the environmental effect and the alleged cause.” *Department of Transportation v. Public Citizen*, 541 U.S. 752, 768 (2004).

Typically, advisory opinions do not trigger NEPA because they do not meet the *Public Citizen* test for a reasonably close causal relationship. In this case, however, FAA is not issuing a purely advisory opinion in this matter; its Determinations have concrete consequences. For example, the Determinations condition the start of construction of the Cape Wind Project on *completion* of the mitigation measures set forth on page 9 of the Determinations. Exhibit 19 (2010 Determinations) at pp. 8-9. OES is requiring, as a condition of its determination, that Cape Wind Associates perform specific mitigation measures, including funding the purchase and installation of a TDX-2000 processor for the existing ASR-8 radar at FMH. The determinations also require Cape Wind Associates to fund a \$15 million escrow fund to cover the cost of a new ASR-11 radar for FMH in the event the TDX-2000 does not resolve known radar interference issues with the existing ASR-8 radar at FMH. Those conditions on construction are imposed solely by OES; the United States Minerals Management Service (MMS) expressly eschewed any responsibility or duty for prescribing mitigation to address aviation impacts. Exhibit 47 (MMS Record of Decision) at 24.

Second, OES acknowledges that, as a result of its action, existing flights operating at or below 940 feet ASL will be forced to alter course/and or altitude in order to avoid the Cape Wind Project. Exhibit 19 (2010 Determinations) at p. 7. The Determinations themselves are action-mandating documents that cannot be treated as mere advisory opinions. Third, OES acknowledges that these course changes may result in noise impacts to areas of Martha’s Vineyard, Nantucket and the mainland. *Id.* at 4. Even if such “noise concerns are outside the

scope of 14 C.F.R. Part 77 and are not addressed in an aeronautical study,” they are precisely the kind of environmental impacts that must be analyzed and disclosed pursuant to NEPA. *Id.*

Fourth, FAA’s Determinations of No Hazard were a condition precedent for the entire Cape Wind Project; without FAA’s Determinations of No Hazard, the Cape Wind Project would not have been allowed to proceed. As the MMS stated in its April 28, 2010 Record of Decision, “[Cape Wind Associates] could not begin construction until “[Cape Wind Associates’] receipt of the FAA’s final determination on whether a hazard exists and compliance with any resulting mitigation measures.” Exhibit 47 (MMS Record of Decision) at 24. Moreover, as a practical matter, it is clear that FAA’s determination was necessary to allow the Cape Wind Project to proceed; that if FAA had found that the Cape Wind Project was a hazard that, the Project would not have proceeded as proposed. Accordingly, FAA’s Determinations have a reasonably close causal relationship to both: (1) the ability of the Cape Wind Project to proceed; and (2) the scope of the Project. Therefore, OES had an obligation under NEPA to perform the required environmental analysis.

It is clear that none of the aviation-related environmental effects of the Cape Wind Project are being analyzed in connection with any Federal approvals. To date, MMS has taken the position that it is not responsible for such analysis because FAA is performing its Part 77 aeronautical study and that MMS is relying on FAA’s purported expertise in this area to address all aviation-related issues. Exhibit 47 (MMS Record of Decision) at 24. MMS has not indicated that it will perform any additional NEPA analysis of the Cape Wind Project based on the results of OES’ 2010 Determinations. Accordingly, no federal agency appears to be considering any of the environmental impacts related to the clear impacts on aviation. Because of the magnitude of the Cape Wind Project, the intensely controversial nature of the Project and the critical enabling

role OES' decision could have, OES' environmental review should take the form of an environmental impact statement.

In addition to noise impacts, FAA should also consider the safety and human health risks associated with, *inter alia*, (1) the risk of a collision with one of the 130 440-foot wind turbines in the middle of heavily used airspace; (2) the risk of collision with other aircraft caused by the displacement of aircraft from the airspace that would be occupied by the Cape Wind Project; (3) impacts on search and rescue missions and air ambulance service; and (4) the cumulative and indirect effects of the Cape Wind Project.

IV. FAA SHOULD GRANT A SUBPART E HEARING

Upon receipt of a Petition for Discretionary Review under 14 C.F.R. § 77.37, FAA has one of two options. Either it can conduct a review “on the basis of written materials” or it can conduct a review “on the basis of a public hearing, conducted in accordance with the procedures prescribed in subpart E of [the Part 77 regulations].” 14 C.F.R. § 77.37(c). A hearing pursuant to subpart E involves the examination of witnesses and submission of testimony evidence. As such, it provides substantially more opportunity for ensuring that FAA has fully examined every possible adverse effect to air navigation.

There is evidence before FAA that the public has not yet had an opportunity to review. For example, FAA only made public its 2010 Radar Report after issuing the 2010 Determinations and still has not made public a study by the MITRE Corporation that Petitioner is led to believe addresses VFR impacts from the Cape Wind Project. Exhibit 48 (Petitioner's FOIA Request); Exhibit 49 (05/20/10 Edgett-Baron email). As noted above, only by coordinating fully with interested and affected parties can FAA ensure that it meets its statutory duty to protect the safety and efficiency of the navigable airspace. H.R. CONF. REP. No. 100-484

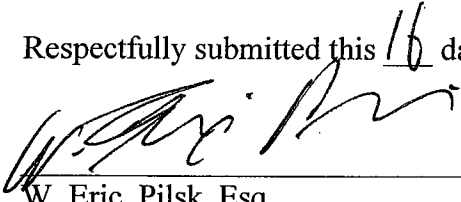
at 85 (“The FAA should coordinate such [aeronautical] evaluations with state and local aviation officials”). The Subpart E hearing process is the optimal means of satisfying that obligation.

It is particularly critical that FAA reach the correct result in the case at hand because the interactions between airports and wind turbines are only just beginning to be fully understood. Indeed, FAA’s determinations on wind turbines have been inconsistent, to date. *Compare*, Exhibit 50 (Aeronautical Studies 2006-AWP-2865 et al.) (Determinations of No Hazard for wind turbines near proposed new airport in Clark County, Nevada, which were subsequently vacated by a federal court for FAA’s failure to fully consider evidence in the record); Exhibit 37 (Aeronautical Study 2005-ANE-995-OE (Determination of Hazard for wind turbines near Logan Airport); and Exhibit 51 (Aeronautical Study 2004-AAL-104-OE) (Determination of No Hazard for wind turbines near Anchorage International Airport, which identified mitigation measures to address known adverse effects). Moreover, the Cape Wind Project is the very first offshore wind energy project to seek federal approvals and is likely to serve as the benchmark for future off-shore projects. In that regard, FAA should invest the energy and resources now, at the beginning of its review of off-shore projects, to ensure that it meets its critical mandate of protecting the safety of air navigation before structures are built.

CONCLUSION

For the foregoing reasons, OES should grant this petition and terminate all 130 Determinations of No Hazard. Such action is necessary to remedy the numerous procedural errors and to ensure compliance with FAA's statutory mandates.

Respectfully submitted this 16 day of June, 2010.



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