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Honorable Alexander Grannis
Commissioner
Department of Environmental Conservation
625 Broadway
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Dear Commissioner:

This letter provides information about a significant environmental impact of the proposed deep natural gas drilling in New York State that is not addressed in the draft SGEIS or the original 1992 GEIS – **the ecological impacts from artificial lighting associated with drilling rigs**. This was formally brought to the attention of NYSDEC during the dSGEIS public comment period in a reply (15Dec09), which I contributed to, from the Cayuga Bird Club. I am submitting this letter to you now because I have just become aware that the drill rig lighting (as is currently operating in PA) is much brighter than I had previously thought, and with little or no control of stray light emissions into the atmosphere. Fortunately, steps can be taken to minimize the ecological impacts from such lighting. I urge the NYSDEC to require such mitigation in the final SGEIS and in all well permits for horizontal drilling and high-volume hydraulic fracturing.

Several weeks ago I was a passenger on a late-evening commuter flight from Philadelphia to Ithaca, NY. Skies were clear and at ~20,000 feet I was shocked to see the **extraordinarily bright lighting** from ~10 drilling rigs in the dark terrain north of Wilkes-Barre, PA. The lighting on these rigs is orders of magnitude greater than any other light source in the landscape. If such lighting is in operation during the peak bird migration periods of August through mid-October and late April through May, large bird aggregations and significant fatality events will occur in the vicinity of the rigs on low cloud ceiling migration nights. Such events are weather dependent and may not happen every year, but in some years massive fatality events of night migrating songbirds could occur. I had previously been unaware of the intensity of the lighting because it is not mentioned in the dSGEIS or 1992 GEIS. My experience last week in seeing the exorbitant lighting on the PA drilling rigs has compelled me to reiterate this concern to you and further raise this issue.

While lighting is essential for rig safety during night operations, steps can be taken to reduce the deleterious impact of such lighting on night migrating birds, lepidoptera and other insects, and perhaps minimize the indirect impact on bats. Such mitigation includes downshielding lights and the use of safety lighting with maximum UV filtering and minimum short wavelength (blue-green) output. The latter frequencies of the light

spectrum are documented to cause greater impacts on birds and insects.¹ For a review of why bird aggregation and fatalities occur in the vicinity of isolated bright light sources, see the introduction of my paper titled *Response of Night-migrating Songbirds in Cloud to Colored and Flashing Lights* linked in the footnote below.²

Mitigation recommendations for environmental impacts of artificial light are currently being implemented by the wind energy industry in the US (including 45+ constructed or proposed wind projects in New York). Federal recommendations and continuing efforts exist for mitigating environmental impacts of artificial lighting on communications towers (potentially involving about 1000 TV and cell towers over 200-ft agl in NY). See links below for Federal guidelines that include artificial lighting mitigation steps for each industry:

Wind industry:

http://www.fws.gov/habitatconservation/windpower/Wind_Turbine_Guidelines_Advisory_Committee_Recommendations_Secretary.pdf

See recommendations #8 & #9 on P. 45.

Broadcast and communications industry:

http://www.fws.gov/habitatconservation/com_tow_guidelines.pdf

See recommendations #5 & #10.

These mitigation recommendations for lighting associated with windpower and communications towers were enacted to reduce fatalities and impacts to more than 50 species of night migrating birds. They include a recommendation for using flashing aviation obstruction lighting but also involve safety and other night lighting in the vicinity of the tower structures. While flashing light is not possible for use as safety lighting in gas drilling operations, downshielding such lighting to the maximum extent possible and using a type of lighting that is documented to have less ecological impact are obvious and relatively simple mitigation steps. The NY gas drilling GEIS and dSGEIS are clearly not in resonance with the national effort to minimize environmental impacts of artificial light. Artificial lighting specifications for ecological impact mitigation are not mentioned in either the GEIS or dSGEIS. Most dSGEIS reviewers would not have a concept of how bright such rig lighting can be, so this was not an obvious topic for reviewers to comment on during the recent dSGEIS comment process.

Unlike shale regions in the western US, the Marcellus shale is located in a region that has a history of large kills of night migrating songbirds at lighted man-made structures. While many bird fatalities at tall man-made structures (e.g., TV and cell towers) are likely due to incidental collisions with supporting steel guy cables during aggregation events, there

¹ See references later in this letter. Also note the following press release from the International Dark Sky Association: http://www.enn.com/press_releases/3112

² Evans, W. R., Y. Akashi, N. S. Altman, and A. M. Manville II. 2007. **Response of night-migrating songbirds in cloud to colored and flashing light.** *North American Birds* 60:476-488.
www.oldbird.org/pubs/lightstudy.htm

is also a substantial record of fatality events at brightly lit facilities in otherwise dark terrain.

Recent examples:

1. 500 dead birds were documented at a brightly lit high school in West Virginia in 2008:

<http://www.wv.gov/news/naturalresources/Pages/BirdStrikeatTuckerCountyHighSchoolonSeptember29.aspx>

While some birds were apparently window kills, many others were found atop the school roof and in the school parking lot. This is evidence of significant bird-bird collisions as well as collisions with any object in the vicinity of the lights.

2. Large Pennsylvania bird kills in October 2005:

Large kills were documented at several brightly lit structures in dark terrain of north-central PA. Staff of the Carnegie Museum of Natural History in Pittsburgh collected many of the carcasses. The PA Game Commission circulated news of the kills (Release #119-05).

Numerous historical records may be found in the following publication:

Avery, M.L., P.F. Springer, and N.S. Dailey. (1980). Avian mortality at man-made structures: An annotated bibliography (revised from 1978 ed.). U.S. Fish and Wildlife Service, Biological Services Program, National Power Plant Team, FWS/OBS-80/54.

For example:

1. Probably hundreds of birds died on the foggy night of 25 September 1965 at a floodlit compressor station atop a West Virginia mountain. At the site are several buildings and a microwave tower. Most of the casualties (“a truck load”) were buried, but 87 birds of 26 species were collected.

Wylie, W.L. 1966. Migration mishap. *Redstart* 33(4):102-103.

2. At two installations near Elizabethton, TN, 1801 birds of 44 species were killed by colliding with floodlit buildings and two small (125 and 85 feet) towers. The weather was foggy with northwesterly winds on 30 September and 1 October 1972 when the losses occurred.

Hendon, L.R. 1973. Bird kill on Holston Mountain. *Migrant* 44(1):1-4.

3. About 1000 birds (22 species) were found on a parking lot at Oak Ridge, TN. Losses were attributed to collisions with overhead power lines, light towers, cars, and pavement. Most carcasses were found beneath the parking lot lights.

Dunbar, R.J. 1954. Bird mortality – Oak Ridge. *Migrant* 25(4):63-64.

Records of such kills are often not published (e.g., recent Oct 2005 kills in PA) or are simply noted in regional bird club newsletters. We know such kills could occur in the Southern Tier of NY because of the fatalities documented at this region's communications towers – e.g., the 20-year avian fatality study organized by Wilfred Howard at the 850-ft high WSYE TV tower atop a hill south of Elmira, NY <http://www.towerkill.com/reports/US/NYR/NYdata1a.html> and a fatality study at a 300-ft communications tower near Alfred, NY by Stephen Eaton. The reason the Southern Tier of NY has not had large bird kills documented away from communications towers is that there have not been isolated brightly lit operations in the dark terrain of this region. While the Southern Tier has brightly lit cities and villages, these areas have a multitude of relatively low-level residential and street lighting that create large domes of light above on cloudy nights. Bird aggregation occurs in such areas, but the density of disoriented birds is more diffused over a broader area and apparently does not lead to notable bird kills. However, as bright lights become more isolated, a different scenario ensues that can result in large bird kills. This is a possibility that the dSGEIS and the original gas drilling law do not address.

The extent of potential artificial light impacts on night migrating birds from natural gas drilling is difficult to gauge because there is no indication in the dSGEIS how many active drilling operations might occur simultaneously in NY and over how many years the drilling may go on. While single well drilling operations apparently may only have an active drilling rig for a month or so, multi-well operations apparently can have active drilling for many months to perhaps a year or more. Based on current operations in PA, it appears like there could be dozens (at least) of simultaneous well drilling operations going on for many years in NY -- I've seen reference that there are already 58 pending well permits in NY.

Going forward with the current dSGEIS could seriously impact, for example, the future status of the Henslow's Sparrow in NY. This night migrating grassland species is in steep decline in NY with perhaps less than a hundred breeding pairs left.³ This species is currently listed as "Threatened" in NY but given current declines may soon be listed as "Endangered" (in the last 20 years it has declined by 80% and nearly disappeared from central and western NY). Any active natural gas drilling operation in the Southern Tier of NY during mid-April through early-May and late September through mid-October has the mechanism to "take" individuals of this species headed to or from the last substantial NY breeding colonies in Jefferson County. Any active drilling operation during these periods will legitimately trigger this concern.

If drilling rig lighting is not substantially mitigated, the following additional species listed as "Threatened" or "Special Concern" in NY will be impacted on some nights during their nocturnal migration: Sedge Wren, Golden-winged Warbler, Cerulean Warbler, Vesper Sparrow, and Grasshopper Sparrow. More than 40 other species of night migrating songbirds will be involved in massive nocturnal aggregation events over natural gas drilling rigs located in dark terrain, and significant fatality events should be anticipated. A NYSDEC notification and drilling operation shutdown protocol should be

³ *Second Atlas of Breeding Birds in New York State*. 2008. McGowan, K.J., Corwin, K. (Eds.) Cornell University Press, Ithaca, NY.

instituted in the final SGEIS for cases when large aggregations of birds are evident. Left unchecked, current lighting regimens used by natural gas drilling operations (as I witnessed in PA) would potentially be in violation of the Migratory Bird Treaty Act.

In addition to impacting migratory birds, bright lighting from drilling rigs will have a major impact on insects. The dSGEIS does not consider insects at all. Each drilling operation would likely be a local population sink for perhaps 500 or more species of lepidoptera, some of which are of population concern. Regional studies in the northeastern US indicate that several species of Saturnid moths (e.g., *Cecropia*) have declined by 90% or more over the past few decades. The NY Natural Heritage Program lists numerous other lepidoptera that are of concern. It is important to recognize that the Southern Tier of NY (where much of the gas drilling would occur) is forested, and hosts a larger and more diverse insect population compared to drilling regions in Wyoming and Texas. Cumulative effects on lepidoptera from 1000+ deep drilling operations in the Southern Tier could have significant insect population impacts if halogen, metal halide, or mercury vapor lighting is used. Fluorescent lighting has a variety of spectral parameters, which have more or less impact on insects depending on the proportions of short wavelength light emitted. While light impacts on insects are difficult to gauge, it would seem that best practice would be to stipulate that the natural gas industry use high pressure sodium night lighting that is known to reduce insect attraction (versus mercury vapor) by up to 75%.⁴ Evidence from my research indicates that such lighting, having less blue and green output, would also be less deleterious to night migrating birds.⁵

A potential impact related to insect aggregation at active drilling sites is attraction of bats. Bats are attracted to concentrations of flying insects.⁶ Most types of artificial lighting cause aggregations of flying insects. Isolated natural gas drilling operations in the wooded Southern Tier of New York would arguably be concentration sites for certain species of bats. Holding pools for recovered hydrofracking fluids in the vicinity of well drilling pads are apparently (according to dSGEIS) proposed to be uncovered. One would anticipate then that bats drawn to insect aggregations in the vicinity of lighted drilling operations might drink from associated frack fluid holding pools – bats can drink while flying and one can imagine feeding bats near rigs swooping down to occasionally get a drink. The dSGEIS does not consider impacts on breeding or migratory bats in the Marcellus shale region of NY. Bat populations, as you know, are already under assault in NY from White-nose Syndrome and commercial wind energy development. See the following link for photographic evidence of bats drinking from a pond:
<http://www.dailymail.co.uk/sciencetech/article-1213851/Stunning-shots-thirsty-bats-swooping-lick-water-garden-pond.html>

⁴ Frank, K. Effects of Artificial Night Lighting on Moths. 2006. In **Ecological Consequences of Artificial Night Lighting**. Catherine Rich and Travis Longcore Eds. Island Press.

⁵ Evans, W. R., Y. Akashi, N. S. Altman, and A. M. Manville II. 2007. **Response of night-migrating songbirds in cloud to colored and flashing light**. *North American Birds* 60:476-488.

⁶ Rydell, J. Bats and Their Insect Prey at Streetlights. 2006. In **Ecological Consequences of Artificial Night Lighting**. Catherine Rich and Travis Longcore Eds. Island Press.

Suggested artificial light mitigation that should be added to the final SGEIS and should be a required condition in all well permits:

1. Based on evidence cited in the volume Ecological Consequences of Artificial Night Lighting⁷, a simple requirement that deep natural gas drilling (or geothermal drilling) operations in NY must utilize relatively long wavelength night lighting (e.g., high pressure sodium lighting) for night-time operations would reduce the impact on multiple species of night-flying lepidoptera and also potentially reduce aggregation phenomenon and associated fatalities of night migrating birds (e.g. Henslow's Sparrow).
2. Downshielding of lighting on drilling rigs must be required to reduce massive avian aggregation events (and associated avian fatalities) on low cloud ceiling migration nights. The SGEIS should specify that the only light that should be visible from above or the side (90 degrees from vertical of light sources) is that which is reflected off the ground or the drilling rig itself).
3. A protocol should be instituted to notify NYSDEC in the event of dead birds in the vicinity of a drilling pad and NYSDEC should have clearance to check pads for dead birds after suspected aggregation nights.
4. A protocol should be instituted for drilling operation shutdown (and rig lights off) in cases when workers notice large aggregations of birds flying in the vicinity of the rig or when NYDEC suspects that such aggregations may occur.
4. Require hydrofracking fluid holding ponds to be covered with nets so that bats (and other animals) are not able to drink from them.

Conclusion

As an environmental consultant involved with utility-scale wind energy in NY⁸, it appears to me that the wind energy siting and review process in NY is more up-to-date and robust in addressing potential environmental impacts. Certainly with regard to artificial lighting, wind energy developments in NY currently include the most up to date artificial lighting specifications for mitigating avian impacts while proposed natural gas drilling requirements are deficient in this regard. Wind energy is addressing bat impacts, while the natural gas industry has apparently not even considered that bats in flight may drink out of frack fluid holding ponds. These are simple issues to address in the final SGEIS and in individual well permits by means of mitigation requirements and permit conditions regarding drilling operation lighting and hydrofracking fluid holding ponds.

⁷ **Ecological Consequences of Artificial Night Lighting**. 2006. Catherine Rich and Travis Longcore Eds. Island Press.

⁸ My expertise on nocturnal bird migration is known to your staff involved with wind power, including Jack Nasca, Chief, Energy Projects & Management in the Division of Env. Permits.

If the final SGEIS does not require adequate mitigation of these issues, many individual drilling operations could require site-specific determinations of significance under SEQR because of potential ecological impacts from night lighting. Legal challenges on other grounds may also be possible and therefore may be a future impediment for natural gas drilling in NY. I believe a broad area of the Marcellus shale region in NY could face such well-by-well legal challenges if the final SGEIS does not programmatically address the issue of artificial lighting and all well permits do not mandate adequate mitigation.

Respectfully submitted,

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