STATE OF NEW YORK
BOARD ON ELECTRIC GENERATION SITING AND THE ENVIRONMENT

Application of Cape Vincent Wind Power, LLC, for a Certificate of Environmental Compatibility and Public Need to Construct an Approximately 200-285 Megawatt Wind Electric Generating Facility in the Town of Cape Vincent, New York	Case 12-F-0410

PRELIMINARY SCOPING STATEMENT

EXHIBIT I

STATE OF NEW YORK

PUBLIC SERVICE COMMISSION

STATEMENT OF INTERIM POLICY

ON MAGNETIC FIELDS OF

MAJOR ELECTRIC TRANSMISSION FACILITY

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

CASES 26529 and 26559 - Proceeding on Motion of the Commission as to Regulations Regarding Electric and Magnetic Field Standards for Transmission Lines

STATEMENT OF INTERIM POLICY ON MAGNETIC FIELDS OF MAJOR ELECTRIC TRANSMISSION FACILITIES

Issued and Effective: September 11, 1990

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

COMMISSIONERS PRESENT:
Peter Bradford, Chairman
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STATEMENT OF INTERIM POLICY ON MAGNETIC FIELDS OF MAJOR ELECTRIC TRANSMISSION FACILITIES

(Issued and Effective: September 11, 1990)

Background

In April 1988, the Commission began a process looking toward the adoption of an interim magnetic field standard for future major electric transmission facilities.[1] The interim standard, by analogy to the Commission's 1978 decision on electric fields,[2] is intended to ensure that magnetic fields at the edges of future major electric transmission facility rights-of-way will be no stronger than the fields typical of the many existing 345 kV lines operating throughout the State.

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1. Cases 26529 and 26559, et al., Order Continuing Interim Transmission Line Electric Field Standard, Directing That an Interim Transmission Line Magnetic Field Standard be Developed and Directing Utilities to Undertake Studies, (Issued and Effective April 12, 1988).
2. Cases 26529 and 26559, 18 NY PSC 665, 690.

Pursuant to other provisions of the 1988 Order, the major New York State electric utilities, in consultation with the Department of Public Service staff, developed a protocol for a statewide survey of magnetic fields around operating 345 kV circuits. Following completion of the survey, the utilities presented the data at a public Technical Conference convened by staff in Albany on July 26, 1989. At the Technical Conference, the utilities explained how the data had been collected and provided statistical analyses of the magnetic field strengths observed. Questions and comments on the presentations were received both during and following the Technical Conference.

After reviewing the record of that Conference, staff developed a proposed interim policy, including an interim magnetic field standard, for consideration by the Commission at the session of March 28, 1990. The Commission issued the proposed interim policy for public comment on April 26, 1990. The nine letters of comment received were reviewed and used to revise this Statement of Policy that we now adopt.

Development of the Interim Policy

The utilities, through the Empire State Electric Energy Research Corporation, issued the results of their magnetic field survey in a June 1989 document, Magnetic Field Levels Associated with 345 kV Transmission Circuits in New York State. The 255-page report examined the accuracy of a computer model used to

calculate magnetic fields, determined the variability of measured fields along transmission line rights-of-way, and calculated fields under various operating conditions (because magnetic field varies with load) for all overhead 345 kV transmission circuits in New York State.

The conditions used for the calculations included three New York Power Pool defined loads: the winter-normal circuit rating; the winter-normal conductor rating; and the winter fifteen-minute emergency conductor rating. Although transmission circuits rarely (less than 0.1% of the time) operate at their winter-normal conductor rating, it is a particularly useful reference point for defining an interim field standard because it is the maximum the transmission wires (conductors) can tolerate for an extended time. This rating will produce the maximum magnetic field which can be sustained continuously; it is essentially a design maximum for normal operation.[3]

Results obtained for the 83 circuits studied showed that the average magnetic field at the edges of the rights-of-way, calculated using the winter-normal conductor rating for all circuits, was about 200 milligauss (mG). As noted above,

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3. The winter-normal <u>circuit</u> rating is not useful for the interim standard because it can change if terminal (substation) equipment is modified; the winter fifteen-minute emergency rating is not useful because it is not a normal operating condition. Summer ratings are not appropriate because they are less than winter ratings.

however, the winter-normal conductor rating is a design maximum; transmission circuits normally produce much weaker magnetic field levels. Ninety-nine percent of the time, the magnetic field level at the edge of the right-of-way of the average 345 kV transmission circuit was less than about 55 mG, according to historical load flow data presented in the report. Ninety percent of the time, the field was less than 45 mG; 50% of the time, it was less than 30 mG; 10% of the time, it was less than 15 mG.

The report also showed that the magnetic field directly above underground 345 kV transmission circuits is on the order of 1 mG, measured one meter above ground during maximum normal power flow.

Methods for using the magnetic field survey to develop a transmission line standard were solicited in the announcement for the Technical Conference. Written comments were submitted by Doreen Banks, secretary of the East Williston Civic Association; by Adam J. Becker and Robert O. Becker, M.D. of Becker Biomagnetics; and jointly by New York State's investor-owned electric utilities and the New York Power Authority. Oral comments were presented by Doreen Banks, by Henry Nowak (a consultant and former Niagara Mohawk employee), and jointly by the utilities and the New York Power Authority.

After reviewing the record of the Technical Conference and the state of knowledge with respect to possible biological

effects of electric and magnetic fields, staff recommended the adoption of a proposed interim policy, including an interim magnetic field standard. On April 26, 1990, we issued a notice requesting comments on the proposed interim policy. Nine letters of comment were received.

Several of those commenting revisited the basic premise for the magnetic field standard. Mrs. Mary Jane L. Row stressed the need for reliable and current health effects information so that informed decisions can be made. Mr. Harry P. Bifulco, Jr. questioned the medical and scientific basis for the proposed standard. Ms. Doreen Banks objected to the idea of basing the standard on fields that are typical of existing 345 kV lines. Dr. Robert O. Becker argued that a direct causal link between magnetic field exposure and adverse health effects has been established, and that a more stringent standard is warranted to protect public health.

The Department of Environmental Conservation, W. T. Kaune and J. M. Silva (Enertech Consultants), the New York State utilities and the Power Authority were generally supportive of the proposed Statement of Policy.

Discussion of Policy and the Interim Standard

The staff recommendations in this matter proceeded from the premise that adoption now of a standard based on health effects would be unreasonable given the current state of

research; the research does not provide a basis for choosing a standard. Hasty adoption of unnecessarily strict standards would itself compromise public safety by making it more difficult and costly to provide needed energy supplies.

In these circumstances, the better approach is one of "prudent avoidance," as advocated in the May 1989 Background Paper, Biological Effects of Power Frequency Electric & Magnetic Fields, issued by the U. S. Congress, Office of Technology Assessment. That approach recognizes that while emerging evidence does not provide a basis for asserting that magnetic fields pose a significant risk, neither does it allow one to assert categorically that there are no risks. Prudence therefore suggests a degree of caution in dealing with magnetic fields until further research permits a more conclusive determination.

These considerations support an interim standard that would avoid unnecessary increases in existing levels of exposure to magnetic fields. Such a standard thus would apply only to future transmission line facilities subject to Article VII of the Public Service Law, and would not be intended to imply either "safe" or "unsafe" levels of exposure. Its function would be to restrict the design choices for future transmission facilities; designs which could produce higher magnetic fields than typical 345 kV lines are to be avoided.

The report, Magnetic Field Levels Associated with 345 kV Transmission Circuits in New York State, shows that the

average magnetic field at the edges of the rights-of-way for all 345 kV transmission circuits in the State, calculated using their winter-normal conductor ratings, is about 200 mG.[4] This magnetic field level can therefore be considered typical of those that can be produced by the many existing 345 kV lines throughout the State, and will be the interim standard. Consistent with the use of winter-normal conductor rating for the interim standard, winter-normal conductor sag should be assumed in compliance calculations. Choice of 200 mG for the interim standard restricts the design options for future transmission facilities, thus avoiding unnecessary increases in magnetic field exposure.

When transmission lines are constructed within or across public thoroughfares, the term "right-of-way" is not directly applicable. For the purpose of this interim standard, typical right-of-way widths will be used in those circumstances: 150 feet for 345 kV circuits, 120 feet for 230 kV circuits, and 100 feet for lower voltage circuits, with the transmission line centered.

When multiple transmission circuits will exist within the same corridor, the interim standard is to apply to the combination of circuits and operating conditions which would

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4. Consistent with ANSI/IEEE Standard 644-1987, maximum rms flux density is used, as opposed to the square root of the sum of the squares of three orthogonal components.

reasonably be expected to produce the highest edge of right-of-way field.

Article VII applications are required to contain a statement explaining what consideration, if any, was given to any alternate method that would fulfill the energy requirements with comparable costs. The statement must include the comparative advantages and disadvantages of any alternative considered. The interim standard requires that the levels of electric and magnetic fields produced at the edge of the right-of-way for each alternative be addressed in this context. Thus, the applicant will be required to consider magnetic fields even when the 200 mG standard may not be a limiting constraint (e.g., in applications for 115 kV vertical configuration circuits).

These interim measures are subject to modification upon a showing of significant change in the body of knowledge on this issue.

Conclusion

The Commission concludes that a prudent approach should be taken that will avoid unnecessary increases in existing levels of magnetic field exposure. Therefore, the following interim measures, applicable only to future electric transmission facilities certified under Article VII of the Public Service Law, are adopted:

1. Future Article VII transmission circuits shall be designed, constructed and operated such that magnetic fields at the edges of their rights-of-way (measured one meter above ground level) will not exceed 200 milligauss when the circuit phase currents are equal to the winter-normal conductor rating (as defined by the New York Power Pool).

2. Where there is no edge of right-of-way defined, the field level shall not exceed the value specified in paragraph 1 above at a horizontal distance of (a) 75 feet from the centerline of the structures supporting an Article VII transmission circuit operating at 345 kV, (b) 60 feet from the centerline of the structures supporting an Article VII transmission circuit operating at 230 kV, and (c) 50 feet from the centerline of the structures supporting an Article VII circuit operating at a lower voltage.

3. For overhead Article VII transmission circuit proposals where multiple transmission circuits will exist within the same corridor, the combination of circuits and operating

conditions that can reasonably be expected to produce the maximum edge of right-of-way fields shall be used in determining compliance with the interim standard.

4. In the Exhibit required by 16 NYCRR Part 86.4, which includes an evaluation of the comparative advantages and disadvantages of any alternative considered, Article VII applicants should address the levels of fields to be produced at the edge of the right-of-way for each alternative considered.

5. Opinion 78-13 established an electric field strength interim standard of 1.6 kV/m for Article VII electric transmission facilities (at the edge of the right-of-way, one meter above ground level, with the line at rated voltage). The conditions set forth in items 2-4 above are to be added to that policy.

By the Commission,

John J. Kelliher

Secretary

STATE OF NEW YORK
DEPARTMENT OF PUBLIC SERVICE

August 20, 1990

TO: THE COMMISSION

FROM: THE STAFF EMF COMMITTEE

SUBJECT: Cases 26529 and 26559 - Proceeding on Motion of the Commission as to Regulations Regarding Electric and Magnetic Field Standards for Transmission Lines

RECOMMENDATION: The Commission should adopt a statement of interim policy to limit magnetic fields at the edges of future major electric transmission line rights-of-way to 200 mG.

Summary

After a review of the nine comments received in response to the Commission's proposal to establish an interim magnetic field standard for new Article VII transmission lines, staff recommends that the Commission adopt the attached statement of policy. It incorporates the basic provisions of the proposed statement with several minor revisions necessitated by the submitted comments. The policy statement provides a prudent approach that will avoid unnecessary increases in existing levels of electric and magnetic field exposure from future electric transmission facilities authorized under Article VII of the Public Service Law. The statement of policy:

1. Establishes a 200 mG edge of right-of-way magnetic field standard;

2. Clarifies application of the standard when no right-of-way exists.

3. Clarifies application of the standard to multiple circuit corridors;

4. Requires evaluation of magnetic fields for any alternative considered in an Article VII application; and,

5. Applies conditions 2-4 to the 1.6 kV/m electric field standard.

Introduction

At its session on March 28, 1990, the Commission considered the adoption of a statement of policy (including an interim standard) to limit magnetic fields at the edges of the rights-of-way of future major electric transmission facilities subject to Article VII of the Public Service Law. A notice requesting comments on the Proposed Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities (Statement of Policy) was issued April 26, 1990; comments were due May 28. Nine letters of comment were received.

Analysis of Comments

Several commentors revisited the basic premise for the magnetic field standard. Mrs. Mary Jane L. Row of Clifton Park stressed the need for reliable and current health effects information so that informed decisions can be made. Mr. Harry P. Bifulco, Jr. of Huntington Station questioned the scientific basis for the proposed standard. Ms. Doreen Banks of Williston Park objected to the idea of basing the standard on fields that are typical of existing 345 kV lines, levels which she argued are

"far greater than what is considered a threat to human health." Dr. Robert O. Becker (Becker Biomagnetics) rejected the claim in the Proposed Statement of Policy that "as yet, no studies have established a direct causal link between magnetic field exposure and adverse health effects;" he argued that the link has been established and that a more stringent standard is warranted to protect public health.

As is indicated in the Proposed Statement of Policy, the proposed standard was chosen after a thorough (and ongoing) review of the current state of knowledge with respect to possible biological effects of fields. While the biological effects research gives cause for concern (the raison d'etre for the proposed interim standard), it does not provide a basis for choosing the standard. Instead, the standard is based on the concept of "prudent avoidance"; the 200 mG standard requires the utilities to avoid certain transmission line designs which produce stronger magnetic fields than the typical or average 345 kV line. Since the question of whether or not a link has been established between magnetic field exposure and adverse health effects is a subject of continuing debate, the statement referenced by Dr. Becker has been deleted from the revised Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities attached to this memorandum.

The Department of Environmental Conservation (DEC) commented that, in addition to placing the 200 mG limit on the winter-normal conductor rating (a design standard), a 100 mG limit should be placed on the "average annual magnetic field" (an operational standard). Ms. Banks also recommended that a limit

be placed on the magnetic fields produced during normal operation.

There are several problems with imposing an operational standard. An operational standard, such as that proposed by the DEC, serves a purpose similar to that of the design standard proposed by the Commission, but at much greater cost and complexity. The design standard simply requires that future transmission lines be designed so that their magnetic fields are no greater than those that can be produced by existing lines. An operational standard, on the other hand, would require extensive monitoring of continually varying field levels to assure compliance, and would require potentially costly remedies if the monitoring were to show a violation of the "average" operational standard. The current state of knowledge of magnetic field health effects does not warrant such an effort.

The New York State utilities and the Power Authority submitted joint comments generally supportive of the Statement of Policy. Their recommended changes are primarily editorial in nature; most are incorporated in the revised Statement of Policy.

The Power Authority submitted independent comments in addition to the joint comments. Concerning the proposed requirement that "where multiple transmission circuits will exist within the same corridor, the combination of circuits producing the maximum edge of right-of-way fields shall be used in determining compliance ...," the Authority recommended that periods of maintenance be excluded. The Power Authority's recommendation runs counter to the purpose of this requirement, which was to <u>consider</u> periods when one or more circuits are out-of-service for maintenance or other reasons. Without this

requirement, the magnetic field of the new line could exceed the standard when one or more circuits are taken out of service. Also, this requirement will normally cause the 200 mG standard to be applied to individual circuits, which is appropriate since the standard is based on a survey of individual circuits.

The Power Authority also points out that the "multiple circuit" requirement does not specify the condition of service of the individual circuits. The revised Policy Statement has been modified to indicate that the combination of circuits and operating conditions that will produce the maximum edge of right-of-way fields shall be used in determining compliance. As a practical matter, this condition should rarely require consideration of more than two or three circuits operating at winter-normal conductor rating (or nominal voltage for the electric field interim standard).

The Power Authority also recommended that the Statement of Policy be modified to specify the condition of sag (the ground clearance) to be used in determining compliance. Consistent with use of the winter-normal conductor rating, the revised Statement of Policy specifies that winter-normal sag be used to determine compliance.

In a second letter, Mr. Bifulco submitted a mathematical derivation showing that, contrary to the assertion in the Statement of Policy that "magnetic fields are not expected to be higher at angles than along straight runs [for underground 345 kV transmission pipelines]," the magnetic field at a right angle bend is 70% higher. Mr. Bifulco's derivation is correct, however the predicted 70% increase is applicable only at distances from the pipeline that are large compared to the radius of curvature

of the bend (which, for a 345 kV pipeline, is typically 100 feet). But the magnetic field of such a pipeline is negligible beyond about 10 feet; within 10 feet of a bend, it is more accurate to use the same magnetic field as for a straight pipeline.

W.T. Kaune and J.M. Silva (Enertech Consultants) recommend that the Statement of Policy specify whether the 200 mG is the maximum flux density, or the square root of the sum of the squares of three orthogonal measurements. Kaune and Silva point out that the second method can give varying results depending on the frame-of-reference chosen. Staff is aware of that problem; the measurements and calculations on which the proposed standard is based use the maximum flux density. For clarity, the revised Statement of Policy has been changed to specify that the 200 mG is the maximum flux density; this specification also is consistent with ANSI/IEEE Standard 644-1987, IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines.

Conclusion

After a review of the comments received in response to the Commission's Notice of Proposed Policy, staff has made several minor revisions to the proposed Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities. The

revised statement, which is attached hereto, carries forward the essential elements of the proposed statement. Staff recommends that it be adopted.

Respectfully submitted,

Frederick M. Carr
Principal System Planner
Power Division

John C. Crary
Deputy General Counsel
Office of General Counsel

Daniel A. Driscoll
Program Research Specialist
Office of Energy Efficiency and Environment

James de Waal Malefyt
Assoc. Aquatic and Terr. Ecologist
Office of Energy Efficiency and Environment

David P. Stricos
Principal Utility Research Analyst
Power Division

APPROVED:

Laurence B. DeWitt
Director, Office of Energy Efficiency and Environment

Gerald F. Walsh
Director, Power Division