D.T.E. 01-68

Investigation by the Department of Telecommunications and Energy on its Own Motion into the Service Quality of Massachusetts Electric Company and Nantucket Electric Company

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APPEARANCES: Amy Rabinowitz, Esq.
Massachusetts Electric Company
and Nantucket Electric Company
25 Research Drive
Westborough, MA 01582
FOR: MECo
Respondent

Thomas F. Reilly, Attorney General
By: Joseph W. Rogers
Assistant Attorney General
Regulated Industries Division
Public Protection Bureau
200 Portland Street
Boston, Massachusetts 02114
Intervenor

I. INTRODUCTION

On August 24, 2001, the Department opened an investigation into the service quality of Massachusetts Electric Company and Nantucket Electric Company (collectively "MECo" or "Company") ("Notice Opening Inquiry"). The Department stated that the focus of this investigation would be MECo's management of its distribution system. The Department specifically directed MECo to provide information in the following areas: growth forecasting; communication and notification procedures during outages; use of emergency generators and other equipment; personnel staffing and deployment during outages;[1] weather forecasting; and maintenance and design of its distribution system. The Department docketed this proceeding as D.T.E. 01-68.

On October 29, 2001, MECo filed a report assessing its distribution system's reliability ("Report"). The Department held four public hearings between November 26, 2001 and December 20, 2001, in Brockton, Worcester, Haverhill, and Gloucester, Massachusetts. The Department also held a public hearing at our offices on January 17, 2002.[2] At these hearings,

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[1] By letter dated September 12, 2001, the Department requested the following additional information regarding personnel: (1) adequacy of staffing levels for operation and maintenance of the distribution system, including inspection staffing levels; (2) identification and description of all training programs for employees engaged in electric service operation and restoration efforts; and (3) a cost/benefit assessment of establishing a program of periodic (i.e., over a specified cycle of years) inspection of both above-ground and underground distribution plant to be conducted by personnel who are expressly dedicated to inspection.

[2] At this public hearing, the Department issued four record requests to which MECo responded.

the Department took comments on the Report from elected public officials, representatives of the Commonwealth agencies, and members of the public.[3]

II. MECo's REPORT

A. Introduction

MECo's Report responds to the Department's inquiries regarding the quality of the electric service MECo provides its customers. The Report includes the results of MECo's own internal assessment of its distribution system's reliability,[4] as well as an assessment conducted by an independent consultant.[5] This Order assesses MECo's management of its distribution system by reviewing MECo's performance in the areas of which the Department inquired. In making this assessment, the Department appropriately exercises its supervisory authority pursuant to G.L. c. 164, § 76 without managing the daily activities of the Company. See New England Telephone and Telegraph Co. v. Department of Public Utilities, 360 Mass. 443,

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[3] The communities in which the public hearings were held are listed chronologically according to the date of each hearing and shall be identified in that order (i.e., Tr. 5 shall refer to the public hearing at the Department's offices on January 17, 2002). In total, approximately four elected public officials, including the Attorney General, and twelve members of the public commented at the public hearings.

[4] MECo did not "engage outside, independent consultants to perform" an across-the-board assessment (Chairman Connelly Letter to Cheryl LaFleur, President, dated August 10, 2001), regarding, instead, its own internal resources sufficient for a credible result (RR-DTE-3). Cf. Investigation by the Department of Telecommunications and Energy on its Own Motion into the Service Quality of Boston Edison Company Commonwealth Electric Company and Cambridge Electric Light Company, d/b/a NSTAR Electric, D.T.E. 01-65, at 3 (2002).

[5] MECo retained Navigant Consulting Inc. to provide a strategic asset management approach on reliability, to raise reliability consciousness among National Grid employees, and to identify a cost-effective approach to address the Department's reliability mandates.

466-468, 483-484, 489 (1971) (interference with exercise of judgment by company business management is beyond Department's regulatory power and authority). Finally, the Order summarizes the recommendations and reporting requirements made throughout this Order.

B. Growth Forecasting

1. MECo

In its Notice Opening Investigation, the Department requested information regarding the adequacy of MECo's growth or load forecasting at the community, business district, or neighborhood level. The Department also solicited comments regarding improvements that could be made to MECo's load forecasting process.

In response, MECo states that it develops an electric load forecast annually using a multi-dimensional forecast model (Report 1, at 13). The model employs econometric techniques to define relationships between local economies and load growth (id.). The model also takes in account MECo's knowledge of business customers' expansion or contractions (id. at 13, 14). MECo updates and tests refinements to the model annually (id. at 13).

MECo states that it divides its service territory into twenty power supply areas ("PSAs") for load forecasting purposes and creates an annual forecast for each (id.). MECo's personnel collect data each month from a network of load recording meters to determine two key load values: (1) the peak load in megawatts ("MW") for each PSA; and (2) the PSA load at the time of the MECo monthly peak (id.). The model is built to forecast the MECo-coincident peak loads that are then used to forecast the peak load for each PSA (id. at 13-14).

MECo also states that the forecast model uses variables to develop an econometric relationship for the load of a PSA at the time of MECo's coincident peak (id. at 14). For each PSA, these variables include weather data, an economic index variable, and a series of dummy variables for the unexplained changes in load during certain months (id.). MECo uses the variables to explain variations in historic loads and improve the model's ability to forecast loads (id.).

Weather is an important element in the determination of peak loads on MECo's distribution system (id. at 15). The regression models include weather experience for either the City of Boston or the City of Worcester as a variable for peak loads (id.). Because weather is such an important factor for the level of peak demands reached on the system, MECo calculates two weather-based load forecasts (id.). First, a normal weather or 50 percent-probability peak demand forecast that reflects the average temperatures over the last fifteen years is generated. In addition, a scenario of a extreme weather, or five percent probability peak demand forecast, is developed (id.).

Finally, MECo states that it uses its load forecast when it performs electric facility planning studies for periods of ten years or longer by modeling the power system under current and future load conditions using the five percent probability extreme weather forecast for load growth (id. at 16). MECo also applies its load forecasts to its annual feeder loading review (id. at 17). The Company compares the projected peak load with the capability of the feeder to meet that load level to determine if improvements need to be made (id.).

2. Analysis and Findings

The Department has long reviewed utility load forecasts. In the past, we have reviewed load forecasts with a view toward generation adequacy. See 220 C.M.R. §§ 10.00 et seq. In this review, however, the Department's analysis focuses on the Company's use of load forecasts in the operation of the distribution system. See Order Commencing a Notice of Inquiry into (1) rescinding 220 C.M.R. §§ 10.00 et seq. and (2) exempting electric companies from any or all of the provisions of G.L. c. 164, § 69I, D.T.E. 98-84/EFSB 98-5 (1998).

Load forecasting is a very important component of transmission and distribution ("T&D") facilities' expansion or upgrade planning. Accurate load forecasts allow planning engineers to simulate the behavior of transmission lines, distribution lines, and the equipment between them. Accurate load forecasts, together with the correctly-modeled, planning databases in the distribution analysis software, allow engineers and management to envision future problems likely to happen through distribution system simulation during normal operating conditions and also during emergency conditions. Results of these simulations allow management to allocate necessary resources properly. Under-forecasts could stress the system beyond its capability and jeopardize the ability to serve customer load, and would make the distribution system more susceptible to frequent breakdown at various locations. Over-forecasts would result in excessive capital and human resources need estimates, ultimately leading to an over-built system needlessly costly to ratepayers.

There are benefits to MECo's multi-dimensional forecast model and forecasting process. For example, the use of an individual PSA growth rate in formulating system load forecasts

allows disaggregation of load growth based on geography, economics, and land use. Further, the inclusion of a new industrial or commercial load (step loads) expected in certain supply areas in future years will improve the allocation and accuracy of peak forecasts.

There are, however, omissions in MECo's forecast model and forecasting process. First, MECo uses extreme weather conditions only for the City of Boston and the City of Worcester in its model, but it has not used extreme weather conditions for each PSA. This could skew the forecast results and hence the planning model.

Second, MECo has not reported the effect of T&D system losses and its impact on the peak demand forecasts. The system losses are an integral part of a total system load that need to be considered in serving customers' load. By using more efficient transformers, larger wires and capacitators, the magnitude of peak load demand required at the system level could be reduced. Therefore, MECo's plans regarding the use of more efficient equipment at each PSA need to be addressed and, if appropriate, incorporated in its load forecasting process.

Third, while MECo states that it uses extreme weather peak demand forecasts for planning facilities, MECo does not discuss how it uses those forecasts. MECo needs to describe whether it uses the forecasts to plan T&D facilities under two conditions: normal (no outages) operations with extreme weather; and, emergency (with outages) operations with extreme weather. Such use would uncover and identify any weaknesses in the infrastructures of the entire T&D system. Therefore, MECo should consider the of use extreme weather peak forecasts for planning T&D facilities during emergency conditions as well as normal conditions.

Fourth, while MECo states it has implemented demand-side management ("DSM") and energy efficiency programs (Report 2, Att. 7, at 4), MECo does not describe how it factors these programs into its forecasting process. Therefore, MECo must address the effect, if any, of these programs in its forecasts.

Based on the foregoing, the Department finds that while MECo has undertaken steps that will enable it to obtain accurate and reliable load forecasts, there are further steps that MECo may take. Therefore, the Department directs MECo to consider including the following in its load forecasting process and to report back by June 1, 2002 on the value and feasibility of these measures:

1. The use of extreme weather conditions in each PSA;
2. The effects of T&D system losses, and measures to reduce them, in each PSA and system-wide peak demand forecasts; and
3. The effects of DSM and energy efficiency programs on its forecasts.

The Department also directs MECo to submit annually 10-year peak demand load forecasts for each PSA, including for each PSA's bulk-stations and feeders, under extreme and normal weather conditions, for summer and winter. These forecasts should include, but not be limited to, the factors discussed above.

C. Communications and Notifications Procedures

1. MECo

In its Notice Opening Investigation, the Department requested information regarding the appropriateness of MECo's communications and notifications procedures. In particular, the Department sought information regarding procedures during outage and storm recovery, both internal to the company and between the company and the following entities: municipalities,

affected neighborhoods, political leaders, and regulators. The Department made specific inquiry into MECo's use of accurate and real-time updates. In response, MECo claims that it has communication and notification procedures in place that permits customers and municipal officials to receive the best available information during any outage (Report 1, at 40). MECo states that its communication and notification procedures include the following: (1) a centralized customer service center, which operates 24 hours a day, seven days a week; (2) dedicated telephone lines for municipal personnel; and (3) emergency operation plans at the system-wide and district levels, which are revised annually, by which MECo assesses overall damage during an outage, obtains resources to perform service restoration work, and communicates with necessary company personnel, the customer service center, municipal officials, and individual customers (id. at 7-8, 40-45). MECo also has special procedures in place for disseminating information to "Life Support Customers," who have a medical condition that requires electric service (id. at 46). Finally, MECo claims that it complies with the Department's outage and reporting protocol ("ORP") regarding the notification of affected municipalities and the Department whenever there is an outage (id. at 7).

2. Analysis and Findings

MECo avails itself of reasonable communication and notification procedures. These procedures include complying with the Department's ORP, which requires regular updating of lists of key contacts at both the municipal and the Department level. These procedures are enhanced by MECo's annual review of their implementation and effectiveness. MECo, however, has not informed the Department what changes, if any, it has made due to its

experience during the outages of the Summer of 2001. Useful lessons may have been drawn from the effects of last summer's weather on the MECo system. These lessons need to be articulated and absorbed before Summer 2002. Therefore, the Department directs MECo to report back on this issue by June 1, 2002.

D. Use of Emergency Generators and Other Equipment

1. MECo

In its Notice Opening Investigation, the Department requested information regarding the adequacy of MECo procedures regarding the deployment of emergency generators and other equipment to restore critical service or ease prolonged interruptions. MECo responds that it has both mobile spare equipment and portable emergency generation to use during emergency conditions (Report 1, at 6, 32).

2. Analysis and Findings

MECo states that it is adequately prepared to restore service during outages because of its inventory of spare equipment and its recent acquisition of portable emergency generation. To support its position regarding spare equipment, MECo has provided a detailed list of mobile spare equipment. MECo has not provided an analysis, however, of the adequacy of the portable emergency generation to support its position regarding portable generation during emergency conditions. This lapse is particularly noteworthy because of the precarious position MECo is in with respect to certain parts of its service territory. For example, MECo admits that Cape Ann continues to face the potential of existing cable failures and service interruptions (id. at 35) during 2002. To manage and reduce the risk of these events, portable emergency

generation may be necessary as MECo has advised us. Therefore, the Department seeks further information regarding this issue, including the number of generators, the magnitude of output of the generators, and MECo's deployment procedures. Based on the foregoing, the Department requests the following by June 1, 2002:

1. A list of mobile emergency generators, including number, magnitude of output, and deployment procedures; and
2. Explanation of the adequacy of MECo's emergency portable generation for MECo's entire service territory, especially considering the acknowledged potential for outages in Cape Ann and the remoteness of some parts of MECo's service territory, e.g, Nantucket.

E. Personnel Staffing and Deployment

1. MECo

In its Notice Opening Investigation, the Department requested information regarding the soundness of staffing levels and personnel deployment procedures. MECo responds that, during the summer of 2001, the Company had sufficient resources, including training, to respond to outages (Report 1, at 37-40). The Company used its own personnel, including those available from outside the operating district needing restoration, and outside contractors (id. at 39). Nevertheless, MECo has committed to add about 125 engineering and physical workers (Tr. 5, at 14).[6] MECo claims that the additional staff together with current employees are adequate for the operation and maintenance of the distribution system under normal and emergency situations (id.). MECo asserts that its staffing adequacy should be even stronger given its merger with Niagara Mohawk (id. at 56; Report 1, at 40).

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[6] For the spring of 2002, MECo has made commitment to add a total of 125 engineering and physical workers on the top of the existing 700 physical workers (Tr. 01-68 at 14).

2. Analysis and Findings

The adequacy of properly trained staff to maintain good service and to restore service after an outage is a matter of great importance. Given MECo's existing resources and plans to hire additional personnel, the Company appears to have adequate resources for its T&D system. While the Company maintains adequate training programs, the Department will need periodic reports on the training programs that the additional 125 engineering and physical workers attend relating to electric service operation and restoration efforts. In conclusion, the Department directs the following quarterly reports:

1. Progress on the hiring and training of the 125 engineering and physical workers; and
2. Activities of the emergency assistance resource sharing, including a description of effect on this program of MECo's merger with Niagara Mohawk.

F. Weather Forecasting

1. MECo

In its Notice Opening Investigation, the Department also sought information regarding MECo's weather forecasting. MECo responds that it obtains weather forecasts from multiple sources (Report 1, at 19). MECo's primary provider of weather forecasts is Meteorlogix of Lexington, Massachusetts. This service includes custom forecasts posted on Meteorlogix web site, forecasts faxed twice daily to various Company locations, additional forecasts faxed to the Company in anticipation of severe weather, and around-the-clock access to certified meteorologists (id.). Further, in circumstances of a significant weather threat, MECo reviews weather forecasts of available media outlets (id.). Finally, MECo notes that it also has access to the Internet's vast resources for weather data and forecasts.

MECo states that it uses the weather forecasts it receives to help make resource acquisition and deployment decisions (id. at 20). First, MECo states it continually monitors the weather forecasts. Second, MECo states that it applies its best judgment, based on its experience, as to the likely impact of the weather event on its distribution system (id.). Then, MECo claims it implements an appropriate level of response according to established emergency plans and restores electric service as safely and quickly as possible (id.).

2. Analysis and Findings

MECo avails itself of reasonable avenues of weather forecasting. The Company, however, must ensure that it maintains a close nexus between forecast reports of extreme weather and adequate staffing of both line crews and the consumer call center commensurate to those reports. There is no detail in MECo's report as to how this nexus will be maintained. Therefore, the Department directs MECo to report back on this issue by June 1, 2002.

G. Maintenance and Design

1. Overall Maintenance Practices and Spares Inventory

a. MECo

In its Notice Opening Investigation, the Department requested information regarding adequacy of overall and particular community maintenance practices and of equipment and spares to meet outage restoration demands. MECo responds that it has several different programs in place for focused maintenance efforts (Report 1, at 28). These programs include: (1) regular maintenance of line reclosers, line voltage regulators, and capacitors; (2) vegetation management; (3) visual inspection of feeders, wooden poles, lightning arresters, blown fuses,

broken insulators, and potential damage due to overloads; (4) an infrared inspection; and, (5) targeted pole replacement (id. at 28-30).

Regarding the pole replacement program, MECo states that the Company is currently putting into place, starting in the beginning of 2002, a geographic information system, known as NEEGIS, that will provide the capability to implement a targeted pole replacement program (id. at 29-30). Furthermore, the Company stated that it intends to begin an underground improvement initiative, which will target areas that have exhibited repeat failures and focus on fuse cutouts, grounding, cathodic protection, and a life extension process for underground cross-linked polyethylene cables (Tr. 5, at 41-42). Finally, MECo states that the Company maintains a large inventory of transformers, circuit breakers, mobile transformers and circuit switchers, battery trailers, and transmission structures (Report 1, at 35).

B. Analysis and Findings

Regarding the maintenance practices, MECo has generally described its procedures and programs (Report 1, at 37). While MECo generally describes adequate procedures and programs, it does not specify in the Report its activities with respect to tree trimming and pole replacement. Tree interference with utility lines is one of the major causes of outage, and trimming is an essential management tool in outage prevention. Therefore, the Department requests quarterly reports for the next two years regarding the following:

1. tree trimming activities, including procedures, schedules, and a description of the cooperation by and coordination with communities; and
2. pole replacement, including procedures for surveying poles and working with other utilities in this process, with particular attention to systematic removal of double-poles and removing the root cause of undue accumulation of double-poles by better coordination with other owners and tenants of poles.

2. Distribution Design

a. MECo

In its Notice Opening Investigation, the Department requested the identification of distribution design flaws that led to repeated outages on particular circuits, especially circuits that serve critical community facilities. MECo responds that its distribution system is adequate to meet the forecast peak load reliably (Report 1, at 23).

MECo states that it has developed design criteria, material specifications, and construction standards to efficiently build and maintain its electric distribution system (id.). MECo reviews and updates the criteria and standards as necessary (id.). From time to time, MECo uses consultants to assist in these efforts (id.).

b. Analysis and Findings

MECo admits that during the Summer of 2001 its distribution system suffered from severe overloading to the point that 200 transformers failed (Tr. 5, at 19). MECo also acknowledges that supply/substation related outages were the third highest cause of outages (Report 1, at 9). MECo is spending $130 million on infrastructure improvements in 2002 and, again, in 2003 (Tr. 5, at 26). Finally, MECo states that based on its experience with outages during the Summer of 2001, it has begun a review of its design standards, construction practices, and annual feeder loading and overloads.

Based on the foregoing, the Department cannot accept MECo's conclusion that the design of its distribution system is adequate. Given MECo's internal review, it must report to the Department the results of its review regarding its design standards, construction practices,

and annual feeder loading and overloads. The Department directs MECo to submit a progress report regarding its distribution planning process, describing the planning criteria and distribution design guidelines, by June 1, 2002, and including consideration of the following:

1. Evaluating the accuracy, validity and need for the 20 MW hour ("MWH") feeder criteria and the 480 MWH supply line criteria, using experts in the field or consultants (Report 1, at 24);
2. Using five percent probability forecasts or extreme weather peak load forecasts to evaluate distribution system performance under normal conditions as well as under emergency or contingency conditions;
3. Evaluating the use of normalized and standardized forecasts for planning studies;
4. Eliminating the inconsistent use of three-phase load flow programs to perform distribution contingency analysis (id.); and
5. Providing resources to implement NEEGIS system and equivalent of three-phase load-flow software program so that all distribution planning engineers can use them uniformly.

The Department also directs MECo to submit the following:

1. An annual operating study showing power flows and voltages for normal and emergency conditions, including a contingency analysis, at each bulk station in MECo's service territory;
2. A list of significant T&D improvement projects, prioritizing future distribution and transmission projects, identifying their cause, and including a one-line schematic and geographic diagrams, and power-flow diagrams for each project; and
3. A list of critical loads such as hospitals, schools, municipalities by town, including magnitude of the load, the circuit on which the town or load is fed, and MECo's plan to provide electricity to each where studies indicate the inability to withstand contingencies.

III. CONCLUSION

The Department directs MECo to consider further action with regard to the several areas described above. For example, MECo should consider adjusting its forecasting process to include several variables, including the effects of extreme weather, DSM programs, and system losses. Further, MECo should re-examine its design criteria to reduce or prevent future outages. In complying with the Department's requests, MECo should consider including the

assistance of outside, independent consultants who can take a fresh view of the questions raised here. To the extent any of the filing requirements directed by the Department raise the concerns regarding system security, the Company should follow normal procedures for protecting confidential information.

To ensure that MECo completes its planned improvements to its distribution system and applicable Department directives, MECo shall make annual and quarterly reports for the next two years, beginning June 1, 2002, both of which are summarized below:

1. Annual Reports Commencing January 1, 2003: ten-year peak demand load forecasts; planning criteria and guidelines for the entire distribution system planning process; an operating study report showing power flows and voltages for normal and emergency conditions; listing of critical loads by town; listing of significant reliability improvement and infrastructure improvement projects; prioritization of future projects; and
2. Quarterly or Progress Reports Commencing June 1, 2002 And Ending June 1, 2004: listing of available emergency generators, as well as deployment procedures; hiring and training of 125 engineering and physical workers; emergency assistance resource sharing; tree trimming; pole replacement activities.

In addition, on June 1, 2002, MECo shall file a Summer 2002 Readiness Report, assessing (with supporting documentation) its expected ability to respond adequately this coming summer to a repetition, if there should be one, of the severe weather conditions experienced in the June-August 2001 period. In this Summer 2002 Readiness Report, the Company should

pay particular attention to the adequacy of its plans to address distribution system reliability in the Cape Ann area. To the extent any of the filing requirements directed by the Department raise the concerns regarding system security, the Company should follow normal procedures for protecting confidential information.

By Order of the Department,

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James Connelly, Chairman

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W. Robert Keating, Commissioner

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Paul B. Vasington, Commissioner

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Eugene J. Sullivan, Jr., Commissioner

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Deirdre K. Manning, Commissioner