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COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Eastern Edison Company	)	D.P.U. 243

TESTIMONY OF PAUL CHERNICK FOR THE ATTORNEY GENERAL ON THE RATE DESIGN OF EASTERN EDISON COMPANY

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August 19, 1980

TESTIMONY OF PAUL CHERNICK

Q: Mr. Chernick, would you please state your name, position, and office address.

A: My name is Paul Chernick. I am employed by the Attorney General as a Utility Rate Analyst. My office is at One Ashburton Place, 19th Floor, Boston, Massachusetts 02108.

Q: Please describe briefly your professional education and experience.

A: I received a S.B. degree from the Massachusetts Institute of Technology in June, 1974 from the Civil Engineering Department, and a S.M. degree from the same school in February, 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, to membership in the engineering honorary society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi. I am the author of Optimal Pricing for Peak Loads and Joint Production: Theory and Applications to Diverse Conditions, Report 77-1, Technology and Policy Program, Massachusetts Institute of Technology. During my graduate education, I was the teaching assistant for courses in systems analysis. I have served as a consultant to the National Consumer Law Center for two

projects: teaching part of a short course in rate design and time-of-use rates, and assisting in preparation for an electric time-of-use rate design case. I am currently assisting East Texas Legal Services in preparation for the rate design and cost allocation issues of a rate case.

Q: Have you testified previously as an expert witness?

A: Yes. I have testified jointly with Susan Geller before the Massachusetts Energy Facilities Siting Council and the Massachusetts Department of Public Utilities in the joint proceeding concerning Boston Edison's forecast, docketed by the E.F.S.C. as 78-12 and by the D.P.U. as 19494, Phase I. I have also testified jointly with Susan Geller in Phase II of D.P.U. 19494, concerning the forecasts of nine New England utilities and NEPOOL, and jointly with Susan Finger in Phase II of D.P.U. 19494, concerning Boston Edison's relationship to NEPOOL. I also testified before the E.F.S.C. in proceedings 78-17 and 78-33, on the 1978 forecasts of Northeast Utilities and Eastern Utilities Associates, respectively, and I have submitted testimony in E.F.S.C. 79-33, on EUA's 1979 forecast. In addition, I testified jointly with Susan Geller before the Atomic Safety and Licensing Board in Boston Edison Co., et. al, Pilgrim Nuclear Generating Station, Unit No. 2, Docket No. 50-471 concerning the "need for power". I recently testified in D.P.U. 20055

regarding the 1979 forecasts of EUA and Fitchburg Gas and Electric, the cost of power from the Seabrook nuclear plant, and alternatives to Seabrook purchases and in D.P.U. 20248 regarding the cost of Seabrook power. I have submitted prefiled joint testimony with Ms. Geller in the Boston Edison time-of-use rate design case, D.P.U. 19845, but we have not yet testified. I recently testified in D.P.U. 200, on Mass. Electric's rate design.

Q: Are Eastern Edison Company's (EECO) rate design proposals in this filing appropriate?

A: No. There are several serious shortcomings in EECO's proposed rate design. The proposed rate design will do little either to reflect costs or to promote conservation. Specifically:

1. Declining block rate structure is extensively retained, despite the instructions of D.P.U. 18810 that such rates be eliminated. In most cases, the declining blocks are steeper in the proposed rates than under the current rates.

2. Special promotional rates for space heating remain open for new business.

3. Several rates appear to restrict alternative energy development.

4. Master metering is not prohibited, restricted, or discouraged.

In addition, in estimating the revenue effect of consolidating the Brockton and Fall River rates, EECO must make numerous assumptions for which there is little or no empirical support. These assumptions would not be necessary under flat rates.

Q: Why is elimination of declining block rates beneficial?

A: There are three general reasons. First, flattening rates redistributes revenue responsibility within a class in a manner which increases the tendency of the class to conserve energy. Under declining block rates, large customers face a lower average price than small users. Thus, the people with the most appliances, and hence with the greatest opportunity to conserve, have the least incentive to do so. Under flat rates, the costs are distributed more evenly into the bills of the larger customers.

For weather-sensitive classes (e.g., commercial with large air conditioning loads, electric heating customers), flat rates effectively increase the rates in high-use months, when insulation, temperature controls, and other conservation measures can be effective, while decreasing rates in the lower-use, off-peak months, when fewer promising conservation options are likely to exist.

Second, the flattening of rates gives the average customer more control over his bill. Under declining block rates, most customers will find that their marginal rate (the marginal rate is the rate paid for a few more KWHs or saved by using a few less KWHs) is considerably lower than the averge price they pay per KWH. Therefore, the amount that customers can save by conserving, or the

amount that they pay for extra use, is relatively small. The careful use of energy can be encouraged, and the customer can be given greater control over his bill, by increasing the marginal charges, that is, by flattening the rate structure.

This problem can easily be seen in EECO's proposed rate structure. The proposed Rate No. 1, for example, applies the highest price (5.135¢/kwh) only to consumption under 100 KWH. Only 79% of EECO's residential bills in the bill frequency analysis were this small, and many of those bills were probably due to vacations, erroneous estimates and the like. Therefore, the vast majority of customers will find that this block is intra-marginal (not near their marginal consumption) and beyond their control. Try as they might, they will not be able to reduce this part of the charge; no matter how profligate they are, they will not be charged 5.135¢ for any more KWH. Instead, a large customer will save only 1.451¢ for each KWH he saves. This will tend to frustrate customers' efforts to control their bills, and limit their reward for conserving.

Third, the flat rate brings the price of using more power closer to the cost of producing more power. The marginal fuel costs in New England last spring were running about 2.5¢/KWH off peak and 3.5¢/KWH on peak (See

Appendix 1, Chernick and Geller, 1979). Oil costs have risen 50% since then for #6 oil, and 70% for #2 oil, indicating that marginal costs are more like 3.75¢ off-peak and 5.5¢ on-peak at this point. Including the marginal losses estimated by Massachusetts Electric Company (1978), an additional KWH at the secondary level costs 4.5¢/KWH off-peak and 7.1¢/KWH on-peak today. This estimate includes no fuel price inflation past April 1980 and no peak month (summer or winter) data. Adding 10% more for oil price increases to April 1981 would raise the costs to 4.9¢ and 7.8¢. Of course, the estimate includes no allowance for any capital costs.

The estimates which I have derived elsewhere for the costs of the Seabrook plant (Chernick 1980a, 1980b) and the Pilgrim II plant (Chernick and Geller, 1979) indicate that the new capacity being built by Montaup and its NEPOOL partners will be more expensive than current oil-fired generation, although it may eventually be justified by the increasing real price of oil.

Therefore, both current fuel costs and future capacity costs are quite high. If rates do not provide incentives for conservation commensurate with these costs, customers will not expend the effort and capital for conservation which is justified by current and future oil prices and by the cost of utility alternatives to

burning oil. In effect, customers would be receiving electricity which is not worth as much to the customers as it costs to generate.

Q: Are there any particular reasons to eliminate EECO's declining blocks in this rate case?

A: Yes. There are two special advantages to flattening rates, both of which result from the merging of the Brockton and Fall River rates. First, the consolidation means that customers in at least one area, and in some cases both areas, will be changed to a new rate structure. It seems unnecessarily disruptive to change a Fall River Rate D customer (for example) to Rate 31 now, then to a flattened rate in another year or two, and perhaps to a time-of-use rate soon thereafter. Since some sort of rate redesign is required by the rate consolidation, the current redesign might at least go as far as flattening rates, eliminating the need for two separate revisions in rate structure.

Second, due to the nature of EECO's data, the revenue effect of the proposed rate consolidation must be estimated. EECO does not know the actual kwh sales by block in the test year. Block sales are estimated from a Bill Frequency Analysis for April 1979-March 1980, and are based on various averages and interpolations. There are only two ways to avoid the problem of estimating kwh sales by block:

1. leave the rate structure the same as in the test year, increasing each block or charge by the same percentage, or

2. flatten the rates, so that only quantities known for each rate class (total kwh, total billing kw, customer number) are required in the derivation of revenues.

The former approach has been the common one in recent rate increases, but it precludes consolidation of Brockton rates with Fall River rates. Therefore, only the second approach allows for both consolidation and an accurate assessment of the revenue impact of that consolidation.

Q: In which proposed rates are declining blocks retained?

A: Proposed rates 1, 11, 21, and 31 are composed of declining blocks.

Q: Do you believe that there is any reason to retain these declining block structures?

A: No. The declining blocks do not appear to have any advantages over flat rates. On the contrary, they distort customer incentives and discourage conservation. My position on this issue is consistent with that of the California Energy Commission Staff.

> The effect of declining blocks is to reduce the cost effectiveness of conservation investments to the customer. . . . Since utility costs are not decreasing, conservation investments, in this [declining-block] example, should be encouraged with flat or inverted rates.

(Legislative Issue Memorandum: Utility Rates to Encourage Conservation, March 20, 1980, p. 4).

This Commission has stated:

> In particular, declining block rate structures have outlived their usefulness. In the circumstances, it is simply unreasonable to charge lower rates as consumption increases. This can only encourage the additional use of electricity. The Commission intends to phase out declining block rates unless they meet the criteria set forth in the regulations proposed herein. (D.P.U. 18810, p. 13)

Those regulations provide that:

> Neither the metered nor the synthetic [i.e., non-time-of-use] rates shall incorporate a declining block structure unless it is specifically cost justified. Moreover, the cost justification must be so significant that it completely outweighs any environmental or energy policies. (Ibid, p. III)

The Congress established a similar Federal standard in PURPA:

> (2) Declining block rates. - The energy component of a rate or the amount attributable to the energy component in a rate, charged by an electric utility for providing electric service during any period to any class of electric consumers may not decrease as kilowatt-hour consumption by such class increases during such period except to the extent that such utility demonstrates that the costs to such utility of providing electric service to such class, which costs are attributable to such energy component, decrease as such consumption increases during period. 16 U.S.C.A. 2621 (d)(2).

Q: Has EECO presented any justification for retaining the declining block rate structures?

A: No. In his testimony, Mr. Erickson indicated that EECO intends to defer "more radical rate design" until the completion of the TOU rate cases which resulted from DPU 18810. EECO offers no arguments that the current rates comply with the instructions in DPU 18810, nor that they otherwise serve a useful function, except that

> Until [a cost of service study is performed], it is desirable to retain the existing structure for other ratemaking objectives such as stability of revenue and rate changes, public acceptability, feasibility of application, value of service, cost of metering and billing, competition, efficiency, fairness, and political impact. (Information Response (IR) R-12)

It is not clear exactly what EECO is concerned about, or even what these "other objectives" are supposed to mean. For example, "feasibility of application" and "cost of metering and billing" would favor flat rates, if they are relevant at all; "efficiency" requires higher marginal charges, as I have explained; and "value of service" and "competition" may reflect EECO's understanding that large customers are price-sensitive and will not use more electricity (especially for uses with competitive energy sources) unless EECO offers them lower rates. In short, most of EECO's vague excuses for retaining declining blocks are really reasons to eliminate declining blocks.

Q: Has EECO used its proposed rate increases to decrease the steepness of the declining blocks in the rates which retain declining blocks?

A: Not generally. In rates 1, 11, 21, and 31, lower use, higher priced blocks actually received larger increases than the lower priced tail blocks, so the slope of the decline would actually be greater under the increased rates than it was under the existing rate (usually a Brockton rate) on which the proposed rate was modeled. In some cases, the proposed rate is also much steeper (much less flat) than the other rate (usually a Fall River rate) which it is replacing. For example:

a. EECO rate 1 is steeper than Brockton 11 for the first 2000 KWH/month, or the bulk of bills rendered. EECO 1 represents an increase in marginal price of at least 7.23 mills/KWH for most Fall River Rate A customers with bills under 300 KWH/month, only a 3.57 mills/KWH increase for customers between 300 and 600 KWH, and an actual decrease in the marginal charge over 600 KWH/month.

b. EECO rate 11 is steeper than Fall River rate B throughout, and steeper than Brockton Rate 21 for bills over 600 KWH/month.

c. EECO Rate 21 is steeper than Brockton Rate 41 throughout, and generally represents smaller

increases for Fall River Rate C customers with usage over 1000 KWH than for those with smaller consumption.

d. EECO Rate 31 is steeper than Brockton 85 throughout. It is also steeper than Fall River Rate G for the first 30,000 KWH, and many customers with large bills (up to a million KWH/month) will actually face a lower marginal energy price under rate 31 than under Rate G.

Q: How would you suggest allocating the rate increases in the rates with declining blocks?

A: The most desirable action would be full-fledged rate redesign, with reallocation of revenue responsibility to classes, based on a comprehensive examination of the causal relationships between costs and energy use patterns. EECO is probably correct in avoiding any such extensive effort in the limited context of this general rate case. Short of comprehensive redesign, EECO could simply flatten all the existing rates. If there is a serious objection to a complete immediate reform of some of the declining block rates, EECO could at least move more directly toward flat rates by placing the entire rate increase in the tail blocks, and none in the higher, inner blocks.

The latter suggestion is really not a very radical one, and should not be difficult to implement. It certainly would be more effective than EECO's proposal in bringing rate incentives into line with system costs and in encouraging conservation.

Q: Which are the special promotional rates for space heating?

A: Proposed Rates 11 and 35 provide substantial discounts compared to Rate 21 for nonresidential customers, and may also be cheaper than Rate 31, depending on the customer's size and load factor. Rate 11 is available to for all uses in "buildings used principally for living quarters, religious or educational purposes", so long as electricity is the principal source of space heating and water heating. Rate 35 is restricted to space and water heating, air conditioning and cooking, without restriction on the purpose of the building.

Q: How are these rates promotional?

A: Customers are being offered lower rates simply because they use electricity for space heating and other uses for which substitute energy sources are available. This tends to encourage the use of electric heating, which is itself wasteful; discourage conservation in electrically heated buildings; and encourage the wasteful use of other end uses served on the same low rates.

Q: Should these uses be encouraged?

A: No. This is another way in which EECO is encouraging the use of large amounts of power, instead of encouraging conservation. Promotional rates, like declining blocks, discourage conservation.

Q: Would it be advantageous to close these rates to new business?

A: Yes. If new customers must pay regular rates (e.g., Rates 21 or 31) for electric heat, they will have more incentive to take one or more of the following actions:

1. Use oil or gas, rather than electricity, for space heat. While new oil furnaces are available with efficiencies in excess of 80%, serving new electric heating customers requires burning oil and transmitting and distributing the electricity at a total efficiency of 25% or 30%. Thus, about three times as much oil will be burned to heat a building electrically as would have been used to heat the same building directly.

2. Install heat storage and use off-peak electricity. It is time to begin discouraging the installation of conventional baseboard electric heating, which cannot easily be converted.

3. Use solar or wood heat as primary or supplementary sources.

4. Use a heat pump, which can deliver two KWH of heat for each KWH of electricity expended.

5. For a large building, cogenerate the space heat and other heating requirements with electricity.

6. Use base board electric heat, but with greater conservation measures (e.g, additional insulation) than would be justified under the promotional rates.

It is important to realize that, once a central heat distribution system is installed, a great deal of flexibility exists. An oil-fired hot water or forced air heating system can be supplemented or replaced by solar heat, by a wood or waste burning furnace, by a heat pump or central storage electric heat, by a district heating system, or by a cogeneration system. Once the building is constructed with baseboard electric heat, converting to other heating systems requires modifications in living spaces and walls. These modifications may be very difficult, and costly, if not impossible. Upgrading building efficiency is also more difficult after the building is completed. Considering the longevity of the building stock, it seems to be quite important to discourage, if not prohibit, irrevocable commitments to this inefficient and expensive heating source.

Q: Does EECO explain why it wishes to keep these promotional rates open for new business?

A: Not really. In IR R-6 EECO claims that leaving these rates open to new business is justified by a "balancing of interests", but no such interests are defined in the response. IR R-6 also claims that:

> "The ultimate role of different forms of electric space heating in the conservation of fossil fuels, and their impact on load diversity and ultimate system costs has yet to be determined."

This admission of ignorance hardly constitutes a reason for promoting electric heat, even if it were true. However, for the forseeable future, it is clear that electric space heating is a serious waste of oil, and that storage space heating will increase load diversity compared to baseboard heat. Hence, EECO's justification for promotional rates is essentially non'existent.

Q: Why is electric space heating wasteful of oil?

A: To heat a home with electricity, EUA (or another NEPOOL member) must burn oil at a heat rate of around 9500-15000 BTU/kwh depending on load unit availability. Since a kwh is equivalent to 3413 BTU, these heat rates represent 36% to 23% efficiency. Massachusetts Electric has calculated marginal losses which average about 24% at the secondary level (MECO, 1978), and my calculations for Boston Edison Company indicate similar levels of losses (Chernick and Geller, 1979). Thus, to supply an additional home with electric heat, EECO must burn oil at a net efficiency of about 19% to 29%.

If oil is burned directly in the home, however, only losses in the furnace are relevant. According to DOE, oil-fired boilers are commercially available at 85% efficiency, and oil forced air furnaces are available with 82% efficiency (Federal Register 1/2/79, pp. 53-56).

DOE's current proposed rules would require all new indoor oil boilers to be 76% efficient by July 15, 1981 and 82% efficient by January 1, 1986. Corresponding figures for oil forced air furnaces are 75% and 80%. All models will have to meet the final standards, and some already exceed them.

Therefore, it requires three to four times as much oil to heat a house electrically, as it does to heat it directly with oil.

Q: Are these promotional rates limited to inherently off-peak uses?

A: No. Rate 11 is extended to all uses in an electrically heated space and Rate 35 is available for the four end uses I listed previously. No end use is limited to off-peak service. For some customers heating may be a heavily on-peak use. This is particularly true for offices and retail stores on Rate 35, and schools on Rate 11. Both commercial heating and commercial air conditioning are apt to contribute heavily to seasonal peaks; commercial cooking is probably heavily on-peak, as well.

Q: Should customers currently on the promotional rates be transferred to corresponding standard rates, such as Rates 1, 21, and 31?

A: This action would probably cause a large amount of dislocation for a small benefit. Most of these customers must have committed themselves to electric heat in the period of declining electric prices, or in the mid-70's, when oil and gas availability problems may have made electricity seem to be the only viable option. These commitments, made in good faith under the conditions of the times, cannot easily be reversed. Flattening the promotional rates, and subsidizing the implementation of conservation, alternative energy, and load management, will provide customers on them with the motivation and means to reduce the burden they impose on the rest of the system. Increasing the revenue contribution of the promotional rates to the same ¢/KWH level as the standard rates will probably do more to lower customers' standard of living (or their financial viability) than to promote conservation.

While Rate 11 is not substantially different from Rate 1, the average price is somewhat lower in Rate 11 due to the declining blocks and the larger average use in that rate. Combining rates 11 and 1 for residential customers, and then flattening the combined rate would result in a considerable increase (about 10-15%) in rate 11 customers' bills.

Q: What rates appear to restrict alternative energy development?

A: Rates 8 and 11 require that electricity be the "principal" source of energy for comfort heating and water heating. This appears to limit the energy that customers on these rates can derive from solar, wood-fired, waste-fired, or cogeneration equipment, to less than half their use.

Similarly, Rate 35 does not specify whether electricity can be supplemented by other energy forms. EECO's discovery responses indicate that no bias against alternative energy is intended; this should be clarified in the rates. Item 16 in the Terms and Conditions allows the company to prohibit customer generation (which may include wind generators, cogeneration or small hydro, for example), without specifying the "terms and conditions" to be applied in each case. At the very least, EECO should list the general criteria which will be applied to determine the specific terms and conditions.

Q: What are the advantages of preventing new master-metering installations and converting existing installations to individual meters?

A: The master-metered electricity user essentially faces a zero price of energy, and therefore has no incentive to to use it wisely. Any connection between

the behavior of the master-metered user and the costs to that user is quite tenuous. Under direct utility metering, submetering (in which the building pays the utility, and the occupants are billed by the building), or check-metering (in which the building bill is simply apportioned to the occupants in proportion to their KwH consumption) the electricity consumer can save money by saving energy.

Consumers do seem to respond to direct metering. Federal Energy Administration figures (UCAN Manual of Conservation Measures, Conservation Paper #35) indicate that single-metered apartments use about 25% less energy than master-metered apartments; Boston Edison data (BECO, 1978) indicates that single-metered apartments use only about half the heating energy of master-metered units. A recent submetering conversion in New York appears to have reduced occupant electric consumption by 35% (Electrical Week, 5/2/80, p. 6).

Q: Do the changes you have suggested making in EECO's proposed rates constitute the sort of "radical" rate design changes which should be deferred to DPU 227, the time of use case; as Mr. Erickson suggests on p. 5 of his prefiled testimony?

A: Not really. The time-of-use cases will deal with some complex, difficult, quantitative issues, such as:

1. What is the actual cost of additional electric consumption, by time, season, day, and voltage level?

2. How should the discrepancies between cost and allowed revenues be resolved?

3. How should cost considerations affect the revenue allocations between classes?

4. Which periods should be designated as peak periods?

5. Which customers should be placed on time-of-use rates?

6. Will inverted rates increase efficiency, and if so, what blocks should be discounted and by how much?

I do not suggest that the Commission attempt to resolve these complex issues in the constrained context of this rate case. But I do believe that the Commission can, and should, take the simple and straight-forward actions I have suggested. The rate design changes I propose are quite modest. Little more than common sense is required to justify closing promotional rates, ending prohibitions on alternative energy development, eliminating master-metering, and flattening rates. None of these actions is dependent on determination of a precise numerical value, or even on selection of a particular pricing methodology. The propriety of these actions is widely recognized.

None of the improvements I suggest for EECO's rate design require any load data for justification. None of them is particularly sensitive to reasonable variations in cost assumptions. None of them impacts inter-class

revenue allocations. And none of them has any direct connection to time-of-use rates, although some of the proposed changes (flattened rates and eliminations of promotional rates) will facilitate the eventual transition to time-of-use pricing. They are appropriate intermediate steps in rate design under a wide variety of circumstances: whether new energy costs 7¢/KWH or 15¢/KWH, whether the appropriate peak period is 12 hours in the winter or 5 hours in the summer, whether or not revenue responsibility should eventually be shifted between classes, whether time-of-use rates are justified for all customers or for only the largest, and so on. Whatever the Commission's eventual findings in the time-of-use cases, EECO will have a more efficient rate design in the interim if EECO's proposed rates are adjusted as I have suggested.

Q: Does this conclude your testimony?

A: Yes.

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