STATE OF ILLINOIS

ILLINOIS COMMERCE COMMISSION

PETITION TO INITIATE A SHOW CAUSE ACTION THAT DIRECTS IOWA-ILLINOIS GAS AND ELECTRIC COMPANY TO JUSTIFY ITS CURRENT LEVEL OF ELECTRIC AND GAS RATES AND CHARGES	DOCKET No.

TESTIMONY OF PAUL CHERNICK

ON BEHALF OF

STATE OF ILLINOIS

OFFICE OF PUBLIC COUNSEL

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TESTIMONY OF PAUL CHERNICK

1 INTRODUCTION AND QUALIFICATIONS

Q: Would you state your name, occupation and business address?

A: My name is Paul L. Chernick. I am employed as a research associate by Analysis and Inference, Inc., 10 Post Office Square, Suite 970, Boston, Massachusetts.

1.1 Qualifications

Q: Mr. Chernick, would you please briefly summarize 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 Massachusetts Institute of Technology in February, 1978 in Technology and Policy. I have been elected to membership in the civil engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate membership in the research honorary society Sigma Xi.

I was a Utility Analyst for the Massachusetts Attorney General for over three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, and the evaluation of power supply options.

In my current position, I have advised a variety of clients on utility matters. My work has considered, among other things, the need for, cost of, and cost-effectiveness of prospective new generation plants and transmission lines; retrospective review of generation planning decisions; ratemaking for plant under construction; and ratemaking for excess and/or uneconomical plant entering service. My resume is attached to this testimony as Exhibit 2A.

Q: Mr. Chernick, have you testified previously in utility proceedings?

A: Yes. I have testified approximately forty times on utility issues before various agencies including the Massachusetts Department of Public Utilities, the Massachusetts Energy Facilities Siting Council, the Texas Public Utilities Commission, the New Mexico Public Service Commission, the District of Columbia Public Service Commission, the New Hampshire Public Utilities Commission, the Connecticut Department of Public Utility Control, the Michigan Public Service Commission, the Maine Public Utilities Commission, the Vermont Public Service Board, the Pennsylvania Public Utilities Commission, the Federal Energy Regulatory Commission, and the Atomic Safety and Licensing Board of the U.S. Nuclear Regulatory Commission. A detailed list of my previous testimony is contained in my resume. Subjects I have testified on include cost allocation, rate design, long range energy and demand forecasts, costs of nuclear power, conservation costs and potential effectiveness, generation system reliability, fuel efficiency standards, and ratemaking for utility production investments and conservation programs.

Q: **Have you testified previously before this commission?**

A: Yes. I testified on the cost and benefits of continued construction of Commonwealth Edison's Braidwood nuclear power plant in ILCC Docket No. 82-0026. At that time, I estimated that the cost of Braidwood would rise from the $1224/kW Edison was projecting, to $2136-$2435/kW, plus inflation due to delays beyond Edison's scheduled in-service dates of 10/85 and 10/86. Edison's current estimate stands at $2254/kW for in-service dates of 5/87 and 9/88.[1]

Q: Have you authored any publications on utility ratemaking issues?

A: Yes. I authored Report 77-1 for the Technology and Policy Program of the Massachusetts Institute of Technology, Optimal Pricing for Peak Loads and Joint Production: Theory and Applications to Diverse Conditions. I also authored a paper with Michael B. Meyer "An Improved Methodology for Making Capacity/Energy Allocation for Generation and Transmission Plant", which won an Institute Award from the Institute for

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1. This is $2070/kW if 5% inflation is removed for the 1.75 year delay since my testimony in 1982.

Public Utilities. My paper "Revenue Stability Target Ratemaking" was published in Public Utilities Fortnightly, and another article "Opening the Utility Market to Conservation: A Competitive Approach" was presented at the 1984 national conference of the International Association of Energy Economists, and was published in the conference proceedings. These publications are listed in my resume.

1.2 The Purpose and Structure of this Testimony

Q: What is the purpose of your testimony?

A: I have been asked by the Illinois Office of Public Counsel to determine whether Iowa-Illinois Gas and Electric Company (IIGE) has excess generating capacity. I have also been asked, to the extent that there is excess capacity, to determine whether that excess can be associated with specific generating units, and if so, to identify the units which are (wholly or partially) excess. Thus, the issues addressed in my testimony include:

1. What is excess capacity?

2. How much of IIGE's capacity is excess?

3. With which plants is that excess associated?

4. Is the excess plant economically advantageous to ratepayers?

Q: How is your testimony structured?

A: Section 2 discusses the determination and significance of excess capacity.

Section 3 determines the amounts of specific units which may reasonably be considered excess.

Section 4 compares the cost of power from the excess capacity to the avoided cost of generation from previously existing IIGE plants.

Q: **To what information did you have access in preparing this testimony?**

A: I have been able to obtain and review the following documents:

- IIGE Annual Reports to Shareholders, 1975-1985,
- 1985 Statistical Supplement to IIGE Annual Report,
- 1985 Annual Report of IIGE to Illinois Commerce Commission,
- Selected pages from Annual Reports of IIGE to Illinois Commission, 1978-84,
- Selected Transcripts from Docket # 82-0892,
- Order from Docket # 82-0892,
- IIGE 1986 Load Forecasting and Compliance Report, portion of 1983 report,
- IIGE Fuel Use Report, Schedule 3, filed from November 1982-May 1986,
- Louisa Site Evaluation Studies, Phase II, Unit Size and Fuel Considerations (Report SL-3290, 12/17/76),
- MAPP Load and Capability Report, 4/1/86,

- MAPP Reserve Requirements Study, October 1980,
- MAPP Generation and Transmission Report, 1986-2000, June 1986.

It is important to note that this testimony was prepared without the opportunity for discovery, and is therefore limited to data which was already available in the public domain. I have frequently estimated parameters for which IIGE would be able to provide more precise values. I would anticipate that many details in my testimony would require revision if a proceeding is docketed and more information is obtained from IIGE. However, it appears that the underlying patterns are clear enough that the general conclusions of this testimony are unlikely to change as a result of data which may be received on discovery.

2 - DEFINING EXCESS CAPACITY

Q: What factors should the Commission consider in determining whether an electric utility has an appropriate amount of generating capacity?

A: Two basic considerations which determine the appropriate amount of generation capacity: reliability of service and economy of service. A certain amount of capacity is needed to provide service at any specified level of reliability. Additional capacity may be economically advantageous, as well.

2.1 - Capacity Requirement for Reliability

Q: What determines the amount of capacity required to maintain reliable service?

A: A number of factors influence the capacity requirement for reliability purposes, which is generally expressed as a reserve requirement: the amount (or percentage) by which installed generating capability should exceed the peak demand. "Installed generating capability" refers to the demonstrated power production ability of the utility's plants, at the conditions of the peak load.[2] For a power

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2. For IIGE, this means the demonstrated generation capability at summer temperatures. At the actual time of summer peak, one

pool, or for a utility which is not part of a pool, factors which control required reserves include:

- the desired level of reliability;
- load shapes, including
    * the peak load level,
    * the number of hours with loads close to the peak, and
    * the extent of low-load seasons, in which maintenance can be performed;
- the forced outage rates of generating units;
- the maintenance requirements of generating units;
- the size of individual units compared to the size of the utility or pool;
- interconnections to neighboring utilities and pools, and the availability of emergency power from those neighbors; and
- interruptible loads, customer-owned generation, and other mitigation measures which reduce loads when needed.

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or more units may be on maintenance, forced out of service, or derated: this does not affect the installed capability calculation.

For a utility which is part of a reliability power pool, as IIGE is a part of the Mid-America Power Pool (MAPP),[3] the required reserve is determined by a two-step process. First, the pool's total requirements (either in megawatts or in percentage reserve) are determined, accounting for the factors discussed above. Second, the pool reserve requirement must be allocated to the member utilities.

Q: What reserve requirement does MAPP impose on IIGE?

A: MAPP requires all members to maintain 15% reserves above their non-coincident peaks, which implies a reserve of about 23% above the coincident MAPP peak. In fact, MAPP recognizes that individual utilities will periodically have reserves of less than 15%, and declares that this is "not a major problem," so long as the pool as a whole has adequate reserves.[4]

Q: Has this standard been reviewed recently to ensure that it is adequate for MAPP as a whole?

A: Yes. A MAPP study dated October 1980,[5] with essentially current data on unit sizes, and very recent data on forced

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3. IIGE is also part of a smaller pool, ENEREX, which dispatches its members' units to produce the lowest total operating cost. This economic dispatch function is conceptually distinct from, and geographically more limited than the reliability pool function of MAPP.

4. See p. 3-3, MAPP Coordinated Bulk Power Supply Program, 4/1/86.

5. "MAPP Reserve Requirements Study, 1980-1994."

outage rates, concluded that "the current fifteen percent reserve level is adequate to maintain present reliability for the next ten years." Even beyond the ten year period, the potential reliability problem concerning MAPP was the tendency for winter peak to rise relative to summer peak, constraining winter maintenance. Current forecasts show lower relative winter peaks through the 1990s than were projected in 1980 for the mid-1980s, so convergence of summer and winter loads should not be a serious problem in the foreseeable future. For current load shapes, 15% non-coincident summer peaks produce loss of load probabilities near one day in ten years, a standard reliability target in the industry. Actually, as the Reserve Requirements Study indicates, the calculated reliability level is less important than the fact that the projected reliability level is comparable to reliability levels in the 1970s, which were considered adequate.

Q: Does the mothballing, sale, or retirement of existing capacity create a need for new plant?

A: No, the causality usually flows in the other direction. The completion of a new unit often allows a utility to consider mothballing, retiring, or selling existing plant. In some cases, a unit may be retired due to a physical failure which would be prohibitively expensive to correct. More often, units are retired when they are no longer needed for reliability purposes, and when the economic benefits of operating them are exceeded by their operation and maintenance costs. Economic considerations are always central to decisions to mothball or sell operable generating units, as IIGE did with Moline 5 and 7, and with the Riverside turbines.

Q: Is it therefore reasonable to treat all IIGE capacity above the required 15% MAPP reserve as excess capacity for reliability purposes?

A: At this point, it appears that the 15% reserve is adequate, and that reserves above that level are surplus for reliability purposes.

Q: Does this imply that IIGE reserves above 15% of peak demand are not useful in providing electric service?

A: No, for two reasons. First, utilities can not always have exactly the right amount of generation capability: generation additions may be more economical in larger increments,[6] plants may be constructed faster or slower than expected, and load and supply situations are always uncertain. Therefore, reserves will be higher than desired at some times, and lower than desired at others. A certain level of inefficiency in matching supply to demand is

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6. This "economies of scale" consideration is becoming less important with new technologies, such as fuel cells, integrated gasification combined-cycle, and fluidized bed combustion, which are economical with small incremental additions.

unavoidable, as are a certain number of bad welds, broken tools, and other adverse events in any construction project. Hence, <u>some</u> deviations from a 15% reserve must be considered a normal part of the cost of providing service.

Second, reserves above 15% may be justified by economic considerations, as will be discussed in the next section.

Q: Considering the factors you have discussed above, how can the Commission identify generating capacity which is excess for reliability purposes?

A: This analysis should start with the 15% required reserve, and then add in an allowance for normal surplus capacity. That allowance might be a simple percentage of peak load, or it could be stated as the number of years until the capacity is needed.[7]

Q: If the allowance is stated as a percentage of peak, what value would you recommend?

A: I know of no rigorous method for deriving such an allowance. Clearly, a margin of only 1% or 2% would not recognize the lumpy nature of capacity additions. Such a small allowance also would count as excess some capacity which would be needed almost immediately at the higher levels of load growth

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7. Both of these standards apply for limited periods of time. Utilities should not be encouraged to perpetually bring plant into service ahead of need.

rates experienced in the post-1973 period,[8] and in a couple of years even at IIGE's currently projected load growth. An allowance of 15% or 20% above the MAPP requirement, on the other hand, would accept very large excess reserves, compared to the size of IIGE's system and compared to the size of its plants: that excess would not be needed for several years at relatively high growth rates, and not for a decade or more at current projections.

Considering all these factors, an additional reserve allowance of 10% seems to be adequate, perhaps even excessive. This allowance is two thirds of the basic reserve requirement, and represents a few years of load growth at levels typical of the mid-1970s (and a much longer period at recent growth rates). Applied to IIGE, 10% of peak is about 100 MW, equivalent to a large fraction of the size of the typical capacity addition: from 36% of Louisa to 80% of Ottumwa. This allowance also brings the total allowed reserve to 25%, the standard used in the Iowa excess-capacity statute.

Q: **If the allowance is stated as the number of years until the capacity is needed, what time period would you recommend?**

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8. IIGE's summer peak grew at an average of 4.2% annually from 1974 through 1980, a period which started after one decrease in peak load and ends before another decrease.

A: I think that it makes good sense to tie the excess capacity allowance to the planning and construction cycle. Since coal plants have generally been requiring no more than five years to build,[9] it seems appropriate to treat as excess that capacity which would not be needed for five years into the future.

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9. For example, Louisa construction started in August 1979 (IIGE 1979 Report to Shareholders, page 2), with completion projected for July 1983: Louisa actually went commercial in October 1983. Ottumwa construction started in 1976, and the plant entered service in May 1981.

2.2 - Economic Justifications for Additional Capacity

Q: How can capacity which is not needed for reliable service be justified?

A: There are several factors which can result in ratepayers being better off paying for capacity which is excess from a reliability viewpoint. The most common factor is fuel cost: if units with low fuel costs are added to the system, and if those units allow for reduced usage of existing capacity with higher fuel costs, total costs may decrease. As of 1982, IIGE was expecting Louisa to be dispatched after Quad Cities, Council Bluffs 3, Ottumwa, and before Neal 3, Riverside, and the oil/gas plants.

Additional capacity may also allow for reduced costs at other plants, through mothballing, retirement, and even sale of assets. These savings are usually much lower than the costs of new capacity, but they may contribute to making excess capacity economical and useful.

Other economic factors may also contribute to the justification of higher reserves. For example, the remote location of some IIGE coal units apparently results in higher transmission losses than from local generation, and periodically requires the operation of Riverside 5 for reliability purposes. These considerations make some units (such as Louisa) slightly more valuable than they would be if plant location did not vary significantly, while making other units (such as Ottumwa) less valuable.

The economics of excess capacity on the IIGE system will be discussed further in Section 4.

3 - IIGE'S EXCESS CAPACITY

Q: How have you estimated the amount of IIGE generating capacity which is excess from a reliability standpoint?

A: I started by examining the need for IIGE's most recent generation additions, since these are the units which would have created any excess which may exist.[10] A preliminary analysis indicated that Louisa and Ottumwa represented large amounts of excess capacity, and that a portion of Council Bluffs 3 might also be excess. To simplify the analysis, I have accepted Council Bluffs as being entirely necessary, and have concentrated on reviewing the need for the two latest additions, Louisa and Ottumwa.

Both of these units are conventional coal-fired steam plants, of which IIGE is one of several joint owners. Both units operate at fairly high efficiency (generally 10,000 - 11,000 BTU/kWh, depending on loading), burning Western low-sulfur coal without scrubbers.

Q: Please describe Louisa.

A: Louisa is located in Muscatine, Iowa. Construction started in August of 1979, and the unit entered commercial service on

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10. If these units are excess capacity, but are justified economically, the excess capacity problem may be related to the amount of old capacity which has been retained. As will be demonstrated in Section 4, this situation does not arise for IIGE.

10/13/83. IIGE is the lead owner and operator of the plant, and claims 280 MW of capability at peak from its 43% share of the plant. The nameplate rating for the unit is 738 MW. Louisa is specifically designed for cycling operation.

Q: Please describe Ottumwa.

A: Ottumwa is located in Chillicothe, Iowa. Ottumwa construction started in 1976, and the plant entered service on 5/22/81. Iowa Southern Utilities is the operator of the plant: IIGE owns 18.5% of Ottumwa's 674.4 MW installed capacity, for which it claims about 125 MW of capability at peak.

Q: How much of Louisa and Ottumwa are needed to maintain IIGE's required reserve, historically, currently, and in the future?

A: Not much, although the answer depends on the time period and the definition of "needed" which are used. Exhibit 2B provides several useful comparisons of IIGE's loads and resources. Line 1 lists IIGE's actual annual peak demand for 1980 through 1985, and its projected peak for 1986 through 1995, the end of IIGE's current forecast. Line 2 of Exhibit 2B lists IIGE's claimed capability for each year 1980-1995, with the addition in and after 1983 of 107 MW of capability which was mothballed as Louisa entered service. Line 3 calculates total reserves, demonstrating that IIGE's reserve margin, with all available capacity, would be above 40% through 1995.

The next two sections calculate reserve margins for the IIGE system without Louisa (lines 4 and 5) and without both Louisa and Ottumwa (lines 6 and 7). Pre-existing capacity without Louisa is sufficient beyond 1995 at a 15% reserve margin and through 1992 at 25%. Without both units, capacity would have been sufficient through 1992 at a 15% reserve, and would have produced approximately 25% reserves through 1988.[11]

The final two sections of Exhibit 2B compute the megawatts of capacity from Ottumwa and Louisa needed to maintain 15% (lines 8-10) and 25% (lines 11-13) reserves. Ottumwa capacity is added first, since it is the older unit. At 15% reserves, no capacity from Louisa is needed through the end of the forecast in 1995, while none of Ottumwa's capacity is needed until 1993, and only about two-thirds of its capacity is needed at the end of the forecast. IIGE would remain above 25% reserves without any of Louisa's capacity through 1993, and only about a quarter of Louisa would be sufficient to maintain 25% reserves at the end of the forecast.[12] Reserves would average 25% without any of Ottumwa for the period 1981-88: 36 MW (or less than one third) of Ottumwa would have kept reserves above 25% in every year.

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11. Reserves would have been slightly higher than 25% in some years, and slightly smaller in other years.

12. It is important to recognize that, while capacity may be "needed" to maintain the required 15% reserve, it is not "needed" for the 25% reserve, since the 25% reserve itself is not a system requirement. Thus, I refer to the amount of capacity which would create a 25% reserve as being "sufficient," rather than being "needed."

Q: Have you summarized the data from Exhibit 2B?

A: Yes. Exhibit 2C presents some of the important results from Exhibit 2B, including some extrapolations of the results, assuming that growth beyond 1995 continues at the average rate IIGE projects for 1985-1995. For example, at a 15% reserve margin, the first MW of Ottumwa is required in 1993, and the entire plant in 1998. The average MW is required in 1995. All of Ottumwa is excess, both in the first five years of its life and in the next five years from today. Exhibit 2C displays similar results for Louisa, and for a 25% reserve allowance.

Exhibit 2D displays the same information graphically. The total potential IIGE generating capability, the capability without Louisa, and the capability without Louisa and Ottumwa are compared to IIGE's peak load, peak plus a 15% reserve, and peak plus a 25% reserve.

Q: Why have you included 107 MW of mothballed capability in your calculation of total IIGE capability?

A: This capability is composed of four combustion turbines at Riverside, with a claimed capability of 61.5 MW and Moline 5 and 7 with a total capability of 46.3 MW.[13] The Moline units are still mothballed, and apparently in condition to be restored to operational status on some months notice, if

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13. These were capabilities reported in 1982/83. Note that the total mothballed capability is 107.8 MW.

required. The Riverside units were mothballed in 12/82, after only about 14 years of service, and were sold to Bonneville Pacific on 12/31/85, apparently with the intention of continued operation. Therefore, both sets of units could have been available capacity, if IIGE had needed them. From a planning perspective, the Moline capacity is still available. As I noted in Section 2, it is inappropriate to reverse the causality, treating the Riverside retirement, which was caused by Louisa, as if it created a need for Louisa.

Mothballing the Moline units, and mothballing and later selling the Riverside units, have produced some economic benefits, which I discuss in Section 4.

Q: Does this capacity represent all the units removed from service in connection with operation of Ottumwa and Louisa?

A: No. Riverside units 2HS and 3, totaling 14 MW capability,[14] were retired in September 1983. I have assumed for this analysis that this retirement was unavoidable. In addition, IIGE's claimed capability, net of additions, retirements, and mothballings, declined 17 MW in the period 1980-85.[15] I do

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14. Installed capacity of these units was 22.5 MW.

15. The July 1978 retirement of Riverside 1, of 20 MW installed capacity and an unknown capability, makes extension of this comparison further back in time rather difficult. From 1977 to 1979, claimed capability increased only 185.2 MW, despite the addition of 226.8 MW of Council Bluffs.

not know how much of this change was due to derating of existing capacity (as opposed to the transfer of Louisa capacity to other utilities, for example), which units were rerated, or whether the reratings were avoidable, so I have accepted this decrease in capability in all my analyses.

Q: Have you repeated your analyses without the capacity from the mothballed units?

A: Yes. I do not believe that this comparison is particularly relevant, since the mothballed units should be included in IIGE's available capability for reliability purposes. However, I have determined IIGE's load and capacity situation without the mothballed plants, in Exhibits 2E, 2F, and 2G, which parallel the analysis in Exhibits 2B, 2C, and 2D, respectively.

Q: Is IIGE's mix of capacity types appropriate?

A: IIGE's mix of capacity is heavily weighted towards base-load, low fuel-cost facilities, as demonstrated in Exhibit 2H, which presents a breakdown of IIGE's capacity by general types. If the mothballed units are included in the analysis, 76% of IIGE capacity is baseload nuclear and high-efficiency coal (with a heat rate below 10,000 BTU/kWh). Without the mothballed units, baseload capacity is 83% of the total. Since base load is typically 30% of peak, and IIGE's <u>average</u> load is only 50% of peak, baseload capacity is over-represented in IIGE's capacity mix.

At the other extreme, peaking plants are only 4% to 8% of the installed capacity if we use the definition of "peaking" from the Iowa Power Pool Generation Expansion Studies of the early 1970s. The peaking percentage would be only 6% to 13%, even if we throw in the old Moline units, which are more efficient than the peakers in the Expansion Studies, which assumed heat rates over 16,000 BTU/kWh. The Expansion Studies found that economical expansion plans required that 25% to 35% of the total capacity be in peaking units.[16]

Very clearly, IIGE's excess capacity is composed of baseload capacity, of which Louisa and Ottumwa are the most recent additions.[17]

Q: Please summarize your conclusions regarding IIGE's reliability need for Ottumwa and Louisa.

A: By any reasonable standard, Louisa and Ottumwa are entirely excess capacity in 1986 and 1987: by most standards, all or most of their capacity is excess for many years into the future. To meet the 15% reserve standard imposed by MAPP, neither unit is needed in 1986, in 1987, or in the five years

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16. The range of optimal ratios may be somewhat different today, given higher costs of fuel (favoring lower peaking percentages) and higher construction and carrying costs (favoring higher peaking percentages).

17. Louisa is operationally a cycling unit, in that its output can be curtailed on a regular basis without damaging the unit, but its high capital cost and low fuel cost imply that it is economically a baseload units, which must be operated at or near full load for a large part of its life if its power is to be competitive with that from other alternatives.

starting with the commercial operation date of the unit, or in the five years starting with 1986. Even if we allow for a 10% reserve above the required level, Louisa's capacity is entirely excess through 1992 (as is at least some of Ottumwa), and none of Ottumwa falls within the 25% reserve in 1986 or 1987.

4 - THE ECONOMICS OF EXCESS IIGE CAPACITY

Q: You demonstrated in the previous section that Ottumwa and Louisa are not needed for reliability purposes. What other benefits may those unit provide to ratepayers?

A: The major advantage of extra baseload capacity is that it reduces total system fuel costs. Ottumwa and Louisa allow IIGE to reduce its usage of coal plants which use more expensive fuel (e.g., Riverside 5), less efficient coal plants (Riverside 3 and 4), and gas/oil fired units of various efficiencies (Moline and the combustion turbines).

Q: Is this a significant advantage for Ottumwa and Louisa?

A: It is not a very great benefit, for two reasons. First, IIGE has large amounts of capacity with fuel costs cheaper than, comparable to, or slightly more expensive than these units: Quad Cities and the other efficient coal plants total about 850 MW of capacity, or about 85% of IIGE's peak. Hence, Ottumwa and Louisa will spend many hours backing out units which are only slightly more expensive to run, and may themselves be backed out a fair amount, depending on plant-specific fuel costs. Second, for both Ottumwa and Louisa, the total costs of owning the unit exceed the incremental operating costs of virtually all of IIGE's capacity.

Exhibit 2J shows my estimate of the total busbar cost of power from Ottumwa and Louisa in 1986: most of the cost inputs are from 1985 data, and some cost categories, such as insurance and overheads, are omitted. On this basis, Louisa will cost about 10 cents/kWh (a very small part of which is deferred), partly because the plant is operated at a very low capacity factor of about 32% in 1985.[18] Ottumwa will cost about 5 cents, at its 1985 capacity factor of 50%.

Exhibit 2K compares these total cost estimates for Louisa and Ottumwa to total 1985 fuel costs for each IIGE unit, using (where necessary) the heat rates assumed in the 1976 Sargent & Lundy study of Louisa options.[19] The fuel costs of other coal plants vary from a little more than one cent/kWh to about 2 cents, all of which are much less expensive than the total costs of either new unit.

The gas-fired units are more expensive to operate than are the coal-fired units. However, even in 1980, before either Ottumwa or Louisa was in operation, Moline and the combustion turbines contributed only about 96 GWH to IIGE's total generation of 4355 GWH. In 1982, with Ottumwa but before the addition of Louisa, gas generation had virtually ceased on the IIGE system: Moline generated only a quarter of a GWH, and the other turbines had negative net generation. Thus,

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18. Its 1984 performance was even worse. Louisa appears to be operating very little primarily because it is not needed.

19. Actual heat rates by unit are not always available, especially for units which have not run much. Reported 1985 heat rates for the Riverside, Moline, and combustion turbines would not accurately reflect the cost of their operation in the absence of Louisa and Ottumwa.

Ottumwa's 545 GWH of generation may be thought of as displacing approximately 20% gas and 80% coal, with Louisa backing out only other coal. Among the gas generators, the Moline combined cycle unit would cost 3.8 cents/kWh.[20] The Moline steam capacity would cost about as much as Ottumwa (5.2 cents/kWh). Even the combustion turbines (which would not run for many hours, even with normal reserve margins) have fuel costs of 6.3 cents/kWh, a cent or so Ottumwa's total cost but still a third less than Louisa's total cost.

Hence, it is clear that fuel savings offset only a relatively small part of the cost of Louisa or Ottumwa. A reasonable estimate of the average cost of fuel displaced would be about 3 cents for Ottumwa (about 65% of its total cost) and 2 cents for Louisa (about 20% of its total cost, and less than operating costs, even without any capital recovery).

Q: Are there other economic benefits of Louisa and Ottumwa?

A: Yes. These benefits include:

- increased economy sales to other utilities, which should generate some operating profit, some of which may benefit the ratepayers,
- for Louisa, reductions in line losses and out-of-order dispatch, due to the closer location of the unit,[21]

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20. This is a 1985 gas cost, which appears to be higher than 1986 costs.

21. These factors may represent a net cost for Ottumwa.

- reduction in Quad Cities fuel costs, by allowing a lengthy coast-down to refueling,[22]

- reduction of O&M and property taxes through the mothballing of Moline 5 and 7, and of the Riverside turbines,

- some payment for the sale of the Riverside combustion turbines.

I do not have specific estimates for any of these benefits, except for non-fuel O&M, which was $10,000 to $12,000 annually for Riverside in the last two years of operation, although maintenance cycles raised this figure to the $40,000 to $60,000 range in some earlier years. Moline non-fuel O&M decreased by about $80,000 from 1982 (the last full year before units 5 and 7 were mothballed) to 1984 (the first full year after mothballing), but it is difficult to determine how much of this change was due to the mothballing. None of

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22. This reduced power levels prior to refueling is in itself an artifact of an excess capacity situation, in this case primarily the excess of Commonwealth Edison (CWE), operator of Quad Cities. Most nuclear units are operated at close to full power until near the start of the refueling outage, to maximize the total annual energy production, displacing more expensive fuels. Since CWE has a large amount of nuclear capacity compared to its loads, and a fair amount of relatively economical coal-fired generation, it is more important for CWE to use up all its nuclear fuel, by coasting down, rather than following the normal practice of wasting some nuclear fuel to maintain a higher capacity factor. Of course, the whole point of building nuclear plants, with their high capital costs, is to generate as many kWh annually as possible with their inexpensive fuel: CWE's excess nuclear capacity has resulted in a very peculiar nuclear dispatch pattern.

these benefits appear to be comparable in magnitude to the cost of Ottumwa or Louisa.

Q: Based on the available data, what is your conclusion regarding the economic benefits of Ottumwa and Louisa?

A: Neither unit produces net benefits for current ratepayers at full cost recovery. The value of Ottumwa is considerably less than its total cost, and the value of Louisa is probably less than its operating costs. The negative net benefits indicate that neither unit is economically useful to ratepayers.

Q: Does your analysis indicate whether either unit will ever be economically beneficial?

A: No. This issue has no bearing on the current usefulness of either plant. The important point is that neither Ottumwa nor Louisa will produce net economic benefits for ratepayers in 1986 or within the near future.

It is unlikely that either plant has produced benefits which exceeded its costs in any previous year. Louisa is particularly unlikely to be beneficial in the near future, due to the recovery of deferred revenues under the phase-in clause.

5 - CONCLUSIONS

Q: **Please summarize the results of your review of the usefulness of Ottumwa and Louisa.**

A: No part of either unit is required for reliability purposes in 1986 or 1987 under any reasonable reserve requirement, or in any reasonable time frame following 1986.

Neither unit results in reduced costs to ratepayers in 1986.

Neither unit is a useful addition to IIGE's previous system, from the perspective of ratepayers.

Q: Does this conclude your testimony?

A: Yes.

6 – EXHIBITS

Exhibit 2B: % RESERVE WITH MOTHBALLED UNITS

YEAR		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	199[illegible]
Peak Demand (MW)	[1]	953	907	936	1022	994	965	971	984	994	1021	1030	1056	1072	1103	1115	115
Capability - All Capacity with Moline and Riverside (MW)	[2]	1269	1409	1404	1647	1646	1641	1641	1641	1641	1654	1654	1654	1654	1654	1654	165
% Reserve	[3]	33.2%	55.3%	50.0%	61.2%	65.6%	70.1%	69.0%	66.8%	65.1%	62.0%	60.6%	56.6%	54.3%	49.9%	[illegible].3%	43.
% RESERVE WITHOUT LOUISA																	
Capability w/out Louisa (MW)	[4]				1367	1366	1361	1361	1361	1361	1373.6	1373.6	1373.6	1373.6	1373.6	1373.6	1373.
% Reserve	[5]				33.8%	37.4%	41.0%	40.2%	38.3%	36.9%	34.5%	33.4%	30.1%	28.1%	24.5%	23.2%	19.
% RESERVE WITHOUT LOUISA AND OTTUMWA																	
Capability Without Louisa and Ottumwa (MW)	[6]		1284	1279	1242	1241	1236	1236	1236	1236	1248.6	1248.6	1248.6	1248.6	1248.6	1248.6	1248.
% Reserve	[7]		41.6%	36.6%	21.5%	24.8%	28.1%	27.3%	25.6%	24.3%	22.3%	21.2%	18.2%	16.5%	13.2%	12.0%	8.
MW REQUIRED TO MAINTAIN 15% RESERVE	[8]	1096	1043	1076	1175	1143	1110	1117	1132	1143	1174	1185	1214	1233	1268	1282	132
Ottumwa	[9]	0	0	0	0	0	0	0	0	0	0	0	0	0	20	34	7
Louisa	[10]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MW REQUIRED TO MAINTAIN 25% RESERVE	[11]	1191	1134	1170	1278	1243	1206	1214	1230	1243	1276	1288	1320	1340	1379	1394	143
Ottumwa	[12]	0	0	0	36	2	0	0	0	7	28	39	71	91	125	125	12
Louisa	[13]	0	0	0	0	0	0	0	0	0	0	0	0	0	5	20	6

Notes: Data for 1980-85 from Iowa-Illinois Gas and Electric Company, 1985 Statistical Supplement.
Peak Demand and Capability Forecasts from Iowa-Illinois Gas and Electric Company, 1986 Load Forecasting Compliance Report.
In 1989, an addition to Riverside 5 will increase I-IGE's generating capability by 12.68 MW.

[4] = [2] - 280 MW, starting in 1983.
[6] = [4] - 125 MW, starting in 1981.
[3] = ([2]-[1])/[1].
[5] = ([4]-[1])/[1].
[7] = ([6]-[1])/[1].
[8] = [1]*1.15.
[11] = [1]*1.25.
[9] = [8] - [6], MW of Ottumwa Necessary to Maintain 15% Reserve, without Louisa.
[10] = [9] - 125 MW, MW of Louisa Necessary to Maintain 15% Reserve, with Ottumwa.
[12] = [11] - [6], MW of Ottumwa Necessary to Maintain 25% Reserve, without Louisa
[13] = [12] - 125 MW, MW of Louisa Necessary to Maintain 25% Reserve, with Ottumwa.

Exhibit 2C: NEED FOR OTTUMWA AND LOUISA (WITH MOTHBALLED UNITS)

Reserve Margin:	15%	25%
Ottumwa		
First year any capacity falls within reserve margin:	1993	1983 [2]
First year entire plant falls within reserve margin:	1998 [1]	1993
Year Average MW Needed:	1995	1989
Average MW Excess:		
First five years (1981-1985):	125	118
Next five years (1986-1990):	125	110
Louisa		
First year any capacity falls within reserve margin:	1998	1993
First year entire plant falls within reserve margin:	2008	2003
Year Average MW Needed:	2003	1999
Average MW Excess		
Average for 1984-1988:	280	280
Average for 1986-1990:	280	280

Notes: [1] The IIGE Demand Forecast was extrapolated to 2010 using the average growth rate of demand from 1985 to 1995, 1.8%.
[2] The 1983 load level is not exceeded until 1989.

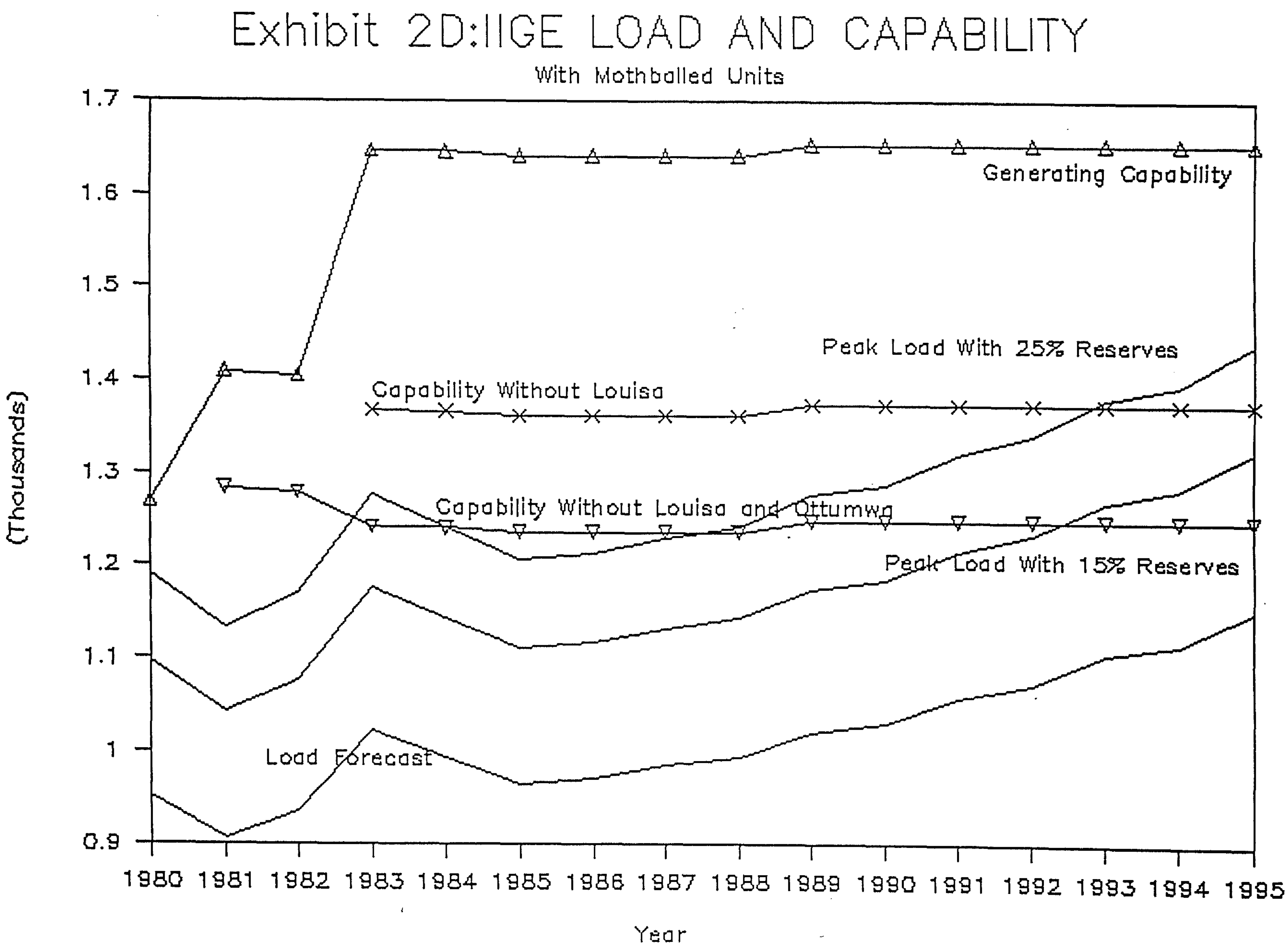

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Exhibit 2D
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Exhibit 2E: % RESERVE WITHOUT MOTHBALLED UNITS.

YEAR		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Peak Demand (MW)	[1]	953	907	936	1022	994	965	971	984	994	1021	1030	1056	1072	1103	1115	1151
Capability (All Capacity, MW)	[2]	1269	1409	1404	1540	1539	1534	1534	1534	1534	1546.	1546.	1546.	1546.	1546.	1546.	1546.
% Reserve	[3]	33.2%	55.3%	50.0%	50.7%	54.8%	59.0%	58.0%	55.9%	54.3%	51.5%	50.2%	46.5%	44.3%	40.2%	38.7%	34.4%
% RESERVE WITHOUT LOUISA																	
Capability (Without Louisa, MW)	[4]				1260	1259	1254	1254	1254	1254	1266.	1266.	1266.	1266.	1266.	1266.	1266.
% Reserve	[5]				23.3%	26.7%	29.9%	29.1%	27.4%	26.2%	24.1%	23.0%	20.0%	18.2%	14.8%	13.6%	10.1%
% RESERVE W/OUT LOUISA AND OTTUMWA																	
Capability Without Louisa and Ottumwa (MW)	[6]		1284	1279	1135	1134	1129	1129	1129	1129	1141.	1141.	1141.	1141.	1141.	1141.	1141.
% Reserve	[7]		41.6%	36.6%	11.1%	14.1%	17.0%	16.3%	14.7%	13.6%	11.8%	10.8%	8.1%	6.5%	3.5%	2.4%	-0.8%
MW REQUIRED TO MAINTAIN 15% RESERVE	[8]	1096	1043	1076	1175	1143	1110	1117	1132	1143	1174	1185	1214	1233	1268	1282	1324
Ottumwa	[9]	0	0	0	40	9	0	0	3	14	32	43	73	91	125	125	125
Louisa	[10]	0	0	0	0	0	0	0	0	0	0	0	0	0	2	16	57
MW REQUIRED TO MAINTAIN 25% RESERVE	[11]	1191	1134	1170	1278	1243	1206	1214	1230	1243	1276	1288	1320	1340	1379	1394	1439
Ottumwa	[12]	0	0	0	125	109	77	85	101	114	125	125	125	125	125	125	125
Louisa	[13]	0	0	0	18	0	0	0	0	0	10	21	53	73	112	127	172

Notes: Data for 1980-85 from Iowa-Illinois Gas and Electric Company, 1985 Statistical Supplement.
Peak Demand Forecast from Iowa-Illinois Gas and Electric Company, 1986 Load Forecasting Compliance Report.
In 1989, an addition to Riverside 5 will increase I-IGE's generating capability by 12.68 MW.

[4] = [2] - 280 MW, starting in 1983.
[6] = [4] - 125 MW, starting in 1981.
[3] = ([2]-[1])/[1].
[5] = ([4]-[1])/[1].
[7] = ([6]-[1])/[1]
[8] = [1]×1.15.
[11] = [1]×1.25.
[9] = [8] - [6], MW of Ottumwa Necessary to Maintain 15% Reserve, without Louisa.
[10] = [9] - 125 MW, MW of Louisa Necessary to Maintain 15% Reserve, with Ottumwa.
[12] = [11] - [6], MW of Ottumwa Necessary to Maintain 25% Reserve, without Louisa.
[13] = [12] - 125 MW, MW of Louisa Necessary to Maintain 25% Reserve, with Ottumwa.

Exhibit 2F: NEED FOR OTTUMWA AND LOUISA (WITHOUT MOTHBALLED UNIITS)

Reserve Margin:	15%	25%
Ottumwa		
First year any capability falls within the reserve margin:	1983 [1]	1983 [1]
First year entire plant falls within reserve margin:	1993	1983
Year Average MW Needed:	1989	1984
Average MW Excess:		
First five years (1981-1985):	115	59
Next five years (1986-1990):	107	9
Louisa		
First year any capability falls within the reserve margin:	1993	1983 [2]
First year entire plant falls within reserve margin:	2004 [3]	2000
Year Average MW Needed:	1999	1994
Average MW Excess:		
First Five Years (1984-1988):	280	280
Next Five Years (1986-1990):	280	274

Notes: [1] 1983 load level not reached again until 1989.
[2] 1983 load level not reached again until 1989
[3] The IIGE Demand Forecast was extrapolated to 2010 using the average growth rate of demand from 1985-1995, 1.8%.

Exhibit 2G: IIGE LOAD AND CAPABILITY

Without Mothballed Units

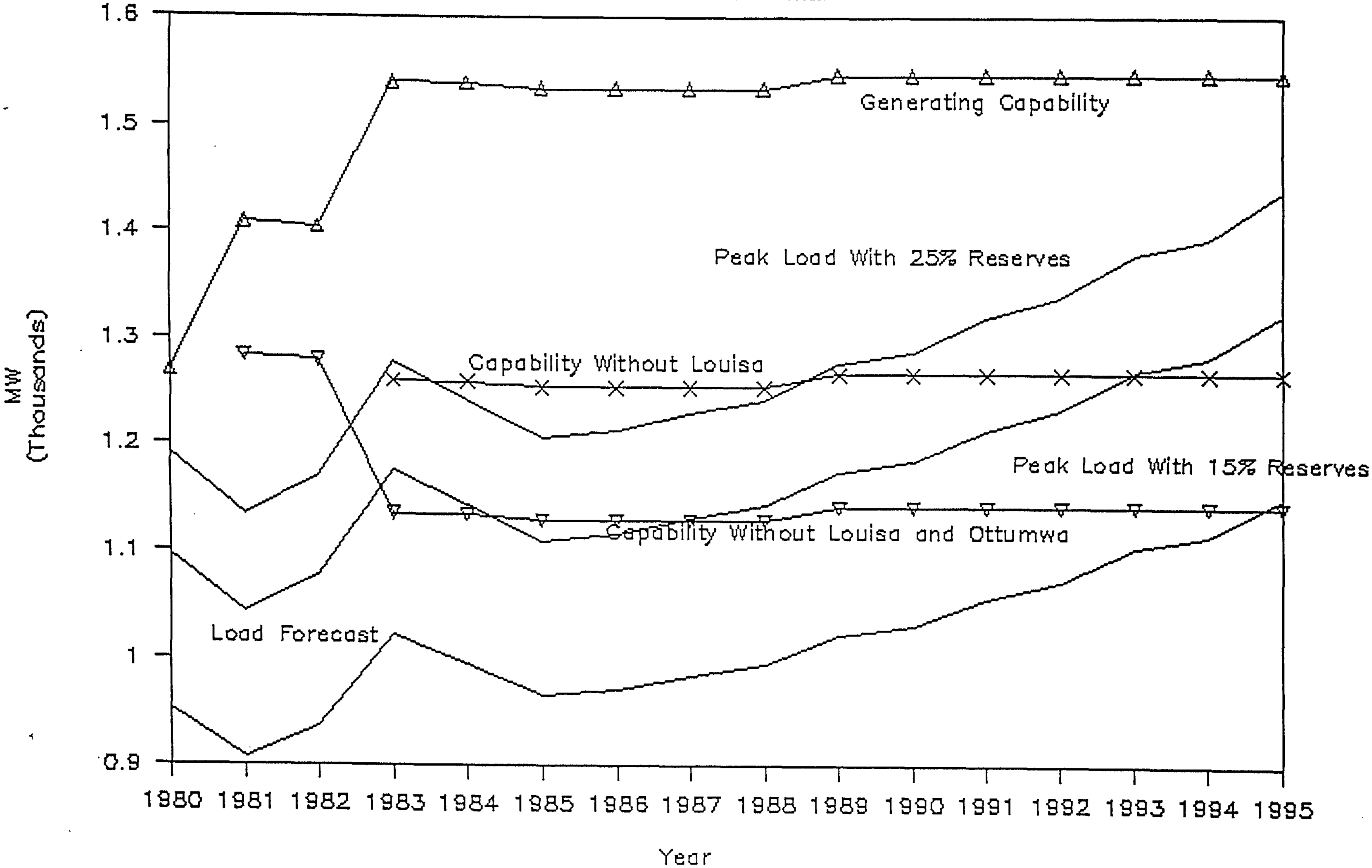

Exhibit 2G
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Exhibit 2H: Composition of IIGE Capacity

With Mothballed Units: | Without Mothballed Units:

Gas Turbines

Plant	MW	Heat Rate	Plant	MW	Heat Rate
Riverside Gas Turbines	61	16,200			
Coralville Gas Turbines	64	16,200	Coralville Gas Turbines	64	16,200

Percentage of Total System: 8% | Percentage of Total System: 4%

Oil/Gas

Plant	MW	Heat Rate	Plant	MW	Heat Rate
Moline 5	21	13,400			
Moline 6	27	13,100	Moline 6	27	13,100
Moline 7	28	13,100			

Percentage of Total System: 5% | Percentage of Total System: 2%

Combined Cycle

Moline Gas Turbines & Moline 8 (Combined Cycle)	106	9,700	Moline Gas Turbines & Moline 8 (Combined Cycle)	106	9,700

Percentage of Total System: 6% | Percentage of Total System: 7%

Low-efficiency Coal (Heat Rate>11,000)

Plant	MW	Heat Rate	Plant	MW	Heat Rate
Riverside 3	25	13,000	Riverside 3	25	13,000
Riverside 4	51	12,000	Riverside 4	51	12,000
Riverside 2HS	1	13,000	Riverside 2HS	1	13,000

Percentage of Total System: 5% | Percentage of Total System: 5%

High-Efficiency Coal

Plant	MW	Heat Rate	Plant	MW	Heat Rate
Council Bluffs	211	10,147	Council Bluffs	211	10,147
Louisa	280		Louisa	280	
Neal Unit 3	151	10,147	Neal Unit 3	151	10,147
Ottumwa	125	10,248	Ottumwa	125	10,248
Riverside 5	141	10,140	Riverside 5	141	10,140
Riverside 3HS	6	10,500	Riverside 3HS	6	10,500

Percentage of Total System: 55% | Percentage of Total System: 59%

Nuclear

Quad Cities	350		Quad Cities	350	

Percentage of Total System: 21% | Percentage of Total System: 23%

Source: Louisa Site Evaluation Studies, Phase II: Unit Size and Fuel Consideration, Appendix B, Report SL-3290, 12/17/76.

Exhibit 2J: Estimated Total Cost of Power in 1986, Louisa and Ottumwa

	Louisa			Ottumwa		
	Rate Base [1]: $229.7			Rate Base [1]: $62.7		
	Ratio	Cost	1986 Annual Costs	Ratio	Cost	1986 Annual Costs
Debt [2]	48.35%	9.18%	$10.2	48.35%	9.18%	$2.8
Preferred [2]	12.63%	9.68%	$2.8	12.63%	9.68%	$0.8
Common [2]	39.02%	15.52%	$13.9	39.02%	15.52%	$3.8
Total Return			$26.9			$7.3
Income Tax [3]			$19.2			$5.2
Original Gross Plant ($ Million) [4]:			$256.7	Original Gross Plant ($ Million):		$70.0
Depreciation [1]	3.5%		$9.0	3.5%		$2.5
1985 Non-Fuel O&M [4]			$2.2			$0.8
Property Taxes [5]			$3.2			$1.3
Total Non-fuel			$60.5			$17.1
Generation (GWH)	778			546.7		
Non-Fuel (cents/kwh)			7.8			3.1
Fuel (cents/kwh) [4]			1.8			1.6
Total (cents/kwh)			9.6			4.7

Notes: [1] Depreciated Original Cost.
[2] From 82-0892 Order, October 1983, p. 37, excluding investment tax credits.
[3] Return times 71.28%, from Exhibit 5, Docket 82-0892, for year 3.
[4] From Annual Report of IIGE, 12/31/85, p. 116(A).
[5] From Annual Report of IIGE, 12/31/85; (Cost of plant, p. 116(a), divided by cost of utility, p. 28) multiplied by total property taxes, p. 65.

Exhibit 2K: Comparison of Louisa and Ottumwa Total Power Cost t
Fuel Costs of Other IIGE Units

Plant	Total Cost [1] (cents/kwh)	Variable Cost [2] (cents/kwh)
Louisa	9.6	1.8
Ottumwa	4.7	1.6
Council Bluff 3	--	1.2
Neal 3	--	2.0
Riverside 5 & 3HS	--	1.4 [3]
Riverside 3 & 4	--	1.7 [3]
Moline Combined Cycle (8)	--	3.8
Moline Steam (5,6,7)	--	5.2 [3]
Combustion Turbines	--	6.3

Notes: [1] From Exhibit 2J.
[2] Heat Rate from Louisa Site Evaluation Studies, Phase II, Unit Size and Consideration, Report SL-3290, 12/17/76. Fuel Cost from Annual Report of IIGE, 12/31/85.
[3] Heat rates averaged over similar units.