

**In the Matter of the Application of  
UNION ELECTRIC COMPANY for  
permission and authority to construct,  
operate and maintain two combustion  
turbine units in the State of Missouri**


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Case No. EA 79-119

**State of Missouri     )**  
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**City of St. Louis     )**

1. My name is L. A. Esswein. I reside in St. Louis, Missouri, and I am the Director of Corporate Planning of Union Electric Company.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and correct.

  
L. A. Esswein

Applicant

Exhibit No. 5  
Date 3/27/79 Case No. EA-79-119  
Reporter Stoelman

Margaret S. Heida  
MARGARET S. HEIDA

MARGARET S. WEIDA  
NOTARY PUBLIC - STATE OF MISSOURI  
ST. LOUIS COUNTY  
MY COMMISSION EXPIRES JANUARY 2, 1982

TESTIMONY OF L. A. ESSWEIN

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. EA-79-119

Q. Please state your name and address.

A. My name is L. A. Esswein and I live at 6011 Leona, St. Louis, Missouri.

Q. By whom are you employed and in what capacity?

A. I am employed by Union Electric Company as Director of Corporate Planning.

Q. What are your responsibilities in that position?

A. I direct the activities of the Corporate Planning Function. The primary responsibilities of Corporate Planning are the making of various corporate studies, load forecasting, capacity planning and coordination, interconnection arrangements and long-term power transactions with other utilities, economic studies, development and use of a corporate model, other modeling, and activities involving application of new or improved technologies and research developments. Much of Corporate Planning's work consists of coordinating various activities involving other Functions of the Company, its subsidiaries and other utilities.

Q. How long have you been employed by Union Electric?

A. I have been employed full time at Union Electric since June 1953. Previously, I worked part-time for Union

Electric for a period of two years. During my full-time employment, after completing an engineer training program, I worked in Power Operations, Engineering & Construction and Corporate Planning. I have held the position of Assistant Engineer, Senior Assistant Engineer, Engineer, Supervising Engineer, Assistant Director of Corporate Planning and Manager of Corporate Planning, prior to assuming my present position of Director of Corporate Planning. I have been involved in corporate planning activities since 1967.

Q. Please describe briefly your education and professional associations.

A. I received from St. Louis University a Bachelor of Science degree in Electrical Engineering in 1958 and a Master of Science degree in Engineering in 1963. In addition, I have taken selected post-graduate courses in economics, business and law. In 1975 I completed the University of Michigan's four-week Public Utility Executive Program in their Graduate School of Business Administration. I have been active in the Mid-America Interpool Network (MAIN) Regional Reliability Council, the National Electric Reliability Council (NERC), the Edison Electric Institute's (EEI) Committee on Interconnection Arrangements, and was a member of the Technical Advisory Committee on Power Supply for the Federal Energy Regulatory Commission (FERC) National Power Survey and the Research Advisory Committee of the Electric Power Research Institute

(EPRI). As such I have participated in writing many reports and papers of regional and national scope. Presently, I am a member of EEI's Corporate Planning Committee.

Q. Are you a registered professional engineer?

A. Yes, I am a registered professional engineer in the states of Missouri, Illinois and Iowa.

Q. Please describe briefly the status of the Company and the business in which it is engaged.

A. Union Electric Company is a Missouri corporation doing business in Missouri, Illinois and Iowa. Its principal business is the generation and supply of electricity in those states. The electric territory served in Missouri includes the City of St. Louis, St. Louis County, portions of five adjacent counties - St. Charles, Franklin, Jefferson, St. Francois and Ste. Genevieve - and portions of Miller, Morgan and Camden counties in central Missouri. The Company also supplies electricity in and around the Illinois cities of East St. Louis and Alton and an area in Illinois and Iowa near the Company's Keokuk hydroelectric plant, which area includes the cities of Keokuk and Fort Madison, Iowa. We have approximately 774,000 retail electric customers, and also serve 15 electric wholesale for resale customers in the states of Missouri and Iowa.

In addition, the Company distributes natural gas to approximately 16,900 customers in Alton, Illinois and vicinity

and provides steam service in the downtown business section of St. Louis to 395 customers.

Q. Are you familiar with the subject matter of the proceeding which is presently before the Missouri Public Service Commission in Case No. EA-79-119?

A. Yes, I am. We are seeking permission and authority to construct, operate and maintain two combustion turbine generating units, each with a maximum peak summer capacity rating of 51 megawatts, one each to be located at our Meramec and Sioux Plants.

Q. When will construction of the proposed combustion turbine generating units commence and when will they be placed in service?

A. The manufacturer has already begun fabrication and it is presently proposed that site preparation for the units at the power plants will commence in May 1979. The units are expected to be in service by May 1980.

Q. Please explain why Union Electric proposes to install the combustion turbine generating units?

A. The units will provide us with a source of generation suitable for use during peak load and emergency conditions. Additionally, they are the type of units known as "black start" units. This is a very important feature in that in case of area-wide wide brownout or blackout, these units are capable of starting without external power.

Thereby, they can provide the necessary external source of power to bring the coal-fired steam generating units at the Meramec and Sioux Power Plants up from a "cold" condition. Further, the unit at Sioux Plant provides additional on-site power sufficient to shut down the coal-fired units with much less risk of damage to those units during brown-out or blackout conditions than that which presently exists with the diesel generator presently located at Sioux Plant.

Q. What factors does Union Electric consider in determining that additional generating capacity is needed?

A. In order to provide adequate and reliable electric service, we must have sufficient generating capacity available at all times to meet the demands of our customers. To do this we must estimate the peak loads expected to occur on our system and determine the amount of generating reserve required. This planning is done on not less than an annual basis and must be done far enough in advance to cover the lead time required for capacity installations. In early 1978, it was determined that the combustion turbine units would be needed. In order to have them manufactured and shipped on a timely basis, the units had to be ordered before June 1978.

Q. In May 1978, when the decision to install the combustion turbines was made, what was the all-time demand on the Union Electric system and when was it experienced?



A. The all-time native system net integrated hour peak demand on Union Electric's system of 5476 megawatts was experienced on July 19, 1977.

Q. As of May 1978 what was the forecasted peak load for the Union Electric system for 1980 when the combustion turbine generating units would go into service?

A. It was estimated that the peak load would be 6140 megawatts in 1980. Adjusting this figure for receipt of firm power and interruptible load, the adjusted peak demand was estimated at 5917 megawatts.

Q. Please describe the methodology utilized by the company in forecasting its peak load demands.

A. We forecast annual net integrated hour peak load for the Union Electric load responsibility area. The net integrated hour peak load is the projected highest average net load, occurring over a one-hour period, during the year. Our demand forecasts are based upon projections of temperature corrected peak demands and known components of historic peak demands and energy sales. In projecting these components, variables known to have, or capable of having, an effect on peak demand are taken into consideration. Variables considered include economic trends, weather, population growth, air conditioning market saturation, use patterns of customers, effect of environmental regulations, effect of possible

shortages (and higher prices) of alternate energy sources, and new product development.

Q. As of May 1978 what was the projected total capacity of the Union Electric system for 1980?

A. After the 102 megawatts of combustion turbines are installed in 1980, Union Electric projected a total capacity of 6910 megawatts. Since no non-firm purchases or sales had been contracted for, the adjusted capacity figure was the same. As I indicated, the peak demand forecast was projected to be 6140 megawatts, and appropriate adjustments yielded an adjusted demand of 5917 megawatts. This provided a 16.8% reserve, which we considered a reasonable reserve margin for 1980.

Q. How much of an allowance for reserve does Union Electric provide?

A. From a planning standpoint, Union Electric considers it prudent to have enough capacity available from its own system and from other sources to provide as a minimum a reserve margin of 15 to 18% above the adjusted peak demand to provide protection for outages of equipment and construction delays, and to provide an allowance for demands exceeding forecasts due to such things as other than normal weather.

Q. You mentioned that a 16.8% reserve was projected



for 1980. How is the amount of required reserve determined?

A. In the course of the development of the electric utility industry, a generally accepted standard of reliability has evolved. As a means of translating this standard into percentage of required reserve, the MAIN Reliability Council, using probability theory and statistical methods, has utilized two methods of reliability analysis known as "Probability of Positive Margin" (POPM) and "Loss of Load Probability" (LOLP). Use of these methods indicates a planning reserve requirement for the MAIN Reliability Council, of which Union Electric is a member, of about 18%. The word "about" is used because the actual number varies from year to year from the mid-16% level to the high-17% level. Therefore, a minimum upper bound of approximately 18% reserve is used for planning purposes. The 15% reserve for the lower bound is based on Union Electric's contractual obligation as a member of the Ill-Mo Power Pool. The 16.8% is a reasonable level in the 15% to 18% range.

Q. In Union Electric's initial application for certification with this Commission to install the two combustion turbines, it was indicated that both units would be installed at the Meramec Plant. More recently, Union Electric amended its petition requesting that only one unit be installed at Meramec Plant and the other at Sioux Plant. Why was this change made?

A. When Union Electric ordered the two combustion turbines for 1980 it was projecting the installation of additional combustion turbines in 1981 and 1982. Two of those combustion turbines were planned to be installed at Sioux Plant in 1981. This would have provided the black start and safe letdown capacity at Sioux Plant which I discussed in an earlier answer. At present, due to a number of factors, Union Electric no longer plans to install combustion turbines in 1981 and hopefully not in 1982. Therefore, to have the long-term benefits which a black start combustion turbine would provide at Sioux Plant, we modified our plans so that one of the turbines would be installed at Sioux Plant rather than Meramec Plant.

Q. You indicated that the location change was due to a number of factors. What are these factors?

A. By the summer of 1978 preliminary information relating to the new 1977 Amendment to the Clean Air Act and information on environment regulations indicated that significant deratings of existing capacity would probably be required by the summer of 1979 to meet state and federal environmental standards. Accordingly, Union Electric continued to survey the interconnected system for possible power purchases to cover potential deratings at the Meramec, Labadie and Sioux Plants. By late August of 1978, the

prospect of large-scale plant deratings appeared very likely; however, engineering estimates were unavailable because of environmental regulatory uncertainty and questions regarding plant performance using various blends of Illinois and Western coals. It was at this time (late August 1978) that the Company, after learning of the definite possibility that low cost Joppa power might be available, expressed a definite intent to purchase power in amounts up to 500 MW from the United States Department of Energy (DOE) in 1979 and later years. Complex negotiations between DOE and the utilities (Sponsoring Companies) forming EEInc (which owns the Joppa Plant for the supply of power to DOE at Paducah) followed.

By early October 1978 the derating uncertainty appeared to clarify to a degree and at the same time Union Electric had updated its load forecast. The best engineering estimate at that time of how the Meramec, Sioux and Labadie Plants would operate in compliance with environmental regulations indicated a derating of 730 MW. It was projected that this derated capacity would be reinstated beginning in 1981 after the installation of additional equipment. In addition to the 730 MW derating, a 45 MW permanent derating at Meramec Plant was incurred due to the use of a type of coal (low sulfur) for which the boilers had not been designed. Also, the updated load forecast indicated a 150 MW projected reduction in

load for 1980. All of this meant that significant purchases in 1979, 1980, 1981 and 1982 would be necessary so that the Company would have a reserve level sufficient to meet the lower level of 15% reserve. Negotiations with DOE for the Joppa power were ongoing at this point.

At the same time, discussions were being held with the Federal EPA and the Missouri Air Conservation Commission (MACC) staffs regarding the final regulations for the Sioux and Labadie Plants. Also, a compliance plan for the Meramec Plant was being developed. Environmental testing at these plants continued.

By early 1979 the following significant events had occurred as new inputs into the planning process:

(1) By early January 1979, final agreement was reached with DOE for the purchase by Union Electric of Joppa power in the amounts of 500 MW, 360 MW and 240 MW for the summers of 1979, 1980 and 1981, respectively.

(2) A compliance plan for Meramec Plant was submitted to St. Louis County and subsequently approved by them in November 1978. This plan must still be approved by the MACC and submitted by them to the EPA for approval. It is estimated, based on tests and engineering judgments, that with final approval the plant derating experienced at Meramec Plant will be 100 MW instead of the 240 MW included in the 730 MW previously projected.

(3) On January 24, 1979 the MACC approved revised state environmental regulations for the Sioux and Labadie Plants. Based on these revised regulations and updated testing at the plants, Union Electric estimated a 100 MW derating at Labadie Plant and no derating at Sioux Plant, instead of the 490 MW for the Sioux and Labadie Plants included in the 730 MW previously projected. These reduced deratings assume EPA approval of the MACC's revised state environmental regulations and favorable results from ongoing testing. It is estimated that the deratings at Meramec and Labadie Plants should be substantially recovered by the summer of 1982 with the installation of additional equipment.

(4) In November of 1978 the Power Plant and Industrial Fuel Use Act (FUA) was passed by Congress as part of the National Energy Act. The draft regulations published pursuant to the FUA cast considerable uncertainty that the Company will be permitted to use Venice boilers 7 and 8. Although meetings with DOE are planned for the near future, the ability to use the 210 MW of oil fired Venice capacity planned for operation by April 1979 appears to be very questionable after May 8, 1979.

(5) Draft FUA regulations covering existing oil fired plants issued in late January 1979 indicate that capacity planning may be further complicated if the Company's oil fired



plants that once operated on coal (Ashley Plant and Venice boilers 1-6) are affected.

(6) With respect to the proposed Meramec and Sioux Plant combustion turbines, draft FUA regulations issued in November 1978 indicate that utilities will be permitted to operate such units; however, a permitting requirement exists. It is important to note that the law itself specifically makes provisions for the installation and operation of peaking units utilizing oil as a fuel.

Q. Please summarize the 1980 situation.

A. Union Electric has ordered two combustion turbines, one each to be installed at the Meramec and Sioux Plants. They are presently being fabricated by the manufacturer. Together they have a net capability of 102 MW. With the 200 MW of temporary environmental derating presently projected for Meramec and Labadie Plants and with the 45 MW of permanent derating at Meramec Plant taken into account, Union Electric will have a net total capacity of 6675 MW assuming Venice boilers 7 and 8 are permitted to be utilized. With the 360 MW of low cost Joppa power purchased from DOE, Union Electric will have an adjusted capacity of 7035 MW. The peak demand is forecasted to be 5990 MW. Taking into account the receipt of 130 MW of diversity interchange from TVA, the estimated entitlement delivery of 48 MW from Associated Electric, and



subtracting the estimated interruptible load of 45 MW, the adjusted demand is 5767 MW. Subtracting the adjusted demand from the adjusted capacity indicates a reserve of 1268 MW equivalent to 22% reserve. While this level of reserve appears high, it can be drastically reduced (to 17.7%) if Venice boilers 7 and 8 are not able to be utilized, which is a distinct possibility. Additionally, it must be remembered that the 200 MW estimated environmentally related deratings could, in fact, be higher since the EPA has not yet approved the State's revised environmental regulations for the Sioux and Labadie Plants nor the Meramec Plant compliance plan. Also, testing of plant performance while burning low sulfur coal is not completed. Further, the effect, if any, of the FUA on existing oil fired plants that at one time burned coal (Ashley and Venice boilers 1-6) is not known.

Additionally, beyond the generation and reserve aspects of the 1980 turbines, there are significant operating reasons for installing these units. They will improve the black start capability in the metropolitan area and the addition of plant letdown power to prevent equipment damage in the event a system blackout should occur. If an area-wide brown-out or blackout should occur, it is first of all difficult to know in advance what parts of the interconnected system might be affected. Presently, by dispatching personnel to

substations on the Osage-Rivermines-Meramec lines, the Company could bring Meramec Plant on-line by use of the Osage Hydroelectric Plant, which has black start capability. This will take some time. Additional substation and transmission line switching must then take place to reenergize the system. The installation of a black start unit at Meramec and Sioux Plants provides additional flexibility to reenergize the system, both from the south and the north end of the metropolitan St. Louis area in addition to continued use of Osage Plant, which is remote from the St. Louis metropolitan area. This is very desirable because the time to accomplish reenergization is substantially reduced. Additionally, the installation at Sioux Plant provides greater flexibility and ability to let down the plant without damage in case all external sources of power to the plant are lost.

Q. Mr. Esswein, in light of the 22% reserve level, could one not contend that the two combustion turbines are not needed in 1980?

A. Certainly one could make such a contention. However in addition to keeping in mind the many uncertainties that still exist, it must be remembered that Union Electric had to order the combustion turbines before the low cost Joppa power became available. Additionally, the commitment for the Joppa power was made when the amount of environmentally

caused deratings was projected to be 730 MW rather than 200 MW. One must also recognize that the DOE negotiations involved a commitment for a "package arrangement" with DOE for power to be available to the four Sponsoring Companies while other utilities such as TVA and the OVEC Companies, supplying the DOE installations at Oak Ridge and Portsmouth, were also interested in the purchase of the power from DOE. In addition to providing Union Electric with a supply of low cost power to cover the 1980 uncertainties, the purchase also covers for the 1979 uncertainties and allows for the delay of the 1981 combustion turbine installation. This sets the stage for the possible elimination of the 1981 and 1982 combustion turbines if purchase power is available. This will mean the deletion of about 350 MW of capacity estimated to be required based on the most recent load forecast. Further, because the Joppa power is being purchased at rates based on early 1950 units, which were financed on a sinking fund basis and which are fueled by Illinois coal, the net advantage of the purchase over and above its cost is conservatively estimated to be \$1.9 million in 1980 and \$4.5 million in 1981. These savings are definitely beneficial to our customers. This is over and above the previously discussed operating benefits, and in addition to providing low cost protection against the many uncertainties that exist. If

any of the uncertainties are resolved in a manner adverse to the Company, the benefits of the Joppa power shown above would be considerably greater.

Q. Will the construction and operation of the proposed combustion turbine generating units adversely affect any other public utility?

A. No, it will not. On the contrary, the increase in our generating capacity will better enable us to help neighboring utilities during periods of emergency just as they help us during such periods.

Q. What is the estimated total expenditure for construction of the proposed units?

A. Installation of the proposed generating units will require an estimated total expenditure of \$18.5 million.

Q. How does Union Electric propose to finance the construction of the proposed units?

A. Union Electric expects to finance the construction of these units out of funds available in its treasury, a portion of which may be obtained from new financing. The amount and nature of any new financing will be submitted to this Commission for approval.

Q. In your opinion, is the installation of the two proposed units in the best interest of the customers of Union Electric?

A. Yes. First of all, they provide additional generating capacity on the Union Electric system, rather than external to it, which is advantageous during emergencies. Also, in addition to the capacity, reserve, and fast start capabilities of the new units, they have distinct advantages for quickly reenergizing the Union Electric system in case of brownout or blackout conditions. Further, the unit at Sioux Plant provides additional letdown capacity, minimizing the risk to the plant boilers.