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SOUTHERN CALIFORNIA EDISON COMPANY
and SAN DIEGO GAS & ELECTRIC COMPANY

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	Docket Nos. 50-361 OL
)	50-362 OL
SOUTHERN CALIFORNIA EDISON)	
COMPANY, <u>et al.</u> (San Onofre)	AFFIDAVIT OF SEYMOUR JAYE
Nuclear Generating Station,)	IN SUPPORT OF MOTION FOR
Units 2 and 3).)	SUMMARY DISPOSITION OF
)	FRIENDS OF THE EARTH, <u>ET</u>
)	<u>AL.'s</u> CONTENTION 9 (URANIUM
)	<u>FUEL COSTS)</u>
<hr/>		
STATE OF COLORADO)	
) ss.	
COUNTY OF BOULDER)	

SEYMOUR JAYE, being first duly sworn, deposes and says that if called as a witness herein he is qualified to testify, as follows:

1. I am currently Vice President of the S. M. Stoller Corporation (hereinafter "SMSC"), General Manager of the Utility

Division, and duly authorized to make the statements herein. SMSC was organized as a nuclear consulting firm specializing in the field of nuclear fuel in 1959. Since that date SMSC has been extensively involved in studies dealing with uranium supply and demand, nuclear fuel design, nuclear fuel cost analysis, and many other studies generally related to nuclear power. As General Manager, in addition to other tasks, I am responsible for the overall coordination, direction and supervision of work performed by SMSC relating to determinations of future market prices for uranium concentrates.

2. I joined SMSC as Manager of Fuel Studies in 1971. In that capacity, I was responsible for studies performed at SMSC for utility clients which related to nuclear fuel and its competitive position relative to fossil fuels. I was a member of the U. S. Atomic Energy Commission task force to project the evolution of power reactors in the United States, which culminated in publication of WASH-1098, "Potential Nuclear Power Growth Patterns."

Prior to joining SMSC, I was employed by Gulf General Atomic (hereinafter "GGA") from 1960 to 1971 and by the Oak Ridge National Laboratory (hereinafter "ORNL") from 1955 to 1960.

At GGA I was responsible for the nuclear fuel design of the High Temperature Gas-Cooled Reactor (hereinafter "HTGR"). This responsibility included developing the nuclear core design; setting nuclear specifications for the core; preparing the core-related sections of the PSAR; and developing specifications for the required nuclear computational methods. I next became manager of the Office of HTGR Fuel Cycle Development where I was

responsible for specifying the overall HTGR fuel cycle. At the time I left GGA to join the SMSC organization, I was Manager of the Nuclear Fuel Marketing Department, where I was responsible for developing proposals and for pricing of both HTGR and light water reactor fuel.

At ORNL, I performed reactor analyses on various reactor types. I then became Group Leader of the Reactor Economics Analysis Section which was given the assignment by the Atomic Energy Commission to determine the relative value of the fissile isotopes U-235, U-233, and Pu-239. This group was also responsible for the Atomic Energy Commission evaluation of the economic potential of various reactor types.

I received Bachelor of Science and Master of Science degrees from the University of Illinois in 1954 and 1955, respectively, and completed a year of study at the Oak Ridge School of Reactor Technology in 1956. I have authored many papers on the subjects of nuclear fuel and fuel cycle economics, several of which were delivered at national and international meetings. I am a Professional Engineer in the Nuclear Engineering discipline in the State of California. I have appeared and qualified as an expert witness regarding nuclear fuel cycle costs at both state and federal hearings including proceedings before Atomic Safety and Licensing Boards of the Nuclear Regulatory Commission concerning nuclear plant licensing.

3. SMSC has been engaged by Southern California Edison Company (hereinafter "SCE") as consultants regarding uranium fuel cycle cost projections for San Onofre Nuclear Generating Station, Units 2 and 3 (hereafter "SONGS 2 and 3"). On behalf of SMSC I

have reviewed and evaluated the work of SCE concerning the projection of uranium fuel costs for the life of SONGS 2 and 3. I have also reviewed the analysis of the NRC in the cost-benefit analysis presented in the Draft Environmental Statement for SONGS 2 and 3 (NUREG 0490).

4. In 1977 SCE submitted its Environmental Report in support of its Operating License Application wherein it projected a levelized uranium fuel cost for SONGS 2 and 3. In its submittal SCE projected a price of U308 of \$42/lb. in 1977 dollars, and assumed a constant escalation rate of 7%/year. This resulted in a series of U308 prices, in current dollars, of \$51.45/lb., \$101.21/lb., \$199.10/lb., and \$391.66/lb. for the years 1980, 1990, 2000, and 2010, respectively.

5. In the seven years prior to 1977, the price of U308, as reflected by the NUEXCO Exchange Value ^{1/} had been stable in the \$6-\$7/lb. range for the first three years; rose rapidly to \$40/lb. in the following three years, and then appeared to stabilize in the \$40-\$45/lb. range. It was generally recognized in the early 1970s by uranium producers that new uranium production facilities could not be accommodated at the price prevailing at the beginning of the 1970s, i.e., \$6-\$7/lb. SMSC recognized that such new facilities could be profitable at

^{1/} The NUEXCO Exchange Value is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the last day of the month. NUEXCO (Nuclear Exchange Corporation) is the leading domestic corporation, headquartered in Menlo Park, CA., which publishes on a monthly basis a report on the uranium market including transactions and prices from which the Exchange Value is determined.

the \$40-\$45/lb. range. Thus, in the 1976-1977 time period it was not uncommon and would be considered reasonable to assume that the \$40-\$45/lb. range could persist for some time, particularly if the impacts of escalation were adequately applied to future prices. Thus, the 1977 SCE assumption should be considered as both reasonable and perhaps somewhat conservative.

6. SCE, with an assumed price of \$42/lb. for uranium concentrates escalated at 7% per year and using computer code FUELCOST IV, a code generally accepted and in use in the nuclear industry, projected a 30-year levelized fuel cost of 16.2 and 17.2 mills/kwh for SONGS 2 and 3, respectively without an allowance for costs associated with waste disposal and storage. SMSC owns a computer program known as SAROS which is also generally accepted in the nuclear industry for projecting fuel costs. Using the SAROS code and assuming the same \$42/lb. and 7% escalation assumptions as did SCE, fuel costs of 16.0 and 16.8 mills/kwh were projected for SONGS 2 and 3, respectively.

7. The NUEXCO Exchange Value remained fairly constant during 1977, 1978, and most of 1979. Toward the end of 1979 the NUEXCO Exchange Value started to decline, and as of May 1980, it had dropped to \$32/lb. U308. The 1977 SCE assumptions projected a 1980 price of U308 of \$51.45/lb., some 60% higher than the current NUEXCO Exchange Value.

8. The Nuclear Regulatory Commission Staff in its Draft Environmental Statement for SONGS Units 2 and 3 (NUREG 0490) used a projection of the U308 price over the period 1975 to 2000 of \$28/lb. and escalated that value at 5% per year. This results in a much lower price than that assumed by SCE.

9. It has been SMSC's practice and procedure in a estimating U308 prices to attempt to mathematically model the uranium production industry. Those models utilize basic information available to SMSC concerning the cost components of U308 production such as resource development costs, mine construction costs, mining labor costs, material costs, etc., together with investment and production schedules for typical new mines, to determine prices which result in a reasonable return on such investment. Based on the trends in the industry, as to mine depth, ore grade, productivity, etc., SMSC then attempts to project what the price would have to be at some future date to provide such a return. The SMSC model assumes supply and demand will remain in reasonable balance and that pricing will follow that of a mature supply industry. The SMSC model had recognized in 1977 that the low prices prevailing in the early 1970s were unrealistic over the long term. The model also recognized that the rapid rise to \$40/lb. was somewhat in excess of what was then required for a reasonable return on investment. However, such excess may have been necessary to compensate for the earlier low prices.

10. As previously indicated, the NUEXCO Exchange Value for U308 has dropped from \$42/lb. in 1977 to a current Exchange Value of \$32/lb. The SMSC model indicates that a significant fraction of the existing uranium production capability in the United States cannot provide a reasonable return on investment at a price of \$32/lb. However, because current production capability is in excess of current demand, a two to three year inventory has been accumulated. The liquidation of a fraction of that

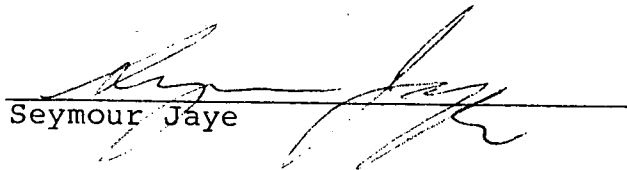
inventory appears to have been the principal pressure in reducing U308 prices during 1980. Further, such liquidation of inventories will probably continue for the next few years. Once this inventory liquidation has been completed, and with nuclear units currently under construction coming on-line, an increase in demand from current levels will result. Therefore, it will be necessary for the uranium prices to rise, at least to the 1977 level, to bring all existing production capability back into operation. I anticipate this will occur in the mid-1980s. In addition, during the late-1980s, additional price increases will be required to attract new investment. In the long term, small but continuous annual increases in U308 prices in excess of inflation should be expected to reflect the trends which have been observed towards deeper ore bodies and declining ore grades.

11. These above discussed forces and trends are converted to expected prices. Those price projections were escalated at 6% per year ^{2/} and then inserted in the SAROS fuel cycle cost program. The SAROS code then produced 30-year levelized fuel costs of 16.0 mills/kwh and 17.0 mills/kwh for SONGS Units 2 and 3, respectively. When compared to the similar fuel costs using the SCE U308 price projections computed on the SAROS code, the results agree to within .2 mills/kwh (supra, Paragraph 6).

12. I conclude from the results of this analysis that SCE has adequately accounted for the escalation of uranium prices

^{2/} This escalation rate was adopted by SCE to represent the general effect of inflation and therefore applies equally to all fuel sources.

for the life of SONGS 2 and 3.


Seymour Jaye

Subscribed and sworn to
before me this 2nd day
of June, 1980.

Maureen M. Haines
NOTARY PUBLIC FOR THE
COUNTY OF BOULDER, STATE OF
COLORADO.

My Commission Expires August 22, 1986

CERTIFICATE OF SERVICE

I hereby certify that on the 6th day of June, 1980, a true and correct copy of the following documents:

1. "Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contentions 1a (Dewatering Wells) and 9 (Uranium Fuel Costs)";
2. "Order (Proposed)";
3. "Brief in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contentions 1a (Dewatering Wells) and 9 (Uranium Fuel Costs)";
4. "List of Project References in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";
5. "Applicants' Statement of Material Facts Regarding Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells) as to Which No Genuine Issue of Fact Exists to be Heard.";
6. "Applicants' Statement of Material Facts Regarding Intervenor Friends of the Earth, et al.'s Contention 9 (Uranium Fuel Costs) as to Which No Genuine Issue Exists to be Heard.";
7. "Affidavit of Lucien Herish in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";
8. "Affidavit of John A. Barneich in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";

9. "Affidavit of Robert L. McNeill in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";
10. "Affidavit of Jay L. Smith in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";
11. "Affidavit of Kenneth P. Baskin in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 1a (Dewatering Wells).";
12. "Affidavit of Robert L. Bridenbecker in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 9 (Uranium Fuel Costs)."; and
13. "Affidavit of Seymour Jaye in Support of Motion for Summary Disposition of Intervenor Friends of the Earth, et al.'s Contention 9 (Uranium Fuel Costs).";

was served upon each of the following by deposit in the United States mail, first-class postage prepaid, addressed as follows:

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