EXHIBIT A

5/12/81

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-250
FLORIDA POWER AND LIGHT COMPANY	)	50-251
	)	(Proposed Amendments to Facility
(Turkey Point Nuclear Generating	)	Operating Licenses to Permit
Unit Nos. 3 and 4)	)	Steam Generator Repair)

AFFIDAVIT OF ROGER A. MESSENGER ON CONTENTION 1

I, Roger A. Messenger, being duly sworn, state as follows:

1. I am employed by Florida Atlantic University as Associate Professor and Chairman of Electrical Engineering and Director of the Florida Atlantic University Center for Energy Conservation. For the past six years my primary research interest has been in energy conservation and energy education.

2. Contention 1 states:

> "The alternative of conservation and/or solar energy is a superior alternative to repairing the steam generators at Turkey Point."

3. I have reviewed the energy conservation potential for the State of Florida using several approaches and find opportunities for across-the-board cuts in electrical energy consumption of 50-70 per cent by the replacement of inefficient energy conversion equipment in the end use sectors by currently available high efficiency equipment.

4. The major energy consumers in the residential sector are air conditioning, water heating and refrigeration. It is now possible to replace existing equipment in these areas with equipment that uses up to 80 per cent less energy. Since essentially all existing air conditioners, water heaters and refrigerators will require replacement during the next 20 years, it is reasonable to assume replacement in accordance with a standard market

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penetration curve. According to the "S" curve, a 60 per cent reduction in per capita consumption over a 20 year period will have intermediate values of 1.8 per cent after one year, 3.6 per cent after two years, 11.4 per cent after 5 years, and 30 per cent after 10 years.

5. The major energy consumers in the commercial sector are lighting and air conditioning. Each accounts for nearly 50 per cent of the total.

Commercial air conditioners are even more inefficient than residential units. They are generally over-sized, poorly controlled, and inefficiently designed. As a result, reductions in consumption in excess of 50 per cent are readily achievable.

Commercial establishments commonly use more than 5 watts per square foot for lighting. New lighting technology enables adequate lighting with 1 watt per square foot--an 80 per cent reduction in energy consumption.

A well designed incentive program could result in achievement of these reductions in the commercial sector in less than 20 years.

6. The marginal costs of efficient replacement equipment compare very favorably with investment in generation capacity. For example, a $1,000 marginal investment in an efficient air conditioner with heat strips, extra insulation, and a clock thermostat can reduce winter seasonal peak load from 10 KW to less than 5 KW on a 3-ton, 10 KW system. This represents an avoidance cost of less than $200 per kilowatt with an added bonus savings of nearly 5000 KWH per year in heating and air conditioning energy consumption. The environmental benefits from not consuming fuel and the economic benefits from energy conservation activity make the choice even more attractive.

A $200 marginal investment in an efficient refrigerator can reduce peaking requirements by 0.2-0.5 KW and can save up to 1800 KWH per year.

A $1,000 marginal investment in a solar water heater can result in peak reduction of 1-1.2 KW and an annual KWH reduction of about 3600.

A $600 marginal investment in a heat recovery system can produce comparable results to a solar system if the air conditioner is run more than 6 months out of the year.

Every KW reduction in commercial lighting produces a KW reduction in summer peak demand along with an annual KWH reduction of 2600 KWH for 50-hours per week operation.

7. Residential retrofit programs tend to provide a more significant reduction in winter seasonal peaks and commercial retrofit programs tend to provide a more significant reduction in summer seasonal peaking. An analysis of interactive contributions to peak reduction is presented in reference (3). A balanced residential/commercial retrofit program hence results in a balanced reduction in both summer and winter seasonal peaks.

Roger Messenger

Roger A. Messenger

Subscribed and sworn to before me
this 12 day of May, 1981.

Notary Public

My Commission Expires: Notary Public, State of Florida at Large
My Commission Expires Feb. 27, 1984
Bonded By American Fire & Casualty Company

References:

1. Messenger, R., "An Analysis of the Achievability and Desirability of Ambitious Conservation Goals in Florida Over the Next Decade", Florida Public Service Commission, Docket #800522-EG, October 7, 1980.

2. Florida Power & Light Company, Petition for Approval of Revised Energy Management Plan, Florida Public Service Commission, Docket #800662-EG (MC), December 30, 1980.

3. Messenger, R., and Villanueva, J., "Conservation--An Abundant, Attractive and Economical Energy Resource", Proc. 3rd International Conference on Alternate Energy Sources, Miami, December, 1980.

ACTIVITY PROFILE

Roger A. Messenger
1628 N. W. 8th Street
Boca Raton, Florida 33432

EDUCATIONAL BACKGROUND

University of Minnesota   Ph.D., E. E. 1969; MSEE, 1966; BS, 1965

EMPLOYMENT HISTORY

Florida Atlantic University, Boca Raton, Florida

Currently	Associate Professor and Chairman, Electrical Engineering
1975 - 1979	Associate Professor of Electrical Engineering
1970 - 1975	Assistant Professor of Electrical Engineering
1969 - 1970	Research Associate in Solid State Physics

CURRENT PROFESSIONAL AND CIVIC ACTIVITIES

I.E.E.E. - Member, Palm Beach Section
Registered Professional Engineer, State of Florida
Master Electrician, Palm Beach and Broward County, Florida
City of Boca Raton Contractors Board, Vice Chairman
Florida Region X Energy Action Committee
Florida Governor's Energy Office - Energy Education Advisory Committee
Florida Energy Research Task Force - Member
Frequent consultation with the media and the public on energy issues

HONORS, LISTINGS

Honors - Florida Atlantic University Distinguished Teacher, 1974
Palm Beach County Engineer of the Year, 1976

Listings - Who's Who in the South and Southwest
American Men and Women of Science
Outstanding Educators of America

RECENT GRANTS AND CONTRACTS

"Increasing the Energy Awareness of University Students, Phase II", contract with Florida Governor's Energy Office, 10/79 - 9/80, $19,967

"Increasing the Energy Awareness of University Students, Phase III", contract with Florida Governor's Energy Office, 7/80 - 6/81, $40,000

"Energy Model for Condominiums", contract with University of Florida Institute of Food and Agricultural Sciences, 7/80 - 3/81, $32,095

PUBLICATIONS

A variety of articles, reports, manuscripts and conference presentations on a variety of topics, including noise in gas discharges, photoabsorption of silicon containing deep impurities, electronics, residential energy conservation, electrical wiring, energy audits, energy efficiency building codes, energy conservation gadgets, and energy education.

Q. Dr. Messenger, please state your full name, address, and occupation.

A. My name is Roger Alan Messenger, I live at 1628 N. W. 8th Street in Boca Raton, Florida and I am employed by Florida Atlantic University as Associate Professor and Chairman of Electrical Engineering and Director of the Florida Atlantic University Center for Energy Conservation.

Q. Please give an account of your educational and experience background.

A. I received the B.S., M.S.E.E. and Ph.D. degrees from the University of Minnesota. Upon graduation in 1969 I came to Florida Atlantic University as a Research Associate in Solid State Physics. I was hired as an Assistant Professor of Electrical Engineering when the Electrical Engineering Department was formed at Florida Atlantic University in 1970. During the past six years, I have been involved in a wide variety of energy-related activities.

In 1975, with Dr. James Manring, I performed one of the first sets of field measurements of residential energy consumption patterns in South Florida. I have made attic temperature field measurements in order to evaluate attic ventilation schemes, have made performance measurements on solar water heater controllers, and have evaluated the performance of many devices marketed as energy savers. I was responsible for the establishment of CETA-sponsored energy audit services in Broward and Palm Beach counties in 1977. I recommended the organization plans, assisted in personnel selection, directed the development of the computerized analysis programs, trained personnel and directed an evalua- study of the programs.

I was selected as one of three training consultants during the implementation stages of the Florida Energy Efficiency Code for Building

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Construction and played an instrumental role in establishing the code in its current format, which has received widespread support from all sectors of the building industry. I have been the principal instructor at more than 30 educational seminars on the Energy Code throughout the state of Florida for building officials and contractors. For the past three years I have directed a statewide Post-Secondary Energy Education Project leading to the development and dissemination of energy materials appropriate for use in more than 100 course offerings in a wide variety of disciplines.

I have served on the Energy Conservation Subcommittee of the Southern States Energy Board and for three years was Chairman of the Florida Region X Energy Action Committee. I am currently a member of the Florida Energy Research Task Force and several other energy advisory groups.

I have appeared on radio and TV, make frequent presentations to public groups, and have testified before the Florida House of Representatives Select Committee on Energy and the Florida Public Service Commission.

Q. Have you made an estimate of the energy savings possible through conservation in the State of Florida?

A. Yes, I have.

Q. What were your conclusions?

A. My conclusions are that we could decrease electrical consumption in all sectors by 60 per cent and electrical demand by 70 per cent.

Q. What is the basis of your conclusions?

A. We have made energy consumption measurements on various appliances in more that 100 dwelling units. In addition, I have observed electric bills for many additional units, and I pay careful attention to examples of conspicuous consumption every time I enter a building. I am aware

that the systemwide average residential consumption is roughly 12,000 KWH per year. Yet, I am aware of examples of comfortable single family detached dwelling units larger than 1500 square feet in floor area which consume less than 5000 KWH per year.

In the commercial sector, buildings are generally over lighted, over cooled, and generally inefficiently operated.

Similar conditions exist in the industrial sector.

Q. Would you please specify measures that will reduce consumption in the residential sector?

A. Air conditioning, space heating, water heating and refrigeration are the major energy consumers in the residential sector. They account for nearly 80 per cent of most electric bills.

Most existing air conditioners were installed at a time when electric power was relatively inexpensive and when the lowest bidder was awarded the air conditioning contract. As a result, most of the air conditioners currently in use have SEERs of 5 or less. Air conditioners with SEERs of 13 are now available. This means the ratio of operating costs will be 5/13, or a 62 per cent decrease in electrical consumption to achieve the same cooling effect. When insulation and weatherization measures are included, the savings go even higher.

Most existing space heating is done with electric resistance heating, commonly known as heat strips. I have calculated the heating load on numerous dwellings and find that the heat strips are always oversized. A program of insulating attics and down-sizing heat strips can substantially reduce winter peak load requirements as well as total consumption requirements for heating.

Water heating consumption of electricity can be reduced by 80 per cent

with solar systems or heat recovery units, depending on lifestyles of of the occupants. Dedicated heat pumps can reduce water heating electrical consumption by 60-70 per cent.

I have found refrigerators sold during the 1960s and 1970s to be extremely wasteful in their use of electric power. New models are now available which use less than half of the energy used by their predecessors. Theoretical analysis shows that further reductions of nearly 50 per cent are still possible. In any case, the refrigerator that used 250 KWH per month in 1972 can now be replaced with a unit that uses 80 KWH per month, a 68 per cent savings.

Q. How about the commerical sector? Where is energy wasted there?

A. Lighting and air conditioning are the primary causes of waste in the commercial sector.

For example, many retail stores use more than 5 watts per square foot for lighting and most use more than 3 watts per square foot. Lighting accounts for nearly 50 per cent of commercial electrical loads.

We are presently building an engineering building on our campus which will use slightly over 1 watt per square foot for lighting. In almost all cases, commercial lighting loads can be reduced by 50-80 per cent.

Commercial air conditioning suffers from the same problems as does residential air conditioning, only more so. Commercial units are generally the lowest cost units available at the time, installed with inadequate controls, oversized, in inefficient envelopes. Since much commercial property is leased, little incentive exists to encourage landlords to improve the systems. As a result, commercial air conditioning consumes 2 to 4 times as much electrical energy as would be necessary. Since air conditioning is also roughly half the commercial load, we see that opportunities exist for reducing commercial energy consumption.

by 50 to 80 per cent.

Q. Florida Power and Light Company, in their Energy Management Plan for the '80s, also indicates substantial conservation opportunities. Would you please compare your data and methodology, if possible, with theirs?

A. The FP & L conservation estimate tends to be more conservative than mine. Although I am not completely familiar with their methodology, I do know that they try to base their estimates on econometric models which account for changes in real income and many other factors. For example, they attempt to predict whether a consumer will run an efficient air conditioner at a lower temperature than an inefficient air conditioner, which would result in the negation of part of the savings.

My model represents the savings which are achievable with current technology, without significant lifestyle changes. Since all models are attempts to predict the future, and since historically few have shown long-term success, it is, in my opinion, important not to let any modeling process replace common sense and good judgment.

My common sense arguments acknowledge that within the next 20 years, almost all refrigerators, water heaters, and air conditioners currently in use will break down and require replacement. A properly directed marketing campaign can result in replacement of all these energy users with the more efficient units previously discussed.

Sooner or later the commercial sector will recognize that energy conservation is their best bet, since it frees up energy for the growth they desire. Proper incentives to commerce and industry can influence their choices of the more efficient systems previously listed.

I speak of no simple task. But the more I look at Florida's alternatives for future energy, the more I realize that we will be forced into

the choice of conservation vs. very expensive electricity. I regard conservation as common sense stewardship of the earth's finite resources, but I also realize that noteveryone feels quite as strongly as I do. I am encouraged by the fact that the ceiling fan stores are selling thousands of fans. This to me is an indication that Floridians are making an effort to cut their electric bills. I think if consumers had accurate information on the short and long term importance of conserving I believe they would cooperate.

Q. What about the cost of energy conservation? How does it compare with generation alternatives?

A. There are two ways to conserve. The no-cost method involves discomfort and deprivation. It involves warm buildings and cold showers. It is very cost effective.

The alternative is to invest in more efficient equipment as mentioned earlier. Since this equipment if phased in over 20 years will replace worn-out equipment, the conservation cost is the marginal cost of high efficiency equipment vs less efficient equipment.

For a replacement 3-ton air conditioner with 10 KW heat strips, an extra $1,000 will buy the most efficient air conditioner along with additional insulation. This investment can reduce winter peaking requirements by 5 KW or more as well as save nearly 5000 KWH/YR. This amounts to a cost per KW avoided of about $200, as well as a savings of over 50,000 KWH in fuel costs over the life of the system.

For a replacement refrigerator, an extra $200 will buy the most efficient model, resulting in a demand reduction of 0.2-0.5 KW and a savings of up to 1800 KWH per year.

A solar water heater timed to run off peak can reduce summer and winter peaking requirements by about 1-1.2 KW and save nearly 3600 KWH per year

in fuel costs. The differential cost of a solar system after federal tax rebates is about $800-$1,000.

Q. What about future electric loads, such as electric cars? How will they affect the conservation/generation picture?

A. The overall thermodynamic efficiency of electric cars when run on hydroelectricity is 5 to 6 times better than the overall thermodynamic efficiency of internal combustion engine cars. However, the overall thermodynamic efficiency of electric cars when run on nuclear, oil or coal generated electricity is comparable to the overall thermodynamic efficiency of internal combustion cars. Hence, in a free market, it is doubtful whether electric cars in Florida will ever by able to compete with comparable performance internal combustion cars.

Other factors, of course, also enter the picture. Pollution from electric cars would be less. They are less noisy. In fact, ambitious conservation will tend to free up large quantities of base-load and peak load generating capacity which might be used for electric cars, and, perhaps, other appliances and for additional customer hook-ups.

Conservation tends to stabilize the electric system in a way which better prepares us to meet the requirments of an uncertain future.

Papers

1. J. V. Kasper, J. H. Parker, and G. C. Pimentel, "Iodine-Atom Laser Emission in Alkyl Iodide Photolysis," J. Chem. Phys., 43, 1827 (1965).

2. J. H. Parker and G. C. Pimentel, "Analysis of Quenching in the CF_3I Atomic Iodine Laser." Paper presented before the Division of Physical Chemistry, 152 Meeting of the American Chemical Society, New York, New York, September, 1966.

3. J. H. Parker and G. C. Pimentel, "Hydrogen Flouride Chemical Laser Emission through Hydrogen-Atom Abstraction from Hydrocarbons," J. Chem. Phys. 48, 5273 (1968).

4. K. L. Kompa, J. H. Parker, and G. C. Pimentel, "UF_6-H_2 Hydrogen Fluoride Chemical Laser: Operation and Chemistry," J. Chem. Phys. 49, 4257 (1968).

5. J. H. Parker and G. C. Pimentel, "Vibrational Energy Distribution through Chemical Laser Studies." Paper presented before the 2nd Conference on Chemical and Molecular Lasers, St. Louis, Missouri, May, 1969.

6. J. H. Parker and G. C. Pimentel, "Vibrational Energy Distribution through Chemical Laser Studies. I. Fluorine Atoms plus Hydrogen or Methane," J. Chem. Phys. 51, 91 (1969).

7. J. H. Parker, "Vibrational Energy Distribution in Reaction Products and Chemical Reactivity of Excited Species through Chemical Laser Studies," Ph.D. Thesis, University of California, Berkeley, 1969.

8. J. H. Parker and G. C. Pimentel, "Some New UF_6-RH Hydrogen Fluoride Chemical Lasers and a Preliminary Analysis of the Chloroform System," IEEE J. Quantum Electron. 6, 1975 (1970).

9. J. H. Parker and G. C. Pimentel, "Vibrational Energy Distribution through Chemical Laser Studies. II. Fluorine Atoms plus Chloroform," J. Chem. Phys. 55, 857 (1971).

10. E. Cuellar, J. H. Parker and G. C. Pimentel, "Rotational Chemical Lasers from Hydrogen Fluoride Elimination Reactions," J. Chem. Phys. 61, 422 (1974).

11. J. H. Parker, T. Casey, R. Slayton, and C. Herod, "Mandatory Deposits on Beverage Containers in Florida" (Report submitted to Florida State Senator J. Gordon), 1974.

12. J. H. Parker, "Hydrogen Fluoride Vibrational Energy Distributions for the Reactions of Fluorine Atoms with Cyclanes" Int. J. Chem. Kinetics 7, 433 (1975).

13. J. H. Parker, "Rotational Chemical Lasers from Hydrogen Fluoride Elimination Reactions." Paper presented before the Division of Physical Chemistry, 26th Southeastern Regional Meeting of the American Chemical Society, Norfolk, Virginia, October, 1974.

14. J. H. Parker, "Reaction Kinetics of the CF_3I Atomic Iodine Laser." (Manuscript in prepartion).

15. J. H. Parker, B. W. Gay, R. Noonan and J. J. Bufalini, "A Kinetic Analysis of the Photodecomposition of Methyl Nitrite in the Presence of Air." (Manuscript in preparation).

16. J.H. Parker, "Environmental, Social and Economic Impacts of Energy Conservation." Paper presented at the Energy Conservation Training Institute, U.S. Federal Energy Administration, Atlanta, Georgia, March, 1976 (invited paper).

17. J.H. Parker and M. Sullivan, "Sulfur Oxides in Dade County." Paper presented before the Dade County Commission Hearing, June 1, 1976.

Recent Papers

18. M. A. Ogden and J. H. Parker, "Ecological Landscaping." Paper presented at a workshop on ecological landscaping, Miami, Florida, April 1977.

19. J. H. Parker, "Frontiers of Environmental Thought." Paper presented at the National Association of Environmental Education Conference, Estes Park, Colorado, April 1977.

20. J. H. Parker, "Precision Landscaping for Energy Conservation," Proceedings of the 1979 National Conference on Technology for Energy Conservation, 1979.

21. Barney L. Capehart and J. H. Parker, "Florida's REAC'D: A Vehicle for Technical Input by Citizens to the State Energy Policy Process," Proceedings of the 1979 IEEE Region III Conference, Roanoke, Virginia, 1979.

22. Danny S. Parker, Mona Sullivan, and J. H. Parker, "Energy Conservation through Landscaping--A Case Study," Meeting of the Florida Academy of Sciences, Miami, Florida, March 1979.

23. Danny S. Parker and J. H. Parker, "Energy Conservation Landscaping as a Passive Solar System." Paper for the 4th National Passive Solar Conference, Kansas City, Missouri, October 1979.

24. J. H. Parker, "An Energy and Ecological Analysis of a Residential Landscape." Paper presented at the Florida Academy of Science Meeting, March 1980.

25. J. H. Parker, "Uses of Landscaping for Energy Conservation." Report submitted to the Governor's Energy Office of Florida, January 1981.

26. J. H. Parker, "Energy Conservation Landscape Designs for Mobile Homes in South Florida." Report submitted to the Governor's Energy Office of Florida, March, 1981.

27. P. J. Shlachtman and J. H. Parker, "Peak Load Energy Conservation." Paper presented at the Florida Academy of Sciences Meeting, May, 1981.