

January 14, 1985

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OFFICE OF SECRETARY
OF ENERGY

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
)	
CAROLINA POWER & LIGHT COMPANY)	
and NORTH CAROLINA EASTERN)	Docket No. 50-400 OL
MUNICIPAL POWER AGENCY)	
)	
(Shearon Harris Nuclear Power)	
Plant))	

AFFIDAVIT OF KEVIN TWINE
ON WILSON 12(b)(3) AND EPJ-2

County of Wake)	
)	ss.
State of North Carolina)	

KEVIN P. TWINE, being duly sworn, deposes and says:

1. I am the Manager of Resources Planning at EnviroSphere Company, a division of Ebasco Services, Inc. In my position, I am responsible for EnviroSphere work related to demographics, land use, and offsite emergency planning. In that capacity, I have participated in offsite emergency planning work at three nuclear power plants in the United States, in addition to the Shearon Harris Nuclear Power Plant. In each of these cases, I have been responsible for estimating resident and transient populations within the 10-mile plume exposure

pathway Emergency Planning Zone ("EPZ") surrounding each plant. In two of these cases, I prepared detailed estimates of the population requiring official transportation assistance, in addition to my involvement in other substantive offsite emergency planning work. I hold a Master of Regional Planning degree from the University of North Carolina at Chapel Hill. A current statement of my professional qualifications and experience is attached hereto. My business address is Two World Trade Center, New York, New York 10048. I have personal knowledge of the matters stated herein and believe them to be true and correct. I make this affidavit in response to Wilson Contention 12(b)(3) and EPJ Contention 2.

2. The purpose of this affidavit is to explain the derivation of the estimated number of members of the general public within the EPZ who might need official transportation assistance in an evacuation due to an emergency at the Harris plant.

3. For purposes of the Evacuation Time Estimate (ETE), Applicants estimated that 410 households within the EPZ do not own a vehicle. As indicated in the ETE report (at page 3-2), data from the 1980 Census of Population, Advance Estimates of Social, Economic, and Housing Characteristics were used to estimate the number of permanent residents within the EPZ who do not own a vehicle. The Census Advance Estimates for the four EPZ counties were used to derive percentages of households not owning a vehicle. The percentages were then applied to the EPZ

data presented in the CP&L report Demographic Data for the Shearon Harris Nuclear Power Plant (SHNPP) Evacuation Time Estimate Report (Revision 1, October 1983) ("Demographic Data Report"), to arrive at the estimated number of households within the EPZ who do not own a vehicle. This estimate was based upon the best data available at the time.

4. Since those estimates were prepared for the ETE, more complete U.S. Census data has become available. Therefore, a more precise estimate of people without transportation specific to the EPZ was prepared, utilizing detailed 1980 U.S. Census data for enumeration districts within the EPZ, and the Demographic Data Report. This estimate includes, a) persons who are members of households which do not own a vehicle, and, b) persons in households in which the vehicle is not at home. This refined estimate is presented by evacuation zone in Table 1 below.

TABLE 1
ESTIMATED NUMBER OF PERSONS
NEEDING OFFICIAL TRANSPORTATION
ASSISTANCE, BY TIME OF DAY

Zone ^{1/}	Evening		Day Time	
	(6 p.m. - 8 a.m.)	(8 a.m. - 3 p.m.)	(3 p.m. - 6 p.m.)	
B	30	19	31	
C	2	1	3	
D	1	2	4	
E	78	84	156	
F	37	35	64	
G	<u>131</u>	<u>105</u>	<u>172</u>	
Wake County	279	246	430	
Total				
H (Harnett County)	16	18	30	
I	3	3	6	
J	<u>6</u>	<u>13</u>	<u>22</u>	
Lee County Total	9	16	28	
K	15	12	19	
L	11	7	12	
M	14	13	25	
N	<u>9</u>	<u>6</u>	<u>11</u>	
Chatham County	49	38	67	
Total				
Total - EPZ	353	318	555	

5. The estimated number of people without transportation was prepared for three times of day (as shown on Table 1):

^{1/} No members of the public reside in Zone A.

1. The evening (non-working) and weekend hours (roughly 6 p.m. to 8 a.m. on weekdays);
2. The hours of 8 a.m. to approximately 3 p.m. during weekdays, when the entire working and school populations are away from home; and,
3. The hours of 3 p.m. to 6 p.m. during weekdays, when the working population is away from home, but the school population is at home.

6. To estimate the weekend and evening population, the number of households without automobiles within the EPZ was taken (a total of 655 households, from the Census) and then multiplied by the number of persons per household (as derived from Census data, and which varied from area to area within the EPZ). For planning purposes, it was then assumed that a maximum of 20 percent of those persons would need transportation assistance from emergency response officials, since past emergency evacuation experience (e.g., the December 11, 1982 evacuation of 16,000 people in and around Hahnville, Louisiana, due to a toxic chemical accident at a Union Carbide facility) indicates that no more than 20 percent of the population which does not own vehicles would remain without transportation in an emergency. The others (80 percent or more) would accept offers of transportation from friends, neighbors, or relatives.

7. To estimate the population without transportation in the EPZ between the hours of 8 a.m. and 3 p.m., the total resident population was adjusted downward to account for school

students and people who are at work. Both of these numbers were derived from detailed 1980 Census data. The number of households without cars during the day was then calculated by deducting the vehicles used for transportation to work (from the Census data), taking into account people who walk to work and those who use car pools (also from the Census data). The average number of persons per household during the day was then calculated (this is somewhat lower than the average persons per household when everyone is assumed to be home), and applied to the number of households without cars during the day, to derive the number of persons without automobiles during the day. As discussed above, a maximum of 20 percent of these persons would need transportation assistance from emergency response officials. The remaining 80 percent or more would receive rides from friends and relatives, or would be picked up by working members of their households. (Residents who work outside the EPZ would be permitted to re-enter the EPZ for this purpose.)

8. To estimate the population without transportation in the EPZ between the hours of 3 p.m. to 6 p.m., the same methodology as for the hours of 8 a.m. to 3 p.m. was used except that school students were assumed to be at home. Other factors -- such as the number of households without cars during the day, and the number of people at work -- remained the same.

9. Dr. Wilson, in his response to Applicants' interrogatories on Wilson 12(b)(3), has suggested the use of an

extremely conservative methodology to estimate the number of persons needing transportation assistance. It should be noted that Dr. Wilson's suggested methodology is normally used to provide a range of estimates including a lower as well as an upper limit. (Dr. Wilson has discussed only the upper limit). Use of Dr. Wilson's conservative methodology, applied to the calculations outlined in paragraphs 5 through 8 above,^{2/} would yield, for example, a range of 322 to 788 persons in the EPZ needing official transportation assistance between the hours of 3 p.m. to 6 p.m. Based on my review of the "Affidavit of Jesse T. Pugh, III on Wilson 12(b)(3) and EPJ-2," I have determined that sufficient transportation resources exist to accommodate such a range.

10. To verify the capability of EPZ residents to evacuate via private vehicles, U.S. Census data was reviewed to determine the number of vehicles remaining inside the EPZ at various times of the day. During the evening hours, the approximately 19,832 persons in the EPZ have access to approximately 13,396 vehicles. During the day, the 12,028 people (including school children) estimated to remain in the EPZ have access to approximately 6,876 vehicles. These statistics demonstrate that evacuation by private vehicle would not pose a problem.

^{2/} Assuming that 80% of persons without access to their own private transportation would evacuate with friends and relatives.

Indeed, assuming that the entire population of the EPZ evacuated by private vehicle, and only 50 percent of the available private vehicles were used, vehicle occupancy rates would nevertheless be only 3 to 3.4 persons per vehicle.

11. In summary, the ETE included an estimate of 410 households within the EPZ which do not own a vehicle. Because complete U.S. Census data has become available since the preparation of the ETE, Applicants have prepared a more precise estimate of people within the EPZ who do not have access to private transportation. This estimate considered the fact that most people in the EPZ without access to their own private vehicles would accept offers of transportation from friends, neighbors or relatives. There is an ample number of privately owned vehicles within the EPZ to provide such private transportation. After allowing for such private transportation of evacuees from the EPZ, it is estimated that between 318 and 555 persons would remain who would need official transportation assistance, depending upon the time of day. This estimate takes into account not only households which do not own vehicles, but also situations where the family vehicle is with a person at work and away from home. It also considers school students, who are home for a part of the day when the family vehicle may

not be. In addition, it considers nighttime and weekend scenarios. Using the best currently available data, this is the most accurate and realistic estimate that can be developed for emergency planning purposes.

Kevin P. Twine
Kevin P. Twine

Sworn to and subscribed before me this 14th day of January, 1985.

Betty L. Heals
Notary Public

My Commission Expires: September 28, 1985

KEVIN P TWINE
Manager - Resources Planning

SUMMARY OF EXPERIENCE (Since 1967)

Total Experience - Seventeen years experience including supervision and direction of numerous projects involving demographic, land use, and socioeconomic impact and environmental assessment analyses.

Professional Affiliations - American Society of Photogrammetry

Education - MRP, University of North Carolina, 1967 - Regional Planning
BA, Wesleyan University, 1965 - History

REPRESENTATIVE ENVIROSPHERE PROJECT EXPERIENCE (Since 1974)

Mr. Twine is currently supervising the technical program to assist Carolina Power & Light Co. in their role to develop the offsite emergency plan in support of the Shearon Harris Nuclear Power Plant. This program has involved close interaction with officials of the State of North Carolina, four counties, and numerous local agencies to define and resolve problem areas in the emergency plan. Included in this project is the provision of technical assistance to CP&L and their legal counsel to support, with expert analysis and judgement, the ASLB hearing process.

Manager - Resources Planning

Responsibilities include management of Envirosphere Staff involved in land use, socioeconomic, aesthetic, and archaeological disciplines; direction of research in these fields; management of projects relating to resources planning; management of Envirosphere's Land Resources Analysis System (LRAS) for satellite imagery analysis and computerized geographic studies; expert testimony before regulatory bodies.

Projects include:

Carolina Power & Light Co. Shearon Harris Nuclear Power Plant. Served as technical project manager for licensing support concerning off-site emergency planning. Work involved extensive contacts with local and state government officials, utility officials, and legal counsel, as well as demographic analyses and planning for shelter and evacuation.

Battelle Memorial Institute; Salt Repository Program. Canyonlands National Park Impact Report. Directed preparation of analysis of aesthetic, cultural resources, recreational and socioeconomic impacts of proposed high-level radioactive waste repository upon Canyonlands National Park.

KEVIN P TWINE

REPRESENTATIVE ENVIRONMENTAL PROJECT EXPERIENCE (Continued)

TRC Environmental Consultants, Inc; Data Base for Air Quality Materials Damage Study. Gathered land use, demographic, and air quality data and incorporated it into a computerized data base for use in an air quality materials damage study. Data base was organized in two formats: 9,000 1-km square grid cells; and 1200 census tracts. Study area was Southern California Air Basin (Los Angeles area).

Kansas Gas and Electric Company (KG&E); Wolf Creek Nuclear Generating Station. Directed a 3 person field team in a four month comprehensive offsite emergency planning effort for Coffey County, Kansas (location of Wolf Creek Nuclear Plant) and the State of Kansas. Functioned as part of KG&E staff. Prepared witnesses and developed testimony for hearings. Reviewed, revised and prepared offsite emergency plans and implementing procedures. Interfaced closely with county and state officials.

Louisiana Power & Light Company; Waterford 3 Nuclear Generating Station. Directed the preparation of Evacuation Time Estimate, 1980 and 1982; testified in defense of findings at hearings of Atomic Safety and Licensing Board, May, 1982; directed preparation of detailed analysis of large evacuation which took place in Waterford 3 vicinity as a result of an industrial accident on December 11, 1982.

Consolidated Edison Company of New York; Site Selection Study for Coal Burning Waste Disposal Facility. Directed preparation of demographic, land use, and aesthetic elements of site selection study; performed analysis of satellite imagery on LRAS for input to site selection procedure.

Pennsylvania Power & Light Company; Pumped Storage Site Selection Study. Directed land use, socioeconomic, aesthetic and archaeological studies and was responsible for assisting a Public Advisory Committee (PAC) in reaching a decision.

New York State Electric & Gas Corp.; Somerset Station Unit No. 1 Licensing. Directed aesthetic impact studies; estimates of construction worker mobilization; landscape architecture; recreational multiple use plan.

Public Power Corporation of Greece; First Nuclear Power Station. Site selection studies in southern two-thirds of Greece, including development and analysis of criteria concerning demographic, land use, socioeconomic and aesthetic factors.

Florida Power & Light Company; St. Lucie Unit 2 Nuclear Generating Station. Directed the preparation of demographic, land use, cultural and aesthetic analyses for the environmental report and safety analysis; testified at ACRS hearings, Oct. 1981.

KEVIN P TWINE

REPRESENTATIVE ENVIROSPHERE PROJECT EXPERIENCE (Continued)

Louisiana Power & Light Company; Waterford Unit 3 Nuclear Generating Station. Directed the preparation of a survey of construction and operational work forces to determine socioeconomic impacts; performed land use and demographic studies for environmental report and safety analysis.

Directed the gathering and presentation of detailed agricultural information within 50 miles of the St. Lucie 2 and Waterford 3 Nuclear Power Stations.

Directed land use and socioeconomic studies for four synthetic fuels plants in central and south-central areas of U.S.

Analyzed land use and industrial development implications of a major coal conversion project in New York metropolitan area.

Served as project manager for a review of decontamination and decommissioning methods for radioactive facilities at Oak Ridge National Laboratories; was project manager of an environmental report and engineering plan for removal of radioactive wastes from the site of the former Kellex laboratory in Jersey City, NJ.

Regional Planner (4 years)

Areas of responsibility included demographic modeling and projections; use of remote sensing techniques land use surveys and analyses; regional economic analysis; socioeconomic impact assessments for large projects; land use surveys and analyses; public services assessment; and community planning.

Projects included:

Developed demographic models for projecting population by annular sector within five and fifty miles of the Waterford Unit 3 Nuclear Generating Station for Louisiana Power & Light Company.

Developed mathematical models to project construction worker influxes and location patterns at major energy projects, enabling the assessment of socioeconomic impacts on a town-by-town basis, for the Lake Erie Generating Station, Dunkirk, New York; Niagara Mohawk Power Corporation. Defended these models at New York Public Service Commission hearings, November 1976 - March 1977.

Directed land use and socio-economic analyses for site-selection studies for large coal-fired generating facilities in British Columbia, Canada, and Washington State.

KEVIN P TWINE

PRIOR EXPERIENCE (8 years) (Cont'd)

Directed the preparation of land use and socio-economic assessments for the Philippine Nuclear Power Plant Unit No. 1, Philippine National Power Corporation. Prepared the land use and socio-economic elements of the environmental report for the Killen Steam Electric Station, Adams County, Ohio, for the Dayton Power and Light Company.

PRIOR EXPERIENCE (8 years)

- The Fantus Company-Consultant (1 year)
- Florida Land Company-Land Planner (2 years)
- Planning Department, City of Portland, Maine-Community Development Coordinator (3 years)
- Gassner, Nathan, Browne - Architects/Planners; Project Manager (1 year)
- Memphis and Shelby County Planning Commission; Associate Planner (1 year)

PUBLICATIONS AND PAPERS

Twine, K P 1983. The Use of Landsat as a Cost-Effective Data Resource: Land Cover Analysis of Multiple Sites (a Case Study). National Conference on Energy Resource Management, San Francisco, CA, August.

Twine, K P 1982. Using Satellite Imagery and Geographic Information Systems. Presented at Seminar on Environmental Impact Assessment: Its Importance, Methods, and Applications, Santo Domingo, Dominican Republic, October.

Twine, K P 1982. Impact Assessment Methods: Sociocultural Studies. Presented at Seminar on Environmental Impact Assessment. Its Importance, Methods, and Applications, Santo Domingo, Dominican Republic, October.

Twine, K P, and P H Astor 1979. Geographic Information Systems In Right-Of-Way Management: The Status And Uses Of Current Computer Technology. Presented at the Second Symposium on Environmental Concerns In Right-Of-Way Management, Ann Arbor, Michigan, October.

Twine, K P 1978. How to pick your plant site. Parts I and II, discussing models for projecting socioeconomic impacts of construction workers at a large electric generating facility, in "The Management Report," Electrical World, August and September.