4-20-81

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	
HOUSTON LIGHTING & POWER COMPANY	Docket No. 50-466
(Allens Creek Nuclear Generating Station, Unit No. 1)	

TESTIMONY OF KEITH WOODARD ON BEHALF OF HOUSTON LIGHTING & POWER CO. ON TEXPIRG CONTENTION 6 (McCORKLE CONTENTION XI) RELATING TO AIRCRAFT HAZARDS)

Q. Please state your name and place of employment.

A. My name is Keith Woodard and I am employed by Pickard, Lowe and Garrick, 1200 18th Street, NW, Washington, DC 20036.

Q. Please state your education and professional qualifications.

A. A statement of my education and professional qualifications is attached to this testimony as Exhibit KW-1.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address TexPirg contention 6 (and McCorkle contention XI) which alleges that:

> The maximum credible accident has not been considered because the present safety and environmental analyses do not consider the effects of a large airplane, such as a Boeing 747, crashing into the containment vessel.

The bases for TexPirg's contention are (1) that large plane traffic has increased at least 30% in the last three years and will be several percent higher before the plant is

closed in about 40 years and (2) new airports capable of handling such large airplanes have been proposed to be built closer to the site than present airports.

Q. Will you describe the large aircraft activities in the region in which ACNGS will be located?

A. Yes. Large commercial aircraft are present in the region primarily in the vicinity of the large airports near Houston and along airways designated by the FAA.

Q. In its contention, TexPirg refers to a "large airplane" such as a Boeing 747. What type of aircraft have you included in the category of large commercial aircraft?

A. Generally speaking the large commercial aircraft are jets and include, for example, the B737, B707, B727, DC9, DC8 and B111. The very large jets such as the B747, L1011 and DC10 are also included and are referred to as "heavy" aircraft.

Q. Where are the present locations of airports within the Houston area which are capable of handling large aircraft including the Boeing 747?

A. The Houston Intercontinental Airport is the largest airport in the Houston region, and with its 12,000 foot runway is the closest airport from the plant site capable of handling large aircraft including the Boeing 747. Houston Intercontinental is located about 47 miles northeast of the ACNGS site. The Houston Hobby Airport, located about 48 miles east of the site, has a maximum runway length of 7600 feet and, thus, cannot accommodate operations by

aircraft much larger than the Boeing 727. There are currently no other airports within a 50-mile radius of the ACNGS site which are capable of handling large commercial aircraft.

Q. Please describe the number of aircraft movements at Houston Intercontinental and Hobby airports of the various sized aircraft.

A. Presently there are about 335,000 aircraft operations annually at Houston Intercontinental. About 60% of this total are commercial air carrier type aircraft, and about 4% of the total are "heavy" jets over 300,000 pounds (e.g., like the Boeing 747 or the DC 10). At Hobby, there are about 350,000 operations annually of which only about 20% are commercial air carriers up to the B727 size.

Q. Under NRC criteria, is an analysis with respect to the probability of accidents of large aircraft landing and taking off from Houston Intercontinental and Hobby airports required for ACNGS?

A. No. Accidents associated with aircraft takeoffs and landings, as well as "in-flight" operations, have been the subject of many statistical studies. From these studies, it is well-known that the accident rate decreases as distance from an airport increases. It also follows that the higher the number of operations at an airport, the greater the chance of an accident. Based on the available accident statistics, the NRC has developed criteria related to distance and traffic for determining whether an aircraft

accident probability analysis should be undertaken. The NRC criteria as set forth in its Standard Review Plan, Section 3.5.1.6 requires a statistical analysis for the following:

a. Any airport located within five miles of the site.

b. An airport with projected operations greater than 500 d^2 movements per year located within ten miles of the site.

c. An airport with projected operations greater than 1000 d^2 movements per year located beyond ten miles from the site, where "d" is the distance in miles from the site.

The major airports (Houston Intercontinental and Hobby) are both more than 45 miles from the ACNGS site, and both have aircraft movements less than 2,000,000 which is approximately the figure resulting from the 1000 d^2 criterion. Thus, under NRC criteria, an accident probability analysis is not required for either airport.

Q. Have you reviewed the projections for growth in air traffic at both Houston Intercontinental and Hobby airports?

A. Yes. As previously stated, current operations stand at about 335,000 at Houston Intercontinental and at about 350,000 at Hobby. The FAA in its "Terminal Area Forecasts" dated February 1981, projects the 1992 traffic to increase to about 526,000 and 494,000 for Houston Intercontinental and Hobby, respectively. Commercial air carrier operations of which only a small fraction are of the "heavy" type are

expected to increase by less than a factor of two.

Q. Assuming the increase in aircraft movements which you have just described, what effect do these projections have on your analysis?

A. None. The projected figures still fall well below the 2,000,000 number of operations required by the NRC for a probabilistic accident analysis. In addition, aircraft safety has an established trend toward improvement which reduces the risk even though the traffic is increasing. For example, in the past 10 years the accident rate for commercial aircraft decreased by about a factor of 2 while the number of hours flown increased by only 20%.

Q. Have you reviewed the airways which pass within the vicinity of ACNGS?

A. Yes. Inspection of aeronautical charts show that two airways occupy airspace near the proposed plant. These are shown on Figure 1 attached. One is Victor Airway (designated V198) which is utilized by aircraft flying below 17,000ft. and the other is "jet" route (designated J138) utilized by aircraft operating above 18,000ft. There are several other Victor and Jet routes also shown on Figure 1; however, the closest approach of these routes is more than 5 miles from the site.

Q. Do you have information on the number of large aircraft flights which use J138 and V198?

A. Yes. The FAA estimates the current use of these airways nearest the site to be about 34,000 annually of which about

40% are large commercial air carriers and less than 1% are of the "heavy" type. This information supplied by the FAA shows that most (98%) of the flights along V198 and J138 are eastbound, many of which are descending into Hobby Airport. Very few are flying westbound along this airway. Heavy aircraft would not be descending into Hobby since the runway length cannot accommodate such large aircraft; therefore, the "heavy" aircraft would pass over the site at altitudes greater than 18,000 feet.

The J138 route is used primarily at very high altitudes by jet traffic in level flight between the navigational aids located at San Antonio and Hobby.

Q. Have you performed an analysis related to the probability of "in-flight" aircraft accidents along these routes?

A. Figure 1 located all designated airways in the site vicinity that are used by large commercial aircraft. The FAA estimate of aircraft traveling along V198 and J138 are all flying IFR (instrument flight rules) and therefore include all commercial aircraft which are required to fly under such rules. The FAA estimates the actual number of "heavy" commercial aircraft traveling along these airways to be about 280 per year, and the number of large commercial jets to be about 14,000 per year.

Since the airports are a considerable distance from the ACNGS site, accidents associated with landing and takeoff activities would not occur near the site. Therefore, the "in-flight" accident rate statistic of 7×10^{-10} accidents

per mile flown is appropriate. We calculate the probability (P) of an accident affecting the plant using the following relationship from the NRC's Standard Review Plan (Section 3.5.1.6):

$$P = R * N * A/W$$

In this equation R is the "in-flight" accident rate, N is the number of large commercial or heavy aircraft flights along the airway, A is the area of critical plant structures and W is the width of the airway:

$P_{\text{heavy aircraft}} = (7 \times 10^{-10})\ (280)\ (0.01)/9.2 = 2.1 \times 10^{-10}$ per year

$P_{\text{large commercial aircraft}} = (7 \times 10^{-10})\ (14{,}000)(0.01)/9.2 = 1.0 \times 10^{-8}$ per year

Thus, the probability of a large aircraft accident affecting the ACNGS facility is extremely low, and under NRC criteria, need not be furthered considered.

Q. Have you considered the projected increase in flights along these airways?

A. Yes.

Q. How does this projected increase affect your analysis?

A. The FAA projects that for the year 1992, the commercial aircraft traffic is projected to double in the Houston area. Therefore, if all other assumptions (including airway routing and accident rates) remain unchanged, the probability of an accident would double yielding 4.2×10^{-10} per year and 2.0×10^{-8} for heavy and large commercial aircraft, respectively. The probabilities of an accident remain extremely low and still well within NRC criteria requiring no further

consideration.

Q. Have you examined the question of whether additional airports will be built in the vicinity of ACNGS which would be capable of handling large commercial aircraft?

A. Yes I have. Over the past several years, the FAA has received applications for various sized airports to be located generally 15-20 miles east of the site. Apparently, the intent of several developers is to build "reliever" airports in the Houston area to relieve congestion at Houston Intercontinental and Hobby. Two proposals for such a reliever airport included new airports in the vicinity of Katy and Rosenberg approximately 15-18 miles east to northeast of the site. These airports would handle mostly privately owned small planes with possibly 10% being twin-engine aircraft operated by commercial air carriers. However, these applications have now expired.

About two years ago, an application was filed with the FAA for a larger airport referred to as "Hou-West." It would also be located about 15 miles east of the site. However, the FAA reports that there is some uncertainty as to whether the facility as currently proposed will be built. The FAA estimates that, if built, this airport could have 100,000 to 200,000 operations annually most of which would be general aviation with some commercial operations.

Q. Would a probability accident analysis for a hypothetical airport located in the Katy-Rosenberg area be required under NRC criteria?

A. No. If a large airport (e.g., Hou-West) were to be located in the Katy-Rosenberg area about 15 miles from the site, NRC criterion (c) would apply only if the airport had 1000 d^2 operations or about 225,000 annual operations. Since the FAA projects 100,000 to 200,000 operations annually for such a facility, a detailed accident probability analysis would not be required by the NRC.

Q. What are your conclusions?

A. Based on this evaluation, the current aircraft operations in the ACNGS site region do not pose a safety hazard. Few large B747 type "heavy" aircraft currently use airspace near the site and there is no reason to expect that the number of large commercial operations combined with accident rate statistics would lead to an accident probability at the site high enough to justify plant design changes to accommodate the effects of such an accident.

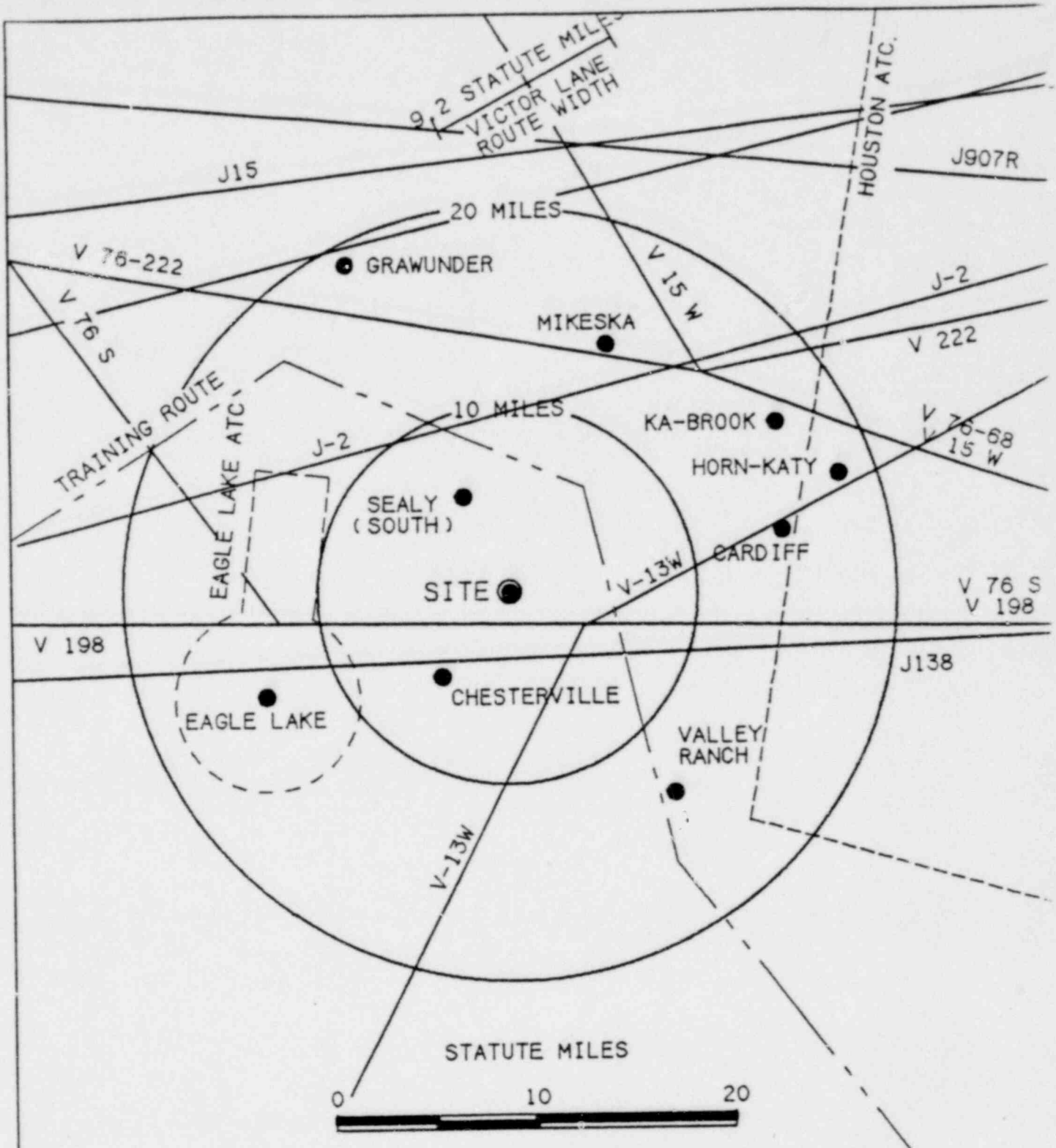

FIGURE 1
AIRWAYS IN THE ACNGS REGION

Exhibit KW-1

EDUCATION AND PROFESSIONAL QUALIFICATIONS

Keith Woodard

I am a nuclear engineer with 17 years experience in engineering consulting, safety analysis, and nuclear power plant siting evaluation. I am presently employed by Pickard, Lowe and Garrick, Inc. of Washington, DC and Irvine, California. My office address is 1200 18th Street, N.W., Suite 612, Washington, DC, 20036. Pickard, Lowe and Garrick, Inc. has provided consulting services to electrical generating utilities concerning all aspects of nuclear power development since 1956. A considerable portion of the firm's work is related to siting studies and, in particular, evaluation of environmental impacts due to power plant operation and evaluation of outside activities to determine their potential for affecting safe plant operations.

I received a Bachelor of Arts degree in Physics at Occidental College, Los Angeles, California in 1961. I received a Master of Science degree in Nuclear Engineering from UCLA in 1963. From 1963 to 1967 I was a project leader with the U.S. Atomic Energy Commission, Division of Reactor Licensing, where I was responsible for safety and siting reviews of nuclear facilities. Since 1967 I have been employed by Pickard, Lowe and Garrick, Inc., where I have been responsible for nuclear safety and siting analyses. I have conducted a number of studies which considered hazards to nuclear plants due to man-made activities including a number of aircraft accident probability studies. I am a member of the

American Nuclear Society, the Air Pollution Control Association and the American Meteorological Society.