UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

TEX PIRG'S SUPPLEMENTAL DIRECT WRITTEN TESTIMONY OF DR. MARRACK

At the beginning of this hearing it was agreed that the intervenors would not present their testimony until both the applicant, H L & P, and the NRC Staff had presented all of their witnesses and closed their case. However to help with a scheduling problem the Board ruled that Dr. Marrack would have to testify on Tex PIRG contentions 2 and 4 before Dr. Frank S. Sanders was finished with his testimony. See page 4356 of record. Dr Marrack testified between pages 4365 and 4699 then Dr. Sanders testified between pages 4701 and 5083 after Dr. Marrack. The following testimony of Dr. Marrack will address only those issues addressed by Dr Sanders between pages 4701 and 5083.

TESTIMONY

A viable fishery is one which is self sustaining. If it needs replenishing with fish, it is not viable. A company like Lockheed or Chrysler which gets special government support to bail it out from a financial bankrupcy is not really "viable". Both Dr Sanders and the Texas Parks and Wildlife Department both admit that for a sustained desirable sport fishery, the Allens Creek Lake will be dependant on regular restocking of fish. The applicant is apparently relying on the State of Texas to do this restocking for them. However no evidence of a contractual agreement with Texas Parks and

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Wildlife to do this restocking for the applicant has been presented into the record. No commitment to another source of fish has been offered into evidence, nor has an binding commitment by the applicant been made to regularly provide, during the life of the plant, adequate funds to buy fish for lake stocking as part of a replenishment program. In fact, neither a criteria or plan for restocking has been presented in the FES, FSFES or elsewhere. Without stocking and regular restocking with sport fish, the Allens Creek Lake will not be one in which fishermen can catch enough fish to interest them and their fishermen friends in returning , ie it will not be a viable fishing lake for fishermen or for fish.

It is my opinion that the fish available to be caught must be free of poisions and toxic chemicals which might reasonably be expected to impair human hea even when eaten in large quantities on a long-term basis. In the Allens Creek Lake, the potential for significant mercury concentrations to build up in the tissues of sport fish is the real risk to the public that this board must recognise. Because of the probable build-up of mercury concentrations as inorganic or organic compounds in the tissues of the sport fish in the Allens Creek Lake, the mercury coming from their food chain, the sport fish caught can be reasonably expected not to be suitable for human consumption.

The Allens Creek Lake is poorly designed to support the growth of fish fry even if they are born. Fry production is likely to be restricted because of the very limited spawning areas. Most game fish desire spawn in shallow, less than 4 feet, water with a firm base. Allens

Creek as proposed has very little such spawning area. The most desireable spawning area is the Allens Creek inlet, but it will be an area of heavy siltation and disturbed by the public activities at the proposed public park such that even that area will be degraded as a spawning area.

Further even if somehow game fish are in the lake, there is a real doubt as to whether there will be enough shad and other smaller fish to supply the dietary needs of the sport fish. First the shad also require shallow water to spawn and it is almost absent. Secondly, the food base needed to support the shad is impaired by several factors. The heavy sediment content of the Allens Creek Lake will restrict the depth that the sunlight can reach to a very few feet so that production of the lower forms of plant life will be limited to much less than the total volume of the lake. The passing of the lake water and its lower forms of plant and animal life through the plant cooling system will kill a significant percentage of the total lake's productive capacity because it will be exposed to the high temperatures, rapid change of temperatures , and the chlorine which is designed to kill them. These factors may also cause many of the shad fry to fail to survive, grow, and reproduce. It is likely that the above factors will prevent the sustained yield of shad in sufficient numbers to support a viable sports fishery in the Allens Creek Lake. The data in the FES and the FSFES fail to adequately address this issue.

The role of the Texas Parks and Wildlife Department in the operation of the Allens Creek Lake and Park has not been clearly defined. It is especially significant that the Texas Parks and Wildlife has not appeared in this proceeding. Nowhere in the

record is there any indication from the Texas Parks and Wildlife that the Allens Creek Lake will be a viable fishery or that they will do anything in an attempt to make it so. No contract between the applicant and the Texas Parks and Wildlife has been introduced into evidence, or other document to indicate that they will take the necessary actions to make Allens Creek a viable fishery. If the Texas Parks and Wildlife Department was interested, even a little, in making the Allens Creek Project into a park or fishing lake they would have presented witnesses and cross-examination with the purpose of showing the Board the quality of such a fishery. Instead, neither the Texas Parks and Wildlife nor the State of Texas have even seen fit to even participate occasionally in this issue. The State of Texas has not even claimed that it will stock the lake, much less maintain it to provide good fishing. Further and most significantly, there has been no showing that the State of Texas even has statutory authority to spend any money on the Allens Creek Lake. The Texas Parks and Wildlife Code does not allow the use of its funds for this purpose except for the, "Expansion and development of additional opportunities of hunting and fishing in state-owned land or water." Section 11.033(10). Neither the Allens Creek Park nor Lake are to be owned by the state, but will be owned by the applicant. Further, State waters must be open to the public. Clearly the exclusion area can not be open to the public, and this applicant has already closed off public access to both its Cedar Bayou and Parish lakes which were once open to the public.

Dr. Sanders discussed a decay constant, k value, for total residual chlorine, TRC. However, this is misleading because there is no single chemical called "TRC". Instead it is a group of chlorinated organic compounds created by adding chlorine to water containing organic compounds. The TRC's are formed by reactions of chlorine and chlorine derivatives with those organics in the water. TRC is also known as "bound available chlorine" to distinguish them from free chlorine. These two forms of chlorine are the major components involved in sterilizing bacterially contaminated water by chlorination. The compounds derived from chlorination depend in part on the nature and amounts of those organics in the water and the amounts of chlorine that is available.

TRCs are only those particular compounds formed which chemically react in the detection reaction under standardized conditions to cause color production. Color production is the end point of this assay as performed in water testing. Each of the variety of chemicals grouped as "TRC" has its own specific decay constant. The decay constant observed in a particular sample of water such as Allens Creek Lake will depend on the specifics of circumstances at the time of chlorination, such as the concentrations of each organic present. As currently performed the TRC decay constant calculated is a composite value that does not indicate the decay constants of its component parts. Thus a more toxic TRC component may have a very long decay constant (in terms of time not inverse time) and still not be detected in the composite decay constant.

Another major problem with the described composite TRC is that not all chlorinated organic compounds that are toxic to

aquatic life even react in the TRC detection test. Thus they are not detected at all by the TRC test. Some of these undetected compounds in addition to being toxic to aquatic organisms are also mutagenic and suspected carcinogens. Trihalomethones is one class from this group of compounds . They have caused concern in public health circles because they can and do occur in domestic water supplies and they have a slow decay constant.

It is the chemicals in the class of "non-TRC reactive compounds" which have to be considered in addition in assessing the biological effects of chlorine additions to the proposed Allens Creek Lake. Their combined toxic effects are not considered in the FES, FSFES, or elsewhere in the record by applicant or staff. They have long-term toxicities at concentrations below those accepted for TRC, and can reasonably be expected to have a significant impact on the aquatic life of Allens Creek with its high temperatures. The high temperatures usually increase the adverse impacts of toxic chemicals on aquatic organisms. The biological effect of the non-TRC reactive compounds is above and beyond that of the effects caused by the compounds measured by the TRC reactive tests.

The calculations for nutrients, derived from the sewage of the communities of Wallis and Sealy, which will reach Allens Creek Cooling Lake because these communities' treatment plants discharge into Allens Creek do not reflect reasonable projections for nutrient load from sewage because they are based on current community populations without the percentage-wise large increases in population in the area occurring during construction of the proposed Allens Creek Nuclear Generating Station from the migration of people into the area to support the construction workers and their families.

The large influx of workers to build the plant will create an additional demand for services above that now available. It is the usual pattern for the needed additional services to be provided by migration of persons into those affected communities. Their excreta will increase the load of nutrients entering Allens Creek Cooling Lake.

In addition to sudden population growth in the two communities generated by a need for worker support services, a long term growth in population above the historic growth rate prediction can reasonably be expected because new industries will move in to the area to be near the proposed ACGNS. Such industries will be ones particularly influenced in their siting by the presence of a nuclear electrical generating plant. This influx of population associated with these new power-plant-specific-industries was not considered in the population projections for the communities of Wallis and Sealy and thus their additional contributions to Allens Creek Lake nutrient load is not part of the nutrient loads projected.

For these reasons, the nutrient loads from sewage from the two small communities is significantly low.

It has been a fact of historic record in this area that when communities grow rapidly for whatever reason, their sewage treatment facilities lag so far behind their growth in population that the treatment plants are grossly overloaded, and inadequately treated sewage is discharged.

There has been no evidence presented that this historic sequence will not be repeated in the communities of Wallis and Sealy. The probable discharge of inadequately treated sewage into Allens Creek Lake with concommitant health risks in a recreational water should be part of the Board's consideration of this matter.

The proposed area designated for water sports and swimming may very well be undesirable because of inadequately treated sewage as addressed above (4720/##) and unattractive because of exotic weed growth and algal blooms. No roped-off, or otherwise protected, swimming area has been described. Other cooling plant lakes in the area have developed unattractive blue-green algal blooms. In a Gulf Coast area freshwater cooling lake, such blooms are primarily triggered by water temperature (Dr. Welch - Rice University) rather than by nutrient loading as reported for lakes further north. Hydrilla and Water hyacinth mats become a fact of life in freshwater recreational lakes of the area after a few years of use.

Algal blooms, Hydrilla and Water hyacinth, none of which are easy to prevent or control, severely reduce the recreational potential of and esthetic impact of freshwater lakes. It is highly probable that these adverse developments will occur in the proposed Allens Creek Lake with its high water temperature characteristic. The potential seriousness of algal blooms was in part recognized by the

NRC Staff and referred to in SFEIS 4.3.2.4.

As shown in response to Dr. Saunders' remarks (4708/1) on viability of Allens Creek Lake sportfishing, there is a significant toxicity from chlorination and the products derived from chlorination of water-containing organic compounds. The toxicity of chlorination is increased by raised water temperatures. This was addressed in my direct testimony and supporting references given for this general biological phenomena.

This project's cooling lake will have at times particularly high temperatures near the lethal temperature for adult fish. Larval and juvenile forms of fish are significantly more susceptible to the adverse effects of both raised water temperatures above the optimum for the species and to toxic chemicals.

At least two classes of toxic chemicals are involved in this proposed lake: Chlorine & Chlorinated compounds and heavy metals. The effects of the three adverse factors are synergistic and, as pointed out in the cited literature, their combined effects cannot be predicted from summing the effect of each toxic factor taken separately. The effects are significantly more severe when the adverse factors operate conjointly. Algal blooms may be an additional adverse factor.

Further, these effects occour directly not only on the sportfish but probably more importantly on the infrastructure, the species of the food chain, which feed them.

The production capacity of the projected lake at 200 lb. fish/acre is dependent on multiple factors including the rate of sportfish stocking and stock replenishment which is not known, and the capacity of the food chain to support and provide for rapid growth of the fish used in stock replenishment.

The capacity fo the food chain can reasonably be expected to be restricted by the adverse aquatic factors addressed above in response to Dr. Saunders' remarks (4732/23). These are the synergistic toxic effects of high water temperature, heavy metals and chlorine & chlorination products and probable algal blooms.

Because of probable inadequate food supplies, the real production capacity of this proposed Allens Creek Lake will be well below the 200 lb/acre given. It is possible to have a massive stock replenishment program in which fish input exceeds die off rate and fish malnutrition so that the 200 lb./acre figure is reached. However, this situation could not be described as a "viable" sport fishery!

The assessment that 3% of the Chlorine added to the power plant cooling water will become organically bound chlorine is not sustainable because the necessary facts to make the determination are not known. Amongst the important unknowns are the concentration of ammonium ion in the lake water; the individual chemicals that make up the organic chemicals in the water since each chemical will react with chlorine at its own specific rate for a given temperature; the concentration of each of the above organic chemicals and the catalytic effects, if any, from metal ions and other chemicals in the water.

In the absence of such basic data, prediction of % of chlorine being organically bound is inappropriate.

A plant shutdown, when it is the only plant warming a lake's water in winter, coinciding with a cold "norther" in a shallow body of water with a fairly uniform depth such as the proposed Allens Creek Lake can result in water cooling to the extent that cold effects on fish occour, including death from cold and/or subsequent infections in weakened fish.

Water in this lake may under an adverse combination of have a drop in temperature to 40°F or below in a few days. circumstances, Both the rate of cooling and the actual temperature affect aquatic organisms. In fish, these effects are more pronounced for those acclimatized to unusually high temperatures for the species. This will be the case for the fish in Allens Creek Lake. Shad and Gizzard are particularly sensitive to cold and die before the water freezes.

It is not clear whether the rough to game fish ratios given by Dr. Saunders refer to fish in natural lakes or in lakes where the sportfish population is dependent on stocking replenishments. When stocking maintains the sportfish population in a body of water, the rate of sportfish restocking is an important factor in determining the rough to sportfish ratio. This restocking rate is not known for this hypothetical Allens Creek Lake so no figure for the ratio can be given.

Whilst the applicant now has a valid NPDES, it will have expired by the time any discharges from the proposed lake occour. Permit renewal is not automatic.

Cadmium concentration in the Brazos River water used for Allens Creek Lake are projected as being 12 ppb. The long term potential toxic effect of this metal on fish depends on the coexistent Magnesium and Calcium concentrations. The lower these two metals' concentration is, the more toxic to fish this cadmium will become.

The limited studies of mercury on fish biology show that with short term exposure sublethal effects can be observed at water concentrations of mercury salts at 0.05 ppm mercury. Effects observed include reduction of feeding and mobility reduction. Of particular significance is the effect of mercury on susceptibility to predation. It has been shown that largemouth bass ate more mercury contaminated fish than uncontaminated control fish. (Kania and O'Hara, 1974). The significance of this in enhancing accumulation of mercury in the bass and the humans that eat them is obvious and important. Elimination of mercury from fish is slow because it is bound in the tissues of the fish. The half life for methylmercury retention was estimated at greater than 200 days (Giblin and Massaro, 1973).

The EPA maximum concentration for mercury in recreational fresh waters is a 0.05 microgram mercury/liter soluble, Exhibit LFT-14 by

the applicants witness claims that his calculations shows this Allens Creek cooling lake water will contain 0.1 to 0.09 micrograms mercury/liter ie, twice the EPA standard for this toxic metal (page 4494, line 14 of record). The standard of 0.05 micrograms mercury/liter is about twice the level of mercury concentration readily measured with precision by current instrumentation. The data accepted by Dames and Moore, the Applicant, and the NRC Staff and presented without comment in table S 2.6 as representing the observed mercury concentrations in the Brazos River water shows that at least 10 of the 12 Brazos River water samples analysed and possibly all 12, exceeded the recommended EPA standard for such waters. This water from the Brazos River will form the bulk of the water in the Allens Creek Lake. With the mercury concentration factors observed in food chains of sport fish exceeding 1,000x and ranging up to 10,000x , fish from the Allens Creek Lake must be expected to have mercury concentrations in their meat exceeding the recommended limit for human consumption of 0.5 miligram/kilogram of fish consumed.

Thus mercury in the fish caught in the proposed Allens Creek Lake must be expected to be a health hazard to those who consume the fish, especially children. It is my experience that fishermen and their friends consume a considerable portion of the fish they catch. This is expected to be increasingly the case as food prices rise.

Algal blooms must be expected at Allens Creek Lake from late April or May until early Autumn, and will not be limited to late summer as implied by Dr. Sanders. Further these algal blooms will be from blue-green algae as shown by the experience at Lewis Creek cooling lake.

Dr Sanders has recognised that the optimim spawning depth for crappie is three feet. With the steep sides around almost all of Allens Creek, there will be only a very narrow band around the proposed lake that provides for spawning. It is very doubtful that such a limited narrow band for spawning will provide a sustained yield of Crappie especially if there was actually heavy sport fishing for this species. The Texas Parks and Wildlife has said that it will not stock Allens Creek with Crappie. It is unlikely that make-up water from the Brazos River will provide sufficient numbers of Crappie to stock the lake because the Crappie are rare, if existent, along this stretch of the Brazos River.

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