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PROBLEMS OF LNG SPILL HAZARD ASSESSMENT

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Problems of LNG Spill Hazard Assessment

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It is apparent from the literature on LNG spills that there is a considerable lack of knowledge in many areas of technical importance to the safety assessment of LNG receiving terminals. For this reason, a thorough critical review of the state-of-the-art regarding the technical aspects of LNG spill evaluation is in preparation. The purpose of this review is to focus attention on these aspects of the problem that are least understood and which are crucial to a proper assessment of the hazards. It is realized that ERDA has already conducted an LNG Safety and Control Workship,* the outcome of which was a set of conclusions and recommendations regarding the safety and control issues of LNG operations. These recommendations, however, only serve to emphasize the need for such a critical analysis in the specific technical areas of importance. These areas are:

(1) Vapor generation and dispersal -- both theory and experiment.

(2) Combustion of pool and vapor clouds -- particularly the role of radiation flux and ground heat exchange.

(3) The potential for fireball formation and detonation of vapor clouds.

Regarding these three items, it is already apparent that considerable differences and omissions exist in the literature. For example, estimates for the size of a vapor cloud from a 25,000 m^3 spill differ by an order of magnitude. Other difficulties in this area concern

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*LNG Safety and Control Workshop, Reston, Virginia, December 15 and 16, 1976; sponsored by ERDA Division of Environmental Control Technology.

the size estimates for a cloud of gas at "lift-off," or where the gas cloud warms sufficiently to become positively buoyant.

The combustion of very larger pools of liquid fuel or vapor clouds appears to be poorly understood, especially the role of the radiation flux, which may be very substantial.

The document in preparation will review available published documents on: (1) vapor generation and spreading, (2) combustion of pool and vapor clouds, (3) fireball formation and detonation of gas clouds, (4) current siting and transportation practices.

In the future research, an interdiscriplinary team of engineers, economists, and legal consultants will analyze this review to consider the role of regulation in the safety question. It is possible, for example, that simple regulatory siting or design changes could obviate the technical uncertainties in spill models. At this stage, it is too premature to speculate on all the possible alternative mitigating measures available, since the technical feasibility of such approaches will become more apparent as the review described above proceeds. Nevertheless, it is clear at this time that many prudent decisions can be made simply on the basis of the existing uncertainties. For example, uncertainty in the rate of growth of spill clouds can be negated by site selection. Other conditions can be avoided by tank burial, and so forth. There are in the social science literature many such precedents for decision-making under uncertainty. The research proposed will identify such possible courses of action given a thorough statement of where technical uncertainty exists. The work proposed here will be coordinated with similar work on liquid hydrogen hazards underway at NASA's Jet Propulsion Laboratory (administered by Caltech). At JPL, Dr. Jose Chirivella and Dr. David Lewis are preparing a program plan for review of the idfficulties and hazards associated with liquid hydrogen spills. The work is very clearly related to LNG problems.