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TESTIMONY OF
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LIQUEFIED ENERGY GASES SAFETY
BEFORE THE
HOUSE SUBCOMMITTEE ON ENERGY AND POWER
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE

Mr. Chairman:

We are pleased to be here today as you consider H.R. 51, a bill to amend the Natural Gas Pipeline Safety Act of 1968. I will be commenting, in part, on its provisions to improve the safety of liquefied energy gases (LEG) facilities. We are concerned about the siting and safety of both liquefied natural gas (LNG) and liquefied petroleum gas (LPG) facilities.

As you recall, we appeared before your committee a year ago, during the hearings on an earlier bill, H.R. 6844. Some of our comments at that time had to be somewhat tentative, because our report on LEG safety was still in draft form.

We also provided to the Committee on Interstate and Foreign Commerce some detailed comments on the LEG provisions of H.R. 11586, the "Fuels Transportation Safety Amendments Act of 1978."

My comments today will begin with a brief summary of the major conclusions in our final report, "Liquefied Energy Gases Safety" (EMD-78-28), issued in July, 1978. I will also summarize the major

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actions taken by Federal agencies in response to our recommendations, and provide an appraisal of the provisions in H.R. 51 that relate to the LEG safety problems identified in our report.

You will remember that we found that many large LEG storage facilities are a very serious hazard to the surrounding area. The facilities are built to the same standards as ordinary buildings, and tanks at three of the five sites we evaluated had earthquake safety margins less than 25 percent. It is virtually certain that the level of natural phenomena that LEG facilities are designed to withstand will be exceeded at a large number of facilities in the next 50 years, with the possibility that one or more of them will fail.

Tank failures might also be caused by acts of sabotage. We found that security procedures and physical barriers at LEG facilities are generally not adequate to deter even an untrained saboteur. Most of the storage tanks are highly vulnerable to sabotage which could lead to complete catastrophic failure of the tank walls.

DLG 8996 National Fire Protection Association standards require that each large LEG tank, or group of tanks, be surrounded by a dike which can hold at least the volume of the largest tank. However, most of these dikes are only designed to contain LEG spilled from relatively slow leaks. They cannot contain the surge of liquid from a massive rupture or collapse of a tank wall or from the sudden appearance of a hole at the bottom of the wall. At five of six sites we examined, where the dikes were all built to NFPA safety criteria, more then 50 percent of the fluid could escape.

Our calculations assumed an immediate, total spill of a full tank, with the fluid moving toward the nearest dike wall. Such an LNG spill occurred in Cleveland in 1944. A similar, much larger LPG spill occurred in the country of Qatar in 1977. Roughly the same amount of material will spill over the dike if a hole is made at the bottom of the tank wall.

If spilled LEG spreads across a city in sewers, subways, or other underground conduits, or if a massive burning cloud is blown along by a strong wind, a city may be faced with a very large number of ignitions and explosions across a wide area.

LEG trucking to and from storage facilities through densely populated areas also is very dangerous. These trucks move routinely through large cities and on elevated highways. The 40 cubic meters of LNG from one truck, vaporized and mixed with air in flammable proportions, are enough to fill 110 miles of a 6-foot diameter sewer line, or 15 miles of a 16-foot diameter subway system. LEG trucks are highly vulnerable to sabotage.

LPG railcars, which are also vulnerable to accidents and sabotage, travel through densely populated areas, even cities which prohibit LPG storage.

We found that double-hulled LNG ships are probably the least vulnerable part of the LNG transportation and storage system. LPG ships with single hulls are much more vulnerable both to collisions and to sabotage.

A major LNG accident could cause damage of such severity that injured parties could not be fully compensated under existing arrangements. Present corporate structures and legal limits on

liability offer nearly total protection to the corporations which reap the profits.

The mixture of Federal, state, local, and National Fire Protection Association codes for LNG and LPG reflect neither the relative dangers from the fuels nor much consistency among themselves. Most of the regulations are based on an uncritical acceptance of National Fire Protection Association standards. Many large LEG facilities have not been subjected to Federal regulation at all, partly because of a failure of cognizant agencies to fully assert their authority. The Federal Power Commission system for approving LNG projects was clearly inadequate to protect the public.

I will not take the time to summarize other conclusions which, though important, are not so relevant to this hearing.

We are glad that our report has already made some impact on the Federal regulation of LEG. For example, FERC's assessments of proposed LNG terminals now include the trucking that would be associated with a terminal. DOT has taken action, or plans to take action, on many of our recommendations.

DOT's Notice of Proposed Rule Making on LNG facilities includes many requirements that reflect our analysis of the hazards. The proposed rules would establish a set of comprehensive Federal safety standards governing siting, design, and construction of new LNG facilities and--equally important--parts of existing facilities that are replaced, relocated, or significantly altered.

The new standards would require:

--Use of greater land area to protect nearby populations against heat radiating from a fire at the facility site.

--Use of greater land area or an ignition system to protect surrounding populations against the hazards of a gas cloud traveling downwind from an LNG spill.

--More detailed geological investigation of a proposed site (based on Nuclear Regulatory Commission standards).

--Stronger design of storage tanks, dikes, and other critical components to guard against the effects of earthquakes, flooding, and high winds. Facilities would be prohibited in active seismic areas.

--Better design of impoundment systems (dikes areas) to contain a major spill of LNG.

--More stringent storage tank design and testing to minimize the possibility of a catastrophic failure.

--New construction procedures, qualification of construction personnel, and testing control systems.

We take special note of the fact that the proposed rules would require that the impounding system have a configuration or design which, to the maximum extent possible, will prevent liquid from escaping impoundment under the worst predictable spill conditions. Imposed loading and surging flow characteristics must be based on a sudden total spill release of the full contents of an LNG tank.

Our study identified the possibility that LEG or LEG vapors could accumulate under a tank elevated on piles and thus cause an explosion that could rupture the tank bottom. A proposed rule

would prohibit the construction of any storage tank with a capacity of more than 15,000 barrels with an underlying airspace where vapors could accumulate. DOT also plans to address this safety concern in future rulemaking on LPG facilities. DOT has said it will be studying the matter further to determine more precisely the nature and extent of damage that might occur to existing elevated tanks.

Since you have been given a detailed report by DOT, and shortly will be receiving our detailed analysis of all agency responses, it is not necessary for me to cite each of them. While DOT reacted positively and constructively to many of our recommendations on LEG facilities, some very important ones were not, we believe, adequately considered. In other areas, such as those involving LEG ships and trucks and LPG railcars, DOT's general response, in our opinion, was not uniformly satisfactory. In summary, while DOT has agreed to take some steps to upgrade safety and security in some areas, action is not planned on a number of other recommendations that we believe are necessary for adequate protection of the public.

We are especially concerned about the DOT response to two major recommendations. The first would require that all new, large LEG storage facilities be built in remote areas, and would preclude the expansion of existing facilities in other than remote areas.

DOT's proposed rules merely set minimum distances between an LNG facility and certain other buildings or activities.

We believe remote siting is the primary factor in safety. Because of the inevitable uncertainties inherent in large-scale use

of new technologies and the vulnerability of the facilities to natural phenomena and sabotage, the public can be best protected by placing these facilities away from densely populated areas.

The other major recommendation would prohibit LEG trucking through densely populated areas and any areas that have features that increase the vulnerability to a major LEG spill, unless delivery is otherwise impossible.

In its substantive reply to our report, sent to the Senate Appropriations Committee, DOT cites 49 CFR 397.9(a) which prohibits truck movement of hazardous materials through densely populated areas, unless no other practicable highway route is available. They note that truck routes in such areas, and the use of vehicular tunnels in particular are usually regulated locally. They also point out that diverting materials to other modes of transportation may involve greater risks or exposures.

DOT has initiated research to develop criteria for use in conjunction with existing highway design, population, geographic, and other factors in the designation of routes for hazardous materials highway carriers. The result will form the basis for advising State and local governments on criteria for route designation, as well as for deciding whether Federal regulation is necessary.

We found that the interpretation of "practicable highway route" has been such that LEG trucks routinely roll through our large cities. The result is that the possibility of a catastrophe continues to exist unnecessarily. Local communities have no power to regulate truck routes on interstate highways passing through them.

We believe urgent action is needed on both of these major recommendations, by Congress if not by DOT.

In this regard, Mr. Chairman, we find that while H.R. 51 also addresses many of our concerns, in some areas it falls short. Title II does not cover LPG facilities at all, and the need for remote siting is included as only one of the factors the Secretary should consider for LNG facilities. We do not believe this is nearly stringent enough, and we believe Title II should be expanded to cover LPG facilities. As our analysis showed, an LPG spill is at least as dangerous as an LNG spill. The public safety requires that large LPG storage facilities be sited, designed, built, operated, and maintained to the same standards as LNG facilities.

H.R. 51 also does not deal specifically with LEG truck movements, or LPG railcar movements, which we also recommend be severely restricted.

Another overall recommendation in our report was for an evaluation of existing, large LEG facilities to determine any remedial steps necessary to protect the public. We recommended that the Secretary of Energy do this, but the Secretary of Transportation could meet this need equally well.

H.R. 51 authorizes the Secretary to require corrective action when he finds any pipeline facility is hazardous to life or property. He may waive notice and hearing requirements if he determines that the failure to issue an expeditious order would result in the likelihood of serious harm to life or property.

We believe that this type of authorization is essential in LEG legislation, and that Congress should make it clear that the Secretary should evaluate each existing facility to determine the potential hazards and to require remedial action.

We also believe the provisions of H.R. 51 should be strengthened in the area of financial responsibility. The bill should require that owners and operators of a liquefied gas facility, including affiliates, be strictly liable without regard to fault for damages, including cleanup costs, sustained as a result of an explosion, fire, or discharge. If a facility is so dangerous that the owners and operators are unwilling to assume this liability, then it is too dangerous for the public.

We also recommend that the Congress establish a fund, financed by industry contributions, from which claims could initially be paid. Injured parties could be recompensed much more promptly from such a fund than they would be through private suits, even if the companies are held strictly liable.

Our detailed suggestions for changes in H.R. 51 are included in an addendum to my statement. Some of the suggested changes are based on findings in GAO's report on "Pipeline Safety--Need for a Stronger Federal Effort" (CED-78-99). We hope they will be useful to the Committee in its efforts to improve the safety regulation of liquefied energy gases. To sum up, Mr. Chairman, H.R. 51 goes a long way toward meeting the serious regulatory deficiencies identified in our report. In the very significant areas I discussed, it does not go far enough. We believe the public safety requires

prompt and thorough legislative action. This concludes my statement, but we will be happy to respond to any questions you or the committee may have.

ADDENDUM: Suggested Changes for H.R. 51, 96th Congress

Page	Line	Recommended Change	Reason
Preamble		To amend the Natural Gas Pipeline Safety Act of 1968 to provide for the safe operation of pipelines transporting natural gas and liquefied petroleum gas, to provide standards with respect to the siting, design, construction, maintenance and operation of liquefied natural gas and liquefied petroleum gas facilities and for other purposes.	Title II focuses on design criteria. LPG facilities should be covered as well as LNG facilities.
General		The bill, as written, does not address all highly volatile substances. Some of these may present similar dangers.	
General		Add "Large Liquefied Gas Facilities" to all titles of the bill. Consideration should be given to including large LPG facilities generally under the provisions of the Natural Gas Pipeline Safety Act of 1968, as amended. The definition of "LNG facilities" should be expanded to "liquefied gas facilities" so as to include LPG facilities. We have recommended a definition of "large" which is set forth below.	Regulation of these facilities should not be left to the discretion of the Secretary under Section 106. Some large liquefied gas facilities do not have pipeline connections; for example, the Petrolane LPG marine terminal in Los Angeles. The Secretary would first have to assert jurisdiction under Section 106 before he could prescribe actions to protect the public from safety hazards at such facilities or before they would have to file leak reports.

Page	Line	Recommended Change	Reason
3	11	Change line to read: "... testing, modification, addition, repair, replacement, or other action, as appropriate"	Extends Secretary's power to correct facility hazards that threaten public safety.
6	13	Insert "and information on pipeline depths, commodities transported, and appropriate telephone numbers" after "pipeline's location"	Useful information.
6	18-19	delete ", on request and for good cause shown"	Unnecessarily restricts public access to information bearing on dangers to the public.
8	3	Replace "3 years" with "18 months"	Unnecessarily long time for implementation.
8	18	Insert "a central analysis group and" after "thereafter maintain"	Assure that a staff will be available and tasked with analyzing the data obtained.
8	22	Delete "on pipeline leaks"	Based on recommended changes for page 10.
9	6	Add "or large liquefied gas facilities and of discovering patterns in such data so that actions may be taken to prevent serious malfunctions"	Specifies additional tasks required to be performed by the analysis group for the purpose stated.
10	17	Substitute "Facility and Large Liquefied Gas Facility Occurrences" for "Leaks"	Reflects suggested changes that expand coverage beyond pipeline leaks.

Page	Line	Recommended Change	Reason
10	22	Substitute "or large liquefied gas facilities to file routine operation summaries annually and to report any occurrence within 48 hours followed by a detailed written report of the occurrence within 30 days" for "shall report, at such time and in such manner as the Secretary shall require, any pipeline leak."	Reporting requirements should be spelled out rather than left to the discretion of the Secretary. Presently only companies with more than 100,000 customers must file written follow-up leak reports. This excludes all the large importers, for example, who only sell to a few other large companies.
11	1	Insert "These reports shall be available to the public in Washington, DC and at an appropriate office near the site of the pipeline facility occurrence" after "should have known".	Facilitates public access to important information and encourages public participation.
11	3,5,9, 11	Substitute "occurrence" for "pipeline leak"	Reflects a previously suggested change.
11	12	Add "(E) cause of occurrence" "(F) such other information as the Secretary may consider appropriate"	Useful information.
11	13-18	Delete	Unnecessarily broad discretion for the Secretary. Exemptions should be by size.

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Page	Line	Recommended Change	Reason
11 through 12	19 3	Substitute the following: "'occurrence' means any attempt by unauthorized persons to enter company premises, any vital machinery break-down, any overpressuring of storage tanks or caverns, or any unintended escape of material, such as leaks or venting."	All these indicate serious potential difficulties.
12	20	Insert "or affecting" after "in"	To require coverage of dangerous installations which might otherwise not be covered.
13	17-18	Delete	To require coverage of dangerous installations which might otherwise not be covered.
17	11-15	Delete Sec. 2(c) (2)	The subsection is probably unworkable since the many local codes and laws would have to be individually and periodically investigated as to adequacy and enforcement.
17	24	Insert "or affecting" after "in"	Covers dangerous facilities otherwise not covered.
19	2	The Committee may wish to consider clarifying whether the minimum training and educational requirements were intended to cover operator pipeline inspectors or Federal pipeline inspectors. If the concern is with the qualifications of State pipeline inspectors alone, consideration might be given to relocating the proposed change to section 5 of the Act.	

Page	Line	Recommended Change	Reason
19	21	If the Committee intends that State agency recipients of funds under current subsection 5(f) still be required to meet their obligations under paragraphs (3) and (4) thereof and particularly if such obligations were not included within the grant agreements, the Committee may wish to consider retaining current subsection 5(f) and include its proposed replacement as subsection 5(g).	
23	1	We believe that the coverage of Title II of the bill should be expanded to include LPG facilities, because LPG is at least as dangerous as LNG.	
23	1	Insert "LARGE" after "SAFETY OF"	Based on next recommended change.
23	9	Insert new definition: "'Large' means storage capacity of at least 1,000 barrels or a through-put capacity of at least 10,000 barrels per month." 'Large' should be inserted before all references to liquefied gas facilities.	Lower limit to the size of liquefied gas facility so that small quantities are excluded. Without a size limitation, home and farm tanks and people carrying home propane torches or butane lighters might be included.
23 32 32	11 18 20	It is not clear whether trains and trucks transporting liquefied gas are intended to be included within the definition of a liquefied gas facility and thus covered by the provisions of Title II of the bill. Use of the term 'transmission' in some places and 'transportation' in others causes confusion. We suggest that this matter be clarified and would recommend that they be included.	
23	24	Insert "or through-put" after "capacity".	Clarifies coverage.
24	16	Change "accident" to "incident"	Better reflects meaning and makes consistent with term used in other laws.

Page	Line	Recommended Change	Reason
25	10	Insert the following definitions: "Owner" means any person holding title to, or, in the absence of title, any other indicia of ownership of a liquefied gas facility, but does not include a person who, without participating in the management or operation of such facility, holds indicia of ownership primarily to protect his security interest in the facility. "Operator" means any person, except the owner, responsible for the operation of a liquefied gas facility by agreement with the owner. "Affiliate" includes, with respect to an owner or operator of a liquefied gas facility: (1) any person owned or controlled by the owner or operator; (2) any person that owns or controls the owner or operator; (3) any person which is under common ownership or control with the owner or operator.	Definitions are necessary to clarify persons liable and to exclude persons holding security interests such as mortgages.
25	15	Add a new Sec. 6(a) as follows and renumber the subsequent subsections accordingly: "(a) After the date standards first take effect under this section, the siting of a liquefied gas facility or the expansion, including additions to the storage capacity or the expanded use, of an existing liquefied gas facility in or near densely populated areas shall be prohibited. The Secretary,	Prohibition of urban siting of large liquefied gas facilities should not be left to the discretion of the Secretary.

Page	Line	Recommended Change	Reason
		by regulation, shall prescribe what constitutes 'near' and 'densely populated area' for this purpose."	
25	15	With regard to existing subsection 6(a), we make the following four suggestions:	

1. Compulsory adjudicatory hearings should be held in the locality concerned.

   a. Public participation in regulatory hearings has proven to be a very effective means of bringing up and focusing high level government attention on important safety problems.

   b. The proceeding record provides a basis for judging the effectiveness of the process. There is no such public record when decisions are reached without a hearing.

   c. In dealing with large-scale applications of new technology, standards are not sufficient because many critical questions cannot be answered with precision. Thus, certain questions need to be considered for each site, and others need to be re-examined as new information and analyses become available. A hearing process may be valuable in supplementing standards in this way.

   d. The agency should announce in the Federal Register and in newspapers in the locality involved that they have held discussions on a possible liquefied gas facility site within 10 days after the first time such a discussion occurs.

2. All aspects of the safety problem a gas facility may present - transportation, storage and processing - should be considered by one regulatory agency.

   The important issue in handling liquid gas is the total danger to the public, including transportation to and from storage

Page	Line	Recommended Change	Reason

sites. The safety issues are related in the knowledge needed to handle them. The total risk to the public cannot be minimized or weighed against economic considerations unless the safety of storage and transportation is considered by the same agency.

Division of responsibility can lead to situations where no one is responsible for important areas. For example: On January 28, 1978, a 39,000 cubic meter butane cavern of the Sun Oil Company at Marcus Hook, Pennsylvania overflowed. The resulting fires destroyed a block of houses.

In a February 14, 1978, letter to the Mayor of Marcus Hook, the Regional Representative of the Secretary of Transportation said that although the Coast Guard could suspend any unsafe operation, "Their jurisdiction ends at the first valve in the pipeline conducting the liquid gas from the ship to the storage tanks" and that "The OPSO jurisdiction ends at the Sun Oil Company property line (40 feet from the tanks) because Sun Oil is the consumer of the liquefied gas." Thus, according to this letter, neither agency had jurisdiction over the cavern.

3. LNG and LPG safety ought to be considered by the same group.

There is a large overlap in the expertise necessary in considering LNG and LPG safety. It would be wasteful to have more than one group with this capability.

4. The same issue should not be considered by hearings at two agencies.

The four principles cited above lead us to believe that all LNG and LPG safety issues should be handled by one agency. Our report on "Liquefied Energy Gases Safety" recommends that an Energy Health and Safety Regulatory Agency be formed to handle these and other energy, health and safety issues. At best it would take some time to form such an agency. In the meanwhile, all LNG and LPG safety should be handled by an existing agency. It

Page	Line	Recommended Change	Reason
		is less important which one does it than that the process bestarted soon and handled competently.	
25	16	Insert ", nor may any construction occur with respect to any existing or new liquefied gas facility," after "be constructed".	Expansion of existing facilities should be covered.
25	22	Insert "and maintained" after "operated".	Increases safety.
25	23	Insert "and (c)" after "(b)".	Operations standards are in subsection (c).
25 through 26	24 through 4	Substitute "(2) Not later than 180 days after the date of the enactment of this title, the Secretary shall establish minimum requirements for the contingency plan of a liquefied gas facility. The Secretary shall not approve construction of any liquefied gas facility under this subsection unless the person seeking such approval submits a contingency plan that at least meets these requirements" for present Sec. 6(a) (2).	Minimum requiremnts for the contingency plan should be specified by the Secretary.
26	14	Substitute "365" for "180"	We do not believe that the time allowed for the Secretary to issue regulations for both new and existing liquefied gas facilities is sufficient to do the job properly.
27	1	Substitute "365" for "270"	
26	18	Insert "design and" before "construction".	Increases safety.
26	20	Insert "and maintenance" after "operation"	Increases safety.

Page	Line	Recommended Change	Reason
27	1	Add a new section 6(c) and renumber subsequent subsections accordingly: "(c) the Secretary shall develop a system which can analyze the entire gas storage and distribution system within 2 years"	The Federal government has long needed the capability to analyze the entire gas storage and distribution system so that the effect of additions and deletions can be determined. The cost and effectiveness of many possible sites satisfying the safety criteria could then be determined.
27	8	Delete "new"	Existing facilities should be covered.
28	1	Insert "and maintaining" after "operating"	Necessary to determine total cost.
28	5	Insert "and maintenance" after "operation"	Necessary to determine total cost.
28	7	Add after (H) the following: "(I) the ability of the existing transportation network to deliver the material and the cost to augment it, if necessary"	To determine the necessity for a new facility.
		"(J) the routing of pipelines, trucks, and trains that would transport the material to and from the facility and any hazards associated with this transportation."	Necessary in determining the total hazard from a facility.

Page	Line	Recommended Change	Reason
		"(K) the existing and projected energy needs of the region in which each such location is situated".	To determine the necessity for a new facility.
28	8	Insert "design and" before "constuction".	Increases safety.
28	14	Insert "the use of piles raising the floor of the storage tank off of the ground, inground tanks," after "insulated concrete"	New large tanks using piles are prohibited by the proposed OPSO rules for good reasons.
28	16	Insert "properties and" after "(C) the"	Clarification.
28	23	Substitute "limit the consequences of any" for "contain an"	The dangers are broader than mere containment.
28	23	Insert "which could be caused by credible natural phenomena or sabotage" after "spill"	
28	24	Insert "and maintenance" after "operation".	Increases safety.
29	9	Substitute "incident" for "accident"	To conform with other suggested changes.
32	8	The bill should require that the owners and operators of a liquefied gas facility, including affiliates, be strictly liable without regard to fault for damages, including cleanup costs, sustained by any person or entity, public or private, as the result of an explosion, fire, or discharge. If a facility is so dangerous that the owners are unwilling to assume this liability, then it is too dangerous for the public.	
32	17&19	Substitute "possible consequences" for "risks".	It is not possible to accurately determine the total probabilistic risk from such a facility.

Page	Line	Recommended Change	Reason
33	6	We believe that Congress should establish a minimum dollar level of financial responsibility that both the owners and operators of liquefied energy gas facilities should separately maintain. It would be very burdensome for the Secretary to investigate each facility to determine the appropriate level of financial responsibility, and enforcement of his determination could involve protracted procedures. We believe the $100,000,000 required in H.R. 11586 of the 95th Congress was too small. The maximum civil penalty for noncompliance of $50,000 should be substantially raised.	
35	11	Add "15(e)" after "section 6".	Clarification.