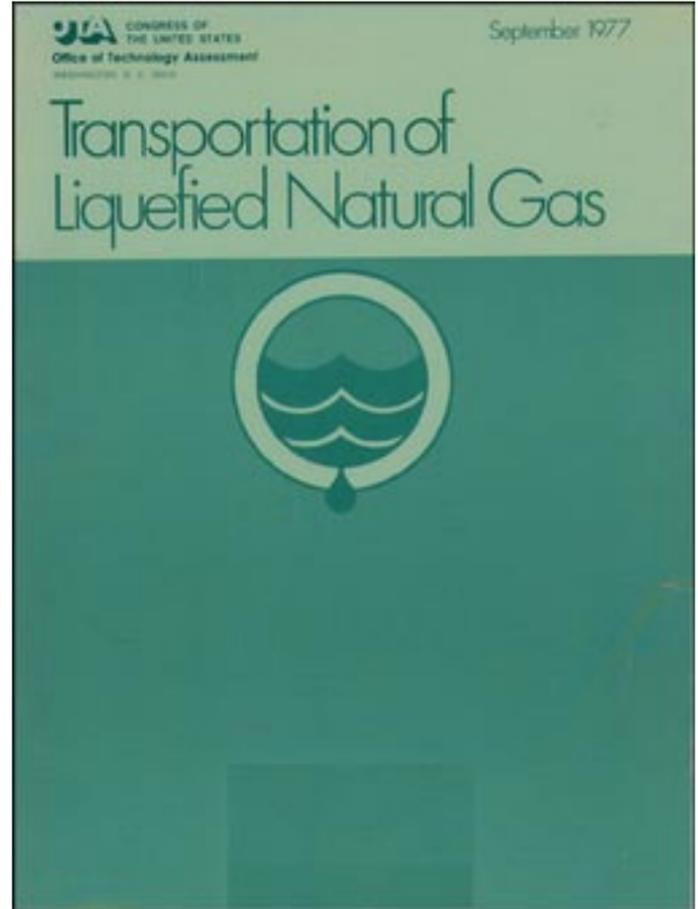


*Transportation of Liquefied Natural Gas*

September 1977

NTIS order #PB-273486



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ACTING DIRECTOR

September 28, 1977

Honorable Warren G. Magnuson  
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U.S. Senate  
Washington, D. C. 20510

Honorable Ernest F. Hollings  
Vice-Chairman, National Ocean Policy  
Study  
U. S. Senate  
Washington, D. C. 20510

Gentlemen:

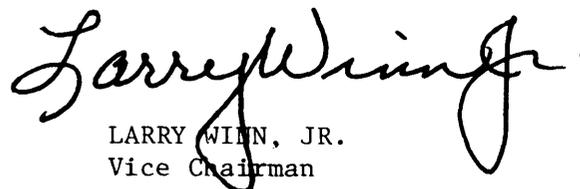
On behalf of the Board of the Office of Technology Assessment, we are pleased to forward the results of this assessment of The Transport at ion of Liquefied Natural Gas which was requested by your Committee.

This report provides a concise analysis of current LNG technology and possible trends in the use of LNG. It also identifies and discusses the major policy issues. We hope this report will be a useful resource to your Committee and to the Congress when it debates energy questions in which LNG is a factor.

Sincerely,

  
EDWARD M. KENNEDY  
Chairman

Sincerely,

  
LARRY WINN, JR.  
Vice Chairman

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## Foreword

This report is an assessment of the transportation of liquefied natural gas (LNG). The assessment was requested by the Senate National Ocean Policy Study for use in consideration of major new projects for the importation of natural gas, and of the competing alternatives for transporting natural gas from Alaska through Canada (pipeline all the way), or through Alaska only and thence via LNG tankers to the lower 48 States.

This report is divided into three parts: Chapter I presents a factual description of the LNG systems and facilities and the Federal regulatory process governing the development and operation of such systems. Chapter II presents a critical review of key portions of the LNG system where technological or political problems may occur. Chapter III outlines the kinds of actions desired by interested parties.

The report identifies nine areas which may be of concern to the Congress as it considers possible new legislation, oversees Federal agencies, and appropriates funds for agency operations and research. The areas of near-term concern are: the design and construction of LNG tankers, the regulation and inspection of LNG tankers and their operation, the regulation and inspection of LNG terminals and their operation, the Federal decisionmak-

ing process in the certification of LNG import projects, and the status of current research on LNG and the need for further inquiry.

The areas of longer range interest are: regulations and criteria for the siting of LNG facilities, liability for LNG accidents, reliability of foreign suppliers of LNG, and policies for pricing LNG.

**One** LNG import terminal is currently operating in the United States. By early 1978, two others will be operational. As a result of these operations and other projects now proposed, LNG could make up **5** to 15 percent of the total U.S. natural gas consumption by 1985. Several pieces of legislation to regulate this growing industry are now before the Congress. Hence the timeliness and importance of this assessment for the Congress.

Two related studies for Congress are currently in progress: a safety study by the General Accounting Office, and an energy facility siting study by the Office of Technology Assessment.

This assessment was performed by Peter Johnson, project director, and the Oceans Program staff, under the overall direction of Robert W. Niblock, the Program Manager.



DANIEL De SIMONE  
Acting Director

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## Summary

It is possible that during the next two decades 5 to 15 percent of the U.S. natural gas consumption could be filled with LNG from Alaska or foreign countries. This would be a major increase over present LNG import levels. This gas will reach the United States by means of a complex and expensive system consisting of liquefaction facilities, specialized cargo tankers, and regasification and storage facilities.

To date, there have been few serious problems in the operation of small-scale LNG facilities existing in the United States. However, new ships and plants will be considerably larger than existing ones, and problems of scale and limited experience make it difficult to predict with any degree of certainty the safety of the LNG system.

It appears that the most serious incidents could occur as a result of an LNG tanker accident. Therefore, while the tankers appear to be well designed and constructed, better control of vessel traffic in U.S. ports and waterways, improved inspection procedures after the ship has been commissioned, and mandatory crew and inspector training are needed.

At the onshore facilities where LNG is received, stored, processed and sent into a gas distribution pipeline, improved inspection procedures are also needed to enhance the public safety. However, the major issue surrounding the onshore facilities is the question of where they should be located. There are currently no Federal guidelines for choosing sites of LNG or any other energy facility. There is considerable public pressure for such guidelines, particularly criteria which would limit facilities to unpopulated areas.

Regulation of LNG systems is hampered by jurisdictional overlaps (particularly between the Federal Power Commission and the Office of Pipeline Safety Operations), some gaps in enforcement (particular the lack of inspection to assure compliance with stipulations in FPC permits), and the lengthy Government procedures which do not result in timely decisions for the applicant and do not give the public adequate participation in decisions (particularly in the FPC licensing of LNG projects).

In addition, the lack of firm Government policy on such matters as LNG import levels, pricing mechanisms to be used, and the Federal role in siting of facilities makes planning difficult for both the gas industry and the public.

Past research has produced conflicting results and predictions about the safety of LNG and it is unlikely that future research will resolve the differences and come to firm decisions. For that reason, public policy decisions about LNG systems will probably be made principally on the basis of nonquantitative approaches. These decisions should result in prudent siting of facilities and strict design, construction and operation standards.

This report identifies nine areas which may be of concern to the U.S. Congress in its consideration of possible new legislation, oversight of Federal agencies with responsibilities for LNG systems, or appropriation of funds for agency operations and research.

The first five areas are concerns about existing equipment and procedures for facilities which are already operating or will be operating in the near future. Regulatory changes in

these areas must be such that they can be applied to ongoing projects. These areas are:

- tanker design and construction (pages 42-45);
- tanker regulations and operations (pages 46-49);
- regulation of terminal operations (pages 50-52);
- decisionmaking process in certification of import projects (pages 53-57);
- safety research on LNG (pages 58-62).

The second four areas addressed have more long-range implications and will affect policies and facilities for future projects. These areas are:

- . LNG facility siting (pages 63-67).
- . liability for LNG accidents pages (68-70).
- . reliability of supply (pages 71-75).
- pricing policy (pages 76-78).

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James Carroll, California Council for Environmental and Economic Balance  
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Sidney Wolf, Environmental Policy Center (Washington, D. C.)