National Pipeline Safety Summit
Newark, New Jersey
June 20, 1994

U.S. Department of Transportation
Research and Special Programs Administration
Office of Pipeline Safety

Edited by: New Jersey Institute of Technology
Institute for Transportation

Dr. Louis J. Pignataro,
Executive Director

Dr. Robert Dresnack
Dr. Joshua Greenfeld
Dr. Eugene Golub
Dr. Fletcher H. (Bud) Griffis
Dawn A. Boggio
This report is a vehicle to document the National Pipeline Safety Summit that was held in Newark, New Jersey on June 20, 1994. The report was prepared by the Transportation Institute of the New Jersey Institute of Technology (NJIT) under contract to the Office of Pipeline Safety of the Research and Special Programs Administration (RSPA). The report opens in part with an executive summary and an introduction with remarks by congressional and administrative officials. These are followed by summary reports of each of the four panels. These summary reports were derived from the remarks by the panelists as understood by researchers from NJIT. The complete text of papers submitted by panelists is included in this report as appendices B1 through B5. The panel summaries are followed by a section containing questions from the floor and answers to those questions as given by the panelists. Based on the preceding sections of the report, an analysis was made by the NJIT researchers of issues that had some commonalty among the panelists and some possible solutions. These are included in the next-to-last section. The main body of the report ends with some brief closing remarks. The appendices contain the agenda of the conference, the papers prepared by the panelists, issue papers distributed at the Summit, two handouts available at the Summit and finally, a list of participants in the Summit.

The Summit was recorded on videotape. Copies will be available approximately 2 months after the Summit. Copies may be purchased from the Transportation Safety Institute in Oklahoma City at telephone (405) 954-4643.
# TABLE OF CONTENTS

I. Opening Session ........................................................................................................ 1
   Welcome................................................................................................................... 1
   Summit Focus ........................................................................................................... 3
   Further Remarks ..................................................................................................... 7
   Opening Remarks ................................................................................................... 9
   Keynote address ...................................................................................................... 13
   Remarks.................................................................................................................. 19

II. Summary of Panel Discussions .............................................................................. 21
   Panel 1:  
   Allaying public Concerns About Pipeline Safety .............................................. 21
   Panel 2:  
   Using Existing and Evolving Technologies to Maximize Pipeline Safety .......... 29
   Panel 3:  
   Calculating the Cost of Pipeline Safety ............................................................... 39
   Panel 4:  
   Creating Effective Partnerships for Reducing Pipeline Risk ............................. 43

III. Question and Answer Summary .......................................................................... 53

IV. Summary and Closing .......................................................................................... 65

V. Common Issues and Proposed Solutions ............................................................... 67

---

Prepared by the Institute for Transportation at New Jersey Institute of Technology

# TABLE OF CONTENTS

## Appendices

### Summit Agenda
Summit Agenda ........................................................................................................... A-1

### Panel 1 Papers
Allaying Public Concerns About Pipeline Safety .................................................. B1

George Mazanec, Chairman  
Panhandle Eastern Corporation .................................................................................. B1-2

Frank Popper, Professor  
Urban Studies Department, Rutgers University ...................................................... B1-8

### Panel 2 Papers
Using Existing and Evolving Technologies to Maximize Pipeline Safety .......... B2

William Burnett, Senior Vice President Technology Development; GRI ............... B2-2

Larry Clyne, Regional Transportation Manager, Mid-Continent Region; Conoco, Inc. .................................................................................................................. B2-9

Rober J. Eiber, Director, Transmission Pipeline Programs; Batelle Memorial Laboratory ................................................................................................................. B2-13

### Panel 3 Papers
Calculating the Cost of Pipeline Safety .................................................................... B3

John Des Barres, Chief Executive Officer  
Transco Energy Company ........................................................................................ B3-2

Bruce B. Ellsworth, Commissioner  
New Hampshire Utilities Commission ........................................................................ B3-6

Richard K. Gordon, Managing Director  
Merrill Lynch & Co. .................................................................................................... B3-10
## TABLE OF CONTENTS

Appendices (cont'd.)

Panel 4 Papers
Creating Effective Partnerships for Reducing Pipeline Risk ............... B4

John Mason, Mayor
City of Fairfax, Virginia............................................. B4-2

Issue Papers (Index on Page B5-1)............................................. B5

Handouts (Index on Page C-1).................................................. C

Listing of Participants............................................................. D
EXECUTIVE SUMMARY

SUMMIT AGENDA

The National Pipeline Safety Summit held in Newark, New Jersey came about as a response to several recent pipeline accidents and the public reaction to these visible and dramatic events. As a result, Senator Lautenberg, Congressman Pallone and Secretary of Transportation Peña pledge to improve an already good record of pipeline transportation safety.

Secretary Peña set the agenda for future action in improving safety in the transportation pipeline industry with a five point plan as noted below:

- Develop detailed maps of the transportation pipeline infrastructure nationwide so that pipeline locations are known with respect to people, structures and environmentally sensitive areas.

- Educate the citizens sited near pipelines to enable them to monitor construction activities in the area of the pipelines and thereby reduce third party damage (the largest cause of pipeline failures) to transportation pipelines. Strengthen one-call systems nationwide to reduce third party damage.

- Take measures to reduce pipeline failures due to corrosion. One initiative in this area would be to increase the frequency of pipeline inspection from once every four years to once every two years.

- Develop new technologies to improve leak detection.

- Integrate all of the above activities to produce a comprehensive unified pipeline transportation system.

There were 206 registered attendees at the conference. The majority of the attendees came from three groups: utility operators, government
regulators and industry consultants. There was a relatively small group representing either local officials or local citizens whose communities have been effected by pipeline failures. Although the Summit did not answer all of the questions on pipeline safety that have been raised due to recent increased public consciousness, it did generate many of the key questions that will need to be addressed by a partnership of industry, government regulators, and the public and elected officials in the near future.

ISSUES AND PROPOSED SOLUTIONS

Several issues were raised by speakers in more than one panel discussion at the Summit along with suggested solutions and/or directions to be taken to improve pipeline safety. These are summarized below:

**Issue** There is a need for partnerships between pipeline operators, regulators and local government and elected officials.

**Solutions** Education program. Joint advisory committees. Emergency response programs. Third party patrols. Linkages between the public, FERC and OPS.

**Issue** Minimization of third party damage with an Enhanced One Call System.

**Solutions** National enforceable one call system. Enlist and educate the public to observe questionable activities and utilize the one call system. Utilize high tech to identify problems.

**Issue** Improved monitoring techniques to reduce pipe failures.

**Solutions** Ultrasonics as pigging devices. Increased monitoring frequency. Increased airborne surveillance. Increase pigging capability. Predictive models to anticipate failures. Leak detection sensors.

**Issue** There is a need for a centralized comprehensive database related to accidents and incidents in the pipeline industry.
Solutions  OPS - centralized repository of data. Review nuclear industry management approaches to accidents. Detailed mapping - updating of all transmission lines and environs. Predictive models to anticipate failures.

Issue  The pipeline transport industry is safer than other means of transport (e.g. truck, rail) of natural gas or hazardous liquids.

Solutions  Centralized database to confirm. Convince the public. Assess enhanced safety versus added cost. Consistent criteria for investigating and documenting accidents. Predictive models to anticipate failures.

Issue  Maintaining or restoring public confidence in light of periodic catastrophic pipeline failures.


Issue  Maintain Economic Viability of the Pipeline Industry.

Solution  Economic impact of changing regulations. Cost recovery for safety measures through user fees. Research and development to enhance safety at reduced cost. Adopt cost effective safety programs of other industries.

Issue  Need for new and improved technologies.

SUMMARY OF DISCUSSION AT THE SUMMIT

The issues of safety as developed at the Summit involve the following areas of agreement by the attendees:

- There was a strong consensus among the industry operators that pipeline transportation was the safest mode of transporting natural gas and hazardous liquids. While it was pointed out that the data on which this conclusion was formed could be improved, the basic conclusion was not challenged.

- A second consensus reached by the industry operators was that costs associated with new regulations imposed on the industry might have economic consequences that could cause other modes of materials transportation to become more economically competitive. This would cause more material to be transported by modalities that are less safe than pipeline transportation, thereby increasing the overall risk in the materials transport industry. This effect would be contrary to the objective of increasing overall safety to the materials transportation industry. On the other hand, it was pointed out by others that political realities may outweigh economic viabilities if public confidence is not restored by the industry.

- There was also strong agreement by all participants that industry safety can and should be improved. While not the total solution, it was agreed that a strengthened one-call system in conjunction with and informed public would go a long way to significantly reduce third party damage to the system.

- There was a consensus that the involvement of the public and local officials is necessary to reduce the risk associated with pipeline transportation. In the current process, the only involvement of the public is in the FERC (Federal Energy Regulatory Commission) Environmental Review Process which occurs prior to the approval of a
new pipeline route. Public involvement should be continued through the entire operational phase of the project.

- The strongest consensus reached at the Summit was that a partnership of industry, government regulators, local officials and citizens was key to establishing both increased safety within the system and restored confidence of the public in the pipeline industry. The partnership must develop a plan to educate, meaningfully involve and restore confidence in the public. Meaningful involvement might include local advisory committees, emergency response teams, and local watchdog groups to reduce third party incidents.

- There was strong agreement that local officials and the public should be involved in the process from the conceptual stage and it should continue while the pipeline is operating. It was clear that both the regulators and the operators did not feel that local officials should have the right of approval over a route's location. This would lead to gridlock since agreement could never be reached, if any, of the multitude of municipalities sited along a major interstate pipeline could say no. The question of how to involve local officials in the process in a meaningful and workable way still needs further discussion. Suggestions, such as participation on advisory committees, was put forth but it is not clear that this will be acceptable to the political body.

An important question that may be synthesized from the discussion at the conference involves a basic paradox. Rare and catastrophic events, such as the Edison incident, will occur even if strong one call systems are initiated and corrosion monitoring and maintenance reduces failures from those causes. The possible consequences of such an event is unacceptable to the public. Reducing the frequency and consequences of rare events may be very costly. A heavy new cost to the industry may make less safe modes of material transport more economical, thereby, increasing the overall transportation risk. The best approach to resolving this apparent paradox, as suggested at the conference, will come from an
open and honest dialogue from the partnership of the public, government and industry.

The presentations and discussions initiated at the Summit represent an appropriate start to this dialogue.
I. OPENING SESSION

WELCOME

George W. Tenley, Jr.
Associate Administrator for Pipeline Safety, RSPA

I want to welcome everybody to this very important meeting. Certainly, in the twelve years that I have been involved with pipeline safety, it is the first event of its kind. I believe it is going to set the stage for the new era in pipeline safety, both for the U.S. D.O.T and also with respect to our constituents in the industry, local and state governments, and the public. I will shortly turn the microphone over to our Acting Administrator, Ana Sol Gutiérrez, to set the stage for the rest of the proceedings today.

We're very fortunate to have a wide range of experts in pipeline safety as well as important members of the public policy-making machinery in this country, particularly with respect to pipeline safety. Secretary Peña will be speaking shortly, as well as Senator Lautenberg. We will also have some remarks from Representative Frank Pallone.

We will synthesize some of the questions submitted (on a 3" X 5" card prior to a final question and answer period) into one topic or thought wherever possible. The proceedings of the Summit will be produced by New Jersey Institute of Technology and the entire day's activity will be video-taped. In your packet you have seven papers already submitted for the record. We will be keeping the record open for thirty days (until July 20th), for any papers to be filed following the conference so we will have a complete record of these proceedings.
It is a distinct honor for me to welcome a new member of the team at RSPA and the U.S. Department of Transportation on pipeline safety issues. She's been with us for about six months, and she has already left her mark on this program. Certainly Ana's commitment to strategic planning will fit in very well with what happens today, here in Newark, New Jersey. Ana has been involved for thirty years in technical project development and management. She's been involved with complex computer and management systems, and I think she sees the RSPA program as one vast laboratory for some new opportunities for the RSPA program, not just in pipeline safety. Much of what she brings to the program will be very beneficial in getting this program going in the direction in which the Secretary wants to go.

Secretary Peña will lay out the outline for that program when he speaks to you. Without any further delay, let me introduce to you the Acting Administrator for Research and Special Programs Administration, Ana Sol Gutiérrez.
SUMMIT FOCUS

Ana Sol Gutiérrez
RSPA Acting Administrator

I'd like to welcome you, every one of you, here this morning. As the new Acting Administrator of RSPA, I want you to know that you're here because I want you to make my job a little bit easier. We're very interested in encouraging and promoting a dialogue that will help us know what are the issues and what are the different viewpoints that we have to take into consideration. This is a meeting of stakeholders. We are all stakeholders in this very important issue. What I hope this forum will provide is the opportunity for open dialogue. I come from the school in which communication and dialogue seem to provide the best basis for making any decision.

So, welcome to the Summit. I am also quite delighted with the work that George's staff and other RSPA staff members have done. We have never done this kind of thing before.

The importance of the issues that are going to be discussed here today are underlined by the level of participation that we have. We have invited participants from all walks of life: academia, industry; government (federal, state and local); interest groups; as well as the general public. We hope that by having them all here in one room, we will be able to establish those important dialogues, points and networks that are necessary for us to continue our work.

Secretary Peña and Senator Lautenberg will be arriving shortly. I hope that all of you did not have as much difficulty getting here as some of us did. Some of us spent four or five hours in National and other airports. I'm very glad that everyone was able to come.
Let me talk a little bit about what the different panels are all about. I'd like to introduce the members of the panels and the moderators and give you an idea of what we hope to accomplish. We looked at the major areas in which we must focus and grouped our panels accordingly.

The first panel will address the subject of *Allaying Public Concerns about Pipeline Safety*. We hope to hear from this panel the concerns of the community and what might be done to address those concerns. We have in that panel those groups that are working directly to serve the public, one-call systems representatives as well as other regulators.

The moderator of that Panel is George Spadaro, who is mayor of the township of Edison, New Jersey.

The panelists are Kathleen Fournier, who is the Executive Director of MISS DIG Utility Communication System, Jim Makris, Director of Chemical Emergency Preparedness & Prevention Office, EPA, George Mazanec, Vice Chairman of the Panhandle Eastern Corporation and Frank Popper, Professor of Urban Studies at Rutgers University.

The issues of encroachment on pipeline areas is a very important issue for us to better understand. We have sponsored a study at the New Jersey Institute of Technology that will hopefully give us better insight into how to use our land use planning instruments. We might need to encourage localities to review and make some changes in local master planning.

The second panel entitled *Using Existing and Evolving Technologies to Maximize Pipeline Safety*, will be moderated by Jim Hall, the Vice Chairman of the National Transportation Safety Board. In this panel we are looking at what technology means in this field. Personally, this is one of my most important agenda items because I want to see how technology
that is being applied in many other areas, particularly in the defense department and NASA, can be used.

My background is closely related to those technologies. What part of that technology can be transferred into the pipeline area? With the Defense Department's current direction of making dual use of investment dollars under the ARPA program, we are hoping that we will be able to re-orient some of those investments into applications that will benefit the pipeline safety program.

The panelists on Panel 2 are Bill Burnett, Senior Vice President, Technology Department for the Gas Research Institute, Larry Clynch, the Regional Transportation Manger, Mid-Continent Region, Conoco, Inc., Robert Eiber, the Director of Transmission Pipeline Programs of Battelle Memorial Laboratory, and Neil Thompson, who is the President of Cortest Columbus Technologies, Inc.

Panel 3, Calculating the Cost of Pipeline Safety, is another important area that perhaps we'll be talking about for the first time. What are pipeline safety costs all about? What are the driving forces that we must keep in mind as we regulate, as we make investments and as we look for research opportunities in this area. The original moderator for that panel, Shirley Neff, unfortunately was not able to be with us this morning, We have asked Gay Friedmann, of INGAA [Interstate Natural Gas Association of America] to help us out, and she has agreed to moderate that panel. The panelists are John DesBarres, Chief Executive Officer of Transco Energy Company, Bruce Ellsworth, the Commissioner from the New Hampshire Public Utilities Commission, Richard Gordon, Managing Director of Merrill Lynch & Company, and Elizabeth Moler, Chair of the Federal Energy Regulatory Commission.

Finally, Panel 4, the panel that will help us prepare the framework for the next steps that we, as stakeholders, must take in Creating Effective Partnerships for Reducing Pipeline Risk. The word partnerships is the
word that we hear more and more frequently at the federal government level. It is a new way of doing business. It is recognizing that we all have important pieces, important roles to play in the resolution of problems.

The moderator for that panel is Joseph Martinelli who is the President of Chevron Pipeline Company. The panelists are John Mason, Mayor from the city of Fairfax, Virginia, Mary McDaniel, Manager of the Pipeline Safety Transportation/Gas Utilities Division Railroad Commission of Texas, Stuart Schwartz, Associate Director of Water Resources of the Interstate Commission on Potomac River Basin, Herb Tate, Jr., President of the New Jersey Board of Regulatory Commissioners, and Jim von Hermann, the Senior Partner of CYCLA Corporation.

We have looked far and wide to bring together many different points of view as in today's program so that we will have real significant dialogue. I encourage each of you, as you sit in the audience, to consider yourselves part of the program, to ask questions, and to be active participants in this dialogue. At the end of the four panels, as your agenda shows, we have a special session for those that we could not accommodate on the panels.

We will hear about lessons learned at the local level. We will hear a citizen, Rachael Chiaramida, a resident of Edison township, giving us her perspective. In addition, Michael Neuhard, Fairfax County Battalion Chief, will discuss recent pipeline incidents. We will have a question and answer session for anybody else who would like to make specific comments. Do not feel that you have come all this way not to be heard. We want to hear from you. We welcome you. If we do not have a chance to complete everything today (we have a very busy program), I personally extend a welcome to any letter or white paper that you would like to send us on the subject matter.

With that, I have set up the panels. We hope that we will have an open session. If you have questions or clarifications as we go along, please feel free to raise your hand and we will try to address them at that time.
FURTHER REMARKS

George W. Tenley, Jr.
RSPA Associate Administrator for Pipeline Safety

Let me fill you in on where we stand with this [Edison] accident, the accident which frames what is going to take place today. Over the weekend, Texas Eastern began to run the first of the two pigs that they are going to run, and while I believe there were some initial glitches, I believe that the runs will go off well.

The pipeline has been operating at a 30% reduction from the pressure at the time of failure, and will continue at that pressure reduction until such time as all the terms of the hazardous facility order, that the Office of Pipeline Safety imposed, are complied with.

Also, this Summit is one of several actions that are underway as a result of that accident. We are also looking to the New Jersey Institute of Technology, which is helping to take care of the record in this proceeding, to begin a funded project that will total, at least in the next two years, about $1.25 million. The study will focus on pipeline risk, looking at the issue of consequences of pipeline accidents, particularly those consequences that result from encroachment of people on pipelines.

We are also doing a joint investigation of all of the six interstate gas transmission pipelines in New Jersey with the New Jersey Board of Regulatory Commissioners. The field work on that will probably end within the next couple of weeks. We will probably have some follow-up work to do with respect to some of the records. We would hope to have a final report on that investigation in September.
Again, this Summit is an important activity following in the wake of that accident and other recent accidents of national significance.
OPENING REMARKS

Frank Lautenberg
United States Senator from New Jersey

I want to welcome all of you, and to welcome our distinguished Secretary of Transportation, Secretary Federico Peña to New Jersey yet another time. He is [in New Jersey] often and is very helpful to us. [I'd like to] say hello to my colleagues and friends in government, Mayor George Spadaro, Congressman Pallone, and other members of the panels, and all of you.

This meeting is an important aftermath of the Edison disaster. All too often when something like this [incident] happens, it is not too long before it fades from view, and attention goes to other places. That hasn't happened in the wake of the Edison explosion, and it will not happen. I know that Mayor Spadaro will not let us forget it.

I am working very closely on the introduction of legislation, with Secretary Peña, Senator Bradley, and Congressman Pallone.

If it is at all possible, we should never permit a disaster like the Edison explosion to happen again. It was devastating to the families involved, devastating to the community, and it was a traumatic experience in many ways across the state. People know that a crowded state like ours, like many others, is criss-crossed with similar pipelines and this incident exposes the view that disaster is potentially there.

We have seen the psychological problems that were created, in addition to the physical results. We have talked to families who lost everything, with the exception of the clothes on their backs. The emotional fallout has been significant, with children and adults who continue to play the events of that evening [in their minds]. Many of the families who lived through
that experience are still struggling to reassemble their lives. For those of you here today, I want to reiterate my pledge to do whatever I can to help you in this post-disaster period. I will continue to have our staff and resources available to you.

Edison is not an isolated event. Since that night, March 23 [1994], there have been other pipeline events that have followed the Edison explosion, not quite as devastating or traumatic, but which are concerns never-the-less. My major concern is what happens here in New Jersey, yet I do not wish to ignore the risk to those across the country.

Secretary Peña has been very responsive in the wake of this disaster. Shortly after the explosion, myself, Secretary Peña and Senator Bill Bradley toured the site. Secretary Peña pledged publicly to support a comprehensive program. A series of steps were laid out that the U.S.D.O.T. could take immediately, to prevent future disasters. The Secretary is known to be a man of his word, and his considerable energy is devoted to many things, but significantly to this problem. He has already requested more resources to provide better regulatory monitoring and oversight of our nation's pipeline system. I, as chairman of the Appropriations Subcommittee that has responsibility for pipeline safety, intend to fund that effort in this year's transportation bill.

The Secretary also approved a $1.25 million grant to the New Jersey Institute of Technology to advance research in pipeline safety, as well as to direct his Office of Pipeline Safety to undertake a complete assessment of potential safety risks of gas [transmission] pipelines in our state. At that time, the Secretary also agreed to my request to bring experts, a Summit of experts, on pipelines and pipeline safety together to discuss ways to improve the system. As a result of his commitment, and the hard work of the U.S.D.O.T. Office of Pipeline Safety, we are gathered here today.

While planning for this review, Senator Bradley, Congressman Pallone and I developed some immediate proposals in reaction to the problems
that we saw at the time. We introduced legislation designed to address deficiencies in one-call systems, not only in New Jersey, but throughout the country. This bill will be the subject of hearings in the House of Representatives on Thursday [June 23, 1994]. Tomorrow, Congressman Pallone, on his side of the Capitol, and Senator Bradley and I will be introducing additional pipeline safety legislation which we believe can dramatically decrease the chances of pipeline accidents and reduce the risks of those who live, work or go to school in the vicinity of pipelines. We recognize, however, that we need to explore more comprehensive solutions.

This Summit gathering is designed to develop a public/private agenda that establishes priorities for pipeline safety initiatives, and identifies some of the steps needed to make them a reality. The report developed from suggestions made at this Summit will form a blueprint for action. Secretary Peña will submit them in legislative form to me for presentation to the Congress. I expect it will get a sympathetic hearing because there are few Congresspersons and Senators who are not faced with the potential problem that arises from gas transmission pipelines criss-crossing their areas.

The whole nation witnessed the fireball that exploded over Edison. Every American who saw that image on television had to ask themselves whether or not that potential exists in their own neighborhood. No member of Congress wants that kind of incident to take place in their district, and they are interested in solutions to the problem.

I would like to encourage everyone who doesn't have the opportunity to participate in today's Summit to submit any comments that they would like to have considered, to my office here in Newark, or directly to N.J. DOT. Once again, I say thanks to all of you for coming here. We look forward to working with you.
KEYNOTE ADDRESS

Federico Peña
Secretary, U.S. Department of Transportation

Three months ago, the tragic explosion in Edison, New Jersey reminded us of how serious the potential risks are where people and our nation's aging pipeline infrastructure intersect. Since then, the Department of Transportation has moved swiftly to enhance the federal government's role in pipeline safety. For example, we have asked Congress for an additional $16.2 million in funding for my Department's Office of Pipeline Safety. This is the largest increase ever in federal pipeline safety funds, nearly twice as much as was provided in last year's budget. Doubling our pipeline safety budget will dramatically change the way that the federal government focuses on this subject and engages with this industry on behalf of the American public. The fact that we are committing this extra money at a time of deep budget cutbacks reflects my commitment, and that of President Clinton, to protecting the lives and property of the American people. We want to make sure that future pipeline growth in this country is achieved as safely as is humanly possible.

The additional funds that we expect Congress to approve will enable us, among other things, to substantially increase pipeline inspections, to finance new technical advances, to improve safety standards, to reimburse states across the country for 50% of their pipeline safety spending, and to launch a nationwide mapping program to track the location of pipelines in relation to areas of high population, environmental sensitivity and water supplies. I want to thank Senator Lautenberg, Senator Bradley, Congressman Pallone and their colleagues for their strong support.
Today's conference itself, which brings together citizens, public officials, academic and industry experts, and media to discuss the central issues in pipeline safety, is part of a wider effort, already underway, to prevent catastrophes like that in Edison. This can be achieved not only through immediate action but through long-term analysis, planning, education and investment.

I especially want to thank each of you for your attendance at this historic summit. Today, we will hear about the new technologies and creative policy initiatives that have the greatest potential to protect this vital infrastructure and assure the American people that the pipelines that serve us will be safe well into the future. More importantly, I hope we will all come to realize the critical role that pipelines play today in America's transportation system now and the even greater role they are set to play in the future. There is no question that the United States will need an even more extensive pipeline network in coming years. There has, for example, been a 30% increase in demand for natural gas since 1986. Given Americans' concerns for cleaner air and the laws that address and reinforce those concerns, it is safe to forecast a similar rise in natural gas demand well out into the next century. There is a need for substantial expansion of natural gas pipelines and storage facilities.

Just as the need for expansion is clear, so is the challenge to cope with continuing threats to the existing pipeline infrastructure as it ages, as corrosion worsens, and as third-party dig-ins continue. Simply put, we need to develop short and long-term strategies and public-private partnerships to enhance the safety of these efficient, essential economic lifelines.

Few Americans recognize the enormous role that pipelines play in our transportation system: out of sight, out of mind, we take them for granted. Yet pipelines carry 605 billion ton-miles of oil and petroleum products a year, more than 25% of our nation's total intercity freight. Three quarters
of the people in the United States rely on natural gas pipelines to supply them with fuel for heating, cooking, or hot water.

Clearly, the pipelines that convey this volume of liquid and gaseous energy are as vital to America's way of life, economy and security as arteries, veins and capillaries are to our own bodies. Just as clearly, we face serious challenges in updating our pipeline system and ensuring its ability to safely meet rising needs. The vast bulk of the pipeline system, for example, was constructed decades ago. Large segments of it are aging. Continued suburban and exurban development is encroaching on it as once-rural areas give way to tract housing and shopping malls. But until recently, pipelines had been nearly invisible not only to the public, but to many of us in government.

That is why the pipeline explosion this March in Edison, N.J. served as such a powerful warning bell, for all of us. There are growing dangers as we see population and commerce expand into areas dense with pipelines. I strongly believe all of us in government at all levels and the pipeline industry itself, must redouble our safety efforts.

In light of the major accidents we have experienced over the last several years, and continued risks from corrosion and third-party damage, I believe that it is critical that we in government step up our inspection efforts. I am sure that the industry shares our commitment to safety. But we in government have a duty, a public trust, to enforce safety standards and to impose strong sanctions for non-compliance where necessary. Working together, industry and government need to re-acquaint the American public with the existence, importance and potential hazards of pipelines. It is, of course, primarily the pipeline companies responsibility to maintain a safe pipeline system and to educate the public about the potential danger of working near or around pipelines. But government should do more to help, and we will.
As regards the problem of external damage to pipelines, it is not just private contractors who damage or breach pipelines. Government agencies themselves, including highway departments, have been known to cause dig-ins to pipelines. All too often, we have been part of the problem. It is time that we become part of the solution.

It is up to all of us in government, and in industry, to take greater responsibility for pipeline safety. It is necessary to inspect systems more often, to increase preventive maintenance, to explore every new technological advance we can find to enhance safety. The fact is that reassuring the American people that industry and government are taking greater responsibility is essential if these systems are to continue to serve Americans' rising need for clean, environmentally sound energy. Sustaining public confidence requires that we develop a clear understanding of the state of the pipeline infrastructure as it is now, and a strategic vision of how we wish to improve it in the future. Gathering a full information base on pipelines is an essential part of the NTS effort. And developing and implementing a comprehensive safety program for pipelines answers the increased demands for safety that the American people demand from all forms of transportation...The American peoples' concerns about pipeline safety are legitimate, and it is our responsibility to address these concerns, with actions as well as words.

It is precisely because I am so committed to ensuring that America has a safe and efficient pipeline system, that I have set the following goals as the core of my vision for pipeline safety in next few years:

- That every pipeline in this country be tested and rehabilitated, if necessary, to assure its safety;

- That every state has a one-call information system detailed enough so that any citizen or excavator can call a single number and promptly find out the precise location of pipelines;
• That new technologies be applied to monitor pipelines so that virtually any serious flaw or break-in can be detected before a massive failure occurs and can be immediately repaired;

• That every community in the country has land use policies which take account of the existence of pipelines and avoids dig-ins; and

• That the federal government's pipeline program enjoys strong public confidence and trust as an independent, competent and credible assessor of the nation's pipeline infrastructure, with the means and the will to address any risks that arise.

To make that vision come true, we will need to work with the Congress to ensure that we sustain the commitment of resources to build a strong DOT inspection staff, to fund research and development on pipeline safety and to enable us to assist in deploying new safety technologies. With support from Senator Lautenberg, Senator Bradley, Congressman Pallone and their associates, I'm confident that Congress will sustain this very important national commitment for the long-haul.

American lives, American jobs, new American technologies and the future of a vital American industry, in fact, our domestic national security, all depend on strengthening our commitment to pipeline safety.

I want to thank all of you today for coming. And I especially want to thank those who have worked hard on the presentations we are about to hear. I look forward to what they have to say. This is, I believe, a genuinely historic conference. We are beginning a new era in pipeline safety. It is an important first step, with a lot more work and effort needed in years to come. But I believe that the understandings we reach at this conference and the commitment and partnerships we secure here today will enable us to keep America's pipeline network the world's safest for years to come. Again, thank you very much.
REMARKS

Frank Pallone  
United States Congressman

I am looking forward to hearing from the Panels. I would like to thank the Secretary for being here today. The reason why this Summit is happening today is because of Senator Lautenberg, who with the Secretary, put this event together.

As all of you know, Durham Woods in Edison is in my Congressional district, and obviously when the accident occurred, we not only wanted to make sure that everything possible was done to help the people who were victims, but also to see what lessons there were in terms of future legislation or future prevention measures that were going to be needed for the rest of the country to prevent such accidents from happening again. I have to say that both the Secretary and Senator were fantastic in coming to the district within a day of the accident and touring the site.

I was amazed with the local community response, with people going door to door to get their neighbors out [of their homes] so that there would not be any fatalities or any serious injuries (with the exception of one fatality as people were fleeing) Overall, it was really a miracle, as Mayor Spadaro said after the explosion, that no one was killed or seriously injured by the explosion itself.

I would also like to thank Mayor Spadaro. I don't think anyone could have done such a fantastic job in helping people, in responding to their concerns and in getting the federal and state agencies in there to help. The Mayor is taking a major role in monitoring the follow-up, to determine what lessons there are that can be used in formulating legislation both statewide and nationally.
I know that the next Panel is about public concerns about the future. Naturally, when an incident like this occurs, which receives so much national attention, people ask what can be done to prevent such explosions from happening again. Senator Lautenberg, Senator Bradley and myself have become involved in a major way in introducing legislation. One bill which has already been mentioned is the one-call bill which has already been introduced in both houses of Congress. In the House [of Representatives] it is HR 4394. Basically, what this provides is a mandatory one-call notification system. As many of you know, a lot of states already have one-call systems, but they are not mandatory. New Jersey has established one, as well, but again, it is not mandatory. What we are trying to do with this bill is require the mandatory participation of excavators, without exception. Anyone who excavates has to make a phone call before they dig. In order to allow excavators to obtain all the information about a site with one-call, underground facilities which are used for gas, electricity, communications, water and sewer will all be required to participate.

We have a system of penalties and fines which we think will work. We also increase the penalties in cases where the violation leads to serious injury or property damage. The Senator mentioned that on the House side, this legislation will be taken up in the Energy and Commerce Committee with a hearing on Thursday [June 23, 1994]. We are hoping that we can move quickly on that legislation. The other legislation that Senator Lautenberg mentioned will be introduced tomorrow [June 21, 1994]. The idea really is prevention. What can we do to change the safety laws to prevent incidents such as the one at Durham Woods from happening again.

The second bill will be mentioned later today. It was interesting to hear Secretary Peña's five point strategy. Many of the points which he mentioned we hope will were addressed in the second bill, in both houses. Thank you all for coming.
II. SUMMARY OF PANEL DISCUSSIONS

PANEL 1: ALLAYING PUBLIC CONCERNS ABOUT PIPELINE SAFETY

Moderator: George Spadaro
Mayor, Township of Edison

Panelists: Kathleen Fournier
Executive Director MISS DIG Utility Communication System

Jim Makris
Director, Chemical Emergency Preparedness & Prevention Office EPA

George Mazanec
Vice Chairman, Panhandle Eastern Corporation

Frank Popper
Professor, Urban Studies Department, Rutgers University

Summary and Issues

The panel discussed the concerns of the public with regard to the safety of pipeline operations and how to respond to those. The words knowledge and education were used frequently by the moderator and the panelists. There was a consensus that in order to restore confidence in the safe operation of pipelines, one needs to know what risks are involved with that operation. It is also important to know how to minimize the probability of
an accident occurring and what to do if an accident should occur. Once this knowledge is developed, the next step is education of the public, local government and pipeline operators on how to live in harmony with pipelines and how to avoid actions that cause accidents.

Natural gas is important to the vitality of the north-east (and other) regions of the United States. There is a need to learn how to deal with risk. Pipeline operators, local/state/federal government and the public must work together in order to become collectively involved in ensuring safety. This can be achieved by requiring the use of a national one-call system, establishing advisory committees, revising the zoning and permitting process, preparing emergency response plans, improving safety inspections, and the public becoming personally involved in looking for suspicious activities around pipelines.

Condensed Presentation of Panel Discussions

George Spadaro. In light of the recent incident in Edison, New Jersey, there is a grave concern about safety in the communities that are in close proximity to existing pipelines. As a result of this concern, Mayor Spadaro urged the pipeline industry, the federal/state regulators and local government to create a level of comfort and instill confidence in the community so that they do not feel that they are at risk. This can be done, for example, when installing new pipelines, by gathering information necessary for proper decision making. The process should involve evaluation of environmental protection issues, excavation processes, land planning issues, pipeline risk issues and the proximity of the pipeline to the population centers. It is also necessary to balance the rights of the pipeline operator on the right-of-way with the interest of new residents.

Mayor Spadaro presented the following questions for discussion:
• How to improve public awareness of the existence of a pipeline in their area and the hazards involved in excavating near it?

• How should the concerns of the community be included in the considerations of alternative routes for the pipeline?

• Who (Federal, State, local government, etc.) should represent the public in matters concerning the operation and the safety of the pipeline?

• What zoning strategy should be considered to address issues of encroachments into the right-of-way?

• How to balance the need for natural gas with the safety of the community?

He also called for the need to develop preventive steps to minimize the chances for an accident to occur and to minimize the consequences of an accident if one should occur, especially in a densely populated area. This could be accomplished, perhaps, by requiring more frequent inspections of the interior of the pipe with new "pigging" technology. Another precaution to be considered is installing remotely controlled or automatic shut off valves to cut off the gas supply as soon as possible after a problem is detected.

Kathleen Fournier. Ms. Fournier stated that a major problem of pipeline safety is education. She called for a major effort to inform the public about one-call systems, their existence and mode of operation. From her experience, when an accident occurs there is a dramatic increase in the usage of the one-call system, but as time passes it decreases again. She suggested that pipeline safety education should start at the school level. This should include teaching about the signs that mark the pipeline route and how to use the one-call system.
She called on everyone to become ambassadors of pipeline safety. This can be done by placing the burden of reporting any suspicious activities around a pipeline on each and every one of us. Ordinary citizens, as well as local government and utility company employees who frequently pass by the pipeline, should make an extra effort to notice changes or ask questions of anyone working in the vicinity of the pipeline. This approach requires education on a continuous basis. In summary, Ms. Fournier said that we need to become pro-active not re-active.

She proposed that the local permit granting procedures require that the one-call system is part of the approval process. Developers and excavators should be made aware of all underground utilities and the necessary precautions they must exercise in order to avoid damaging pipelines.

Jim Makris. Mr. Makris suggested that the gas industry learn from the experience of disasters (or near disasters) that occurred in the chemical and nuclear industries. The public has the right to know about hazardous facilities in their backyards. The consequence of an incident in an uninformed neighborhood can be much more severe than in a well informed community. After the 1986 Union Carbide accident in India, the U.S. Congress enacted the Emergency Planning and the Community Right To Know Act (introduced by Senator Lautenberg) which establishes local responses to a hazardous substance-related disaster. This should be expanded to hazardous liquids and gas pipelines. Mr. Makris said we must recognize that the population needs to have knowledge about the risks and the measures it must take in an event of an incident.

Another consequence of the Right To Know Act was the establishment of local committees which in turn apply pressure on the risk makers to provide data and to answer tough questions regarding their operations. A similar scenario should develop with gas pipeline operators.
Another issue regarding preparation for disasters is to have local expertise to deal with such situations. Often, when an outside team of experts arrive at the site of an incident, it is too late to prevent extensive damage. A local team of experts could limit the consequences of a potentially disastrous incident in the early stages after an incident occurs.

Mr. Makris suggested the following course of action:

- Recognize that government and pipeline operators have a responsibility to work together and assist each other in order to have a safer system.
- Create meaningful research into the technology required to prevent accidents. We need to research and understand the spatial impact of an accident (how far will the damage of an accident reach) and the consequences of a major earthquake.
- Move in the direction of more openness and education of the public.
- Devise and implement realistic accident exercises.
- Learn from the experiences of other countries.

All of these activities should be accomplished through a cooperative effort. All responsible parties need to work together to make our collective lives safer.

**George Mazanec.** Mr. Mazanec gave a short overview of the company that he represents. Panhandle Eastern Corporation (a parent company of Texas Eastern) is responsible for delivering 12% of the natural gas consumed by the U.S. Natural gas makes up 25% of the total energy used in the U.S.. The safety record of gas transmission via pipelines is by far the best as compared to other modes of transportation.
Mr. Mazanec made it clear that maintaining this safety record is very important to the gas transmission industry because they cannot make money from an unsafe operation. To ensure that this safety record will continue or even improve, gas transmission companies are operating with more stringent safety procedures than called for by Federal regulations.

Unfortunately, about 50% of pipeline incidents are attributed to outside forces over which the pipeline operator has little or no direct control.

In order to minimize the damage from outside forces, he expressed the need to develop an education program for public awareness, damage prevention and emergency response. It is important to develop public awareness of the existence of a pipeline in their area, and a one-call system and a reporting system on any unusual activities in the vicinity of the pipelines. The public should also be informed about existing pipeline rights-of-way and the pipeline operator should be more involved in the local development process to oversee the safety of the pipeline.

Damage prevention can also be achieved by evaluating new technologies on a cost/benefit based analysis. Finally, there is a need for emergency response programs for the pipeline operator and for local fire, police and EMS units to contain incidents with minimum losses.

Frank Popper. Professor Popper stated that pipelines fall into the category of projects that are essential to modern society but are Locally Unwanted Land Uses (LULU's). Since pipelines are a necessity, there is a need to deal with them effectively. He suggested that the industry study and learn from experiences of other LULU's on how to reduce the risks associated with pipeline transmission. He described, as an example, the LULU of railroad crossings. The number of accidents at railroad crossings decreased significantly after the public was educated to the risks. As a result, the location of new railroad crossings were planned more carefully, redesigned, and made more visible, etc.
Local and regional planning and zoning boards need to pay more attention to pipelines in their area, as do environmental, regulatory and emergency management agencies at all levels of government. There should be a local, county and state citizens advisory committee on pipelines. They should be able to participate in auditing performance and inspecting the safety of the system.

It is most important to realize that it will become more difficult to build new pipelines due to the LULU syndrome. Instead, we need to concentrate on how to use the existing pipeline network less expensively and more effectively.

Mayor Spadaro then invited questions from the audience. The following questions were presented and responded to:

Question:

In an event of an accident, where does the municipality fit into the process of pipeline inspection, studying records, re-opening, etc. Should the municipality have an official role?

Answer:

(F. Popper) In other LULU's such as those that may involve environmental problems, local government is already part of the approval and emergency response process. The case of gas pipelines should not be different.

(K. Fournier) What we need is education. How many people understand the signs that mark pipelines. How many people understand terms such as right-of-way and encroachment?
(Senator Lautenberg) Legislation will aim at expanding the information base to ordinary citizens so that they know the facts. Detailed maps will be available to the public to better understand the specific local situation.

Question:

*We heard here that pipeline operators have communication channels with property owners. What about people who rent? People who work in the area?*

Answer:

(G. Spadaro) After the accident, Edison has enacted a local ordinance that requires managers of rental complexes to notify potential renters about the existence of gas pipelines.

(Rep. Pallone) It is a good idea to include them. I will change the wording of the Bill to include residents and businesses who rent.

Question:

*Will Texas Eastern compensate the residents affected by the Edison incident for post traumatic stress counseling and treatment?*

Answer:

(G. Mazanec) Texas Eastern will review any reasonable claim that is submitted to them. They will not consider general claims that are not medically supported.
PANEL 2: USING EXISTING AND EVOLVING TECHNOLOGIES TO MAXIMIZE PIPELINE SAFETY

Moderator: Jim Hall  
Vice Chairman, National Transportation Safety Board

Panelists: Bill Burnett  
Senior Vice President, Technology Development, GRI

Larry Clynch  
Regional Transportation Mgr., Mid-Continent Region,  
Conoco, Inc.

Robert Eiber  
Director, Transmission Pipeline Programs, Battelle Memorial Laboratory

Neil Thompson  
President, Cortest Columbus Technologies, Inc.

Summary and Issues

Considerable efforts are being made to use existing technologies and to develop new technologies to improve pipeline safety. There are three elements that comprise pipeline safety: the types of events, the probability of an event, and the consequences of the event. The first line of defense against pipeline failures targets reducing risk-causing events. The second line of defense attempts to reduce the probability of failure of the pipeline system. The third line of defense seeks to reduce the impacts of a failure.
It was noted that the pipeline mode of transmission is 18 times safer than other transportation modes. Technology is improving this safety record. It was noted that the database for the comparison of safety records is deficient.

There was a technical presentation focusing on corrosion, a natural process that attempts to return a metal to its oxide form. Research in cathodic protection and coating development is making progress in controlling corrosion.

Research is necessary in the areas of excavation damage reduction, internal pipeline inspection, effective identification of improvement areas, corrosion control and prompt identification and control of releases.

Condensed Presentation of Panel Discussions

Bill Burnett. The Gas Research Institute (GRI) was formed in the late 1970's. A focus on Research and Development began in 1980 with the mission of developing and deploying new technologies for gas producers, distributors, pipelines and customers. R&D is concentrated on lowering the cost of gas supplies and improving pipeline safety. Ten million dollars is spent annually on pipeline safety programs.

GRI's Pipeline Safety program seeks to minimize risk through preventative technology development. The basic assumption of GRI is that pipeline system design and installation do not represent a risk. This premise allows a focus on the three elements that affect the safety of a system.

- An initial risk-causing event is characterized by construction-caused defects, coating failures, corrosion, outside force damages, or natural disasters.
• The risk associated with the event is the probability that a leak or pipe failure will occur.

• The third component of risk is the consequences of a failure.

The "first line of defense" targets risk-causing events: e.g. one-call systems to reduce third-party incidents; cathodic protection systems, coatings, and biocides that mitigate biocorrosion are currently used in corrosion prevention; improved incident reporting and tracking systems; real-time notification of third-party damage; and future technologies that will focus on satellite pipeline surveillance systems.

The "second line of defense" focuses on the reduction of the probability of failure of the pipeline system through inspection and repair. Sensor technology includes such technologies as pigging, a form of in-line-inspection, which is used to pinpoint corrosion, cracks, gouges and other defects using magnetic flux leakage (MFL) technology which detect metal losses in pipeline thickness. A limited portion of existing transmission pipelines is piggable due to intrusive valves, sharp turns and variable pipe diameters. Pigging currently has a 60% detection rate of pipe flaws. It does not detect in-line longitudinal cracks and small defects, or exterior flaws in the form of corrosion cracking as well as gouges and dents from excavation. New technologies include ultrasonic pigs which will operate in a "dry" environment with improved sensitivity over current technologies.

The final "line of defense" attempts to reduce the consequences of an event by introducing land use (encroachment) policies, and rapid response procedures that include emergency system shut-down. Current research includes development of expert systems that can discern a line break from normal upstream or downstream occurrences.

Risk management is a combination of risk minimization and economic factors that requires a prioritization of efforts using expert systems to help in risk management. New technology development is dependent upon
appropriate research facilities, such as the Pipeline Simulation Facility. Cooperative efforts and jointly funded projects will help create the mechanisms necessary for pipeline safety in the future.

**Larry Clynch.** His comments were relative to the technical issues associated with hazardous liquid pipeline transmission. The liquid pipeline industry is on average 18 times safer than other transport modes and accounts for approximately half of United States freight measured in ton-miles. Safety is an issue which benefits the industry economically, therefore it is beneficial to continually improve methods which increase the safety of hazardous liquid transmission.

Voluntary groups such as the American Petroleum Institute and the American Society of Mechanical Engineers began the design of operating procedures before the United States Department of Transportation Pipeline Safety Regulations existed and these influenced DOT standards. The partnership that exists between government and voluntary entities creates standards that are used as models in design, construction, operation, and maintenance of pipeline systems on a world-wide basis. The United States and the International Standards Organization are currently conducting a voluntary effort to develop a worldwide safety standards for pipelines.

Mr. Clynch discussed the current areas of risk reduction in the pipeline industry, including hydrostatic testing, cathodic protection, smart-pigging for the detection of flaws and one-call systems to reduce third-party damage. Further, he stated that U.S. use of Supervisory Control and Data Acquisition (SCADA) to monitor pipeline systems operation on a continual basis, allows the U.S. to be the most highly monitored system in the world.

He recommended that the U.S.D.O.T. should have the authority to investigate a system and utilize pigging technology in their review.
Robert J. Eiber. Mr Eiber discussed three factors in his presentation; the causes of incidents, the effect of aging on pipelines, and the potential improvements that new technologies offer.

Mr. Eiber identified the difficulties in comparing incidents in the United States with those of other countries. The difficulties are attributable to variations in reporting requirements. Using cause data expressed as a percentage gives a better comparative basis between data sets.

It is of interest to view the cause of accidents for the United States. These are:

- Third-party damage comprises 40% of gas and 18% of liquid incidents.

- Corrosion damage accounts for 21% of gas and 20% of hazardous liquid incidents.

- Gas and liquid material defects make up 16% each of the total reported incidents.

- Finally, 23% of gas and 45% of liquid pipeline incidents are from operational causes.

Mr. Eiber includes an extensive statistical set of data on accidents and their causes for the U.S. and world-wide (See Appendix B2).

Fatalities and injuries resulting from an event can be correlated with the incident type. Comparing fatality statistics from the transport industry on an annual average basis, there are seven fatalities from pipeline transmission, 600 from rail, and 8,500 from truck transportation. It appears that pipeline transmission fatalities are much less than the other modes of transportation. (During the Question and Answer session, Mr. Eiber indicated that the truck and rail statistics encompass all fatalities.
appears that pipeline transmission fatalities are much less than the other modes of transportation. (During the Question and Answer session, Mr. Eiber indicated that the truck and rail statistics encompass all fatalities and are not limited to gas- or liquid-related transportation incidents, thus creating a distorted comparison.)

There are three factors which need to be evaluated in ascertaining infrastructure effects and pipeline incident probabilities. The time effect on mechanical properties of pipes, the location effect of line-pipe steel deterioration, and long-term operational effects.

Steel strength level is increased over time, although laboratory tests on its resistance to fracture shows some losses during pipe production. Fracture resistance is related to transition temperature and toughness and is taken into consideration during pipe design.

Location results in several potential effects, resulting from soil corrosivity, resistance, moisture level, pipe coating condition, cathodic protection level and temperature.

In-line technology and corrosion control methods are improving, with corrosion-related incidents dropping from 26 in 1985 to 9 in 1992. Steel yield strength is more likely to produce pipe failure than age or fracture toughness. Research continues to prevent and control corrosion-related metal loss or stress cracking.

Population encroachment is a second location-related effect which produces. Outside forces account for 40% of the incidents, with 70% of those occurring on lines that have already been marked most likely using a one-call system. Establishing firmer policies and enforcement can lead to reduction of outside-force events.

Static stress and stress fluctuation occurs in pipelines that have been in service for a long time. The former does not have long-term effects,
though the latter can cause small defects which can become larger as the pipelines continue to operate with pressure cycles.

Neil Thompson. Mr Thompson gave a technical presentation focusing on corrosion concerns which have equal emphasis with third-party pipeline damage and aging infrastructure. The technology for corrosion prevention is about 55-65 years old with developments primarily focusing on prevention and control issues. The American Gas Association has contributed significant efforts to corrosion control.

High pressure lines are subject to significant failures that result in significant damage and loss of life, with distribution system failures causing the greatest number of fatalities. Money spent on corrosion control represents 4% of the Gross National Product (GNP), therefore it is a country-wide problem, not just a pipeline problem.

Iron ore (oxide) is refined to a metal in order to produce steel products. Corrosion takes metal back to its original oxide state. Control is the only viable solution that can extend the finite life of a pipeline. In order to deal with the aging process of pipelines, life assessment programs should be established. The solution is to mitigate, not eliminate.

Cathodic Protection (voltage is applied to a to pipeline, which changes electrochemical reactions and thereby prevents corrosion) used with coatings is more effective than coatings alone. The past 10 years has seen an improvement in application methods and coating formulations which both affect how a coating ages. Moisture also affects coatings and can prevent adequate protection from cathodic measures. Field studies to determine coating failures are expensive. This represents a major area of research and development, as well as optimizing the interconnection between coatings and cathodic protection. The application methods have been unchanged for 30-40 years and are very effective. Funding should continue on improving methods of monitoring cathodic protection, and on identification of corrosion, before it compromises pipeline integrity.
Other detection methods include measuring the pipe to soil electrical potential related to corrosion activity. These are indirect measurements which do not indicate the material that is corroding or rate of corrosion.

This technology needs to be utilized with in-line inspection tools. Ultrasonic and magnetic flux technologies can identify areas which have corroded. These methods detect failures after damage has been done. The primary effort in corrosion testing is to prevent, not to identify after the fact.

Prediction model development is a new technology, requiring basic research. Methods need to be developed to determine how to handle pipeline maintenance (i.e. replace, lower operating pressure, recondition the line). Over the ditch reconditioning methods and internal corrosion detection will become more important as pipeline infrastructure ages.

Jim Hall. The National Transportation Safety Board pipeline accident reports have addressed the research needs commonly expressed by the panel. Research is necessary in the areas of excavation damage reduction, internal pipeline inspection, effective identification of improvement areas, corrosion control and prompt identification and control of releases. Other areas which are supported by the NTSB are pipeline facilities mapping and database development, response preparedness to accidents, safety analysis and increase of urban area inspection and maintenance.

Other essential activities which will increase the safety of pipeline transmission are training and education programs for pipeline employees and the public.

The gas industry research decision making process should incorporate public sector input to assure that the research outcome is providing the optimal public safety improvement. This might be accomplished by
current public attendance at GRI research development meetings, and also by public representation in the final decision process which determines how funds are spent.
PANEL 3: CALCULATING THE COST OF PIPELINE SAFETY

Moderator: Gay Friedmann  
*Interstate Natural Gas Association of America*

Panelists:  
John DesBarres  
*Chairman and C.E.O. - Transcontinental Gas Pipe Line*  
Bruce Ellsworth  
*Commissioner New Hampshire Public Utilities Commission*  
Richard Gordon  
*Merrill Lynch & Co.*  
Elizabeth MolerChairperson  
*Commissioner Federal Energy Regulatory Commission*

Summary and Issues

The panel provided information and discussion related to the costs required and spent by the industry to provide safety; the view of regulators as to the effectiveness of the existing system of regulation by the Office of Pipeline Safety, and siting approvals by the Federal Energy Regulatory Commission; the relationship required between expenditures made to promote pipeline safety and the ability of industry to recover costs (or partial) through regulated user fees; and the need for cost regulation to maintain the competitiveness of the gas and hazard liquid pipeline industry.
Condensed Presentation of Panel Discussions

John DesBarres. Public confidence must be achieved by the industry or there will be no industry. It is imperative that industry expend appropriate sums of money to insure minimization of risk to the extent that is needed so that the public maintains confidence in the industry. Mr. DesBarres provided a series of slides indicating present expenditures by the gas industry for safety measures (e.g. four billion dollars per year nationally amounting to a cost of $71 per year for its 56 million customers; two hundred and thirty six million dollars is spent annually by the five interstate gas companies in New Jersey).

It is important for regulators to recognize the need for allowing pipeline safety user fees to be passed along to customers to recover costs to promote pipeline safety. User fees have recently increased dramatically for gas pipelines, and increased moderately for hazardous liquid pipelines in order to promote greater safety in pipeline transmission. Data compiled on relative risks associated with annual fatalities in the United States due to pipeline failures vis-a-vis falls from ladders, falls in bathtubs, drownings, etc. demonstrate that the pipeline industry, from a risk standpoint, fares extremely well compared to fatalities associated with various activities experienced in our daily lives.

Expenditures are essential for pipeline safety and should be directed in accordance with risk assessment based studies and related outcomes to insure improved safety reliability and more effective return on investment. Regulators should be sensitive to and provide means for industry to recover costs utilized to promote safety.

Bruce Ellsworth. The Pipeline Safety Act of 1968, which initiated the development of the Office of Pipeline Safety (OPS), has enhanced safety in the pipeline industry it regulates through its inspection program. The shared Federal/State Program of pipeline inspection is a good concept,
but the costs for inspection should be equitably (i.e. 50% of the share) distributed to the states. It is important that a perspective be maintained when reviewing risks associated with the pipeline industry compared with other alternative means of transportation (i.e. truck, rail, etc.) that could be utilized.

Richard Gordon. Mr. Gordon, of Merrill Lynch's Energy Group, has 22 years experience working with the gas industry in helping to finance construction and operation of pipelines and related infrastructure. Concern was expressed that the safety record of the gas industry shouldn't be overlooked because of the recent incident in Edison, New Jersey. New safety regulations imposed on the industry, as a reaction to the Edison incident, may be counter productive and inappropriate. Due Diligence Studies of the gas industry performed by Mr. Gordon demonstrates the industry to be a safe one. The industry is already capital intensive. In order for public companies in the pipeline industry to be competitive in the market place, caution should be applied by those that may attempt to apply new stringent safety regulations on the industry.

Elizabeth Moler. The Federal Energy Regulatory Commission has regulatory powers over the pipeline companies which include determining rate structures and certification of the siting of all new natural gas pipelines.

All sitings must meet U.S.DOT. safety requirements, and are regulated under Section 7C of the Pipeline Gas Act. The Commission (i.e. FERC) evaluates sitings based on environmental (e.g. wetlands, habitats, etc.) and land use perspectives, and each application requires the preparation of an environmental assessment (EA) or environmental impact statement (EIS) as per various environmental acts including NEPA (i.e. National Environmental Policy Act). The Commission looks at route alternatives in
their decision-making process, and try to stay with routes that affect the smallest number of people.

**Summation by Gay Friedmann.** The pipeline industry is very safe from a risk standpoint when compared to other modes of transportation and/or activities and risks associated therewith that one encounters on a daily basis (e.g. swimming, climbing ladders, driving to/from work, flying, etc.)

While safety should be a major objective in the industry, it comes with a cost that must ultimately be borne by the customer. This requires understanding by the pipeline industry, the regulatory agencies and the public. Future cost expenditures of the pipeline industry related to safety should be determined using risk-based methodologies as an integral part of the decision-making process.
PANEL 4: CREATING EFFECTIVE PARTNERSHIPS FOR REDUCING PIPELINE RISK

Moderator: Joseph Martinelli
Chevron Pipe Line Company

Panelists: John Mason
Mayor - City of Fairfax, Virginia

Mary McDaniel
Texas Railroad Commission

Stuart Schwartz
Potomac River Commission

Herbert Tate
New Jersey Board of Regulatory Commissions

Jim Von Hermann
CYCLA Corporation

Speakers: Michael Neuhard
Battalion Fire Chief, Fairfax County, Virginia

Rachael Chiaramida
Resident Edison, New Jersey - near incident location
Summary and Issues

The major issues discussed by panel four are summarized as:

- Effective partnerships are required to reduce risks associated with transportation pipelines.

- Effective partnerships require collaboration at many levels among industry and regulators, regulators from different agencies, and industry, regulators and the public.

- Professionals should speak in English not industry jargon when communicating with the public.

- The role of local public officials must be defined throughout the process.

- The confidence of the public in the safety of the transportation industry has been shaken by recent accidents and will require significant effort to restore.

- Political realities may outweigh the interests of maintaining the economic vitality of the industry.

- Risk management by the industry is a good business practice.

- The industry will have to invest in risk reduction of the rare catastrophic event.
Condensed Presentation of Panel Discussions

The session was led off by presentations from two individuals who had experienced pipeline incidents/accidents in their communities.

Michael Neuhard. The first of the two talks was given by Michael Neuhard, a fire battalion chief from Fairfax County, Virginia. He related that there are four transmission pipelines in Fairfax County, two hazardous liquid and two natural gas. He then described three hazardous liquid pipeline releases that have occurred in the past fourteen years. The first accident involved the release of 336,000 gallons of aviation-grade kerosene to the Occoquan Watershed; the second involved the spill of 16,000 gallons of premium-grade gasoline into a townhouse community under construction; and the third accident caused the release of 408,000 gallons of #2 fuel oil into the Sugarland Run and the Potomac River.

Mr. Neuhard indicated that Fairfax County's technical assessment revealed major regulatory deficiencies for hazardous liquids transport. These include:

- Required pipewall thickness is the smallest of the major national pipe codes.
- Pipeline design does not consider the population density or environmentally sensitive areas along the pipeline route.
- Pipeline design does not consider pressure induced cycle fatigue.
- There is currently no requirement for periodic inspection of pipeline condition.

He outlined nine areas where Fairfax County felt that action should be taken to improve safety in pipeline operations. These recommendations are based on experiences within this county:
• There should be increased oversight of pipeline systems by all levels of government.

• Critical evaluation of physical and operational conditions of pipelines should be conducted.

• Regulatory codes should be changed to include mandated internal inspections, the application of class criteria based on population density and sensitive environmental areas should be applied to design and operation, implementation of isolating valve requirements and consideration of fatigue in design and operation.

• The regulatory structure needs increased resources for failure response and routine inspection.

• More comprehensive accident analysis should be implemented.

• Industry and government should increase their planning for response to an accidental release.

• State and local codes should be strengthened in the areas of land use and dig laws.

• Public participation in the Office of Pipeline Safety, Risk Assessment Program should be encouraged.

• Those involved in pipeline safety should move from an attitude of response to prevention.

Rachael Chiaramida. The second talk was presented by a resident living in proximity to the recent accident in Edison, NJ. She eloquently presented the view of the public that were involved in the Edison accident. Her residence and point of observation of the accident is approximately
five miles from the point of the accident. Her comments, which represent a challenge to the industry to restore public confidence, include:

- How could anyone allow a pipeline so close to residential homes?
- The roaring never stopped [that night]. We never heard the sirens from the emergency vehicles going by because the noise was so loud.
- We know we are not safe. We do not have faith that anyone can make us safe.
- The quality assurance procedures used by the gas company is not acceptable.
- Pipelines and houses should be separated by greater distances.

**Joseph Martinelli.** Joseph Martinelli, the session moderator, in response to the first two presentations stated that pipeline transmission is a risk business and total elimination of risk is not feasible. Better management of risk is desirable. He further stated that better cooperation and collaboration is needed to reduce risk in the pipeline industry. He also pointed out that while protecting the public and the environment the economic viability of an important industry, must also be protected.

He set a task for panelists to answer two questions:

- What process do you suggest to determine which risks are most important to the transportation pipeline industry?
- What process do you suggest to allow all interested parties to set mutual priorities for risk reduction?
John Mason. Panel member, John Mason, Mayor of the City of Fairfax, VA, gave the perspective of the local official at the end of a pipeline. He began by taking a quick poll of all attendees and panelists. Of the approximate 200 participants in the Summit, approximately fifteen were regulators, approximately ten were consultants, three were elected officials and the remainder were from industry.

Mayor Mason described the confusion and complexity related to who has responsibility at an accident. Normally, the local official is responsible for fire protection and the state for environmental concerns. This, however, changes when an interstate pipeline is present and the federal government takes responsibility. He noted that a tank farm in his community had four different operators and that one facility was different than the others because it was subject to different regulations.

He indicated that risk is in the eye of the beholder for the elected official and it cannot be viewed simply as a mathematical computation. To a local homeowner being asked to leave his/her home after an accident, risk is not a calculation that is easily explained nor the reason why the elected official allowed that risk to be taken. To the homeowner no risk is acceptable.

He presented the view that communication with local officials must be improved. They are currently out of the dialogue on pipelines and this must be changed since the elected official is the communication link with the local people. He also made the recommendation that the industry not use insider jargon when communicating with the public. The additional problem for the public of confusion on regulatory responsibility in design and response should be clarified for local officials and the public in general.

Mayor Mason closed by noting that the word partnership was used many times in the Summit. From his perspective of a partnership, he wanted to know what each partner would be asked to pay.
**Jim Von Hermann.** Jim Von Hermann of the CYCLA Corporation indicated that industry wide risk (average across the industry) is not the same as local risk for a specific pipeline. He urged that the industry and regulators differentiate between the two. What is appropriate for Pipeline A might not be appropriate for Pipeline B.

He complimented OPS for its Risk Prioritization Program because it is simple, open and effective.

He recommends that each operator be required to develop a Pipeline Specific Risk Management Program as is currently used in the chemical and nuclear industries. In this approach to risk management, each operator determines and discloses the risks in their system and the actions they will take to reduce them. This information is open to the public. The Program is then reviewed by the regulators who measure the operators actions against the national standards.

**Joseph Martinelli.** Joseph Martinelli followed up with the observation that it is a basic business strategy to manage safety, environmental and economic risks. He further stated that seeking an absolute solution in a dynamic world doesn't work since tomorrow the solution will be different. The approach to risk management should be a "continuous improvement solution".

**Herbert Tate.** Herbert Tate of the NJ Board of Regulatory Commissions stated that the people in New Jersey feel highly at risk since the Edison accident because of the high population density and the density of pipelines in the state. Mr. Tate stated that the cooperation and actions of the myriad number of parties at the Edison accident was exemplary.

He also observed that it will be difficult to restore the public confidence in the system and that political realities may well outweigh the economic
viability of the pipeline industry. He further recommend that local and state officials consider appropriate land use planning in siting new homes and businesses near existing interstate pipelines.

He suggested that the Edison accident represents an excellent case study for the pipeline industry.

Mary McDaniel. Mary McDaniel of the Texas Railroad Commission suggested that safety evaluations should be done both nationally and regionally thereby satisfying both minimum national standards as well as local interests. She recommended the formation of “risk assessment teams” with representation from the public, industry and regulators as a start toward forming partnerships. Regional representation on these teams would balance out local and national needs.

With regard to OPS established risk assessment issues, Ms. McDaniel suggests that regional public hearings be held to receive public comment. She indicated that state-federal partnerships be established and that the 50% federal funding of state programs be maintained.

Stuart Schwartz. Stuart Schwartz focused on the importance of protecting water resources in managing risk. He also divided risk management into three parts, the description of risk, the analysis of risk and then the management of risk. In studying risk he recommends that various actions be studied with respect to their ability to reduce risk.

He recommended that the nuclear industry might have good data on risk management that could be of assistance to similar efforts in the pipeline transportation industry.
He further recommended that the National Research Council convene a meeting of nationwide experts to define probabilistically, the level of risk for the various risk components in the pipeline industry.

Mr. Schwartz discussed the apparent lack of positive cost benefit associated with the risk reduction of rare, catastrophic events. It was his perspective that the reduced exposure to catastrophic loss is important and has been found to be beneficial in the water and nuclear industries.

**Joseph Martinelli.** Joseph Martinelli then summarized the panel discussion.

To develop effective partnerships requires collaboration at many levels i.e. between agencies so that industry knows what the rules are, between industry and agencies and between agencies, industry and the public.

At the Edison accident, there was good collaboration between all parties to handle the situation.

The requirement that the professionals speak in English rather than industry jargon is an important one if we are to develop effective partnerships. We must do a more effective job communicating with all stakeholders on the safety of pipelines.
III. QUESTION AND ANSWER SUMMARY

Moderator: Judy Kaleta, RSPA

Panelists: All panelists from previous panels

A series of questions from the attendees at the conference were summarized by the OPS staff and then asked of the panelists. The questions and summary responses follow:

Question:

Professor Popper talked about LULU's (Locally unwanted Land Uses). "No new hazardous waste sites", he says What is the future for new pipeline construction?

Answer:

(F. Popper, G. Mazanec, J. Martinelli, B. Ellsworth) In recent years there has been a slowdown in the need for new pipelines. In the future as new pipelines seek approval, the siting agencies, because of the Edison explosion, will exercise a more stringent review. The approval process will be more time and cost intensive but in the end they will be built. The business decision to build a new pipeline will likewise be more complex.

Question:

Moving to the subject of one-call legislation, the basic premise has been that certain flow and gathering systems in the exploration and production industry are located in rural areas and production fields
Answer:

(K. Fournier, B. Ellsworth) One of the current complaints about existing one-call systems is that there are too many exemptions. It is not considered to be a good idea to exempt gathering areas.

Participants in the one call system are given immediate notice and may respond. Twenty-four hour service is provided for emergency provisions.

Question:

*Mayor Spadaro asked for an official role in pipeline safety issues and not just for an accommodation. Mayor Mason suggested that there are some hurdles in communication. Should there be a more defined role for local officials in pipeline safety?*

Answer:

(J. Makris, B. Ellsworth, J. Des Barres, J. Mason, G. Tenley) Local officials have a right to know but authority should not be delegated to the local area because it would cause chaos and bring the industry to a halt. Local officials can work in an advisory capacity to industry and the regulators since they have an important knowledge of local issues. If, however, the public gets the perception that the regulators and the regulated are in bed together, confidence in the system will be eroded.

Question:

*Assume a transmission line, currently not piggable operates at 30% SMYS [specified minimum yield stress] with proper cathodic protection levels and periodic patrol inspections. What form, if any, of integrity testing do you recommend?*
Answer:

(R. Elber) Assuming the line is in service for a long time with a history of problems and the pipeline is not piggable, use the following sequence of actions:

Conduct cathodic protection review to see if corrosion is occurring.

Dig a bell hole to determine the condition of the coating on the outside surface.

If the pipeline is degrading, perform a hydrostatic test. Operating at 30% of SMYS the pipe can tolerate defects without causing a problem.

Question:

Please comment on any technology developments in the area of protecting or upgrading aging cast iron or ductile iron pipeline, both used in distribution systems. Do you have any information, statistics and research, in these areas?

Answer:

(W. Burnett) The primary issue is pipe leakage at the joints since the pipe operates at low pressure. There is promising new technology on maintaining those pipes. One technology is internal lining which is being developed by the British and the Japanese. A second approach is splitting the cast iron pipe and pulling through a new plastic pipe of the same diameter.
Question:
People were concerned that we have talked about safety issues in terms of only deaths and injuries. What about damage to property and what about environmental harm? How do you calculate that in looking at the impacts on pipeline safety issues?

Answer:
(G. Mazanec, R. Eiber, J. von Herrmann, G. Tenley, J. Makris)
Pipeline accident-incident is a high consequence/low frequency event and therefore it is difficult to set standards. In this situation short term environmental damages are not as important as the loss of life or severe environmental loss such as the loss of a water supply facility.

It is important to the industry that a clear definition of environmentally sensitive areas be developed.

Question:
Recently, the EPA issued substantial fines to a number of pipeline companies for past spills in water. This was based on EPA's authority under the Clean Water Act as amended by the Oil Pollution Act of 1990. As OPS gets more focused on environmental issues as stated in OPS strategy, and with regulations under the Oil Pollution Act, should OPS have the enforcement authority for spills related to pipelines and relieve EPA of that jurisdiction responsibility?

Answer:
(L. Clynch, J. Martinelli, J. Makris, J. Mason) It is an advantage to the industry if they are responsible to only one agency instead of two. More agencies tend to lead to more confusion.
Question:
If properly maintained to NACE (National Association of Corrosion Engineers) standards, would the pipeline still have a finite life?

Answer:
(N. Thompson) The National Association of Corrosion Engineers (NACE) has standards and criteria for maintaining pipes. Under normal operating circumstances utilizing NACE criteria, it is unrealistic to expect that all corrosion is mitigated. Eventually, significant reconditioning is needed.

Question:
NTSB evidently doesn't think the industry safety efforts are sufficient. Mr. Hall referred to inadequate safety issues. Mr. Gordon, on the other hand, evaluates the industry for investment and in the process, evaluates the safety programs of the industry, finding them adequate. Who is right?

Answer:
(B. Ellsworth, N. Thompson) There is no right or wrong since incidents do happen. Although industry does a good job, it must continue to be improved.

Question:
To the extent that industry has unrecoverable prevention costs, how should the industry approach these costs?

Answer:
(J. Des Barres, B. Ellsworth, G. TENley, J. Mazanec, L. Clynch) Safety must precede costs because the system must be safe. The bill must be paid, however, for the industry to be maintained, the cost should be passed on to the consumer. Industry does not perceive that there is a problem in non recoverable costs.
Question:

Regarding the chart from Battelle which reported 8,500 truck-related fatalities per year and the chart on the Panhandle Eastern graph which talked about 993 marine, 1,013 aviation and 691 railroad fatalities. Were all these trucks and shipments transporting oil and gas? If so, what is the relationship and what do you want to leave this crowd with in terms of those transportation statistics?

Answer:

(B. Ellsworth, G. Mazanec, G. Tenley) Data came from the 1993 NTSB publications. These represent the total fatalities from all truck transport. A better knowledge base is required to do better comparisons.

Question:

In terms of GRI data, GRI indicated in its presentation that it has a database. What data does it keep that the federal government doesn't keep, and what kind of partnership do we need to enter into so that we are data sharing?

Answer:

(W. Burnett, B. Ellsworth, R. Eiber, G. Tenley, J. Martinelli, K. Fournier) Currently, GRI only maintains U.S.D.O.T. data which is not different than the data presented at the conference. GRI is in the process of establishing new protocols jointly with the Interstate Natural Gas Association to see if they can get better information on the cause of accidents. GRI should work closely with OPS. It is important to consolidate all available data. The current data base is weak. All data should come to one place. An advisory board should be developed to study the data for accuracy and effectiveness.
Question:

In the area of cost management and cost effectiveness, the basic premise is that it is more cost effective and practical that each company that owns and operates transmission pipes supply an adequate emergency gas response plan which can include automatic shut-off valves, if necessary, rather than have general across-the-board regulation. Similarly, the question is posed...to what extent might an industry-wide, fully implemented quality management system be appropriate, as opposed to solution-specific oversight, to improve pipeline safety?

Answer:

(J. Martinelli, J. Makris) Total Quality Management (TQM) is a philosophy that can deal with the issue. There is value in considering a performance-based perspective rather than a prescription-based perspective. Both a performance-based approach and TQM should be used giving a holistic approach.

Question:

Our final question will deal with the issue of partnership. We heard it at the beginning of today's Summit, and now I'd like to close at least this portion of questions from the audience with a question that each of the panelists responds to. That is, I'd like you to complete the question: Creating effective partnerships is necessary because or is necessary to...?

Answer:

(All Panelists)

- It is the only way to improve safety.

- Pipelines are part of our lifestyle. Industry is subject to the concerns of the public. It is a joint situation, not a matter of choice.
• Adversarial approaches are not effective. Develop a win/win situation using partnerships.

• We should all work to a common goal.

• Partnerships are critical to effective communication that should take place at the executive level in talking to local officials.

• Competition requires that we maximize the use of our dollars. We need partnerships to effectively do this.

• It will assure that all parties understand the problems, the solutions and can have confidence that the correct solution is implemented.

• It is needed so that all points of view are both heard and considered. We can achieve knowledge through best practices.

• No single person can get the job done alone.

Question:
What one fact can people in pipeline safety take back to help allay public concerns about pipeline safety in this country.

Answer:
• People are talking and trying to improve safety.

• The first step forward has been taken by this conference.

• Continuous improvement is the safety goal.

• We are learning more every day on how to minimize the risk.

• We have a safe system that will have to get safer still.
• We live in a complex society with interdependence among all.

• A consensus is needed on safety of operations.

The floor was then opened for any attendee at the conference to come forward and make a statement or ask a question.

Dr. Sotirios J. Vahaviolos
President and Chief Executive Officer Physical Acoustics Corp.
Past President American Society for Non-Destructive Testing.

• The problem of corrosion will never go away, it is part of aging.

• Real people and real dollars are needed to solve the problems with pipelines.

• The industry must be willing to assign money for research.

• The users must be willing to pay more and the government must act as a catalyst to see that the research is done.

• He does not agree with the effectiveness of hydrotesting.

• If more research is not done and the problem not solved, then the accident at Edison will be small compared to what will occur.

• Acoustic testing is his recommended method for pipe review.
Albert J. Lamkie  
Chief Edison Division of Fire, Edison, NJ.

- He expressed concerns about the shutoff valves. He doesn’t understand why the industry doesn’t like automatic shutoff valves.

- He stated that it took 2.5 hours to close the upstream valve at the Edison release. He felt that there should be better valves in place and a response time of 2.5 hours is unacceptable to a fire chief. He indicated that there was difficulty closing the valve in the Edison incident.

- He questioned why procedures do not dictate going to the next upstream valve which, when finally used, was closed in five minutes.

- While he was told that it couldn’t happen again, an incident occurred five weeks later where a high voltage pole fell over a pipeline. The high voltage wire dug a hole 2.5 feet deep where the pipe was 4.5 feet deep. He is aware of cases where fallen high voltage lines have dug holes 10 feet deep. He stated that if this pipe had been ignited, it would have been worse than the Edison incident.

- A response was presented that often several utilities are sited in one corridor because it is so difficult to develop utility corridors.

Rick Patterson, Consultant.

- He related that he has had similar experience in California with regard to pipeline safety.

- Total systems approach should be used including management oversight risk-free followed by the HAZOP approach.
• He recommends high-tech from the aerospace industry. Impact sensors should be placed on the line for immediate information on unauthorized excavation at pipelines. He also suggested tagging all backhoes and following them by satellite.
IV. SUMMARY AND CLOSING

SUMMARY

George W. Tenley, Jr.

I am very impressed by the range of talent and the perspective that have been brought to this deliberation. I think knowledge is really the key. Secretary Peña accepts the view that through sessions like the one created at this Summit, we will increase knowledge in two areas: one, we will have a better knowledge of infrastructure; and two, that people who have to make critical decisions about pipeline safety will be better informed. I have been involved with pipeline safety for about twelve years, and this single event, perhaps only symbolically, but, I think, more than symbolically, has raised the knowledge level about pipelines. That is our charge as we go on from here.
CLOSING

Ana Sol Guttiérez

As a result of this Summit, there are so many suggestions that will become part of the record. Our moderators did a wonderful job of summarizing the main ideas. What I would like to do is express to you my enormous feeling of thanks. The conference has exceeded my expectations for what we would be able to accomplish. We have heard the voices of every stakeholder and every sector for this issue speak loud and clear to us. I fully appreciate your participating and being so supportive of the issue. The record remains open so that anyone who did not get a chance to express their view today are more than welcome to contact U.S.D.O.T..

I hope this is not the last of this type of encounter. I believe fully in the need to hear from my customers, and you are my customers. I would like to thank you whole-heartedly for being here today, for a very successful encounter. The proceedings will be available, and we hope the dialogue will continue.
V. COMMON ISSUES AND PROPOSED SOLUTIONS

Outlined below are a list of issues that were raised by speakers in more than one panel discussion at the Summit. The specific issue and suggested solutions and/or directions proposed by panelists and the audience during the public portion of the Summit are provided herein.

Although no specified directives were recommended for consideration by the OPS, the issues and solutions/directions below may be useful for the OPS to consider in their future deliberations with the pipeline industry representatives and related interested parties (e.g. G.R.I., public officials, etc.)

<table>
<thead>
<tr>
<th>ISSUE</th>
<th>SOLUTION AND/OR DIRECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The need for partnerships between pipeline operators, regulators and the public (i.e. local officials, potentially impacted residents)</td>
<td>a. Education program with interfacing between the operators and the public.</td>
</tr>
<tr>
<td></td>
<td>b. Establish joint advisory committees.</td>
</tr>
<tr>
<td></td>
<td>c. Develop an emergency response program for all communities.</td>
</tr>
<tr>
<td></td>
<td>d. Develop third party patrol capability by the public.</td>
</tr>
<tr>
<td></td>
<td>e. Develop direct linkages between the public, FERC and the OPS from conception to operation of pipelines.</td>
</tr>
</tbody>
</table>
ISSUE

2. Minimization of Third Party Damage with An Enhanced One Call System

SOLUTION AND/OR DIRECTIONS

a. Develop a national one call system with enforcement capability

b. Enlist and educate the public, municipal officials and pertinent observers (i.e. police, emergency crews, area meter readers) to actively observe questionable activities and utilize the one call system.

c. Develop and/or utilize high tech to identify potential pipeline problems, (e.g. ground sensors).

3. Improved monitoring techniques to reduce potential pipe failures.

a. Enhanced use of ultrasonics as a pigging device.

b. Increased frequency of monitoring techniques presently employed (i.e. cathodic protection checks).

c. Increased airborne surveillance techniques.

d. Increase pigging capability in the system as well as sensitivity in the utilization of present pigging techniques.

e. Development of predictive models to anticipate possible failures.

f. Utilize leak detection sensors to prevent breaks.
4. Need for a centralized comprehensive database related to accidents and incidents in the pipeline industry.

   SOLUTION AND/OR DIRECTIONS

   a. OPS should serve as the centralized repository of data.
   b. The Nuclear Industry should be reviewed for their database management approaches to incidents and accidents.
   c. Detailed mapping and periodic updating of all transmission lines and their environs should be performed.
   d. Development of predictive models to anticipate possible failures.

5. The pipeline transport industry is safer than other means of transport (e.g. truck, rail) of natural gas or hazardous liquids.

   SOLUTION AND/OR DIRECTIONS

   a. Need a centralized database (see above) to be able to confirm claims reliably through risk analysis.
   b. Need approaches to convince the public of subject claim.
   c. Approaches to be developed to assess enhanced safety versus added cost trade-offs that can be understood by the user public.
   d. Utilize a consistent set of criteria for investigating and documenting accidents.
   e. Development of predictive models to anticipate possible failures.
<table>
<thead>
<tr>
<th>ISSUE</th>
<th>SOLUTION AND/OR DIRECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Maintaining or restoring public confidence in light of periodic catastrophic pipeline failures.</td>
<td>a. Develop public understanding (if not acceptance) that it is impossible for the pipeline industry (or any industry) to be completely fail-safe.</td>
</tr>
<tr>
<td></td>
<td>b. Emphasize utilization of state-of-the-art cost effective measures (e.g. reduction of operating pressure, use of automatic control shut-off valves, reduced spacing between shut-off valves, reasonable separation distance in populated and environmentally sensitive areas, other expert systems) to mitigate the severity associated with a pipeline failure.</td>
</tr>
<tr>
<td></td>
<td>c. Minimize frequency of occurrence of pipeline failures through improved technologies (see issue #8)</td>
</tr>
<tr>
<td></td>
<td>d. Develop comprehensive emergency response plan.</td>
</tr>
<tr>
<td></td>
<td>e. Review protocols for emergency shutdown to improve response time.</td>
</tr>
</tbody>
</table>
ISSUE


SOLUTION AND/OR DIRECTIONS

a. Promoters of new or modified pipeline regulations should be cognizant of the economic impact of changing regulations.

b. Mechanisms should be maintained to allow for cost recovery for safety measures through user fees.

c. Continued research and development to enhance safety at reduced cost.

d. Adopt cost-effective safety programs developed by other industries (e.g., nuclear power) and in other countries.
<table>
<thead>
<tr>
<th>ISSUE</th>
<th>SOLUTION AND/OR DIRECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Need for new and improved technologies.</td>
<td>a. Evaluation of the adequacy of the Present Class Location system in the gas pipeline safety regulations, particularly in high-risk areas.</td>
</tr>
<tr>
<td></td>
<td>b. Identify criteria or factors that should be considered in siting hazardous liquid pipeline in high risk areas.</td>
</tr>
<tr>
<td></td>
<td>c. Identify sections in both the gas pipeline and hazardous liquid pipeline safety regulations that could be revised to reduce the risk of pipeline failures.</td>
</tr>
<tr>
<td></td>
<td>d. Identify factors for establishing a new pipeline right-of-way (or safe separation distance) in high risk areas.</td>
</tr>
<tr>
<td></td>
<td>e. Develop predictive models or guidelines on the siting of pipelines using land use indicators.</td>
</tr>
<tr>
<td></td>
<td>f. Development of a full information base on all transmission lines in the United States.</td>
</tr>
<tr>
<td></td>
<td>g. Development of new technologies in maintenance.</td>
</tr>
<tr>
<td></td>
<td>h. Improvements in Smart Pigging/Pipeline Simulation Facility Development</td>
</tr>
<tr>
<td>ISSUE</td>
<td>SOLUTION AND/OR DIRECTIONS</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td>j. Development of an Advanced Smart Pig for Detecting Cracks (e.g. sensors)</td>
</tr>
<tr>
<td></td>
<td>k. Development of an Incident Reporting and Trending System.</td>
</tr>
<tr>
<td></td>
<td>l. Development of Maintenance Optimization Systems by estimating the frequency of major defects occurring as a function of the numerous factors involved (e.g. age, coatings, maintenance history, operating pressure, etc.)</td>
</tr>
<tr>
<td></td>
<td>m. Airborne Pipeline Integrity Monitoring (either fly over by aircraft, or by satellite).</td>
</tr>
<tr>
<td></td>
<td>o. Study effect of cyclic stress on pipeline fatigue.</td>
</tr>
<tr>
<td></td>
<td>p. See GRI pipeline Safety Research Program Document provided in the Appendix for other potential research areas.</td>
</tr>
</tbody>
</table>
APPENDIX A

Agenda
# AGENDA

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker/Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:30 A.M. - 9:00 A.M.</td>
<td>Registration</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>OPENING SESSION</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Welcome</td>
<td>George W. Tenley, Jr., RSPA Associate Administrator for Pipeline Safety</td>
</tr>
<tr>
<td>9:15 a.m.</td>
<td>Summit Focus</td>
<td>Ana Sol Gutiérrez, RSPA Acting Administrator</td>
</tr>
<tr>
<td>9:30 a.m.</td>
<td>Opening Remarks</td>
<td>Frank Lautenberg, United States Senator (NJ)</td>
</tr>
<tr>
<td>9:45 a.m.</td>
<td>Keynote Address</td>
<td>Federico Peña, Secretary of Transportation</td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td>Panel 1: Allaying Public Concern About Pipeline Safety</td>
<td>George Spadaro, Mayor, Township of Edison, NJ (Moderator)</td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td>BREAK</td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Panel 2: Using Existing and Evolving Technologies to Maximize Pipeline Safety</td>
<td>Jim Hall, Vice Chairman, National Transportation Safety Board (Moderator)</td>
</tr>
<tr>
<td>12:15 p.m.</td>
<td>LUNCH</td>
<td></td>
</tr>
<tr>
<td>1:15 p.m.</td>
<td>Panel 3: Calculating the Cost of Pipeline Safety</td>
<td>Gay Friedmann, Vice President Legislative Affairs, Interstate Natural Gas Association of America (INGAA)</td>
</tr>
<tr>
<td>2:15 p.m.</td>
<td>Panel 4: Creating Effective Partnerships for Reducing Pipeline Risks</td>
<td>Joseph Martinelli, President, Chevron Pipe Line Company (Moderator)</td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>BREAK</td>
<td></td>
</tr>
<tr>
<td>3:45 p.m.</td>
<td>Question and Answer Session</td>
<td></td>
</tr>
<tr>
<td>4:50 p.m.</td>
<td>Summary and Closing</td>
<td>Ana Sol Gutiérrez, George W. Tenley, Jr.</td>
</tr>
<tr>
<td>5:00 p.m.</td>
<td>ADJOURN</td>
<td></td>
</tr>
</tbody>
</table>
PANEL MODERATORS AND PANELISTS

Panel 1: Allaying Public Concerns About Pipeline Safety

Moderator: George Spadaro, Mayor, Township of Edison, NJ

Panelists:
- Kathleen Fournier, Executive Director, MISS DIG Utility Communication System
- Jim Makris, Director, Chemical Emergency Preparedness & Prevention Office, EPA
- George Mazanec, Vice Chairman, Panhandle Eastern Corporation
- Frank Popper, Professor, Urban Studies Department, Rutgers University

Panel 2: Using Existing and Evolving Technologies to Maximize Pipeline Safety

Moderator: Jim Hall, Vice Chairman, National Transportation Safety Board

Panelists:
- Bill Burnett, Senior Vice President, Technology Development, Gas Research Institute
- Larry Clynch, Regional Transportation Manager, Mid-Continent Region, Conoco, Inc.
- Robert Elber, Director, Transmission Pipeline Programs, Battelle Memorial Laboratory
- Nell Thompson, President, Cortest Columbus Technologies, Inc.

Panel 3: Calculating the Cost of Pipeline Safety

Moderator: Gay Friedmann, Vice President Legislative Affairs, Interstate Natural Gas Association of America (INGAA)

Panelists:
- John DesBarres, Chief Executive Officer, Transco Energy Company
- Bruce Ellsworth, Commissioner, New Hampshire Public Utilities Commission
- Richard Gordon, Managing Director, Merrill Lynch & Co.
- Elizabeth Molter, Chair, Federal Energy Regulatory Commission

Panel 4: Creating Effective Partnerships for Reducing Pipeline Risk

Moderator: Joseph Martinelli, President, Chevron Pipe Line Company

Panelists:
- John Mason, Mayor, City of Fairfax, VA
- Mary McDaniel, Manager, Pipeline Safety Transportation/Gas Utilities Division Railroad Commission of Texas
- Stuart Schwartz, Associate Director, Water Resources, Interstate Commission on Potomac River Basin
- Jim von Herrmann, Senior Partner, CYCLA Corporation
George Mazanec  
Vice Chairman, Panhandle Eastern Corporation

I am pleased to be here today as a representative of the natural gas industry and as a member of the general public to discuss a topic that we take very seriously at Panhandle and as an industry. The safety of our natural gas transportation systems is of paramount concern as we perform daily operations. We believe that public awareness and education about pipeline safety through correspondence and in public forums such as this can play a vital role in improving the already excellent safety record of the gas transportation network.

It is a common perception to view large companies such as those that operate interstate gas pipelines as "in it only for the money". However we don't make money by having pipelines that leak, rupture or explode. Our livelihood is directly tied to maintaining the integrity of the system. This industry has the responsibility to operate a safe and reliable pipeline network, and we take this responsibility very seriously. The public sector has a responsibility for safety, as well. We have seen it work in some cases, while in others it has not. There continues to be a lack of an effective system to minimize and/or prevent damage and accidents that result from outside forces.

Panhandle Eastern owns and operates one of the nation's largest natural gas transmission networks with four interstate and two intrastate natural gas pipelines as well as natural gas storage and processing facilities. It also has an interest in and is the operating partner of an interstate products pipeline. Together the Panhandle Eastern natural gas pipelines
cover more than 26,000 miles and made deliveries accounting for approximately 12% of U.S. natural gas consumption in 1993.

In 1993 the United States consumed over 20 trillion cubic feet of natural gas. This volume represents 25% of total energy consumed in this country, and is second to petroleum as a primary energy source. It is followed by coal, nuclear and hydroelectric power. To put it in perspective, 20 trillion cubic feet of natural gas is the energy equivalent of almost 10 million railcars of coal, or over 2,200 super tankers of oil, roughly the size of the Exxon Valdez (Note: 1.5 Million barrels or 63 million gallons per tanker). The transportation network for delivering this significant energy source carries supplies from wellheads to burner tips that are thousands of miles apart. However, the network is essentially invisible and goes largely unnoticed by the majority of people on a daily basis until the rare occasion when something does go wrong. This is a rare occasion, because the natural gas transportation system has earned the best safety record among all major transportation systems according to statistics provided by the National Transportation Safety Board and the U.S. Department of Transportation's Office of Pipeline Safety. These statistics measure incidents by numbers of fatalities, and as you can see on the chart (see B1-), fatalities related to pipelines accounted for a very small percentage of total transportation related deaths in 1992. (20 out of 42,000)

Of the fifteen gas pipeline related fatalities, four were attributable to transmission lines and three of those were a result of outside forces. The remaining eleven fatalities were attributable to distribution lines. However, this industry does not consider any loss of life as acceptable and it strives to maintain as safe a system as possible.
Pipeline operators go to great lengths to ensure the safety of their systems. New technologies are being developed and employed in construction and maintenance procedures. Where possible, the lines are inspected internally through the use of relatively new tools that electronically measure the pipe walls to detect for corrosion and other anomalies. Regular visual inspections are made by aerial and ground patrol to examine the rights-of-way, to detect leaks or identify construction activity that may threaten the integrity of the system. Periodic inspection of valves, meters, cathodic protection systems and other facilities are conducted to ensure proper operation. The frequency of these inspections varies according to the density of surrounding populations or the type of equipment or facility.

It is not currently possible to insure that accidents never occur, particularly where the operator has to protect the pipeline system from damage by the public. According to statistics compiled by the U.S. Department of Transportation, since 1970, roughly 50% of all gas pipeline incidents have been related to outside forces, such as mechanical excavation. Although that number has been reduced over more recent years, it is the one area that pipeline operators have the least ability to control.

In an effort to reduce incidents related to outside forces, pipeline operators like Panhandle Eastern both individually, and with groups such as the Interstate Natural Gas Association, American Gas Association and the Gas Research Institute, devote considerable resources to public education, damage prevention and emergency response programs. Panhandle Eastern's efforts include communications to property owners within a certain proximity to the pipelines. This can be in the form of hand delivered letters, pamphlets and calendars which contain facts and
information that are intended to heighten awareness about the properties of natural gas, how to recognize trouble spots, the need to watch for and report suspicious activities near the pipelines, and important phone numbers to call in the event a potential problem is identified. Many of these materials are printed in several languages. Newspaper advertisements are placed periodically with a "Communicate Before You Excavate" type of slogan. We also conduct periodic meetings in communities along our pipeline routes. The meetings educate contractors and local utilities to coordinate procedures for working near pipelines, local emergency response authorities about emergency planning, and residents and landowners about the location of existing lines and proposed routes.

In addition to the direct communications, we also have markers with phone numbers along the pipeline routes. These are used to inform individuals that there are pipelines in the vicinity and that they should call to have the line located and marked before they dig, or should report anything unusual around the pipeline easement...There are numerous accounts where Panhandle Eastern has been able to inspect for, and repair damage caused to the lines by outside forces prior to a serious incident occurring simply because we were notified of the potential problem by the third party. It is advised that notification should take place before any digging.

Panhandle Eastern continually reviews its policies and procedures to identify where improvements can be made that will help to increase public awareness as to line locations and hopefully further reduce the number of third party related pipeline incidents.
The operators of the nations pipelines are under considerable regulatory oversight in regards to operation, location and maintenance. Interstate pipelines are under the extensive regulatory jurisdiction of the Federal Energy Regulatory Commission, Department of Transportation, National Transportation Safety Board and the Environmental Protection Agency. These various regulatory bodies oversee all issues ranging from commerce to safe operation and to minimize the environmental impact of new and existing lines. They are responsible for reviewing pipeline plans and environmental impact statements prior to issuing site and construction permits. Each of these groups has requirements in place to ensure the safest possible routing, construction and operation of each line that is built. The proceedings conducted by these regulatory agencies are public and can be attended by, commented on or intervened in by any interested party, including Public Utility Commissions and local governments.

It is possible to enhance safety precautions through cooperative efforts that are more cost effective than mandating the use of expensive and unproven technology. The enactment of a mandatory "One Call" program, which the pipeline industry supports, and other anti-tamper legislation, without exemptions, would significantly reduce pipeline incidents beyond the pipeline operators direct control. By taking a greater role in the existing regulatory framework, local governments can participate to ensure a balance of the interests of local land owners and developers with the need to maintain safe and secure pipelines in clear, well marked rights-of-way and easements. We can broaden communications and information exchange with all groups affected by pipeline locations, and continue research and development activities to develop effective safety related technologies while paying attention to resulting costs and benefits.
Today more than ever it is becoming increasingly difficult to further develop the nation's transportation systems. Pipelines are no exception to this dilemma. Highways, electric utilities, airports and many others confront enormous challenges while trying to satisfy increasing public needs. As people become more mobile, new market locations develop and the demands for new infrastructure emerge. It is not easy or possible to install infrastructure in locations that are 100% conducive to all affected parties, but we must work together to balance the interests of the changing society while weighing whether benefits achieved are commensurate with the costs.

The statistics are indicative of an extremely safe system designed to transport the nation's second most highly depended upon energy resource. The most effective way to maintain and improve the existing record as the safest transportation system is to coordinate and expand the exchange of information with the real users of the system so that we all take an active role in securing our safety.
Frank Popper  
Professor, Urban Studies Department, Rutgers University

Pipelines as LULUs

The United States faces a large, distinct and fast-growing number of development projects that are regionally or nationally needed or wanted, but objectionable to many people who live near them. Examples of such pariah land uses are hazardous waste facilities, airports, power plants, prisons, highways, low-income housing and group homes.

The projects create a political tension: as a society we want them, but as individuals--and often as communities--we do not want them close by. The projects are Locally Unwanted Land Uses, or LULUs.

Pipelines clearly qualify as LULUs. They raise all the same issues other LULUs create--for instance, the issues of how to plan, site, regulate, operate, find, retrofit, remediate, insure and replace pipelines that we will discuss today.

I have studied LULUs as a class of land uses for more than a decade. We have learned to deal effectively with other LULUs many times before. We can learn to do it again with pipelines.

A transportation example: early in this century the nation's growing road and rail networks began to intersect with each other extensively. The nation wanted more cars, trucks and trains. But it did not want the ten thousand deaths a year that occurred at the exact point of intersection--the railroad crossing--almost every year in the first two decades of the century.
We have since learned to make the one-time LULU of the railroad crossing less fearsome. We planned the crossings' locations more carefully. We made the crossings more visible, especially from farther distances and at night. We retired dangerous old crossings whenever we could. People still die at crossings, mostly because they are driving or walking foolishly or under some influence. But we no longer have the mass carnage of 1908. The railroad crossing is not a LULU anymore.

The LULU of the pipeline poses more complicated, hidden dangers than the railroad crossing ever did, but our land-use and environmental skills have advanced too. We now have to focus them more tightly on the pipeline. Local and regional planning, particularly zoning, need to pay more attention to it, as do environmental, regulatory and emergency management agencies at all levels of government.

Thus public notification and participation procedures ought to be wider and more inclusive, even if at the cost of some delay. We need to combine more accurate, more historically detailed registries of the pipelines already in the ground with more exact information on what kinds of new development (including other pipelines) are headed toward them. Creating these cross-check combinations is an obvious task for county and state government, as is making them quickly available to developers, other government agencies and the public.

We also need stronger local, county and state citizen advisory committees on pipelines. We may on occasion need innovative types of more active citizen review boards with serious new powers—for instance, to audit performance, respond to violations, conduct inspections and help hire senior management. Developers and state government would probably have to pay for the relevant technical assistance here, including for
emergency management equipment and training to deal with possible problems at the pipeline, up to the level of major explosions. The federal government should prepare to undertake the research and demonstration projects underlying all these initiatives.

Most important, the entire pipeline community needs to face up to an eventuality that has already hit other LULUs: more land-use and environmental assertiveness often means fewer LULUs and less expansive operations for the surviving ones. Almost no large new free-standing hazardous waste facilities have opened anywhere in the United States since the late 1970s. Only a handful of cities have built major airports since the early 1960s. The United States can and should deal effectively with pipelines. In time it probably will. But it needs to become more aware of what that effectiveness entails.
APPENDIX B2

Panel 2
*Using Existing and Evolving Technologies to Maximize Pipeline Safety*

Presentation Papers
William Burnett  
Senior Vice President Technology Development, GRI

It is a pleasure to be here today to discuss one of my favorite topics - that of existing and emerging technology. In particular, we are here to discuss how we can maximize pipeline safety. Or, minimize the risk associated with the operation of the nation's pipeline transportation system. You will hear a lot today about the excellent safety record that this industry has already compiled. But, if it were already good enough, we wouldn't all be here today, would we?

The good news is: emerging technology has much to offer to further minimize risk. The bad news: we have to decide who pays for the technology and its implementation.

The Gas Research Institute, GRI, was formed in the late 1970s and has been conducting research and development (R&D) on pipeline safety since the mid-1980s. Our mission is to develop and deploy new technology in support of the gas industry -- producers, pipelines, and distributors -- and its customers. GRI represents a commitment by the industry to its own future. And, this commitment includes robust efforts directed toward environment and safety. While we fund R&D efforts ranging from lowering the cost of gas supplies through both existing and new uses of natural gas, I will be focused today on pipeline safety.

Pipeline safety R&D funded by GRI amounts to approximately $10 million per year. You will hear about several important aspects of this effort today and I have provided copies of a brief summary of current and planned projects.

To apply technology to risk minimization, we must first understand what risk is. We start with an important assumption: as designed, the pipeline system and its installation represents essentially no risk. If you accept
this premise, and we all know that the system as actually installed and operated does have risk, then where does the risk come from? It is the result of three elements -- risk causing "events," the probability that an event will cause a leak or failure, and the consequences of the failure.

Since these three elements -- events, probabilities, and consequences -- can all be addressed by technology, they are worth further elaboration. Some common events include construction defects, coating failures, corrosion, damage from outside forces, or natural disasters, such as floods or earthquakes. These are familiar since the DOT often characterizes failures in terms of these events.

Once an event has occurred, then we have risk. The level of the risk is determined by the probability that the event will lead to a failure multiplied by the consequences of the failure. So, if we want to minimize risk with technology, then we must devise approaches that:

- Reduce the number of events
- Reduce the probability of incidents
- Reduce the consequences of incidents

Before I address each of these strategic objectives, I will cover three areas of technology in general. First, the advance of technology has had the greatest impact on materials of construction and on our understanding of the effects of corrosion and aging. While much of this technology has impacted on the design of safer and safer systems in the first place (without which my initial premise would not be true), it has also been instrumental in understanding the events that may occur over time. Second, and probably the most important technology evolution that will impact on pipeline safety in the future, is the development of sensors. For our discussion today, think of sensors as exactly what the word means - the eyes, ears, and touch of the pipeline. Imagine a future in which we
are able to virtually see the condition of the piping system. As you all well
know, we have a long way to go to reach this ideal. The third area of
technology that will allow us to reach our common objective of risk
minimization is computers and telecommunications. We will need
sophisticated systems to communicate and analyze the data received by
our sensors.

Let's turn our attention to the first of our three strategic objectives --
reducing the number of events. We can accomplish this through
prevention policies and technologies. Of course, much of the discussion
regarding prevention will focus on policy for one-call systems. This is
appropriate because these systems address the most frequent cause of
pipeline damage. We have no other existing technology to deal with the
problem of third party excavators, however, the future holds much
promise. GRI is now evaluating several emerging technologies that hold
the potential to provide real-time notification of third-party damage. It will
come as no surprise to you that this problem in not confined to the US.
GRI has active contacts with the international gas industry and we are
collaborating with the Japanese gas industry on two technologies that can
detect contact with the pipeline. Perhaps even further away is the
possibility of satellite surveillance of our pipeline system.

Excavation damage is only one of the many "events" that can lead to risk.
Technology already is in place that helps to reduce the events cause by
corrosion. Cathodic protection systems, coatings, and biocides that
mitigate against biocorrosion are already standard practice.

The combination of existing prevention policies and technologies -- one-
call and corrosion protection represent the first line of defense of our
industry. Future technologies will strengthen this line of defense. Before I
leave this topic, I need to add my voice to those of others who are calling
for better information on the "events" leading to pipeline incidents. The
gas industry, GRI and INGAA, have embarked on an Incident Reporting
and Tracking System to help supplement the DOT efforts in this regard.
Our next strategic objective is to reduce the probability of an incident occurring once an event has happened. I call this our second line of defense. It is anchored in the concepts of inspection and repair, where technology is already playing an important role and the future is also promising. You have probably all heard the terms "pigging" and "in-line-inspection." These terms describe the technology of examining the condition of the pipeline from the inside. It is an effective means of detection assuming we can travel through the piping system and we can find the "events" of corrosion, cracks, gouges, or other defects. Today's technology is based on the use of a single "sensor," termed magnetic flux leakage, or MFL. MFL pigs travel through limited segments of the piping system. They can detect metal losses, usually a result of corrosion. Based on some limited data, they are able to accurately detect no more than 60 percent of pipe defects. They cannot detect longitudinal cracks. They cannot detect stress corrosion cracking. They cannot detect small defects. And, they cannot reliably detect gouges and dents caused by excavation damage. They should, of course, be used where possible because 60 percent identification is remarkably better than no knowledge at all. Here's where the emerging sensor technology of the future can have the biggest impact. Ultrasonic sensor technology is proven and can detect both smaller defects and cracks. However, existing sensors require a liquid to provide contact between the sensor and the material being inspected. This is easier in liquid pipelines, and gas pipelines commonly use ultrasonic sensors to inspect new welds during construction. We are actively researching ultrasonic sensors that can function in the "dry" environment of a natural gas pipeline, as well as advanced sensor technologies. Today's "smart" pigs rely on MFL, tomorrow's "smarter" pigs will use these new sensors.

We can also learn much about the pipeline condition from the outside. Already, we conduct periodic aerial and walking surveys of our pipeline system. Vegetation damage, cathodic protection conditions, and other features can now be detected. GRI is working with several of our pipeline member companies to evaluate an airborne pipeline integrity monitoring
system that uses advanced sensors to detect pipeline location and condition from a helicopter.

The most difficult internal inspection challenge is the hundreds of thousands of miles of the piping system that cannot be "pigged" because of design constraints, such as intrusive valves, sharp turns, or varying pipe diameter. We need to collectively consider the feasibility of developing a tool to travel through such systems. This will be a major R&D effort requiring cooperative efforts and funding with government and industry.

Our third area of interest is in minimizing the consequences of an incident. We still have one defense, but it is not technological. It is policies that control land use and encroachment, and design practices that allow rapid action. Beyond this point, our defense has let us down, and we must go on the offensive. We must have emergency response plans and methods to shut down the affected parts of the system. Once again, sensors are the key. The faster we can detect a true line break, the faster we can shut it down. Here, I think, we need to develop computerized "expert systems" that can discern a line break from normal upstream or downstream occurrences. GRI is planning to evaluate the effectiveness of developing smart valves or smart central control systems that offer this potential.

Sounds good, doesn't it? We technologists are always enamored with advanced concepts -- satellites, Cray super computers, robots traveling through the pipes. But, who's going to pay? When we bring economics into the picture, we can introduce the concept of risk management. I like to think of risk management as the result of combining the concept of risk minimization with economic reality. When we manage risk, we force ourselves to prioritize the needs. We want to spend our limited resources on the events that result in the highest level of risk, that is, the highest probability times consequences. Let's not spend a lot of money to prevent all incidents when the probability is already low, or the consequences are limited. After all, the consequences of poor management are potentially
more damaging than the risk of an incident. If we make natural gas uneconomic as a result of our actions, who will benefit then?

R&D can help us with risk management as well as with the physical aspects of the piping system. Here come those computer models and "expert systems" again. We are well along with the development of the Pipeline Inspection and Maintenance Optimization System, design to focus attention on the highest risk segments of a pipeline. We can go much further in integrated analysis of all the factors and information elements available to pipeline operators. These advances can make sure we invest our dollars where we can have the biggest impact. After all, let's remember who's paying!

Let me close with a few words on what we must collectively do if we are to reduce events, probabilities, and consequences. First, we must put in place the research facilities needed to pursue the technologies I have briefly described. Most important on the industry's list is the Pipeline Simulation Facility. The industry has worked hard to raise the funds for this $10 million facility -- within our own industry. Those of you from Washington should note that very large benefits can be had from such "small science" research facilities. The price is a drop in the bucket compared to the projects fully funded by the federal government to develop technologies that compete with natural gas. Second, we must continue to reinforce the cooperative nature of the efforts I have described. We must jointly fund the R&D efforts that hold the promise of significant risk reduction in the future. GRI has enjoyed an excellent working relationship with the Department of Transportation, both the NTSB and RSPA. The pipeline industry has aggressively supported our efforts and intends to continue to do so. I can say from first hand knowledge that this industry does not "bury its head in the sand" when it comes to complex issues of safety or environment.
In closing, let me once again say that I am pleased to be here. GRI stands ready to move ahead on behalf of our member companies and the public. Thank you.
My comments are about pipelines; however, my experience is limited to liquid operations. Several of the issues are common to both gas and liquid pipelines, but there are salient differences between gas and liquid systems, and my comments about technical issues should be taken in a liquid context.

The pipeline industry is the safest form of transportation available in the world today. Pipeline industry accounts for over half of the ton mile freight moved daily in the United States. The liquid pipeline industry has amassed an impressive safety record and is, on an average, 18 times safer than its next competitor. The American Petroleum Institute conducts annual safety contests among its membership, focusing primarily on accidents that result in personal injury. In the most recent contest, over 20 pipeline companies qualified with zero accident records. Is safety a coincidence? No! Safe operation is of great economic benefit to the industry, and the continuing improvement in the industry safety record is to no one's benefit if an individual, the public, or the environment is harmed. It is much to our benefit that the "quiet steel" remains unnoticed and continues to transport crude, refined products, and natural gas in the safest, most efficient method known to man.

In the early history of the pipeline industry, interest groups were formed to produce voluntary performance standards. Groups such as the American Petroleum Institute and the American Society of Mechanical Engineers were designing and writing safe operating procedures years prior to the implementation of the United States Department of Transportation Pipeline Safety Regulations. In fact, the first draft of the Department of Transportation Standards was largely drawn from the voluntary standards. The Department of Transportation and the industry groups work
continuously to improve the safety performance of the pipeline industry. This cooperation between government and voluntary standards setting groups results in a system that is copied throughout the world. United States Standards are used throughout the world for design, construction, operation, and maintenance of pipeline systems. If our standards are not adopted directly, they are a base document for other national standards. The United States is currently involved in a major effort with the International Standards Organization. We are writing a standard for the design, construction, operation, and maintenance of pipeline systems for worldwide application which will result in safe systems. This is, again, voluntary. The base documents for many parts of this international standards are API and ASME codes. Our voluntary organizations are agents for change which will result in technical improvements and safer systems. The industry's continued interest in a safer, environmentally sound transportation system is manifested in our continuing contribution and participation in industry and governmental regulatory activities, the most recent of which is the change to a metric society. The ASME will publish its first metricized code in 1995, and the other codes will follow until full conversion in 1998.

The industry has a continuing research effort centered on items that will lead to the improvement in performance of the pipeline transportation industry. The GRI is an outstanding example of research being done for pipeline safety improvements. The GRI facilitates cooperation between the gas and liquids industries in areas of common interest. Both the gas and liquids industries sponsor ongoing research in areas of corrosion, measurement, leak detection, and technical improvements for the pipeline business.

The United States Pipeline Industry is the most highly monitored pipeline industry in the world. Almost all mainline pipeline systems within the United States are monitored via SCADA Systems 24 hours a day, 7 days a week, 365 days a year. These systems have the ability to monitor the operations of pipeline systems as they deliver their products throughout
the United States. They meter in and meter out all of their products and, by such a method, are able to do a mass or net volume balance to maintain system integrity. Research is continuing with manufacturers to develop a more accurate leak detection system. It is to the pipeline industry's benefit to produce and install such a system. The most recent improvement is that the American Petroleum Institute is currently publishing a new document, Recommended Practice #1130 for Computational Pipeline Monitoring. This document will provide a guideline for common evaluation of systems. The most recent example of industry/government cooperation for safer systems is the installation of flow restricting devices in gas transmission systems.

The integrity of the United States pipeline system is our greatest concern. The systems are built with the best materials and most current technology that we possess. Once a system is installed, its initial integrity is verified via hydrostatic test. All systems are under continuous cathodic protection to minimize or eliminate any deleterious effects. Our greatest challenge was third-party damage. Organizations created in the last few years known as one call systems have significantly affected the number of incidents related to third-party damage, but we have not gone far enough. The industry supports one call systems and further supports strenuous legislation that demands participation by underground utilities and excavators. We further insist that excavation done without benefit of one call systems should receive maximum penalties for damage done to underground systems. There should be no exemptions on either the underground utilities' side nor the excavator's side, and this must include all forms of government. The most recent tool in use for improving the integrity of the pipeline system is the instrumented pig, commonly called the "smart pig." The smart pig is a device that uses electromagnetic flux or ultrasonics to detect anomalies on or near the pipe wall. This is an extremely useful tool and should be utilized at the discretion of the operator to verify the integrity of the system. These tools are subject to error but the new generation of smart pigs is significantly better than earlier models. The industry supports that new systems should be
constructed to allow for the passage of smart pigs and that the Department should have at their disposal the means to request a system be interrogated using this tool. It should be noted that the smart pig, like any other tool, is not the solution to all problems. It will not detect failures in the weld seam nor in the girth weld, and it will reflect a pop can or welding rod end buried near the pipe just as if it were a defect in the pipe wall.
Causes of Pipeline Incidents, Effect of the Aging Infrastructure On Incidents, and Areas of Technology Development

Three factors are addressed in this paper: (1) the causes of incidents on pipelines in the U.S., (2) the effect of an aging pipeline infrastructure on potential incidents in pipelines, and (3) the improvements that existing and new technologies offer to offset the effect of the aging infrastructure. To set the stage for what follows, I believe it would be appropriate to make a few comments with regard to Battelle's involvement and my involvement in the area of integrity of pipelines.

Battelle has a history that goes back to the late 1940's when hydrostatic tests were first conducted on pipelines. Since that time, Battelle has been involved with research on pipelines to determine toughness requirements to control fracture initiation and arrest, determine allowable areas of corrosion on pipelines, develop guidelines for lowering pipelines, identify line-pipe steel improvement, improve and develop in-line inspection tool capabilities, develop an understanding of the mechanisms of failure and develop repair methods for defects. This research has been performed for the Pipeline Research Committee of the American Gas Association, the Gas Research Institute (GRI), the U. S. Department of Transportation's Office of Pipeline Safety, and various individual gas and liquid pipeline companies. In addition to the research conducted on pipelines, over 400 failure investigations have been conducted. These investigations have been conducted for the Pipeline Research Committee, GRI, individual gas transmission and liquid pipeline companies, and the National Transportation Safety Board (NTSB).
Caused of Incidents on Pipelines

Data on pipeline incidents are collected by a number of countries or organizations throughout the world. Data on gas and liquid pipelines have been assembled into Table 1. This table summarizes U.S. gas pipeline incident data, which is known as 30-day incident data by the U.S. Department of Transportation’s (DOT) Office of Pipeline Safety, for the time periods shown. It should be noted that there are differences in reporting requirements for the different countries involved. These differences are summarized in Appendix B2-A.

There are also differences in the total mileage of pipelines in each of the various countries. There are significant differences in terms of the incidents per 1000 mile/years. For example, Canada experiences almost 3 incidents per 1000 mile/years on gas pipelines, and the U.S. experiences only approximately 0.3 incidents per 1000 mile/years, which is less by an order of magnitude. This difference is related to the reporting requirements for each of the data sets. Probably the most consistent way to evaluate the data is on the basis of the distribution between causes on a percentage basis as shown by the number in parentheses in Table 1.¹

Figure 1 presents the percentage data from Table 1. Here, outside force and third party damage are listed as OF/TP; corrosion is listed as CORR; material and construction defects as MTL/CONSTR; and operating accidents as OPERAT. Figure 1 indicates that 40 percent of the U.S. gas pipeline incidents are due to outside force or third-party damage, 21 percent are due to corrosion, approximately 16 percent are due to material construction defects, and approximately 23 percent are due to operational causes. For U.S. oil pipelines, only 18 percent of the incidents are due to outside force or third-party damage, with 20 percent

Table 1. Incident data on gas and liquid pipelines.

<table>
<thead>
<tr>
<th>Cause</th>
<th>U.S. DOT Gas Pipeline Incident Data July '84-'90; Mileage = 315,000</th>
<th>U.S. DOT Liquid Pipeline Incident Data '92; Mileage = 169,514</th>
<th>Canadian Gas Incident Data 84-93, Mileage = 14156</th>
<th>European Gas Pipeline Data, 970,000 km-yrs of operation, published '88</th>
<th>European Liquid Pipeline Data; Mileage = 11,563, Period '79-'83</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Incidents</td>
<td>Incidents per 1000 mi-yr (percentages)</td>
<td>No. Incidents</td>
<td>Incidents per 1000 mi-yr (percentages)</td>
<td>No. Incidents</td>
</tr>
<tr>
<td>Constr/MLT Defect</td>
<td>84</td>
<td>0.041 (15.6)</td>
<td>36</td>
<td>0.212 (16.1)</td>
<td>142</td>
</tr>
<tr>
<td>Operation al Error</td>
<td>123</td>
<td>0.060 (22.9)</td>
<td>101</td>
<td>0.596 (45.3)</td>
<td>172</td>
</tr>
<tr>
<td>Corrosion -ext.</td>
<td>115</td>
<td>0.056 (21.5)</td>
<td>45</td>
<td>0.265 (20.2)</td>
<td>48</td>
</tr>
<tr>
<td>Corrosion -int.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside Force</td>
<td>214</td>
<td>0.105 (39.9)</td>
<td>41</td>
<td>0.242 (18.4)</td>
<td>172</td>
</tr>
<tr>
<td>Third Party Damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
due to corrosion, 16 percent due to material construction defects, and 45 percent due to operational incidents.

Comparing the U.S. gas and oil incident data with those from the other countries shows that corrosion accounts for about 20 percent of the incidents on U.S. pipelines, which is within the worldwide range of 12 to 28 percent. Outside force/third-party incidents account for 18 to 40 percent of the U.S. incidents, while the world-wide range is 13 to 54 percent. With regard to operationally-related incidents, the European oil lines are quite low at 4 percent, while the worldwide range is 4 to 45 percent, which is quite wide.
Table 2 provides a more detailed breakdown of the causes of incidents on U. S. gas pipelines from 1984 through 1990. This table breaks down the causes of incidents into small subcategories. The environmental area includes general corrosion and pitting corrosion along with erosion, stress-corrosion cracking, sour gas, chemical attacks, CO₂, micro biologically induced corrosion, and others. Here, the primary causes are due to general and pitting corrosion, which account for 82 percent of the total incidents in this category. In the outside force area, 93 percent of the incidents are due to third-party damage or construction equipment damage. In the “other” category, the failure of mechanical components and fires cause approximately 75 percent of the incidents. (Note that this table subdivides the “other” DOT/OPS data into an operationally related cause category or into one of the existing three categories.)

At the bottom of Table 2, the percentages of injuries and fatalities associated with the various causes of defects are identified. Figure 2 is a plot of the percentage data for incident causes, injuries, and fatalities from Table 2. If the bar heights were the same for each cause category, then the injuries and fatalities would be proportional to the numbers of incidents. The lowest relative injury and fatality category is corrosion. Here, the percentage of corrosion fatalities and injuries is less than the percentage of corrosion incidents. Outside force/third-party incidents are about proportional, and operationally related incidents and material/construction related incidents produce proportionally more injuries and fatalities. So, personnel may be at more risk at an operating or material/construction incident than at an outside force or corrosion incident.

Considering the relative percentage of fatalities only, though, outside force is the category with the highest percentage followed closely by material and construction defects. On the average for U.S. gas pipelines, there are 18 injuries and 7 fatalities per year. This can be contrasted to data
Table 2. Summary of U. S. DOT 30-day incidents on gas-transmission pipelines from July 1984 through 1990.¹

published by the NTSB² data on fatalities due to trucks (over 8500 per year) and for fatalities due to rail (about 600 per year). Thus, pipelines are generally considered a safe mode for transporting large tonnages of products.

The Effect of an Aging Infrastructure on the Probability of Incidents Occurring on Pipelines

There are three potential factors to consider in assessing the effect of an aging infrastructure on the probabilities of incidents occurring in pipelines. The three factors are:

² NTSB News Digest, Volume 12, Numbers 4 - 7, 1993.
(1) the effect of time on the mechanical properties of the line-pipe steel
(2) the effect of the location around the pipeline on the potential degradation of the pipe steels (such as corrosion)
(3) the long term effect of the operating characteristics of the pipeline on the line-pipe properties.

Figure 2. U. S Gas Transmission Pipeline Injury and Fatality Data Related to Cause (July 1984 - 1990)

The Effect of Time on Steel Line Pipe

The effect of aging or time on line-pipe steels generally has no significant effect on the serviceability of the steel. Aging tends to increase the
strength level of the steel by a few percent over a period of many years. This does not affect the serviceability of the steel as the increase is small and thus is not detrimental to the steel. A second factor affected by aging is the transition temperature and the toughness of the steel. Here, transition temperature and toughness refer to the resistance of a steel to fracture.

Small losses in fracture toughness and transition temperature have been found in laboratory studies on line-pipe steel. Because line pipes are cold expanded or are worked significantly during their production, there has been some degradation in the fracture toughness and transition temperature of the steel from the time it was manufactured as plate until it was formed into a pipe. This loss is generally taken into account in the design of a pipe to develop properties that are adequate for the intended service. With continued aging, the small changes that occur are not considered significant in terms of their effect on subsequent serviceability, because the margins present in the pipe are adequate.

**Effect of Pipeline Location on Pipe Integrity**

The location around the pipe has two potential effects on the integrity of a line pipe. One effect is related to the corrosivity of the soil surrounding the pipe. The other factor is the effect of encroachment of population from the time the line is laid.

The effect of the soil environment on the pipeline and its ability to corrode the pipe is a function of many factors, including the corrosivity of the soil, the moisture level and resistance of the soil, the condition of the coating on the pipe, the cathodic protection level applied to the pipe, and the temperature of the pipe. In-line inspection technology and improved knowledge of corrosion control are available to maintain pipelines, and corrosion control on new and existing lines is improving. The U. S. DOT incident data confirm this as the number of corrosion incidents have
dropped from 26 in 1985 to nine in 1992. Thus, corrosion incidents are becoming a decreasing problem with regard to pipeline integrity. One significant factor is that the tolerance of older line pipes to corrosion defects is the same as in the new improved line pipes being produced today. Failure, if it occurs, is related more to the yield strength of the steel than to the steel's age or fracture toughness. Research is continuing to develop new ways to prevent and control metal loss due to corrosion and stress-corrosion cracking or other environmental types of mechanisms.

The encroachment of centers of population brings with it construction. The probability of damage to the pipe goes up as the frequency of construction near the pipeline occurs and, therefore, this is a concern to the integrity of pipelines. As demonstrated earlier, 40 percent of the incidents that occur are due to outside forces. Of these, nearly all are due to contact with construction equipment.

Over 70 percent of the outside force incidents occur on lines that have been located and marked; presumably the lines were marked after calls to a one-call system. The one-call system, which is in effect in many states, assists excavation contractors in locating pipelines to avoid damaging them. But even the one-call system cannot be totally effective without universal coverage (without exception), appropriate penalties, and effective enforcement. An evaluation of the overall one-call system and its weaknesses could lead to reduced incidents.

**Effect of Operating Characteristics on Pipe Integrity**

Pipelines that have been in service for extended periods of time have been subjected to static stresses at the operating pressure level and to stress fluctuations. The static stresses at the operating pressure do not have a long-term effect on the serviceability of the pipe at the normal operating temperatures. For the static stress to have an effect, the
temperature of the pipe would have to be hundreds of degrees higher, i.e., 700 F, which is not the situation.

The stress fluctuations applied to an operating pipeline can cause small imperfections to grow depending on the magnitude of the fluctuations and the size of the imperfection. This has not been a significant factor on gas pipelines; however, as pipelines continue to operate pressure cycles may begin to contribute to failures by the enlargement of existing imperfections. Most pipelines receive high-pressure, pre-service tests, though, which eliminates imperfections that might grow in service. Thus, the main effect of the stress fluctuations is on imperfections that occur after the line is put into service.

**New Technologies That Have Been Or Are Being Developed To Improve Pipeline Integrity**

Pipeline integrity involves many factors, among which are:

- line-pipe steel properties (strength and fracture toughness)
- diameter, wall thickness, and grade of the pipe
- operating pressures
- burial depth
- soil characteristics and moisture content
- coating types
- installation procedures, including those used to weld and bend the pipe
- preservice test on the pipe
- maintenance applied to the pipe to control corrosion and encroachment from construction equipment
- inspectability
- cathodic protection surveys

Table 3 lists a number of areas of concern and briefly summarizes the current technological situation and also identifies what technology
developments may be possible in the future. These have not been prioritized. The important observations from Table 3 are:

(1) In-line inspection tools can detect some, but not all, types of injurious defects. To be an effective replacement for hydrostatic retesting, inspection tools would need to detect all types of defects that would normally fail during a hydrotest.

(2) Many pipelines cannot be inspected with in-line inspection tools. Increasing the amount of pipelines that can be inspected could involve developing tools that can pass through obstructions or eliminating the obstructions.

(3) Satellite monitoring of leaks could provide another method of leak detection and location.

(4) Improved methodologies for assessing the severity of defects may be needed. Corrosion defect assessment criteria are available, but mechanical damage criteria are not.

(5) A basis for assessing the risk to the public from pipelines would allow appropriate and well-founded actions to be taken in high risk areas.

(6) With improved effectiveness, the one-call system could eliminate many of the outside force incidents on gas pipelines.

(7) Remote sensing of cathodic protection levels and improved assessment techniques for the results could improve monitoring of pipeline conditions.

(8) Instrumentation to avoid contact between pipelines and construction equipment may be possible.
Table 3. Summary of Technological Improvements Possible for Pipelines

<table>
<thead>
<tr>
<th>Feature</th>
<th>Current Technology</th>
<th>Future Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTEGRITY ISSUES:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>High toughness, low transition temperature line-pipe steels are commonly used.</td>
<td>Some pipeline companies test their pipelines to pressures levels of 100 to 110 percent SMYS to eliminate material and construction defects.</td>
</tr>
<tr>
<td>Preservice Hydrostatic Tests</td>
<td>Pipelines are typically tested to pressures levels of 90 to 100 percent SMYS to eliminate material and construction defects.</td>
<td></td>
</tr>
<tr>
<td>Retest</td>
<td>Many lines are being hydrostatically retested, which is currently the best way to assess the integrity of a pipeline. However, a hydrostatic test does not test all possible defects in a line (i.e., girth weld defects can be missed by a hydrostatic test).</td>
<td>Additional retesting of pipelines in high risk areas may be desirable. Risk assessment methods are being developed to define risk to the public on segments of pipelines (GRI program). These methods may identify which pipelines would benefit most from retesting.</td>
</tr>
<tr>
<td>In-Line Inspection</td>
<td>In-line inspection tools (ILI) are available and being used to locate, detect and characterize metal loss (MFL and UT), dents (caliper or sonar tools), some gouges (MFL), laminations (UT), and areas of pipe movement and pipe location (inertial or curvature tools). These tools are available in first and second generation forms, with differing capabilities.</td>
<td>A definition of what defects can be reliably detected and accurately characterized with existing tools would improve their effectiveness. New tools may need to be developed to close the gaps identified.</td>
</tr>
</tbody>
</table>
Table 3. Summary of Technological Improvements Possible for Pipelines

<table>
<thead>
<tr>
<th>Current Technology</th>
<th>Future Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Line Inspection</td>
<td>The use of an in-line inspection tool to locate mechanical damage may not be practical for routine use because the damage can occur immediately after an inspection run. However, detecting mechanical damage would be valuable for selected conditions. The capabilities of available tools need to be defined for these situations and to determine if their capabilities are acceptable.</td>
</tr>
<tr>
<td>Existing ILI tools are used to find some mechanical damage defects. It is not known how reliable or accurately these can be determined.</td>
<td>Most in-line inspection tools cannot detect cracks. When inspection tools are available to locate cracks in seam welds and base metal, the integrity of a pipeline can be similarly verified with either in-line inspection or a high pressure hydrostatic test. (GRI program.)</td>
</tr>
<tr>
<td></td>
<td>Many gas pipelines are currently not inspectable with in-line tools because of tight bend radii, non-full opening valves, and/or dual diameters. The development of an inspection tool that can inspect under these limitations would allow pipeline companies to use the tools on more lines.</td>
</tr>
<tr>
<td>Current Technology</td>
<td>Future Technology</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>Leakage detection</strong></td>
<td>Satellite monitoring for leaks has been shown to be effective. Additional research, implementation, and usage would be beneficial to reduce the cost and improve reliability. Improved SCADA systems could also offer the possibility of better leak detection. (Note, however, that leaks are not a common problem on gas transmission pipelines.)</td>
</tr>
<tr>
<td>The SCADA system, coupled with walking and flying the line, are used to find leaks. The significance of a leak depends on whether the line is liquid or gas.</td>
<td></td>
</tr>
<tr>
<td><strong>Defect assessment methods</strong></td>
<td>An improved methodology for assessing mechanical damage defects would be beneficial. Existing methods do not accurately predict severity.</td>
</tr>
<tr>
<td>Assessment methods are available for girth weld defects and corrosion defects in pipes.</td>
<td></td>
</tr>
<tr>
<td><strong>Methods of mitigating incident consequences</strong></td>
<td>The accuracy of current models is not well known. Methods of defining realistic distances from pipelines to buildings in high risk areas may be needed. Such methods should consider radiation limits to prevent flammability and distances that particles may be thrown.</td>
</tr>
<tr>
<td>Studies have been conducted into the consequences of pipeline ruptures(1,2). These have focused on the downwind flammability distance of the vapor cloud based on liquid pipeline ruptures. (The release from the initial vapor cloud has been more severe than the steady state release that occurs as the pipeline is depressurizing. Thus, rapid shutdowns do not usually affect accident consequences.)</td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Summary of Technological Improvements Possible for Pipelines

<table>
<thead>
<tr>
<th>MAINTENANCE:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance prioritization models</td>
<td>The PRC and GRI have models published or under development for maintenance on gas pipelines. There is no model for liquid lines.</td>
<td>Maintenance prioritization models could be coupled with risk assessment modeling to provide maintenance on a priority basis to the most critical locations in a system.</td>
</tr>
<tr>
<td>One-call systems</td>
<td>Existing systems are not uniformly applied and are not always effective.</td>
<td>A study on the effectiveness of the one-call system would allow its weaknesses to be identified. If the weaknesses can be addressed, a national one-call system may be warranted. This can be tied to a global position systems and geographic information systems.</td>
</tr>
<tr>
<td>Repair Sleeves</td>
<td>Use of repair sleeves has been demonstrated and guidelines developed. The “Clockspring” sleeves under development by GRI have not yet had guidelines developed for their use and application on all types of defects.</td>
<td>Repairs methods are generally considered effective.</td>
</tr>
<tr>
<td>Pipe Coating</td>
<td>Fusion bonded epoxy (mill applied) has had good performance in the field.</td>
<td>Replacement field-applied coating methods are needed for the recoating of pipelines in the field. (With improved coating removal methods being developed by GRI, a need will probably be created for field recoating of line pipe.)</td>
</tr>
</tbody>
</table>
Table 3. Summary of Technological Improvements Possible for Pipelines

<table>
<thead>
<tr>
<th>Protection</th>
<th>Description</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cathodic Protection</td>
<td>Criteria are available for cathodic protection application. In spite of this, corrosion still occurs on some lines.</td>
<td>Improved methods to measure cathodic protection, such as from aircraft, could reduce the cost of obtaining the data and identify problem sites.</td>
</tr>
<tr>
<td>SCADA</td>
<td>SCADA systems are widely used on pipelines today.</td>
<td>Improvements in SCADA could offer faster shutdown of pipeline lines in accident situations. Research will be needed to define the best criteria for shutting down a line under accident conditions. This may lead to new sensors on the line and careful monitoring.</td>
</tr>
<tr>
<td>Mechanical Damage</td>
<td>Currently, not used frequently in the U.S.</td>
<td>The U.K., Europe, and Japan use mechanical damage barriers of either concrete or steel above or around the pipe. The cost effectiveness of these barriers is not well known.</td>
</tr>
<tr>
<td>Protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detection of Impending Mechanical Damage</td>
<td>Not currently used.</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------</td>
<td></td>
</tr>
</tbody>
</table>

1. Sensors could be developed for installation on the pipe or on the construction equipment to sense the presence of excavator or the pipeline. This is a subject that has been explored in the laboratory, but we are not aware of any commercial operations. The reliability of these systems is unknown.

2. Another possibility is to use construction equipment that cannot damage pipelines even if it contacts the pipe. An example is the EPRI soft trencher. Such systems are not commonly used today.

APPENDIX B2-A

REPORTING CRITERIA FOR INCIDENTS ON GAS AND LIQUID PIPELINES

U.S. Incident Reporting Requirements. In July 1984, the incident report form was revised to reduce the amount of data collected and the definition of a reportable incident was redefined by the U. S. Department of Transportation's Office of Pipeline Safety as:

(1) An event that involves a release of gas from a pipeline or of LNG or gas from an LNG facility and
   (i) a fatality or personal injury necessitating in-patient hospitalization:
       or
   (ii) estimated property damage, including costs of gas lost by the operator or others, or both, of $50,000 or more.
(2) An event that results in an emergency shut-down of an LNG facility.
(3) An event that is significant, in the judgment of the operator, even though it did not meet the criteria of Paragraphs (1) or (2) above.

Canadian Pipeline Reporting Requirements

Gas and liquid-transmission pipeline operators are required to report to the National Energy Board (NEB) every incident relating to the construction, operation, or abandonment of its pipelines that:

(a) Results in the death of a person or in an injury that requires a person to be hospitalized
(b) Results in an explosion
(c) Results in a gas or HVP hydrocarbon ignition
(d) Results in the removal from service of any main line piping
(e) Results in an uncontained spillage of oil in excess of 1.5 cubic meters
(f) Results in an inadvertent and uncontrolled escape of gas or HVP hydrocarbons

(g) Results in the discharge of toxic substances on land or into a body of water

(h) Results in an interruption in the operation of the pipeline

(i) Represents an emergency situation as set out in the scope of application of the emergency procedures

(j) In the judgment of the company is significant even though it does not meet any of the criteria set out in paragraphs (a) to (f)

(k) Meets only the criterion of (c) (d) or (h) if the incident is potentially hazardous.

European Gas Pipeline Incident Reporting Requirements

Six European gas-transmission companies (British Gas, Distigaz, Gaz de France, Gasunie, Ruhr Gas, and SNAM) collect information on incident statistics. The incident data that are collected are limited to incidents of pipeline damage that resulted in loss of gas in onshore gas-transmission lines, outside the boundaries of above-ground installations with a design pressure of more than 15 bar.

European Oil Line Incident Reporting Requirements

Incidents are reported whenever the spillage is greater than one cubic meter. However, spillages of less than one cubic meter are taken into consideration when their impact on the environment is noteworthy. Thus, it would appear that most all spillages from oil pipelines are reported, and in fact, the data included herein contain incidents in the zero to one cubic meter.

U. S. Liquid Pipeline Incident Reporting Requirements
Part 195 of the Code of Federal Regulations Paragraph 195.50 imposes the following reporting requirements for hazardous liquid or carbon dioxide transported through pipeline systems, which are subject to this part of the Code of Federal Regulations.

(1) Explosion or fire not intentionally set by the operator
(2) Loss of 50 or more barrels of liquid or carbon dioxide
(3) Escape to the atmosphere of more than five barrels a day of highly volatile liquids
(4) Death of any person
(5) Bodily harm to any person resulting in one or more of the following
   (a) Loss of consciousness
   (b) Necessity to carry the person from the scene
   (c) Necessity for medical treatment
   (d) Disability, which prevents the discharge of normal duties or the pursuit of normal activities beyond the day of the accident
(6) Estimated property damage to the property of the operator or others or both exceeding $5,000.
APPENDIX B3

Panel 3
*Calculating the Cost of Pipeline Safety*

Presentation Papers
John DesBarres  
Chief Executive Officer, Transco Energy Company

I appreciate the opportunity to be a part of this afternoon's panel and share some thoughts on pipeline safety and its costs. Let me say right up front that no matter what the cost of pipeline safety may be, safety can never be compromised. The public's confidence in the safety and reliability of our nation's pipelines is an absolute necessity. Without that public confidence the industry is not viable. I also believe that notwithstanding the terrible incident at Edison, given the industry's long run safety record, the public should continue to have confidence that pipelines are very safe. Nothing in this world is risk free, but statistics prove year after year that pipelines are very safe and are the safest form of transportation this country has. That superior record doesn't just happen. It results from a continual focus on safety issues by both operators and DOT that is supported by significant industry expenditures. Having said that, none of us can or should sit on our hands believing there is nothing left to do. Safety is an every day proposition and we all have a role to play to insure that the risks inherent in the operation of our national pipeline grid are minimized.

Given the short time allotted, I intend to cover four points.

• The comparative safety of pipelines and need for risk-based improvements.

• The fact that significant dollars are currently being spent by the industry to assure safe operations.

• The issue that DOT pipeline user fees are dramatically escalating, and,
• The pressing need for pipelines to have a reasonable and predictable cost recovery mechanism for mandated or otherwise required safety costs.

Let me discuss each in a bit more detail. It may surprise some people that the entire gas transmission and distribution industry already spends some $4.0 billion on safety-related expenditures. That's $71 per customer or about the equivalent of 10% of a typical northeast gas customer's annual gas bill. In New Jersey, the five gas transmission companies, including mine, will spend an estimated $236 million in 1994 for normal ongoing safety-related items. I believe it is fair to say that virtually all pipelines in the business spend substantially more on safety than required by the DOT regulations. I don't know of a single operator that views the DOT regulations as anything but minimum requirements and therefore go well beyond what's called for.

Now let me turn to the issue of cost recovery. Given the fact that safety is an integral part of our operations, how are safety-related costs recovered? For gas, the federal regulators set our rates, or prices to customers. In simple terms, the Federal Energy Regulatory Commission allows the recovery of costs plus what they feel is a reasonable return on investment. While oil pipeline costs may be recovered in a similar manner, their regulatory process is in the midst of change and competitive forces often prohibit cost recovery by restricting the level of competitive pipeline rates. In such circumstances, an overall cost recovery methodology must be devised.

Public policymakers and regulators are appropriately concerned with the safety of the nation's pipeline system. We share that concern. But new requirements, if mandated, will cost money, and we have to confront the issue of how these costs will be recovered.
There are two types of costs. The first is pipeline safety user fees, which are used to defray the costs of DOT's pipeline safety program. User fees are not controlled by the pipeline. They are dictated by Congress in the budget process and collected and disbursed by DOT. As you can see on the slide, pipeline user fees are projected to increase substantially in 1995 and I suspect beyond. The industry needs to recover these costs in a timely manner. FERC's current and well-proven method to recover user fees for its regulatory program through the annual charge adjustment, or ACA, is a good model. We in the industry also want to work with DOT to find alternative means to help fund the Office of Pipeline Safety to prevent further significant increases in pipeline user fees.

The other more significant type of cost is that associated with any additional operating safeguards that may be mandated by regulators or deemed necessary by the industry. These include physical changes in valves, remote sensors and use of metal loss or "smart pigs" as well as operation and maintenance expenses for increased patrolling, inspections and leak surveys. All of these safety options are being considered by legislators, by regulators, by the entire pipeline industry and, in particular, by our own gas pipeline industry task force, of which I am a member.

If additional safety regulations are adopted, they should be based on sound risk assessment techniques. This means optimizing safety dollars so that they are spent to correct the largest, most correctable risks first. We have to realize that not all risk can be eliminated. As you can see from this slide, we all live with risk every day. The fact is that we have a very safe pipeline industry, but we must work to make it even safer. A single fatality or injury is one too many, and zero has to be the goal. From an investor interest and capital formation standpoint, we need to be able to convince the financial community that, reasonable safety costs, mandated or not, can be recovered on a timely basis. To accomplish this, we need to work with our regulators--FERC and DOT. We need assurances that reasonable safety and environmental costs are prudent.
and reflect appropriate risk mitigation to the public. Further, we need to be able to make appropriate safety and environmental changes quickly. Required construction and modifications for safety should be allowed to proceed on a blanket approval basis. Regulatory and permitting delays are both costly and often detrimental in achieving maximum safety. Gas pipelines need regulatory approval to defer recovery of safety costs until the pipeline's next rate case. The proper regulatory terminology is to "create a deferred account" or a "regulatory asset." A policy statement similar to that provided by the FERC last year in response to FASB 106 would be of great assistance. At the same time, oil pipelines need some cost-of-service mechanism which will allow these safety costs to be recovered.

In summary, pipeline safety should never be compromised due to costs. The industry must have the public's confidence in our safety and reliability. We need to spend dollars based on solid risk assessment that takes into account serious risk, probability of occurrence, available technology and its practical application. As an industry, we are competing for investors' interests and ultimately capital to improve and expand our systems. We need to be able to assure the financial community that we can recover costs incurred, including safety, on a timely basis. I am confident I reflect industry thinking when I say we want to work with the DOT, FERC and others to accomplish our mutual, shared goal of serving the public's need for gas and oil transportation in the safest possible and most reliable manner. I look forward to the panel's discussion about the issues I have raised.
Bruce B. Ellsworth
Commissioner, New Hampshire Public Utilities Commission

Thank you for the opportunity to participate on this panel which is charged with the responsibility of commenting on "calculating the costs of pipeline safety".

As New Hampshire utility regulators, we are charged by state statute with requiring that gas utilities provide safe and adequate service at just and reasonable rates. That charge is similar to, and was probably drawn from, the charges of almost every other state utility regulatory agency in the country. That charge presents a dilemma for regulators: safe and adequate service costs money; just and reasonable rates limit the availability of money. We share with federal regulators and the gas industry itself the dilemma of how to provide reasonably safe and adequate service at reasonably just and fair rates.

The cost of pipeline safety is part of the dilemma. The gas industry in New England has inherited, over a period of some 150 years, a gas distribution system which is comprised of a mixture of plastic, steel, ductile iron and cast iron distribution mains and services located in areas that in some cases are impossible to replace and which, generally, continue to serve their customers adequately and safely. Thanks to the standardization of performance standards attributable to the Office of Pipeline Safety at the Department of Transportation, those pipelines are uniformly monitored, inspected, and maintained at a level which, in my opinion, should give customers and residents the comfort of knowing that they are living within a safe gas distribution environment.

There is no question that pipeline safety comes at a cost. There is no doubt in my mind that the establishment of the Office of Pipeline Safety increased the costs of maintaining this pipeline network. Those costs
increased customer bills. Those increased customer bills challenge the industry's ability to compete in the marketplace. It is our responsibility to assure that adequate funds are available to assure a safe gas pipeline environment while keeping in mind that the cost of that safety is borne by ratepayers and taxpayers.

In my opinion, the funding process which was established by the Office of Pipeline Safety, under the Pipeline Safety Act of 1968, has contributed greatly to an improved pipeline safety environment. Although prior to the Act, each state committed resources to gas pipeline safety programs, the standardization which the Office of Pipeline Safety brought to the nation increased each state's commitment to pipeline safety. The funds which the Act provided allowed states to make that commitment without unreasonably burdening their own customers. The requirement that each state provide at least 50% of its own moneys to fund the program assured that a reasonable perspective was built into the funding process and made each state its own stakeholder in the process.

A state-federal fund sharing philosophy should continue. States should reasonably be expected to bear part of the burden since it is, after all, their customers who benefit from the program and who should be responsible for supporting the costs of part of the program. The states programs are enhanced, however, by the standardization which the Office of Pipeline Safety brings to the program, and since taxpaying residents of all communities benefit from the enhanced safety that the program brings, it is reasonable to continue to expect that taxpayer dollars contribute to a federal portion of program costs. I support the state-federal program as it is now administered. I recommend that the letter of the law be followed, however, to assure that each state be entitled to its full 50% share of its inspection costs, and that we no longer be required to carry more than our fair share as most of us have had to do in the absence of adequate funding to date.
As we look at pipeline safety requirements we must always maintain a perspective on the severity of pipeline incidents. Pipeline incidents, when they occur, are by their very nature dramatic and dangerous and they receive an inordinate, but understandable, amount of public attention. When an incident occurs it is easy to forget how relatively few incidents occur to the pipeline industry as compared to other modes of the transportation industry. For instance, in 1989 of the over 48 thousand fatalities that occurred in the transportation industry only 39 of them occurred in the pipeline industry. We all have to keep that perspective in mind because to do otherwise could cause us to require an unreasonable commitment to pipeline safety expenses which would be unfair to add to the burden of ratepayer and taxpayer costs. Our challenge is to assure that every accident is properly evaluated and that reasonable and adequate steps are taken to minimize the likelihood of future occurrences.

State regulators are also very mindful of the fact that there is a great distinction between the costs of providing safety inspection measures, and the costs of taking corrective actions which result from those inspections. It is the local ratepayer of the local gas distribution company which pays for all corrective actions. That is as it should be. It must never be forgotten, however, that their ability to pay is not unlimited and it puts a continued burden on all of us to know which investments in safety issues must be required and which may not.

The transition to a competitive market adds new challenges to pipeline safety costs. Competition generally suggests a reduction in regulation. We must be very careful as we prod the gas industry toward a competitive environment that we do not take away from them the financial opportunities or the safety responsibilities of maintaining their commitment to pipeline safety. We must continue to assure that they are provided with the assets and the encouragement to maintain a safe pipeline network. The public has a right to expect that of all of us.
In summary, I commend the Office of Pipeline Safety for its success in standardizing the Pipeline Safety Program for the nation. I commend it for its willingness to contribute to a state-federal relationship that really works. As a player in the pipeline safety field for some 30 years, I can attest to the fact that the Office of Pipeline Safety listens as well as talks, and that they have provided the states -- to the extent that the congressional budget has allowed -- that portion of our investigation costs that are available.

I strongly recommend that the congress commit to providing states with the 50% share of its inspection procedures that it currently is empowered to do and I support the ongoing commitment to increasing the budget of the Office of Pipeline Safety in order for it to increase and improve its commitment to interstate pipeline inspection that it alone is empowered to perform.

Finally, it continues to be appropriate that local gas ratepayers support the costs of those operating and maintenance expenses which are necessary to maintain a safe gas distribution system. We, as regulators, have to keep a perspective on which gas-related issues require investments. The state commissions are in the best position to judge how the resources of their companies should be allowed. Its laws, rules, and policies will assure that gas safety will be given the highest priority.

Thank you very much.
Richard K. Gordon
Managing Director, Merrill Lynch & Co.

My name is Richard K. Gordon. I am a Managing Director of Merrill Lynch & Co. ("Merrill Lynch") and a Co-Head of the firm's Energy Group. Merrill Lynch is a holding company that, through subsidiaries and affiliates, provides investment banking, brokerage, trading, insurance and related services. As an investment banking firm, Merrill Lynch is the leading underwriter and distributor of securities of industrial corporations, public utilities, transportation companies, financial institutions, governments and government agencies, international institutions and foreign corporations. During the period 1988-1993, Merrill Lynch managed or co-managed 8,211 public offerings, Rule 144A offerings and private placements involving a total of approximately $1.4 trillion in the world's capital markets. In 1993 alone, the firm managed or co-managed 2,388 transactions involving approximately $468 billion. Merrill Lynch also provides general advisory services on a wide range of matters including long-range financial policy and planning, leasing, project financing, tax strategies, pension strategies, mergers, acquisitions, divestitures and valuations.

An industry of considerable importance to Merrill Lynch and the industry in which I have spent a considerable portion of my 22 year career as an investment banker is the natural gas industry. My involvement with natural gas companies has included the development of financing plans, the design of indentures and other security instruments, the structuring and sale of all types of securities including common stock, preferred stock, convertible preferred stock, debt and convertible debt, and the execution of mergers, acquisitions and divestitures. In the past 12 months alone, I have been involved in five debt financings totaling $825 million, two convertible preferred stock offerings totaling $190 million, five common stock offerings totaling $2,002 million, a $300 million bondholder
consent program and six mergers and acquisitions totaling $621 million, all for natural gas companies.

My testimony today is advanced from the perspective of an investment banker and a member of the financial community. From this perspective, I was grieved, like other concerned citizens, by the unfortunate natural gas pipeline rupture that occurred in Edison, New Jersey on March 23, 1994. Although regrettable, I believe that we should not lose sight of the excellent record of safe operations established by the natural gas industry over many years. Indeed, the industry has a well-deserved reputation for the provision of safe and reliable service. This is particularly impressive when one considers that the natural gas industry delivered approximately 20.6 trillion cubic feet of natural gas through approximately 285,000 miles of transmission lines and 885,000 miles of distribution mains in the U.S. in 1993 alone.

As the public, government officials and regulators reflect on the operations of natural gas pipelines, I also believe it is important to understand that the imposition of new burdensome regulation/legislation would be counterproductive and inappropriate inasmuch as natural gas pipeline companies already attach the highest priority to safety, reliability and related matters. I base this opinion on my experience in raising capital and arranging mergers for many of the major pipelines over the past two decades. In connection with both of these activities, I conduct thorough due diligence reviews of the subject company or companies pursuant to which I analyze their business operations and financial condition. Based on these reviews, I have found on a first-hand basis that pipeline companies and their management take seriously their responsibility to provide safe and reliable gas service to the customers and communities they serve. I have also found that pipeline companies and their management have acted responsibly, decisively and quickly when issues of safety or reliability have arisen. For these reasons, I do not believe that it is necessary or would be beneficial to subject the pipeline industry to
new legislation or rules, the practical effect of which could be expected to increase the cost of providing pipeline service without attendant benefit.

I also believe that it is relevant to point out that investors and the financial community in general are interested in, among other things, the operating integrity of pipeline companies and generally share my opinion as to the adequacy of present safety and reliability safeguards and standards in the natural gas pipeline industry. Investor confidence in the pipeline industry is important because pipelines are capital intensive by nature and, thus, often require external capital to augment their cash flow from operations to fund capital expenditures relating to the expansion, modernization and upgrade of their systems. Investors obviously have a wide spectrum of investment alternatives from which to choose and can be expected to channel their funds into those investments that offer the highest return relative to the least amount of risk. Clearly, if the operating integrity of pipelines were an issue of concern, investors would respond by either requiring a higher expected return or avoiding the investment altogether regardless of the expected return. My experience in marketing gas pipeline securities to investors, however, does not suggest that investors are troubled by this issue. On the other hand, investors are acutely interested in the economic competitiveness of the enterprises in which they invest and could be expected to view negatively the imposition of new burdensome regulation/legislation, the end result of which would not necessarily improve the safety or reliability of pipeline operations but which would almost invariably increase their cost providing service and thus negatively impact their competitive position.

I appreciate the opportunity to participate in this Summit and would be delighted to respond to any questions you might have.
APPENDIX B4

Panel 4
Creating Effective Partnerships for Reducing Pipeline Risk

Presentation Papers
July 5, 1994

Ms. Ana Sol Gutierrez  
Acting Administrator  
Research and Special Programs Administration  
U.S. Department of Transportation  
400 Seventh Street, SW  
Washington, DC 20590

Dear Ms. Gutierrez:

This letter follows up the excellent Pipeline Safety Summit that you hosted on June 20 in Newark. It was an informative and productive session, illuminating many of the issues that are of concern with respect to pipeline safety. The purpose of this letter is to forward my revised remarks (copy attached) for the record (as these differed somewhat from draft submitted prior to the summit).

As I mentioned in my brief self-introduction, I was particularly pleased to participate as one of only two locally elected officials and to bring the unique perspective of a DOT-regulated end-of-line facility in the context of a regional tank farm. Our experience at the Pickett Road tank farm in Fairfax has been very instructive with respect to the complexities of multiple agencies overseeing pipeline facilities co-located with tank farm operations. While not advocating a change in DOT responsibility for pipelines, I do encourage that consideration be given to improving local understanding of the various responsible agencies and ensuring that DOT and EPA standards within a tank farm are similar.

Again, thanks for inviting the City of Fairfax to participate in this important summit. If we can be of further assistance, please do not hesitate to call on us.

Very truly yours,

John Mason  
Mayor

Attachment: as

cc: City Council  
    R. Sisson, City Manager

City Hall • Fairfax, Virginia 22030-3630 • (703) 385-7800 • Fax (703) 385-7811

Printed on recycled paper
**TALKING POINTS**

**MAYOR JOHN MASON**  
**U.S. DOT PIPELINE SAFETY SUMMIT**  
Creating Effective Partnerships for Reducing Pipeline Risk Panel  
June 20, 1994

* CONTEXT (of remarks)

- Experience in dealing with one of the largest leaks from a petroleum bulk storage facility in the Country led to detailed examination of various governmental roles and responsibilities.

- Fairfax Tank Farm
  
  * Storage capacity of 73,000,000 gallons
  * Annual through-put of approximately 1 billion gallons
  * Supplies approximately 40 percent of the region's level
  * Supplies aviation fuel to Washington Dulles International Airport

- Subsurface Contamination
  
  * Began in September 1990 with discovery of oil sheen on nearby creek
  * Investigation revealed subsurface contamination of the groundwater emanating from Star Enterprise facility
  * Estimates of the amount of petroleum leaked range from 170,000 gallons to over a million gallons.
  * Size of the underground plume is approximately 20 acres, including a large residential area.
  * 81 private residences have been evacuated and/or sold due to the contamination

- In oversimplified terms, regulatory responsibilities for the tank farm are:

  * **Local jurisdiction:** fire prevention/protection, enforcement of fire, building and zoning code.
  * **State:** environmental concerns (in effect carrying out Federal responsibilities)

- **Except** for the Colonial Pipeline facility
  
  * Interstate pipeline that provides/delivers all petroleum products to the four major oil companies located at the Fairfax Tank Farm (1 billion gallons annually)
• Federally regulated by the Department of Transportation
QUESTION #1

IS THERE A BETTER PROCESS TO REACH CONSENSUS ON WHICH RISKS ARE THE MOST IMPORTANT? FOR EXAMPLE, AN OBJECTIVE REVIEW BY A CREDIBLE, RECOGNIZED SCIENTIFIC BOARD?

- "Risk" will be in the eye of the beholder.

- Need to better determine evaluation measures - scientific community must establish, but must involve all affected groups.

- DOT has exclusive authority to regulate the facilities unless a state demonstrates it has an adequate regulatory program and it is "certified" to regulate intrastate pipelines or become an "agent" to inspect interstate pipelines and facilities (Virginia is in the process of getting the certification, which will take several years).

- While the facilities may cooperate with local jurisdictions, the local regulatory authority is preempted by federal law from any safety regulation at the facilities - perhaps areas may be identified for local authority.

- DOT's Office of Pipeline Safety (OPS) lacks the resources to regulate the nation's pipelines facilities at a level of scrutiny often desired at the local level; it is possible even states that become certified will lack resources.

- Current federal regulations do not require either DOT or a pipeline operator to provide information such as pipeline testing and test results to local officials.

QUESTION #2

ONCE RISKS ARE IDENTIFIED, WHAT PROCESSES CAN BE CREATED TO ALLOW ALL INTERESTED PARTIES TO SET MUTUAL PRIORITIES FOR RISK REDUCTION

- DOT personnel should establish regular liaison with local jurisdictions' regulators and share/route appropriate information to them.

- Meaningful and comprehensive communication is critical.

- Pipeline operators should cooperate with local officials in regulatory concerns.

- Involvement of citizens to ensure
Effective partnerships in this arena have been successful.

Key is in establishing clear direction and focus.

- **Oversight Committee**
  - Formed in response to massive leak from the Star Tank Farm.
  - Composed of local, state, and federal officials and citizens/affected community groups.
  - Communication/interaction with oil companies.

- **Community Remediation Committee (CRC)**
  - Provides enhanced communication/interaction between federal officials and local officials, and the citizenry with respect to remediation alternatives for the Fairfax Tank Farm incident.
  - Anticipate problems in advance.
  - Ensure citizen/community buy-in and confidence in solutions.
APPENDIX B5

Issue Papers
INDEX

AGA and Interstate Natural Gas Association of America (INGAA) .... B5-19
Mike Baly III, President AGA; Jerald V. Halvorsen, President, INGAA

City of Fredericksburg, Virginia ........................................... B5-11
James M. Pates, City Attorney

Colonial Pipeline Company ................................................... B5-30
D.R. Brinkley, President and Chief Exec. Officer

Columbia Gas Transmission Corporation .................................. B5-35
Jon O. Loker, Director, Technical Services

Comments of the American Gas Association (AGA) ............... B5-16

Enron Corporation ................................................................ B5-27
Dale L. Coates, Director Codes and Standards

Fairfax County, Virginia: A Pipeline Safety Perspective ........ B5-2

Hazard Control Systems ....................................................... B5-48
Maurice V. Scherb, President

Issue Paper ........................................................................... B5-51
Craig J.J. Snyder

Lone Star Gas Company ....................................................... B5-14
Ellen Weaver, Senior Attorney

NACE International ............................................................... B5-40
David E. Krause, Buckeye Pipeline, Chairman, NACE International Public
Affairs Committee

Northwest Pipeline Corporation ............................................. B5-32
James W. Smith, Manager, Safety and Environmental Health

Southwest Research Institute ............................................... B5-28
M.F. Kannien, Vice President and Director, Structural Systems and
Technology Division

Teneco Gas ........................................................................... B5-24
Glimer R. Abel, Vice President Field Operations

Tree-tops Consultation Center .............................................. B5-44
Roxanne G.F. Croft, Ph. D, Executive Director

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-1
Fairfax County is an urban/suburban community located in the northeastern corner of Virginia in the Washington, D.C., metropolitan area. It has a net land area of approximately 400 square miles and a population of approximately 850,000, projected to grow to 1.2 million by 2010. The County currently ranks as the 45th most populous county in the nation. Within its boundaries are located three incorporated towns, Clifton, Herndon and Vienna, which are underlying units of government with the County. The governing body of the County is a 10-member Board of Supervisors, headed by a Chairman who is elected at-large. The Board of Supervisors appoints a County Executive to act as the administrative head of the County. During the last 30 years, Fairfax County has grown from a rural farming community serving the nation's capital to a major business center and one of the most desirable residential communities in the metropolitan region. Fairfax County provides a comprehensive range of public services characteristic of its form of government under Virginia law and its integral position within the Washington metropolitan area.

Crossing Fairfax County are four interstate transmission pipelines: two hazardous liquid pipelines operated by Colonial Pipeline Company and Plantation Pipeline Company, and two natural gas transmission pipelines operated by Transcontinental Gas Pipeline Company and the Columbia Gas Transmission Corporation. Collectively, these lines and their spurs represent several hundred linear miles of working pipeline through what is now an urban environment.

During the past 14 years, Fairfax County citizens have been impacted by three major hazardous liquid pipeline releases. They include the 1980 Manassas failure which released approximately 336,000 gallons of aviation-grade kerosene into the Occoquan watershed. This spill resulted from thinning of the pipe wall by corrosion.\(^1\) The 1987 Centreville failure which released approximately 16,000 gallons of premium-grade gasoline into a townhouse community under construction. This very dangerous spill was the result of direct contact of a piece of construction machinery with the pipeline. Finally, the Reston failure in 1993 released approximately 408,000 gallons of #2 fuel oil into Sugarland Run and the Potomac River. This spill resulted from the fatigue failure at a crack which was probably

\(^1\)National Transportation Safety Board Pipeline Accident Report on Colonial Pipeline Release, Adopted July 15, 1981.
initiated by mechanical damage from heavy construction equipment. Fairfax County and its citizens cannot tolerate future releases. As a result, the County has conducted engineering evaluations, initiated investigations, established an ongoing dialogue with the Federal Office of Pipeline Safety, lobbied for further delegation of inspection functions to the state, supported changes in the one-call system and proposed changes to the Fairfax County Code for land-use policy and subsurface utility engineering requirements near pipelines. While engaged in these activities, several relevant and important issues have been identified.

First and foremost, we note that our experience in Fairfax County is not unique. Other jurisdictions are responding to similar occurrences in scope and magnitude as a result of hazardous liquid pipeline failures. For example, 27 releases larger than the 408,000 gallon Reston release have been reported in the United States since December of 1985. This does not even begin to take into consideration the releases smaller than 408,000 gallons, but which may have also had an impact on public safety, health or the surrounding environment.

Second, our technical assessment of pipeline requirements has revealed what Fairfax County believes are major regulatory deficiencies. Many of these issues have been previously identified in various National Transportation Safety Board investigations during the last 15 years. A review of technical issues and associated regulatory matters concerning the Reston failure further supports the need for increased focus on this area (technical issues).

- The County's observations include:
  
  - The current hazardous liquid pipeline design Code and Federal Regulations result in:
    * Thinnest pipe wall thickness of any of the major national piping codes (e.g., the pipe has the least margin to failure). (See Attachment A.)
    * Failures that are most likely to be catastrophic (e.g., no warning leakage before pipe breaks catastrophically). Thus, it is very difficult to have a meaningful leak detection system (i.e., there is warning while the leakage is still small). Because of the thin wall, the pipe fails catastrophically all at once with no warning.

---

2National Transportation Safety Board Pipeline Accident Brief No. DCA93MP007, March 18, 1993.

3Letter from National Transportation Safety Board to the Chairman of the Fairfax County Board of Supervisors, April 11, 1994.
-- Design codes/federal regulations for hazardous liquid pipelines do not require the design of the pipeline to take into consideration population density or environmentally sensitive areas (water supply). Natural gas pipeline codes or other design codes require thicker walls in sensitive areas and/or reduction in operating pressure in sensitive areas where population changes have occurred after the pipeline is installed. (See Attachment B.)

-- Design codes/federal regulations do not require that pipeline design take into consideration pressure induced cyclic fatigue—the lines are often operated with a high number of pressure cycles. These cycles can cause fatigue of very small defects (regardless of whether defect caused by manufacture, installation, third party damage, etc.) to grow to a point where catastrophic failure can occur.

-- Design codes/federal regulations do not require the pipeline to incorporate features which will readily permit periodic internal inspections of the line.

-- There currently is no requirement for the periodic inspections and assessment of the condition of the pipeline.

It is our belief that fundamentally we have an industry which does not have the necessary basic regulatory underpinnings for today's conditions.

Third, it is important to realize that our pipeline systems are getting older. Influences on the systems, such as cyclic fatigue, corrosion and external force damage are becoming more important considerations.

Fourth, and of vital importance, is that failures will continue to occur. Systems design, construction, maintenance, repair and inspection should take this fact into account and use the best available technology to reduce the number and impact of leaks or rupture. It is a process that requires continued evaluation and periodic updating of design, safe operations, maintenance and inspection.

Finally, engineering analysis suggests the need to consider further the cyclic stresses on pipelines in relationship to fatigue. Past studies do not appear to have taken into account the effects of cyclic stresses on the various types of conditions found within the physical structures of the pipelines.

Considering these issues and reflecting upon our experience with the processes concerning hazardous liquid pipeline safety, the County believes firmly that action must be taken and sustained in nine fundamental ways. It is important to note that no one single solution is available to solve the more comprehensive problem. It requires a concerted and sustained effort backed by proper resources in several distinct areas simultaneously. Fairfax County believes that those areas are as follows (not necessarily in order of importance):
1. There must be increased oversight of pipeline systems by all levels of government and their constituents. This includes enhancing the communications between the levels of government, particularly the local level. This goes beyond public information efforts or pipeline summits to the level of establishing continuous mechanisms of interaction and ensuring that challenging questions are welcomed and considered, to the delegation of responsibilities to the full extent of the law and, finally, to ensuring that, collectively, priorities are identified and acted on in a systematic way.

2. Critical, rigorous and practical engineering evaluation of physical and operational conditions must be further conducted. A process for continuing re-evaluation must be established. The approach should be one of challenging the status quo and the initial efforts should focus specifically on:
   - the cyclic fatigue questions,
   - leak before break issues, and
   - internal pig inspection technology and methodology.

3. Regulatory code and standard revisions must be undertaken (many have already been mandated under legislative acts such as the Pipeline Safety Act of 1992) which specifically include 1) mandated internal inspections and inspection intervals; 2) the application of class areas to hazardous liquid pipelines; 3) the implementation of isolation valving requirements; and 4) the compensation for fatigue effects on the pipelines through a change in operating parameters (e.g., reduction in operating pressure) or construction requirements.

4. The physical regulatory structure must be revised to provide for increased field resources for failure response, investigation and routine inspections, as well as to provide for consistent and adequate technical support (i.e., engineering evaluations and opinions).

5. The system, either through the National Transportation Safety Board or the Office of Pipeline Safety, must provide for more frequent and comprehensive (including more critical) accident analyses. Investigations should be made a priority and should be conducted under a set of established criteria. It is imperative that appropriate investigations with comprehensive findings are conducted on a consistent basis to effectively identify trends and make preventative corrections in system components or operations.
6. Industry and communities must increase site specific release planning. This planning must be done at the state and local levels with support and guidance from the federal government and should include both basic and advanced techniques, including diversion and containment areas, evacuation zones and innovative equipment deployment schemes. Planning should be based on the worst-case scenario as reflected in national experience.

7. State and local codes should be evaluated and strengthened in the areas of land use and dig laws. They should specifically address increased set-backs, restricted development and the use of new technology for identifying line locations, as well as increased penalties for failure to comply with one-call dig regulations.

8. Increased public participation in the Office of Pipeline Safety's newly implemented risk assessment process must be encouraged. This should go beyond the simple publication of a notice in the Federal Register to an active outreach program in communities through which the pipelines traverse.

9. Last, but certainly not least, there must be a change in attitude in all of us; industry, government and the public. We must not accept the status quo. We must challenge industry to find new and better solutions to making the system safer through design, construction, maintenance, repair, inspection and oversight. We must anticipate that with aging systems in the ground we will be confronted with new problems. We must be prepared to realize this, accept it and act upon it. We must move from response (reactive) to prevention (proactive).

Fairfax County, and we hope other jurisdictions having pipelines or responsibilities for pipelines, is prepared and committed to participating in what is hoped to be a new and better process for confronting and solving the issues of pipeline safety currently facing the industry. We are willing and committed to sharing any and all of our information, insights and experiences with those who share our desires to reduce and ultimately prevent significant releases from hazardous liquid and natural gas pipelines.
<table>
<thead>
<tr>
<th>Design Code</th>
<th>Applicability of Design Code</th>
<th>Minimum Wall Thickness (inches) for Pipe Made of X-52 and Operated at 700 psi for 100°F</th>
<th>Critical Crack Size (inches) for 36&quot; Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ANSI B31.1, 1992</td>
<td>Piping Design Code for Power Plants, Boilers, Etc.</td>
<td>0.709</td>
<td>15.7</td>
</tr>
<tr>
<td>2 ANSI B31.3, 1993</td>
<td>Piping Design Code for Chemical Plants and Petroleum Refineries</td>
<td>0.519</td>
<td>10.0</td>
</tr>
<tr>
<td>3 ASME Boiler and Pressure Vessel Code, Section III, Subsection NC, 1992</td>
<td>Non-Reactor Piping in Nuclear Power Plant</td>
<td>0.709</td>
<td>15.7</td>
</tr>
<tr>
<td>4 ANSI B31.8, 1975</td>
<td>Natural Gas Transmission and Distribution Piping</td>
<td>0.606</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>(populated areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.337</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>(uninhabited areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 AWWA M11</td>
<td>Steel Water Pipe</td>
<td>0.485</td>
<td>9.0</td>
</tr>
<tr>
<td>6 ANSI B31.4, 1979</td>
<td>Liquid Petroleum Transportation Piping</td>
<td>0.337</td>
<td>4.4</td>
</tr>
</tbody>
</table>

*Note: The longer the critical crack size is, the more margin or more fault tolerance the piping system has before the piping ruptures catastrophically; therefore, one has a reasonable chance finding and fixing a "leak before rupture."


Figure 2A

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-7
## Minimum Wall Thickness for 36" Diameter Pipe as Required by Various Design Codes and Resulting Critical Crack Size

<table>
<thead>
<tr>
<th>Design Code</th>
<th>Applicability of Design Code</th>
<th>Minimum Wall Thickness (inches) for Piping Made of ASTM A333 and Operated at 100 psi (for Design Code Equations)</th>
<th>Critical Crack Size (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ANSI B31.1, 1992</td>
<td>Piping Design Code for Power Plants, Boilers, Etc.</td>
<td>0.709</td>
<td>15.7</td>
</tr>
<tr>
<td>2 ANSI B31.3, 1993</td>
<td>Piping Design Code for Chemical Plants and Petroleum Refineries</td>
<td>0.519</td>
<td>10.0</td>
</tr>
<tr>
<td>3 ASME Boiler and Pressure Vessel Code, Section III, Subsection NC, 1992</td>
<td>Non-Reactor Piping in Nuclear Power Plant</td>
<td>0.709</td>
<td>15.7</td>
</tr>
<tr>
<td>4 ANSI B31.8, 1975</td>
<td>Natural Gas Transmission and Distribution Piping (populated areas)</td>
<td>0.606</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>Liquid Petroleum Transportation Piping (inhabited areas)</td>
<td>0.337</td>
<td>4.4</td>
</tr>
<tr>
<td>5 AWWA M11</td>
<td>Steel Water Pipe</td>
<td>0.485</td>
<td>9.0</td>
</tr>
<tr>
<td>6 ANSI B31.4, 1979 (same as 49 CFR, Ch. 1, Part 195.106)</td>
<td>Liquid Petroleum Transportation Piping</td>
<td>0.337</td>
<td>4.4</td>
</tr>
</tbody>
</table>

*Note: The longer the critical crack size is, the more margin or more fault tolerance the piping system has before the piping ruptures catastrophically; therefore, one has a reasonable chance finding and fixing a "leak before rupture."


---

Figure 2A
### Maximum Allowable Pressure and Critical Crack Size for 36" Diameter, Pipe as Required by ANSI B31.4 (Liquid Petroleum Transportation Piping) and ANSI B31.8 (Gas Transmission and Distribution Piping Systems)

<table>
<thead>
<tr>
<th>Design Code</th>
<th>Applicability</th>
<th>Maximum Allowable Pressure (MAP), psi API 5LX-5Z</th>
<th>Critical Crack Size at MAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME B31.4</td>
<td>All Locations</td>
<td>649</td>
<td>4.2</td>
</tr>
<tr>
<td>(Liquid Petroleum Piping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASME B31.8</td>
<td>Class 1 Locations: Wastelands deserts, mountains, grazing land, farmland</td>
<td>649</td>
<td>4.2</td>
</tr>
<tr>
<td>(Natural Gas Piping)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Class 2 Locations: Fringe areas around towns, industrial areas, ranch or country estates</td>
<td>541</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>Class 3 Locations: Suburban housing developments, shopping centers, residential areas, hospitals, schools or places of public assembly</td>
<td>451</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Class 4 Locations: Multi-story buildings, four or more floors above ground; heavy traffic, numerous other utilities underground</td>
<td>361</td>
<td>9.6</td>
</tr>
</tbody>
</table>
June 15, 1994

Ms. Ana Sol Gutiérrez
Acting Administrator
Research & Special Programs Administration
U. S. Department of Transportation
400 Seventh Street, S.W.
Washington, D. C. 20590

Re: Pipeline Safety Summit

Dear Ms. Gutiérrez:

On behalf of the City Council of the City of Fredericksburg, I would like to express the City's appreciation for having been invited to participate in the Pipeline Safety Summit being held in Newark, New Jersey, on June 20, 1994. Although a previous commitment prevents me from attending the conference, the City will be represented by a member of my staff, Mr. Tracy Morethamp.

There are several comments that the City would like to share with you and the other participants regarding the issue of public participation in the pipeline regulatory process. First, the very fact that this Summit is taking place and that the City has been invited to participate appears to represent a commitment on the part of the Office of Pipeline Safety ("OPS") to reach out to localities that have been seriously affected by pipeline accidents and to promote greater public participation in OPS proceedings. We are hopeful that the Summit marks the beginning of such a trend.

Second, allow me to relate briefly some of our recent pipeline misfortunes. Fredericksburg has the dubious distinction of being one of the few municipalities in the country to have twice experienced public water supply emergencies due to oil pipeline accidents. In 1980 and again in 1989, a 32-inch interstate pipeline operated by Colonial Pipeline Company ruptured near Locust Grove, Virginia, contaminating the Rappahannock River and the City's raw water supply. In each case, the City's water treatment plant was shut down for more than a week, emergency conservation measures instituted, and water hauled from neighboring jurisdictions to meet demand.

In the aftermath of the 1989 spill, the City resolved never again to suffer a third accident from this still-hazardous pipeline. Over the past four years, the City has learned a great deal about pipeline safety issues, the operations of OPS and pipeline operators, and the need for greater public awareness of the risks posed by gas and liquid pipelines. We have petitioned the Virginia General...
Assembly, OPS, NTSB, and Congress for redress of our particular problems with Colonial but little has been accomplished.

In short, it has been an extremely frustrating process. Like OPS, the City is a governmental body committed to protecting its citizens and the environment from pipeline accidents. But it has been both shocking and disheartening to discover that pipeline accident victims such as the City have no legal standing before OPS, have limited remedies in the courts, and have to fight continuously just to obtain basic information and documents from OPS about its enforcement efforts.

Experience has convinced us that the single most effective step that the federal government could take today to improve pipeline safety would be to enhance the rights of pipeline accident victims before OPS and in the courts. We would like to suggest five (5) specific steps that should be taken to accomplish this goal:

1. **Task Force on Public Participation** - OPS should immediately appoint a special advisory task force on public participation in agency proceedings. This group should include representatives of state and local governments, industry, and other interested parties. The task force would be charged with developing a plan to continue the outreach effort represented by this conference and to devise ways to empower local communities and private citizens to improve the federal regulation of pipelines and protection of the environment.

2. **Public Notice and Comment on Proposed Enforcement Actions** - OPS should promulgate regulations requiring a 30-day public notice and comment period prior to the imposition of any non-emergency hazardous facility order, consent order, voluntary testing plan arising out of a pipeline accident, or similar enforcement-related order. Notices should be published in newspapers of general circulation in every locality affected by a pipeline accident. These notices would alert citizens that OPS was considering enforcement action and would enable them to share their experiences and expertise with OPS prior to final agency action.

3. **Public Participation in Agency Proceedings** - OPS should consider issuing regulations that would allow interested parties to participate formally in certain agency proceedings. For example, a local government that has suffered a pipeline accident should be allowed to petition the agency to intervene in related enforcement proceedings and thus receive notices of agency hearings, gain the right to submit comments, and attend hearings. Such a procedure would eliminate the present ad hoc system whereby affected parties are forced to besiege OPS, either directly or through their elected officials, in order to make themselves heard.

4. **Community Outreach Officers** - OPS should hire additional staff to serve as community outreach officers in the aftermath of pipeline accidents. Just as EPA designates on-site coordinators for major environmental accidents, so should OPS take the initiative and contact affected state

---

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-12
and local government agencies involved in responding to pipeline accidents. These outreach officers could also conduct educational programs, respond to citizen inquiries, and serve as permanent liaisons for intergovernmental relations.

5. **Expand Citizens' Legal Remedies Against Violators** — Congress should amend the two federal pipeline safety statutes to provide meaningful citizen suit remedies for aggrieved pipeline accident victims. To my knowledge, no citizen suit has ever been successfully brought under current law to enforce either the gas or hazardous liquid safety acts. If pipeline operators feared private citizens' suits when they violated the law, OPS would have a far easier time securing voluntary compliance with its regulations.

In our view, these five measures would go a long way toward restoring public confidence in DOT's efforts to prevent and minimize the effects of pipeline accidents. The City of Fredericksburg stands ready and willing to provide additional information on these proposals and to assist in your timely efforts to improve pipeline safety in this country.

Thank you again for this opportunity to participate in the Pipeline Safety Summit.

Sincerely,

[Signature]

James N. Bates

cc: Marvin S. Bolinger, City Manager
    Mayor Lawrence A. Davies
    Members of City Council
    Sen. Charles S. Robb
    Sen. John W. Warner
    Rep. Philip P. Sharp
    Rep. Herbert H. Bateman
    William J. Leidinger, Fairfax County Executive
June 14, 1994

Mr. George Tenley, Jr.
Associate Administrator
for Pipeline Safety
Research and Special Programs
Administration
Department of Transportation
Room 8321
400 7th Street S.W.
Washington, D.C. 20590

Re: Pipeline Safety Summit
Issue Paper

Dear Mr. Tenley:

This letter serves as Lone Star Gas Company's issue paper submitted in response to the request for same as requested in the June 8, 1994 Federal Register. Lone Star is an intrastate pipeline company operating transmission and distribution facilities throughout the State of Texas. Lone Star operates more than 32,000 miles of interconnected natural gas pipeline which transports and distributes natural gas to approximately 1.25 million residential, commercial, industrial and electric generation customers within the State of Texas. With respect to pipeline safety, Lone Star is regulated by the Railroad Commission of Texas, an approved agency of the RSPA. Therefore, Lone Star is directly interested in the initiatives of this pipeline safety summit and appreciates the opportunity to submit this brief issue paper.

It is Lone Star's position that the single most important issue that the summit attendees can address that will optimize public safety and protect the environment is the implementation of a one-call system. However, in order to be workable, the one-call system must require that all underground facility owners are members of the one-call system and that all excavators, with the exception of excavators who engage in emergency excavation, call the one-call center prior to beginning their excavation. Because all underground facility owners should be members of the one-call system and all excavators should be required to timely notify the

---

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-14
one-call system, this improvement to public safety cannot be
crafted solely by the DOT because a workable one-call system will
exceed the jurisdictional authority of DOT. The summit attendees
should focus on this needed improvement to enhance public safety
and protect the environment and join in supporting federal
legislation that mandates state one-call systems that require all
underground facility owners be a member of a one-call system and
require all excavators to timely notify a one-call center.

Again, thank you for the opportunity to submit this brief
issue paper.

Yours truly,

[Signature]

ELLEN WEAVER

ETW:js
INTRODUCTION

The American Gas Association (A.G.A.) is a national trade association comprising approximately 275 natural gas distribution and transmission companies throughout the United States, Canada and Mexico. These firms deliver gas energy from the wellhead and various unconventional sources to the burner tip, serving over 56 million customers. Collectively, 90 percent of the natural gas consumers in this country are served by A.G.A. members. A.G.A. appreciates the Department of Transportation Research and Special Programs Administration’s efforts to enhance pipeline safety and reduce the risk to the environment associated with pipeline transportation. This Pipeline Safety Summit provides an opportunity for the natural gas industry to demonstrate publicly its unsurpassed safety record.

Natural gas delivered to the consumer by buried pipeline continues to be the safest source of energy. Moreover, the safety of the public is the number one concern of the natural gas industry, with nearly $4 billion dollars spent annually and millions of man-hours of effort to ensure that the pipeline system is operated safely. About $1 in $4 spent by the gas industry for operation and maintenance is for purposes directly related to public safety. This translates into $70 of the average customer’s annual gas bill going for safety-related costs, more than is paid in dividends to shareholders.

NATURAL GAS PIPELINES ARE SAFE COMPARED WITH OTHER ENERGY TRANSPORTATION MODES

The 1.5 million mile natural gas pipeline network delivers energy to over 56 million homes and businesses in the U.S., representing about 25 percent of U.S. energy consumption. The unsurpassed safety record of the gas industry demonstrates that natural gas delivered by buried pipeline is the safest mode of delivering energy to the consumer. According to government statistics, compared with other alternative energy transportation methods, it delivers energy with the least adverse impact on the public and the environment. To deliver the same amount of energy by rail results in about 20 times more public fatalities than gas pipelines, while electric transmission causes about 10 times more. To put this in perspective, the capacity to deliver energy through a 36 inch natural gas pipeline operating at 1000 psig is roughly equal to one million rail cars of coal/year or one Exxon Valdez-size oil tanker per week.

Moreover, there has been an overall downward trend in the number of injuries/fatalities resulting from gas pipeline incidents since 1970. While the numbers fluctuate from year to year, there has been a significant decrease in injuries from gas incidents from around 400 in 1970 to around 60 in 1989. These figures are indicative of the fact that the natural gas pipeline system is not deteriorating, but actually becoming safer over time.

PIPELINE SAFETY INITIATIVES

The natural gas industry has been complying with codes and standards predating the 1970 Department of Transportation pipeline safety regulations. The natural gas industry developed the concept of class locations, which measure population density and require increasingly stringent design and inspection as population increases.

Regulation of the pipeline industry is a careful balance between the public demand for reasonably priced gas energy and protection from accidents. In recent years, expensive new regulatory
proposals are hastily conceived in the aftermath of a pipeline accident. The cost to implement of the proposals would run into billions of dollars. Usually overlooked in the debate are two

1) The consumer will ultimately bear this expense with little or no gain to the public interest, more importantly,

2) The higher price of gas will cause some consumers to switch to other, more hazardous, less environmentally sound, energy sources.

Moreover, many of these regulations do nothing to address the leading cause of pipeline incidents, outside force damage, also known as “third-party damage”. In the over 20 years that DOT has been collecting reports of pipeline incidents, two-thirds of all reported incidents were due to damage caused by an outside force. It is the most difficult for gas industry managers and government pipeline safety authorities to address because neither has direct control over the action of third parties.

One Call Systems

One-call systems, where an excavator can call to have the location of all buried utilities in the vicinity of the work marked by utilities is a proven, effective method for reducing dig-ins. However, many one-call systems suffer from one or more of the following limitations: Not all utilities participate; some excavators may be exempt, such as state and local governments; penalties on violators are not enforced; and, often the public is not aware of the availability of the system or the dangers of digging without first having lines marked. A.G.A. believes that significant improvements in public safety near natural gas pipelines can only be achieved by strengthening damage prevention programs. Therefore, it is the gas industry’s goal to have every square inch of the U.S. covered by, and the public aware of, one-call systems that include all utilities, as well as to exempt no excavators and penalize violators.

On June 1, A.G.A.’s Board of Directors reiterated its longstanding support for one-call systems by unanimously passing the following resolution:

RESOLVED:

Whereas, natural gas pipelines have an outstanding safety record;

Whereas, outside force damage has caused two thirds of reportable incidents on natural gas pipelines since 1970;

Whereas, one-call systems can be effective in minimizing outside force damage; and

Whereas, existing one-call systems could be more effective if one-call could notify all operators, all excavators were required to use it, penalties were enforced for not using the one-call and the public were aware of these services.

Therefore, A.G.A. supports a comprehensive national damage prevention program, including,

1. Mandatory participation in one-call systems by all operators of buried facilities;
2. Mandatory use of the one-call by all excavators;
3. Penalties for not following one-call procedures; and,
4. Increased public awareness and educational programs to alert excavators of the availability and importance of the one-call.
Use of Remote- or Automatic-activated Valves

The accident in Edison has rekindled interest in technologies to shorten the delay between the moment a transmission pipeline ruptures and when block valves can be closed to stop the flow of gas into the ruptured line section. Two options frequently discussed are remotely-activated valves and automatically-activated valves. Automatic valves are designed to close automatically when flow rate pressure drop, or some other physical parameter measured at the valve falls outside predetermined normal limits. Remote valves can be closed from the pipeline control room miles away from the valve when the gas controller confirms that a rupture has occurred. Both types of valves have merit and have been used by pipelines under limited circumstances however, the benefit of widespread use of these technologies is questionable. Since natural gas is a compressible fluid, isolating the ruptured line section will not immediately stop the flow of gas from the leak; over 20 million cubic feet of gas must escape from a 36 inch, 1000 psig 8 mile pipeline section before it reaches atmospheric pressure. With Edison being the notable exception, almost all damages from a pipeline rupture occur in the first few minutes after the leak occurs and would not be significantly reduced by rapid closure of valves.

In addition, the reliability of automatic and remotely activated valves is a major concern. False closures could be caused by sudden changes in the parameter sensed by an automatic valve, or by spurious telemetry signals to a remotely-activated valve. Installing remote- or automatic-activated valves we estimate would cost from $80,000 to $250,000 per valve with dubious potential to reduce damages.

Instrumented Internal Inspection Devices (Smart Pigs)

Smart pigs are a promising technology for detecting certain types of metal loss, typically corrosion defects, before they jeopardize pipeline integrity. Corrosion is responsible for about 12 percent of natural gas pipeline incidents reported to DOT since 1970 and fewer than 10 percent of reported fatalities from pipeline accidents. Therefore, it is significantly less of a problem than third party damage. The expense involved in rebuilding pipelines to accommodate smart pigs and then running smart pigs is very large. A 1992 DOT study estimates that it will cost over $4 billion just to modify natural gas transmission lines to allow smart pigs to pass through the pipe. Costs to run magnetic flux leakage pigs, the current technology for smart pigs, ranges from $1000 to $4000 per mile, according to a 1986 study by the Pipeline Research Committee.

DOT is developing rules required by the Pipeline Safety Act of 1992 to require periodic inspection of natural gas pipelines in heavily populated areas. Pipeline operators already take steps to reduce the risk of accidents in populated areas; lines are operated at no more than 50 percent of design pressure and leakage surveys and patrols occur more frequently. These current actions have been effective in minimizing the risk of corrosion-caused accidents, as evidenced by DOT's incident report data. This data shows that there have been no deaths or injuries from corrosion-caused transmission line failures in populated areas over the last 10 years.

The natural gas industry continues to commit R&D resources to improve smart pig technology. Earlier this year, the Gas Research Institute broke ground on a new non-destructive testing research center at Battelle. Between GRI and the Pipeline Research Committee, the industry will spend nearly $24 million over the next two years on non-destructive testing.

In sum, neither remote or automatic valves, nor smart pigs has the potential to significantly improve upon the already outstanding safety record of natural gas pipelines. Only actions to prevent third party damage have potential for significant improvement to pipeline safety.
June 17, 1994

Honorable Phil Sharp
Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
U.S. House of Representatives
Washington, D.C. 20215

Dear Chairman Sharp:

In response to a natural gas pipeline rupture last March in Edison, New Jersey, the Energy and Power Subcommittee will hold a hearing on pipeline safety on June 23. The National Transportation Safety Board's preliminary investigation has indicated that this accident was caused by an excavator striking and damaging the pipeline.

Department of Transportation records clearly show that since 1970, over 60 percent of all pipeline accidents have been attributed to "third-party" or "outside force damage." This is why A.G.A. and INGAA strongly support legislation establishing federal minimum standards that require states to provide that all underground facility operators and excavators to participate in "call-before-you-dig" programs. We also endorse statewide coverage, appropriate penalties for non-compliance and the development of a single, easy-to-remember nationwide telephone number.

We applaud the introduction of H.R. 4394, the "Comprehensive One-Call Notification Act of 1994," introduced by your colleague, Representative Frank Pallone, D-New Jersey. We are working hard to forge the necessary consensus to allow this legislation to move forward. As time is limited, we urge expeditious consideration and passage of a comprehensive, mandatory one-call bill this Congress.

While there are well-run mandatory one-call programs currently in place in many states throughout the country, some areas lack one-call coverage or have programs in which participation is voluntary. We support maintaining effective existing one-call programs, and envision the federal role as providing guidance and incentives to the states, enforcement assistance, and public awareness resources. With this backing, states can strengthen and supplement the existing one-call programs operating within their boundaries.
Together, INGAA and A.G.A. represent over 300 natural gas pipeline and distribution companies in North America. Our members transport and deliver over 90% of the natural gas used in the United States. Safety is our highest priority. Our member companies spend almost $4 billion annually on safety programs and research. Our commitment to safety over the years is well documented, and the industry's overall record has been excellent.

Enclosed is an A.G.A.-INGAA background and position paper on comprehensive one-call legislation. We look forward to working with you as this legislation progresses. If you have any questions about this issue or any other concerning our industry. Please, do not hesitate to contact us.

Sincerely,

Mike Baly

Michael Baly III
President, A.G.A.

Jerald V. Halvorsen
President, INGAA
One-Call Legislation Should Be Passed by Congress This Year,
Natural Gas Transmission, Distribution Associations Say

WASHINGTON—The trade associations representing the nation's natural gas transmission and distribution companies said today they are working toward passage of mandatory one-call legislation in the current session of Congress.

Jerald V. Halvorsen, president of the Interstate Natural Gas Association of America (INGAA), and Michael Baly III, president of the American Gas Association (A.G.A.), said in a letter to members of the House Energy and Power Subcommittee that the two associations are "working hard to forge the necessary consensus to allow this legislation to move forward."

The subcommittee is scheduled to hold a hearing on one-call legislation June 23. One-call bills would set federal standards to require states to establish "call before you dig" programs covering all underground-facility operators and excavators.

"As time is limited, we urge expeditious consideration and passage of a comprehensive, mandatory one-call bill this Congress," Halvorsen and Baly said.

The trade association presidents applauded the introduction of H.R. 4394, a one-call bill sponsored by Rep. Frank Pallone (D-N.J.).
Department of Transportation records "clearly show that since 1970 over 60 percent of all pipeline accidents have been attributed to 'third-party' or 'outside force' damage," Halvorsen and Baly said.

"This is why A.G.A. and INGAA strongly support legislation establishing minimum standards that require states to provide that all underground-facility operators and excavators participate in 'call before you dig' programs," the association presidents said. "We also endorse statewide coverage, appropriate penalties for noncompliance and the development of a single, easy-to-remember nationwide telephone number."

The letter from INGAA and A.G.A. said, "While there are well-run mandatory one-call programs currently in place in many states throughout the country, some areas lack one-call systems or have programs in which participation is voluntary."

"We support maintaining effective existing one-call programs, and envision the federal role as providing guidance and incentives to the states, enforcement assistance and public awareness resources," Baly and Halvorsen said. "With this backing, states can strengthen and supplement the one-call programs currently operating within their boundaries."

A.G.A. and INGAA represent over 300 natural gas pipeline and distribution companies in North America. The associations' members transport and deliver over 90 percent of the natural gas used in the U.S.

###
Background

Natural gas transmission and distribution companies have long been supporters of effective, comprehensive programs to help prevent damage to underground facilities, such as natural gas pipelines. Almost two-thirds of all damage to pipelines is caused by a "third-party" or an "outside-force". This type of damage typically results from excavation or demolition activities. The primary tool for protection of all underground facilities, not just pipelines, from this type of damage is the "one-call system".

One-call systems work as follows: 1) an excavator calls the appropriate one-call center to inform them of a planned excavation or demolition activity; 2) the one-call center notifies the participating operators of the underground facilities of the impending excavation; and 3) the facility operators locate and mark their facilities prior to excavation. These systems are primarily funded by underground facility operators.

The ideal one-call system safeguards all excavators, all underground facilities and the public from incidental or deliberate damage to underground facilities. Presently 49 states have some degree of one-call coverage and excavator participation. However, not all states require all excavators and all underground facility operators to participate, nor provide for statewide coverage nor have an effective enforcement program.

Industry Position

The natural gas transmission and distribution industries support passage of legislation to encourage the development and implementation of comprehensive, mandatory one-call systems in every state. Such legislation should embody the following principles:

- Federal legislation should set performance-based standards for states and provide incentive for states to adopt such standards. States should pass laws providing for comprehensive one-call systems but should be given the flexibility to determine the details of each state system. The systems should not be operated by government. Government's role should focus on providing guidance, enforcement and public awareness.

- Legislation should not weaken or replace effective one-call systems already in existence, rather it should serve to strengthen and supplement these systems.

- The systems should be easy to use and accessible from anywhere in the country.

- All underground facility operators/owners should be required to participate.

- All excavators, including state and municipal Departments of Transportation, should be required to call prior to excavation or demolition activities.

- States should establish workable and flexible penalty and enforcement programs. Such programs should emphasis giving notice prior to excavation or demolition. The programs should also emphasize the need to notify the facility operator in the event of accidental damage by allowing waivers or reduction of penalties for these situations.

- Effective, nationwide public safety awareness programs must be implemented to educate the public on the benefits of using one-call systems before digging.
Tenneco Gas

June 14, 1994

Ms. Ana Sol Gutierrez
Acting Administrator
Research and Special Programs Administration
U. S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

Dear Ms. Gutierrez:

Thank you for inviting me to the Department’s Pipeline Safety Summit on June 20, 1994. Unfortunately, I will be unable to personally attend, but our Company will be appropriately represented by Mr. Dave McNeil, Vice President, Technical Services, Mr. John Zurcher, Director, Pipeline Services and Mr. Richard Irby, of our Washington Office. Additionally, Tenneco Gas has enclosed a short paper for consideration by you and the distinguished panel of experts assembled for this meeting. So that we might gain full benefit from this occasion, Tenneco Gas asks that any journal or record of this Summit be made available to industry members for their study.

The enclosed paper treats what Tenneco Gas considers to be THE single important unresolved legislative and regulatory issue affecting pipeline safety. Excavation damage consistently causes about half of the serious pipeline incidents, and accounts for most resulting deaths and injuries. Pipeline industry efforts to resolve this problem have already accomplished all that is possible until Congress and certain Federal Agencies establish a simple nationwide one-call telephone number and take steps to cause the participation of ALL underground facility operators in adequate one-call systems. Following the establishment of a single one-call number to reach the operators of all underground facilities, a nationwide public awareness/excavation safety program will be necessary to virtually eliminate this cause of casualties and property damage.

We believe that the strategic direction our Pipeline Safety program should take is clear and hope the Summit concurs.

Sincerely,

G. R. Abel
Vice President, Operations

cc: Ms. Whetsel
R.S.P.A. Room 8321
PREVENTING EXCAVATION DAMAGE TO PIPELINES

Each year, owners of underground facilities suffer tremendous losses as the result of improper and often irresponsible excavation practices. When pipelines are involved, the excavator and innocent parties may suffer great property damage and serious injury or death. The greatest part of this waste could be easily eliminated by several related programs. In order to significantly reduce these injuries and damage, the following proposals should be implemented.

PROPOSAL - Establish a simple, easily remembered, nationwide telephone number reserved and dedicated for requesting the location of underground facilities when powered excavation equipment is used.

RATIONALE - Many current one-call centers have different telephone numbers, often overlap each other's territory, and excavators sometimes have difficulty contacting the proper center. Advertising of telephone numbers together with public awareness and excavation safety messages are being done separately by each center when they are done at all. Conflicting and confusing messages keep such programs from being effective.

PROPOSAL - Enact Federal legislation encouraging states to follow a consistent set of standards in establishing and administering "Underground Facility Damage Prevention Programs," including requirements and performance standards for one-call systems and for public awareness/excavation safety programs.

RATIONALE - Nationwide promotion of excavation safety and one-call systems will be most effective if programs in all states operate under a consistent set of standards.

PROPOSAL - Federal standards should establish meaningful penalties for failing to call a one-call center before digging with power equipment, and must stipulate severe penalties for excavators who damage underground facilities and fail to immediately notify the operator or the one-call system.

RATIONALE - Damage can often be prevented from progressing to a more serious situation if the operator is notified as soon as the damage occurs.

PROPOSAL - Federal standards should mandate the participation in a one-call system for ALL operators of underground facilities on public property or property that is not under their control.

RATIONALE - Most excavation is done by or is under the
control of underground facility operators. Failure to protect their own facilities by participation in a one-call system indicates that an operator lacks appreciation for the seriousness of excavation damage. Such an operator is likely to dig without calling the one-call center to locate underground facilities that may be in conflict with his excavation plans. Participants are much more likely to fully support the one-call program by calling in each of their excavations and awaiting proper location marking by other operators.

PROPOSAL - Various Federal Agencies should determine how they might promote the "Protection of Our Nation's Valuable Underground Infrastructure" through promulgation and enforcement of regulations in their areas of interest. Such programs might include conditions on the funding of highway activities, public works, and Federal communication systems. Agencies such as OSHA might encourage the use of one-call and excavation safety programs to protect the excavator's employees.

RATIONALE - Many municipal and state agencies object to mandatory participation in one-call and damage prevention programs, calling them too expensive. Much of this objection results from a present lack of adequate records and the agency's inability to easily find their facilities when contacted by excavators. The consistency offered by a Federal mandate is necessary to resolve this problem.

Establishing a simple nationwide number such as 344 (which is DIG on most phones) and a consistent set of rules for one-call systems will set the stage for a nationwide advertising/public awareness campaign focusing underground facility awareness information to the general public and excavation safety information at even the most infrequent user of power excavation equipment. The minimum acceptable effectiveness of these campaigns should also be established in the Federal standards.

Federal legislation and regulation should stop short of specifying how each state is to set up its one-call systems or how the information campaigns are to be carried out. Different states have differing needs and problems. The federal efforts to establish consistency must be limited to a mandated level of performance or results.
Research and Special Programs Administration  
400 Seventh Street  
Washington, D.C. 20590-0001  

Re: Pipeline Safety Summit  
Issue Papers

Enron Operating Company (EOC), an operating unit for Enron Corporation, is responding to your invitation for issue papers to be distributed at the June 20th Pipeline Safety Summit. This response is in behalf of the Enron Corp. natural gas transmission companies. These include Transwestern Pipeline, Northern Natural Gas, Houston Pipe Line, and Florida Gas Transmission. These companies operate nearly 30,000 miles of pipeline subject to the federal pipeline safety regulations and are vitally interested in enhancing pipeline safety.

The pipeline industry has an excellent pipeline safety record, a record that is not approached by any other sector of the energy industry. We now have a unique opportunity to further improve that safety record. Enron wishes to give added visibility to the largest problem facing the pipeline industry today, that being damage to the pipelines by outside forces. Outside force damage cost the pipeline industry, and subsequently their customers, more than $3.5 million in 1993. There were 161 reportable incidents caused by outside force damage, resulting in 35 injuries and 8 fatalities.

The solution to this insidious problem is known by all of us! Comprehensive mandatory one-call systems in all of the states will, over a period of time, eliminate outside force damage as a serious pipeline safety problem. The time to act is now! Legislation is required to provide for mandatory one-call systems. Even though the Edison incident was tragic, it is another example of the seriousness of outside force damage to pipeline systems, and has provided the catalyst needed to enact the required legislation. Enron is committed to providing all possible support to assure that legislation requiring mandatory one-call systems is enacted.

Thank you for the opportunity to express our views on this very important issue.

Respectfully submitted,

Dale L. Coates  
Director, Codes and Standards

Prepared by the Institute for Transportation at New Jersey Institute of Technology  
B5-27
The Honorable Fredrico Peña, Secretary  
U.S. Department of Transportation  
Room 10200  
400 Seventh Street S.W.  
Washington, DC 20590

Dear Mr. Peña:

DOT PIPELINE SAFETY SUMMIT  
Newark, NJ, 20 June 1994

I was pleased to be able to participate in the subject meeting, and in particular to hear about the high priority that you and Senator Lautenberg place on pipeline safety. This letter responds to the invitation that the Senator extended to the attendees of the summit meeting to provide comments and suggestions relative to that topic to you.

While pleased at the wide range of sincere expressions of interest and concern for pipeline safety that I heard, I was nonetheless disappointed by the lack of attention given to the need for further research that could mitigate the problem. Given that roughly half of all pipeline failures are caused by damage imposed by third parties, the need for "one call" systems is obvious. However, this still leaves a sizeable potential for research that can help to eliminate pipeline failures that are unrelated to third party intervention.

The obvious approach to eliminate pipeline failures due to general corrosion, stress corrosion cracking, weld defects, improper design and repair procedures, and other such causes is in-line inspection. However, it should be understood that no inspection can be effective in the absence of accurate knowledge of the critical size, shape and location of the various types of damage that can trigger failures. Obviously, inspections focused on damage sizes well above critical are useless. Performing inspections that can detect damage states that are far below critical is wasteful of resources, and can also be harmful if such findings engender unneeded repairs that introduce truly serious flaws.

It is in the area of connecting in-line inspection to the criticality of damage that I believe research is particularly needed. The methodologies that now exist to quantify critical states of damage in pipelines are empirically-based and, hence, do not have the theoretical basis that is needed. In addition, there is still a need for procedures whereby a "second line of defense" can be instituted to defeat third party impact damage when one-call does not work as it should. I refer to the development of impact-resistant pipe in new construction and remedial measures such as crack arresters in existing pipe.
I do not intend to lobby here to promote opportunities for my organization. Rather, my suggestion to you—drawn from the above considerations—is simply that you follow your generally successful summit meeting with a more specialized meeting on research needs. Such a meeting could be aimed at achieving a consensus on the specific topics for which further research could be most effective in enhancing pipeline safety.

I believe that such a meeting needs to have the participation of gas industry engineers, the regulatory agencies, and a cross section of those research specialists who have actively contributed to the body of pipeline safety knowledge. To help maximize this participation, I humbly suggest that such a meeting be held in South Texas. If you, RSPA and OPS agree, we at the Southwest Research Institute would be pleased and honored to be allowed to host such a meeting at our Institute.

Regardless of venue, we stand ready to assist you and your associates in this or any other way in effectively and promptly addressing this critical national issue.

Sincerely,

M. F. Kanninen
Vice President and Director
Structural Systems and Technology Division

MFK/lis
B:4/05294/w60

cc: Senator Frank Lautenberg
July 20, 1994

Mr. George W. Tenney, Jr.
Associate Administrator
Office of Pipeline Safety
Research & Special Programs Administration
U. S. Department of Transportation
400 7th Street, S.W.
Washington, D.C. 20590

Dear Mr. Tenney:

Colonial Pipeline Company commends the Department of Transportation, the Research & Special Programs Administration and the Office of Pipeline Safety for their efforts in convening the Pipeline Safety Summit in Newark, New Jersey, on June 20, 1994.

Representatives of Colonial attended this meeting and we were impressed with the degree of commitment expressed by the Secretary and other members of the DOT, particularly with respect to the industry's efforts to minimize the incidents of third party damage to its facilities. Responding to the announcement that the record will be kept open for comments until July 20, 1994, Colonial Pipeline Company requests that these comments be made a part of the record of the proceedings.

Despite the numbers involving third party damage that were quoted by some of the participants, we believe that the seriousness and the incidence of third party damages, particularly on hazardous liquid pipelines, is understated. Our own experience over the past ten years is that, where a release of product exceeding 50 bbls. occurred from line pipe, nearly 80% of the incidents were the result of third party damage.

In addition, we have experienced many incidents where a third party has damaged a line to the extent that it required repair but since no leak occurred the "incident" was not reported. Some of these incidents have been discovered after the fact by Colonial inspection techniques and some have been reported by contractors immediately after striking the line.

It is our opinion that in pipelines such as ours which have corrosion pigging programs in place and that are aggressively maintaining cathodic protection systems, third party damage is the overwhelming cause of failures to line pipe. We feel strongly that third party damages can best be minimized by incentives to limit the incidence of unauthorized excavation on our right-of-ways rather than by schemes to discover the damage after it has occurred. We urge the adoption of our proposals to achieve these objectives.
Mr. George W. Tenley, Jr.
Office of Pipeline Safety

July 20, 1994

(1) Excavators who violate one-call regulations should be assessed civil penalties whether or not the unauthorized excavation resulted in damage to underground facilities. One-call regulations must apply to all excavators, both private and government entities.

Consistent enforcement of regulations as is done in local automobile traffic is the only way to ensure compliance in the long run.

(2) In instances of clear third party damage which results in a release of product regulations should allow for penalties to be assessed on the perpetrator rather than the operator.

(3) Contractors working on pipeline easements should be required to demonstrate financial responsibility and pipeline operators should have available to them injunctive relief in the event that a contractor cannot demonstrate such financial responsibility.

We have had a number of unhappy experiences wherein contractors have few or no assets and inadequate liability insurance which usually includes a pollution exclusion. It is unfair to leave pipeline operators holding the bag under these circumstances over which we presently have very little control.

(4) Local authorities should be encouraged to consider utility easement encroachments when approving development plans.

Being cognizant of utility easements, establishing transportation corridors and approving development plans that try to minimize crossings and construction in these corridors could greatly reduce the number of opportunities for third party damage to occur to underground utilities.

We thank you for the opportunity to present these concepts and look forward to continue working with the DOT to address the hazards of this most common threat to trunk pipeline systems.

Sincerely,

D. R. Brinkley

FAXED 7/20/94
July 8, 1994

Research and Special Programs Administration
U.S. Department of Transportation
Attn: Cheryl Whetsel (Room 8321)
400 7th Street, SW
Washington, DC 20590-0001

Re: Pipeline Safety Summit, Newark, New Jersey
    Issue Papers

Dear Sir or Madame:

Enclosed is Northwest Pipeline Corporation's response to your invitation for brief issue papers for inclusion as appendices in the final report of the above Pipeline Safety Summit.

The Summit was highly successful in highlighting for all stakeholders, the process needed to optimize public safety and environmental protection.

Northwest thanks you for extending the opportunity to attend the Summit and to express our views on the important legislative and regulatory issues affecting pipeline safety.

Sincerely,

[Signature]

James W. Smith
Manager, Safety & Environmental Health
Northwest Pipeline Corporation (Northwest) owns and operates 4000 miles of interstate natural gas transmission pipelines extending from points of interconnection near Ignacio, Colorado, and Blanco, New Mexico through the states of New Mexico, Colorado, Utah, Wyoming, Idaho, Oregon, and Washington to the Canadian border near Sumas, Washington. In doing so, Northwest's paramount concern is the safety of the public and its employees. As such, Northwest appreciates the Department of Transportation, Research and Special Programs Administration's endeavors to enhance the pipeline safety program. Northwest has worked diligently with representatives of State and Western Region Office of Pipeline Safety toward that goal.

In the 10 year period prior to 1984, pipeline failures resulting from outside force damage on Northwest's system, averaged nearly 3 per year. Since 1984, failures resulting from outside force damage have averaged less than one per year. This decrease is in spite of the increased potential for excavation damage stimulated by spreading population and the resulting building boom. We can only conclude that the heightened public awareness brought about by the mid 1980s damage prevention and public education programs and State one-call legislation was a major factor in this reduction.

Unfortunately, leak incident statistics do not tell the whole story. Northwest's pipelines sustain excavation damage that does not result in leaks. These "near misses" require rapid response and costly repairs just the same as if they were line ruptures. During routine pipeline maintenance, Northwest all too often uncovers evidence of pipeline damage that was never reported. These troublesome revelations are a constant reminder of the ever present threat of third party damage and the potential consequences.

For these reasons, we at Northwest believe the current One-Call Notification actions to be the single most important pipeline safety initiative being considered today.

Consequently, Northwest supports a comprehensive national one-call system program that includes:

- Mandatory participation in one-call systems by operators of buried facilities.
- A nationwide dedicated one-call number.
- Mandatory use of one-call systems by all excavators with no exceptions for State and local government agencies.
• Exemptions for agricultural tilling of soil to a depth of 12 inches only.

• A mechanism for excavators to share in the cost of the one-call programs.

• State penalty schemes for non-compliance that are swift and can be increased in cases of repeat and knowing offenders.

• Provisions of public awareness and educational programs that alert potential excavators of the availability, benefits and consequences of non-compliance with the one-call rules.

Northwest subscribes to the philosophy that all accidents can be prevented, and all exposures can be safeguarded. However, this only works with careful planning, education, and a willingness to accept the inherent responsibilities by all those involved. It will not work with hasty reactions to the tragic accidents that do happen, such as has been the case with proposed pipeline safety legislation in the past.

There are many important pipeline safety projects in the rulemaking process today. These include, among others; smart pigs, automatic and remote valves, maps and records, and operator qualification. All of the initiatives must be placed in some type of order. Indeed, the entire pipeline safety program of rulemaking, research, pipe integrity and risk assessment, and land use practices must be carefully analyzed before clouding it with additional pipeline safety legislation.

Northwest spends millions of dollars each year on pipeline safety related activities. At a time of growing competition in the natural gas industry and increased consumer concern over energy costs, the need for an increase in pipeline safety user fees should be weighed very carefully. We believe that any increase in user fees should not be used for duplicative research or fast-tracking the rulemaking process. The bulk of any increase should be employed in the area that will counter the greatest potential threat to public safety, third party damage to pipelines. That area is public education and damage prevention programs.
June 14, 1994

Ms. Cheryl Whetsel
Research and Special Programs
Administration
U.S. Department of Transportation
Room 8321
400 7th Street, S.W.
Washington, D.C. 20590

Re: June 20, 1994 Pipeline Safety Summit

Dear Ms. Whetsel:

Pursuant to your request for comments in the June 8, 1994 Federal Register, Columbia Gas Transmission Corporation (Columbia Transmission) is submitting this letter for consideration at the June 20 Pipeline Safety Summit.

Columbia Transmission is one of the largest interstate natural gas pipeline systems in the country, operating 18,900 miles of pipeline in ten states. In addition, Columbia Transmission operates one of the nation's largest underground natural gas storage systems, consisting of 45 storage fields and approximately 3700 wells. Columbia Transmission transports and stores natural gas for over 200 local distribution companies, industrial customers and marketers in 15 northeastern and middle Atlantic states and the District of Columbia.

Columbia Transmission strongly agrees with the U.S. House of Representatives' Appropriations Committee regarding the critical role of effective one-call notification systems in preventing pipeline incidents. In its recent Committee report accompanying legislation appropriating funds for the Department of Transportation's fiscal year 1995 budget, the House Appropriations Committee noted that "... adoption of comprehensive one-call notification systems...may be the single most important action that states could take to prevent future pipeline incidents." [See page 152, Committee Report, emphasis added.] Almost two-thirds of all damage to pipelines is caused by outside force damage, including, apparently, the March 23 incident in Edison, New Jersey.

Columbia Transmission believes the most effective way to strengthen state one-call programs is by enacting federal legislation which establishes strong, minimum standards for one-call notification, including penalties for excavators who fail to
call before they dig. While not perfect, H.R. 4394 and S. 2101 provide an excellent starting point to debate such legislation. These bills strike a fair balance between ensuring that all state programs meet standards intended to ensure public safety while giving states enough latitude to enable them to continue programs which are now working well.

Columbia Transmission commends the Department of Transportation for hosting this summit and for providing this opportunity for interested persons to share views. Columbia Transmission plans to submit more detailed comments covering the use of existing and evolving technologies and creating partnerships to reduce risk, among other issues, before the July 20 deadline.

Respectfully,

Jon O. Loker
Director, Technical Services
July 20, 1994

Ms. Cheryl Whetsel
Research and Special Programs
Administration
U.S. Department of Transportation
Room 8321
400 7th Street, S.W.
Washington, D.C. 20590

Dear Ms. Whetsel:

This letter responds to your request for comments in the June 8, 1994, Federal Register. It is intended to supplement the June 14 letter which Columbia Gas Transmission Corporation (Columbia Transmission) submitted for your consideration at the June 20 Pipeline Safety Summit. As promised in that letter, these comments address, first, the use of existing and evolving technologies and, second, the creation of effective partnerships to reduce risk.

Columbia Transmission is one of the largest interstate natural gas pipeline systems in the country, operating 18,900 miles of pipeline in ten states. In addition, Columbia Transmission operates one the largest underground natural gas storage systems, consisting of 45 storage fields and approximately 3700 wells. Columbia Transmission transports and stores natural gas for over 200 local distribution companies, industrial customers and marketers in 15 northeastern, middle Atlantic, midwestern, and southern states and the District of Columbia.

Maximizing the Effectiveness of Existing and Evolving Technologies

The pipeline industry has invested considerable time and resources on projects aimed at maximizing pipeline integrity and safety. This work has been funded by such organizations as the American Society of Mechanical Engineers, the American Petroleum Institute, the American Gas Association's Pipeline Research Committee, the Gas Research Institute, and many pipeline operators. Results from other relevant research, including government-sponsored projects, also have been useful. The following suggestions are intended to maximize the benefits of this type of research:

- Implementation of the technologies resulting from these projects is often impeded by regulations which require specific practices or methodologies. To stimulate the use of innovative technology, regulations must be less prescriptive. For example, a variety of methods can be used to assure pipeline integrity. Current regulations place too much reliance on smart pigs to achieve this result. Smart pigs are
designed primarily to evaluate corrosion, and may not reliably detect other critical defects.

- Government-funded research should both complement and build on existing technology and be conducted in partnership with industry members, or stakeholders. Independent, parallel research projects should be avoided. For example, a recent report indicated that the Research & Special Projects Administration plans to contract with the National Institute of Standards and Technology to evaluate current pipeline design principles and develop current regulation in light of new technologies. A large part of this project will consist of evaluating work developed by and regularly used by the industry. In addition, one of the stated tasks implies the development of limit state design methods which, in itself, constitutes a major effort. For these reasons, this project should be conducted in partnership with the industry.

- To achieve the partnership described above, DOT regulators should be provided more opportunities to serve on relevant code committees and to attend various conferences, meetings, and seminars.

- In selecting DOT representatives to serve on the Technical Pipeline Safety Standards Committee (and, similarly, the Technical Hazardous Liquids Pipeline Safety Standards Committee), great weight should be accorded to selecting those who have technical expertise and who are likely to be with the agency on a long-term basis.

Creating Effective Partnerships to Reduce Pipeline Risk

It is in the interest of both the Department of Transportation (DOT) and the natural gas industry to accurately assess and evaluate pipeline risks. Accurate assessments enable maintenance resources to be used more effectively, thereby reducing the incident rate. Working together, DOT and the industry can facilitate development and implementation of risk analyses to help accomplish this goal.

Many pipeline operators already have programs in place to assess risk and prioritize maintenance. The recent development of more sophisticated probabilistic risk models has made these programs even more effective. However, there are many remaining areas where DOT can play a constructive role:

- The Transportation Safety Institute should work in partnership with industry to develop even greater expertise in pipeline risk/integrity analysis and make available training programs in this area for DOT and industry specialists.

- DOT funding and participation in industry-sponsored research and development projects would be most helpful. One such project, now nearing completion, is the Pipeline Inspection
and Maintenance Optimization System, developed by the Gas Research Institute. In its final form, PIMOS will facilitate integrity/risk assessment of pipelines, or segments of pipelines. However, additional technology and methodology for managing risks need to be developed and presented in a manner which can be customized to suit the requirements of particular pipeline operators.

- An essential element of good probabilistic risk models is the collection and analysis of large amounts of data. DOT should facilitate this effort by improving access to relevant trend data, e.g., Safety-Related Condition Reports.

Columbia Transmission commends the Department of Transportation for providing this opportunity for interested persons to share views.

Respectfully,

Jon O. Loker
Director, Technical Services
July 15, 1994

Cheryl Whetsel
Research and Special Programs Administration
Federal Department of Transportation
400 7th Street, SW
Room 8321
Washington, DC 20590

Dear Ms. Whetsel:

As Chairman of NACE's Public Affairs Committee and an invitee to the National Pipeline Safety Summit in Newark on June 20, I submit this briefing paper and request that it be included as an appendix to the Summit proceedings.

Pipeline corrosion is one of NACE's core issues of concern, and many of our technical activities target ways to prevent corrosion damage on pipeline systems. We hope to continue to be a resource for your office in our common mission of increasing public safety and ensuring the continued effective operation of our nation's pipeline infrastructure.

Sincerely,

David E. Krause
Buckeye Pipe Line Co.
Chairman, NACE International Public Affairs Committee

Attached: briefing paper "Corrosion Control and Risk Assessment: Protecting Pipelines Through Maintenance and Monitoring"

cc: Art F. Brunn, Chairman, Government and Intersociety Committee
    Jim Chmilar, Chairman, Technical Practices Committee
    Norm J. Moriber, Vice-Chairman, Public Affairs Committee

Don M. Waters, President
Gerald M. Shankel, Executive Director
NACE International Briefing Paper

CORROSION CONTROL AND RISK ASSESSMENT:
PROTECTING PIPELINES THROUGH MAINTENANCE AND MONITORING

When pipeline operators assess risk, corrosion control must be an integral part of their calculation. An effective corrosion control program can be an operator's best insurance against preventable pipeline failures. Without proper maintenance, every pipeline system eventually degrades. However, technology exists to extend structural life indefinitely if applied correctly and consistently.

The keys to effective corrosion control of pipelines are quality design and installation of proven technologies followed by ongoing maintenance and monitoring by trained professionals. This paper provides background on corrosion control for pipelines and describes the key elements necessary for implementing an effective pipeline corrosion control program. Such a program will result in a significant reduction in the risk of pipeline failure as well as long term benefits for industry and the public in terms of lower costs for industry and more protection for public safety and the environment.

Background

Next to third party damage, corrosion is the leading cause of pipeline accidents in the United States. The costs to both industry and society of such failures include repairing the damage to the pipeline and the subsequent lost production time of the structure, as well as the threat to public safety and the environment from each incident.

Steel pipelines, whether buried in the ground or submerged in water, are prime candidates for corrosion. The galvanic corrosion mechanism which causes most pipeline corrosion is a dynamic phenomena which will eventually destroy a pipeline if not properly controlled.

Federal regulations (49 CFR, Parts 192.455-491, 195.236-238, 195.414-418) require pipeline operators to install adequate corrosion control mechanisms, including protective coatings and cathodic protection, and to monitor those mechanisms to ensure continued protection. The regulations also require that the design, installation, operation, and maintenance of cathodic protection systems must be carried out by, or under the direction of, a person qualified by experience and training in pipeline corrosion control methods. Civil penalties of up to $10,000 a day and criminal penalties including up to 5 years in prison can be imposed for noncompliance with the regulations.

Keys to Implementing Effective Corrosion Control

Corrosion control programs will protect pipeline integrity and save money. Such programs require four key ingredients to be effective:

- Corporate philosophies that promote and support long-term corrosion control.

The benefits of corrosion control and the costs associated with noncompliance are familiar to pipeline operators. Unfortunately, maintenance and monitoring budgets are
often the first to be cut in a difficult business climate. The result is deferred or eliminated corrosion control projects which ultimately cost the operator and the consumer more money from either failures or premature deterioration of a pipeline structure. For corrosion control to be effective, it must be included as an integral part of a corporation's long-term planning, rather than as an extra expense that is funded only if budgets permit. For evidence that corrosion control works, we only need look at 40 and 50 year old pipelines that were installed with coatings and cathodic protection and that have received regular maintenance and monitoring. Those pipelines are not failing and are being uprated to operate under higher pressure levels.

> **Management who know and understand corrosion control.**

Corporate support of corrosion control systems is vital but only half the battle. Another key element to an effective maintenance and monitoring program is having pipeline management personnel, responsible for the day to day operations of the pipeline system, actively engaged in promoting corrosion control among their staff. Management must give line workers, those persons actually in the field taking the measurements and doing the evaluations, the message that their job is critical to keeping the pipeline operating. They must receive management support for continuing education and training to make sure their skills are maintained. Workers should give feedback to management on the effectiveness of the corrosion control program, such as lower maintenance costs and reductions in the number of violations, citations, or warning letters received by the operating company.

> **Trained and informed corrosion control personnel.**

Pipeline corrosion control programs without appropriately trained personnel to carry out necessary maintenance and monitoring are a waste of time and resources. Effective corrosion control must begin with people who are professionally trained to understand the mechanisms that cause corrosion and how they exist in various environments. They must know how to evaluate the severity of corrosion problems and to "troubleshoot" systems within federal and industry timetables, including recording data obtained from regular monitoring and evaluating the data to determine if corrosion is occurring or is likely to occur in the near future. Those activities are vital components of an effective risk assessment for pipelines and can be used to calculate the most effective expenditure of maintenance dollars. Pipeline corrosion control personnel must be able to design cathodic protection systems that are economical, easy to maintain, and that protect without causing detrimental stray current interference to other nearby metallic structures. Personnel also must understand the application and performance of different materials for corrosion control. For example, the pipeline must be properly coated above and below ground with materials specified in regulations. Modern technology has produced coating systems that are environmentally safe and that protect workers. NACE has the best coatings training and certification program in the industry.
NACE International Briefing Paper  
Risk Assessment and Corrosion Control for Pipelines

There are numerous sources for pipeline operators to get the engineering and technical expertise they need for implementing effective corrosion control programs. Education and professional development programs, state-of-the-art publications and software, all of which NACE provides, can support corrosion control training programs for in-house operating company personnel. Consulting engineering firms can provide trained people who will review a company's corrosion control needs and implement a plan to create a complete corrosion control program.

The material and equipment necessary to maintain a corrosion control system.

In conjunction with NACE, pipeline companies continue to lead the way in developing technological advances designed to mitigate corrosion in the areas of improved protective coatings, materials, equipment, and instrumentation. Intelligent pigging, remote monitoring, improved welding procedures and inhibitors that mitigate internal corrosion are just a few examples of such recent scientific developments.

New manufacturing procedures, such as higher yield strength steel and improved coatings, and improved methods of construction and design, such as directional boring, provide a wide range of high quality, economical alternatives for pipelines and corrosion control. Operators also now benefit from new materials, methods of construction, and design that offer more efficient and economical cathodic protection installation. Risk management procedures and improved quality assurance in areas such as the manufacture of pipe and its coating qualities further ensure the safety and integrity of the pipeline.

Conclusion: Implementing Corrosion Control Reduces Risk

Whether it comes from in-house personnel or outside services, corrosion control of a pipeline system is an ongoing, dynamic process of maintenance and monitoring. Effective corrosion control does not just happen. No matter how well designed or constructed a pipeline system is, it will eventually fail without proper maintenance and monitoring. The increased risk of pipeline failure far outweighs the costs associated with installing, maintaining, and monitoring corrosion control systems.

NACE International, with 15,000 members worldwide, has helped the pipeline industry address corrosion control concerns for over 50 years. Its services include recommended standards, state-of-the-art technology reports and test methods, education and training, professional certification, and conferences and symposia (phone: 713/492-0535; fax: 713/492-8254).
Durham Woods Survivors Mental Health Resource Association

presents

"Allaying Public Concerns about Pipeline Safety"

Roxanne G.F. Croft, Ph.D.
Pipeline Safety Summit
June 20, 1994

In the aftermath of the Durham Woods Explosion, "the public" was divided into three parts; the Durham Woods Homeless, the Durham Woods Tenants and the rest of the world.

Post-traumatic Stress Disorder is a syndrome of severe dissociation, intrusion, avoidance, and hyperarousal symptoms in the aftermath of a traumatic stressor (physical assault, rape, abuse, fire or explosion, or serious accident) and is associated with an elevated risk of poor coping and emotional and cognitive vulnerability. Experiences of flashbacks, nightmares, constant anxiety, irritability, jumpiness, numbness, depression, inability to sleep, eating disturbances, lethargy, and feelings of helplessness and hopelessness are common. Treatment should be rapid, thorough, and trauma focused.¹²

Although a segment of the rest of the world rallied to provide emergent mental health consultation for those individuals who were fortunate to find out about existent services, there is currently not enough affordable mental health care of a high enough quality available to the adults and children who survived the trauma of March 23, 1994 explosion in Edison, New Jersey.

Texas Eastern Transportation Corporation has consistently refused to pay for medical and psychological/psychiatric care. Likewise, requests for funds to set up a treatment center to provide efficient, state-of-the-art treatment for survivors suffering from Post-traumatic Stress Disorder were rejected out of hand by Texas Eastern as financially unnecessary, and likely to raise the mental health suffering claims of survivors who, through no fault of their own, have now become litigants.³

The position expressed by Texas Eastern is incorrect as well as "penny-wise and pound foolish". Most individuals have "not been given enough money to pay for their mental health care". In addition, the mental health care of untreated currently experienced symptomatology and the predictable delayed reactions will cause significantly more damage

³Conversations: RGF Croft,Ph.D. with Mr. A. Schroeder. Texas Eastern Transportation Corporation, 5/8/94 and 6/18/94.
and therefore create future extensive mental health problems and cause medical conditions due to untreated psychological reactions.

To adequately "allay public concerns about pipeline safety", government must not omit concerns of these two important subsections of the public that composed Durham Woods residents on March 23, 1994, and adequately prepare for the sub-sections of future victims.

The path to allay the fear of pipeline safety in prior Durham Woods Residents is through affording them the quality and quantity of mental health care that they, as passive victims, deserve in an immediate fashion. Fortunate individuals have received evaluations and treatment. Too many have not.

The Durham Woods Survivors Mental Health Resource Association has been struggling publically since April 18, 1994 to create public awareness of the private suffering of the survivors and establish a treatment center to provide the necessary services.

The commitment, expressed in the text of a speech delivered at the WEDDING Ceremony held by the Durham Woods Survivors at Embassy Suites, Piscataway, New Jersey on April 15, 1994 continues:

"...let no one forget that you, the brave residents of the Durham Woods apartments, ran for your lives from the noise, heat, flames, flying glass and debris, with neighbors, friends and strangers into the dark of a late Wednesday evening, away from the smells of burning homes and cars, with barely time to glance over your, in some cases, bare, shoulders, at the vivid yellow-red incendiary torch, looming larger than the Statue of Liberty, into the early, empty, darkness of a "Thursday" that continues.

Nor (can) the community at large forget their responsibility to provide care for you, care that can allow you as a community and as individuals to turn around and face the terror hiding seven weeks behind you, still ensconcing you in palpable pain, before it seeps into the very fabric of your beings.

In addition,(we) publicly enlist the commitment of politicians and the health community of all levels to a coordinated effort to provide each and everyone of you the best forum in which to achieve your newly recommitted vows."

No volunteers enlisted. The "wake-up call for mental health has been virtually ignored.

Just as these survivors were not able to put out the flames and reduce the heat in the early morning of March 24, 1994 alone, they are not able to put out the raging fires of Post-traumatic Stress symptoms in their psyches alone. The current status remains:

1. As a group, prior residents of Durham Woods do not have the medical insurance to cover more than 10 - 17% of therapy needs.
2. Agencies are not prepared to give the frequency or quality of care most advantageous.
3. No coordination between agencies and private sector providers has been established.
4. A RAPID grant from the Trauma Section of NIMH was not possible because proposal deadlines are within six-weeks of event occurrence.
5. Between April 18, 1994 and today over 1,000 pages of materials were faxed to politicians from President Clinton to Mayor George Spadaro. Except for an invitation and thorough follow-up from Senator Lautenberg's office (Ms. Lisa J. Plevin and Ms. Mada L. Liebman), government, at all levels, local, state, and federal, has been unresponsive to the attempts to call attention to the unraveling lives of this population. At present, grant applications are stymied by funds necessary for preparation.

6. More than $35,000 of private services materials and expenses has been expended in an attempt for funding from federal, state, local and private sectors, in addition to countless hours of volunteer time and funds by members of the Durham Woods Homeless Association (Ms. Toby Glovinsky, Mrs. Phyllis Siegel and Mrs. Nancy Kemps) and the Durham Woods Tenants Association (Ms. Diane Kahan and Mrs. Francine Nieves). These organizations will participate with the Durham Woods Survivors Mental Health Resource Association.

7. Colleagues at Stanford University (Dr. David Speigel and Dr. Cheryl Koopman) are collaborating in on-going research and treatment plans specifically for survivors of the Durham Woods Explosion.

8. Randall A. Marshall, M.D. has made services available at no cost for survivors under the auspices of the Anxiety Disorders Clinic directed by Michael Liebowitz, M.D., New York State Psychiatric Institute, Columbia University. Treatment will be free and 3 additional months of free treatment will be available after completion of the first 12 week treatment.

This availability is generous, however many individuals will not be able to travel to the 168th Street Clinic. Funds should be available to set-up treatment in survivors environs.

The focus on "policy" has come before any focus on "people". This should not continue. The wake up call for "policy" is in the early part of it's day; no one, at any level to intervene effectively, appears to have heard the "mental health care wake-up call".

Professional staff, associates and community members wait, frustrated in the wings, for the stage to be set by government or responsible industry to provide necessary funds. As attendees of the PIPELINE SAFETY SUMMIT, I urge consideration of the weighty problem that exists for "people" as you discuss "policy".

Concerned individuals, organizations and politicians should contact the Durham Woods Survivors Mental Health Resource Association, sponsored by:

Reach for the
Tree-tops Consultation Center.

thank you for reading the
"wake-up call"
for
"people and policy"

---

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-47
HAZARD CONTROL SYSTEMS
Risk Management
Beverly Hills, Cal. - River Edge, N.J.
Box 4124
River Edge, New Jersey 07661
(201) 836-3781
Fax: (212) 596-1399

July 20, 1994

Research and Special Programs Administration
Attn: Cheryl Whetsel (Room 8321)
400 7th Street, SW
Washington, DC 20590

Ref: National Pipeline Safety Summit
Subject: Risk Management System

Introduction

Some elements of a total system risk management system were presented at the Safety Summit. These are necessary but not sufficient. Lessons learned from Flixborough, Seveso, Bhopal, Exxon Valdez, the shuttle disaster, World Trade Center bombing, and even railroad accidents, provide an ample basis for developing a total systems approach to risk management.

The recent Edison pipeline accident came close to becoming a "Tombstone Syndrome" event. Arguments about the safety of transmission pipelines remain unconvincing to the public and their representatives. They are particularly concerned about the "low probability - high consequence" events - especially if they live near a pipeline. As was pointed out at the Summit, an ageing pipeline system plus increasing urbanization along pipeline routes require a more demanding approach to system safety. Total risk management as pointed out by Thero in the recent (Jan. 1994) BLM report on TAPS line audit deficiencies has its roots in the aerospace and nuclear industries. Their standards serve as a model for the chemical oil and gas industries.

Major Elements of a Total System Risk Management Program

1. MORT - Management Oversight Risk Tree
   Top management is held directly responsible for system safety. Such a risk tree features a hot line to allow any level of the organization to report directly to top management any system anomalies. It could also tie in to Government regulatory agencies.

2. Quality Assurance
   It should start at the design and specification phase of a new pipeline. For pipeline fabrication, it begins with spectroscopic analysis of pipeline metal and continues through fabrication and installation of the line. The same applies to pumping stations and control centers including SCADA.
3. HAZOP Studies
These focus on "what if" scenarios and should be coupled with FEMA and FTA analysis. "Black Hat" scenarios focusing on deliberate damage acts and how to counter them should also be examined.

4. Reliability Data Bank
Compiled on a company and industry wide basis.

5. Incident Reporting System Analysis
Relatively minor events are often a precursor to major accidents.

6. Best Available Control Technology
This may be tempered by cost/benefit considerations.
Subelements include:
A. SCADA systems including low orbit satellite communication links, fiber optic links, redundancy,
B. Simulators can be used for training as well as gaming design basis and worst case accident scenarios. They are now used in the marine, railroad, nuclear and process control industries.
C. Human Factors - Certification of all pipeline system personnel. Performance parameters including "Fitness for Duty" This includes alcohol/drug tests, circadian cycle effects, personality profiles e
d. Condition Monitoring Systems. This involves predictive maintenance as well as early warning of potential failure modes. Work is being carried out on such systems at the EPRI center in Edystone, Pa. and at the Institute for Nuclear Operations in Atlanta.

7. Emergency Prodecures
Late stage risk management. Gaming of such procedures with company as well as local govt teams essential. Depending on product may include suppression or ignition techniques.

8. Public Participation
A critical element. The Responsible Care program managed by CMA includes community advisory panels as well as independent 3rd party audits. Responsible Care is a model.

9. Research and Development
The GRI program is excellent and has reached a landmark with the completion of the pipeline test facility. Beyond NDE techniques (including smart pigs), and other tasks in their R and D program it should be extended to include control centers, pumping stations and simulators. Besides magnetic flux smart pigs, ultrasonic pigs such as developed by British Gas and NKK are coming into use. As AGA has pointed out, they cover a limited class of defects. Hydrostatic testing for older lines especially coupled with passive sensors such as acoustic (acoustic emission, leak detection and impact sensing) should be a valuable NDE test especially where pigs are not feasible. The concept of a "smart pipeline" especially in urban areas should be explored. Such a pipeline segment would have an array of sensors (acoustic, fiber optic, microchip strain gages)
and could be part of an on-line monitoring system. The smart pipeline could also respond to live loads similar
to bridge sensing systems. Improved sensors, digital
data processing and the use of expert or neural
networks makes this a promising approach. Finally, neutron radiography is coming to the field and could offer
over X-ray techniques.

Dig We Must - 3rd Party Excavation Damage

Excavation impacts have long been identified as a major cause
of damage to transmission and distribution pipelines
The recent Edison event has led to a flurry of new legislation
at the Federal level for mandatory "one-call" systems. This,
again, is necessary but not sufficient. We have to examine more
closely, the role of the contractor, the excavating equipment,
and the machine operator. We ask the question - what role can
technology play in this operation?

We game the following scenario:

A. the one call is carried out (with excavation permit)
B. The pipelines (and other lifelines) are displayed
   on a computer generated map. The location of the
   excavator can be located to within a few inches by
   a differential Global Positioning System. This
   would be displayed both in the excavator cabin and
   the local government office. This excavator is no
   ordinary machine. It is high tech. Not only does it
   make precise excavations but features magnetic or
   ground radar sensors in a positive feedback mode to
   prevent damage to the pipeline. On the human factors
   question we still have to raise the fitness for duty
   requirement (such as a few drinks at lunch)
C. High Tech Excavators
   This system is not some futuristic concept.
   We already have high tech tractors for farms. In recent
   years, Komatsu in Japan has developed automated
   hydraulic excavators which can be programmed even
   without a human in the cab. These computerized
   excavators in demonstrations have uncorked a bottle
   of wine and poured the wine into glasses without
   spilling a drop. These excavators are already available
   and carry a modest premium coast

Maurice V. Scherb
President

MVS@ tk

Prepared by the Institute for Transportation at New Jersey Institute of Technology
B5-50
July 19, 1994

BY FEDERAL EXPRESS

Ms. Cheryl Whetsel (Room 8321)
Research and Special Programs Administration
400 7th Street, SW
Washington, DC 20590

Re: National Pipeline Safety Summit
Briefing Paper

Dear Ms. Whetsel:

Enclosed for inclusion in the appendix to the Summit proceedings is my issue paper.

I am the husband of the woman who died as a result of the Edison explosion and attended the morning session of the Summit. Although, due to other commitments, I was unable to attend the afternoon session, I found the Summit informative and well organized. I would certainly wish to attend or take part in future proceedings of this nature.

As you will see, my issue paper is well-researched and fully documented. Unfortunately it is a bit long. If necessary, feel free to delete the endnotes. If you do, please be so kind as to type at the end of the issue paper "End notes deleted by R.S.P.A. due to space limitations. End notes may be obtained from the author." If you have any questions, I can be reached at 212-238-8851. Thank you for your kind consideration.

Yours truly,

Craig J.J. Snyder

Enclosure
Shortly after midnight on March 24, 1994, a natural gas transmission pipeline coursing through Edison, New Jersey exploded and burned for approximately three hours. The pipeline was owned and operated by Texas Eastern Transmission Corporation ("Texas Eastern"), a wholly-owned subsidiary of Panhandle Eastern Corporation, which styles itself as "America's Natural Gas Transportation Company" ("Panhandle Eastern"). The explosion and fire resulted in the destruction of nearby buildings in the Durham Woods Apartments, a terrifying late-night evacuation by approximately 1500 people, injuries to more than 100 people and the death of my 32 year old wife.

Although the National Transportation Safety Board has not yet issued its final report detailing the cause of the Edison explosion, the gas pipeline industry and Texas Eastern have embarked upon a calculated public relations crusade. Within hours of the explosion, George L. Mazanez, Vice-Chairman, and Fred J. Fowler, President of Texas Eastern were at the scene of the explosion. The homeless were provided temporary shelter and $1,000 checks were rained upon the residents of Durham Woods. Texas Eastern even sent flowers to my wife's funeral.

In the wake of the explosion, Edison Mayor George Spadaro obtained an injunction postponing commencement of operation of the repaired pipeline. However, as noted by PR News, Texas Eastern officials were so adept at public persuasion that Mayor Spadaro, rather than being praised for acting responsibly in seeking to protect his constituents, was cast in news accounts as being motivated by political considerations. The repaired pipeline resumed operations on April 13, 1994. Stock analysts were so pleased with Texas Eastern's public relations efforts that they predicted that the Edison explosion would have little effect upon the bottom line of Panhandle Eastern. The value of Panhandle Eastern's shares remained stable.

On April 19, 1994, the U.S. Senate Committee on Energy and Natural Resources conducted a hearing concerning the Edison explosion and Senator Frank Lautenberg subsequently introduced legislation to provide for a "one call system" purportedly to prevent future pipeline damage by excavators. The pipeline industry voiced nearly unanimous support for this legislation, thus, attempting to avoid more rigorous regulation and shifting the blame for pipeline explosions to anonymous third parties.

The U.S. Department of Transportation, Research and Special Programs Administration, Office of Pipeline Safety invited pipeline industry representatives, pipeline operators and interested groups to a Pipeline Safety Summit in Newark, New Jersey on June 20, 1994 (the "Pipeline Summit"). I attended the morning session of the Pipeline Summit. The first panel included Department of Transportation Secretary Federico Pena, Senator Lautenberg, Representative Frank Pallone, Mayor Spadaro and George Mazanez of Texas Eastern.

The subject of the first panel was "Allaying Public Concerns about Pipeline Safety." The focus was not necessarily on improving pipeline safety, but convincing the apparently naive public that there is no reason for concern. Mr. Mazanez of Texas Eastern proudly touted the safety record of the pipeline industry, noting, with the aid of sophisticated charts and graphs, that in 1992 more folks were killed in motor vehicle accidents than by pipeline explosions. While trying to convince the audience of the safety of pipelines, however, Mr. Mazanez failed to mention that in the United States more than 500 people have died as a result of pipeline accidents since 1970. He also failed to mention the countless other families that have been displaced and injured as a result of pipeline accidents. In addition, Mr. Mazanez left out the troubling history of his own company. Texas Eastern was involved in a number of pipeline accidents that resulted in fatalities. "On November 25, 1984, a natural gas line operated by Texas Eastern exploded near Jackson, La., leaving five people dead and 22 injured. In 1985 and 1986, two separate accidents involving a stretch of Texas Eastern pipeline in Kentucky killed five people and injured six. In March, 1990, two people were killed in North Blenheim, N.Y., and the center of the town was turned into a blackened wasteland when a propane line cracked and exploded. The partnership that operated the line was partly owned by Texas Eastern." Notwithstanding Mr. Mazanez's commendable performance at the Pipeline Safety Summit, the people of Edison are unlikely to have their concerns about gas pipeline safety allayed for many years to come.

Fortunately, Senator Lautenberg and Representative Pallone refused to allow the Edison explosion to fade into obscurity. They announced the introduction of legislation that would incorporate the prior "one call systems" legislation with a number of additional safety measures (the "Legislation").

As a result of my young wife's death, resulting from the Texas Eastern Edison explosion, I have developed an interest in pipeline safety. I have reviewed the Legislation and many relevant articles. The Legislation is commendable, though...
flawed, and deserving of support. Adoption of the proposed safety measures in the Legislation, together with my proposal for statutory strict liability, would go a long way toward ensuring safe natural gas supplies.

One Call Systems.

The pipeline industry has seized upon the opportunity to shift the blame for pipeline explosions from those who own, operate and profit from the pipelines, namely, themselves, to anonymous third parties by enthusiastically endorsing proposed mandatory "one call systems."

"One call systems work as follows: 1) an excavator calls the appropriate one call center to inform them of a planned excavation or demolition activity; 2) the one call center notifies the participating operators of the underground facilities of the impending excavation; and 3) the facility operators locate and mark their facilities prior to excavation."

It is no surprise that the pipeline industry has seized upon "one call systems" as a panacea for pipeline safety. The pipeline industry is behaving as all industries behave when threatened with substantial regulation. It supports the least expensive, least intrusive regulatory burden while vigorously opposing more substantial alternatives that, in this case, would provide greater safety for the public. As an additional benefit to the pipeline industry, the one call system proposal deflects blame for pipeline explosions from the pipeline industry to anonymous excavators.

While many gas pipeline explosions may result from third party excavations, this fact should not be used by the pipeline industry to avoid its responsibilities, moral and legal. The pipeline industry is a profitable industry that, like other industries, should be accountable for its actions. The "one call system," if enacted together with other regulatory proposals makes sense. It should not supplant other important regulation or shift responsibility for pipeline safety from the pipeline industry which benefits from pipeline use. After all, Texas Eastern's past participation in a voluntary one-call system did not prevent repeated excavations near its Edison pipeline nor prevent the pipeline's explosion.

Remotely or Automatically Controlled Valves

One of the more surprising revelations following the Edison explosion was the extraordinary delay in shutting off the supply of gas to the damaged pipeline. Once the explosion occurred, it took nearly three hours to shut off the gas supply because three men had to manually turn a valve cutoff 753 times. Texas Eastern explained that the pressure-powered valve failed to operate due to the sudden decrease in pipeline pressure. It would seem that an explosion resulting in a rapid pipeline pressure decrease would represent the most critical and likely event requiring the operation of a cutoff valve. It is, therefore, surprising and disappointing that Texas Eastern and much of the pipeline industry has declined to significantly adopt available technology such as remotely or automatically operated valves. How can the pipeline industry, and especially Texas Eastern which has had substantial experience in dealing with pipeline explosions, not have known that a pipeline explosion would result in decreased pipeline pressure which would in turn require manual cutoff?

The Legislation would mandate regulations requiring the "installation and use, wherever technically and economically feasible, of remotely or automatically controlled valves that are reliable and capable of shutting off the flow of gas in the event of an accident, including accidents in which there is a loss of the primary power source [hereinafter "Effective Valves"][."

These regulations would be developed in cooperation with, and special consideration would be given to recommendations of, groups from the gas pipeline industry.

Despite the Legislation's deference to the gas pipeline industry in respect of participation in promulgation of the proposed regulations and the limitation of the mandate for Effective Valves only where "technically and economically feasible," the gas pipeline industry has opposed requirements for Effective Valves. The pipeline industry argued that "with Edison being the notable exception, almost all damages from a pipeline rupture occur in the first few minutes after the leak occurs and would not be significantly reduced by rapid closure of valves." Of course, Edison is an extremely "notable exception." This seems to be, at best, a cavalier approach to pipeline and human safety. Although according to George Mazenc of Texas Eastern this was the first gas pipeline explosion in a similarly populated area in his 30 years experience, the Edison explosion is likely to be a harbinger of future incidents. The business and residential development that occurred in proximity to the Texas Eastern pipeline in Edison is surely replicated in many areas of the Northeast. Where once was rural, scarcely populated countryside, now exists businesses, roads, homes and apartment buildings. In all likelihood, the Edison explosion does not represent a "notable exception," but, in all likelihood, will in the future represent the rule.

The pipeline industry has also argued that installation of Effective Valves would be too expensive, costing from $80,000 to $250,000 per valve. This argument probably reflects the pipeline industry's most sincerely-held concern -- making money. The pipeline industry apparently has concluded that the costs to it arising from death, injury and destruction...
resulting from explosions and fires are simply less than the costs of Effective Valves. Apart from the callous nature of the calculus performed by the pipeline industry, costs could easily be limited by requiring Effective Valves only in locations of high population.

Relating requirements for Effective Valves to population proximity is a far more sound regulatory basis than requiring them where "technically and economically feasible" and inviting the pipeline industry to define these terms. The Legislation, at a minimum, should be amended to tie Effective Valve requirements to population proximity.

Strict Liability

One potentially valuable tool for ensuring safer gas pipelines, which is not proposed by the Legislation, is imposition of statutory strict liability upon gas pipeline owners and operators. Presently, innocent victims of pipeline explosions must hire contingency fee lawyers and finance expensive investigations to determine who, among the potentially limitless cast of culprits, is responsible for a pipeline explosion. A just and fair process would be to hold the pipeline owners and operators liable to innocent victims for their damages and permit owners and operators to seek reimbursement from negligent third parties. It is, after all, the pipeline owners and operators who reap abundant financial benefits from pipelines while shifting the risk of death, injury and loss to unsuspecting residents and businesses.

Strict liability is a common law and statutory doctrine that "provides that one who carries on an abnormally dangerous activity is liable for the harm inflicted by the activity, although he has exercised the utmost care to prevent the harm." Common law strict liability has been applied to the manufacture, storage, transportation and use of high explosives, use of atomic energy, operation of oil and gas wells, water collection in large quantities in a hillsode reservoir and storage of gas and gasoline. Statutory strict liability has been imposed for contamination of land and water. Thus, the owners of polluted properties are strictly liable for clean up costs, regardless of the source of the pollution. One formulation of the strict liability doctrine is that "[a]n enterprise engaged in a hazardous activity is liable for harm to others resulting from the activity, even though the enterprise has exercised the utmost care to prevent the harm. . . . An activity is hazardous if: (a) it poses a risk of loss of life or serious personal injury or substantial property damage; and (b) neither the incidence nor the extent of the harm is subject to significant control by the injured party in the normal course of events." Under this formulation, Texas Eastern would be held strictly liable to innocent victims for the damages resulting from the explosion of its Edison pipeline. The pipeline posed a risk of, and indeed its explosion caused, loss of life, personal injury and substantial property damage. Surely, the victims had no control over the incidence or extent of the harm caused by the Edison explosion. It is unlikely any of the victims knew the pipeline existed. My wife certainly didn't. Strict liability seems uniquely suited for the pipeline industry.

Of course, strict liability would only be applicable as between the pipeline owner/operator and the victims. The pipeline owner or operator could still sue negligent third parties. Gas pipeline owners and operators, as efficient participants in the marketplace, will act in their own economic self interest. Thus, we have the current debate concerning Effective Valves. If strict liability results in higher costs than prudent safety measures, safety measures, such as Effective Valves, will be enacted to reduce the likelihood of economic loss. If, on the other hand, it is less expensive to purchase insurance and conduct an effective post-explosion public relations campaign, safety measures will not be enacted.

Legislation should be enacted that imposes statutory strict liability upon pipeline owners and operators with respect to deaths, injuries, and property damage sustained as a result of pipeline leaks and explosions. The pipeline owners and operators reap the benefits of their pipelines in the form of multi-million dollar revenues and should be responsible for resulting losses that are suffered by innocent victims.

Conclusion

The threat of death, injury and destruction resulting from gas pipeline explosions will grow in the future unless meaningful safety requirements are enacted. The Edison explosion was not simply a public relations problem to be swept under the rug and settled by insurance adjusters. It was a wake up call to our nation. Since the Edison explosion, two people died and two others were injured when a state highway crew hit a gas line in Wyoming. In addition, a senior citizen's residence in Pennsylvania was evacuated when a gas line was hit.

I can only hope that others will be spared the pain that I, my wife's family and her friends have suffered as a result of the explosion of the Texas Eastern Edison pipeline. Let's act now so that we can minimize future damages and loss of human life.
1. Testimony of George L. Mazanec before the United States Senate Committee on Energy and Natural Resources, April 19, 1994.


3. Edison's Pipeline Reopens as Mystery of Blast Remains. New York Times, Section A at 1, Col. 1.


6. Explosion in Edison: Pipeline Owner was at Fault in Fatal Accidents in the 80's. New York Times, March 26, 1994, Section 1 at 24, Col. 1.

7. H.R. 4616, S. 2219, 103rd Cong. 2d Sess.


10. Mazanec, supra Note 1.


14. Id.

15. Issue paper of the American Gas Association Before the Pipeline Safety Summit, p. 3.

16. Id.


APPENDIX C

Handouts
INDEX

Allaying Public Concerns About Pipeline Safety ........................................... C-14
George Mazenac, Vice Chairman Panhandle Eastern Corporation

Fact Sheet Federal Pipeline Safety Program............................................... C-20

Frank Lautenberg: “Lautenberg, Bradley, Pallone to Introduce
Comprehensive Pipeline Safety Legislation”.............................................. C-25

Gas Research Institute Pipeline Safety Research Program......................... C-2

The Research and Special Programs Administration Today .............. C-24
Gas Research Institute
Pipeline Safety Research Program

U.S. Department of Transportation
Pipeline Safety Summit
Newark, New Jersey
June 20, 1994
INTRODUCTION

The natural gas industry's commitment to public safety is expressed in the Gas Research Institute's (GRI) program of research, development, and deployment for natural gas transmission systems. As a research arm of the natural gas industry, GRI plays an important role in developing technologies that help ensure the integrity and safe operation of the more than 300,000 miles of high-pressure, cross-country pipelines that carry natural gas from its source at production wells to homes and businesses.

Natural gas pipelines are one of the safest transportation methods available as demonstrated by statistics released by the National Transportation Safety Board. Department of Transportation (DOT) statistics for 1992 indicate that 20 deaths were associated with all pipelines, including liquid and gas pipelines. Of these, four fatalities resulted from accidents on gas transmission and gathering lines. While these numbers are impressive, any loss of life or injury is unacceptable to the pipeline industry, which is dedicated to maximizing safety.

DOT statistics show that in the period from 1984 through 1990, the greatest cause of pipeline failures was damage from outside forces (39.9 percent), such as damage from third-party construction equipment and natural occurrences, such as landslides and washouts. The second most frequent cause of accidents was grouped in a category called "other" (22.9 percent), which includes mechanical equipment failure. The third most frequent cause was corrosion (21.5 percent), followed by material defects (9.9 percent) and construction defects (5.8 percent).

Over the years, many research studies and experiments on pipeline integrity have been performed both in the laboratory and in the field to eliminate these causes of failure. From these efforts, the gas industry has gained extensive knowledge on causes of failures and has developed additional procedures for safe operation.

GRI PIPELINE SAFETY R&D

GRI conducts an extensive, ongoing program in pipeline safety and works cooperatively with other organizations such as the American Gas Association (A.G.A.), the Pipeline Research Committee (PRC), the Interstate Natural Gas Association of America (INGAA), the American Petroleum Institute (API), the U.S. Department of Transportation/Office of Pipeline Safety (DOT/OPS), and most major codes and standards writing organizations. Elements of GRI's pipeline safety R&D program include:

---

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-3
Pipeline Inspection and Nondestructive Evaluation

In the mid-1960s, the pipeline industry recognized the potential benefits of instrumented inline inspection (ILI) tools for pipeline inspection. These tools, commonly called "smart pigs," are used to detect metal loss due to corrosion or mechanical damage, and to determine pipeline shape and location.

Improvements in Smart Pigging/ Pipeline Simulation Facility

In 1986, the PRC published a report that identifies the needs of the industry in nondestructive testing, with emphasis on the potential capability of smart pigs. The PRC recommended that GRI develop a high-pressure flow loop for testing and evaluation of smart pigs under simulated pipeline conditions. Consequently, planning for a Pipeline Simulation Facility (PSF) was initiated in 1987.

Two years later, the first major element of this facility, a "pull rig," was built for testing smart pigs in non-pressurized pipe. Funds were also allocated to develop a 24-inch "flow loop" to simulate the real world, operating at pressures of 200 to 1000 psi, and maximum flow velocity of 10 miles per hour.

Recognizing the need for a PSF, GRI has earmarked a sizable portion of its pipeline safety resources for this facility. Construction began in April 1994 and the facility is scheduled to begin operations in early 1995.

Development of an Advanced Smart Pig for Detection of Metal Loss

GRI has conducted research for several years to determine the current and potential capabilities of magnetic flux leakage (MFL) pigs to detect the wide range of metal loss defects likely to be found in pipeline systems. It is generally accepted that MFL pigs can detect significant defects arising from general corrosion, when the defects are found outside weld zones and away from pipeline components such as valves and elbows. It is also known that MFL is sensitive to the speed of the pig as it travels through the pipe. Because the speed changes

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-4
dramatically during a run through many miles of pipe, it is essential to understand the impact of varying pig speeds on the quality of data captured by the pig. Under controlled laboratory conditions and using sophisticated finite element models of MFL sensors, GRI is determining the extent to which current technology can detect, discriminate, and characterize defects. The research is providing guidance in improving the design of MFL pigs used to detect and characterize a wider range of metal-loss defects.

**Development of an Advanced Smart Pig for Detection of Third-Party Damage**

Most MFL research has concentrated on metal loss caused by corrosion. While corrosion plays a major part in affecting the integrity of a pipeline, nearly 40 percent of all pipeline incidents are caused by damage to the pipe by outside forces, usually the result of excavators using heavy equipment.

Outside force can dent the pipe or gouge metal. If the contact with the pipe goes unreported and untreated, the damage to the pipe coating and the pipe itself can lead to corrosion and fatigue weakening, increasing the potential for a leak or pipe rupture at a later time. While MFL pigs detect some types of mechanical damage, little is known about their ability to detect gouges or dents. The industry plans to conduct research on this topic.

**Development of a Smart Pig for Detecting Cracks**

Cracks and crack-like defects are another category of pipe defects that cannot be reliably detected today. Cracks can form in many ways but are associated with poor pipe welds in girth welds that join pipe segments or in longitudinal seam welds formed when steel plates are made into pipe. Fine cracks can also result from a chemical and physical process called stress corrosion cracking. Since the industry does not fully understand conditions that lead to stress corrosion cracking (SCC) or its growth behavior in metal pipe, its extent or location is largely unknown. Although several organizations are developing technology to detect crack defects, there are no commercially available pigs for crack detection. GRI is working with the PRC to develop sensors and other technology to detect crack defects.
While smart pig development has focused on sensors, battery-powered systems, data acquisition and conditioning, and survivable vehicle design, other technologies can increase the capability of smart pigs. For example, smart pig technologies would be improved if the pig speed could be controlled independently of the gas flow. GRI is currently evaluating the potential for better data analysis and vehicle designs employing speed controls.

Pipeline Integrity and Risk Management

The second major element of the GRI pipeline safety program focuses on technologies to maintain the pipeline system and reduce the risk of pipeline incidents. Current data collected by the DOT/OPS do not differentiate between the causes of pipeline incidents. The industry needs better information on major incidents related to outside force, corrosion, material defects, and the large "other" category.

Incident Reporting and Trending System (IRATS)

In cooperation with INGAA, GRI is developing a computer-based data collection and analysis system to assess pipeline incident data required by the DOT/OPS. IRATS will augment the data reported to DOT/OPS through an automated characterization and classification procedure. When completed, IRATS will enable the industry to identify causes and to initiate efforts toward prevention of all types of incidents that compromise pipeline safety. GRI will operate IRATS on behalf of the pipeline industry. INGAA and A.G.A. will report industry data to regulatory agencies.

Pipeline Inspection and Maintenance Optimization System (PIMOS)

PIMOS is being developed to provide pipeline companies with a tool for developing strategies for inspection and maintenance to ensure the integrity of the pipeline system, and to assist the industry in allocating its limited resources on pipeline inspection and maintenance activities. PIMOS is a software package that uses statistical models to estimate the frequency of major defects occurring on any pipe segment of a pipeline system as a function of pipe age, coatings, soil type, operating conditions, type of pipe, cathodic protection history, smart pigging results, maintenance history, failure incidents and other similar data. By focusing on the highest risk pipeline segments, pipeline companies can improve their maintenance strategy and overall system safety will be improved.
Pipeline Monitoring

The third element of GRI's pipeline safety program focuses on monitoring of factors that are indicative of a pipeline's condition. Development of advanced monitoring techniques will allow more accurate, faster data collection, and even real-time gathering of certain data.

Airborne Pipeline Integrity Monitoring (APIM)

Airborne monitoring of the pipeline system offers the potential for major cost savings and risk reduction. The prototype APIM system integrates data from a global positioning system, vector magnetometers, radar, and infrared sensors. GRI is conducting an evaluation of APIM with the assistance of four major pipeline companies in Texas. If proven, APIM will be able to 1) locate the exact centerline of the pipe on the earth's surface, 2) measure the depth of cover, 3) detect major gas leaks, and 4) measure the level of cathodic protection.

Real-Time Monitoring of Pipelines (RMP)

In a cofunded effort with the Japanese Gas Association, GRI is exploring innovative technologies for the real-time monitoring of pipelines (RMP) for third-party damage. Two concepts, using electromagnetic and acoustic sensors, may be able to alert the pipeline operator when and where third-party contact has occurred on a pipeline. The first technique detects the interruption of an electrical current on the pipe caused by contact with the pipe wall. The other technique uses acoustic and vibration sensors to "listen and feel" for any external contact on the pipeline. Starting in 1994, both concepts will be evaluated in a field test to determine effective range and signal strength. If the field trials are successful, a commercialization plan for introducing this technology to the U.S. pipeline industry, including manufacturing partners, will be developed. Capability to manufacture sensors and provide data acquisition, signal processing, and field installations will be evaluated for possible future participation.
Remote Sensing of Pipeline Condition Using Satellites

GRI is considering a program to evaluate the current capability of satellite-borne sensors to perform a number of pipeline monitoring tasks. In a 1987 study, GRI recognized the potential for remote sensing to monitor encroachment activity on a right-of-way. It was determined that satellites did not provide the coverage or the resolution required. Remote sensing by satellite has now progressed to the point where objects less than a meter across can be detected, identified, and tracked using infrared, visual, and radar. Remote sensing holds the promise of periodic monitoring for third-party activity, the creation of digital alignment maps, and encroachment surveys.

Pipeline Corrosion, Repair, and Rehabilitation

The fourth element of GRI's pipeline safety program focuses on factors that can affect the structural integrity of pipe, as well as an understanding and the prevention of adverse effects.

Assuring the Structural Integrity of Line Pipe

PRC is conducting research on the structural integrity of line pipe with emphasis on developing information that will permit increased safety and reliability in operating high-pressure pipelines. Current efforts focus on the fitness for service of pipe with defects, deformation limits for repair sleeves, fatigue life of shallow dents, and optimum hydrostatic testing strategies to minimize the probability of subsequent service failure. New knowledge of the structural integrity of line pipe and fracture control technology is being used directly by operating companies to develop strategies for safe design, operation, and repair of pipeline systems.

Mechanisms Causing Stress Corrosion Cracking

PRC and GRI are conducting research to identify the operating and environmental conditions that are conducive to SCC on pipelines. Information is being developed to identify the conditions on pipelines where SCC can occur, to assess the integrity of pipelines with SCC, and develop methods to mitigate and prevent SCC on both new and existing pipelines. New knowledge on the relationship between SCC growth and pipeline failure is necessary before smart pig technologies can be developed for detecting SCC.
Protection of Pipelines from Corrosion

PRC and GRI are conducting research that emphasizes cathodic protection and pipeline coating systems to control and prevent corrosion. Coatings on steel pipe provide the first line of defense against corrosion. Cathodic protection provides a second line of defense by the application of voltage between the pipe and the ground. Current research is directed at evaluation of the effectiveness of various cathodic protection systems, assessing potential interference from high-voltage power lines, and evaluating the pipeline coatings for effectiveness in preventing corrosion.

Microbiologically Influenced Corrosion

Microbiologically produced acids and acidic components have recently been identified as a potential cause of internal and external corrosion that leads to pipeline leaks and failures. Methods for identifying the microbes contributing to this phenomenon have been developed, as have chemical inhibitors and biocides for preventing or destroying them. Environmentally benign, non-chemical remediation methods are also being explored, but no reliable, economically viable method has yet been identified. In addition, the industry needs methods for identifying areas of active microbial activity and a broad-based information campaign to disseminate the results of these efforts.

Pipeline Design and Operation

Pipeline design and operating issues constitute the fifth element of GRI's pipeline safety program. Work to date has centered on the topic of safety of rail and highway crossings and the impacts of heavy equipment operating over buried pipelines.

Pipeline Reaction to Live Loads

The effects of superimposed loads from construction and farming equipment and other similar loading scenarios are of major concern to many pipelines. GRI has developed a model for accurately evaluating highway and railroad loads on operating gas pipelines. The effects of the loads from construction and farming operations cannot, in many instances, be properly evaluated using this model. Enhancement of this existing model is being evaluated against the development of a model focused on the shallower, construction-type loads.
PIPELINE SAFETY R&D PROGRAM ENHANCEMENTS

The major projects described above are already under way to enhance pipeline safety and to detect conditions that could result in unsafe operations. Additional projects are being evaluated that will improve the industry's ability to monitor the integrity of the system, increase the effectiveness of actions to enhance safe operations, and provide improved pipe design. These projects fall into the areas of:

- Risk Assessment/Management
- Smart Pigging and Nondestructive Evaluation
- Emergency Procedures
- Structural Integrity

Risk Assessment/Management

Integrated Spatial Analysis Technology (ISAT)

GRI is exploring use of an ISAT to enhance computer mapping systems by integrating all pipeline monitoring, operating, and maintenance activities. Current systems built around geographical information systems (GIS) or automated mapping/facility management (AM/FM) systems have proven difficult to implement. Data collection and database creation are expensive. Commercial systems are incompatible and lack needed power and flexibility. However, new information and communications technologies are available that will allow more powerful application of spatial database techniques for the management of a pipeline system. A study is underway on an ISAT system that will link a computer mapping system with remote sensing data, smart pigging data, electrical and leak survey data, inspection and maintenance history, and other data to provide better pipeline integrity management.

Accidental Releases of Natural Gas

Fires and explosions resulting from pipeline incidents represent a public safety risk and can be a major source of financial loss for the gas industry. Current risk assessment and management tools do not fully address these safety and financial factors. Further, new regulations being developed by DOT and the Environmental Protection Agency will require greater characterization of these hazards. Available GRI hazard models are not structured to address these new rules. GRI plans to develop techniques to model hazards associated with anticipated
regulations, develop experimental data for key hazards not adequately studied in the U.S. (vapor cloud explosions, pressurized two-phase releases), and validate hazard models appropriate to the gas industry.

**Smart Pigging and Nondestructive Evaluation**

**Development of an Advanced Smart Pig for Detection of Third-Party Damage**

Third-party pipeline damage can occur without causing an instantaneous leak or rupture. When this damage occurs, the defect can be left in the pipeline, unknown to the operator, where it can grow to failure. The risk of failure, either by leak or rupture, can depend on the type of damage (dent, dent with gouge, gouge), type of material, and service conditions. Pigs can detect some conditions that may exist as a result of third-party damage, but there has not been a comprehensive review of the capability of MFL pigs to detect and characterize third-party damage. Geometry, variation in material properties, and mechanical anomalies can affect the resulting MFL signal. A systematic approach would mimic the advanced MFL pig program at GRI and take advantage of the availability of the PSF.

**Development of an Inspection Robot for Unpiggable Lines**

GRI is conducting an evaluation to determine if a self-powered, self-propelled inspection robot could be developed for the inspection of pipelines that cannot be inspected using currently available smart pigs. Most pipeline mileage today cannot be inspected with smart pigs because of obstructions in the lines, including tight-radius bends, reduced-port valves, telescoping pipe systems, and large branch tees. An inspection robot would have the advantage of being insensitive to gas flow and would be capable of detailed examination of specific pipe segments suspected of damage, corrosion, or cracking. GRI’s evaluation will build upon the inspection robotic technology already under development for inspecting gas distribution mains.
Emergency Procedures

Emergency Preparedness for Response to Natural Disasters

Recent events have raised questions about the effects of natural disasters on gas pipeline systems. GRI plans to document the gas system response, both the physical system and the service capabilities, to four recent major natural disasters: 1) the 1989 Loma Prieta earthquake in the San Francisco Bay area; 2) the 1994 earthquake in the Los Angeles area; 3) Hurricane Andrew in 1992 in Florida and Louisiana; and 4) the 1993 floods in the Midwest. Gas company participants include Pacific Gas and Electric, Southern California Gas, City of Palo Alto Municipal Gas System, Peoples Gas System, and Laclede Gas. The documentation will include conditions and information about releases of natural gas, what the ignition sources were when fires occurred, to what standards the pipeline was constructed, how any gas releases and/or fires affected response operations, and what actions were taken by response teams and the gas company. The study will identify issues that could be addressed by research. Examples of research that could be suggested are: 1) guidelines for developing emergency response plans; 2) the development of modified (e.g., earthquake tolerant) installation practices for critical system components; and 3) development of safety-related monitoring and shutdown systems.

Improvements in Automatic and Remotely Operated Valves

Improvements can be made in the performance of line break valve-control equipment for high-pressure pipelines. The newer electronic controls provide advantages over older pneumatic controls. However, reliable performance still depends on sensing the appropriate pipeline operating variables (typically rate of pressure drop and static pressure) and distinguishing an actual line break from other transient conditions. Research can be conducted to get a better understanding of characterization of pipeline conditions resulting from a line break and those associated with other types of transient conditions. This will result in more reliable use of existing line break valve-control equipment. However, due to the similarities between some line break and pipeline transient conditions, non-conventional pipeline operating parameters may have to be investigated for further performance improvements. In addition to more reliable use of line break control sensors and algorithms, research can investigate potential improvements in valve operator hardware.
**Structural Integrity**

**Development of a Structural Integrity Criteria for Third-Party Damage**

Third-party damage usually results in a combination of distortion to the geometry of the pipe, cold working of some material, and loss of thickness in the pipe. PRC has developed pipe-fracture models that could be extended to cover changes in material properties through the thickness. Correspondingly, loads in dented areas could be calculated by extending current shell or finite-element models. These models would then need to be verified with tests.

**CONCLUSION**

The ongoing GRI pipeline safety program represents a positive action on the part of the U.S. gas industry to address the inherent risks in the operation of a high-pressure pipeline system. The results of the program will continue to improve on an already impressive safety record. New efforts in the planning phase offer the long-term promise of further risk minimization.
Pipeline Safety Summit

Allaying Public Concerns About Pipeline Safety

George Mazanec
Vice Chairman, Panhandle Eastern Corporation
Pipeline Safety Summit

Panhandle Eastern Corporation

Pipeline Safety Summit

1993 U. S. Energy Mix

Natural Gas
25%

Nuclear
8%

Petroleum
40%

Hydro
4%

Coal
23%

Source: EIA Monthly Energy Review March 1994

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-15
Pipeline Safety Summit

Energy Equivalents

20 Tcf Natural Gas = 9,523,810 Railcars Coal = 2,222 Supertankers Oil

Pipeline Safety Summit

1992 Transportation-Related Fatalities

Highway 33,790
Pedestrian 5,410

Total 41,917

Source: NTSB and U.S. DOT

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-16
Pipeline Safety Summit

Pipeline Transmission Incidents 1970-1993

Outside Forces 50%
Corrosion 18%
Construction or Material Defect 23%
Other 9%

Source: U.S. Department of Transportation

Pipeline Safety Summit

Public Awareness Campaigns

- Letters
- Brochures
- Public Service Announcements
- Advertisements
- Meetings
- Voluntary “One Call” Program

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-17
**Pipeline Safety Summit**

**Reaching the Public**

NATURAL GAS PIPELINE
CALL 1-800-225-3013

---

**Pipeline Safety Summit**

**Current Regulatory Oversight**

- Federal Energy Regulatory Commission
- Department Of Transportation
- National Transportation Safety Board
- Environmental Protection Agency
Pipeline Safety Summit

Moving Forward

• Mandatory "One Call"
• Increased Right-of-Way Protections
• Expanded Information Exchange
• Continued Safety-related Research and Development
FACT SHEET

FEDERAL PIPELINE SAFETY PROGRAM

The U.S. Department of Transportation's Research and Special Programs Administration (RSPA), acting through the Office of Pipeline Safety (OPS), administers the national regulatory program to assure safe transportation of natural gas, petroleum, and other hazardous materials by pipeline. The mission of OPS is to protect the people and the environment of the United States through a comprehensive pipeline safety program that includes effective risk management, thorough pipeline operator compliance, high-quality training, and a strong, balanced federal/state partnership.

Legislative Authority. Two substantially identical statutes provide the framework for the federal pipeline safety program. The Natural Gas Pipeline Safety Act of 1968 as amended (NGPSA) authorizes the Department to regulate pipeline transportation of natural (flammable, toxic, or corrosive) gas and other gases as well as the transportation and storage of liquefied natural gas (LNG). Similarly, the Hazardous Liquid Pipeline Safety Act of 1979 as amended (HLPSA) authorizes the Department to regulate pipeline transportation of hazardous liquids (crude oil, petroleum products, anhydrous ammonia, and carbon dioxide). The Consolidated Omnibus Budget Reconciliation Act of 1985 authorizes OPS to assess and collect annual fees from the pipeline industry on a per-mile of transmission pipeline basis to fund the cost of the pipeline safety program under NGPSA and HLPSA.

Two recent acts expanded the Department's mandate to the areas of environmental protection and emergency response planning. The Pipeline Safety Act of 1992, which amends NGPSA and HLPSA, places protection of the environment on a par with public safety as a basis for program activities. To improve emergency response capabilities and minimize the environmental impact of oil discharges, the Oil Pollution Act of 1990 requires operators of vessels and onshore facilities, including pipelines, to prepare and submit plans for responding to oil spills from those facilities. OPS has been delegated authority to require, review, and approve pipeline operator onshore response plans. Both these recent acts have the effect of increasing emphasis on hazardous liquid pipelines.

Safety Jurisdiction. OPS' pipeline safety jurisdiction covers some 2,800 gathering, transmission, and distribution operators as well as approximately 52,000 master meter and 106 liquefied natural gas operators who own and/or operate approximately 1.7 million miles of gas pipelines. In addition, on the hazardous liquid side, safety jurisdiction includes over 250 operators and an estimated 155,000 miles of pipelines. The Pipeline Safety Act of 1992 lifted the exception to regulating low-stress pipelines, resulting in an additional 8,600 miles of jurisdictional hazardous liquid lines.

OPS has 68 employees (authorized strength is 72). Half the employees work at OPS Headquarters; the other half are located in five Regional Offices across the country (Eastern Region — Washington, D.C.; Southern Region — Atlanta, Georgia; Central Region — Kansas City, Missouri; Southwest Region — Houston, Texas; and Western Region — Lakewood, Colorado) and at RSPA's training facility, the Transportation Safety Institute (TSI), in Oklahoma City, Oklahoma.

Regulations and Risk Management. The federal pipeline safety regulations, published in the Code of Federal Regulations, 49 CFR Parts 190-199, (1) assure safety in design, construction, inspection, testing, operation, and maintenance of pipeline facilities and in the siting, construction, operation, and maintenance of LNG facilities; (2) set out parameters for administering the pipeline safety program; and (3) delineate requirements for onshore oil pipeline response plans. The regulations are written as minimum performance standards. They do not specify the methodology for compliance but set the level of safety to be attained and allow the pipeline operator discretion in achieving that level.

As an adjunct to regulation, OPS uses alert notices to inform pipeline operators and federal and state pipeline safety personnel of critical safety or environmental risks, usually identified during pipeline accident
investigations. OPS also releases periodic advisory bulletins highlighting issues which have the potential of becoming safety or environmental risks. Alert notices and advisory bulletins are effective vehicles for flagging possible problems and may avoid the need for additional regulations altogether.

To prioritize safety and environmental issues, OPS is developing a risk model that will enable it to assess the probability and consequences of any given risk; determine the cost impact of each practical solution (e.g., regulation, alert notice, training, compliance activity); and rank the most effective solution for managing or abating the risk. Known as Risk Assessment Prioritization (RAP), this process will allow OPS to support the development and implementation of its pipeline safety agenda, leading to optimal use of resources and effective response to increasing pipeline safety and environmental concerns. The first RAP ranking cycle is expected to be completed in FY 1994.

Partnership with States. While the federal government is primarily responsible for developing, issuing, and enforcing pipeline safety regulations, NGPSA and HLPSA provide for state assumption of the intrastate regulatory, inspection, and enforcement responsibilities under an annual certification. To qualify for certification, a state must adopt the minimum federal regulations and may adopt additional or more stringent regulations as long as they are not incompatible. A state must also provide for injunctive and monetary sanctions substantially the same as those authorized by NGPSA and HLPSA.

A state agency which does not satisfy the criteria for certification may enter into an agreement to undertake certain aspects of the pipeline safety program for intrastate facilities on behalf of OPS. While the state agency under an agreement will inspect pipeline operators to ascertain compliance with federal safety regulations, any probable violations are reported to OPS for enforcement action. NGPSA and HLPSA also provide for exclusive federal authority to regulate intrastate pipelines. OPS may authorize a state to act as its agent to inspect interstate pipelines, but retains responsibility for enforcement of the regulations. Most states have supported the concept of common stewardship in pipeline safety. The resulting federal/state partnership forms the cornerstone of the pipeline safety program.

OPS is authorized to reimburse a state agency up to 50 percent of the actual cost for carrying out its pipeline safety program, including the cost of personnel and equipment. The actual amount of federal reimbursement depends upon the availability of appropriated funds and state program performance. The formula used to allocate funds includes performance factors such as extent to which the state asserts safety jurisdiction over pipeline operators, whether the state has adopted all federal requirements, and number and qualifications of state pipeline safety inspectors. OPS Regional Offices monitor the performance of the state agencies participating in the pipeline safety program.

Partnership with Industry. Industry-government collaboration and communication have increased significantly over the last several years. As an example, a team representing a cross section of industry and government has been assembled to develop a risk assessment model that could be used by liquid pipeline operators in allocating resources to most effectively reduce risk. Another industry-government team is developing an approach for a national pipeline mapping program using geographic information system technology. Industry is providing more well-prepared and realistic petitions for rulemaking on pipeline safety issues. OPS is participating in more industry meetings across the country.

Compliance. Achieving operator compliance with the pipeline safety regulations is critical to preventing accidents. A major aspect of compliance involves regular inspections of pipeline facilities and, in the event of a violation of the regulations, imposition of an appropriate administrative, civil, or criminal remedy. A cadre of 30 federal and 250 state safety inspectors perform standard, follow-up, drug, and construction inspections of pipeline operators. These inspectors also conduct accident investigations and respond to public complaints concerning pipeline operations.
OPS Regional Offices inspect interstate pipeline systems and intrastate facilities under direct federal jurisdiction to determine operator compliance with pipeline safety regulations. These facilities include municipal and master meter gas systems that by state law are not subject to state regulation or intrastate pipelines in states where the state agency is not participating in the program. To allocate its compliance resources to maximize the impact on safety, OPS has implemented a computer-based program, known as the pipeline inspection priority program (PIPP), which rates pipeline operators on system characteristics, filed reports, and accident data. PIPP helps increase productivity by targeting high-risk inspection units.

OPS investigates major pipeline accidents to determine whether corrective action is needed for continued operation, whether violations of regulations occurred, and whether revisions or additions to the regulations are needed. The National Transportation Safety Board may also perform independent investigations of accidents to determine probable cause. OPS requires pipeline operators to report immediately by telephone all accidents that fall under criteria established in the regulations. A written report must follow within 30 days of an accident. The leading cause of pipeline failures is outside force damage, followed by corrosion, which is becoming increasingly significant as the pipeline infrastructure ages. Upon determination that a probable violation of the pipeline safety regulations has occurred, OPS has a variety of enforcement actions available. These actions range from issuance of a warning letter to a hazardous facility order requiring immediate suspension of operations or restricted use of a pipeline facility. Violations have also resulted in civil and criminal penalties.

Increasing Focus on Environmental Protection. Requirements in the Oil Pollution Act of 1990 and Pipeline Safety Act of 1992, coupled with a March 26, 1993 pipeline spill of 400,000 gallons of diesel fuel into a tributary of the Potomac River threatening the local water supply, were instrumental in increasing emphasis on protection of the environment from the risk of pipeline spills. After the March spill, OPS conducted a review of the pipeline safety program to determine its capability for carrying out its emerging environmental protection mission. Based on the review, the Secretary of Transportation announced an Action Plan that includes (1) accelerating five rulemakings which address hydrostatic testing of older pipelines, previously excepted low stress pipelines, internal inspection of new and replaced pipelines, damage prevention, and emergency flow restricting devices and related systems; (2) refocusing compliance efforts to increase inspections of newly constructed and high-risk hazardous liquid pipeline facilities; (3) promoting more comprehensive one-call centralized notification systems to locate and mark underground utilities; (4) bringing more states into the hazardous liquid program and deputizing states to help with construction inspections and accident investigations; and (5) continuing implementation of the Oil Pollution Act with emphasis on reviewing response plans for low stress pipelines and working with the Environmental Protection Agency and Coast Guard to involve Area Contingency Planning Committees in identifying environmental areas at risk from pipelines.

Program Enhancements. A March 23, 1994 interstate natural gas transmission pipeline explosion in Edison, New Jersey, raised further concerns about the safety and integrity of the Nation's pipelines. The Secretary of Transportation took steps to substantially improve the pipeline safety program in recognition that pipelines are a critical component of the national transportation system. The Administration sent to Congress an amendment to the Department's FY 1995 budget request to increase resources available for pipeline safety by 93 percent. The proposed increase would provide stronger capability for field inspection, accident investigation, technical assessments, computer mapping, and R&D into new technologies, as well as fund state program costs at the 50 percent level.

Training. Training is fundamental to ensuring a thorough understanding of the pipeline safety regulations, compliance requirements, inspection techniques, and enforcement procedures. OPS requires new federal and state pipeline safety inspectors to complete all applicable training courses in a 3-year period. Most of these training courses are held at TSI's facility in Oklahoma City. TSI also holds seminars for industry at state-selected sites across the country.
Research and Data Analysis. OPS conducts research to support regulatory and compliance activity and to provide the technical and analytical foundation necessary for planning, evaluating, and implementing the pipeline safety program. OPS collects, compiles, and analyzes a variety of pipeline safety data to aid in decision making. These data largely come from accident/safety-related condition reports submitted by pipeline operators and annual reports submitted by gas pipeline operators which include information on miles and types of pipelines. OPS also publishes a comprehensive annual report to Congress on the status of the pipeline safety program.

Advisory Committees. Congress mandated two technical advisory committees — the Technical Pipeline Safety Standards Committee (for gas) and the Technical Hazardous Liquid Pipeline Safety Standards Committee (for hazardous liquids) — to review proposed pipeline safety regulations for technical feasibility, reasonableness, and practicability. Committee members, who represent government, the industry, or the public, provide a valuable, independent base of technical knowledge and practical experience to OPS. The committees generally meet twice a year to review regulations and provide advice on various pipeline safety issues.

Outreach. OPS works closely with the National Association of Pipeline Safety Representatives (NAPSR) and the National Association of Regulatory Utility Commissioners (NARUC). NAPSR is an affiliation of state program managers involved in day-to-day pipeline safety activities. Each year, NAPSR holds a national board of directors meeting and five regional meetings, corresponding to the five OPS Regional Offices. These sessions promote information exchange on pipeline technology, inspection techniques, operational problems, significant accidents, and innovative approaches for implementing the pipeline safety program. NAPSR, on an annual basis, also submits resolutions on a variety of pipeline safety concerns of national scope for OPS consideration. NARUC is an organization of governmental agencies committed to improving the quality and effectiveness of utility regulation in America. The Staff Subcommittee on Pipeline Safety under NARUC’s Committee on Gas addresses specific pipeline safety issues.

OPS frequently interacts with organizations such as the American Gas Association, American Public Gas Association, Interstate Natural Gas Association of America, American Petroleum Institute, and Association of Oil Pipe Lines. Additionally, OPS coordinates with a number of federal agencies which have missions that affect pipeline safety, including the Minerals Management Service and Bureau of Land Management in the Department of the Interior, Environmental Protection Agency, Coast Guard, Department of Energy, Federal Energy Regulatory Commission, the National Oceanic and Atmospheric Administration and National Institute of Standards and Technology in the Department of Commerce, and the Occupational Safety and Health Administration in the Department of Labor.

OPS Headquarters and Regional Offices

<table>
<thead>
<tr>
<th>Region</th>
<th>Contact Person</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters</td>
<td>George W. Tenley, Jr., Associate Administrator for Pipeline Safety</td>
<td>(202) 366-4595</td>
</tr>
<tr>
<td></td>
<td>Cesar De Leon, Director, Office of Technology and Standards</td>
<td>(202) 366-4583</td>
</tr>
<tr>
<td></td>
<td>Tom Forner, Director, Office of Compliance and State Programs</td>
<td>(202) 366-4584</td>
</tr>
<tr>
<td></td>
<td>Stacey Gerard, Director, Office of Program Development</td>
<td>(202) 366-6855</td>
</tr>
<tr>
<td>Eastern Region</td>
<td>William H Gute, Regional Director</td>
<td>(202) 366-4580</td>
</tr>
<tr>
<td>Southern Region</td>
<td>Frederick A. Joyner, Regional Director</td>
<td>(404) 347-2632</td>
</tr>
<tr>
<td>Central Region</td>
<td>Ivan A. Huntoon, Regional Director</td>
<td>(816) 426-2654</td>
</tr>
<tr>
<td>Southwest Region</td>
<td>James C. Thomas, Regional Director</td>
<td>(713) 750-1748</td>
</tr>
<tr>
<td>Western Region</td>
<td>Edward J. Ondak, Regional Director</td>
<td>(303) 969-5150</td>
</tr>
<tr>
<td>Transportation</td>
<td>Richard Sanders, Manager, Pipeline Safety Division</td>
<td>(405) 954-7214</td>
</tr>
</tbody>
</table>

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-23
OFFICES OF RSPA

THE RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION TODAY
For Immediate Release:
Monday, June 20, 1994

Lautenberg, Bradley, Pallone to Introduce
Comprehensive Pipeline Safety Legislation

Frank Pallone (D-N.J.) today unveiled comprehensive pipeline safety
legislation to prevent future disasters like the Edison explosion.
Sen. Bill Bradley (D-N.J.) is a cosponsor of the bill in the Senate.

The lawmakers announced their legislation at a news
conference during a Pipeline Safety Summit in Newark hosted by the
U.S. Department of Transportation. The purpose of the summit is to
develop a public/private agenda that establishes priorities for
pipeline safety initiatives and identifies the next steps needed to
make them a reality.

"The Edison tragedy woke us up," Lautenberg said. "It showed
us how vulnerable all of us are to a potential gas pipeline
explosion. It was only by luck and outstanding work by local
emergency teams that the Edison disaster wasn't worse.

"Tighter controls of our underground pipelines are
needed to prevent another disaster. These measures would
dramatically increase the safety margin of underground pipelines in
New Jersey and around the country."

The Lautenberg/Bradley/Pallone bill would:

- Provide grants to the states and one-call centers to promote
  their one-call systems.

- Provide the Secretary of Transportation with the authority to
develop a national campaign to increase understanding by the public
of the risks involved in pipeline transportation and the benefits of
one-call notifications systems.

- Require pipeline operators to notify residents if they are in
  the vicinity of a pipeline and to set up a system where residents
can report suspicious activities (digging or dumping) on the pipeline
right-of-way.

Prepared by the Institute for Transportation at New Jersey Institute of Technology
C-25
o Require the Federal Energy Regulatory Commission to review its practices and guidelines for siting natural gas interstate transmission facilities in urban areas.

o Mandate periodic inspection of pipelines by instrumented internal inspection devices (p.i.g.s.) and new pipelines to be pigged to establish a baseline on data on the pipeline.

o Mandate the use of remotely or automatically controlled shut-off valves whenever possible in the vicinity of a pipeline and to set up a system where residents can report suspicious activities (digging or dumping) on the pipeline right-of-way.

"New Jersey has thousands and thousands of miles of underground gas pipelines. Most of us live above or near one of these pipelines. It's critical that we improve the safety system to prevent future pipeline explosions," Lautenberg concluded.
APPENDIX D

Attendees
**ATTENDEES**

**Department of Transportation**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judith Burrell</td>
<td>Special Assistant to the Secretary</td>
<td>(202) 366-5524</td>
</tr>
<tr>
<td>Richard Mintz</td>
<td>Director of Public Affairs</td>
<td>(202) 366-4570</td>
</tr>
</tbody>
</table>

**Research and Special Programs Administration**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bernestine Allen</td>
<td>Staff</td>
<td>(202) 366-4398</td>
</tr>
<tr>
<td>Barbara Betsock</td>
<td>Deputy Chief Counsel</td>
<td>(202) 366-4401</td>
</tr>
<tr>
<td>Linda Booth</td>
<td>Staff, Office of Hazardous Materials Safety</td>
<td>(202) 366-4472</td>
</tr>
<tr>
<td>Bill Holt</td>
<td>Staff, Office of Hazardous Materials Safety</td>
<td>(202) 366-4448</td>
</tr>
<tr>
<td>Jim Kabel</td>
<td>Staff, Program and Policy Support</td>
<td>(202) 366-66714</td>
</tr>
<tr>
<td>Judith Kaleta</td>
<td>Chief Counsel</td>
<td>(202) 366-4400</td>
</tr>
<tr>
<td>Patricia Klinger</td>
<td>Governmental/Public Affairs Specialist</td>
<td>(202) 366-4831</td>
</tr>
<tr>
<td>David Sharma</td>
<td>Administrator Designate</td>
<td>(202) 366-4433</td>
</tr>
<tr>
<td>Cheryl Whetsel</td>
<td>Staff</td>
<td>(202) 366-4431</td>
</tr>
<tr>
<td>Joseph E. Young</td>
<td>Director of Budget and Programs</td>
<td>(202) 366-4348</td>
</tr>
</tbody>
</table>

Headquarters Mailing address: 400 7th Street, S.W., Washington, DC 20590
## ATTENDEES

### Office of Pipeline Safety

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Phone</th>
<th>Address</th>
<th>City, State</th>
<th>Zip</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cesar DeLeon</td>
<td>Director, Office of Technology and Standards</td>
<td>(202) 366-1640</td>
<td>1720 Peachtree Road, NW, Suite 426N</td>
<td>Atlanta, GA</td>
<td>30309</td>
<td>(404) 347-2632</td>
</tr>
<tr>
<td>Tom Fortner</td>
<td>Director, Office of Compliance and State Programs</td>
<td>(202) 366-4564</td>
<td>911 Walnut Street, Room 1811</td>
<td>Kansas City, MO</td>
<td>64106</td>
<td>(816) 426-2654</td>
</tr>
<tr>
<td>Stacey Gerard</td>
<td>Director, Office of Program Development</td>
<td>(202) 366-6855</td>
<td>2320 LaBranch, Room 2116</td>
<td>Houton, TX</td>
<td>77004</td>
<td>(713) 750-1746</td>
</tr>
<tr>
<td>Bill Gute</td>
<td>Eastern Regional Director</td>
<td>(202) 366-4580</td>
<td>555 Zang Street, 2nd Floor</td>
<td>Lakewood, CO</td>
<td>80228</td>
<td>(303) 696-5150</td>
</tr>
<tr>
<td>Karen Sagett</td>
<td>Staff</td>
<td>(202) 366-4577</td>
<td>6500 South MacArthur Boulevard</td>
<td>Oklahoma City, OK</td>
<td>73125</td>
<td>(405) 954-7214</td>
</tr>
<tr>
<td>Lance Wallace</td>
<td>Eastern Regional Inspector</td>
<td>(202) 366-4580</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fred Joyner</td>
<td>Southern Regional Director</td>
<td></td>
<td>1720 Peachtree Road, NW, Suite 426N</td>
<td>Atlanta, GA</td>
<td>30309</td>
<td>(404) 347-2632</td>
</tr>
<tr>
<td>Ivan Huntoon</td>
<td>Central Regional Director</td>
<td></td>
<td>911 Walnut Street, Room 1811</td>
<td>Kansas City, MO</td>
<td>64106</td>
<td>(816) 426-2654</td>
</tr>
<tr>
<td>Jim Thomas</td>
<td>Southwest Regional Director</td>
<td></td>
<td>2320 LaBranch, Room 2116</td>
<td>Houton, TX</td>
<td>77004</td>
<td>(713) 750-1746</td>
</tr>
<tr>
<td>Ed Ondak</td>
<td>Western Regional Director</td>
<td></td>
<td>555 Zang Street, 2nd Floor</td>
<td>Lakewood, CO</td>
<td>80228</td>
<td>(303) 696-5150</td>
</tr>
<tr>
<td>Richard Sanders</td>
<td>Manager, Pipeline Safety Division</td>
<td></td>
<td>6500 South MacArthur Boulevard</td>
<td>Oklahoma City, OK</td>
<td>73125</td>
<td>(405) 954-7214</td>
</tr>
<tr>
<td>Deidre Breithaupt</td>
<td>Regional Chief</td>
<td></td>
<td>10 Park Place, Suite 550</td>
<td>Newark, NJ</td>
<td>07102</td>
<td>(201) 645-3968</td>
</tr>
</tbody>
</table>
## ATTENDEES

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Company/Location</th>
<th>Phone</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Abboud</td>
<td>Senior Vice President of Operations and Engineering</td>
<td>Santa Fe Pacific Pipelines, Inc. 888 South Figueroa Street Los Angeles, CA 90017</td>
<td>(213) 486-7721</td>
<td></td>
</tr>
<tr>
<td>Ronald L. Adams</td>
<td>Vice President - Pipeline Operations</td>
<td>Transcontinental Gas Pipe Line Corporation P.O. Box 1396 Houston, TX 77251</td>
<td>(713) 439-2322</td>
<td>(713) 439-2345</td>
</tr>
<tr>
<td>P. S. (Pat) Anderson</td>
<td>Vice President, Engineering and Operations</td>
<td>Foothills Pipe Lines Ltd. 3100 - 707 Eighth Avenue, S.W. Calgary, Alberta, CANADA T2P 3W8</td>
<td>(403) 294-4434</td>
<td>(403) 294-4177</td>
</tr>
<tr>
<td>Robert S. Bahnick</td>
<td>Division Manager</td>
<td>Transcontinental Gas Pipe Line Corporation 214 Carnegie Center - Suite 300 Princeton, NJ 08540</td>
<td>(609) 951-0990</td>
<td>(609) 936-2400</td>
</tr>
<tr>
<td>Charles Batten</td>
<td>Resource Specialist</td>
<td>National Transportation Safety Board 490 L'Enfant Plaza, S.W. Washington, DC 20594</td>
<td>(202) 382-0672</td>
<td>(202) 382-0060</td>
</tr>
<tr>
<td>W. Lynn Beason</td>
<td>Associate Professor</td>
<td>Texas Transportation Institute Texas A&amp;M University College Station, TX 77843</td>
<td>(409) 845-4987</td>
<td>(409) 845-6554</td>
</tr>
<tr>
<td>James E. Beech</td>
<td>Manager, Pipeline Safety</td>
<td>Texas Gas Transmission Corporation 3800 Frederica Street Owensboro, KY 42301</td>
<td>(502) 926-8686</td>
<td>(502) 926-8686</td>
</tr>
<tr>
<td>Philip Bennett</td>
<td>Manager</td>
<td>Natural Gas Pipeline 701 E. 22nd Street Lombard, IL 60148</td>
<td>(708) 691-3742</td>
<td>(708) 691-3828</td>
</tr>
<tr>
<td>Robert W. Best</td>
<td>President and Chief Executive Officer</td>
<td>TRANSCO Gas Company P.O. Box 1396 Houston, TX 77251</td>
<td>(713) 439-2311</td>
<td>(713) 439-4269</td>
</tr>
<tr>
<td>Paul Biancardi</td>
<td>President Eastern Corporation</td>
<td>5400 Westheimer Court Houston, TX 77056</td>
<td>(713) 627-5225</td>
<td></td>
</tr>
<tr>
<td>Richard Biljetina</td>
<td>Vice President</td>
<td>Institute of Gas Technology 3424 S. State Street Chicago, IL 60616</td>
<td>(312) 690-6418</td>
<td>(312) 690-6419</td>
</tr>
<tr>
<td>Russell Bishop</td>
<td>Director of State Regulatory Affairs</td>
<td>Panhandle Eastern Corporation 5400 Westheimer Houston, TX 77056</td>
<td>(713) 627-5527</td>
<td></td>
</tr>
</tbody>
</table>
ATTENDEES

Lisa Bogardus
Lebouf, Lamb, Greene-Macrae
125 West 55th Street
New York, NY 10019
(212) 424-8569

Joseph C. Caldwell
Consultant
Caldwell & Associates
2111 Wilson Boulevard - Suite 700
Arlington, VA 22201
(703) 875-8775

Dawn Boggio
Technology Transfer Specialist
Center for Transportation Studies and Research
New Jersey Institute of Technology
Newark, NJ 07102-1982
(201) 596-6463
(201) 596-6454 FAX

Khalil Callier
Intern - Senator Frank Lautenberg
10 Grant Avenue
East Orange, NJ 07016
(201) 674-1382

Jean Bratsafalis
Elizabethtown Gas Company
1 Elizabethtown Plaza - P.O. Box 3175
Union, NJ 07083-1975
(908) 289-5000

Joseph Carey
Philadelphia Gas
800 West Montgomery Avenue
Philadelphia, PA 19122
(215) 684-6372
(215) 684-6324

Donald Brinkley
President and CEO
Colonial Pipeline Company
945 East Paces Ferry Road, NE
Atlanta, GA 30326
(404) 841-2325
(404) 841-2466 FAX

Dr. John M. Carlyle
Executive Director
Physical Acoustics
15 Princess Road
Princeton, NJ 08645
(609) 844-0800
(609) 895-9726

Jesse A. Brothers
Manager, Engineering & Compliance
Ashland Pipe Line Company
P.O. Box 391
Ashland, KY 41114
(606) 329-5616
(606) 329-4771 FAX

Rachael Chiaramida
Resident, Edison Township
4 Fox Hill Road
Edison, NJ 08820
(908) 548-1970

Bill Burnett
Senior Vice President
Technology Development
Gas Research Institute
8600 West Bryn Mawr Avenue
Chicago, IL 60631-3562
(312) 399-8121
(312) 399-8326 FAX

William G. Christman
Vice President - Senior Analyst
Moody's Investors Service
99 Church Street
New York, NY 10005
(212) 553-0375
ATTENDEES

Henry Cialone
Battelle Memorial Laboratory
505 King Avenue
Columbus, OH 43201
(614) 424-4650
(614) 424-5263 FAX

Dan Considine
Publications Editor
Texas Gas Transmission Corporation
3800 Frederica Street
Owensboro, KY 42301
(502) 686-2205
(502) 686-4545 FAX

Edward B. Clark
Structural Integrity Administrator
Columbia Gas Transmission Corporation
1700 MacCorkle Avenue
Charleston, WV 25314
(304) 357-2151
(304) 357-2424 FAX

Dan Coughlin
Engineer-in-Charge
National Fuel Gas Company
10 Lafayette Square
Buffalo, NY 14127
(716) 857-7060
(716) 857-7212 FAX

Larry Clynh
Regional Transportation Manager
Mid-Continent Region
Conoco, Inc.
P.O. Box 1267
Ponca City, OK 74062-1267
(405) 767-6352
(405) 767-3527 FAX

R. G. F. Croft
Executive Director
Tree-tops Consultation Center
114A South First Avenue
Highland Park, NJ 08904
(908) 249-3220
(908) 846-7388 FAX

Dale L. Coates
Director, Codes
ENRON
PO Box 1188
Houston, TX 77251-1188
(713) 646-7340
(713) 646-7130 FAX

Bob Cronk
Senior Vice President
MAPCO
1800 South Baltimore Avenue
Tulsa, OK 74119
(918) 599-3650

Randall Coleman
Panhandle Eastern Corporation
5400 Westheimer Court
Houston, TX 77056
(713) 627-5519

Gary Dean
Operating Analyst
South Jersey Gas Company
Number One South Jersey Plaza
Route 54
Folsom, NJ 08037
(609) 561-9000 (x313)
(609) 561-8225

Peter Collette
Manager - Planning and Design
Systems Engineering and Technical Support
Public Service Electric and Gas Company
80 Park Plaza, PO Box 570
Newark, NJ 07101
(201) 430-7827
(201) 430-5519 FAX

John DesBarres
Chairman, President & Chief Executive Officer
Transco Energy Company
P.O. Box 1396
Houston, TX 77251
(713) 439-2222
(713) 439-4269 FAX
ATTENDEES

Paul Devaney  
Chairman, ULCC  
American Public Works Association  
106 W - 11th Street - Suite 1800  
Kansas City, MO  64105-1806  
(816) 472-6100

Bruce Ellsworth  
Commissioner  
New Hampshire Public Utilities Commission  
8 Old Suncook Road  
Concord, NH  03301  
(603) 271-2443  
(603) 271-3878 FAX

Mario DiCocco  
Division Technical Manager  
Transcontinental Gas Pipe Line Corporation  
214 Carnegie Center - Suite 300  
Princeton, NJ  08540  
(609) 951-0990  
(609) 936-2400 FAX

John Erickson  
Vice President, Engineering  
American Gas Association  
1515 Wilson Boulevard  
Arlington, VA  22209  
(703) 841-8450  
(703) 841-8695 FAX

J. A. (Andy) Drake  
Director, Engineering - Codes and Safety Compliance  
Panhandle Eastern Corporation  
5444 Westheimer  
Houston, TX  77056-5388  
(713) 989-2311  
(713) 989-2102 FAX

Carl E. J. Ericson  
Manager, News Bureau  
American Gas Association  
1515 Wilson Boulevard  
Arlington, VA  22209  
(703) 841-8661

Bob Dresnack  
Professor of Civil/Environmental Engineering  
New Jersey Institute of Technology  
323 King Boulevard  
Newark, NJ  08816  
(201) 596-2469  
(201) 242-1823 FAX

Angelo G. Fabiano  
Director, System Engineering  
Brooklyn Union  
One MetroTech Center  
Brooklyn, NY  11201-3850  
(718) 403-3036  
(718) 488-1761 FAX

H. Noel Duckworth  
Owner  
Pipeline Consultants  
1911 Quarterpath Drive  
Richmond, TX  77469  
(713) 342-6118

Fraser Farmer  
PipeLink Associates  
323 MacDonald Road  
Oakville, Ontario, Canada  L6J2A8  
(905) 842-4635  
(905) 845-8122 FAX

Robert Eiber  
Director  
Transmission Pipeline Programs  
 Battelle Memorial Laboratory  
505 King Avenue  
Columbus, OH  43201  
(614) 424-4650  
(614) 424-5263 FAX

Jamie Finch  
Special Assistant to Jim Hall  
National Transportation Safety Board  
490 L'Enfant Plaza, S.W.  
Washington, DC  20594  
(202) 382-6506  
(202) 382-6848 FAX

Prepared by the Institute for Transportation at New Jersey Institute of Technology  
D-6
ATTENDEES

Jean Fitzgerald  
Chairman  
Florida Alliance, Inc.  
Box 13038  
Ft. Lauderdale, FL 33316  
(305) 767-3319  
(305) 767-3368 FAX

Gay Friedmann  
Vice President, Legislative Affairs  
Interstate Natural Gas Association of America  
555 13th Street, NW - Suite 300 West  
Washington, DC 20004  
(202) 626-3200

Roger W. Fleming  
Manager Field Operations  
Explorer Pipeline Company  
P.O. Box 2650  
Tulsa, OK 74101  
(918) 493-5100

Robert Gants  
Director, Executive Branch Relations  
American Gas Association  
1515 Wilson Boulevard  
Arlington, VA 22209  
(703) 841-8615

James R. Forster  
Manager, Engineering Services  
Elizabethtown Gas Company  
One Elizabethtown Plaza  
Union, NJ 07083  
(908) 287-5000

Kevin R. Gardner  
Attorney at Law  
Connel, Foley & Geiser  
85 Livingston Avenue  
Roseland, NJ 07068  
(201) 535-0500  
(201) 535-9217 FAX

Kathleen Fournier  
Executive Director  
MISS DIG Utility Communication System  
1030 Featherstone Road  
Pontiac, MI 48342-1830  
(810) 332-3422 ext. 300  
(810) 332-7523 FAX

James R. Gattis  
Senior Vice President - Technical Services  
Transcontinental Gas Pipe Line Corporation  
P.O. Box 1396  
Houston, TX 77251-1396  
(713) 439-2308  
(713) 439-4551 FAX

John H. Frantz  
Manager, Engineering  
Gas Operations  
PECO Energy Company  
2301 Market Street, S20-1  
Philadelphia, PA 19101-8699  
(215) 841-4973  
(215) 563-0618 FAX

John Gawronski  
Chief, Gas & Petroleum Safety  
N.Y.S. Public Service Commission  
Three Empire State Plaza  
Albany, NY 12223  
(518) 486-2648  
(518) 473-5625

Doug Freberg  
Legislative Representative  
American Gas Association  
1515 Wilson Boulevard  
Arlington, VA 22209  
(703) 841-8615

Vincent E. Gentile  
Attorney at Law  
Cohen, Shapiro, Polisher, Shiekmann and Cohen  
1009 Lenox Drive, Building Four  
Lawrenceville, NJ 08648  
(609) 895-6219  
(609) 895-1329 FAX

Prepared by the Institute for Transportation at New Jersey Institute of Technology
D-7
ATTENDEES

Patrick Gibson  
Project Manager, Strategic Planning  
Panhandle Eastern Corporation  
5400 Westheimer Court  
Houston, TX  77056  
(713) 627-5186  
(713) 989-3185 FAX

Mary Anne Gray  
Chair, Port Everglades Authority  
1850 Eller Drive  
Ft. Lauderdale, FL  33316-4201  
(305) 523-3404 (x 3794)  
(305) 761-1561 FAX

Thomas H. Gilmour  
Captain of the Port of New York  
U.S. Coast Guard  
Governors Island, Building 108  
New York, NY  10004  
(212) 668-7917  
(212) 668-7907 FAX

Joshua Greenfeld  
New Jersey Institute of Technology  
Newark, NJ  07102  
(201) 596-5808  
(201) 242-1823 FAX

Tobi Glovinisky  
Spokesperson  
Durham Woods Homeless Association  
123 Hidden Valley Drive  
Edison, NJ  08820  
(908) 603-9787

Ronald Griffiths  
Orbital Sciences  
2771 N. Garey Avenue  
Pomona, CA  91767  
(909) 593-3581  
(909) 593-7126 FAX

JoAnn Goc  
AMOCO Pipeline Company  
1 Mid America Plaza  
Oakbrook Terrace, IL  60181  
(708) 990-6105

Ana Sol Gutiérrez  
Acting Administrator  
Research and Special Programs Administration  
U.S. Department of Transportation  
400 7th Street, S.W.  
Washington, DC  20590  
(202) 366-4461  
(202) 366-7431

Eugene Golub  
Professor  
Department of Civil and Environmental Engineering  
New Jersey Institute of Technology  
Newark, NJ  07102  
(201) 596-2448

Jim Hall  
Vice Chairman  
National Transportation Safety Board  
490 L’Enfant Plaza, S.W.  
Washington, DC  20594  
(202) 382-6506  
(202) 382-6848 FAX

Richard Gordon  
Managing Director  
Merrill Lynch & Co.  
1 Houston Center  
1221 McKinney  Suite 2700  
Houston, TX  77010  
(713) 759-2510  
(713) 759-2581 FAX

Michael Harrington  
Legislative Director  
c/o Congressman Bob Franks  
429 Cannon House Office Building  
Washington, DC  20515  
(202) 225-5361  
(202) 225-9460 FAX
ATTENDEES

Clyde Hart
Counsel
Senate Commerce, Science & Transportation Committee
428 Hart Senate Office Building
Washington, DC 20510
(202) 224-8430
(202) 224-1882 FAX

James W. Hart, Jr.
Vice President, Public Affairs
Panhandle Eastern Corporation
5400 Westheimer Court
Houston, TX 77056-5310
(713) 627-4900

James W. Hart, Jr.
Vice President, Public Affairs
Panhandle Eastern Corporation
5400 Westheimer Court
Houston, TX 77056-5310
(713) 627-4900

Tracy B. Horstkamp
Office of City Attorney
City of Fredericksburg, VA
PO Box 7447
Fredericksburg, VA 22404
(703) 372-1020
(703) 372-1121 FAX

John Huff
Engineer in Charge
National Fuel Gas
1100 State Street - P.O. Box 2081
Erie, PA 16512
(814) 871-8577

Richard D. Huriaux
Director, Office of Engineering
District of Columbia Public Service Commission
450 5th Street, N.W.
Washington, DC 20001
(202) 626-5100

Rick Irby
Director of Federal Relations
Tenneco Gas
701 Pennsylvania Avenue, N.W. - Suite 710
Washington, DC 20004
(202) 942-0215

Lawrence E. Jackson
Acting Chief, Pipeline Division
National Transportation Safety Board
Washington, DC 20594
(202) 382-6620
(202) 382-6715 FAX

Lawrence E. Jackson
Acting Chief, Pipeline Division
National Transportation Safety Board
Washington, DC 20594
(202) 382-6620
(202) 382-6715 FAX

Michele Joy
Counsel
Association of Oil Pipe Lines
1725 K Street, NW
Washington, DC 20006
(202) 331-8228
(202) 822-1964 FAX

Judith Kaleta
Chief Counsel
Research and Special Programs Administration
U.S. Department of Transportation
400 7th Street, S.W.
Washington, DC 20590
(202) 366-4400
ATTENDEES

Mel Kanninen
Structural Systems and Technology Division
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78228
(210) 522-3248
(210) 647-5001 FAX

Walter Kelly
Consultant
Walter Kelly Enterprises, Inc.
1026 West Tenth Street
Winona, MN 55987
(507) 454-5147

John F. Kiefner
President
Kiefner & Associates, Inc.
PO Box 268
Worthington, OH 43085
(614) 888-8220
(614) 888-7323 FAX

Ted Kinne
Vice President, Environmental Safety and Operations
Interstate Natural Gas Association of America
555 13th Street, N.W. - Suite 300W
Washington, DC 20004
(202) 627-3217

Steve Kirk
New Jersey Board of Regulatory Commissioners
2 Gateway Center
Newark, NJ 07102
(201) 648-2204

Joseph F. Klesin
Gas & Petroleum Inspector II
NYS Public Service Commission
One Penn Plaza
New York, NY 10119
(212) 290-4371
(212) 290-4373

Dave Klucsik
New Jersey Natural Gas Company
1415 Wyckoff Road - P.O. Box 1464
Wall, NJ 07719
(908) 938-1114

Takashi (Tony) Kobori
Assistant Manager, Inspection Engineering
Pipeline Engineering & Development Center
Tokyo Gas Co., Ltd.
7-7, Suehiro-Cho- 1-Chome
Tsurumi-KU, Yokohama, JAPAN 230
(045) 505-7304
(045) 521-1451 FAX

Frank Kranik
Ecology & Environment, Inc.
111 W. Jackson Boulevard
Chicago, IL 60604
(312) 663-9415

David Krause
Corrosion Program Administrator
Buckeye Pipe Line Company
PO Box 368
Emmaus, PA 18049
(215) 967-3131, ext. 247
(215) 965-5164 FAX

Albert J. Lamkie
Chief
Edison Division of Fire
100 Municipal Boulevard
Edison, NJ 08817
(908) 248-7567
(908) 287-5719

Senator Frank Lautenberg
U.S. Senate
500 Hart Senate Office Building
Washington, DC 20510-3002
(202) 224-4744
(202) 224-9707 FAX
ATTENDEES

Terry Lechinger
Stress Engineering
13800 Westfair East Drive
Houston, TX  77041
(713) 955-2900

Keith G. Leewis
Senior Metallurgist
TransCanada Pipelines
TransCanada Pipeline Tower
111 Fifth Avenue, S.W.
P.O. Box 1000 - Station M
Calgary, Alberta, CANADA T2P 4K5
(403) 267-6400
(403) 267 6394 FAX

Holly Lehr
New Jersey Board of Regulatory Commissioners
2 Gateway Center
Newark, NJ  07102
(201) 648-2204

Mada Liebman
Deputy Director
Constituent Services
Office of Senator Frank Lautenberg
Newark, NJ  07102
(201) 645-3030

Edward Lihan
New Jersey Board of Regulatory Commissioners
2 Gateway Center
Newark, NJ  07102
(201) 648-2204

Don Linger
Algonquin Gas Transmission Company
1284 Soldiers Field Road
Boston, MA  02135
(617) 560-1318

John Loker
Columbia Gas Transmission Corporation
P.O. Box 1273
Charleston, WV  25325
(304) 357-2767

Kevin P. Madden
Director, Office of Pipeline Regulation
Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, DC  20426
(202) 208-0700
(202) 208-0353 FAX

Jim Makris
Director
Chemical Emergency Preparedness and Prevention Office
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC  20460
(202) 206-8600
(202) 260-7906 FAX

Rick Marini
Administrator, Safety Division
New Hampshire Public Utilities Commission
8 Old Suncook Road
Concord, NH  03054
(603) 271-2431
(603) 271-3878 FAX

Joseph Martinelli
President
Chevron Pipe Line Company
P.O. Box 5059 - Bishop Ranch #8
San Ramon, CA  94583-0959
(510) 842-6968
(510) 842-6906 FAX

Joseph Martinelli
President
Chevron Pipe Line Company
P.O. Box 5059 - Bishop Ranch #8
San Ramon, CA  94583-0959
(510) 842-6968
(510) 842-6906 FAX
## ATTENDEES

<table>
<thead>
<tr>
<th>Name</th>
<th>Title/Position</th>
<th>Company/Address</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Mason</td>
<td>Mayor</td>
<td>City of Fairfax</td>
<td>(703) 385-7850 (703) 385-7811 FAX</td>
</tr>
<tr>
<td>Norris E. McDivitt</td>
<td>Senior Vice President, Operations &amp; Engineering</td>
<td>Texas Gas Transmission Corporation</td>
<td>(502) 926-8886 (502) 926-8886 FAX</td>
</tr>
<tr>
<td>Marty Matheson</td>
<td></td>
<td>American Petroleum Institute</td>
<td>(202) 682-8189</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1220 L Street, NW</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Washington, DC 20005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Maxwell</td>
<td></td>
<td>New Jersey Petroleum Council</td>
<td>(609) 392-0800</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 West State Street</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trenton, NJ 08608</td>
<td></td>
</tr>
<tr>
<td>Dave McNeil</td>
<td>Vice President</td>
<td>Tenneco Gas</td>
<td>(713) 757-3931</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1010 Milam Street</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.O. Box 2511</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Houston, TX 77252-2511</td>
<td></td>
</tr>
<tr>
<td>George Mazanec</td>
<td>Vice Chairman</td>
<td>Panhandle Eastern Corporation</td>
<td>(713) 627-4623 (713) 627-4691 FAX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5400 Westheimer Court</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Houston, TX 77056</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richard L. McClellan</td>
<td>New Jersey Board of Regulatory Commissioners</td>
<td>CN 350</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trenton, NJ 08625</td>
<td>(609) 777-3309 (609) 777-3330 FAX</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hal R. Melendy</td>
<td>Director of Human Resources</td>
<td>Colonial Pipeline Company</td>
<td>(404) 841-2386 (404) 841-2466 FAX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>945 East Paces Ferry Road, NE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Atlanta, GA 30326</td>
<td></td>
</tr>
<tr>
<td>George A. Miller</td>
<td>Assistant Director</td>
<td>New Jersey Division of Fire Safety</td>
<td>(609) 633-6070 (609) 633-6324</td>
</tr>
<tr>
<td></td>
<td></td>
<td>101 South Broad Street, CN 809</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trenton, NJ 08625</td>
<td></td>
</tr>
</tbody>
</table>

---

*Proceedings of the U.S.D.O.T. National Pipeline Safety Summit, June 20, 1994*
*Prepared by the Institute for Transportation at New Jersey Institute of Technology*
ATTENDEES

Elizabeth Moler
Chair
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Washington, DC 20426
(202) 208-0000
(202) 208-0671 FAX

Richard F. Morrow
Vice President
Stone & Webster Management Consultants, Inc.
250 West 34th Street
New York, NY 10119-2998
(212) 290-7015
(212) 290-7123 FAX

Dean Moyer
Buckeye Pipe Line Company
3900 Hamilton Boulevard
Allentown, PA 18103
(610) 820-8300
(610) 820-3823 FAX

Ron Mucci
Vice President, Operations and Engineering
Williams Natural Gas Company
One Williams Center
PO Box 3288
Tulsa, OK 74101
(918) 588-3912

Rick Neal
Vice President, Public Affairs
MAPCO
1800 South Baltimore Avenue
Tulsa, OK 74119
(918) 599-3650

Michael Neuhard
Battalion Chief
Office of the Fire Marshal - Fairfax County
4100 Chain Bridge Road
Fairfax, VA 22030
(703) 246-3928
(703) 385-7591 FAX

Nancy Nickell
Editor, Community and Worker Right-to-Know News
Thompson Publishing Group
1725 K Street, N.W., 2nd Floor
Washington, DC 20006
(202) 872-4000
(202) 463-8381 FAX

Judith O'Brien
Professional Staff Member
House Energy and Commerce Committee
331 Ford House Office Building
Washington, DC 20515
(202) 226-2500
(202) 225-3962 FAX

Kathleen O'Leary
Director, Federal Government Affairs
Columbia Gas Transmission Corporation
700 13th Street, N.W. - Suite 900
Washington, DC 20002
(202) 626-1422
(202) 626-1420 FAX

Representative Frank Pallone, Jr.
U.S. House of Representatives
420 Cannon House Office Building
Washington, DC 20515-3006
(202) 225-4671
(202) 225-9665 FAX

Daniel G. Parrota
Senior Engineer
Consolidated Edison Company of New York
4 Irving Place
New York, NY 10003
(212) 460-6839

Larry Paulson
Interstate Natural Gas Association of America
555 13th Street, NW
Washington, DC 20004
(202) 626-3200
(202) 626-3250 FAX
ATTENDEES

William Penney, Jr.
Algonquin Gas Transmission Company
1284 Soldiers Field Road
Boston, MA 02135
(617) 560-1318

David Port
Senior Editor
Natural Gas Intelligence
PO Box 70587
Washington, DC 20024
(703) 318-8848
(703) 318-0597 FAX

Dr. Louis Pignataro
Executive Director
Center for Transportation Studies and Research
New Jersey Institute of Technology
Newark, NJ 07102
(201) 596-3355
(201) 596-6454 FAX

Eleanor P. Posey, P.E.
Professional Engineer
Andrews H. Payne, Jr., Consulting Engineers, Inc.
3258 Cahaba Heights Road
Birmingham, AL 35243
(205) 967-2520
(205) 967-2521 FAX

Richard C. Pittman
Senior Consultant, Planning and Evaluation
Four Corners Pipe Line Company
PO Box 787
Long Beach, CA 90810-0787
(310) 428-9080
(310) 428-9009 FAX

Eleanor P. Posey, P.E.
Professional Engineer
Andrews H. Payne, Jr., Consulting Engineers, Inc.
3258 Cahaba Heights Road
Birmingham, AL 35243
(205) 967-2520
(205) 967-2521 FAX

Mark A. Plake
Manager, Safety, Health and Environmental Protection
ARCO Pipe Line Company
15600 JFK Boulevard - Suite 300
Houston, TX 77032
(713) 986-5407
(713) 986-5315 FAX

Eleanor P. Posey, P.E.
Professional Engineer
Andrews H. Payne, Jr., Consulting Engineers, Inc.
3258 Cahaba Heights Road
Birmingham, AL 35243
(205) 967-2520
(205) 967-2521 FAX

Lisa J. Plevin
Director of Constituent Services
Office of Senator Frank R. Lautenberg
One Gateway Center - Suite 1001
Newark, NJ 07102-5311
(201) 645-3030

John Jay Range
Attorney
Hunton & Williams
2000 Pennsylvania Ave., NW - Suite 9000
Washington, DC 20006
(202) 955-1573
(202) 778-2201 FAX

Frank Popper
Professor
Urban Studies Department
Rutgers University
New Brunswick, NJ 08903
(908) 932-4009
(908) 932-0934 FAX

Joseph R. Rizzo
Director of Fire Investigative and Consulting Services
Cozen and O'Connor
The Atrium
1900 Market Street
Philadelphia, PA 19103
(215) 665-2058
ATTENDEES

Susan Robinson                             Chuck Shackelford
Manager, Health, Environment, and Loss  Buckeye Pipe Line Company
Prevention                                3900 Hamilton Boulevard
Chevron Pipe Line Company                Allentown, PA 18103
4000 Executive Parkway - Bishop Ranch No.  (601) 820-8300
8                                          (610) 820-3823 FAX
San Ramon, CA 94583-0959                  (510) 842-6847
(510) 842-6906 FAX

Robert Sachse                             Yusuf A. Shikari
President                                 Manager, Gas Transport Research
MAPCO                                    Institute of Gas Technology
1800 South Baltimore Avenue              4201 West 36th Street
Tulsa, OK 74119                           Chicago, IL 60632-3898
(918) 599-3650                             (312) 890-6443
                                             (312) 890-6460 FAX

Richard Sandahl                          Katie Shoemaker
Vice President, Operations               Intern, Office of Senator Frank Lautenberg
Lakehead Pipe Line                      54 Waldon Avenue
21 West Superior Street                  Glen Rock, NJ 07452
Duluth, MN 55802                         (201) 444-2196
(218) 725-0102                             
(218) 725-0109 FAX

Ed Sawicki                                Cheryl Smith
New Jersey Natural Gas Company           Staff Assistant
1415 Wyckoff Road - P.O. Box 1464       House Appropriations Committee
Wall, NJ 07719                            2358 Rayburn Building
(909) 938-1116                             Washington, DC 20515
                                             (202) 225-2141
                                             (202) 225-3509 FAX

M. V. Scherb                              James W. Smith
President                                Manager, Safety and Environmental Health
Hazard Control Systems                   NW Pipeline Corporation
Box 4124                                  295 Chipeta Way - P.O. Box 58900
River Edge, NJ 07660                     Salt Lake City, UT 84158-0900
(201) 836-3781                            (801) 584-6906
(212) 596-1399 FAX

Stuart Schwartz                          Craig Snyder
Associate Director, Water Resources      2 Wall Street
Interstate Commission on Potomac River   New York, NY 10005
Basin                                    (212) 238-8851
6110 Executive Boulevard, #300           
Rockville, MD 20852-3903                  
(301) 984-1908                            
(301) 984-5841 FAX

Prepared by the Institute for Transportation at New Jersey Institute of Technology
D-15
ATTENDEES

George Spadoro  
Mayor, Township of Edison  
100 Municipal Boulevard  
Edison, NJ 08817  
(908) 248-7299  
(908) 287-6679 FAX

Neil Thompson  
President  
Cortest Columbus Technologies, Inc.  
2704 Sawbury Boulevard  
Columbus, OH  43235  
(614) 761-1214  
(614) 761-1633 FAX

Scott Speaker  
Associate Editor  
Natural Gas Week  
Washington, DC  
(202) 662-3208  
(202) 347-8089 FAX

Dr. Pin Tong  
Research and Special Programs Administration  
Volpe Center  
55 Broadway - Kendall Square  
Cambridge, MA 02142  
(617) 494-2488

Massoud Tahamtani  
Virginia State Corporation Commission  
P.O. Box 1197  
Richmond, VA  23209  
(804) 371-9264

Steve Touw  
Preparedness Coordinator  
U.S. Environmental Protection Agency, Region II  
2890 Woodbridge Avenue  
Edison, NJ 08837-3679  
(908) 906-6900  
(908) 321-4425 FAX

Herbert Tate, Jr.  
President  
New Jersey Board of Regulatory Commissioners  
2 Gateway Center  
Newark, NJ  07102  
(201) 648-2503  
(201) 648-4195 FAX

Salvatore Trupiano  
Brooklyn Union  
1 Metrotech Center  
Brooklyn, NY 11201  
(718) 403-5027

George W. Tenley, Jr.  
Associate Administrator for Pipeline Safety  
U.S. Department of Transportation  
400 7th Street, S.W.  
Washington, DC  20590  
(202) 366-4595  
(202) 366-4566 FAX

Laura Tucker  
Counsel/Legislative Assistant  
Office of Representative Frank Pallone, Jr.  
420 Cannon House Office Building  
Washington, DC  20515  
(202) 225-4671  
(202) 225-9665 FAX

T. C. Thomas  
Issues Coordinator  
Mobil Oil Corporation  
3225 Gallows Road  
Fairfax, VA  22037  
(703) 846-4729  
(703) 846-6887 FAX

Michael R. Tuosto  
General Manager - Federal Affairs  
Public Service Electric and Gas Company  
One Massachusetts Avenue, N.W. - Suite 710  
Washington, DC  20001  
(202) 408-0210  
(202) 408-0214
ATTENDEES

Perry L. Turner  
Transportation Specialist  
Pennzoil Company  
700 Milam Street  
Houston, TX 77002  
(713) 546-4349  
(713) 546-8505

Mike Williams  
EPA-TAT  
1999 Bryan - Suite 2000  
Dallas, TX 75201  
(214) 220-0318

Dr. Sotirios J. Vahaviolos  
President and Chief Executive Officer  
Physical Acoustics Corporation  
15 Princess Road  
Lawrenceville, NJ 08648  
(609) 844-3010  
(609) 895-9726 FAX

Ted Willke  
Vice President, Operations R&D  
Gas Research Institute  
8600 West Bryn Mawr Avenue  
Chicago, IL 60631-3562  
(312) 399-8345  
(312) 399-8326 FAX

Tom Vince  
Press Officer  
Office of Mayor George Spadaro  
100 Municipal Boulevard  
Edison, NJ 08817  
(908) 248-7298  
(908) 287-6679 FAX

Jack Winter  
Senior Associate  
Associated Utilities Consultants  
9510 Oakhurst Road  
Seminole, FL 34646  
(813) 596-9567  
(813) 596-3702 FAX

Jim von Herrmann  
Senior Partner  
CYCLA Corporation  
1209 Belle Vista Drive  
Alexandria, VA 22307  
(703) 768-6441  
(703) 768-0655 FAX

David W. Wohlfarth  
Public Service Electric and Gas Company  
PO Box 570  
Newark, NJ 07101

Jerry White  
AMOCO Pipeline Company  
1 Mid America Plaza  
Oakbrook Terrace, IL 60181  
(708) 990-6105

Bobby G. Woodward  
Manager, Codes and Compliance  
Transco Transcontinental Gas Pipe Line  
2800 Post Oak Boulevard  
Houston, TX 77251-1396  
(713) 439-2002  
(713) 439-2551 FAX

Jerry White  
AMOCO Pipeline Company  
1 Mid America Plaza  
Oakbrook Terrace, IL 60181  
(708) 990-6105

Nusha Wyner  
New Jersey Board of Regulatory  
Commissioners  
2 Gateway Center  
Newark, NJ 07102  
(201) 648-2204

Prepared by the Institute for Transportation at New Jersey Institute of Technology
D-17
ATTENDEES

John Zurcher
Director, Pipeline Services
Tenneco Gas
1010 Milam Street
P.O. Box 2511
Houston, TX  77252-2511
(713) 757-3931