National Energy Board | Office national de l'énergie

File 320-A000-027

28 April 2003

To: All Oil and Gas Pipeline Companies and Interested Parties

Re: *Focus on Safety - A Comparative Analysis of Pipeline Safety Performance*

The National Energy Board (the NEB or the Board) recognizes that the safety performance of the companies it regulates is important to everyone. From the contractor working in the field to the pipeline company employees in a downtown office tower, safety is everyone's responsibility.

The attached report entitled *Focus on Safety - A Comparative Analysis of Pipeline Safety Performance (Focus on Safety)* is the first of what will become an annual publication aimed at providing a clear understanding of the safety performance of the NEB-regulated oil and gas pipeline industry. The report is based upon data received through incident reporting under the *Onshore Pipeline Regulations, 1999* and data received under the Board's Safety Performance Indicators initiative.

Focus on Safety is more than the simple repackaging and reporting of data. The report provides comparisons between the performance of NEB-regulated pipeline companies and that of external reference organizations. The Board recognizes that these comparisons may be imperfect but believes that they are useful in assessing the performance of NEB-regulated pipeline companies relative to other organizations.

The data presented in this report provides details on the safety performance of NEB-regulated oil and gas pipelines for the periods from 1 January 2000 to 31 December 2000 (2000) and from 1 January 2001 to 31 December 2001 (2001). The data is limited to companies regulated under the *National Energy Board Act* and does not include performance data on pipelines carrying products other than hydrocarbon liquids or natural gas.

The Board has identified six key indicators which provide meaningful measures of the safety performance of pipeline companies. These key indicators include:

- Fatalities;
- Ruptures;
- Injury Frequencies;
- Liquid Hydrocarbon Releases;
- Gas Releases; and
- Damage Prevention.

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As this report evolves the Board anticipates that these indicators will be continually refined to provide the best possible assessment of safety performance.

The Board notes that the safety performance of NEB-regulated pipeline companies has improved in some areas. For example, the reported number of unauthorized excavations which had the potential to damage a pipeline dropped by 57% between 2000 and 2001. A similar decrease was observed for the number of incidents where the pipeline was actually struck or contacted by equipment during excavation (decrease of 50% from 2000 to 2001).

At the same time, however, the Board is concerned with the apparent increase in contractor injury frequency shown within this report. The injury frequency among contractors rose 217% between 2000 and 2001. The Board notes that there are irregularities in the data reported in 2000 and acknowledges that accurate projections can not be made based on only two years of data. The Board intends to focus on the 2002 injury frequency data as soon as it becomes available to determine if the 2001 contractor safety performance is anomalous or if it points to a performance problem within the industry. If the 2002 data indicates that contractor safety performance is of continuing concern, the Board may take steps to heighten awareness of contractor safety provisions within the *Onshore Pipeline Regulations, 1999* through its inspection and audit programs.

The Board intends to continue refining the indicators used within this report to measure the safety performance of NEB-regulated oil and gas pipelines. The collection of performance data is being reviewed along with the current mandatory reporting requirements under regulations such as the *Onshore Pipeline Regulations, 1999* in an effort to ensure that the data collected is used and useful.

The Board thanks all organizations who have participated in the preparation of this report, either by acting as reviewers or by contributing data, and looks forward to continued co-operation with regulated companies and referenced organizations in the future. Please provide any comments or suggestions which can improve the effectiveness of this report and which may improve the Board's ability to provide meaningful, useful and effective measures of pipeline safety performance.

Address any comments directly to:

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Yours truly,

for Michel L. Mantha
Secretary

attachment

Safety Performance Indicators

National Energy Board

Office national de l'énergie

Focus on Safety

A Comparative Analysis of Pipeline Safety Performance

April 2003

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FOREWORD

The information contained within this report on the safety performance of oil and gas pipeline companies regulated by the National Energy Board under the *National Energy Board Act* has been collected from two sources. Some of the information has been obtained from incident reports submitted pursuant to the *Onshore Pipeline Regulations, 1999*. The balance has been provided voluntarily by pipeline companies under the Safety Performance Indicators initiative.

All data provided is for "pipelines" as defined within the *National Energy Board Act*:

> *"pipeline" means a line that is used or to be used for the transmission of oil, gas or any other commodity and that connects a province with any other province or provinces or extends beyond the limits of a province or the offshore area as defined in section 123, and includes all branches, extensions, tanks, reservoirs, storage facilities, pumps, racks, compressors, loading facilities, interstation systems of communication by telephone, telegraph or radio and real and personal property and works connected therewith, but does not include a sewer or water pipeline that is used or proposed to be used solely for municipal purposes.*

The report does not include data pertaining to the safety performance of pipelines carrying commodities other than hydrocarbon liquids and natural gas.

The Board welcomes comments on this report and intends to engage stakeholders in future discussions on the content and structure of the Safety Performance Indicator (SPI) initiative. Any comments or concerns pertaining to this report or the SPI initiative in general can be directed to:

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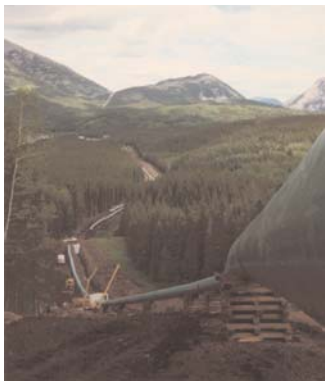
Note: This report includes data comparisons to external reference organizations. Wherever possible, the definitions and reporting criteria employed by external reference organizations have been provided. In addition, all referenced organizations have been provided with a copy of this report. The Board thanks these agencies for their assistance in the preparation of this report.

EXECUTIVE SUMMARY

Focus on Safety is the first of what will become an annual report on the safety performance of oil and gas pipeline companies regulated by the National Energy Board (the Board or the NEB) under the *National Energy Board Act* (the Act). The Board has undertaken the production of *Focus on Safety* as part of the Safety Performance Indicators (SPI) initiative which was introduced in 1999.

The data presented in this report may be used to assess quantitatively the safety performance of NEB-regulated pipeline companies. To assist in this assessment, the Board has identified six key indicators:



1. Fatalities;
2. Ruptures;
3. Injury Frequency;
4. Liquid Releases;
5. Gas Releases; and
6. Damage Prevention.

Over time, performance indicators can provide valuable information pertaining to the effectiveness of safety programs. By identifying areas that show declining performance and, correspondingly, areas where performance is improving, programs can be adjusted to provide the most efficient allocation of safety resources.

Data Reliability

Differences between the 2000 and 2001 data are significant. For example, the number of worker hours (company employee hours and contractor employee hours combined) reported in 2001 were more than 50% less than the hours recorded in 2000. Some of this difference is attributable to the completion of major construction projects. However, company employee hours reported in 2001 were also down. Approximately 31% less company employee hours were reported in 2001 than were reported in 2000.

Fatalities

There were no fatalities recorded by NEB-regulated pipeline companies over the reporting period. Comparisons of fatality rates between NEB-regulated companies and reference organizations is problematic due to the magnitude of the difference in reported hours. Organizations reporting on over 1 billion worker hours annually are statistically more likely to have data pertaining to fatalities. The total number of worker hours reported under the SPI initiative was 13.3 million in 2000 and 6.4 million in 2001.

Ruptures

The number of ruptures recorded by NEB-regulated pipeline companies increased from 1 in 2000 to 2 in 2001 (and 3 in 2002). The leading cause of ruptures or failures among NEB-regulated pipelines is corrosion. Similarly, corrosion is the leading cause of pipeline incidents and failures identified by both the Alberta Energy and Utilities Board and the U.S. Office of Pipeline Safety. The leading cause of pipeline incidents reported by the European Gas Pipeline Incident Data Group is third party damage.

The second most common cause of failure of NEB-regulated pipelines appears to be operational errors. The Alberta Energy and Utilities Board and the U.S. Office of Pipeline Safety have both identified the second leading cause of pipeline failure as third party damage.

Injury Frequency

Overall injury frequencies (employee and contractor injuries combined) reported by NEB-regulated pipeline companies for 2000 and 2001 appear to be in line with the frequencies reported by external reference organizations such as the U.S. Bureau of Labor Statistics. When company employee and contractor employee injuries are looked at as individual groupings, the comparisons are less favourable.

In 2000, company employees of NEB-regulated pipeline companies experienced an injury frequency of 0.23 injuries every 200 000 hours or per 100 full time equivalent workers. The frequency of employee injuries reported by NEB-regulated pipeline companies rose to 0.87 in 2001.

The contractor injury frequency in 2001 was 5.35 injuries per 100 full time equivalent workers. This number is well above the highest reference organization data for this same period (U.S. Bureau of Labor Statistics - 3.90) and represents a 217% increase over the 2000 SPI data.

Liquid Releases

The number of hydrocarbon liquid releases (spills) reported by NEB-regulated pipeline companies dropped from 265 in 2000 to 55 in 2001. The number of spills reported in 2000 was anomalous due to the high levels of construction activity in 2000 and the 2001 data may prove to be more representative of industry averages over the coming years.

Gas Releases

The overall number of gas releases reported by NEB-regulated companies remained relatively constant between 2000 (23 releases) and 2001 (29 releases). All gas releases by NEB-regulated pipeline companies, including those in stations and gas processing plants, are reportable regardless of the volume or effects. Data from the U.S. Office of Pipeline Safety is for pipeline incidents where there has been death, hospitalization or gross costs of more than US$50,000. Data from the European Gas Pipeline Incident Data Group does not include releases within stations and represents losses from the pipe body. As such, a close comparison between U.S. and European data appears reasonable as the types of releases reportable would be primarily releases from the pipe body, including ruptures. A comparison of the European data and the U.S. data to NEB-

regulated pipeline company releases from the pipe body collected under the *Onshore Pipeline Regulations, 1999* reveals very similar performance between all three organizations.

Damage Prevention

The number of encroachments on NEB-regulated pipeline rights of way increased by 19% between 2000 and 2001. However, over the same period, the number of unauthorized excavations fell by roughly 57% and the number of unintentional contacts fell by 50%. The number of overall incidents rose slightly by approximately 6%.

In conclusion, the Board recognizes that the value of reports such as *Focus on Safety* can only be judged by organizations and individuals who use or reference the data and analysis presented within this report. The Board is confident of the success, and looks forward to the continued improvement of this report with the continued participation of NEB-regulated pipeline companies and organizations referenced within this report.

INTRODUCTION

1.1 The National Energy Board

The NEB's purpose is to promote safety, environmental protection and economic efficiency in the Canadian public interest within the mandate set by Parliament in the regulation of pipelines, energy development and trade.

The Board regulates the design, construction, operation and abandonment of interprovincial and international pipelines within Canada. The Board also holds regulatory authority and oversight over matters such as tolls and tariffs of interprovincial and international pipelines, the construction and operation of international power lines, the exports of oil, electricity and natural gas, and the exploration and development of oil and gas resources in non-Accord frontier areas.

1.2 Safety Performance Indicators

Performance indicators are used throughout industry and government to assess the performance of specific sectors or departments relative to other sectors or departments. In addition, performance indicators can, over time, provide valuable information pertaining to the effectiveness of safety programs. By identifying areas that show declining performance, and correspondingly, areas where performance is improving, regulatory and company programs can be adjusted to provide the most efficient resource allocations to improve safety performance.

In 1999, the Board initiated discussion with the Canadian Energy Pipeline Association (CEPA) and the Canadian Association of Petroleum Producers (CAPP) to determine what measures could be used to assess the safety performance of the pipeline industry. The goal of these consultations was to develop meaningful, comparable and useful performance indicators which could be derived from data which is generally available.

On 30 April 2001, the Board issued a letter to NEB-regulated oil and gas pipeline companies formally introducing the SPI initiative and requesting data for the calendar year 2000. The letter informed companies of the intent of the initiative as well as the data requirements and definitions. Companies were encouraged to provide comments on the initiative and suggest improvements or changes.

Table 1.1 provides a detailed list of data which the Board has determined through consultation to be useful for the measurement of safety performance and for the tabulation of Safety Performance Indicators. The table also indicates where refinements have taken place by showing when indicators have been introduced or discontinued by year.

TABLE 1.1

Safety Performance Data

Information	1 Jan. 2000 - 31 Dec. 2000	1 Jan. 2001 - 31 Dec. 2001
Additional Information Required Under SPI Initiative	X	X
Company Work Injury	X	X
Contractor Work Injury	X	X
Company Employee Hours	X	X
Contractor Worker Hours	X	X
Company Employee Safety Training Hours	X	X
Contractor Worker Safety Training Hours	X	Discontinued[1]
# of Hydrocarbon Liquid Spills ≤1.5 m^3	X	X
Near Miss	X	Discontinued[2]
Information Currently Reported Under Regulations		
# of Serious Injuries	X	X
# of Hydrocarbon Liquid Spills > 1.5 m^3	X	X
# of Gas Releases	X	X
# of Fatalities	X	X
# of Pipeline Ruptures	X	X
# of Pipeline Contact Damage Incidents	X	X

1. Contractor Worker Safety Training Hours were discontinued following consultation with industry as they could only be collected reliably while contractors were working for NEB-regulated pipeline companies and as such are not a valid indicator.

2. Near Miss data was discontinued following consultation with industry due to a lack of common definitions and reporting methods among NEB-regulated pipeline companies.

KEY INDICATORS

The Board has identified six "key indicators" which provide meaningful, comparable and useful information on safety performance. The six indicators are:

1. Fatalities;
2. Ruptures;
3. Injury Frequency;
4. Liquid Releases;
5. Gas Releases; and
6. Damage Prevention.

2.1 Fatalities

Fatalities resulting from pipeline activities may have far reaching consequences well beyond the immediate tragic effects. These incidents can result in significant changes to legislation, regulations and to industry codes and standards.

Fatality data is typically reported as the number of contractor, company employee and third party fatalities. This number is often normalized and expressed as the number of fatalities per 100 million hours worked. Additional methods could be used for normalizing fatality data. For example, the number of fatalities could be expressed as the number of fatalities per million kilometres of pipeline.

Within this report, fatalities which have occurred among NEB-regulated oil and gas pipeline companies are reported by number per year and by number per 100 million hours.

For reporting purposes, fatality data provided by NEB-regulated pipeline companies is separated into three categories:

1. Employee Fatalities

   These are company employee fatalities occurring during periods where the company employee was actively involved in activities associated with his/her duties.

2. Contractor Fatalities

   These are contractor fatalities occurring during periods where a contractor who is performing work for a pipeline company is actively carrying out activities pursuant to a contract with that company.

3. Third Party Fatalities

   These are fatalities involving persons other than pipeline contractor personnel or company employees (most commonly the general public).

2.2 Ruptures

Ruptures are defined as a "loss of containment event that immediately impairs the operation of the pipeline". These events may pose severe risks to safety and the protection of the environment due to the high consequences associated with the spontaneous and uncontrolled release of the contents of the pipeline. In addition, the cause of ruptures may be due to systemic issues pertaining to the materials or operation of the pipeline system.

The Pipeline Risk Assessment Steering Committee (PRASC) has developed the following definitions for "leak" and "rupture" which will form part of future reporting requirements in the interest of standardization:

Leak	Loss of containment event that does not immediately impair the operation of the pipeline.
Rupture	Loss of containment event that immediately impairs the operation of the pipeline.

2.3 Injury Frequency Data

Injury frequency data is collected by most organizations as a measure of safety performance. This information can be used by companies to target specific areas of their operations for improvement and to allow for the more efficient allocation of resources within their safety programs.

Injury frequency data is commonly reported as the number of lost time injuries per 100 full time equivalent workers (i.e. number of injuries per 200 000 hours) or as the number of injuries per 1 million hours.

For the purposes of this report, data has been presented as "Injuries per 100 Full Time Equivalent Workers". For calculation purposes, it is assumed that 100 full time equivalent workers will work 200 000 hours each year.

2.4 Liquid Releases (Spills)

Hydrocarbon liquid releases may have serious environmental and safety related effects. The nature of the product released may result in the formation of explosive or poisonous vapour or gas plumes and severe environmental damage. As such, the Board is interested in assessing the performance of industry in the operation and safe containment of hydrocarbon liquids within the pipeline system.

The number and relative volume of liquid releases reported under the SPI initiative includes spills associated with construction and maintenance activities. Therefore, the number of releases does not strictly represent releases from the pipe body or from the pipeline system as result of failure.

2.5 Gas Releases

Releases of natural gas may occur as a result of loss of containment through the failure of the pipe body or components within the pipeline system. Natural gas releases may also occur through the routine functioning of equipment as well as through seepage at flanges through gaskets.

Any unintended release of natural gas experienced by NEB-regulated pipeline companies is reportable under the *Onshore Pipeline Regulations, 1999*.

2.6 Damage Prevention

Incidents which are reported to the NEB under the *Pipeline Crossing Regulations*, (Part I or Part II) include activities which have the potential to damage a pipeline or which may impede access to a pipeline for maintenance or emergency response.

The activities considered to be indicators of pipeline safety performance with respect to damage prevention include:

1. Unauthorized mechanical or explosive excavation within 30 metres of the right of way of a pipeline;
2. Unintentional contact with a pipeline; and
3. Right of way encroachments.

COMPARATIVE DATA

3.1 Reference Organizations

The following organizations have been selected for comparison purposes within this report:

- Office of Pipeline Safety - United States Department of Transport (OPS);
- Bureau of Labor Statistics - United States Department of Labor (BLS);
- Alberta Energy and Utilities Board (EUB);
- Canadian Association of Petroleum Producers (CAPP);
- Pipe Line Contractors Association of Canada (PLCAC);
- European Gas Pipeline Incident data Group (EGIG);
- CONCAWE, the Europeam Oil Companies Association for Environment, Health and Safety (CONCAWE);
- International Association of Oil and Gas Producers (OGP); and
- National Energy Board, *Canada Oil and Gas Operations Act* (COGOA).

Detailed information on reference organizations including web addresses, report references and data can be found in Appendix A.

Table 3.1 provides a listing of reference organizations and how their data is used for comparative purposes within this report.

TABLE 3.1

Comparative Data by Source

Organization	Ruptures	Fatalities	Injury Frequency	Liquid Releases	Gas Releases	Damage Prevention
OPS	X			X	X	
BLS			X			
EUB	X			X		
CAPP			X			
PLCAC			X			
EGIG	X				X	
CONCAWE				X		
OGP		X	X			
COGOA			X			
NEB	X	X	X	X	X	X

3.2 Limitations of Comparative Data

Very few of the reference organizations used within this report publish comparisons of their own data with the data of other reporting organizations. This may be due to the fact that the definitions of terms such as "injury" or "rupture" are not perfectly comparable between organizations. This means that any comparisons made must include some degree of inaccuracy.

The Board is publishing *Focus on Safety* on the assumption that comparisons with external reference organizations provide value and context for the data presented in this report. This section of the report explains the differences between the various reference organizations and how these differences may impact the direct comparisons of data.

3.2.1 Fatalities

Straight comparison of the number of fatalities between reference data organizations does not provide meaningful information regarding safety performance. Reference organizations such as OGP which report on more than 1 billion hours of work each year are statistically more likely to have data arising from fatalities. In contrast, the total work hours reported under the SPI initiative were 13.3 million in 2000 and 6.4 million in 2001.

3.2.2 Ruptures

Data from the Alberta Energy and Utilities Board presented within this report is not limited to ruptures and represents pipeline failures which include "leaks" and "breaks".

The data obtained from the OPS is for incidents which undoubtedly include ruptures but which may also include other incidents where the associated cost of the incident exceeds US$50,000 or where death or injury requiring hospitalization has occurred. OPS incidents may also include non-rupture events where more than 8 cubic metres of pipeline liquids are released.

The data obtained from EGIG is for pipe body releases and as such may include leaks.

A comparison of the terms used within each reference organization is provided in Table 3.2.

3.2.3 Injury Frequency

Injury frequencies are calculated based on the number of injuries which occur during a standardized reporting period. The frequency is typically expressed as the number of injuries per 100 full time equivalent workers or as the number of injuries per 200 000 hours.

The total number of hours worked reported under the SPI initiative dropped from 13.3 million hours in 2000 to 6.4 million in 2001. This is attributable to a number of factors including:

- refinements in reporting practices;
- industry restructuring; and
- large scale construction projects in 2000.

TABLE 3.2

Comparison of Reporting Criteria for Ruptures

Source	Reporting Requirements
NEB	Rupture Loss of containment event that immediately impairs the operation of the pipeline.
OPS	Incident Gas releases that were associated with a death or personal injury requiring hospitalization, or a total cost of US$50,000 or more. Or Loss of 8 or more cubic metres or where property damage costs exceed US$50,000.
EUB	When a leak or break occurs in a pipeline, the licensee shall immediately cause the Board to be informed of the location of the leak or break. "Break" means a rupture in any part of a pipeline and "leak" means the escape of substance from a pipeline
EGIG	Incidents include any unintentional release of gas which occurs on an onshore pipeline operating at greater than 1500 kPa outside of the fenced boundaries of installations and excluding all components except the pipe.

One company alone showed a 70% drop in company employee hours between 2000 and 2001 equating to more than 2.5 million hours. Anomalies such as this lead to questions pertaining to the overall reliability of the company employee and contractor hours reported for 2000.

Some error is also induced when making comparisons to reference organizations due to differences in how "injury" is defined. The definition of an "injury" for the purposes of the SPI initiative is:

> *"any occupational injury (including fatal injury) that: prevents an employee from reporting for work or from effectively performing all the duties connected with the employee's regular work on any day subsequent to the day on which the occupational injury occurred, whether or not that subsequent day is a working day for that employee".*

Table 3.3 provides a summary of the "injury" definitions used by reference organizations.

3.2.4 Liquid Releases

The reporting criteria for liquid releases varies between the external data sources referred to in section 3.1 of this report. These differences are summarized in Table 3.4.

TABLE 3.3

Injury Definitions of Comparative Data Sources

Organization	Definitions	Comment
BLS	Data presented is taken from data for "Heavy construction, except highway" and from "Gas production and distribution" for injuries resulting in "days away from work, days of restricted work activity, or both"	Heavy construction data should be roughly comparable to contractor data under the SPI initiative. Gas production and distribution data should be comparable to company employee data.
CAPP	Data represents "job-related injuries that were fatal or where the worker could not return to work the next scheduled workday".	CAPP members are primarily upstream oil and gas companies and data may not be directly comparable to pipeline transportation companies.
PLCAC	Any work related personal injury or illness that results in time loss from work. Time loss begins on the day subsequent to the day the accident occurs.	PLCAC data does not include non-union pipeline contractor data. Mainline construction data should be roughly comparable to contractor data under the SPI.
COGOA	Data represents "loss time injuries" which prevent an employee from reporting for work or from effectively performing all the duties connected with the employees regular work on any day subsequent to the day on which the injury occurred, whether or not that subsequent day is a working day for the employee.	The definition is identical to the definition used under the SPI initiative.
NEB	Under the OPR: "serious injury" includes an injury that results in: the fracture of a major bone; the amputation of a body part; the loss of sight in one or both eyes; internal hemorrhage; third degree burns; unconsciousness; or the loss of a body part or function of a body part. For the SPI initiative, - "Any occupational injury (including fatal injury) that prevents an employee from reporting for work or from effectively performing all the duties connected with the employees regular work on any day subsequent to the day on which the injury occurred, whether or not that subsequent day is a working day for the employee."	The example provided as guidance to companies by the NEB "medical aid where the employee can not return to work the following day regardless of the day of the week or injury". Arguably, the definition could include modified work injuries.
OGP	Lost Workday Case (LWDC). Any work related injury or illness other than a fatal injury which results in a person being unfit for work on any day after the day of occurrence of the occupational injury. "Any day" includes rest days, weekend days, leave days, public holidays or days after ceasing employment.	

The volumes associated with spills of less than or equal to 1.5 cubic metres on NEB-regulated pipelines can not be reliably determined from available data.

3.2.5 Gas Releases

The reporting criteria for gas releases varies between the external data sources referred to in section 3.1 of this report. These differences are summarized in Table 3.5.

Given that the majority of gas releases occur at mechanical connections such as flanges, the exclusion of station releases within the EGIG data has significant effects when making direct comparisons with the SPI data which includes gas releases within compressor stations, metering facilities and gas processing plants.

TABLE 3.4

Comparison of Liquid Release Reporting Criteria

Source	Reporting Requirements
NEB	Any unintended or uncontained release of liquid hydrocarbons in excess of 1.5 cubic metres.
OPS	Loss of 8 or more cubic metres or where property damage costs exceed US$50,000.
CONCAWE	The minimum spill size has been set at 1 m^3 for reporting purposes unless there are exceptional serious safety / environmental consequences as a result of a <1m^3 spill
EUB	When a leak or break occurs in a pipeline, the licensee shall immediately cause the Board to be informed of the location of the leak or break. "Leak" means the escape of substance from a pipeline and "break" means a rupture in any part of a pipeline.

TABLE 3.5

Comparison of Gas Release Reporting Criteria

Source	Reporting Requirements
NEB	Any unintended or uncontrolled release of natural gas.
OPS	Gas releases associated with a death or personal injury requiring hospitalization, or a total cost of US$50,000 or more.
EGIG	Any unintentional release of gas which occurs on an onshore pipeline operating at greater than 1500 kPa outside of the fenced boundaries of installations and excluding all components except the pipe.

3.2.6 Damage Prevention

The indicators used represent violations of the *Pipeline Crossing Regulations*, Part I and Part II. There appears to be no equivalent data available from external organizations which can be readily compared with unauthorized excavation within 30 metres of the right of way of a pipeline, unintentional contact with a pipeline, or right of way encroachments.

ANALYSIS

4.1 Fatalities

Fatalities among NEB-regulated pipeline companies are presented in Figure 4.1.

The last recorded fatalities on NEB-regulated pipelines were in 1997. Both fatalities that year involved contractors working on pipeline construction projects. The last fatality to a member of the public occurred in 1985 when a plough installing drainage tile struck an operating gas transmission pipeline resulting in a rupture and killing the operator of the plough.

Direct comparisons of fatality data between reference organizations does not provide a useful measure of performance given the differences in sample sizes between organizations. Despite this limitation, it may be argued that the frequency of fatalities per 100 million hours of work should be roughly comparable over time.

Figure 4.2 provides a contrast between the SPI data and that of the OGP for 2000 and 2001.

Given the small sample size and the zero fatality rate among NEB-regulated pipeline companies no conclusions may be drawn from the comparison provided by Figure 4.2.

FIGURE 4.1

NEB Pipeline Fatalities

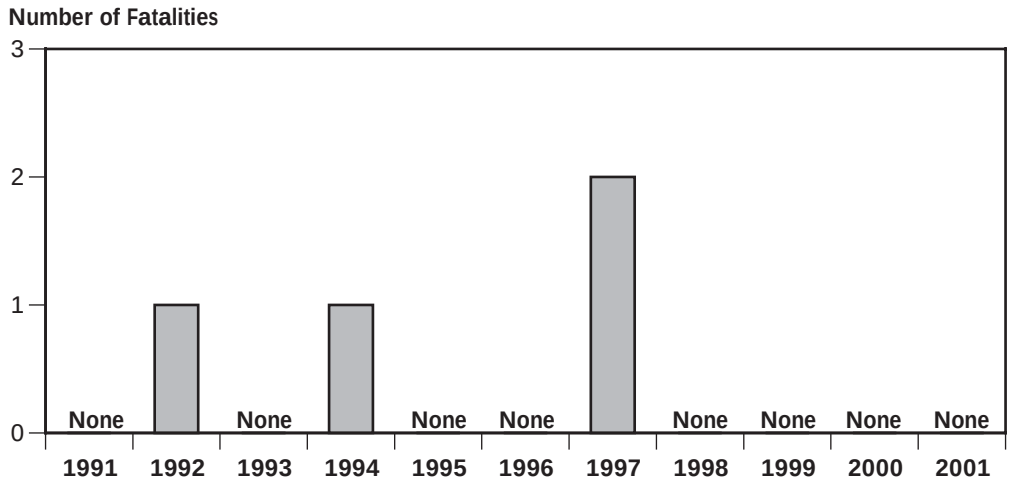
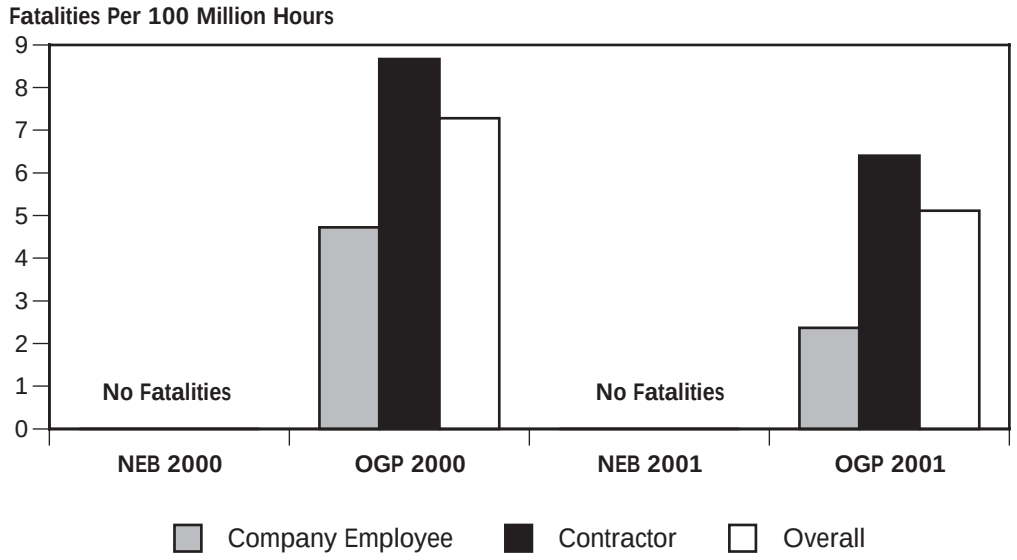


FIGURE 4.2

Fatality Frequency per 100 Million Hours



4.2 Ruptures

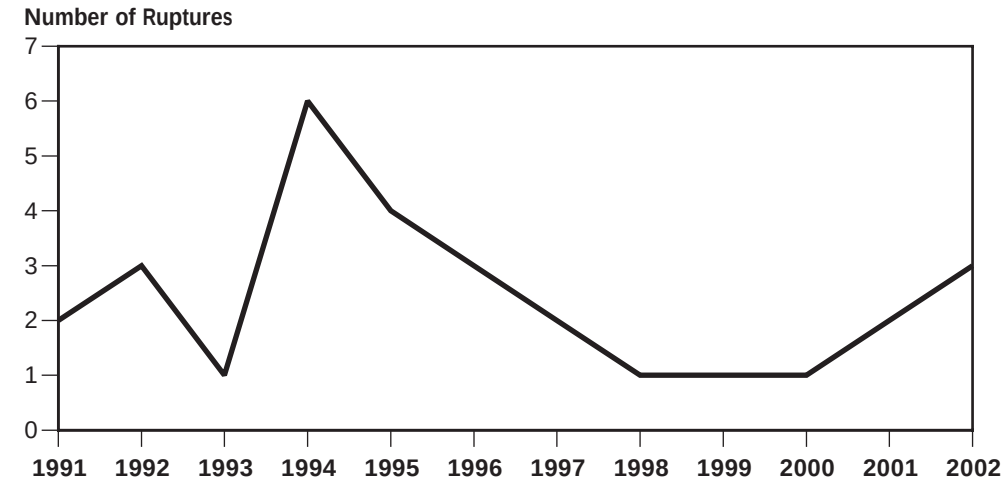
Figure 4.3 shows the number of ruptures reported by NEB-regulated pipeline companies between 1991 and 2002. The analysis in this report is limited to the data collected up to 31 December 2001. The number of ruptures in 2002 is provided for reference only.

Figure 4.4 provides the causes of ruptures on NEB-regulated pipelines based on data for the period from 1 January 1991 to 31 December 2001.

The leading cause of pipeline ruptures among NEB-regulated pipeline companies is corrosion. Fifteen of the 26 ruptures which occurred on pipeline systems regulated by the NEB between

FIGURE 4.3

Number of Ruptures Reported by NEB-Regulated Pipeline Companies



1991 and 2001 were attributed to corrosion. Note that stress corrosion cracking (SCC) failures are not separated from other types of corrosion for the purposes of this report.

Figure 4.5 provides a comparison of NEB ruptures with failures and incidents reported by the EUB, the OPS and the EGIG. The OPS data is based on reported incidents for 1997 thru 2001. The EUB data is based on data from 1980 thru to 1997. Data for EGIG is based on the period from 1970 to 2001.

Corrosion (internal and external combined) remains the leading cause of failure among the North American reference organizations shown in Figure 4.5. In Europe, EGIG records indicate the leading cause of pipeline incidents is third party damage. This is consistent with the second leading cause of failure within the EUB and the OPS. Third party damage accounts for 27% of OPS incidents and 18% of EUB leaks and breaks. On NEB-regulated pipeline systems, third party damage accounts for 4% of ruptures.

FIGURE 4.4

Causes of Ruptures on NEB-Regulated Pipelines

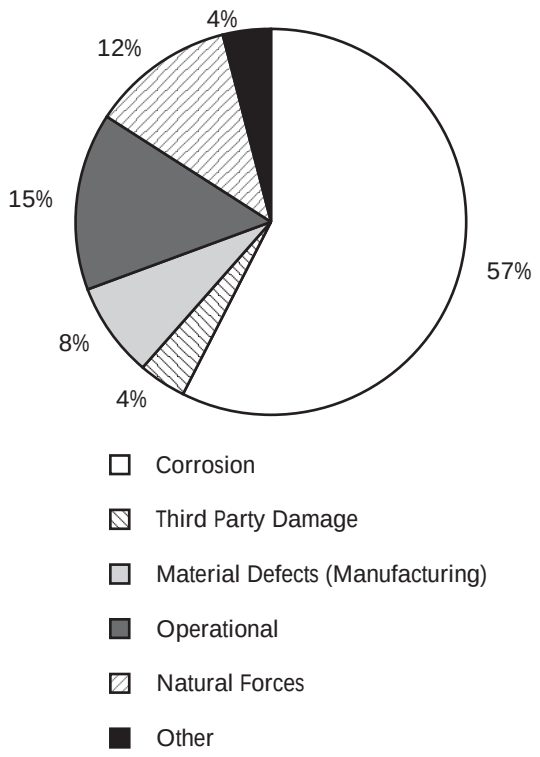
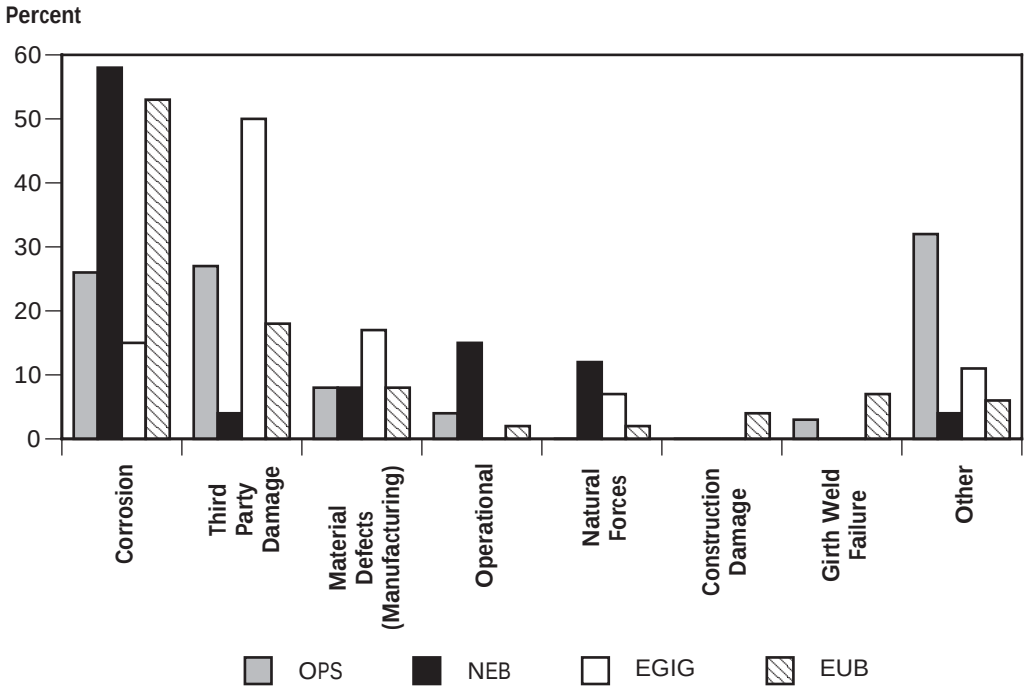


FIGURE 4.5

Comparison of Leak/Break/Rupture by Cause



Differences in pipeline content and purpose (i.e. gathering, transmission, distribution) make exact comparisons difficult but may account for subtle differences in rupture or failure modes. The population density in the U.S. and Europe is significantly greater than in Canada so a higher incidence of third party damage is not unexpected. The density of the pipeline network regulated by the EUB coupled with high levels of construction activity in the oil and gas sector in Alberta may account for higher third party damage rates in Alberta.

Internal corrosion has not been separated from external corrosion for comparison in Figure 4.5. Internal corrosion is the leading cause of pipeline failures in Alberta. This may be attributable to the unrefined and corrosive nature of products gathered by upstream oil and gas producing companies regulated by the EUB. The majority of NEB-regulated pipelines are long distance, transmission pipelines carrying refined products that are less corrosive in nature than those carried by pipelines regulated by the EUB.

4.3 Injury Frequency

The injury frequency rate is shown below in Figure 4.6.

The injury frequency rate for contractors and company employees increased significantly among NEB-regulated pipeline companies between 2000 and 2001. Contractor injury frequency increased by approximately 217% increasing from 1.69 injuries per 100 full time equivalent workers to 5.35 injuries per 100 full time equivalent workers. Company employee injury frequencies increased by 282% rising from 0.23 injuries per 100 full time equivalent workers in 2000 to 0.87 injuries per 100 full time equivalent workers in 2001. The combined overall increase in injury frequencies from 2000 to 2001 was 117% (0.92 in 2000 and 1.99 in 2001).

These increases may be due in part to inaccuracies in the data provided by companies in 2000 regarding the number of hours reported. The total number of hours reported (contractor and company employee combined) decreased from 13.3 million hours in 2000 to 6.4 million hours in 2001. Some of this decrease is attributable to the completion of a major pipeline construction project in 2000. Still, company employee hours for the same period decreased from

FIGURE 4.6

NEB Pipeline Injury Frequency (SPI Data)

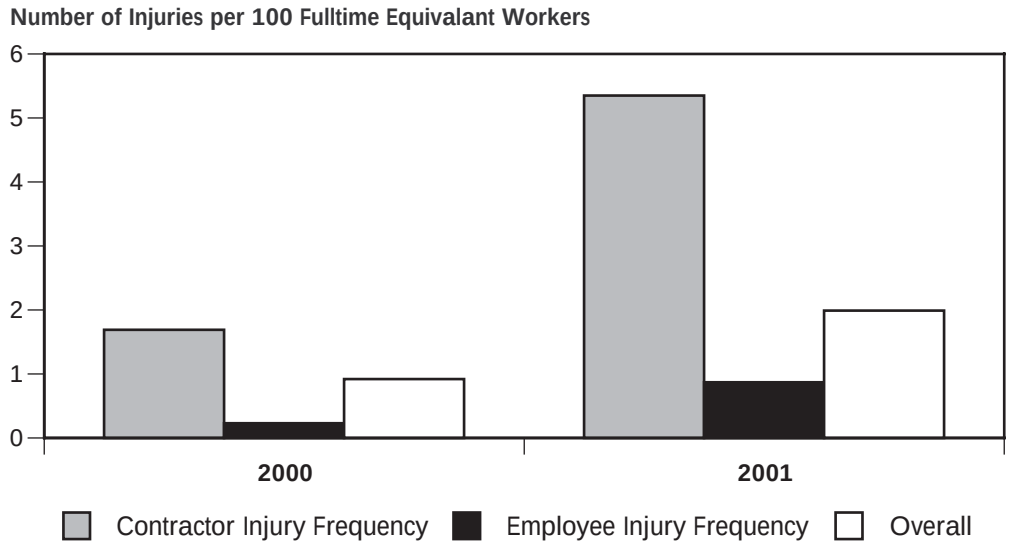
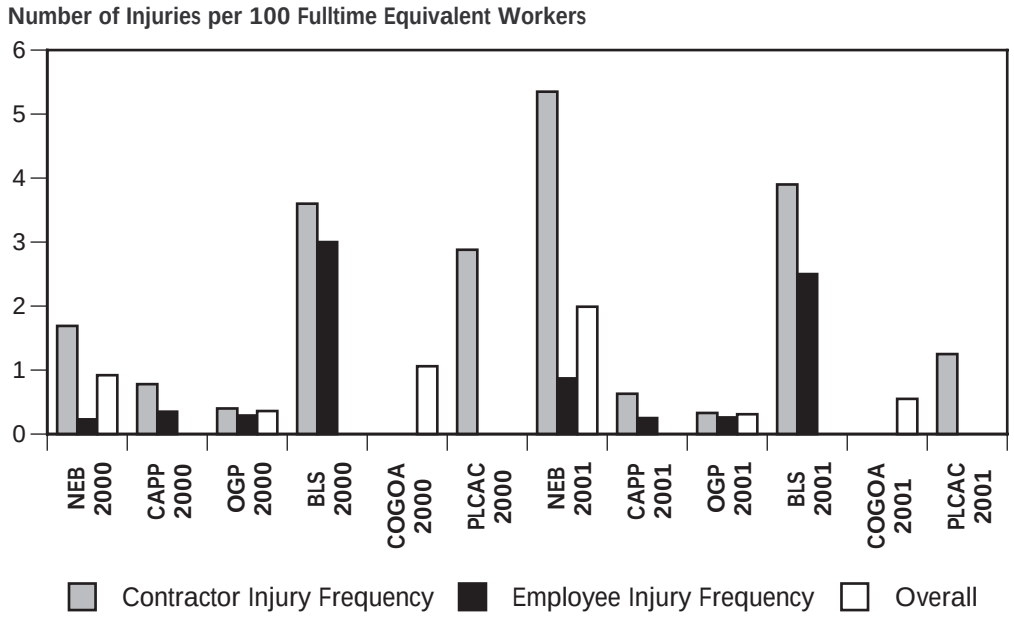


FIGURE 4.7

Comparative Injury Frequencies



approximately 7.0 million to 4.8 million hours. This equates to roughly a 31% decrease in company employee hours from 2000 to 2001.

When contrasted with data obtained from the reference organizations described in section 3.1 of this report, the overall SPI data (company employee and contractor data combined) appears to roughly match the performance of these external reporting agencies. However, when contractor injury frequency is looked at individually, the comparison of SPI data with external reference organizations is less favourable. Figure 4.7 provides this comparison.

While the comparison provides some comfort that the SPI data is within reasonably expected performance criteria, the 2001 contractor data remains of some concern.

It should be noted that the severity of reportable injuries is not reflected in Figure 4.7. Injury severity rates are often calculated and reported as the average number of lost work days per injury. The Board may consider the collection of injury severity data for future inclusion within the SPI initiative.

4.4 Liquid Releases

Spills between reference organizations can be contrasted based on their frequency and their volume. Figure 4.8 provides a comparison of the spill frequency on liquids pipelines between selected reference organizations.

Figure 4.8 compares the frequency of spills in excess of 1.5 cubic metres reported by NEB-regulated pipeline companies transporting liquids with spills reported by CONCAWE, the OPS and the EUB. This comparison is not precise but provides a relative comparison of liquid releases from the pipe body.

Since the impact of spills is directly related to the volume and type of fluids released, efforts have been made to compare spill volumes per kilometre of pipeline. Unfortunately, because the

reporting criteria differ between reference agencies, direct comparisons are impossible. The volume of each spill less than 1.5 cubic metres has not been reported by all NEB pipeline companies. Approximately 14% of reported spills less than 1.5 cubic metres reported in 2000, and 9% of those reported in 2001, had no volume estimates. Further, the volume and number of spills less than 8 cubic metres is largely unavailable from the OPS.

Figure 4.9 provides a comparison of spill volumes per 1000 kilometres between the reporting agencies referenced in Figure 4.8.

The frequency of spills reported by EUB regulated pipeline companies as shown in Figure 4.8 is substantially greater than the frequencies reported by the NEB or other reference organizations. However, as shown in Figure 4.9, the volume of fluids released normalized over the pipeline

FIGURE 4.8

Spill Frequency (Liquids Pipelines)

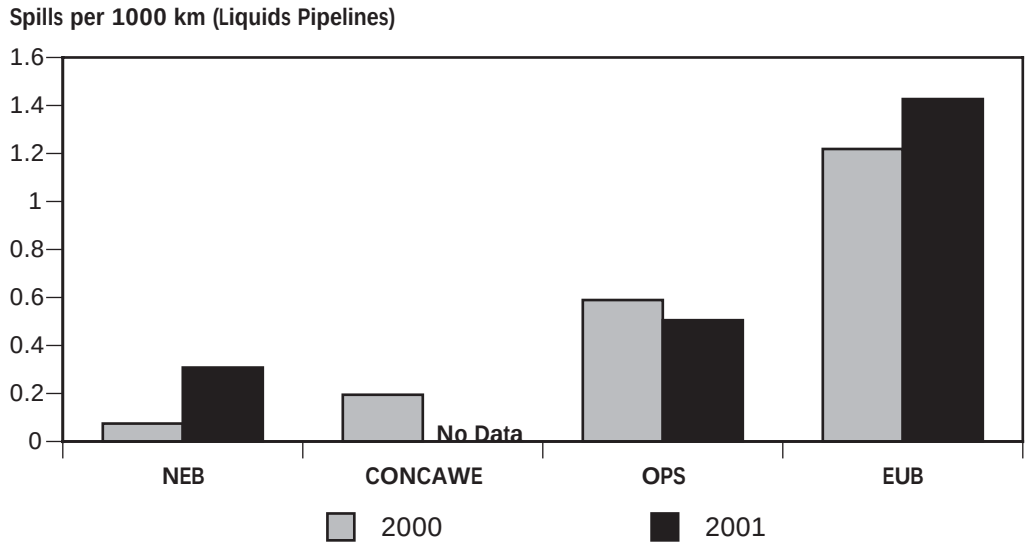
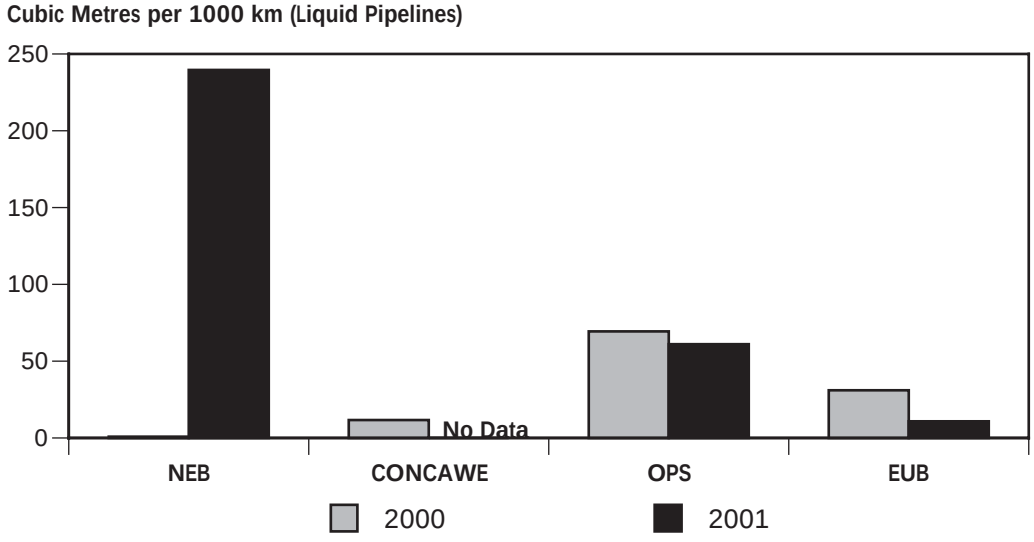


FIGURE 4.9

Spill Volumes



system length is much lower among EUB regulated companies. The pipelines regulated by the EUB are predominantly small diameter, upstream gathering lines carrying unrefined (and often corrosive products) as opposed to large diameter transportation systems carrying refined products which are more typical of the pipelines regulated by the NEB. Further, all spills (regardless of volume) are reportable under EUB requirements. This explains the variances shown in Figures 4.8 and 4.9.

In 2002, the OPS revised their definition of incident and future data will be based on the following:

> *Effective 1 October 2002*
>
> *Failure of a pipeline resulting in the release of 5 gallons (19 litres) or more. (Accidents resulting in the release of less than 5 barrels (0.8 cubic metres) resulting from maintenance do not need to be reported if the release is confined to the ROW and cleaned up promptly)*

This revised definition should allow for more meaningful comparisons between the OPS and the NEB in future editions of this report.

The causes of spills reported by NEB-regulated pipeline companies are presented in Figure 4.10.

The cumulative percentage of spills experienced among NEB-regulated pipeline companies by cause is presented in Figure 4.11. The figure clearly shows that the majority of reported spills are related to construction, maintenance and lubrication activities (79%).

F I G U R E 4 . 1 0

SPI Reported Spills by Category

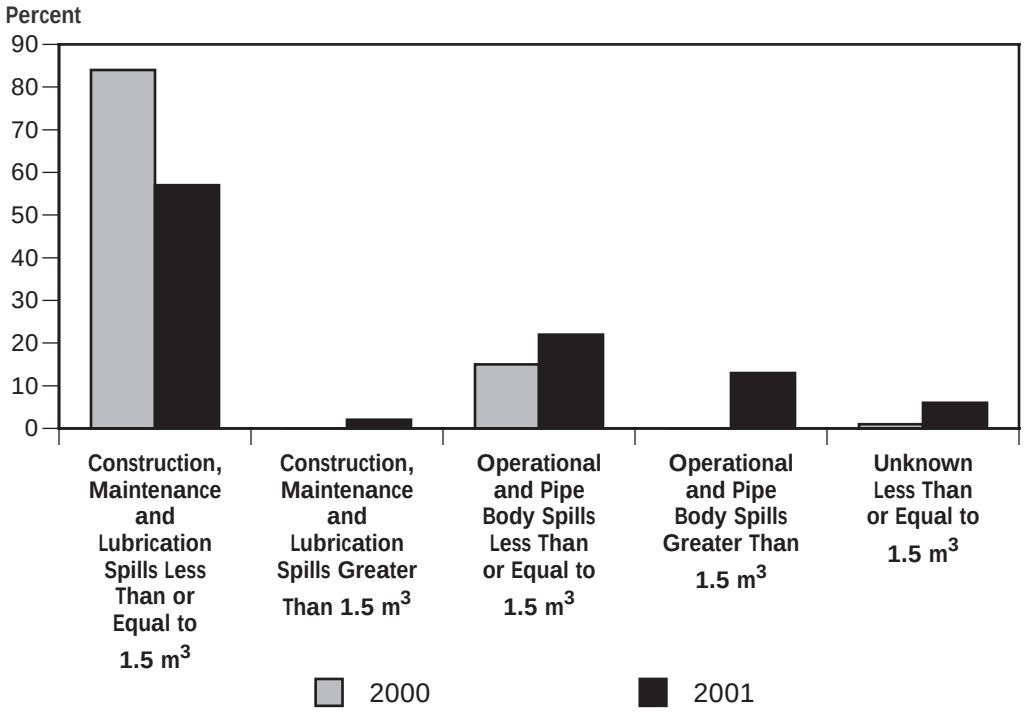
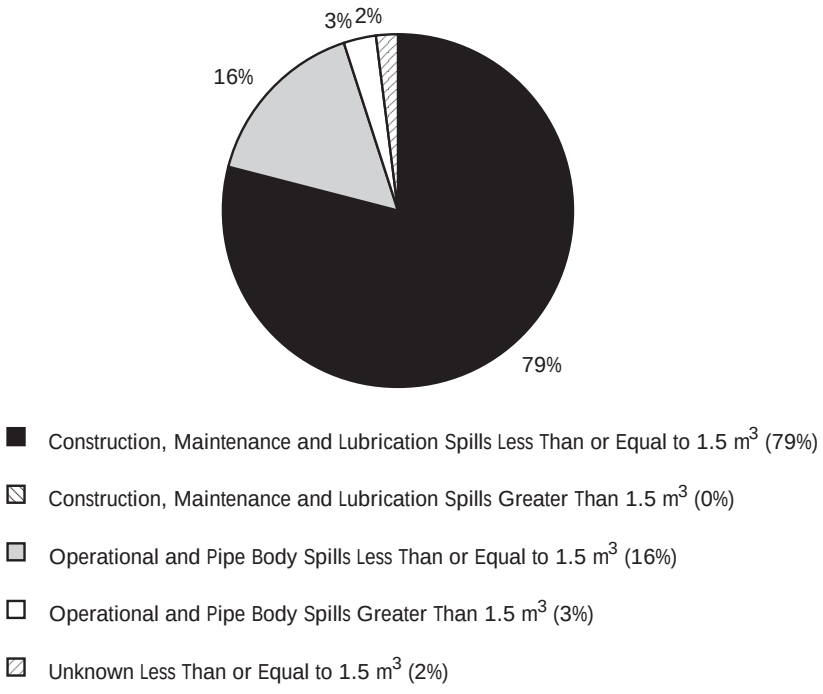


FIGURE 4.11

Cumulative Spills (NEB-Regulated Pipeline Companies) by Category

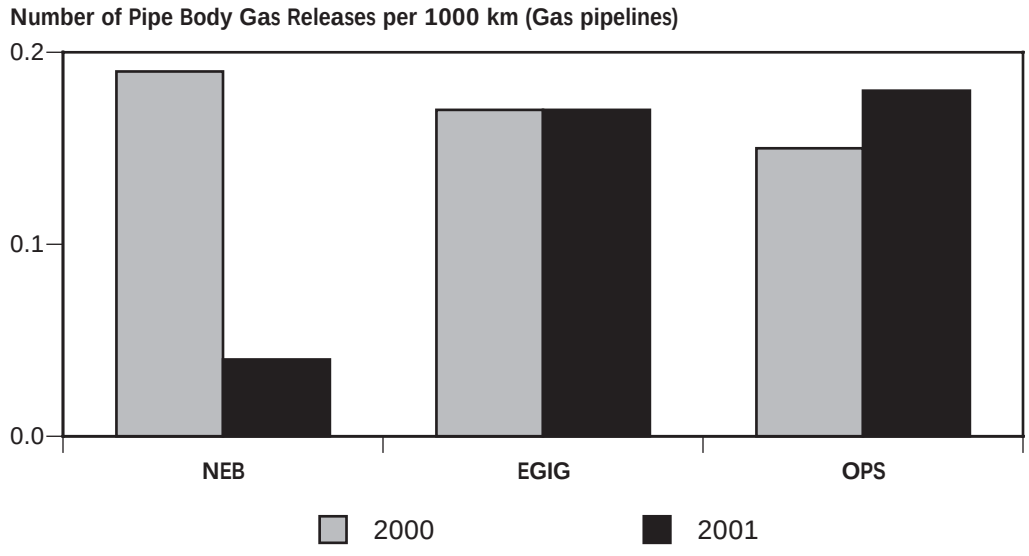


4.5 Gas Releases

The number of pipe body gas releases per 1000 kilometres of NEB-regulated gas pipeline companies is contrasted with data from EGIG and the OPS in Figure 4.12.

FIGURE 4.12

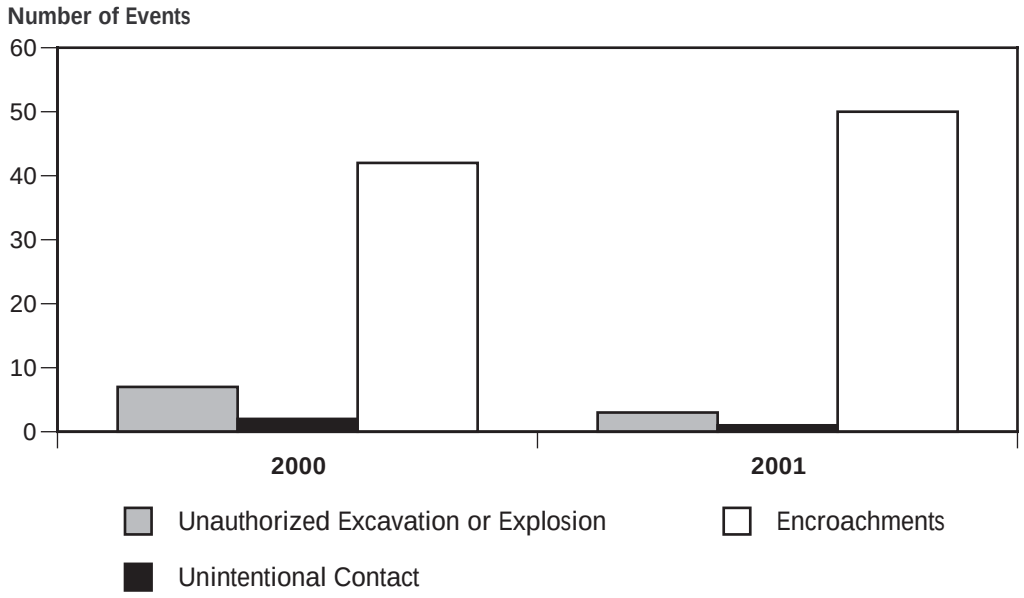
Number of Gas Releases (Gas Pipeline Companies)



The data presented in Figure 4.12 is for gas releases from the pipe body of natural gas pipeline companies. Under the *Onshore Pipeline Regulations, 1999*, gas releases on NEB-regulated pipeline systems are reportable regardless of volume. This includes leaks at fittings and flanges and includes stations and gas processing plants as opposed to simple line pipe.

FIGURE 4.13

Damage Prevention by Category



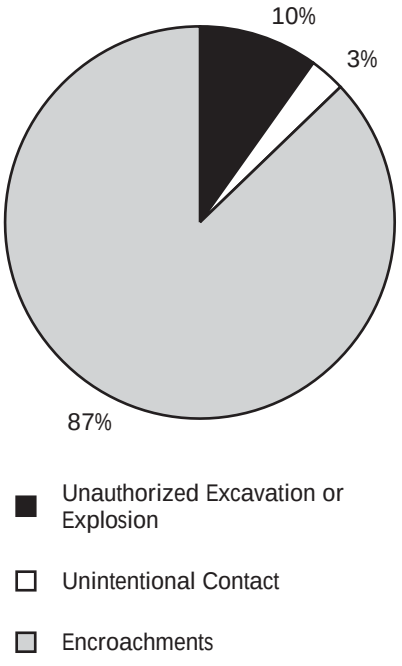
4.6 Damage Prevention

The number of reported occurrences of activities having the potential to damage a pipeline or interfere with pipeline maintenance are shown for 2000 and 2001 in Figure 4.13. The figure shows a net increase in encroachments of 19%. However, over the same period, the number of unauthorized excavations using power-operated equipment or explosives fell by roughly 57% and the number of unintentional contacts fell by 50%. The number of overall incidents rose slightly by approximately 6%.

The majority of reported occurrences pertain to encroachments where there is usually no imminent danger to the pipeline. Figure 4.14 shows the percentage of occurrence of each type based on combined data from 2000 and 2001.

FIGURE 4.14

Damage Prevention by Category (Cummulative Average)



CONCLUSION

In general, the safety performance of NEB-regulated oil and gas pipeline companies appears consistent with reference organizations with some notable exceptions. However, with just two years of data, it remains impossible to determine if differences in performance data between 2000 and 2001 represents anything more than anomalous data.

The more significant observations which can be made based on the data presented in this report are summarized below.

Data Reliability

Differences between the 2000 and 2001 data are significant. For example, the number of worker hours (company employee hours and contractor worker hours combined) reported in 2001 were more than 50% less than the hours recorded in 2000. Some of this difference is attributable to the completion of major construction projects. Questions of reliability remain however, as the company employee hours reported in 2001 were approximately 31% less than the numbers reported for 2000.

Fatalities

There were no fatalities recorded by NEB-regulated pipeline companies over the reporting period. Comparisons of fatality rates between NEB-regulated companies and reference organizations is problematic due to the magnitude of the difference in reported hours. Organizations reporting on over 1 billion hours annually are statistically more likely to experience fatalities. In contrast, the total number of worker hours reported under the SPI initiative was 13.3 million in 2000 and 6.4 million in 2001.

Ruptures

The number of ruptures recorded by NEB-regulated pipeline companies increased from 1 in 2000 to 2 in 2001 (and 3 in 2002). The leading cause of ruptures or failures among NEB-regulated pipelines is corrosion. Similarly, corrosion is the leading cause of pipeline incidents and failures as identified by both the Alberta Energy and Utilities Board and the U.S. Office of Pipeline Safety. The leading cause of pipeline incidents reported by the European Gas Pipeline Incident Data Group is third party damage.

The second most common cause of failure of NEB-regulated pipelines appears to be operational errors. The Alberta Energy and Utilities Board and the U.S. Office of Pipeline Safety have both identified the second leading cause of pipeline failure as third party damage.

Injury Frequency

Overall injury frequencies (employee and contractor injuries combined) reported by NEB-regulated pipeline companies for 2000 and 2001 appear to be in line with the frequencies reported by external reference organizations such as the U.S. Bureau of Labor Statistics. When company employee and contractor employee injuries are looked at as individual groupings, the comparisons are less favourable.

In 2000, company employees of NEB-regulated pipeline companies experienced an injury frequency of 0.23 injuries every 200 000 hours or per 100 full time equivalent workers. The frequency of employee injuries reported by NEB-regulated pipeline companies rose to 0.87 in 2001.

The contractor injury frequency in 2001 was 5.35 injuries per 100 full time equivalent workers. This number is well above the highest reference organization data for this same period (Pipe Line Contractors Association of Canada - 1.25) and represents a 217% increase.

Liquid Releases

The number of spills reported by NEB-regulated pipeline companies dropped from 265 in 2000 to 55 in 2001. The number of spills reported in 2000 was anomalous due to the high levels of construction activity in 2000 and that the 2001 data may prove to be more representative of industry averages over the coming years.

Gas Releases

The overall number of gas releases reported by NEB-regulated companies remained relatively constant between 2000 (23 releases) and 2001 (29 releases). All unintended gas releases by NEB-regulated pipeline companies (including those in stations and gas processing plants) are reportable regardless of the volume or effects. Data from the U.S. Office of Pipeline Safety is for pipeline incidents where there has been death, hospitalization or gross costs of more than US$50,000. Data from the European Gas Pipeline Incident Data Group does not include releases within stations and represents losses from the pipe body. As such, a close comparison between U.S. and European data appears reasonable as the types of releases reportable would be primarily releases from the pipe body, including ruptures. A comparison of the European data and the U.S. data to NEB-regulated pipeline company releases from the pipe body collected under the *Onshore Pipeline Regulations, 1999* reveals very similar performance between all three organizations.

Damage Prevention

The number of encroachments on pipeline rights of way increased by 19% between 2000 and 2001. However, over the same period, the number of unauthorized excavations fell by roughly 57% and the number of unintentional contacts fell by 50%. The number of overall incidents rose slightly by approximately 6%.

In conclusion, the Board recognizes that the value of reports such as *Focus on Safety* can only be judged by organizations and individuals who use or reference the data and analysis presented within this report. The Board is confident of the success, and looks forward to the continued improvement of this report with the continued participation of NEB-regulated pipeline companies and organizations referenced within this report.

A1. Reference Organizations

Organizations chosen for comparative analysis of data within this report have been selected based on their similarities to the NEB. Sources of reference data are evaluated on an ongoing basis and may be subject to change in future editions of this report.

Limitations of reference data for comparison purposes are discussed in section 3.2 of this report.

A1.1 Office of Pipeline Safety - United States Department of Transport

Website: ops.dot.gov

The Department of Transportation's Research and Special Programs Administration, acting through the Office of Pipeline Safety (OPS), administers the Department's national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline. OPS develops regulations and other approaches to risk management to assure safety in design, construction, testing, operation, maintenance, and emergency response of pipeline facilities.

OPS safety jurisdiction over pipelines covers more than 3 000 gathering, transmission, and distribution operators as well as some 52 000 master meter and liquefied natural gas operators who own and/or operate approximately 1.6 million miles of gas pipelines, in addition to over 200 operators and an estimated 155 000 miles of hazardous liquid pipelines.

OPS data is presented within this report for comparative purposes for the following key indicators:

- Liquid Releases; and
- Gas Releases.

A1.2 Bureau of Labor Statistics - United States Department of Labor

Website: www.bls.gov

The Bureau of Labor Statistics (BLS) is the principal fact-finding agency for the Federal Government of the United States in the broad field of labour economics and statistics. The BLS is an independent national statistical agency that collects, processes, analyzes, and disseminates essential statistical data to the American public, the U.S. Congress, other Federal agencies, State and local governments, business, and labour. The BLS also serves as a statistical resource to the Department of Labor.

BLS data must satisfy a number of criteria, including relevance to current social and economic issues, timeliness in reflecting today's rapidly changing economic conditions, accuracy and consistently high statistical quality, and impartiality in both subject matter and presentation.

BLS data is presented within this report for comparative purposes for the following key indicator:

- Injury Frequency.

A1.3 Alberta Energy & Utilities Board (EUB)

Website: www.eub.gov.ab.ca

The Alberta Energy and Utilities Board (EUB) is an independent, quasi-judicial agency of the Government of Alberta. Their mission is to ensure that the discovery, development, and delivery of Alberta's resources takes place in a manner that is fair, responsible, and in the public interest.

The EUB regulates the safe, responsible, and efficient development of Alberta's energy resources including oil, natural gas, oil sands, coal, and electrical energy.

Regulation is done through four core functions: adjudication and regulation, applications, surveillance and enforcement, and information and knowledge.

EUB data is presented within this report for comparative purposes for the following key indicators:

- Ruptures; and
- Liquid Releases.

A1.4 Canadian Association of Petroleum Producers (CAPP)

Website: www.capp.ca

The Canadian Association of Petroleum Producers (CAPP) represents more than 140 member companies who explore for, develop and produce over 97% of Canada's natural gas, crude oil, oil sands and elemental sulphur.

CAPP data is presented within this report for comparative purposes for the following key indicator:

- Injury Frequency.

A1.5 Pipeline Contractor Association of Canada (PLCAC)

Website: www.pipeline.ca

The Pipe Line Contractors Association of Canada (PLCAC) represents contractors in labour relations matters and establishes training courses for the development of Canadian workers in special pipeline construction skills.

PLCAC interests and activities extend to issues such as occupational health and safety, legislative review, pipeline standards and codes and a host of other activities.

PLCAC data is presented within this report for comparative purposes for the following key indicator:

- Injury Frequency.

A1.6 European Gas Pipeline Incident Data Group (EGIG)

Website: www.gastransportservices.nl/egig

In 1982 six European gas transmission system operators took the initiative to gather data on the unintentional releases of gas in their pipeline transmission systems. This co-operation was formalized by the setting up of EGIG (European Gas pipeline Incident data Group). Now EGIG is a co-operation between a group of nine major gas transmission system operators in Western Europe and is the owner of an extensive gas pipeline-incident database.

The creation of this extensive pipeline-incident database (1982) has helped pipeline operators to demonstrate the safety performances of Europe's gas pipelines. This information has helped the pipeline operators to improve safety in their gas pipeline transmission systems.

Considering the number of participants, the extent of the pipeline systems and the exposure period involved (from 1970 onwards for most of the companies), the EGIG database is a valuable and reliable source of information. The regional differences are not taken into account so that the result of the database presents an average of all participating companies.

EGIG data is presented within this report for comparative purposes for the following key indicators:

- Gas Releases; and
- Ruptures.

A1.7 CONCAWE, the European Oil companies Association for Environment, Health and Safety (CONCAWE)

Website: www.concawe.be

Most oil companies who refine crude oil in Western (OECD) Europe are members of CONCAWE.

CONCAWE is founded as an international association with a scientific objective and without profit-making intent. The organization produces sound economic, technical and scientific information.

CONCAWE data is presented within this report for comparative purposes for the following key indicator:

- Liquid Releases.

A1.8 International Association of Oil and Gas Producers (OGP)

Website: www.ogp.org.uk

The International Association of Oil and Gas Producers (OGP) is a worldwide association of oil and gas companies involved in exploration and production. OGP members include private and state-owned oil and gas companies, national associations and petroleum institutes. OGP's purpose is to:

- provide information to interested bodies on the oil and gas exploration and production industry;
- represent member's interests at global and regional regulatory bodies; and
- develop operating guidelines.

OGP data is presented within this report for comparative purposes for the following key indicators:

- Injury Frequency; and
- Fatalities.

A 2.1 Data

A2.1.1 Sample Size

Data was submitted voluntarily to the Board from 24 of 81 companies for the period from 1 January 2000 to 31 December 2000 (2000). The companies which reported owned or operated approximately 86% of the total length of pipelines regulated by the NEB under the Act. The data for this period included estimates of the number of hours spent by contractors on safety training as well as near miss/near hit data. In discussion with industry, the reporting of this information was removed from future reporting initiatives due to the low confidence in the numbers reported.

For the period from 1 January 2001 to 31 December 2001 (2001), 37 of 96 companies provided data for their systems representing approximately 99% of the total length of pipeline regulated by the NEB under the Act. All of the Group I Pipeline Companies provided data for 2001.

The length and number of companies reporting is contrasted with the overall length and number of companies regulated by the NEB under the Act in Table A2.1.

TABLE A2.1

NEB Regulated Company Statistics

Year	No. Companies Reporting	No. Companies Regulated (Total)	No. Kilometres Reporting	No. Kilometres Total
2000	24	81	39 190	42 720
2001	37	96	42 670	42 920

Table A2.2 provides comparative data for the reference organizations cited within this report.

TABLE A2.2

Reference Organization Statistics

Year	Organization	Kilometres of Gas Pipeline	Kilometres of Hydrocarbon Liquids Pipeline	No. Kilometres Total
2000	NEB	25 970	13 220	39 190
2000	OPS[1]	524 000	249 020	773 020
2000	CONCAWE[2]	n/a	30 800	30 800
2000	CAPP[3]	n/a	176 000	176 000
2000	EGIG[4]	110 236	n/a	110 236
2000	EUB[5]	229 034	16 410	245 444
2001	NEB	26 510	16 170	42 680
2001	OPS[1]	479 800	255 060	734 860
2001	CONCAWE[2]	n/a	n/a	0
2001	CAPP[3]	n/a	183 000	183 000
2001	EGIG[4]	110 236	n/a	110 236
2001	EUB[5]	245 466	16 818	262 284

1 U.S. Office of Pipeline Safety, http://ops.dot.gov/stats.htm

2 Western European Cross Country Oil Pipelines 30 Year Performance Statistics, Report No. 1/02 published in February 2002

3 2002 Stewardship Progress Report - Changing Behaviour - ONE Focus. ONE Direction, published by the Canadian Association of Petroleum Producers in December 2002.

4 5th EGIG Report, 1970-2001 Gas Pipeline Incidents, Document No. EGIG 02.R.0058, published in December 2002.

5 Field Surveillance Provincial Summary, April 2001/March 2002, Statistical Series 57, Alberta Energy and Utilities Board, published in July 2002.

A2.2 Data

A2.2.1 Fatalities

The number of fatalities recorded by NEB-regulated companies since 1991 is presented in Table A2.3.

TABLE A2.3

NEB Fatality Data

Year	Company Employee	Contractor	Third Party	Total
1991	0	0	0	0
1992	0	1	0	1
1993	0	0	0	0
1994	0	1	0	1
1995	0	0	0	0
1996	0	0	0	0
1997	0	2	0	2
1998	0	0	0	0
1999	0	0	0	0
2000	0	0	0	0
2001	0	0	0	0

Comparative data is provided by source organization in Table A2.4.

TABLE A2.4

Comparative Fatality Data (Fatalities per 100 million hours)

Year	SPI Contractor	SPI Employee	OGP[1] Contractor	OGP[1] Employee
2000	0	0	8.7	4.7
2001	0	0	6.4	2.4

1 Safety Performance of the Global E & P Industry, 2000 by the International Association of Oil and Gas Producers, Report No. 6.93/319 published June 2001 and Safety Performance of the Global E & P Industry, 2001 by the International Association of Oil and Gas Producers, Report No. 6.59/330 published July 2002.

A2.2.2 Ruptures

The number of pipeline ruptures per year on NEB-regulated oil and gas pipelines and their assigned causes are provided in Table A2.5.

TABLE A2.5

NEB Pipeline Ruptures (No. of Ruptures and Causes)

Year	No. of Ruptures	Causes					
		Corrosion	Operational	Third Party Damage	Natural Forces	Material Defect	Unknown or Under Investigation
1991	2	1					1
1992	3	2	1				
1993	1			1			
1994	6	2	2		1	1	
1995	4	4					
1996	3	2			1		
1997	2	1			1		
1998	1		1				
1999	1	1					
2000	1					1	
2001	2	2					
2002	3						3
Total	**29**	**15**	**4**	**1**	**3**	**2**	**4**

Data for the year 2002 is provided for information purposes and is not included for analysis purposes within this report.

Comparative data on ruptures is provided by source organization in Table A2.6.

TABLE A2.6

Comparative Rupture Data by Cause
(% of Ruptures, % or Failures, or % of Incidents)

	EGIG[1] (1970-2001)	EUB[2] (1980-1997)	NEB (1991-2001)	OPS[3] (1997-2001)
Corrosion	15	53	58	26
Third Party Damage	50	18	4	27
Material Defects (Manufacturing)	17	8	8	8
Operational	0	2	15	4
Natural Forces	7	2	12	0
Construction Damage	0	4	0	0
Girth Weld Failure	0	7	0	3
Other	11	6	4	32

1 5th EGIG Report, 1970-2001 Gas Pipeline Incidents, Document No. EGIG 02.R.0058, published in December 2002.

2 Causes of Natural Gas and Crude Oil Operating Pipeline Failures (combined) taken frm the report *Pipeline Performance in Alberta 1980 - 1997*, Report 98-G published by the Alberta Energy & Utilities Board in December 1998

3 U.S. Office of Pipeline Safety, http://ops.dot.gov/stats.htm

A2.2.3 Injury Frequency

The raw data used to calculate the injury frequencies of NEB-regulated companies is presented below in Table A2.7.

TABLE A2.7

SPI Injury Frequency Data

Year	Contractor Hours	Employee Hours	Contractor Injuries	Employee Injuries
2000	6 255 390	7 031 437	53	8
2001	1 606 271	4 827 678	43	21

Comparative data is provided by source organization in Table A2.8.

TABLE A2.8

Comparative injury frequency Data
(# Injuries per 100 Full Time Equivalent Workers)

Year	Source	Contractor Injury Frequency	Employee Injury Frequency	Overall Injury Frequency
2000	NEB	1.69	0.23	0.92
2000	CAPP[1]	0.78	0.35	n/a
2000	OGP[2]	0.4	0.29	0.36
2000	BLS[3]	3.6	3	n/a
2000	PLCAC[4]	2.88	n/a	n/a
2000	COGOA	n/a	n/a	1.06
2001	NEB	5.35	0.87	1.99
2001	CAPP[1]	0.63	0.25	n/a
2001	OGP[2]	0.33	0.26	0.31
2001	BLS[3]	3.9	2.5	n/a
2001	PLCAC[4]	1.25	n/a	n/a
2001	COGOA	n/a	n/a	0.55

1 2002 Stewardship Progress Report - Changing Behaviour - ONE Focus. ONE Direction, published by the Canadian Association of Petroleum Producers in December 2002.

2 Safety Performance of the Global E & P Industry, 2000 by the International Association of Oil and Gas Producers, Report No. 6.93/319 published June 2001 and Safety Performance of the Global E & P Industry, 2001 by the International Association of Oil and Gas Producers, Report No. 6.59/330 published July 2002.

3 Table 1. Incidence rates of non-fatal occupational injuries and illnesses by industry and selected case types, 2000, and Table 1. Incidence rates of non-fatal occupational injuries and illnesses by industry and selected case types, 2001 (Contractor is “Heavy construction, except highway”, Employee is “Gas production and distribution”) U.S. Department of Labor, http://stats.bls.gov/

4 Mainline Contractor Injury Frequencies, Safety Statistics Page from http://www.pipeline.ca/

A2.2.4 Liquid Releases

The number and relative volume of liquid releases reported by NEB-regulated companies is presented below in Table A2.9.

TABLE A2.9

SPI Liquid Release Data

Year	No. of Releases ≤1.5m^3	No. of Releases >1.5m^3 On all NEB-Regulated Pipeline Companies	No. of Releases >1.5 m^3 On Pipelines Carrying Liquids	Total No. of Releases
2000	264	1	1	265
2001	48	7	5	55

Comparative data on the frequency of spills is provided by source organization in Table A2.10.

TABLE A2.10

Comparative Liquid Release Data on Pipelines Carrying Liquids (Releases per 1,000 km of Liquids Pipeline)

Year	NEB	CONCAWE[1]	OPS[2]	EUB[3]
2000	0.08	0.19	0.59	1.22
2001	0.31	n/a	0.51	1.43

1 Western European Cross Country Oil Pipelines 30 Year Performance Statistics, Report No. 1/02 published in February 2002, page 48.

2 OFFICE OF PIPELINE SAFETY HAZARDOUS LIQUID PIPELINE OPERATORS ACCIDENT SUMMARY STATISTICS BY YEAR 1/1/1986 - 12/31/2002, U.S. Office of Pipeline Safety, http://ops.dot.gov/stats.htm

3 Alberta Energy and Utilities Board, Correspondence dated 4 April 2003, 20 Hydrocarbon Liquid Releases From Crude Oil Pipelines in 2000 and 24 releases in 2001.

Comparative data on the volumes of spills is provided by source organization in Table A2.11.

TABLE A2.11

Comparative Liquid Release Data by Volume (Cubic Metres)

Year	NEB	CONCAWE[1]	OPS[2]	EUB[3]
2000	11	360	17 300	510
2001	3 877	n/a	15 580	183

1 Western European Cross Country Oil Pipelines 30 Year Performance Statistics, Report No. 1/02 published in February 2002, page 48.

2 OFFICE OF PIPELINE SAFETY HAZARDOUS LIQUID PIPELINE OPERATORS ACCIDENT SUMMARY STATISTICS BY YEAR 1/1/1986 - 12/31/2002, U.S. Office of Pipeline Safety, http://ops.dot.gov/stats.htm

3 Alberta Energy and Utilities Board, Correspondence dated 4 April 2003, Crude Oil Relase Volumes for 200 and 2001.

A2.2.5 Gas Releases

The raw data used to calculate the gas release frequencies of NEB-regulated companies is presented below in Table A2.12.

TABLE A2.12

SPI Gas Release Data

Year	Number of Releases (Total)	Number of Releases (Pipe Body)
2000	23	5
2001	29	1

Comparative data on the frequency of gas releases is provided by source organization in Table A2.13.

TABLE A2.13

Comparative Pipe Body Gas Release Data (Release per 1000 km of Gas Pipeline)

Year	NEB	EGIG[1]	OPS[2]
2000	0.19	0.17	0.15
2001	0.04	0.17	0.18

1 5th EGIG Report, 1970-2001 Gas Pipeline Incidents, Document No. EGIG 02.R.0058, published in December 2002.

2 OFFICE OF PIPELINE SAFETY NATURAL GAS PIPELINE OPERATORS INCIDENT SUMMARY STATISTICS BY YEAR 1/1/1986 - 12/31/2002, U.S. Office of Pipeline Safety, http://ops.dot.gov/stats.htm

A2.2.6 Damage Prevention

The raw data pertaining to activities having the potential to damage NEB-regulated pipelines is provided in Table A2.14.

TABLE A2.14

Damage Prevention Incidents (No. of Reported Incidents)

Year	Unauthorized Excavation or Explosion	Unintentional Contact	Encroachments	Total
2000	7	2	42	51
2001	3	1	50	54