Performance History and Project Capability
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2.9 PERFORMANCE HISTORY AND PROJECT CAPABILITY

2.9.1 History of Compliance with Safety, Health and Environmental Requirements

1) Commitment

TransCanada is committed to the protection of the environment and to providing safe and healthy surroundings for its employees, contractors and the public. Health, safety and environment is a priority in all of TransCanada's operations. The HSE Committee of TransCanada Corporation's Board of Directors monitors conformance with the TransCanada HSE corporate policy through regular reporting provided by TransCanada's department of Community, Safety & Environment. TransCanada's senior executives are also committed to ensuring TransCanada is in conformance with its policies and regulated requirements and is an industry leader. Senior executives are regularly advised of all important operational issues and initiatives relating to HSE by way of formal reporting processes. TransCanada's HSE management system and performance are assessed by an independent outside firm every three years or more often if the HSE Committee requests it. The most recent assessment was conducted in November 2006 by Det Norske Veritas ("DNV"). These assessments involve senior executive and employee interviews, review of policies, procedures, objectives, performance measurement and reporting.

TransCanada's HSE management system is modeled to the elements of the ISO standard for environmental management systems, ISO 14001. The HSE management system facilitates the focus of resources on the areas of significant risk to the organization's HSE business activities. The system highlights opportunities for improvement, enables TransCanada to work towards defined HSE expectations and objectives, and provides a competitive business advantage. Independent third party assessments, internal management system assessments and work place and facility planned inspections are used to evaluate the implementation effectiveness of the HSE programs, processes and procedures, and confirm TransCanada's compliance with regulatory requirements.

TransCanada employs full time staff dedicated to HSE matters, and incorporates HSE policies and principles into the planning, development, construction and operation of all its projects. TransCanada's HSE performance is assessed through four levels of governance. This includes:

- **Tier 1 Activities**: These are the many detailed and proactive activities which form the foundation of all HSE governance at TransCanada, driven by regulatory specifications, internal risk analysis and identification of best practices. Across TransCanada's lines of business and its geographical footprint in the United States, Canada and Mexico, five federal regulators and 74 state and provincial agencies drive in excess of 161,000 regulatory tasks.
- **Tier 2 Inspections:** As the next level of governance, planned inspections are completed primarily by first line personnel and entail formal workplace and facility inspections to identify hazards. Findings from such inspection are addressed to eliminate and/or minimize the potential for injuries and property damage, and to correct substandard practices and conditions.

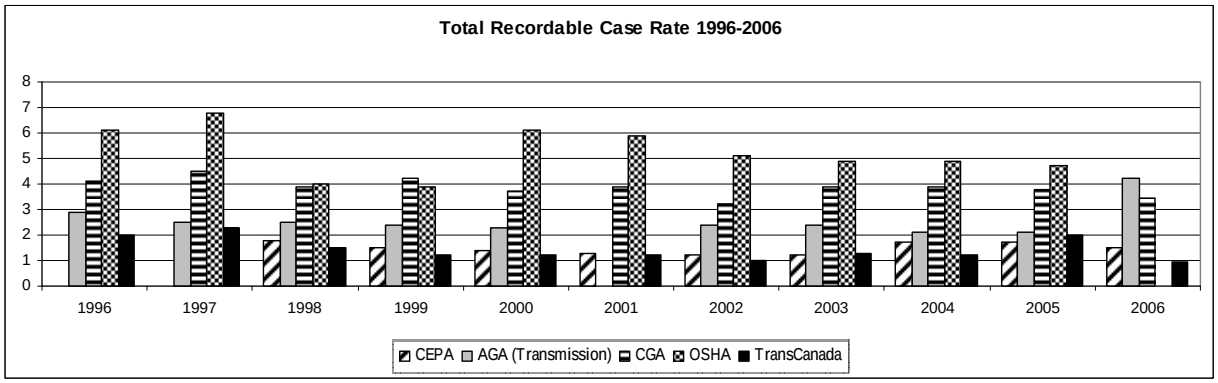
- **Tier 3 Audits (Internal):** Tier 3 audits are a biennial, internal assessment, conducted by a broad leadership team to review the effectiveness and adequacy of TransCanada's HSE Management System framework. Audit evidence is collected through facility verification reviews, document and records checks, and a combination of formal and informal interviews.
- **Tier 4 Audits (External):** Tier 4 audits are carried out by third parties, initiated either by regulatory agencies or by TransCanada, for the purpose of measuring regulatory compliance, HSE Management System effectiveness, and due diligence. Regulatory audits have included:
  - AEUB inspections and enforcement action;
  - NEB facility inspections;
  - NEB *Onshore Pipeline Regulations* audit of Trans-Québec & Maritimes operations;
  - Natural Resources Canada / Transportation Security Association – Cross Border Initiative;
  - Rhode Island Department of Environmental Management ("RIDEM");
  - Spokane County Aid Pollution Control Authority ("SCAPCA"); and
  - U.S. DOT-PHMSA audits and enforcement actions.

  As previously referenced, the most recent company-initiated external audit occurred in 2006 and was conducted by DNV using their "isrs7" audit protocol.

TransCanada's HSE Commitment Statement Guiding Principle, as endorsed by the company's Operations Committee, is included at the end of this Section 2.9.1.

2) Safety Performance

TransCanada's safety performance across all of its business units, in terms of Total Recordable Case Rate ("TRCR"), is illustrated on the following graph.



The graph shows the company's safety performance compared to the average of peer companies in various industry groups: the Canadian Energy Pipeline Association ("CEPA"); American Gas Association ("AGA"); Canadian Gas Association ("CGA"); and the U.S. Occupational Safety and Health Administration ("OSHA"). TRCR is defined as the number of recordable cases related to a common exposure base of 100 full-time employees. For 2006, TransCanada's TRCR was 0.93.

TransCanada routinely works with some 1,500 contractors. The same rigorous safety standards are applied to TransCanada's contractors as to its employees. A system is in place to assess and evaluate contractor performance prior to, during, and after the delivery of services. In 2006, TransCanada approved 275 new contractors through the contractor safety prequalification process. Not all contractors who express interest in working with TransCanada meet the company's safety standards for attitude, behaviours and applicable programs. In 2005, approximately 25% of new contractors failed to meet TransCanada's requirements and, therefore, were not approved for contracting. In addition, TransCanada conducts safety prequalifications and updates on its suppliers.

Gas Transmission Northwest Corporation ("GTN"), acquired by TransCanada in 2004, represents an excellent case study with respect to safety. TransCanada has grown rapidly in recent years and this can present challenges to ensure that employees in newly acquired companies successfully adopt TransCanada's standards of safety. GTN is an Oregon-based natural gas pipeline company that owns and operates two pipeline systems – the Gas Transmission Northwest pipeline system and the North Baja Pipeline system, totalling over 1,400 miles of pipe stretching from British Columbia to the Mexico border.

In 2005, GTN employees achieved a zero lost-day incident record. The employees received the Safety and Health Achievement Recognition Program ("SHARP") award from the Oregon OSHA. Oregon's SHARP program provides an incentive for employees to find and correct hazards, implement safety and health programs, and manage occupational safety and health issues. An Oregon OSHA representative told employees that GTN was one of only 42 companies to complete this program out of a total of 90,000 registered businesses in Oregon. This was the fifth year in a row that GTN employees have received the award. Safety performance and standards were retained, even in a year of significant transition.

3) Environmental Compliance

TransCanada's environmental record is proven over many years. A significant element of the company's corporate performance is environmental compliance. To support compliance, TransCanada develops and maintains programs and procedures to guide activities at all its facilities. These programs and procedures outline statutory and regulatory requirements and industry best practices to be followed. As described in Section 2.9.1(1) above, the company's audit programs regularly assess compliance with regulatory requirements and company directions. To mitigate risk and to improve environmental performance, TransCanada has numerous programs and initiatives underway, some of which include:

- planned inspections of facilities and workplaces;
- contractor management;
- land reclamation;
- habitat reclamation;
- wildlife conservation;
- assessment, remediation and monitoring of historical sites;
- waste management;
- PCB management;
- reduction of greenhouse gas emissions;

- active participation in development of new regulatory policy and legislation; and
- issue and incident management for continuous improvement.

Over many years, TransCanada has provided environmental leadership to the North American pipeline industry. Through active participation in various multi-stakeholder forums, TransCanada strives to promote environmental responsibility, to support appropriate and workable legislation, and to demonstrate environmental stewardship across all its energy facilities. Following are examples of TransCanada's efforts:

- Dating back to the late 1960s and the early 1970s, TransCanada has responded to public issues, directed toward the overall oil and gas industry, which emerged with respect to disturbances and potential damage to land. Taking a proactive stance in the pipeline sector, TransCanada developed and implemented improved soil handling and reclamation techniques.
- TransCanada was a founding member of the Alberta Pipeline Environmental Steering Committee and, more recently, has partnered with Canada's NEB in establishing the Canadian Pipeline Environmental Committee. Through these organizations, environmental issues that were impacting industry growth have been addressed and proactive approaches have been developed in relation to conservation and reclamation.
- TransCanada is fulfilling industry representation roles in a number of regulatory implementation forums including the *Species At Risk Act* Regulatory Advisory Committee and the *Canadian Environmental Assessment Act* Regulatory Advisory Committee as well as a role in a regulatory modernization initiative under the *Migratory Birds Convention Act*, 1994.
- TransCanada continues its almost 20-year history of supporting collaborative efforts towards the conservation of caribou including research to understand threats to the species and what can be done to improve caribou populations. TransCanada is currently involved in the Caribou Landscape Management Association project in west-central Alberta. The resultant findings and new management practices are benefiting exploration and production as well as pipeline sectors of the energy industry.
- TransCanada's respect for cultural history was recognized in 2006 with the Richard G. Forbis Award from the Archaeological Society of Alberta in recognition of the company's stewardship of archaeological resources. The award also recognized TransCanada's commitment to the society to assist in communicating the results of significant digs in the past.
- TransCanada has a comprehensive climate change strategy in place that includes direct emissions reduction programs. Industry-leading procedures to reduce methane emissions from the company's pipelines have resulted in a 75% reduction in emissions since 1990, a timeframe over which TransCanada's Canadian pipeline facilities and throughput essentially doubled. Activities have included:
    - Implementing a Leak Detection and Repair ("LDAR") program that involves identifying leaks from equipment; setting priorities; conducting repairs for those components that do not require pipeline outages; and documenting results. The LDAR program has become part of TransCanada's standard operating procedures.

- Valve sealing procedures that stop leaks in very large valves on transmission pipelines, substantially reducing the amount of natural gas vented to the atmosphere.
- Designing and implementing an Outage Decision Model that assesses and minimizes the frequency and duration of all pipeline outages (service interruptions), usually by combining several repair and maintenance jobs into a single outage. This practice reduces the requirements for releasing methane to the atmosphere.
- Developing technology to eliminate methane emissions from dry gas seals on compressor units. A patent application was recently filed for this new technology.

TransCanada has received both domestic and international recognition for its efforts in managing methane emissions from its pipeline systems. TransCanada has also been called upon to provide expert advice on fugitive and venting emissions to the U.S. Environmental Protection Agency and the California Climate Change Registry.

Health, Safety and Environment **Commitment**

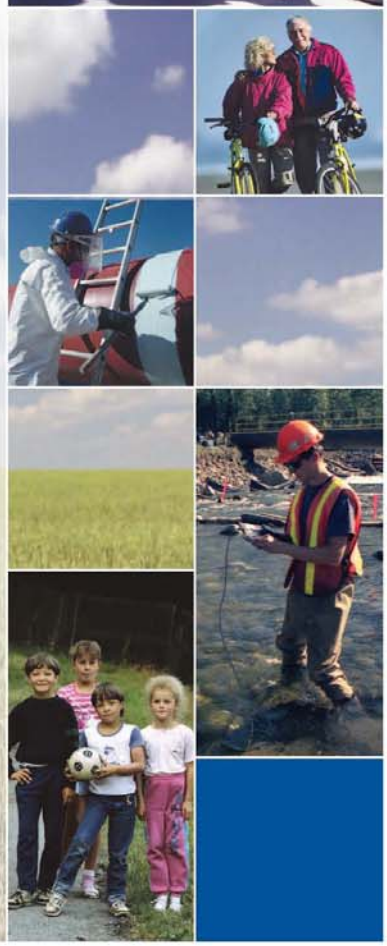
GUIDING PRINCIPLE

The executive leadership team, management and employees at TransCanada are committed to being an industry leader in health, safety and environmental practices, to maintaining a safe and healthy workplace and to protecting environmental quality. We believe excellence in Health, Safety and Environment practices is vital to the well being of all people everywhere and essential to all aspects of our global business.

The following principles will guide and measure our corporate goals and objectives in Health, Safety and Environment:

- We conduct our business so it meets or exceeds all applicable laws and regulations and minimizes risk to our employees, the public and the environment;
- We are committed to continuously improving our Health, Safety and Environment performance;
- We will continually promote employee safety on and off the job;
- We believe all occupational injuries and illnesses are preventable;
- We will respect the diverse environments and cultures in which we operate;
- We will endeavor to do business with companies and contractors which share our expectations for Health, Safety and Environment performance and commitment and we will regularly assess their performance;
- We will use our influence with companies in which we have partial ownership, to meet the Health, Safety and Environment Commitment of TransCanada, and
- We support open communication between TransCanada, the public, the scientific community and policy makers and public interest groups who research, develop and implement standards for Health, Safety and Environmental protection.

As endorsed by TransCanada's Operations Committee.



At TransCanada, we believe all employees are responsible and accountable for Health, Safety and Environment Performance.

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2.9.2 Capability to Follow a Detailed Work Plan and Schedule

TransCanada's credentials in this area are included in the response to Section 2.9.3 which follows.

2.9.3 Capability to Operate within a Cost Estimate

TransCanada is an experienced and successful developer of major world-class, natural gas transmission projects. This is well illustrated through the company's massive system expansion projects of the 1990s, the largest growth decade in the company's history. TransCanada's project teams directly managed large-scale Canadian facility expansion programs with costs totalling approximately Cdn$14 billion. These capital programs included approximately 6,700 miles of large diameter pipe (30 to 48 inch OD); almost 3.2 million hp of compression power; and 376 custody transfer measurement stations. The work stretched across the continent and included individual projects up to 750 miles in length.

Details are summarized in the following chart:

TRANSCANADA'S CAPITAL EXPANSION PROJECTS 1990-2000			
YEAR	*ANNUAL CAPITAL EXPENDITURES ($)	ANNUAL PIPE ADDITIONS (MILES)	ANNUAL COMPRESSOR ADDITIONS (HP)
1990	1,193	796	369,000
1991	1,947	994	222,000
1992	1,814	892	532,000
1993	1,341	645	264,000
1994	1,291	1,027	287,000
1995	1,038	865	249,000
1996	891	380	131,000
1997	1,466	465	513,000
1998	1,700	369	346,000
1999	982	175	237,000
2000	309	75	16,000
TOTAL	**13,973**	**6,683**	**3,166,000**

*Annual Capital Expenditures shown in millions of Canadian dollars.

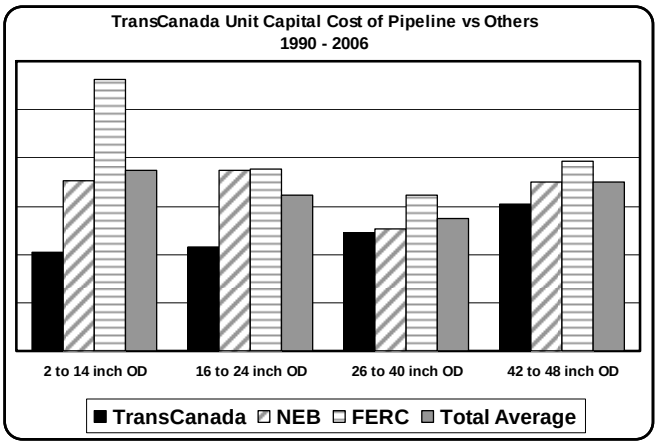
The results from an independent 2001 benchmark study confirm that, in its industry, TransCanada was the lowest cost provider of safe and reliable pipeline facilities during the decade. Of more than 1,000 of the top quartile (lowest cost) projects in Canadian NEB and U.S. FERC databases, TransCanada's total installed capital costs were, on a unit capital cost basis, lower than that of any of the other competitors.

In addition to installing these facilities at the lowest cost, TransCanada's overall project development efforts were, and continue to be, consistently on budget and on schedule. During the 1990s, TransCanada's $14 billion capital program was delivered within 0.6% of the budgeted amount. The projects were generally ready for service on or before originally scheduled dates and in no case were substantial schedule setbacks experienced.

At the same time, TransCanada was active internationally, partnering with a number of multinational energy project developers at locations around the world. In addition to projects owned, TransCanada's project teams managed other large projects under contract. Total value of all these projects exceeded U.S.$10 billion. From 1999 to 2001, TransCanada international project teams managed through to completion major projects with construction values in excess of U.S.$1.3 billion, in Mexico, Chile and Argentina on gas transmission pipelines, and in Venezuela on NGL extraction and fractionation plants.

TransCanada Construction in British Columbia

Although the decade of the 1990s was the period of largest growth for TransCanada, the company continues to be active through both greenfield and expansion projects. For the period 1990 to 2006 collectively, the following graph shows TransCanada's average capital cost of pipelines, on a cost per diameter-length basis, as compared to the average cost of FERC and NEB pipelines installed during the same timeframe.



The illustration is a scaled, relative comparison for the groups. TransCanada's pipelines have consistently ranked among the most cost-effective installations in the North American industry. The company has achieved a similar record on its compressor station installations.

Currently, TransCanada has a number of significant projects in development, including:

- ongoing expansion of the company's gas transmission network;
- cogen, wind and nuclear re-start power generation;
- two LNG terminals;
- a Canada/U.S. high voltage, direct current transmission line; and
- a 2,148 mile large-diameter crude oil pipeline from Alberta to the U.S. mid-West.

TransCanada's success in major project development can be attributed to extensive project management experience, the ability to develop effective relationships with key stakeholders and the implementation of leading edge technologies such as high strength steels and mechanized welding.

The following Fact Sheet titled "Project Management" summarizes TransCanada's accomplishments during its largest growth period.

Project Management

In Canada, the US, and around the world, we have been highly successful in planning, constructing and operating pipelines in some of the most challenging physical and political-social environments. We have the knowledge, skills, experience and drive to deliver a major pipeline project in virtually any environment.

TransCanada's expertise in project management is the result of decades of experience as one of North America's leading pipeline companies. We are experts in the design, construction and operation of natural gas transmission pipelines and have received international recognition in the energy industry.

Our project management skills have been tested and proven in pipeline projects around the world. Whatever it takes, we can deliver.

- Joint venture partners seek us out to control their project risks. We have an enviable track record on large-scale pipeline projects both domestically and internationally. We complete our projects on time, on budget and without complications. That's why our partners choose us to manage their project investments.
- We specialize in innovative project management arrangements with clients, joint venture partners and contractors. We have the demonstrated ability to enable project partners to leverage strengths to control project risks.
- Whether we are the sole owner, or the managing joint venture partner, TransCanada project teams smoothly execute the role of owner's engineer. Our strong performance on complex international projects has earned us a reputation for project management reliability.
- We rely on our proven management systems to coordinate and maintain complex schedules and manage cash flows at all project phases. We have the tools to plan and execute complex regulatory permitting in single or multiple jurisdictions, and to effectively control the commercial procurement process.

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MAJOR PIPELINE INDUSTRY PROJECTS MANAGED SINCE 1990

Since 1990, TransCanada has managed nearly $30 billion in pipeline and related projects. In a world where major project over-runs are common, we are proud of our track record of tightly controlling schedule, budget and risk on all of our major projects.

A selection of our larger projects during the last decade are profiled below:

Canadian System Expansions

Mainline and BC Expansion (NEB) – Since 1990, over 170 facility applications to the NEB and 14 major system expansions of up to $1.8 billion each (excludes Foothills, TQM and Express), total facility expenditures of $8.1 billion, a major system expansion cost of $6.5 billion

- More than 3,100 km of pipeline loop (>36"), 1080 megawatts of compression
- Multiple annual hearings with extensive public notifications (>26,000) and landowner consultations (>8,600), wide variety of terrain, dispersed logistics, over 80 environmental assesments completed under the Canadian Environmental Assesment Act

Alberta System Expansion (EUB) – Since 1990, over 300 facility permit applications and 250 meter station applications

- Pipeline, compression and measurement cost of more than $4 billion (excludes meter stations)
- More than 6,200 km of pipeline loop (10" to 48"), 500 megawatts of compression
- More than 200 conservation/reclamation assessments completed, dispersed logistics, numerous cold climate installations

International Projects

Accroven – Natural gas processing and storage facilities in eastern Venezuela, three dispersed brownfield sites, commenced operation June 2001

- US$425 million bid competition, project financed, TransCanada as managing partner
- Two extraction plants, a fractionation plant and storage, on budget and on schedule
- A model state privatization initiative, regional labour unrest and skills shortages, political and currency risk management

Energia Mayakan – A greenfield gas pipeline to new markets in Mexico's Yucatan Peninsula, commenced operation in September 1999

- US$260 million bid competition, project financed, TransCanada as managing partner
- 700 km of 16" and 24" pipe, on budget and on schedule
- Complex federal/state permitting (122 permits), archaeological/cultural risk management, challenging landowner relations

Gas Pacifico – A greenfield gas pipeline from Argentina to new markets in Chile, commenced operations in October 1999

- US$261 million, TransCanada as majority owner and project manager
- 543 km of 20" to 24"pipe, on budget and ahead of schedule
- high elevation Andes crossing, workforce peak at 2,380, 900 landowners, 50 canal/river crossings

GasAndes – A greenfield gas pipeline from Argentina to new markets in Chile, commenced operations in July 1997

- US$323 million, TransCanada as majority owner and project manager
- 463 km of 24" pipe, on budget and on schedule
- Crossing the Andes at 3,700 m (>12,000 ft), workforce peak 1,400, first cross-border gas pipeline, 74 hydrostatic tests, approval and use of air testing

For more information, contact:

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00449 ProjMan December 9, 2003

2.9.4 Integrity and Good Business Ethics

1) Stakeholder Reputation

In 2003, TransCanada undertook an extensive survey of its stakeholders to identify how landowners, key community opinion leaders, and other stakeholders such as shareholders and employees, viewed TransCanada. This survey provided the company with information about the views of these stakeholders both about TransCanada individually, and about the company in comparison to other Canadian energy companies.

The results of this survey indicated that for all stakeholder groups (but particularly with key opinion leaders and landowners), TransCanada ranked considerably higher than other companies in the Canadian energy industry. Importantly, all stakeholders surveyed ranked TransCanada higher than the industry as a whole in the area of Social Responsibility.

TransCanada's stakeholders recognize the company as an industry leader in the areas of environmental responsibility, social responsibility and community investment.

2) Corporate Governance

TransCanada is committed to the highest standards of corporate governance. TransCanada Corporation is listed on the New York Stock Exchange ("NYSE") and meets all governance standards of the NYSE, Toronto Stock Exchange ("TSX") and Canadian security standards and requirements. Eleven of the company's thirteen directors are fully independent, as are the members of the company's Audit and Compensation committees. TransCanada has been recognized for its corporate disclosure by the Canadian Coalition for Good Governance. The company's corporate governance practices comply with the requirements of all relevant regulators and securities agencies. The majority of the company's directors are independent of TransCanada and this is reviewed regularly. All directors are financially literate with respect to understanding the breadth and complexity of issues that can reasonably be expected to be raised by TransCanada's financial statements.

TransCanada takes its corporate responsibilities seriously. A summary of the most recent *Corporate Responsibility Report* is included at the end of this Section 2.9.4. The full report can be viewed online at http://www.transcanada.com/social/responsibility/index.html.

TransCanada operates under a strict *Code of Business Ethics*. This Code was approved by the Board of Directors and sets out expected standards of conduct to ensure that the company's reputation for honesty, integrity and reliability is maintained. This Code provides guidance to employees of TransCanada regarding activities and operations with respect to compliance with laws, conflicts of interest, fair dealings, corporate opportunities, confidential information, fiscal integrity and responsibility, health safety and environment, employment practises, inter-affiliate Codes of Conduct, and fraud or criminal conduct. Annual training is provided to all employees of TransCanada on the Code, and annual certification is required.

TransCanada Corporation and its affiliates also adhere to inter-affiliate codes of conduct prescribed by Canadian and U.S. regulators, which ensure that TransCanada's inter-affiliate relations including the management of regulated resources and confidential information is conducted transparently and appropriately. Specifically, these codes prohibit non-regulated affiliates of TransCanada from receiving any unfair competitive advantage arising from their relationship with TransCanada's regulated affiliates.

TransCanada has received numerous recognitions for its strong operating performance, disciplined growth and commitment to corporate responsibility. Two of the more significant tributes in this regard are the following.

a) Top 100 Most Sustainable Corporations

TransCanada has been named to the 2007 list of the Global 100, a list of the world's top 100 sustainable corporations. Unveiled each year at the World Economic Forum in Switzerland, The Global 100 recognizes corporations that demonstrate a better ability than their industry peers to manage environmental, social and governance risks and opportunities. The Global 100 was selected from a list of 1,800 publicly traded companies from around the world.

TransCanada was one of only five Canadian companies on the list.

b) Dow Jones Sustainability Indexes

In September 2006, TransCanada was named a member of the Dow Jones Sustainability Indexes ("DJSI") World and North America. This was the fifth year in a row that the company was recognized in the World index for the sustainability of its practices in areas including corporate governance, risk management, climate change, supply chain standards and labor practices.

The DJSI North America was launched in 2005 and TransCanada has been included in both the 2005 and 2006 indexes. The annual review of the DJSI components is based on a thorough assessment of corporate economic, environmental and social performance. TransCanada is one of 11 Canadian companies on the World index and one of 17 on DJSI North America.

A Message from Hal Kvisle, President and CEO

The importance of corporate responsibility

At TransCanada, we have no higher corporate responsibility than to operate our energy infrastructure in a reliable, safe and cost-effective manner. We fulfill that obligation through operational excellence. This is part-and-parcel of maximizing the strength and value of our company.

To us, acting responsibly provides a distinct competitive advantage. It makes it easier for us to:

- enhance our relationships with all stakeholders;
- attract more customers and investment;
- recruit and retain the finest employees;
- strengthen our relationships with regulators;
- manage the risks inherent in a business like ours; and
- maintain our all-important license to operate.

This is nothing new for TransCanada. At our company, corporate responsibility rests on a well-defined and publicized set of values. We refer to these values as SPIRIT: Social Responsibility; Passion; Integrity; Trust and Respect; Results; Innovation; and Teamwork.

These values drive our decisions and guide our actions. Corporate responsibility at TransCanada is, in fact, nothing less than these values put into action by our dedicated employees.

In the years ahead, the integrated and sharply focused vision that makes TransCanada a responsible corporation will be more important than ever.

Issues such as the growing labour shortage, the rising cost of materials and the uncertain effects of new government policies mean we must continue to seek acceptable ways of dealing with escalating economic and social costs.

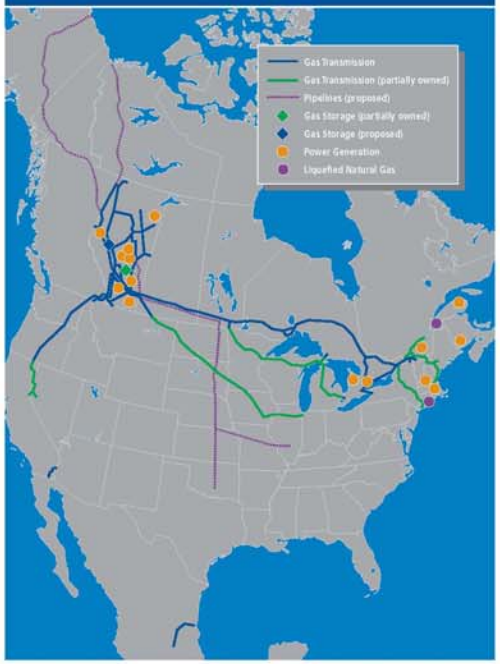
But most importantly, our attitude of corporate responsibility will allow us to address North America's infrastructure deficit in a proactive and sensible manner.

North America needs more energy transmission and electric power generating capacity to meet peak demands. Fortunately, our company is well equipped to address both deficits.

In doing so, TransCanada will continue to act from the deep sense of responsibility that our employees have always exhibited in their daily activities.

TransCanada at a Glance

TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure. TransCanada's network of approximately 41,000 kilometres (25,600 miles) of pipeline transports the majority of Western Canada's natural gas production to key Canadian and U.S. markets. A growing independent power producer, TransCanada owns, or has interests in, approximately 7,000 megawatts of power generation in Canada and the United States.



01100 Corporate Responsibility Report – Summary (November 2006)

Corporate Responsibility Report

Summary

To read TransCanada's complete 2005 Corporate Responsibility report, please visit our website at www.transcanada.com

2005

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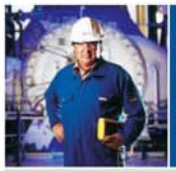


People

Engaging our Stakeholders

TransCanada strives to develop and maintain positive relationships with our stakeholders.

Those stakeholders include our employees, customers, landowners, shareholders, regulators, the residents of communities where we operate, Aboriginal peoples, our industry peers, partners, contractors, educational and research institutions, members of the media, non-governmental organizations, and many others.

By treating these people respectfully, we build the foundation needed to attract and retain good employees, plan and develop new projects, and help to sustain broadly based community initiatives for positive social change.

There are four main ways we engage our stakeholders. These cut across all functions of the company and all geographical regions in which we operate. They are:

- consulting with stakeholders;
- providing a rewarding and respectful workplace;
- ensuring the well-being of our employees and others with whom we come into contact; and
- investing in the communities where we live and work.

In addition to conducting regular internal reviews of our approach to employee and stakeholder relations, safety and investment, we also seek guidance from independent, third-party organizations about best available practices.

To view key statistical measurements about our people performance, please visit our online Corporate Responsibility report. There you'll find statistics on our:

- People Profile
- Vehicle Incident Frequency
- Total Recordable Case Rates
- Away-from-work Case Rates
- Community Footprint by Province (U.S. and International included)
- Community Investment – Why We Contribute, How We Contribute, What We Support

Environment

Minimizing our Impact

As owner of one of the largest natural gas transmission systems in North America, and as a generator of significant electrical capacity, TransCanada works to minimize negative environmental impacts while upholding our responsibility to meet the strategic energy demands of the continent.

This can be challenging, as continental energy demand continues to grow in lock-step with greater regulatory oversight of environmental issues. As a result, we have defined and adopted a holistic, company-wide, risk-based approach.

Consisting of an integrated Health, Safety and Environment (HS&E) Management System framework and a continuous improvement cycle, the approach focuses on:

- managing greenhouse gas and air emissions;
- encouraging biodiversity;
- fostering energy efficiency; and
- participating in public policy discussions.

The framework is based on ISO 14001, an international standard for environmental management systems, and is used to capture, organize and document our company's commitment and expectations when it comes to managing our responsibilities. Our continuous improvement cycle contains 11 elements, or checkpoints, that complement the framework.

As always, we remain committed to following best industry practices as we continue to contribute positively to energy reliability and security across North America.

To view key statistical measurements about our environmental performance, please visit our online Corporate Responsibility report. There you'll find statistics on our:

- Green House Gas Emissions (2004/2005)
- Spills
- Environmental Non-compliance

Business

Managing for the Long Term

One of the most responsible acts any business can perform is to achieve financial stability over the long term.

When a company succeeds financially, it is able to make a significant contribution to the society in which it operates, and when a company acts responsibly, it is more likely to succeed. This reciprocity is at the heart of TransCanada's values and success.

We believe we have positioned ourselves well for long-term growth by embracing effective governance, by applying a risk-based economic model that maintains our competitive advantage and brings greater reward to our stakeholders, and by continually refining our corporate strategy.

Within North America, the next challenge and opportunity for the energy sector is a serious infrastructure deficit. While reducing or eliminating that deficit will challenge the ingenuity of our industry as a whole, at TransCanada we are confident we have the resourcefulness and the will to make a significant contribution to resolving this issue.

For more information about our business performance, please visit our online Annual Report at www.transcanada.com

2.9.5 Other Relevant Factors

In addition to those already discussed, other factors are also important in considering the overall readiness to develop a project of the scale and complexity of the APP. These include:

- the understanding of Aboriginal issues in the north and the strength of Aboriginal relationships;
- the ability to successfully implement optimum technology for cost effectiveness, safety and long term reliability; and
- competency in major pipeline system operation, particularly as relates to extreme northern conditions.

TransCanada's capabilities and capacity in these areas are summarized as follows.

1) Aboriginal Relations

TransCanada is recognized by government, industry and communities to be a leader in building positive relationships with Aboriginal communities impacted by its projects and operations. Aboriginal Relations has been an integral part of TransCanada's operations for nearly 30 years. TransCanada's principle-based Aboriginal Policy (included at the end of this Section 2.9.5(1)) combined with years of experience has proven to be successful in the corporation's ability to gain access to land within Canadian First Nation traditional territories.

Today, TransCanada operates facilities in the proximity of over 150 Aboriginal communities. TransCanada's flexible and innovative approach in managing the diversity of issues that arise with First Nations has proven itself time and again. This success is measured by the lack of opposition to TransCanada's activities and the numerous community agreements negotiated and implemented.

TransCanada, through its wholly owned subsidiary, Foothills, has been actively involved in on-going information, consultation and liaison activities with First Nation communities affected by the APP in Canada since 1977. Over the years, these activities have focused on establishing and maintaining a positive working relationship with affected First Nations in order that issues and concerns identified by affected First Nations can be effectively addressed.

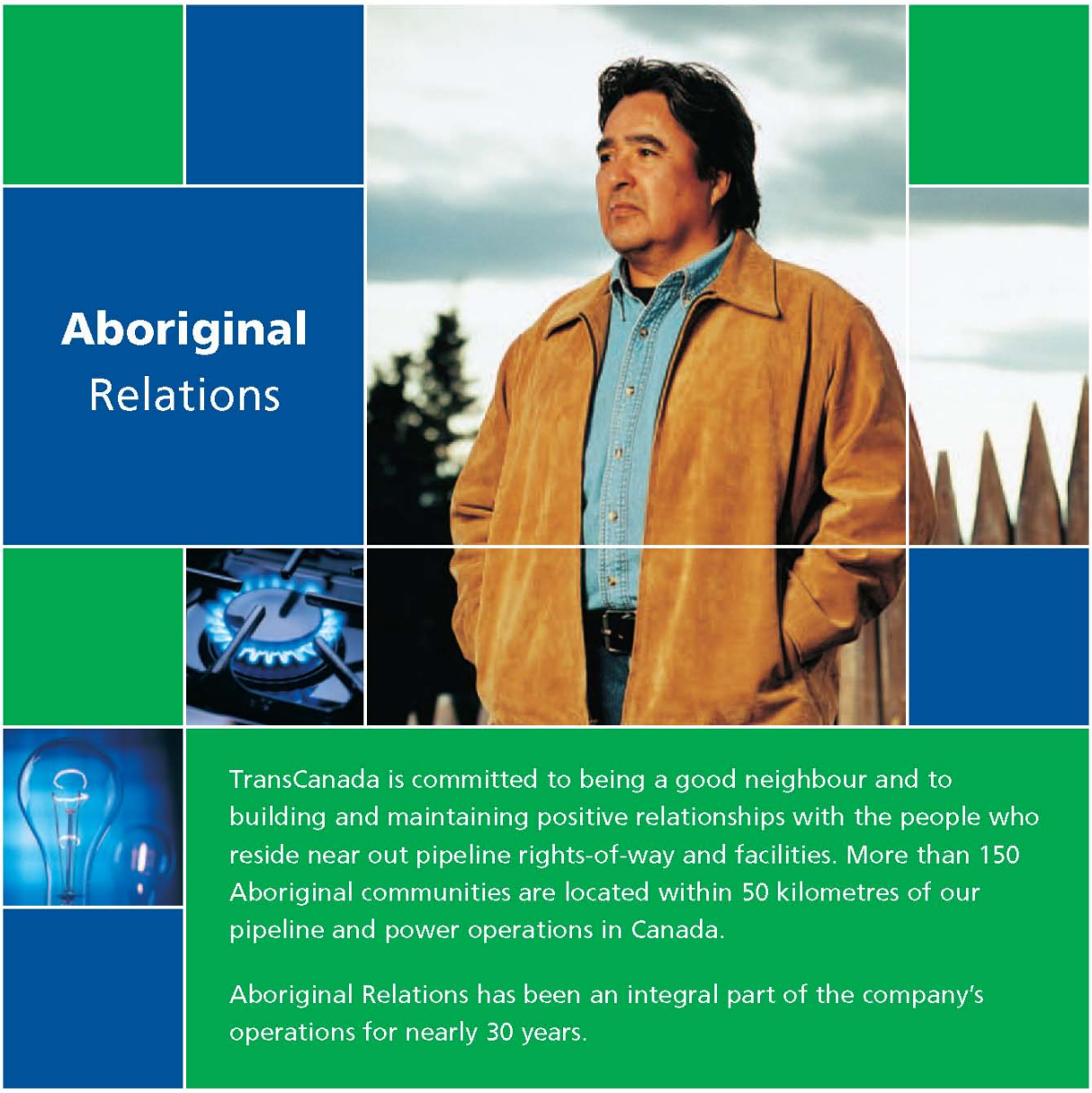
In recent years, TransCanada representatives have met with community leaders of every First Nation in Yukon and British Columbia whose Traditional Territory is traversed by the pipeline route.

In many instances, TransCanada representatives upon invitation, have provided project information presentations in many of the First Nations' communities located along the pipeline alignment. These communities include: Beaver Creek, Yukon (White River First Nation); Burwash Landing, Yukon (Kluane First Nation); Haines Junction, Yukon (Champagne and Aishihik First Nation); Whitehorse, Yukon (Kwanlin Dun First Nation); Teslin Yukon (Teslin Tlingit); Watson Lake and Ross River, Yukon; and Lower Post, Good Hope Lake and Kwadacha, British Columbia (Kaska First Nation).

Further, TransCanada has invited all First Nations located along the pipeline corridor to engage in negotiations leading to Participation Agreements. TransCanada is most advanced

in this regard with the Kaska First Nation. TransCanada and the Kaska have entered into a series of agreements including: *Cooperation Agreement*, *Agreement in Principle for a Participation Agreement*, and *Traditional Knowledge Protocol*. As a result of the deliberations with the Kaska, TransCanada now has developed a Participation Agreement template which can be used in completing future Participation Agreements with other First Nations.

TransCanada is currently an active supporter of the Alaska Highway Aboriginal Pipeline Coalition (AHAPC) and has participated in workshops and other events the AHAPC has organized.



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TransCanada's approach to **Aboriginal Relations**

TransCanada's proactive approach to community dialogue is based on three elements: communication, consultation and commitment. We believe it is important to continually communicate with our impacted communities, consult on our activities and follow through on our commitments.

In order to manage the diversity of the Aboriginal communities we interact with, we are developing internal capacity. That means we develop and implement Aboriginal programs and initiatives through individual internal groups. Employees who understand Aboriginal issues and their business impacts can help us proactively and positively manage these issues.

For example, our Aboriginal Human Resource Strategy was developed to increase Aboriginal employment accessibility and to ensure an environment that is respectful of Aboriginal peoples. TransCanada also has an Aboriginal Contracting Strategy that provides opportunities for Aboriginal businesses in both the construction of new facilities and the maintenance of existing facilities.

We also build and maintain local ongoing Aboriginal relationships through regionally based Aboriginal Relations liaisons who are dedicated to developing economic, educational and social opportunities with Aboriginal communities along our system.

Aboriginal Education

TransCanada has been a long-time supporter of educational initiatives focused on Aboriginal people. The company has awarded millions of dollars through scholarships, contributions and donations to Aboriginal students and institutions in support of post-secondary education.

By encouraging Aboriginal people to obtain an education, we can help increase the number of Aboriginal professionals and tradespeople in the workforce. This is beneficial to both the energy and resource industry and the Aboriginal community.

We are proud of our long-standing commitment to education and we will continue to enhance and find new ways of furthering our support.

Aboriginal Awareness

With a view to increasing TransCanada's employees' own understanding of Aboriginal history and culture, and the role Aboriginal people play in Canada and our business, we have implemented a training program specifically for our employees and contractors. This is an important step forward in the support and successful implementation of our Aboriginal Policy.

The Future

TransCanada will continue to review and adapt our Aboriginal Policy, programs and initiatives to meet the changing needs of our business and the Aboriginal community. For example, we are continually looking at partnering with other interested organizations to help Aboriginal youth stay in school.

While our methods may change, our commitment remains.

TransCanada's Aboriginal Policy

TransCanada is a leading North American energy company, focused on natural gas transmission and power services. These businesses operate in an increasingly competitive environment.

TransCanada constructs and operates our facilities near many Aboriginal communities across Canada. TransCanada believes that by developing positive relationships with the Aboriginal communities whose lives are impacted by our activities, we can achieve our respective business and community interests.

TransCanada's Aboriginal Policy must be flexible to address the legal, social and economic realities of Aboriginal communities across Canada. The following principles guide this policy:

- TransCanada respects the diversity of Aboriginal cultures, recognizes the importance of the land and cultivates relationships based on trust and respect;
- TransCanada works together with Aboriginal communities to identify impacts of company activities on the community's values and needs in order to find mutually acceptable solutions and benefits;
- TransCanada strives to create short and long-term employment opportunities for Aboriginal people impacted by our activities;
- TransCanada supports learning opportunities for Aboriginal people to provide a well trained source of Aboriginal employees and to build capacity within Aboriginal communities; and
- TransCanada respects the legal and Constitutional rights of Aboriginal peoples and recognizes that its relationships with Aboriginal peoples are separate and different from that of the Crown.

All TransCanada employees have a responsibility to help build and maintain relationships with the Aboriginal communities where we do business.

Dreamcatcher

The Ojibwe Dreamcatcher has been used for many years in the Indian ways. It is believed that dreams, both bad and good, descend from the dark night sky. The bad dreams are captured in the web and held there until the morning sun's rays evaporate them with the dew. Good dreams simply slip through the centre hole in the web on to the one who's sleeping.

For more information about TransCanada or our Aboriginal Relations activities, please write to:

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Or visit our website at www.transcanada.com

Aboriginal Relations – January 2006

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2) Technology

a) TransCanada's Record

For more than five decades, TransCanada has been a pioneer in leading-edge gas transmission technology. TransCanada is a recognized industry leader in successfully developing and applying new technologies and engineering solutions in response to business needs. Today, the company operates one of the world's most technologically-advanced and efficient natural gas transmission systems.

Following are some of the technical accomplishments that TransCanada has implemented and proven on its existing system. In many cases, work was carried out in close collaboration with other APP stakeholders including BP and ExxonMobil.

i) Design – Practices

TransCanada is the industry leader in applying a strain-based approach to difficult pipeline design situations. It is the first company in the onshore pipe industry to receive explicit regulatory acceptance for a full strain-based design for a gas transmission pipeline in permafrost areas. TransCanada's *Engineering Design Methodology* for the proposed 36-inch Dickins Lake and Vardie River Projects near the Alberta / Northwest Territories border was accepted in principle by the Alberta Energy Utilities Board ("AEUB") in July 2005. This approach can result in a design and operation with lower life cycle costs than is the case through more traditional approaches.

At a more advanced level, TransCanada is working on the development of fully verified, reliability-based design methodology. It has played leading roles in the development of these standards for the CSA Z662 code in Canada as well as for ASME B31.8. Advances in this area will enhance confidence in managing pipeline integrity while maximizing cost savings.

ii) Design – Frost Heave and Thaw Settlement

TransCanada has developed a comprehensive pipeline design model which takes into account hydraulic simulation, heave/thaw predictions and pipeline response predictions, and validates recommendations against operating data. This model has been successfully applied to difficult projects in northern discontinuous permafrost areas.

Since the 1960s, TransCanada has been a leading participant in project groups for every major gas transportation corridor that has been studied through Canada's northern territories. This includes the Northwest Project Study Group (~1969 to 1972); the Gas Arctic Study Group (~1970 to 1972); the Canadian Arctic Gas Pipeline (~1972 to 1977); the Foothills Maple Leaf Project (~1974 to 1976); the Polar Gas / Polar Delta Project (~1972 to 1991); the SIXCO Agreement (~1991 to 1998); and the Alaska Highway Project / ANGTS (~1975 to present). Through these involvements, TransCanada has gained unique expertise in engineering that is related to frost heave and thaw settlement.

iii) Design – Fracture Control

Northern pipelines will need to accommodate large volumes of gas, in high grade steels, at very high pressures, with potentially rich gas specifications. TransCanada personnel have been at the leading edge of industry technology developments on these issues and have conducted, or participated in, many of the significant programs of full-scale testing undertaken in this area. TransCanada is intimately involved in ongoing research and we have drafted fracture control plans for several northern pipeline projects, including some that have already received regulatory approval.

TransCanada also owns and operates a gas de-compression test facility at Didsbury, Alberta that has been used to study a wide range of gas de-compression behaviour and verify de-compression models.

iv) Materials – High Strength Line Pipe

TransCanada is widely recognized in the industry as the technology leader in the implementation of high-strength line pipe steels. The company's ongoing program of high-strength steel utilization has driven pipe costs down substantially and has enabled higher-pressure designs to be installed.

TransCanada introduced X70 line pipe in the early 1970s and, at the same time, implemented a 0.8 design factor for Class 1 design locations, a substantial improvement over the 0.72 historic factor. In the early 1990s, TransCanada introduced X80 and now operates this extensively across its system, including installations in discontinuous permafrost in northern Alberta. Since 2002, the company has also successfully installed X100 on several projects. Leading the industry, X100 is now one of TransCanada's design platforms and it is installed on projects where it represents an optimal engineering solution.

In 2004, in a partnership with ExxonMobil and Nippon Steel, TransCanada installed the worldwide industry's first X120. This installation was completed near Peerless Lake in northern Alberta in winter conditions where temperatures dropped below minus 40F. It remains in operation today.

The potential for cost savings related to the purchase of high strength line pipe is considerable. TransCanada has accumulated cost savings to date for installed X70 and X80 pipe amounting to several hundreds of millions of dollars for materials alone. In addition, related savings are also realized in transportation and welding.

v) Materials – Pipeline Components

Prior to the installation of X120 pipe in 2004, no fittings higher than grade X70 had been utilized in the industry. Codes enforce constraints on the wall thickness and grade of high pressure components of un-matched strength which are welded together. On TransCanada's X120 project, this meant that fittings welded to X120 pipe required a minimum grade rating of X80. As a result, TransCanada worked with regulators and manufacturers to provide X80 3R fittings, the industry's first fittings of this grade. Additional high-grade components have since been developed.

vi) Construction – Welding

TransCanada first introduced mechanized welding (CRC-Evans) in 1971. It has been the company standard on large diameter construction for more than 25 years. TransCanada refined the process and used it extensively through the major expansion period of the 1990s. A number of key weld inspection and weld assessment technologies were also developed and implemented.

Working in collaboration with industry and academia, TransCanada has played a leading role in advanced weld process development. The company has successfully incorporated single tandem welding equipment (one head x two wires) on projects, some of which were constructed during harsh winter conditions in northern Alberta. TransCanada continues to pursue the development of dual tandem, fully automated equipment (two heads x two wires). In practice, this may translate to weld deposit speed up to four times faster than currently available systems and a savings of approximately 25% on total welding costs and approximately five percent on total pipeline capital expenditures overall. Equally important, the reduced timeframe for welding will be critical to pipeline planning in the Arctic where construction seasons will be limited to short winter installation windows.

Tandem Welding Equipment

vii) Construction – Pressure Testing

In February 2005, TransCanada received approval from the AEUB to forego a post-construction hydrostatic test on one of its northern Alberta pipelines in favour of an alternative integrity validation ("AIV") process. Although the concept had been discussed previously, its implementation was a first for TransCanada and for the industry as a whole. On a typical pipeline project, AIV offers a cost-saving opportunity of approximately 2% of total capital costs.

To qualify for regulatory approval for the AIV process, TransCanada was required to demonstrate its strengths in quality management to the AEUB. The company's practices in pipeline design, manufacturing and construction were scrutinized as part of the process.

In 2006, TransCanada also received approval for AIV in lieu of hydro-testing on its 42-inch OD Deux Rivières loop in Ontario. This represented the first time that the AIV process was accepted by the NEB.

viii) Compression

TransCanada operates one of the world's largest aero-derivative gas turbine fleets primarily used to drive compressor units for unmanned and remote control operations.

TransCanada's maintenance activities are optimized through an industry-leading, internally developed, risk-based approach which allows optimum maintenance intervals to be determined. The company's maintenance methodology includes a unique turbine blade rejuvenation process which has resulted in the life of these components being significantly extended beyond the Original Equipment Manufacturers' (OEM) recommended life expectancy. As a result of a thorough program of component life analysis, the safe and reliable operation of some of the highest-hours turbine blades in the industry is ensured. Benchmarking has shown TransCanada's compression operations costs to be considerably less than the industry average. The company continues to look for opportunities to lower life-cycle costs, improve efficiency and reduce environmental emissions.

TransCanada has experience with compressor turbines of the type and size that will be necessary for the high throughput and demanding conditions of the Alaska Pipeline Project. In particular, TransCanada operates units in the 40,000+ hp (30+ MW) range including GE LM2500+ DLE and Rolls Royce RB211-6761 DLE models. These turbines are characterized by high power output, high combustion efficiency, low environmental emissions, low operating costs and high reliability in remotely controlled operations.

b) The Key to Success

TransCanada's success in leading the North American pipeline industry in the implementation of new technology can be attributed to a few key factors. First, a long-term technology management process has been in place for many years and is linked to the company's key business strategies.

Success is also dependent upon strategic relationships. TransCanada understands the importance of aligning the interests of industry regulators and standards bodies with its own. In parallel, and to facilitate rapid technology development, work is also conducted with other diversified stakeholders including major pipe and other materials manufacturers; welding and other construction contractors; educational and research institutes; and peer companies.

Although the technological innovations which have been incorporated were driven largely by cost reduction efforts, TransCanada never compromises its standards of safety in doing so. In fact, as a result of the technological advances, the company's operations have been made safer.

As TransCanada improves its facilities and its operations with technology, it believes in sharing its findings and learnings with the rest of the industry. TransCanada openly publishes the results of its work and maintains an ongoing dialogue with all stakeholders.

Collaboration and cooperation are fundamental in developing the best technology and in realizing the most successful projects. TransCanada believes that optimum technology will be the key that will bring significant savings in costs combined with added reliability over the life cycle of the APP.

c) Number One in Pipeline Technology

In 2005, the Pipeline Systems Division of the ASME established the Global Pipeline Award to recognize outstanding innovations and technological advances in the field of pipeline transportation. In October of that year, TransCanada was chosen from a field of 10 applications from around the world as the recipient of the first-ever Global Pipeline Award. TransCanada was selected based on its Peerless Lake and Godin Lake projects in northern Alberta where a number of leading technologies were implemented including X100 and X120 high-strength pipe; advanced mechanized welding; 100 % mechanized ultrasonic inspection on all welds; high-performance composite coating; high-strength fittings; and AIV.

Proactively adopting these kinds of technologies gives TransCanada the ability to develop its pipelines faster, safer and more cost-effectively to the benefit of its shippers and the industry as a whole.

Strain-Based Design; Customized for the North

TransCanada's cold climate operating experience gives us the ability to use pipe designs customized to the northern environment. Strain-based design is essential for safety, integrity and cost optimization of pipelines transversing permafrost areas and seismic zones.

TransCanada PipeLines Limited is a leader in the development and application of strain-based design methodologies. We have an in-depth understanding of material and structural behaviour, an extensive operations database, and advanced analytical models to support design innovations. Our improved designs have been tested and incorporated into our system designs, including those for high-strength steels in discontinuous permafrost, water crossings, ice scour and in areas susceptible to slope instability.

Conventional Pipe Design Relies on a Stress-Based Approach

Conventional pipeline design relies on a stress-based approach which does not fully exploit pipe material properties, or take into account pipe failure mechanisms. TransCanada believes stress-based design is not cost-effective for the challenging physical and climatic environment of a northern pipeline. To fully develop cost-effective designs, TransCanada is currently working on alternative design approaches:

- **strain-based design** – specifies pipe material characteristics and welding procedures to meet expected strain demands
- **reliability-based design** – quantifies and maintains reliability to meet a pre-defined reliability level over the entire operating life of the pipeline.

TransCanada has fully tested and implemented the strain-based approach in appropriate circumstances. Strain-based design has been used for our Northwest mainline in northern Alberta, and is now commonly used to respond to localized challenges of permafrost, unstable slopes, and watercourse crossings. A strain-based design approach combined with a reliability-based design framework will permit TransCanada to design, construct and operate safe and cost-effective pipelines in northern regions.

Strain-Based Design Matches Pipe Characteristics to the Loading

Strain-based design applies to a subset of the limit states where displacement-controlled loads dominate the pipeline response. Dependent on the nature of a load event, it can be classified as load-controlled or displacement-controlled. In a load-controlled event, the magnitude of the load is independent of the displacement and deformation of the structure, for example, internal pressure or self-weight. In these circumstances stress or strength-based design criteria are common.

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STRAIN-BASED DESIGN; CUSTOMIZED FOR THE NORTH

Increasingly sophisticated design techniques are now available to address frost heave and thaw settlement challenges.

In a displacement-controlled event, the magnitude of the load is dependent on the displacement and deformation of the structure. Typical examples are thermal expansion, frost heave and imposed displacements. In these circumstances, a strain-based design is used.

Strain-based designs take maximum advantage of the behaviour characteristics of the chosen pipe materials. By accommodating the applicable limit states, these designs lead to lower capital and operating costs without compromising integrity.

Reliability-Based Design; the Ultimate Goal

Reliability-based design and assessment is an iterative process to establish a cost-effective set of design and operational parameters that meet target reliability levels for all applicable limit states. TransCanada has developed a methodology for the implementation and design of northern pipelines using reliability-based approaches.

The goal of reliability-based design is to achieve a tolerable and consistent risk level for all design cases. This is achieved by setting a maximum permissible failure rate for each limit state, or category of limit states with similar consequences. Risk consistency is achieved by setting the maximum permissible failure rate to a value that equals the tolerable risk divided by the failure consequence severity.

Although these targets are based on a rational approach implemented through state-of-the-art models and data, it is recognized that industry and regulators must accept them before they can be used in an actual design. Regulators see the process as a unique approach to demonstrating the safety and reliability of an operating system.

TransCanada continues to develop the operational experience that will pave the way towards full acceptance of reliability-based design approaches for future pipelines.

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Strain-Based Design – November 2007

Designing for Frost Heave and Thaw Settlement

Frost heave and thaw settlement are unique northern pipeline design challenges. Northern Alberta's discontinuous permafrost has given TransCanada the experience it needs to design for the Mackenzie Valley, Alaska and other northern pipelines.

Northern pipelines will encounter many large patches of permanently frozen ground (permafrost). The numerous transitions between frozen and unfrozen ground will be a particular design challenge as frost heave and thaw settlement at these transitions can induce excessive stress and strain on the pipe.

TransCanada Routinely Builds and Operates in Discontinuous Permafrost

Significant portions of TransCanada's system in northern Alberta operate in the zone of discontinuous permafrost. TransCanada has been designing and operating pipelines in this region since the mid-1990s. These consist of mid- to large-diameter pipelines utilizing high-strength steels and operating over a range of temperatures and pressures. TransCanada now operates in excess of 900 km of large and small diameter gas pipelines within the zone of discontinuous permafrost in northern Alberta.

Heave/Thaw Design is a Multi-Discipline Challenge

To adequately design for permafrost conditions, a detailed database along the route is the first step. Information required includes:

- A detailed temperature profile of the route and the local annual temperature cycle. This data enables the establishment of appropriate zonal operating strategies and conditions.
- A detailed understanding of soil types and conditions, and microclimate and aspect variations. With this data, life cycle frost heave and thaw settlement conditions can be predicted.
- Pipe response analysis data in a wide range of heave and thaw permafrost environments. This data allows prediction of the maximum strains the pipe will encounter, and enables the matching of pipe materials and installation techniques to local terrain and climate.

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FROST HEAVE AND THAW SETTLEMENT CHALLENGES

Increasingly sophisticated design techniques are now available to address frost heave and thaw settlement challenges.

Our Integrated Design Tools and Processes Make us Ready for the Challenge

Frost heave and thaw settlement design requires highly integrated design tools and processes. TransCanada and its subsidiary Foothills Pipelines have, over many years developed the required data management and integration technology. Refined tools, models and techniques include:

- Integration of data on soils, ground temperatures, climate, weather, and lab and field data on heave and thaw in a database.
- Simulation models to analyze pipeline hydraulics, geothermal and structural parameters.
- A model to simulate the combined geothermal and structural effects of various operating strategies
- A model, and procedures, to determine segregation potentials for wide ranges of soil and geothermal conditions.
- A quick, reliable and cost-effective test capability to support application and design proposals.
- An understanding of the sensitivities and variabilities of the key parameters in a reliability-based design framework.

All these tools and techniques are integrated in a comprehensive geothermal and structural model. The model melds hydraulic simulation, heave/settlement predictions and pipeline response predictions, and validates recommendations against operating data.

TransCanada is confident that these design innovations, supported by its extensive discontinuous permafrost operating experience, assure problem-free and cost-effective northern pipeline design.

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Frost Heave – November 2007

High-Strength Pipe Materials

The application of high-strength steel continues to drive down costs and enable higher-pressure designs. Since 1994, TransCanada has installed X80 (Grade 550) and X100 (Grade 690) line pipe on numerous large diameter projects, including projects through discontinuous permafrost in northwestern Alberta.

TransCanada PipeLines Limited is a world leader in the introduction and application of high-strength steels and related technologies in the pipeline industry. We have an enviable record in the implementation of pipe, compression, measurement and environmental technologies. TransCanada uses technology to keep costs down and productivity and reliability up.

High-Strength Line Pipe

TransCanada is widely recognized as the technology leader in the implementation of high-strength line pipe steels. The application of high-strength steel has continued to drive down costs and enable higher-pressure designs to be used.

Early in the 1970s, we successfully introduced the use of X70 (Grade 483) line pipe and at the same time, implemented the use of the 0.8 design factor for Class 1 locations. The introduction of X70 has resulted in cost savings for our customers of 16 per cent on a $3 billion material investment.

After an initial trial in the early 1990s, TransCanada implemented X80 (Grade 550) on its eastern Alberta System in 1994. Since that time, more than 500 kilometres of large diameter X80 has been installed, including projects dealing with discontinuous permafrost in northwestern Alberta. The use of X80 continues to lower pipeline design costs and has reduced the project material costs by 12.5 per cent compared to X70 on an investment of $250 million.

TransCanada was the first company in North America to utilize X80 and we continue to look to the future. In October of 2002, a field trial using X100 (Grade 690) was successfully completed. Since that time, more than 10 kilometres of large diameter X100 has been installed. TransCanada's success in implementing high-strength steel technology is the result of a coordinated approach that includes technology management and a leadership role on the CSA pipeline code committees. Steel technology advances have been complemented with a change in the integrity of pipeline coatings. TransCanada has assumed a leadership role in the development and application of a wide range of advanced pipeline coatings including Fusion Bond Epoxy, which are now the worldwide industry standards.

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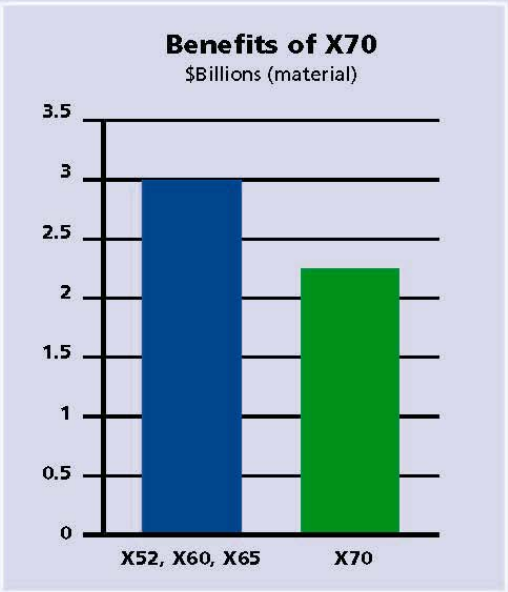
HIGH-STRENGTH PIPE MATERIALS

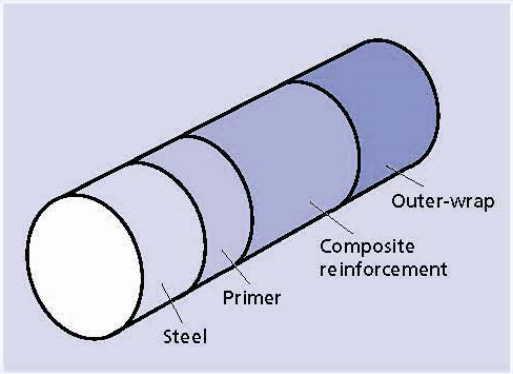
For high-pressure design, Composite Reinforced Line Pipe (CRLP™) can be an economic advantage relative to steel line pipe and can provide increased fracture resistance.

Composite Technology

In addition to the leadership role in pipe steel technology, TransCanada is also advancing developments in the area of composite technology. For high-pressure design, Composite Reinforced Line Pipe (CRLP™) can be an economic advantage relative to conventional steel line pipe and can provide increased fracture resistance. It can also extend the capability of pipe mills, enabling them to participate in projects for higher pressures for which they could not produce standard steel line pipe.



Initial trial projects on the use of CRLP™ have been implemented including the test facility at Russell Creek, Alberta, which incorporates the first CRLP™, designed and operated at full capacity.



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High-Strength Pipe Materials – November 2007

Advancements in Welding Technologies

High productivity mechanized welding will be essential for mainline welding of any northern pipeline project.

TransCanada PipeLines Limited is a leader in the introduction and application of new welding technologies. We have an enviable record in the implementation of pipe, compression, measurement and environmental technologies.

High productivity mechanized welding will be essential for mainline welding of any northern pipeline project. More automated and higher productivity welding, with minimum intervention by the welder, will be a distinct advantage in harsh conditions and short construction seasons.

Automated Pipeline Welding System

TransCanada is developing a new, fully automated pipeline welding system. The system will use one or two tandem torches on a single welding tractor or bug (tandem and dual tandem welding) and will result in welding travel speeds up to four times faster than currently available pipe welding systems. Tandem gas metal arc welding (GMAW) differs from conventional GMAW as two welding wires are passed through the same welding torch. A single torch with two contact tips is used to feed both wires into a single weld pool.

The tandem or dual tandem head will be combined with a through-arc sensor based control system reducing the need for a skilled operator to continuously monitor the weld. This will provide an adaptive welding system with high productivity, leading to substantial savings in welding costs. It is estimated that the cost of alignment, welding, NDT and weld coating can be reduced by about 25 per cent with savings of total pipeline capital expenditures of approximately five per cent.

The development work was carried out at Cranfield University in the UK and the technology has been transferred to CRC Evans Automatic Welding, RMS Welding Systems and Serimax.

The tandem welding technology was implemented in conjunction with X80 and X100 line pipe on TransCanada's Godin Lake Project in northern Alberta and the Stittsville and Deux Rivières projects in Ontario.

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ADVANCEMENTS IN WELDING TECHNOLOGIES

TransCanada implemented mechanized welding about 30 years ago and it has been our standard practice on large-diameter pipeline construction for the last 25 years.

Proven Results

TransCanada implemented mechanized welding about 30 years ago and it has been our standard practice on large-diameter pipeline construction for the last 25 years. Mechanized welding is only recently beginning to see selective implementation on cross-country pipelines in the remainder of North America and in Europe. Over the last 22 years, TransCanada has also developed and implemented a number of key production welding, inspection and weld assessment technologies. Techniques and procedures for both manual and mechanized welding have also been developed to improve quality performance and productivity on cross-country pipeline construction. We use two additional technologies to complement mechanized welding – automated ultrasonic testing and alternative weld acceptance standards.

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Dual Tandem Head

Tandem Welding Torch

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Advancements in Welding Technologies – November 2007

3) Excellence in Operations

a) Industry Leadership

TransCanada operates one of the most operationally efficient and cost-effective gas transmission systems in North America. The company has a superior record, established over many years, with respect to reliability and security of throughput. TransCanada's leading performance is particularly impressive considering that much of the system is located in cold and hostile areas of northern Canada.

Through the extremes of the Canadian climate, TransCanada operates its system remotely from the company's operations control center. Facilities are manned for certain maintenance purposes only.

TransCanada operates in some very isolated areas where there is no access to commercial utilities. TransCanada generates power for its own use where necessary from gas-fired power units and is experienced with advanced-technology links for site communication.

TransCanada can operate more than just high pressure pipelines. TransCanada has experience in rural and community gasification programs; in generating electricity from the waste heat of compressor turbines; and in the installation of fibre optics communications links alongside pipelines.

TransCanada's technical personnel are experts at pipeline operation and maintenance. They are capable of the overall planning and management of all O&M requirements of the APP Pipeline System as well as the effective management of subcontractor activities, as required.

b) Asset Management

TransCanada's Asset Management System ("AMS") is the company's way of collaboratively optimizing the care and use of TransCanada assets over their entire life cycle to best meet the needs of stakeholders. The system is designed around a plan, do, check and act cycle of continuous improvement. Based on risk and inherent value of specific assets, the AMS consists of processes, techniques and tools that provide an integrated and scalable approach in decision-making, enabling assets to meet performance requirements.

Some key components of TransCanada's AMS that would be important to the APP Pipeline System are the Pipe Integrity, Plant Integrity and Compliance Management processes. These are discussed in more detail below.

i) Pipeline Integrity

As previously referenced in Section 2.4(8) "Integrity Management Processes", TransCanada has developed and implemented an industry-leading Integrity Management Process for Pipelines. The IMPP is designed to protect the integrity of the company's facilities while maximizing the safety of employees and the public and minimizing environmental impact. The process is based on quantitative risk assessments and the identification and prioritization of maintenance needs to achieve best-in-class cost performance.

Under the program, risk assessment is used to identify potential integrity threats and to initiate inspection/mitigation activities. Results from advanced inspection of known or suspected integrity threats are used to develop specific integrity maintenance activities. The IMPP provides the basis for developing the annual Pipeline Maintenance Program together with a five-year outlook. In addition to satisfying safety and service reliability of the Pipeline System from a TransCanada business perspective, the IMPP also addresses the requirements of regulators and industry standards.

Pipeline Patrol

The IMPP is reviewed annually by TransCanada's Asset Reliability senior personnel as part of the execution of the program. This internal review is intended to ensure that all processes and assumptions utilized in the IMPP are practicable; reflect engineering best practices; incorporate the most up-to-date information concerning hazards and consequences; meet evolving regulatory expectations; and produce results that are in keeping with the intuitive system performance expectations.

The IMPP is similar to the ISO model for quality assurance in that the overall ISO process for Quality Management Systems is followed and emulated. In addition to annual internal reviews, the IMPP is subject to periodic internal audits to ensure its effectiveness, TransCanada's conformance to the process, and general regulatory compliance. As a company regulated by the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration ("DOT-PHMSA"), TransCanada is also subject to periodic DOT audits to enable verification that the integrity management processes and procedures meet regulatory requirements. The last such DOT audit was conducted in June 2006.

At the conclusion of each review and audit process, TransCanada's IMPP is updated where appropriate.

ii) Plant Integrity

TransCanada's Plant Integrity Management Plan covers the integrity of all facilities that are outside the scope of the linear pipeline. This plan addresses:

- compressor units and associated auxiliary systems;
- electrical and control systems and instrumentation;
- measurement systems;
- civil structures;

- HVAC;
- environmental protection systems;
- noise; and
- gas quality.

Plant integrity is maintained through a comprehensive risk-based approach to ensure that facilities meet expected requirements with regard to:

- safety of the public and TransCanada staff;
- potential impact on receipt and delivery reliability;
- potential impact on the environment;
- public and regulatory perception;
- protection of the installed asset base; and
- lowest life cycle cost.

Objectives of the program are achieved by proactive processes that ensure mitigation activities address the areas of unacceptable risk on the system.

iii) Compliance Management

For TransCanada's U.S. based pipeline entities, the company falls under the regulation of the DOT-PHMSA. For Canadian pipelines, TransCanada is regulated by the NEB with the exception of pipelines located in Alberta which fall under the AEUB. TransCanada has developed a specific process to ensure that all its design, construction, operation and maintenance activities are conducted in accordance with applicable standards, codes and legislative requirements.

TransCanada's approach to compliance management is supported by incident management, emergency management, issue management and regulatory management systems. This integrated process ensures systematic control of all operational incidents.

c) O&M Capabilities and Performance

The following Fact Sheets further describe TransCanada's credentials in areas that would be particularly applicable to the APP:

- Cold Weather Design and Construction
- Asset Management System
- Pipeline Integrity
- Integrated Systems Ensure Operational Compliance
- Real Time Systems

Cold Weather Design and Construction

TransCanada has as much experience constructing pipelines and other facilities in winter as in summer seasons. The vast majority of our construction in northern Alberta has been done in challenging winter conditions.

Since the 1950s, TransCanada PipeLines Limited has been living and learning in the extremes of the Canadian climate. We have gained significant experience from the many projects completed during this half-century. Our knowledge and the skill level required to conduct cold weather design and construction is solid. As a result of this continuous learning process, we are able to operate a uniquely dependable and cost-effective system, year round.

We have as much experience constructing our pipelines and other facilities in winter as in summer seasons. In the 1970s and 1980s, we were industry leaders in establishing topsoil conservation standards and practices that allowed winter construction through agricultural land. The vast majority of our construction in northern Alberta has been done in challenging winter conditions.

Extensive Experience in Northern Regions

- In 1958, TransCanada was considered a Canadian pioneer when we completed the installation of our cross-country mainline. In northern Ontario, we met the challenges of a hostile terrain of Canadian Shield bedrock and muskeg. Much of our construction through this area was carried out in the winter.
- Since the early 1970s, we have experienced the harsh climate of the most northern parts of Alberta. Here, we design, construct and operate pipelines, compression and measurement facilities in climatic, environmental and discontinuous permafrost zones similar to those that extend into much of the Yukon and the Northwest Territories.
- Since the late 1960s, we have been a leading participant in project groups for every major gas transportation corridor that has been studied through Canada's northern territories. Through that involvement, we have gained unique expertise in engineering that is related to frost heave and thaw settlement. This expertise has been applied in our northern Alberta designs. We also led, or participated in, virtually every major full-scale burst test during the period and we studied, on-site, many construction procedures specific to permafrost environments.

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COLD WEATHER DESIGN AND CONSTRUCTION

Our design features allow us to maximize our ability to operate unmanned in remote and cold climates while reducing our overall operating and maintenance costs.

Ease of Installation

A key aspect of our cold weather design is modularization. Virtually all of our meter stations are module-designed and skid-fabricated for ease of installation in remote areas or extreme climates. In fact, we have built meter stations in Alberta for installation on other continents. We have also designed and built large compressor station packages under this concept.

Unmanned Operation

The best cold weather design is one that allows for facilities to operate unattended for the longest periods of time. On our TransCanada system, each of our 1300+ measurement stations is designed to operate unmanned. As well, each of our 100+ compressor stations is started, stopped and controlled from our modern gas control center in Calgary, Alberta. Our design features support this operating philosophy. For example:

- We design special remote monitoring and diagnostic equipment into our meter stations, which allows us to manage instrumentation failures for periods of time, eliminating the need for many unplanned visits.
- We specify that much of our measurement instrumentation be able to function accurately even in the absence of building heat.
- We design full back-up power systems into our compressor stations to ensure uninterrupted operation. We specify gas-fired thermoelectric generators for many of our measurement stations, units with which we have proven performance records for all weather conditions.
- At our gas control center, we have developed software that identifies numerous anomalies and unusual hydraulic conditions on the system, decides causes and offers solutions to the gas controller.

All of these design features generate the same result. They allow us to maximize our ability to operate unmanned in remote and cold climate areas while reducing our overall operating and maintenance costs.

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00449 Cold Weather January 7, 2004

Asset Management System RACI Chart

	Asset Management System Owner (Director, FOSP)	Field Operations & Engineering Leadership	Managers	Employees	Asset Management System Resources
Asset Management System Development and Continuous Improvement	A	C	I	I	R
Rollout Asset Management System Processes, Tools and Techniques	A	R	R	I	R
Apply Asset Management System Processes, Tools and Techniques	I	A	R	R	C

A: Accountable	**The Buck Stops Here** – The individual or group who is ultimately answerable, includes yes/no and power of veto. Only one "A" can be assigned to each task.
R: Responsible	**The Doer** – The individual(s) or groups who actually complete the task. The degree of responsibility is defined by the accountable person. "Rs" can be shared.
C: Consulted	**In The Loop** – The individual(s) or groups to be consulted prior to a final decision or action being taken. Requires two way communication.
I: Informed	**Keep In The Picture** – The individual(s) or groups who need to be informed after a decision is made.
Asset Management Steering Committee	Jim Baggs, Dan King, Garnet Scaman.
Field Operations & Engineering Leadership	Field Operations & Engineering: Vice-President and Directors.
Managers	All Field Operations & Engineering line managers.
Employees	All Field Operations & Engineering full-time, part-time, and contract employees.
Asset Management System Resources	Ian MacKay (Project Manager, Asset Management Strategy), Dean Mah (Asset Reliability), other resources assigned to develop, improve and rollout the Asset Management System.

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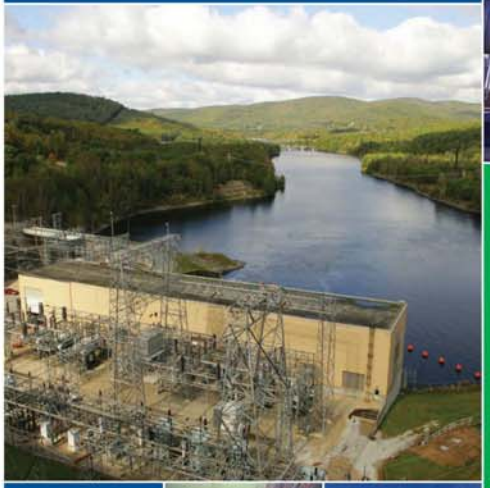
Asset Management System – September 2006

Field Operations and Engineering's

Asset Management System



We are highly successful in planning, constructing and operating energy assets across North America. Our Asset Management System (AMS) will be functional, integrated, and a key component of the company's operational excellence strategy. The AMS will enable Field Operations and Engineering to maximize our contribution to the value of our assets and position us for continued growth and success.

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Introduction

TransCanada has a network of more than 41,000 kilometres of wholly-owned pipeline, owns or has interests in approximately 6,700 megawatts of power generation in Canada and the United States. Over the past five years, the company has invested more than $8.5 billion in expansion, acquisition, construction, and improvement of our core business, including natural gas and oil transmission, power and hydroelectric generation, wind energy, natural gas storage, and LNG. The company will continue to grow in these areas.

Asset Management is about people delivering the optimal outcome through shared understanding, cross-functional collaboration and teamwork, and problem-solving. Improving processes, tools and techniques for management of our assets will enable us to maximize long-term value and create further value from existing, new and future assets.

This document describes the Field Operations and Engineering Asset Management System, its key elements, and the responsibilities our leaders and staff have for ensuring the successful implementation of the Asset Management System in their business areas.

Field Operations and Engineering Asset Management System

The Asset Management System (AMS) is a plan, do, check, and act cycle and includes measures of portfolio performance. Based on risk and inherent value of specific assets, the AMS consists of processes, techniques and tools that provide an integrated and scalable approach in decision-making and enabling assets to meet performance requirements. It targets TransCanada's objectives associated with the cost, availability, efficiency, quality, regulatory, safety and environmental expectations of our energy assets.

Purpose of the Asset Management System

The Asset Management System will:

- align all operating groups to ensure business objectives and specific performance targets for assets are understood,
- ensure performance targets drive the decisions on investing operating, maintenance and capital resources,
- drive broad and ongoing continuous improvement which builds on past successes,
- establish the organizational capability to effectively implement the Asset Management System,
- establish the capability to successfully add (or divest) assets to TransCanada's portfolio while minimizing start-up issues impacting technical or commercial performance,
- align related management systems, processes, policies and procedures that will support achieving the objectives above.

Hierarchical Asset Management System Framework

Continuous Improvement Cycle

The Asset Management System consists of 11 elements. They are:

1. Strategy
2. Organization
3. Risk Assessment and Acceptability
4. Compliance Requirements
5. Asset Management Plans
6. Information Management and Systems
7. Awareness and Competencies
8. Operations Control
9. Performance Measurement
10. Asset Business Review and Improvement
11. Management System Review and Improvement

Manage our assets by ensuring the 11 elements support the "Continuous Improvement Cycle" which links processes and individual work/activities together

Strategy (Elements 1 & 2):

Organizational alignment is obtained through agreed goals and objectives, shared understanding, and leadership commitment. Enabling tools include:

- TransCanada and FO&E strategy and objectives
- Asset Management System (AMS) governance structure
- Responsible, Accountable, Consulted, Informed (RACI) chart
- Asset Management Strategy framework document

Asset Management Information, Risk Assessment and Planning (Elements 3, 4, 5 & 6):

Integrated and decisive planning is important to ensure that the right job is performed on the right assets, at the right time, with the right resources. Enabling tools include:

- Risk assessment tools (PRIME, Plant Risk Tool, Investment Valuation)
- Asset Management Plan template
- Equipment Management Plans
- TransCanada Operating Procedures (TOPs) Management System
- Avantis

Operation (Elements 7 & 8):

All identified operating, maintenance, and project work or other actions are effectively planned and scheduled and performed successfully by competent employees. Enabling tools include:

- Employee Development Management System
- Project Management Office (PMO) standards
- Work Management process
- Pipe and Plant Integrity Management processes
- Avantis
- Incident and Issue Tracking (IIT)
- TransCanada Operating Procedures (TOPs)

Business Review (Elements 9 & 10):

Various proficient tools and techniques, such as FO&E operations and performance reports and scorecards, internal and external benchmarking studies and trend analyses are needed to identify opportunities and improvement of the performance of assets and the organization as well as better utilization of resources while achieving optimal results.

Management Review (Element 11):

A consistent, critical and concise review of the asset management system which considers all aspects of its performance with the goal of ensuring organization objectives are met.

Pipeline Integrity

TransCanada's integrity management system enables us to operate and maintain the pipeline system in a safe and reliable manner.

TransCanada PipeLines Limited uses an industry-leading integrity management program to ensure pipeline integrity and the safety of employees and people who live near the pipeline system. This program uses advanced inspection and mitigation technologies applied within a comprehensive risk-based methodology. Risk assessment is used to identify potential integrity threats for initiation of inspection/mitigation activities. Results from the inspections for known or suspected integrity threats are then fed back into an information database to plan future programs.

- Risk measures are quantitative and allow for direct comparison of safety risk levels to acceptable industry risk tolerances and compliance with corporate risk tolerances. Quantitative risk measures enable TransCanada to develop maintenance programs which optimize pipeline integrity expenditures as program costs can be directly compared to risk reduction achieved (value ratio). Qualitative risk measures only give relative risk rankings of pipeline segments making it difficult to know exactly where to draw the line between not enough and too much effort.
- Risk models are developed from analysis of historical pipeline performance, and in-house and collaborative research & development projects. Models are calibrated to reflect the historical performance of TransCanada's 38,000 kilometre pipeline system, leveraging nearly 1,000,000 km-yrs of pipeline experience.
- TransCanada's integrity management system enables us to operate and maintain the pipeline system in a safe and reliable manner.
- TransCanada's overall failure frequency has steadily declined since the mid-1980s.

Our Pipeline Integrity Edge

Application of TransCanada's integrity management process has considerably reduced integrity related maintenance costs with no compromise to overall pipeline safety or system reliability. For example, integrity related non-capacity capital expenditures have decreased 60 per cent in 2002 relative to pre-risk-based program development forecasts. Corresponding expense expenditures have decreased 25 per cent.

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MAJOR PIPELINE INDUSTRY PROJECTS MANAGED SINCE 1990

TransCanada's integrity management process has considerably reduced integrity related maintenance costs with no compromise to overall pipeline safety or system reliability.

Exclusive to TransCanada

Risk Assessment Tool

TransCanada's risk assessment tool, PRIME, calculates risk on a metre by metre basis over the entire pipeline system. Risk measures are quantitative. This allows us to comply with corporate risk constraints on public safety and determine risk benefits and residual risk exposure.

One and Multi-Run In-Line Inspection Corrosion Growth Modeling

TransCanada has led the development of sophisticated one- and multi-run in-line inspection corrosion growth modeling. Application of this modeling capability has resulted in $14 million savings over five years due to optimization of corrosion inspection programs.

Integration of corrosion information from cathodic protection and in-line inspection programs and consistent application of risk-based decision making maximizes the benefits of TransCanada's cathodic protection remediation programs.

Geotechnical Hazard Risk Models

We have successfully implemented results from several geotechnical research and development projects in developing predictive models for slope instability and river scour hazards. Application of these models within the risk-based philosophy has resulted in more than $7 million savings in 2002 with projected annual savings of more than $1 million per year to TransCanada's geotechnical programs.

In-Line Inspection Tool Development

TransCanada is involved in the development of new in-line inspection technologies for the detection and characterization of Stress Corrosion Cracking (SCC). These new inspection technologies will enable application of defect management techniques for mitigation of SCC hazard on certain pipelines replacing more costly hydrostatic testing programs.

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00449 PI January 7, 2004

Integrated Systems Ensure Operational Compliance

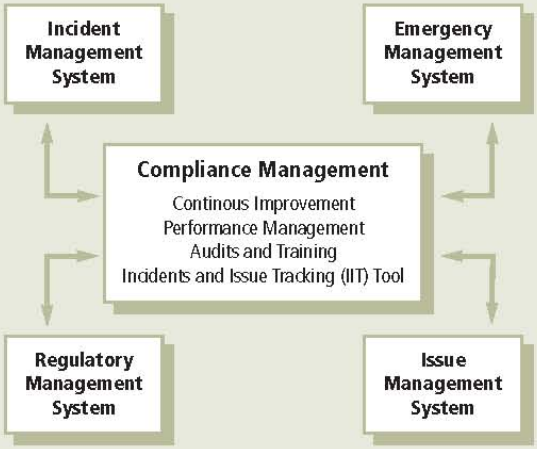
Our compliance management systems are proactive, integrated, and a key component of our operational excellence strategy.

TransCanada PipeLines Limited has established a unique set of management systems to ensure that design, construction, operation and maintenance activities are conducted in accordance with applicable standards, codes and legislative requirements.

Systematic Control of all Operational Incidents

Our compliance management system provides a range of tools and processes for responding to and managing all operational incidents, whether regional or corporate in scope. The aim of the system is to protect health, safety and environment, preserve system integrity and satisfy all stakeholder requirements for information, including regulatory filing needs.

Illustrated at right are the four cornerstones of TransCanada 's approach to compliance management: Incident Management System, Emergency Management System, Issue Management System and the Regulatory Management System.



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INTEGRATED SYSTEMS ENSURE OPERATIONAL COMPLIANCE

Our Incident & Issue Tracking (IIT) tool won a 'Best in Class' Award from the Canadian Energy Pipeline Association (CEPA) in 2001.

Each Component Shares Common Elements and Characteristics

Although each component management system fulfills a distinct role and purpose in managing compliance, they all share a set of common characteristics:

- They use a management system model that emphasizes the development of clear system documentation, the provision of centralized technical support and training, regular performance measurement and compliance audits, and a focus on operational excellence and continuous improvement. This approach is fully compatible with the principles of ISO management systems.
- They are scalable, meaning that they can be integrated easily into new business ventures and environments, within or outside the energy industry.
- They incorporate crosschecks to ensure that system outcomes are legally consistent and appropriate with the regulatory requirements of specific or multiple jurisdictions.
- The systems all make extensive use of TransCanada's proprietary Incident & Issue Tracking (IIT) tool. This user-friendly, relational database captures and stores incident information, and generates email-based, time-sequence staff reminders for issue action and resolution.

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Real-Time Systems

TransCanada uses leading-edge software to operate our SCADA system. A top tier SCADA vendor supplies our software. This allows us to focus on our core skills of applying the technology – not developing proprietary, expensive in-house solutions.

TransCanada PipeLines Limited maintains around-the-clock, real-time applications for monitoring and remote control of our pipeline system. Our systems help us deliver low-cost reliability using proven technology.

SCADA Host Systems

- TransCanada uses leading-edge software to operate our SCADA system. A top tier SCADA vendor supplies our software. This allows us to focus on our core skills of applying the technology – not developing proprietary, expensive in-house solutions.
- There is no restriction to the type of end devices we poll. A large number of devices are already supported (including GE, Allen Bradley, Bristol, Barton and Daniel) and we have access to a variety of other protocols that could be easily integrated into our systems. This allows us to quickly integrate pipe that may come with new or different end devices.
- We use a variety of telecom options to communicate to our remote sites (satellite, data radio, frame relay, dial-up lines, leased lines, etc.). This allows TransCanada to choose the right telecom solution based on site requirements and cost, not based on a cast-in-stone standard.
- Our systems are highly available (99.9 per cent), fully redundant with a remote hot standby contingency site.
- Scalability is a strength of our systems. Our Mainline system, installed in late 2000, contains 250,000 data points, which is only half its actual capacity. This gives us the ability to double the amount of units/stations supported by the system without upgrading software or hardware.

Advisory System

The Advisory System we use provides early notification to gas control of operational anomalies. We have captured gas controller knowledge into an expert system and fully integrated this in real-time with the host SCADA system.

To date, TransCanada has transferred the knowledge of our controllers and key operations employees into the Advisory System to produce the following modules:

- Within minutes of a rupture our rapid linebreak detection monitors and assesses the general geographical location and pipeline segment of the linebreak.

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REAL-TIME SYSTEMS

TransCanada continuously improves our SCADA systems to reduce costs and improve efficiency. By applying new technology, we have gone from 14 control centres with a supervisory gas control centre down to a single gas control centre. We have the real-time tools to deliver – high accuracy, low risk, and low cost solutions.

- Mainline Valve Closure quickly detects the closure of a mainline valve within a general location and loop, whether operator-initiated or not.
- Transient Analysis identifies and compactly displays station flow and pressure transients with drill-down on the trends.
- Station Anomalies and Bottleneck Detection identify simple anomalies at stations and indications of where throughput bottlenecks exist.
- Hydraulic Loop Detection indicates segments where there may be small or large recycle loops happening between multiple flowing lines.

The TransCanada Edge

We have leading-edge capabilities in SCADA and Expert System technology application.

TransCanada continuously improves our SCADA systems to reduce costs and improve efficiency. By applying new technology, we have gone from 14 control centres with a supervisory gas control center down to a single gas control centre. We have reduced the number of controllers we need from 70 to 18 on the Mainline. We have also applied new telecommunications technology to help eliminate the majority of required site visits.

We have a proven track record of integrating separate pipelines into our system. Adding a new pipeline, such as the ANG system, to our gas control was done quickly and without interruption to our existing operations.

We have the real-time tools to deliver – high accuracy, low risk, and low cost solutions.

Real-Time Tools at TransCanada

Remote Viewer – Gas Control Host Systems (WEBXOS)

WEBXOS provides a 'read only' view into our host systems. Part of the vendor supplied OASyS suite of tools, WEBXOS enables pipeline operations personnel to remotely see the same view as the gas controller. This tool is used both on the desktop at work and remotely from home, enabling operations staff a view of the system, without having to go to gas control.

Remote Viewer – Local Site HMI Systems (WebClient)

Webclient provides a flexible (full control, partial control or no control) view into our site HMI systems across the pipeline.

Remote Viewer – Advisory System

We maintain a reliable system by using the Advisory web-based viewer so our employees get early notification of operational anomalies on the system.

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