Risk Assessment and Mitigation
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2.7 RISK ASSESSMENT AND MITIGATION

1) TransCanada's Process

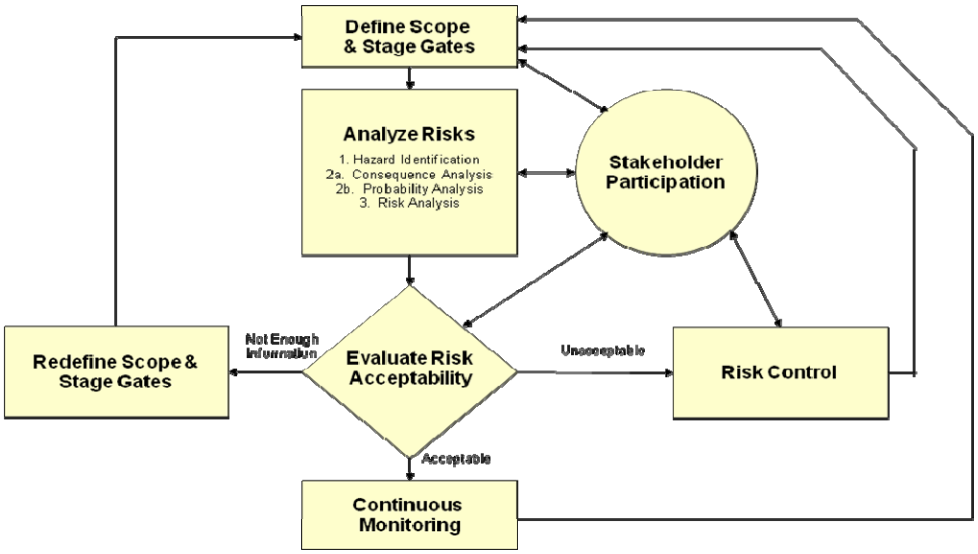
a) Formal Procedures

TransCanada utilizes a quantitative risk management process in all phases of the development, construction, and operation of its pipeline system. Formal risk management procedures are in place for the following areas:

- **Safety Management:** To assess and mitigate the potential for harm to individuals, both public and employees, arising as a result of construction or operational activities.
- **Integrity Management:** To assess and mitigate the potential for pipeline or facility failure due to time-dependent hazards, such as corrosion, wear and tear, and third party interference to pipeline and plant facilities.
- **Cost Management**: To analyze and optimize costs associated with the construction and operation of pipeline and plant facilities.
- **Reliability and Performance Management**: To assess the inherent reliability of a facility's design and operating strategy, and identify cost-effective solutions to improve performance within acceptable design and safety parameters.
- **Project Management**: To identify and manage risks and uncertainties associated with developing and implementing capital infrastructure projects.

b) Conceptual Framework

TransCanada's philosophy is that the risk management process begins at the inception of a project and lasts until the end of the life-cycle of the facilities. All risk management processes are structured around a conceptual framework as illustrated and described below.



- **Define Scope and Stage Gates**: Define the scope of the activity or project and identify critical decision points (known as Stage Gates) in its timeline.
- **Analyze Risks**: Risks are events that have a probability of occurrence and result in an undesirable outcome or consequence. Due to TransCanada's 50+ years of experience constructing and operating a gas pipeline system that now totals more than 36,500 miles in length, the company possesses a large amount of data on both pipeline construction and pipeline operations. This data is used in identifying and quantifying risk.

  Risk analysis includes:

  - **Hazard Identification**: Identify the event or hazard that may impact the project or operational activity.
  - **Consequence Analysis**: Identify the consequence arising from the hazard's occurrence. TransCanada takes a comprehensive view of consequence analysis, assessing safety, cost, reliability, environmental, and social consequences.
  - **Probability Analysis**: Quantitatively determine the probability of the hazard's occurrence. TransCanada is uniquely positioned to develop an unbiased and fact-based assessment of probability through its fifty years of experience of constructing and operating pipelines.
  - **Risk Analysis**: Risk analysis refers to the mathematical integration of probability and consequence for all hazards affecting the facility. These quantitative measures are then used to objectively assess the magnitude of the risk.
- **Evaluate Risk Acceptability**: TransCanada utilizes quantitative risk acceptance standards in the areas of safety, environmental and social risks. Within the bounds of these fixed acceptability thresholds, rigorous cost-benefit analyses are conducted to identify and evaluate the most appropriate action to take to address the hazard.
  - **Acceptable → Continuous Monitoring**: Risks that meet TransCanada's risk acceptance criteria are monitored regularly to ensure that the risk does not increase to unacceptable levels during the course of the project or operations.
  - **Unacceptable → Risk Control**: Risks that exceed TransCanada's risk acceptance criteria are identified for risk control measures to either reduce the risk's probability or limit its consequence. Risk control measures are identified and managed as projects, in the form of preventative maintenance activities, or incorporated into projects as planned actionable activities or processes, as in the case of TransCanada's project cost control processes.
  - **Not Enough Information → Redefine Scope & Stage Gates**: When an area of concern is too broad or vague to be quantifiable, TransCanada will break the area down into smaller components until a level is reached where the scope is small enough to be more easily comprehended and analyzed. In the area of defining and managing a project, TransCanada's Work Breakdown Structure is the framework through which this is achieved. In circumstances where a risk is new or unique and cannot be quantified or assessed effectively,

the response is to redefine the Stage Gates used to govern the activity in which the risk is contained. Stage Gates are set up prior to major milestones and are subject to management review prior to the activity or project proceeding through the 'Stage Gate' to the next phase of the activity. Through the proper use of Stage Gates, activities can be monitored closely and frequently enough to ensure that emerging risks are understood as they occur and timely action can be taken to mitigate the consequences.

c) Life Cycle Approach

The risk management process is an ongoing cycle that takes place through every stage of a facility's lifecycle from early development, through construction, operations, and ultimately to abandonment and reclamation. Some of the areas where TransCanada's life-cycle approach to risk management have the most significant impact are:

- **Community Relations**: Effective communication with communities and stakeholders is critical to the success of a project and must take place proactively, well before land acquisition and construction. Proactive dialog with communities opens the channels of communication and helps build the relationships that are necessary to successfully develop a pipeline project. TransCanada has been working with, and developing relationships with the communities along the Alaska Highway route for several decades and is well positioned to build even stronger relationships in the development of the APP.
- **Cost Estimating**: TransCanada recognizes that the cost estimating process is critical to setting up a project for success. TransCanada's disciplined and structured approach to project development ensures that every element of the project that can affect cost is scrutinized at the appropriate stage of development.
- **Capital Cost Control**: Project estimates are structured and developed to facilitate cost control systems, and provide a basis for productivity management and accurate project forecasting. Project risk assessments are routinely used to identify cost risks to a project and ensure that mitigation plans are identified and implemented.
- **Supply Chain Management**: TransCanada has, over many years, developed strong relationships with many of the material suppliers and construction contractors that will be needed to build the Alaska Pipeline Project. While TransCanada is committed to working with the best contractors and vendors, and has structured its vendor management programs on this principle, TransCanada also invests considerable efforts to qualify new suppliers and will work with them to help them meet TransCanada's quality requirements. TransCanada also invests time in maintaining relationships with suppliers of materials and services, and maintains market intelligence on the industry as a whole in order to understand market trends affecting the availability and cost of pipeline materials and equipment. TransCanada's philosophy is to reduce supply chain risk by developing its relationships with contractors and suppliers and working pro-actively with them early in a project in order to ensure that materials, equipment and construction resources will be available when required at competitive prices.

- **Pipeline Safety**: TransCanada is an industry leader in the development and use of pipe materials; construction practices and procedures; pipeline coating systems; in-line inspection technologies; third party damage prevention programs; corrosion growth models; and hazard assessment models.
- **Integrity Management**: TransCanada has utilized a quantitative risk-based approach to pipeline integrity management for over a decade, resulting in industry top-quartile results in pipeline safety and reliability.
- **Technology Management**: Many companies are involved in research into new pipeline technologies that are applicable to the Alaska Pipeline Project. TransCanada however, believes in moving such innovations out of the laboratory and incorporating them into everyday construction practice. TransCanada's strategy is to progressively introduce new technology, beginning with limited implementation on smaller projects under carefully controlled conditions. Based on the learnings from these limited applications, the technology is then applied on a gradually increasing scale. TransCanada believes that this staged approach is an effective way to manage the risks that are inherent in the implementation of new technology.

  Examples of technologies that TransCanada has implemented in this way include high strength steels, mechanized welding, Alternative Integrity Verification, Strain Based Design and Reliability Based Design. For more detail on technology implementation, refer to Section 2.9.5 (2) Technology.

In summary, Risk Management is at the center of all of TransCanada's operational and project management activities. Through the framework outlined above, TransCanada is able to identify risks using an objective and fact-based approach, and develop risk management solutions that draw on its many years of experience, operating one of the largest and most technically sophisticated pipeline systems in north America.

2) Project Specific Risk

See Project Key Risk Assessment and Mitigation chart below:

ALASKA PIPELINE PROJECT PROJECT KEY RISK ASSESSMENT AND MITIGATION			
ITEM #	RISK DESCRIPTION/ DRIVER	IMPACT	MITIGATION PLANS
1.0	**Key Risk Factor - Failed Open Season**		**See Section 2.2.3**
1.1	Shippers do not commit any volumes during the initial binding Open Season	Additional Open Seasons required - cost increases, high degree of schedule uncertainty, design basis uncertainty	• Provide sound commercial plan • Provide sound economic viability analysis • Work with the State to develop and implement strategies to overcome financing obstacles • Continue to work with potential Shippers and solicit commitments
1.2	Shippers do not commit sufficient volumes for the continental pipeline	Marginal economic case for continental pipeline	• Prepare options for alternative solutions e.g., pipeline for an LNG facility
2.0	**Key Risk Factor - Regulatory Risk**		**See Section 2.2.4**
2.1	FERC cannot process application in stated timeframes	Delay in Project - cost and schedule impacts	• Provide sound commercial plan • Early clarification of regulatory requirements and expectations • Manage commitments and issues effectively • Utilize bench strength in managing regulatory issues • Use best practices and lessons learned from other projects
2.2	Canadian regulatory uncertainty	Schedule and cost impacts	• Utilize NPA and ensure Northern Pipeline Agency is prepared for its responsibilities • Leverage experiences from Foothills Pre-build and original establishment of the Northern Pipeline Agency
2.3	Complexity of environmental issues	Schedule, cost and reputation impacts	• Thorough issue scoping • Include local experts on design team • Utilize TransCanada's issue tracking process

ALASKA PIPELINE PROJECT PROJECT KEY RISK ASSESSMENT AND MITIGATION			
ITEM #	RISK DESCRIPTION/ DRIVER	IMPACT	MITIGATION PLANS
3.0	**Key Risk Factor - Construction Cost Issues**		**See Sections 2.2 and 2.3**
3.1	'Heated market' for construction labor and equipment	Cost and schedule impacts	• Provide sound Development and Execution Phase plans • Utilize TransCanada's procurement and resourcing strategies and market intelligence • Develop strategies that consider early commitment to suppliers of critical resources • Utilize strategies that consider locking-in prices of major cost drivers (purchase of pipe and major equipment, setting up construction cost framework) prior to committing to Execution Phase
3.2	Cost increases and schedule delays resulting from unforeseen issues	Cost and schedule impacts	• Utilize TransCanada Project Management Office processes for Project governance and risk management • Disciplined use of TransCanada's project stage gate process to manage expenditures
4.0	**Key Risk Factor - Community**		**See Section 2.2**
4.1	First Nations issues regarding Consultation in Canada	Potential schedule delays, lack of clarity for solutions	• Provide sound Development Phase plans • Implement effective Project communication strategies • Encourage and facilitate appropriate Crown Consultation

ALASKA PIPELINE PROJECT PROJECT KEY RISK ASSESSMENT AND MITIGATION			
ITEM #	RISK DESCRIPTION/ DRIVER	IMPACT	MITIGATION PLANS
4.2	ROW access in Canada	Schedule and cost impacts	• Utilize easement in Yukon and perfect rights in BC and Alberta through existing business processes • Utilize TransCanada's Participation Agreement template for effective First Nation dialogue and agreement finalization
5.0	**Key Risk Factor - Technical**		**See Sections 2.2, 2.3 and 2.4**
5.1	Permafrost issues - slope stability, trenching	Schedule impacts	• Provide sound Development Phase, Execution Phase, Operations Phase and supporting plans • Leverage existing external and internal studies and research, including studies by industry research organizations • Collaborate with other sponsors of research within the pipeline industry and other related industries • Engage local experts in design and planning processes
5.2	Pipe and material availability	Schedule and cost impacts	• Continue to develop and maintain relationships with key suppliers and leverage TransCanada's market intelligence and buying power • Leverage TransCanada's supply chain strength to the development of a Project procurement strategy
5.3	River crossing challenges	Schedule and cost impacts, environmental issues	• Undertake pre-planning work and assess industry capability • Focus on technology solutions and lessons learned from previous projects • Include contingency planning where appropriate in river crossing design

ALASKA PIPELINE PROJECT PROJECT KEY RISK ASSESSMENT AND MITIGATION			
ITEM #	RISK DESCRIPTION/ DRIVER	IMPACT	MITIGATION PLANS
5.4	Tight labor market	Schedule and cost impacts	• Continue to develop high-productivity welding processes and other technologies that reduce labor requirements • Engage unions, governments and major contractors in preparing labor force • Include premiums for construction workers and look into other ways to attract workforce