5.1.1 PURPOSE

Navigant Consulting, Inc. (NCI) and Energy and Environmental Analysis, Inc. (EEA) were retained to evaluate the long-term market demand for natural gas from the Mackenzie Delta region. The NCI study assessed the ability of the marketplace to absorb gas produced in the Mackenzie Delta and Mackenzie Valley regions using the EEA market simulation model. This assessment included both a regional market analysis and an evaluation of gas supply and deliverability for North America as a whole. The adequacy of the existing intra-Alberta and export gas pipeline infrastructure was also reviewed.

This section summarizes the results of the NCI study. A copy of the complete report, *Mackenzie Valley Pipeline Market Demand/Supply and Infrastructure Analysis,* April 13, 2004, is also being filed with this regulatory submission.

5.1.2 SCOPE OF STUDY

The NCI study is an in-depth analysis of North American gas demand focusing on the regions that are connected via gas pipelines to the Western Canada Sedimentary Basin. The regions reviewed included:

- Alberta
- British Columbia
- Central Canada
- the US Pacific Northwest
- California
- the US Midwest
- the US Northeast

The analysis considered a base case and three sensitivity cases:

- Base Case – identified the impact of the Mackenzie Delta region delivering 34 Mm^3/d (1.2 Bcf/d) of gas to the marketplace by the end of 2009

- Sensitivity Case 1, Mackenzie Expansion Case – identified the impact of Mackenzie Delta production expanding to 42.5 Mm^3/d (1.5 Bcf/d) in 2015 and to 51 Mm^3/d (1.8 Bcf/d) in 2020

- Sensitivity Case 2, North American Economic Slowdown Case – identified the impact on gas markets from a North American economic slowdown, i.e.,

5.1.2 SCOPE OF STUDY (cont'd)

a 0.5% per year slower economic growth than assumed in the base case, in both Canada and the US

- Sensitivity Case 3, Alaskan Pipeline Development Case – identified the impacts of Alaska gas coming on stream at 70.8 Mm^3/d (2.5 Bcf/d) in 2013 and ramping up to 113.3 Mm^3/d (4 Bcf/d) in 2014

Only Sensitivity Case 3 included Alaska gas.

5.1.3 STUDY METHOD

The study used EEA's Hydrocarbon Supply Model (HSM) to forecast the long-term supply trends and gas production. The resulting supply and demand forecasts were input into EEA's Gas Market and Data Forecasting System (GMDFS). The forecast period extended to 2030, the first 21 years of Mackenzie Valley pipeline operation.

5.1.4 RESULTS OF MARKET STUDY

The base case analysis concluded that market conditions warrant the need for the proposed 34 Mm^3/d (1.2 Bcf/d) of gas to be transported by the Mackenzie Valley pipeline. During the first 20 years of the pipeline's operations, the forecast is for strong growth in gas demand in Canada and the US for:

- electrical power generation
- residential and commercial consumption
- use in industrial and resource development in Alberta

The growth in gas demand is expected to exceed conventional production, thereby requiring additional sources of supply, including frontier gas and liquefied natural gas (LNG). The volumes from the Mackenzie Valley pipeline will help fill the growing supply deficit.

5.2.1 NORTH AMERICAN GAS DEMAND FORECAST

The NCI study projects that, from 2002 to the first full year of gas pipeline operations in 2010, total gas demand in Canada and the US is projected to grow by 16%. The result is an incremental 313.4 Mm^3/d (11.1 Bcf/d) of gas demand. From 2010 through 2030, gas demand in both countries is projected to expand by an additional 25% (556.3 Mm^3/d or 19.6 Bcf/d). The projected growth in gas demand will enhance the ability of the marketplace to absorb the incremental supplies of gas delivered by the Mackenzie Valley pipeline during the first 21 years of its operation. Even in the case of lower demand growth, there is high confidence in the need for a pipeline to deliver northern frontier gas to Canadian and US gas markets because of the expected decline in conventional gas supplies.

5.2.2 US GAS DEMAND FORECAST

The NCI study indicated that, by 2006, the US is projected to add 236,000 MW of gas-fired combined cycle and combustion turbine capacity. This will more than double gas use for electrical power generation to an expected rate of about 680 Mm^3/d (24 Bcf/d) by 2015. The total gas demand will continue to grow significantly through the forecast period for the US regional markets that are connected to Canada's natural gas export pipeline infrastructure.

5.2.3 CANADIAN GAS DEMAND FORECAST

In Alberta, the two major growth markets will be:

- extracting and processing bitumen from Alberta oil sands
- generating electrical power

From 2003 through 2030, gas consumption by the Alberta oil sands bitumen production industry, excluding cogeneration requirements, is projected to quadruple from 14.5 to 55 Mm^3/d (0.5 to 1.9 Bcf/d). From 2003 to 2030, power generation requirements in Alberta, including the cogeneration requirements of oil sands developers, are projected to grow from 11.5 Mm^3/d (0.4 Bcf/d) to nearly 31 Mm^3/d (1.1 Bcf/d).

Increases in Canadian gas demand are also projected in:

5.2.3 CANADIAN GAS DEMAND FORECAST (cont'd)

- British Columbia
- Ontario
- Quebec

These increases will primarily be driven by electrical power generation, which is expected to increase the aggregate gas demand for the three provinces by 79.3 Mm^3/d (2.8 Bcf/d).

5.2.4 NORTH AMERICAN GAS SUPPLY AND DELIVERABILITY

The NCI study indicates only modest growth in gas production in Canada and the US. The primary factor is the long-term decline in the gas production capacity of the mature producing regions, including:

- the Western Canada Sedimentary Basin
- the US Gulf Coast
- the US Midwest
- the San Juan Basin
- the Permian Basin

The exception is the Rocky Mountains and the deep US Gulf, where significant growth is expected.

The declines in production from existing supply sources mainly result from the:

- decreased availability and calibre of remaining producible gas resources
- increase in expected well decline rates
- lower initial production from newly connected wells

The result is a significant decline of gas deliverability in most regions. Therefore, a larger part of future gas supplies will have to come from non-conventional sources of supply, including gas from:

- the northern frontier
- deep-water Gulf of Mexico
- the Rocky Mountains
- offshore Eastern Canada
- LNG imports

The NCI study suggests that a significant shift to currently untapped resources will need to take place over the next 20 years to meet the growing gas demand.

By 2030, supply from the new production sources will account for roughly 34% of North America's gas supply compared to 15% in 2002. In contrast, supplies from conventional sources are expected to stay flat or increase marginally. Substantial growth of North American gas supply over the forecast period will

need to come from developing currently untapped supply sources in areas that are more remote from the primary consuming regions of Canada and the US.

5.2.5 MARKET SENSITIVITY CASES

5.2.5.1 Mackenzie Expansion Case – Sensitivity Case 1

The Mackenzie Valley Pipeline Expansion Case, Sensitivity Case 1, assumes that compression is added to boost the capacity of the pipeline to 42.5 Mm^3/d (1.5 Bcf/d) in November 2015 and to 51 Mm^3/d (1.8 Bcf/d) in November 2020. All other assumptions remain the same as in the base case. The capacity expansions increase the total Canadian gas supply marginally by 1.4% in 2016 and by 2.9% in 2021. In the same time period, the total supply in Canada increases by 0.4%, and in the continental US by 0.8%. The NCI study concluded that volumes brought to market as a result of the expansion of the Mackenzie Valley pipeline can easily be absorbed by the North American market.

5.2.5.2 North American Economic Slowdown Case – Sensitivity Case 2

To examine the impacts of the Mackenzie Valley pipeline in an environment of low economic growth, a low-gas-demand sensitivity case was run. This case assumed that the Canadian and US economies would grow 0.5% slower than in the base case, i.e., economic growth of 2.1% in Canada and 2.3% in the US. The decrease in economic performance builds over the forecast period. Total gas demand in Canada and the US is projected to be 10% lower than in the base case because of slower economic growth. Most of the reduction takes place in the electrical power generation sector as a result of the slower growth in electricity consumption, followed by a reduction in consumption in the industrial sector. As a result of the lower demand growth, the overall volume of LNG imports declines, because the gas markets cannot support all the forecasted growth in LNG imports. The result is that the new LNG projects predicted to be online after 2007 are scaled back. Thus, LNG import volumes decline. By 2030, LNG imports to the continental US are projected to be 30% less than in the base case. Gas production is also expected to be between 8.5 and 11.3 Mm^3/d (0.3 and 0.4 Bcf/d) lower than in the base case in Canada, and between 14.2 and 42.5 Mm^3/d (0.5 to 1.5 Bcf/d) lower in the US. The combination of reduced LNG imports and lower gas production brings gas supply into balance with gas demand in the low demand case.

The NCI study concluded that, in the low-demand case, the Mackenzie Valley pipeline is an important source of incremental gas supplies to Canadian and US markets, even if natural gas demand grows substantially less than forecasted in the base case. Even with an economic slowdown, gas production still grows at a slower pace than gas demand, resulting in the continued need for supplies from untapped sources to balance the North American demand and supply.

5.2.5.3 Alaskan Pipeline Development Case – Sensitivity Case 3

The Alaska sensitivity case assumes that an Alaska pipeline is constructed to deliver 70.8 Mm^3/d (2.5 Bcf/d) of sales gas from the North Slope of Alaska to

5.2.5.3 Alaskan Pipeline Development Case – Sensitivity Case 3 (cont'd)

Alberta and downstream markets in January 2013. In 2014, the capacity of the Alaska pipeline is assumed to be expanded to 113.3 Mm^3/d (4 Bcf/d) by adding compression. The pipeline is assumed to follow the southern or Alaska Highway route to a terminus near Boundary Lake, Alberta, where the gas would be delivered into the pipeline systems of Alliance, Duke Energy's BC system, TransCanada, and other pipeline operators. No facilities downstream of Boundary Lake are assumed to be built by the Alaska Pipeline proponents. About 85 Mm^3/d (3 Bcf/d) of takeaway pipeline expansion capacity within and exiting Alberta is assumed to be constructed by third-party pipeline companies.

Even with the addition of the Alaska and Mackenzie Valley pipeline volumes, the North American gas production profile still falls short compared with the growth in gas demand over the forecast period.

5.3.1 INTRA-ALBERTA AND EXPORT PIPELINE SYSTEMS

Although downstream transportation arrangements are the responsibility of individual shippers, the NCI study also assessed the capability of the intra-Alberta pipeline system and the main export pipelines from the Western Canada Sedimentary Basin to deliver Mackenzie Delta gas to markets in:

- Central Canada
- the US Pacific Northwest
- California
- the US Midwest
- the US Northeast

These markets are currently served by five export corridors from the Western Canada Sedimentary Basin. These are:

- Duke Energy's British Columbia Gas Transmission and Williams Energy's Northwest Pipeline
- TransCanada's British Columbia System and Gas Transmission Northwest Corporation (GTN)
- Alliance Pipeline
- Foothills Pipe Lines Ltd. and Northern Border Pipeline
- TransCanada's mainline system

The study concluded that because gas demand in Western Canada is likely to increase and conventional gas production in the Western Canada Sedimentary Basin is expected to decrease, no pipeline constraints on gas exports from the Western Canada Sedimentary Basin will exist. No export pipeline facility expansions are required to accommodate increased exports arising from the delivery into Alberta of 34 Mm^3/d (1.2 Bcf/d).

As for intra-Alberta infrastructure, the Mackenzie Valley pipeline volumes can be accommodated in the NGTL system with a modest NGTL expansion in the northwest part of the system.

5.3.1 INTRA-ALBERTA AND EXPORT PIPELINE SYSTEMS (cont'd)

The NCI study concluded that the existing takeaway infrastructure will be able to accommodate the incremental gas volumes from the Mackenzie Delta in all cases, except the Alaska pipeline sensitivity case.