**UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION**

**Northern Border Pipeline Company §  Docket No. RP06-___-000**

# PREPARED DIRECT TESTIMONY OF EDWARD H. FEINSTEIN

Q. Please state your name and business address.

A. My name is Edward H. Feinstein and my business address is 1155 15th Street, N.W., Suite 400, Washington, D.C. 20005.

Q. Please state your occupation.

A. I am a consulting petroleum engineer with the firm of Brown, Williams, Moorhead & Quinn, Inc.

Q. What are the services offered by your firm?

A. The firm offers technical and policy assistance to the various segments of the natural gas, oil and electric industries on business and regulatory matters.

Q. Please briefly describe your education, background and training.

A. I received my Bachelor of Petroleum Engineering degree at the University of Tulsa in May 1963. From July 1963 to February 1998, I worked at the Federal Energy Regulatory Commission ("FERC" or "Commission") and its predecessor, the Federal Power Commission ("FPC"). From the time of my employment at the FPC until approximately 1970, I was engaged in work involving economic feasibility studies in certificate proceedings under the Natural Gas Act ("NGA"). This work was concerned primarily with market, engineering, and financial analyses for the purpose of determining the economic feasibility of pipeline projects proposed in certificate applications. From 1970 to the present, my efforts have been concentrated on determining the appropriate depreciation rates for oil and gas pipeline facilities, including the determination of potential supplies of oil and natural gas, and with other rate issues such as storage utilization, operations and cost allocation and gathering rates. During my nearly 35 years with the Commission, I earned positions of increasing responsibility, including Chief of the Depreciation Branch. In March 1998, I joined the firm of Brown, Williams, Scarbrough and Quinn, Inc., precursor to Brown, Williams, Moorhead & Quinn, Inc.

Q. Are you a member of any professional societies?

A. Yes, I am a member of the Society of Depreciation Professionals and the Society of Petroleum Engineers.

Q. Have you testified in proceedings before the FPC and the FERC?

A. Yes, I have presented testimony in many different areas, including gas supply and deliverability, depreciation, gathering issues, storage operations, and cost allocation. I testified in numerous proceedings while employed by the FERC and since leaving the FERC.

Q. On whose behalf are you presenting testimony in this proceeding?

A. I am presenting testimony at the request of Northern Border Pipeline Company ("NB").

Q. What is the purpose of your testimony in this proceeding?

A. My testimony is directed to the determination of the just and reasonable depreciation and negative salvage rates to be applied to NB's depreciable transmission and general plant.

Q. Would you please summarize the results of your analyses of the just and reasonable depreciation rates for NB?

A. Based on my study of the relevant facts (as discussed in further detail below), I determined a depreciation rate of 2.84 percent should be applied to NB's transmission plant. The indicated rate for transmission plant is an increase over the existing rate of 2.2 percent. The existing 2.2 percent depreciation rate was established as a result of a settlement in NB's previous rate proceeding, Docket No. RP99-322. Further, I determined a negative salvage rate of 0.59 percent, which also should be applied to NB's transmission plant.

A comparison of NB's existing authorized depreciation rates, including those for general plant, with the rates indicated by my analysis is shown on Schedule No. 1 of Exhibit No. NB-14.

Q. Would you please summarize how you determined the indicated depreciation rates?

A. I analyzed NB's system operations along with its markets and sources of gas supply. I also rely upon information made available by NB witnesses Haessel and Halpin. I determined an average remaining life of NB's facilities based on the physical lives of its facilities and an average remaining economic life of 26 years based upon projected gas supplies. I also considered how competition in the natural gas industry affects the economic life of its facilities. I applied the average remaining life to each of its plant accounts to determine the composite depreciation rates for the transmission plant. The methodology I employed for determining NB's just and reasonable depreciation rates is consistent with Commission precedent.

## I. DEPRECIATION

Q. Let us turn first to a definition of depreciation. Would you please define and describe depreciation?

A. Depreciation is the allocation of the original cost of tangible facilities in service over their useful lives. Stated another way, depreciation is the mechanism by which the plant investment is recouped in an orderly fashion over the useful life of the investment. For rate purposes it is treated the same as an operating expense. Depreciation is intended to systematically recover the invested capital over the useful life of the universe of relevant assets.

The concept of depreciation can be viewed in the light that the purchase of capital goods is in essence a purchase of future services. Consequently, depreciation is the expiration or consumption, in whole or in part, of the service life, capacity, or utility of property resulting from one or more of the forces operating to bring about the retirement of such property from service. It therefore follows that the basic objective of depreciation under established regulatory practice is the recovery of the full capital investment in facilities in a reasonable and consistent manner over the time period related to such facilities' use in providing service. This means that customers who are served by a particular investment pay for that investment in timed installments over the life of the investment.

Plant costs are incurred to make the provision of services possible. Units of plant are no more than stored up services, or stored up work units. The use of plant results in the provision of services and reduces the remaining inventory of future services. As service is performed, a corresponding part of the cost of plant (cost of stored up services) should be charged to the service. The remaining inventory of services are usually referred to as the service life. Accordingly, depreciation signifies the using up of service capacity or utility of plant.

Q. What are some of the official definitions of depreciation?

A. The Commission in its Uniform System of Accounts prescribed for natural gas companies defines depreciation as follows:

> "Depreciation" as applied to depreciable gas plant, means the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of gas plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities, and, in the case of natural gas companies, the exhaustion of natural resources.

This definition bears a striking resemblance to that stated in a landmark Supreme Court decision in Lindheimer v. Illinois Bell Telephone. The key to the Court's definition is its concept of depreciation as a loss. In spite of the concept of depreciation as a loss or decrease in value, its present application in accounting, financial, engineering, tax, and rate cases for interstate gas transmission facilities is always based on cost, not value.

The National Association of Railroad and Utilities Commissioners Committee on Depreciation stated:

> Depreciation is the expiration or consumption in whole or in part, of service life, or utility of property resulting from the action of one or more of the forces operating to bring about the retirement of such property from service; the forces so operating include wear and tear, decay, action of the elements, inadequacy, obsolescence, and public requirements.

The American Institute of Accountants defines depreciation by stressing its purpose:

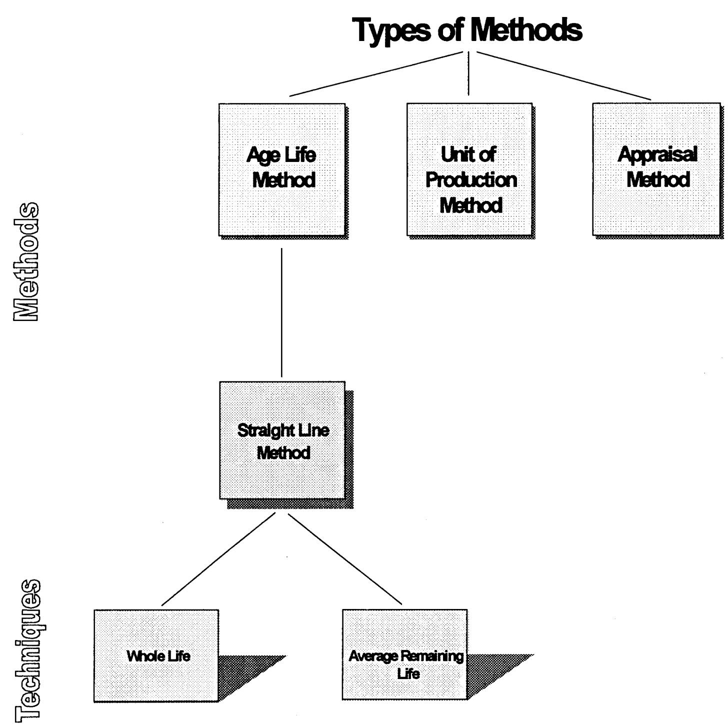
> Depreciation accounting is a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not valuation. Depreciation for the year is the true portion of the total charge under such a system that is allocated to the year. Although the allocation may properly take into account occurrences during the year, it is not intended to be a measurement of the effect of all such occurrences.

Q. What methodology did you use in your study of the appropriate life for NB's facilities?

A. I used the Average Service Life Methodology, specifically, the straight line method, average remaining life technique and recommend that NB's depreciation rate for transmission plant in this case be based on this

Schedule No. 2
Exhibit No. NB-____

**Accepted Methods for Accruing Depreciation on Utility Properties**




methodology. This methodology is the most widely used of all the methods to determine depreciation rates for major onshore transmission pipeline systems (see Schedule No. 2 of Exhibit No. NB-14).

Depreciation rates depend on estimates of service life of plant investment. Because natural gas pipeline systems are made up of a host of different complex property units, it would be impractical to calculate and apply separate depreciation rates for each unit of facility. This calculation would place an undue burden on the accounting system, requiring the maintenance of records for each unit of property. Consequently, the normal approach for developing depreciation rates is to calculate the rates for groups of plant based upon average service lives for those groups which are determined through studies of the forces affecting the lives of the pipeline's facilities. Under this method, individual facilities booked to each relevant FERC account are treated as a single group by those accounts.

## II. DETERMINATION OF DEPRECIATION – THE REMAINING LIFE FACTORS

Q. Would you please discuss the relationship between useful life and depreciation?

A. The measurement of depreciation recognizes that all plant will ultimately reach the end of its useful life. The end of the useful life and retirement from service may be caused by the following factors:

wear and tear
action of the elements
deterioration
inadequacy
obsolescence
requirements of public authorities and
adequacy of supply or market.

The physical causes, such as wear and tear and deterioration, are the most readily observed reasons for retirements. Normal use of facilities involves fatigue of materials, stress and friction, which results in wear and tear. An example of wear and tear is the wearing out of major components of compressor stations. Deterioration, on the other hand, may be caused by rusting, chemical processes, or temperature variations. An example of deterioration is the corrosion of metal pipeline segments that require costly repairs or retirement.

Functional causes, such as inadequacy, obsolescence, requirements of public authorities and inadequacy of supplies or markets are probably the more prevalent causes of retirements in the pipeline industry.

Inadequacy refers to the lack of capacity, which is required for supply and demand. Thus, a pipeline main may be retired and replaced by one of larger size in order to achieve an adequate delivery level.

Obsolescence may result in retirements due to improvements that render certain facilities uneconomical and inefficient. A common example of obsolescence is the communication equipment used by the pipeline industry. New communication equipment is being developed continually.

Public authorities may from time to time require pipelines to be replaced with thicker walled pipe because of population encroachment toward such facilities, or relocated because of infrastructure improvements, such as highway widening.

For a pipeline system such as NB, all of the above causes of retirement, whether physical or functional, have one thing in common: they are ever-occurring and affect individual facilities. On the other hand, the adequacy of supply or market is unrelated to the physical characteristics of the property or the action of public authorities. Adequacy of supply or market is probably the single most important factor resulting in premature retirements because this factor may affect a large portion of a pipeline system. Therefore, I will treat this subject in more detail.

In a depreciation study, the adequacy of supply and markets is referred to as the economic life.

## III. THE DEPRECIATION MODEL

Q. Would you please describe the depreciation model that you employed in your study?

A. I employed the straight-line average remaining life method as traditionally adopted by the Commission. It is derived and described as follows:

$$\textbf{Depreciation Expense} = \frac{\textbf{Investment}}{\textbf{Life}}$$

The remaining life approach:

$$\textbf{Depreciation Expense} = \frac{\textbf{Undepreciated Investment}}{\textbf{Average Remaining Life}}$$

The Depreciation Model:

$$\textbf{DE} = \frac{\textbf{DB - (S - COR) - DR}}{\textbf{ARL}}$$

Where,

**DE** = the annual depreciation expense
**DB** = the depreciation base or original cost
**S** = the gross salvage related to the DB
**COR** = the cost of removal related to the gross salvage
**DR** = the accumulated depreciation reserve
**ARL** = the average remaining life

$$\textbf{Depreciation Rate} = \frac{DE}{DB}$$

The determination of depreciation using the above equations serves three purposes:

capital recovery - ratably allocates a known fixed cost,

cost of removal - ratably allocates a future obligation, and

salvage - ratably reflects recognition of future value.

Q. Would you describe the average remaining life approach?

A. The concept of an average service life or remaining service life for a property group implies that the various units in the group have different lives. The average life of any group of plant items is a matter of estimate until all the items in that group have been finally retired. The issue then is to determine the average life before complete retirement of all units occurs. The average remaining service life method determines the average period of time the facilities will be in service. This is normally done by first determining the historical life of the plant group and then estimating the life expectancy for the items remaining in service. The life experienced plus the expected life comprises the average life for the group. This analysis can be done by determining the separate lives for each of the property units or by constructing a survivor curve for the entire group. In this testimony, I employed the group method and I used a survivor curve for each group of facilities.

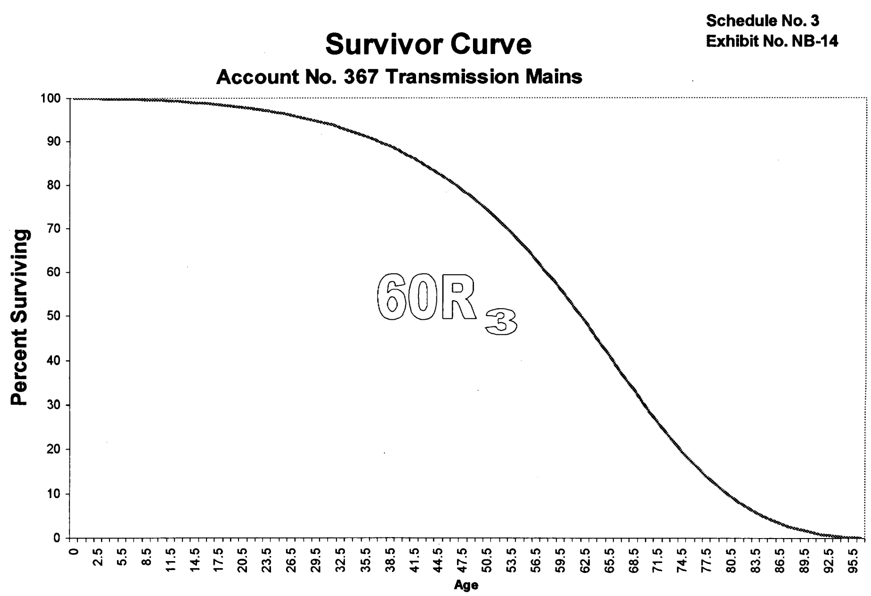
Q. What is a survivor curve?

A. A survivor curve, fitted to a particular type of plant, predicts the average remaining service life and retirement pattern of that plant. A survivor curve graphically reflects the percent of capital investment existing at each age throughout the entire physical life of an original group of property. From the survivor curve, the average service life or average remaining life can be calculated. The average service life is obtained by calculating the area under the survivor curve from age zero to the maximum age and dividing the area by 100 percent. The average remaining life at any age is obtained by calculating the area under the survivor curve from the observation age to the maximum age, and dividing this area by the percent of plant surviving at the observation age.

The average remaining life is the average length of time that all units of a group are expected to last. The retirement pattern estimates how much of the group will be retired each year as the group ages. The average remaining life, which is of particular importance in the calculation of the depreciation rate, is derived from the useful life of the facility and from each plant's survivor curve.

Analyses of historical data are employed in estimating average service lives due strictly to physical or commonly occurring retirement forces. The analyses consist of compiling the past history of the plant groups, reducing the history to mortality trends by the use of actuarial techniques, and forecasting the trend of survivors for each depreciable group on the basis of past trends and future company plans. The combination of the historical trend and the future trend yields a complete survival pattern from which the physical portion of the average service life is derived. The historical experience data upon which indications of past service life are based reflect not only the capital investment of property items retired during each year of age but also the capital investment of property items that remain in service at the beginning of each year of age out of the total capital investment originally placed in service in any year. These properties that remain in service are said to be exposed to the risk of retirement.

The survivor curves are referred to as Iowa type survivor curves (see Schedule No. 3 of Exhibit No. NB-14.)



They were originally developed at the Iowa State College Engineering Experiment Station and refined through an extensive process of observation and classification of the ages at which industrial property had been retired. Iowa survivor curves are used to account for the normal retirements that occur over the life of a specific type of plant.

The determination and use of a survivor curve to determine the physical life of facilities requires a great deal of experience and knowledge in the interpretation of the results of such a study. The use of judgment must include investigation into whether future normal retirements can be predicted based on the past performance of those facilities. For example, research on my part along with discussions with NB's operating personnel allowed me to confirm and/or adjust indicated retirements beyond that predicted by the survivor curve study. The development of a survivor curve based only upon historical retirements is not necessarily the ultimate predictor of future retirements. It is however, a useful tool.

## IV. ECONOMIC LIFE OF NB'S PIPELINE PROPERTIES

Q. Would you please describe your analysis of the Northern Border system as it relates to the useful life of its facilities?

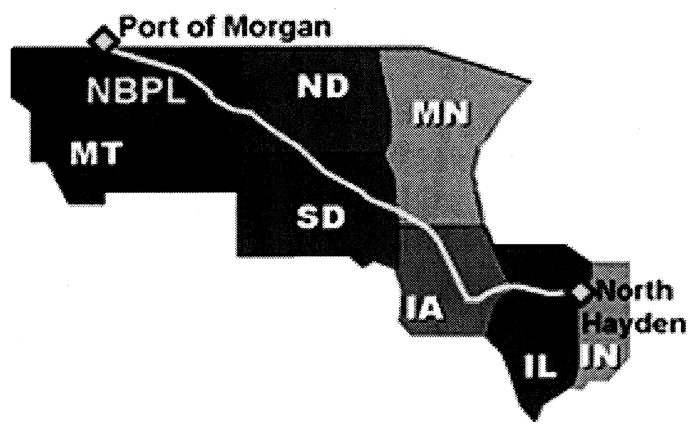
A. The purpose of the depreciation study is to determine the useful life of NB's transmission facilities. To achieve this goal, I analyzed and determined the forces bringing about retirement of NB's facilities. A nexus must be developed between the forces bringing about the retirement and the facility subject to retirement. I developed a nexus through various studies and determined factors relating the likely available and declining gas supply to the facilities dependent upon such supply.

Q. Would you please describe NB's pipeline transmission system?

A. The NB pipeline system is a major link between the western Canada gas supply regions and to a smaller extent, certain areas of the United States northern Rocky Mountain area with ultimate markets throughout the Midwest.

Schedule No. 1
Page 2 of 2
Exhibit No. NB-14

**Generalized Map of Northern Border's Pipeline System**




The NB system was originally constructed in 1981-1982 and placed into service in early 1982.

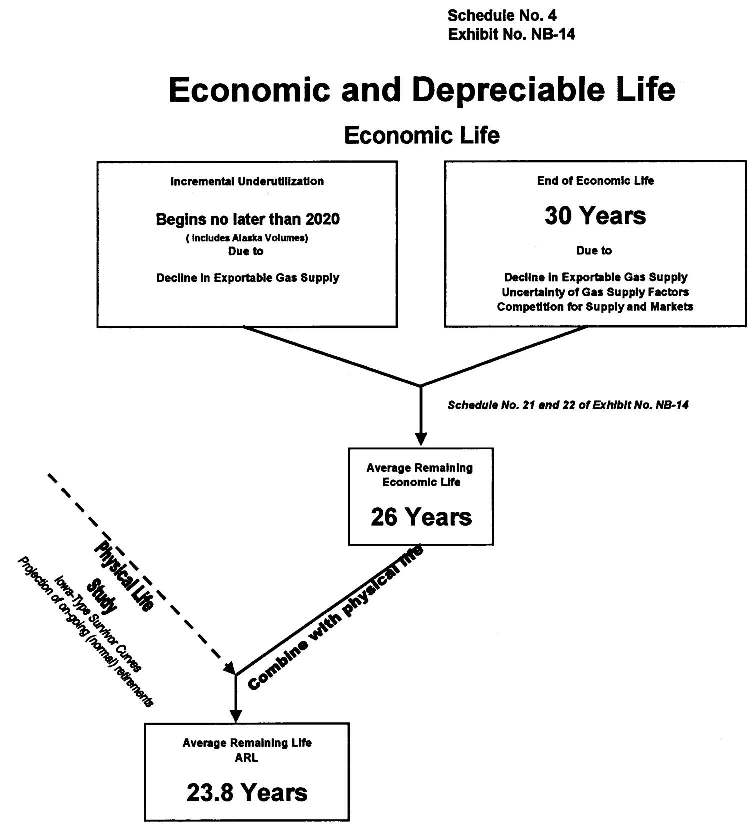
Q. Did you perform a study on how NB's facilities are impacted by declining gas supply?

A. Yes.

Q. Would you please describe your studies, analysis and determination of the economic life of NB's pipeline properties?

A. The economic life or life span of NB's existing gas pipeline facilities is dependent primarily upon the productive capability of the supply areas to which it is connected, from which it receives gas for transmission. The economic life is also dependent upon the effect of competition on the company's existing facilities, as any potential loss of supply or markets may affect the useful life of a particular facility.

Adequate supply of gas for shipment is crucial to the economic life of a pipeline system. In the case of NB's existing facilities, the sources of gas are the Western Canada Sedimentary Basin and certain portions of the Rocky Mountain Region. Gas from other Lower 48 States supply areas would not benefit NB's existing facilities, as I explain later. Generally all of the gas transported by NB originates either in Western Canada or to a limited extent, portions of the U.S. Rocky Mountain regions. Because of the dominant role of these regions on NB's system, I analyzed how the future viability of the gas supply basins in these areas would affect NB's existing properties. The results of those studies, when directly related to NB's existing facilities, indicate an economic life of NB's facilities of between 25 and 30 years. The average remaining economic life of NB's facilities, which I will discuss further on in my testimony, equated to 26 years. It is this average economic life of 26 years that forms the basis for the economic life that should be used to determine the average remaining life for the calculation of depreciation in this proceeding. I employed 30 years as the end of the economic life in the average remaining economic life calculation. A diagram describing the procedure in determining the average remaining economic life is shown in Schedule No. 4 of Exhibit No. NB-14.




Q. Concerning your statement above that gas from sources other than NB's traditional supply areas would not flow through the vast majority of NB's existing facilities, please elaborate.

A. NB's existing facilities are geographically placed such that gas supplies reasonably and economically available to the system come from only certain gas supply regions. NB's existing mainline facilities are not geographically situated to carry significant amounts, if any, of Midcontinent and Gulf Coast gas.

Q. Please explain how you applied this information.

A. In order to put the average economic life and resulting average remaining life in proper perspective, I employed the group method of determining depreciation. The group method treats large amounts of NB's facilities as a group in the useful life determination, rather than determining the life of each and every facility. The facilities are grouped by FERC account number. This approach is regularly accepted by the Commission. Further, it is important to note that the economic life determined relates to NB's existing facilities rather than NB itself or any future facilities.

## V. GAS SUPPLY

Q. Would you please describe the gas supply studies?

A. NB Witness Walter Haessel studied, analyzed and modeled gas supplies located in the WCSB, and Northern Frontier areas in order to determine their future capability as supply sources. The future capability of these gas supply areas directly affects the useful life of NB's facilities. He analyzed data available on the existing proven reserves of natural gas in these areas as well as estimates of potential gas resources in these areas. He modeled the availability of gas from these supply sources in the future. Included in his forecast of Western Canadian gas supplies for export are estimated volumes of conventional and unconventional gas. Gas supply reserves and resources are split into two categories, conventional and nonconventional. Conventional resources are located in distinct accumulations. They generally have more favorable performance characteristics and are responsive to traditional exploratory techniques. Nonconventional resources, such as coalbed methane, tight gas, gas hydrates and shale gas are typically continuous accumulations that are much larger in aerial extent than conventional distinct accumulations. They also have relatively poor or nonexistent production performance. Traditional exploratory techniques employed for conventional resources are relatively inaccurate in predicting productivity in a nonconventional deposit.

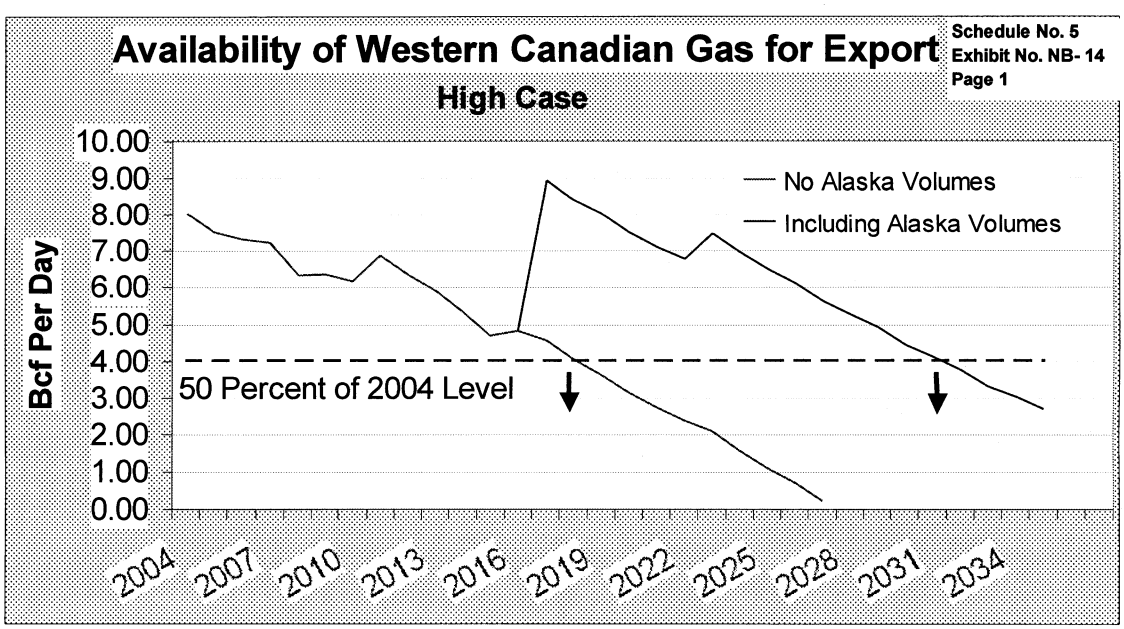
Further, NB also transports smaller proportions of gas, which is sourced from various U.S. Rocky Mountain regions. I have forecasted overall gas volumes which would be available from the entire Northern Rocky Mountain region. This study, The Assessment of the Availability of Natural Gas in the Northern Rocky Mountain Area, is presented in Exhibit No. NB-14, Appendix A. This study, along with NB witness Haessel's analysis and consideration of nonconventional sources, as well as the potential for Arctic gas to be transported on NB system, will allow me to evaluate the effect of gas supply forecasts on the operation of NB's pipeline system in order to determine a realistic economic life of the pipeline facilities that are dependent on such supplies.

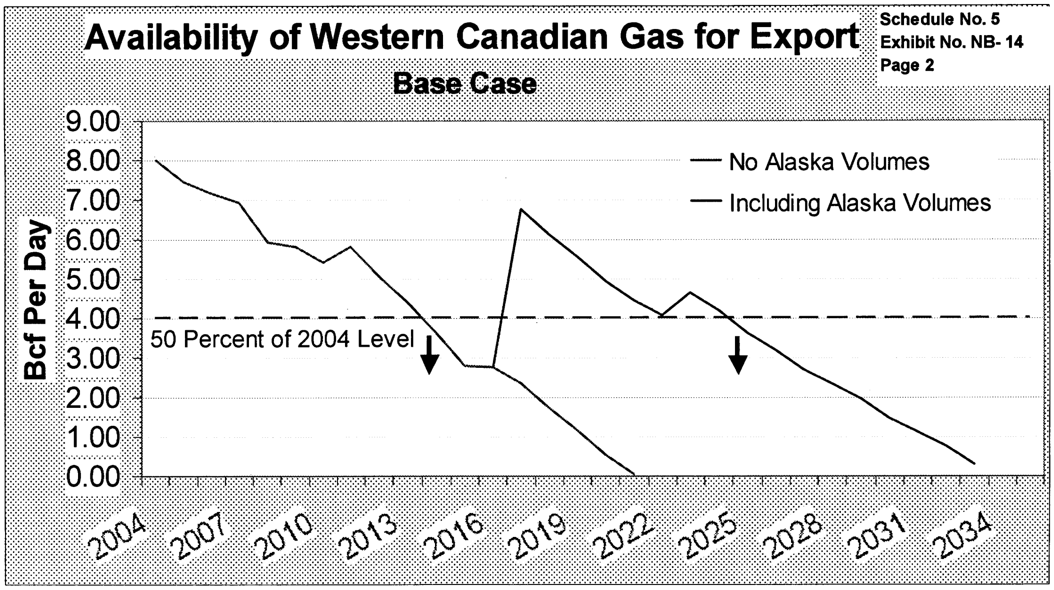
Q. What can you conclude from the results of NB witness Haessel's Western Canada export gas supply forecasts, the Rocky Mountain region gas forecast developed herein and the various Western Canada unconventional supply sources?

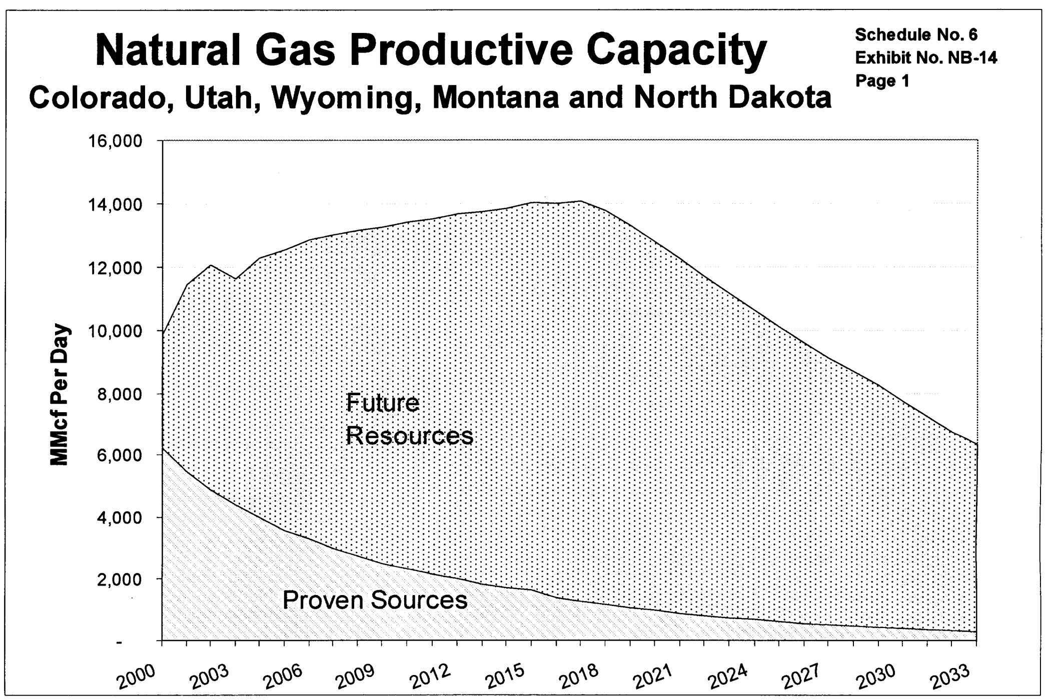
A. Supply deficiencies will likely take place over time in various portions of Northern Border's system. Such deficiencies would affect NB's ability to maintain the same level of flows it presently exhibits.

Q. How did you apply the results of your gas supply studies to a determination of the economic life of NB's pipeline properties?

A. The estimated gas availability profiles set forth in Schedule No. 5 of Exhibit No. NB-14 indicate initially subtle declines, but later significant deficiencies, in the ability of NB's supply areas to provide adequate throughput for its mainline facilities. The profiles, in graphic form, are shown on Schedule No. 5 of Exhibit No. NB-14, for witness Haessel's Western Canada gas supply forecasts and on Schedule No. 6 of Exhibit No. NB-14, for my Northern Rocky Mountain gas supply forecasts.






Q. Could you put into context the current status of conventional Canadian gas resources as it affects the economic life of NB's system?

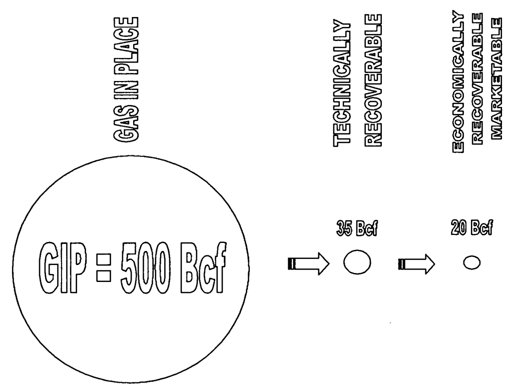
A. The purpose of depreciation is to allow for the recovery of the investment in facilities. The economic life component is an integral part of that depreciation determination. The determination of the economic life must rely upon logical and reasoned gas supply forecasts as it affects the useful life of NB's facilities. The gas supply forecasts must meet a standard by which a company can be reasonably assured that it will recoup its investment and shippers can be reasonably assured that through allowed rates they are bearing their fair generational share of such recovery, no more and no less.

I believe this can be achieved through the gas supply studies of Western Canada that NB Witness Haessel presented in this proceeding. NB Witness Haessel constructed a series of scenarios for the exploration, discovery, production and probable export of Western Canadian gas.

Western Canada contains exceedingly large quantities of hydrocarbon resources in-place. In-place gas resources are deposits that reside in the underground reservoirs. Only a fraction of such resources are producible and marketable, however, that fraction ranges from a high of 60 percent of conventional gas resources in Alberta to a very low (less than 10 percent) for unconventional resources such as tight gas and coalbed methane. Schedule No. 7 of Exhibit No. NB-14 shows a diagram of the transition between gas in-place volumes and that which is marketable.

Schedule No. 7
Exhibit No. NB-14

Diagram of the Relationship Between the Volume of Gas Resources
**Example: WCSB Coalbed Methane and Tight Gas Sands**




Producer exploration for marketable natural gas is driven by a number of factors. The most important factor is the existence of geological prospects. As gas deposits in a basin, such as the WCSB are discovered, the number and size of remaining deposits to be discovered falls. Higher gas prices and advanced technology such as imaging tools are required to accelerate recovery of available resources or reduce the risk of uneconomic drilling. Nevertheless, future supplies of gas must be limited to the remaining endowment of gas of the WCSB

The reality of Western Canadian natural gas supplies includes the following facts. The majority of the WCSB conventional resources have been discovered (see Schedule No. 8 of Exhibit No. NB-14). The trend is towards discovery of smaller and smaller pools (gas reservoirs) (see Schedule No. 9 of Exhibit No. NB-14). The largest pools are the most depleted.

Schedule No. 8
Exhibit No. NB-14

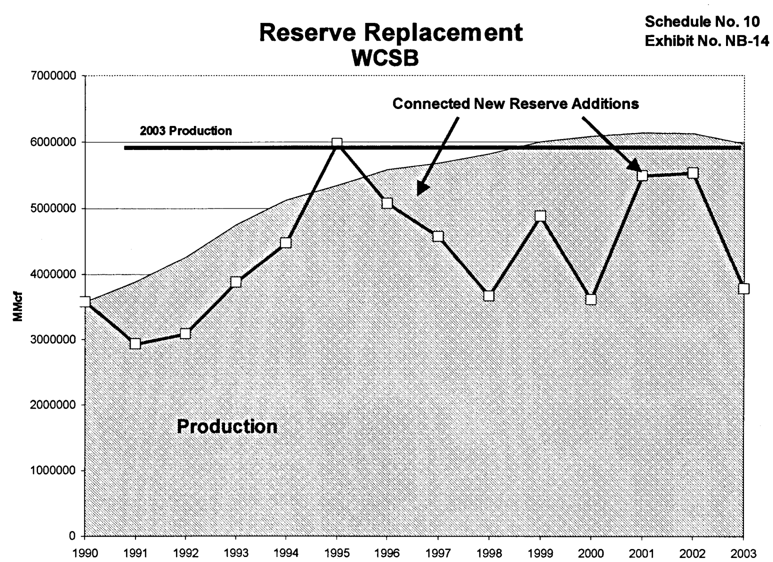
**Relationship Between Discovered Resources and Ultimate Potential Gas Resources in the WCSB**
***Volumes in Bcf***
**Year-end 2003**

| | Discovered Marketable Resources | Undiscovered Resource | Ultimate Resource Potential |
|---|---|---|---|
| WCSB Conventional | | | |
| Alberta | 161,241 | 61,557 | 222,798 |
| British Columbia | 24,531 | 26,448 | 50,978 |
| Saskatchewan | 8,591 | 462 | 9,053 |
| Southern Territories | 1,030 | 5,929 | 6,958 |
| Total | 195,392 | 94,395 | 289,787 |

Discovered Marketable Resources includes cumulative production and remaining proved reserves.

Source: AEUB, Alberta's Ultimate Potential for Conventional Natural Gas

Annually connected new reserve additions have not reached a level to replace the 2003 production level since 1995. In six of the eight years the new reserves were from 1 to 2 Tcf (15 to 30 percent) under the consumption level (see Schedule No. 10 of Exhibit No. NB-14).



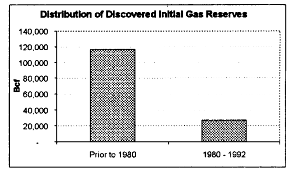

Reserve additions by year of discovery are progressively smaller (see Schedule No. 11, page 1, of Exhibit No. NB-14). Additional more recent data is shown by the trend in reserves by discovery year (see Schedule No. 11, page 2 of Exhibit No. NB-14.)

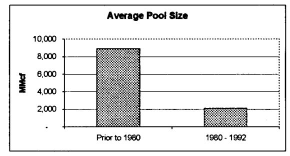
Schedule No. 11
Page 1
Exhibit No. NB-14

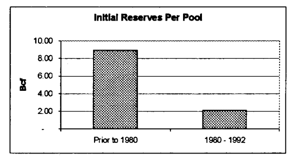
**WCSB Initial Established Reserves by Discovery Year**

| | Prior to 1980 | 1980 - 1992 |
|---|---|---|
| Number of Pools | 13,074 | 12,764 |
| Initial Reserves (Bcf) | 116,900 | 26,900 |
| Average Pool Size (MMcf) | 8,900 | 2,100 |
| Initial Reserves per Pool (Bcf) | 8.94 | 2.11 |

Source: Canadian Energy Supply and Demand 1993 - 2010 Technical Report, NEB

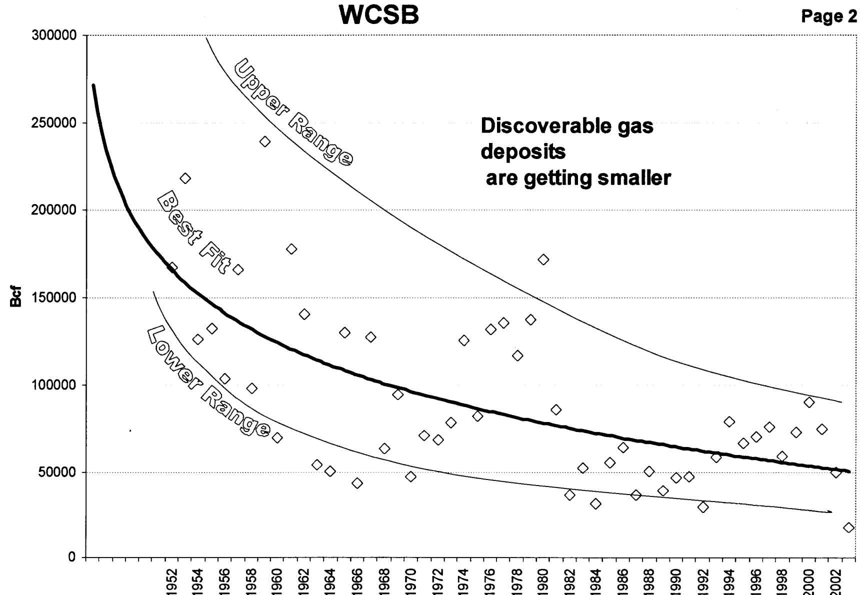


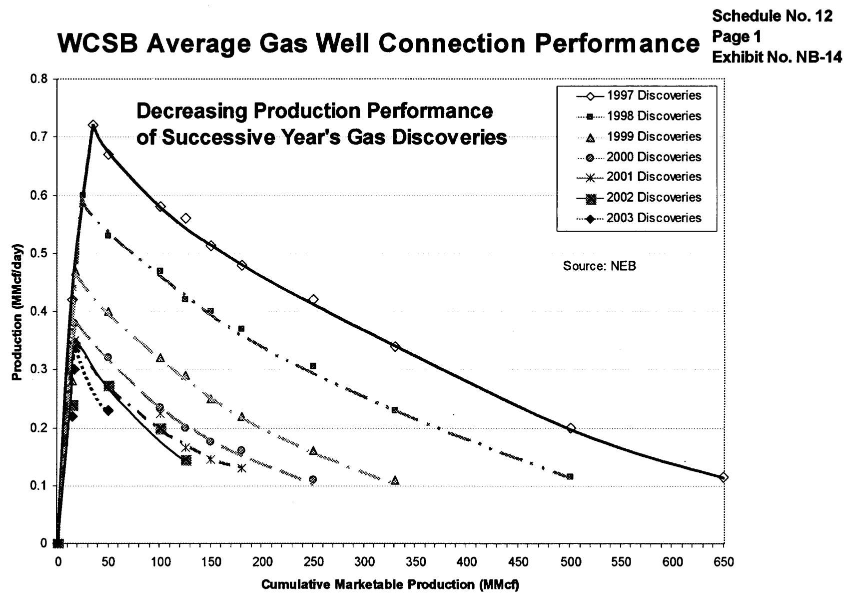




**Initial Established Gas Reserves by Year of Discovery**
**WCSB**

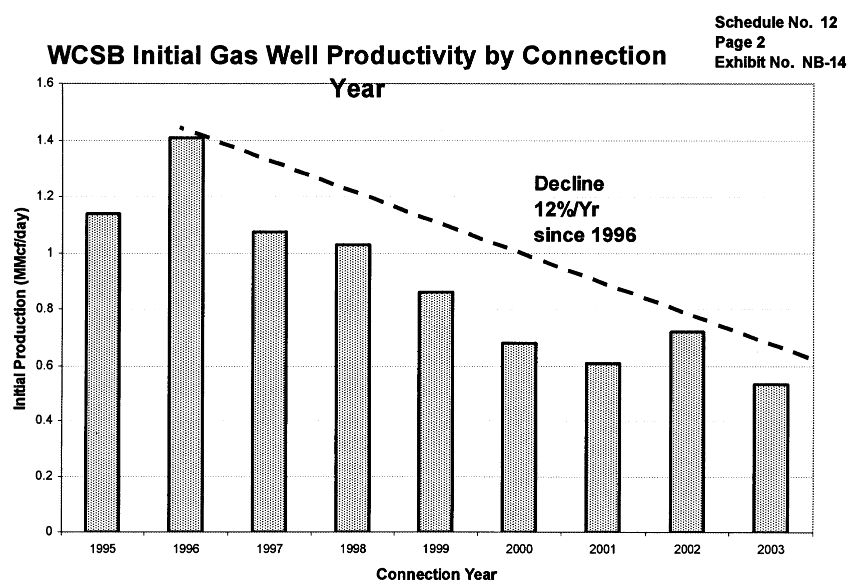
**Schedule No. 11**
**Exhibit No. NB-14**
**Page 2**



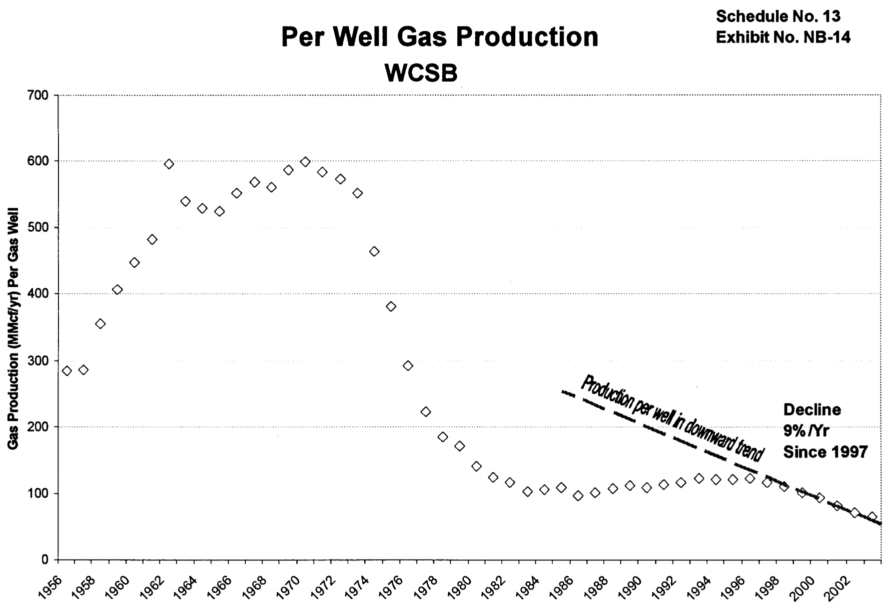

The production performance of successive year's new gas discoveries is decreasing (see Schedule No. 12 of Exhibit No. NB-14).



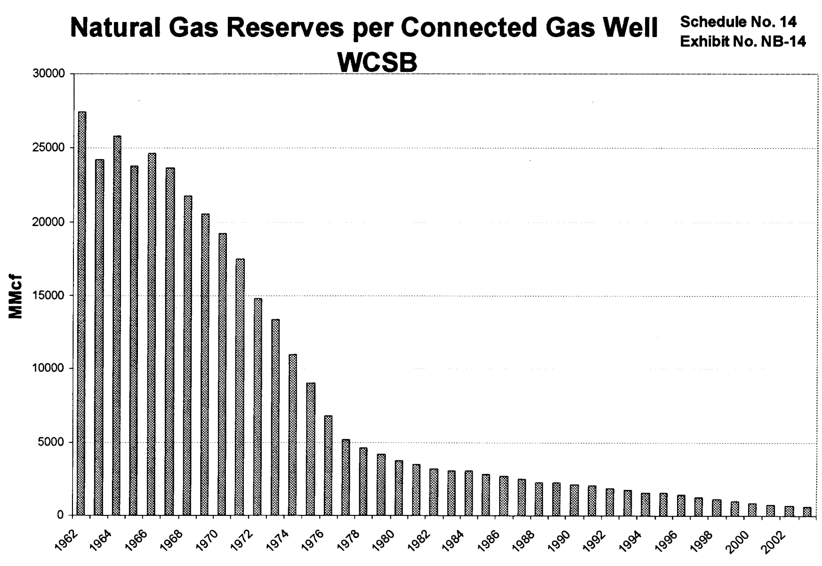

The decline in productivity is shown below and in Schedule No. 12 page 2 of 2 of Exhibit No. NB-14.



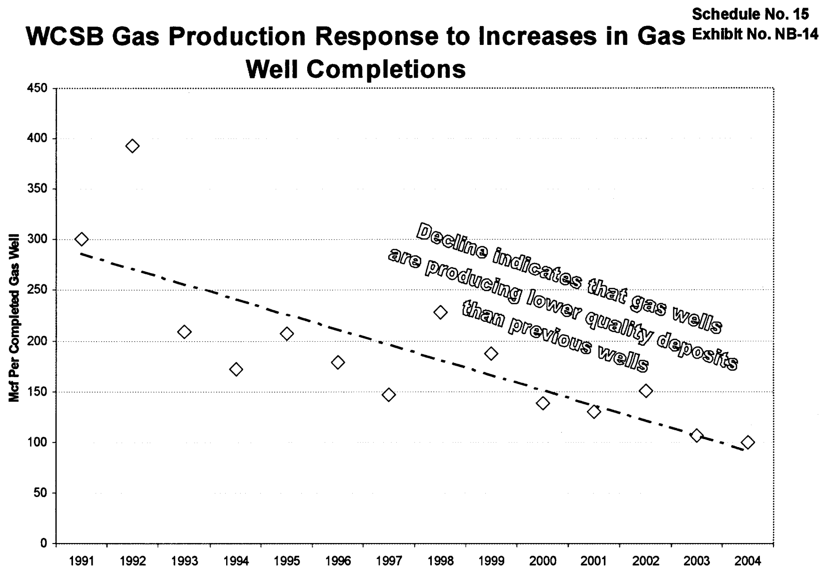

Per well production throughout the WCSB is decreasing (see Schedule No. 13 of Exhibit No. NB-14).



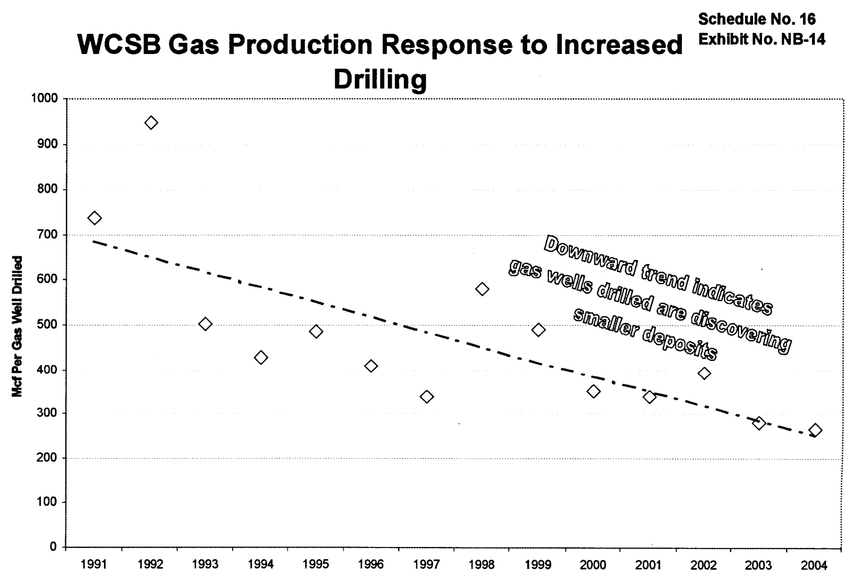

The level of per well reserves throughout the WCSB is decreasing (see Schedule No. 14 of Exhibit No. NB-14).




Gas production response to the increasing number of gas wells completed is in a clear decline (see Schedule No. 15 of Exhibit No. NB-14).

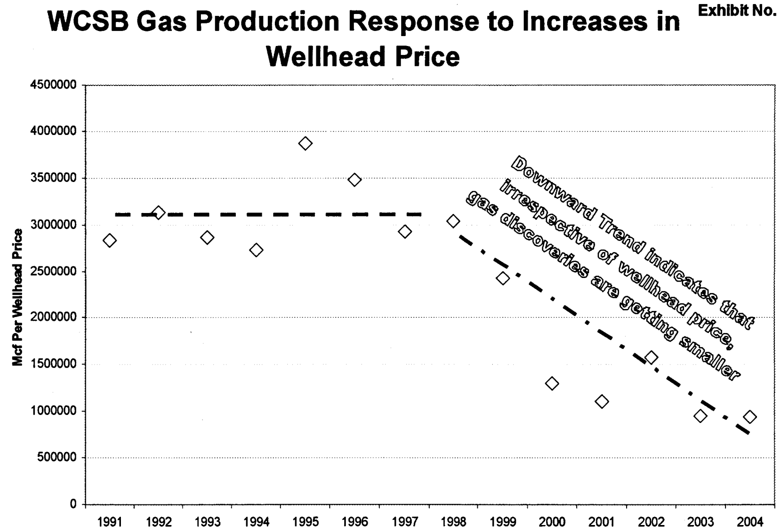



Gas production response to increased drilling is a clear decline (see Schedule No. 16 of Exhibit No. NB-14).




Gas production response to wellhead price increases is a clear decline (see Schedule No. 17 of Exhibit No. NB-14).

Schedule No. 17
Exhibit No. NB-14




The above facts indicate that the WCSB is entering the mature stage. The NEB has recognized these facts and states that "recent drilling and production data suggests that the WCSB may be maturing; and changes in natural gas resource estimates may be warranted for some areas." This is shown in Schedule No. 18 of Exhibit No. NB-14.

In essence, the WCSB is in a treadmill status where the angle of the treadmill is increasingly steep.

Q. What are the implications of the current status of the conventional WCSB gas supply on the economic life of a pipeline relying on such supplies?

A. The implications are an initially substantial, yet declining gas supply from conventional gas sources in the WCSB. The decline is discussed by NB witness Haessel. The conventional gas resource base of the WCSB is the only gas supply in Western Canada where there is a long-term reasonably assured supply, based on actual experience, albeit declining.

Q. Mr. Feinstein, are there any other gas supplies that mitigate the declining

WCSB conventional gas supplies and underutilization of NB's system?

A. Yes, there are. They are: the Northern Rocky Mountain area, Canadian coalbed methane and the MacKenzie Delta gas.

Q. Would you please describe how increments of Northern Rocky Mountain gas can mitigate the decline in conventional WCSB gas supplies?

A. Northern Rocky Mountain gas already is supplementing the lower availability of WCSB gas through NB's system. Historically, most gas flowing in the Northern Border system was sourced from the WCSB. And, to a certain extent, Northern Rocky Mountain gas will, in the future, in part, supplement the fall-off of WCSB volumes.

The Northern Rocky Mountain area is still growing in the ability to provide gas to the West Coast and Midwest markets. As a result of its growth, more and more capacity to transport such gas to markets will be necessary. What this means is that, in 2017, when the area will begin to decline, NB's share of such gas will begin to shrink. That is, while the pie is getting smaller (decreasing availability), the added slices (increased available capacity) will reduce the amount to NB when decline takes place. The availability of gas from the Northern Rocky Mountain area as well as the year when volumes begin to decline are shown in the Assessment of the Availability of Natural Gas from the Northern Rocky Mountain Area in Appendix A to Exhibit No. NB-14. Further, I recognized the additional Rocky Mountain gas capacity projects including the potential for major pipeline systems transporting gas east, such as Kinder Morgan.

Q. Could you put into context the current status of Western Canada nonconventional gas supplies as it affects the economic life of NB's pipeline system?

A. As the decline in WCSB production continues, interest in non-conventional resources is expected to increase.

Q. Please describe Canada's unconventional resources.

A. Canada's unconventional resources fall into four categories: coalbed methane (CBM), tight gas, shale gas and gas hydrates.

Q. Please describe CBM and its relationship to Canada's resource base.

A. Large amounts of methane rich gas are generated and stored in coal formations. Recently, since the late 1980's, stand-alone commercial production of coalbed methane has been undertaken in the United States. Most gas in coal is stored on the internal surfaces of organic matter. Gas content generally increases with certain insitu characteristics, with depth and with reservoir pressure. Fractures, or cleats, that are prevalent in coalbeds are usually filled with water, some of which may be saline. Where water is present, in order for gas to flow to the wellbore, the pressure must be reduced, which is accomplished by removing water from the coalbed. Large amounts of water, sometimes saline, are produced from most CBM wells. While certain quantities of gas can be technically produced, water disposal options that are environmentally acceptable and yet economically feasible are a concern.

Western Canada (Alberta) contains vast amounts of coal distributed throughout the southern Plains, Foothills and Mountains.

However, in contrast to the U.S., coalbed formations in Western Canada tend to be thinner, in many cases, buried deeper and to have lower permeability (the ability to flow towards the wellbore). There are a number of challenges to successfully develop Canadian CBM. They are: find localized areas where the CBM has all the right characteristics, develop the correct technique for production, water disposal, resolve legal issues over ownership and overcome the large cost of compressing produced gas to pipeline pressures.

Over 3,000 wells have been drilled that specifically targeted CBM in Canada. Hundreds of million dollars have been spent, but there has been relatively little CBM production to date.

Less than half of the CBM wells drilled had produced or were producing by year-end 2004. CBM production from such wells in 2004 was minimal (58 MMcf per day, or less than 0.5 percent of just Alberta's gas production.) One thing that must be noted is that there is a difference between CBM production and production from CBM wells. CBM wells are those wells that are drilled to produce CBM, while CBM may produce from conventional gas wells. Conventional gas wells in Alberta, in many instances, produce from a coal zone.

More than 100,000 wells completely penetrate the coal bearing formations, thus, the locations and characteristics of the coal have been well known for some time. The actual CBM production to date continues to remain uncertain because of the current inability to completely differentiate CBM from conventional gas production.

Further, recorded reserves and production from conventional sources included CBM to some extent.

As of the end of 2004, the EUB estimates remaining established reserves of CBM to be 262 Bcf. Schedule No. 19 of Exhibit No. NB-14 shows the various CBM reserves. Industry practice indicates that long-term CBM production will be from project style developments which would necessarily involve re-completions of existing wells with the drilling of new development wells to reduce costs as much as possible.

Q. Mr. Feinstein, have there been estimates of WCSB CBM resources?

A. Yes, which vary widely.

Q. Mr. Feinstein, could you please reiterate the relationship between CBM GIP and marketable gas that would be produced?

A. Recall that GIP is only the total amount of gas that resides buried in the reservoir. Only a fraction can be recovered technically and economically. For the case of CBM, according to estimates performed on known data, by the EUB in its Supply and Demand outlook, Alberta Reserves 2004, published in 2005, only an average of 6 to 8 percent of the GIP can be recovered once technically recoverable deposits are found and established.

Q. Please address the amount of CBM supply that you believe is reasonable and prudent to employ in a determination of the amount of investment recovery via depreciation accruals.

A. The long-term outlook of volumes of Canadian CBM is far more uncertain than conventional gas supply sources. The reason for such caution is that there is virtually no track record of sustained production from stand-alone Canadian CBM projects.

Q. Would you please describe the other nonconventional gas supply source in Canada, gas shale?

A. There are over 35,000 producing gas shale wells in the United States, from Texas to Ohio and West Virginia, with a current production of about 600 Bcf per year. Outside the United States, in Canada, the story is quite different, where gas shales have received little attention. There is little, if any indication that the two have similar producible characteristics.

Gas shales are fine grain sedimentary rocks in which a significant component of gas storage is by absorption. They have very low matrix permeability, much less than 1 millidarcy. Permeability is measured in darcys. It is the ability of fluids to flow through porous media (rock-shale). Localized natural facturing is essential for technical and economic gas reserves. There is no evidence that the Canadian gas shales exhibit any significant amount of localized natural fractures.

Technical and non-technical issues for assessing the resource potential are somewhat similar to that for CBM. These include a lack of production test data, need for natural fractures, water handling issues and need for large continuous land blocks. Only a very small percent of GIP resource would, in any event, be developable. Even within that developable area (natural fractures, etc) only a very low recovery factor would be appropriate.

Q. Would you please describe the other potential nonconventional supply source, tight gas sands?

A. The WCSB has many potential tight gas zones, especially on the western, deeply buried side of the basin. Gas pool areas with tight gas potential have already produced conventionally, however, the line separating conventional and nonconventional reserves and resources is not sharp. These fields or units have both a conventional and nonconventional component.

Western Canada may not have the same characteristics and potential for tight or what is referred to as "basin centered" gas as seen in the U.S. Rocky Mountain or Gulf Coast regions. Numerous wells have already been drilled through the potential tight gas zones. WCSB basin center (tight gas) developments to date have largely been in "sweet spot" areas (i.e., natural fractures) and little effort has been made to commercialize associated poorer quality, lower grade basin center gas deposits. In the WCSB, deep basin tight gas is generally in small pools with low GIP. There is very little public data for assessing deep basin centered gas, such as detailed information on well fracture stimulation treatments. Further, Canada does not have a specific definition (for regulatory purposes) of tight gas, and therefore efforts to separately quantify tight gas with WCSB runs the risk of double counting resources because of the difficulty and potential confusion in terms associated with tight gas resources.

Some of the very low permeability tight gas sands behave differently than conventional reservoirs. One behavior that distinguishes the two is that involving relative permeability, which is not widely known but whose characteristics are widely observed. Wellbore core data show that as the matrix permeability drops from the millidarcy (md) into the tens of microdarcies range the critical gas saturation in the reservoir (the gas saturation necessary for gas flow) increases and the critical water saturation also increases. This produces a widening range of water saturation at which both phases (gas and water) are effectively immobile. This no-flow regimen is referred to as "permeability jail." Thus, in sections of reservoir rock that have low permeability and in "permeability jail", the presence of gas does not translate to recoverable resources. And, further, if higher permeability intervals (sweet spot - natural fractures) are the carrier beds for gas production from adjoining lower permeability sections, then as a consequence these intervals will be more prone to water production.

The CGPC assessment does not distinguish between conventional and tight gas. Their estimates include potential tight gas pools, as well as higher permeability pools. Therefore, one can presume that tight gas potential in the WCSB is largely captured in the conventional exploration plays assessed by the CGPC, EUB and NEB. For example, historically 50 percent of WCSB gas wells undergo fracture stimulation (frac job) indicating relatively low permeability. These wells account for 25 percent of new gas production.

Q. What is the effect of NB Witness Haessel's gas supply study of the WCSB and the study of the US Northern Rocky Mountain Region on the determination of the economic life of NB facilities?

A. The effect of NB Witness Haessel's high gas supply case availability on NB's pipeline system is that large sections over time will become underutilized as shown in Schedule No. 20. This will be somewhat mitigated by the potential of Rocky Mountain gas entering NB's system. However, the Rocky Mountain gas supplies are projected to decline around 2017.

The indicators that the WCSB is entering its mature stage; NB Witness Haessel's supply availability that indicates gas availability below 50 percent of present levels in 30 years; along with both competition for supply and markets, establishes the end of the economic life to be 30 years from the end of 2004. Therefore, the combination of the underutilization of major facilities and the end of the economic life of 30 years results in an average remaining economic life of 26 years using the high gas supply case. The determination of 26 years is shown conceptually and quantitatively in Schedule Nos. 4 and 20, page 1 of Exhibit No. NB-14, respectively. NB witness Haessel's base case indicates an average remaining economic life of 18 years (see Schedule No. 21, of Exhibit No. NB-14).

Q. How did you determine that the end of the economic life would be most reasonably be represented by a 30 year period, from the beginning of 2005?

A. The end of the economic life of 30 years is based upon the following factors:

- NB Witness Haessel's WCSB base gas supply case indicating no exportable gas supply in 30 years.
- NB Witness Haessel's WCSB high gas supply case indicating over 50 percent reduction in current availability in 30 years.
- Mr. Feinstein's Rocky Mountain gas supply indicating over 65 percent reduction in current availability in 30 years.
- More capacity, i.e. pipeline, will be necessary to produce Rocky Mountain gas supply, resulting in a long-term reduction in share of gas availability per Mcf of constructed pipeline capacity.
- High degree of concensus of a downward trend in WCSB conventional supplies – e.g., current declines in size and productive availability.
- Uncertainty of long-term unconventional gas supplies e.g., CBM, tight gas and shale gas.
- Uncertainty of the flow of Alaskan gas through NB's system.

Q. What is the effect of the determined gas supplies on pipeline facilities?

A. Because of the fall-off in the supply from NB's traditional gas supply areas, significant amounts of pipeline facilities would become underutilized. Specifically, NB Witness Haessel's studies indicate gradual, yet steady and significant decreases in the supply of gas from the WCSB area over the 2005 to 2034 year period. Similar fall-offs also occur in the Rocky Mountain supply areas. However, even this source of gas will eventually begin to decline, as shown in the accompanying Northern Rocky Mountain gas supply studies. This decline in production directly affects the utilization of NB's mainline transmission facilities. NB Witness Haessel's analysis of the Western Canada gas supplies for export indicate, under his high gas supply scenario, that, by the year 2025, the volumes available in the WCSB supply region, including Mackenzie Delta gas as well as coalbed methane will have decreased to approximately 13 percent of the 2005 levels. And, by 2034 that supply region will not produce enough gas to satisfy Canadian requirements. The base case is worse; by 2021 there is no gas to export from Western Canadian sources. The fall-off in NB's other supply area, the Rocky Mountain region is also significant. Such fall-offs in the availability of natural gas from these gas supplies would affect the utilization of NB's mainline facilities.

Q. What are the results of your analysis of the economic life of NB's present facilities?

A. As a result of my analysis of NB's system operation, the nature of its markets, and the gas supply comprising its throughput, I determined the average remaining economic life to be between 25 and 30 years. This conclusion is based upon underutilization of certain of its facilities ("major retirements") due to depletion of its traditional gas supply sources. It is also due to the uncertainty of market retention due to competitive pressure from other sources.

Q. What are major retirements, and how do you conceptualize them with respect to the economic life?

A. Major retirements are severely underutilized facilities due to economic forces (rather than physical forces), such as gas supply depletion causing underutilization and changes in system operations.

Q. How did you determine 25 to 30 years as the economic life for NB's pipeline facilities?

A. I determined major underutilization that would take place along NB's system from the results of NB Witness Haessel's WCSB gas supply study and the studies I performed of the availability of Rocky Mountain gas. The results are shown on Schedule Nos. 20 and 21(WCSB) and Schedule No. 22 (Northern Rocky Mountain area) of Exhibit No. NB-14. Basically, I established candidates for retirement in direct proportion to the decline in availability. I performed the calculations for each supply area and how they would affect the Northern Border pipeline system.

Q. How did you determine these "major retirements?"

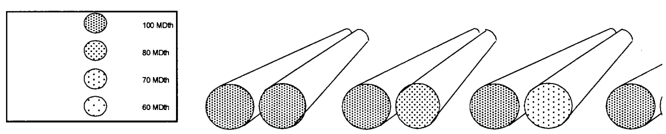
A. I determined the effect that the combined supply areas would have on NB's facilities by assuming that the percentage decline in supply would result in underutilization of NB's facilities at the same extent as other pipelines exporting volumes from Western Canada. The approach I took was to establish major retirements or candidates for major retirement from underutilization of pipeline facilities in direct proportion to the decline in gas availability.

Permanent underutilization of NB's facilities shortens the economic life of the pipeline and will lead to the eventual physical retirement of various facilities prior to the final system closure or abandonment date. My economic life reflects the projected underutilization of NB's facilities due to declines in throughput. It is not necessary that an actual physical retirement take place in order to qualify a facility as underutilized in the determination of the economic life of the Northern Border system. However, certain facilities, such as compressor station equipment may actually be physically retired at points in time closely following underutilization. For example, most of NB's compression facilities are expected to be retired before the final closure date. Nevertheless, economic life is based upon a forecast of the permanent underutilization of NB's facilities. Fairness and intergenerational equity support the concept of projecting declines in throughput to establish permanent underutilization as a part of calculating economic life. Intergenerational equity is nothing more than directly relating cost responsibility to those shippers who will use the pipeline facility. For example, when a compressor unit or a loop line is no longer used on a regular basis, other than for repair or emergency purposes, it should be fully accrued (depreciated). However, such a facility may linger in service for a period of time as an emergency back up; it may be put in mothball status waiting for the appropriate time to physically retire the facility when abandonment is formally approved; or it may simply not be used because it is a component of a larger facility, a portion of which is still used and useful.

An illustration of my underutilization of facilities concept, sometimes referred to in this case as "major retirements", and the economic life concept is found in Schedule No. 23 of Exhibit No. NB-14.

Schedule No.
Exhibit No. NE

**ILLUSTRATIVE EXAMPLE OF THE EFFECTS OF UNDERUTILIZATION ON THE ECONOMIC LFE OF A**




| | | | | |
|---|---|---|---|---|
| **Plant Investment ($)** | 10,000 | 10,000 | 10,000 | 10,000 |
| **Cost of Service ($)** | 1,000 | 900 | 800 | 700 |
| **Depreciation Rate -** | 3.33 | 3.33 | 3.33 | 3.33 |
| **Depreciation Expense ($)** | 333 | 333 | 333 | 333 |
| **Time Period (Years)** | 0 TO 15 | 16 to 18 | 19 to 21 | 22 to 24 |
| **Throughput (MDth)** | 100 | 80 | 70 | 60 |
| **Depr Exp Per MDth** | 3.33 $/MDth | 4.16 $/MDth | 4.76 $/MDth | 5.55 |
| **Cost of Serv Per MDth** | 10 $/MDth | 11.25 $/MDth | 11.43 $/MDth | 11.67 |

| | Depreciation Cost Per MDth |
|---|---|
| 1 | 3.33 |
| 2 | 3.33 |
| 3 | 3.33 |
| 4 | 3.33 |
| 5 | 3.33 |
| 6 | 3.33 |
| 7 | 3.33 |
| 8 | 3.33 |
| 9 | 3.33 |
| 10 | 3.33 |
| 11 | 3.33 |
| 12 | 3.33 |
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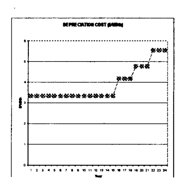
| 18 | 4.16 |



The importance of this concept is avoiding a situation where depreciation dollars per unit of gas service become so high as to be unreasonable.

This occurrence can only be prevented by taking future declines in gas supply availability into account as a part of calculating economic life.

Referring to the cost responsibility concept, one objective in depreciation is that one generation of ratepayers should not pay an inequitable portion of depreciation with respect to another generation of ratepayers.

This same depreciation concept was supported by the Commission in its orders concerning cost responsibility for unused capacity of new pipelines. That is, a generation of ratepayers who use a portion of a pipeline's capacity should not bear responsibility for any unused capacity.

Q. Does underutilization or major retirements actually take place in the gas pipeline industry?

A. Yes. It is my experience, in analyzing the operation and actual retirements of pipeline properties, that such situations in varying degrees take place. In market areas, loss of customer base causes underutilization and eventual retirement from such economic forces. In supply areas, depletion of gas reserves and competition are typical causes of underutilization and eventual retirement. For example, offshore Gulf of Mexico facilities are constantly being retired. Further, on March 9, 2000, Trunkline Gas Company, after exhibiting underutilization on its south Louisiana to Tuscola, Illinois mainline system, retired an entire 700-mile loop line. The reason that the pipeline loop was retired is because of the severe underutilization on Trunkline's mainline system.

Further, other examples exist. Trans-Northern Pipelines Inc. sought, and was granted, abandonment authority by the NEB for its entire Don Valley Lateral to Toronto Harbour. That decision was made as the facility was in a "serious deficit position" due to reduced throughput.

Q. Are there any other examples of major retirements related to supply or throughput deficiencies?

A. There are other examples of major retirements. Florida Gas Transmission Company (Florida Gas) has experienced major retirements of pipeline and compressor facilities in its South Texas Gulf Coast production area due to decreasing gas availability. Specifically, Florida Gas has retired: (1) pipeline facilities located south of its Compressor Station No. 2 and (2) pipeline facilities and Compressor Station No. 2, both located south of Station No. 3 and the Matagorda Offshore Pipeline System interconnect. While the facilities were sold for $2.3 million, a fraction of their replacement cost or original cost, the fact remains that they were no longer useful to Florida Gas' operations.

Another example, but on even a larger scale is the abandonment by CenterPoint Energy – Mississippi River Transmission Corporation ("MRT") (Docket No. CP04-334-000) of 307 miles of its Main Line No. 1, consisting of 22-inch diameter pipeline and other equipment such as compressor engines. While, in the case of this facility, the system was old and, in many places, in need of upgrading, other portions were not old.

This facility was underutilized. An indication of its underutilization is that it was not replaced by MRT.

Another aspect of the economic life component in the determination of depreciation is the capital recovery objective. In addition to providing an adequate opportunity to recoup the investment in pipeline facilities and appropriately matching revenues to the costs of providing gas transportation services, which have already been described, another important factor in establishing depreciation rates is the long-term fairness of the depreciation component. Specifically, the objective in this regard is to minimize intergenerational inequities in the consumption of service value (depreciation).

An important part of regulatory depreciation is the need to maintain long-term intergenerational equity among users of NB's pipeline system. If the recovery of invested capital is unnecessarily deferred, an unfair burden would be placed upon future customers. Inherent in regulatory depreciation is the premise that the ratepayers who are using the pipeline system should pay for its use. If NB's primary depreciation rates remain approximately the same as its current rates, further deferral of the recovery of invested capital will either increase costs to future users of the system or expose NB to potential under-recovery beyond the value of the service that will be consumed in that period.

Thus, as facilities become underutilized due to declining throughput, a depreciation rate which does not take such declines into consideration would result in inequitable treatment of future ratepayers, as the unit cost of depreciation would be many times higher than that for current ratepayers. This is an important concept that must be considered.

The Court of Appeals in the landmark Memphis decision on depreciation emphasized, "Even assuming continued serviceable life, declining use of pipeline facilities might conceivably lead in future years to depreciation dollars per unit of gas so high as to be unreasonable." Memphis Light, Gas and Water v. FPC, 504 F.2d 225, 234 (D.C. Cir. 1974).

Q. Mr. Feinstein, do any other pipelines who rely upon WCSB gas supplies employ 25 to 30 years as the economic life to determine depreciation?

A. Yes, the National Energy Board of Canada authorized depreciation rates for TransCanada, which were directly developed from a 25-year economic life.

Q. Are there examples of retirements for reasons other than supply or throughput deficiencies?

A. Yes. Wear and tear is probably a leading cause of retirement due to physical forces on NB's system. Compressor equipment and meters are subject to such a physical force of retirement.

Population growth is directly and indirectly responsible for many of the maintenance-type capital improvements and related interim retirements on the NB system in various areas. As population density increases, and communities grow closer to NB's pipeline, Class Location changes often dictate the installation of thicker walled pipe. In addition, the growing population requires improvements to the infrastructure to support the additional inhabitants. These infrastructure improvements often take the form of highway widening or the extension or expansion of other utility facilities, which would require the relocation of NB facilities, which were constructed adjacent to existing roadways or in utility easements to minimize environmental disturbance.

Q. Please discuss how you evaluated and included the increment of negative salvage in your depreciation analysis.

A. As I stated earlier in my testimony, net salvage is an integral element in the analysis of depreciation. If the net salvage is positive, then the difference between gross plant in service and the reserve for depreciation (referred to as net plant) must be decreased in order to compensate for a smaller depreciable base to be recouped. However, if the net salvage is negative, the depreciable net plant must be increased in order to allow for the recoupment of such a capital cost component.

The vast majority of the items retired during the most recent 10-year period were transmission plant facilities. The difference between the gross salvage value and the cost of removal was clearly negative. That is, for many retirements, the cost of removal exceeded the gross salvage value. I estimated that the average net salvage, as a percent of the cost of the facility retired for the period ranged from negative 5 to negative 20 percent. Thus, on average, for every dollar of plant retired, the company is actually "out-of-pocket" certain funds, without recognition of negative salvage costs.

Q. Did you build negative salvage into your depreciation calculations?

A. No, I did not. I treated negative salvage separate from the depreciation calculation. The depreciation calculation is for capital recovery only.

## VII. THE DETERMINATION OF DEPRECIATION FOR THE NB SYSTEM

**The Straight Line Remaining Life Approach**

Q. How did you apply the 26-year economic life to the depreciation model?

A. The 26-year economic life plays a key role in the determination of the ARL (average remaining life). It represents the average year of the final recoupment of NB's investment in its facilities as an overall group. The best way to describe the relationship of the economic life to the ARL is to overlay it with the normal retirement survivor curve.

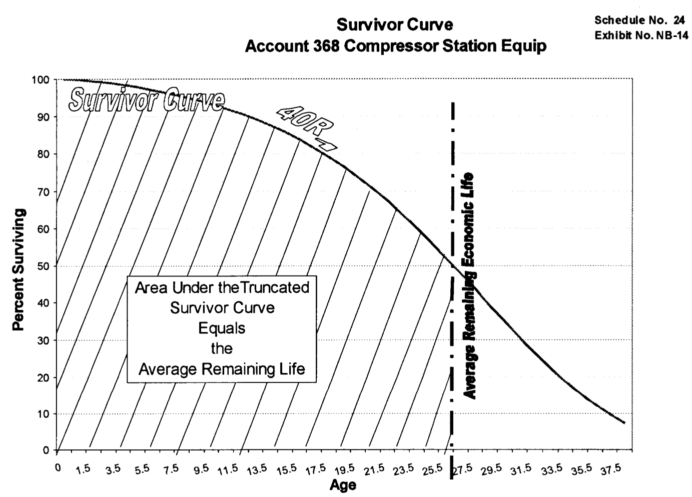
Q. Please describe how you determined the normal retirement survivor curve.

A. The survivor curve represents the pattern of annual normal retirements that will occur over time for property of a certain character. I determined the normal retirement curve for each of NB's transmission accounts. For example, I determined that Account 367 (Mains) has an average service life of 60 years, with an $R_1$ survival pattern. Mains make up about 80 percent of NB's mainline transmission system. My analysis began with a Iowa-type survivor curve determination utilizing the Simulated Plant Record (SPR) method. The SPR is a method which, depending upon the quality of the plant balance and retirement data, can accurately portray a survivor curve based upon historical retirements. There are two methods of determining a survivor curve from historical plant data. The SPR method is one. The other is the actuarial method. The actuarial method determines a survivor curve based upon the assembly of historical retirements categorized by the year in which it first went into service. The SPR method establishes a survivor curve based upon the curve which best compares to the actual plant retirements and, surviving plant balances. One important point concerning a survivor curve developed from historical retirements is that it is only as good as the data it assembles. For example, heavy reliance on the shape and average service life of a “stub curve” would not be prudent. A “stub curve” may represent only 10 percent as the amount of plant retirement experience. This is not enough from which to conclude a specific curve. In such cases, I also rely upon an analysis of the type of equipment, its usage and condition, as well as its age and survivor curve retirement patterns that are typical in the industry of such facilities. For the Mains account, the 60 $R_1$ survivor curve is shown on Exhibit No. NB-14, Schedule No. 3. I determined the survivor curve and resulting average service life which best applies for each of the other accounts as follows:

| Account No. | Description | Average Service Life | Survivor Pattern |
|---|---|---|---|
| 365.2 | Rights-of-way | 60 | $R_1$ |
| 366 | Structures | 34 | $R_2$ |
| 368 | Compressor Sta. Equip. | 40 | $R_1$ |
| 369 | Meas. & Reg. Sta. Equip. | 31 | $R_2$ |
| 370 | Communication Equip. | 10 | $R_1$ |

Q. What is the next step in your analysis?

A. When the economic life is applied to the survivor pattern, future normal retirements beyond 26 years are not relevant. The average remaining life is determined by integrating or calculating the area under the truncated survivor curve. This calculation is shown in conceptual form in Schedule No. 24 of Exhibit No. NB-14.




For the transmission mains, the ARL was determined to be 23.8 years. Similar determinations were made for the rest of the accounts in the transmission function. ARL is a function of both physical life and economic life. This is shown on the diagram in Schedule No. 4 of Exhibit No. NB-14.

Q. Would you please explain the mechanics of your calculation of the depreciation rate for the transmission plant?

A. After determining the individual ARLs for each account, I then divided each ARL into the difference between the depreciable plant and the accumulated reserve for depreciation, thus arriving at the indicated depreciation expense. The indicated depreciation expense for each account was totaled. This then is the indicated depreciation expense for the total transmission plant. The results of my calculation of the indicated composite depreciation rate for the total transmission plant is shown on Schedule No. 25 of Exhibit No. NB-14.

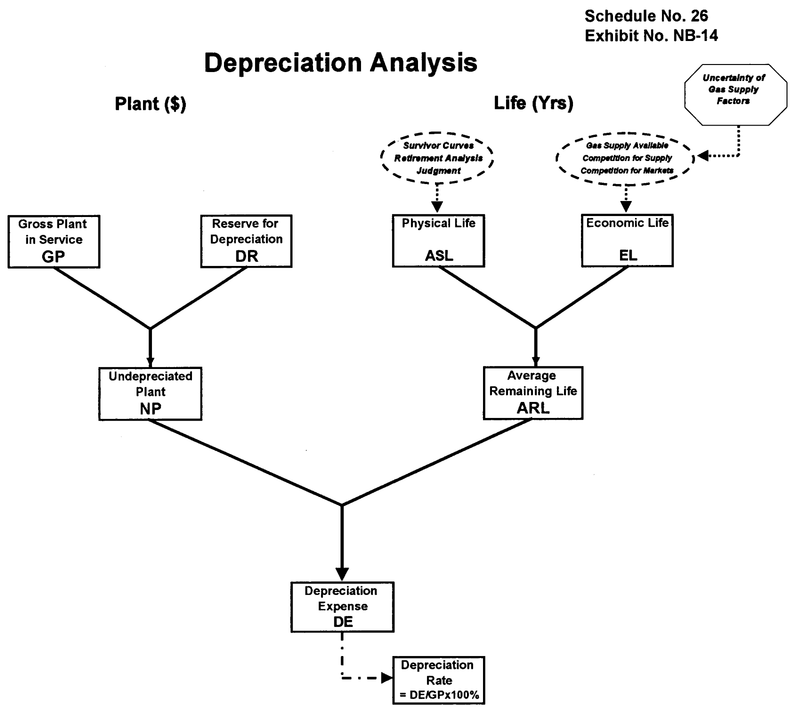
Schedule No. 25
Exhibit No. NB-14

**NORTHERN BORDER PIPELINE COMPANY**

**DETERMINATION OF THE DEPRECIATION RATE**
**TRANSMISSION PLANT**
Economic Life -- 26 years

| | Account No. | Description | Gross Depreciable Plant Investment 7/31/2005 $ | Accumulated Reserve for Depreciation 7/31/2006 $ | Net Depreciable Plant 7/31/2007 $ | Average Remaining Life Years | Indicated Depreciation Expense $ | Depreciation Rate % |
|---|---|---|---|---|---|---|---|---|
| | | *Transmission Plant - Onshore* | | | | | | |
| 2005 | 365.2 | Rights-of-Way | 3,680,068 | 1,130,899 | 2,549,169 | 25.0 | 101,967 | |
| | 366.1 | Structures - Compressor Station | 23,539,977 | 7,892,986 | 15,646,991 | 20.6 | 759,563 | |
| | 366.2 | Structures - M&R Station | 1,949,990 | 973,042 | 976,948 | 17.5 | 55,826 | |
| | 366.3 | Structures - Other | 17,762,893 | 8,047,780 | 9,715,113 | 18.6 | 522,318 | |
| | 367 | Mains | 1,861,355,297 | 747,425,733 | 1,113,929,564 | 23.8 | 46,803,763 | |
| | 368 | Compressor Stations | 357,404,904 | 83,155,729 | 274,249,175 | 22.6 | 12,134,919 | |
| | 369 | Meas. & Regulating Sta. Equip. | 40,456,160 | 12,523,130 | 27,933,030 | 20.1 | 1,389,703 | |
| | 370 | Communication Equipment | 31,669,008 | 15,138,672 | 16,530,336 | 10.0 | 1,653,034 | |
| | 371 | Other Equipment | - | | | | | |
| | | Subtotal | 2,337,818,297 | 876,287,971 | 1,461,530,326 | | 63,421,092 | |
| | | Additions | 160,000,000 | - | 160,000,000 | 26.5 | 6,037,736 | |
| | | Retirements | 4,000,000 | (4,000,000) | - | | | |
| | | Total | 2,493,818,297 | 872,287,971 | 1,621,530,326 | | 69,458,828 | 2.79 |
| 2006 | 365.2 | Rights-of-Way | 3,680,068 | 1,232,865 | 2,447,203 | 24.2 | 101,124.08 | |
| | 366.1 | Structures - Compressor Station | 23,539,977 | 8,652,549 | 14,887,428 | 19.8 | 751,890.32 | |
| | 366.2 | Structures - M&R Station | 1,949,990 | 1,028,868 | 921,122 | 16.7 | 55,157.01 | |
| | 366.3 | Structures - Other | 17,762,893 | 8,570,098 | 9,192,795 | 17.8 | 516,449.17 | |
| | 367 | Mains | 1,861,355,297 | 794,229,496 | 1,067,125,801 | 23 | 46,396,773.95 | |
| | 368 | Compressor Stations | 357,404,904 | 95,290,648 | 262,114,256 | 21.8 | 12,023,589.71 | |
| | 369 | Meas. & Regulating Sta. Equip. | 40,456,160 | 13,912,833 | 26,543,327 | 19.3 | 1,375,301.92 | |
| | 370 | Communication Equipment | 31,669,008 | 16,791,706 | 14,877,302 | 9.1 | 1,634,868.38 | |
| | 371 | Other Equipment | - | - | - | | | |
| | | Total Plant Additions (2005-2006) | 320,000,000 | 6,037,736 | 313,962,264 | 25.7 | 12,216,431 | |
| | | Total Plant Retirements (2005-2006) | 8,000,000 | | | | | |
| | | Total | 2,649,818,297 | 945,746,799 | 1,712,071,498 | | 75,071,585.04 | 2.83% |
| 2007 | 365.2 | Rights-of-Way | 3,680,068 | 1,333,989 | 2,346,079 | 23.4 | 100,259.77 | |
| | 366.1 | Structures - Compressor Station | 23,539,977 | 9,404,439 | 14,135,538 | 19.0 | 743,975.68 | |
| | 366.2 | Structures - M&R Station | 1,949,990 | 1,084,025 | 865,965 | 15.9 | 54,463.21 | |
| | 366.3 | Structures - Other | 17,762,893 | 9,086,547 | 8,676,346 | 17 | 510,373.29 | |
| | 367 | Mains | 1,861,355,297 | 840,626,270 | 1,020,729,027 | 22.2 | 45,978,785.00 | |
| | 368 | Compressor Stations | 357,404,904 | 107,314,238 | 250,090,666 | 21 | 11,909,079.33 | |
| | 369 | Meas. & Regulating Sta. Equip. | 40,456,160 | 15,288,135 | 25,168,025 | 18.5 | 1,360,433.79 | |
| | 370 | Communication Equipment | 31,669,008 | 18,426,574 | 13,242,434 | 8.2 | 1,614,930.96 | |
| | 371 | Other Equipment | - | - | - | | | |
| | | Total Plant Additions (2005-2007) | 640,000,000 | 18,254,166 | 621,745,834 | 24.9 | 24,969,712 | |
| | | Total Plant Retirements (2005-2007) | 16,000,000 | | | | | |
| | | Total | 2,961,818,297 | 1,020,818,384 | 1,956,999,913 | | 87,242,013.23 | 2.95% |
| | | Composite Depreciation Rate = | | | | | | 2.84% |

The indicated rate for the transmission plant is 2.84 percent. The procedure in determining the depreciation is illustrated in the diagram shown in Schedule No. 26 of Exhibit No. NB-14.




Q. Please continue.

A. In order to reflect near-term plant additions and retirements for purposes of rate stability, I performed the calculation of depreciation for a period of three years beginning in 2005 and ending in 2007. This is also shown on Schedule No. 25 of Exhibit No. NB-14. I then calculated the indicated depreciation rate by dividing the total indicated 3-year expense by the depreciable plant.

Schedule No. 25 of Exhibit No. NB-14 shows the gross plant balances for the transmission plant for depreciation determination purposes.

Q. Please discuss the accumulated reserve for depreciation used in your rate determination.

A. I determined a theoretical reserve for depreciation for each account for calculation purposes, all the while maintaining the actual total booked reserve figure. The reserve for depreciation for the transmission function is shown on Schedule No. 25 of Exhibit No. NB-14.

Q. Mr. Feinstein, why is the depreciation rate of 2.84 percent (transmission plant) based on the straight-line method?

A. The straight-line remaining life approach allocates the capital recovery in equal installments over the applicable useful service life. In this approach, I determined the remaining economic life in years by a concise analysis of the life of the supply. I believe this method is the one which most reasonably allocates NB's investment over its useful life.

**Depreciation Rate for General Plant**

Q. What accounts make up the general plant?

A. The general plant is made up of the following accounts:

| Account No. | Description |
|---|---|
| 390 | Structures and Improvements |
| 391 | Office Furniture & Equip. |
| 392 | Transportation Equipment |
| 394 | Tools, Shop and Garage Equip. |
| 396 | Power Operated Equipment |
| 397 | Communication Equipment |

Q. What is your recommendation of depreciation rates for the general plant depreciable assets?

A. Based on my analysis, I believe the current depreciation rates are reasonable.

Schedule No. 27
Exhibit No. NB-14

**General Plant Depreciation**
**Recommended Depreciation Rates**

| Account Number | Description | Depreciation Rate % |
|---|---|---|
| 390 | Structures and Improvements | Term of Lease |
| 391 | Office Furniture and Equipment | 10 |
| 391 | Computer Equipment | 20 |
| 392 | Transportation Equipment | 20 |
| 394 | Tools, Shop, and Garage Equipment | 10 |
| 396 | Power Operated Equipment | 20 |
| 397 | Communication Equipment | 10 |

My analysis is based on discussions with NB personnel, as well as the experience of similar properties of other pipeline companies. The determination of the above depreciation rates differs from the mechanics employed for the transmission plant. Because of the high turnover rate of the facilities in the general plant, the whole life method, also referred to as the average service life method, was used to determine depreciation instead of the remaining life method. The reason for this treatment is that the turnover rate for general plant facilities is so much higher than that of the transmission plant.

**Negative Salvage Rate**

Q. Please explain the term “negative salvage.”

A. Negative salvage is the net amount of funds necessary to retire a specific facility or group of facilities. It is the difference between the gross salvage, if any, and the cost of removal. Gross salvage may be in the form of value of the facilities stored in a warehouse for reuse or the proceeds from a sale of such facilities.

Q. What is a negative salvage rate?

A. A negative salvage rate is the annual rate, as a percent of the gross plant subject to retirement that will accrue enough funds in an orderly and fair manner to cover the cost of retirement. I used the same straight line remaining life method that I employed to determine the depreciation rates to accrue negative salvage funds.

The negative salvage rate reflects the future obligation of removal when the plant is retired. Like depreciation, the cost of retiring facilities is a legitimate cost of doing business. It is both reasonable and necessary for the ratepayers who are receiving service from these facilities to fund the additional costs of retirements through negative salvage depreciation rates. To ensure that an adequate reserve will be on hand to decommission the facilities when they are retired, and to restore the land, I recommend that NB propose to collect such an amount in rates over the estimated remaining useful life of its plant. Failing to include such an expense in current rates will force a subsequent generation of ratepayers to subsidize service provided to current ratepayers, or could impose on the company the cost even though it is the natural result of service being provided today. Furthermore, a negative salvage allowance requires current ratepayers to pay the full cost of using these facilities by bearing their fair share of these costs.

Q. What determines the manner in which abandonment takes place?

A. Authorization under Section 7 of the Natural Gas Act for the abandonment of natural gas facilities provides for actions that require an environmental assessment by the FERC (see 18 C.F.R. § 380.5 (2001)). It is this process which establishes abandonment authorization. This places a monetary burden on NB to decommission its facilities correctly and restore the land to its original condition.

Q. In your view, will NB's facilities eventually be decommissioned?

A. NB's pipeline facilities will have to be decommissioned. Pipeline facilities eventually wear out, become obsolete or uneconomic. This fact is demonstrated by my plant retirement and survivor curve analysis, which reflects retirements due to physical causes and my discussion of pipeline retirements.

Q. What did you calculate NB's negative salvage rate to be and how did you determine that rate?

A. I analyzed NB's historical retirements, obtained information from company personnel and reviewed the experiences of other companies. I found that the cost of removal will out-pace any gross salvage received for such retirements. Based on that analysis, I determined a composite transmission plant net negative salvage rate to be 0.59 percent.

Q. Can you provide a more detailed description of your determination?

A. My determination of the appropriate negative salvage rate began by familiarizing myself with NB witness Halpin's terminal salvage and cost of removal study for NB.

My determination of the negative salvage rate is a combination of two distinct annual negative salvage accrual calculations – interim negative salvage and terminal negative salvage. The negative salvage rate is the quotient of the annual negative salvage accruals, divided by the gross plant. I determined the negative salvage base for the ongoing normal, interim retirements separately from the major retirements and final closure (terminal negative salvage), because each has an associated average life different from the other.

Normal retirements will occur from 2004 for a period of an average of 26 years. The remaining facilities will be subject to the final closure at the 26-year average remaining economic life. I determined the retirements for each plant account from the same survivor curves that I developed earlier for depreciation purposes. Recall that the survivor curve is actually a graphic representation of normal retirements over a period of time. The 26-year period of interim retirements for each account is shown on Schedule No. 28 of Exhibit No. NB-14. I combined all the interim retirements and determined a weighted average remaining life of 14.52 years that would apply as the average period of time to accrue the negative salvage for the interim retirements. This is also shown on Schedule No. 28 of Exhibit No. NB-14.

Schedule No. 28
Exhibit No. NB-14

**Northern Border Pipeline Company**

**Transmission Plant**
DETERMINATION OF THE AVERAGE REMAINING LIFE OF INTERIM NEGATIVE SALVAGE

| | | Normal Retirements | | | | Estimated | Number of | Weight |
|---|---|---|---|---|---|---|---|---|
| | | Acct 367 | Acct 368 | Acct 369 | Total | Negative Salvage | Years Remaining in Service | |
| 1 | 2005 | 3,687,840 | 9,516,654 | 492,727 | 13,697,221 | 1,047,856 | 0.5 | 6,848,611 |
| 2 | 2006 | 4,002,460 | 10,853,227 | 550,597 | 15,406,284 | 1,156,159 | 1.5 | 23,109,425 |
| 3 | 2007 | 4,358,072 | 12,014,961 | 607,032 | 16,980,064 | 1,266,308 | 2.5 | 42,450,161 |
| 4 | 2008 | 4,743,013 | 12,923,893 | 659,566 | 18,326,471 | 1,373,372 | 3.5 | 64,142,649 |
| 5 | 2009 | 5,120,263 | 13,505,510 | 705,759 | 19,331,533 | 1,467,965 | 4.5 | 86,991,898 |
| 6 | 2010 | 5,535,981 | 13,722,710 | 742,881 | 20,001,573 | 1,556,734 | 5.5 | 110,008,650 |
| 7 | 2011 | 5,987,079 | 13,742,975 | 768,830 | 20,498,884 | 1,643,729 | 6.5 | 133,242,745 |
| 8 | 2012 | 6,441,786 | 13,668,356 | 782,168 | 20,892,311 | 1,726,006 | 7.5 | 156,692,330 |
| 9 | 2013 | 6,934,456 | 13,503,999 | 784,360 | 21,222,815 | 1,810,194 | 8.5 | 180,393,925 |
| 10 | 2014 | 7,466,563 | 13,268,578 | 780,734 | 21,515,876 | 1,898,186 | 9.5 | 204,400,817 |
| 11 | 2015 | 7,994,129 | 12,975,584 | 772,907 | 21,742,620 | 1,982,792 | 10.5 | 228,297,508 |
| 12 | 2016 | 8,563,264 | 12,635,135 | 761,792 | 21,960,191 | 2,072,800 | 11.5 | 252,542,198 |
| 13 | 2017 | 9,183,052 | 12,247,301 | 748,643 | 22,178,997 | 2,170,097 | 12.5 | 277,237,457 |
| 14 | 2018 | 9,810,455 | 11,821,141 | 733,722 | 22,365,317 | 2,267,260 | 13.5 | 301,931,786 |
| 15 | 2019 | 10,466,594 | 11,361,917 | 717,051 | 22,545,562 | 2,368,255 | 14.5 | 326,910,649 |
| 16 | 2020 | 11,185,308 | 10,863,885 | 698,920 | 22,748,112 | 2,479,056 | 15.5 | 352,595,744 |
| 17 | 2021 | 11,900,959 | 10,346,573 | 679,277 | 22,926,808 | 2,588,425 | 16.5 | 378,292,337 |
| 18 | 2022 | 12,674,037 | 9,800,753 | 658,271 | 23,133,061 | 2,707,003 | 17.5 | 404,828,566 |
| 19 | 2023 | 13,515,424 | 9,240,071 | 636,012 | 23,391,506 | 2,837,181 | 18.5 | 432,742,870 |
| 20 | 2024 | 14,330,967 | 8,666,252 | 612,810 | 23,610,030 | 2,962,124 | 19.5 | 460,395,588 |
| 21 | 2025 | 15,227,076 | 8,083,911 | 588,568 | 23,899,555 | 3,101,105 | 20.5 | 489,940,879 |
| 22 | 2026 | 16,178,595 | 7,500,321 | 563,661 | 24,242,578 | 3,249,889 | 21.5 | 521,215,419 |
| 23 | 2027 | 17,131,318 | 6,917,274 | 537,986 | 24,586,578 | 3,398,753 | 22.5 | 553,198,005 |
| 24 | 2028 | 18,160,771 | 6,341,620 | 511,832 | 25,014,223 | 3,561,554 | 23.5 | 587,834,248 |
| 25 | 2029 | 19,254,679 | 5,775,784 | 485,274 | 25,515,737 | 3,736,171 | 24.5 | 625,135,557 |
| 26 | 2030 | 20,326,840 | 5,228,853 | 458,596 | 26,014,288 | 3,907,416 | 25.5 | 663,364,356 |
| 27 | 2031 | 21,499,923 | 4,694,385 | 431,878 | 26,626,185 | 4,097,193 | 26.5 | 705,593,903 |
| 28 | 2032 | 22,714,474 | 4,187,533 | 405,087 | 27,307,094 | 4,295,249 | 27.5 | 750,945,082 |
| 29 | 2033 | 23,913,710 | 3,703,121 | 378,736 | 27,995,568 | 4,491,309 | 28.5 | 797,873,685 |
| 30 | 2034 | 25,194,180 | 3,249,834 | 352,494 | 28,796,508 | 4,702,946 | 29.5 | 849,496,981 |
| 30 Year Total | | 363,503,267 | 292,362,111 | 18,608,172 | 674,473,550 | 77,923,086 | 16.26 | 10,968,654,030 |
| 26 Year Total | | 270,180,981 | 276,527,237 | 17,039,977 | 563,748,196 | 60,336,389 | 13.95 | 7,864,744,379 |
| 27 Year Total | | 291,680,903 | 281,221,622 | 17,471,855 | 590,374,381 | 64,433,582 | 14.52 | 8,570,338,282 |
| 24 Year Total | | 230,599,463 | 265,522,600 | 16,096,107 | 512,218,170 | 52,692,803 | 12.84 | 6,576,244,465 |

After I determined the future annual normal or interim retirements for each account that would be affected by negative salvage, I then applied various net negative salvage values ranging from 5 to 20 percent as factors to the anticipated facility retirements. These factors are supported by observation of NB's historical retirement experience referred to earlier, discussion with NB operating personnel and the experience of other pipeline companies.

I adjusted NB Witness Halpin's total negative salvage estimate to reflect the fact that some of the facilities will not be retired at final closure, but as normal (interim) retirements over a previous period of time. The difference between NB Witness Halpin's negative salvage estimate and that for the interim retirements represents the negative salvage at the final closure. This is shown on Schedule No. 29 of Exhibit No. NB-14. The 26-year average economic life was applied to the final closure estimate. I then created a composite of the 26-year accrual period for the final closure with the 13.95-year accrual period for the interim retirements to arrive at an average period of 23.77 years. This is shown on Schedule No. 30 of Exhibit No. NB-14.

Schedule No. 30
Exhibit No. NB-14

**Northern Border Pipeline Company**

**Transmission Plant**

**AVERAGE REMAINING LIFE OF NEGATIVE SALVAGE OF PLANT SUBJECT TO RETIREMENT**

| | Net Negative Salvage Cost | Average Number of Years to Retirement | Weight | |
|---|---|---|---|---|
| | | | Direct | Reciprical |
| | $ | Years | | |
| Interim Retirements | 60,336,389 | 13.95 | 841,741,546 | 4,324,937.83 |
| Final Closure | 264,962,972 | 26 | 6,889,037,268 | 10,190,883.53 |
| Total and Composite Direct Wt. | 325,299,361 | 23.77 | 7,730,778,814 | 14,515,821.37 |
| Reciprical Wt. | | 22.41 | | |

The 23.77 years is the result of direct weighting of the net negative salvage cost and the number of years to retirement. When they are reciprocally weighted, the result is 22.41 years. I employed direct weighting in order to be consistent with other direct weighting factors.

Q. Can you describe the mathematical calculations used to determine the negative salvage rate?

A. Schedule No. 31 of Exhibit No. NB-14 shows the calculation of the negative salvage rate for NB's transmission plant. I divided the estimated amount of negative salvage by the accrual period of 23.77 years. I then divided that quotient by the transmission plant in service to arrive at 0.59 percent.

Schedule No. 31
Exhibit No. NB-14

**Northern Border Pipeline Company**

**DETERMINATION OF NEGATIVE SALVAGE RATE**
**Transmission Plant**

| | | |
|---|---|---|
| 1 | Total Depreciable Transmission Plant ($) | 2,337,818,297 |
| 2 | Negative Salvage ($) | 325,299,361 |
| 3 | Accumulated Reserve for Negative Salvage ($) | - |
| 4 | Unaccrued Negative Salvage ($) | 325,299,361 |
| 5 | Average Remaining Life (Years) | 23.8 |
| 6 | Annual Accrual ($) | 13,688,100 |
| 7 | Negative Salvage Rate (%) | 0.59% |

Q. How do you recommend net salvage be reflected for accounting purposes?

A. I recommend that NB establish a sub-account for negative salvage in Account 108, Accumulated Provision for Depreciation of Gas Utility Plant. Negative salvage accruals and net salvage (gross salvage and cost of removal) will be recorded in this sub-account. This treatment will enable the negative salvage accruals and the actual net salvage costs resulting from retirements to be identified separately, apart from the accumulated depreciation accruals.

Q. What is the reason for creating this sub-account?

A. There are two reasons for it. First, a sub-account allows the negative salvage reserve to be reviewed periodically with ease. This allows the detection of deficiencies or excesses in the accumulated reserve. Second, when negative salvage accruals and net salvage costs from retirements are reflected in the depreciation reserve, such reserve is distorted by the negative salvage amounts. This obscures the data in the reserve when making capital recovery depreciation analyses. Inflation, environmental and political considerations may result in future negative salvage costs that may differ from today's estimates.

Q. Based on your analysis, what did you determine NB's net negative salvage for each dollar of plant retired to be?

A. Analysis of NB's operations, facility configuration, and actual retirements indicates future retirements will result in a cost of removal in excess of any gross salvage for such facilities. I expect that NB will average approximately 5 to 20 percent net negative salvage for each dollar of plant retired.

Q. Mr. Feinstein, would you please summarize your testimony?

A. The purpose of my testimony is to determine the just and reasonable rates of depreciation for the depreciable facilities belonging to Northern Border Pipeline Company. To do so, I have analyzed the tangible properties and operations of its pipeline system and estimated its average remaining life. I concluded that the remaining economic life of NB's pipeline system is 25 to 30 years (I employed an average remaining life of 26 years), and I developed a composite depreciation rate of 2.84 percent for transmission plant. Further, I determined a separate rate of 0.59 percent to cover the accrual for negative salvage expense.

Q. Does this conclude your prepared direct testimony?

A. Yes, it does.