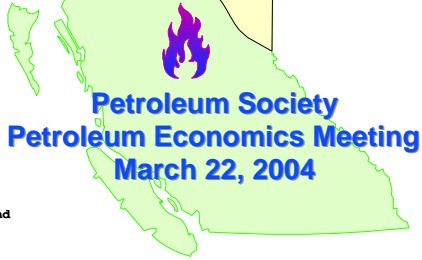


**NORTHEAST BRITISH COLUMBIA
NATURAL GAS
HISTORICAL DISCOVERY TRENDS
JANUARY 1990 TO DECEMBER 31, 2002**



**Petroleum Society
Petroleum Economics Meeting
March 22, 2004**



- ▶ For the presentation I will review the gas resource base as of December 31, 2002, and illustrate the historical trends that can be used to make projections for the future.
- ▶ I will examine in more detail the period from 1990 to 2002.
- ▶ The historical record suggests this period may reflect what reserves additions could be added in the next 10 to 12 years.
- ▶ And I will present one possible forward projection to the year 2015.

**PRESENTATION ON B.C. NATURAL GAS
HISTORICAL TRENDS AND PROJECTION TO 2014**

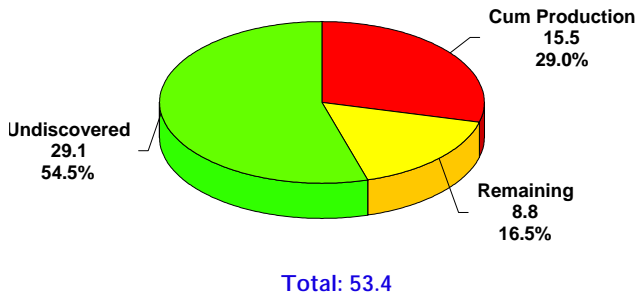
- ▶ Review historical record and current resource base as of Dec 31, 2002.
- ▶ Review the discovery record, reserves additions and production for the period 1990 to 2002.
- ▶ Projection to 2014.
- ▶ Comparisons - Alberta & NWT

**N.E. BRITISH COLUMBIA NATURAL GAS
DECEMBER 31, 2002**

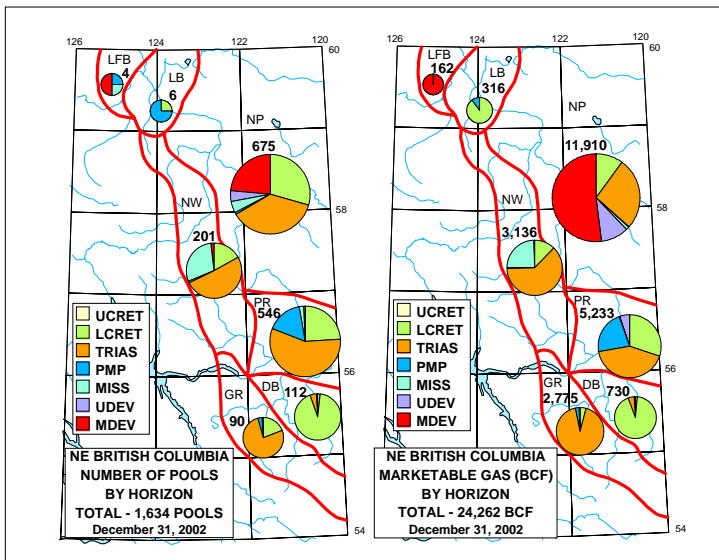
- ▶ 1,634 GAS POOLS
- ▶ GAS-IN-PLACE - 39.1 TCF
- ▶ INITIAL MARKETABLE GAS - 24.3 TCF
- ▶ REMAINING MARKETABLE GAS - 8.8 TCF
- ▶ AVERAGE POOL SIZE - 14.8 BCF
- ▶ MEDIAN POOL SIZE - 2.7 BCF
- ▶ 95th PERCENTILE - 52.6 BCF

- ▶ As of December 31, 2002, reserves have been assigned to 1,634 pools, with gas-in-place of 39.1 Tcf, and initial marketable gas reserves of 24.3 Tcf.
- ▶ Remaining marketable gas reserves are 8.8 Tcf
- ▶ The overall average pool size is 14.8 Bcf.
- ▶ The median is 2.7 Bcf, that is half the pools discovered are greater and half smaller than 2.7 Bcf.
- ▶ The 95th percentile is 52.6 Bcf, 5%, or 82 pools are larger than 10.9 Bcf.

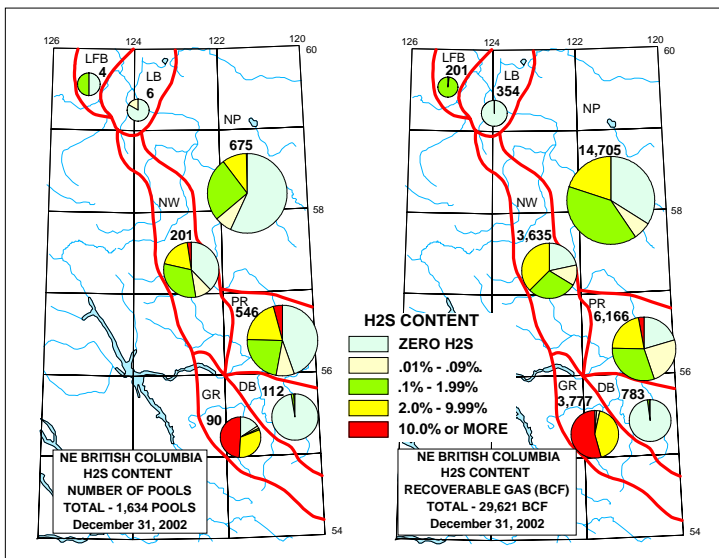
NORTHEAST BRITISH COLUMBIA ULTIMATE MARKETABLE GAS (Trillion Cubic Feet)



- ▶ The distribution of the ultimate marketable gas, as of year-end 2002 is shown in this pie chart.
- ▶ My current estimate of the ultimate marketable gas resource is 53.4 Tcf.
- ▶ The current NEB estimate is 51 Tcf.
- ▶ Cumulative production to year end 2002 is 15.5 Tcf, 29% of the total.
- ▶ Remaining marketable gas reserves are 8.8 Tcf (16%)
- ▶ The estimated undiscovered marketable gas resource is 29.1 Tcf, or 55% of the total resource.

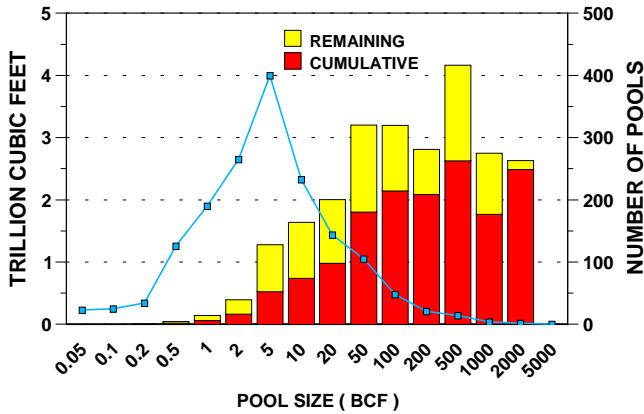


- ▶ The maps show the number of pools and volumes of marketable gas by stratigraphic horizon for each of the structural areas, as of Dec. 31, 2002.
- ▶ The structural areas are for the Plains, Deep Basin, Peace River Arch, Northern Plains, and Liard Basin. The Foothills include the Grizzly Foothills, Northwest Foothills, and Liard Fold Belt.
- ▶ The largest number of pools and volume of initial marketable gas is in the Northern Plains, which is dominated by the Middle Devonian.
- ▶ The dominant stratigraphic horizon is the Triassic, with significant numbers and volumes of marketable gas in the Grizzly Foothills, Northwest Foothills, Peace River Arch and Northern Plains.



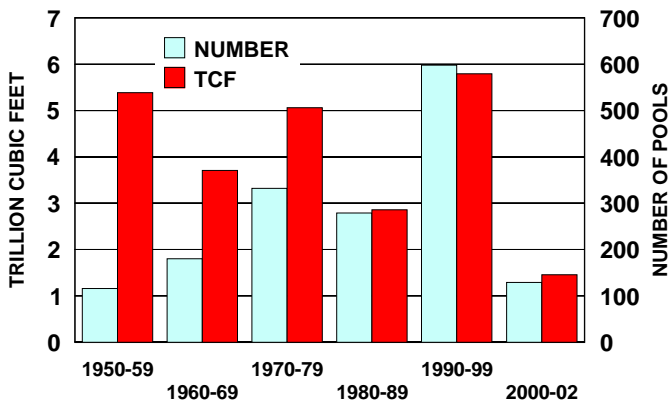
- ▶ These two maps show the distribution of H₂S by Structural Area.
- ▶ The higher concentrations of H₂S is in the Grizzly Foothills where about half the pools, and over half the recoverable gas has concentrations greater than 10%.
- ▶ The lowest concentrations are in the Deep Basin and Liard Basin. However the deeper horizons in these areas are relatively unexplored.

B.C. POOL SIZE DISTRIBUTION MARKETABLE GAS



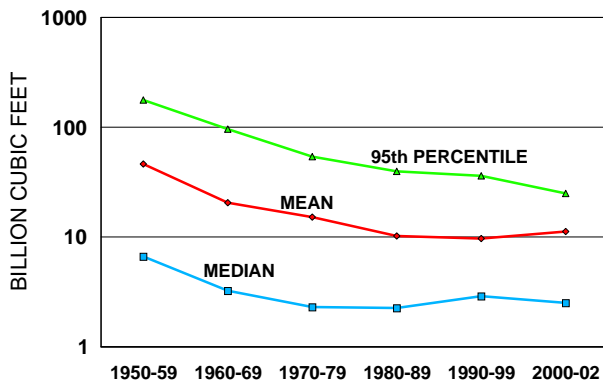
- ▶ The pool size distribution of marketable gas shows the largest numbers of pools are in the small size classes, with the largest number (the mode) in the size range of 2 to 5 Bcf.
- ▶ The largest volumes are in the larger pool sizes, with the largest volume in the 200 to 500 Bcf range.
- ▶ The greater percentage of remaining marketable gas is in the smaller pool sizes.
- ▶ The class sizes used are approximately lognormal, as I prefer units of 1,2,5,etc rather than statistically correct log base 2 intervals of 1,2,4,8,16,etc.

B.C.- MARKETABLE GAS BY DECADE DISCOVERED



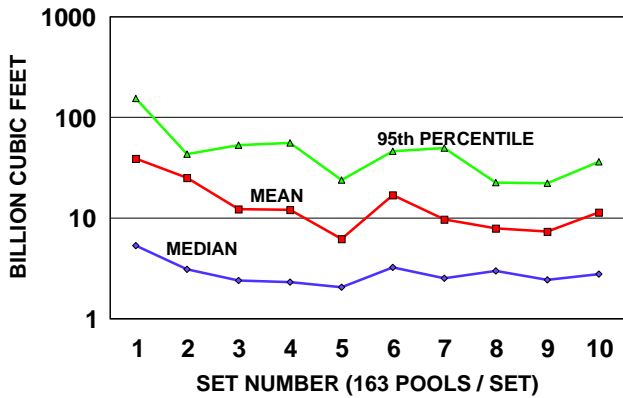
- ▶ The historical discovery record has been examined by decade of discovery. Number of pools per decade are increasing and volumes of discovered gas per decade are quite variable.
- ▶ The decade with the largest number of pools and volume of marketable gas discovered was the 1990's.
- ▶ The historical period most pertinent to the immediate future is that of the period 1990 to 2002. The trends of this period are a good forecast of what could occur in the next 5 to 10 years.
- ▶ 30 percent of the initial marketable gas was discovered in the period 1990-2003 in 45% of the total pools.

B.C.- INITIAL MARKETABLE GAS POOL SIZE BY DECADE DISCOVERED



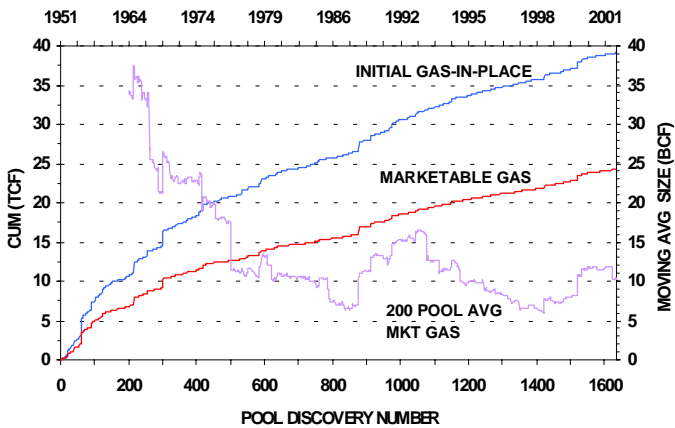
- ▶ This slide shows the mean, median and 95th percentile pool sizes by decade.
- ▶ The sizes have decreased from the 1950s, however the more recent years show a flattening trend with possibly a slight increase in the mean for the period 1990 to 2002.

B.C. INITIAL MARKETABLE GAS POOL SIZES IN SETS BY DISCOVERY SEQUENCE



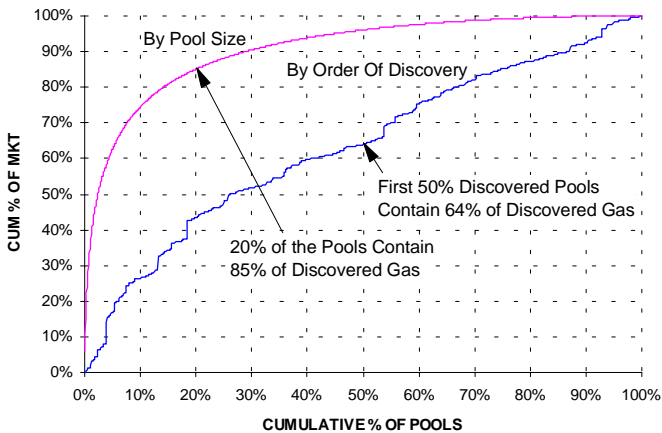
- ▶ The discovery sequence is examined by dividing the pool population into 10 sets by chronological order of discovery and statistics calculated for each set. This methodology has been adopted from Kronman, et al, 1995.
- ▶ The overall discovery trend, and in particular the last set of discoveries can be used as a guide to the size of future discoveries.
- ▶ When examined by decade, the mean pool size has declined steadily. However, when examined by equal sets of discovered pools, it has been relatively constant to a slight increase for the last three sets, each with 163 pools.
- ▶ The values for the last 10% are mean of 11.4 Bcf, median of 2.8 Bcf, and 95th percentile 36.4 Bcf. Projection of these values suggests 1.4 Tcf to be found in the next 500 pools, with 25 pools greater than 36.4 Bcf.

BRITISH COLUMBIA CUMULATIVE GAS DISCOVERY PLOT



- ▶ This is a cumulative discovery history chart (creaming curve) for initial gas-in-place and marketable gas. There is an initial sharp increase as the larger pools are discovered early and then a later decrease in the slope. The most recent years do show a rather constant addition of reserves with discovery.
- ▶ A 200 pool moving average shows the change through time of the overall average pool size. Note there is a sharp rise for the last 200 pools, due to the Ladyfern discovery. The average for the last 200 pools is 10.3 Bcf.

BRITISH COLUMBIA - CUMULATIVE PERCENT MARKETABLE GAS vs NUMBER OF POOLS

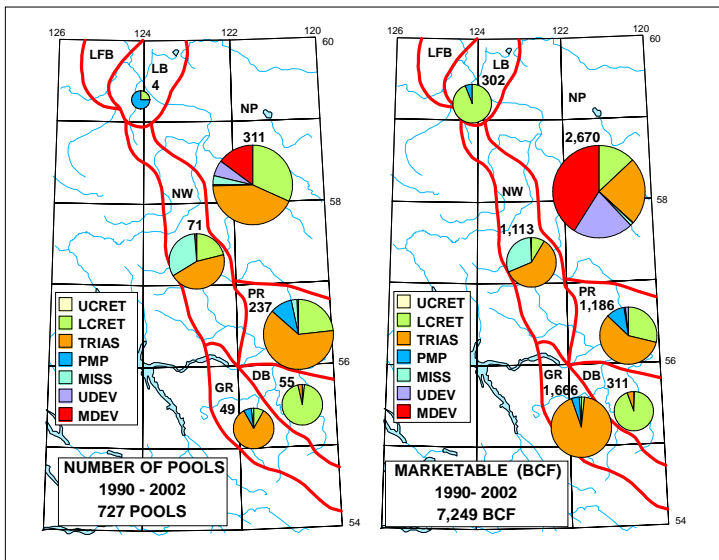


- ▶ This is the marketable gas cumulative discovery history plotted on a percentage basis.
- ▶ The bottom curve is the actual discovery sequence and the top curve is the pools ordered by size.
- ▶ By the time 50% of the pools were discovered, they contained 64% of the initial marketable gas (December 31, 2002). A perfect discovery sequence, discovering pools in the order of their size, would have found 96% of the marketable gas in the first half.
- ▶ A very efficient discovery process would leave very little to be discovered in the latter part of a basin's history. Thirty-eight percent (9.1 Tcf) of B.C.'s initial marketable gas was discovered by January 1, 1970 in just 18.2 % of the pools, discovered to year-end of 2002.
- ▶ By discovery sequence, 80% of the initial marketable gas is in the first 67% of pools discovered. The first 80% of pools discovered has 87% of the initial discovered marketable gas. The last 20% of discovered pools have only 13% of the marketable gas discovered to date. Eighty percent of BC initial marketable gas is in 14% of the pools.

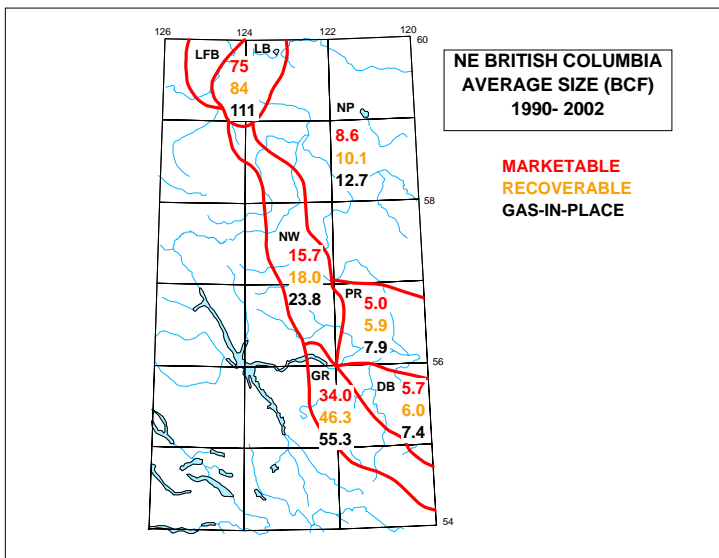
N.E. BRITISH COLUMBIA NATURAL GAS JANUARY 1, 1990 - DECEMBER 31, 2002

- ▶ 727 GAS POOLS
- ▶ GAS-IN-PLACE - 11.1 TCF
- ▶ INITIAL MARKETABLE GAS - 7.2 TCF
- ▶ REMAINING MARKETABLE GAS - 4.3 TCF
- ▶ AVERAGE POOL SIZE - 10.0 BCF
- ▶ MEDIAN POOL SIZE - 2.8 BCF
- ▶ 95th PERCENTILE - 35.4 BCF

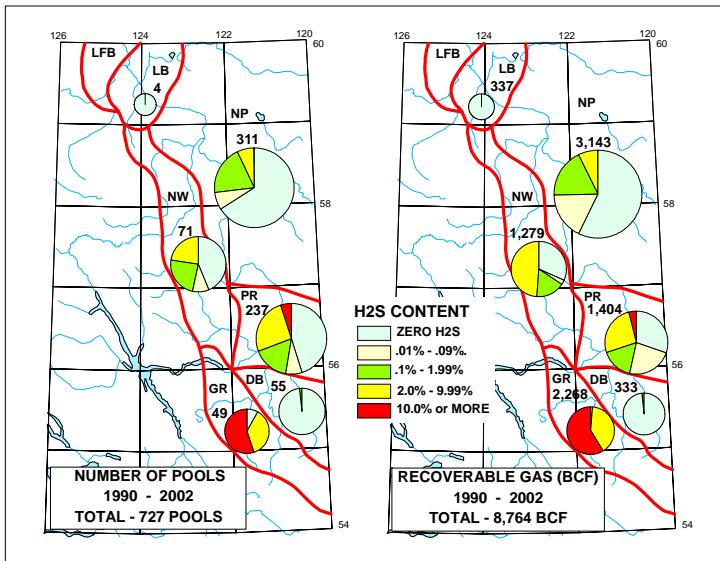
- ▶ We will now examine the period January 1, 1990 to December 31, 2002. There are two aspects to this, one is the year of discovery data from the year-end 2002 BC OGC database, and the second is the BC OGC year-end reports.
- ▶ For the 1990-2002 period, by year of discovery 727 pools were discovered, with average pool size of 10.0 Bcf, and a median size of 2.8 Bcf. 82 pools (5%) were larger than 35.4 Bcf (95th percentile).
- ▶ 36% (4.3 TCF) is remaining marketable gas.



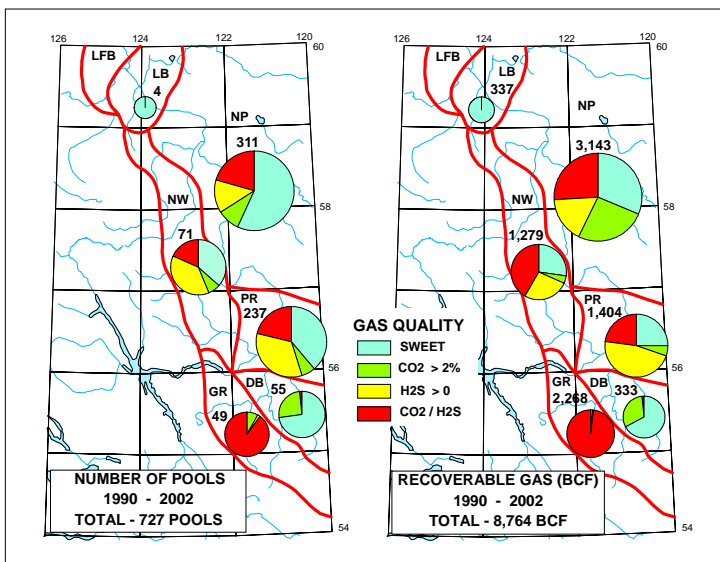
- ▶ The maps show the number of pools and volumes of marketable gas by stratigraphic horizon for each of the structural areas, for the period Jan 1, 1990 to Dec. 31, 2002.
- ▶ The largest number of pools and volume of initial marketable gas is in the Northern Plains, again dominated by the Middle Devonian.
- ▶ The dominant stratigraphic horizon is the Triassic, with significant numbers and volumes of marketable gas in the Grizzly Foothills, Northwest Foothills, Peace River Arch and Northern Plains.
- ▶ Areas dominated by the Lower Cretaceous are the Deep Basin and Liard Basin.



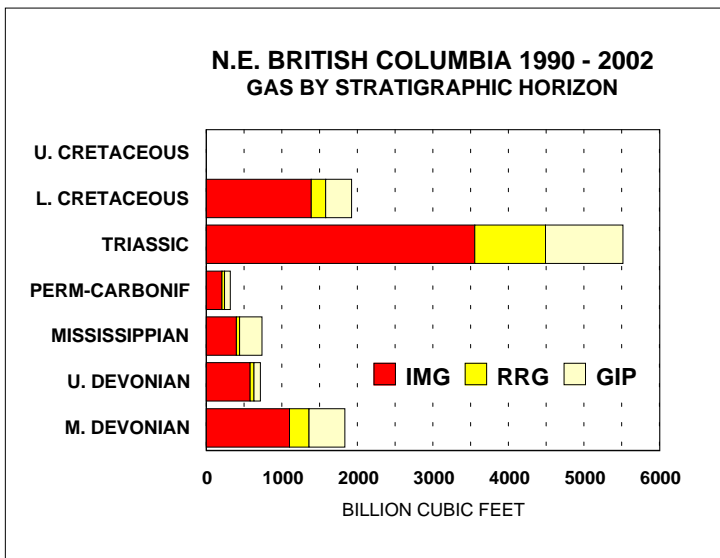
- ▶ This slide shows the average pool size for the structural areas for the period 1990-2002.
- ▶ The Liard Basin has the largest average pool size. However there is one large pool, Maxhamish Lake and two small ones.
- ▶ In general, the largest pool sizes occur in the Foothills, with the Grizzly Foothills at 34 Bcf, and the Northwest Foothills at 15.7 Bcf marketable gas.



- ▶ These two maps show the distribution of H₂S by Structural Area for the period 1990-2002.
- ▶ The higher concentrations of H₂S is in the Grizzly Foothills where over half the pools, and recoverable gas has concentrations greater than 10%.
- ▶ The lowest concentrations are in the Deep Basin and Liard Basin. However the deeper horizons in these areas are relatively unexplored.

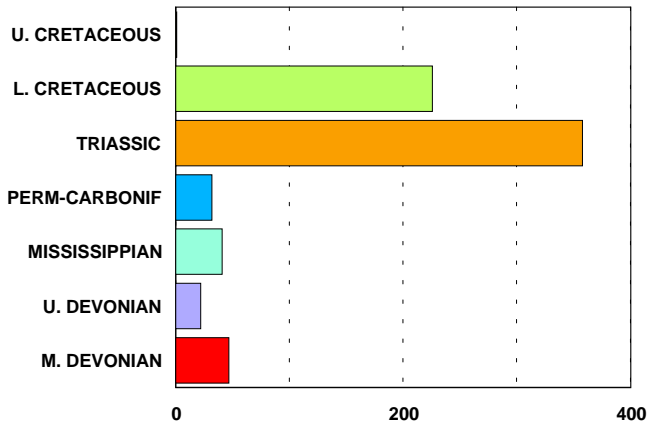


- ▶ These two maps show the distribution of the quality of marketable gas by structural area, based on concentrations of H₂S and CO₂.
- ▶ In general the higher quality gas occurs in the eastern portion of the province, primarily in the Deep Basin and the Liard Basin.
- ▶ The Foothills is dominated by sour gas, in particular the Grizzly Foothills, where 97% of the recoverable gas contains H₂S and CO₂ greater than 2%.



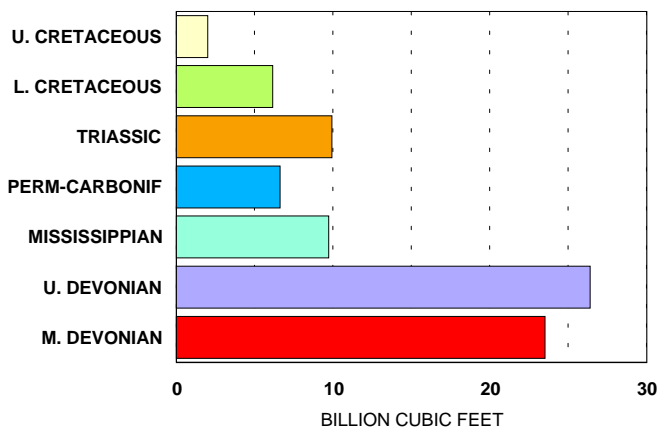
- ▶ For the period 1990-2002, the largest volume of gas is in the Triassic with 3,558 Bcf (49%) of marketable gas.
- ▶ This is followed by the lower Cretaceous, with 1,391 Bcf (19%) of marketable gas.
- ▶ Third is the Middle Devonian, with 1,106 Bcf (15%) of marketable gas.

**N.E. BRITISH COLUMBIA 1990 - 2002
NUMBER BY STRATIGRAPHIC HORIZON**



- ▶ For the period 1990-2002 the largest number of pools was discovered in the Triassic, 358 pools (49%).
- ▶ Followed by the Lower Cretaceous with 226 pools, 31% of the total.

**N.E. BRITISH COLUMBIA 1990 - 2002
AVERAGE SIZE (MARKETABLE) BY HORIZON**



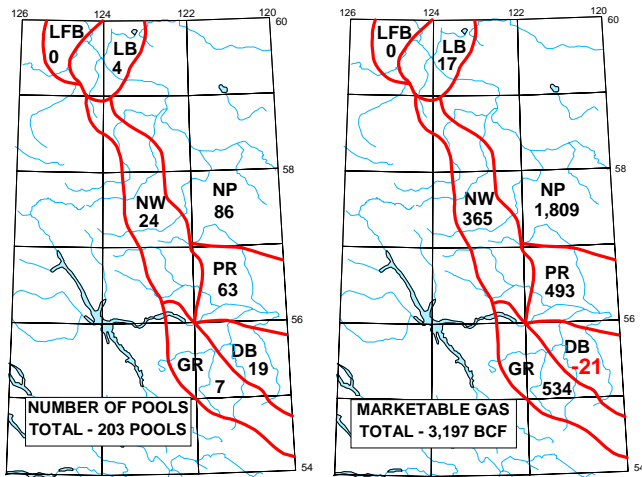
- ▶ The Upper Devonian, characterized by continuous type gas accumulations of the Jean Marie, has the largest average pool size.
- ▶ This is followed by the Middle Devonian, dominated by the Ladyfern Slave Point A discovery.

**BRITISH COLUMBIA GAS POOLS
PRE-1990 vs 1990-2002**

	PRE-1990	1990-2002
RECOVERY FACTORS (% OF GIP)		
RECOVERABLE	74.4%	79.2%
MARKETABLE	60.7%	65.5%
MARKETABLE GAS (BCF)		
AVERAGE POOL SIZE	18.8	10.0
MEDIAN POOL SIZE	2.7	2.8
95th PERCENTILE	62.9	35.4
AVERAGE DEPTH (FEET)	5,391	5,434
AVERAGE RECOVERABLE (MCF/AC-FT)	945	460
% POOLS WITH H2S > 10%	3.9%	5.5%
% RECOVERABLE GAS H2S > 10%	4.0%	15.9%
AVERAGE H2S CONTENT	2.0%	3.9%

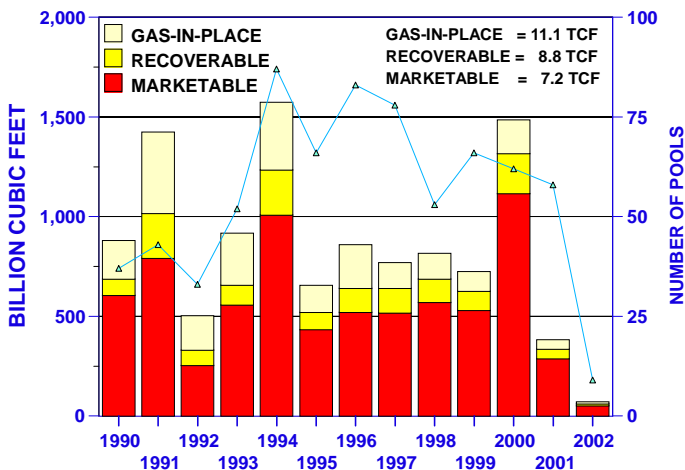
- ▶ A comparison of gas pools pre-1990 with the period 1990-2002 indicates:
 - ▶ Recovery factors have improved
 - ▶ Somewhat smaller pool sizes
 - ▶ Average depth slightly deeper
 - ▶ Poorer average reservoir quality
 - ▶ Increase in sour gas with higher H2S content

B.C. CHANGES JAN, 2000 - DEC, 2002



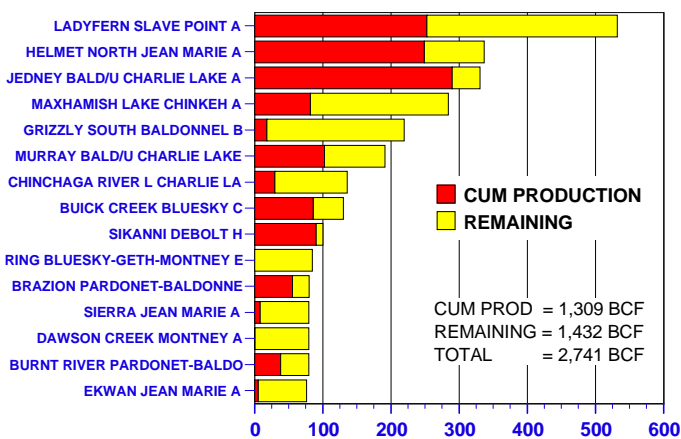
- ▶ These two maps show the additions in number of pools and volume of marketable gas for the period Jan 1, 1990 to Dec. 31, 2002.
- ▶ The greatest number of pools (86) and volumes of marketable gas (1,809 Bcf) was discovered in the Northern Plains area.
- ▶ This is followed by 7 pools with 534 Bcf in the Grizzly Foothills.
- ▶ In the Deep Basin 19 new pools were added, however negative revisions to existing pools resulted in a decrease of 21 Bcf.

B.C. GAS BY YEAR OF DISCOVERY



- ▶ Gas by year of discovery shows a rather constant reserves addition for the years 1995 through 1999, with a significant increase in 2000, as a result of Ladyfern.
- ▶ Data for 2002 is still incomplete.

B.C. - TOP 15 GAS POOLS 1990 - 2002



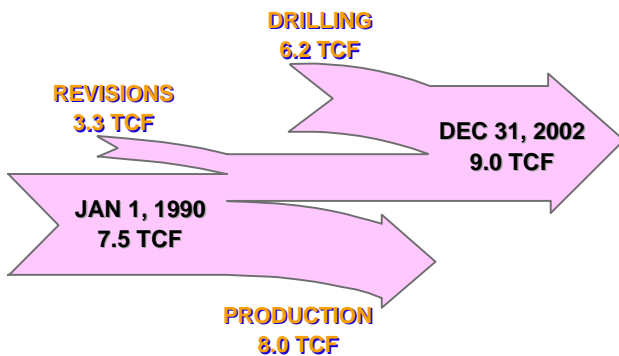
- ▶ This slide shows the top 15 pools discovered in the years 1990 to 2002.
- ▶ The largest is Ladyfern Slave Point A, with 532.4 Bcf marketable gas.
- ▶ The pools contain 2,741 Bcf, which is 37.8% of the total.
- ▶ Cumulative production is 1,309 Bcf, and remaining marketable gas is 1,432 Bcf.

B.C. MARKETABLE GAS OGC YEAR-END REPORTS

	JAN 1 1990	DEC 31 2002	ADDED 1990-2002	PER YEAR
NUMBER OF POOLS	905	1,634	729	56
INITIAL MARKETABLE (TCF)	15.0	24.5	9.5	0.733
REMAINING MARKETABLE (TCF)	7.5	9.0	1.5	0.122
CUM. PRODUCTION (TCF)	7.5	15.5	8.0	0.610

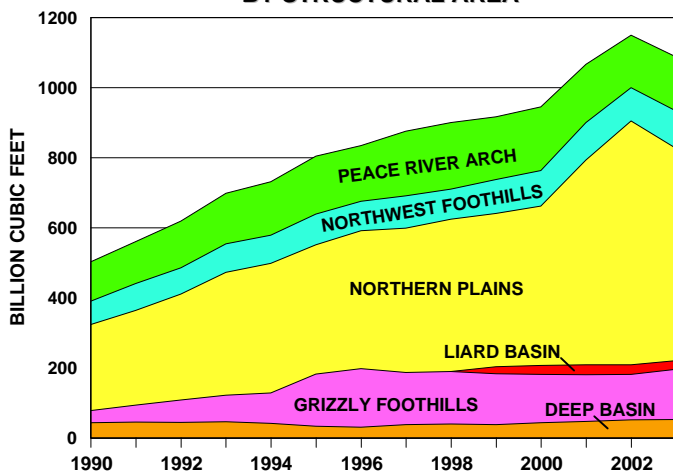
- ▶ This table summarizes the changes for the period Jan 1, 1990 to December 31, 2002 from the BC year-end hydrocarbon reserves reports.
- ▶ For the 13 year period average marketable gas reserves additions were 733 Bcf per year.
- ▶ Remaining marketable gas increased at an average of 122 Bcf per year.
- ▶ Marketable gas production averaged 610 Bcf per year.

BRITISH COLUMBIA SUMMARY 1990 - 2002 REMAINING MARKETABLE GAS RESERVES

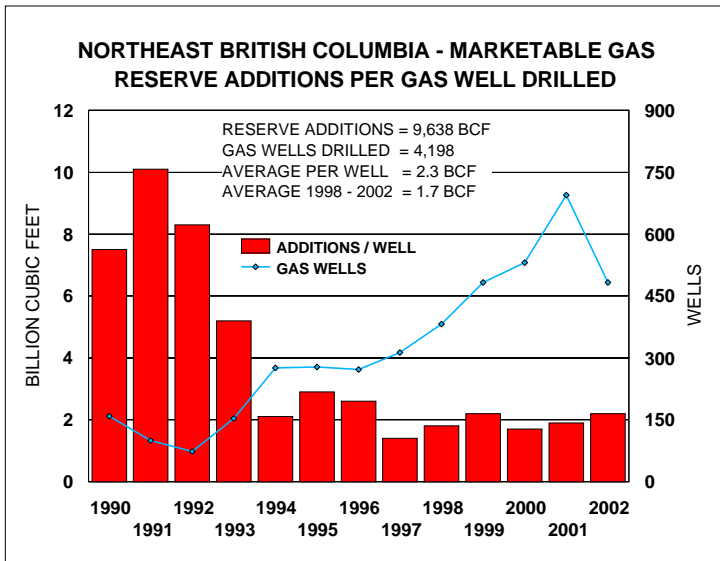


- ▶ The reserves flow diagram shows remaining reserves, production and reserves additions of marketable gas for the period January 1, 1990 to December 31, 2002, based on the BC OGC year-end reserves reports.
- ▶ New discoveries, development and revisions added 9.5 Tcf of marketable gas.
- ▶ Production during the period was 8.0 Tcf.
- ▶ There was a net increase of 1.5 Tcf in remaining marketable gas from 7.5 Tcf at the beginning of 1990 to 9.0 Tcf at the end of 2002.
- ▶ This represents a 20% increase in remaining marketable gas. This contrasts with Alberta which had a 29% decrease in remaining reserves for the same period

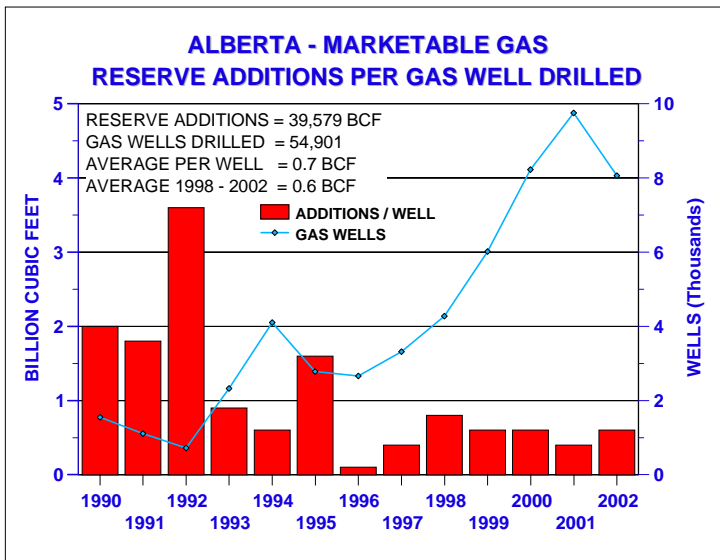
BRITISH COLUMBIA GAS PRODUCTION BY STRUCTURAL AREA



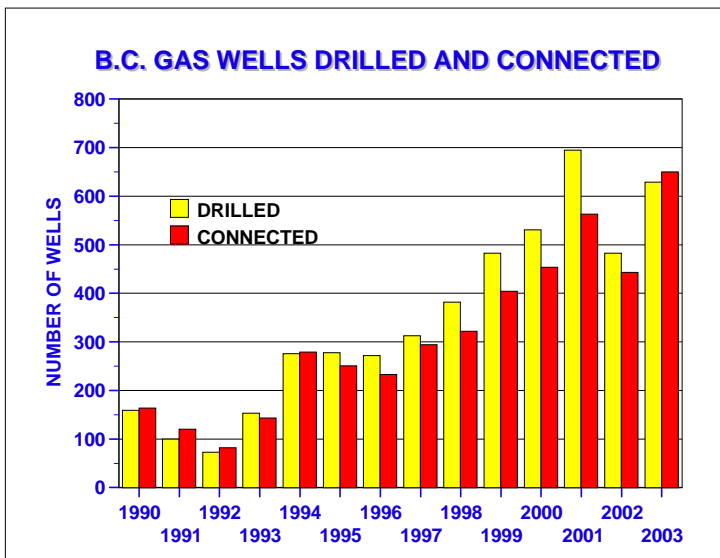
- ▶ Chart shows BC yearly gas production increasing from 503 Bcf in 1990, peaking at 1,150 in 2002 and declining to 1,088 in 2003.
- ▶ The increase for the Northern Plains from 2000 to 2002 and subsequent decline in 2003 is a reflection of Ladyfern production.
- ▶ Maxhamish Lake in the Liard Basin began production in 1999 and has remaining fairly constant at an average of about 25 Bcf per year.
- ▶ Grizzly Foothills production has increased from 34 Bcf in 1990, peaking at 150 Bcf in 1996, and fairly constant for the last 5 years averaging 138 Bcf.
- ▶ Percentages for 2003; Deep Basin - 5%, Grizzly Foothills - 13%, Liard Basin - 2%, Northern Plains - 56%, Northwest Foothills - 10%, and Peace River Arch - 14%.



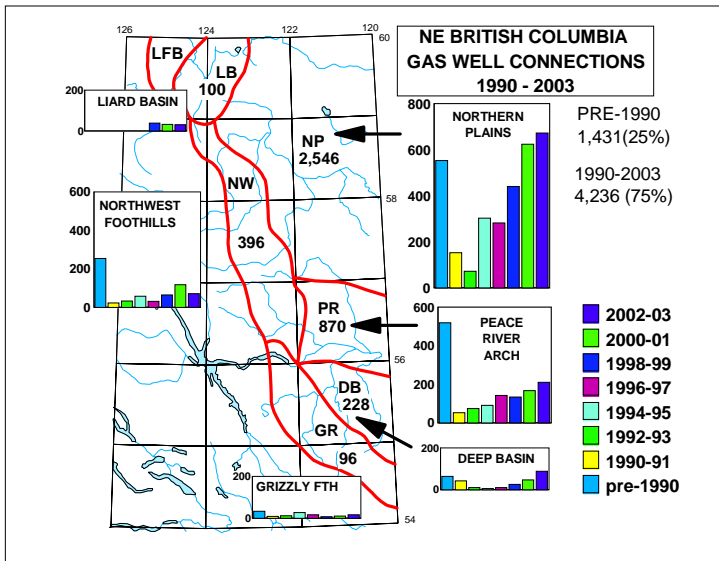
- ▶ This slide shows the reserve additions and gas wells drilled for the period 1990-2002.
- ▶ The total marketable gas added is 9.6 Tcf with 4,198 gas wells drilled.
- ▶ The average additions per well is 2.3 Bcf (1990-2002)
- ▶ Additions for the last 5 years have been rather constant, with an average per well for the 5 years 1998-2002 of 1.7 Bcf.



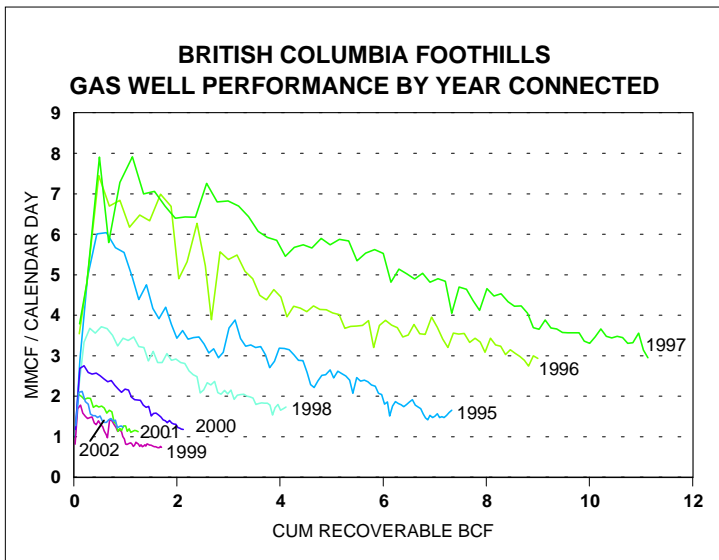
- ▶ As a comparison Alberta reserve additions for the period 1990-2002 were 39.7 Tcf, with 54,901 wells drilled
- ▶ The average per well drilled is 0.7 Bcf for 1990-2002
- ▶ For the past 5 years (1998-2002) the average per gas well is 0.6 Bcf.



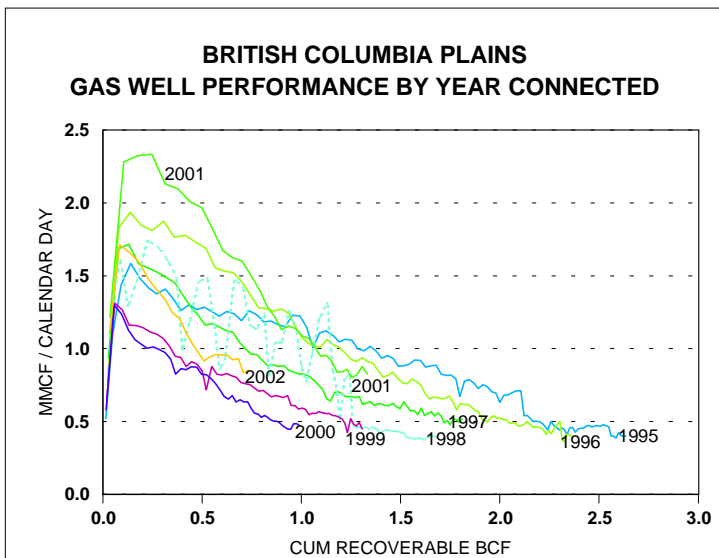
- ▶ This chart shows the number of gas wells drilled and the number connected for the period 1990 to 2002.
- ▶ Through time there is a steadily increasing trend in wells drilled and connected.
- ▶ For the past 3 years the number drilled has averaged 602 and the number connected is 552 per year.



- ▶ The map shows the gas well connections in 2 year periods for the years 1990 to 2003 for each of the structural areas.
- ▶ The period 1990-2003 accounts for 75% of the gas completions in Northeast BC.
- ▶ With 2,546, 60% of the connections were in the Northern Plains, followed by the Peace River Arch with 870.
- ▶ Note there is an increasing trend in completions in the Deep Basin, Peace River Arch and Northern Plains.
- ▶ Completions in the last 2 years, 1,093, account for 25% for the period and 19% overall.

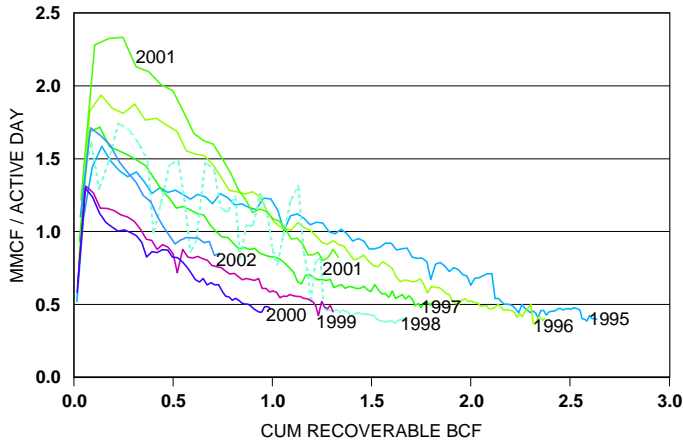


- ▶ This set of curves shows the typical well performance (calendar day rate versus cum production) by year of connection for the Foothills (Grizzly and Northwest Foothills).
- ▶ Best performing wells are those connected in 1997, followed by 1996 and 1995.
- ▶ In general there is a continuing decrease in performance for the most recent years.
- ▶ On average wells connected in the years 1999 to 2002 will have recoverable gas in the range of 3 to 5 Bcf per well.



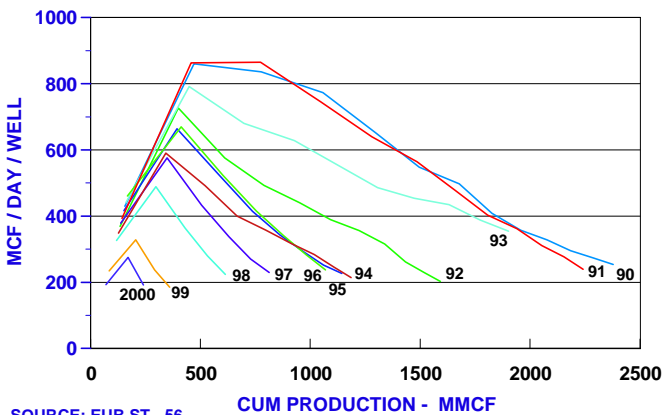
- ▶ This set of curves shows the typical well performance (calendar day rate versus cum production) by year of connection for the Plains (Deep Basin, Peace River Arch, Northern Plains, and Liard Basin).
- ▶ Best performing wells are those connected in 1995, 1996 and 1997.
- ▶ In general there is a continuing decrease in performance from 1995 to the most recent years.
- ▶ The highest initial rate with the steepest decline are wells connected in 2001, reflecting production from Ladyfrn.
- ▶ On average wells connected in the years 1999 to 2002 will have recoverable gas in the range of 2 to 2.5 Bcf per well.
- ▶ Wells connected in 1998, for some reason, show a seasonal fluctuation.

NORTHEAST BRITISH COLUMBIA GAS WELL PERFORMANCE BY YEAR CONNECTED



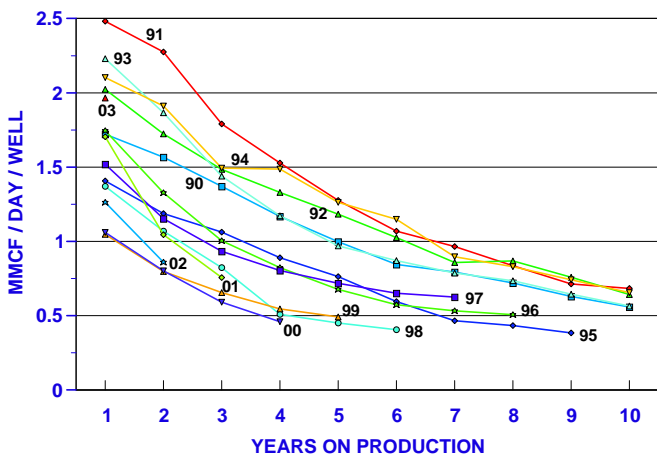
- ▶ This set of curves shows the typical well performance (calendar day rate versus cum production) by year of connection for NE BC gas wells.
- ▶ Best performing wells are those connected in 1995, 1996 and 1997.
- ▶ In general there is a continuing decrease in performance from 1995 to the most recent years.
- ▶ The highest initial rate with the steepest decline are wells connected in 2001, reflecting production from Ladyfrn.
- ▶ On average wells connected in the years 1999 to 2002 will have recoverable gas in the range of 2 to 3 Bcf per well.
- ▶ Wells connected in 1998, for some reason, show a seasonal fluctuation.

ALBERTA AVERAGE GAS WELL PRODUCTION BY ON PRODUCTION YEAR



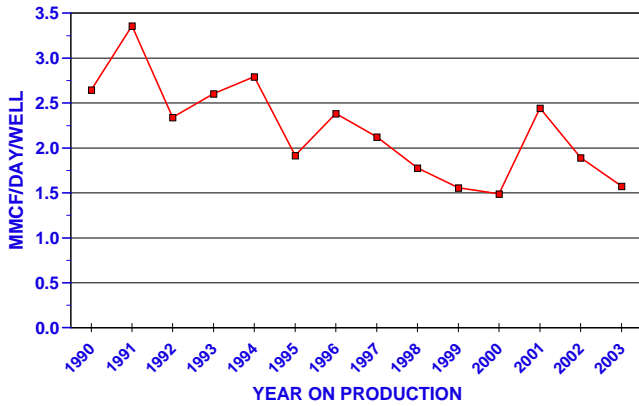
- ▶ The average gas well production profiles for the years 1990 to 2000 are shown normalized to the first month on production.
- ▶ First year is generally only a part year, so maximum rate occurs in the second year.
- ▶ The productive rates are lower for each succeeding year, and declines are somewhat steeper as well.

B.C. AVERAGE GAS WELL PRODUCTION BY ON PRODUCTION YEAR



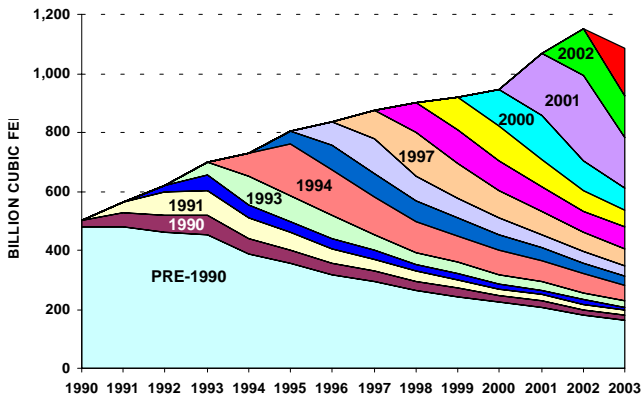
- ▶ The average gas well production profiles for the years 1990 to 2000 are shown normalized to the first month on production.
- ▶ First year is generally only a part year, so maximum rate occurs in the second year.
- ▶ The productive rates are lower for each succeeding year, and declines are somewhat steeper as well.

**B.C. INITIAL GAS WELL PRODUCTIVITY
AVERAGE ACTIVE DAY RATE - FIRST 3 MONTHS**



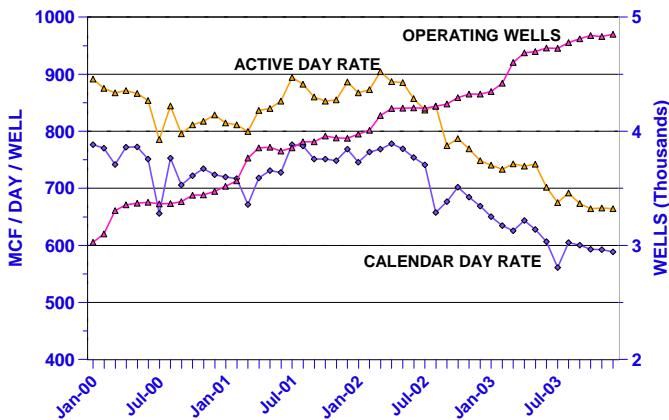
- ▶ This slide shows the average operating day rate for gas wells by the year of connection.
- ▶ There is a decreasing trend from about 1.2 MMcf/day in 1990-91 to 430 Mcf/day in the last two years.

**BRITISH COLUMBIA GAS PRODUCTION
BY CONNECTION YEAR**



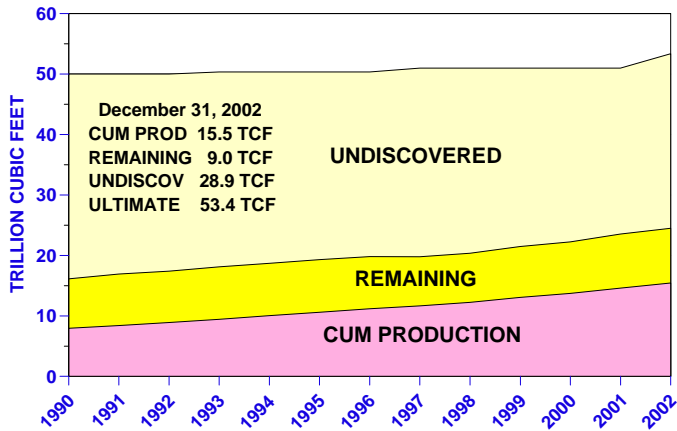
- ▶ This chart shows the vintage of raw gas production by on production date for the period 1990 to 2002.
- ▶ The bottom band is gas production from pre-1990 connections. Each subsequent band represents production from new gas well connections by year.
- ▶ Pre 1990 completions accounted for 15% of the 2003 production. Year 2001 completions account for 16% and post 2000 completions represent 44%.
- ▶ The steepening in the later years is indicative of the increasing decline rates.

**BRITISH COLUMBIA GAS WELLS
AVERAGE PRODUCING WELL RATE**



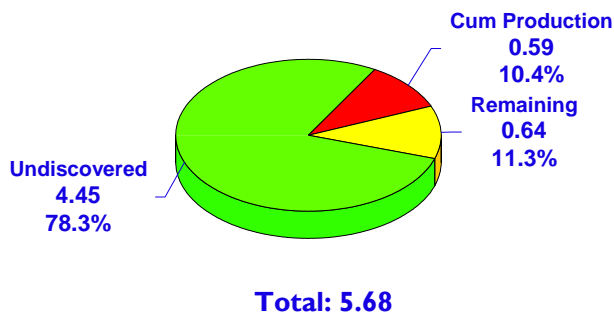
- ▶ This slide shows the monthly average calendar day rate and active day rate for producing gas wells, and the number of operated wells.
- ▶ The chart shows an overall decline in the active day rate from 870 mcf/day in first few months of January, 2000 to 590 mcf/day in the last 3 months of 2003.
- ▶ The number of operated wells has increased from 3,028 in Jan., 2000 to 4,851 in December 2003.

NORTHEAST BRITISH COLUMBIA ULTIMATE NATURAL GAS



- ▶ Shown is the historical cumulative marketable gas production and remaining reserves as reported in the BC OGC year-end reserves reports.
- ▶ The estimated undiscovered potential is added to give the overall ultimate potential for marketable gas. The ultimate of 50 to 51 TCF in the early years is from the NEB, 1993, 1997. Year end 2002 is my current estimate of 53.4 Tcf.
- ▶ Cumulative production to Dec. 31, 2002 is 15.5 Tcf, an average annual production of 4.3 Tcf. Remaining reserves have increased from 7.5 Tcf to 9.0 Tcf, an average yearly increase of 0.12 Tcf.
- ▶ The initial established marketable gas reserves have increased from 15.0 Tcf to 24.5 Tcf over the period, for an annual average reserves addition of 0.73 Tcf/year.

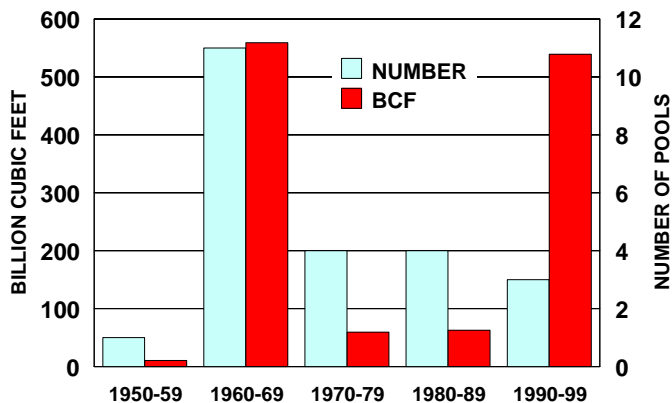
LIARD PLATEAU / SOUTHERN TERRITORIES ULTIMATE MARKETABLE GAS (Trillion Cubic Feet)



December 31, 2003

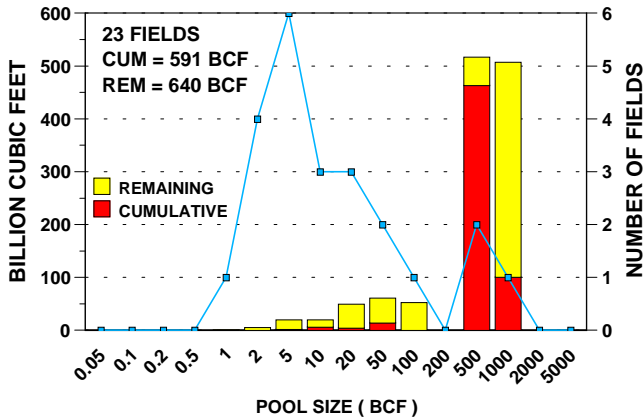
- ▶ I will now review the northern extension of the WCSB into the southern Yukon and Northwest Territories.
- ▶ The estimated ultimate marketable gas resource is 5.68 Tcf.
- ▶ Cumulative production is .591 Tcf, 10% of the total.
- ▶ Initial marketable gas is 1,231 Bcf, with remaining marketable gas reserves of 640 Bcf (19%)
- ▶ The estimated undiscovered marketable gas resource is 4.4 Tcf, or 78% of the total resource.

LIARD/S. NWT- MARKETABLE GAS BY DECADE DISCOVERED



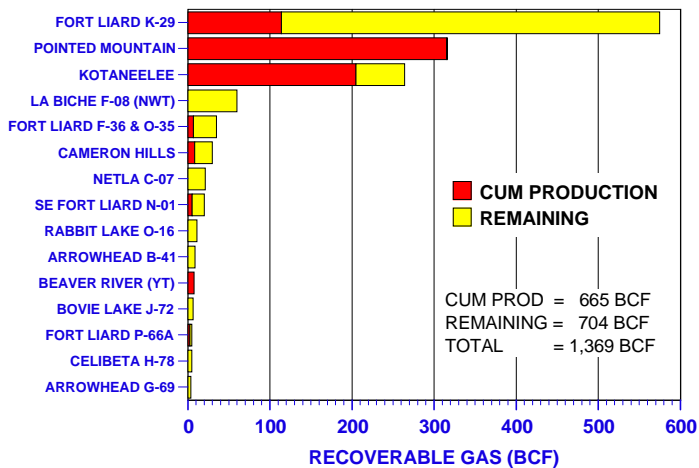
- ▶ The historical discovery record by decade of discovery shows most of the gas was added in the 1960's and the 1990's.
- ▶ The decade with the largest number of pools and volume of marketable gas discovered was the 1960's.
- ▶ Activity in the Yukon and Northwest Territories has been sporadic, and there is not a sufficient number of wells and discoveries to establish any significant trends.
- ▶ Forty-five percent of the initial marketable gas was discovered in the period 1960-1969 in 48% (11 pools) of the total pools, and another 44% in the period 1990-99 in 3 pools.

LIARD / SOUTHERN TERRITORIES MARKETABLE GAS FIELD SIZE DISTRIBUTION



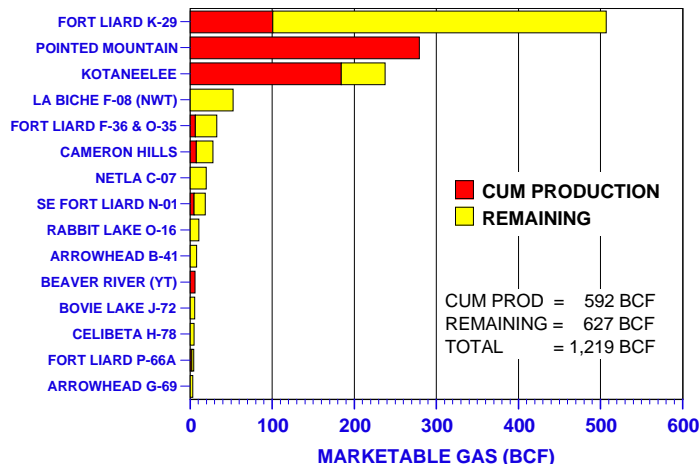
- ▶ In the Southern Yukon and Northwest Territories a total of 23 fields have been discovered, containing an estimated 1,231 Bcf of marketable gas.
- ▶ The area is characterized by 3 large fields and 20 much smaller fields.

LIARD / S. NWT - TOP 15 GAS FIELDS



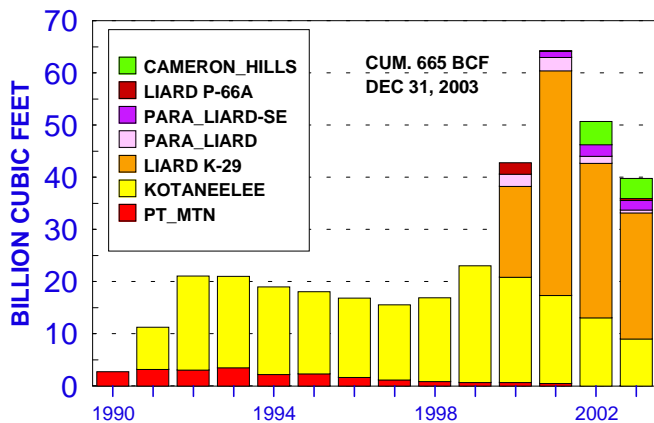
- ▶ This slide shows the top 15 pools, by recoverable gas, discovered in the Southern Yukon/Northwest Territories.
- ▶ The largest is Fort Liard K-29, with 575.0 Bcf of marketable gas.
- ▶ The pools contain 1,369 Bcf, which is 99% of the total (1,383 Bcf).
- ▶ Cumulative production from the fields is 665 Bcf, and remaining marketable gas is 704 Bcf

LIARD / S. NWT - TOP 15 GAS FIELDS



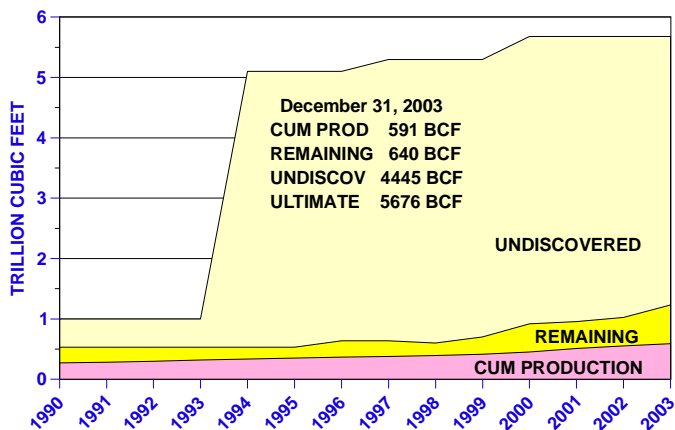
- ▶ This slide shows the top 15 pools by marketable gas discovered in the Southern Yukon/Northwest Territories.
- ▶ The largest is Fort Liard K-29, with 575.0 Bcf of marketable gas.
- ▶ The pools contain 1,219 Bcf, which is 99.0% of the total (1,231 Bcf).
- ▶ Cumulative production from the fields is 591 Bcf, and remaining marketable gas is 627 Bcf

LIARD/ SOUTHERN NWT ANNUAL RAW GAS PRODUCTION



- ▶ This slide show the historical production for the Yukon/ Southern Northwest Territories from 1990 to the end of 2003.
- ▶ Net cumulative recoverable gas production, including pre-1990, for the Liard / Southern NWT to Dec.31, 2002 is 665 BCF.
- ▶ Cum. production from the fields is; Liard fields - 101.9 Bcf, Kotaneelee - 195.7 Bcf, Pointed Mtn - 315.7 Bcf, Cameron Hills - 4.4 Bcf, and Beaver River - 7.7 Bcf.

LIARD / SOUTHERN NWT ULTIMATE MARKETABLE GAS



- ▶ Shown is the historical cumulative marketable gas production and remaining reserves.
- ▶ The estimated undiscovered potential is added to give the overall ultimate potential for marketable gas. The ultimate of in the early years is from the NEB The latest is my best current estimate from a synthesis of published information.
- ▶ Cumulative production to Dec.31, 2003 is 592 Bcf.
- ▶ Remaining reserves have increased from 261 Bcf to 640 Bcf, an average yearly increase of .29 Bcf.
- ▶ The initial established marketable gas reserves have increased from 532 Bcf to 1,231 Bcf over the period, for an annual average reserves addition of 54.8 Bcf/year.

B.C. - ALBERTA GAS POOLS 1990-2002

	B.C.	ALBERTA
RECOVERY FACTORS (% Of GIP)		
RECOVERABLE	79.2%	71.8%
MARKETABLE	65.5%	64.7%
MARKETABLE GAS (BCF)		
NUMBER OF POOLS	727	15,321
MARKETABLE GAS	7,249	23,878
AVERAGE POOL SIZE	10.0	1.6
MEDIAN POOL SIZE	2.8	0.6
95th PERCENTILE	35.4	5.6
DEPTH AND RESERVOIR QUALITY		
AVERAGE DEPTH (FEET)	5,434	3,585
AVERAGE RECOVERABLE (MCF/AC-FT)	460	282
AVERAGE MARKETABLE / GAS WELL (BCF)	2.3	0.7
H2S CONTENT		
% POOLS WITH H2S > 10%	5.5%	0.7%
% RECOVERABLE GAS H2S > 10%	15.9%	3.4%
AVERAGE H2S CONTENT	3.9%	1.0%

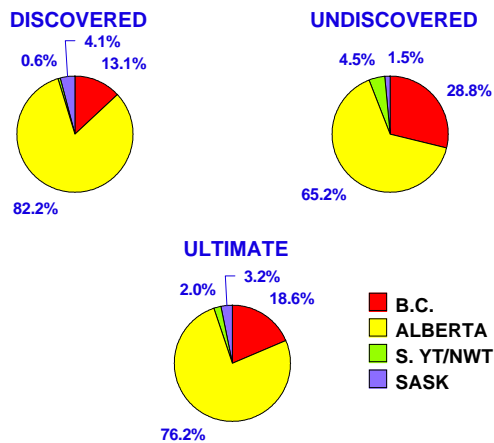
- ▶ This table shows a comparison of BC and Alberta gas pools discovered in the period 1990-2002.
- ▶ BC recovery factors are higher. The recoverable factor is much higher, however due to more sour gas in BC the marketable gas recovery factor is only slightly better.
- ▶ BC pool sizes are larger.
- ▶ BC average depth is deeper.
- ▶ Better average reservoir quality
- ▶ Gas in BC has a greater concentration of H2S.

WESTERN CANADA SEDIMENTARY BASIN MARKETABLE GAS RESOURCES

(TCF)	B.C.	ALBERTA	S.YT/NWT	SASK	WCSB	%
ULTIMATE	53.4	218.8	5.7	9.1	287.0	100%
DISCOVERED	24.3	153.0	1.2	7.6	186.1	64.8%
UNDISCOVERED	29.1	65.8	4.5	1.5	100.9	35.2%
CUM PRODUCTION	15.5	111.5	0.6	4.9	132.5	46.2%
REM. RESERVES	8.8	41.5	0.6	2.7	53.6	18.7%
REM. RESOURCE	37.9	107.3	5.1	4.2	154.5	53.8%
MATURITY	46%	70%	21%	84%	65%	
% REM. RESOURCE	24.5%	69.4%	3.3%	2.7%	100%	

- ▶ This is an overall summary of the ultimate gas resources for the WCSB. For this I have added Saskatchewan. The estimated ultimate marketable gas resource for the WCSB is 287 Tcf.
- ▶ 46% (132.5 Tcf) has been produced, with remaining reserves of 19% (54 Tcf), for a total of 65% (186 Tcf) Discovered.
- ▶ Remaining Resource is 155 Tcf (54%).
- ▶ By Province/Territory Saskatchewan is the most mature at 84%, followed by Alberta at 70%, BC at 46% and the YT/NWT at 21%.
- ▶ The largest remaining resource is in Alberta at 69% of the total, followed by BC at 69%.

WCSB MARKETABLE GAS



- ▶ This slide shows the same information graphically.
- ▶ Alberta is the dominant area, however BC and the southern Territories become more important for undiscovered marketable gas.
- ▶ BC has 13% of the discovered marketable gas, and 29% of the undiscovered.
- ▶ The Southern Territories have less than 1% of the discovered gas and 4.5% of the estimated undiscovered.
- ▶ Saskatchewan has 4% of the discovered and 1.5% of the undiscovered.

CONCLUSIONS

- ▶ HISTORICAL TRENDS IN RESERVES ADDITIONS FOR THE PERIOD 1990 TO 2002 ARE REMARKEABLY CONSTANT.
- ▶ A LITTLE OVER HALF OF BRITISH COLUMBIA'S ULTIMATE GAS RESOURCE REMAINS TO BE DISCOVERED.
- ▶ AS OF DECEMBER 31, 2003 31% OF BRITISH COLUMBIA'S ESTIMATED ULTIMATE GAS RESOURCE HAS BEEN PRODUCED AND BY 2015 IT IS ESTIMATED TO BE 58%.
- ▶ B.C. GAS PRODUCTION WILL REMAIN FAIRLY CONSTANT FOR THE FORECAST PERIOD AS RESOURCE ADDITIONS SHOULD BE ABLE TO SUSTAIN PRODUCTION LEVELS.