Natural Gas Productive Capacity for the Lower-48 States

Executive Summary

This analysis examines the availability of effective productive capacity to meet the projected wellhead demand for natural gas through 2003. *Effective productive capacity* is defined as the maximum production available from natural gas wells considering limitations of the production, gathering, and transportation systems. Surplus or unutilized capacity is the difference between the effective productive capacity and the actual production. This report contains projections of natural gas effective productive capacity in the Lower-48 States for 2003 and is based on prices and production forecasts in EIA's February 2003 *Short Term Energy Outlook* (STEO).

The analysis projects an average surplus capacity of 5.6 Bcf/d in 2003 under STEO Base case conditions, indicating that projected demand for natural gas in that scenario can be met (Figure ES-1, Table ES-1). However, the relatively narrow margin of surplus capacity – roughly 10 percent of the projected 51.4 Bcf/d average production rate in 2003 – limits the available production response to any sudden demand increase or drop in production because of severe weather or other event. Withdrawals of stored natural gas can respond to such problems, just as they are regularly used during peak winter periods when daily natural gas demand can be more than 1.5 times daily production. Nonetheless, the narrow surplus margin indicates a significant potential for short-term price increases in the event such contingencies occur.

Maintaining or increasing gas well drilling is critical to maintaining or increasing gas productive capacity. About 25 percent of estimated wellhead capacity is from wells one year old or less. The two largest supply areas, Texas and the Gulf of Mexico, which together produce about 50 percent of the nation's total gas production, also have the highest percentage of capacity from wells one year old or less at 30 percent. If drilling were to stop completely, all surplus or unutilized wellhead capacity would vanish in less than a year.

Recent trends in productive capacity have closely tracked the number of well completions. The year 2001 had a large increase in completions, reaching 22,800 and capacity increased. There were only 17,000 well completions in 2002, a large drop, and productive capacity declined. A large increase in completions is projected for 2003, about the same increase as in 2001, and effective productive capacity is projected to increase by about 2 Bcf/d.

Fifty six percent of the expected 2003 increase in well completions is forecast to occur in Texas and the Rocky Mountain Area. Rocky Mountain well completion increases are largely due to coal bed methane drilling in the Powder River Basin.

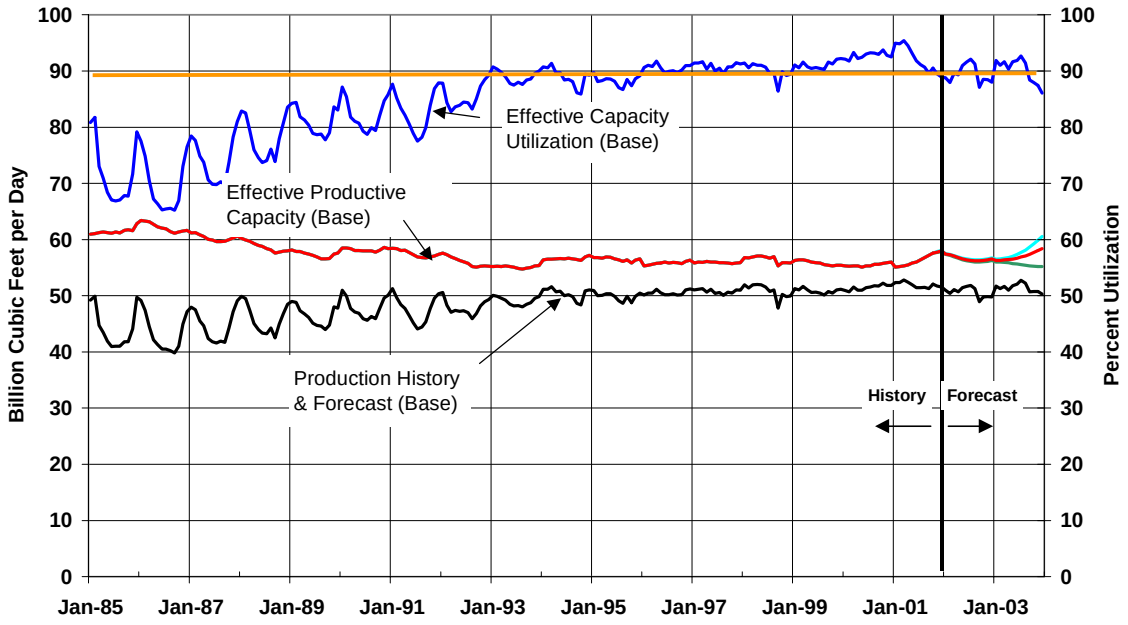
The Rocky Mountain area is projected to have the largest estimated surplus capacity in 2003 at 1.4 Bcf/d followed by Texas with 1.3 Bcf/d, New Mexico at 0.5 Bcf/d, and Oklahoma at 0.4 Bcf/d. Estimated surplus capacity in the rest of the Lower-48 States and

Gulf of Mexico is roughly 2.0 Bcf/d. While the Lower-48 States taken together are likely to have a small surplus or unutilized capacity, specific areas may have little or none. Because of the limitations in the transportation network, surplus capacity in one area may not be available to all other areas.

Because of exceptional growth in well completions in the Rocky Mountain Area, growth in effective productive capacity in that region is expected to be limited in the short term by a slower growth rate of the delivery infrastructure. Based on historical experience, infrastructure capacity was assumed to grow at approximately 1/3 the wellhead productive capacity growth rate. This limitation reduces estimated Rocky Mountain surplus or unutilized capacity in 2003 from 2.7 to 1.4 Bcf/d.

In 2003, the forecast indicates that Gulf of Mexico production will be limited by effective productive capacity. Lower drilling rates in the Gulf are the cause of the expected loss of surplus effective capacity. However, deep water prospects now being developed appear to produce at higher rates than completions in the recent past. Future completions in the study are modeled after recent past completions. Therefore, if the new wells are sufficiently more productive, some of the declining capacity indicated in this study could be alleviated. Adding to pipeline infrastructure could also increase effective productive capacity in the Gulf.

Figure ES1. Lower-48 States Monthly Dry Gas Production Rate, and Effective Productive Capacity and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

Table ES1. Year 2003 Lower-48 Average Dry Gas Production Rate, Effective Capacity, and Surplus Capacity (Base Case) Billion Cubic Feet per Day (Bcf/d)

Area	Expected Production Rate	Estimated Effective Capacity	Surplus Capacity
Federal Gulf of Mexico	13.607	13.851	0.244
Texas	13.231	14.553	1.322
Oklahoma	4.331	4.734	0.403
Louisiana	3.996	4.152	0.156
California	1.009	1.067	0.058
Kansas	1.373	1.554	0.181
New Mexico			
Conventional Gas	2.463	2.714	0.251
Coal Gas	1.727	1.942	0.215
Rocky Mountain			
Conventional Gas	3.316	4.019	0.703
Coal Gas	2.339	3.051	0.712
Southeast			
Conventional Gas	1.240	1.490	0.250
Coal Gas	0.521	0.631	0.110
Other	2.253	3.248	0.995
Total	51.406	57.005	5.599

*Rocky Mountain effective capacity infrastructure growth limited to one-third of wellhead capacity growth.

Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

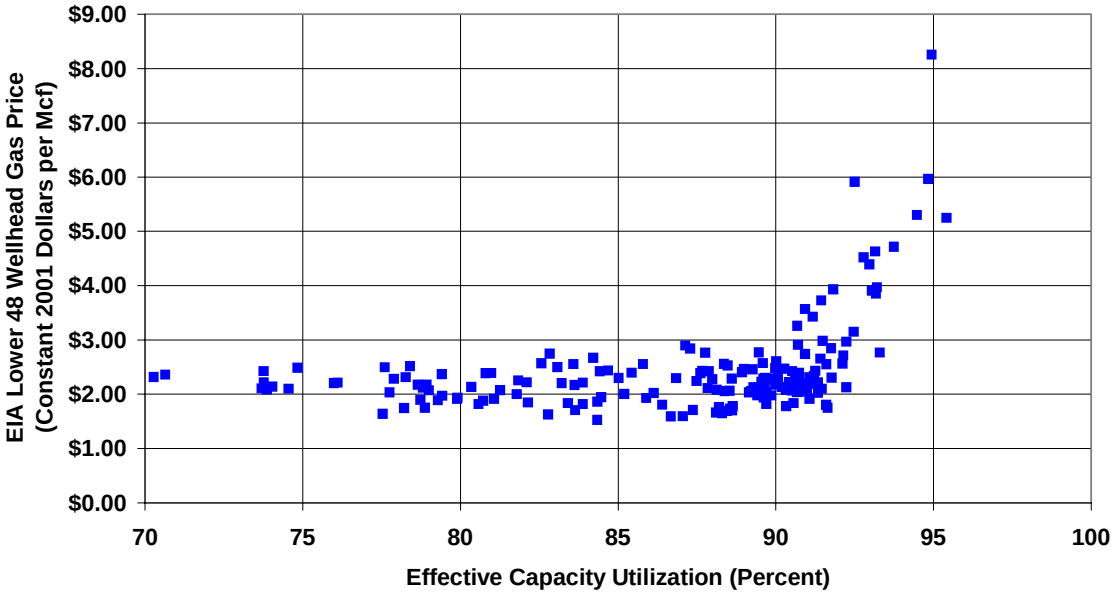
Introduction

- An important issue facing the U.S. natural gas markets is whether or not natural gas production will rise to meet expected growth in demand. However, lags of several months in the availability of natural gas production data, and the fact that production data tends to be revised upward over time, leaves considerable uncertainty regarding the supply response resulting from current drilling levels.
- This assessment attempts to estimate the natural gas productive capacity that should be expected given recent natural gas drilling and price trends.
- This report contains projections of natural gas effective productive capacity in the Lower-48 States for 2003. The effective productive capacity is an upper limit on the amount of natural gas that could be produced in 2003 by region and by month.
- Until 2001, EIA made these projections by summing the maximum measured monthly production rates of each well in each year (wellhead capacity), tacitly assuming that all wells could produce maximally at the same time. However, a review of the historical data showed that all wells cannot produce at their wellhead capacity at the same time, mainly because:
    - Field processing equipment has limitations that prevent handling the maximum wellhead capacity production of every well concurrently.
    - Some gathering and pipeline systems cannot handle peak wellhead capacity production from all wells concurrently within certain geographical areas.
    - Compression capabilities may be less than the peak wellhead capacity.
    - Some natural gas plant throughput capabilities are lower than peak wellhead capacities.
- Since 2001, EIA has calculated an effective productive capacity, which better reflects the ability of producing wells to deliver gas into the gathering and transportation system. Projections from this methodology will not be exact but are within reasonable accuracy to provide a better indication of surplus or unutilized effective productive capacity.

Recent History

- Lower oil and gas prices in 1998 and early 1999 resulted in reduced gas rig counts, reduced new gas well completions, and a decline in capacity. This increased the effective productive capacity utilization rate to between 90 and 92 percent (8 to 10 percent surplus capacity). The anomalous data in September 1998 is the result of production being shut in for hurricanes (Figure ES1).
- Capacity utilization rates above 90 percent create the potential for higher natural gas prices. Figure 1 shows that monthly average wellhead natural gas prices have stayed below $3.00 per Mcf whenever capacity utilization remains below 90 percent. Capacity utilization rates above 90 percent are consistent with a much wider range of prices.

Figure 1. Lower-48 States Effective Capacity Utilization and Gas Price (1987-2001)

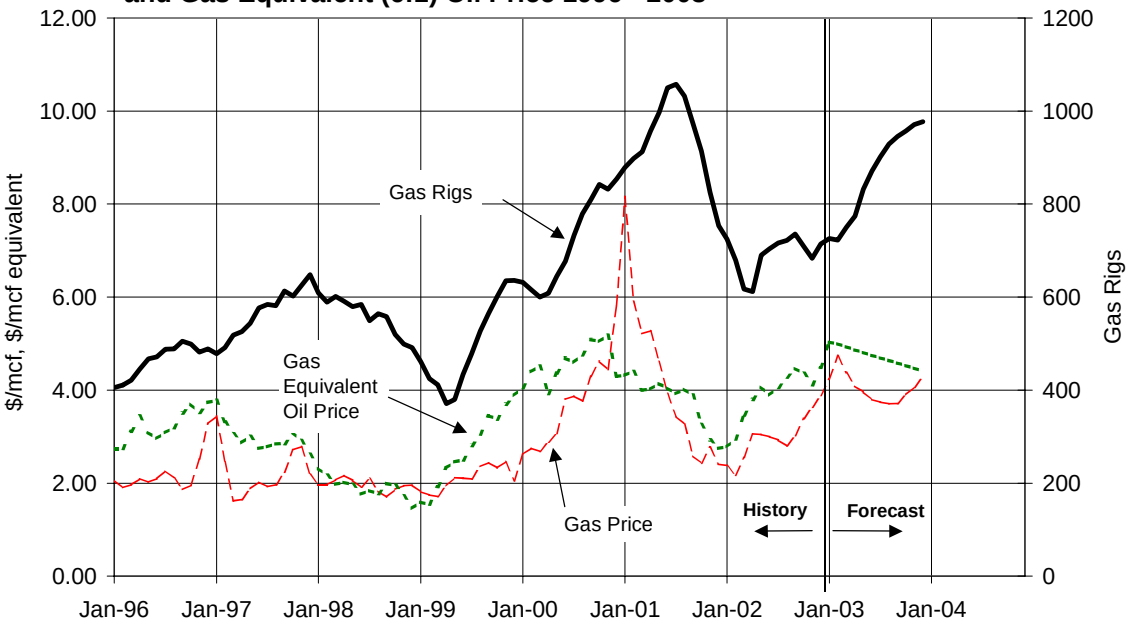


Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Supply tightness, along with low gas storage levels and higher demand, created the conditions for the rising prices realized in 2000 and early in 2001 (Figure 2). These higher prices stimulated drilling and increased gas completions to approximately 2020 completions per month in mid-2001 with over 1000 rigs searching for gas and increasing capacity in 2001.
- The increasing capacity through 2001, in turn, caused the capacity utilization to drop to about 90 percent and lessen the potential for high prices. The Lower-48 average gas price declined from a January 2001 high of $8.16 to a low of $2.17 per thousand cubic feet (Mcf) in February 2002.

- Declining prices reduced gas completions to 17,000 in 2002. The gas rig count dropped to approximately 600. The previous report, "Natural Gas Productive Capacity for the Lower-48 States" May 2001, anticipated this trend. The decrease in gas prices, drilling, and completions in late 2001 and early 2002 caused a decrease in productive capacity in early 2002.
- Monthly natural gas prices returned to the $3.00 per Mcf range in April 2002 and are expected to peak in February 2003 at $4.74 per Mcf before stabilizing in the range of $3.90 to $4.28 per Mcf for the remainder of 2003 (Table 1). Gas completions are expected to increase to 2000 per month by November 2003 with a gas rig count of 970 (Base Case) (Figure 2). Capacity began to increase in mid-2002 and continues to increase as gas prices and completions remain at high rates relative to recent historical rates. The effective capacity utilization is projected to remain at or above 90 percent through most of 2003 (Base Case) indicating that sudden changes in demand or supply such as severe cold weather or storms that require wells to be shut in could cause short term shortages and high prices until the gas system adjusts.

Figure 2. Lower-48 History and Forecast Gas Rigs, Gas Price, and Gas Equivalent (6:1) Oil Price 1996 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production.

Table 1. Lower-48 Natural Gas & Oil Prices and Gas Rigs History & Forecast

Month	Base Gas Price	Base Oil Price	Base Gas Rigs	Month	Base Gas Price	Base Oil Price	Base Gas Rigs
Jan-96	2.06	16.44	406	Jan-00	2.62	24.32	632
Feb-96	1.90	16.43	411	Feb-00	2.75	26.36	616
Mar-96	1.96	18.68	421	Mar-00	2.68	27.12	600
Apr-96	2.09	20.62	446	Apr-00	2.89	23.54	609
May-96	2.02	18.56	467	May-00	3.07	26.19	645
Jun-96	2.09	17.77	471	Jun-00	3.80	28.13	677
Jul-96	2.26	18.50	488	Jul-00	3.87	27.59	733
Aug-96	2.11	19.17	488	Aug-00	3.76	28.55	779
Sep-96	1.86	21.03	505	Sep-00	4.30	30.51	810
Oct-96	1.95	22.20	499	Oct-00	4.62	30.29	842
Nov-96	2.52	21.11	482	Nov-00	4.44	31.09	832
Dec-96	3.28	22.40	489	Dec-00	5.82	25.79	854
Jan-97	3.44	22.68	478	Jan-01	8.16	25.90	879
Feb-97	2.46	19.89	492	Feb-01	5.91	26.40	898
Mar-97	1.62	18.35	518	Mar-01	5.21	23.99	913
Apr-97	1.65	17.21	526	Apr-01	5.27	24.14	957
May-97	1.88	18.04	543	May-01	4.62	24.84	997
Jun-97	2.02	16.50	577	Jun-01	3.93	24.26	1050
Jul-97	1.92	16.70	584	Jul-01	3.43	23.53	1058
Aug-97	1.96	17.07	581	Aug-01	3.27	24.12	1032
Sep-97	2.23	17.08	614	Sep-01	2.58	23.37	972
Oct-97	2.72	18.56	602	Oct-01	2.43	19.55	913
Nov-97	2.79	17.48	625	Nov-01	2.77	17.57	825
Dec-97	2.18	15.70	648	Dec-01	2.41	16.47	754
Jan-98	1.97	13.92	609	Jan-02	2.38	16.69	725
Feb-98	1.97	13.01	589	Feb-02	2.17	17.66	679
Mar-98	2.07	11.86	601	Mar-02	2.55	20.77	617
Apr-98	2.17	12.09	591	Apr-02	3.06	22.80	612
May-98	2.06	11.83	580	May-02	3.05	24.41	690
Jun-98	1.92	10.57	585	Jun-02	3.00	23.37	704
Jul-98	2.10	11.02	549	Jul-02	2.93	24.35	716
Aug-98	1.83	10.66	565	Aug-02	2.80	25.67	721
Sep-98	1.71	11.95	559	Sep-02	3.02	26.80	736
Oct-98	1.87	11.72	519	Oct-02	3.39	26.15	709
Nov-98	1.95	10.33	499	Nov-02	3.63	24.65	683
Dec-98	1.96	8.77	491	Dec-02	3.89	26.91	714
Jan-99	1.82	9.54	461	Jan-03	4.24	30.18	726
Feb-99	1.75	9.27	425	Feb-03	4.74	29.97	723
Mar-99	1.72	11.55	412	Mar-03	4.38	29.59	750
Apr-99	1.95	13.94	371	Apr-03	4.09	29.22	774
May-99	2.12	14.75	380	May-03	3.96	28.86	832
Jun-99	2.11	15.00	434	Jun-03	3.79	28.51	871
Jul-99	2.09	16.85	478	Jul-03	3.74	28.17	901
Aug-99	2.36	18.29	527	Aug-03	3.70	27.84	929
Sep-99	2.44	20.71	565	Sep-03	3.71	27.50	945
Oct-99	2.33	20.27	601	Oct-03	3.90	27.17	957
Nov-99	2.46	22.16	635	Nov-03	4.06	26.83	971
Dec-99	2.05	23.33	636	Dec-03	4.28	26.49	977

History through Dec-02.

Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

Methodology

- The *effective productive capacity* is the estimated maximum production available for use from natural gas wells. It is a demonstrated limit that is lower than the wellhead capacity. It reflects the ability of producing wells to deliver gas into the gathering and transportation system.
- To estimate the effective productive capacity, the wellhead productive capacity must first be estimated for all wells. The monthly wellhead capacity projections are the sum of capacity forecasts for older wells and new wells.
  - To estimate old well capacity, the wells are grouped by vintage year. Productive capacity is modeled for each vintage using a hyperbolic function relating the peak monthly production rates to cumulative production. A monthly projection is made for each vintage and then all vintages are summed.
  - In areas that have significant coal bed methane production after 1987, the coal bed wells and their respective production history are summarized by vintage. A growth curve relating the average production rate per well to the cumulative production per well and a separate decline curve are fit to the data and merged at the peak rate.
  - New well capacity is a function of the number of new well completions, which depends on the monthly drilling rig forecast based on the monthly price and production forecasts in EIA's *Short Term Energy Outlook* (*STEO*).
    - The Drilling Rig Model uses oil and gas revenue to project total active rigs and the percent of rigs drilling for gas. A *well completion/rig ratio* for each of the ten U.S. supply areas is used to convert the number of gas rigs to well completions. This conversion includes an efficiency factor that models the efficiency losses normally seen when the number of drilling rigs increases.
    - The wellhead capacity to produce gas from these new well completions is estimated by an average growth curve for the first 12 months, and a hyperbolic function relating monthly production rate to cumulative production and calibrated to the most recent 3 years of data for conventional wells. New coal bed methane wells use an average growth curve and decline rate as determined by the last 3 data years.
- The *effective capacity utilization* rate is the ratio of the *production* to the *effective productive capacity*.
- The production forecast is based on the U.S. production forecast in the most recent STEO.
  - The U.S. production forecast is distributed among the ten supply areas considered in this study according to each area's monthly share of production during the past two years.
  - Each area's effective productive capacity is then compared to its monthly production forecast. If the area's production forecast is greater than the estimated effective productive capacity, the unmet production requirement is allocated to other supply areas that have surplus or unutilized effective productive capacity.
- *Surplus* (unutilized) *capacity* is defined as the difference between the estimated *effective productive capacity* and the projected *production*.

Note: This study uses average monthly values, which do not reflect phenomena - such as a severe cold snap - that might push production to full capacity (100% utilization rate) for a short time. Monthly peak winter natural gas demand is usually 1.5 times or greater than natural gas production; the deficit is met by withdrawals from natural gas storage and imports. Potential uncertainties of up to several percent may exist in some monthly production and effective productive capacity estimates used in this study.

Description of Areas

- The Lower-48 States are divided into 10 areas for analysis (Figure 3).
  - The Federal Offshore Gulf of Mexico and the states of Texas, Oklahoma, Louisiana, New Mexico, California, and Kansas were evaluated separately.
  - The producing states combined to create the Rocky Mountain area are Colorado, Montana, North Dakota, Utah, and Wyoming.
  - The Southeast area is made up of Arkansas, Mississippi, and Alabama.
  - The area titled "Other" includes eighteen states that have no individual well data available for the determination of wellhead capacity or produce very small volumes. The eighteen states are:

Arizona	Michigan	Oregon
Florida	Missouri	Pennsylvania
Illinois	Nebraska	South Dakota
Indiana	Nevada	Tennessee
Kentucky	New York	Virginia
Maryland	Ohio	West Virginia

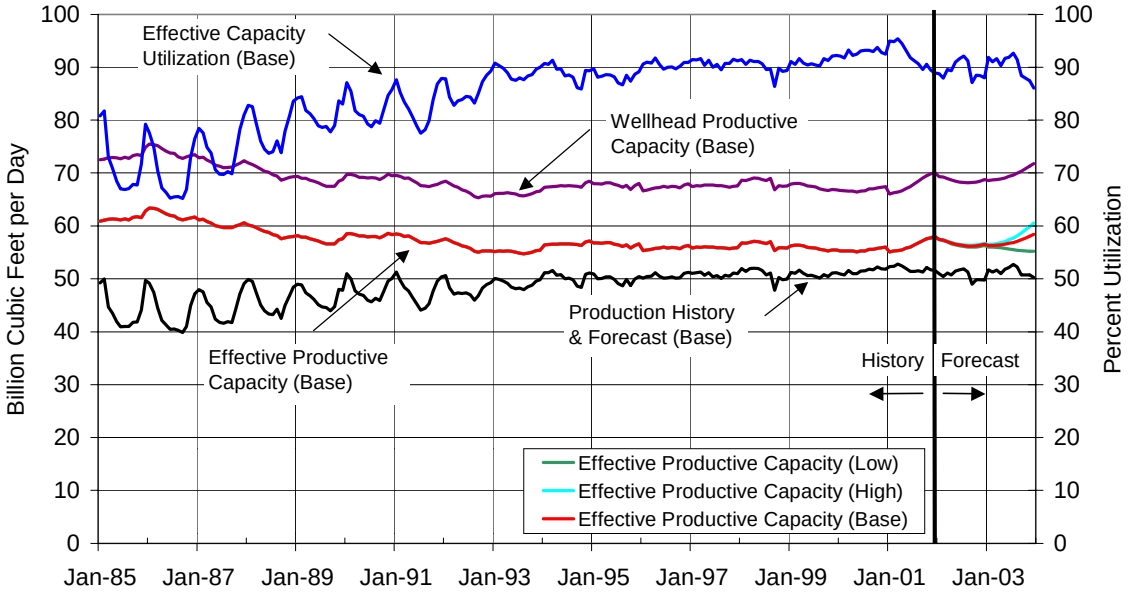
- The 10 Areas can be grouped by producing rates.
  - Federal Offshore and Texas are the largest producers at approximately 13 Bcf/d each. Each produces approximately 25 percent of the Lower 48 rate (50 percent when combined).
  - The states of New Mexico, Oklahoma, Louisiana, and the Rocky Mountain area each produce approximately 3.8 to 6.0 Bcf/d. When combined, this volume is approximately one third of the Lower 48 total.
  - The remaining states and groups of states (California, Kansas, and Southeast) produce less than 2.0 Bcf/d each and the area designated Other produces approximately 2.3 Bcf/d. The sum of daily production from California, Kansas, and the Southeast area in 2003 is projected to be 8.1 percent of total production. Production from states in the Other area is projected to 4.4 percent of the total production.

Figure 3. Analysis Areas for Gas Capacity Study

Results by Area

- Lower-48 States
  - Average effective productive capacity is expected to exceed production by 5.6 Bcf/d in 2003 in the Lower-48 States (Base Case). Average production for 2003 is projected to be 51.4 Bcf/d (Figure 4a). However, the Low Case shows the capacity difference becoming smaller by the end of 2003 when compared to the Base Case production.
  - Maintaining gas well drilling is critical to maintaining gas productive capacity. The 17,000 gas well completions in 2002 were not quite enough to replace the capacity decline from all the older wells producing at the end of 2001. The effective productive capacity declined about 1.5 Bcf/d in 2002. Completions are projected to increase by 5,800 in 2003 to about the same level as in 2001. Effective productive capacity is projected to increase about 2 Bcf/d in 2003.
  - Effective capacity utilization is at or above 90 percent for most of 2003 in the Base Case.

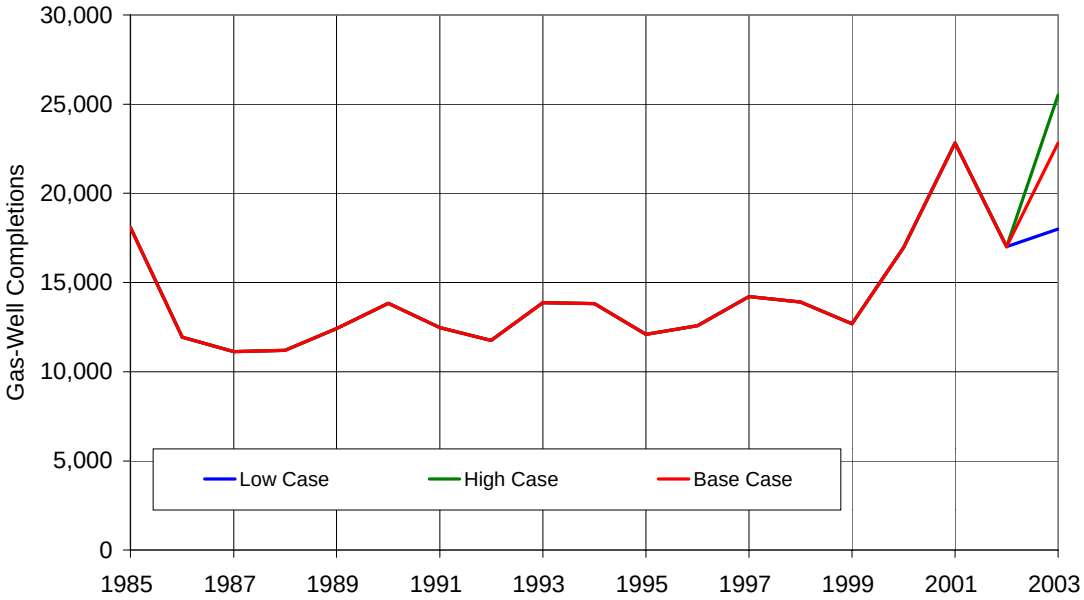
Figure 4a. Lower-48 States Monthly Dry Gas Production Rate, and Effective Productive Capacity and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- The number of gas well completions added each year has increased from 13,000 – 14,000 per year prior to year 2000 to 22,800 in 2001. Completions added in 2002 decreased to 17,000 but are expected to increase to the 22,800 level again in 2003 (Base Case). The majority of the increase is in Texas and the Rocky Mountain area (Figure 4b).

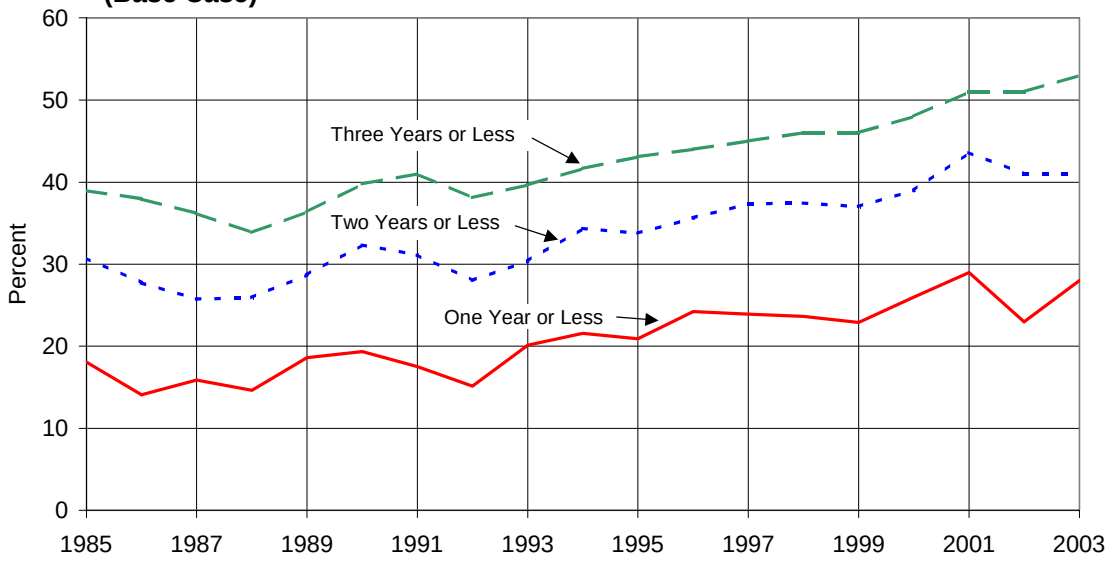
Figure 4b. Lower 48 States Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- Completions that are one year old or less contribute 25 to 30 percent of the total wellhead capacity and completions three years old or less contribute slightly more than 50 percent of the total wellhead capacity (Figure 4c). One reason for higher percentages of production capacity from new wells is improved completion technology that allows high rates of production (and therefore higher depletion rates) from new wells. If drilling were to stop completely, all surplus wellhead capacity would vanish in less than a year.

Figure 4c. Percent of Total Wellhead Productive Capacity of Lower 48 States (Excluding 18 Minor Producing States*) Gas Wells by Well Age (Base Case)



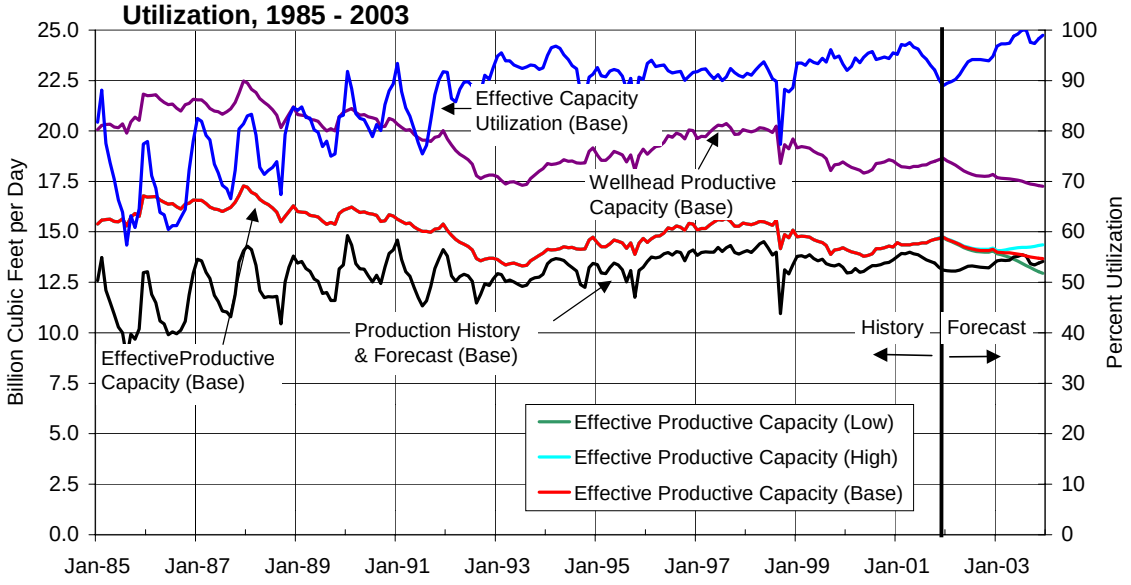
Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

Note: *The 18 States group collectively contibutes 5 to 6 percent of Lower-48 production.

- Federal Offshore Gulf of Mexico

  - The Federal Offshore Gulf of Mexico is one of the highest producers of gas at 13 - 14 Bcf/d. Production is at 95 to100 percent of effective capacity and has been at 90 to 95 percent since 1993 (Figure 5a).
  - The difference between wellhead capacity and effective capacity is large because of infrastructure limitations. Small changes in infrastructure such as pipeline or processing improvements could result in significant improvement in effective capacity.
  - Current surplus capacity of approximately 0.5 to 0.8 Bcf/d is expected to decline to 0.24 Bcf/d in 2003 because of a projected decrease in drilling.

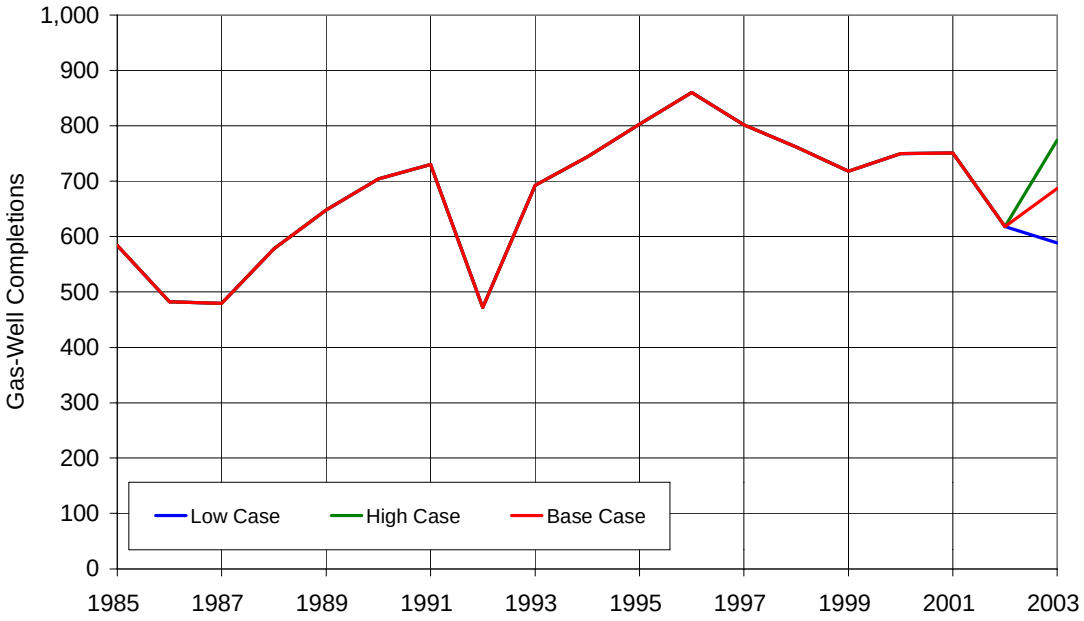
Figure 5a. Gulf of Mexico OCS Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Rigs drilling for gas in the Gulf of Mexico are expected to decline in 2003 based on the STEO forecast. New completions added are expected to decrease to the lowest rate in over 10 years (Figure 5b).
- As a result of the decreased drilling in the Federal Offshore Gulf of Mexico the average surplus effective productive capacity is expected to decrease to 0.24 Bcf/d in 2003.

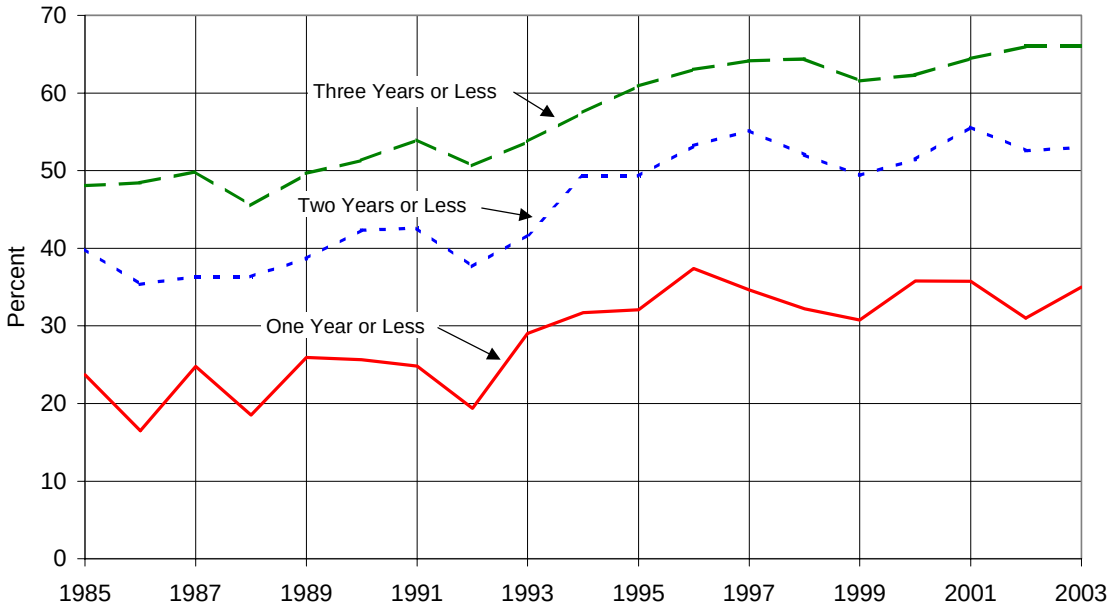
Figure 5b. Gulf of Mexico OCS Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- High initial rates and high production decline rates of offshore wells explain why wells one year old or less contribute over 30 percent of total wellhead capacity. Wells two years old or less contribute over 50 percent of total capacity and three year old or less wells contribute about 65 percent of total wellhead capacity.

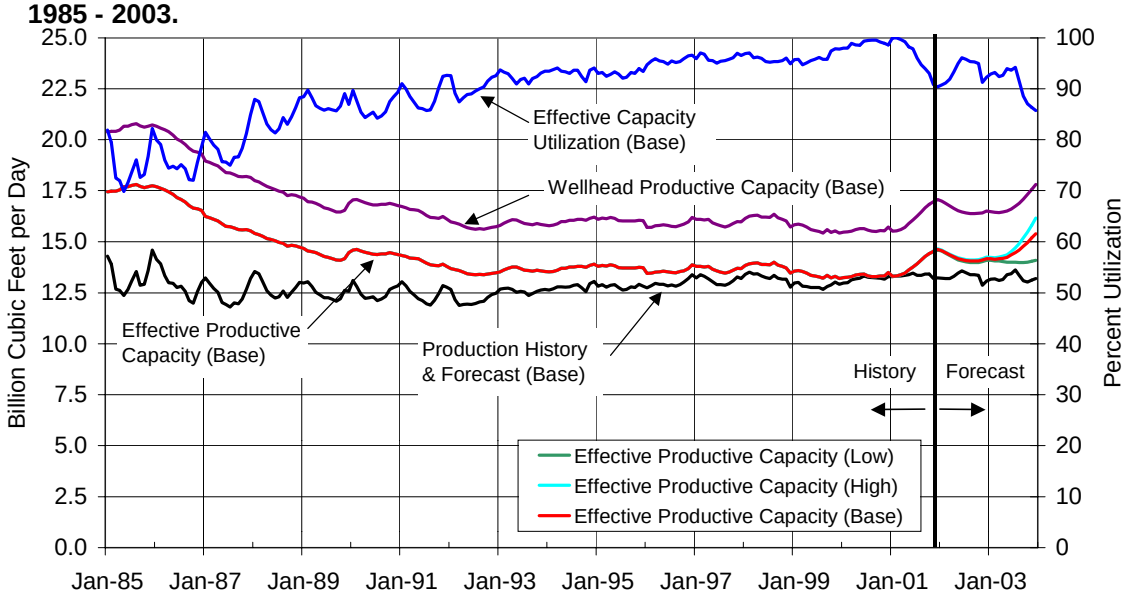
Figure 5c. Percent of Total Wellhead Capacity of Gulf of Mexico OCS Gas Wells by Age (Base Case)



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- Texas
  - Texas wells also produce approximately 13 Bcf/d. Effective capacity utilization is approximately 90 percent with average surplus capacity of 1.32 Bcf/d in 2003 (Figure 6a).
  - Along with the expected capacity increase, production is expected to be 13 Bcf/d by the end of year 2003.

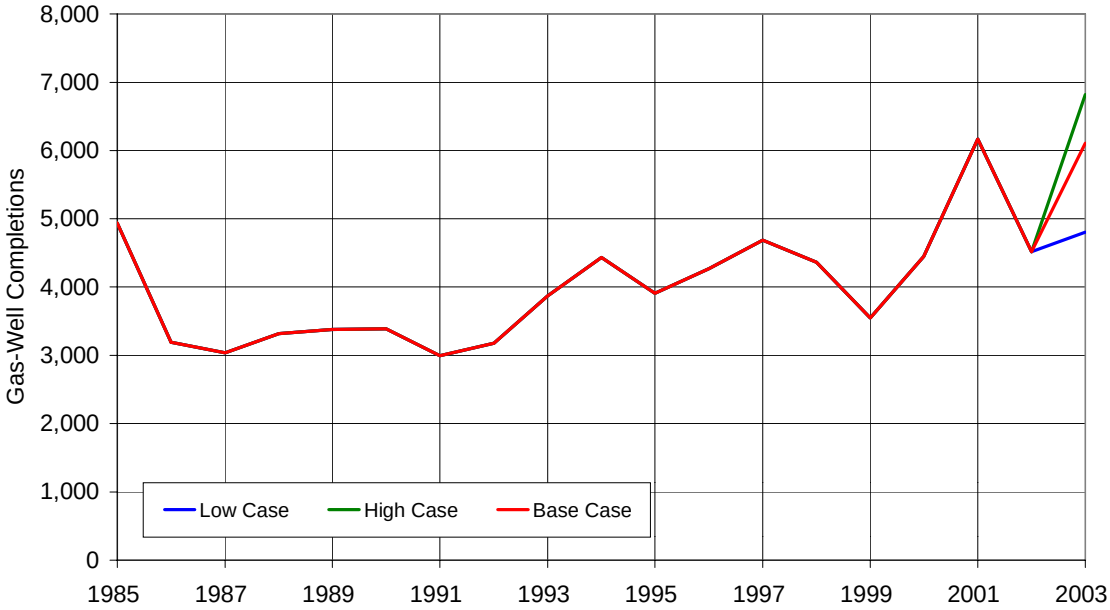
Figure 6a. Texas Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003.



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- New gas well completions for Texas in 2003 are expected to be approximately 6,000 (500 per month), an increase to near peak rates of year 2001, causing capacity to increase (Figure 6b).

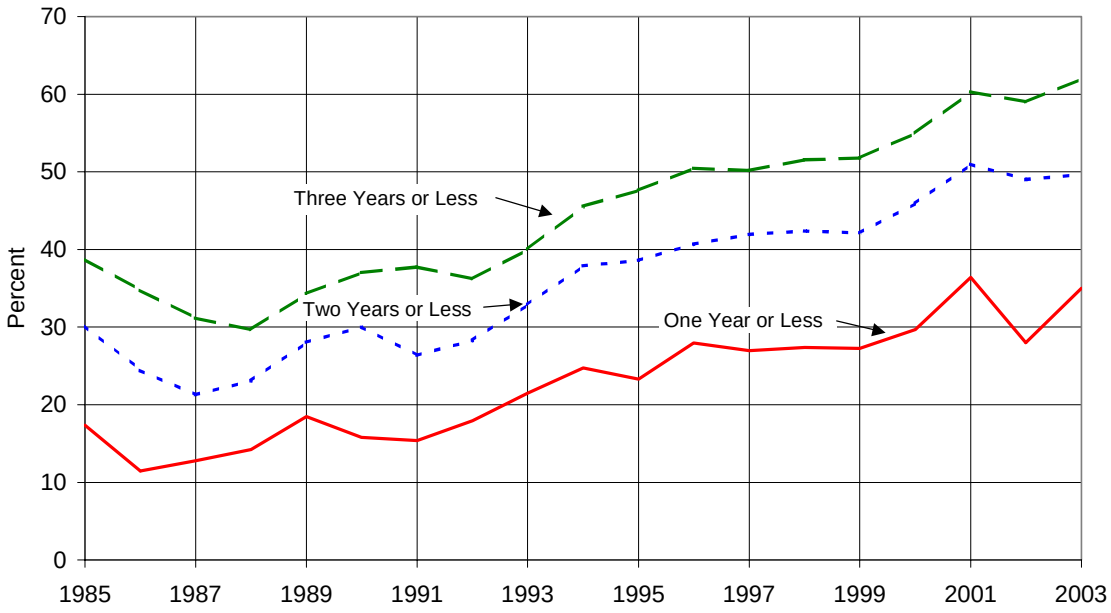
Figure 6b. Texas Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- The capacity of one year old or less wells in Texas represents nearly 35 percent of total wellhead capacity. Three year old or less wells have 60 percent of the wellhead capacity (Figure 6c).

Figure 6c. Percent of Total Wellhead Capacity of Texas Gas Wells by Age (Base Case)

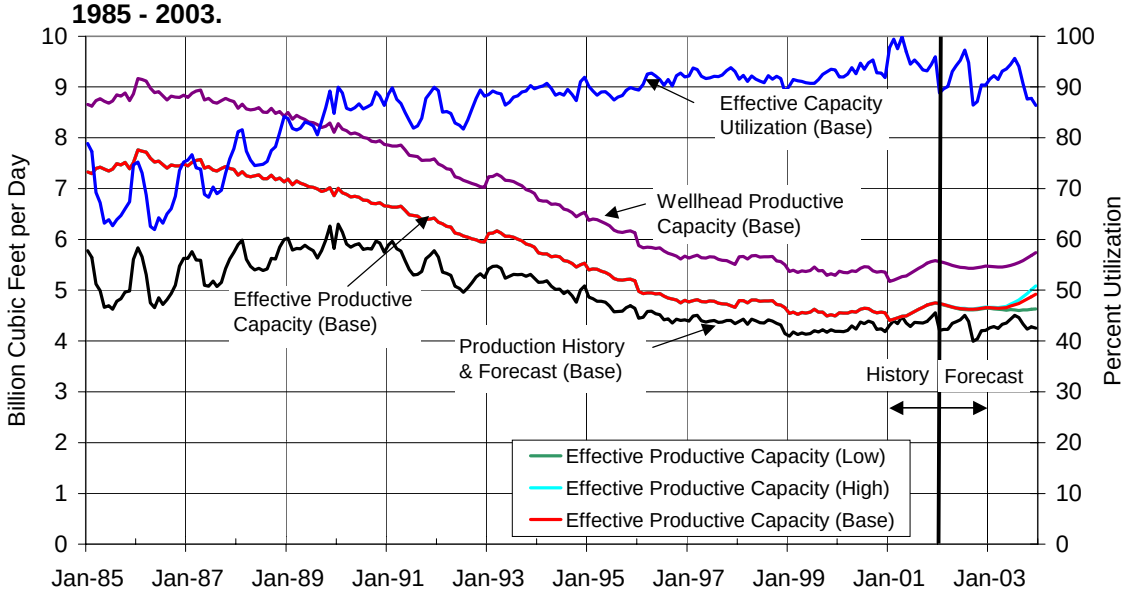


Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Oklahoma

  - Oklahoma's effective capacity utilization is projected to reach 95 percent in 2003.
  - The average difference between effective productive capacity and production is expected to be 0.4 Bcf/d in 2003 (Figure 7a).

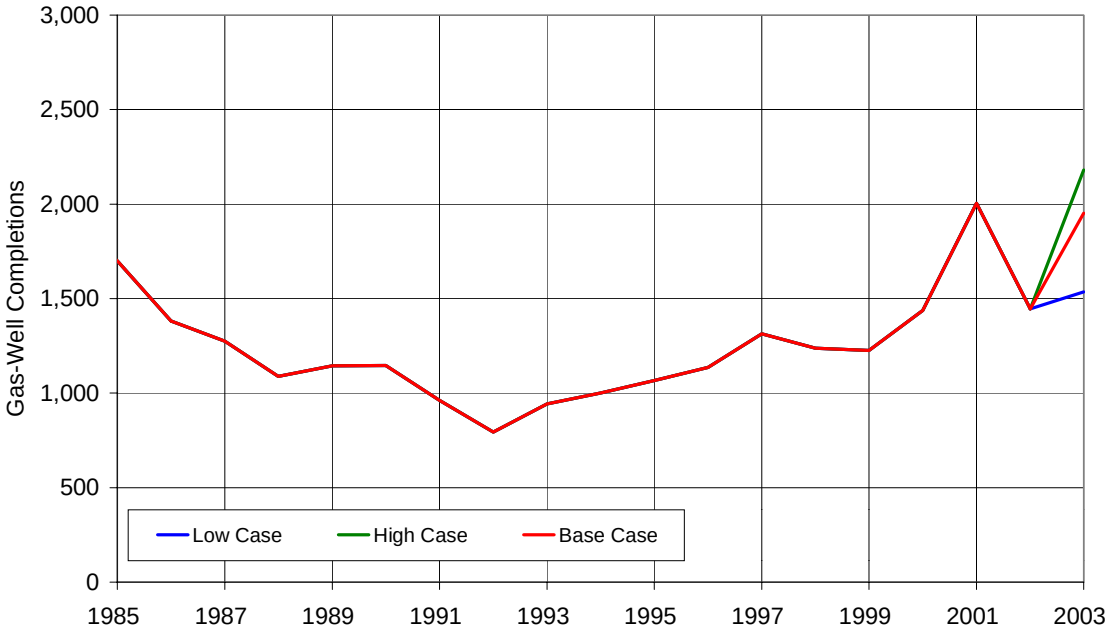
Figure 7a. Oklahoma Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003.



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Gas well completions in Oklahoma in 2003 are expected to remain high at 1880 to 2000 (157 to 163 per month) allowing production to increase from an average in 2002 of 4.26 Bcf/d to an average of 4.33 Bcf/d in 2003 (Figure 7b).

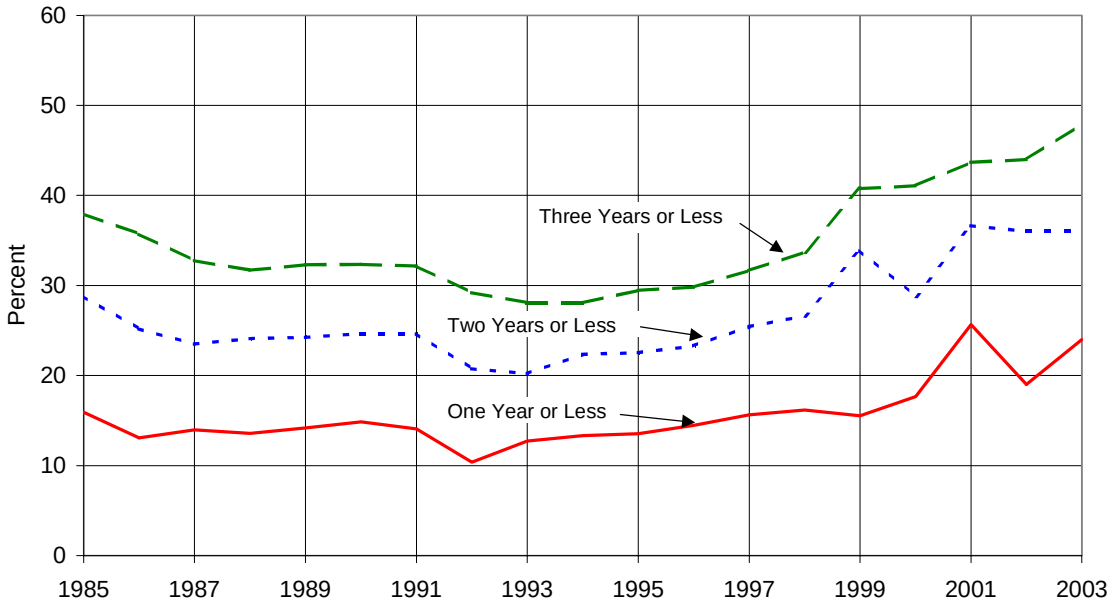
Figure 7b. Oklahoma Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- The percentage of wellhead capacity contributed by one year old or less completions in Oklahoma has increased from 12 percent to 22 percent in the last 10 years. Wells two years old or less and also the three year old or less completions show a similar increase in percentage of wellhead capacity over the last 10 years.
- The contribution to wellhead capacity of three year old or less completions is approaching 50 percent of total capacity (Figure 7c).

Figure 7c. Percent of Total Wellhead Capacity of Oklahoma Gas Wells by Age (Base Case)

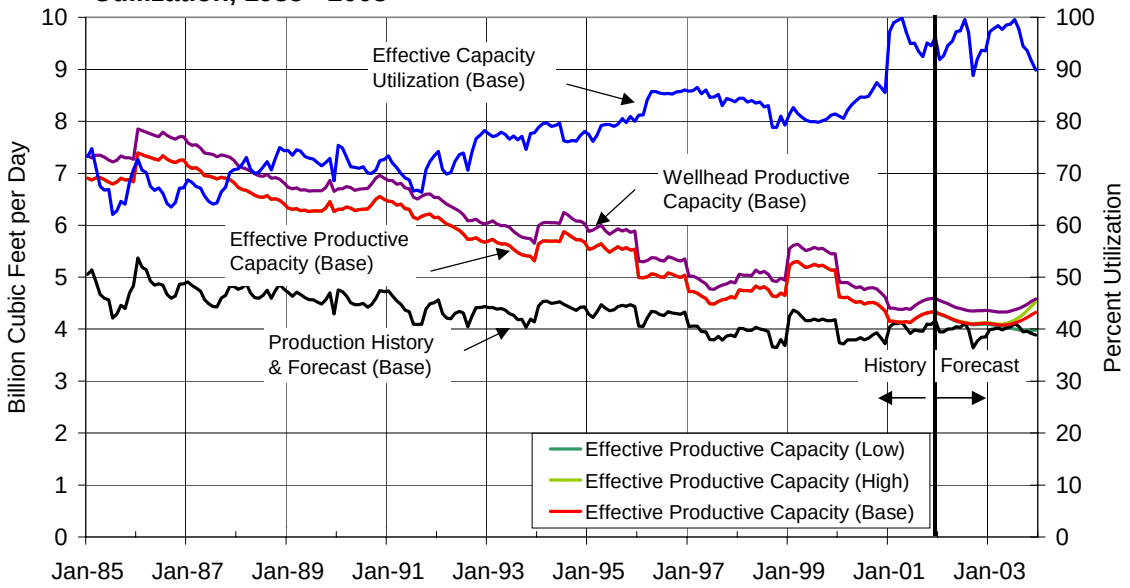


Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- Louisiana

  - Louisiana has very little surplus effective capacity (approximately 0.16 Bcf/d) with effective capacity utilization averaging over 95 percent (Figure 8a).
  - Louisiana is a mature area. Recent drilling is able to develop sufficient new capacity to maintain production at the present level and to add a small surplus capacity of 0.16 Bcf/d in 2003.

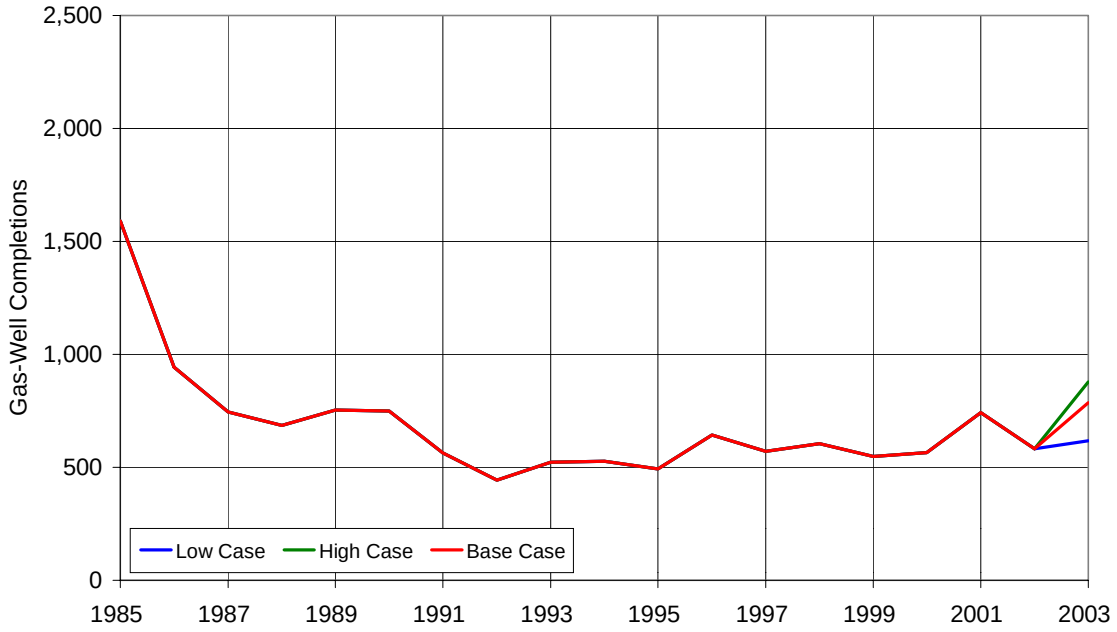
Figure 8a. Louisiana Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utiliization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- An increase of gas well completions to approximately 750 is projected to maintain Louisiana production at 4.0 Bcf/d and to create a small surplus of 0.16 Bcf/d in 2003 (Figure 8b) but to increase capacity and production significantly, an additional increase in completions would be necessary. Limited drilling prospects of this mature area cause the rates to remain stable and surplus capacity to remain small.

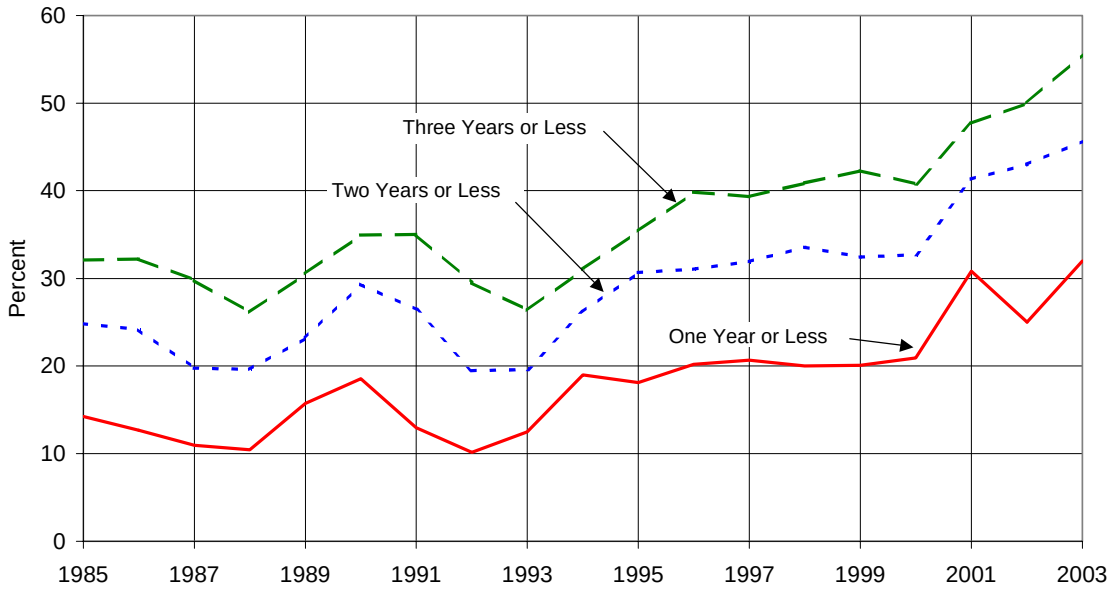
Figure 8b. Louisiana Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Recently completed wells in Louisiana provide an increasing share of total wellhead capacity over the last 10 years. One year old or less wells now contribute 30 percent of the total wellhead capacity while wells that are 3 years old or less contribute over 50 percent of total capacity with that value approaching 55 percent in 2003 (Figure 8c).

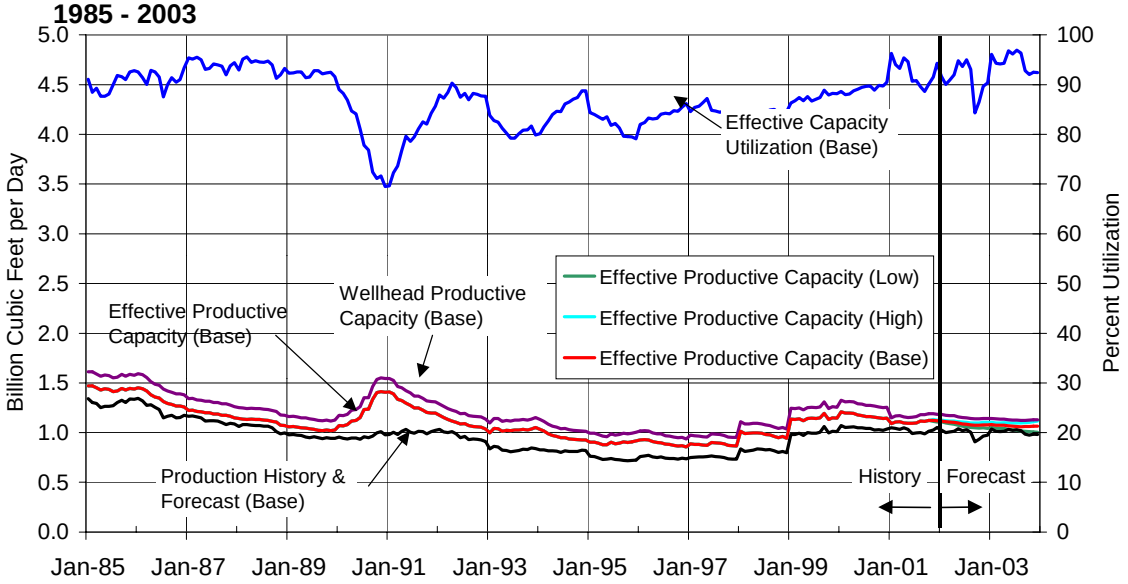
Figure 8c. Percent of Total Wellhead Capacity of Louisiana Gas Wells by Age (Base Case)



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- California
  - California gas production is 1.0 Bcf/d with less than 0.1 Bcf/d surplus capacity (Figure 9a).
  - The vast majority of California gas production is associated gas from oil wells (currently about 80 percent).

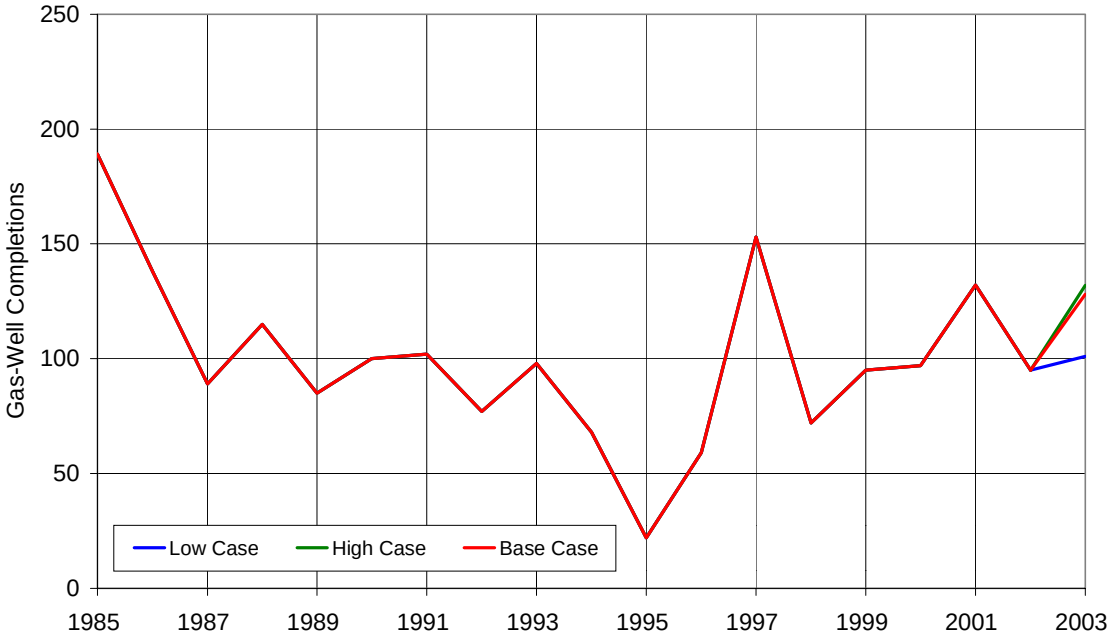
Figure 9a. California Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- The number of gas wells added is small at an average of 10 per month (Figure 9b).

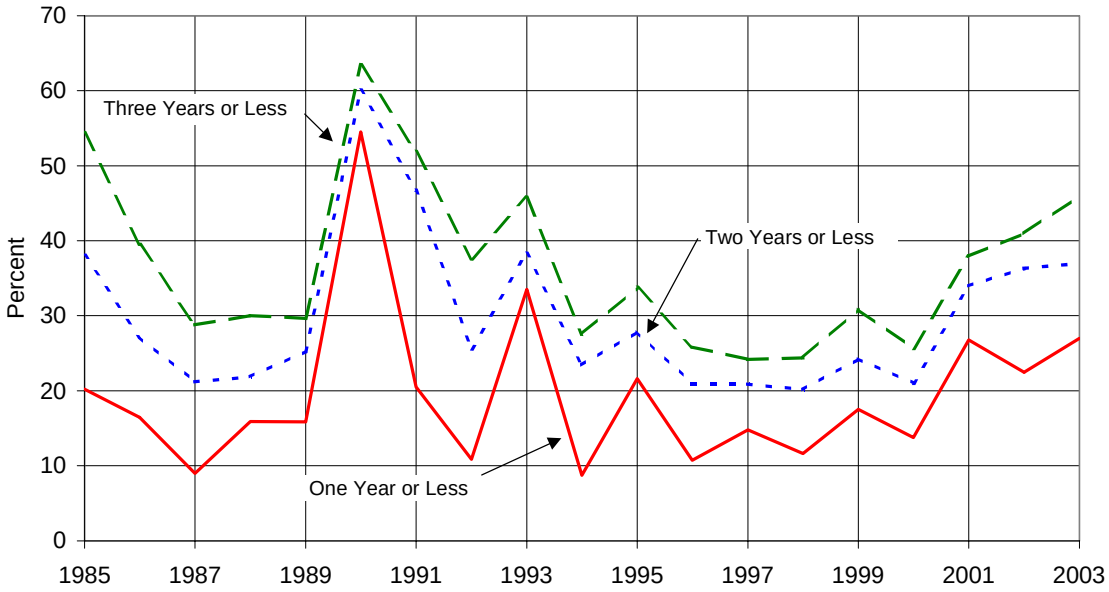
Figure 9b. California (Including Pacific OCS) Gas-Well Completions Added During Year,1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- Wells in California that are one year old or less contribute 25 percent of the total wellhead capacity and wells of three years old or less contribute 45 percent of total wellhead capacity (Figure 9c).

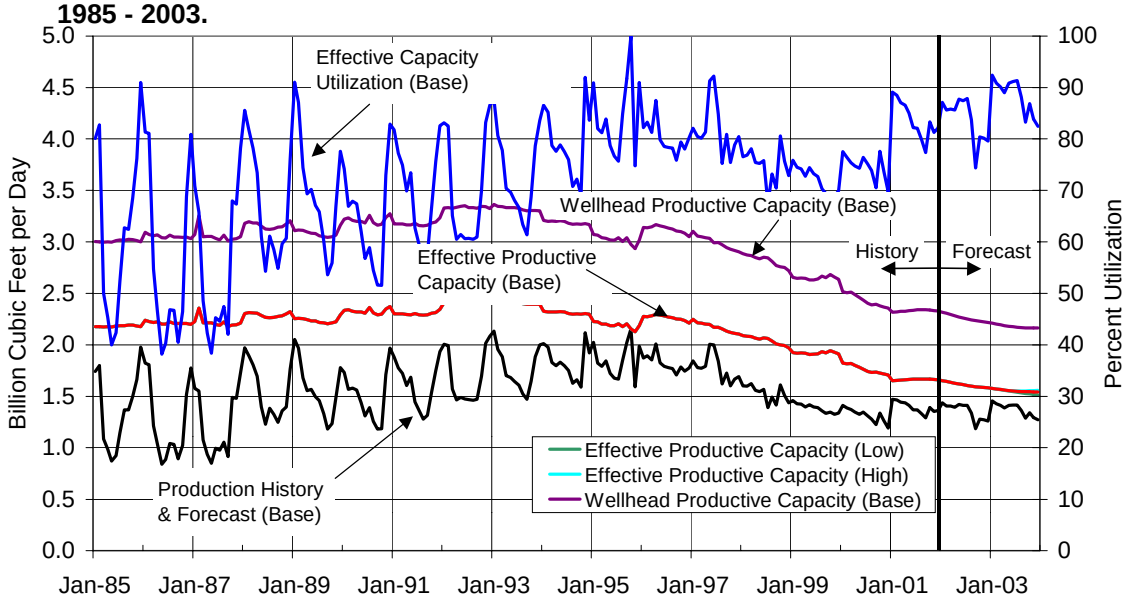
Figure 9c. Percent of Total Wellhead Capacity of California (Including Pacific OCS) Gas Wells by Age (Base Case)



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Kansas
  - Kansas gas production is approximately 1.4 Bcf/d with 0.18 Bcf/d surplus effective capacity projected for 2003.
  - Additional capacity is not expected from this area (Figure 10a).

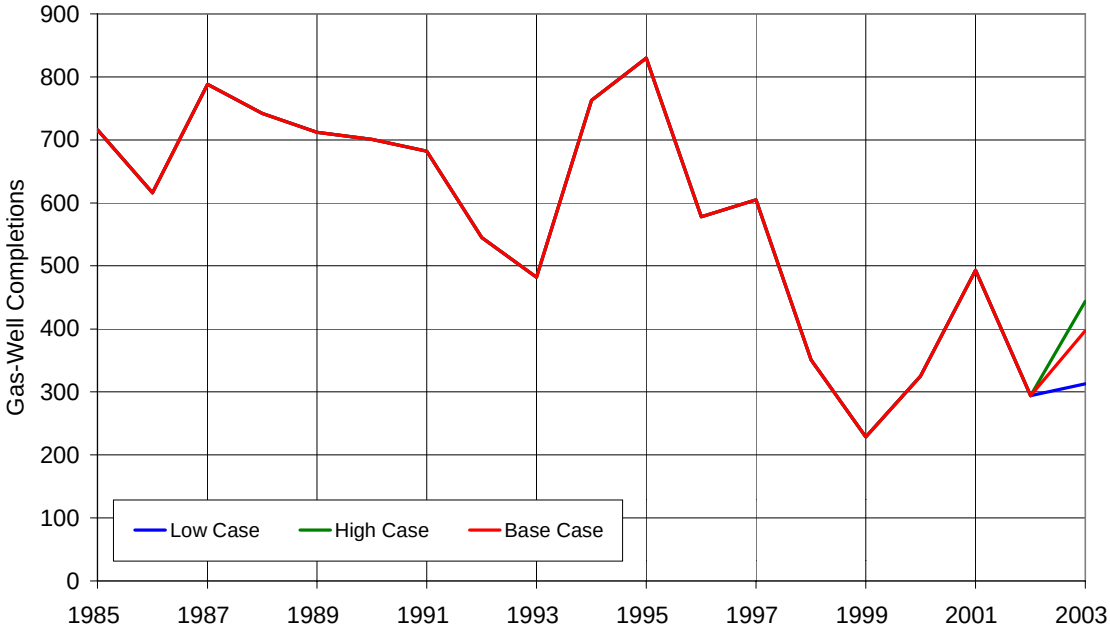
Figure 10a. Kansas Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003.



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Gas well completions in Kansas have declined from over 800 in 1995 (65 per month) to 230 in 1999 (20 per month) (Figure 10b). The long term trend is decreasing but there are several recent years of increasing completion activity. This completion trend indicates an area that is becoming mature with less potential to maintain drilling activity.

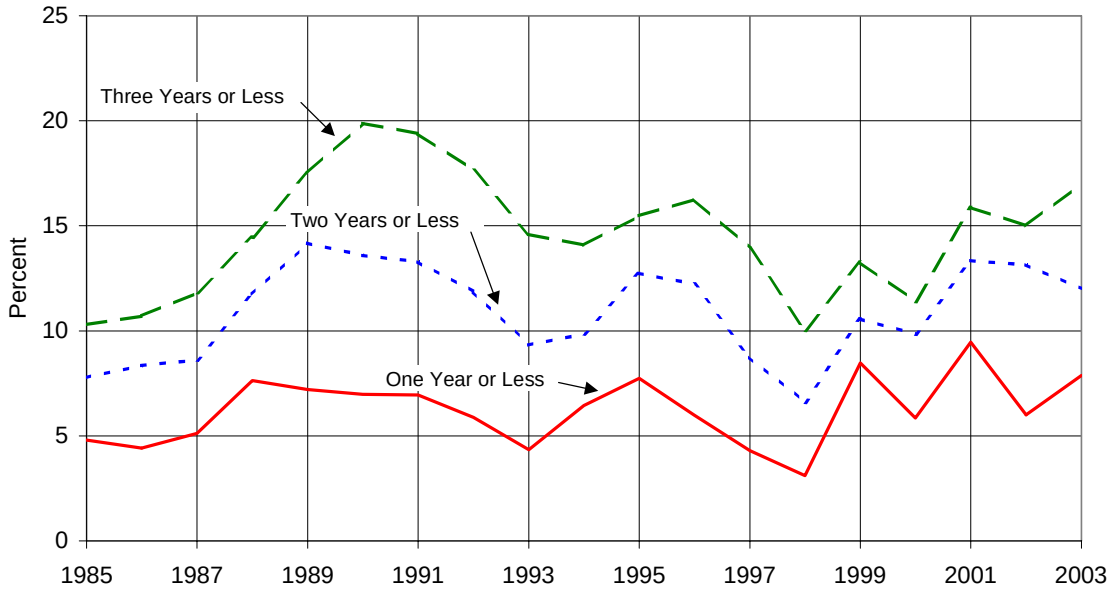
Figure 10b. Kansas Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Wells that are one year old or less contribute about 8 percent of total capacity in Kansas. Wells three years old or less contribute about 17 percent of total wellhead capacity (Figure 10c).

Figure 10c. Percent of Total Wellhead Capacity of Kansas Gas Wells by Age (Base Case)

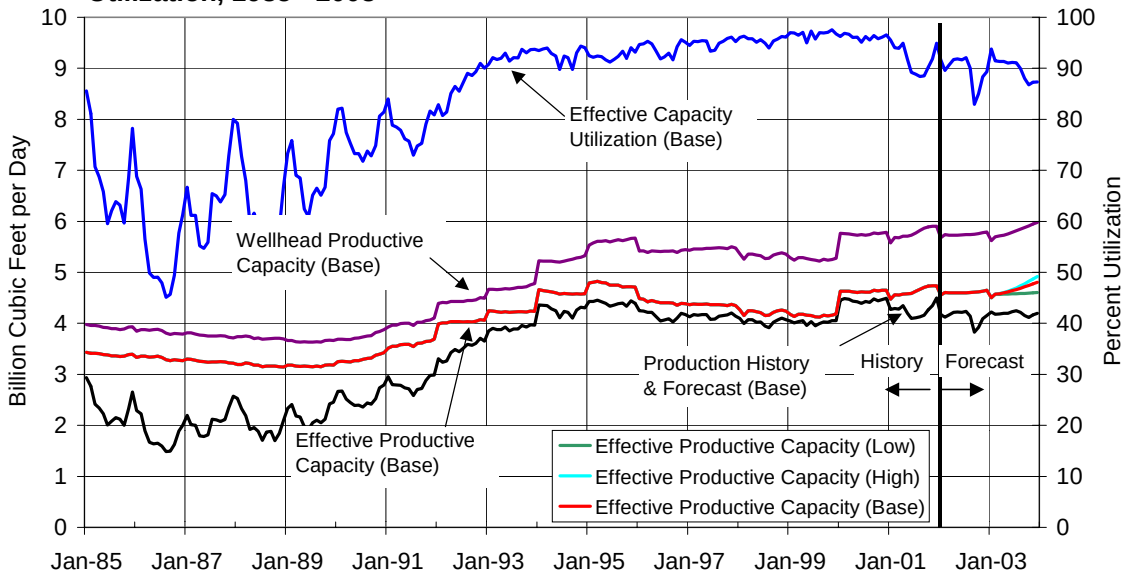


Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- New Mexico

  - Forty percent of New Mexico's 4.2 Bcf/d production is from coal bed methane wells. Effective capacity utilization exceeds 90 percent for most of 2003.
  - Coal bed methane production in New Mexico is declining and only 0.22 Bcf/day of surplus effective coal bed methane capacity is available from coal bed wells (Base Case).
  - Conventional gas wells are producing at 90 percent of effective capacity with a surplus capacity in 2003 projected at 0.25 Bcf/day.
  - Total New Mexico gas wells have surplus effective capacity of 0.47 Bcf/d (Figure 11a).

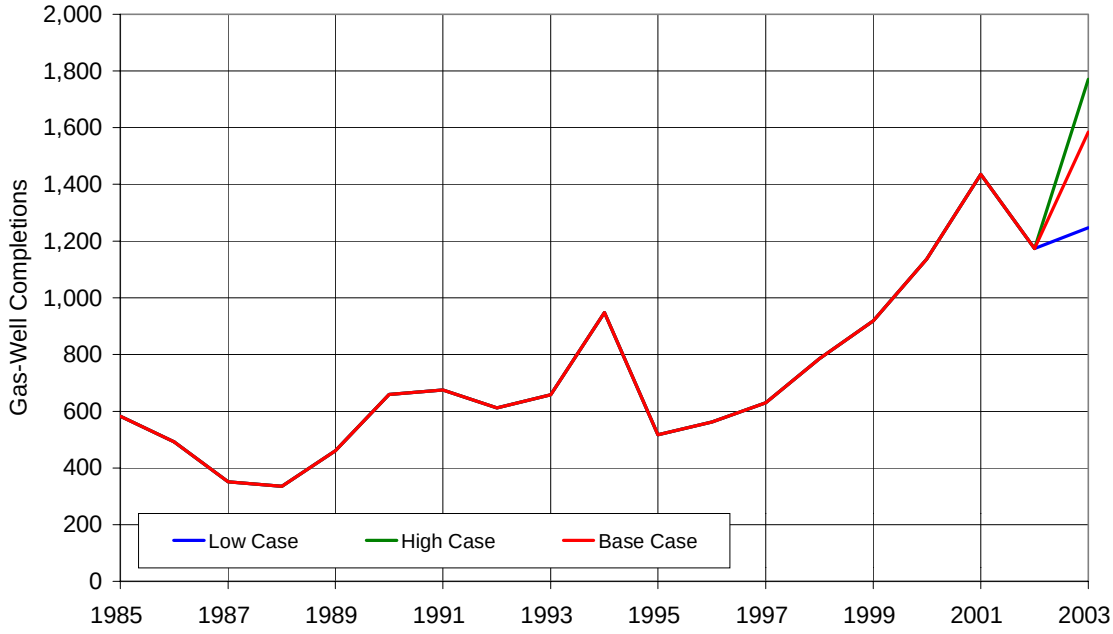
Figure 11a. New Mexico Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- New gas well completions per year have increased from 517 in 1995 (45 completions per month) to an expected 1,585 (130 completions per month) in 2003 in New Mexico (Figure 11b).

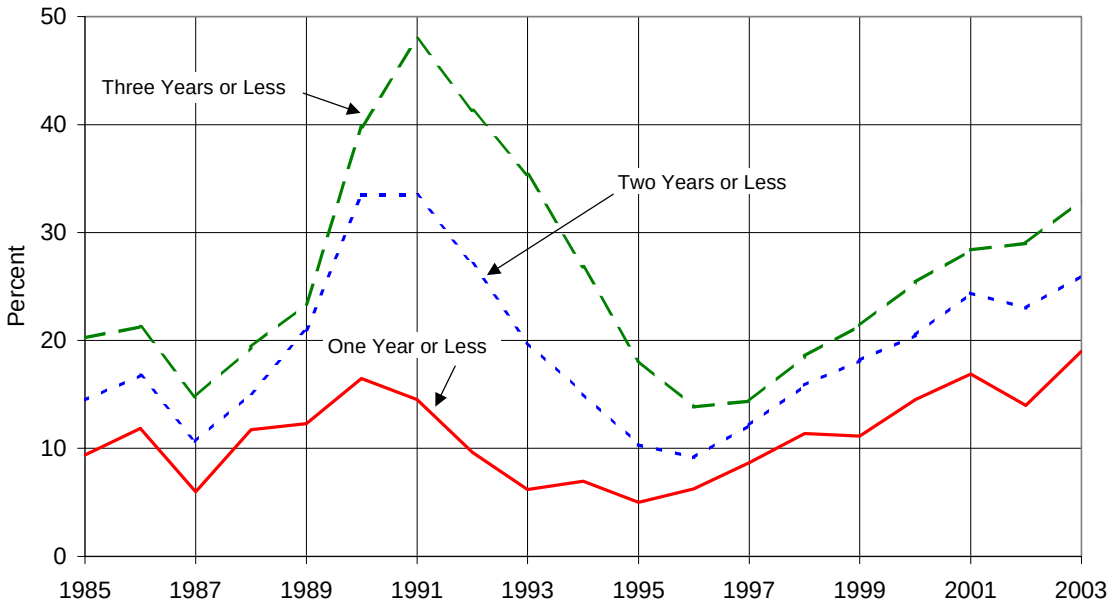
Figure 11b. New Mexico Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Well completions one year old or less in New Mexico contribute less than 20 percent of total capacity, an increase from 5 percent in 1995. Completions that are three years old or less contribute 33 percent of total wellhead capacity, an increase from 15 percent in 1996 (Figure 11c).

Figure 11c. Percent of Total Wellhead Capacity of New Mexico Gas Wells by Age (Base Case)

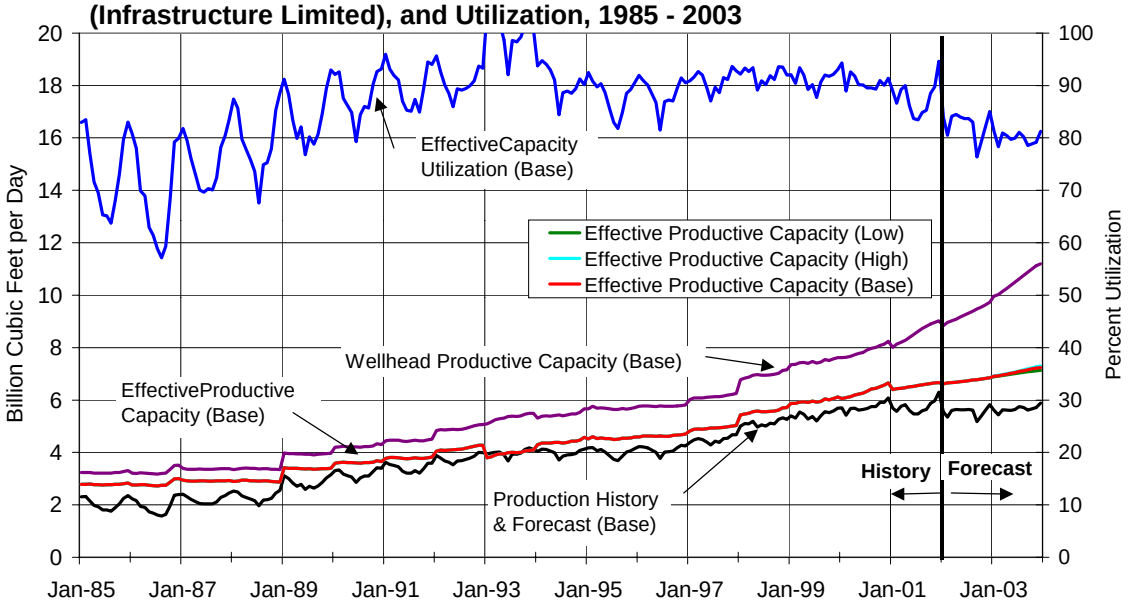


Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

- Rocky Mountain Area

  - The Rocky Mountain Area gas production has increased from 4 billion cubic feet in the mid-1990's to the current rate of 6 Bcf/d with much of the increase coming from coal bed methane.
  - Current conventional and coal bed production of 6 billion cubic feet per day is expected to be maintained through 2003 with coal bed methane production expected to increase to 2.3 Bcf/day by 2003 from an average of 1.9 Bcf/d in 2002.
  - In the Rocky Mountain Area wellhead capacity is growing at a faster rate than the infrastructure. Therefore, the effective capacity growth is assumed to be one-third of the wellhead capacity growth rate resulting in a surplus or unutilized capacity of 1.4 Bcf/d rather than 2.7 Bcf/d in 2003.
  - Additional pipeline capacity is expected to alleviate the infrastructure limitations (Figure 12a).

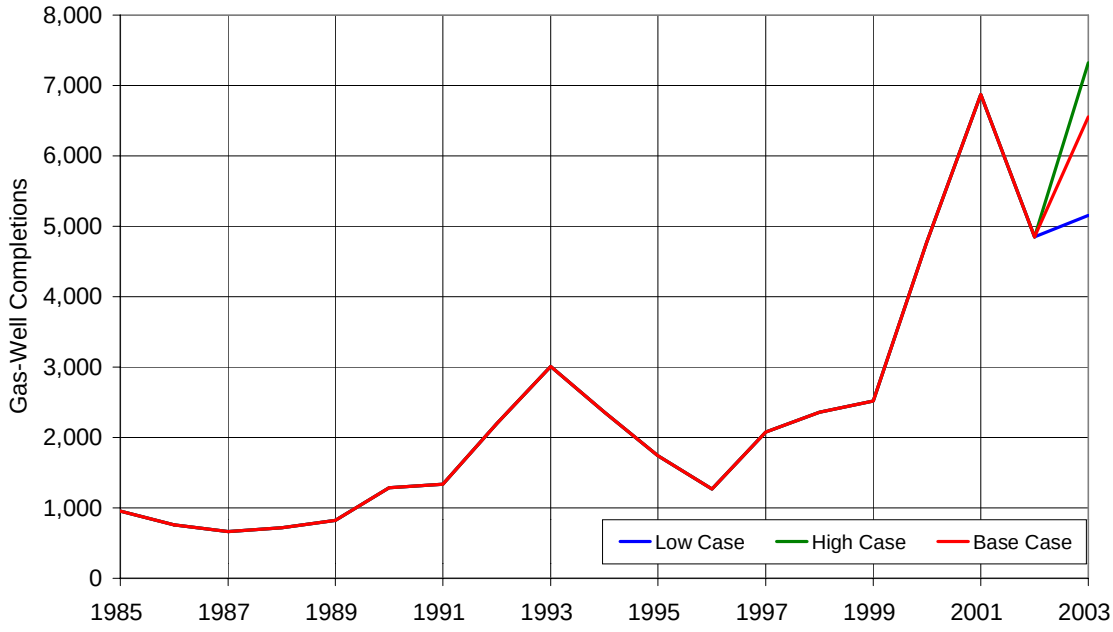
Figure 12a. Rocky Mountain Monthly Dry Gas Production Rate, Wellhead Productive Capacity, and Effective Productive Capacity (Infrastructure Limited), and Utilization, 1985 - 2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Gas well completions in the Rocky Mountain area have increased from 1,270 in 1996 to 6,870 in 2001. After a decrease to 4,850 in 2002 an increase to 6,550 is expected in 2003. Most of the increase was in the number of coal bed wells completed (Figure 12b).

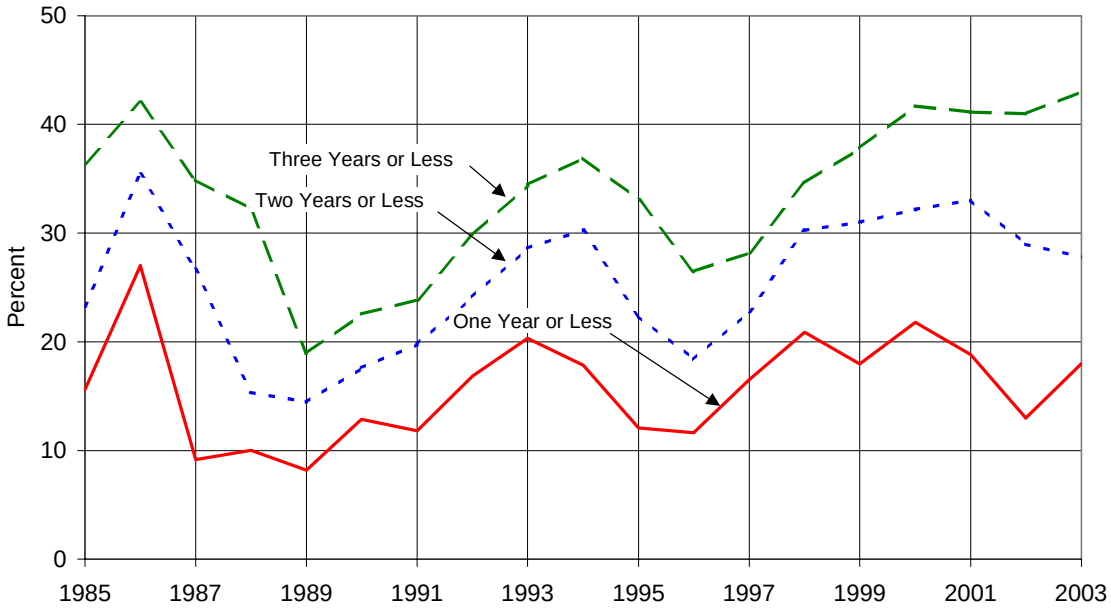
Figure 12b. Rocky Mountains Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

- Completions one year old or less in the Rocky Mountain area contribute approximately 17 percent of total wellhead capacity. The wellhead capacity of wells three years old or less exceeds 40 percent of total capacity (Figure 12c).

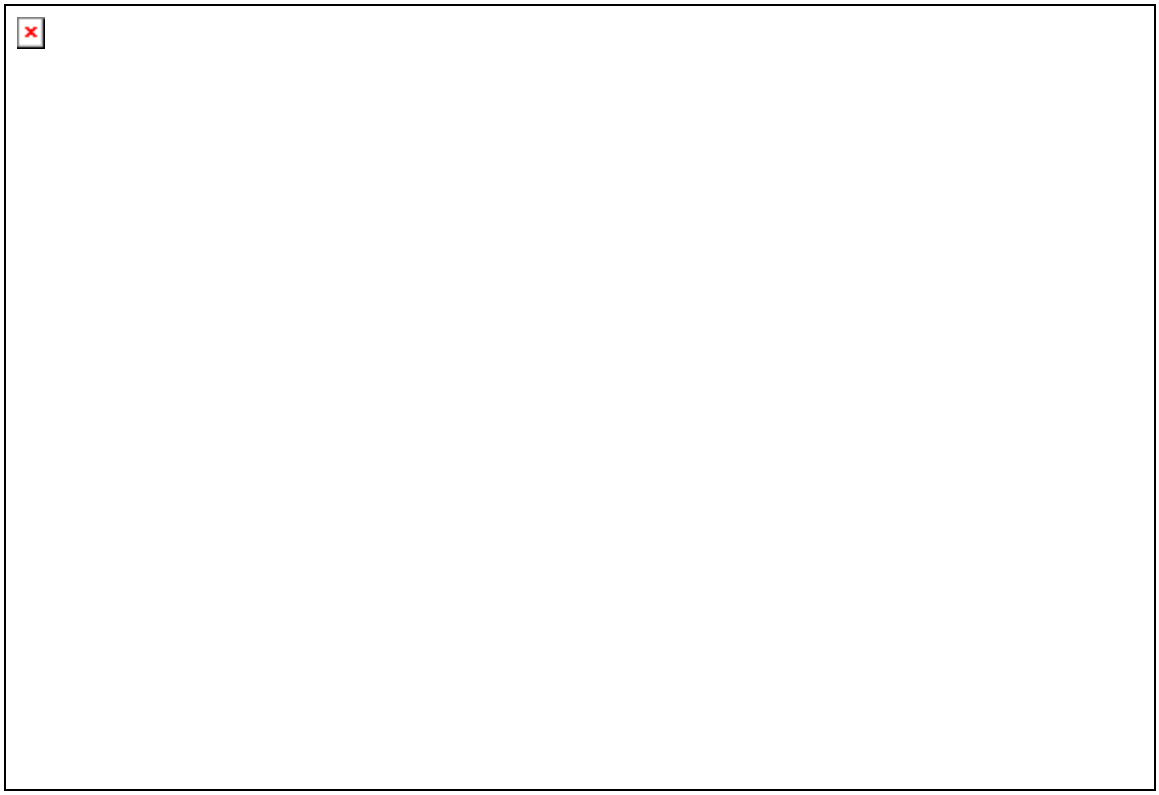
Figure 12c. Percent of Total Wellhead Capacity of Rocky Mountains Gas Wells by Age (Base Case)



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production

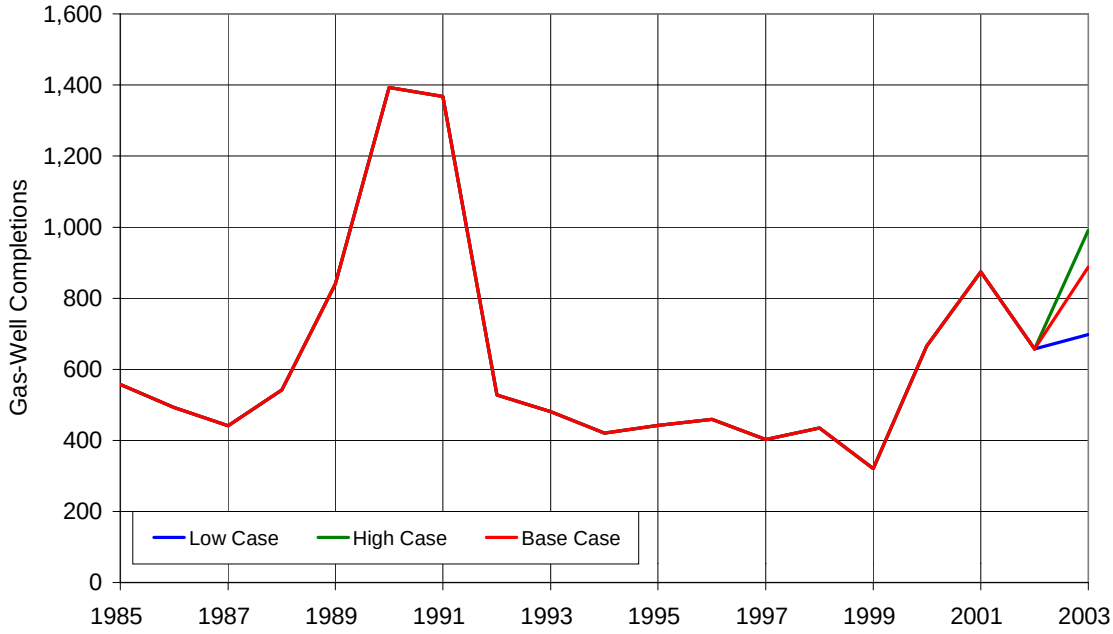
- Southeast Area

  - Coal bed methane production from the Southeast area is expected to average 0.52 Bcf/d and conventional gas production is projected to average 1.24 Bcf/d in 2003. Surplus effective productive capacity from this area is 0.36 billion cubic feet per day (Figure 13a).

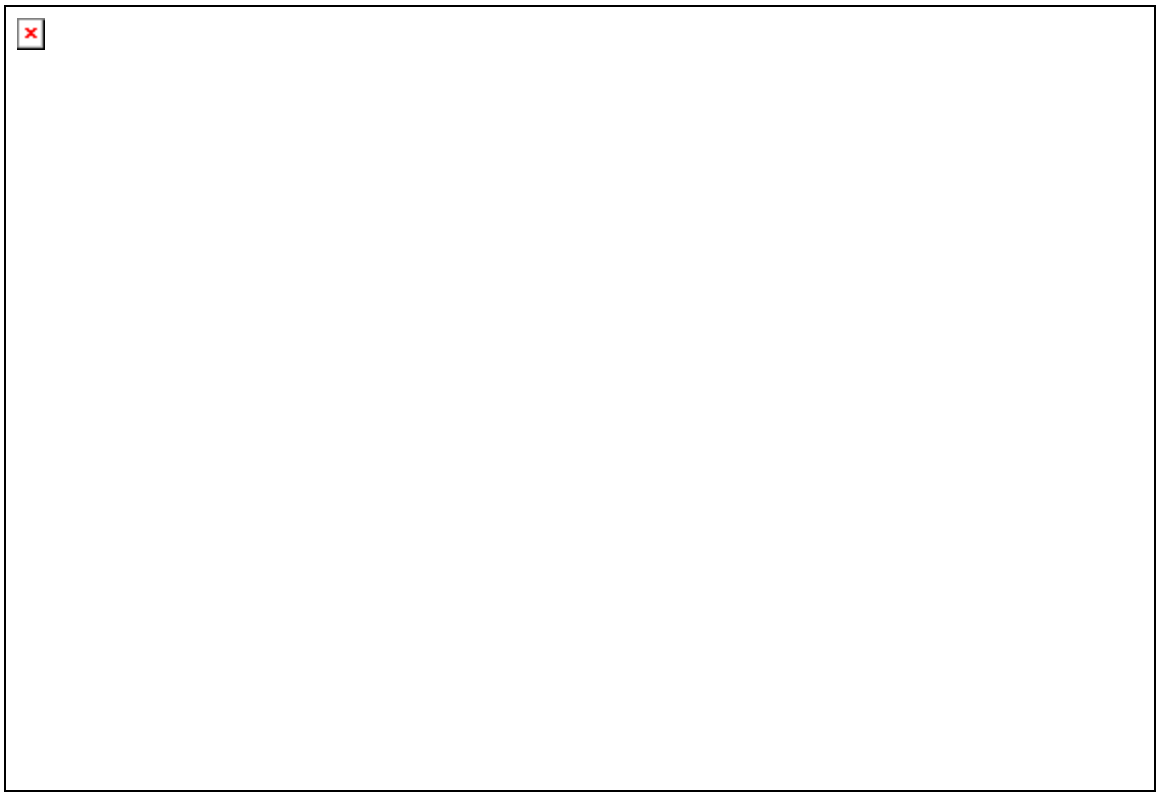


- The number of completions in the Southeast area has doubled since 1993 - 1999 to over 800. The new completions one year old or less contribute 20 percent of the total wellhead capacity and three year old or less completions contribute 45 percent of total wellhead capacity (Figures 13b and 13c).

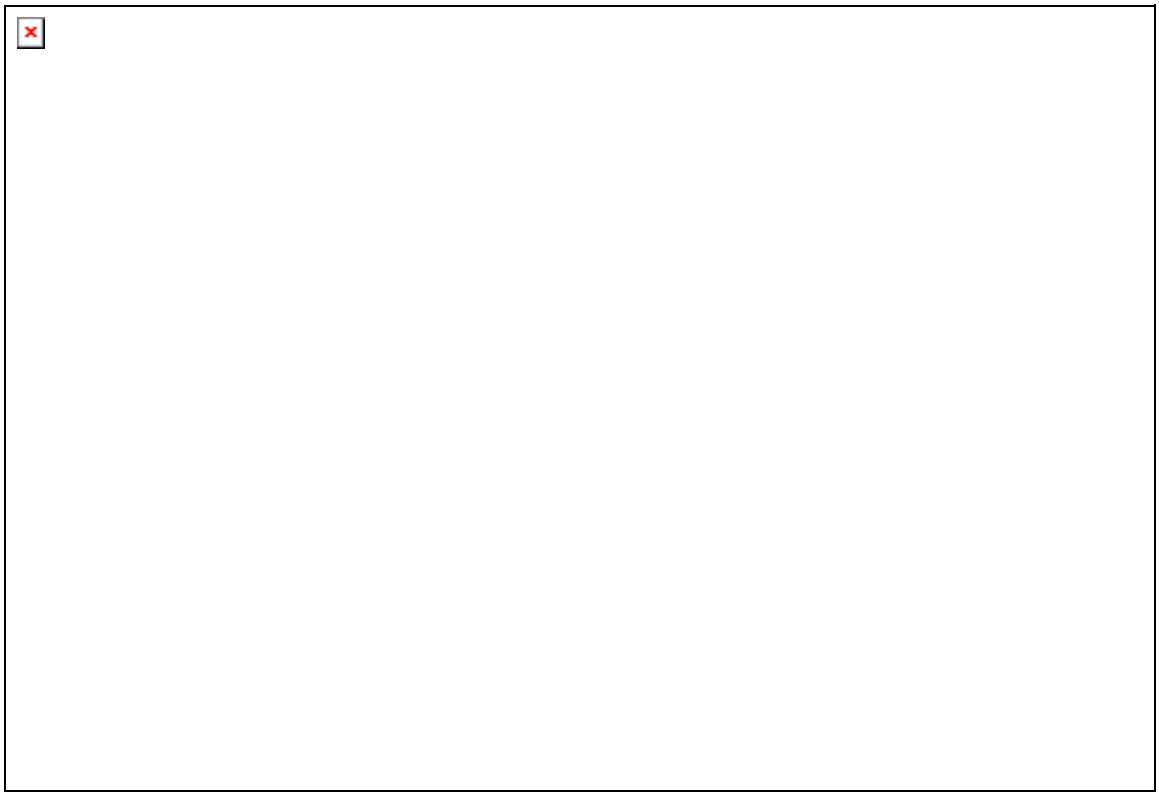
Figure 13b. Southeast Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

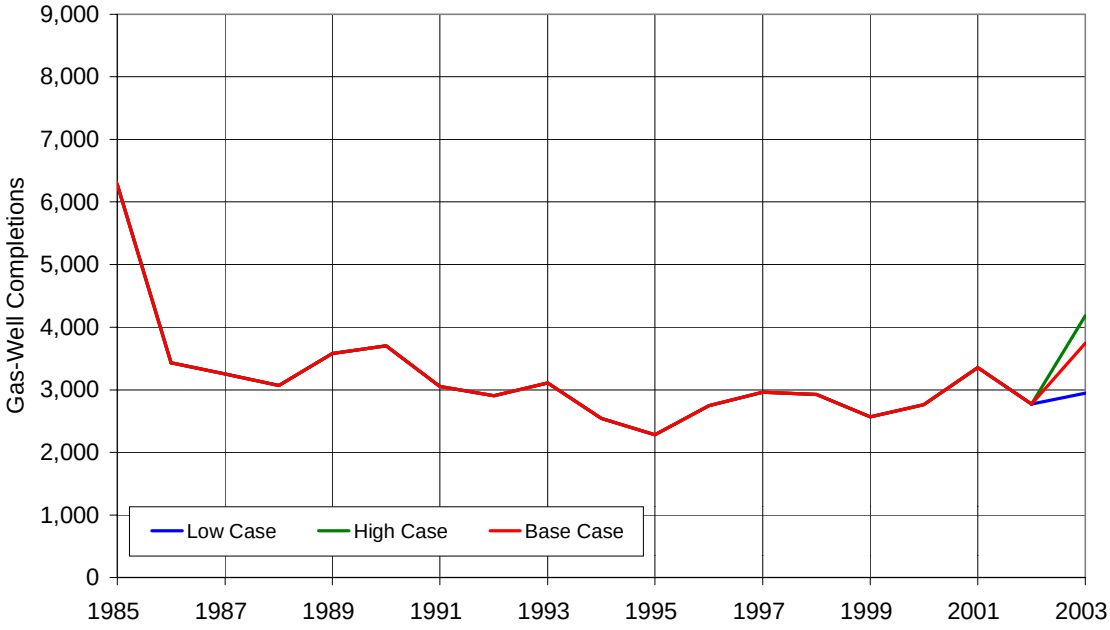


- Other Area
    - States that are not included in the nine areas analyzed produce 2.25 Bcf/d of natural gas.
    - There is not sufficient monthly information available to analyze the effective capacity of these States; therefore, the effective capacity is assumed to equal the wellhead capacity of 3.2 Bcf/day (Figure 14a).



- There are approximately 3,000 gas well completions added each year from 1986 through 2002 in the eighteen states combined in the Other Area (Figure14b). An increase to over 3,700 completions is expected in 2003.

Figure 14b. Eighteen States Gas-Well Completions Added During Year, 1985-2003



Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

Conclusions

- Average surplus or unutilized capacity (the difference between expected effective productive capacity based on model forecasts of rigs drilling for gas and forecast production demand from the February 2003 *Short Term Energy Outlook* for the Lower-48 States) is projected to be 5.6 Bcf/d through 2003 (Table 2). Estimated effective productive capacity is therefore expected to be sufficient to meet the forecasted demand for gas during 2003.
- The projected 2003 Base Case surplus of 5.6 Bcf/d is 10 percent of the projected production rate of 51.4 Bcf/d. This is relatively small compared to the surplus margin between 1985 and 1995 but is similar to the period 1996 to 1999.
- The high utilization of effective productive capacity indicates market supply is relatively tight with a potential for short-term price increases should there be a sudden increase in demand or drop in production because of severe weather or other problems.
- The gas well completions in 2002 were sufficient to maintain production but effective capacity declined. Increased completions in 2003 by 5,800 to 2001 levels are expected to increase effective capacity about 2 Bcf/d through 2003.
- Due to infrastructure limitations, available surplus in the Rocky Mountain Area is estimated to be 1.4 Bcf/d, notwithstanding the rapid development of coal-bed methane resources. Absent such limitations, the estimated effective surplus would be 2.7 Bcf/d.
- Texas estimated surplus capacity of 1.32 Bcf/d is exceeded by the infrastructure limited Rocky Mountain area surplus of 1.4 Bcf/d in 2003 and is the largest estimated unutilized capacity.
- Anticipated reduction in drilling in the Gulf of Mexico will cause its effective productive capacity utilization rate to approach 100 percent in 2003.
- Additional uncertainty surrounds the estimates for effective productive capacity in the Gulf of Mexico and Rocky Mountain Areas. The possible development of high rate completions in the deep water or deep shelf area of the Federal Offshore Gulf of Mexico and the completion of gas pipelines in the Rocky Mountain Area and Gulf of Mexico could increase effective capacity more than accounted for in the current estimates.
- Completions that are one year old or less contribute approximately 25 percent of the total wellhead capacity.
- Two year old or less completions contribute 40 percent of total wellhead capacity.
- Three year old or less completions contribute slightly more than one half of the total wellhead capacity.

Table 2. Year 2003 Lower-48 Average Dry Gas Production Rate, Effective Capacity, and Surplus Capacity (Base Case) Billion Cubic Feet per Day (Bcf/d)

Area	Expected Production Rate	Estimated Effective Capacity	Surplus Capacity
Federal Gulf of Mexico	13.607	13.851	0.244
Texas	13.231	14.553	1.322
Oklahoma	4.331	4.734	0.403
Louisiana	3.996	4.152	0.156
California	1.009	1.067	0.058
Kansas	1.373	1.554	0.181
New Mexico			
Conventional Gas	2.463	2.714	0.251
Coal Gas	1.727	1.942	0.215
Rocky Mountain			
Conventional Gas	3.316	4.019	0.703
Coal Gas	2.339	3.051	0.712
Southeast			
Conventional Gas	1.240	1.490	0.250
Coal Gas	0.521	0.631	0.110
Other	2.253	3.248	0.995
Total	51.406	57.005	5.599

*Rocky Mountain effective capacity infrastructure growth limited to one-third of wellhead capacity growth.

Source: Energy Information Administration, Office of Oil and Gas, Reserves and Production Division.

Data Sources

- Production History: Energy Information Administration, Office of Oil and Gas; and IHS Energy.
- Productive Capacity: Model GASCAP94 C102500.
- Price Forecast: Energy Information Administration, February 2003 Short Term Energy Outlook
- Production Forecast: Energy Information Administration, Short-Term Integrated Forecasting System, February 2003; and Model GASCAP94 C102500.
- Well Completions History: Energy Information Administration, Office of Oil and Gas; and IHS Energy.
- Well Completions Forecast: Energy Information Administration, Office of Oil and Gas, Drilling Rig Model; and Model GASCAP94 C102500
- Previous Report: The previous report is available on the web and can be accessed for more details on the gas capacity process and model at http://www.eia.doe.gov/oil_gas/natural_gas/analysis_publications/natural_gas_productive_capacity/cp97.html and http://www.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/nat_gas_productive_capacity_2001/index.htm.
- Methodology Documentation: A functional description of the methodology used in this analysis will be available on the EIA website in approximately 90 days.
- The associated spreadsheets containing the history and projections of this report can be obtained by clicking on the following Excel files: GasCapData.xls, RatioData.xls, and WellCountData.xls.