

In December, 1999, The National Petroleum Council published “Meeting the Challenges of the Nation’s Growing Natural Gas Demand”. Since its publication, this study has been cited as the leading report regarding natural gas supply and demand dynamics.

A widely respected panel of industry and government experts met in Washington on March 5 – 6, 2001. The purpose of this meeting, arranged by DOE, was for the panel to share their individual observations on the report and changes seen in the market place since the report was released. A substantial portion of this panel consisted of alumni of the NPC Study. After reviewing pertinent natural gas supply and demand data, this panel concluded that the conclusions and recommendations of the 1999 NPC Natural Gas Study are still not only valid, but are more urgent.

U.S. Lower- 48 Natural Gas Resource Base Estimates

1999 NPC Report

Total Resource Base (TCF)	1,466
Proven Reserves	157
Total Unproven Resource Base	1,309
Exploitation of Existing Fields	305
New Fields to be Discovered	633
Nonconventional Sources (Coalbed Methane, Tight Gas, Shale)	371

Known with
current
technology
and prices

Requires:

- Additional drilling
- Technology evolution
- Accessibility

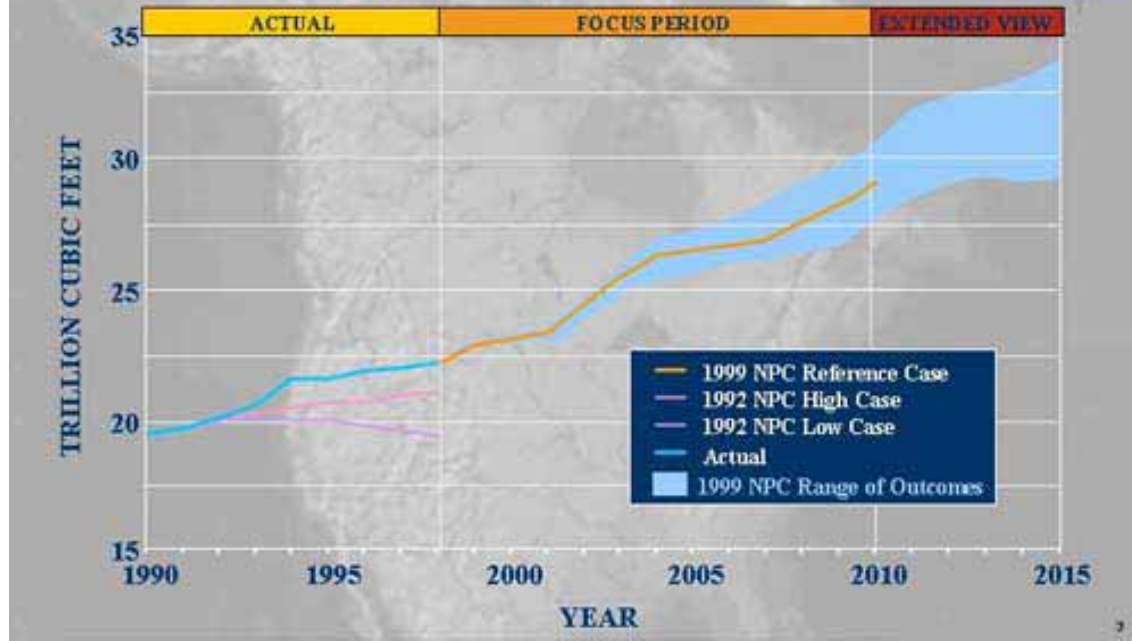
Entails a higher degree of risk

Total North America Resource
Base = 2,446 TCF

The NPC estimates the U.S. resource base at 1,466 Trillion Cubic Feet, which represents many decades of supply. This new assessment of the size of the resource base represents a 23% increase over the 1992 study, taking into account the gas that has been produced then

U.S. Natural Gas Demand

Comparison of 1992 and 1999 NPC Study Results



The NPC Study estimates that natural gas demand will increase by slightly more than 30% over the next decade. The U.S. natural gas demand has grown from 19 Trillion Cubic Feet (TCF) in 1990 to approximately 22 TCF in 1998, or about 2% per year, and has continued to represent about one quarter of the nation's fuel needs.

EIA estimates that natural gas demand will increase to 34.7 TCF by 2020, an increase of about 60%.

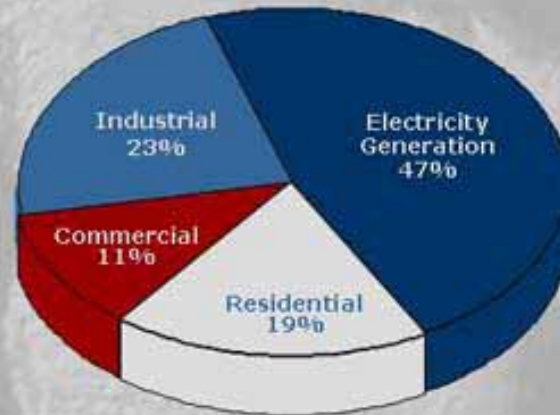
Estimated demand in 2001 may be 0.5 – 1.0 TCF lower than the NPC projection for that year. The NPC Study assumed GDP growth of 2.5% p.a. Actual GDP growth will be lower. As a result, natural gas demand will be lower.

Key Issue: Is reduced gas demand, induced by lower economic activity, masking problems in the supply base?

Growth in Reference Case Demand

1998-2010

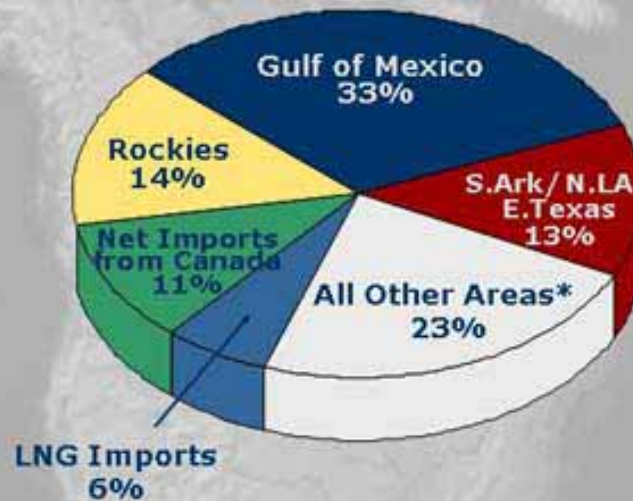
Distribution of 7 TCF Increase by Sector



The increase of 7 Trillion Cubic Feet (32%) over current demand comes largely from incremental electrical generating capacity, that being 47 %.

Where New Supplies Come From – 1998-2010

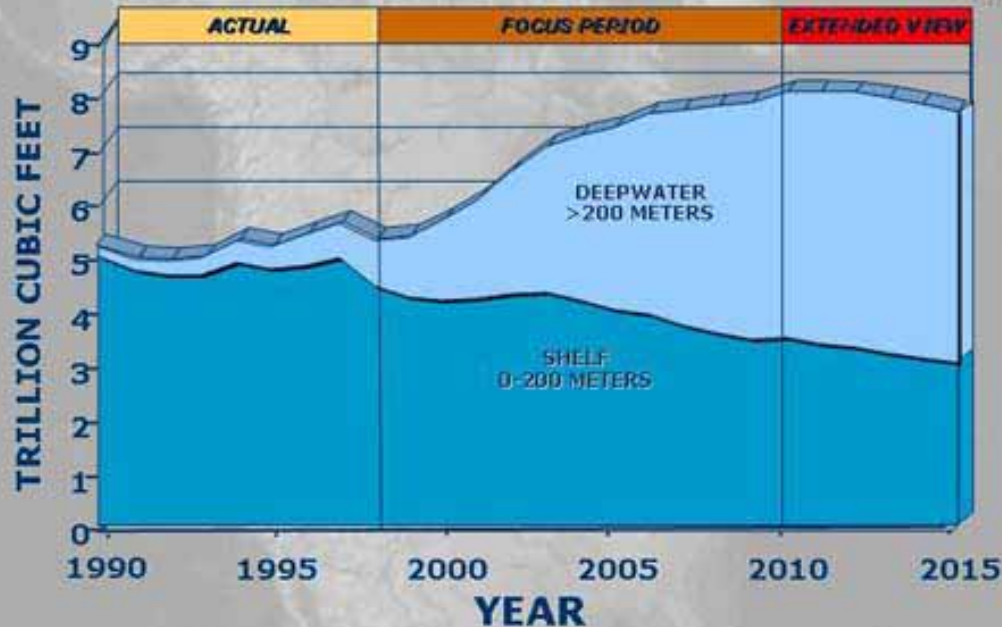
Distribution of 7 TCF Increase by Source



**Represents production from all or parts of approximately 20 states, including the following areas: Permian Basin, Appalachia, Gulf Coast Onshore, Mid-Continent*

We project growth in supply will come predominantly from the Gulf of Mexico, the Rockies, and the Ark / La / Tex regions. U.S. production will increase from 19 TCF in 1998 to 25 TCF in 2010 and 27 TCF in 2015. Imports from Canada will grow from 3.0 TCF to 4.5 TCF but will still represent about 14% of the overall supply. LNG imports will also increase - to 0.9 TCF, essentially maximizing use of existing import facilities, but it is assumed that no new facilities will be built and operational before 2015.

U.S. Gulf of Mexico Natural Gas Production



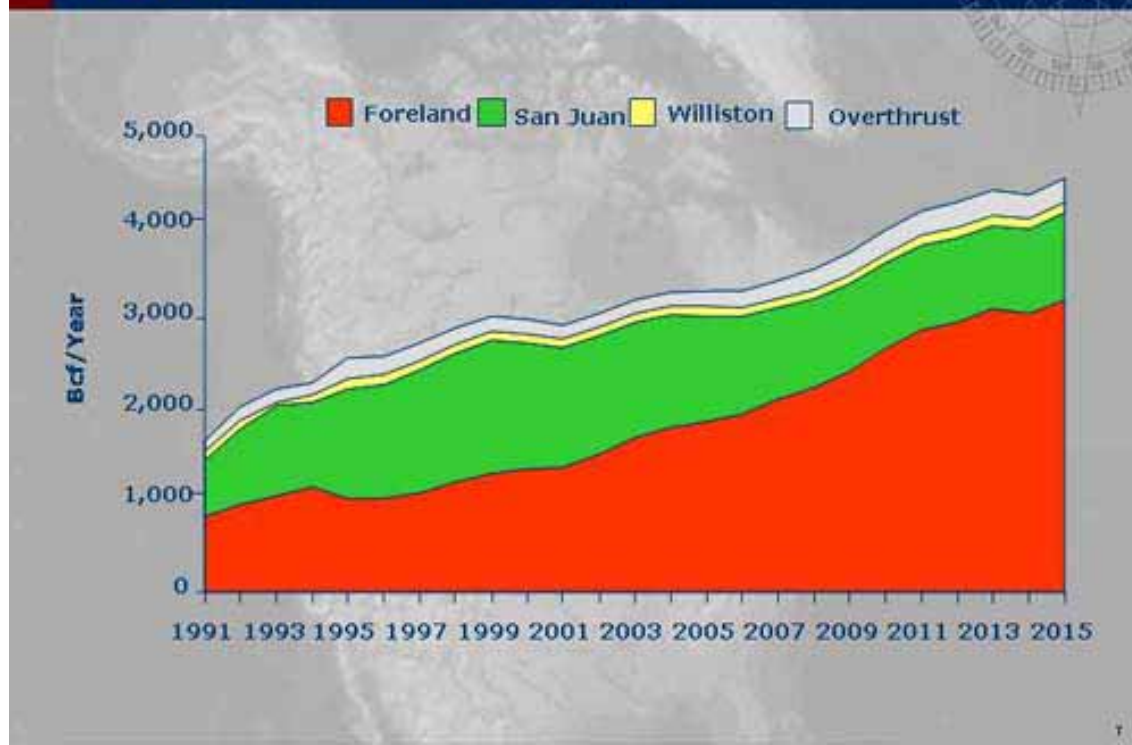
The Gulf of Mexico represents about one-third of the Lower 48 increase in 2010, and is particularly interesting when you look at it a little closer.

The Shelf, which has been the bread and butter of the industry, represents almost 25% of current supply, and we project will decline over time at approximately 3% per year.

The projected offsetting increase out of the Gulf production will come from the deepwater, with that source growing from under 1 TCF per year to over 4.5 TCF per year by 2010. This increase in production is driven by advances in technology as well as increased activity generated by lower federal royalties from 1995 through 2000.

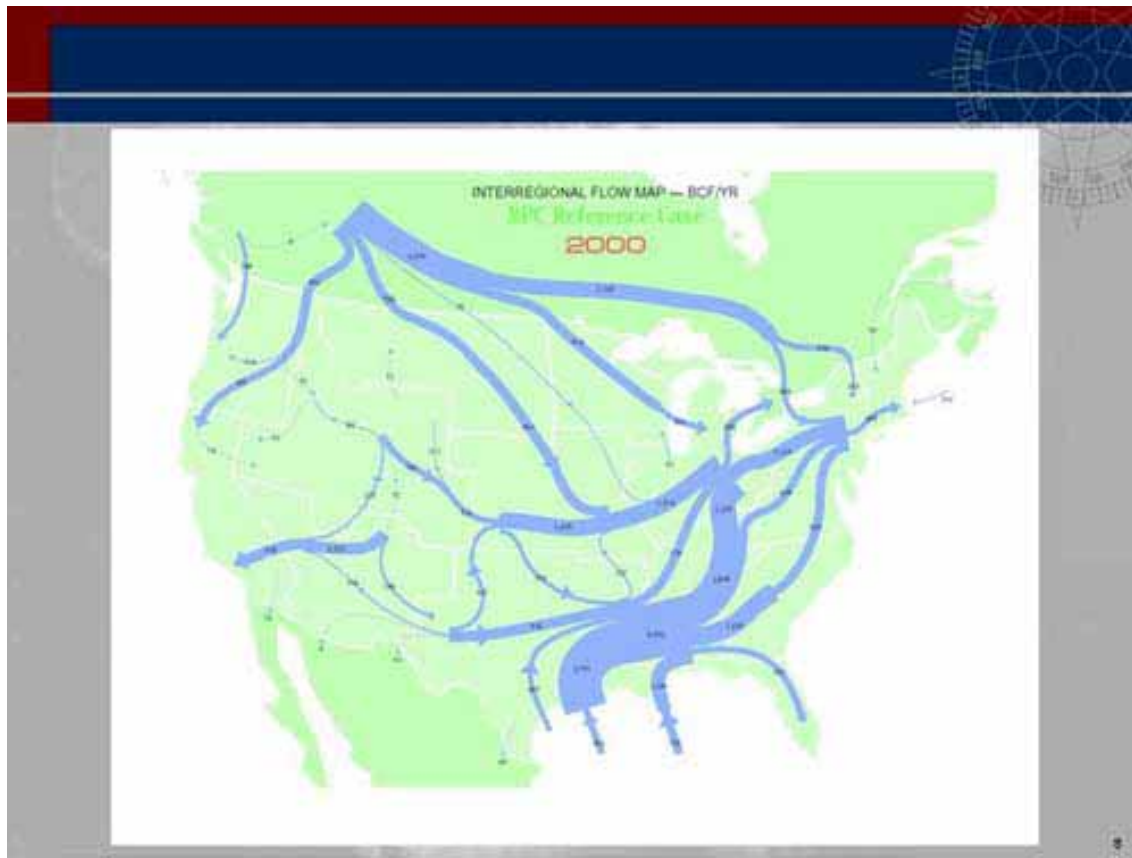
Key Issue: Is the decline on the Shelf sharper than the NPC Study projected?

Rockies Gas Production



Turning to the Rockies, the study estimates that total Rockies production will increase from 3.0 TCF presently to approximately 4.5 TCF by 2015. Most of the production growth will occur in the Foreland region. This projection already accounts for access restrictions on both pipelines and drilling. Rockies production can be higher with better access to gas productive areas and additional pipeline right-of-ways. Production growth in the Rockies will be dependent on technological advances, as all of the increases will come from unconventional gas (CBM and Tight Gas). This is one of the Critical Factors noted below.

NOTE: The Foreland is the area of the Rockies east of the Overthrust Belt. This includes almost all of the states of Wyoming and Colorado and parts of Utah, New Mexico, Montana and Arizona.



Title: North America Gas Flow - 2000

This map shows natural gas flows as they exist today. Gas supplies from the GOM and the Gulf Coast basically service the Midwest, east and southern parts of the country. Canadian gas mainly services the Midwest, with a minor amount going to the California market, along with San Juan Basin gas (southwestern Colorado, northwestern NM)



Projected North America Gas Flows - 2015

The 2015 NPC Flow Map shows some important changes:

- California becomes more dependent on the Rockies
- Very significant increase from the GOM and the Gulf Coast area into the Midwest and eastern US.
- Gas demand in Florida increase by almost 100%, supplied by Gulf Coast & GOM gas
- Canada becomes a larger supplier
- Sable Island gas (offshore eastern Canada) is projected to account for 40% of the New England gas market by 2010.

Critical Factors

- **Access**
- **Technology**
- **Financial Requirements**
- **Skilled Workers**
- **Rigs**
- **Lead Times**
- **Requirements of New Customers**

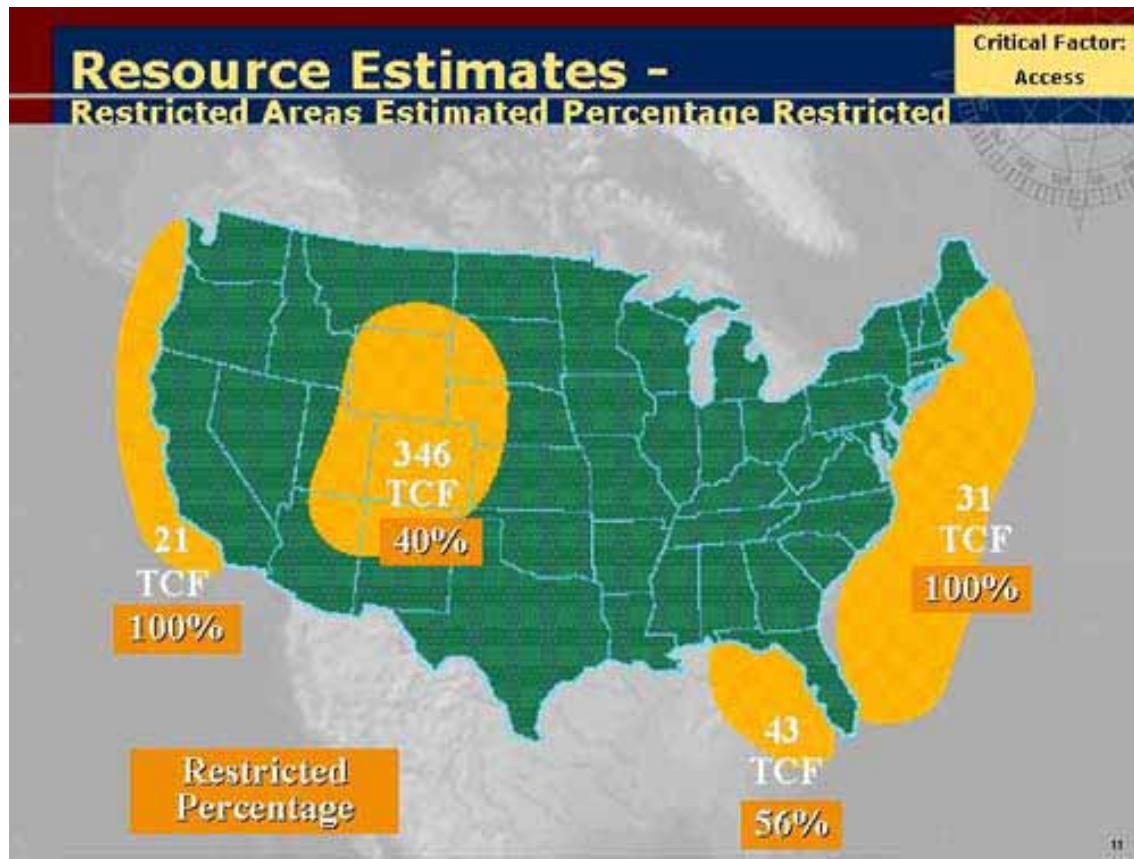
All Of These Factors Must Be Satisfied To Meet The Nation's Growing Demand For Natural Gas

The NPC Study concluded that the North American resource base is sufficient to meet the projected demand for natural gas. However, this ability is very dependent on industry and government positively addressing seven key challenges.

These include access - a major issue for the E&P sector, technology, financing, workforce, the physical infrastructure including rigs, lead times, and the requirements of the new customer base which includes the new Independent Power Producers.

The DOE panel in March agreed that the natural gas resource is adequate to meet the growing demand for gas, but if, and only if, the above factors are adequately address by positive collaboration by both industry and government. The general consensus was the above Critical Factors are even more critical.

The following slides explain why these factors are so critical.



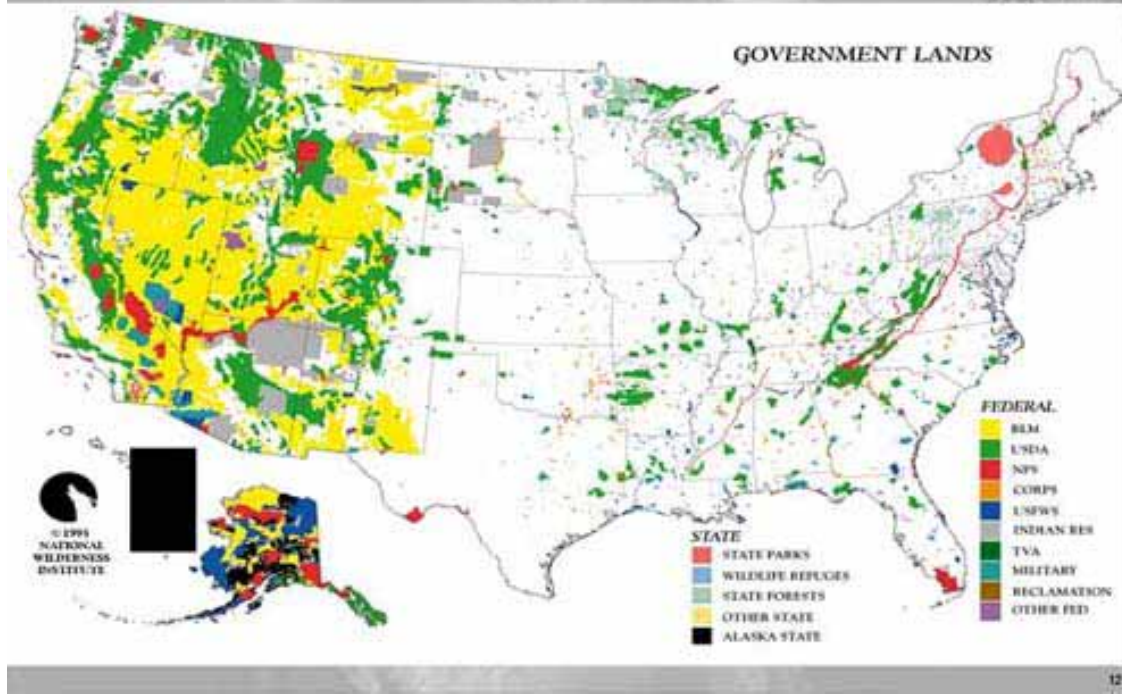
Access to the resource base and to rights of way for infrastructure is critical for sustainable supply. The NPC Study estimates that slightly over 200 TCF, or 15% of the Lower 48 unproved resource base is either off limits or is available with significant restrictions.

Of the almost 1,500 TCF of lower 48 resource base cited in the Study, approximately 47% is owned by the Federal Government. Offshore drilling moratoria have virtually closed activity in the Eastern Gulf, Atlantic and Pacific coast waters, all under Federal jurisdiction. Policy makers need to understand the importance of this resource base in meeting the nation's growing gas demand.

It is important to note that technology has advanced to a point that we can assess and develop resources in these areas more efficiently, and with less environmental impact, than ever before.

Government Lands

Critical Factor:
Access

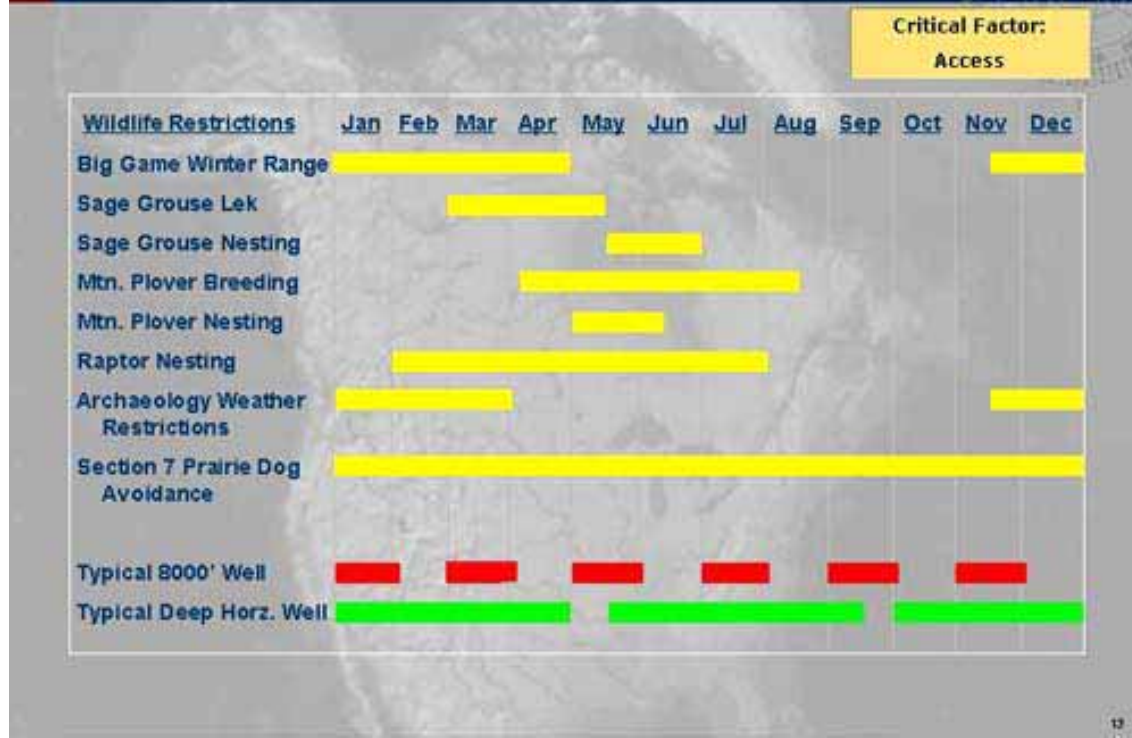


A significant portion of the Rocky Mountain area is owned by the Federal Government, either via the BLM or the Forest Service (US Dept. of Agriculture).

Access to the resource base is the most important issue facing the industry regarding lands under federal jurisdiction

It should be noted that the industry is not advocating exploration in National Parks. However, a significant portion of the yellow (BLM) acreage in the states of Wyoming, Colorado, New Mexico and Utah has considerable gas potential. Significant cooperation between these entities and industry will be required to access this important area of natural gas supply.

Surface Use/Seasonal Restrictions



When we speak of access restrictions, we refer to a layering of restrictions such as those shown above. There are only limited periods in which necessary natural gas exploration can occur. As you can also see, some deep wells that take longer than the allowed drilling window either will not be drilled, or must be drilled in inefficient and probably prohibitively expensive phases over more than one year

SOURCE: Cabot Oil & Gas

Only 200 TCF of a 1,466 TCF Resource Base is Restricted.

Critical Factor:
Access

- **Why Be Concerned?**

- Frontier areas such as the Rockies, eastern GOM and the other offshore moratorium areas offer the potential of larger fields. High potential for significantly greater resources than in assumptions/estimates. The GOM and the Rockies are 50% of the Lower 48 Resource Base
- Outside of the Rockies and the offshore, production will remain essentially flat (the other 50%). The potential of larger field size discoveries in these areas is remote due to decades of exploitation.
- Restricted areas often close to large and growing demand centers and many can deliver gas to consumers in a shorter timeframe and potentially lower cost than other marginal supplies (Florida is an example).

The industry will be hard pressed to meet the growing demand for natural gas by staying in traditional producing areas. Production must expand into newer areas to meet the nation's needs for efficient, clean natural gas.

Resource Base Estimates Rockies & GOM Almost 50%

Model Region (BCF)	Proven Reserves	Unproven	Resource Base	Critical Factor: Access
A: Appalachia	9,717	91,161	100,878	6.9%
B: Eastern Gulf Onshore	1,955	18,952	20,907	1.4%
C: North Central	2,195	36,982	39,177	2.7%
D: Arkla - East Texas	12,017	85,083	97,100	6.6%
E: South Louisiana	5,855	32,199	38,054	2.6%
G: Texas Gulf Onshore	14,858	116,005	130,863	8.9%
WL: Williston Basin	1,241	5,741	6,982	0.5%
FR: Rocky Mtn. Foreland	17,312	309,161	326,473	22.3%
SJB: San Juan Basin	14,872	23,940	38,812	2.6%
OV: Overthrust Belt	2,917	7,433	10,350	0.7%
JN: Mid-Continent	25,942	112,477	138,419	9.4%
JS: Permian Basin	12,293	73,193	85,486	5.8%
L: West Coast Onshore	2,217	25,922	28,139	1.9%
BO: Eastern Gulf of Mexico	5,700	42,815	48,515	3.3%
EGO: Cent. & West. Gulf of Mex.	26,927	275,989	302,916	20.7%
LO: West Coast Offshore	600	21,829	22,429	1.5%
AO: Atlantic Offshore	0	30,580	30,580	2.1%
Lower 48 total	156,618	1,309,462	1,466,080	

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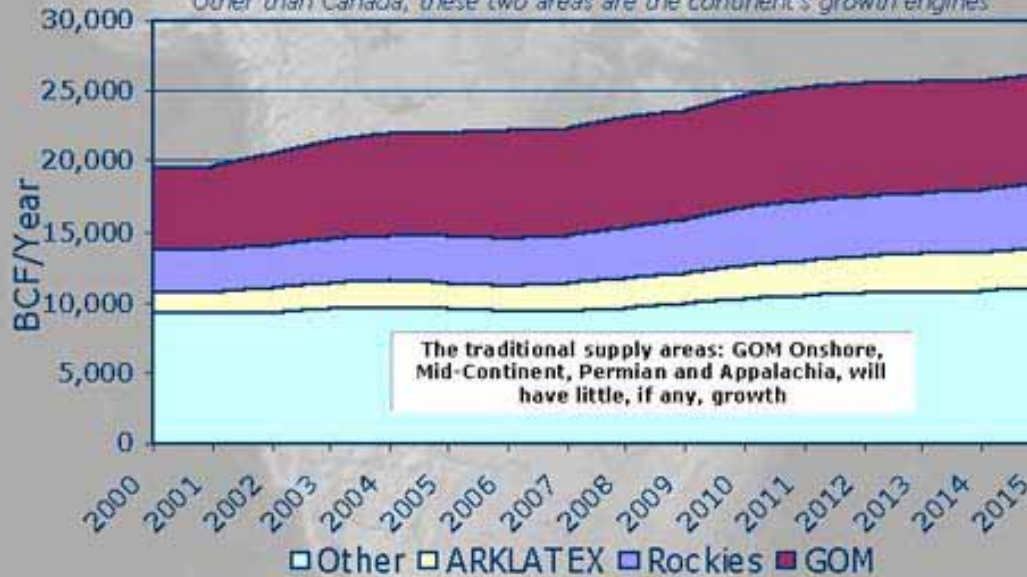
The Rockies and the GOM regions account for 50% of the unproven resource base and almost 50% of the total resource base.

The Rockies and the GOM are the Growth Areas

Critical Factor:
Access

Lower 48 Production

Other than Canada, these two areas are the continent's growth engines

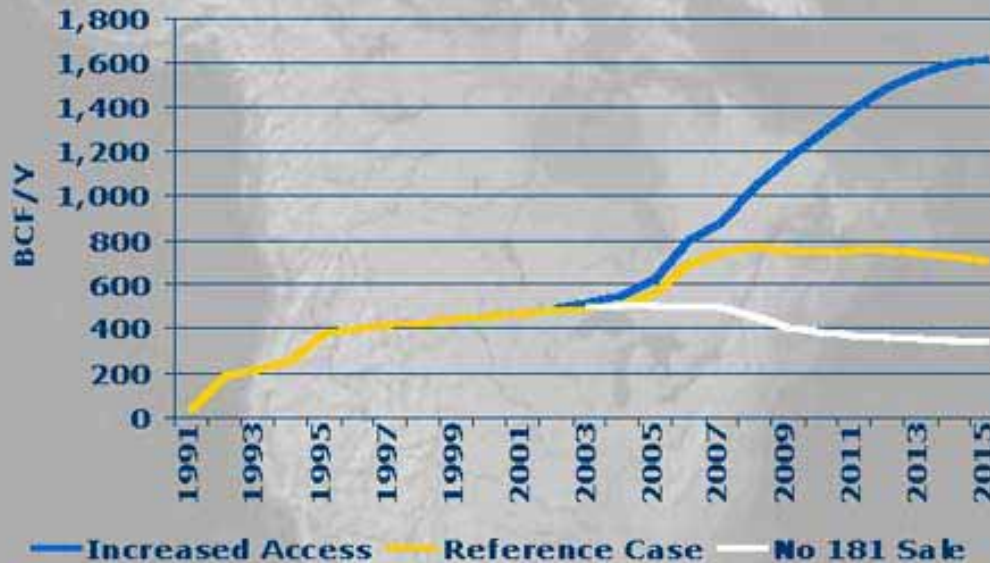


This is the NPC projection by region. It shows that the traditional producing areas (Gulf Coast Onshore, Permian Basin, Mid-Continent and Appalachia) will basically just maintain their productivity. Additional gas demand will be met from increased production from the Rockies and the GOM.

Eastern Gulf of Mexico Upside

(NPC Projection)

Critical Factor:
Access



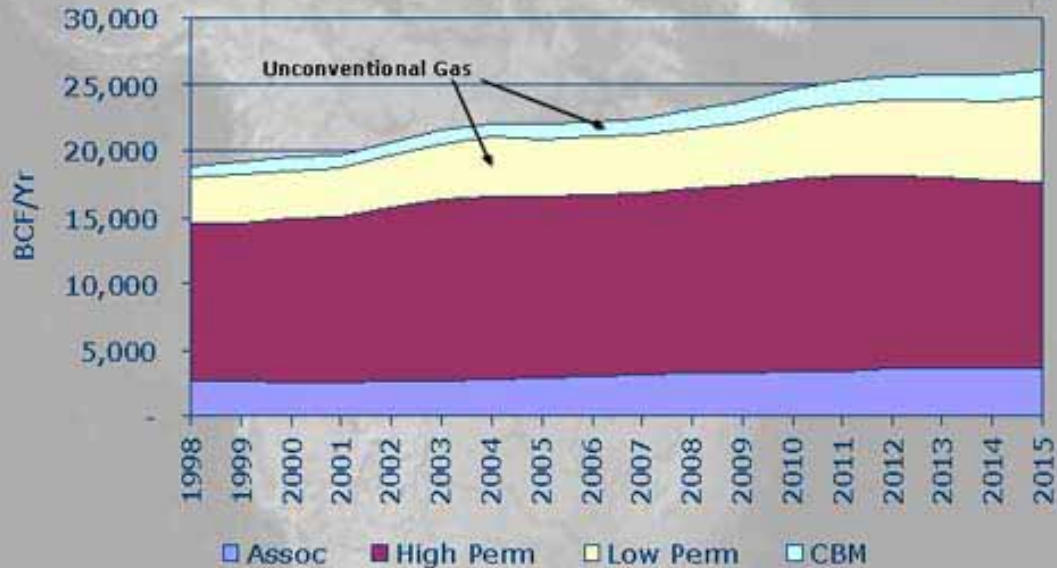
This slide illustrates the NPC's projection of the impact of Access Restrictions in the eastern Gulf of Mexico. The Reference Case curve (yellow line) assumes that Western Norphlet, off the coast of Mobile, Alabama, and MMS Lease sale 181 will be the only areas in the eastern gulf that will produce gas. Given the recent announcements on Lease sale 181, the NPC Reference Case is probably too optimistic. As a result, eastern Gulf of Mexico production potential is probably closer to the white line. Initial estimates indicate that the 181 potential has been cut by 75% as result of the recent compromise between DOI and Congress.

However, as the blue line indicates, the NPC study anticipates substantial additional gas supplies to feed the country's growing energy demand if industry is allowed access beyond what is currently permitted. Florida's gas demand will increase to 1,100 BCF per year by 2015, an increase of almost 100% since 2000. The Increased Access case shows that the eastern GOM has the potential to more than satisfy Florida's gas needs. The increased gas demand in Florida will be driven by gas fired electrical generation growing by 25,000 MW by 2015.

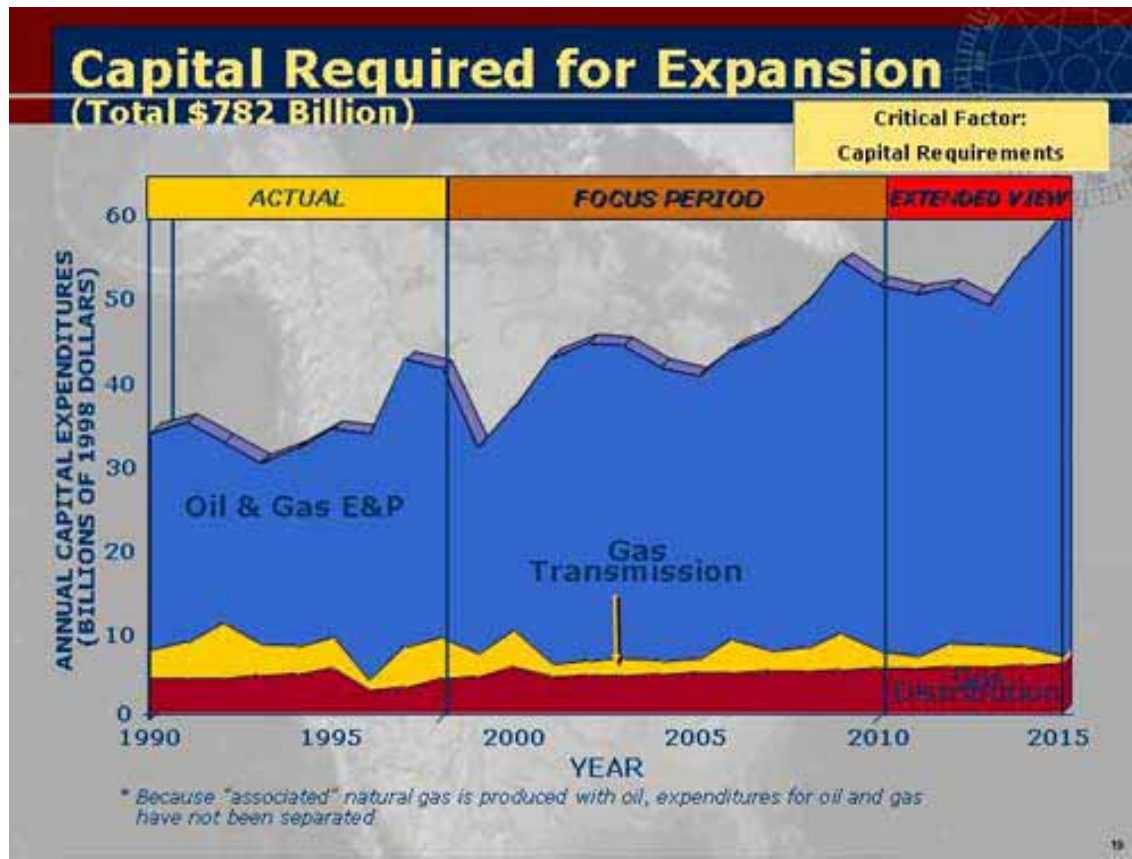
Lower 48 Gas Production

(By Type)

Critical Factor:
Technology



This graph shows the NPC estimate by the type of gas production. As can be seen, non-conventional gas (coalbed methane and gas from low permeability reservoirs) will play a greater role, increasing from 24% in 2000 to 33% by 2015. Certain technological advances will have to come to fruition to make this forecast happen.

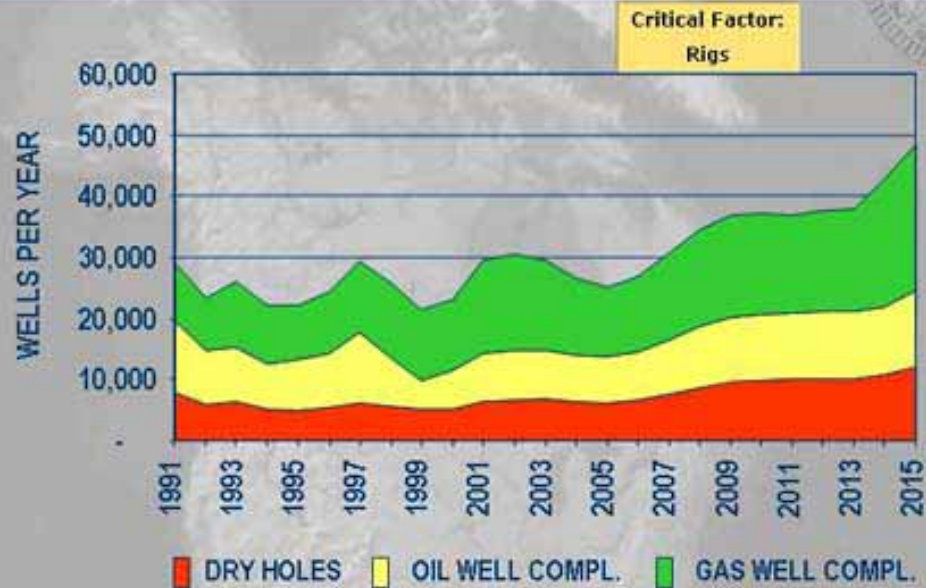


Almost \$1.5 trillion (1998 dollars) will be needed to fund the industry through 2015. This includes operating costs

Almost \$800 billion of the above number will be for Capital Expenditures with over \$650 billion in the E&P sector and over \$120 billion for T&D. This equates to a 35% increase in annual Capital expenditures from \$34 billion over the last decade [1990 to 1998] to \$46 billion over the next 15 years.

Many of these expenditures will involve higher risk and longer lead time projects, such as large deepwater projects or pipelines to new frontiers, any one of which could easily exceed a half a billion dollars.

Lower 48 Drilling



The NPC study estimates that the total number of wells needed to be drilled to meet estimated demand will have to double to 48,000 wells per year, from approximately 24,000 currently.

Key Issue: Where will the rigs come from to handle this growth in drilling?

Gas Supply: Hard to Maintain



This slide shows the decline profile for gas wells for their given year of completion. As you will see, the younger the vintage, the sharper the rate of decline. There are two key reasons for this increasing rate of decline:

The new field discoveries tend to be smaller in size

Drilling and completion technological advances have enable higher flow rates, resulting in shorter reserve lives versus older vintages.

This means that drilling rates will have to increase to meet projected demand, as indicated on the previous slide.

Industry & Government Need To Act Soon! The Offshore "Lead Times" Are Considerable



This slide shows the numerous steps required to take a prospective area offshore from the conceptual stage, to actual leasing to commercial production.

Other OCS areas presently off limits are well beyond that time horizon even assuming the moratorium until 2012 is revised.

You just can not "turn on the spigot" and get gas when the need arises. A considerable amount of planning is required.

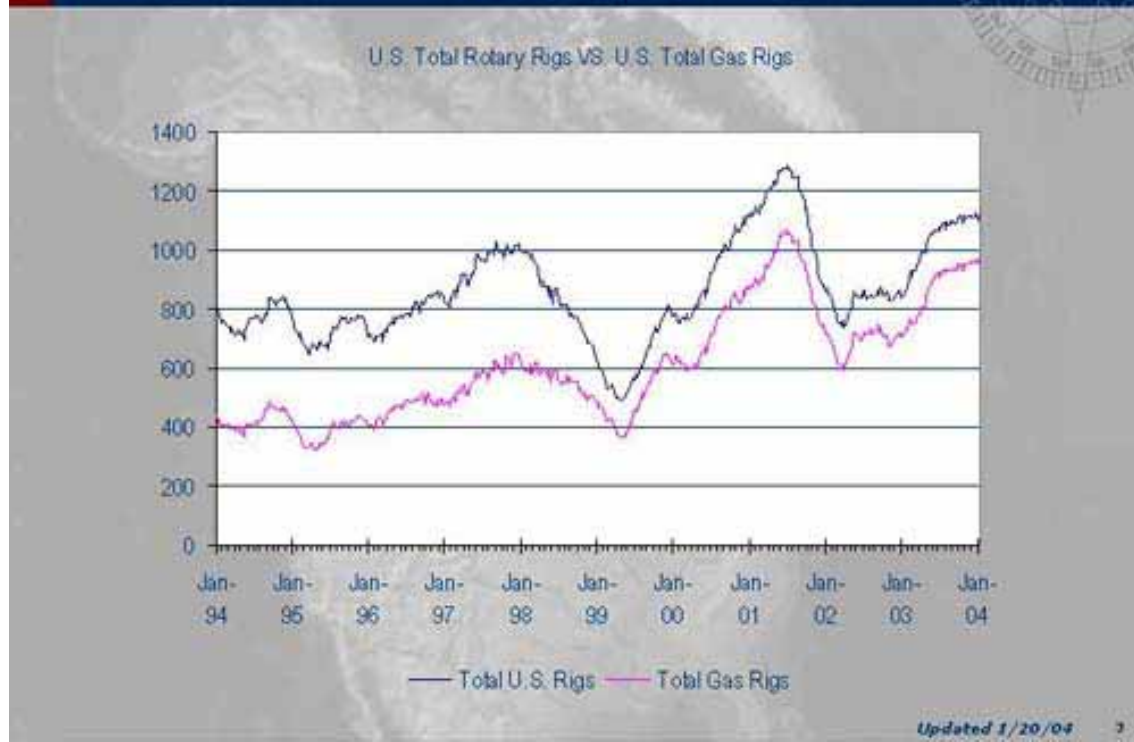
Natural Gas Prices (NYMEX)



Tight natural gas supply/demand balance has led to some price volatility and generally higher price levels. However, the forward curve of futures contracts shows moderation.

Key Issue: Can supply match demand in the short term. Recent rig counts show a disturbing trend.

Natural Gas Producers: The Response



Recent natural gas price increases are encouraging increased drilling to find and produce additional supply.

Key Issue: Will price-induced increases in exploration and production be sustained and add enough supply to better ensure stable prices?