# Current Natural Gas and LNG Projections

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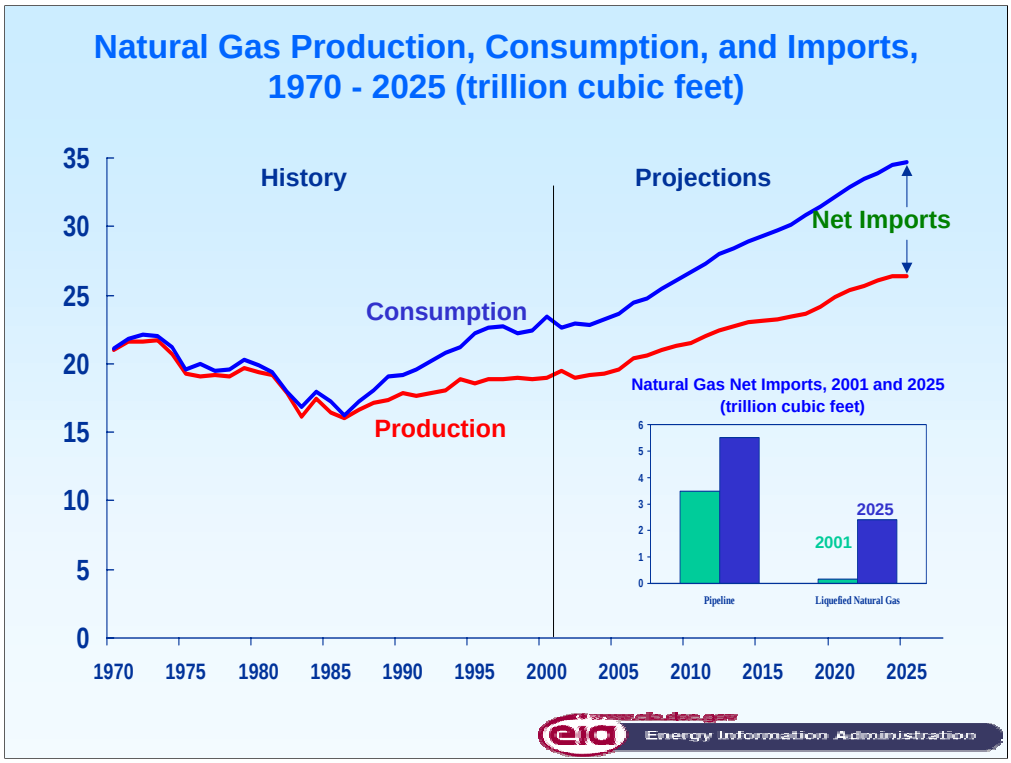
This morning I'm going to talk about EIA's mid-term natural gas outlook. How much are we going to use? Where's it going to come from? How much will it cost?

These projections are from the reference case from the *Analysis of S.139, the Climate Stewardship Act of 2003*, a new report issued on July 3. It was an update from our *Annual Energy Outlook 2003*. The projections focus on domestic energy consumption, supply, and prices. They are the product of the Energy Information Administration, an independent analytical and statistical agency within the U.S. Department of Energy. We do not speak for any particular point of view on energy policy, and our views should not be construed as representing those of the Department or the Administration.

Assumptions are critical to any forecast. The projections are not statements of what *will* happen but of what *might* happen, given certain assumptions. The reference case projections are business-as-usual forecasts, given known technology and technological trends, demographic trends, and current laws and regulations.

EIA does not propose, advocate, or speculate on changes in laws and regulations. So, one of our key assumptions is that all current laws and regulations remain as enacted. For the mid-term forecast, that means, for example, that provisions in the current House and Senate energy bills, such as an Alaska gas pipeline tax credit, are not included in this forecast.

Let's start with an overview of the forecast.

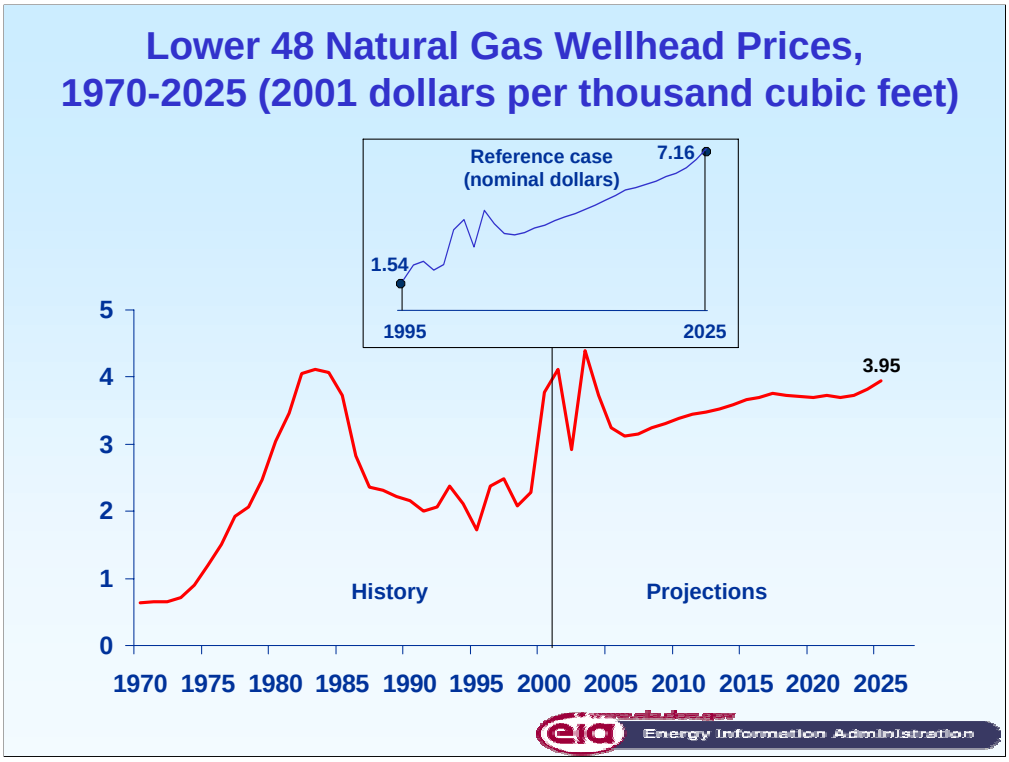



By 2025 total natural gas consumption is expected to increase to almost 35 Tcf or 26 percent of U.S. delivered energy consumption.

Domestic gas production is expected to increase more slowly than consumption over the forecast, rising from 19.5 Tcf in 2001 to 26.4 Tcf in 2025. Growing production reflects increasing natural gas demand and is supported by rising wellhead gas prices, relatively abundant gas resources, and improvements in technologies, particularly for unconventional gas. In this forecast, economic conditions allow an Alaskan pipeline to begin moving gas to the lower 48 States in 2020. The national average wellhead price is projected to reach $3.95/Mcf in 2001 dollars by 2025.

The difference between consumption and production is made up by increasing use of imports throughout the forecast, particularly from liquefied natural gas (LNG), with a 2.1 Tcf increase expected over 2001 levels. By 2025 we expect expansion at three of the four existing terminals and construction of new LNG terminals in the Bahamas, on the Eastern Gulf Coast, and in Baja California, Mexico.

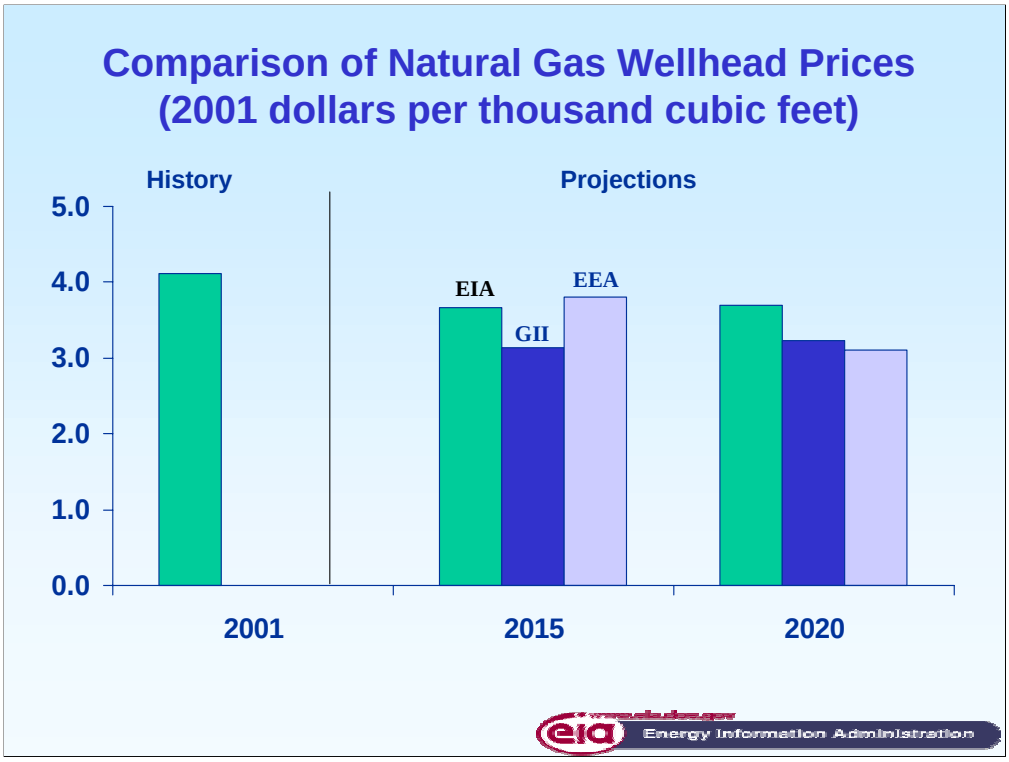
I'll spend the rest of my talk looking at prices, consumption, production, and imports in more detail—starting with prices.




Natural gas wellhead prices are projected to decline from their current high levels, falling to just over $3 per thousand cubic feet in 2006 due to robust drilling. Over the forecast, gas prices are projected to move higher, reaching $3.95 per mcf by 2025 or 31 percent higher than the average of the last 5 years. In nominal dollars, this is equivalent to about $7.20 per mcf.

Natural gas wellhead prices are projected to move higher as technology improvements and new supply sources prove unable to completely offset the effects of resource depletion and increased demand.

Prices are projected to increase in an uneven fashion as major new, large-volume supply projects temporarily depress prices when initially brought online. These include deep and ultra-deep offshore projects in the Gulf of Mexico, liquefied natural gas facilities, the MacKenzie Delta pipeline in Canada, and an Alaskan natural gas pipeline.

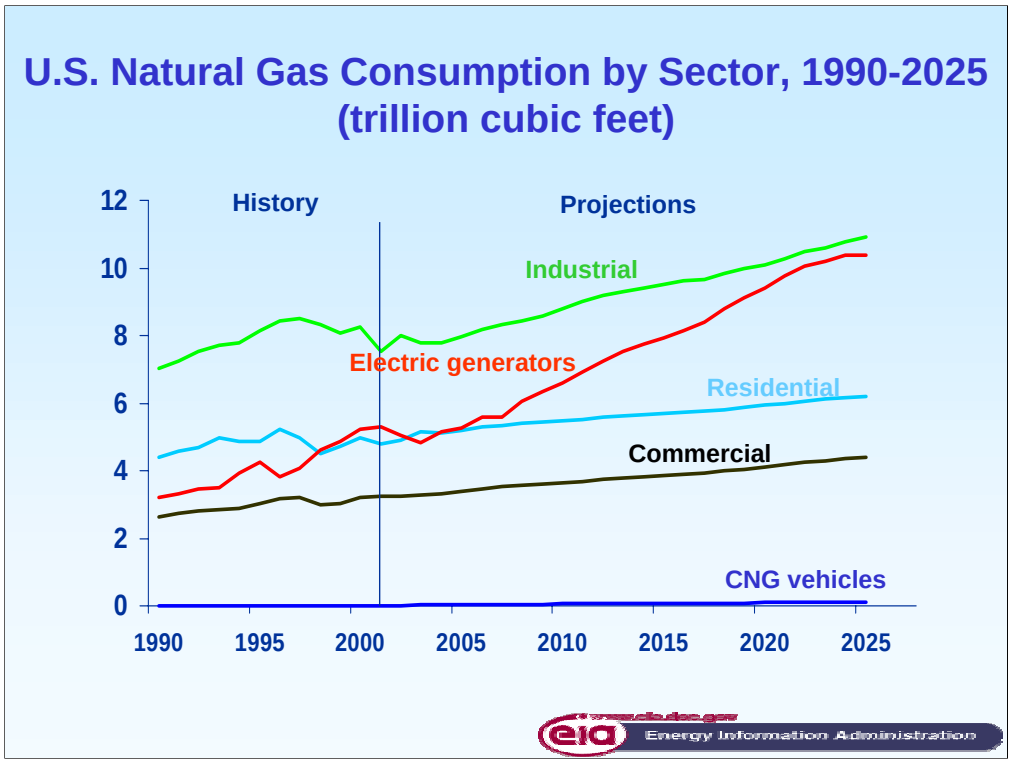



To give you a sense of how these prices compare to some other forecasts, let me show you a couple other data points.

With the exception of the Energy and Environmental Analysis projection for 2015, all the wellhead price projections in the EIA forecast are higher than the other forecasts, in part because EIA projects generally higher domestic production levels. Similarly, in some work with the Energy Modeling Forum for the EMF20 natural gas study that's about to be released, EIA's price forecasts were higher than those of six other modelers under reference case conditions.

Unfortunately, price comparisons in isolated years can be difficult. For instance, the incorporation of a cyclical price trend based on exploration and production cycles in the Energy and Environmental Analysis forecast makes particular year comparisons problematic.

Now, let's look at consumption in a little more detail.



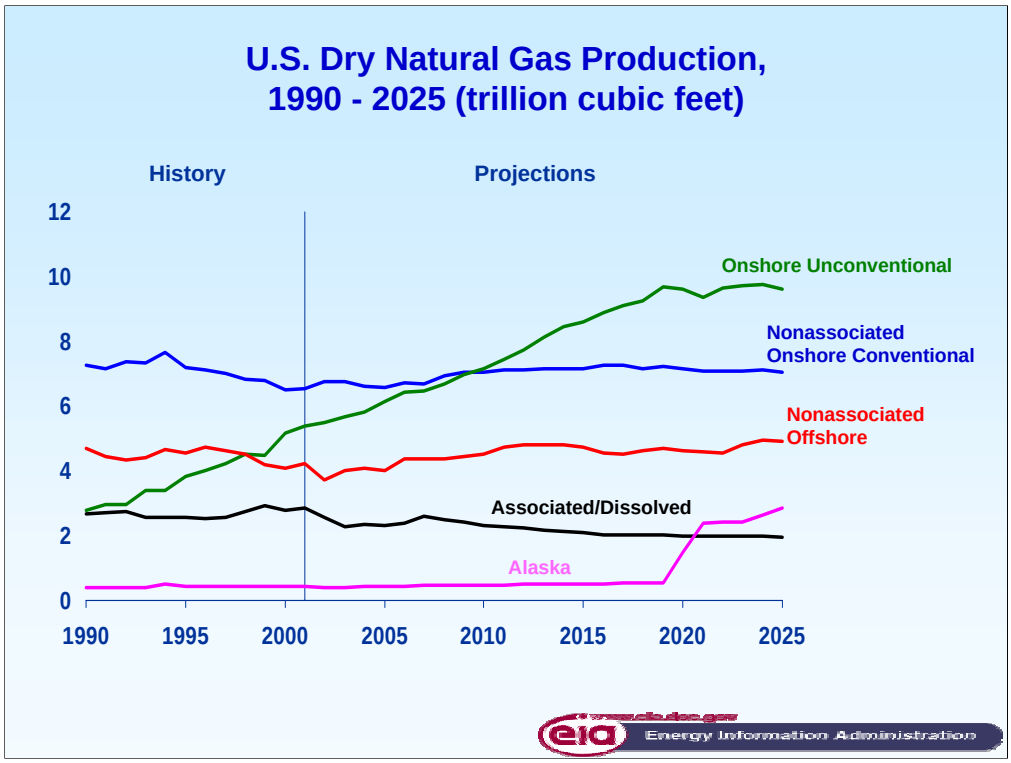

U.S. natural gas consumption is expected to increase by 1.8 percent annually from 2001 through 2025, to nearly 35 trillion cubic feet (Tcf). Gas consumption by electric generators is expected to nearly double over the forecast, from 5.3 trillion cubic feet in 2001 to 10.4 trillion cubic feet in 2025. Demand by electricity generators is expected to account for 30 percent of total natural gas consumption in 2025.

Most new electricity generation capacity is expected to be fueled by natural gas, so natural gas consumption in the electricity generation sector is projected to grow rapidly throughout the forecast as electricity consumption increases. Although average coal prices to electricity generators are projected to fall throughout the forecast, natural-gas-fired generators are expected to have advantages over coal-fired generators, including lower capital costs, higher fuel efficiency, shorter construction lead times, and lower emissions.

Historically the industrial sector, excluding lease and plant fuel, is the largest gas-consuming sector, with significant amounts of gas used in the bulk chemical and refining sectors. Industrial consumption is expected to increase by 3.4 Tcf over the forecast, driven primarily by macroeconomic growth. The chemical and metal durables sectors show the largest growth.

Combined consumption in the residential and commercial sectors is projected to increase by 2.5 Tcf from 2001 to 2025, driven by increasing population, healthy economic growth, and slowly rising prices in real terms. Natural gas remains the overwhelming choice for home heating throughout the forecast period, with the number of homes heated by natural gas rising nearly 18 million.

Now let's move from the demand side to the supply side.




Domestic gas production is expected to increase from 19.4 Tcf in 2001 to 26.4 Tcf in 2025. Increased U.S. natural gas production comes primarily from unconventional sources and from Alaska.

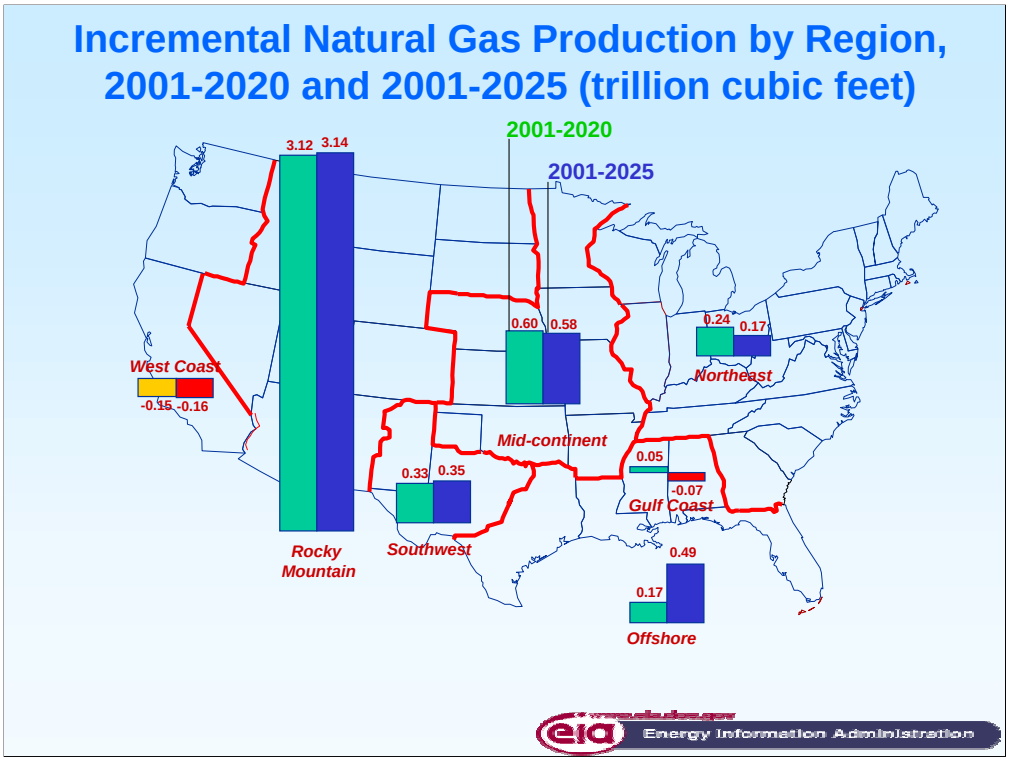
Unconventional gas production increases by 4.2 Tcf over the forecast period—more than any other source, largely because of expanded tight sands gas production in the Rocky Mountain region. Annual production from unconventional sources is expected to account for 36 percent of production in 2025, more than any other source, compared to 28 percent today.

Alaska natural gas production begins flowing to the Lower-48 States in 2020 along a pipeline through Canada, reaching 4.5 bcf per day in 2021, with further expansion beginning in 2024. Alaska also continues to provide for consumption in the State itself and for LNG exports to Japan. In 2025, total Alaskan gas production is projected to be 2.9 Tcf.

Non-associated offshore production adds 710 Bcf, with increased drilling activity in deep waters; however, its share of total U.S. production declines from 22 percent in 2001 to 19 percent by 2025. Conventional onshore non-associated production increases by 500 bcf over the forecast, driven by technological improvements and rising natural gas prices.

Associated dissolved production declines by 900 Bcf, consistent with a projected decline in crude oil production. Lower 48 associated-dissolved natural gas is projected to account for 7 percent of U.S. natural gas production in 2025, compared with 15 percent in 2001.

Now, let’s look at the same growth on a regional basis.




The Rocky Mountain region, with the majority of the unconventional production, shows the greatest increase in production due to improved technologies and the availability of abundant resources. Over the forecast the Rocky Mountain region goes from the third highest to the highest producing region.

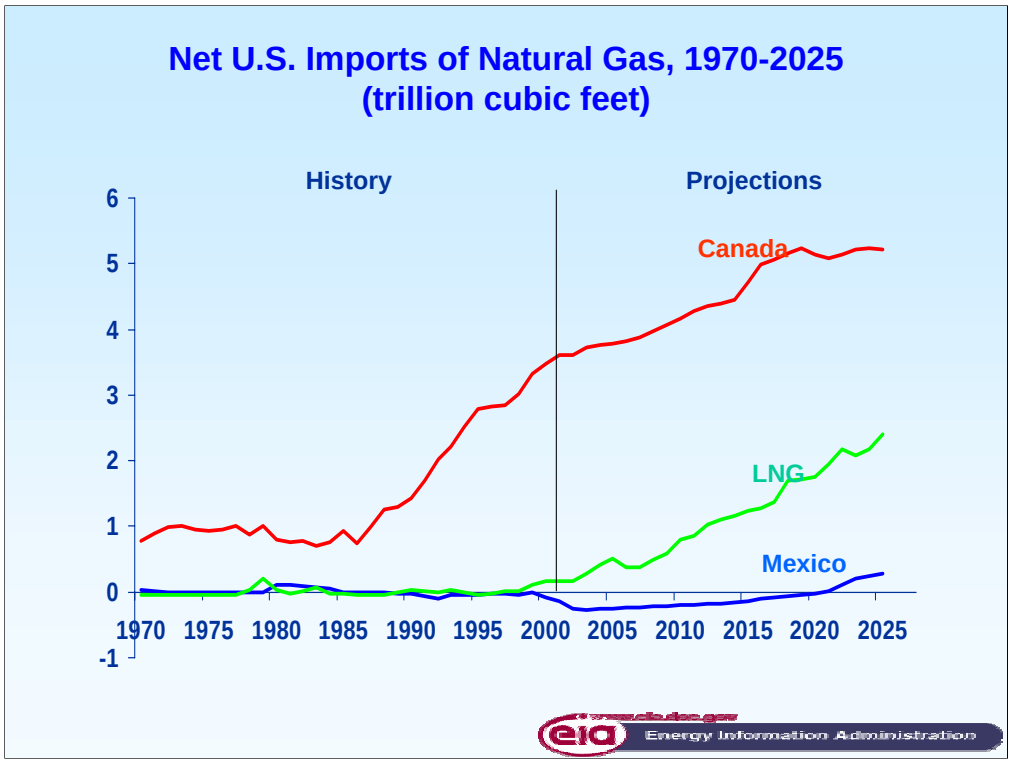
The highest producing region until 2014 is the Gulf offshore. At first deepwater production is expected to offset the decline in production from shallow fields. Discoveries of large ultra-deep fields in the Gulf of Mexico may temporarily interrupt the declining trend after that. But compared to 2001, production in 2025 is up by only about half a Tcf. The onshore Gulf Coast region is the second or third highest producing region throughout the forecast, but over the forecast it actually declines.

The Mid-continent region grows at about the same rate as the total Lower 48 production, generally maintaining its regional share.

The Southwest region is one of only two regions that does not show a decline in production toward the end of the forecast. Much of the increase in production is due to advances in technologies that improve the ability to develop resources from gas shales and deep conventional fields, greater than 10,000 feet.

The Northeast continues to be the second lowest producing region throughout the forecast and is not expected to add significant production. The West Coast including the offshore is one of two regions that shows an overall decline over the forecast period.

Now, let's look at the other source of supply, which is imports.

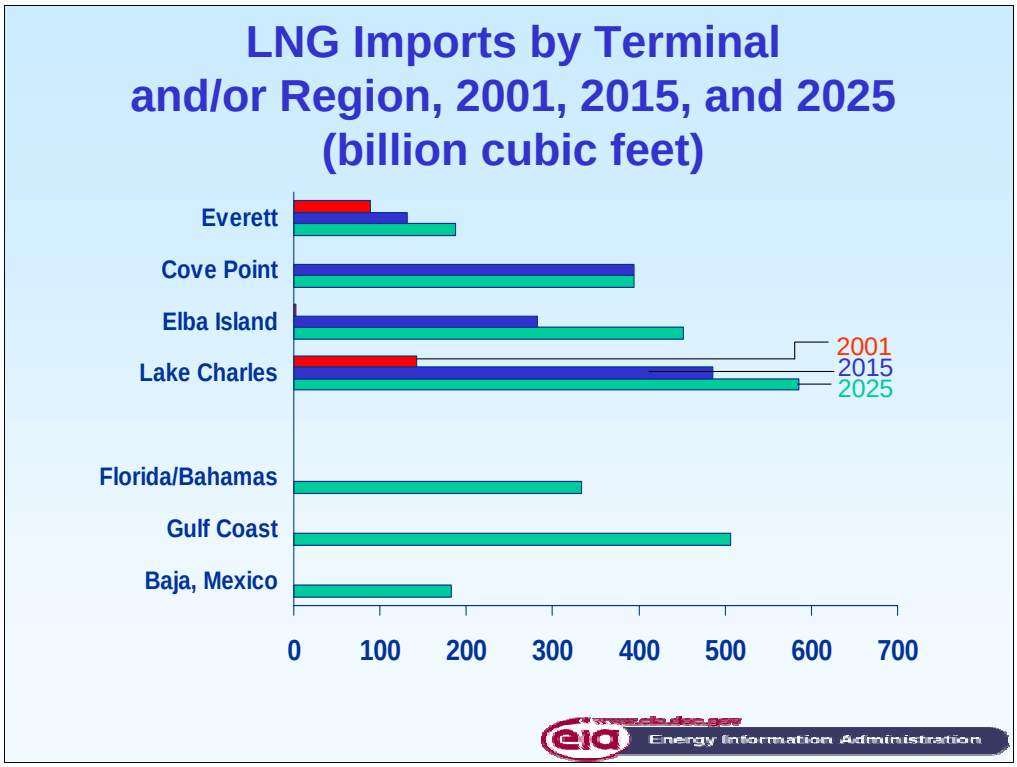



Net imports of natural gas, primarily from Canada, are projected to increase from 3.7 trillion cubic feet in 2001 to 7.9 trillion cubic feet in 2025. Imports contributed 16 percent to total natural gas supply in 2001, compared to 23 percent in 2025.

More than half of the increase in U.S. imports is expected to come from LNG. Much of the increase comes from expansion at existing sites, but additional facilities are also built to serve Florida and the Eastern Gulf Coast. The new LNG facilities are expected to have a combined gas delivery rate of 2.3 billion cubic feet per day. By 2025, LNG imports are expected to equal 7 percent of total U.S. gas supply.

Growth in pipeline imports from Canada partly depends on the completion of the MacKenzie Delta pipeline, which is expected to be completed in 2015 and expanded in 2022. The initial full flow rate into Alberta is assumed to be 1.5 Bcf per day. Additional imports will come from the Scotian Shelf in the offshore Atlantic. The forecast of Canadian imports largely depends on the ability of Canadian producers to economically produce and market their untapped unconventional resources, particularly coalbed methane. Net imports from Canada are projected to provide 15 percent of total U.S. supply in 2025, about the same as in 2001.

Mexico is projected to go from a net importer of U.S. natural gas to a net exporter in 2021, as another LNG facility begins operating in Baja California, Mexico, in 2021, predominantly serving the California market. By 2025, the United States is expected to import about 290 billion cubic feet of natural gas from Mexico per year.

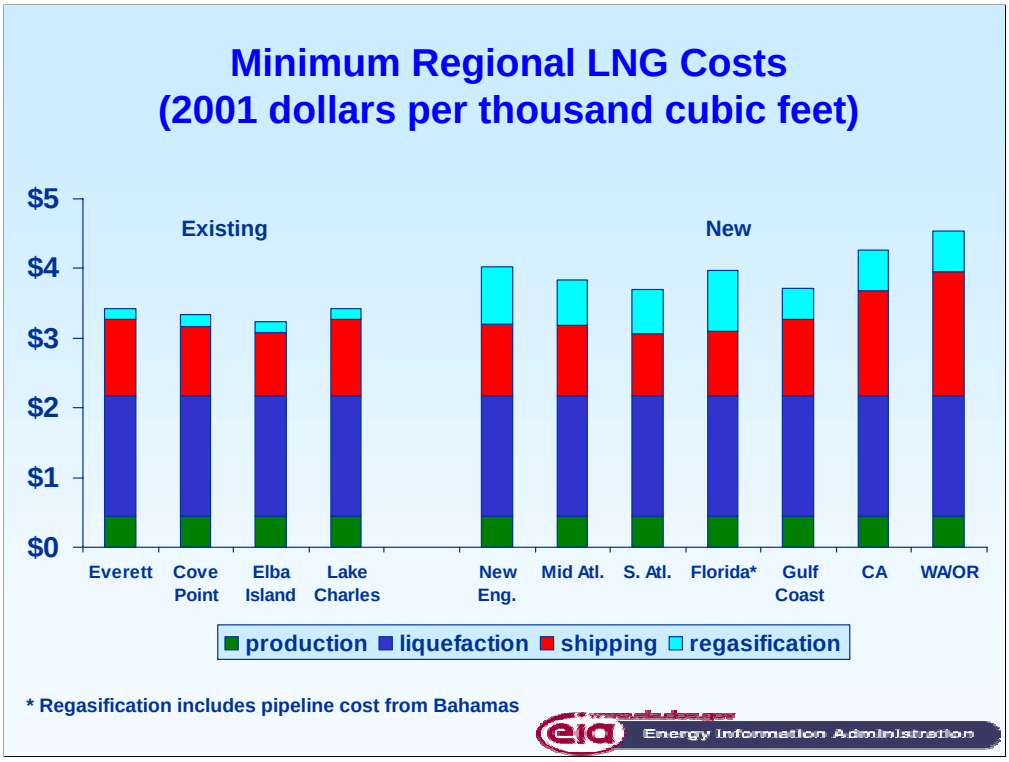



In addition to expansion at three of the four existing terminals, our forecast calls for the construction of new terminals to serve Florida (from the Bahamas), the Gulf Coast, and California from Baja California, Mexico.

The current capacity of the four U.S. LNG facilities is 832 billion cubic feet per year; we expect that to rise to 1.47 tcf over the forecast. We see expansion at Cove Point, Elba Island, and Lake Charles continuing after 2015, but no new terminals are expected to come on line prior to 2017. Thus, much of the growth in LNG imports occurs between 2015 and 2025.

Within the NEMS model, we represent the potential for new generic facilities (with a sustained capacity of 500 million cubic feet/day) to be built in any of the coastal regions. If the market price for LNG in a region exceeds our estimated minimum cost of delivering LNG to the region, then the model begins construction of a new facility. Construction for new facilities is assumed to take 3 years.

The minimum costs range from $3.40 in Baja California to $4.64 in the Pacific Northwest, as we'll see on the next slide.




The cost of delivering LNG is calculated as the sum of four items: production cost, liquefaction cost, transportation cost, and regasification cost. These costs were derived from various industry sources.

Ranges for the four costs that were used in the forecast are as follows:

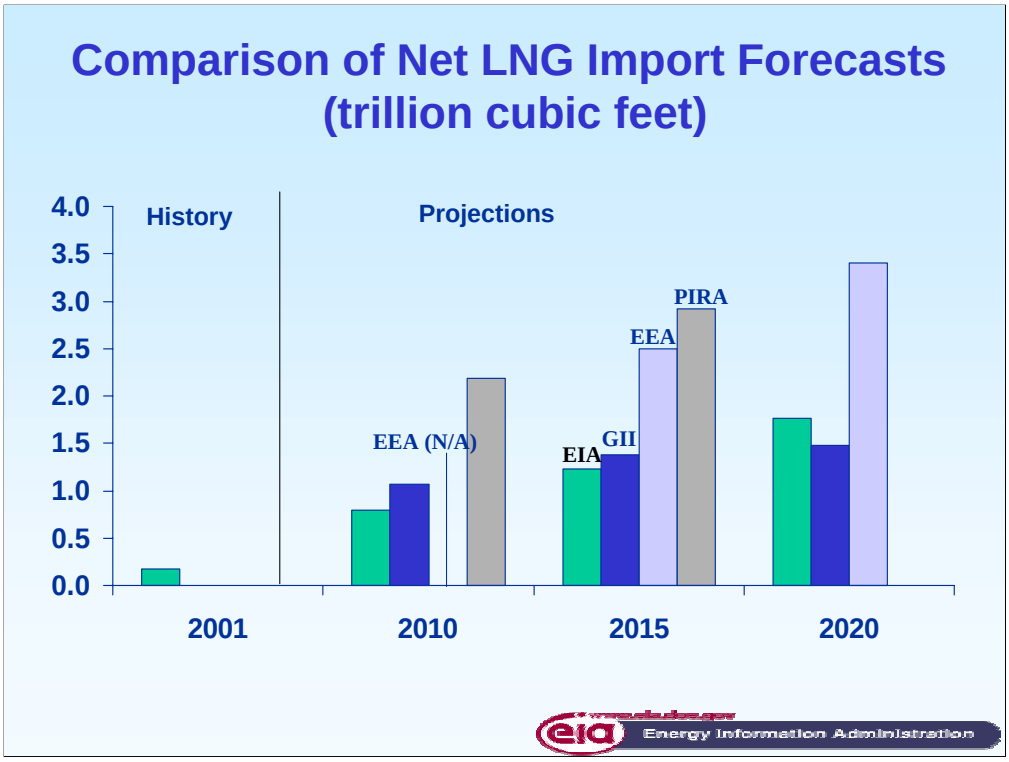
**Production costs** : Range from $0.25 in Qatar to $0.60 in Algeria in $2001 per mcf.

**Liquefaction costs** : Range from $1.32 in Algeria to $1.72 in "other" regions. "Other" is a conglomerate of newer and/or smaller supply sources not specifically represented

**Transportation costs**: Range from $0.89 from Trinidad to the South Atlantic region to $3.72 from Qatar to California

**Regasification costs**: Range from $0.45 in the Gulf Coast to $0.87 in Florida (which includes the cost of a pipeline from the Bahamas) Note that because of lower regasification costs, expansion at existing facilities is less expensive than new construction. We have assumed that new construction will not occur in a region with an existing facility until the existing facility has expanded to its assumed maximum.

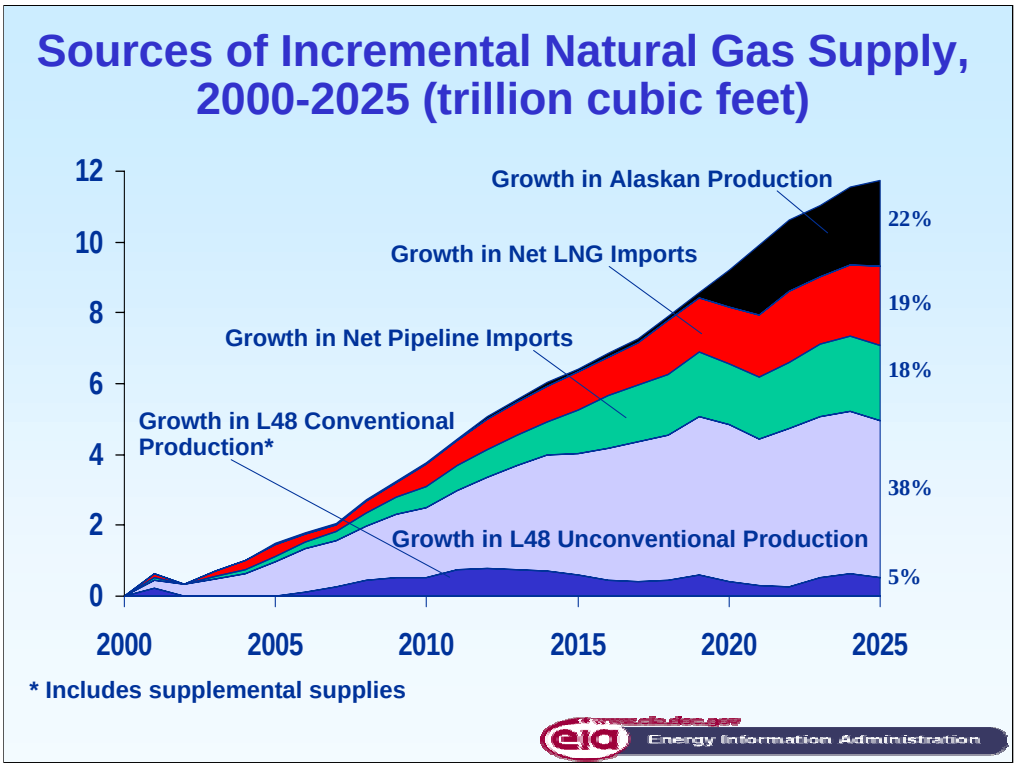
To underscore some of the uncertainty surrounding any forecast for LNG, I'd like to show how our forecast compares with some others.




We have forecasts from Petroleum Industry Research Associates (PIRA), Energy and Environmental Analysis (EEA), and Global Insight (GII). PIRA and EEA are clearly more optimistic about the growth of the LNG market than Global Insight and EIA. PIRA and EEA expect LNG to satisfy 9 and 10 percent of domestic consumption by 2015, respectively. In contrast, Global Insight and EIA project LNG to satisfy 5 and 4 percent respectively.

While the basic economics is certainly a factor, in the end, a lot of judgment must be imposed in forecasting expanded regasification capacity in the United States. Not only must reasonable cost estimates be made, but also the likelihood of investors taking on such risk and the likelihood of necessary site licenses being approved must be assessed. The availability of ships and competition with other consumers in the world must also be assessed.

Finally, let's look at what LNG is competing against.




Growth in "domestic" natural gas supplies will depend on two sources: increased unconventional natural gas production and construction of an Alaskan natural gas pipeline to begin operating in 2020. Of the 11.1 tcf increase in supply from 2001 through 2025, 38 percent is expected from unconventional gas and 22 percent from Alaska.

Total nonassociated unconventional gas production is projected to grow from 5.4 Tcf in 2001 to 9.6 Tcf by 2025. Total Alaskan production is projected to increase from 0.4 Tcf in 2001 to 2.9 Tcf by 2025.

Although total net LNG imports are projected to increase from 0.3 Tcf in 2001 to 2.4 Tcf by 2025, pipeline gas from Canada and Mexico increases almost as much, from 3.5 to 5.5 tcf over the forecast. So, 18 percent of the increase comes from pipeline gas and 19 percent from LNG.


In summary, the projections indicate that more than 11 tcf of new supplies will be needed by 2025. At a wellhead price of $3.95 per mcf in 2001 dollars, LNG imports and Alaskan production are expected to provide important new sources of supply, while unconventional and Canadian gas production continue to increase.