The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

EIA Annual Energy Outlook 2011: Don't Worry, Be Happy.

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We no longer have to worry about energy supply or prices. That is the message from the U.S. Energy Information Administration's (EIA) Annual Energy Outlook (AEO) 2011. Cheap energy will characterize the world for most of the next decade, according to the report. Oil will not reach $100 per barrel until 2017 and natural gas will remain below $5 per thousand cubic feet (mcf) until 2022 (Figure 1).

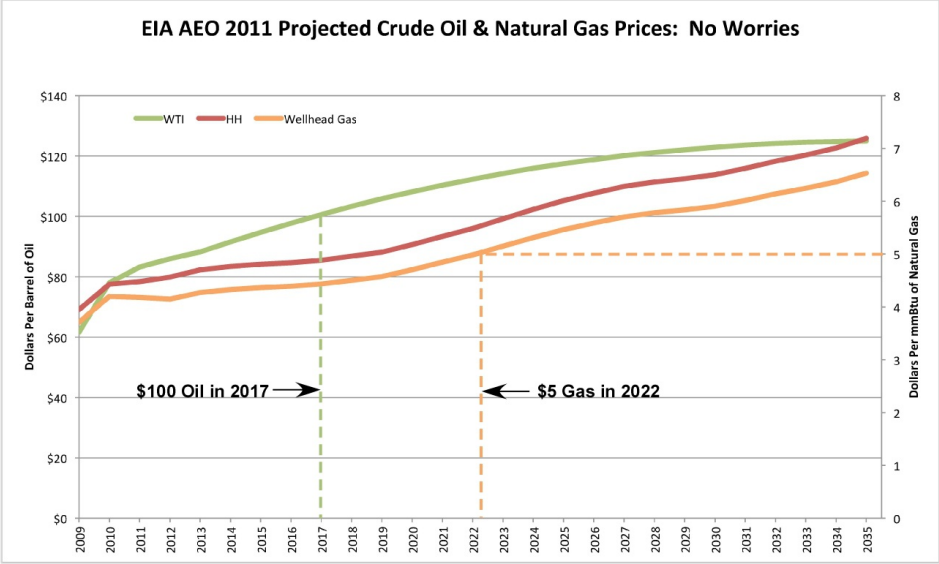

Figure 1. Projected crude oil and natural gas prices. Source: EIA AEO 2011.

Despite four decades of oil shocks and natural gas price spikes, the future looks stable with supply and demand comfortably balanced (Figure 2). Wasn't it just two-and-a-half years ago that $147 per barrel oil helped push the world into the current global recession? The EIA forecast is as troubling for the smooth and gradual progression of oil and gas prices as it is for the improbably low values of those prices. The history of oil and gas price, supply and demand is characterized above all by volatility but the EIA projection does not reflect this characteristic. Don't worry, be happy.

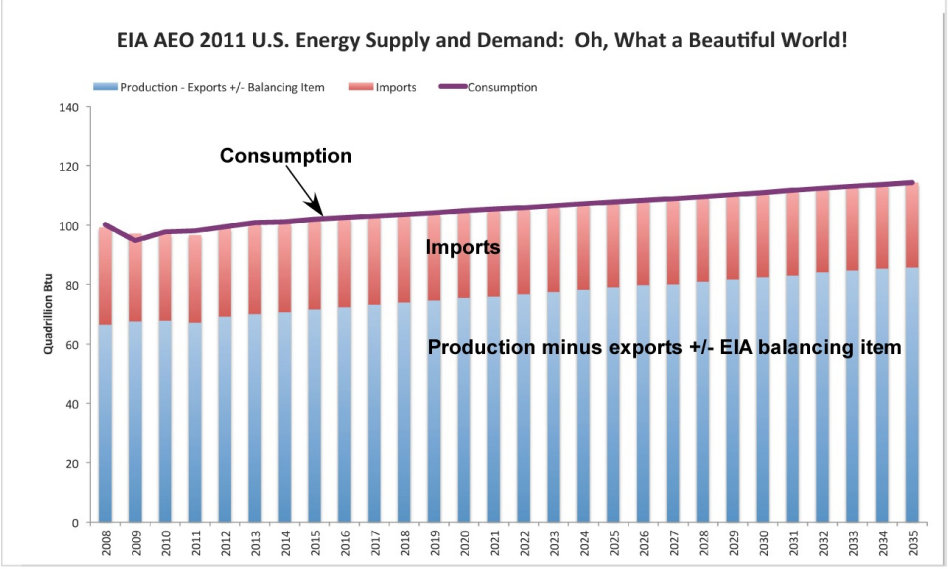

Figure 2. U.S. energy supply and demand. Source: EIA AEO 2011.

Natural Gas

The headline of the AEO 2011 Early Release Overview (http://www.eia.gov/forecasts/aeo/) published December 16, 2010 is that shale gas resources in the U.S. have more than doubled since last year's report. The current estimate is 827 trillion cubic feet (tcf) of gas, up 474 tcf from last year's assessment of 353 tcf. The new figure is 25% higher than the Potential Gas Committee's (PGC) 661 tcf from shale in its June 2009 report (http://www.mines.edu/Potential-Gas-Committee-reports-unprecedented-incre...). Notably, the PGC also presented a "probable" case of total gas resources of 441 tcf. Shale gas represents approximately one third of this estimate and is 17% of the EIA estimate (147 tcf). We hope to get more detail on how the EIA determined total and shale gas resources, along with other aspects of the EIA Outlook when the full AEO 2011 is released in March.

Technically recoverable resources should never be confused with reserves because resources do not take commercial considerations into account. These may be in accumulations so small or so deep that the gas may never be drilled or produced at any price, or may be in areas that are off limits or impractical to drill. It includes plays and basins that are, as yet, untested.

A resource assessment begins by estimating a total resource in place based on assumptions about gas richness, shale thickness, thermal maturity and areal distribution. A technically recoverable resource is a sub-set of the total resource that is determined by eliminating areas where one or more of these factors are marginal. There is great uncertainty involved in both of these estimated volumes. The expectation of future production based on as yet uncertain current production decline models is a key factor. For North America, The Baker Institute estimates 583 tcf of technically recoverable shale gas resources. Other estimates include Navigant Consulting (900 tcf), the Potential Gas Committee (661 tcf), and ARI (1000 tcf).

Given the variations in these recent evaluations (2008-2010) by credible organizations, resource estimates should not have much bearing on future production volume or price forecasts. The EIA, however, takes a different view. Slide 27 in Richard Newell's December 26 unveiling of the AEO 2011 states, "Natural gas price projections are significantly lower than past years due to an expanded shale gas resource base" (Figure 3).

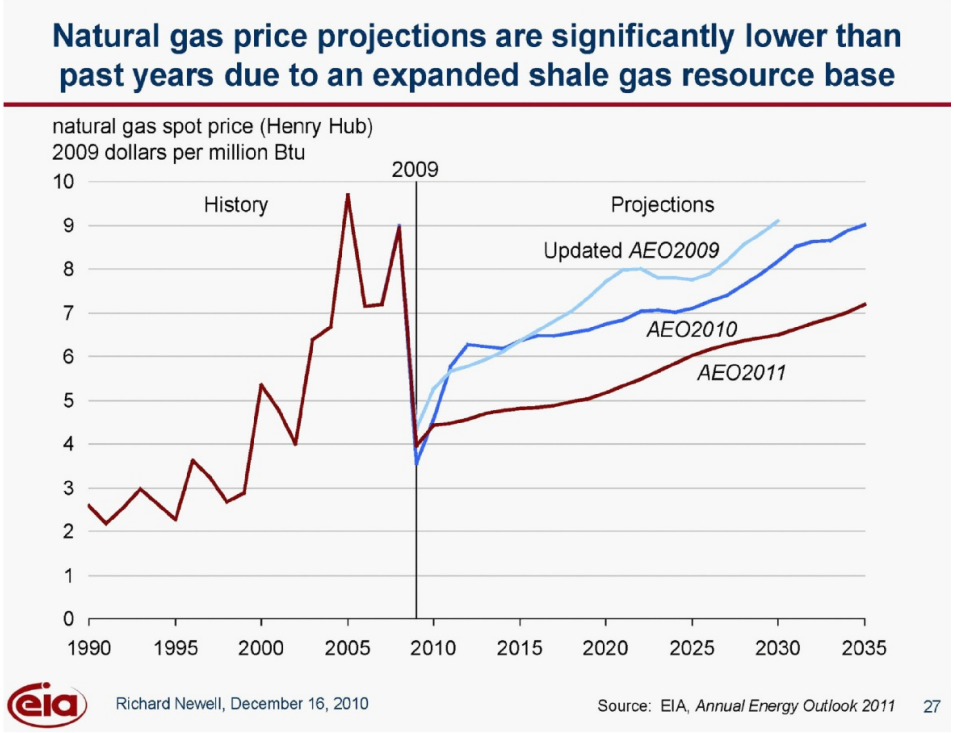

Figure 3. Natural gas price projections, 2009-2011. Source: EIA AEO 2011.

For the EIA, increased estimates for U.S. shale gas resources equate to higher production volumes, lower prices, and decreased imports of natural gas with shale gas accounting for 45% of total supply by 2035 (Figure 4). Average annual gas prices are 20-25% lower than predictions made a year ago in AEO 2010.

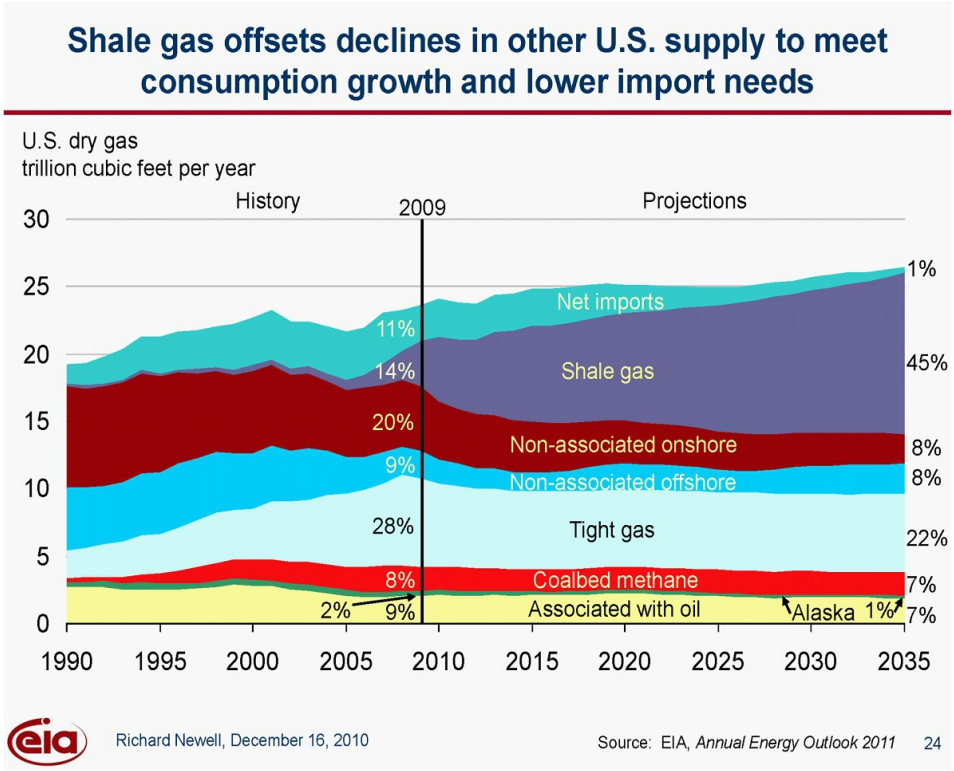

Figure 4. Projected shale gas production growth & corresponding gas source contributions.
Source: EIA AEO 2011.

The only volume that really matters is proved developed reserves. While the EIA's estimate of

resources has doubled since last year, proved reserves only increased 2.5% in 2010 (EIA AEO 2011). Much of this increase will likely be proved undeveloped reserves (PUD) thanks to revisions in Securities and Exchange Commission definitions for 2009. Clearly, the commerciality of undeveloped reserves is more questionable than proved developed reserves.

The EIA fails to grasp that the exploration and production business succeeds or fails based on earnings and profit, and not on production growth, resource or even reserve additions. Natural gas operators require at least $7.00 per mcf on average to break even in the shale plays (Figure 5).

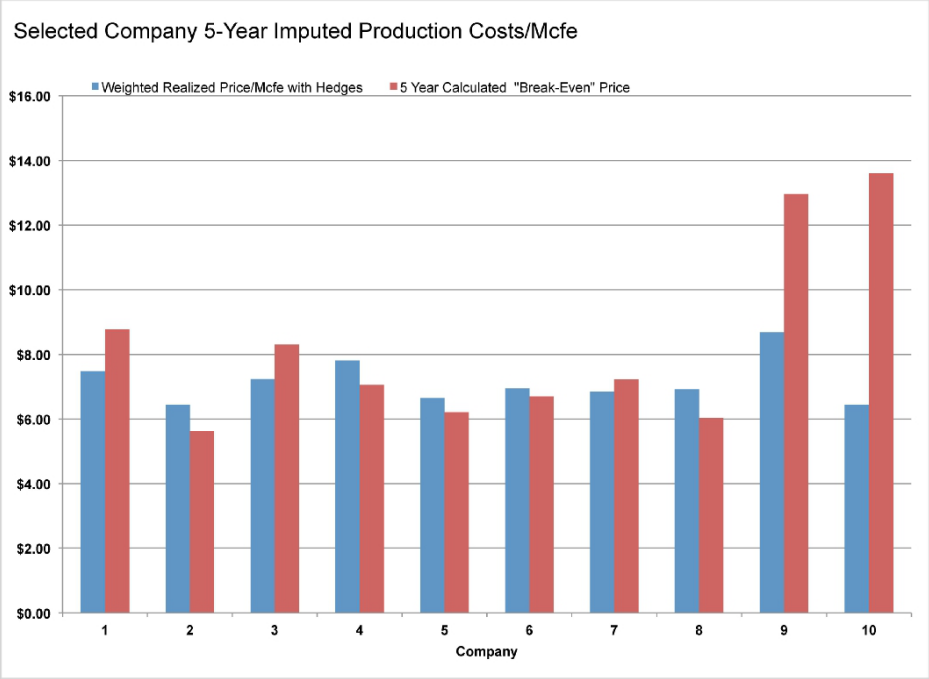

Figure 5. Selected shale company 5-year production costs and realized prices.
Source: Company files.

Favorable hedge positions over the past five years have carried companies through fluctuating and, more recently, low product prices. With futures strips now below $5.00/mcf for the next twelve months, hedges fail to guarantee the marginal cost of production.

While shale play enthusiasts have claimed profitability at gas prices below $5/mcf in recent years, these half-cycle economics do not include significant “fixed” and “sunk” costs such as debt service and overhead. With the flight to liquids-rich plays in recent months, the truth about true cost is being revealed. Chesapeake Energy, the paragon of shale operators, states in their most recent investor presentation that they do not intend to drill anything other than obligation wells in gas plays “until natural gas prices rise above $6.00 per mcf” (Figure 6). This reveals their commercial threshold despite past claims of profit at lower gas prices.

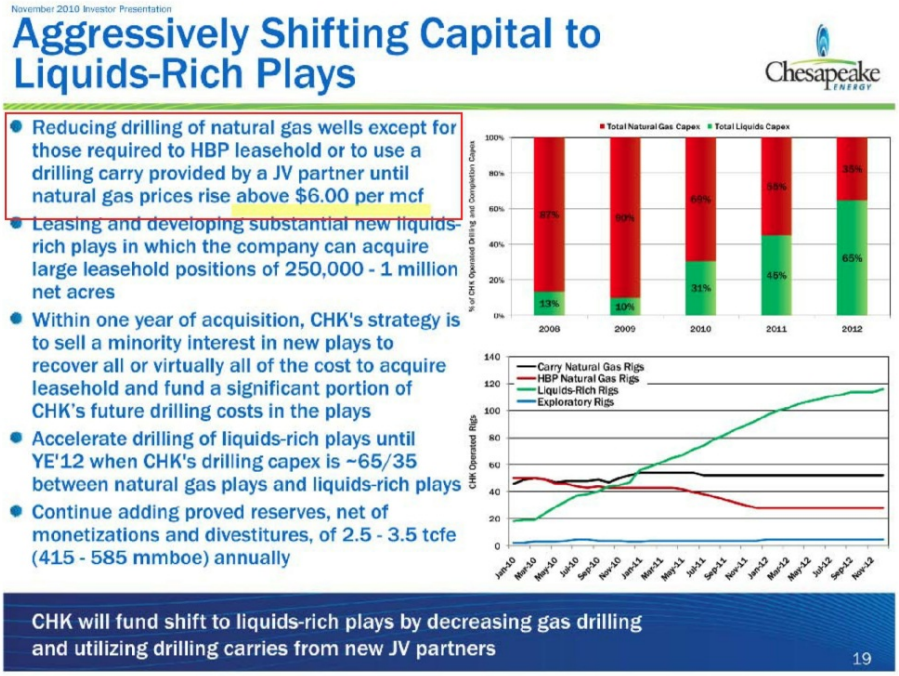

Figure 6. Shifting capital to liquids-rich plays. Source: Chesapeake Energy.

The EIA gas price forecast, therefore, implies that operating companies will continue to drill and produce gas at a loss for the next decade. This cannot happen. Because of the high decline rates of shale gas wells, drilling must continue at current rates just to maintain production rates.

Because some large operators in the Barnett Shale stopped drilling new wells in 2010, we can determine true portfolio decline rates, and they are substantially greater than predicted hyperbolic decline models. Figure 7 shows that the portfolio production decline rate is more than 40% for Barnett Shale wells operated by Encana, ConocoPhillips, Range Resources and Williams.

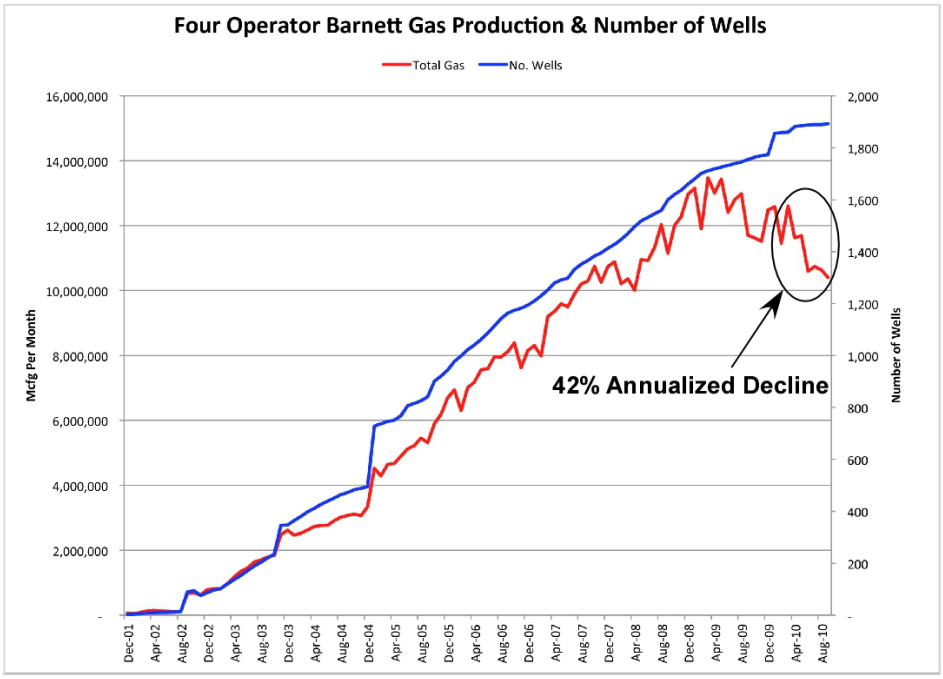

Figure 7. Combined portfolio decline of Encana, ConocoPhillips, Williams and Range Resources in the Barnett Shale. Source: Texas Railroad Commission.

For shale gas production to double and reach 45% of total U.S. supply as the EIA predicts by

2035 (Figure 4), rig counts will have to more than double. This cannot happen unless gas prices rise substantially beyond EIA predictions regardless of improvements in drilling efficiency and economies of scale.

The most likely average natural gas spot price for 2011 will be $4.10/mcf (J. M. Bodell, personal communication). Toward the end of the year, it is possible that gas prices will strengthen toward $5.00 as drilling to hold land by production decreases.

Crude Oil

The EIA's assessment of crude oil supply, demand and price is similarly puzzling by its departure from current data and considerable informed opinion that oil price will rise in the near term. The projection that oil prices will remain below $100 per barrel until 2017 conflicts with every credible source on the topic. The U.S. military, the world's largest single consumer of oil, has publicly stated its belief that there may be a liquid fuel shortage by 2012 (Joint Operating Environment (JOE) Report, 2010: http://www.jfcom.mil/newslink/storyarchive/2010/JOE_2010_0.pdf).

Oil closed at $91.51 on Friday, December 24, 2010 and will probably end 2010 at an average price of about $79.50 per barrel, yet the EIA estimate for the year is $78.03. Many experts predict that oil prices will exceed $100 per barrel in 2010, but my sources indicate that West Texas Intermediate crude oil prices will average $88 per barrel (J. M. Bodell, personal communication) but will increase to $95 or $100 per barrel later in the year.

The main factor that will control crude oil prices in 2011 is demand from the developing economies of countries outside of the OECD (Organization for Economic Cooperation and Development). Demand is expected to increase 3.6% (IEA) among developing nations and this should challenge OPEC (Organization of the Petroleum Exporting Countries) spare capacity. Because of subsidized oil and motor fuel prices in all OPEC countries, crude oil demand is largely insensitive to price. In contrast, the IEA predicts that oil demand in OECD countries will decrease 0.5% in 2011.

The EIA AEO 2011 report features a 14% increase in U.S. crude oil and lease condensate production from 2011 to 2020 (Figure 8) despite an 8 percent decline in production over the past decade and a 44% decrease since the 1970 U.S. production peak (Figure 9).

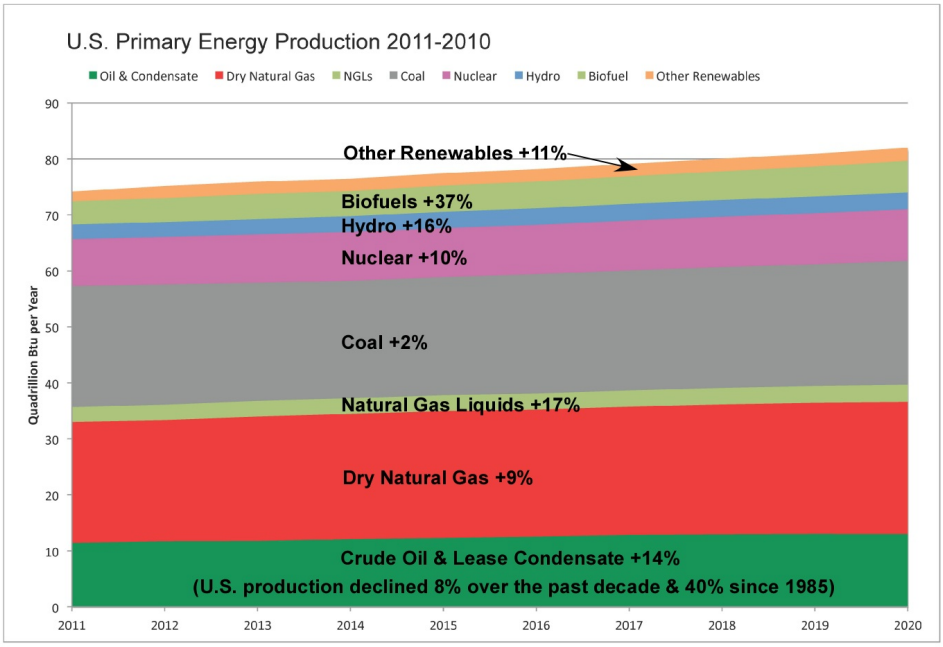

Figure 8. U.S. Primary Energy Production, 2011-2020. Source: EIA AEO 2011.

It further implies that unprecedented increases in nuclear, hydroelectric, biofuels and renewable energy sources will magically materialize to meet growing U.S. energy demand. EIA forecasts also imply that global liquids production will reach 115 mmbopd before 2035 while other estimates, including those by the IEA (International Energy Agency), do not anticipate that production can exceed 100 mmbopd (Figure 10), and many doubt that it can even reach that level. In any case, the price of oil would have to be substantially higher than EIA estimates to reach the production levels that it predicts.

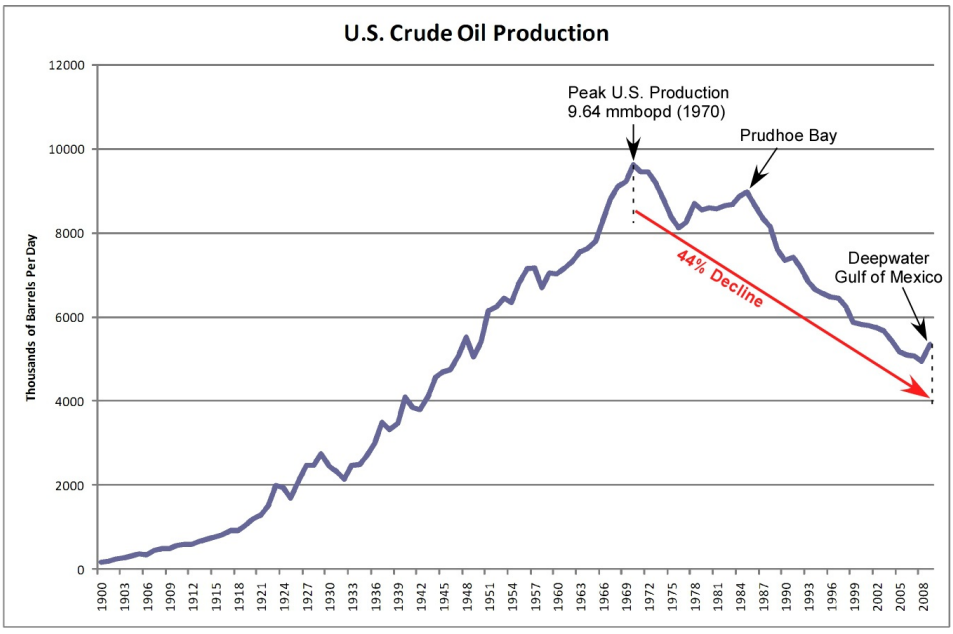

Figure 9. U.S. crude oil production, 1900-2009. Source: EIA.

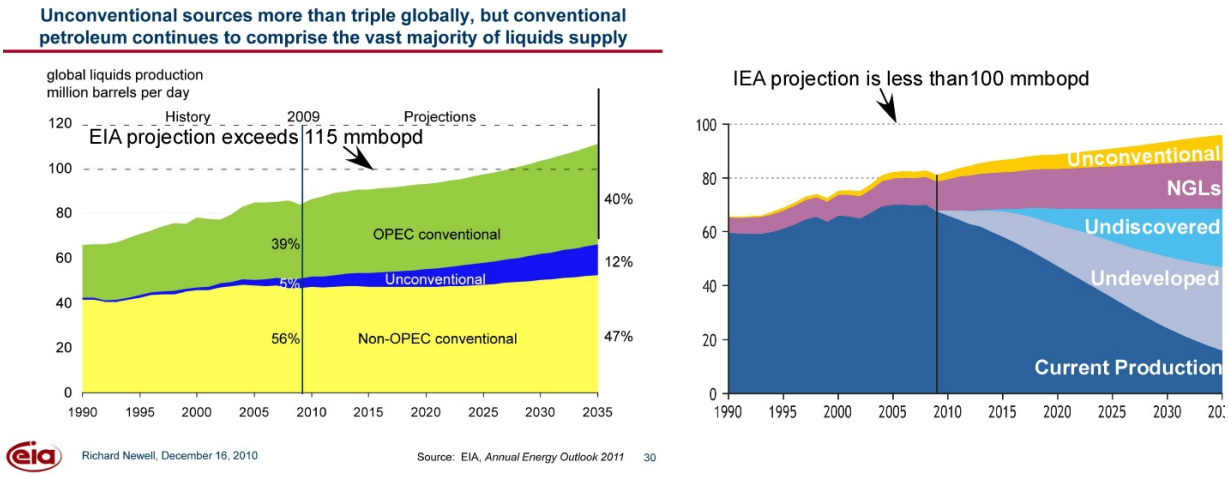

Figure 10. Global liquids production. Source: EIA AEO 2011 and IEA.

Conclusions

It is understandable that the EIA, as a branch of government, must produce an annual report that is politically expedient and that supports a view that meets public policy expectations. The EIA approach takes a long-term economic view and is, therefore, not concerned with the fluctuations that characterize the real world of petroleum supply, demand and price. At the same time, it is not useful that this report is in conflict with industry best practices and opinion as well as trend data available to the public.

The EIA's resource estimate of technically recoverable gas from shale is interesting but not relevant to future price or production volume forecasts. The Potential Gas Committee's 2009 report is the benchmark of credibility, and we hope that the full EIA report in March will explain why we should accept unwarranted and insupportable upward revisions to PGC resource estimates and how these might translate to energy reserves and price. The EIA treats shale gas just like conventional gas in its forecasting and does not acknowledge the much higher decline rates and, therefore, great number of wells required to maintain supply.

Exploration and production companies involved in shale gas production have presented a position that emphasizes production and reserve growth over earnings or profit. It is confusing that the EIA has assumed that market forces and improving efficiencies will save the day for oil and gas prices. It would be more appropriate to frame the problem in the context of reasonable expectations that would be useful to public understanding of the shale gas phenomenon and its potential contribution to natural gas volumes and price. It is unsettling that the EIA has not acknowledged the belief by the U.S. military and other credible sources of an impending liquid fuel shortage that confronts the United States and the world (e.g. Hirsch, Benzdek and Wendling, 2010; JOE Report) . Instead, the EIA has provided an unrealistic view of future oil and gas supply and price that will inevitably not serve public understanding or promote reasonable planning for resource availability or price.