TOPIC PAPER #15

SUMMARY DISCUSSIONS ON PEAK OIL

On July 18, 2007, The National Petroleum Council (NPC) in approving its report, *Facing the Hard Truths about Energy,* also approved the making available of certain materials used in the study process, including detailed, specific subject matter papers prepared or used by the Task Groups and their Subgroups. These Topic Papers were working documents that were part of the analyses that led to development of the summary results presented in the report's Executive Summary and Chapters.

These Topic Papers represent the views and conclusions of the authors. The National Petroleum Council has not endorsed or approved the statements and conclusions contained in these documents but approved the publication of these materials as part of the study process.

The NPC believes that these papers will be of interest to the readers of the report and will help them better understand the results. These materials are being made available in the interest of transparency.

The attached Topic Paper is one of 38 such working document used in the study analyses. Also included is a roster of the Subgroup that developed or submitted this paper. Appendix E of the final NPC report provides a complete list of the 38 Topic Papers and an abstract for each. The printed final report volume contains a CD that includes pdf files of all papers. These papers also can be viewed and downloaded from the report section of the NPC website (www.npc.org).

NATIONAL PETROLEUM COUNCIL

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Summary of Discussions on the Occurrence of Peak Oil Production

Subcommittee's Observations and Recommendations

Observations:

1. The concerns regarding a supply shortfall due to post-peak production decline have merit and warrant further consideration.
2. Lack of consistent definitions and accurate reporting of production and reserve data creates uncertainty in supply forecasting. This lack of transparency frequently clouds discussions regarding critical issues regarding the future supply of oil, including the issue of peak oil production.
3. The combined risks and uncertainties of a supply shortfall are substantial and include geologic, economic and political issues.
4. Current and forecasted market tightness aggravates the risk brought on by uncertainties in investment, access, timing, technology, and geopolitics.

Implications (these principles apply to exhaustible resources.):

1. An unexpected oil supply shortfall has economic, environmental and political consequences.
2. An oil supply shortfall will have to be accommodated by either supply side or demand side adjustments or both.

Policy Recommendations:

1. Promote market solutions to oil supply and demand issues so that adequate price signals are sent for the development of new supplies and technologies and that economically viable and appropriate risk mitigation measures are developed.
2. Encourage development of an acceptable global transparent standard of reporting reserve and production data that is readily available and verifiable.
3. Identify and monitor key leading indicators towards peak oil production. Continue analysis of this issue and report findings to policy makers.

Introduction

Within the context of addressing Secretary Bodman's energy concerns and within the framework of including diverse views on energy forecasts, the National Petroleum Council hosted three conference calls to gather information and a greater understanding on the subject of peak oil production. Two conference calls were conducted with leading peak oil production forecasters, those who believe that the peak in oil production will occur within the decade, on February 23, 2007 and on March 1, 2007[1,2,4,5]. A third conference call on March 13, 2007 involved people who do not believe that peak oil production will occur in the near future[3,4,5]. This document captures only the general messages and themes conveyed by those participating in these calls. The details of individual peak oil production forecasts for these presenters as well as other forecasters have been captured through conventional means incorporated in the broader Supply Task Group study. These methods include using a data template as submitted by the individual forecasters, extraction of data (and input onto the data template) from published reports provided by the forecasters, or by providing answers to a more general questionnaire. The findings and analysis of these detailed forecasts are captured in a separate report.

Summary

There is growing concern among many supply forecasters that global peak oil production is increasingly near-at-hand as perceived leading indicators of a peak in global oil supply have become more prevalent. These indicators include:

- the peak of new field discoveries occurred circa 1960s,
- several significant oil producing countries or regions have already witnessed peak production, such as the United States, Norway, and the United Kingdom, and
- some exporting countries, such as Indonesia, have witnessed reduced levels of trade flows as either production declines or internal demands have outstripped their ability to grow production to meet domestic demand as well as provide for exports.

Other forecasters do not believe the above indicators are indicative of a pending peak in oil production. While not denying the existence of the above facts, they believe that the resources below and above ground (financial, material and political) are such that oil production will continue to grow over the time period of this study.

There were two fundamental concepts surrounding the peak oil production argument that the presenters felt were often misunderstood or misinterpreted by those outside of the oil industry community. Both of these concepts are generally agreed to by both sides of the argument. First, “peaking” does not mean “running out”, as peak oil forecasters see oil production continuing for a very long period of time, measured in several decades as opposed to several years. Rather, peak oil refers to the maximum production rate obtainable. Some of the forecasters foresee a period of flat production at peak, known as the plateau. Others see a more acute maximum point of production. In both scenarios (plateau and acute), the supply of oil will not be able to continue to meet a growing demand for oil. A production plateau will be able to provide a relatively stable supply of oil to the market for a period of time while a production decline will present a greater challenge with respect to a growing shortfall between supply and demand. Again, timing of the occurrence of either the plateau or peak is core to the debate.

The second fundamental concept here is the production decline rate, also referred to as the decline rate or depletion and is a physical reality in the production of crude oil and natural gas from all reservoirs. Given that the resource endowment is of finite size, production will begin and end with a peak in production somewhere in between. While this basic concept is recognized by both sides of the argument, the size and nature of the resources available for production is also core to the debate.

All forecasters, whether belonging to the peak community or not, recognize that oil is a finite and therefore depletable resource. All forecasters also recognize that one of the primary challenges associated with peak oil production is the lack of reliable data reported for both production and resource estimates. Many countries that provide substantial portions of the global oil supply and hold much of the remaining resources are not transparent regarding capabilities and capacities of their assets. In addition, an ambiguity in definitions surrounding both production rate and resources leads to misunderstanding of key issues, depending on which side of the debate one sits, and provides fodder for continued argument on both sides of the issues.

The exact timing of peak is not a primary concern of the peak oil production community. Their primary concern, and what they consider to be critical, is the post-peak oil production decline. Oil will continue to be produced but in diminishing quantities with time. This post-peak shortfall in oil supplies due to declining oil production can, and most likely will, have a strong economic impact. They believe that there is an urgent need to develop domestic and foreign policies to address the regional and global economic implications associated with post-peak oil production decline as well as the mitigation of associated issues. The urgent need for global action was clearly the most strident issue raised by the presenters.

Both sides of this argument recognize that oil will continue to be produced in some quantities for many decades to come. A major point of contention goes to a second common theme voiced by the peak group in that peak production is about the “rate”, not the “resources”. The peak oil production community believes that due to the constraints listed above, the rate of production will reach a peak in the near term. The non-peak oil production community believes that the resource base is sufficient to sustain an increasing rate of production. They see a huge resource endowment in all forms of fossil energy, both conventional and unconventional. Their contention that technological solutions will allow this endowment to be captured at ever increasing rates is a major point of debate with those concerned about an oil supply peak within the next 10 years.

Risks mentioned by all participants can be grouped into three broad categories: geologic, economic and political. Within these areas some specific risks that will influence the overall rate of production include access to potentially productive acreage, the rate of investment, capital availability, capital equipment, technology, a skilled work force and difficulty of any particular project.

Finally, while this area of study is focused on supply, the presenters emphasized that demand cannot exceed supply. This is true on either side of peak oil production. As demand for oil grows, the risk that peak oil production is near increases. Accordingly, once past peak oil production, oil demand growth may well be limited by post-peak oil production supply constraints. A reduction in demand for oil can push further out in time the occurrence of peak-oil production as well as reduce the post-peak decline rate in oil production. Another factor of growing concern pointed out by several presenters is the concept of a carbon footprint. Consideration must be given to climate change debate and the carbon footprint, the amount of carbon release by methods associated with conventional as well as unconventional production.

Discussion

Many presenters felt that there is an urgent need to inject the peak oil production issue into U.S. and world policy discussions. Most of the presenters believed that the public, in general, is not very well educated on the issue of peak oil production and much less so with respect to its implications. The precise date of peak oil production is uncertain, but the implications of reaching peak production and the subsequent post-peak production decline are so important and the economic risks so great that they should be studied and addressed

The essence of the peak oil production argument is a simple construct. Any particular reservoir is of finite size. Once pierced by a well and brought on-line for production, the remaining amount of oil in the reservoir is reduced and continues to be reduced as more oil is produced. There are only so many wells required to effectively and efficiently produce the oil and gas from a reservoir. Each of these wells will eventually reach a maximum flow rate in transferring oil and gas from the reservoir to the surface. At some point in time, a maximum production rate for the reservoir will be attained. This rate may be sustained for a period of time but the persistent removal of oil and gas from the reservoir leaves less and less with which to sustain a maximum rate of production. At some point in time, production will begin a steady decline until the cost of production exceeds the value of the product sold. No oil and gas reservoir has ever been pumped dry. Peak production is a real phenomenon, characteristic of all producing oil and natural gas fields and can be calculated, within a range of values, with proper reservoir information (including reserve, bottom hole and production data). Determining peak production on a global basis, however, is a difficult proposition due to the unreliable and misunderstood nature of production and reserve reporting.

The concept of peak oil production presents the corollary of regional and global economic growth vulnerability. Energy, and specifically oil-derived energy which succeeded the age of coal, has been critical to continued economic growth and expansion of the developed and developing world. Peak oil production, when it occurs, means that the historic annual oil demand growth rate of 1% to 2% can no longer be met, and economies must adapt, by various methods and technologies, to an environment of flat and ultimately declining oil supply.

Accordingly, the peak oil production presenters unanimously recommended policy makers urgently and seriously consider the economic implications of future oil supply that will not be able to meet future oil demand and consider how regional economies need to respond to local and global shortages. They believe that this issue is too great to simply dismiss or postpone. The nature of this argument needs to be depoliticized and international cooperation in these policy discussions is vital.

The ability to evaluate the economic impacts of peak oil production requires a solid data base. The ambiguity of present-day technical data compromises the ability to properly assess the timing and level of peak oil production as well as the pace of post-peak production decline. The presenters recommend that policy makers consider ways to capture this critical information so that realistic supply estimates can be calculated, providing a basis for future planning and investments. With respect to the narrowly defined policies concerning the identifying and monitoring of leading indicators of peak oil production and post-peak production decline, suggestions include standardizing reserve and production stream definitions, mandating 60-quarter production history for the world's 250 largest oil and natural gas fields, and imposing production and / or import fines in order to facilitate compliance[6]. With respect to the broader implications to an oil demand and supply gap, suggestions include energy conservation (a near-term demand side solution), energy efficiency (a longer-term demand side solution) and development of alternative and unconventional energy resources (a longer-term supply side solution).

The particular date for the occurrence of peak oil production varies over a wide range of time. Depending on the size of the conventional resource base used and whether or not unconventional resources are included in the forecast, this event may have occurred in the recent past or may not happen until after 2030. This summary report is not intended to capture the various methodologies and data inputs of the individual supply forecast models, thus the derivation of the year in which peak oil production occurs is not important here. Moreover, peak oil production forecasters readily admit that the data available for analysis and modeling is inadequate for this precise determination. It is the situation that presents itself after the peak in oil production has happened. Post peak oil production, the diminishing supply of oil year in and year out, is the event that the peak oil production community is greatly concerned about because they believe that it will happen sooner, not later. The non-peak oil production community strongly believes that continued growth in oil production will be possible over the time span of this study, at least until 2030.

The peak oil production argument is one of production flows and risks, not the resource size. While both production rate and resource size are important components of supply forecasts, the peak oil production argument is focused on production and production is an issue of rate – How quickly can the reserves be converted to sales to market? This premise is well justified from a physical measurement basis. As mentioned above, any particular well has a limit in the rate at which it can transfer oil (and/or gas) from the reservoir to the surface. At the surface, a pipeline has a volume limit as does an oil tanker which can only travel a certain distance in any period of time. And then the crude oil needs to be refined into a finished product for the market. But at what rate can crude oil be supplied to this distribution network? Some believe that this rate of oil production will soon reach a peak while others believe that growth in production will continue.

Both sides of this debate discussed the critical importance of facilities and capital equipment. This represents one of the major risks in maintaining a rate of production. Both sides commented on the state of the drilling rig fleet. It is aging. New rigs utilizing the latest technology are required to maintain production and explore for new reserves. This takes money, and like any piece of oil field equipment, or facilities in general, it usually takes a lot of money. The larger the amounts of money need for an investment, the greater the risk. Rigs drill wells which establish a rate of production. Facilities and infrastructure need to be built to handle this production rate and deliver it to market. Some level of confidence that the resource, in the ground, is present in sufficient quantity to meet production needs is another risk. The better the resource numbers, the easier it is to accept this risk and make the investment in rigs, wells, facilities and infrastructure. This argument also applies to maintenance of production and production facilities.

The amount of oil and gas in the ground and believed to be available for production is where opinions begin to sharply differ. These reserves may have different definitions depending upon the purpose of the definition which is usually reflected by regulatory requirements and / or national interests. Given this ambiguity in reserve definitions, of which there are several, and the lack of third party audits for a significant portion of global oil reserves, one can see that there is no universally accepted standard of measure with which to estimate such a vital asset. The issue of “fuzzy” oil reserve reporting is most acute in regions or countries considered to have the largest accumulation of resources. OPEC members in the Middle East are considered the most important here although Russia is frequently mentioned. Accordingly, there is a meaningful error bar around the true size of the resource endowment that is magnified by the lack of any reliable estimates of costs and time to extract these resources. Along these lines, readers of supply forecasts need to understand that not all in-ground barrels of oil are the same in terms of their energy content and their economic and environmental costs to find, extract and refine into usable products.

Resource definitions vary. Because of this data transparency is a key issue. Estimating the potential size of an oilfield early in its life poses no particular scientific challenge although the estimate is naturally subject to a range of uncertainty. With respect to supply forecasts, however, the difficulty arises from the “reporting” of these reserves on a global basis, which are subject to broad inconsistencies. Financial regulations by the SEC are considered to introduce a bias in reserve data, resulting in understating reported reserves which are later subject to subsequent, and most likely upward, revisions. At the other end of the spectrum are self-assessed reserves (as opposed to third party audited reserves), which serve to magnify the uncertainty. Data validity, as well as consistency in reporting production and reserve data, is needed for proper reserve assessment, production forecasting and accurate determination of the rate of production decline.

Many risks present themselves over the length of the distribution infrastructure, from wellhead to burner tip or gas tank. They are considered to be many but can be broadly categorized as geologic, economic and political. Geologic risks include greater reservoir complexity, smaller reserve accumulations, and poorer quality content (i.e., oil that is heavier and contains greater amounts of sulfur). Economic risks include rising and uncertain costs and an aging infrastructure, an aging in the experienced work force, and the availability of capital and ability to make investments. Political risks include geopolitical tensions in key exporting regions such as the Middle East, Russia, Venezuela and Nigeria. Political risks influence the ability to access prospective acreage as well as the ability to make the necessary investments in these areas. Forecasting these risks is tricky and usually done by calculating several different forecasts incorporating different levels of inherent risk. Any forecasted risk is an assumption. All forecasters are confronted with the problems presented by these risks.

Depletion is vitally important in understanding peak oil production as well as the post-peak / post-plateau production decline. The rate of production decline for individual fields of the existing production base is critical to determining global peak oil production and post-peak production decline. Decline rates for many key producing areas are, unfortunately, not well known. Typically, in the early stages of field development, production rate increases to a maximum, reaching a peak level. Over this time period to maximum production, the physical forces within the reservoir that drive production, the reservoir’s internal energy (water drive, pressure depletion, gravity drainage, etc.) is weakened to the point where peak levels of production can no longer be sustained and the production of the field begins to decline toward an economic limit where the cost of production equals or exceeds sales. At this point the operator either sells the property or production comes to an end. Prior to this economic limit, primary production can be enhanced with artificial lift (pumps) before secondary and tertiary production technologies are employed. These production technologies impact rates of production and their timely implementation is critical to sustaining a good rate of production or minimizing decline. In a geographical region or basin containing many fields that are developed over extended periods of time, the production profile can become very complex. The profile is a function of the rate of discovery of individual fields over time, as well as economic factors that enhance or reduce capital expenditures for development and improved recovery of the resources. Over a long timeframe, geographic regions go through a similar production profile witnessed within individual fields. These regions will ultimately reach a peak and decline toward an economic limit. The more efficient the industry is at extracting the resource, the sooner it will reach peak oil production. A concern of the peak oil production community is that growing demand has caused industry to develop conventional resources at an increasing pace. Several peak oil production presenters pointed out that many geographic regions have reached their peak production capacity and are currently in decline. One presenter noted that 28% of today's producing oil fields / basins are in decline and that this number will rise to 40% in the 2008 – 2009 timeframe[7]. There is also an increasing frequency of countries reaching peak oil production and this trend is expected to continue.

The non-peak oil production community believes that technology is critical to their model that production will continue to grow, reaching a peak or plateau further out in time. The ability to apply this technology depends on whether or not an operator is willing to make the investment, an important risk to consider.

One primary concern illuminated by several peak oil production presenters was the fact that oil exploration activity, as measured by the number and size of discoveries per year, peaked in the 1960's and has steadily declined since that time. It is this volume of discovered oil up to this point in time that provides the majority of the foundation for present production. Although large discoveries are made today, their volumetric contribution has no significant impact on the timing of peak oil production.

The non-peak oil production community believes that not-yet-discovered and unrecognized reserves are a critical component to the reserve base and that reserve growth potential is as important as exploration discoveries. From the peak oil production perspective, reserve growth is actually reserves already discovered and included in their P2 category (proved + probable reserves). They point out that reserve growth is facilitated by the U.S. SEC which requires, for investment reporting reasons, that oil companies only book proved (P1) reserves. Probable reserves that become proved over time provide for a significant portion of growth in reserves. The peak-oil production community believe that their P2 values already account for this "reserve growth" whereas the non-peak oil production community believe that recent production data indicate that there is "reserve growth" potential on a global scale.

While the concept of decline in reserves and production is relatively straight forward, from the peak oil production perspective, what is missed most often in supply forecasting is the vital aspect of the increasing average age of the current production base and that technology has served to enable maximum production rates and to accelerate reserve recovery from existing fields. The end result is a considerably steeper decline rate on the current production base that makes it more difficult for new fields to fill the supply gap. This affects peak oil production (magnitude and timing) as well as post-peak / post-plateau production decline.

The non-peak oil production perspective considers that reserve growth and new discoveries can replace a good portion of the decline in established reserve base. They also believe that technology is a key component in bringing these new reserves online providing for continued growth in production over the time period of this study, to 2030.

Compounding the assessment of peak oil production timing and effect is that no one knows the underlying decline rate of global oil production or how this rate may be changing as the average

age of existing fields grows. Better data transparency is needed to properly analyze depletion on a global basis.

For the peak oil production community, an indicator of peak oil production is the increasing number of oil producing countries and regions reaching peak production. One presenter stated that half of the top 20 oil producing countries in the world have reached peaked production for various reasons which include political, and geologic and economic limits. These 20 countries represent 83% of global oil production. Specific countries mentioned include the United States, Norway, and the United Kingdom. Specific giant oil fields in decline mentioned include Cantarell (Mexico), Burgan (Kuwait), and Daqing (China)[8]. It happens that these three fields are among the five largest producing oil fields in the world. As mentioned earlier, 28% of the world's oil fields are in decline at the end of 2005 and that 40% would be in decline by the 2008 – 2009 timeframe. As country-level production peaks occur more frequently, the impact to local and regional economies are expected to be substantial and potentially elicit undesirable political and economic responses. It follows then, that country-level responses to peak oil production will take place at different points in time as their political leaders become increasingly aware of what peak oil production is and how it can effect them.

Resource nationalization is an important factor affecting production flows. Peaking of oil trade flows will occur before peak oil production. Another signal cited by the peak oil production presenters suggesting that peak oil production is near is the peaking of oil export trade. As domestic oil consumption in an exporting nation grows and increasingly so at a rate greater than their ability to expand production, oil trade flows will peak ahead of the production peak. The exporter will choose to meet domestic demand first. This will serve to exacerbate oil price volatility, regional shortfalls, and hoarding behaviors including asset nationalization and strategic storage initiatives. There are several examples where exports have peaked ahead of the production peak, including Indonesia, which is an OPEC country that is now a net-importer of crude oil. Resource nationalization also goes to access to potentially productive acreage. Without access investment can not be made on a timely basis to maintain a rate or production, either before or after peak oil production.

Political and national factors will play an important role in future supply constraints. One such area is the rise in production / reserve dominance of the national oil companies (NOC). One presenter noted that 80% of the world's reported reserves are now held by NOC's[9]. The result is a growing trend that denies the traditional international oil company (IOC) access to find and develop these reserves. Some of these NOC's are actively investing in projects outside of their national boundaries, providing competition to the IOC community. Actions taken by individual or a group of NOC's can have meaningful consequences on global production flows and country behavior, providing an additional layer of risk.

Peak oil production will occur when production increases cannot be achieved due to several interrelated issues. The primary issue is the amount of reserves in the ground but issues above ground are also important such as the age of facilities and equipment and the rate at which investments can be done. The peak oil production community believes that unconventional resources will not significantly delay the time when peak oil production occurs. This is because they will not be brought to market at a sufficient rate to have an impact and offset the decline in conventional oil. Unconventional oil supplies may provide for a slowing in the decline of conventional oil post peak production, but it is not likely to provide for net production gains. Moreover, there is the issue of net-energy as a factor that needs to be seriously studied and analyzed. In the effort to produce unconventional resources, how much energy is consumed to produce a unit of unconventional energy? As mentioned earlier, a consequence of this production effort is an environmental impact due to carbon emissions that is referred to as a carbon footprint.

The non-peak oil production community cites different indicators for peak oil production. Some of the indicators they cite include high exploration efforts yielding little or no results, steadily rising costs, beyond background noises of the market, of oil and gas and increasing periods of tight supply not due to above ground factors.

For the peak oil production community, real solutions will involve demand side solutions that not only solve temporary problems but can bridge the transition to a sustainable energy picture. With respect to the supply – demand balance for oil, and energy in general, risks are getting more acute. In the words of one presenter, "Time is as critical of a factor here as is the amount of oil." The ability to develop alternative energy solutions is highly dependent on the time required for research-development-commercialization schedules, which are expected to extend beyond the date of peak oil production. There are many traditional oil developments currently underway that may cause a temporary supply surge, but it is likely to be short-lived and susceptible to a corresponding demand surge. It is critical for policy makers to keep an "eye on the ball" to ensure that the inevitable consequences of supply constraints are not dismissed. Demand driven solutions are as critically important as finding alternative resources and alternative energy sources. Conservation provides short-term demand relief, whereas efficiency is perceived by some to provide long term demand relief. Further, demand measures need to be balanced with economic activity and both supply and demand measures need to be balanced with environmental concerns, notably the carbon footprint.

The non-peak oil community does not foresee an impending crisis. Factors that will impact post-peak oil production, however, are also important to the non-peak oil community. They believe that resources, investments, facilities and production in the immediate future are sufficient to meet demand. For continued growth investments in production maintenance, infrastructure maintenance, capital equipment improvements, technology and exploration must be continued and accomplished in a timely fashion.

Conclusions

The purpose of our teleconferences with those involved in the peak oil production debate was to improve our understanding and gain an insight on their perspectives. We wanted to understand why they believe in their perspective of the situation and what they believe needs to be done to resolve the situation of peak oil production. Of course one side of the debate does not see an immediate need for a solution as production will continue to increase and meet demand through the period of time of this study.

There are several factors in common to both sides of the peak in oil production that can be very helpful in assuring the future supply of oil. Both need better and more reliable data on reserves and production.

Both are very concerned with the rate of production as this goes to the core of their arguments. The non-peak oil community believes that the rate of production will continue to grow. They believe that resources in the ground are sufficient to meet this rate of production demand. The greatest risks to them are above ground. To minimize these risks, timely investments, and the ability to make these investments all along the value chain, from well to gas tank or burner tip, are critical.

For the peak oil production community, post peak oil production rate is critical. They believe that the resources in the ground are not sufficient to continue to meet demand and that oil production will reach a peak rate in the near future. Their greatest concern is the diminishing supply of oil due to post-peak oil production decline. To minimize the production decline rate and assure as much oil supply to the market as possible, timely investments, and the ability to make these investments all along the value chain, from well to gas tank or burner tip, are critical.

Both sides believe that unconventional resources will supply oil and gas to the market on their respective sides of the oil production peak. One side believes that unconventional resources will help meet growing demand. The other side of the argument believes that unconventional resources will help to minimize post peak oil production decline but, regardless of this contribution, production will continue to decline. Therefore, factors regarding other sources of energy, better utilization of the energy used and changes in the type and amount of energy demanded by the market become important. These factors are important to the non-peak oil production argument as they well positively impact supply with the arrival of peak or plateau production postponed.

To maintain the rate of production on their respective sides of peak oil production, both sides face investment risks, political risks, geopolitical risks and environmental risks.

Regardless of the time at which peak oil production occurs, common challenges present themselves that require common solutions and policies.

Presenters participating on the Peak Oil Production conference calls included:

1. Presenters for the NPC hosted Peak Oil Production conference call on February 23, 2007: Steve Andrews (The Association for the Study of Peak Oil – USA), Robert Hirsch (Science Applications International Corp), Albert Bartlett (University of Colorado), Colin Campbell (The Association for the Study of Peak Oil – Ireland), Freddy Hutter (TrendLines Market Research), Jean Laherrere (The Association for the Study of Peak Oil – France), Douglas Low (The Oil Depletion Analysis Centre), and Ron Swenson (Swenson Technology).
2. Presenters for the NPC hosted Peak Oil Production conference call on March 1, 2007: Roscoe Bartlett (U.S. Congress – accompanied by John Darrell and Lisa Wright), Roger Bentley (The University of Reading), Mark Gaffigan (U.S. Government Accountability Office), Richard Heinberg (Post Carbon Institute), Matt Simmons (Simmons & Company International), Art Smith (John S. Herold, Inc.), Sturart Staniford (The Oil Drum), and Randy Udall (Association for the Study of Peak Oil – USA).
3. Presenters for the NPC hosted Peak Oil Production conference call on March 13. 2007: Ken Medlock (Rice University), Peter Jackson (Cambridge Energy Research Associates), and Michael C. Lynch (Strategic Energy & Economic Research Inc).

Non-presenters participating on the Peak Oil Production conference calls included:

4. Subcommittee members responsible for this report: Tony Barker (Marathon Oil Corporation), Tim Grant (U.S. Department of Energy), Scott Gill (Simmons & Company International), Mariano Gurfinkel (University of Texas, Bureau of Economic Geology), Will Kirchner (Marathon Oil Corporation), and Steve London (Halliburton Company),
5. Other committee members: Joseph Caggiano (Chevron Corporation), John Guy (National Petroleum Council), Nancy Johnson (U.S. Department of Energy), Andrea Lisa (National Petroleum Council), Marshall Nichols (National Petroleum Council), and Don Paul (Chevron Corporation).

Footnotes

6. Matt Simmons (Simmons & Company International), et.al.
7. Douglas Low and Chris Skrebowski (Oil Depletion Analysis Centre).
8. Jean Leherrere (The Association for the Study of Peak Oil), et.al.
9. Steve Andrews (The Association for the Study of Peak Oil), et.al.