Comments on the NARUC-Initiated Report:

***Analysis of the Social, Economic and Environmental Effects of Maintaining Oil and Gas Exploration Moratoria On and Beneath Federal Lands* (February 15, 2010)**

Comments by James F. Wilson

June 22, 2010

I. Introduction

In 2007, the NARUC Board adopted the resolution, *Developing Reliable Research Regarding the Social, Economic and Environmental Effects of Maintaining Domestic Energy Exploration and Production Moratoria On and Beneath Federal Lands*,[1] and provided some funding for a research study. A "Moratoria Study Group" was formed, additional funding was obtained,[2] consultants were retained,[3] and a model was chosen.[4] The results of the study were presented by the consultants at NARUC's annual convention in November 2009.[5] The final report, *Analysis of the Social, Economic and Environmental Effects of Maintaining Oil and Gas Exploration Moratoria On and Beneath Federal Lands* ("Report"),[6] was released at the time of the NARUC winter meetings in February, 2010 and a resolution accepting the study was adopted. NARUC has invited comments on the Report, to be discussed in a session at the summer meetings in July, 2010.[7] These comments are submitted in response to the NARUC invitation to comment.

I am an economist, principal of Wilson Energy Economics, and affiliate of LECG, LLC. I have over 25 years of consulting experience to the electric power and natural gas industries. Throughout my career I have been involved in analysis and modeling of energy markets for business decision-making, policy analysis, and other purposes. My interest in this study is also prompted by my involvement in a review, published in 2005,[8] of a similar study, the National Petroleum Council's 2003 report, *Balancing Natural Gas Policy – Fueling the Demands of a Growing Economy*. Additional information on my background and experience, including a CV, is available at www.wilsonenec.com.

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[1] Available at http://www.naruc.org/Resolutions/GS-1%20Developing%20Reliable%20Research%20Regarding%20the %20Social%20and%20Economic%20Costs_July07.pdf

[2] NARUC provided $50,000 and an additional $250,000 was raised from the various Study sponsors, mainly oil and gas industry firms and organizations, listed on Report p. E-3.

[3] Science Applications International Corporation (SAIC) was selected for the modeling and Gas Technology Institute (GTI) for the resource base update.

[4] The Study used the Energy Information Administration's National Energy Modeling System (NEMS) with modifications for the purpose of the Study ("NARUC-NEMS").

[5] Jay Ratafia-Brown and Rick Irby, Science Applications International Corporation (SAIC), and Kent Perry, Gas Technology Institute (GTI): *Analysis of the Impact on the Social, Economic and Environmental Effects of Maintaining Oil and Gas Exploration and Production Moratoria*, November 16, 2009 ("November Presentation"), available at http://www.narucmeetings.org/presentations/GasStudy11-09-09.pdf.

[6] Available at http://www.naruc.org/Publications/NARUC_MORATORIA_REPORT_02-17-10.pdf

[7] The invitation to comment is posted on the NARUC home page at http://www.naruc.org/ and notes the session to discuss comments at the summer meetings. However, I understand the session to discuss comments may be rescheduled.

[8] Ken Costello, Hillard G. Huntington, and James F. Wilson, *After the Natural Gas Bubble: An Economic Evaluation of the Recent U.S. National Petroleum Council Study*, Energy Journal Vol. 26 No. 2 (2005), p. 89-109.

I attended the NARUC winter meetings where the Study and Report were discussed and I reviewed the Report in the weeks after it became public on February 15. When NARUC invited comments on the Report in May, I contacted the Study consultants and Moratoria Study Group coordinator[9] and requested additional information about the Study's assumptions, approach and results. While not all of the requested information was provided, these comments benefited from the additional information I did receive. I provided a draft of my comments to the Moratoria Study Group coordinator and the Study consultants in late May, and this final version also benefits from some informal reactions that were provided on the draft version.

My objective in submitting comments is to provide additional insights into the Study's results (which, as I will explain, were widely misunderstood), and a critique of some aspects of the Study approach and Report. I also offer some suggestions should NARUC choose to further pursue analysis of the important issue addressed by the Study. These comments focus on certain economic aspects of the analysis, and are by no means comprehensive. They were prepared on my own time; there is no client or sponsor for my efforts, and the comments represent my own views.

II. Summary of Comments

1. The Study entailed two main tasks – to update estimates of the U.S. oil and gas resource base, and to evaluate the potential impact of eliminating the moratoria on oil and gas development. The update to the resource base resulted in a substantial increase that has major impacts on the energy outlook; indeed, the impacts of the growing resource base overshadow the potential impacts of eliminating the moratoria.

2. However, these two very different sets of impacts – of the factual update to the resource base, and of a policy decision to eliminate the moratoria – were not clearly distinguished in the Study's Report and presentations. The potential impacts of eliminating the moratoria (the information which NARUC initiated the Study to obtain) were not summarized in the presentations or in the Report's Executive Summary; instead, the Report and presentations highlighted the (substantially larger) *combined* impacts of the update to the resource base and elimination of the moratoria.

3. The Study Team's decision to present numbers from the combined case, but surrounded by text emphasizing the impacts of the moratoria, invited misinterpretation, and that is exactly what happened. In the press releases of Study sponsors and in press coverage of the Study, the impact of the moratoria on natural gas prices was overstated by a factor of six, and the impact on real GDP was overstated by a factor of four (reflecting the additional questionable choice of reporting undiscounted sums).

4. The Study also likely overstates the impacts of the moratoria as a result of failing to fully model the dampening effects of producer and consumer reactions to long-term changes in energy prices. Apparently the Study Team chose not to use the NEMS model's international modules to

[9] I was in contact with Jay Ratafia-Brown of SAIC and Dave Harbour, Moratoria Study Group Vice Chairman and coordinator. In these comments, references to the study consultants are to SAIC, not GTI, with whom I had no contact. In these comments, I will use "Study Team" to refer collectively to the Moratoria Study Group and Study consultants who performed the Study and produced the Report.

model the responses of producers and consumers world-wide to oil and natural gas price pressures originating in the U.S.

5. The Study also fails to recognize or evaluate the very significant value of the domestic resources that would be conserved as a result of the moratoria. The potential value of these resources in the years after 2030 offsets the value of developing them during 2009-2030, and should be considered in order to have an "apples-to-apples" comparison of the impact of the moratoria.

6. The Report lacks important details expected in the documentation of any such study. It provides no results from any of the scenarios evaluated, instead reporting only *differences* between the various scenarios in the form of "comparison cases". In addition, few annual details are provided, and important modeling and data assumptions are not described in sufficient detail. To be able to perform the review reflected in these comments, I requested and obtained additional information about the Study's assumptions and results.

7. The Report also exhibits symptoms of inadequate review by persons knowledgeable about the subject matter and concerned about the accuracy of the Report. I note one section of the Report that, in part, was cut and pasted from a poorly written and badly outdated report by a firm of questionable authority on the particular topic, suggesting the section was never reviewed.

8. NARUC intended the Study to develop "reliable research" on the impacts of the moratoria, according to the 2007 resolution; I interpret "reliable" to mean accurate and neutral. To accomplish the objective, the Study was organized with a Moratoria Study Group (described as "a large and diverse group of energy experts") and nine Official Observers.[10] However, some characteristics of the Study and Report call into question how actively the Moratoria Study Group embers and observers participated in the Study and in the preparation and review of the Report, and whether the Study organization was successful in achieving the objective of neutrality.

9. In the final section of these comments, I suggest a few ways the Study's analysis and reporting could be augmented and its results evaluated, should NARUC wish to further pursue reliable estimates of the potential impacts of restrictions on oil and gas development.

The remainder of these comments is organized as follows:

- Section III provides some background on the Study's main tasks and scenarios for the benefit of readers who may not be familiar with the Study and Report in detail.
- Section IV provides the main comments on the Study and Report.
- Section V provides excerpts showing how the Report's conclusions were misunderstood and misreported, and traces the misunderstanding to the Study presentations and Report.
- Section VI provides recommendations, should NARUC wish to further pursue the topic.

[10] Report Executive Summary, p. E-2-E-3.

III. Background

This section describes the two main tasks undertaken in the Study and the primary scenarios that were evaluated (which are further discussed throughout these comments), for the benefit of readers who may not be familiar with these details of the structure of the Study.

a. The Study's two main tasks were to update the resource base and to evaluate the impacts of the moratoria

The primary objective of the Study, consistent with the 2007 Resolution that called for it, was to estimate the impact on the U.S. economy of policies that maintain restrictions ("moratoria") on exploration and development of oil and gas resources on certain federal lands. Failing to develop these resources keeps some potential oil and gas supply from the market, leading to higher prices for oil products, natural gas, and other goods and services whose costs are directly or indirectly affected by oil and gas costs. The Study's focus was to model and quantify the potential direct and indirect impacts over the 2009 to 2030 period of maintaining the moratoria (also described as "limited access", as opposed to removing the moratoria and providing "full access").

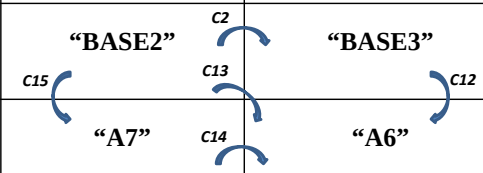
However, estimates of the United States' oil and gas resource base have been increasing rapidly in the past few years, resulting from deployment of new technologies, successes in finding and developing shale gas resources, and other advances, as described in the Report. The increase in the domestic resource base expands the available supply and lowers expectations of future oil and gas prices with positive impacts on the economy (the same kinds of impacts as result from providing full access). Accordingly, the Study's consultants updated the existing estimates of the total U.S. oil and gas resource base, and the Study documents the social and economic impacts of the expanded resource base in addition to the potential impacts of the moratoria. The two main tasks are described in the Report's Executive Summary as follows (p. E-3, footnotes omitted):

> "The report achieves the dual goals of: 1) providing a comprehensive review and update of domestic oil and natural gas resources by GTI, and, 2) using the GTI updated resource estimates, projecting (using NARUC-NEMS) the relative social, economic and environmental effects on the nation of maintaining various moratoria and restrictions on domestic oil and gas exploration and production through 2030."

b. Description of the main scenarios evaluated in the Study

While many of the restrictions on oil and gas development have been removed in recent years, for the most part the restricted lands are not presently under exploration, and further action by various agencies is required for their development (as described in Report section 1.2). Consequently, in these comments I will consider the starting point to be a future with limited access and the restrictions effectively remaining in place. Compared to this base case, the Study results show 1) the (positive) impact of the updated resource base, and 2) the potential additional (positive) impact of a policy decision to remove the restrictions and allow full access to domestic oil and gas resources. These impacts are assessed by comparing the Study scenarios BASE2, BASE3, A7, and A6 described in Table 1.

Table 1: Four Primary Scenarios and "Comparison Cases"		
	Moratoria Are Maintained ("Limited Access")	Moratoria Are Eliminated ("Full Access")
Prior Resource Base Estimate	**"BASE2"**	**"BASE3"**
Updated Resource Base	**"A7"**	**"A6"**



The Report describes comparisons between these scenarios ("comparison cases", shown as C2, C13, etc. in Table 1), rather than the underlying scenarios. The comparisons that address the two key questions evaluated in the Study are as follows:[11]

- Comparing A7 to BASE2 quantifies the impact of the update to the resource base, assuming limited access (that is, both A7 and BASE2 assume the moratoria are maintained). This comparison would be a useful first step before evaluating the benefits of removing the moratoria. However, this comparison case was not defined or included in the Report in any form. Based on data I was provided by the Study's consultants, I have calculated it, designating it "C15", and present some of its results later in these comments.
- Comparing A6 to A7 quantifies the impact of eliminating the moratoria, taking into account the updated resource base (that is, both A6 and A7 use the updated resource base). In the Report, this is designated Comparison Case C14. This case answers the question that was the main purpose of the Study – What is the impact of maintaining (or eliminating) the moratoria? – and appropriately answers it based on the best information currently available (the updated resource base).
- Other comparison cases are mentioned in the Report but are less important than C15 and C14. Comparison case C2 compares BASE3 to BASE2, quantifying the impact of removing the moratoria while ignoring the update to the resource base; this could be of interest to the extent there are concerns that the update to the resource base may be too optimistic. Comparison case C12, comparing A6 to BASE3, quantifies the impact of the updated resource base assuming the moratoria are eliminated.
- Comparing A6 to BASE2 shows the *combined* impact of both the update to the resource base and elimination of the moratoria (A6 uses the updated resource base and full access, while BASE2 uses the prior resource base and assumes the moratoria are in place). Because this comparison case (designated "Combined Comparative Case" C13 in the Report) combines the impacts of the resource base update with the impact of eliminating

[11] The Report mentions an additional base case, BASE1, which is the Energy Information Administration's Annual Energy Outlook 2009 forecast. Because EIA assumes policies in place at the time of the forecast, BASE1 represents a level of restrictions falling between the limited access scenario BASE2 case and the full access scenario BASE3.

the moratoria, it shows the largest values for all or nearly all indicators presented in the Report.

In documenting and presenting the results of the Study in both the November Presentation and the final Report, the study authors chose to focus on this last case, the combined comparative case C13, described in the Report's Executive Summary as follows (p. E-5):

> "1. The "Combined Comparative Case," whose results are highlighted here and presented in report Section 1, represents a comparison between an energy future that maintains all production moratoria and uses the current EIA resource base estimate and an alternative energy future that eliminates all oil and gas production moratoria and makes use of the GTI updated estimate of the oil and gas resource base."

However, because this comparison case combines the impact of updated facts (resource base) with the potential impact of the key policy decision (whether to provide full access), it fails to shed light on either issue.

IV. Comments

a. The Report lacks critical details and was inadequately reviewed

While the Report runs some 300 pages, it omits some important assumptions and documentation one would expect to find in the report for such a study.

1. The Study's most critical assumption is the portion of the updated oil and gas resource base that would not be available for development if the moratoria remain in effect. This is critical because the primary purpose of the Study was to evaluate the impact of making these resources available for development. However, this assumption is not documented in the Report. As a result, the most important assumption in the study – how much of the resource base would be off limits due to the moratoria? – is not reported.

Table 1-8 on p. 1-31 describes the assumptions behind the various scenarios but shows the exact same description and resource values for all three base cases (BASE1, BASE2, BASE3) and for the two key study cases (A6 and A7). Pieces of the information (oil or gas, onshore or offshore) are found in a few places in the report, but other pieces were missing entirely. The Study consultants provided, apparently with some difficulty,[12] additional pieces of the puzzle; however, the additional information appeared inconsistent with the results of some of the scenarios and raised more questions than it answered.

2. The Report does not provide results for the individual scenarios (BASE2, BASE3, A6, A7, etc.), instead presenting results only for the various comparison cases, showing only the *differences* between the scenarios. As a result, the oil and natural gas prices resulting under the various scenarios and all other key results are not reported for the individual scenarios. This means that the social, economic, and energy future simulated under each scenario is not presented, and there are no results that can be compared to other projections without additional work. In addition, as noted earlier, a very important comparison case – showing the impact of

[12] I originally requested this information on May 12, 2010, and after a few telephone conversations and follow-up emails, finally received the missing details on June 16, 2010. The apparent difficulty in providing this information suggests the Study's consultants had to perform additional work to determine what they had assumed in this regard.

the updated resource base assuming the moratoria remain in place (which I have called C15) – was not included.

3. The results provided are reported on a cumulative or average basis for the study period (2009-2030). Annual details are provided only in graphical form, and only for some results.

I requested and received the results of the individual scenarios, with annual details. These details reveal some important results of the modeling, as I will show in the next section of these comments.

4. There is very little discussion of how (or whether) international oil and gas markets were modeled, or the results of such modeling. As discussed in detail below, higher oil and gas prices in the U.S. will lead to some impact on prices in other parts of the world, and some response by suppliers and consumers in other regions that will tend to dampen the price impacts in the U.S.

In addition to omitting some important types of information, there is also evidence that at least some sections of the Report were drafted by insufficiently qualified personnel relying upon sources of questionable authority, and those sections were never carefully reviewed. For example, the section on liquefied natural gas ("LNG"; Section 3.5.10, LNG Technology and Markets Development) references a 2005 report on LNG[13] prepared by RNCOS, a market research firm located in Delhi, India (p. 3-63, footnote 41). The information is from a source of questionable authority on the subject; RNCOS prepares market research reports on a broad range of industries, and is not specialized in energy or LNG.[14] In addition, the RNCOS report that was relied upon is very out of date (from 2005, when expectations for growth in LNG were very different from today's as reflected in the Report) and is not even RNCOS's most recent report on LNG; RNCOS offers reports on global LNG markets prepared in 2008 and 2009.[15]

In addition, the following text from the LNG section of the Report (p. 3-62 and 3-63), which is notable particularly for its unusual English, is identical to the language in RNCOS's brief online summary of its out-of-date 2005 report (including a typographical error), indicating that it was simply cut and pasted from RNCOS' website into the Report:

> "Most of the gas consuming countries stress on commercialization of their resources.... The market for LNG has been growing at a tremendous pace spanning all the continents, ranging between one to 40 projects in a country... The LNG market has grown in 2005 and shows signs of continuous growth. In 2004, the global liquefaction capacity was 150MTPA in 13 countries with a total number or [sic] 18 plants. At present, there are 14 importers of LNG. It is expected that by 2010, the LNG market will expand with more than 35 countries raring to join the race. The LNG market will soon become twice its size with a major share of Taiwan, Korea, Japan, and other Asian countries."

This strongly suggests that at least this section of the Report was not reviewed by anyone knowledgeable of the subject matter and concerned that the Report be current, accurate, and well-written. I did not comprehensively review the Report for other such examples so I do not know whether others exist.

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[13] Available at http://www.rncos.com/Market-Analysis-Reports/New-Projects-Lead-to-a-Boom-in-the-Global-LNG-Market-Industry-Analysis-2005-2010-IM018.htm.

[14] RNCOS' brochure is available at http://www.rncos.com/CompPro.pdf

[15] RNCOS, *Global LNG Market Analysis*, September, 2009, and RNCOS, *Global LNG Market – The Road Ahead*, November, 2008, available at http://www.rncos.com/LNG.htm.

The November Presentation concluded as follows (slide 25): "SAIC and GTI are currently preparing the comprehensive draft study report for review by the project's independent Moratoria Study Group… The study group is a large and diverse body of experts, including a wide range of private and public sector viewpoints." However, I believe there is cause to doubt that the Report received careful review by a diverse and independent group. In particular, I expect thoughtful reviewers would have objected to the focus on the Combined Case C13 and would have commented that the section on LNG needs additional attention.

b. The Study details show that the impacts of the moratoria are only a fraction of the widely-reported "combined impacts" and come almost entirely after 2020

The Moratoria Study Group's main message, as reflected in Study presentations, the Report's Executive Summary, and in the press releases of study sponsors, was clear: maintaining the moratoria on oil and gas exploration on federal lands would be very costly to the U.S. economy. Press releases by Study sponsors, and news articles based on them, described the impact of the moratoria on U.S. GDP over the period of the Study (2009 to 2030) as $2.36 trillion and stated that the moratoria would cause natural gas prices to be 17 percent higher on average, among other reported impacts.[16]

However, the potential impacts of the moratoria, according to the details of the Study and Report, are only a fraction of this. The widely reported impacts ($2.36 trillion GDP, 17 percent gas price, among others) combine the (larger) impacts of the update to the resource base with the forecasted impacts of the moratoria. The misreporting of the Study's results, and the roots of the errors in the Study's Report and presentations, are described in detail in Section V of these comments.

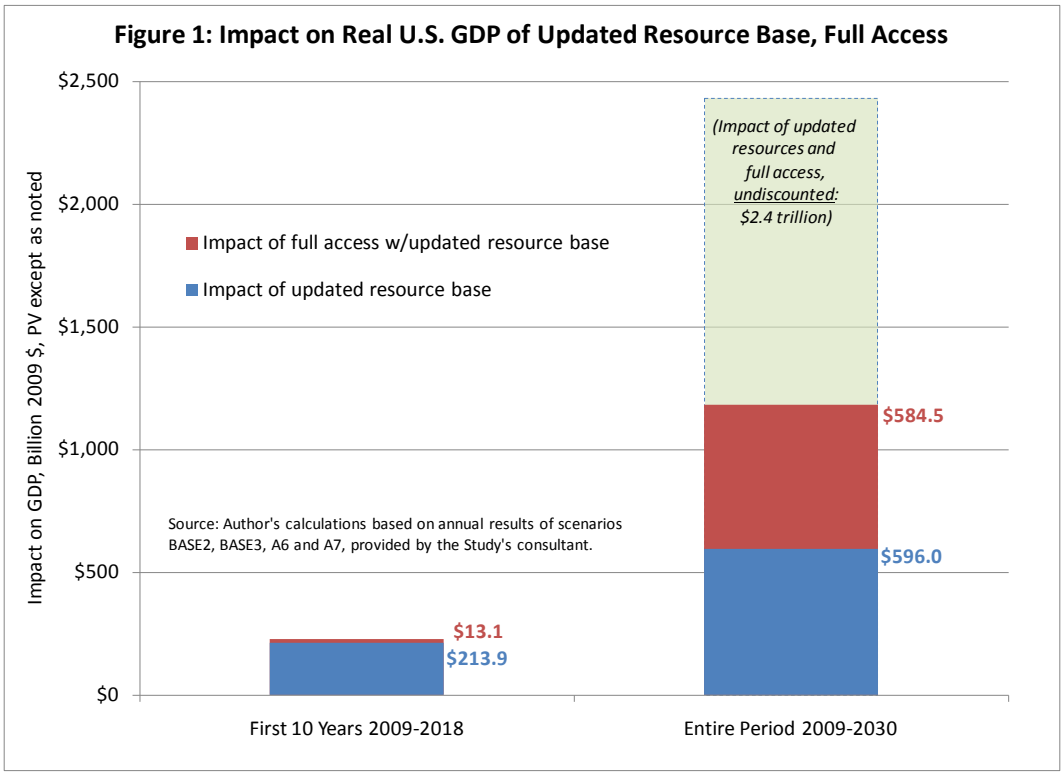
The Study's main message, if the numbers speak for themselves, is the enormous increase in the country's estimated oil and gas resource base in just the past year or two (our resource base is "off the charts" in the words of one study observer[17]). The projected increase in natural gas production over the Study horizon resulting from the resource update is six times larger than the projected increase from providing full access, while the increase in oil production from the resource update is roughly 80 percent of the increase that is forecast to result from full access.[18] The impact of the recent resource base update on GDP, natural gas prices, and other indicators is larger than the potential impact of providing full access.

The Report includes numerous outputs for each documented comparison case: energy production, consumption, imports, prices, costs, and emissions; and economic indicators such as GDP, personal income, housing starts, and employment, among others. Perhaps the indicator that comes closest to providing a "bottom line" summary of impact is real U.S. GDP. Figure 1 summarizes the impact on real U.S. GDP, in cumulative present value terms, for the first ten years of the Study horizon (left bar) and the entire Study horizon (right bar). The lower, blue

[16] Section V of these comments provides details of how the Study results were described in press releases of Study sponsors.
[17] Comment by Michelle Michot Foss, PhD., at the February 2010 NARUC Gas Committee meeting.
[18] Comparing the increase in total natural gas production, 2009-2030, from the base case with limited access (BASE2) to the base case with full access (BASE3; comparison case C2), to the increase from the same base case to the case with expanded resource base (A7; comparison case C15). These cases are described in the Background section of these comments.

blocks show the impact of the update to the resource base while the red blocks show the impact of providing full access.

Figure 1 shows that the update to the resource base is projected to increase U.S. real GDP by $213.9 billion over the first ten years of the Study horizon. Providing full access, by contrast, is projected to increase GDP by only an additional $13.1 billion over the first ten years. The relatively low impact of full access is partly due to the lead time to develop the additional resources should full access be provided and partly due to weak demand for these resources (some of which are costly to develop) during the early years of the Study horizon when prices are relatively low.



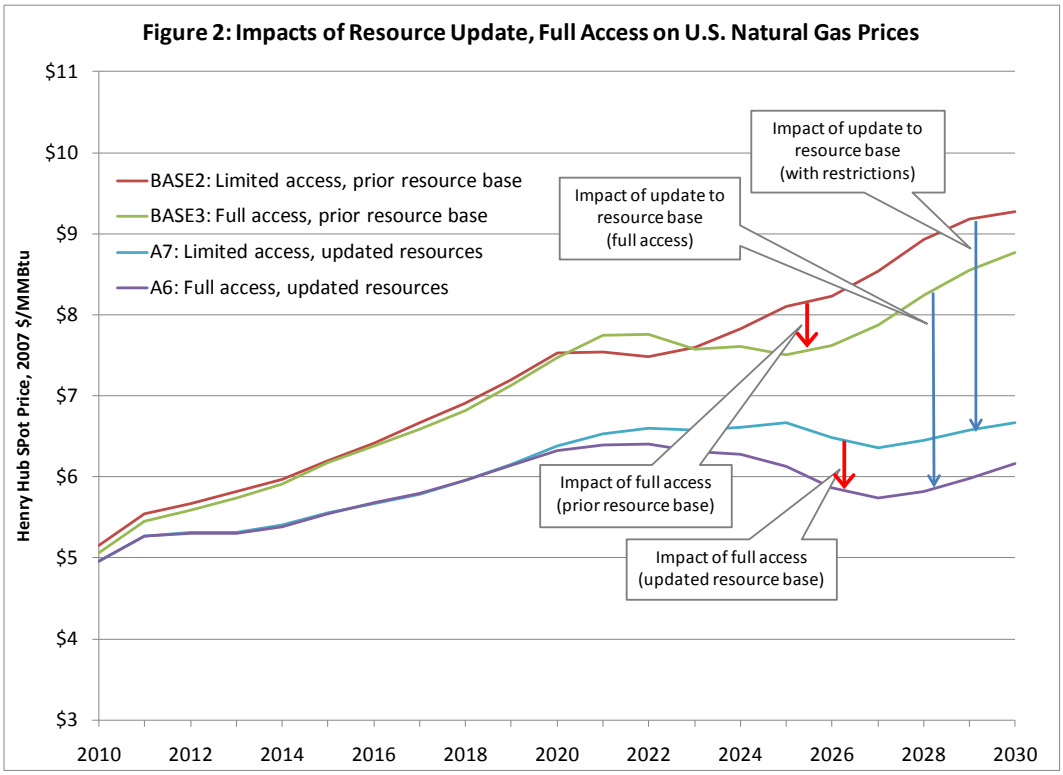
Over the entire Study horizon, the recent increase in the resource base is projected to raise GDP by $596.0 billion while full access is projected to increase GDP a slightly smaller amount, $584.5 billion (the sum of these last two values is $1.180 trillion, the present value impact associated with combined case C13 and found in Table 1-11 on p. 1-42 of the Report).

These values are all expressed in present value terms, discounted at five percent, the discount rate used in the Study for present value calculations. Figure 1 also shows (in light green) the undiscounted sum of combined forecasted GDP impacts over the Study horizon. GDP impacts over time should of course be summed in discounted, present value terms, not undiscounted terms, especially when most of the impacts are more than ten years into the future. I do not consider the undiscounted sum to be useful information but include it here because it was prominently featured in the Study Report's Executive Summary, Introduction, and presentation,[19] found its way into the press releases of NARUC and other Study sponsors, and

[19] Report Executive Summary, blue box on p. E-1; Introduction p. 1-8; February Presentation slide 10.

appeared in various media reports on the Study, as described in the next section of these comments. The $2.4 trillion GDP impact value, which was widely described as the impact of the moratoria, is four times the impact of the moratoria as shown in the Report ($584.5 billion; Case C14, p. 1-51).

Figure 2 shows the natural gas price projections resulting from the primary cases evaluated in the Study (BASE2, BASE3, A6 and A7; see Table 1 above). The two upper lines represent the projections based on the prior resource base estimates, with the lower of the pair reflecting full access. The two lower lines reflect the projections based on the updated resource estimates, and again the lower of the two assumes full access. The two blue arrows show the impact of the update to the resource estimates while the red arrows indicate the impacts of full access.



This data shows that the update to the resource base has a significant impact on U.S. natural gas prices beginning almost immediately while full access is projected to have a significant impact on natural gas prices only beginning around 2022. This very fundamental result of the Study – the projected natural gas prices – is not included in the Report; only differences in some retail prices between scenarios are shown in graphic form, and only for the comparison cases C13 and C14 (Report p. 4-35 and 4-52). As Figure 2 suggests, of the widely reported 17 percent difference in natural gas prices, nearly all of it results from the updated resource base. Providing full access is projected to only lower natural gas prices 2.2 percent (Case C14, Table 4-8 on p. 4-47).

This sampling of key results clarifies the different impacts of the resource base update and the potential provision of full access. This distinction was obfuscated in the reporting of Study results due to the focus on the combined case C13.

c. The Study also likely overstates the impacts of the moratoria because it fails to fully model the dampening effect of consumer and producer responses to long-term price changes

The impact on prices and the economy of keeping some resources from the market (as the moratoria would do) depends upon the reactions of consumers, producers, and markets to the upward price pressure that results from fewer resources being available. This is the primary challenge in attempting to model the potential impact of the moratoria; if these reactions are not fully and accurately modeled, the forecasted impacts may be highly inaccurate. Consumers can respond to higher energy prices by reducing consumption, deploying more energy-efficient technologies, and/or switching to other, lower cost forms of energy. While alternatives are somewhat limited over short periods of time, more types of reactions are possible in response to a significant price difference over an extended period of time, as occurs in the Study's scenarios. Consumers' reactions to higher prices will tend to dampen the price increases, and the stronger the price pressure, the more such actions will be taken. Similarly, producers react to higher prices by accelerating efforts to find and develop additional oil and gas resources, which will also moderate price impacts. And because both oil and natural gas are traded in international markets, consumers and producers around the world should see some impact on their oil and gas prices due to a long-term, significant change in available resources in the U.S., and therefore, worldwide consumption and production should also respond to price pressure originating in the U.S., dampening it to some extent.

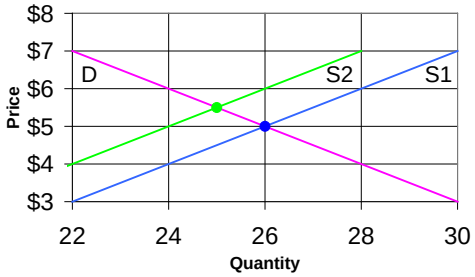
The importance of producer and consumer responses to higher prices (supply and demand elasticity) are illustrated in Figure 3.[20] In this figure, the upper panel, "Model 1", reflects fairly elastic (price-responsive) supply and demand, as indicated by the low slope of the supply and demand curves. In Model 1, a reduction in supply of 2 units (as indicated by the green line, shifted two units compared to the blue line) raises the price by about $0.50. By contrast, in Model 2 (the second panel) which assumes less elastic supply and demand, the same 2-unit shift in supply leads to a $2 price increase. This example illustrates that if such reactions by consumers and producers are not modeled accurately, or if the reactions of some consumers and producers are ignored, the analysis could greatly overstate the impacts of a reduction (or increase) in supply on prices and other indicators. Therefore, to evaluate the Study's results, it is critical to understand how consumer and producer reactions to prices under the various scenarios were modeled.

The available evidence suggests that the Study may have understated how consumers and producers, in the U.S. and around the world, would react to a long-term difference in oil and gas supply and the resulting upward price pressure. For instance, despite large and persistent differences in prices (17 percent average for natural gas between A6 and B2), energy consumption in the Study is reported as "essentially unchanged" (Report p. 1-8).

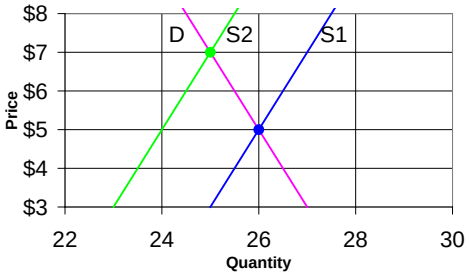
[20] Figure 3 is adapted from slide 15 of the presentation by Ken Costello, Hill Huntington, and James F. Wilson at the 24th Annual North American Conference of the USAEE/IAEE, July 8-10, 2004, *After the Natural Gas Bubble: A Critique of the Modeling and Policy Evaluation Contained in the National Petroleum Council's 2003 Natural Gas Study*.

Figure 3: Modeling of Supply, Demand Responses Determines Price Movement (part 2)

Model 1:
If supply shifts
2 units to S2,
price rises to $5.50



Model 2:
If supply shifts
2 units to S2,
price must rise to $7



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As noted above, there is very little description in the Report of how international markets were modeled. The Report projects (p. E-5) that imports of OPEC oil will be 19 percent higher under the combined case C13 assumptions. However, this primarily reflects an assumption and input to the modeling rather than a result. The data I was provided reveal that both production and consumption in all world oil supply regions other than "OPEC – Middle East" (which region represented less than a third of 2008 world-wide production) are unchanged across the various scenarios in all years.[21] This apparently reflects the Study Team's choice not to run the International Energy Module[22] (one of the modules of the NEMS modeling system used in the Study) or to prevent this module from determining supply and demand reactions to price pressures. The International Energy Module would have determined impacts of higher world oil prices on supply and demand in all regions of the world.[23] Even for Canada and Mexico, significant non-OPEC oil-producing nations located close to the U.S., oil production and consumption were unchanged between the various cases, despite higher world oil prices (over $20/barrel higher during 2025-2030 in case C13) and lower U.S. production. Again, in response to upward pressure on world oil prices over an extended period of time originating from a change in U.S. supply, consumers in other parts of the world could be expected to reduce consumption

[21] Table 19, International Petroleum Supply and Disposition Summary, provided by the Study consultants. The values are unchanged across the various scenarios to all 14 decimal places. The data provided by the Study consultants, and workpapers for the calculations and graphics presented in these comments, are available by request (jwilson@wilsonenec.com).

[22] See Energy Information Administration, *The National Energy Modeling System: On Overview 2009, October, 2009*, p. 17, available at http://www.eia.doe.gov/oiaf/aeo/overview/index.html

[23] While EIA does not always re-run all NEMS modules for all "side" cases, it does run the International Energy Module for the oil price scenarios documented in the Annual Energy Outlook. As a result, unlike in the Study, the Annual Energy Outlook low and high oil price cases reflect differences in oil and gas production and consumption in all parts of the world relative to the reference case.

somewhat, and producers to expand production somewhat, dampening the price movement and mitigating all other projected impacts.

Similarly, reduced U.S. natural gas production and higher prices over an extended period of time, as results from limited access in the Study, should lead to increased LNG imports and import capacity, which will affect the prices of LNG and natural gas in other parts of the world. The U.S. Federal Energy Regulatory Commission has approved numerous proposals for new LNG import terminals in recent years,[24] of which some have been built and others have not; we should expect that under the scenarios with significantly higher natural gas prices, LNG imports will increase and additional import terminals may be built. LNG exports and export capacity should also vary across the scenarios. However, there is very little increase in LNG imports between the Study's scenarios and no change in LNG import or export capacity.[25] Apparently, as with oil, the Study Team chose not to run the NEMS module that simulates international natural gas market supply and demand (the International Natural Gas Model, or INGM[26]).

As suggested above, the price-dampening reactions of producers and consumers in the U.S. and around the world are a critical determinant of the accuracy of this or any similar modeling effort. I have not made the effort to compare these responses as reflected in the Study to such responses as reflected in other studies that use the same or different models. However, such comparisons are routinely undertaken in a rigorous manner by Stanford University's Energy Modeling Forum (EMF), most recently, with respect to natural gas, in its EMF-23 research program, which compared the results of approximately a dozen models across seven scenarios.[27] The EMF 23 final report states the following in its conclusions (p. 25):[28]

> "This study evaluated the long-run implications of several scenarios incorporating changes in world demand and export restrictions on Russian, Persian Gulf and LNG supplies. Except for the LNG constraints, the price path changed only modestly. The main reason for this result is that the scenarios assumed significant infrastructure building in natural gas export capacity in all unconstrained producing regions. The extent to which market prices can return back to the reference price path can be considered market resiliency.
>
> Although models displayed a wide range of market resiliency, they tend to share the common perspective that expanding international transportation corridors between regions dampens the long-run shifts in the natural gas price path as underlying conditions change."

I tend to agree with the EMF conclusion that energy markets are resilient and dampen shifts in the price paths; while supply or demand shocks can lead to much higher prices over the short term (a period of days, months, or even a few years), over longer periods consumers and producers around the world tend to adjust, leading to relatively modest longer-term impacts.

Because the NEMS oil and natural gas international modules were not used to model the dampening effect of international supply and demand responses to price pressures, the Study

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[24] FERC's summary of approved LNG terminals is available at http://www.ferc.gov/industries/lng/indus-act/terminals/lng-approved.pdf

[25] Table 76, Natural Gas Imports and Exports, End of Year Liquefied Natural Gas Capacity, provided for cases BASE2, BASE3, A6 and A7 by the Study's consultants by request.

[26] See Energy Information Administration, The National Energy Modeling System: An Overview 2009, October, 2009, p. 61, available at http://www.eia.doe.gov/oiaf/aeo/overview/index.html

[27] The EMF 23 report and data are available at http://emf.stanford.edu/research/emf23/

[28] Stanford University Energy Modeling Forum, *Prices and Trade in a Globalizing Natural Gas Market*, EMF Report 23, September 2007, p. 25.

very likely overstates the impact of the moratoria on energy prices and the various other measures calculated in the Study, potentially by very significant amounts. However, further analysis would be required to determine the extent of the overstatement.

d. The Study also fails to recognize that conserved domestic resources have considerable potential value in the years after 2030

If policies prevent the development of certain oil and gas resources (as assumed in the Study's "Limited Access" scenarios), those resources would remain in the ground and undersea in 2030, and could potentially be developed after 2030. The Study's estimate of the impact of the moratoria fails to recognize this or to assign any value to the conserved resources, which could be considered a "strategic reserve" that the nation might eventually decide to exploit, and which would then create the same kinds of positive impacts as the Study shows resulting from their development over the 2009-2030 period. Especially if oil and gas are relatively scarce and their prices high in 2030 and later years, conserving the resources until 2030 and then developing them could turn out to be a more beneficial strategy than developing them over the 2009 to 2030 period, although the benefits would accrue to a future generation of Americans. An estimate of the potential value of the conserved reserves in 2030 should be noted for those cases in which the moratoria are in place, to assist in making "apples to apples" comparisons between the policy alternatives. I would provide a rough estimate; however, creating such an estimate from the available model results is not straightforward.

The discussion of model results earlier in these comments pointed out that the benefits of full access are very small until about 2022. This suggests another policy alternative that merits evaluation: maintaining the moratoria until, say, 2015 or 2020, and reconsidering at that time whether to allow development of the resources. In light of the relatively small impact of the incremental resources before 2020, and the recent experience of substantial increases in the estimated resource base, a policy of delaying the decision for five or ten years and then reconsidering could be attractive relative to both immediate development or development after 2030, especially in light of the high degree of uncertainty about future energy resource base growth, supply, demand, and price at this time.

e. The Moratoria Study Group failed to adapt its message to changing Study results

The 2007 Resolution suggested an urgent need to remove barriers to development of domestic oil and gas resources, stating in part:

> "…WHEREAS, As energy prices have spiraled higher and domestic supplies continue to diminish,…
>
> WHEREAS, NARUC has recognized that the Nation's demand for energy continues to increase at a faster pace than the supply of energy,…
>
> WHEREAS, The deficit in gas supply at the end of the next decade might in large part be satisfied by increasing liquefied natural gas (LNG) imports, assuming sufficient receiving terminals are approved; and
>
> WHEREAS, While NARUC has consistently supported LNG import projects, its Members remain vigilant to the social and economic policy implications triggered by the sheer volume of projected LNG imports necessitated by dwindling domestic natural gas reserves,[fn]…

> [fn] EIA estimates that by 2025 the U.S. dependence on imported LNG could grow from less than 4% to about 17%."

This language reflects a very different understanding of natural gas demand and supply circumstances than we now face. Rather than diminish, domestic resources have expanded rapidly since the time of this resolution (as documented in the Report), and projections of future reliance on LNG imports have sharply declined.

The substantial change in the outlook since 2007 is not unprecedented; in our 2005 review (cited on p.1 above) of the National Petroleum Council's 2003 study,[29] K. Costello, H. Huntington and I summarized an earlier swing of the energy outlook pendulum (citations omitted):

> "…Views of the future – and corresponding policy recommendations -- can and do change quickly, as the energy sectors have repeatedly demonstrated over the past few decades. Forecasts that seem reasonable at one point in time can quickly prove otherwise, and the policies that were warranted under those forecasts may no longer be appropriate.
>
> For instance, the NPC Report's Finding #1 states, "There has been a fundamental shift in the natural gas supply/demand balance that has resulted in higher prices and volatility in recent years…" (p. I-17) To be clear, however, the fundamental shift in the NPC outlook has been in supply, not in demand. In the NPC's 1999 natural gas report (National Petroleum Council, 1999), Supply Finding #1 stated, "Sufficient resources exist to meet growing demand well into the twenty-first century." (p. 36) In the 2003 NPC Report, the resource base assessment for Lower-48 and Canada has been reduced 20% (p. II-111), and the conclusion is now that these resources will meet only 75% of a lower level of future demand. The NPC forecast of U.S. gas consumption for the 2005 to 2015 period has been reduced over 15% compared to the 1999 report (from 29 Tcf/year to 24 Tcf/year; p. II-101), while prices are expected to be 40% to 70% higher than anticipated in the 1999 report."

The current Study includes a significant upward revision of earlier resource estimates. The Moratoria Study Group undoubtedly did not anticipate the magnitude of the update to the resource base when it commenced the Study. The impacts of the update to the resource base overshadow the potential impacts of the policy choice that was supposed to be the primary focus of the Study – whether or not to eliminate the moratoria and provide full access to the restricted resources. Unfortunately, while the data and results changed as the resource outlook changed, the Study's story and message were not adapted accordingly.

V. Press Releases and Press Coverage Misrepresented Study Results

This section of the comments provides the evidence that press releases and press articles on the Study substantially overstated the impacts of the moratoria by citing results of the combined case C13 (combining the impacts of both the update to the resource base and removal of the moratoria), while describing these results as the impacts of only the moratoria (which is case C14, which shows considerably smaller impacts). The misunderstanding is traced to the manner in which the Study was presented in the November Presentation and Report.

[29] The NPC reports are available at http://www.npc.org/.

a. Press releases and press coverage cited the combined impacts of the update to the resource base and removal of the moratoria, but described them as impacts of only the moratoria

Study sponsor Consumer Energy Alliance's press release, *CEA: New Study Reveals Economic Consequences of Continued Inaction on American Energy Exploration* (February 15, 2010)[30] states as follows:

> "… The following represent some of the key findings contained in the study – again, modeled under a scenario that assumes energy resources on federal lands (onshore and offshore) currently locked away continue to be denied to the American people in the future: …
>
> - Annual average natural gas prices increase by 17 percent; …
> - Gross Domestic Product (GDP): Projected to decrease by $2.36 trillion…"

These figures are from the combined case C13, representing impacts of the update to the resource base and removal of the moratoria, but the description clearly suggests these are impacts of just the moratoria. As described earlier, the Report states the net present value impact of the moratoria as $584 billion (p. 1-51; Comparison Case C14). The $2.36 trillion figure is actually the combined impacts of the removal of the moratoria and the substantial change in the resource base estimate (p. 1-35; Comparative Case C13), summed without proper discounting.

Similarly, study sponsor Natural Gas Supply Association, in its press release, *Ban On Drilling Along U.S. Outer Continental Shelf Could Cost U.S. Trillions* (February 15, 2010)[31] quotes its president as saying,

> "This landmark study attests that a drilling ban along the Outer Continental Shelf (OCS) and some restricted onshore lands carries an estimated adverse effect on the GDP of more than $2 trillion between now and 2030."

Another study sponsor, the American Gas Association, stated as follows in its press release, *AGA Commends New NARUC-Administered Study on Oil & Gas Moratoria* (February 15, 2010):[32]

> "Specifically, if the moratoria from 2009-2030 remains unchanged, the average natural gas price is expected to increase by 17 percent."

These results again are from the combined case C13, not the moratoria-only case. The increase in gas prices due to the moratoria was only 2.2 percent (Case C14, p. 4-47).

I checked the websites of other Study sponsors and could not find any press releases about the Study that correctly identified the projected impacts of the moratoria. The NARUC press release, *NARUC Gas Committee Receives Final Report Detailing Oil/Gas Moratoria Impacts*, February 15, 2010, [33] also failed to report impacts of the moratoria. It too focused on the combined case C13, but did correctly describe the results as the combined impact of the moratoria and the update to the resource base. However, even the NARUC press release invited misinterpretation, reading in part as follows:

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[30] Available at http://consumerenergyalliance.org/2010/02/cea-new-study-reveals-economic-consequences-of-continued-inaction-on-american-energy-exploration/.
[31] Available at http://www.ngsa.org/assets/Docs/2010%20Press%20Releases/6-%20Cost%20of%20OCS%20Moratoria%20Is%20Huge.pdf
[32] Available at http://www.aga.org/Newsroom/news+releases/2010/AGACommendNewNARUCAdministered.htm
[33] Available at http://www.naruc.org/News/default.cfm?pr=183

"The report projects effects on the nation of maintaining moratoria under two scenarios: 1) determining the social, economic and environmental effects of maintaining moratoria and the updated oil and natural gas resource base estimates, and 2) determining those effects without the updated resource base.

SAIC's NEMS-NARUC model results determined that maintaining traditional energy exploration and production moratoria on Federal lands would result in an alternative domestic energy future that, "…increases the cost and restricts the availability of domestic oil products and natural gas…" in all economic sectors and regions of the country. According to the study, under the "Combined Comparative Case", which combines the estimated increase in the oil and gas resource base with maintaining moratoria from 2009-2030, model projections show that:

– Cumulative domestic oil and natural gas production decreases by 15% and 9%, respectively.
– Average natural gas price increases by 17% and average electricity prices increase by 5%.
– Cumulative national real disposable income decreases by $1.163 Trillion ($4,500 per capita).
– GDP decreases cumulatively by $2.36 Trillion ($1.16 Trillion NPV), an average annual decrease of 0.52%
– Cumulative oil imports from OPEC countries increase by 4.1 Billion barrels.
– Cumulative national payments to OPEC countries increase by $607 Billion ($295 Billion NPV)."

Only a careful reader of this press release would understand that the impacts of the moratoria, according to the Study, could be far smaller than suggested by these numbers. Media coverage of the Study reflected the same misunderstanding of the Study results as found in these press releases.[34]

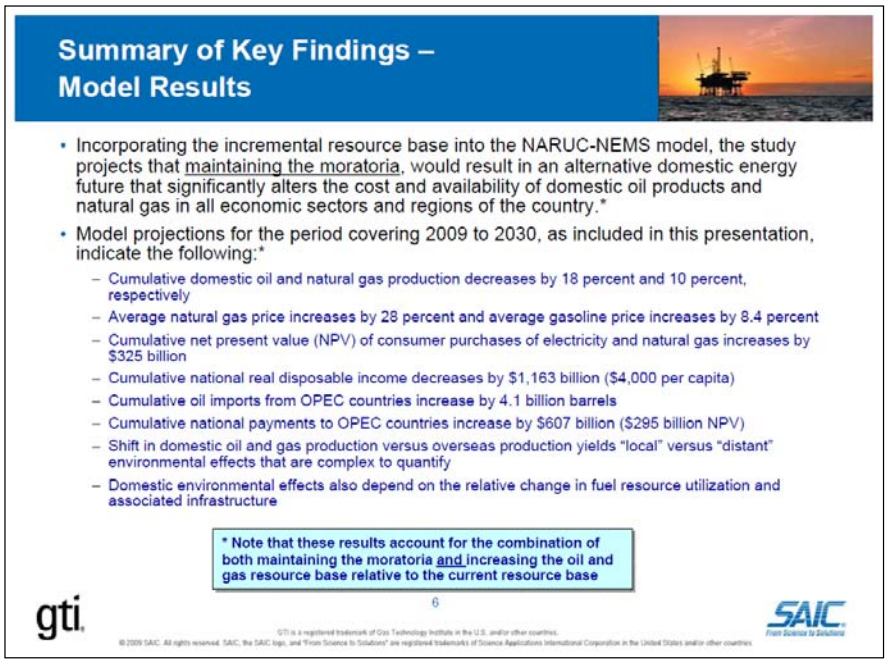
Thus, the press releases by NARUC and other study sponsors, and press coverage based on them, did not present the estimated impacts of the moratoria at all, instead focusing on the much larger impacts that include the update to the resource base, but describing them as impacts of the moratoria.

b. The roots of the misunderstanding of the Study results are found in the Study presentations and Report

The common mistake of misinterpreting and misrepresenting combined case C13 as reflecting impacts of only the moratoria is easily traced to the presentation and documentation of the Study. Slide 6 from the November Presentation (Figure 4) clearly suggests that it is discussing impacts of the moratoria (note the underlined phrase), not the combined case. The explanation of the asterisk shown in the blue box at the bottom of the slide suggests that the results presented "account for" increasing the resource base, implying that the numbers take the update into account in calculating the effect of removal of the moratoria, when in fact the numbers reflect both sets of impacts combined. The audience will take away that these are results of the moratoria.

[34] See, for instance, Ian Talley, Dow Jones Newswires, *UPDATE: Regulators' Report Warns Of Econ Harm From US Oil Ban*, February 15, 2010, available at http://www.foxbusiness.com/story/markets/industries/utilities/update-regulators-report-warns-econ-harm-oil-ban/; Nick Snow, Oil & Gas Journal, *Study for NARUC lists ongoing OCS ban's adverse impacts*, February 16, 2010, http://www.ogj.com/index/article-display.articles.oil-gas-journal.general-interest-2.2010.02.naruc-study_lists.QP129867.dcmp=rss.page=1.html

Figure 4: Slide 6 from November Presentation



The "Concluding Remarks" from the November Presentation (slide 24, shown here as Figure 5) clearly states conclusions about the impacts of the moratoria; but the impacts of the moratoria are not presented anywhere in the presentation – only results of the combined case were shown.

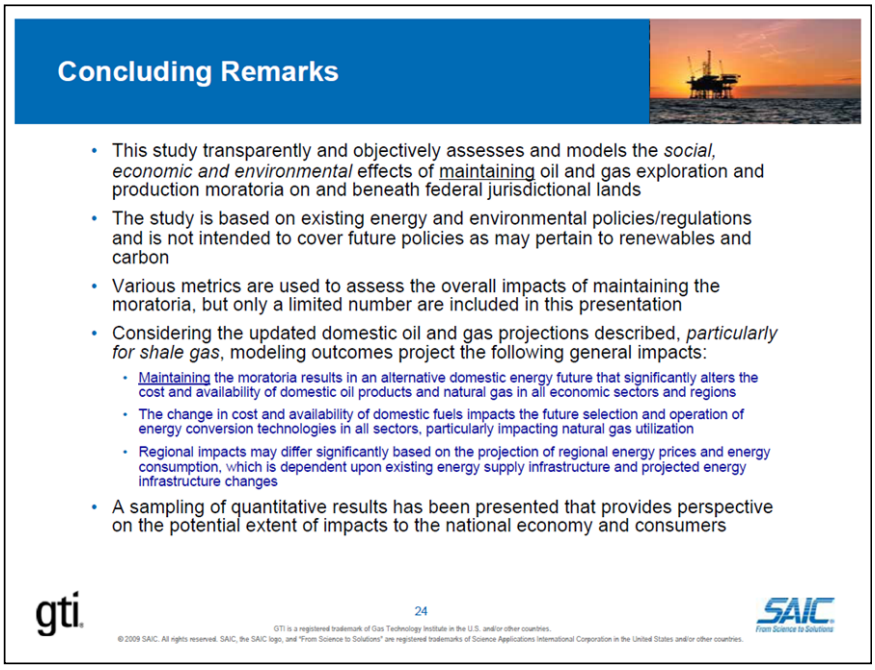
In addition, the November Presentation describes results of case C13 as "Projected Change in Delivered Energy Prices if Moratoria Is Maintained and Resources Increase" on slide 19, and other results are similarly described on slides 18 to 23. However, case C13 shows the impacts of maintaining the moratoria and *ignoring* the update to the resource base (or equivalently, the impact of removing the moratoria, and updating the resource base estimates). "If Moratoria Is Maintained and Resources Increase" confusingly suggests a case with offsetting impacts of maintaining the moratoria (which reduces resources) and updating the resource base (which increases resources).

Thus, the widespread misrepresentations of the Study's results had their roots in the November Presentation of the Study results. A similar presentation of the Study results was prepared for the February 15 meeting but was not presented; it is, however, available on NARUC's web site.[35] It, too, presents results only from case C13, not C14 or C2, which present impacts of the moratoria.

NARUC's press release on the November Presentation, *NARUC's Gas Committee Receives Update on 'Moratoria' Study*, November 16, 2009, also was prone to misinterpretation, presenting preliminary results of the combined case, described as impacts of the moratoria:

[35] Available at http://www.narucmeetings.org/Presentations/GasMoratoria_NARUC%20Mtg%202-15-10%20E2.pdf

Figure 5: Slide 24 from November Presentation

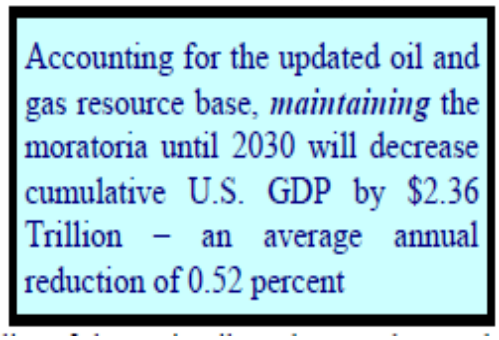


"SAIC's NEMS-NARUC model results determined that maintaining traditional energy exploration and production moratoria on Federal lands would result in an alternative domestic energy future that "significantly alters the cost and availability of domestic oil products and natural gas in all economic sectors and regions of the country."

According to the study, which also includes an estimated increase in the oil and gas resource base, if moratoria were maintained from 2009-2030, model projections show that:

- Cumulative domestic oil and natural gas production decreases by 21% and 10%, respectively.
- Average natural gas price increases by 28% and average gasoline price increases by 8.4%.
- Cumulative net present value (NPV) of consumer purchases of electricity and natural gas increases by $325 Billion.
- Cumulative national real disposable income decreases by $1.163 Trillion ($4,000 per capita).
- Cumulative oil imports from OPEC countries increase by 4.1 Billion barrels. - Cumulative national payments to OPEC countries increase by $607 Billion ($295 Billion NPV)."

Figure 6: Box from Report Executive Summary page E-1


Accounting for the updated oil and gas resource base, *maintaining* the moratoria until 2030 will decrease cumulative U.S. GDP by $2.36 Trillion – an average annual reduction of 0.52 percent

The Report, too, focused on the combined case C13 and set the stage for misinterpretation of the Study results. The Executive Summary presents only results of the combined case C13. A box on the first page of the Executive Summary (Figure 6) suggests that the values presented "account for" the update to the resource base,

when in fact they do not account for the update, but *include the impacts* of the update. Readers of the Executive Summary learn nothing about the magnitude of the potential impacts of the moratoria. With respect to natural gas prices, the impact is described in the Executive Summary as 17 percent, but the impact of the moratoria on natural gas prices is actually only 2.2 percent, as noted earlier. The results of the combined case C13 are confusingly labeled in the Executive Summary (p. E-5, E-6) as "Effects of the GTI Updated Resources and Maintaining the Moratoria (2009 – 2030)."

It is not surprising, given these presentations and the Report's Executive Summary, that the media and even Study sponsors generally misunderstood and misreported these results as impacts of the moratoria, given that such results were supposed to be the Study's main focus.

VI. Recommendations

Should NARUC wish to further pursue a better understanding of the potential impacts of restrictions on oil and gas development, I offer the following suggestions.

1. These comments identified several types of information that would typically be found in the final report of a study of this kind, but were not. NARUC should consider asking the authors to augment the Report with additional reporting of results and modeling assumptions, as suggested in these comments and perhaps in other comments received on the Report.

2. The final report of a study of this kind often includes a critique section in which the authors discuss limitations encountered in obtaining the data needed for the modeling, simplifying assumptions that were adopted, etc., and the likely impact on the results of these considerations, individually and collectively. Such a section provides the reader some insight into the likely level of accuracy of the modeling, and whether the results more likely over- or understate the key results. NARUC might consider asking the authors to provide such a critique.

3. The reasonableness of the price and other impacts of the moratoria as represented in the Study could be evaluated by comparing the energy supply, demand, and price responses to these responses as estimated in other, similar modeling exercises. For natural gas, one source of data for such comparisons is the EMF 23 website cited earlier. NARUC might consider seeking such comparisons for Study validation purposes.

4. NARUC should also consider asking the authors to estimate, for each limited access scenario, the impacts of the option to develop the conserved resources in the years after 2030. NARUC should also consider requesting the authors to evaluate an additional policy scenario, under which full access is provided after a ten year delay.

5. NARUC might want to query the Moratoria Study Group and Observers to clarify how active various members were in this effort. If it appears the Study and Report have not received sufficient attention to date, NARUC might consider sponsoring a peer review.

6. NARUC might want to evaluate whether the organization of this Study was adequate to ensure that it would be performed and communicated in a neutral manner, and, if not, NARUC should identify how the organization of future studies could be improved in this regard. The discussion of the Study at the February 2010 meeting suggested that there was little or no involvement in the Study by individuals with an opposing view, or even a skeptical view, of the Study's main message.