UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

March 3, 2008

MEMORANDUM

SUBJECT: Transmittal of the Peer Review Process Document and Peer Review Comments Summary Document, both in support of the Oak Ridge National Laboratory Report "Estimating the Benefits of Reduced U.S. Oil Imports" (ORNL/TM-2007/028)

FROM: Ed Coe
OAR/OTAQ/TCD (6401A)

TO: The Docket
Rulemaking under RFS2

The purpose of the memorandum is to transmit the Peer Review Process Document and the Peer Review Comments Summary, both in support of Oak Ridge National Laboratory's Report, "Estimating the Benefits of Reduced U.S. Oil Imports" (ORNL/TM-2007/028) to The Docket, supporting the RFS2 Rulemaking.

Documents:
- Peer Review Process of: "Estimating the Benefits of Reduced U.S. Reduced Oil Imports" (ORNL/TM-2007/028)
- Peer Review Report Summary, "Estimating the Benefits of Reduced U.S. Reduced Oil Imports" (ORNL/TM-2007/028)

Peer Review Process of: "Estimating the Benefits of Reduced U.S. Oil Imports" (ORNL/TM-2007/028) by Oak Ridge National Laboratory

A peer review of the study, "Estimating the Benefits of Reduced U.S. Oil Imports" was conducted according to the guidelines contained within the US EPA's "Peer Review Handbook, 3rd Edition". The Peer Review began on July 7, 2007 and was completed September 14, 2007.

Key Milestones of the Peer Review are listed in the table below and key documents are attached.

Milestone	Notes	Date
ICF, Int'l selected as contractor to conduct review		06/22/07
ICF, Int'l identifies and selects initial set of expert reviewers	Memo to Ed Coe attached	07/16/07
ICF, Int'l finalizes set of expert reviewers	Memo to Ed Coe attached	07/23/07
ICF, Int'l sends out letters to expert reviewers explaining the peer review process and charge questions	Sample letter attached, charge questions attached. Charge questions were developed by an Interagency group consisting of members from EPA, DOE, DOT, CEQ, and OMB	07/25/07
ICF Int'l moderates Kick-off Mtg	Agenda attached	07/31/07
ICF, Int'l moderates final mtg		08/30/07
ICF, Int'l completes Comment Peer Review Summary Document	Peer Review Summary document attached	09/14/07

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications
Aldy	Joseph	Resources for the Future	PhD, Economics Harvard, 2005	aldy@rff.org	202-328-5091	Resources for the Future 1616 P Street, NW Washington, DC 20036	
Brown	Stephen	Director of Energy Economics and Microeconomic Policy Analysis, Federal Reserve Bank of Dallas	PhD, Economics University of Maryland, 1979	stephen.p.brown@dal.frb.org	214-922-5152		"Energy Security and Global Climate Change Mitigation," (with Hillard G. Huntington) Energy Policy, 32(6), 2004. "Oil Price Shocks and the U.S. Economy: Where Does the Asymmetry Originate?" (with Nathan S. Balke and Mine K. Yücel) The Energy Journal 23(3), Third Quarter 2002. "Directions for U.S. Energy Conservation and Independence," Business Economics, October 1996.
Farrow	Scott	Professor and Chair, Department of Economics; Faculty Fellow, Center for Urban Environmental Research and Education, University of Maryland, Baltimore County	PhD, Economics Washington State Univ., 1983	farrow@umbc.edu	410-455-5922	Department of Economics UMBC, 1000 Hilltop Circle Baltimore, MD 21250	
Gately	Durmot	Professor of Economics, Faculty of Arts and Sciences, New York University	PhD, Economics Princeton, 1971	Dermot.Gately@nyu.edu	212-998-8955	NYU Economics Dept. 19 W. 4 Street New York, NY 10012	"How Plausible is the Consensus Projection of Oil Below $25 and Persian Gulf Oil Capacity and Output Doubling by 2020?" Energy Journal, Fall 2001, 22(4), pp. 1-27 "The Asymmetric Effects of Changes in Price and Income on Energy and Oil Demand", Energy Journal, 2002, 23(1), pp. 19-55 (with Hillard G. Huntington)

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications
Hamilton	James	University of California, San Diego	PhD, Economics Berkeley, 1983	jhamilton@ucsd.edu	858-534-5986	Department of Economics, 0508 9500 Gilman Drive La Jolla, CA 92093	"Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy," Journal of Money, Credit, and Banking, 36 (April 2004): 265-286 (coauthored with Ana Maria Herrera)
Huntington	Hillard	Executive Director, Energy Modeling Forum Management Science and Engineering Stanford University	PhD, Economics SUNY Binghamton, 1974	hillh@stanford.edu	650-723-1050	TERMAN ENGINEERING B Stanford, California, 94305-4026	"Energy Disruptions, Interfirm Price Effects and the Aggregate Economy," forthcoming, Energy Economics, 2003. "The Asymmetric Effects of Changes in Price and Income on Energy and Oil Demand," with Dermot Gately, Energy Journal, 2002, 23(1): 19-55. "Crude Oil Prices and U.S. Economic Performance: Where Does the Asymmetry Reside?" Energy Journal, 1998, 19(4): 107-132.
Jones	Donald	Senior Economist and Vice President for Marketing, RCF Economic and Financial Consulting Incorporated	PhD, Geography with a concentration in economics University of Chicago	info@rcfecon.com	312-431-1540	333 North Michigan Ave. Suite 804 Chicago, IL 60601	"Oil Price Shocks and the Macroeconomy: What has been Learned Since 1996," The Energy Journal, Vol. 25, No. 2 (with Paul Leiby). "The Outlook for US Oil Dependence," Energy Policy, Vol. 26, No. 1 (with Paul Leiby) "Improving Energy Security Through an International Cooperative Approach to Emergency Oil Stockpiling," Oak Ridge National Laboratory, March 29, 2002 (with Paul Leiby)

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications
Moniz	Ernie	Professor of Physics, Massachusetts Institute of Technology	PhD, Theoretical Physics Stanford University	ejmoniz@mit.edu	617-253-7515	Center for Theoretical Physics Massachusetts Institute of Technology 77 Massachusetts Ave. 6-303 Cambridge, MA 02139	Moniz, E. J., M. A. Kenderdine, Meeting Energy Challenges: Technology and Policy, Physics Today (April 2002).
Morgenstern	Richard	Resources for the Future	PhD, Economics Michigan, 1970	morgenstern@rff.org	202-328-5037	Resources for the Future 1616 P Street, NW Washington, DC 20036	"Environmental Regulation: U.S. Competitiveness, Benefits and Costs,"The Convergence of U.S. National Security and the Global Environment | Dick Clark, ed. | Aspen, CO: The Aspen Institute | 1997 | Vol. 12, No.2

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications
Parry	Ian	Resources for the Future	PhD, Economics U of Chicago, 1993	parry@rff.org	202-328-5151	Resources for the Future 1616 P Street, NW Washington, DC 20036	"Should Corporate Average Fuel Economy (CAFE) Standards be Tightened?" (With Carolyn Fischer and Winston Harrington). Energy Journal, forthcoming. "Does Britain or The United States Have the Right Gasoline Tax?" (With Kenneth A. Small). American Economic Review 95: 1276-1289, 2005. "The Economics of Fuel Economy Standards." (With Paul R. Portney, Howard K. Gruenspecht, Winston Harrington) Journal of Economic Perspectives 17 (Fall): 203-217, 2003. Economic Impacts of Tightening the Corporate Average Fuel Economy Standards. (With Carolyn Fischer and Winston Harrington). Report prepared for the US Environmental Protection Agency and the National Highway Traffic Safety Administration, 2005. The Costs of US Oil Dependency. (With Joel Darmstadter). Report prepared for National Commission on Energy Policy, 2003.

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications
Toman	Michael	Director of the Energy, Environment and Economic Development Program at the RAND Corporation Johns Hopkins School of Advanced International Relations University of California, Santa Barbara	PhD, Economics University of Rochester				"International Oil Policy: Problems and Policies," The Brookings Review, Vol. 20, No. 2, 2002. "The Economics of Energy Security," The Energy Journal, Vol. 18, No. 1, 1997.
Weiner	Robert	The Elliott School of International Affairs, George Washington University	PhD, Business Economics Harvard, 1986	rweiner@gwu.edu	202-994-5981	Funger 401A 2201 G Street, N.W. Washington, D.C. 20052	"Sheep in Wolves' Clothing?: Speculators and Price Volatility in Petroleum Futures," Quarterly Review of Economics and Finance, forthcoming 2001.
Yücel	Mine	Vice president and senior economist , Federal Reserve Bank of Dallas	PhD, Economics Rice University, 1984	mine.k.yucel@dal.frb.org	214-922-5160	2200 N. Pearl St. Dallas, TX 75201	"Oil Price Shocks and the U.S. Economy: Where Does the Asymmetry Originate?" with Nathan Balke and Stephen Brown, The Energy Journal, Vol 23 (3), 2002 "Reducing U.S. Vulnerability to Oil Supply Shocks: Reply," Southern Economic Journal, April 1996.

Last Name	First Name	Affiliation	Education	E-mail	Phone Number	Address	Relevant Publications

Last Name	Link to bio or resume	Link to writing sample	BLURB
Aldy	http://www.rff.org/rff/Documents/CV/RFF_CV_Aldy_Dec_06.pdf	http://www.rff.org/Documents/RFF-DP-06-13.pdf	Joe Aldy's research addresses issues of climate change and energy policy, but not strictly from an energy security vantage point. If the reviewers want perspective on the intersection between energy security and climate change as it relates to oil imports, Joe would be a good choice. If not, there are other, more relevant reviewers in the pool to choose from.
Brown	http://www.dallasfed.org/research/vita/brown.pdf http://www.dallasfed.org/research/bios/brown.html	http://www.dallasfed.org/news/speeches/03brown_testimony.pdf	Stephen Brown has extensive experience in the economics of energy markets as the Director of Energy Economics and Microeconomic Policy Analysis for the Federal Reserve Bank of Dallas. In his current capacity, he advises the Bank President on issues pertaining to energy economics, including world energy markets and the effects of energy price shocks on economic activity. He has also worked as an economist at the National Center for Analysis of Energy Systems, Brookhaven National Laboratory. His publications include "Energy Security and Global Climate Change Mitigation" (2004) and "Oil Price Shocks and the US Economy" (2002). Dr. Brown received his PhD in economics from the University of Maryland in 1979.
Farrow	http://www.umbc.edu/economics/faculty_cv/SFumbcCV.pdf		Not a good candidate for this review.
Gately	http://www.econ.nyu.edu/dept/courses/gately/resume_dg.pdf	http://www.econ.nyu.edu/dept/courses/gately/Gately_What%20oil%20export%20levels%20should%20we%20expect%20from%20OPEC_2007.pdf	Durmot Gately has been on the faculty of the Economics department at New York University since 1973. In that time he has also consulted for numerous agencies and organizations – including the Department of Energy, OECD, and the World Bank – on issues related to oil supply and demand and pricing behavior, and serves as Associate Editor for the journal *Energy Economics* . Dr. Gately's recent articles include "The Asymmetric Effects of Changes in Price and Income on Energy and Oil Demand" from 2002, co-written with Hillard Huntington. Dr. Gately received his PhD in economics from Princeton University in 1971.

Last Name	Link to bio or resume	Link to writing sample	BLURB
Hamilton	http://weber.ucsd.edu/~jhamilto/jvita.pdf http://econ.ucsd.edu/~jhamilto/	http://dss.ucsd.edu/~jhamilto/JDH_palgrave_oil.pdf	James Hamilton has been a Professor of Economics at the University of California, San Diego, since 1992. He is the recipient of numerous research grants, including one from the National Science Foundation to study "Inventories, Oil Shocks, and Macroeconomic Dynamics," and one from the Department of Energy on the topic of the transmission of oil price shocks throughout the economy. His journal publications similarly mirror his interest on the effects of oil shocks, as represented by his 2004 article entitled "Oil Shocks and Aggregate Macroeconomic Behavior: The Role of Monetary Policy." Dr. Hamilton received his PhD in economics from the University of California, Berkeley, in 1983.
Huntington	http://www.stanford.edu/dept/MSandE/people/teaching/huntington/index.html	http://www.stanford.edu/group/EMF/publications/doc/op51.pdf	Hillard Huntington is the Executive Director of the Energy Modeling Forum at Stanford University, which works to improve models to better understand issues at the nexus of energy and the environment. Dr. Huntington's current research interests are modeling electricity competition, natural gas markets, energy price shocks, and energy market impacts of environmental policies. His lengthy background in energy economics includes terms as both the President of the US Association for Energy Economics and as Vice President for Publications for the International Association for Energy Economics. Recent publications on the topic of energy security include "Energy Disruptions, Inter-firm Price Effects and the Aggregate Economy" (2003) and "The Asymmetric Effects of Changes in Price and Income on Energy and Oil Demand (2002), co-authored by Dermot Gately. Dr. Huntington received his PhD in economics from SUNY Binghamton in 1974.
Jones	http://www.rcfecon.com/djones.htm		Donald Jones is a senior economist and Vice President for marketing at RCF. He is author or co-author of four monographs, one edited volume and over 50 articles in professional journals. A number of his articles have been reprinted in collections of readings and classic articles in their fields. Dr. Jones has served as a research staff member and economist at Oak Ridge National Laboratory. His experience includes energy project and program evaluation (U.S. and Third World), risk management, investment in new technologies, transportation demand, and macroeconomic impacts of oil price shocks. Dr. Jones received his Ph.D. in Geography with a concentration in economics from the University of Chicago.

Last Name	Link to bio or resume	Link to writing sample	BLURB
Moniz	http://web.mit.edu/physics/facultyandstaff/faculty/ernest_moniz.html	Moniz, E. J., M. A. Kenderdine, Meeting Energy Challenges: Technology and Policy, Physics Today (April 2002).	Ernest J. Moniz is a Professor of Physics at the Massachusetts Institute of Technology, where he has served on the faculty since 1973. Professor Moniz served as Under Secretary of the Department of Energy from October 1997 until January 2001. He also served from 1995 to 1997 as Associate Director for Science in the Office of Science and Technology Policy in the Executive Office of the President, where his responsibilities spanned the physical, life, and social and behavioral sciences, science education, and university-government partnerships. At MIT, Professor Moniz served as Head of the Department of Physics and as Director of the Bates Linear Accelerator Center. Professor Moniz' current research interests are centered on energy, science and technology, and national security policy. Professor Moniz is also a member of the Council on Foreign Relations. Dr. Moniz received his PhD in theoretical physics from Stanford University.
Morgenstern	http://www.rff.org/morgenstern.cfm	http://www.rff.org/Documents/RFF-DP-03-42-REV.pdf	Richard Morgenstern is a Senior Fellow at Resources for the Future, where his research focuses on economic analysis of environmental issues with an emphasis on the costs, benefits, evaluation, and design of environmental policies. His expertise in energy security is limited, and probably would not be an ideal candidate.

Last Name	Link to bio or resume	Link to writing sample	BLURB
Parry	http://www.rff.org/rff/Documents/CV/RFF_CV_Parry_Mar_07.pdf personal website:www.rff.org/~parry	http://www.rff.org/Documents/RFF-DP-03-46.pdf	Ian Parry is a Senior Fellow at Resources for the Future, where his recent research has analyzed gasoline taxes and fuel economy standards. In 2003, he prepared a report for the National Commission on Energy Policy entitled *The Costs of US Oil Dependency*, and has penned numerous articles on gasoline taxes and the economic impacts of tightening fuel economy standards. Dr. Parry received his PhD in economics from the University of Chicago in 1993.

Last Name	Link to bio or resume	Link to writing sample	BLURB
Toman	http://www.rand.org/media/experts/bios/toman_michael.html	"Energy, Equity, and Economic Development," Douglas F. Barnes and Michael A. Toman, in Economic Development and Environmental Sustainability: New Options, Ramón López and Michael A. Toman, eds., Oxford University Press, 2006	Michael Toman is the Director of the Energy, Environment and Economic Development Program at the RAND Corporation, as well as a Professor of Environmental Economics at the Johns Hopkins School of Advanced International Studies and the University of California, Santa Barbara. He has previously served as the Senior Staff Economist of the President's Council of Economic Advisers. He has expertise and experience in energy security, having authored several publications on oil economics and energy security, including "International Oil Policy: Problems and Policies" and "The Economics of Energy Security." Dr. Toman received his PhD in economics from the University of Rochester.
Weiner	http://home.gwu.edu/~rweiner/	links at http://home.gwu.edu/~rweiner/	Robert Weiner is a Professor of International Business and International Affairs at George Washington University. He is also an associate member of the *Groupe de Recherche en Économie de l'Énergie des Ressources Naturelles* at the University of Laval. He has written extensively on issues related to petroleum pricing, including a 2001 article entitled "Sheep in Wolves' Clothing? Speculators and Price Volatility in Petroleum Futures." Dr. Weiner received his PhD in business economics from Harvard University in 1986.
Yücel	http://www.dallasfed.org/research/vita/yucel.html http://www.dallasfed.org/research/bios/yucel.html	http://www.dallasfed.org/research/swe/2004/swe0403a.html	Mine Yucel is the Senior Economist and Vice President at the Federal Reserve Bank of Dallas, where she has worked since 1989. At the Bank, she analyzes the regional economy and energy markets and has published numerous articles on energy and regional growth. Yucel is also a past president of the United States Association for Energy Economics. She has written numerous articles on oil prices and shocks, many co-written by Stephen Brown, including "Oil Price Shocks and the U.S. Economy: Where Does the Asymmetry Originate?" (2002). Dr. Yucel received her PhD in economics from Rice University in 1984.

Last Name	Link to bio or resume	Link to writing sample	BLURB

ICF INTERNATIONAL

MEMORANDUM

DATE: July 16, 2007

TO: Edmund Coe

FROM: Melinda Harris, Michael Obeiter, and Elyssa Gelmann

SUBJECT: Selection of Peer Reviewers

ICF has completed the process of identifying and assessing the qualifications of candidates for the peer review of "Estimating the Energy Security Benefits of Reduced U.S. Oil Imports' by Paul N. Leiby. After confirming that the 12 candidates we evaluated all satisfied the specific criteria provided in the Work Assignment, we also evaluated the candidates on the basis of:

- Publication record including both the number and prominence of journals and other media in which articles appeared;
- Clarity of writing style; and
- Related field(s) of expertise including energy policy, oil markets, and macroeconomic analysis.

Based on this assessment we have selected the six individuals list in alphabetical order below and one alternate for the peer review:

- Stephen Brown;
- Durmot Gately;
- Hillard Huntington;
- Ian Parry;
- Michael Toman; and
- Mine Yucel

In the event that one of these individuals is unable to provide a review, we have also selected Joseph Alby as an alternate. It is our plan to have all six reviewers needed for this project on-board no later than the 18th of July and to have arrangements in place for a kickoff meeting sometime on Thursday the 19th.

If you have any questions or comments regarding our selections and/or planned schedule, please feel free to call Melinda Harris at 301-261-3038.

ICF INTERNATIONAL

MEMORANDUM

DATE: July 23, 2007

TO: Edmund Coe

FROM: Melinda Harris, Michael Obeiter, and Elyssa Gelmann

SUBJECT: Confirmation of Peer Reviewers

As indicated in our memorandum of July 12, 2007 ICF completed the process of identifying and assessing the qualifications of candidates for the peer review of "Estimating the Energy Security Benefits of Reduced U.S. Oil Imports' by Paul N. Leiby. After confirming that the 12 candidates we evaluated all satisfied the specific criteria provided in the Work Assignment, we also evaluated the candidates on the basis of:

- Publication record including both the number and prominence of journals and other media in which articles appeared;
- Clarity of writing style; and
- Related field(s) of expertise including energy policy, oil markets, and macroeconomic analysis.

Based on this assessment we selected six individuals and one alternate for the peer review. The following have agreed to provide a review of Dr. Leiby's paper.

- Stephen Brown;
- Durmot Gately;
- Hillard Huntington;
- Joseph Aldy;
- Michael Toman; and
- Mine Yucel

Dr. Ian Parry declined our invitation to participate in the peer review process indicating that he had other obligations that would prevent him from undertaking the review.

If you have any questions or comments regarding our selections and/or planned schedule, please feel free to call Melinda Harris at 301-261-3038.

Peer Review
"Estimating the benefits of reduced U.S. oil imports"
Kick-off Meeting
Agenda

31 July 2007

1. Introductions

2. About the study: "Estimating the Energy Security Benefits of Reduced US Oil Imports"

3. ICF's reviewer selection process

4. EPA's peer review process—steps and requirements

5. Handling of questions to Paul Leiby

6. Leiby presentation on study with question and answer session

7. Alternative 3rd call to discuss key topics

8. Period of performance for the review

9. Submission of reviews

10. Question on peer review process

11. Wrap and next steps

ICF INTERNATIONAL

July 25, 2007

Stephen Brown
1305 Windmill Court
Arlington, TX 76013

Dear Dr. Brown;

We greatly appreciate your willingness to participate in the peer review of Paul Leiby's study "Estimating the Energy Security Benefits of Reduced Oil Imports." Accompanying this letter is a review copy of Dr. Leiby's paper as well as the charge containing a list of specific questions that we would like for you to address in your comments. In addition to providing answers to this set of questions we would also appreciate a concise narrative expressing your overall views on the analysis, assumptions, results, and any other attributes of the study that in your view merit particular notice.

While we are seeking answers to each question in the charge, we also recognize that some might be outside of your particular area of expertise. If you are not comfortable with addressing all of the questions, you are at liberty to so indicate and are not required to provide an answer. However, we do request that you begin your participation in this peer review process by considering the questions in the charge document and letting us know within the next 3 days which, if any, questions you do not anticipate addressing in your comments.

Within the next week, we plan to hold a kick-off meeting with all of the individuals that will be contributing to the peer review, EPA and other interested parties. I will let you know the exact timing of the meeting, which you will be able to attend via teleconference. We also plan to hold a second teleconference this time including Paul Leiby to allow you an opportunity to ask any questions you might have regarding his study. At present we anticipate that this second call will be scheduled for early August. I will get back to you with an exact date.

As we discussed previously, ICF International will be issuing a Purchase Order in the amount of $4,000 to compensate you for your time and any expenses you might incur in obtaining materials to complete your review. The period of performance for the Purchase Order will run from today through August 31st, when your final comments are due to

ICF. If it is at all possible, an earlier delivery would be very much appreciated. Along with the Purchase Order, we will be sending a W-9 form for you to complete and return along with an invoice for your services.

If you have any questions at any point during your review, please feel free to contact me via telephone at 301-261-3038 or through email at mharris@icfi.com . I look forward to working with you over the coming weeks.

Sincerely,

Melinda Harris
Senior Economist
ICF International

Peer Review: "Estimating the Energy Security Benefits of Reduced Oil Imports", ORNL/TM-2007/028, Oak Ridge National Laboratory, March 2007

Background

Oak Ridge National Laboratory (ORNL) has developed and updated a model that quantifies U.S. energy security benefits. The model was first developed for this report, "Oil Imports: An Assessment of Benefits and Costs", ORNL-6851, Oak Ridge National Laboratory, November 1, 1997. The identical model was updated by using more recent market conditions data for the current report, "Estimating the Energy Security Benefits of Reduced Oil Imports", ORNL/TM-2007/028, Oak Ridge National Laboratory, March 2007.

Since U.S. energy security will be a key consideration in future actions aimed at reducing our dependence on oil, it is important to assure that the methodology and estimates of energy security impacts have been thoroughly examined. Comprehensive, objective peer review leads to good science and product acceptance within the economics community.

Questions for Peer Review Charge

1. What are the market failures associated with U.S. oil imports from an energy security perspective (i.e., effects that are not internalized/incorporated in private decisions)?

2. Does the ORNL methodology/model represent an appropriate approach for estimating the energy security benefits to the U.S. from reducing U.S. oil imports? In particular, is there a monopsony effect associated with reduced U.S. oil consumption? If so, does the ORNL methodology/model appropriately address this effect? In particular, does it adequately capture potential supply responses (e.g., strategic and otherwise) to a reduction in U.S. demand? Is there a better way to model potential supply responses (e.g., using game theory)? Is there a macroeconomic disruption/adjustment cost effect? If so, does the ORNL methodology/model appropriately address this effect?

3. Do alternative methodologies provide additional useful information for estimating the energy security benefits of reduced U.S. oil imports? What are the strengths and weaknesses of the ORNL model relative to other models? What data and analysis techniques would be necessary (to conduct an alternative analysis)? What is a reasonable time to conduct such an analysis?

4. Is the model adequate for supporting regulations that reduce U.S. dependency upon foreign oil? More specifically, can the model be generalized to incorporate discrete changes in U.S. oil imports (e.g., President's "Twenty in Ten: Strengthening America's Energy Security" Initiative?) in addition to marginal changes in U.S. oil imports?

5. Are there existing methodologies/models that can quantify the military component of U.S. energy security benefits? If so, can and should these methodologies be incorporated into the ORNL methodology?

6. Do the estimates appropriately account for the existence of, and recent decision to increase the size of, the Strategic Petroleum Reserve? Should the costs of the maintaining the Strategic Petroleum Reserve be accounted for in the energy security premium?

7. Comment on the appropriateness of the analytical boundaries used in the ORNL model (e.g. domestic vs international).

8. Are the assumptions invoked in the ORNL model appropriate? Are ORNL model parameters (e.g., supply and demand elasticity estimates, the elasticity of GDP with respect to the price of oil, functional form, the probability and magnitude of supply disruptions) appropriate? Does the ORNL use the most recent data?

9. Does the ORNL model appropriately reflect the underlying uncertainties associated with the assumptions invoked and parameters used in the model?

10. Can and should the model be generalized to incorporate price volatility/supply shocks in other fuel markets that are likely to be substitutes for U.S. imported oil (e.g., natural gas, corn-derived ethanol)?

11. Provide any additional comments that you feel should be included in this peer-review, but have not been addressed by these Charge questions.

Peer Review Report Summary

Estimating the Energy Security Benefits of Reduced U.S. Oil Imports

Paul Leiby

ORNL/TM-2007/028

Table of Contents:

Detailed Comments

Commenters	Comments	Responses
1. Joseph Aldy	The paper "Estimating the Energy Security Benefits of Reduced U.S. Oil Imports" provides a central estimate and an associated range of the oil import premium reflecting the effects of U.S. monopsony power and the macroeconomic costs associated with oil shocks. This builds on a 1997 analysis that estimated the per barrel oil import premium of $3.59 with a range of $2.57–$5.64 (2004$). This updated version of the analysis finds a higher mean estimate of $13.58 per barrel and a larger range of $6.71–$23.25. The larger estimate in the 2007 analysis reflects changes in a variety of determinants of the oil import premium, including a larger U.S. economy, greater U.S. oil imports, higher oil prices, and greater likelihood of an oil supply disruption. The paper's methods rely on several simple equations for characterizing the net benefits to the economy of oil imports. From these equations, two key terms are derived to represent the marginal effect of a change in net imports on net benefits through monopsony power and the change in net imports on net benefits through the disruption premium. The paper then parameterizes these terms, and performs a variety of simulations using primarily discrete distributions for these parameters to generate the sample of oil import premium estimates used to construct the mean estimates and 90 percent ranges presented above. This review proceeds with several major comments about the paper and then concludes with responses to the questions for peer review charge. **(1) Is this the right analysis for the policy question under consideration?** As I understand it, this analysis has been commissioned to inform the regulatory analyses for rules that would promote the use of renewable fuels in the United States transportation sector. This raises several questions relevant to the application and conduct of this analysis. Would a renewable fuels mandate reduce U.S. net crude imports? If so, would it reduce OPEC market share (and thus market power)? How would it affect the GDP loss sub-component of the oil disruption component of the oil import premium? The first two questions require a consideration of both the marginal cost of oil production in non-OPEC countries (including U.S. domestic production) and OPEC strategic behavior. At current and forecast oil prices, OPEC member states are paid above the cost of their marginal barrel extracted. Marginal production is more likely occurring in unconventional sources, such as Canadian tar sands, as well as through more advanced recovery in existing fields and in exploration in more remote areas, such as the arctic. If U.S. consumption declined significantly, it may adversely affect high-cost producers more than OPEC. It's possible that it could adversely affect high-cost domestic production. Part of this – whether net oil imports actually go down with various policy proposals under consideration – appears to be beyond the scope of this analysis. Part of this, however, is integral to this kind of analysis. If reduced U.S. consumption causes prices to fall, then it is an important question whether production declines occur in the competitive fringe or in OPEC. The extreme case of this was evident during the Asian financial crisis when oil prices fell to $11-$12 per barrel over the 1998-1999 winter, and a significant number of U.S. production wells were shut-in. If OPEC market share increases because lower prices drive out some of the competitive fringe, then the seller side oligopoly power is stronger and may, in the long term, overwhelm the U.S. monopsony power. Unfortunately, this question is not addressed in this analysis, or the broader question of how changes in U.S. consumption influence OPEC strategic behavior. The third question concerns whether there are any disruption cost benefits from substituting domestic renewable fuel for imported crude oil. If imports were lower, then the transfers associated with buying imports would be lower during a positive price shock. If a price shock is to work through the economy and cause GDP losses, either through a shock to productivity or a shock to aggregate demand via monetary policy, then the total amount consumed of petroleum products *and its near-perfect substitutes* of renewable fuels matters. As evident by the very substantial rents earned by ethanol producers during the recent spike in gasoline prices, renewable fuel prices track gasoline prices. Subject to transport and fuel-mixing constraints, a crude oil price shock will	

Commenters	Comments	Responses
	drive up ethanol prices as retailers bid for more ethanol-mixed fuels to substitute for the gasoline-only fuels they bring to market. This would have the same effect as simply increasing domestic production of crude oil. The important point to make here, and this is valuable for policy-makers who still focus too much on imports and not enough on consumption, is that the GDP losses associated with a price shock to oil depends on total consumption, including competitively-supplied substitutes like ethanol. In the case of ethanol substituting for imports, there would not appear to be a benefit to the economy during a shock (aside from the lower transfers outside of the country associated with imports). **(2) Comments on monopsony power.** Nearly two-thirds of the estimated oil import premium reflects U.S. monopsony power. To be more exact, it reflects a simple model representation of U.S. monopsony (in a world with competitive fringe buyers) and OPEC oligopoly (in a world with competitive fringe suppliers). I have several reservations about the monopsony analysis. First, while the paper reviews several papers that have estimated the monopsony component of the oil import premium through simulations, it does not appear to report empirical estimates of U.S. monopsony power based on econometric analysis. Simulations rely on assumptions about strategic behavior, but an econometric analysis would reveal the outcome of strategic behavior. This would strengthen the case for monopsony power. There would presumably be several cases in which one could examine explicit U.S. policy decisions that would reveal the extent of U.S. monopsony power. For example, fuel rationing in the 1970s would be a prime example of the U.S. government taking an action in line with what a monopsonist would do – commit to lower consumption to drive down prices. Likewise, fuel economy standards over time would have a similar effect. Or the introduction of ethanol, and then its mandate as a fuel additive in the 1990s. Some empirical basis for the assumptions made in this report are necessary to build confidence in this result, which drives the bottom line of the report. Second, the monopsony effect is most sensitive to the assumption of the OPEC supply response elasticity. This one elasticity term effectively represents the resolution of joint strategic behavior by the monopsonist and the oligopoly and the fringe players. On page 35, the paper notes that this parameter takes values ranging from zero to 5, with a mode of 1.0. Let me first note a confusion: I presume that this is the same as the net supply elasticity for oil imports referred to on page 28 (this was not clear to me, but the subsequent bulleted comments on “OPEC supply responses” on the following page would appear to confirm this). But technically, the monopsony effect (equation 8) cannot be evaluated when this elasticity is zero. More importantly, the paper does not provide a basis for these values. There are no citations provided for what we might expect for this elasticity. Nor is there any game theory analysis to suggest plausible values. Nor is there a discussion of the historical evidence of monopsony like what I described above. Third, this analysis assumes away any behavioral responses outside of OPEC. First, fringe oil producers may supply less oil in response to a decline in price, as noted in (1), and this could strengthen OPEC’s position in the world market. Second, some suppliers may decide to cooperate with OPEC to sustain oil prices. For example, when oil prices fell in 1998, several countries in the “competitive fringe” pledged to cut their production in concert with OPEC, including Mexico, Oman, Yemen, and Norway. Effectively “expanding” OPEC would offset OPEC revenue losses from reduced consumption in various modeling analyses of greenhouse gas mitigation policies (Ghanem et al. 1999). Third, some importers may respond to lower U.S. consumption and associated change in prices by importing more oil, offsetting some of the U.S. monopsony effect. In this case, I disagree with this statement in footnote 32: “It seems especially unlikely that other major oil consuming countries would take an opportunistic or even non-cooperative strategy given current widespread concern about the need for energy conservation and climate change.” I have a sharply different take on other importers’ reactions to a U.S. policy that lowers net U.S. imports and thus oil prices. Countries with or planning to build large emergency public reserves would be wise to take advantage of the U.S. policy. For example, China would welcome lower prices that it could take advantage of as it builds up its emergency reserves. Further, developing countries	

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	have more substantial interests in development than climate change. Since these countries will be responsible for approximately 80 percent of the growth in petroleum consumption between now and 2020 and 2030 (based on EIA 2007), their responses should be accounted in this framework and not simply assumed away. The bottom line is that this analysis on monopsony needs either a more detailed exposition on the game theory underlying this effect or a more detailed assessment of empirical estimates of monopsony. A discussion of relevant game theory would be valuable, in part, because there is some literature on this issue. For example, this paper should address the applicability of the cases where Maskin and Newberry (1990) find that a large oil importer is actually disadvantaged by its monopsony position. Without any empirical or theoretical basis for the reduced form equation and parameter values chosen to represent monopsony effects, it is difficult to accept these results in light of the literature. **(3) Comments on disruption costs.** In addition to my concern expressed in (1) about whether there are GDP losses if domestically-produced renewable fuels substitute nearly perfectly for oil imports under an oil price shock, I also have reservations about the GDP loss that would be expected under an oil price shock. The paper notes that the GDP loss elasticity varied from -0.01 to -0.08. It is not clear whether this is over a uniform distribution or some other distribution. If it is uniform, then it suggests a mean GDP loss elasticity of -0.045. The paper notes that this "encompasses essentially the bulk of recent econometric and modeling estimates." This value strikes me as large, especially in light of recent macroeconomic responses to oil price shocks. The U.S. economy today functions in a fundamentally different way than it did in the 1970s, when the large fluctuations in energy prices and output provide much of the variation used to identify the GDP loss elasticity in many econometric analyses in the literature. Several papers have commented on what has become known as the Great Moderation – a period of lower variances in many important economic aggregates since about 1984 (Kim and Nelson 1999, McConnell and Perez-Quiros 2000, Stock and Watson 2002). A variety of explanations have been put forward – better monetary policy, more flexible labor markets, and a declining share of oil in the U.S. economy. Recent papers by Nordhaus (2007) and Blanchard and Gali (2007) show that the response of the U.S. economy to recent oil price spikes, such as 1999-2000 and 2002-present, are much smaller than the effects of the 1970s shocks. In fact, Nordhaus notes that after the most recent price spike, the ratio of economic output to potential output increased relative to the pre-spike level. This is despite the fact that the percentage change in prices was comparable across these latter shocks and the 1970s shocks. To have more confidence in the basis for GDP losses presented in this paper, it should first refer to the papers that generate the range of elasticity estimates used. Then it should be more specific about the distribution these estimates take. Finally, it should make a case for why these estimates are credible in light of recent macroeconomic research that suggests that shocks of any kind and shocks in oil prices have less of an economic impact today than they did in the past. **(4) Presentation of a range.** The paper presents a range of estimates. I understand that the government does more uncertainty analysis in its regulatory assessments. I would caution that this range is not a proper characterization of uncertainty in the parameters. Some parameters take only arbitrary discrete values, such as OPEC oil supply elasticity. It is not clear whether the range in the GDP loss elasticity reflects the range of published estimates or the estimated precision around a preferred estimate. In several cases, one would also like to take draws from joint distributions, and it is not clear if that was undertaken in this case. For example, a state in which the GDP loss elasticity is large is probably correlated with a specific range of OPEC supply responses (and hence certain ranges of values for the supply elasticity parameter).	

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2. Stephen Brown	The ORNL report presents an updated estimate and assessment of what is commonly known as the “oil-import premium.” As typically conceived, the oil-import premium reflects the external costs to the United States of importing an additional barrel of oil or petroleum products—excluding the environmental consequences that result from the production or use of the oil. The oil-import premium can be useful in policy analysis because it reflects the additional costs beyond the purchase price that are borne by the United States for a marginal barrel of oil imports. The report is impressive in its thoroughness and in the judgment its author used to draw from the disparate elements of the economics literature to create an estimate and assessment of the oil-import premium. The ORNL report takes a well thought out approach, and the resulting analysis is solid. Using a well-accepted formula, parameter values drawn broadly from the economics literature and a baseline assessment of the world oil market drawn from the U.S. Energy Information Administration (EIA), the analysis divides the oil-import premium into two parts. The first part represents the monopsony purchasing power that the United States can exert on the world oil market by reducing its oil imports. The second part represents the expected cost to the United States of an oil price shock that originates in the disruption of foreign supply. The expected cost to the United States of a foreign oil supply shock comprises multiple elements, including a shock to the direct costs of oil imports and the loss in aggregate U.S. economic activity that occurs when a supply shock boosts world oil prices. The former element depends directly on U.S. oil imports. The latter element is a function of U.S. oil imports because a change in U.S. oil imports works through the world oil market to affect the production levels of potentially unstable producers and in doing so determines the size of potential supply shocks. Some have suggested that military expenditure to protect U.S. interests in overseas oil production and the costs of the strategic petroleum reserve ought to be included in the costs of imported oil. The ORNL approach assigns a zero value to these elements from the analysis on the grounds that the expenditures on these activities aren’t affected by the marginal barrel of oil imports. Combining all these elements yields a comprehensive approach to estimating the oil-import premium as it is understood in the existing economics literature. The report estimates the oil-import premium in a range of $6.71-23.25 per barrel with a midpoint value of $13.58 per barrel (expressed in real 2004 U.S. dollars). A similar analysis conducted by Leiby, Jones, Curlee and Lee in 1997 found a much lower range of $2.57-5.64 per barrel with a midpoint of $3.59 (expressed in real 2004 U.S. dollars). Changes in oil market conditions—including higher oil prices, increased U.S. imports and reduced excess capacity in the world oil market—account for the increased premium. The wide range of estimates shows that there is considerable uncertainty about the oil-import premium. Given how the parameters are drawn from the economics literature, the range of estimates well represents a consensus view about the value of the optimal oil-import premium. Summation of the analysis as a midpoint is on substantially less solid ground.	

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3. Dermot Gately	This is a comprehensive, well-written report. Its quality would warrant publication in *The Energy Journal*, the best journal in the field of energy economics. Having said this, let me list some ways in which the report could be improved: • Major points of clarification • Minor points of clarification • Editorial suggestions • Typographical errors **Major Points of Clarification** 1. It's difficult for me to understand the numerical assumptions that are embedded in the two key graphs of the paper, Figures 2 and 3. Each of these require significant elaboration and expansion, in order to clarify the assumptions that underlie the median results, as well as those of the extreme cases that create the low and high estimates of the import premium. 2. I do not fully understand the basic conceptual assumption involved in calculating the import premium. A simple diagram or two would address these questions easily. I assume that the basic idea involves a leftward-shift of the US demand for oil, or a slowing of the rate at which this curve shifts rightward over time. Over what time period? By what government policy would it be implemented? Under what oil market conditions are we assuming that such a shift will happen: what level of excess OPEC capacity is assumed, and what response to the demand shift is assumed for OPEC? Given such a leftward shift in the US oil demand curve, it will also shift left the US demand for oil imports, and the non-OPEC demand for oil imports. Price will then fall by some amount, determined in part by OPEC's response – or at least price won't increase (unless OPEC retaliates, as part of a strategy to deter such leftward demand shifts). Given the resulting oil price decline, there will be some movement along the curves, such that: • Quantity demand for US, and for non-US, would increase slightly because of the price drop; • Quantity supplied by US, and non-US non-OPEC, would decrease slightly because of the price drop; • Quantity imported by US and non-US non-OPEC would increase slightly 3. Finally, I do not know what numerical quantities are implied for the important variables of the model – price, demand, supply, imports – nor how they will change over time. How would these quantities change over time, once the lagged effects of the demand shift and the price change worked their way through the long-term responses of demanders and suppliers? 4. I would suggest that the author create a couple of graphs and tables that would address these concerns. What I have in mind is something similar to what I have attached in Appendix A; these graphs and tables I created for my 2004 article in *The Energy Journal*, "OPEC's Incentives for Faster Output Growth". Figure 1 and Table 1 in Appendix A present the median values that I assumed, and also the extreme cases that bound the various parameter values. What illustrative diagrams (like my Figure 1 in Appendix A) would be implied by the median values for the following:	

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	• US and non-US demand curves for oil, • US and non-US non-OPEC supply curves for oil, • US demand for imported oil, • Non-US demand for imported oil • Non-OPEC demand for imported oil • OPEC price reaction function. Such graphs would address Point #2 above, which would provide a more realistic diagram to supplement the report's Figure 2 (page 26). In addition, there should be a table summarizing the main parameter values (like my Table 1 in Appendix A). 5. I would also like to see a table that summarizes the numerical implications in several future years (say 2010, 2020, 2030) for the key variables in the model, comparing the base case projections with those of the demand-constrained projections. These would be similar to my Table 3 in Appendix A. 6. Page 29, Figure 3 is very difficult for me to interpret, other than the obvious implications that the current import premium will be higher: the higher the current price of oil, and the less elastic the import supply to the US. As noted above, this is a highly-reduced-form representation of more detailed diagrams. I'd like to understand what these more detailed diagrams look like, for three cases: median parameter values, extreme parameter values that would correspond to the lowest – and the highest – estimates for the import premium. 7. Finally, as noted below, in my response to Question 8 from Peer Review Charge, the parameter value assumptions are summarized only cryptically in the report, on pages 35-36. My sense is that the parameter choices are made reasonably, but it's difficult for me to evaluate what is very cryptic. I would prefer a full table that lists all the parameters, with their median values, their low-premium "optimistic" values and their high-premium "pessimistic" values. In such a table, I would like to see how the extreme values for each parameter would impact the import-premium estimate if that single extreme value were adopted but all other parameters took their median values. **Minor Points of Clarification:** 8. Page 7, Table 3. The title of this table is misleading. Initially it seemed to indicate that the % estimates for each variable related to the % increase in the import premium – some type of parametric sensitivity impacts on the import premium. Instead these are just the % changes in the variables themselves, between 1996 and 2007. I would re-do the table with 3 numerical columns: one with 1996 values, one with 2007 values and (the existing) one with the % differences in these values. I would also re-title the table as "Market and Parameter Changes from 1996 to 2007". 9. Section II.2, page 11. This should be an important section, as indicated by its title. But instead of explaining what the oil import premium *is,* it explains what it's *not*. The first sentence is too cryptic an explanation; it needs much more explanation – say a paragraph or two. The remainder of the section consists of minor caveats that ought to be relegated to footnotes. 10. Page 26-27 Why focus on *optimal* import premium? It's not clear to me that there would be that great a numerical difference	

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	between the “free market premium” and the “optimal premium”. Regardless of that, I’m more interested in the “free market premium”. That seems far more relevant for policy. Why not explain the “free market” import premium for our current level of imports? **Editorial suggestions:** 1. Page 17, line 5: replace “market share” with “output level”; strictly speaking, this possibility is that OPEC would exactly maintain its output level, not its market share. Given a demand reduction, OPEC’s market share would actually increase slightly. 2. Page 28, line 9: “opportunity cost” is not clear or well-explained. I am unsure what type of “opportunity cost” is involved. A single sentence could provide clarification. 3. Page 29, line 3: replace “OPEC response, behavior” with “OPEC response”. This is an awkward sentence; it could be improved by dropping the last word, which is redundant. 4. I would suggest an additional reference be included: Gately, Dermot (2007), “What oil export levels should we expect from OPEC”, *The Energy Journal*, Vol. 28, No. 2. The article is available in PDF form on my website. It argues that the DOE’s Reference Case projection is much too optimistic about the level of OPEC oil exports and therefore prices. This need not require the report to re-do any calculations; my guess is that such a case would be covered already by the range of parametric assumptions that Leiby makes. 5. The tables on pp. 41-42 ought to be incorporated within the flow of the report, rather than tacked on at the end. (Page 36 line 6 refers to “Appendix A” but there is no such labeled Appendix at the **back of the report.)** Typographical Errors: Page 12, line 15: ~~Example~~ Page 15, line 37: after “oil”, insert “price” Page 28, line 5: deletion: “.. at ~~a~~ “ Page 35, line 27: XXXhigher : fix. Page 36, line 6: replace “a” with “an” Page 37, line 7: replace “1993” with “1983” Page 43, line 27: replace “and” with “an”	
4. Hill Huntington	The revised Oak Ridge National Laboratory estimate (ORNL) of the oil import premium uses a methodology that is consistent with their 1997 estimate. That previous study has been widely circulated and has been accepted by many groups as perhaps the best available approach for deriving estimates. I am not surprised by the higher cost in the new analysis, but do think that several	

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	issues should be investigated further. This review addresses the U.S. Environmental Protection Agency's questions for reviewers. I will focus my comments on improving or clarifying some aspects of the methodology or approach, but I do not anticipate that my recommendations will substantially alter the ORNL estimates. The summary contains my principal recommendations. **The Basic Issue** When buyers and sellers negotiate an oil price in the private market, they may not incorporate all of the oil security costs associated with increased oil use or imports. The oil import premium should represent the difference between the societal and private costs of purchasing one more barrel of imported oil. Some policymakers think of the premium as "hidden costs" because buyers and sellers do not directly see them. Although this issue is fundamental to energy security analysis, it does not represent all of the issues that energy policymakers must address. Below are three fundamental decisions: How much should the government spend to abate energy security costs? Should policymakers use tariffs, fuel-efficiency standards, renewable portfolio standards, oil stockpiling reserves, monetary policy, fiscal policy, or military expenditures? Is the oil security premium substitutable for the oil environmental premium or are the two premia complementary? It is important to address the first issue, because if the premium is small or non-existent, the other two questions are moot. Addressing the first question, however, reveals nothing about the second question (the appropriate tradeoff between energy policies, monetary policies, or military expenditures) or the third question (how to combine the oil security and environmental premia). **References** The article by Nesbitt and Choi (1988) is missing from the references.	
5. Michael Toman	This report maintains the author's high standards for careful and lucid explanation of a complex and controversial subject, with significant attention paid to uncertainties and competing points of view. There are some cases, noted below, in which a reader has difficulty inferring from the paper alone what is assumed and what is done analytically. Additional valuable information is provided in the July 20 Power Point briefing, which might be added to the paper as an Appendix. Some readers looking for more detail will want to (re-) examine the 1997 ORNL report. The conceptual basis for the paper is entirely consistent with the literature on energy security premia and oil imports. The analysis here focuses on the monopsony and macroeconomic adjustment premium components. My review, therefore, focuses on the particular assumptions and calculations going into the estimates presented for these premium components. The Summary Results in Table 1 (page 5) show a much higher premium in absolute terms, and a significantly larger premium relative to the base price of oil (~25% versus ~18%). (By way of further comparison, the 2002 National Research Council report on CAFÉ used a figure of $5/bbl for the security premium, with a possible range of $1-10. Depending on whether the $5 is seen as applying to a 2000 or 2002 oil price – both years coming before the run-up in prices from 2003, the result is on the order of 16-19% of the price	

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	of oil). Section II.1 of the paper deals with the reference point. The paper argues for focusing on a value from an incremental change in oil imports (or consumption), relative to a current baseline. This is a very reasonable point of view. However, as noted in Section II.2, the use of this incremental measure needs to be kept in mind when interpreting the findings. The concern here is not just with what is included or excluded. The energy security benefit of a policy that proposed to cause a non-incremental reduction in imports generally would be overstated by taking the incremental premium value times the reduction in imports, since this would not take into account the presumed declining marginal value of successive incremental external benefits. This is illustrated by the comparison of the value of the classic monopsony premium and the value of an optimal tariff for maximizing monopsony benefits. This would need to be kept in mind when using the results of the paper to evaluate energy security benefits from a proposed RFS program, assuming the program had more than a marginal effect on fuel consumption and imports. The oil import monopsony component is given by the level of oil imports divided by the price elasticity of imports to the US. The heart of the calculation of this premium is found at the top of page 17, where key assumptions are explained. Using the standard formula that US oil import demand = OPEC (net) supply + net import demand in other parts of the world, and the parameters given on slide 39 of the July presentation, one can infer the premium. Two questions arise in this context. The elasticity of non-US import demand is given in the text and on slide 39 as -0.86. This figure seems low compared to what one might infer from calculations built-up from elasticities of non-US, non-OPEC supply and non-US consumption demand. (I am grateful to Frank Camm of RAND for the information that follows; he of course is not responsible for my interpretation of it.) The range for demand appears to fall between -0.2 and -0.7, with higher values in more industrialized countries. Cooper (2003) places the G7 elasticity around -0.2 to -0.5 and the total OECD a bit lower. Gately and Huntington (2002) sees OECD around -0.6 to -0.7 and non-OECD about -0.2 to -0.3. Based on his repeated assessments of markets over the last decade Greene (in Greene and Ahmad, 2005) chooses -0.4 as the best point estimate. (Earlier time series estimates of gasoline demand elasticity were significantly higher, ranging up to -0.9 as noted in Parry and Small, 2004). The supply elasticity is harder to gauge. Huntington (1994) suggests a range from 0.2 to 0.6. He chose 0.4 as the best point estimate. Based on his own updated assessments, Greene (Greene and Ahmad, 2005) chooses 0.3 as the best point estimate. Using the quantity parameter information in slide 39, and assuming a demand elasticity of at least -0.4 and a supply elasticity of at least 0.3 yields a ROW import demand elasticity of at least -1.87. This is over twice the elasticity apparently assumed in the study. Since the import supply elasticity to the US is positively related to the modulus of this elasticity, these calculations would imply a more elastic US import supply and a lower monopsony premium. By my calculations, the elasticity would go up by more than 5, holding constant what is assumed about OPEC behavior. This leads to the other key question, the assumptions about OPEC behavior. The text on page 17 describes a range of assumptions, from fixed output in the face of a drop in US demand with price allowed to drop, to coordinated supply reduction so as to completely offset the demand drop and maintain the price. A somewhat narrower range of actual responses is assumed in the model. It is possible that I am incorrectly interpreting this part of the analysis, but these formulations do not seem to include any individually value-maximizing behavior within OPEC, implying a conventional upward sloping supply curve. It is certainly true that OPEC producers are state owned companies, and many individual OPEC members probably have low near term flexibility in their production because of the need to continue financing imports and making debt payments. Saudi Arabia's flywheel role must also be taken into account. However, it seems reasonable that over 10 or more years, some producers with potential for developing	

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	new capacity would respond to softer world oil demand with a reduction in the rate of supply via slowing down the schedule of new investment. A positive elasticity of overall supply, even if relatively small, would have a significant positive impact on the elasticity of import supply to the US, reducing the monopsony premium. In this context, the bullet point on page 35 about the supply response elasticity – which does not seem to say the same thing as page 17 –needs clarification. Section IV.3.1 provides a short but nice discussion of the debate over whether any monopsony power the US has should be used. The arguments against accounting for monopsony power based on exporter retaliation have more force in the context of a direct measure like a tax on oil consumption (taxation of imports would be difficult to do without undercutting an already wobbly international trade system), than they do in the evaluation of a more technology-based oil demand displacement policy like promotion of renewables or energy efficiency. The converse would seem to suggest that in the face of such a policy, there is less prospect for coordinated countervailing production cuts to maintain prices. (As well, of course, in a full analysis any potential deadweight losses of such technology measures must be considered as well.) Shifting to the macroeconomic disruption premium, Section III.2.2. of the paper discussed some recent evidence supporting the widely held view that there are spillover macroeconomic losses relative to potential output when oil prices jump rapidly, rather than increasing slowly. These are described through an iso-elastic relationship between short-term percentage jumps in the price of oil and reductions in realized relative to potential GDP. The range of elasticities assumed, -0.08 to -0.01, is the same as was used in the 1997 report. The paper notes that many observers have suggested a declining macroeconomic vulnerability of the US economy to oil price shocks, noting in particular the decline in physical oil intensity in the economy; on the other hand, recent oil price increases have implied a growth in total oil payments as a share of GDP. Empirical evidence on lower vulnerability is described as mixed. Accordingly, the paper relies on a range of GDP elasticities with respect to oil price jumps that is the same as the previous 1997 report. While arguing that the underlying mechanisms are such that these are spillovers from the oil market – costs to the economy not fully accounted for in individual energy related decisions – Section III.2.3 of the paper reviews the strengths and weaknesses of arguments that the private market does internalize these disruption costs. The analysis uses a range of estimates assuming different degrees of private internalization (zero, 25%, 100%). Although empirical work does yet provide a clear indication of the implications for macroeconomic vulnerability of a declining physical share of oil in output, there does seem to be a reasonable argument that this declining share would reduce output vulnerability. Starting in a pre-disruption equilibrium, it would seem that a lower physical intensity of oil should mean any particular jump in prices would have a lower impact on the total cost of firms' input bundles and induce less incentive for further substitution. The increase in aggregate oil expenditures would be smaller for a given jump in the oil price, and the effect on real wages would seem to be less. While oil might be less substitutable in sectors where it is more intensively used, as especially in transport, the decline in overall intensity would seem to imply less vulnerability. If these arguments are wrong – and other reviewers with more macroeconomic experience are better able to judge that – then at a minimum the relatively widespread and intuitive view that a declining physical dependence on oil reduces vulnerability. Similarly, the importance attributed to a rising value share of oil in GDP needs better explanation. This would seem to imply, for example, that European countries with higher domestic prices due to taxation but lower oil intensities than the US are more vulnerable, other things equal. Or, one could imagine a series of gradual increases over time in the domestic price of oil (perhaps because of a rising carbon tax in some future policy regime). Would it follow that at the end of this gradual price escalation, the economy would be more at risk of macroeconomic adjustment losses? Along the same lines, Slide 17 of the Power Point spells out the equation for GDP losses. Does it follow from this equation that a larger base level of GDP necessarily raises the cost of a	

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	particular oil price shock, even if that growth has been accompanied by a decline in the oil intensity of economic activity? All of these questions suggest at least the possibility that the range of GDP elasticities from the 1997 report should be reduced, with more emphasis in this study on the lower elasticities (lesser degrees of vulnerability). Chart 24 in the Power Point seems to show a more complex set of relationships since 1985, with more oil price volatility a more complex relationships between oil prices and recessions than in the two hallmark shocks of the 1970s. This is consistent with the argument the overall economy has become more flexible since the 1970s, with reductions in the neo-Keynesian rigidities that could lead to spillover effects from oil to labor and capital markets as well as more flexible energy market. The run-up in oil prices since 2002, including several "bumps" along the way, does not seem yet to have precipitated a major economic problem (unlike what seems to be happening in credit markets). Moreover, the entire relationship between oil price movements and oil supplies has become more complex since 1985, with price movements driven by economic growth and expectations-driven changes in inventories (Lilian, 2007). Changes in US oil demand, or shocks in international supply, may therefore have proportionately lower influence on the direction of prices. A final comment on the disruption cost analysis concerns the assumptions about disruption risks. These are described in Table 3 (page 7) as significantly higher than in the 1997 study, based in particular on recent work at the Energy Modeling Forum (see also Beccue 2005, page 2 for a comparison to earlier EMF work). The new EMF results are presented as decadal probabilities of at least one disruption of 3 different severities occurring; it also considers three different durations from quite short to very long. How these EMF figures are translated into use in the model is not really explained. Slides 21 and 22 in the Power Point provide a bit more information, but the explanation is still missing. Given the importance of this set of assumptions, this paper should contain more information about how the probabilities were derived and adapted for use in the premium analysis, to allow readers to form their own judgments. (Intuitively it would seem possible to argue that the probability of more frequent but smaller and more contained disruptions has risen in the volatile environment we confront; the probability of a major and prolonged disruption seems more difficult to gauge.) How in particular would different views about the evolution of Saudi excess production capacity change the picture? Since the EMF study explicitly excludes SPR drawdown offsets, how would the availability of a larger SPR affect the disruption risks assumed (occurrence frequency and size)? The report notes that it is keyed to EIA's base case scenario, and that if other scenarios (high or low price, high or low growth) were considered, the range of estimates would be even larger. I wish this point had been developed further, even at the risk of lengthening and complicating the analysis. A key uncertainty, as revealed retrospectively during the recovery from the Asian economic crisis, is the rate of growth of non-OECD oil demand. Evaluating the sensitivity of the premium estimates to such differences seems quite important for judging the value of a RFS policy or other policy for limiting US demand. (This analysis would require more than just looking at different EIA scenarios with different probability weights, since those scenarios are keyed to specific price paths and assume in particular adjustments in OPEC supply to rationalize those paths, given other supply and demand behavior.)	
6. Mine Yucel	It was a pleasure to read "Estimating the Energy Security Benefits of Reduced Oil Imports". The analysis has been very carefully done and the paper is extremely well written. The literature survey is extensive and very thorough. After documenting the previous work on the import premium, the paper analyzes the arguments for an import premium by presenting the cost components of a barrel of imported oil in addition to its purchase price. The costs consist of the monopsony cost, arising from the large share of US oil imports, plus disruption costs. The disruption cost, in turn, is composed of an import cost component and a GDP dislocation cost component. Given the assumptions made about the costs of disruption, the paper is executed flawlessly. My concern is with some of the assumptions and parameter values that might bias the import premium upward. The paper states on page 17 that "… changing the quantity of petroleum imported into the U.S. may also affect the probability or size of such a	

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	disruption" The effect of imports on the probability of disruption is later taken as zero, but the assumption that U.S. imports affect the size of the disruption is left intact. I am not sure how viable this assumption is. Clearly high U.S. imports increases the call on OPEC and reduces their excess capacity. Part of the energy security argument is that our imports come from unstable parts of the world and hence are susceptible to disruption. That the majority of U.S. imports do not come from the Middle East is a moot issue because oil is a fungible good and a disruption anywhere in the world will increase the price of oil. But the question is how would a disruption arise? Embargoes on oil exports? War between two Middle Eastern producers (as in the Gulf War)? I would put the highest probability on a disruption due to random terrorist acts on oil industry infrastructure. I don't think our oil imports would affect the size of this type of disruption. Moreover, lengthy disruptions where prices increase and stay elevated for a long time are not in OPEC's interest. Gately (2007) shows that constant export share is the most likely objective function for OPEC. If constant export shares are OPEC's goal, high prices are not necessarily in OPEC's interest because higher prices bring forth non-OPEC supply, and lower OPEC's export share. Gately points out that after the price doubling in 79-80, OPEC's exports have still not gotten back to the 29 mb/d level 30 years ago. Hence, OPEC might try to quickly remedy the situation by filling the supply gap, if possible. In addition, the global economy is becoming more and more interdependent. Increased trade in goods and services between nations will dictate that economic decision-making dominate rather than politics. The sensitivity of GDP to oil prices is another parameter that could bias the premium upward. Most analysts and scholars have been surprised that the tripling of oil prices since 2002 has not had as detrimental an effect on the economy as expected. There may be many reasons for this, including a lower oil to GDP ratio, better monetary policy, and a more flexible economy (more flexible prices and wages, less regulation in financial markets, energy markets and in energy-dependent industries such as airlines). Although we hadn't been able to capture these effects in earlier models, there are several new studies that have been more successful. For example, Blanchard and Gali (2007) show that the price elasticity of GDP is much lower now, compared to the 70s. Although the policies that would be used to lower imports are not the subject of this paper, they are an important piece of the puzzle. The paper states "It is only the change in the expected costs of disruption that result from policy that is relevant. The expected cost of disruption may change from lowering the normal (pre-disruption) level of domestic petroleum use and imports, (and) from altering the short-run elasticity of petroleum use." The choice of policy to lower oil imports is very important. A policy that lowered imports but didn't lower oil consumption would be very costly. Any subsidy to domestic oil producers for example, would increase rather decrease our vulnerability to oil price shocks. Because the oil price is a world price, a disruption would also increase domestic oil prices and the economy would be worse off, even with less imports. The best policy would be one that increases the price elasticity of demand for oil as the paper states, especially in the transportation sector, which has the most inelastic demand. I have a couple of suggestions that would make the estimation part of the paper easier to understand: a. The paper is very well written and documented until we get to the calculation of the oil import fee. It would be helpful to the reader if there was more detail on the calculations. The 1997 paper is better documented and I had to refer to it to get a better understanding of the numbers. b. The current document does not include a table of the parameters used in the study. A table similar to the one in Paul Leiby's presentation slides is necessary to fully understand the model.	

Question 1

What are the market failures associated with U.S. oil imports from an energy security perspective (i.e., effects that are not internalized/incorporated in private decisions)?

Commenter	Comment	Response
1. Joseph Aldy (1)	The primary market failure in this market is the imperfect competition associated with OPEC cartel behavior. (Of course, there are a variety of environmental externalities associated with oil extraction and consumption.)	
2. Stephen Brown (1)	The market failures associated with U.S. oil imports could include the loss in U.S. GDP that occurs when an overseas shock to the world oil supply produces a sharp increase in world oil prices. To the extent they are positively related to the level of oil imports, the costs of policies—such as military spending and the use of the strategic petroleum reserve (SPR)—to prevent or offset such supply disruptions should also be incorporated in the social costs of imported oil. The monopsony premium for U.S. oil imports does not reflect a market failure. Rather it reflects an opportunity for the United States to use its position as a dominant world oil consumer to alter the terms of trade to its own advantage. In a negotiating framework, a buyer's monopsony power can be used to improve overall welfare when there is a monopoly seller. Although the United States is a large buyer, the use of tax or regulatory policies to reduce oil imports will not achieve an overall gain in international welfare. Such policies will reduce world oil production and yield transfers from oil-exporting countries to oil-importing countries. The adverse transfer in income from the United States to oil exporting countries that occurs when there is an oil price shock would not normally be thought of as a market failure, but it can create a wedge between the market price of oil and the expected cost of its use. A social cost may arise within the United States because individual American consumers will not take into account how their increased use of imported oil will affect the magnitude of disruptions faced by Americans and the size of the transfer that is made to oil-exporting countries.	
3. Dermot Gately (1)	The report describes these clearly and sufficiently.	
4. Hill Huntington (1)	**Market Failures** This review will focus on the security but not the environmental premium. There are potentially three important market failures that might create hidden security costs. First, oil producers might charge a price that exceeds their marginal costs. Governments owning oil resources and wanting to stay in power often exploit their resources more slowly than private companies. The resulting higher oil prices allow these governments to provide a range of public services that reinforce their control of the country's political process. Absent effective competition from private companies in developing these resources, governments have some leeway to depart from pricing strategies that achieve economic efficiency. Moreover, explicit or informal cooperation among oil-producing countries enhance the opportunities to overprice oil resources relative to competitive conditions. Although monopolistic conditions may expand or contract over time as market conditions change, many experts view the Organization for Petroleum Exporting Countries (OPEC) as a clumsy cartel that still exerts some upward pressure on oil prices. ORNL includes this market failure as the market or monopsony power component, by estimating the ability of US society (organized as one buying unit rather than as individual	

Commenter	Comment	Response
	consumers) to reduce the monopoly price charged by OPEC. Second, oil suppliers and consumers may not understand the actual risks of another oil disruption caused by political unrest in overseas areas. Typically, OECD governments spend enormous resources to develop information about political trends overseas and they do not share what they learn with the private sector. Although the government might overestimate the risks of oil disruptions under some conditions, it seems just as likely that the private sector may underestimate these risks. For example, the best analysis of private oil stockpiling within the OECD nations implies that it takes a reduction of 8 or 9 barrels of public stockpiles to encourage one more barrel of private crude oil stockpiles (Aldy 2007). This 8:1 ratio represents a very low "crowding out" between private and public stockpiles, much lower than for many other public expenditures. ORNL includes this market failure as the import cost disruption component, by incorporating different assumptions about how much oil producers and consumers correctly anticipate the risks of another disruption. Third, firms and workers may make pricing and output decisions that harm other sectors of the economy in the form of increased unemployment and idle capacity. Unlike the security costs in the second point above that are incurred by the decisionmaker who lacks sufficient information, these costs are external to the ones making the decisions. Since these interdependencies operate through the market system, these macroeconomic externalities should be viewed as pecuniary rather than technical externalities. If the oil-using economy was comprised totally of many competitive sectors, the analyst could ignore these pecuniary externalities because they do not influence welfare (Folkerts-Landau 1984). Many macroeconomic and industrial organization economists, however, have shown that monopolistic competition may be a better representation than perfect competition for modern economies (Bresnahan 1989). Under such a market environment, pecuniary externalities cannot be ignored because they do influence welfare (Romer 1996, p. 114). Using such a framework, Huntington (2003) shows that the risk-adjusted macroeconomic externalities might produce welfare losses that are comparable to the market or monopolistic power component. Other suggested components for the oil import premium are either subsets of the above market failures or do not belong in the estimate. For example, some public commentary calls today's higher oil price an oil tax imposed by governments owning oil resources. Citizens hate taxes, which can be very inefficient. It seems likely, however, that the market or monopsony power component already incorporates this effect. Alternatively, the revenue received by oil-exporting countries may finance terrorism and other activities that are particularly distasteful to the OECD nations. Essentially, this issue means that a dollar sent overseas to an oil-producing country represents a cost that exceeds that dollar. Cost-Benefit analysis can place different values on the market power component to reflect our distaste for revenues collected by these governments and recirculated to harmful groups, but this approach would be an adjustment to the market power component rather than a new component. I support the decision to exclude this issue from the ORNL estimate, because it is very difficult to determine. I do not think that the premium should include military expenditures for the reasons discussed later in my report.	

Commenter	Comment	Response
5. Michael Toman (1)	The paper properly identifies the two most important candidates – the potential for US energy policy to marginally lower world oil prices from above-competitive levels, and the potential for energy policy to reduce vulnerability of the aggregate economy to price shocks. The question is their empirical size and significance.	
6. Mine Yucel (1)	There are several market failures in the energy market. a. Monopoly producers. The energy market is not a competitive market because OPEC can act as a cartel and keep prices higher and output lower than a competitive market. b. Monopsonistic buyer. The U.S. consumes 24.4 percent of world oil and its share of world exports is nearly a 25 percent. Hence, it is a monopsonistic buyer of oil, i.e. changes in U.S. oil imports can affect the world price of oil. c. Energy R&D is a public good. Another market failure in the energy sector is that there is less R&D in oil substitutes than is optimal because the benefits of R&D are a public good, while the costs are private. There is some subsidization of R&D (fuel substitutes, etc), but I don't know the magnitude and how close we may be to an optimal allocation. d. Asymmetric information. Private users of energy may not have information about the probability of disruption and will not stockpile enough privately to protect against an oil-supply disruption.	

Question 2

Does the ORNL methodology/model represent an appropriate approach for estimating the energy security benefits to the U.S. from reducing U.S. oil imports? In particular, is there a monopsony effect associated with reduced U.S. oil consumption? If so, does the ORNL methodology/model appropriately address this effect? In particular, does it adequately capture potential supply responses (e.g., strategic and otherwise) to a reduction in U.S. demand? Is there a better way to model potential supply responses (e.g., using game theory)? Is there a macroeconomic disruption/adjustment cost effect? If so, does the ORNL methodology/model appropriately address this effect?

Commenter	Comment	Response
1. Joseph Aldy (2)	I do not believe that the current version of this analysis is adequate to inform the question of the energy security benefits associated with reducing U.S. oil imports. Please refer to my discussion in (2) and (3) above for more details.	
2. Stephen Brown (2)	The ORNL analysis takes the standard approach to computing the oil-import premium. It includes U.S. monopsony purchasing power in the world oil market and the expected cost to the United States of a foreign oil supply shock. The latter comprises multiple elements, including a shock to the direct costs of oil imports and the loss in aggregate U.S. economic activity that occurs when a supply shock boosts world oil prices. Military expenditures and the cost of the SPR are excluded. Assuming that it is appropriate to conclude that U.S. military expenditures and the cost of the SPR are not a function of U.S. oil imports, these elements represent a comprehensive approach to estimating the oil-import premium as it is understood in the existing economics literature. Also see section 8 below.	
3. Dermot Gately (2)	I believe that both of these effects exist and that the ORNL approach address them appropriately. There are additional supply responses that could be listed, such as the possibility that the Saudis' could quietly communicate their displeasure with proposed "US market manipulation". They might threaten to modify their output behavior and capacity expansion plans so as to ensure that the price-path would be higher not lower if the US were to pursue such a policy. Private Saudi threats could be accompanied by well-timed public announcements about Saudi capacity expansion plans, which might well deter US policy adoption.	
4. Hill Huntington (2)	**Higher Premium Estimates** Although ORNL evaluates reasons why the revised premium is higher in 2006 than in 1997, this issue will continue to confuse many readers. Based partly on equation (8), I expected that the per-barrel market power premium to rise directly with the baseline oil price path and no other factors would affect the estimate. In other words, if the baseline elasticity assumptions are not changed, the *percentage* by which the premium exceeds the baseline oil price path should be relatively constant. A more careful reading shows that oil import levels influence the premium through the price elasticity of import supply. Perhaps that point could be emphasized after introducing the equation and refer the reader to the later footnote 31. From Table 2, the baseline oil price path is 2.25 times higher in the revised estimate than in the 1997 estimate. Meanwhile, the revised mean market power premium is 3.5 times the 1997 mean estimate as reported in Table 1. With a little revision, Figure 3 could elaborate on this issue. The 1997 mean estimate ($3.50) intersects the $15 price curve at an import elasticity of about 6. The 2006 mean estimate ($9.00) intersects the $45 price curve at an import elasticity of about 5. Are these import elasticity estimates close to being the actual ones used in the simulations for the mean values? The discussion would flow much more	

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	easily if the report could provide more calibration on the expected size of the market power premium. There is an important inconsistency between the $15 oil price in the 1997 study (Figure 3) and the $20 oil price counterpart (Table 2). Which is the better estimate to use for computing the change in oil price conditions between the two studies? In addition to higher oil prices, the revised macroeconomic premium could be higher for several reasons: greater disruption risks (30% according to Table 3), larger *percentage* price shocks (unknown), or different GDP responses (held constant, p. 36). Ignoring the last two factors, we might expect that this revised premium would be 30% higher due to disruption risks and 125% higher due to oil prices, or 2.55 times the 1997 estimate (2.55 = 1.00 + 0.30 + 1.25). Instead, it exceeds its 1997 counterpart by an even greater amount, at 4.5 times the original value. The sharply higher disruption costs are puzzling, unless additional information can be provided. **ORNL Methodology for Market Power Premium** ORNL provides a careful and thorough analysis of the market power premium. The probabilistic simulation framework allows them to incorporate many different perspectives on market behavior, including the assumption that United States actions will have very little impact on oil prices. Detailed discussion of alternative methodologies and parameter values will appear later in my report. **ORNL Methodology for Disruption Premium** In contrast to the market power premium, the disruption premium will generate much discussion and anguish, principally due to the inclusion of GDP effects. On this issue, I confess some sympathy with the ORNL researchers, who have tried to represent these effects within a probabilistic framework that includes a wide range of estimates from the literature. At the lower end of this range are estimates from large macroeconomic models that do not distinguish today's high oil prices from events where oil supplies are explicitly disrupted. At the high end are estimates from smaller research econometric studies focusing explicitly on oil shocks. I have one broad recommendation before making a set of detailed comments. Can you separate the direct oil import costs caused by disruptions from the GDP output losses? This procedure would allow the reader to ignore the GDP losses rather than the total disruption costs if he thought that oil shocks have no effect on the economy's output or that GDP losses have no effect on welfare (both incorrect in my view). *Disruption Risks.* Table 3 reports that disruption risks are about 30% higher than in the 1997 study. The probabilities listed at the bottom of page 41 appear to contradict that assertion, or additional commentary is necessary. The EMF-2005 estimates of at least one disruption are lower than the 1996 mid estimates for both 1 and 6 million barrels per day reductions. *Import costs.* ORNL makes a critical assumption in moving from equation (12) to equation (14) on pages 32-33. The first equation specifies the oil price shock as a function the quantity disruption in the oil market. The second equation makes it a function of the US pre-disruption import level as well. It is not obvious that greater imports from Mexico will increase the size of the oil price shock caused by a shut-down of Middle Eastern production of some given size. (Working with linear US import supply and demand functions, I shifted the demand curve inward for the import-reduction policy and the supply curve upward for the shock. I find that the oil price shock is the same whether I move along the original demand curve or along the demand curve after the import reduction. Although a decrease in imports clearly exposes fewer barrels to disruption losses directly, I do not understand how it affects the oil price shock indirectly.) I will continue under the assumption that US oil import levels can affect the size of the price shock. In this case, import levels can	

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	create more GDP losses through the oil price shock size. If this assumption cannot be justified, however, I think that the GDP effects from importing one more or less barrel will vanish. (GDP effects may still apply for oil *consumption*, but that is a different issue that is not being addressed in the report.) *Constant GDP Responses.* Although ORNL does a good job at representing the diversity of views about the GDP response to oil price shocks, I wonder about the decision to keep the GDP elasticities unchanged from ten years ago. I have a simplistic view that what really matters is the capacity of monetary authorities to keep inflation under control *prior to a disruption.* That foresight allows them the ability to offset some of the GDP losses once a disruption happens, without escalating inflation further. If this line of reasoning has value, then the appropriate risk tree might look like the following. If a disruption happens, there is an X percent chance that monetary authorities will be able to respond and the GDP impacts will be at the lower end of the range. But there is also a probability of (1-X) that economic conditions will not allow an appropriate offset, whereby the GDP impacts will be at the higher end of the range. One might assign a relatively high probability for 1-X (perhaps equal to or above 40%), if one did not have much faith in the authorities in many growing LDCs that export goods to the United States. The governments in these countries control their monetary authorities pretty tightly. On the other hand, 1-X might be a low probability if today's environment is a good indicator of future conditions. One possibility that would communicate the same information would be to conduct a sensitivity on how changes in the GDP response assumptions affect the total import premium. *Measuring Welfare with GDP.* ORNL computes the output losses from disruptions in terms of reduced GDP, the principal activity variable analyzed by macroeconomists. Energy and microeconomists are much more comfortable with economic surplus losses. Unfortunately, there is little communication between these groups to guide ORNL. I do not think that GDP losses bias the welfare losses in one direction or another, but I do recommend that the report acknowledges that GDP and welfare are not necessarily the same concept. Those who argue that GDP losses and rising unemployment overstate the welfare losses usually focus on workers who voluntarily drop out of the labor market in order to retrain or search for different employment. Those who argue that recession-induced welfare losses often exceed the decline in GDP usually focus on the deadweight triangular losses from producing less than optimal output (Gertler, Gali and Lopes-Salido, 2007). As output departs further from the full-employment level, welfare losses increase more than proportionately.	
5. Michael Toman (2)	None of these questions admit simple answers. There necessarily is some ability of the US to lower world oil prices by cutting its own oil demand, except in the unlikely polar case of 100% offset by a well organized producer cartel. This will be the case across a range of demand reduction policies, be they increased efficiency or fuel substitution. The risk of retaliation would likely be modest in the face of such actions, compared to more explicitly beggar-thy-neighbor policies. I do not think a more complex or strategic approach to addressing these issues would be that helpful, since the basic uncertainties regarding elasticities and other behavioral parameters are high enough as it is. There is a need, as noted in my comments, to address questions regarding the magnitude of the potential monopsony gain, which may be somewhat to significantly smaller than estimated here. With respect to the disruption component, time series and other evidence does seem to indicate the presence of a statistically significant negative effect on GDP from oil price shocks, even after monetary policy influences are taken into account. The nature and magnitude of these effects remains subject to debate. Large models tend to show smaller impacts than small reduced form models, but the larger models also may not be designed to capture all the relevant short term adjustments. Thus, a different or more complex model might not really help much at this stage; more basic micro-level research will help. In the meantime, as noted in my comments, the estimates presented here seem likely to be on the high side, not giving enough emphasis to various	

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	factors that could be expected to have lowered the oil price change-GDP elasticity over the past 10-20 years.	
6. Mine Yucel (2)	The ORNL methodology/model is a well-know methodology that has been used by many researchers ever since the first oil shock, for estimating the energy security benefits to the U.S. from reducing U.S. oil imports. These papers, such as Bohi and Montgomery (1982), Hogan (1981), Plummer (1982), (Broadman (1986), Broadman and Hogan (1988) have all been cited by the ORNL study. Monopsony. There is a monopsony effect associated with reduced U.S. oil consumption. The U.S. is a very large buyer of oil, importing nearly 25% of world oil exports and consuming a similar amount of total world oil production. Theoretically, in a bilateral monopoly, (somewhat similar to the oil market with OPEC as monopolist and U.S. as monopsonist), the market outcome is indeterminate and the price and quantity outcome depend on the market power of the monopolist and monopsonist. Bilateral monopoly examples are usually taken from labor markets where the final price and output depend on negotiation between the two players and could be closer to a competitive outcome if the monopsonist and the monopolist are equally matched. Supply Response. Although the ORNL study does not explicitly model the supply response, the range of parameter values used for OPEC and non-OPEC supply elasticities are wide enough to capture the potential supply response. However, even though the realistic OPEC response may lie within the range of parameters, we need a base or reference case that will represent the most likely scenario which is not necessarily the mid point of the parameter range. The supply response will depend upon which model of OPEC behavior one subscribes to. Hence, the outcome will be different whether we think OPEC has a goal of target revenue, target price or target market share or some other target. A recent study by Gately (*Energy Journal*, 2007) argues quite persuasively that OPEC's target could be stable export share. If the US reduces its imports of oil and this reduction is evenly distributed among all exporters (OPEC and non-OPEC) and, in addition, OPEC is operating under a constant market-share target, then OPEC would not have to change its output or exports because its market share would not change. However, OPEC's response would also depend on how non-OPEC supply responded to reduced prices (non-OPEC supply elasticity is fairly low in the model). If there are threshold prices for certain high-cost supply regions (i.e. the price has to be above a certain level for production to be feasible), then supply from these regions could fall with falling prices, which would lead to a cut in output from OPEC to keep their export share constant. In such a case, import reduction by the U.S. would not necessarily lower world oil prices. If OPEC's target was a certain price level, then a reduction in US imports would lower the world price of oil and OPEC would cut production and exports to keep to a price target. If constant export shares are OPEC's goal, high prices are not necessarily in OPEC's interest because higher prices bring forth non-OPEC supply, and lower OPEC's export share. Gately points out that after the price doubling in 79-80, OPEC's exports have still not gotten back to the 29 mb/d level 30 years ago. Lengthy disruptions where prices increase and stay elevated for a long time are not in OPEC's interest. I suspect a disruption would most likely be the result of terrorist activity. OPEC would try to quickly remedy the situation by filling the supply gap, if possible. There are quite a few studies which show that the response to oil shocks are asymmetric, i.e. the response is smaller for a price decline that it is for a price increase. If a US reduction in imports reduces world oil prices, the demand response from other countries may be smaller than the same magnitude price increase, which may not be captured	

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	by the model. Macroeconomic effects. There is a macroeconomic disruption/adjustment cost effect, and it depends on our consumption of oil. The cost to the economy from higher oil prices is a function of our consumption, not how much we import. Because the price of oil is a world price, as soon as there is a disruption or an increase in oil prices, domestic producers in the U.S. will also receive the higher price. The paper states that they are not positing how the import reduction is generated, just calculating the cost to GDP. I don't think we can abstract from how we reduce imports, because it will alter the cost calculations. The cost will depend upon whether consumption is changed or not. Costs will be lowered if our demand for oil becomes more elastic. For example: Import reduction is achieved through increasing domestic supply. If consumption stays the same, disruption effect will be the same even if we import less. Plus, we would have to add the costs of increasing supply (subsidy?) Import reduction is achieved through use of a substitute. This is most important in the transportation sector where demand is the most inelastic. If hybrid technology were developed enough that we could switch to a fuel cell when gasoline prices went up, demand would be very elastic and disruption costs would be much lower. On the other hand, substitution into a fuel where gasoline is used in a fixed ratio (such as the current ethanol in conjunction with gasoline) would not increase the elasticity of demand for oil. In the non-transportation sector we could lower imports and the consumption of oil by switching to natural gas in all uses possible. The increased demand for natural gas will push natural gas prices up. Although we currently have a domestic market for gas, the U.S. may have to import more gas to meet increased demand. Moreover, the market for gas is also becoming a world market, with the possibility of a gas cartel also looming in the distant future. So we may eventually find ourselves in a similar situation with gas imports.	

Question 3

Do alternative methodologies provide additional useful information for estimating the energy security benefits of reduced U.S. oil imports? What are the strengths and weaknesses of the ORNL model relative to other models? What data and analysis techniques would be necessary (to conduct an alternative analysis)? What is a reasonable time to conduct such an analysis?

Commenter	Comment	Response
1. Joseph Aldy (3)	First, I would build a simple model from first principles to describe how oil affects the U.S. economy and to describe the OPEC-US oil trade relationship. I found the reduced form presentation of the benefits and costs of consuming imported oil difficult to follow and not very transparent. Second, I would present econometric evidence of the monopsony effect and the GDP losses from oil price shocks. The recent work by Blanchard and Gali would be a good reference for this. They present both a new theory model of the macroeconomy that includes oil and a variety of econometric analyses that account for how the U.S. economy responds to shocks differs in recent years relative to the 1970s. Building a new model would take a fair amount of time. To do it right, and to do the complementary econometric analysis (e.g., for generating parameter estimates with most recent data), would likely take a year or so. It is also important to note that modeling the monopsony question is very hard. I would advise starting with a simple model like what Maskin and Newberry developed, and determine how to expand on that to provide some more insights. But at the end of the day, I believe that empirical estimates of monopsony based on historical data may deliver better payoffs.	
2. Stephen Brown (3)	The ORNL approach draws on an existing economic literature that extends back over more than 20 years and includes thinking from some of the best minds in economics. Creating an entirely new approach that is accepted by the economics profession would be a considerable challenge. One may quibble with the approach of modeling OPEC behavior through assumed supply elasticities. Previous economic research has taken a variety approaches to modeling OPEC behavior, including a cartel, a dynamic cartel, using pricing rules, market sharing rules, etc. The existing empirical research suggests that OPEC is a poorly performing cartel and that its production responds positively to oil price movements. The use of a range of OPEC supply elasticities likely captures its behavior reasonably well. The use of a game-theoretic model would substantially complicate the analysis and likely yield results that do not conform well to reality.	
3. Dermot Gately (3)	My understanding of the ORNL approach is that it is a "comparative statics" analysis. One alternative approach would involve simulation of the world oil market over the next 20-30 years, comparing base case projections with those involving restrictions on US oil demand. My own model (used in my *Energy Journal* papers of 2001, 2004, 2007) would be a natural candidate. Such calculations could be done within a reasonable time, at a modest cost.	
4. Hill Huntington (3)	**Alternative Methodologies for Market Power Premium** Additional insight might be gained by applying game theoretic models that allow a range of different strategies that could influence the market power premium. Modest changes in assumptions, however, will lead to very different conclusions, and I am pessimistic about whether this work will lead to robust conclusions about the premium's magnitude. Ultimately, a framework like ORNL will be needed to incorporate and communicate the rather diverse perspectives that experts hold about the existence and size of the market power premium. A completely different approach would be an econometric study where a researcher tries to tease from the historical data how oil prices have responded to import-reduction policies. The effort would need to model Non-OPEC supply and demand decisions together with OPEC behavior to determine oil prices. In addition to the usual market determinants, the modeling would need to insert policy variables that measured independent measures (e.g., taxes or vehicle fuel efficiency standards) for reducing imports.	

Commenter	Comment	Response
	It would not be easy to implement this approach because it has been very difficult to produce credible world oil models, but the effort might produce some interesting insights about the assumptions incorporated in the ORNL study.	
5. Michael Toman (3)	I don't think this is primarily a modeling problem. Over the longer term we need better micro-level data, additional analysis of the macro-level impacts, and improved information to support guesses about future supply and supply and demand behavior. This is a research program for some years. Given the current state of knowledge the ORNL approach, while quite simple, is sufficient both to show the numbers and to perform critically needed sensitivity analysis.	
6. Mine Yucel (3)	The ORNL model is a partial equilibrium analysis, so the response of oil exporters, other importers and the response of the economy is calculated using elasticity estimates from the literature. Aside from the parameters that are varied, it is a ceteris paribus world. Even though the U.S. is a large player in this market, demand from importers like China and India is having a major effect on the market and prices. The increase in demand from these countries may offset some of the import reduction from the US. A dynamic, stochastic general equilibrium (DSGE) model may better capture some of the responses to a US oil import reduction. As Leiby also notes in the presentation slides, some of the large macro models have much smaller oil price effects on GDP. The GEM model of the IMF or the Federal Reserve Board of Governor's SIGMA models are the kinds of models that may be useful in doing sensitivity analysis with respect to how the world reacts to a US oil import reduction. These models are hard to build and would take considerable time and effort. A joint effort with ORNL and the IMF or FRB might be more efficient than starting from fresh. There may be spillover effects from benefits to allies and trading partners. The paper mentions this issue, but it is not much explored. The feedback from other countries in response to a change in oil prices could be captured with a large macro/international model. For example, in a recent paper which employs a DSGE model, Steve Brown, Nathan Balke and I find a complex feedback mechanism that works through channels that do not exist in a partial equilibrium model. We show that oil price increases that arise from increased demand from other importers of oil need not necessarily be hurtful to the US economy. The benefits come through increased US exports of non-oil goods to the other importer and a change in the labor/leisure trade-off in the US. Hence the costs of the oil price increase are offset by other benefits to the US economy. The cost of an import reduction will depend greatly on the response of OPEC. As I mentioned above, OPEC's objective function is an important driver of the response. Even though OPEC's response from any model of OPEC behavior would lie within the parameter ranges of the model, it is important to specify OPEC's objective function in the base/reference case.	

Question 4

Is the model adequate for supporting regulations that reduce U.S. dependency on foreign oil? Can the model be generalized to incorporate discrete changes in oil imports (e.g., President's "Twenty in Ten: Strengthening America's Energy Security" Initiative?) in addition to marginal changes in U.S. oil imports?

Commenter	Comment	Response
1. Joseph Aldy (4)	No. See answer to (2).	
2. Stephen Brown (4)	Consistent with previous estimates of the oil-import premium, the quantitative analysis implicitly assumes that the premium will be applied as an optimal tariff. Directly implementing such a tariff is generally inconsistent with overall U.S. trade policy. Worse than prompting retaliation from world oil producers, implementation of such a tariff could lead to a global increase in protection and an overall lessening of world trade. Consequently, the ideas contained in the oil-import premium are likely to be used indirectly, such as to guide regulatory policies or subsidies that would promote energy conservation or the development of alternative energy sources. In such cases, the premium must be scaled down to reflect by how much the policy will reduce oil imports. Guidance for such implementation can be derived from the world oil model used in the ORNL analysis. Use of other models may not be consistent with estimated premium. Care must be given to applying the optimal oil-import premium to inframarginal policies, such as the President's initiative "Twenty in Ten: Strengthening America's Energy Security." To assure consistency across a number of such policies that might be implemented, the optimal premium should be used to evaluate all such policies initiatives. In addition, the effectiveness of each policy in reducing oil imports should be evaluated in the light of other policies that are likely to be implemented simultaneously. Otherwise, the estimated benefits may be too large. The United States also has a long-standing position of favoring free-trade. The explicit use of monopsony purchasing power over imports as an element of energy or environmental policy could be viewed as against U.S. interests, even when such policies are applied indirectly.	
3. Dermot Gately (4)	It appears to me to be appropriate. I don't see any important difference here.	
4. Hill Huntington (4)	**Regulatory Analysis** ORNL is not a policy model but instead provides a benchmark estimate to determine whether government should adopt a certain policy or set of regulations. For example, President Bush's "Twenty in Ten: Strengthening America's Energy Security" Initiative seeks to reduce U.S. gasoline usage by 20% in the next ten years. That policy should be evaluated with a detailed energy model like the National Energy Market System (NEMS) maintained by the U.S. Energy Information Administration. Baseline and policy simulations would produce estimates of the marginal costs of reaching the 20% target. These costs should include the price changes for petroleum and replacement fuels as well as any additional vehicle costs. If the policy costs exceeded the premium estimates, the policy incurs net costs to society and should be avoided. If those costs fell below the range of ORNL premium estimates, the policy might be worthy of further consideration.	

Commenter	Comment	Response
5. Michael Toman (4)	The question of what is “marginal” is to an extent a matter of judgment. Impacts on the order of a 20% reduction in US gasoline demand likely would require some adjustment of the truly marginal premium estimates derived here. I suspect (based on intuition, not analysis) that this could be done using numerical approximation methods without such great difficulty. The bigger difficulty is what confidence we would have in potential changes in elasticities and the like with such non-marginal changes in the market.	
6. Mine Yucel (4)	The model lays the basis for calculating the marginal benefits of reducing US oil imports and can be generalized to incorporate the effect of discrete changes in oil imports. However, the costs will depend on how the imports are reduced, because the policies undertaken to reduce imports will have effects on the economy and on oil consumption and prices. The model does not take into account how imports are reduced. Because of the uncertainties inherent in the parameters, any regulation based on the model needs to take the lowest import premium case and calculate the benefits and costs of the regulation compared to that “least cost of imports” scenario.	

Question 5

Are there existing methodologies/models that can quantify the military component of U.S. energy security benefits? If so, can and should these methodologies be incorporated into the ORNL methodology?

Commenter	Comment	Response
1. *Joseph Aldy (5)*	I am not familiar with existing methods or models that can quantify the military component of the U.S. energy security benefits. One could consider the analyses undertaken by Bill Nordhaus and Joe Stiglitz about the costs of the Iraq War. They may provide some leads. I would caution against including military cost estimates. First, the expenditures on military are a transfer, not a cost. (Although one could account for the marginal excess burden in such a calculation, assuming that military expenditures that would have supported a base or operations in an oil-producing region would not just go to expenditures elsewhere in the federal budget.) Second, military expenditures tend to be very lumpy (i.e., building a base, an aircraft carrier, the Iraq War), so it may be difficult to ascertain the marginal effect of being "more energy independent" on military decisions.	
2. *Stephen Brown (5)*	The decision to exclude military spending from the ORNL analysis follows the existing literature on the oil-import premium, but it may prove controversial in light of continued U.S. intervention in the Middle East. A case can be made that absent U.S. oil imports and world dependence on oil produced in the Middle East, the United States would have substantially less reason to intervene in the Middle East. On the other hand, the United States has intervened militarily in a number of places where oil is not at stake, and has not intervened in other places where oil is at stake. Of interest, however, is the narrower issue of whether U.S. military spending is affected by the *marginal* barrel of imported oil. Even if the substantial U.S. reliance on oil imports and the instability of oil supplies have led to military intervention in oil-producing regions of the world, the ORNL report asserts that the extent of military spending is likely to be unrelated to the marginal barrel of imported oil. If one envisions a single barrel of oil against projected U.S. oil imports of 12.8 million barrels per day, the effect is likely to be vanishingly small. Unfortunately, such thinking can be misleading. Instead, one should be asking whether U.S. military spending is positively related to U.S. oil imports. Using data from 1968 through 1989, Darwin Hall (1992) finds such a relationship. Using rough procedures, he estimates that for every million barrels of daily U.S. imports, the United States increased its national defense spending by $2.67 billion (real 1982 dollars) annually, which would translate to $7.31 (real 1982 dollars) per barrel of imported oil. Although the validity of Hall's specific estimates is unclear, they do suggest the possibility of a positive relationship between U.S. oil imports and U.S. military spending that would be taken into account in a more complete analysis. Assuming that the probabilities of disruption used in the ORNL analysis are consistent with current military spending, Hall's estimates could be translated into a rough estimate of $12.76 per barrel (real 2004 dollars) and added to the ORNL estimates. A more refined and updated analysis, which could take into account the effects of U.S. military spending on the probability of disruption, might yield substantially different estimates of the relationship between U.S. oil imports and military spending, including no significant relationship.	
3. *Dermot Gately (5)*	I am not familiar with any such methods or models, but this does not imply that none exist, because I do not feel qualified to comment on such questions.	

Commenter	Comment	Response
4. Hill Huntington (5)	**Military Expenditures** Military expenditures have nothing to do with the damages incurred by countries that depend too much on oil imports. They describe the costs of a policy choice rather than the societal damages caused by the oil import level. If you add military costs to the premium, you are essentially double counting damages or costs. To elaborate further, suppose that you know that greenhouse gas emissions cost society $25 per ton-equivalent of carbon in terms of the damages on health, seacoast preservation and other socioeconomic impacts. The government responds by implementing a greenhouse gas emission fee of $25 per ton-equivalent of carbon. Adding the cost of the program (the greenhouse gas emission fee) to the damages that you are trying to avoid is similar to combining military expenditures with the premium. This procedure inflates the premium estimate to the point that it now has no meaning as a policy benchmark. In short, premiums should refer to damages rather than costs. In all likelihood, the government may spend too little on emissions reductions or too much on military protection to be good indicators of the true costs to society. Military expenditures are the costs of one approach for achieving energy security. Presumably, if spent optimally, more expenditures should protect overseas property rights and reduce the risk of another disruption, which would lower the expected disruption premium. The costs of this strategy could be compared with the ORNL premium estimates or with other policy options, e.g., oil stockpile reserves, better-coordinated monetary policy, or the "Twenty in Ten: Strengthening America's Energy Security" Initiative described above. But these issues should lie outside how the premium estimates are developed.	
5. Michael Toman (5)	No such methods exist. Incremental US costs associated with energy security are essentially impossible to quantify; they consist partly of transfers of benefits to other oil importers, the value of which to the US likewise is virtually impossible to quantify; and it is impossible to gauge with any confidence what others would to do to fill in for a reduced US military involvement. It is not even clear that such a component can be realistically defined, let alone measured.	
6. Mine Yucel (5)	The only model that I recall which has estimates for the military component of energy security is by Darwin Hall in Energy Policy (1991). Hall estimates the defense subsidy for imported oil to be $7.32 per barrel in 1985 dollars. In 1985, when the US was importing 5 mb/d, the total subsidy came to $14.8 billion dollars per year of additional defense spending attributable to oil. Another estimate for defense expenditures due to oil imports is by Earl Ravenal (whose paper is mentioned by Hall) who came up with a $25.41 per barrel estimate (in 1985 dollars). How does defense spending fit into the ORNL model? One could conjecture that increased defense spending focused on unstable parts of the world could lower the disruption probabilities in the model. Whether or not one believes this to be a correct conjecture probably depends on their view of how our current military spending in the Middle East has changed the probabilities of disruption. Idon't think these methodologies should be incorporated into the ORNL methodology. Much of defense spending is fixed costs. It would be very hard to come up with the marginal increase in defense spending due to imports, or vice versa, how much defense spending would be reduced by a reduction of imports.	

Question 6

Do the estimates appropriately account for the existence of, and recent decision to increase the size of, the Strategic Petroleum Reserve? Should the costs of the maintaining the Strategic Petroleum Reserve be accounted for in the energy security premium?

Commenter	Comment	Response
1. Joseph Aldy (6)	The paper is not sufficiently transparent on how the SPR would offset oil shocks to assess this question. If one assumes "perfect" decision-making by the Executive and full use of the SPR, then all shocks represented by the 1 million bbls/day category and the 3 million bbls/day category would always be offset. (This also depends on the duration of the shocks, but again, I found this information elusive in the paper.) The larger SPR should offset most of the largest 6 million bbls/day category of disruption. Another question is whether there is any consideration of coordinated IEA draws. It is not clear in the paper, but one might expect such a decision in response to a 6 million bbls/day shock.	
2. Stephen Brown (6)	The decision to exclude the costs of the SPR from the ORNL analysis rests on the assertion that there does not seem to be a positive relationship between the size of the SPR and U.S. oil imports. Given that recent decisions to expand the SPR seem to be linked to a perception that the United States has become more vulnerable to supply disruptions, that assertion probably needs more investigation.	
3. Dermot Gately (6)	I am not sure of the answers to either of these questions. My sense is that such changes in the size of the SPR would have relatively little impact upon these estimates, and that the cost of SPR maintenance ought to be accounted for separately.	
4. Hill Huntington (6)	**Strategic Petroleum Reserve Expenditures** The costs of maintaining the Strategic Petroleum Reserve should not be included in the premium estimates for the same reasons that military expenditures should be excluded. They are not damages caused by too much dependence upon oil imports but rather are policy options for reducing those damages.	
5. Michael Toman (6)	The disruption risks assumed are taken from a 2005 EMF report, which explicitly excludes SPR drawdowns as offsets. The costs of maintaining the SPR are costs of having a capacity to respond. they should be calculated separately from the benefits of a response, just as the opportunity costs of a RFS or a higher CAFÉ standard in terms of economic efficiency should be accounted for separately from any benefits accruing from such policies.	
6. Mine Yucel (6)	The estimates take the existence of the SPR into account by assuming that the SPR will be used to offset the disruption in all cases. In two cases the SPR offsets 50% of the disruption and fully offsets the disruption in the third case. The maximum disruption level in the paper is 6 mb/d. My recollection of the maximum drawdown amount from the SPR is that it was less than 6 mb/d. Has this rate increased to 6 mb/d? Moreover, the disruptions in the paper are assumed to last a year. As I remember, the SPR drawdown rates also decline with time, with the maximum rate not sustainable for a year. Hence, there may be a slight disconnect between the assumption of full offset and the drawdown rate. The cost of maintaining the SPR has been calculated by many researchers, with estimates of the per barrel cost of maintaining the SPR. At issue in this paper would be whether lowering imports will lower the cost of maintaining the SPR. I am not sure how the change in import levels will change the cost of maintaining the SPR. As with military expenditures, there is a very large fixed cost related to the SPR. In addition, decisions to change SPR levels are discrete in time and are high-level government decisions. I	

Commenter	Comment	Response
	don’t think one could calculate the change in SPR maintenance costs due to a change in import levels. Moreover, the SPR is used not only during import disruptions, but also during disruptions to domestic production, as in the case of Hurricanes Katrina and Rita. So, it would be quite hard to separate out import effects on SPR maintenance costs.	

Question 7

Comment on the appropriateness of the analytical boundaries used in the ORNL model (e.g. domestic vs international).

Commenter	Comment	Response
1. Joseph Aldy (7)	The domestic boundary effectively relabels some transfers as losses. From a global welfare perspective, we don't care if U.S. dollars are spent on oil imports or domestic oil production. But with the domestic boundary, part of the oil import premium reflects the increase in transfers to oil exporters when a price shock occurs.	
2. Stephen Brown (7)	Consistent with the existing economics literature on the oil-import premium, the ORNL analysis takes a U.S.-only perspective. As the stated in the ORNL report, much higher estimates would result if one was to extend the analysis to cover a larger group of oil-importing countries, such as the OECD, particularly if policy is implemented in a cooperative manner. The higher estimate results from increased monopsony power and from recognizing the reduced vulnerability to oil supply disruptions in more countries. If the analysis is extended to include the entire world, however, the estimated value of the oil-import premium could fall considerably. Much of the value in the oil-import premium comes from excluding the interests of the oil-exporting nations. Policies to reduce U.S. oil imports lower world oil production and transfer income from all the oil-exporting nations to all the oil-importing nations. If the whole world is included, there is also no longer any value in restricting imports to prevent transfers abroad when there is an oil price shock. All that remains to offset the welfare losses associated with reduced world oil production is the muting of the effects that an oil-price shock would have on world economic activity, much of which would be in the OECD.	
3. Dermot Gately (7)	These all seem appropriate.	
4. Hill Huntington (7)	**Regional Boundaries** ORNL has compactly represented the key concepts, including the distinction between US and world oil markets. Their net import demand curve represents the critical factors shaping in US oil consumption and production, while their net import supply curve envelops OPEC behavior and the reactions of other oil-importing countries outside the United States.	
5. Michael Toman (7)	The analysis looks at the impacts of a change in US oil demand. That seems perfectly reasonable when the goal is to use the results as part of an analysis of a US policy like a RFS standard. Additional uncertainties could be added by looking at different scenarios for levels of demand in other countries to capture potential implications of their oil demands growing faster or slower. As the report notes, this further increases the bounds that can be put on the premia. Looking at an OECD premium that would come from coordinated action would make sense only in the context of debate over coordinated action, which is not the case here (and such analysis would have to consider retaliation risks more carefully).	
6. Mine Yucel (7)	The analytical boundaries used in the ORNL study are very much in line with how we think about the oil market, i.e. on the supply side, OPEC and the non-OPEC competitive fringe and on the demand side US and the rest of the world. With the larger, DSGE models, one could differentiate both the supply and demand sides in a more detailed manner. For example, one could have fast growing non-US, non OECD demanders such as China and India. The dynamic GE models can give rise to results that differ from partial equilibrium frameworks. For example, in recent DSGE model paper mentioned above, Steve Brown, Nathan Balke and I show that not all oil price shocks are the same. The macro effects of an oil price shock that arises from increased demand (coming from China, say) is much are	

Commenter	Comment	Response
	different than the effects from a price shock from lower supply. Higher oil prices due to increased demand from other importers do not necessarily lead to GDP losses in the US. We had not been able to find such an effect with partial equilibrium models.	

Question 8

Are the assumptions invoked in the ORNL model appropriate? Are ORNL model parameters (e.g., supply and demand elasticity estimates, the elasticity of GDP with respect to the price of oil, functional form, the probability and magnitude of supply disruptions) appropriate? Does the ORNL use the most recent data?

Commenter	Comment	Response
1. Joseph Aldy (8)	Refer to (2) and (3) above.	
2. Stephen Brown (8)	Overall, the ORNL approach to modeling the world oil market and the assumptions used in the analysis are well grounded and broadly drawn from the economics literature. Some elements of the analysis are drawn from an outlook for the world oil market provided by the U.S. Energy Information Administration (EIA). In the energy economics literature, the EIA outlooks are widely used as a standard for analysis. 8.1 The Baseline Oil Price The analysis assumes a baseline oil price that is quite a bit lower than is currently suggested by the futures market. The difference owes to the use of an old EIA projection and from the fact that the EIA is projecting a composite oil price that is somewhat lower than the price for West Texas Intermediate crude oil (WTI) that is most widely reported. Given the model's construction, the use of a higher baseline price would mean that a given shock would yield a greater oil price increase and a higher oil-import premium. The use of current futures prices for the baseline could prove to be misleading. Given the volatile reaction of prices to small changes in supply or demand in a tight market, the futures price likely reflects some premium for expectations over the fundamental price of oil, where the fundamental price is one that represents oil market conditions in the absence of any concern for the possibility of disruption. Nonetheless, the EIA has increased its projected oil prices above those used in the ORNL analysis, which may warrant the use of somewhat higher oil prices in the ORNL analysis. 8.2 OPEC One may quibble with the approach to modeling OPEC through supply elasticities. Previous research has taken a variety of approaches to investigating OPEC behavior, including a treating it as cartel or dynamic cartel, using pricing rules, market sharing rules, etc. The empirical work that explicitly examines OPEC behavior suggests that OPEC is a poorly performing cartel and that its oil production does respond positively to oil price movements. The use of a range of OPEC supply elasticities likely captures its behavior reasonably well. The use of a game-theoretic model for OPEC would substantially complicate the analysis and would likely yield results that do not well conform to reality. 8.3 The Aggregate Economic Effects of an Oil Disruption The estimated premium depends on the assertion that the estimated response of the U.S. economy to oil price shocks has remained unchanged from 1996 to 2006. To reach this conclusion, the ORNL report draws on an extensive and well-developed empirical literature. Although economists have a sense that reductions in the energy-to-GDP ratio and the changing composition of U.S. economy from the 1970s to the 2000s ought to have changed how the U.S. economy responds to oil price shocks that result from disruptions in foreign oil supply, the empirical literature largely suggests that the response has been unchanged. The inconsistency between the empirical literature and what economists think should be the case may owe to a variety of financial frictions and allocative effects that amplify how oil price shocks affect economic activity, the contributions of correlated factors not	

Commenter	Comment	Response
	taken into account in the empirical analysis, and the relatively low frequency of oil supply shocks over the estimation periods used in the empirical literature. In contrast to the ORNL assumptions about the effect of oil price shocks on U.S. economic activity, recent (unpublished) simulation work by Dhawan and Jeske (2007) suggests that how energy is used will affect the economy's response to energy price shocks. In addition, recent (unpublished) empirical work by Blanchard and Gati (2007) finds that the response of the industrialized economies' to oil price shocks seemingly has declined since the early 1970s because there was better luck (a lack of concurrent adverse shocks), a smaller share of oil in production, more flexible labor markets, and better monetary policy. If the latter research is correct, oil price shocks account for only a portion of the economic losses for which they have been blamed and their effects have lessened over time. Such a finding points to the lower end of the estimated range in the ORNL analysis about the effects of oil price shocks on U.S. economic activity. There may also be some inconsistency between the way oil price shocks are generated in the model used for the ORNL analysis and frequency of data used in the empirical work that has quantified the effects of oil price shocks on aggregate economic activity. 8.4 The Monopsony Estimates As explained in the ORNL report, the monopsony estimates are dependent upon the assumed parameters of the world oil market. These parameters are drawn from the literature, which means the resulting estimates are well grounded. The ORNL report and some of the previous literature suggest that use of its monopsony power allows the United States to create a countervailing force to OPEC's monopoly power. In such a case, the full exercise of U.S. monopsony power *could* result in lower world oil prices, increased world oil production, and increased U.S. oil consumption. Such an outcome is possible if the United States acts a single buyer. In contrast, implementation of the oil-import premium as a tariff would simply drive a wedge between world and U.S. oil prices that will reduce both world oil production and U.S. oil consumption. Subsidies or regulatory policies for reducing oil imports would have similar effects. To the extent U.S. policy can increase the elasticity of demand for oil, it may be able to reduce OPEC market power and cause OPEC to produce more oil, which would lower world oil prices. These countervailing actions may lead to an increased dependence on unstable foreign oil supplies.	

Commenter	Comment	Response
3. Dermot Gately (8)	These assumptions are summarized only cryptically in the report, on pages 35-36. My sense is that the parameter choices are made reasonably, but it's difficult for me to evaluate what is very cryptic. I would prefer a full table that lists all the parameters, with their median values, their low-premium "optimistic" values and their high-premium "pessimistic" values. In such a table, I would like to see how the extreme values for each parameter would impact the import-premium estimate if that single extreme value were adopted but all other parameters took their median values. In addition, such a table should list all values explicitly, not refer to "the same 1997 study values". In addition to noting (p.35, line 26) that all estimates are based upon AEO-2006 Reference Case projections, Leiby should explain the implications for import-premium estimates of divergence from the AEO projections. (My view is that the AEO Reference Case is far too optimistic in its projections of large increases in OPEC exports: see my 2007 article in *The Energy Journal*, cited previously.)	
4. Hill Huntington (8)	**Assumptions and Uncertainties** A strength of the ORNL framework is its use of a fairly wide range of parameter values to represent the important uncertainties associated with the oil import premium issue. The distribution of these ranges was centered around the most likely estimates from the literature. *OPEC supply response.* Range includes no supply adjustment (0.0) to very little price adjustment (5.0). These assumptions should cover a range of different theories about how OPEC responds to demand reductions. *Long-run price elasticities of demand.* ORNL used the same long-run price elasticities as in the 1997 study, but they do not specify values or ranges in the revised report. The long-run estimates on page 41 cover a very wide range, 0.0 to –0.64. Also, it is unclear whether a range of estimates is used as was the case for OPEC supply response. There is compelling evidence to use more recent elasticity estimates. During the 1960s and 1970s, residual fuel oil represented a considerable share of total oil use. The price shocks during the 1970s eliminated much of that demand, which did not recover when oil prices fell. As a result, there are fewer opportunities to replace oil when prices rise. Nevertheless, the long-run price elasticity of oil demand is still pretty high, as evidenced by recent surveys by Dahl (2007), Goodwin, Dargay, and Hanly (2004) and Graham and Glaister (2004). I tend to discount estimates that fall below –0.5, because these estimates may be suffering from data sampling and specification problems that limit their robustness. *Price elasticities of non-OPEC supply.* ORNL does not provide details. Huntington (2005, p.5) suggests a short-run elasticity of 0.05, based upon earlier estimates from an EMF model comparison, reported in Huntington (1992). There is considerable uncertainty about what the best value should be. *Short-run price elasticities of U.S. imports.* If a reasonable estimate of the short-run price elasticity of demand is added to the above response for non-OPEC supply, the combined price elasticity of U.S. imports is pretty close to the ORNL range. Huntington (2005, p.5) suggests a value of –0.08 for the short-run crude oil price elasticity for demand, based principally upon the surveys by Goodwin, Dargay, and Hanly (2004) and Graham and Glaister (2004). He used recent end-use prices to convert their refined product price elasticities to crude oil price elasticities. *Disruption probabilities.* The procedure for describing the disruption probabilities on page 41 should be explained in greater detail. Are they read directly from the EMF report, or have you made adjustments? Are they short disruptions (less than 6 months), long disruptions (6-18 months), or very long disruptions (more than 18 months)? Are disruptions allowed every year, or do you calculate the premium based upon a representative year in the next decade? How does the approach aggregate market power and security components? If there exists a 10% chance of a disruption, there will be a 90% chance of *no* disruption. Is the total premium then equal to 10% times the security welfare loss plus 90% times the market power loss? *Baseline oil market projections.* ORNL uses a single oil market projection based upon EIA's reference case. This assumption is consistent with	

Commenter	Comment	Response
	the development of the disruption probabilities, because the EMF study also used the EIA reference case. It should be recognized, however, that this sole projection may bias the results towards higher oil premia. Gately (2007) criticizes these EIA projections as being much too bullish about OPEC's willingness to supply oil in future markets. Disruptions in any region will have a larger impact on the world oil price if that region is providing a larger share of the total market. *GDP loss elasticities.* These assumptions from the previous study may overstate the premium, as discussed previously.	
5. Michael Toman (8)	See my detailed comments. I have questions about several of the assumptions and concern that they may over-state the premia.	
6. Mine Yucel (8)	Many of the ORNL model parameters are in the range of estimated parameters and elasticities in the literature. I have a couple of comments about some of the parameters and data. I think the GDP disruption loss elasticity is too high. The range falls well within estimates in the literature, but the mid point seems high. The consensus estimate many years ago from the early EMF studies was around -0.045. The recent estimates are much smaller. A study by Blanchard and Gali (2007) who compare oil price shocks in the 70s to oil price shock episodes in 1990-2000 and 2002-2005 shows that the effect of oil prices have changed over time, with much smaller effects on prices, wages, employment and output. Their reasons for this change include decrease in real wage rigidities, increased credibility of monetary policy and the decrease in the share of oil in consumption and production. Paul Leiby's presentation slides also mention that elasticities in the large macro models are much smaller, with a mean of-0.011. The data come from the AEO (2006). The oil price path in the AEO (2006) has been revised up in the AEO (2007). For 2010, there is a substantial increase of $10 per barrel in the reference case. Will the model parameters be updated to reflect this revision?	

Question 9

Does the ORNL model appropriately reflect the underlying uncertainties associated with the assumptions invoked and parameters used in the model?

Commenter	Comment	Response
1. *Joseph Aldy (9)*	As noted in (4) above, the range presented is not a fully appropriate representation of the uncertainty around the estimated oil import premium. It is difficult to assess the appropriateness of the uncertainties around various parameter values because the description of values used, their distributions, and their references were opaque or missing.	
2. *Stephen Brown (9)*	There is considerable uncertainty about the premium, and that is shown in the wide range of the estimates. Given how the parameters are drawn from the economics literature, the range of estimates well represents a consensus view about the value of the optimal import premium. A summation of the analysis as a midpoint value is on substantially less solid ground.	
3. *Dermot Gately (9)*	I believe so, given my other comments about the report and the model. However, the method used (p.25, line 24: "probabilistic simulation") is not described clearly enough to be sure.	
4. *Hill Huntington (9)*	See question 8.	
5. *Michael Toman (9)*	Following on my answers to #7 and #8 – the model incorporates several important uncertainties (e.g., GDP elasticity to oil price shocks), but the ranges of assumptions may need reconsideration and other assumptions about the international oil market are not addressed.	
6. *Mine Yucel (9)*	I think the range of parameter estimates is wide enough to take care of much of the underlying uncertainties in the oil market. These uncertainties include disruption probabilities, OPEC supply response, non-OPEC supply, world economic growth and hence oil demand growth.	

Question 10

Can and should the model be generalized to incorporate price volatility/supply shocks in other fuel markets that are likely to be substitutes for U.S. imported oil (e.g., natural gas, corn-derived ethanol)?

Commenter	Comment	Response
1. Joseph Aldy (10)	I believe there would be low returns to doing this. The model attempts to capture shocks in the oil market based on the recent EMF effort. The effects of these shocks should dwarf whatever shocks in the ethanol market would have on the economy.	
2. Stephen Brown (10)	Natural gas and, to some extent, coal prices generally move with crude oil prices. The effects on economic activity that are widely attributed to oil prices in econometric research likely represents the combined effects of changes in oil, natural gas and coal prices. Such misattribution will not affect the ORNL analysis if the interaction between these energy markets need not be taken into account in the formation of international crude oil prices, as is suggested by Yücel and Guo (1994) and Brown and Yücel (2007). Extending the modeling to other fuels is necessitated only to the extent that they are characterized by an insecurity of foreign supply *and* prices in their markets are independent of or shape those in oil markets. Other fuels also might be considered if the United States wants to exert monopsony buying power in their markets.	
3. Dermot Gately (10)	It might be useful to add a paragraph or a sub-section that mentions these possibilities, but I don't think it is necessary to extend the model and do the calculations that would be involved.	
4. Hill Huntington (10)	**Substitute Fuel Markets** Although it would be conceptually more pure if ORNL had provided a welfare analysis within a computable general equilibrium framework, I do not think that we are anywhere near knowing enough about the substitution possibilities to conduct such an analysis. Econometrically, it would be very difficult to simultaneously evaluate the relationships and cointegration between gasoline, ethanol, corn and natural gas prices. Brown and Yucel (2007) have made some progress on these issues, but I think that this issue will have to wait for another day.	
5. Michael Toman (10)	With respect to the economic costs of energy price shocks, it would be useful but empirically challenging to deal with how natural gas price jumps affect the economy through impacts on *electricity* prices. With respect to direct substitution for crude oil, until such a day in the future when these substitutes are so prevalent that they set the price of motor fuels, that price will almost entirely reflect what is happening in oil markets. Quantities of the substitutes simply can be included on an energy-equivalent basis in the basic representation of fuels demand and supply, and the risks of disruption could be marginally altered if the physical availability of the alternatives was considered less risky than that of oil.	
6. Mine Yucel (10)	I don't think the model should be generalized to incorporate other fuel markets such as natural gas or ethanol. The US is relatively self sufficient in natural gas currently. Although we consume 22% of world gas production, we only import 3.5% of it. Our imports are from Canada, a very stable source of exports and not a security risk. Moreover, the world natural gas market is not yet cartelized. There is a potential for a natural gas cartel in the future, because 60% of world reserves are in Russia, Iran and Qatar, and not the most stable parts of the world. However, exports are more diverse, with Russia, Canada, Norway, Algeria, and the Netherlands, the top exporters. We may eventually have a natural gas cartel, but not in the short term. Corn-derived ethanol need not be included in the model either. Corn-derived ethanol is a domestic product. Any increase in price	

Commenter	Comment	Response
	paid by consumers of ethanol is a transfer to the domestic producers of ethanol.	

Question 11

Provide any additional comments that you feel should be included in this peer-review, but have not been addressed by these Charge questions.

Commenter	Comment	Response
1. Joseph Aldy (11)	See above, especially (1).	
2. Stephen Brown (11)	No comments.	
3. Dermot Gately (11)	I think the report needs to state more positively what might be done with such an import premium. My natural interpretation is that it measures the size of the oil import tariff that ought to be enacted by the US Government. In addition, I would like to see the estimate made in percentage terms not absolute $ terms, insofar as I believe that a tariff ought to be imposed that way.	
4. Hill Huntington (11)	**Summary** ORNL provides a credible estimate of the market power premium for U.S. oil imports. Its probabilistic estimate incorporates many alternative perspectives on the existence and size of the hidden costs. It represents the best available estimate when policymakers need to evaluate energy policies that replace oil imports. There is one important caveat related to the market power premium estimates. Currently, the estimates are tied to a single baseline oil market projection from the U.S. Energy Information Administration. One reason for using this projection is that the risk assessments provided by the EMF are also based upon these estimates. It should be recognized, however, that this projection may overstate the willingness of OPEC to produce more oil and hence the volume of oil that may be insecure. One of the critical unknowns in many policy analyses is often the baseline conditions for conducting the evaluation. The disruption premium will be more contentious, primarily because the causal linkages are not as well developed in the literature. Before adding the disruption premium to the social costs, I would suggest further clarification on the following issues that may be overstating the total import premium: What is the relationship between oil imports and GDP losses during a disruption? If more imports escalate the oil price shock of a given supply reduction, the analysis needs to develop this point because I do not find it obvious. Disaggregating disruption costs into GDP losses and oil import costs would allow the reader to gauge the sensitivity of the results due to this assumption. The GDP impacts of a given oil price shock may be less than 10 years ago, primarily because monetary authorities have been more successful in controlling inflation prior to a disruption. These conditions do not eliminate the disruption costs of a shock, but they may have reduced the expected damages. Unfortunately, there is no recent empirical evidence to know the strength of this possible change in baseline conditions. It is unclear whether the total import premium should include the market power component when there is a disruption. The market power premium usually applies to stable market conditions rather than to disruptions. The report might show the decrease in the total premium if the market power component were excluded for disruptions.	

Commenter	Comment	Response
	Finally, the report needs to show briefly how the revised disruption probabilities were derived from the EMF study and to clarify the ambiguity between Table 3 and the probabilities listed on page 41.	
5. Michael Toman (11)	See detailed comments.	
6. Mine Yucel (11)	No comments.	