CRS Analysis on FERC's "Economic Reach"

Attached is an analysis estimating the economic significance of the Federal Energy Regulatory Commission, conducted by the nonpartisan Congressional Research Service.

The goal of the report is to provide at least a rough metric of the scope and magnitude of FERC's "economic reach." Although there are multiple ways of addressing this question and even defining this term, computing the value of the volumes of commodities that flow through FERC-regulated wires and pipes is a reasonable middle-ground methodology. Using this approach, CRS concluded that the total value approximates $435 billion each year. This sum is the equivalent to approximately just under 3% of the gross domestic product.

This estimate should be used cautiously as a way to conceptualize the significance of an economic regulatory agency, not as a precise measurement. CRS identified a number of limitations in the availability of data and in its transparent analysis. This is the start of a conversation to establish a reasonable shorthand for showing FERC's considerable economic reach.

Questions and comments may be directed to Tristan Abbey, a member of Sen. Lisa Murkowski's committee staff, at 202-224-4971.

Congressional Research Service

MEMORANDUM August 1, 2013

To: Senate Energy and Natural Resources Committee
Attention: Tristan Abbey

From: Paul Parfomak, Specialist in Energy and Infrastructure

Subject: **Estimating the "Economic Reach" of FERC**

This memorandum responds to your July 12 request for an estimate of the "economic reach" of the Federal Energy Regulatory Commission (FERC). The goal of the estimate is to provide context for discussion about FERC's role and significance as a government agency. FERC's economic reach, as CRS has interpreted it, is intended to reflect the portion of the economy over which the commission has economic influence, as further discussed below.[1] Within the constraints of available data—which are significant—CRS has prepared an estimate which hopefully meets your needs. Note that this estimate can be considered only a very rough approximation due to the many assumptions necessary to make the calculation, as further detailed below. The process of making the estimate is, perhaps, more enlightening than the value of the estimate itself for what it reveals about methodology and data limitations related to FERC-regulated commerce. Accordingly, the estimate should be interpreted and used with caution. Please feel free to call anytime to discuss it further.

FERC's Regulatory Authorities and Reach

FERC directly influences the U.S. economy in two principal ways: granting permits for energy infrastructure and regulating interstate energy commerce.

Under the Natural Gas Act of 1938 (NGA), FERC issues certificates of "public convenience and necessity" for "the construction or extension of any facilities ... for the transportation in interstate commerce of natural gas" (15 U.S.C. § 717f(c)). This authority encompasses the siting of interstate natural gas pipelines as well as natural gas storage facilities integrated with the interstate pipeline system. Under the NGA as amended by the Energy Policy Act of 2005 (P.L. 109-58), the commission also authorizes the construction of liquefied natural gas (LNG) terminal facilities onshore or in state waters.[2] FERC similarly authorizes licenses for the construction of nonfederal hydroelectric power projects on navigable waterways and federal lands under the Federal Power Act (FPA), and subsequent statutes (16

[1] Note that economic "reach" is not intended to be synonymous with "impact" or "effect" which have different economic interpretations and are beyond the scope of this analysis.

[2] FERC's authority to permit LNG terminal *facilities* is distinct from that of the Department of Energy, which is authorized to regulate the import and export of natural gas as a *commodity* (15 U.S.C § 717b).

U.S.C. §§791(a)-835r). Companies seeking to build interstate natural gas facilities, LNG terminals, or jurisdictional hydroelectric projects must, therefore, first obtain approval from FERC.[3]

FERC also affects the economy through its economic regulation of interstate commerce in electricity, natural gas, and oil.[4] Under the FPA, the commission has exclusive jurisdiction over "transmission of electric energy in interstate commerce," over the "sale of electric energy at wholesale in interstate commerce," and over "all facilities for such transmission or sale of electric energy" (16 U.S.C. §§ 824-824e). The commission has authority to ensure "just and reasonable" rates, terms, and conditions for electric transmission service and for interstate wholesale electricity sales. Under the NGA, the commission has similar authority to establish "just and reasonable rates" for the transmission or sale of natural gas in interstate commerce (15 U.S.C. 717d(a)). Under the Interstate Commerce Act (ICA), FERC likewise is authorized to ensure "just and reasonable" rates for interstate oil pipelines (49 U.S.C. app. § 1(5)(a)), although the commission regulates oil pipeline rates in a more limited manner than gas pipeline rates due to different authorities under the NGA and ICA.

In addition to the regulatory authorities above, FERC has economic influence in other ways. The commission reviews certain mergers, acquisitions, and corporate transactions by wholesale power generators to determine whether they are in the public interest (16 U.S.C. § 824b(a)(B)). The commission monitors and investigates wholesale electricity gas markets to prevent manipulation and fraud (FERC Order 670). FERC also administers financial accounting and reporting requirements for regulated companies, enforces its regulations by imposing civil penalties, regulates electric grid reliability, and has other responsibilities.

The Meaning of "Economic Reach"

FERC is an influential agency with a diverse regulatory scope. One way to understand FERC's importance could be to examine its role—or "reach"—in the economy. As stated above, FERC's economic reach is intended to reflect the portion of the economy over which the commission has economic influence. Furthermore, because FERC regulates energy infrastructure and commerce, both of which are presumably measurable, it is reasonable to ask whether such economic reach can be quantified. Unfortunately, while "economic reach" as a description of influence is commonly used in public debate and in the press, there is no consensus definition for the concept, nor is there a generally accepted method to measure it.[5] One academic study defines "economic reach" as "the power to solve economic problems."[6] Another defines it is "the capacity to attract producers and consumers."[7] A third associates economic reach with "the quality and diversity of local resources and global investments."[8] Others define

[3] FERC must also approve the abandonment of gas facility use and services. The commission does not have similar siting authority over oil pipelines, nor over natural gas pipelines located entirely within a state's borders not involved in interstate commerce. Siting of oil and *intra*state natural gas pipelines is, instead, variously regulated by the states.

[4] "Oil" includes petroleum and petroleum products (e.g., gasoline, kerosene).

[5] See, for example: Albright, M., "Disney has Wide Economic Reach," *Tampa Bay Times*, April 14, 2011; Morici, P., "Sandy's Long Economic Reach," *Journal of Commerce*, October 29, 2012; McNally, S. "Between the Sheets: The Economic Reach of Local Tourism," *Monterey County Herald*, March 8, 2013. Note that, in the consumer sence, "economic reach" is more commonly used to denote "affordability," but that meaning is unambiguous and not relevant to this analysis.

[6] Rumley, D., *The Geopolitics of Australia's Regional Relations*, Kluwer Academic Publishers, 2001, p. 22.

[7] de Blij, H.J. and Murphy, A.B., *Human Geography: Culture, Society, and Space*. 7th Ed., J. Wiley & Sons, Inc., 2013, p. 132.

[8] Hicks, D.A. and Nivin, S.R., Global Credentials, Immigration, and Metro-Regional Economic Performance, Urban Geography, Vol. 17, No. 1, 1996.

the economic reach of government strictly in terms of taxation.[9] These definitions and those implied in other references differ according to context, but what they all seem to have in common is that "economic reach" suggest a breadth of economic influence beyond the direct control of a particular product or market. It appears, however, that any quantitative estimates of reach are applicable only for specific purposes in specific economic discussions. Developing such a quantitative view of reach for FERC, therefore, requires its own original approach.

Estimating FERC's "Reach"

One possible way to estimate FERC's economic reach is in the context of its infrastructure permitting authority. Through this authority, FERC has a direct influence on the development of capital-intensive projects which enable trade in energy commodities. Therefore, its economic reach could hypothetically be quantified in terms of capital invested—some measure of the capital asset value of the installed base of FERC-permitted natural gas and hydroelectric projects. Estimating this invested capital might not be possible in practice, however. Many private companies do not report asset values on a project-by-project basis in Securities and Exchange Commission filings, and there may be no way to clearly distinguish between FERC-jurisdictional assets and other assets in these public financial reports for companies involved in both interstate and intrastate trade. Looking at capital estimates only for new projects in a given year is a possibility, but such an approach would be "lumpy" because permit applications can vary dramatically from year to year (for example, due to a sudden construction boom in shale gas pipelines or LNG terminals). Furthermore, because FERC has no permitting authority over oil pipelines, this approach would leave out oil pipeline trade that FERC influences through rates.

FERC's rate and wholesale market regulation suggests other ways to quantify its economic reach. One would be to estimate only the total revenues from providing transmission and related services for FERC-jurisdictional electric transmission lines, natural gas pipelines, and storage—exclusive of the value of the commodity itself. Some economists might go further, arguing that FERC's influence is only the difference between rates under FERC regulation and what rates would otherwise be without regulation (which is not known). Such assumptions could tend to minimize FERC's apparent economic reach because transportation costs typically account for only a fraction of total energy costs.[10] They also may be too limited, given the breadth of "economic reach" implied by other studies as discussed above. Such approaches also encounter the same difficulties with insufficient public information discussed above for asset values.

On the other end of the spectrum, some might argue that, because FERC regulates key aspects of electricity, natural gas, and oil trade, the commission's reach could simply be quantified as the total value of those three commodities consumed in the United States in a given year. Some might even argue for including of more economic value, such as the value of gas and oil well drilling and production enabled by the availability of FERC-regulated infrastructure. Incorporating these indirect economic influences could make FERC's reach seem more extensive. However, although such estimates might be analytically simple, they may overstate FERC's reach by overlooking the dominant role of the states in regulating energy commerce, infrastructure, and development within their borders.

[9] Arbetman-Rabinowitz, M., and Johnson, K., "Relative Political Capacity: Empirical and Theoretical Underpinnings," white paper, Claremont, CA.

[10] For example, the Association of Oil Pipelines (AOPL) states that "Approximately 2.5 cents of the cost of a gallon of gas to an end-user can be attributed to pipeline transportation." See: AOPL, "Economic Regulation," web page, Washington DC, July 23, 2013, http://www.aopl.org/cms/index.cfm?fa=view&id=1038.

A less expansive approach would be to estimate the market value only of the wholesale energy commodities whose prices are regulated by FERC or which are carried on FERC-jurisdictional infrastructure. FERC regulations directly affect the price and availability of those commodities, so this approach seems to fall well within what could be considered FERC's economic reach as discussed above without taking too much credit from the states. Sufficient data to make this estimate—at least to a first approximation—are available from public sources. Such an estimate would probably yield a larger measure of FERC's economic reach than asset values because the value of the commodities carried in a transportation system over time generally exceeds the value of the transportation infrastructure itself. Other economic arguments could lead to other analytic approaches. However, this approach is relatively easy to understand and seems to strike a balance between the more restrictive and more inclusive approaches. Following our discussions about these differing analytic options, CRS has opted to employ this last approach, which is detailed below.

FERC-jurisdictional Commodity Values

The following sections estimate the total market value of electricity, natural gas, and oil carried on FERC-jurisdictional transmission lines and pipelines for 2011, the most recent year for which data are available. The total estimated value for this trade in the context of the total U.S. economy is examined afterwards.

Electric Power

For 2011, the Energy Information Administration (EIA) reported total U.S. wholesale electricity sales ("sales for resale") of 5,143,121 Gigawatt-hours (GWh).[11] This number appears to include some double counting, however, as it exceeds total U.S. electricity generation of 4,100,656 GWh plus total imports of 52,300 GWh.[12] The double counting appears largely due to the inclusion of sales by "energy-only providers" (marketers) who serve as financial intermediaries in the wholesale market but do not generate electricity. Thus, sales by an independent power producer to a marketer who subsequently resells the electricity to another marketer or utility may be double counted in the data. In 2011, sales for resale by marketers totaled 2,206,981 GWh. Excluding these sales yields total wholesale transmission volumes of 2,988,440 GWh, approximately 58% of U.S. electricity supply.[13] Note that some of the marketer sales may not be double-counted, but there is no way to tell from the published data how much. So rather than overstate the marketer contribution to wholesale sales, this estimate excludes it altogether.

Nearly all wholesale electricity would be carried on FERC-jurisdictional transmission lines. The exceptions would be intrastate wholesale sales in states whose transmission systems are not connected to the interstate grid: Alaska, Hawaii, and most of Texas. [14] The EIA does not report state-by-state statistics for wholesale electricity sales. As a rough proxy for "sales for resale," this analysis uses net generation by independent power producers (IPPs) in these three states to back out intrastate wholesale volumes from the national total. (Note that this proxy excludes wholesale electricity sales by utilities in these states.)

[11] Energy Information Administration (EIA), *Electric Power Annual 2011*, January 2013, Table 2.12.

[12] Ibid., Tables 2.12 and 3.1A.

[13] 5,143,121 GWh + 52,300 GWh– 2,206,981 GWh = 2,988,440 GWh

[14] Electric Reliability Council of Texas (ERCOT), "Quick Facts," May 2013, http://www.ercot.com/content/news/presentations/2013/ERCOT_Quick_Facts_May%202013.pdf. In 2011, approximately 85% of the electricity in Texas, 283 billion kWh, was carried on transmission lines entirely within ERCOT, an intrastate system not under FERC jurisdiction.

According to the EIA, net generation for 2011 from IPP's in Alaska, Hawaii, and Texas (85%) was 209 GWh, 3,636 GWh, and 252,781 GWh, respectively.[15] Excluding the IPP generation totals above for Alaska, Hawaii, and Texas from the national figures yields 2,731,814 GWh of wholesale electricity and imports carried on FERC-jurisdictional transmission lines.

The EIA reports wholesale electricity market data for 10 major electricity trading hubs in the continental United States, two of which are in ERCOT.[16] Based on these data, according to CRS calculations, the weighted average price for wholesale electricity in 2011 ranged from $28.46/MWh (Mid-Columbia) to $55.52/MWh (NEPOOL Mass Hub) among the eight hubs excluding ERCOT. The unweighted average wholesale electricity price across all eight hubs was $41.17/MWh. Applying this price to the wholesale electricity volumes estimated above ($41.17/MWh x 1,000 MWh/GWh x 2,731,814 GWh) yields a total market value for FERC-jurisdictional wholesale electricity of approximately $112 billion in 2011. Note that averaging wholesale electricity prices from a limited number of trading hubs may introduce some error into this estimate. Furthermore, the value of electric transmission ancillary services (e.g., spinning reserves), or capacity incentives offered by Regional Transmission Organizations, may not be appropriately captured in this calculation, but there is insufficient information to provide an estimate.

Natural Gas

There are no public sources of data which accurately report total annual natural gas shipments on interstate pipelines. Aggregating data from FERC Forms 2 and 2A, which collect annual operating statistics from regulated pipeline companies, leads to potential double counting of natural gas volumes (e.g., the same shipment of gas moving across multiple pipeline systems).[17] Total interstate movement of natural gas as reported by the EIA also includes double counting.[18]

An alternative approach to estimating interstate natural gas transmission volumes is to calculate "excess" production in gas-producing states. This approach subtracts a given state's consumption from its production, assuming that production in excess of the state's own needs ultimately is supplied to other states. These excess volumes would all be transported on interstate pipelines operating under FERC-regulated rates. In practice, such an assumption would not be entirely correct because gas prices, pipeline rates, and proximity to pipelines influence gas movements in different ways.[19] Furthermore, some *intra*state gas shipments may use FERC-regulated interstate pipelines (e.g., in Texas). Finally, this approach would not clearly account for pipeline exports or LNG imports, although the latter were not significant in 2011. So this approach may underestimate actual interstate natural gas shipments, but it yields a first approximation to interstate pipeline shipments. Based on EIA statistics for state-specific "marketed production" and "total consumption" of natural gas in 2011, this approach yields

[15] EIA, January 2013, Table 3.6.

[16] EIA, "Wholesale Market Data," web page, July 11, 2013, http://www.eia.gov/electricity/wholesale/index.cfm.

[17] See, for example, EIA, "Thirty Largest U.S. Interstate Natural Gas Pipeline Systems, 2008," web page, December 31, 2008, http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/MajorInterstatesTable.html. The quantity of transported natural gas reported significantly exceeds total U.S. gas consumption for the same year.

[18] EIA, "International & Interstate Movements of Natural Gas by State," web page, June 28, 2013, http://www.eia.gov/dnav/ng/ng_move_ist_a2dcu_nus_a.htm.

[19] The EIA also reports import and export volumes, but much of that gas may also move between states, so imports and exports are excluded from this estimate to avoid double counting.

approximately 14.3 Tcf (Trillion cubic feet) of interstate natural gas trade, about 59% of total U.S. natural gas consumption in that year.[20]

The citygate price is the price paid by natural gas utilities for gas delivered to their local distribution systems. It is often used as a proxy for wholesale price in a given market. In 2011, the U.S. average citygate price for natural gas was $5.63 per Mcf (thousand cubic feet).[21] Multiplying the interstate volumes estimated above by citygate price yields a total market value for FERC-jurisdictional natural gas movements of approximately $80 billion in 2011.

Oil

CRS has not been able to identify publicly available sources of data which report total annual shipments of oil on interstate pipelines accurately or with high confidence. Such data collected on the FERC Form 6, for example, appear to include double counting and may not be submitted with consistent data definitions by all oil companies.[22] The "excess" production approach used to estimate pipeline volumes for natural gas is not appropriate for oil because oil is also shipped in large volumes on barges and by rail—and that approach cannot distinguish among these modes. Furthermore, crude oil typically needs to be shipped first to distant refineries before it can enter the market as refined products whereas natural gas does not. Finally, the excess production approach would not account for oil imports. However, the EIA does report pipeline movements of oil between Petroleum Administration for Defense Districts (PADDs), five geographic aggregations of the 50 states and the District of Columbia (**Figure 1**).[23] Because major regions of supply (e.g., Gulf Coast) and demand (e.g., East Coast) are in different PADDs, pipeline movements of oil between PADDs can serve as a proxy for overall U.S. interstate oil pipeline volumes. Oil shipments on interstate pipelines entirely within PADDs (e.g., between Texas oil fields and Louisiana refineries) would be excluded from these data, however, so inter-PADD pipeline movements underestimate total U.S. interstate oil pipeline volumes. Nonetheless, a PADD- based estimate of oil movements should capture a large share of U.S. interstate oil pipeline volumes.

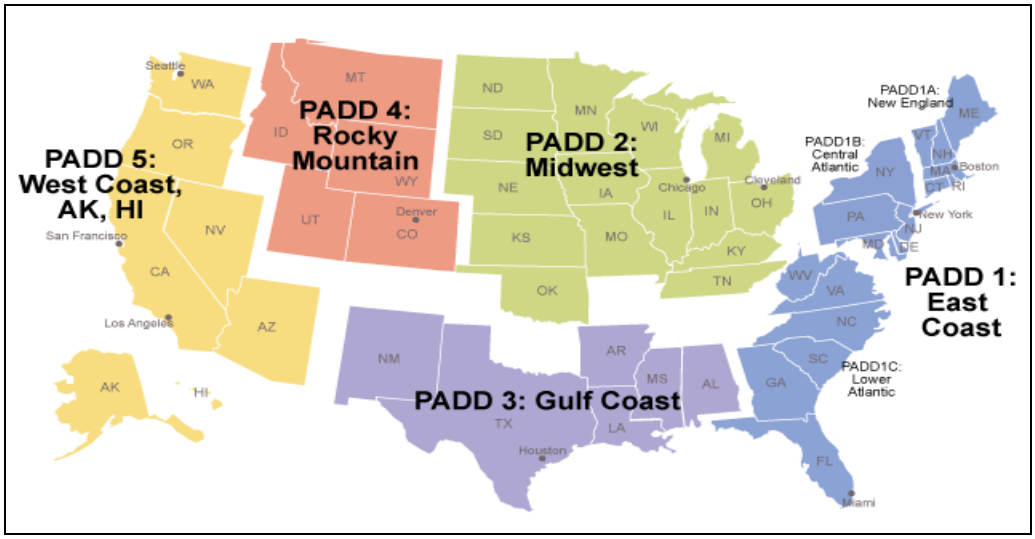
[20] EIA, "Natural Gas Summary," web page, June 28, 2013, http://www.eia.gov/dnav/ng/ng_sum_lsum_a_EPG0_VC0_mmcf_a.htm.

[21] EIA, "Natural Gas Prices," web page, June 28, 2013, http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm.

[22] Federal Energy Regulatory Commission, FERC Financial Report, FERC Form No. 6: Annual Report of Oil Pipeline Companies, OMB No. 1902-0022, July 22, 2013, http://www.ferc.gov/docs-filing/forms/form-6/form-6.pdf.

[23] These districts were established by executive order during World War II for the rationing of gasoline. The Defense Production Act of 1950, which created the Petroleum Administration for Defense, used the same five districts.

Figure 1. Petroleum Administration for Defense Districts (PADDs)



Source: EIA, "PADD Regions Enable Regional Analysis of Petroleum Product Supply and Movements," web page, February 7, 2012, http://www.eia.gov/todayinenergy/detail.cfm?id=4890.

Table 1 details movements of crude oil and petroleum products by interstate pipeline between PADDs in 2011. The table also reports the U.S. average wholesale prices of these commodities on a per barrel basis and their total wholesale value. The volume and price figures are derived from EIA data. According to **Table 1**, the total market value of oil movements on FERC-jurisdictional oil pipelines in 2011was approximately $243 billion. Note that crude oil may move twice through the pipeline system, first as crude to a refinery, then as a refined product. Because such movement involves two different products, CRS does not consider it to be double counting for this analysis.

Table 1. Crude Oil and Petroleum Products Pipeline Shipments between PADDs (2011)

Product	Barrels (1,000s)	Price (Dollars/gallon)	Price (Dollars/barrel)	Total Value ($Millions)
Crude oil	518,308	2.43	101.93	52,831
Pentanes Plus	50,602	1.75	73.5	3,719
Liquefied Petroleum Gases	328,706	1.47	61.61	20,253
Motor Gasoline Blending Components	544,545	2.87	120.41	65,571
Finished Motor Gasoline	224,974	2.87	120.41	27,090
Kerosene-Type Jet Fuel	176,133	3.01	126.59	22,296
Kerosene	163	3.07	128.73	21
Distillate Fuel Oil	373,050	3.22	135.37	50,498
TOTAL	**2,216,481**		109.31	**242,279**

Sources: EIA, Annual Energy Review, September 2012, Tables 5.21-5.22; EIA, "2012 Brief: Natural Gas Liquids Prices Down in 2012," January 15, 2013, http://www.eia.gov/todayinenergy/detail.cfm?id=9590; EIA, "Movements by Pipeline between PAD Districts," web table, June 27, 2013, http://www.eia.gov/dnav/pet/pet_move_pipe_dc_R20-R10_mbbl_m.htm; CRS analysis.

Notes: Pentanes plus are equivalent to "natural gasoline." Motor gasoline blending component prices are not published by the EIA, so the finished motor gasoline price is used as a proxy. The distillate fuel oil price used is for No.1 oil. Propane price is used for liquefied petroleum gases.

Total Commodity Values on FERC-jurisdictional Transmission

The sections above estimate the total value of electricity, natural gas, and oil products on interstate pipelines under FERC's rate jurisdiction in 2011. **Table 2** summarizes these three estimates and reports a total value for all three commodities of $435 billion. For 2011, total U.S. gross domestic product (GDP) reported by the Bureau of Economic Analysis was approximately $15,076 billion.[24] So the value of energy commodities moved on interstate electric transmission or interstate pipelines under FERC-regulated rates would be comparable in magnitude to about 2.9% of GDP in 2011. Because both natural gas and oil production have been rapidly increasing in North America (including Canadian oil imported via pipelines), FERC's economic jurisdiction may have increased since 2011.

Table 2. Approximate Commodity Values on FERC-jurisdictional Transmission (2011)

Product	Volumes	Price	Total Value ($Billions)
Electricity	2,731,814 GWh	$41.17/MWh	$112
Natural Gas	14.3 Tcf	$5.63/Mcf	$80
Petroleum and Petroleum Products	2,216,481,000 barrels	$109.31/barrel	$243
TOTAL			**$435**

Source: CRS analysis.

Limitations of this Analysis

As stated in the introduction and the commodity sections above, this analysis is, at best, a rough approximation of the "economic reach" of FERC reflecting the portion of the economy over which the commission has influence through its regulation of interstate energy commerce. The analysis is explicit about limitations in the availability of public data; analytic assumptions that could prove, at least partly, incorrect; the use or proxy information; and the inclusion or exclusion of specific categories of economic activity that arguably could have been included.[25] Furthermore, there is no basis for estimating "error bars" on the estimates to give an indication of their potential accuracy. Accordingly, CRS urges caution in presenting these data publicly in any manner that implies that the estimate is precise.

This memorandum tries to quantify FERC's economic reach in a novel way as a means to support a broader discussion of FERC's importance in the economy, as you requested. However, the validity of CRS's approach is open to debate depending upon one's view of what "reach" ought to include. Choosing the specific analytic approach was driven more by a desire to inform the discussion than to make a definitive statement about FERC. Nonetheless, CRS believes the approach is reasonable. The estimate also is transparent. Hopefully, having actual numbers to examine can help to focus discussions about FERC's importance more effectively than a strictly conceptual analysis might. Performing the calculation also has highlighted some of the challenges of making such an estimate and possible ways to improve the analytic methodology. I would be happy to further discuss these issues with you anytime.

[24] Bureau of Economic Analysis, "National Income and Product Accounts Tables," web table, June 26, 2013, http://www.bea.gov/itable/.

[25] CRS has discussed FERC data limitations with FERC staff, who acknowledged them but could not offer substantially more useful commodity volume data due to limitations in the way pipeline operator statistics are collected.