



# Do Government Policies Favoring Fossil Fuels Hamper the Development of Wind and Solar Power?

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CO2 COALITION



July 2020





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## Executive Summary

A number of studies claim that pervasive subsidies provide an unfair competitive advantage to fossil fuels over renewable energy. Many estimates have been made of the value of direct and indirect subsidies provided to fossil fuels, the most extreme being the 2015 study by the International Monetary Fund estimating fossil fuels subsidies at \$5 trillion annually.

On examination, many of the direct subsidies in this study turn out to be generally available to other businesses, and most of the value of the indirect subsidies is estimated from uncertain projections of future damages from fossil-fueled global warming, which are discussed in detail in a previous CO2 Coalition White Paper, *The Social Cost of Carbon and Carbon Taxes: Pick a number, any number*. The most thoughtful and transparent evaluations of subsidies are those of the Organization for Economic Cooperation and Development (OECD), a European-based coalition of 36 market economies, and its International Energy Agency (IEA). Many of the roughly 2,200 items listed by the OECD as “subsidies” are debatable. However, focusing on subsidies alone obscures the real policy issue, which is whether government policy *in total* reduces fossil fuel prices below their hypothetical market level and whether these distortions occur in markets where renewables are trying to compete.

To address this issue, this White Paper (a) distinguishes “subsidies” from “externalities,” (b) includes taxes in the calculation, and (c) makes proper geographic distinctions. Taking these factors into account, the paper concludes that, even taking at full value the direct subsidies cited by the OECD and IEA, fossil fuels are significantly overtaxed and not unfairly advantaged in most countries of the world.

In fact, although most countries do offer some subsidies to fossil fuels, as outlined in the OECD data, the massive taxes imposed by most governments are generally far higher, resulting in a net increase in the price of fossil fuels. Taking into account all taxes and subsidies, fossil fuels in the United States are overtaxed by an estimated \$50 billion per year. The 28 other largest industrial democracies (most of the European countries, Canada, South Korea, New Zealand and Australia) are overtaxed an estimated \$363 billion, and the BRIC countries (Brazil, Russia, India, and China) are overtaxed an estimated \$104 billion. The primary exceptions to this rule are found in oil-producing developing countries that offer their citizens heavily subsidized motor fuels but are not likely candidates for renewable energy.

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Note: The data used as the basis for this White Paper are contained in a separate spreadsheet, which is available at: <http://co2coalition.org/2020/07/15/global-fuel-subsidies-2015/>



## Introduction

The rationale for the elimination of fossil fuels has evolved from early concerns about air quality to national security to depletion (“peak oil”) and more recently to climate change. Supporting this narrative is the claim that the “true” costs of fossil fuels are disguised by large subsidies, creating unfair marketplace competition for renewable energy. For example, Fatih Birol, Executive Director of the International Energy Agency, claims that, “Today, the most important roadblock for renewable energy implementation is the world’s fossil fuel subsidies.”<sup>1</sup>

A number of studies have attempted to document this case.

In 2011, the consulting firm Management Information Services, Inc. (MISI) published a study arguing that federal incentives for energy between 1950 and 2010 amounted to \$910 billion (in 2015 dollars), of which \$645 billion or 71% were given to fossil fuel industries.

The Organization for Economic Cooperation and Development (OECD) maintains an inventory of fossil fuel subsidies. According to OECD Secretary-General Angel Gurría, “The time is ripe for countries to demonstrate they are serious about combating climate change, and reforming harmful fossil fuel support is a good place to start.”<sup>2</sup> OECD’s 2015 tally of fossil fuel subsidies by the major countries of the world is nearly \$135 billion.<sup>3</sup> The International Energy Agency (IEA) claims in its most recent outlook that global subsidies in the countries they studied totaled \$355 billion in its most recent outlook.<sup>4</sup>

In 2015 the International Monetary Fund published a much-cited paper entitled “How Large Are Global Energy Subsidies?,” which claims that fossil fuels are subsidized to the tune of \$5.3 trillion every year.<sup>5</sup>

## Analytical Approach

To determine if fossil fuels enjoy an unfair competitive advantage in the marketplace, we need to apply three rigorous principles: (a) define subsidies correctly, (b) include taxes in the calculation, and (c) make proper geographic distinctions.

Principle #1: Define subsidies correctly. The studies cited are all essentially efforts to develop a list of everything that’s wrong with fossil fuels, quantify the effects and add them all up. In the process, they tend to conflate “subsidies” and “externalities,” which are valid but quite different concepts. The Oxford English Dictionary defines subsidy as “a sum of money granted by the government or a public body to assist an industry or business so that the price of a commodity or service may remain low or competitive.” Renewable advocates often ignore this definition. For example, in its May 18, 2015 edition, the UK *Guardian* reported the IMF study with the statement “fossil fuel companies are benefitting from global subsidies of \$5.3tn (£3.4tn) a year, equivalent to \$10m a minute every day, according to a startling new estimate by the International Monetary Fund ... The \$5.3tn subsidy estimated for 2015 is greater than the total health spending of all the world’s governments.”<sup>6</sup> This headline suggests that the \$5.3 trillion identified by the IMF represents some kind of cash outlay for the benefit of fossil fuel companies that could better be spent on more important priorities.

Even a cursory look at the IMF study demonstrates that they are not using the term “subsidy” with any precision. Table 1 shows the breakdown of the \$5.3 trillion.



**Table 1: IMF Estimates of Fossil Fuels “Subsidies” for Year 2015**

		Value (\$B)	% of Total	Comment
1	Pre-tax subsidies	333	6%	Reflects cases where government policies, in the absence of taxes, would reduce consumer prices below market levels
2	Global Warming	1,268	24%	
3	Local air pollution	2,734	52%	
4	Traffic congestion	359	7%	
5	Traffic accidents	271	5%	
6	Road damage	24	<1%	
7	Foregone tax revenue	313	6%	Reflects cases where taxes are less than the general consumption tax (sales tax or Value Added Tax)
	Total	5,302	100%	

Of this list, only Row 1 represents actual subsidies. Row 7 is more correctly called “undertaxation” which we will address in more detail later. Rows 2-6 are not in fact subsidies, but more properly called “externalities.” On balance, the arguments in the IMF study are almost entirely about externalities, not subsidies.

About one-quarter of the alleged externalities relate to catastrophic climate change, which remains primarily a hypothesis about *future* damage. Furthermore, several of the current externalities in the IMF study (traffic congestion, traffic accidents and road damage) relate to vehicles, not fuels. Electric cars contribute just as much to traffic and are just as likely to cause accidents and road damage as gasoline-powered cars. Accidents are not externalities at all, since they are priced into the market through insurance.

Once the vehicle-related externalities (\$654 billion) are subtracted, the remaining current externalities (\$2,734 billion) relate entirely to air pollution, and over 60% of that amount (\$1,734 billion) is attributed to China, primarily to Chinese coal use. The final “unpacked” result is shown in Table 2.

**Table 2: IMF Estimates of Fossil Fuels “Subsidies” for Year 2015**

		Value (\$B)	% of Total
1	Subsidies	333	6%
2	Undertaxation	313	6%
3	Air pollution in China	1,734	33%
4	Air pollution elsewhere	1,000	19%
5	Current vehicle externalities	654	12%
6	Predicted externalities (global warming)	1,268	24%
	Total	5,302	100%



A quick look at Table 2 demonstrates that the IMF's main argument is not that fossil fuels are subsidized, but that (1) the highly controversial climate change hypothesis is correct and (2) China has pollution problems. These are important questions, but need to be treated separately from the issue of subsidies.

Principle #2: Include taxes in the calculation. In order to determine whether fossil fuels enjoy an unfair advantage, we need to ask a very specific question: Does government policy *in total* raise or lower the price of fossil fuels compared to its hypothetical market value? To do this, we must consider taxes as well as subsidies.

In France, for example, the OECD list includes \$6 million in “subsidies” for Corsica, a relatively poor part of France. This amount consists of a reduction of the VAT rate from 20% to 13% (\$5 million) and an excise tax reduction of €0.001 per liter (\$1 million) on all gasoline purchases on the island. For 2015, these two tax breaks reduced the price of gasoline by \$0.34 per gallon in Corsica compared to the rest of France. These benefits, however, are reductions from a high excise tax of \$2.80 and VAT of \$0.95 per gallon on gasoline. Corsicans, therefore, were still paying an above-market price for gasoline—\$5.39 per gallon, compared to \$5.73 on the French mainland. By comparison, Australian consumers paid \$1.51 per gallon in excise tax and VAT on gasoline compared to \$3.42 per gallon in Corsica, yet the OECD attributes no subsidies to Australian gasoline consumption. Thus, even though Corsicans pay nearly a third more for gasoline than their Australian counterparts, the OECD regards them as subsidized.

The correct methodology for making this calculation involves the following steps:

- a) Establish the pre-tax price for the product,
- b) Calculate the total hypothetical tax on the product before any rebates or exemptions,
- c) Determine the normal consumption taxes (general sales tax (GST) or Value Added Tax (VAT)),
- d) Subtract (c) from (b) to determine the Gross Over or Undertaxation,
- e) Subtract the OECD subsidy from (d) to determine the Net Over or Undertaxation.

If (e) is negative, the product is “undertaxed.” If (e) is positive, the product is “overtaxed.”

Principle #3: Avoid meaningless aggregation. The economics of interfuel competition are local, not global. Current gasoline prices in Venezuela are about US \$0.01 per gallon—a heavily subsidized price, but irrelevant to the competitive position of wind power in Illinois. Yet, most of the subsidy studies add the national and regional numbers together to get a supposedly “global” estimate of world fossil fuels subsidies.

This paper will focus on the narrower question of true subsidies and undertaxation, which correspond to lines 1 and 2 from the IMF study in Table 2. The analysis that follows is based on a transparent and straightforward structure:

1. The year 2015 served as the basis.
2. Sixty-four countries representing 85% of total world primary energy consumption were analyzed in four groups: the U.S., other industrialized countries, the so-called BRICs (Brazil, Russia, India, China) and the oil producing countries.





3. Twenty-three separate product/sector analyses were completed according to the following matrix:

	Transportation	Residential	Commercial	Industrial
Gasoline	X			
Distillate	X	X	X	X
Jet	X			
Other kerosene		X	X	X
LPG	X	X	X	X
Heavy fuel oil				X
Other oil products				X
Crude oil <sup>7</sup>				X
Natural gas		X	X	X
Coal				X
Electricity*		X	X	X

\*Fossil fuel share only.

4. Most taxes in the world are assessed at the retail level. However, we will include taxes assessed at intermediate levels, including, for example, crude oil and coal.

5. In the U.S., lease bonuses and royalties for production on state or federal land are not included in the analysis, since these payments are compensation to governments as resource owners rather than true taxes. Taxes on fossil fuel production on private lands are included. Outside the U.S., with only a few small exceptions, governments own all mineral rights. Production taxes on fossil fuels outside the U.S. are therefore excluded from the analysis on the presumption that they represent either compensation to the resource owner or return on state investments.

6. In agreement with the IMF study, fossil fuel taxes are compared with prevailing sales tax or VAT in each country. In the U.S., the analysis was done at the state level.

7. Income taxes and property taxes are excluded from the analysis.

8. The subsidy analyses by both the OECD and the IEA are taken as a given and included in the analysis. The only OECD subsidies eliminated were those subject to double counting. Certain countries were addressed by both studies. IEA numbers were used if the country was an oil producer and OECD numbers if the country was an oil consumer.



9. Volumes are expressed in gallons (for oil) or gallons of gasoline equivalent (for other fossil fuels) as a convenient unit familiar to a wide range of readers.

10. Definition of terms:

- “Hypothetical taxation” is the amount of tax collected if excise tax rates were applied to all consumption without exemptions, rebates or subsidies,
- “Reference taxation” is the amount of tax that would have been collected if customary consumption taxes (sales taxes or value added taxes (VAT)) had been applied,
- “Gross over/undertaxation” is hypothetical taxation less reference taxation. A positive number will indicate that the product is overtaxed, while a negative number indicates undertaxation.
- “Net over/undertaxation” is gross over/undertaxation less the subsidies included in the OECD or IEA studies.

## United States

In 2015, the U.S. had a population of 321 million and consumed fossil fuels equivalent to 415 billion gallons of gasoline (gge) or 1,293 gge per capita. The total retail value of these fossil fuels was roughly \$850 billion.

U.S. consumption of the 23 analyzed product/sectors for 2015 is shown in Table 3.

**Table 3: U.S. Fossil Fuel Final Consumption by Fuel and Sector, 2015<sup>8</sup>**  
(billion gallons or gallons of gasoline equivalent)

	Transportation	Residential	Commercial	Industrial <sup>9</sup>	Total
Gasoline	108	-	-	-	108
Distillate (incl diesel)	46	2	2	9	59
LPG	1	6	2	11	20
Kerosene (incl jet) <sup>10</sup>	24	negl	negl	negl	24
Heavy fuel oil	2	-	-	1	3
Other oil products	-	-	-	4	4
<i>Total oil</i>	<i>181</i>	<i>8</i>	<i>4</i>	<i>25</i>	<i>218</i>
Natural gas	6	38	26	48	118
Coal (ex powergen)	-	-	-	9	9
Electricity (fossil fuel share)	-	26	25	19	70
<i>Total fossil fuels</i>	<i>187</i>	<i>72</i>	<i>55</i>	<i>101</i>	<i>415</i>



Of the 415 billion gallons of gasoline equivalent, just over half is oil, and a quarter is natural gas. Just over 45% of fossil fuel use is for transportation, about a quarter for industry, 17% for residential use and the remaining 13% for commercial consumption.

**Table 4: U.S. Hypothetical Taxation by Fuel and Sector, 2015 (\$billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$48.1	-	-	-	\$48.1
Distillate (incl diesel)	\$23.1	\$0.1	\$0.2	-	\$23.4
LPG	\$0.3	-	\$0.4	-	\$0.7
Kerosene (incl jet)	\$2.3	-	-	-	\$2.3
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	-	-
Crude oil/other oil	-	-	-	\$4.5	\$4.5
<i>Total oil</i>	<i>\$73.8</i>	<i>\$0.1</i>	<i>\$0.6</i>	<i>\$4.5</i>	<i>\$79.0</i>
Natural gas	-	\$2.4	\$1.6	\$5.2	\$9.2
Coal (ex powergen)	-	-	-	\$2.0	\$2.0
Electricity (fossil fuel share)	-	\$6.2	\$7.1	\$2.0	\$15.3
<i>Total fossil fuels</i>	<i>\$73.8</i>	<i>\$8.7</i>	<i>\$9.3</i>	<i>\$13.7</i>	<i>\$105.5</i>

Table 4 shows the total hypothetical taxation of fossil fuels in the U.S. for 2015. The calculation is simply the actual applicable tax rates times the volumes shown in Table 3 before any of the “subsidies” in the OECD list shown below in Table 7. This table is not based on actual tax receipts and is just an approximation of tax revenue if there were no tax exemptions or other breaks. The total hypothetical tax is about \$105 billion, roughly 70% of which applies to transportation fuels, with the rest distributed over the residential, commercial and industrial sectors.

The taxes on crude oil and industrial natural gas represent state excise and severance taxes. As noted earlier, royalties and other income from production on government-owned land are considered compensation for the resource owner and are not included in these amounts.



**Table 5: U.S. Reference Taxation by Fuel and Sector, 2015 (\$billion)**

	<b>Transportation</b>	<b>Residential</b>	<b>Commercial</b>	<b>Industrial</b>	<b>Total</b>
Gasoline	\$16.4	-	-	-	\$16.4
Distillate (incl diesel)	\$7.3	\$0.4	\$0.2	-	\$7.9
LPG	negl	\$0.8	\$0.4	-	\$1.3
Kerosene (incl jet)	-	negl	negl	-	-
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	-	-
Crude oil/other oil	-	-	-	-	-
<i>Total oil</i>	<i>\$23.7</i>	<i>\$1.2</i>	<i>\$0.6</i>	<i>-</i>	<i>\$25.6</i>
Natural gas	-	\$3.3	\$1.7	-	\$5.0
Coal (ex powergen)	-	-	-	-	-
Electricity (fossil fuel share)	-	\$8.1	\$6.5	-	\$14.6
<i>Total fossil fuels</i>	<i>\$23.8</i>	<i>\$12.6</i>	<i>\$8.8</i>	<i>-</i>	<i>\$45.2</i>

Table 5 shows reference taxation for the U.S. for 2015. These are the taxes that would have been applied if fossil fuels were taxed as ordinary consumption goods and not burdened with special excise taxes.

The United States has no national sales tax system, and the primary consumption taxes are applied at the state and local level. Only four states (Delaware, Montana, New Hampshire and Oregon) have no sales tax.<sup>11</sup> Ten states (Connecticut, Indiana, Kentucky, Maine, Maryland, Massachusetts, Michigan, Mississippi, Rhode Island and Virginia) and the District of Columbia have a state sales tax but no local tax. Alaska has a local sales tax but no state tax, while the other 35 states have both state and local taxes. Local taxes can vary by city or county and change often. As a result, the U.S. sales tax picture is a moving target. Mid-year 2015 estimates were used when necessary, and local taxes for the largest municipal area were used as a proxy for local sales taxes for simplicity.

Total reference taxation would have been about \$45 billion, about half imposed on transportation fuels and the remainder on residential and commercial energy use. In theory, governments should impose consumption taxes at the retail level, and not on intermediate goods, such as jet fuel or industrial energy use.







**Table 6: U.S. Gross Over/Undertaxation by Fuel and Sector, 2015 (\$billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$31.7	-	-	-	\$31.7
Distillate (incl diesel)	\$15.8	(\$0.3)	-	-	\$15.5
LPG	\$0.2	(\$0.8)	-	-	(\$0.5)
Kerosene (incl jet)	\$2.3	negl	-	-	\$2.3
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	-	-
Crude oil/other oil	-	-	-	\$4.5	\$4.5
<i>Total oil</i>	<i>\$50.1</i>	<i>(\$1.1)</i>	<i>-</i>	<i>\$4.5</i>	<i>\$53.5</i>
Natural gas	-	(\$0.9)	(\$0.1)	\$5.2	\$4.2
Coal (ex powergen)	-	-	-	\$2.0	\$2.0
Electricity (fossil fuel share)	-	(\$1.8)	\$0.6	\$2.0	\$0.8
<i>Total fossil fuels</i>	<i>\$50.1</i>	<i>(\$3.8)</i>	<i>\$0.5</i>	<i>\$13.7</i>	<i>\$60.5</i>

Table 6 shows gross overtaxation, i.e., the total hypothetical taxation minus the reference taxation, calculated as the values in Table 4 minus the values in Table 5. On balance, in 2015, the U.S. taxed fossil fuels by a total of about \$60 billion more than would have been the case if normal consumption taxes had applied.

In the U.S. in 2015, gasoline was subject to a federal excise tax of \$0.184/gallon and state excise taxes ranging from \$0.505/gallon in Pennsylvania to \$0.08 in Alaska and averaging about \$0.26/gallon nationwide.

Despite constant budget pressure voters generally oppose motor fuel excise tax increases in the United States. Proposed rate hikes are often perceived as threats to personal mobility, and are never politically popular. Between 2015 and 2018, 14 states raised gasoline taxes by an average of \$0.06 per gallon, while 24 states reduced gasoline taxes by an average of \$0.04 per gallon and 13 states kept gas taxes at the same level. The federal gasoline excise tax has not increased since 1993.

In 2015, diesel was subject to a higher federal excise tax of \$0.244 per gallon with state excise taxes varying from \$0.642 per gallon in Pennsylvania to \$0.08 in Alaska and averaging \$0.261 per gallon nationwide.



The federal excise taxes on gasoline and diesel are used to fund the Highway Trust Fund and the Leaking Underground Storage Tank Trust Fund (LUSTTF). At present, 0.1 cents is designated for the LUSTTF. In the Highway Trust Fund, 2.86 cents per gallon are designated for the mass transit and the remainder (15.44 cents for gasoline and 21.44 cents for diesel) for the Highway Account used for the construction and repair of federal roads. Some argue that these excise taxes are really user fees and not taxes, but they do impose a competitive disadvantage on fossil fuels since vehicles using electricity or biofuels use the same roads and cause the same road wear and damage, yet are not subject to these taxes.

Jet fuel is subject to a federal excise tax of \$0.044 per gallon plus a variety of state taxes. Jet fuel, however, is not a retail product and should not theoretically be subjected to any consumption taxes, any more than aircraft parts, equipment, salaries or other business costs. The reference tax for jet fuel is therefore zero.

The only segments showing significant gross undertaxation are residential fuels, including heating oil, LPG, natural gas and electricity. Residential heating fuels have a particular emotional appeal in the U.S. political system, since expensive heat conjures images of low-income families freezing in the dark. Use of distillate heating oil is concentrated in the Northeast and Mid-Atlantic, and the 11 states of these two regions (Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and Virginia) account for about 90% of U.S. home heating oil use. Because of its high cost relative to natural gas, home heating oil use in the U.S. has declined over time, falling from 8.2 billion gallons in 1984 to just under 4 billion gallons in 2015, accounting for only about 1% of U.S. oil demand.

Given the political sensitivity of residential fuels, of the eleven states, only Maryland imposes sales tax on home heating oil. No state imposes sales tax on LPG or kerosene for home heating use.

Residential natural gas, the primary home heating fuel in the U.S., is also undertaxed by a total of about \$1 billion. Electricity, however, is a bit more complex. Relatively few households in the colder parts of the U.S. rely on electricity as their main source of space heat (15% in the Northeast and Mid-Atlantic and 21% in the Midwest).<sup>12</sup> Electricity use is increasingly concentrated in air conditioning and appliances – applications not so fraught with political concerns. As a result, the picture for residential electricity use is mixed. In 2015, 30 states undertaxed residential electricity by a total of \$5.2 billion, while 10 states overtaxed by a total of \$2.5 billion and 11 states treated residential electricity like other consumption goods with normal sales taxes.

Industrial petroleum fuels, which are sold in a free market, are not generally taxed in the U.S. Crude oil and coal produced on private lands are subject to federal and state production taxes and are included in the “industrial” sector for convenience.

Table 7 shows the list of OECD “subsidies.”



**Table 7: OECD Subsidies for the U.S. by Fuel and Sector, 2015 (\$billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	(\$0.2)	-	-	-	(\$0.2)
Distillate (incl diesel)	(\$0.2)	(\$0.4)	-	-	(\$0.6)
LPG	-	(\$0.2)	-	(\$1.3)	(\$1.5)
Kerosene (incl jet)	(\$0.3)	-	-	-	(\$0.3)
Heavy fuel oil	-	-	-	(\$0.4)	(\$0.4)
Other oil products	-	-	-	-	-
Crude oil/other oil	-	-	-	(\$3.3)	(\$3.3)
<i>Total oil</i>	<i>(\$0.7)</i>	<i>(\$0.6)</i>	<i>-</i>	<i>(\$5.0)</i>	<i>(\$6.3)</i>
Natural gas	-	(\$1.6)	-	(\$1.1)	(\$2.7)
Coal (ex powergen)	-	-	-	(\$1.4)	(\$1.4)
Electricity (fossil fuel share)	-	(\$0.2)	(\$0.2)	-	(\$0.4)
<i>Total fossil fuels</i>	<i>(\$0.7)</i>	<i>(\$2.4)</i>	<i>(\$0.2)</i>	<i>(\$7.5)</i>	<i>(\$10.8)</i>

As shown in Table 7, OECD fossil fuel “subsidies” totaled about \$11 billion for 2015. For the year 2015, the OECD listed 395 “subsidies” in the U.S., of which 176 or 45% offered no quantification. Of the total, 222 or 56% were exemptions, deductions or reductions from excise and sales taxes. A total of 26 items were eliminated due to double counting.<sup>13</sup>

The transportation sector subsidies are almost entirely rebates or exemptions from excise and sales taxes. For example, Texas does not impose gasoline excise tax on fuel used for off-road usage, maritime navigation or agriculture, or by the federal government, public schools, construction, industry, and some commercial services. The OECD assesses the total value of this Texas “subsidy” at \$76 million. West Virginia exempts from diesel excise taxes fuel used for stationary engines, heating, commercial watercraft, railroad locomotives, or as a solvent or lubricant. Note, however, that these users must still pay the market price for fuel plus federal excise tax.

About 20% of the “subsidies” (\$2.4 billion out of \$11 billion) apply to residential fuels. One of the few true subsidies on the OECD list is the Low Income Home Energy Assistance Program (LIHEAP), instituted by Congress in 1981 to help pay heating bills for low-income consumers. At \$2 billion, LIHEAP accounted for almost all the OECD residential energy subsidies.

Table 8 shows the net over/undertax for each market segment, derived by subtracting the OECD subsidies from the gross taxation. Despite the OECD “subsidies” and the exemption from most sales taxes, fossil fuels were still overtaxed in the U.S. by some \$50 billion in 2015. Most of the overtaxation was attributable to transportation fuels. The only sector undertaxed in the U.S. is residential use.

**Table 8: U.S. Net Over/Undertaxation by fuel and sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$31.5	-	-	-	\$31.5
Distillate (incl diesel)	\$15.6	(\$0.7)	-	-	\$14.9
LPG	\$0.2	(\$1.0)	-	(\$1.3)	(\$2.1)
Kerosene (incl jet)	\$2.0	-	-	-	\$2.0
Heavy fuel oil	-	-	-	(\$0.4)	(\$0.4)
Crude oil/other oil	-	-	-	\$1.2	\$1.2
<i>Total oil</i>	<i>\$49.3</i>	<i>(\$1.7)</i>	<i>-</i>	<i>(\$0.5)</i>	<i>\$47.1</i>
Natural gas	-	(\$2.5)	(\$0.1)	\$4.1	\$1.5
Coal (ex powergen)	-	-	-	\$0.6	\$0.6
Electricity (fossil fuel share)	-	(\$2.0)	\$0.4	\$2.0	\$0.4
<i>Total fossil fuels</i>	<i>\$49.3</i>	<i>(\$6.2)</i>	<i>\$0.3</i>	<i>\$6.2</i>	<i>\$49.6</i>

The correct statements about U.S. fossil fuel subsidies are as follows:

1. In total, the U.S. imposes taxes on fossil fuels that raise consumer prices above their hypothetical market levels. The total gross overtaxation of U.S. fossil fuels was about \$60 billion in 2015.
2. The federal and state governments provide many tax breaks for specific activities. Taking the OECD list at face value, these tax breaks reduce the overtaxation by about 20%, resulting in a net overtaxation of about \$50 billion in 2015.
3. As a matter of social policy, residential energy use is the only subsidized sector in the U.S., enjoying a net undertaxation of just over \$6 billion, or less than 1% of the retail value of fossil fuels. All other sectors are overtaxed.

## Other Industrial Countries

Twenty-eight other industrial countries were analyzed.<sup>14</sup> In 2015, this country group had a total population of about 726 million or more than twice the U.S. As shown in Table 9, total fossil fuel consumption in 2015 was about 741 gge or roughly 1,014 gge per capita, compared to 1,293 per capita in the U.S. Nearly 60% of fossil fuel use in this group is for industrial use, with about 20% for transportation and the remaining 20% for residential and commercial use. The total retail value of this fossil energy was roughly \$1,890 billion in 2015.



**Table 9: Other Industrial Countries Final Consumption by Fuel and Sector, 2015**  
(billion gallons or gallons of gasoline equivalent)

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	51.9	-	-	-	51.9
Distillate (incl diesel)	82.8	9.2	7.1	15.6	114.7
LPG	5.0	4.9	2.3	11.9	24.1
Kerosene (incl jet)	26.5	3.5	1.6	1.2	32.8
Heavy fuel oil	-	-	-	21.8	21.8
Other oil products	-	-	-	41.0	41.0
<i>Total oil</i>	<i>166.2</i>	<i>17.6</i>	<i>11.0</i>	<i>91.5</i>	<i>286.3</i>
Natural gas	2.9	46.2	24.5	121.1	194.7
Coal (ex powergen)	-	-	-	189.7	189.7
Electricity (fossil fuel share)	-	18.1	22.2	29.6	69.9
<i>Total fossil fuels</i>	<i>169.1</i>	<i>81.9</i>	<i>57.7</i>	<i>431.9</i>	<i>740.6</i>

**Table 10: Other Industrial Countries Hypothetical Taxation by Fuel and Sector, 2015, (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$141.6	-	-	-	\$141.6
Distillate (incl diesel)	\$220.0	\$7.7	\$2.3	\$25.2	\$255.2
LPG	\$4.6	\$1.9	\$0.9	\$2.4	\$9.8
Kerosene (incl jet)	\$6.8	\$1.1	\$0.4	\$0.4	\$8.7
Heavy fuel oil	-	-	-	\$2.6	\$2.6
Other oil products	-	-	-	\$0.6	\$0.6
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$373.0</i>	<i>\$10.7</i>	<i>\$3.6</i>	<i>\$31.2</i>	<i>\$418.5</i>
Natural gas	\$0.8	\$19.4	\$9.2	\$6.4	\$35.8
Coal (ex powergen)	-	-	-	\$10.2	\$10.2
Electricity (fossil fuel share)	-	\$30.4	\$19.7	\$22.1	\$72.2
<i>Total fossil fuels</i>	<i>\$373.8</i>	<i>\$60.5</i>	<i>\$32.5</i>	<i>\$69.9</i>	<i>\$536.7</i>



As shown in Table 10, the total hypothetical tax take for these countries in 2015 would have been nearly \$537 billion or \$0.72 per gge on all fossil fuels.

All countries in this group impose significant excise taxes on fuels, including for industrial use. These taxes can more than double the cost of the fuel. In addition, value added taxes (VAT), varying from 5% in Japan and Canada to as high as 27% in Hungary, are also charged on transportation, residential and commercial fuels. Furthermore, the VAT is assessed on the total retail value of the fuel. For example, if gasoline were priced at \$3.00 per gallon with a 20% VAT, the final retail price would be \$3.60. If a \$2.00 per gallon excise tax were added, however, the final retail price would be \$6.00 per gallon, making the excise tax effectively \$2.40 per gallon. The result is high energy prices for consumers in virtually all market segments.

For example, in 2015 the gasoline excise tax in Italy was \$3.27. With an additional 21% VAT, the final consumer price was \$6.56 per gallon – nearly three times the price paid by U.S. consumers. Most European countries charged similar taxes. The lowest taxes in this country group were in Canada, which charged an excise tax of \$1.01 per gallon with a 9.1% General Sales Tax,<sup>15</sup> making the final retail price \$3.56 per gallon—more than 50% higher than in the U.S. The average gasoline tax burden for this group was \$2.10 per gallon in excise tax plus an additional \$0.66 in VAT for a total tax burden of \$2.76 per gallon.

Diesel excise taxes in this group were lower than gasoline taxes- averaging \$2.66 per gallon. Tax policy in some countries has created substantial differentials between gasoline and diesel prices. For example, in 2015, diesel cost \$2.40 per gallon less than gasoline in New Zealand, \$2.10 per gallon less in South Korea and \$1.33 less in Greece. This differential is one of the reasons Europe has a substantial fleet of private diesel passenger cars while the U.S. does not. Even when diesel prices are lower than gasoline prices, however, drivers in Europe still pay substantially more than the hypothetical market price for fuel.

Although excise taxes on motor fuels are particularly high, accounting for almost 70% of all taxes, these countries impose some excise taxes on virtually all market segments, even residential and industrial energy use. Electricity taxes can be particularly high. Germany and Denmark, for example, countries with high renewable energy penetration, imposed taxes on residential electricity of \$5.43 per gge and \$6.41 per gge respectively in 2015. German and Danish electricity consumers paid about three times as much for residential electricity as their American counterparts.



**Table 11: Other Industrial Countries Reference Taxation by Fuel and Sector, 2015, (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$15.6	-	-	-	\$15.6
Distillate (incl diesel)	\$31.3	\$3.1	\$0.5	-	\$34.9
LPG	\$1.2	\$1.5	\$0.6	-	\$3.3
Kerosene (incl jet)	-	\$0.8	\$0.3	-	\$1.1
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	-	-
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$48.1</i>	<i>\$5.4</i>	<i>\$1.4</i>	<i>-</i>	<i>\$54.9</i>
Natural gas	\$0.6	\$14.9	\$8.2	-	\$23.7
Coal (ex powergen)	-	-	-	-	-
Electricity (fossil fuel share)	-	\$12.5	\$15.4	-	\$27.9
<i>Total fossil fuels</i>	<i>\$48.1</i>	<i>\$32.8</i>	<i>\$25.0</i>	<i>-</i>	<i>\$106.5</i>

Table 11 shows reference taxation for this group of countries, totaling about \$106 billion in 2015—only a fifth of the hypothetical taxation. The reference tax on these countries is the VAT that would have been charged on the pre-tax prices of the products. Note that this excludes the VAT charged on the excise taxes. The reference tax is much higher in other industrial countries (about \$0.14 per gge) than in the U.S. (\$0.07 per gge), which has no national consumption tax.

American states charge excise taxes in lieu of consumption (sales) taxes. With very few exceptions, however, the other industrial countries charge both excise and value added taxes. The term “value-added” means that the effective tax rate is applied only on the value added in each step of the manufacturing process. This is usually accomplished by assessing VAT on the value of the product produced and rebating to the manufacturer the VAT paid on inputs to that step. These rebates keep the tax from “cascading” through multiple steps in the manufacturing process where an initial input could conceivably be taxed multiple times before reaching the consumer. As a result, energy used in the industrial sector is rarely subject to VAT.

VAT rates vary considerably among the countries in this group. The highest rates are in Hungary (27%), Norway, Sweden (25%) and Finland (24%) with Greece, Ireland, Poland and Portugal just a little lower at 23%. The lowest rates are in Canada (9.1% national average) and Switzerland and Japan at 8%.



**Table 12: Other Industrial Countries Gross Over/Undertaxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$126.0	-	-	-	\$126.0
Distillate (incl diesel)	\$188.7	\$4.6	\$1.8	\$25.2	\$220.3
LPG	\$3.4	\$0.4	\$0.3	\$2.4	\$6.5
Kerosene (incl jet)	\$6.8	\$0.3	\$0.1	\$0.4	\$7.6
Heavy fuel oil	-	-	-	\$2.6	\$2.6
Other oil products	-	-	-	\$0.6	\$0.6
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$324.9</i>	<i>\$5.3</i>	<i>\$2.2</i>	<i>\$31.2</i>	<i>\$363.6</i>
Natural gas	\$0.3	\$4.5	\$1.0	\$6.4	\$12.2
Coal (ex powergen)	-	-	-	\$10.2	\$10.2
Electricity (fossil fuel share)	-	\$17.9	\$4.2	\$22.1	\$44.2
<i>Total fossil fuels</i>	<i>\$325.2</i>	<i>\$27.7</i>	<i>\$7.4</i>	<i>\$69.9</i>	<i>\$430.2</i>

As shown in Table 12, even adjusting for general consumption taxes, the excise tax burden on fossil fuels in this group is extremely high—totaling over \$430 billion or nearly 2% of the group’s GDP. By comparison, the \$53 billion gross overtaxation in the U.S. accounts for less than 0.3% of GDP.

**Table 13: OECD Subsidies for Other Industrial Countries by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	(\$0.9)	-	-	-	(\$0.9)
Distillate (incl diesel)	(\$13.8)	(\$2.5)	(\$0.7)	(\$14.7)	(\$31.7)
LPG	(\$0.2)	(\$0.3)	(\$0.1)	(\$0.2)	(\$0.8)
Kerosene (incl jet)	(\$4.8)	(\$0.6)	-	-	(\$5.4)
Heavy fuel oil	-	-	-	(\$1.5)	(\$1.5)
Other oil products	-	-	-	(\$0.8)	(\$0.8)
Crude oil	-	-	-	(\$2.0)	(\$2.0)
<i>Total oil</i>	<i>(\$19.7)</i>	<i>(\$3.4)</i>	<i>(\$0.8)</i>	<i>(\$19.2)</i>	<i>(\$43.1)</i>
Natural gas	(\$0.3)	(\$0.7)	(\$0.1)	(\$12.5)	(\$13.6)
Coal (ex powergen)	-	-	-	(\$6.3)	(\$6.3)
Electricity (fossil fuel share)	-	(\$2.9)	(\$0.6)	(\$0.9)	(\$4.4)
<i>Total fossil fuels</i>	<i>(\$20.0)</i>	<i>(\$7.0)</i>	<i>(\$1.5)</i>	<i>(\$38.9)</i>	<i>(\$67.4)</i>





As shown in Table 13, the OECD subsidies total \$67.4 billion for 2015, with over half attributed to industrial uses (including energy production and transportation), 30% to transportation fuels and the remainder to the residential and commercial sectors.

The list includes 1,425 items, of which 627 or 44% are simply deductions, rebates or exemptions from high excise taxes. Six hundred fifty-seven items or 46% list a subsidy but provide no data. The OECD subsidies are nearly an order of magnitude smaller than the gross overtaxation of fossil fuels (\$67.4 billion versus \$430.2 billion).

**Table 14: Other Industrial Countries Net Taxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$125.1	-	-	-	\$125.1
Distillate (incl diesel)	\$174.9	\$2.1	\$1.2	\$10.5	\$188.7
LPG	\$3.2	\$0.1	\$0.2	\$2.2	\$5.7
Kerosene (incl jet)	\$2.0	(\$0.2)	-	\$0.3	\$2.1
Heavy fuel oil	-	-	-	\$1.0	\$1.0
Other oil products	-	-	-	(\$0.2)	(\$0.2)
Crude oil	-	-	-	(\$2.0)	(\$2.0)
<i>Total oil</i>	<i>\$305.2</i>	<i>\$2.0</i>	<i>\$1.4</i>	<i>\$11.8</i>	<i>\$320.4</i>
Natural gas	(\$0.1)	\$3.8	\$0.9	(\$6.1)	(\$1.5)
Coal (ex powergen)	-	-	-	\$3.9	\$3.9
Electricity (fossil fuel share)	-	\$15.0	\$3.6	\$21.2	\$39.8
<i>Total fossil fuels</i>	<i>\$305.1</i>	<i>\$20.8</i>	<i>\$5.9</i>	<i>\$30.8</i>	<i>\$362.6</i>

Table 14 shows net taxation for this group, derived by subtracting OECD subsidies from the gross overtaxation. The result is a substantial overtax \$362.6 billion, which amounts to \$0.49 per gge for all fossil fuels.

Unlike in the U.S., all sectors were overtaxed, including residential fuels. Only a few segments (residential kerosene, natural gas transportation, crude oil and industrial natural gas) exhibit small undertaxation.

On balance, the only statement that can be made for the Other Industrial Countries group is that fossil fuels as a whole are substantially overtaxed at an average of \$0.49 per gge. With one or two small exceptions, the overtaxation applies to virtually every point of potential competition with renewables.



## The BRICs (Brazil, Russia, India, China)

Brazil, Russia, India and China are often grouped together because they represent the largest emerging markets—countries supposedly undergoing development to the status of world economic powers. This group accounts for 42% of the world's population and 21% of global GDP.

Analysis of fuel subsidies in these countries is difficult, since these economies have a heavy state-planning component. In Western market economies, prices determine investor and consumer decisions regarding which fuels to use and how and where to use them. Government tax and subsidy policy acts primarily by influencing investor and consumer decisions. This is not the case in centrally planned economies, however. In China, for example, the new 13<sup>th</sup> Five Year Plan calls for increasing nuclear power capacity from the current level of 32.4 GW to 58 GW in 2020-2021. The Chinese government sets the prices paid for this power and the prices charged for the materials and labor required to build these plants to try to make the projects economically viable, but the planning authorities determine the number, type and location of the plants.

Furthermore, tax enforcement can be rather weak in these countries with extensive black markets, corruption and underground economic activity. On the other hand, there are often hidden taxes at the provincial (or state) and local levels.<sup>16</sup>

With these caveats, we will make a best effort to identify the taxes currently at work in these countries and compare them to the OECD subsidies list to make a rough estimate of the net tax balance.

**Table 15: BRIC Final Consumption by Fuel and Sector, 2015**  
(billions gallons or gallons of gasoline equivalent)

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	59.0	-	-	-	59.0
Distillate (incl diesel)	71.2	2.2	4.1	22.3	99.8
LPG	0.8	26.4	2.0	7.7	36.9
Kerosene (incl jet)	15.5	2.3	0.3	0.1	18.2
Heavy fuel oil	-	-	-	13.1	13.1
Other oil products	-	-	-	34.6	34.6
Crude oil	-	-	-	-	-
<i>Total oil</i>	146.5	30.9	6.4	77.8	261.6
Natural gas	17.1	25.9	4.7	130.7	178.4
Coal (ex powergen)	-	-	-	950.6	950.6
Electricity (fossil fuel share)	-	25.6	13.3	102.9	141.8
<i>Total fossil fuels</i>	163.6	82.4	24.4	1,262.0	1,532.4



In 2015, the BRICs had a total population of about 3,055 million—more than 40% of the world’s population. As shown in Table 15, total fossil fuel consumption for this group was about 1,532 gge or roughly 500 gge per capita, compared to 1,293 per capita in the U.S. and 1,044 gge in the other industrial countries. In contrast to the industrial countries, about 83% of fossil fuel in this group is for industrial use, with about 10% for transportation and the remaining 7% for residential and commercial use. The total retail value of this fossil energy in 2015 is estimated at \$1,650 billion.

**Table 16: BRIC Hypothetical Taxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$93.8	-	-	-	\$93.8
Distillate (incl diesel)	\$77.7	\$0.7	\$4.1	\$13.3	\$95.8
LPG	\$0.7	\$11.8	\$1.4	\$0.2	\$14.1
Kerosene (incl jet)	\$4.2	\$1.5	\$0.4	\$0.1	\$6.2
Heavy fuel oil	-	-	-	\$4.3	\$4.3
Other oil products	-	-	-	\$0.1	\$0.1
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$176.4</i>	<i>\$14.0</i>	<i>\$5.9</i>	<i>\$18.0</i>	<i>\$214.3</i>
Natural gas	-	\$1.9	\$0.4	\$1.7	\$4.0
Coal (ex powergen)	-	-	-	\$8.2	\$8.2
Electricity (fossil fuel share)	-	\$1.7	\$1.7	-	\$3.4
<i>Total fossil fuels</i>	<i>\$176.4</i>	<i>\$17.6</i>	<i>\$8.0</i>	<i>\$27.9</i>	<i>\$229.9</i>

As shown in Table 16, fossil fuel taxes in the BRIC countries total about \$230 billion or about \$0.15 per gge, closer to the U.S. level of \$0.10 than the other industrial countries’ level of \$0.49. As in other countries, however, these taxes are heavily concentrated on motor fuels, where taxes are easy to collect and demand is relatively inelastic. Gasoline taxes average \$1.59 per gallon, while diesel taxes average \$1.09. Residential, commercial and industrial fuels are taxed rather lightly.

**Table 17: BRIC Reference Taxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$23.5	-	-	-	\$23.5
Distillate (incl diesel)	\$23.9	\$0.7	\$1.2	-	\$25.8
LPG	\$0.3	\$11.8	\$1.4	-	\$13.5
Kerosene (incl jet)	-	\$1.4	\$0.1	-	\$1.5
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	-	-
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$47.7</i>	<i>\$13.9</i>	<i>\$2.7</i>	<i>-</i>	<i>\$64.3</i>
Natural gas	-	\$1.9	\$0.4	-	\$2.3
Coal (ex powergen)	-	-	-	-	-
Electricity (fossil fuel share)	-	\$1.7	\$1.7	-	\$3.4
<i>Total fossil fuels</i>	<i>\$47.7</i>	<i>\$17.5</i>	<i>\$4.8</i>	<i>-</i>	<i>\$70.0</i>

Reference taxation is a bit fuzzy in these countries, since VAT rates vary significantly from sector to sector and tax enforcement is often weak. General VAT rates are 19% in Brazil, 18% in Russia and 17% in China, although it is not clear how well collection of these taxes is managed. In 2015, VAT in India was a complex set of tax rates at the state level, with different rates for different types of goods and services. For purposes of this analysis, the average rate for 2015 was assumed to be 25%. In 2017, India simplified its consumption taxes by replacing state taxes with a single national tax structure.

As shown in Table 17, a reasonable estimate for reference taxation in the BRICs is \$70 billion for 2015—a little less than one-third of the hypothetical taxation.

**Table 18: BRIC Gross Over/undertaxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$70.3	-	-	-	\$70.3
Distillate (incl diesel)	\$53.8	-	\$2.9	\$13.3	\$70.0
LPG	\$0.4	-	\$0.5	\$0.2	\$1.1
Kerosene (incl jet)	\$4.2	\$0.1	\$0.3	\$0.1	\$4.7
Heavy fuel oil	-	-	-	\$4.3	\$4.3
Other oil products	-	-	-	\$0.1	\$0.1
Crude oil	-	-	-	-	-
<i>Total oil</i>	<i>\$128.7</i>	<i>\$0.1</i>	<i>\$3.7</i>	<i>\$18.0</i>	<i>\$150.5</i>
Natural gas	-	-	-	\$1.7	\$1.7
Coal (ex powergen)	-	-	-	\$8.2	\$8.2
Electricity (fossil fuel share)	-	-	-	-	-
<i>Total fossil fuels</i>	<i>\$128.7</i>	<i>\$0.1</i>	<i>\$3.7</i>	<i>\$27.9</i>	<i>\$160.4</i>

As shown in Table 18, gross overtaxation of fossil fuels for the BRICs is still substantial at about \$160 billion (\$230 billion less \$70 billion).

**Table 19: BRIC OECD Subsidies by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	(\$7.1)	-	-	-	(\$7.1)
Distillate (incl diesel)	(\$28.4)	-	-	(\$1.2)	(\$29.6)
LPG	(\$0.2)	(\$0.2)	(\$0.2)	(\$2.5)	(\$3.1)
Kerosene (incl jet)	(\$3.0)	(\$1.7)	-	-	(\$4.7)
Heavy fuel oil	-	-	-	-	-
Other oil products	-	-	-	(\$0.1)	(\$0.1)
Crude oil	-	-	-	(\$7.5)	(\$7.5)
<i>Total oil</i>	<i>(\$38.7)</i>	<i>(\$1.9)</i>	<i>(\$0.2)</i>	<i>(\$11.3)</i>	<i>(\$52.1)</i>
Natural gas	-	(\$0.3)	-	(\$3.7)	(\$4.0)
Coal (ex powergen)	-	-	-	(\$0.4)	(\$0.4)
Electricity (fossil fuel share)	-	-	-	-	-
<i>Total fossil fuels</i>	<i>(\$38.7)</i>	<i>(\$2.2)</i>	<i>(\$0.2)</i>	<i>(\$15.4)</i>	<i>(\$56.5)</i>





The OECD subsidy list for the BRICs is shown in Table 19, totaling \$56.5 billion for 2015. Out of a total of 180 items, 79 have no data, and 35 are exemptions, deductions or rebates from excise taxes. China's "Petroleum Fuels Price Reform Support Programs," India's complex price control support program, Russia's support for oil and gas development in remote areas and Brazil's sporadic CIDE production/import tax account for most of these subsidies.

Table 20 shows the net taxation for the BRICs, i.e., gross taxation less reference taxes and OECD subsidies.

**Table 20: BRIC's Net Taxation by Fuel and Sector, 2015 (\$ billion)**

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	\$63.2	-	-	-	\$63.2
Distillate (incl diesel)	\$25.4	-	\$2.9	\$12.1	\$40.4
LPG	\$0.2	(\$0.2)	\$0.3	(\$2.3)	(\$2.0)
Kerosene (incl jet)	\$1.2	(\$1.6)	\$0.3	\$0.1	-
Heavy fuel oil	-	-	-	\$4.3	\$4.3
Other oil products	-	-	-	-	-
Crude oil	-	-	-	(\$7.5)	(\$7.5)
<i>Total oil</i>	\$90.0	(\$1.8)	\$3.5	\$6.7	\$98.4
Natural gas	-	(\$0.3)	-	(\$2.0)	(\$2.3)
Coal (ex powergen)	-	-	-	\$7.8	\$7.8
Electricity (fossil fuel share)	-	-	-	-	-
<i>Total fossil fuels</i>	\$90.0	(\$2.1)	\$3.5	\$12.5	\$103.9

BRIC countries show substantial excise taxes and VAT on fossil fuels for the purpose of raising revenue, but eroded by tax breaks, exemptions and payments designed to shield both producers and consumers from market impacts. This situation does not, however, suggest that fossil fuels in these countries are sold at below hypothetical market prices. As shown in Table 20, the net overtaxation of fossil fuels is \$103.9 billion or \$0.07 per gge, compared to \$0.10 in the U.S. and \$0.49 in the other industrialized countries. The only exception to this conclusion appears to be residential fuels, which are slightly undertaxed.



## Oil Producing Countries

The OECD subsidy project covers only a handful of oil producing countries, but the International Energy Agency (IEA) has analyzed a more comprehensive list of 25 countries.<sup>17</sup>

**Table 21: Oil Producers' Final Consumption by Fuel and Sector, 2015**  
(billion gallons or gallons of gasoline equivalent)

	Transportation	Residential	Commercial	Industrial	Total
Gasoline	54	-	-	-	54
Distillate (incl diesel)	36	1	15	25	77
LPG	1	12	1	6	20
Kerosene (incl jet)	10	2	-	1	13
Heavy fuel oil	-	-	-	29	29
Other oil products	-	-	-	3	3
Crude oil	-	-	-	-	-
<i>Total oil</i>	101	15	16	64	196
Natural gas	4	22	6	185	217
Coal (ex powergen)	-	-	-	39	39
Electricity (fossil fuel share)	-	17	10	19	46
<i>Total fossil fuels</i>	105	54	32	307	498

As shown in Table 21, in 2015 the oil producing countries consumed 498 billion gge of fossil fuels, about 40% of which was oil. About 60% of consumption was for industry, about 20% for transportation and the rest for residential and commercial use. With a total population of just over 1 billion, this group consumed about 475 gge per capita, compared to 1,293 gge in the U.S., 1,041 gge in the other industrial countries and 500 gge in the BRICs.

The IEA uses a definition of the term “subsidy” that is rather more intuitive and logical than the OECD definition. Rather than looking at individual policies, the IEA simply compares prevailing energy prices in these countries against a hypothetical market price based on costs and prevailing VAT rates.

The mechanism for these countries is generally simple and straightforward. Their energy industries are managed by state companies, which derive their revenues from energy production and often have substantial cash flow. Governments can sell retail energy to their consumers at low prices as one avenue of distributing societal benefits.

The IEA does not break down their calculations by product and sector, but only by oil, gas, coal and electricity. Table 22 shows the summary results.



**Table 22: Oil Producing Countries – IEA Subsidies (2015) \$ billion**

	Oil	Natural Gas	Coal	Electricity	Total
<b>Algeria</b>	\$8.6	\$2.2	-	\$2.7	\$13.5
<b>Angola</b>	\$0.2	-	-	\$0.2	\$0.4
<b>Azerbaijan</b>	negl	\$0.4	-	\$0.5	\$0.9
<b>Bahrain</b>	\$0.3	-	-	\$1.2	\$1.5
<b>Brunei</b>	\$0.1	-	-	negl	\$0.1
<b>Ecuador</b>	\$2.3	Negl	-	-	\$2.3
<b>Egypt</b>	\$9.7	\$0.5	-	\$5.0	\$15.2
<b>Gabon</b>	\$0.1	-	-	negl	\$0.1
<b>Indonesia</b>	\$7.1	-	-	\$8.7	\$15.8
<b>Iran</b>	\$17.2	\$17.6	-	\$12.3	\$47.1
<b>Iraq</b>	\$3.1	\$0.2	-	\$1.8	\$5.1
<b>Kazakhstan</b>	\$0.5	\$0.3	\$1.0	\$0.4	\$2.2
<b>Kuwait</b>	\$1.4	\$1.2	-	\$3.3	\$5.9
<b>Libya</b>	\$3.3	negl	-	\$0.4	\$3.7
<b>Malaysia</b>	\$0.4	-	-	-	\$0.4
<b>Mexico</b>	negl	-	-	\$6.2	\$6.2
<b>Nigeria</b>	\$2.4	-	-	-	\$2.4
<b>Oman</b>	\$0.1	-	-	-	\$0.1
<b>Qatar</b>	\$0.7	\$0.9	-	\$1.4	\$3.0
<b>Saudi Arabia</b>	\$28.0	\$4.5	-	\$12.1	\$44.6
<b>Trinidad</b>	\$0.5	-	-	\$0.3	\$0.8
<b>Turkmenistan</b>	\$2.8	-	\$2.5	\$1.0	\$6.3
<b>UAE</b>	\$0.9	\$7.2	-	\$2.1	\$10.2
<b>Uzbekistan</b>	\$0.2	\$5.0	-	\$1.0	\$6.2
<b>Venezuela</b>	\$18.8	\$2.7	-	\$3.7	\$25.3
<b>Total</b>	\$108.7	\$42.7	\$3.5	\$64.3	\$219.3

Fossil fuel subsidies in these countries are clearly substantial, totaling about \$219 billion in 2015, with about 50% for oil, 30% for electricity and 20% for natural gas. Although there are 25 countries on the list, four (Iran, Saudi Arabia, Indonesia and Venezuela) account for over 60% of the total.





The IEA subsidy numbers include exemption from customary VAT. VAT rates vary considerably among these countries with high rates in Uzbekistan (20%), Algeria (19%), Azerbaijan (18%) and Mexico (16%) and zero rates in eleven of the 25 countries (Bahrain, Brunei, Gabon, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Turkmenistan and the UAE). On this basis, the IEA subsidy estimates are equivalent to the definition of net taxation used in this study for the other country groups.

In total, these subsidies are quite significant, amounting to \$350 per capita for over 1 billion people, compared to OECD subsidy estimates of \$34 per capita in the U.S., \$71 per capita in the other industrial countries and \$27 per capita in the BRICs. Furthermore, the IEA estimates for the oil producing countries are net of taxes, while the OECD estimates are not.

These subsidies have brought some political benefits to ruling elites, but have also caused serious problems. When most of these subsidies were first offered in the 1960s, local consumption of energy was insignificant compared to exports. Demand tends to grow rapidly, however, when goods are underpriced, and these countries now consume about 20% of the world's fossil fuels. In 2015, Venezuela consumed 26% of its oil production, while Saudi Arabia consumed 32% and Iran nearly 50%. This wasteful consumption robs these countries of export revenue. The likely impact, however, is to raise the price of oil for the rest of the world, since the overconsumed energy is denied to the world market.

It's unlikely, however, that these subsidies disadvantage renewable energy in any meaningful way. Hydrocarbon rich countries have little if any economic incentive to use renewable energy. Iran, for example, sits on massive, unused natural gas reserves, which are second in magnitude only to Russia's. Qatar's natural gas reserves rank number three in the world, and less than 1% is currently produced each year. Nigeria flares substantial amounts of natural gas from its oilfields for lack of any market.

## Final Comment

It is tempting to add together the listed OECD/IEA subsidies for the four country groupings and to conclude that fossil fuels enjoy a huge subsidy in the global economy, thereby providing a global disincentive for renewable energy development. It would be equally easy to argue that gross overtaxation of the four country groups totals an even larger, offsetting amount, thereby providing a global disincentive for fossil fuel use. In reality, interfuel competition is a purely local issue, determined by the competitive position in a particular place at a particular time. Global totals are therefore meaningless. A full analysis does not support the narrative that fossil fuel subsidies impede the development of wind and solar power and other "renewable" sources of energy.



## Endnotes

1. <https://www.cisl.cam.ac.uk/news/press-releases/international-organisations-countries-and-businesses-commit-to-work-together-on-fossil-fuel-subsidies-elimination-3-july-2015>
2. OECD at <http://www.oecd.org/environment/support-to-fossil-fuels-remains-high-and-the-time-is-ripe-for-change.htm>
3. At [http://stats.oecd.org/Index.aspx?DataSetCode=FFS\\_AUS](http://stats.oecd.org/Index.aspx?DataSetCode=FFS_AUS)
4. Eliminating double counting of the OECD subsidy list.
5. At [www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf#page=7&zoom=auto,-170,420](http://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf#page=7&zoom=auto,-170,420)
6. *The Guardian*, May 18, 2015.
7. Crude oil is rarely consumed in raw form, but is included here since some taxes and OECD subsidies are assessed on crude oil.
8. For consistency, all consumption tables use IEA data.
9. Including international bunkers but excluding power generation, which is captured under electricity demand.
10. Including international bunkers.
11. For convenience, we will refer to the 50 states plus the District of Columbia as “the states.”
12. Energy Information Administration, 2015 Residential Energy Survey at <https://www.eia.gov/consumption/residential/data/2015/#fueluses>
13. Some of these “subsidies” apply to refining and oil distribution, and the OECD arbitrarily allocated these items among the different fuels and sectors.
14. Canada, Belgium, the Czech Republic, Denmark, Germany, Estonia, Greece, Spain, France, Ireland, Italy, Luxembourg, Hungary, the Netherlands, Austria, Poland, Portugal, Slovenia, Slovakia, Finland, Sweden, the United Kingdom, Norway, Switzerland, Japan, South Korea, Australia and New Zealand
15. Average for Canada. GST in some provinces, including Nova Scotia and New Brunswick, can be as high 15%.
16. For a complete discussion of this problem, see Sylvie Cornot-Gandolphe, “China’s Coal Market: Can Beijing Tame ‘King Coal’?”, Oxford Institute for Energy Studies, December 2014.
17. Mexico, Algeria, Angola, Azerbaijan, Bahrain, Brunei, Ecuador, Egypt, Gabon, Indonesia, Iraq, Iran, Kazakhstan, Kuwait, Libya, Malaysia, Nigeria, Oman, Qatar, Saudi Arabia, Trinidad and Tobago, Turkmenistan, the UAE, Uzbekistan and Venezuela.
18. Fossil Fuel Share.
19. Totals may not add due to rounding.





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The mission of the CO2 Coalition of scientists, engineers and economists is to promote a broader understanding of the effects of CO2 on the atmosphere, land and oceans. The Coalition fosters informed debate on the scientific evidence. The Coalition's initial paper, published in the fall of 2015, urged the public to "see for yourself."



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July 2020

