A Report from the *ENERGY AND THE WEST* Series by

HEADWATERS ECONOMICS

U.S. Energy Needs and the Role of Western Public Lands

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ABOUT HEADWATERS ECONOMICS

Headwaters Economics is an independent, nonprofit research group. Our mission is to improve community development and land management decisions in the West.

P. O. Box 7059
Bozeman, MT 59771
406-599-7423

www.headwaterseconomics.org

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ABOUT THE *ENERGY AND THE WEST* SERIES

This report is the second in a series *Energy and the West* published by Headwaters Economics on the topic of energy development. This series is designed to assist the public and public officials in making informed choices about energy development that will benefit the region over the long term.

In the reports in the *Energy and the West* series listed below, we consider the policy context for energy development in the West. Our focus is the impact of energy development on states, counties, and communities, from the perspectives of economic performance (i.e., jobs, personal income, wages) and fiscal health (i.e., state and county budgets, revenues and expenses). The series also includes state and local area case studies that explore benefits and costs in greater detail.

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- Fossil Fuel Extraction as a County Economic Development Strategy: Are Energy-focusing Counties Benefiting?
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INTRODUCTION

Current U.S. energy policy in the West is focused on accelerating the amount of fossil fuel energy brought to market. The stated goals of this policy are to strengthen the nation's energy independence and security, and also to moderate recent price increases paid by consumers.

This report explores the major assumptions and relevant data underlying this supply-side approach and assesses whether it has been, or can be, an effective way to accomplish the important goals of energy independence and security, and reasonable consumer prices for energy.

In particular, we examine whether the scale of national and western public lands energy reserves is adequate to meet national demand. And we evaluate the determinants of fossil fuel prices to show whether additional energy supplies in the West are capable of significantly affecting consumer prices.

We explain why the markets for oil, natural gas, and coal are very different from each other and that the extent to which the U.S. relies on foreign supplies of these resources is equally diverse. We conclude that the assumptions behind current U.S. energy policy need to be revisited.

Questions Answered in this Report:

1. What is the focus of current U.S. Energy Policy?
2. Can U.S. fossil fuel energy reserves satisfy domestic demand?
3. What factors influence consumer energy prices?

SUMMARY FINDINGS

U.S. energy policy is focused on increasing domestic, especially federal, fossil fuel production to bolster national energy independence and security, and to reduce consumer prices.

The current presidential Administration has framed the U.S. energy challenge as a mismatch between domestic supply and demand. The Energy Policy Act of 2005 calls for a rapid increase in production of fossil fuel energy resources in order to increase energy independence and security, and to reduce energy prices. As a result, current U.S. energy policy is largely supply-side focused.

The push to increase production has centered in large part on public lands. In the last eight years, drilling for oil and natural gas on public lands, primarily in the West, has grown nearly four-fold.

This increase has been accomplished by promoting enhanced oil and natural gas recovery from existing wells, removing impediments to additional federal leasing of offshore and onshore reserves, exempting drilling activities from federal laws, exploring opportunities for royalty reductions paid by companies, and streamlining the permitting process for developing federal reserves.

U.S. and western public lands energy resources are not large enough to meet current U.S. demand for oil. Energy companies face no significant roadblocks in the production of natural gas and coal.

Since the U.S. is virtually self-sufficient in natural gas and is a net exporter of coal, a supply-oriented solution to U.S. fossil fuel independence and security hinges on oil. However, it is highly unlikely that we will ever be self-sufficient with respect to oil—our national reserves, both onshore and offshore, are simply too small, and our consumption too large.

The U.S. controls only 2.4 percent of the world's proved reserves of oil, and western public lands contain an even smaller portion of world reserves—approximately 0.2 percent. In 2007, the U.S. produced 8 percent of the world's oil (6.9 million barrels per day) but consumed 24 percent of the annual global production of oil (20.7 million barrels per day), a 13.8 million barrel-a-day deficit.

The U.S. oil reserves-to-production ratio is 11.7, which means that in just under 12 years we will deplete our proved reserves at current production levels. Developing all proved oil reserves in the Intermountain West would meet the oil needs of the country for 116 days, and have little bearing on world supply.

The current energy surge in the West is focused primarily on natural gas. However, there is no independence or security threat with natural gas as we have substantial reserves and are almost self-sufficient, and production is advancing faster than demand. In fact, the main challenge for the natural gas industry is finding new sources of demand to match growing reserves and production.

The U.S. is a net coal exporter. We have large proved reserves of coal, and national as well as Intermountain West production is growing. The big question for coal is not so much a supply issue as whether the U.S. will choose to shift electricity generation from coal to other sources because of climate change concerns.

Increasing domestic production does not guarantee lower energy prices.

Oil is a globally traded commodity. Its price is set by world supply and demand fundamentals, as well as by policies that directly affect supply (such as OPEC quotas) and demand (such as national subsidies in places like China and India). In recent years, the low value of the U.S. dollar relative to other currencies has further exacerbated high domestic gas prices.

The price of crude oil is the largest component of U.S. gas prices (58% according to the Energy Information Administration) at the pump. Because the U.S. is a modest producer and large consumer, U.S. consumers are price takers—not price setters—in the oil market. Even when Americans use less oil in response to price increases, which happened in the summer of 2008 when U.S consumers cut their usage by almost 5 percent from the previous year, that drop in demand has had no impact on world prices.

Natural gas prices respond primarily to conditions of domestic supply and demand. This is because the U.S. is largely self sufficient in natural gas production. Factors that may decrease natural gas prices are: improving production, increasing imports, and releasing natural gas inventories. Factors that may raise the price of natural gas are: increased demand (due to cold winters, for example), high oil prices (when alternatives are expensive, gas prices may also rise), and access to markets where customers pay a higher price (as is the case in the Northeast).

In recent years, natural gas production has increased while demand has been flat. Prices have risen because of harsh winters and the high price of oil, but are now falling rapidly as supply exceeds anticipated demand and new reserves are coming online.

Energy companies have access to federal energy reserves, but are not developing them as fast as they are being leased and permitted. They lease 47.5 million acres of public lands for oil and natural gas production, but only 13 million acres are currently producing. And in the last four years alone, the Bureau of Land Management (BLM) approved almost 10,000 more drilling permits than companies are using. In the case of natural gas, companies are scaling back production in order to keep prices up.

The Intermountain West has enjoyed low natural gas prices (by national standards), in part due to regional production and lower transmission costs. However, the development of new pipeline capacity, such as the Rockies Express Pipeline, which is designed to transport natural gas from the Intermountain West to the east, means that regional natural gas production is now marketed to higher priced markets. Energy and pipeline companies will sell to these higher priced markets and consumers in the Rockies will pay higher prices as a result.

Coal prices are set largely by domestic supply and demand factors. While the U.S. is a net exporter of coal, strong domestic demand for electricity has raised prices and stimulated new production. Still, coal remains cheaper than other sources of energy.

Not all U.S. coal commands the same price. The price of western coal varies based on its quality, Btu content, and distance to market. Powder River Basin coal, for example, sells for substantially less than either Northern or Central Appalachia coal. And within the West, prices for coal vary dramatically, with Colorado and New Mexico on the high end, and Montana and Wyoming on the low end.

Looking ahead, coal prices will likely be determined by the viability of clean coal technologies, carbon tax proposals, and the price of alternative sources of electricity.

WHAT IS THE FOCUS OF CURRENT U.S. ENERGY POLICY?

In 2001, when President Bush took office, resolving what the Administration called the nation's "energy crisis" was a top policy priority. The President appointed Vice-President Cheney to chair an "Energy Task Force," called the National Energy Policy Development Group, which produced a report in 2001 by the same name. [1]

This report framed the U.S. energy challenge as "a fundamental imbalance between supply and demand [that] defines our national energy crisis."[2] This imbalance, based on projections of large increases in U.S. demand for oil, natural gas, and coal, was anticipated to get worse in coming years.

The report made a number of recommendations, but the core logic was to increase domestic production of fossil fuel energy resources in order to increase energy independence and security, and to reduce energy prices. As the President put it, "The goals of the this strategy are clear: to ensure a steady supply of affordable energy for America's homes and businesses and industries."[3]

With a focus on increasing domestic energy production, especially of fossil fuels, the report recommended promoting enhanced oil and natural gas recovery from existing wells, removing impediments to additional federal leasing of offshore and onshore reserves, exploring opportunities for royalty reductions paid by companies, and streamlining the permitting process for developing federal reserves.

These recommendations were incorporated into the Energy Policy Act of 2005 (P.L.109-58 364), which the U.S. Congress adopted on July 9, 2005, with few changes.[4] The Act loosened regulatory oversight over energy companies and relaxed requirements for compliance with federal law. For example, it provided oil and natural gas producers with exemptions from the requirements of the Safe Drinking Water Act. The Act also created new financial incentives for energy companies to increase production. These included tax breaks and reductions on royalty payments totaling in the billions of dollars.[5]

The Act also contained provisions specifically aimed at boosting leasing, permitting, and production of oil, natural gas, and coal on public lands. It relaxed preexisting limitations on the amount of acreage a single entity could lease, gave companies more time to reinstate lapsed leases, established a National Pilot Program to expedite federal permit coordination and fast-track the process of making new public lands available for development, and directed the Secretary of the Interior to complete a sweeping environmental impact statement—covering commercial leasing of oil shale and tar sands resources in Colorado, Utah, and Wyoming.

In this policy context, energy development on public lands, mainly those lands managed by the BLM and Forest Service, has surged in recent years. A consultant's review of the National Pilot Program to expedite permitting reported that "the BLM has improved reliability in providing industry the permits needed to develop new energy resources for the nation."[6] A recent study by the U.S. House Committee on Natural Resources estimates that new drilling for oil and natural gas on public lands increased nearly four-fold from 1999 to 2007.[7]

The next sections of this report investigate whether this supply-side approach to America's energy challenge, focused largely on developing federal energy reserves, can increase energy independence, provide energy security, and reduce energy prices.

CAN U.S. FOSSIL FUEL ENERGY RESERVES SATISFY DOMESTIC DEMAND?

Definitions

There is considerable popular confusion about the terms used to describe fossil fuel energy deposits. This confusion has led to widely varying descriptions of current and potential energy resources.

In order to understand the size of U.S. oil, natural gas, and coal assets, it is important to distinguish between different types of resources and what are called "proved" reserves. Following is a summary of terminology commonly used by government and industry.[8]

Resources	The total volume "formed and trapped within the Earth before production."
Unrecoverable resources	According to the Energy Information Administration, "The largest portion of this total resource base is not recoverable by current or foreseeable technology."[9] Most of it exists at very low concentrations and would require more energy to extract than it would produce. Also, production technologies do not exist to recover the resources, nor would it be economically justifiable to try.
Undiscovered resources	Unspecified volume of resources "surmised to exist" on the basis of geological knowledge and theory.[10]
Recoverable resources	A subset of the total resource base that can potentially be recovered.
Proved reserves	Volumes of oil and natural gas that "geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions."

Proved reserves are the most pertinent to near-term demand because they are technically feasible and economically viable to develop under current market conditions.

The analysis below focuses on proved reserves, but also refers to *undiscovered resources* as a possible energy source for meeting future energy needs.

U.S. Proved Reserves, Production and Consumption of Oil, Natural Gas, and Coal

Here we summarize the U.S. proved reserves, production and consumption of fossil fuels in order to understand better—assuming current and projected increases in U.S. demand—whether it is possible for the U.S. to become energy independent and secure through added production. For more detailed information see Appendix 1.

OIL – The U.S. is a Large Importer of Oil

The U.S. controls 2.4 percent of the world's proved reserves of oil, or 29.4 billion barrels of oil. In 2007, the U.S. produced 8 percent of the world's oil (6.9 million barrels per day) but consumed 24 percent of the annual global production of oil (20.7 million barrels per day). [11]

Because U.S. proved reserves are small, it is not feasible at current or increased demand levels to become energy self-sufficient with respect to oil. In fact, the U.S. oil reserves-to-production ratio is 11.7, which means that in just under 12 years the U.S. will deplete proved reserves at current production levels.[12]

Because of the gap between production and consumption, the U.S. is a massive importer of oil. The U.S. imports 13.8 million barrels per day, or twice current domestic production.[13] The U.S. will continue to be dependent on foreign oil for the foreseeable future.

From an energy security point of view, most of the oil imported into the U.S. comes from established trading partners. In 2007, 63 percent of U.S. imported oil came from just four countries: Canada, Saudi Arabia, Mexico, and Venezuela.[14] This supply security is enhanced by geographic proximity, economic relationships, free trade agreements, integrated pipeline networks, and shared security commitments.

On the other hand, in 2007, the Organization of Petroleum Exporting Countries (OPEC) controlled 78 percent of proved reserves and 45 percent of the production of global oil. Saudi Arabia and Venezuela are OPEC members.[15] How this cartel manages production will have large implications for both the supply and price of oil in the U.S.

NATURAL GAS – The U.S. is Largely Self-Sufficient in Natural Gas

The U.S. controls 3.4 percent of the world's proved reserves of natural gas, or 211 trillion cubic feet of natural gas. In 2007, the U.S. produced 19 percent of the world's natural gas and consumed 23 percent of global production.[16]

The U.S. is largely self-sufficient in natural gas, producing nearly as much as is consumes. What little we import comes primarily from Caribbean nations. Current U.S. natural gas reserves-to-production ratio is 10.9, which means that in just less than 11 years the U.S. will deplete proved reserves at current production levels.[17]

New shale fields are rapidly enlarging U.S. natural gas reserves and production. The recent success of the Barnet Shale in Texas has led to new discoveries such as the Haynesville Shale in Louisiana and East Texas, and the Marcellus Shale in Appalachia, which could significantly expand U.S. natural gas reserves.[18]

From an energy independence and security standpoint, the U.S. holds a strong natural gas position.

COAL – The U.S. is Self-Sufficient in Coal

The U.S. controls 29 percent of the world's proved reserves of coal, or 242 million tons. In 2007, the U.S. produced 19 percent of the world's coal and consumed 18 percent of global production.

The U.S. is self sufficient in coal, and a modest net exporter of coal. The U.S coal reserves-to-production ratio is 234, which means that U.S. will not deplete proved reserves for over well over 200 years at current production levels.[19]

From an energy independence and security standpoint, the U.S. holds a strong coal position.

COMPARISONS

The graphs below summarize the major differences between oil, natural gas, and coal in reserves (Figure 1) and consumption, i.e., production and net imports, (Figure 2).

Figure 1. U.S. Proved Reserves as a Percent of World Proved Reserves, 2007[20]

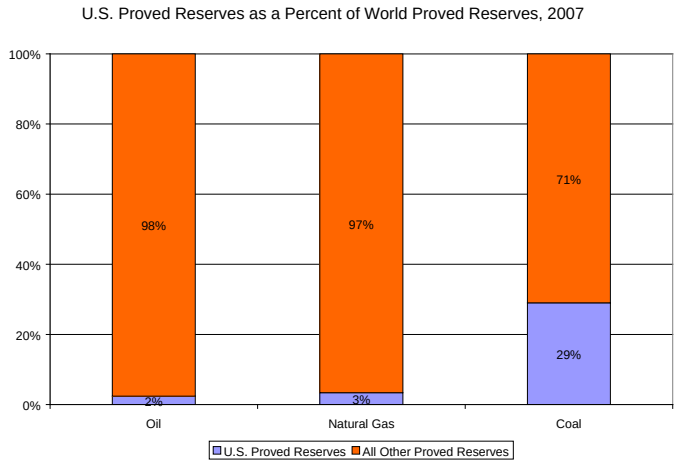
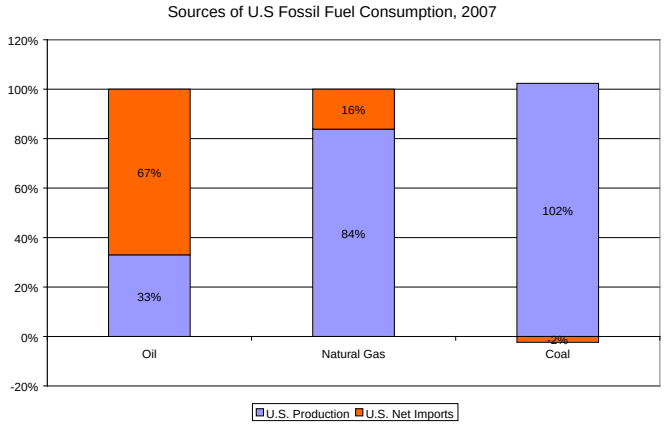


Figure 2. Sources of U.S. Fossil Fuel Consumption, 2007[21]



Note: U.S. fossil fuel consumption equals domestic production plus net imports. The chart above does not include inventories.

Oil is the only fossil fuel where the U.S. has a significant vulnerability between proved reserves and production on the one hand, and consumption on the other.

For more detailed information on U.S. proved reserves, production, and consumption of fossil fuels see Appendix 1.

Federal Offshore and Intermountain West Oil and Natural Gas Proved Reserves

Federal oil and natural gas reserves are typically referred to as "onshore" and "offshore" reserves. We ask whether federal offshore and Intermountain West (federal and all other) proved reserves for oil and natural gas are large enough to provide for energy independence and security for the U.S.

Table 1 shows that in 2006 federal offshore proved oil reserves were 0.3 percent of all world reserves, while the five western energy states, including federal and all other proved oil reserves in the region, possessed 0.2 percent of all world reserves. If they could be developed tomorrow, federal offshore reserves would supply U.S. demand for oil for about 195 days. Proved oil reserves in the Intermountain West (federal and all other) would supply the U.S. for approximately 116 days. Neither reserve base can support longer-term oil independence or security.[22]

Table 1. U.S. Proved Reserves of Oil and Natural Gas as a Percent of World Proved Reserves, 2006[23]

Proved Reserves in 2006	Oil (millions barrels)	Percent of World Total	Natural Gas (trillion cubic feet)	Percent of World Total
Total U.S.	20,972	1.7%	211	0.1%
Federal Offshore	4,096	0.3%	15	0.01%
5 Western Energy States*	2,438	0.2%	65	0.04%
Total World	1,237,900	100%	177,360	100%

* Colorado, Montana, New Mexico, Utah, Wyoming

Table 1 also shows that in 2006 federal offshore proved natural gas reserves were 0.01 percent of all world reserves, while all natural gas proved reserves in Intermountain West energy states added up to 0.04 percent of all world reserves. If they could be developed tomorrow, federal offshore reserves would supply U.S. demand for natural gas for about 238 days. Intermountain West proved natural gas reserves would supply the U.S. for approximately 1,032 days, or a little less than three-years. Neither reserve base can meet longer-term U.S. natural gas needs.[24]

Federal Oil and Natural Gas Production and Domestic Consumption

The Energy Information Administration (EIA) estimates that oil and natural gas production from the federally managed estate will play an increasingly important role in total domestic oil and natural gas production, with the majority of production expected to occur in offshore locations (e.g., the Gulf of Mexico) and not in the Intermountain West.[25]

In 2006, the total U.S. consumption of petroleum was 7,550.9 million barrels (Table 2). Of that amount, 8 percent was from all federal sources (onshore and offshore) and only 1 percent was from federally managed public lands (onshore lands, such as BLM and Forest Service lands). In terms of production, federally managed lands contributed 5 percent of all domestic petroleum production.[26]

Total U.S. consumption of natural gas in 2006 was 21.9 trillion cubic feet (Table 2). Of that amount, 23 percent was provided by a combination of offshore and onshore federal resources; 10 percent was provided by onshore federally managed lands (i.e., BLM and Forest Service lands). In terms of production, the contribution of onshore federal lands is slightly higher, contributing 11 percent of domestic natural gas production.[27]

Table 2. Oil and Natural Gas Production from Federal Sources and Domestic Consumption, 2006

As a proportion of consumption:

	Petroleum (million barrels)	% of Total U.S. Consumption	Natural Gas (trillion cubic feet)	% of Total U.S. Consumption
Production from Federal Lands	600.5	8%	5	23%
Onshore	100.4	1%	2.1	10%
Offshore	500.1	7%	2.9	13%
Other U.S. Production	1261.8	17%	13.5	62%
Total U.S. Production	1862.3	25%	18.5	84%
Total U.S. Consumption	**7550.9**	**100%**	**21.9**	**100%**

As a proportion of production:

	Petroleum (million barrels)	% of Total U.S. Production	Natural Gas (trillion cubic feet)	% of Total U.S. Production
Production from Federal Lands	600.5	32%	5	27%
Onshore	100.4	5%	2.1	11%
Offshore	500.1	27%	2.9	16%
Other U.S. Production	1261.8	68%	13.5	73%
Total U.S. Production	**1862.3**	**100%**	**18.5**	**100%**

Overall, the U.S. produces 84 percent of its natural gas needs and 25 percent of its oil needs. Since the U.S. is largely self-sufficient in natural gas production (and completely self-sufficient in coal production), the push to become more energy independent focuses on oil.[28]

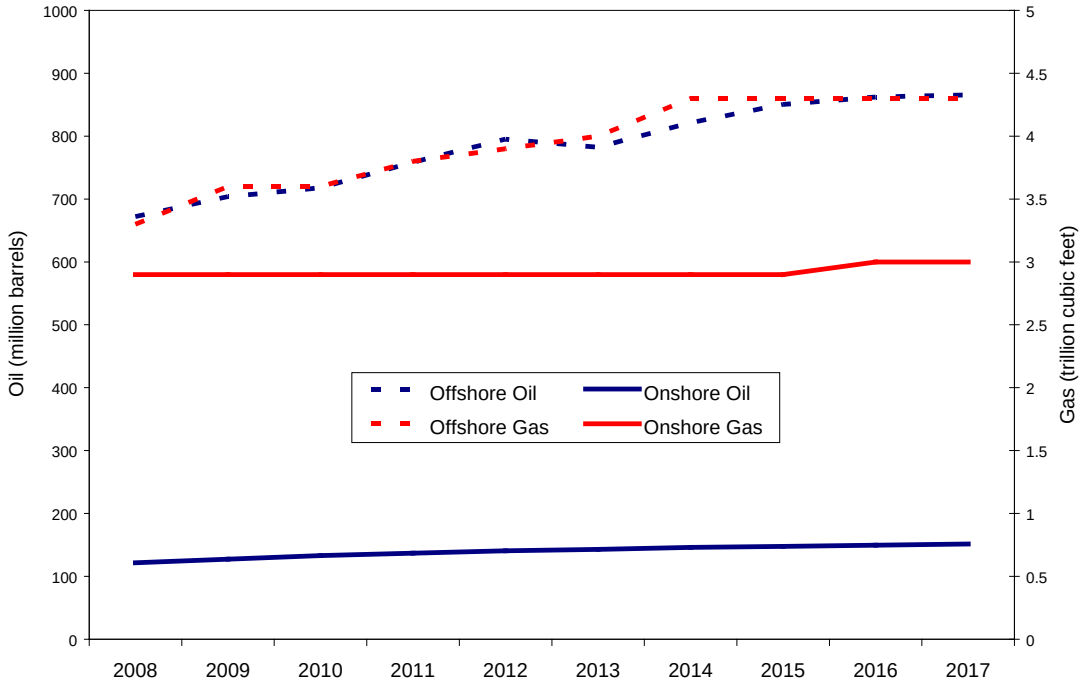
However, it is extremely unlikely that U.S. energy independence can be achieved, or even approached to a significant degree, by accelerated petroleum development on the public lands of the West. Under no scenarios currently under consideration will the U.S. be able to meet demand from these domestic reserves—they are simply too small.

According to the EIA, the U.S. will increase its reliance on offshore federal oil production (Figure 3). From 2008 to 2017, federal offshore oil production is expected to increase to over 865 million barrels (at 2006 levels of consumption this is equivalent to 11% of the nation's needs). The

majority of this, 80 percent, is expected to come from the Gulf of Mexico. Federal onshore oil production is projected to grow to 151 million barrels per year (at 2006 levels of consumption, this is equivalent to 2% of the nation's needs).[29]

The EIA also estimates that offshore production of natural gas between 2008 and 2017 will increase by 30 percent, while onshore production will increase by 3 percent. At 2006 levels of consumption, this equates to 20 percent of U.S. needs for natural gas from offshore sources, and 14 percent from onshore sources, such as BLM and Forest Service lands.[30]

Figure 3. Projected Oil and Natural Gas Production from Federal Sources, 2008–2017



Because of the relatively small contribution of onshore public energy resources to U.S. energy consumption (1% of oil, 10% of natural gas), and because most of the future production of public energy resources will occur offshore (85% of oil production, 60% for natural gas production), it is not possible for the U.S. to achieve energy independence and security by further development of onshore resources on public lands, such as those managed by the BLM and Forest Service.

Potential Future Energy Resources in the Intermountain West

The U.S. Geological Survey (USGS) periodically conducts a National Oil and Gas Assessment to determine the potential for undiscovered oil and natural gas resources in the United States—that is, the energy potential if undiscovered resources were converted to proved reserves and developed.[31]

There is often confusion about the difference between "undiscovered resources" and "proved reserves." Undiscovered resources refer to the volume of energy resources "surmised to exist" on the basis of geological knowledge and theory.[32] Proved reserves are estimated quantities that analysis of geologic and engineering data demonstrates with reasonable certainty are recoverable under existing economic and operating conditions."[33]

In theory, "undiscovered" oil and natural gas resources could become "proved reserves." For that to be the case, resources hypothesized to be underground, based on geology and geological theory, would actually have to be there, and the technology would have to exist to extract the resource. The amount of energy required to extract the resource would also have to be less than what is produced. And, the right economic conditions would have to be in place.

Geologists refer to 13 provinces, that is, areas with common geologic or geomorphic attributes, that are in the Intermountain West. The undiscovered resources surmised to exist in these 13 provinces total 6.1 billion barrels of oil, 239 trillion cubic feet of natural gas, and 39 billion barrels of liquid natural gas. Appendix 2 at the end of this report shows details on the potential for undiscovered oil and natural resources in the region.

Table 3 shows the scale of these undiscovered oil and natural gas resources relative to U.S. and world proved reserves. In the case of oil, Intermountain West undiscovered resources amount to 21 percent of national and 0.5 percent of global proved reserves. In the case of natural gas, the region's undiscovered resources amount to 113 percent of national and 3.8 percent of global proved reserves. [34]

Table 3.The Potential Contribution of Undiscovered Oil and Natural Gas Resources in the Intermountain West

	Estimate Year	Oil (trillion barrels)	Gas (trillion cubic feet)
U.S. proved reserves	2007	29.4	211
Global proved reserves	2007	1,238	6,263
Intermountain West undiscovered resources	2002 - 2007	6.1	239
Intermountain West undiscovered resources as a percent of U.S. proved reserves	2002 - 2007	21%	113%
Intermountain West undiscovered resources as a percent of global proved reserves	2002 - 2007	0.5%	3.8%

This is a theoretical exercise, since "undiscovered resources" are not the same as "proved reserves." Under the most optimistic scenario, there are significant potential onshore resources to develop in the West. However, regional undiscovered oil resources are not large enough to alter significantly the nation's energy dependence on foreign oil sources.

In the case of natural gas, the U.S. is already largely self-sufficient. If current undiscovered natural gas resources were real, technically feasible and economically viable, more than doubling the nation's natural gas supplies would support continued energy independence.

Access to Current Federal Proved Reserves

More important than theoretical postulations on potential future fossil fuel sources, especially for near-term energy needs, is the question of whether energy companies can access current proved reserves. In the case of onshore proved reserves on public lands, the answer is affirmative.

Table 4 and Figure 4 show the rapid acceleration of permits to drill for oil and natural gas on federally managed public lands. From 1994 to 2007, 4,725 permits to drill were approved, a 122 percent increase. The fastest growth of new permits to drill was in Wyoming, which saw a 564 percent increase in new permits from 1994 to 2007.[35]

Figure 4. Number of Applications for Permits to Drill (APDs) Approved for Federal Lands, FY1994–FY2007.[36]

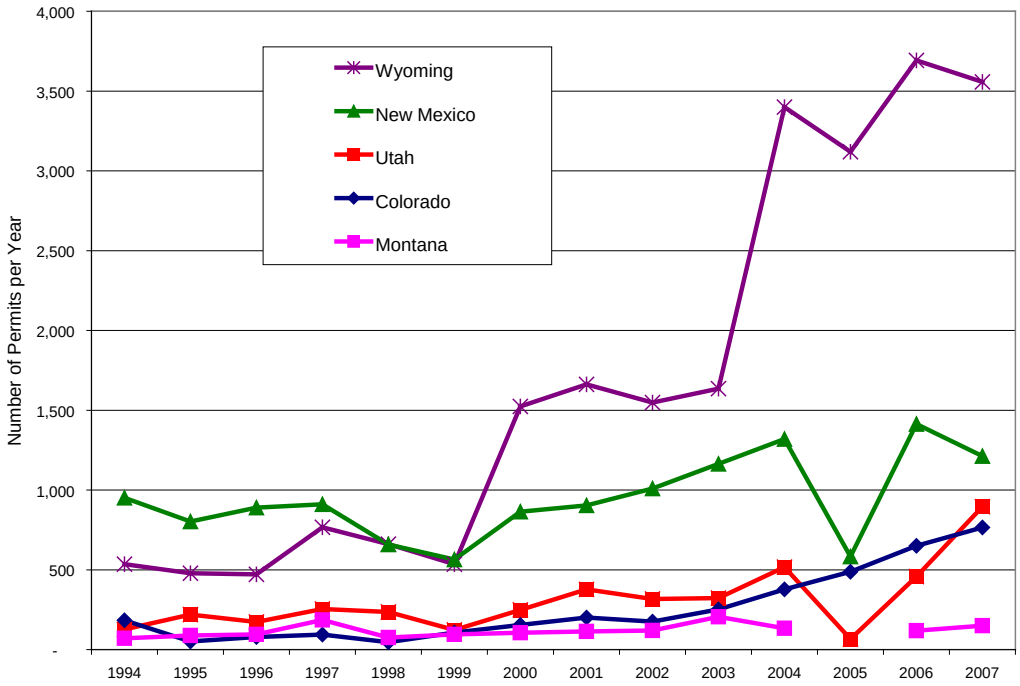


Table 4. Number of Applications for Permits to Drill (APDs) Approved for Federal Lands, FY1994 and FY2007.

	1994	2007	New Permits Approved	Percent change, 1994 to 2007
Colorado	184	765	581	316%
Montana	71	150	79	111%
New Mexico	951	1,213	262	28%
Utah	127	896	769	606%
Wyoming	536	3,557	3,021	564%
Total	3,863	8,588	4,725	122%

According to a 2008 report by the U.S. House Committee on Natural Resources:

> In the last four years, the BLM has issued 28,776 permits to drill on public land; yet, in the same time, 18,954 wells were actually drilled. That means the companies have stockpiled nearly 10,000 extra permits to drill that they are not using to increase domestic production.[37]

In other words, companies with drilling permits are not developing these energy resources at the pace at which they are being issued by the federal government.

According to the same study, oil and natural gas companies hold leases to nearly 68 million acres of federal land and waters that are currently not under production, and they are not being excluded from access to additional resources. Offshore, of 44 million acres leased to oil and natural gas companies, only 10.5 million are producing oil and natural gas. Onshore, of 47.5 million acres leased, only 13 million acres are producing oil and natural gas.

The U.S. House Committee, citing the Minerals Management Service, estimated that of all the oil and natural gas believed to exist on the Outer Continental Shelf, 82 percent of the natural gas, and 79 percent of the oil is open for leasing. And onshore, 72 percent of oil and 84 percent of natural gas resources are either fully accessible, or will be as soon as land-use plans and environmental reviews are complete.[38]

In other words, the majority of offshore and onshore federal energy resources are available for development. The 2005 Energy Policy Act has played an important role in making these resources available to energy companies, but despite its supply-side approach to energy independence and lower consumer prices, companies are not developing the resource as quickly as they might.

An examination of the market for natural gas helps explain the trend. As *The Wall Street Journal* reported in a story titled "Natural Gas Firms Seek Outlet for Growing Supplies," U.S natural gas companies are struggling to find buyers for all the natural gas they are producing. Production has soared recently, while demand has inched up more slowly, and actually fell from 2003 to 2006.[39]

According to the Chief Executive of Chesapeake Energy, one of the nation's largest natural gas companies, "We're not going to expand if the market for that expansion isn't there." In other words, if companies like Chesapeake Energy can't find demand for their current supply of natural gas, they will not sustain their profits levels. According to the same article in *The Wall Street Journal*, "Analysts say that if natural gas prices settle below $8 per million British thermal units, producers will cut back production—which will tighten up supplies and drive prices up again."[40]

At a time when the federal government has leased and permitted far more resources than companies are developing, the profit motive explains why more energy is not being developed in the region. For the Intermountain West, where the current surge in energy development centers on extracting tight sands natural gas and coal-bed methane, this could mean a slow-down in production and continued higher prices for consumers. The supply-side approach to meeting energy needs has its limits when companies will simply delay or shut down production in order to drive energy prices up.

WHAT FACTORS INFLUENCE CONSUMER ENERGY PRICES?

To understand whether further development of public lands in the West can influence consumer prices for oil, natural gas, and coal, it is essential to review how prices are determined for these commodities. The pricing dynamics for each of these resources functions quite differently. As a result, Intermountain West energy supplies have a different relationship to the price of each resource.

OIL

Gas prices hit an all-time, inflation-adjusted high in the U.S. in the summer of 2008. Since most of the cost of gasoline is based on crude oil prices, we discuss the factors that influence its price.

For every dollar a U.S. consumer pays at the gas pump today, the real cost of gas breaks down as follows: 58 percent is from crude oil, 15 percent is from federal and state taxes (down from 24% in 2000), 17 percent is attributable to refining costs and profits, and 10 percent is from distribution and marketing costs. [41]

In sum, the largest determinant of gas prices at the pump is crude oil price. Oil is a globally traded commodity and its price is determined by global conditions of supply and demand, which in turn are impacted by governments policies around the world, as well as socioeconomic conditions, civil unrest, subsidies, regional inventories, etc.

Recent high prices of oil have little to do with geology, and are mostly attributable to cartel and government policies.

On the supply side, OPEC controlled an estimated 78 percent of world oil reserves and 45 percent of world oil production in 2007.[42] OPEC countries, two of which (Saudi Arabia, Venezuela) are major exporters of oil to the U.S., have artificially restricted global production to keep prices high. In addition, production reductions in the Russian Federation, decreasing production on maturing

oil fields around the world, and civil unrest in places like Nigeria have further disrupted production.

On the demand side, global consumption outside of the U.S. is growing rapidly. According to Mark Finley, President of British Petroleum America, 90 percent of the growth in energy consumption in the last five years came from newly industrializing countries—with China alone representing a third of the growth in recent demand. This consumption is artificially stimulated, or induced, because fuel prices in many developing nations, such as China, are subsidized. It is estimated that 25 percent of global oil consumption today is subsidized by national governments.[43]

The U.S. simply does not have enough proved reserves or production to impact oil prices; U.S consumers are price takers and not price setters in the market. The U.S. consumes 24 percent of global oil production and this high demand, which has steadily risen for decades until this year, has helped to sustain prices. In recent years, the declining value of the U.S. dollar relative to other world currencies has increased the price of our imports.

NATURAL GAS

Unlike oil, natural gas prices respond to domestic—not global—supply and demand fundamentals. This is the case because the U.S. is largely self-sufficient in natural gas production.

The cost of natural gas can be explained by two factors: the cost of the natural gas itself, and costs related to transmission and distribution. In 2007, 53 percent of the cost of natural gas was attributable to the cost of the commodity, and 47 percent was attributable to transmission and distribution costs.[44] The price of natural gas may or may not reflect these costs, depending on inventories and imbalances between supply and demand.

Factors expected to decrease natural gas prices are: improving production, increasing imports, and releasing natural gas inventories. Factors that may increase the price of natural gas are: increased demand (cold winters, for example) and high oil prices. Some large-volume users of natural gas (for example, industrial consumers and electricity generators) can switch from natural gas to oil, depending on prices. When oil prices rise, the competitive pressure to maintain low natural gas prices diminishes, and natural gas prices rise accordingly.

The Intermountain West has enjoyed low natural gas prices (by national standards), in part due to regional production and lower transmission costs. However, the development of new pipeline capacity, such as the Rockies Express Pipeline, which is designed to transport natural gas from the Intermountain West to the East, means that regional natural gas production is now marketed to higher priced markets. [45]

For states like Colorado and Wyoming, which have enjoyed moderate natural gas prices, the loss of a regional market means that increases in state production will translate into higher—not lower—prices as the amount of natural gas exported out of state to more lucrative markets increases. Between 2000 and 2006, Colorado residential consumers saw an almost 60% increase in natural gas rates, and in Wyoming residential consumers saw a more than 50 percent increase in natural gas rates—while these states experienced record-breaking energy leasing and drilling.[46]

New regional natural gas production that is exported from the Rockies benefits energy companies in the form of higher profits, and states in the form of higher energy tax revenues, but regional consumers pay higher prices.

At the same time, natural gas companies, though lacking the cartel power of an OPEC, will cut production if the price of natural gas falls below a certain level. That's exactly what happened last fall when, according to *The Wall Street Journal*, "producers cut back production when predictions of a warm winter drove prices to below $6 per million Btus."[47]

COAL

Like natural gas, coal prices are influenced largely by domestic supply and demand factors. The majority of coal (roughly 92%) in the U.S. is used for generating electricity – about 50 percent of U.S. electricity is generated from coal.[48]

The U.S. has extensive coal reserves and in net terms produces more coal than it consumers. Over half of U.S. coal production comes from the West.[49]

Cold weather and expensive alternatives (high oil and natural gas prices, for example) can increase the demand for coal as a fuel for generating electricity.

The price of western coal varies based on its quality, Btu content, and distance to market. Powder River Basin coal, for example, sells for substantially less than either Northern or Central Appalachia coal. And within the West, prices for coal vary dramatically, with Colorado and New Mexico on the high end, and Montana and Wyoming on the low end.[50]

Coal is often compared in price to other fossil fuels used to generate power—such as fuel oil and natural gas—and trades at significantly lower prices for the equivalent Btu generation. According to the EIA, "…by 2006, on a dollars-per-million-Btu basis, natural gas was the most expensive fossil fuel ($6.94), petroleum was second ($6.23), and coal was least expensive ($1.69)."[51]

Coal prices have risen in recent years, largely due to increased demand relative to available supply. Western coal and railroad companies are operating at full capacity today, and are working to expand their ability to mine and ship coal to coal-fired power plants.[52]

Coal faces an uncertain future. Major questions include: Will concerns about climate change drive down demand for coal and expedite large-scale development of alternative energy sources? If so, in what timeframe? Will "clean coal" technologies prove viable? And, will the price of alternative energy sources play a larger role in determining the future price of coal?

CONCLUSIONS

Under the current Administration, the National Energy Policy Development Group report of 2001 and Energy Policy Act of 2005 have framed U.S. energy policy. These documents posit that an energy crisis founded on "a fundamental imbalance between supply and demand" threatens national security and has unduly raised consumer prices, and that both can be remedied by increasing domestic energy production, especially from offshore and onshore public holdings.

By providing subsidies to industry, fast-tracking the permitting process, and exempting oil and natural gas companies from a number of environmental regulations, the Administration has boosted leasing, permitting and production of oil, natural gas and coal on public lands.

However, the resulting increase in production has not significantly improved national energy independence and security. Nor has it lowered prices for consumers.

The question of energy independence and security centers on oil since the U.S. is virtually self-sufficient in natural gas and is a net exporter of coal. It is highly unlikely that we will ever be self-sufficient or able to influence price with respect to oil. Our national reserves, both onshore and offshore, are simply too small, and our consumption too large. Western public lands contain an even smaller portion of world reserves, and as a result will have little bearing on world supply and price.

The current energy surge in the West is focused primarily on natural gas, and some hope that aggressive development of public lands resources will meet domestic needs and lower consumer prices. However, there is no self-sufficiency or security threat with natural gas as we have substantial reserves and production is advancing faster than demand. In fact, the main challenge for the natural gas industry is finding new sources of demand to match growing reserves and production.

This natural gas supply-demand mismatch should reduce prices for customers, but instead it is leading companies to cut production to keep prices up. The Administration's supply-side approach, which is creating an ever larger backlog of leased acres and drilling permits, has missed the mark. For consumers in the Rockies, natural gas prices are going up, not down, as regional production is connected to more lucrative coastal markets through new pipelines.

The U.S. faces no independence or security threats related to coal production as we have very large reserves and are a net exporter of coal. Coal production is increasing, though more slowly than demand—mainly due to the capacity constraints of current operators and railroads—and per Btu is still a cheaper energy source than either oil or natural gas.

The big question for coal is not so much a supply issue as it is whether the U.S. will choose to shift electricity generation from coal to other sources because of climate change concerns. The viability of clean coal technologies and carbon tax proposals, and the price of alternative energy sources will play a large role in determining the future coal as an energy source.

For these reasons, the Administration's supply-side approach, and focus on western public lands, has not been effective at achieving its stated goals. What has been lacking is a demand-side focus.

The U.S. stands a far better chance of achieving energy independence if we reduce oil consumption. Recent high prices have begun to do just that—Americans are price sensitive and are driving fewer miles in order to save money (12.2 billion fewer miles in June of 2008 than in June of 2007, a 4.7% decrease).[53]

Helping consumers reduce their demand for fossil fuel energy is the surest way to increase long-term U.S. energy self reliance and price relief. Efficiency standards of all stripes and renewable fuel sources are proven ways to accomplish this goal.

Further Reading in our Energy and the West *Series*

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APPENDIX 1:

U.S. PROVEN RESERVES OF OIL, NATURAL GAS, AND COAL IN A GLOBAL CONTEXT

Every year British Petroleum (BP) produces a publication called the Statistical Review of World Energy. This appendix summarizes information from BP's June 2008 report, which can be obtained online. http://www.bp.com/productlanding.do?categoryId=6929&contentId=7044622.

Summary Points

OIL

The U.S. controls 2.4 percent of the world's proved reserves of oil.

The U.S. produces 8 percent of the world's oil but consumes 24 percent.

In the last decade, world consumption of oil rose by 15.8 percent: all of it in Asia, Europe, Eurasia, and Africa. U.S. oil production has actually declined in these years.

Half of the U.S.' oil imports are from the American continent (Canada, Mexico, S. America, etc.). Only 16 percent of oil imports are from the Middle East.

NATURAL GAS

The U.S. controls 3.4 percent of the world's proved reserves of natural gas.

The U.S. produces 19 percent of the world's natural gas and consumes 23 percent, so we are close to being self-sufficient.

In the decade, the worlds' consumption of natural gas rose by 31.5 percent: 23.5 percent of the growth was in Europe and Eurasia, followed by another 25.6 percent in the Middle East and 20.8 percent in Asia Pacific. U.S. production has been flat during these years.

Of the natural gas that we import, most of it comes from the Caribbean.

COAL

The U.S. controls 29 percent of the proved reserves of coal.

The U.S. produces 19 percent of the world's coal and consumes 18 percent.

In the last decade, the world's consumption of coal increased by 37 percent and production increased by 36 percent. Almost all of the growth in production and consumption (95%) was in countries of Asia Pacific.

The U.S. consumes its own coal and imports very little.

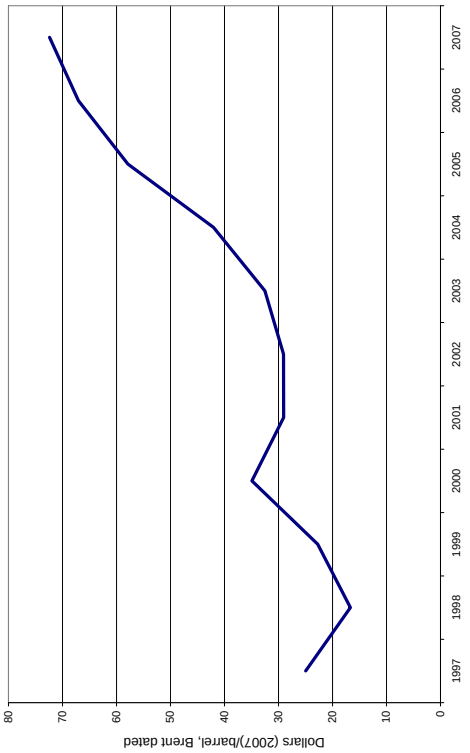
OIL

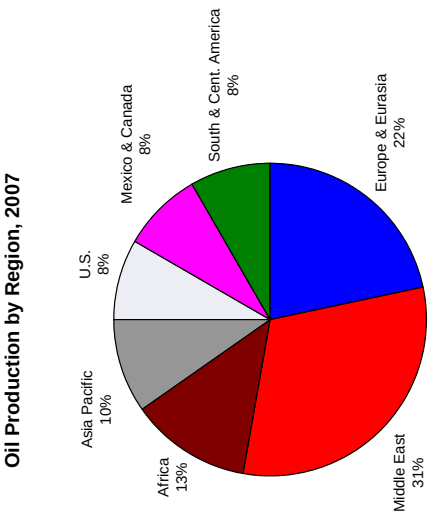
Prices have risen 190% from 1997 to 2007

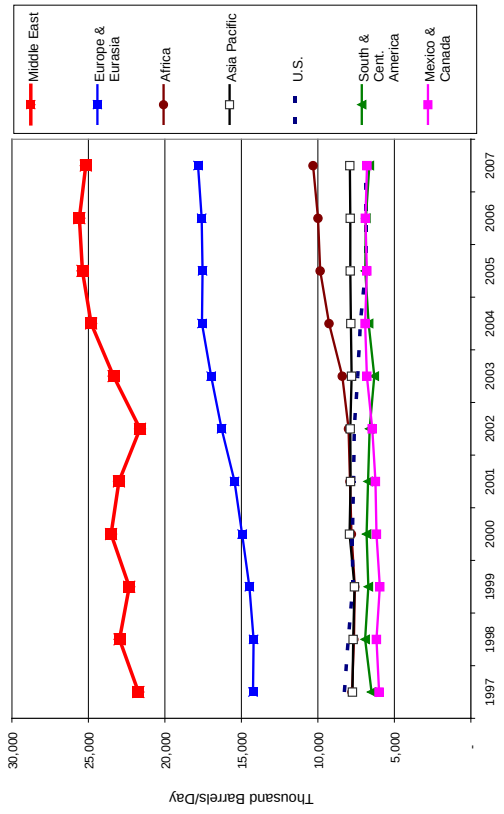
The U.S. produces 8% of the world's supply. The Middle East provides 31%. From 1997 to 2007 global production increased by 12.9%. Europe and Eurasia contributed 38.7% of the rise in production; 37% was from the Middle East; and 27.4% was from Africa. U.S. production declined during those years.

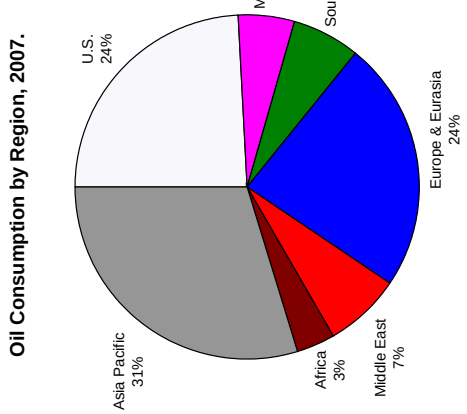
The U.S. consumes 24% of the world's oil. From 1997 to 2007 world consumption rose by 15.8%. The U.S. share of the rise was 17.9%; Asia Pacific's was 46.3%.

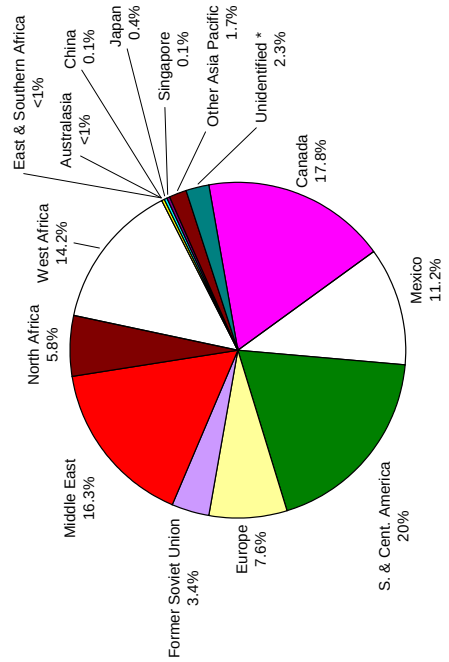
The U.S. controls 2.4% of the world's proven reserves of oil.
50% of the oil the U.S. imports comes from the American Continent; 16.3% comes from the Middle East.

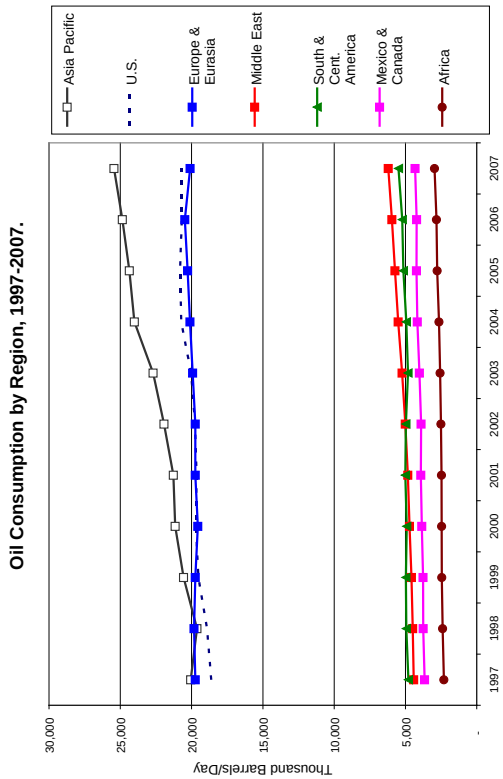


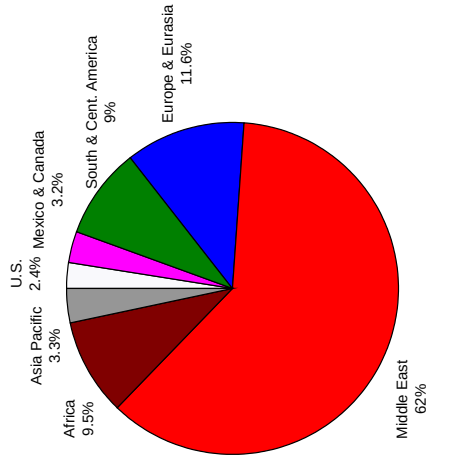





Oil Consumption by Region, 2007.
Mexico & Canada 5%
South & Cent. America 6%
Europe & Eurasia 24%
Middle East 7%
Africa 3%
Asia Pacific 31%
U.S. 24%


Who Does the U.S. Import Oil From?
Canada 17.8%
Mexico 11.2%
S. & Cent. America 20%
Europe 7.6%
Former Soviet Union 3.4%
Middle East 16.3%
North Africa 5.8%
West Africa 14.2%
East & Southern Africa <1%
Australasia <1%
China 0.1%
Japan 0.4%
Singapore 0.1%
Other Asia Pacific 1.7%
Unidentified * 2.3%


Oil Consumption by Region, 1997-2007.
Asia Pacific
U.S.
Europe & Eurasia
Middle East
South & Cent. America
Mexico & Canada
Africa
Thousand Barrels/Day
30,000
25,000
20,000
15,000
10,000
5,000
-
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007


Proved Oil Reserves at end of 2007
Middle East 62%
Africa 9.5%
Asia Pacific 3.3%
U.S. 2.4%
Mexico & Canada 3.2%
South & Cent. America 9%
Europe & Eurasia 11.6%

NATURAL GAS

The prices of liquid natural gas rose by 98% from 1997 to 2007.

Most of the production is in Europe and Eurasia (37%), followed by the U.S. (19%), and Middle East (12%). Global production rose by 31.5% from 1997 to 2007. Compared to Europe and Asia, the U.S.' levels of production have been flat in the last 10 years. Most of the growth in production from 1997 to 2007 was in Europe and Eurasia (accounting for 25.3% of new production), followed by the Middle East (25.6% of new production) and Asia Pacific (20.8% of new production).

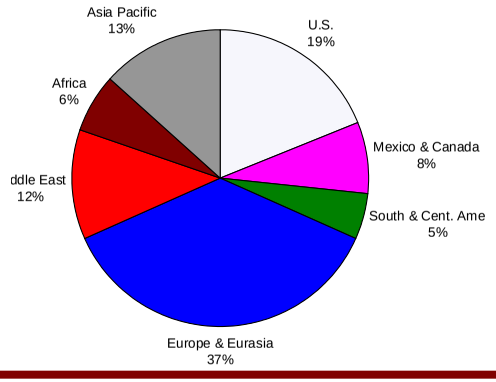
Most of the growth in consumption is in Europe, Eurasia, and Asia Pacific. The largest consumers are Europe and Eurasia (39%), followed by the U.S. (19%). From 1997 to 2007, 32.4% of the rise in consumption was from Europe and Eurasia, followed by Asia Pacific (29% of new consumption) and the Middle East (19.9% of new consumption).

Most of the U.S.' gas imports are from Caribbean nations.

The U.S. controls 3.4% of the world's proven reserves of natural gas.

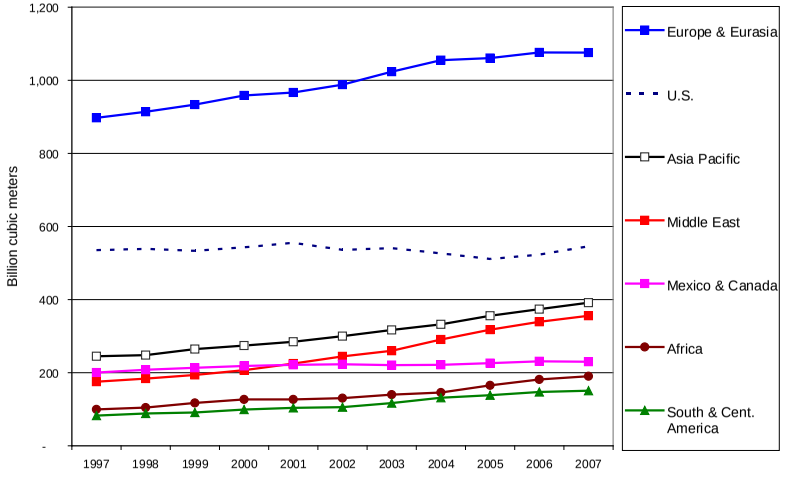
In 2007, the U.S. imported 21.82 billion cubic meters & exported 1.18 billion cubic meters.

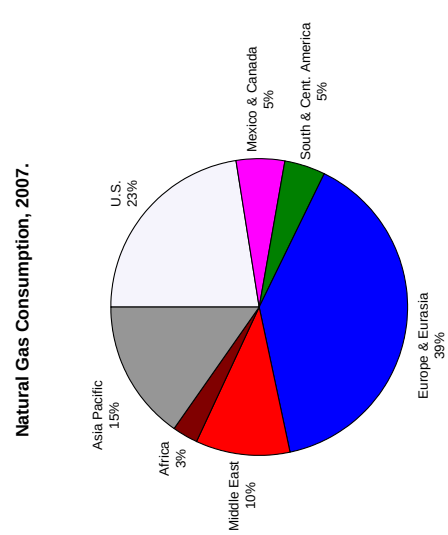
Natural Gas Production by Region, 2007.

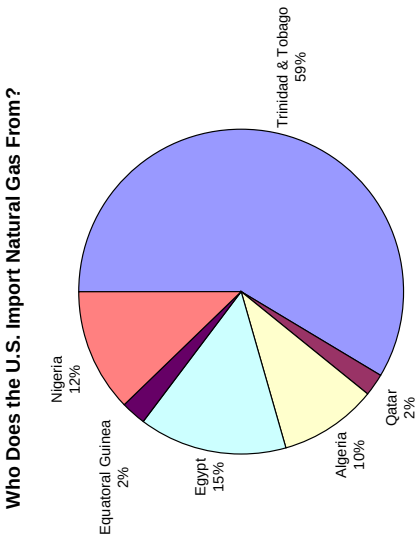


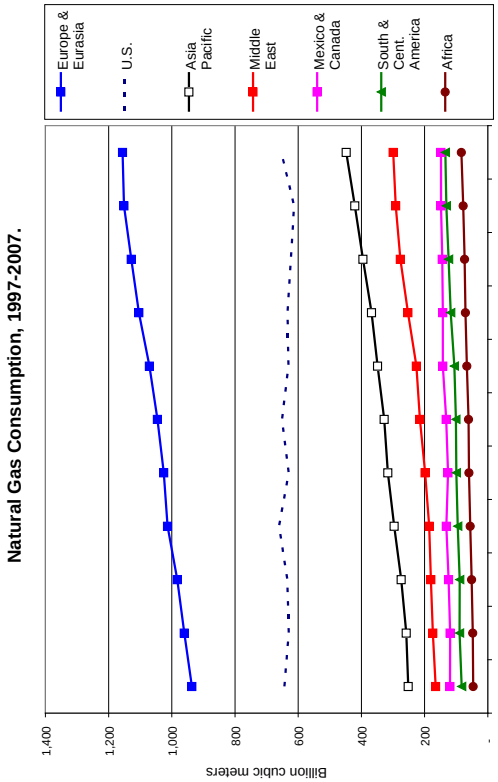
Natural Gas Prices, 1997-2007

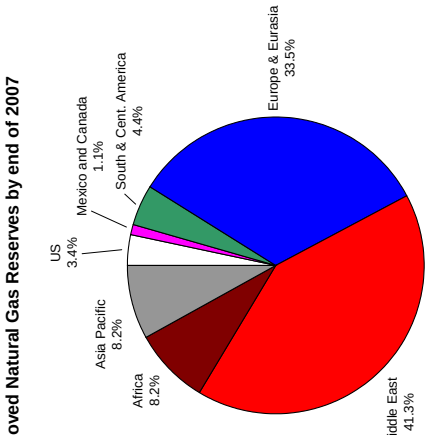
Natural Gas Production by Region, 1997-2007.




Natural Gas Consumption, 2007.
Europe & Eurasia 39%
Middle East 10%
Africa 3%
Asia Pacific 15%
U.S. 23%
Mexico & Canada 5%
South & Cent. America 5%


Who Does the U.S. Import Natural Gas From?
Trinidad & Tobago 59%
Qatar 2%
Algeria 10%
Egypt 15%
Equatoral Guinea 2%
Nigeria 12%


Natural Gas Consumption, 1997-2007.
Europe & Eurasia
U.S.
Asia Pacific
Middle East
Mexico & Canada
South & Cent. America
Africa
Billion cubic meters
1,400
1,200
1,000
800
600
400
200
-
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007


Proved Natural Gas Reserves by end of 2007
Europe & Eurasia 33.5%
Middle East 41.3%
Africa 8.2%
Asia Pacific 8.2%
US 3.4%
Mexico and Canada 1.1%
South & Cent. America 4.4%

COAL

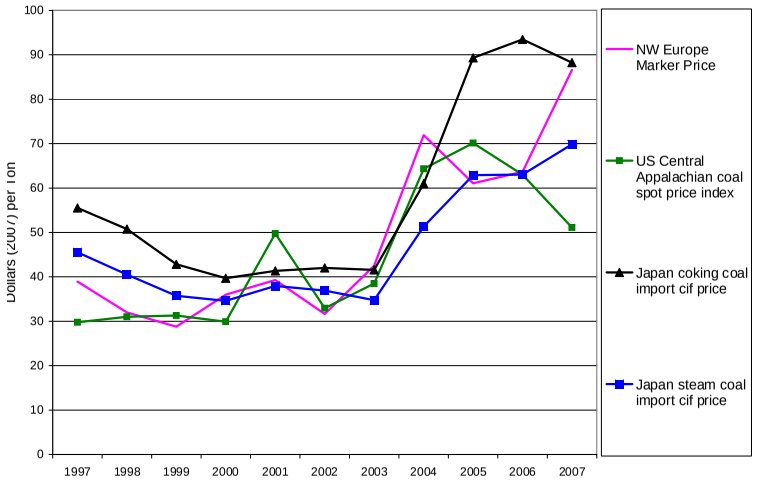
The price of coal (U.S. Appalachian) rose by 135% from 1997 to 2005, and then declined 27% from 2005 to 2007. Japan steam coal prices rose by 53% from 1997 to 2007.

From 1997 to 2007 global coal production increased by 36%. Asia Pacific countries contributed 94% of the growth in production. The U.S. contributed only 3% of the increase in production.

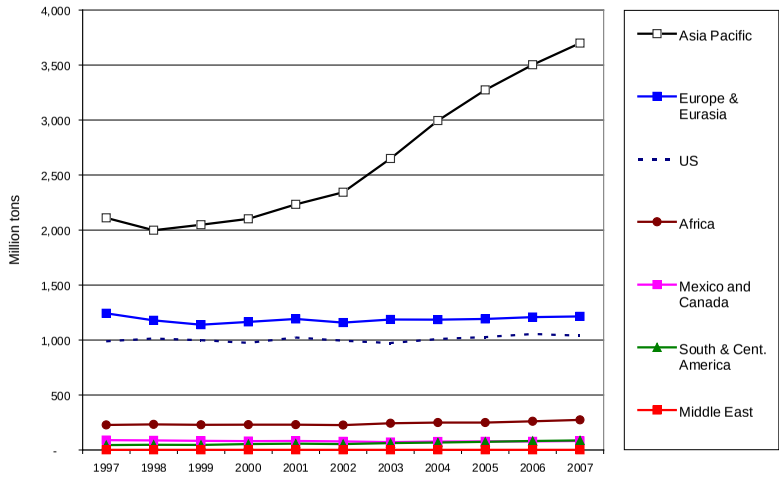
From 1997 to 2007 consumption increased by 37%. Asia Pacific countries constituted 95% of the increase in consumption. The U.S. contributed 3.9% to the increase in consumption.

The U.S. holds 29% of the world's proven reserves of coal.

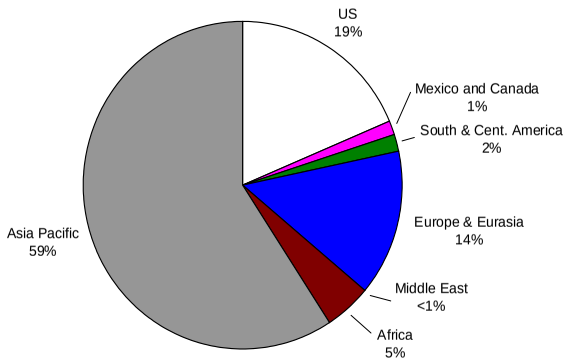
Coal Prices, 1997-2007.



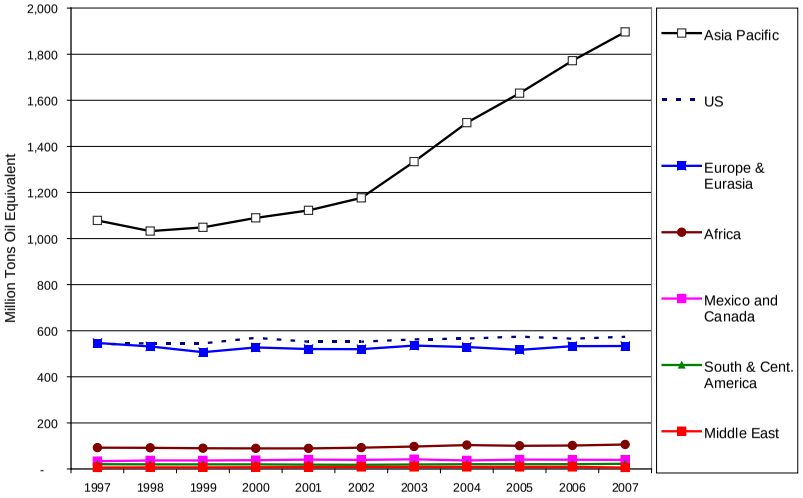
Coal Production by Region, 1997-2007.



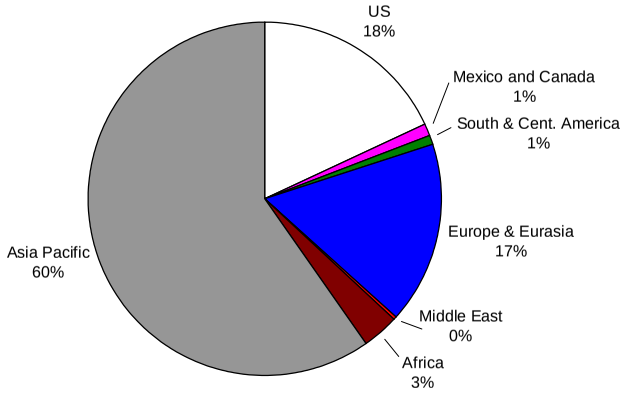
Coal Production by Region, 2007.



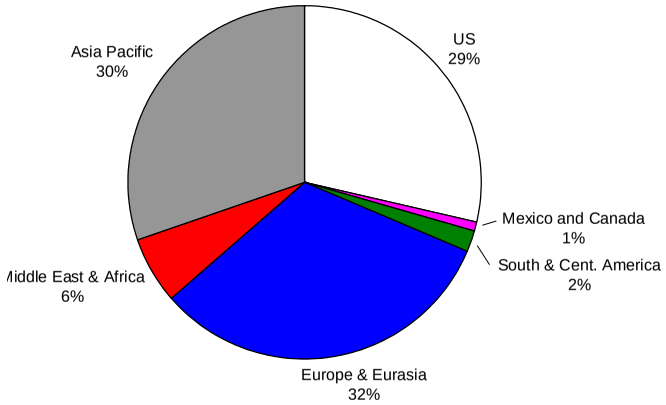
Coal Consumption, 1997-2007.



Coal Consumption by Region, 2007.



Proved Coal Reserves at the End of 2007



There is little international trade in coal. Countries producing coal tend to be the consumers of their own coal resources. Only 15% is traded internationally.

Source: Mark Finley, BP America, Statistical Review of World Energy, see http://www.bakerinstitute.org/events/the-bp-statistical-review-of-world-energy-1

In 2007, the U.S. exported 59.2 short tons, and imported only 36.3 short tons. To put this in perspective, total U.S. coal production in 2007 was 1.14 billion short tons.

Source: http://www..eia.doe.gov/cneaf/coal/page/special/feature.html

APPENDIX 2:
UNDISCOVERED OIL AND NATURAL GAS RESERVES IN THE INTERMOUNTAIN WEST

Table 1 shows the total amount of "undiscovered" resources of oil and natural gas in the 13 "provinces" that are either entirely or partially inside the Intermountain West. The provinces are defined by the U.S. Geological Survey.

Undiscovered resources are unspecified volumes of oil and natural gas that are "surmised to exist" on the basis of geological knowledge and theory. They are not the same as "proved reserves," which are oil and natural gas deposits that are recoverable under current technological and economic conditions.

The undiscovered resources surmised to exist in the 13 provinces of the Intermountain West total 6.1 billion barrels of oil, more than 238, 913 billion cubic feet of natural gas, and 38,546 millions of barrels of liquid natural gas.

Table 1: Estimated Oil and Natural gas Undiscovered Resources in the Intermountain West.

		Total undiscovered oil and gas resources (mean estimate):		
Fossil Fuel Regions ("Provinces") of the Intermountain	Estimate Year	**Oil** (MMBO)	**Gas** (BCFG)	**Natural gas liquids** (MMBNGL)
Uinta-Piceance Province of CO and UT	2002	59.17	21,424	42.77
Southwestern Wyoming Province	2002	131.4	84,590	2,578
Wyoming Thurst Belt Province	2003	38.83	918	57.28
Wind River Basin Province	2005	41	2,393	20,540
Powder River Basin Province of WY and MT	2006	638.96	16,632	130.91
Hanna, Laramie, Sirley Basins Province, WY	2005	94	238	13,560
Montana Thrust Belt Province	2002	108.8	8,638	240
North-Central Montana Province	2008		6,192	
Willinston Basin Province of MT and ND	2008	3,649	1,848	148
Denver Basin Province of CO, KS, NB, SD, WY	2002	104.23	2,519	51.81
San Juan Basin Province of NM and CO	2002	19.1	50,585	148.37
Raton Basin-Sierra Grande Uplift Province of NM	2004	0.0	2,353	28.12
Permina Basin Province of TX and NM	2007	1,257	40,584	1,021
TOTAL		6,141	238,913	38,546

MMBO = million barrels of oil; BCFG = billion cubic feet of natural gas; MMBNGL = millions of barrels of natural gas liquids. Source: US Geological Survey (USGS), National Oil and Gas Assessment. http://energy.cr.usgs.gov/oilgas/noga/ Assessed 6-23-08.

Theoretically, "undiscovered" oil and natural gas resources may one day become "proved reserves." For that to be the case all resources that are hypothesized to be underground, based on geology and geological theory, would have to actually be there. The technology would have to exist to extract the resource. The amount of energy required to extract the resource would have to be less than what is produced. And, the right economic conditions would have to be in place.

ENDNOTES

[1] National Energy Policy Development Group, "Reliable, Affordable, and Environmentally Sound Energy for America's Future." May 2001. Washington, D.C.: GPO. Accessed online: http://www.whitehouse.gov/energy/2001/index.html, 8/29/08.

[2] Ibid., vii.

[3] Ibid., xv.

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