Recent Economic Trends in Colorado's Oil and Gas Industry

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Summary

Colorado's economy lost more than 120,000 jobs over the course of the Great Recession. Since the recession ended in 2009, state employment totals have climbed by 137,500. The oil and gas industry added more than 5,000 of these jobs, as new drilling techniques have increased the economic viability of several fields in the state.

This paper reviews recent trends in the industry and discusses some of the economic issues affecting its prospects in Colorado. Although the oil and gas industry has added more than 17,600 jobs statewide since 2001, both state and regional employment totals are regularly impacted by national output and price volatility. Additionally, the state is seeing intense public debate about industry regulation, which may affect future employment.

Colorado's Economic Growth over the Past Decade

Colorado's economy is steadily recovering from the Great Recession.[1] In August 2013, state non-farm employment totaled 2.369 million, up 137,500 jobs from the recession's end in July 2009. While recent job growth has been consistent with the state's historical experience, the gains have barely kept pace with labor force growth. As a result the unemployment rate remains much higher than normal. Colorado's August 2013 unemployment rate stood at 7.0 percent, 3 percentage points higher than it was at the start of the recession.

The recovery has been broad-based. Since 2009 professional and business services has added 46,100 jobs, educational and health services has added 32,100 jobs, and leisure and hospitality has added 31,400 positions. Together, these sectors account for 80 percent of the total job gains.

Yet not all sectors have bounced back to pre-recessionary levels. Like the nation, Colorado's housing market was hard hit by the financial crisis, and new residential construction remains well below pre-recessionary levels. While negative trends are turning around somewhat, the information and finance and insurance industries have also suffered significant job losses over the past several years.

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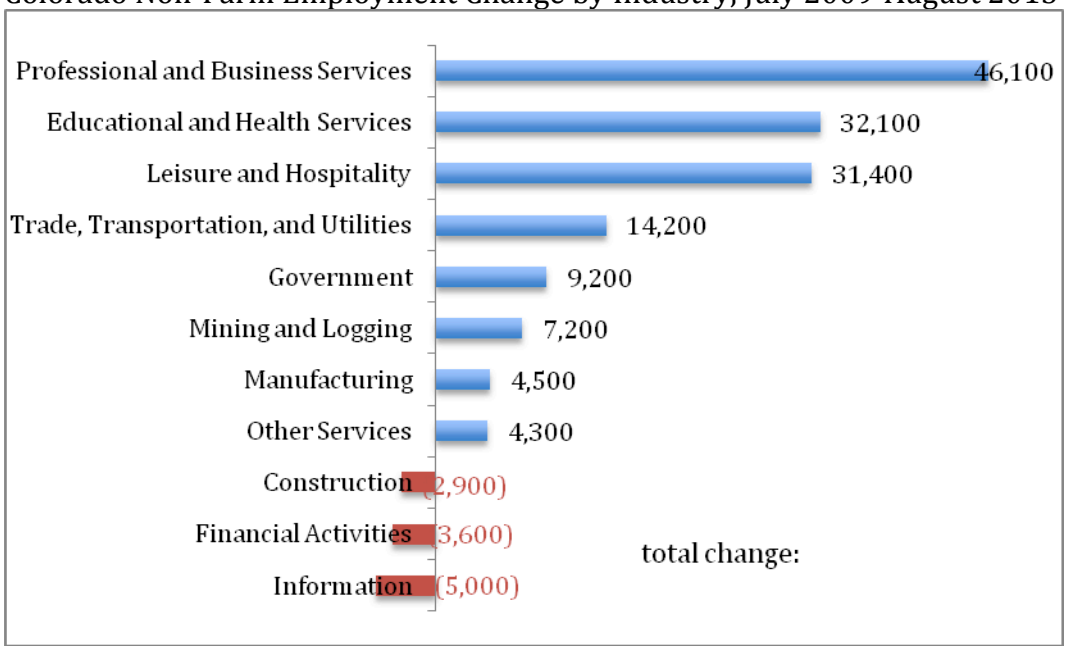
[1] Precipitated by the collapse housing market bubble and the subsequent financial crisis, The Great Recession ran from December 2007-June 2009. Over this time the number of U.S. unemployed rose to 15 million from 7 million. Although the recession ended more than 4 years ago, the recovery has been slow. In February 2013 the Congressional Budget Office (CBO) estimated the U.S. GDP is still about $850 billion (5.5 percent) below its potential.

Colorado Non-Farm Employment Change by Industry, July 2009-August 2013



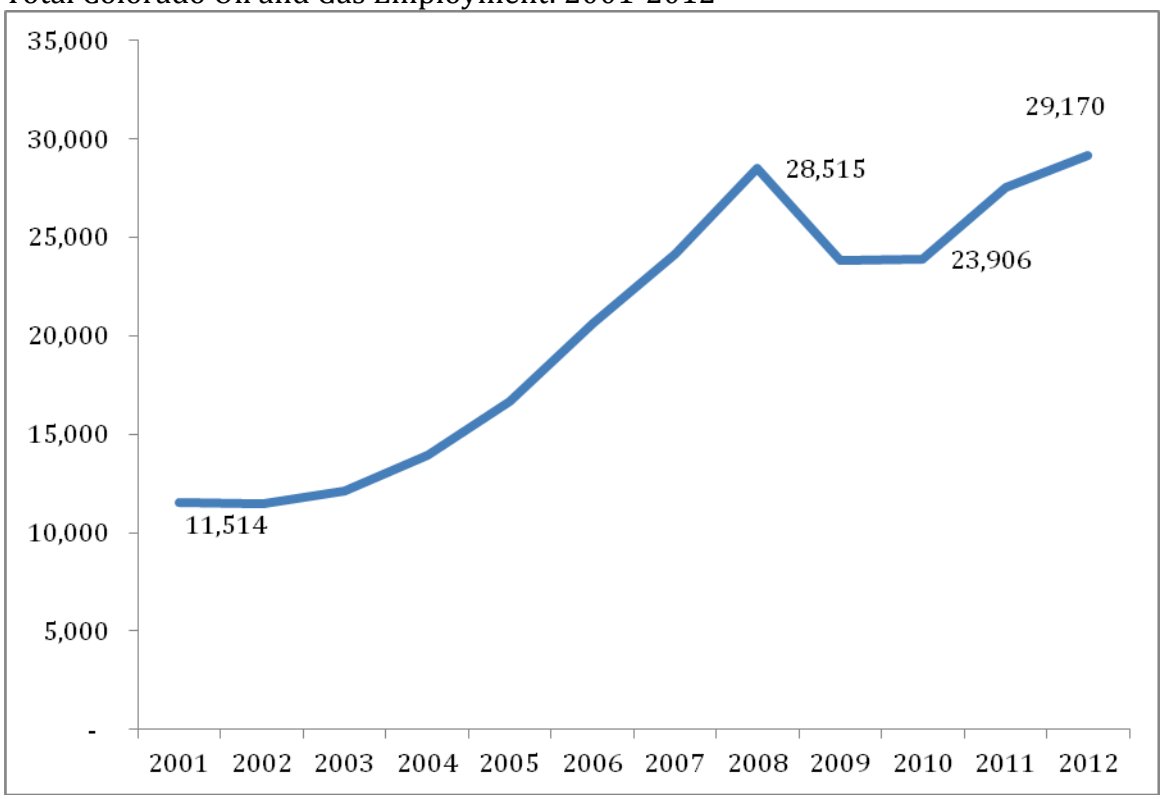
Source: Colorado Department of Labor and Employment/Current Employment Statistics (CES)

A Closer Look at the State's Oil and Gas Industry

Buoyed by a recovering national economy and new drilling practices, Colorado's oil and gas industry is once again adding jobs. In 2012, employment related to extraction, distribution, transportation and refining totaled 29,170 workers (see the appendix for the industry definition used here). This represents slightly more than 1 percent of total state employment, and is 655 more jobs (2.3 percent) than its previous peak in 2008. Over the past 11 years the sector has added 17,656 jobs statewide, a 65 percent increase. In Colorado, about 144,300 total jobs were added over this time, a 6.5 percent gain.[2]

[2] The employment totals here represent workers that are covered by the state's unemployment insurance system. Over the past several years there has been a substantial increase in so-called "1099 workers." These are contract workers who employers hire temporarily and do not receive any benefits. These workers file a 1099 form with the IRS rather than a W-2. According to a recent report by EMSI, the *mining, quarrying, and oil and gas extraction* industry has seen the biggest jump of workers not covered by unemployment insurance (33% in 2005 to 53% in 2010). Thus, the numbers shown here likely underrepresents total industry-related employment in Colorado.

Total Colorado Oil and Gas Employment: 2001-2012

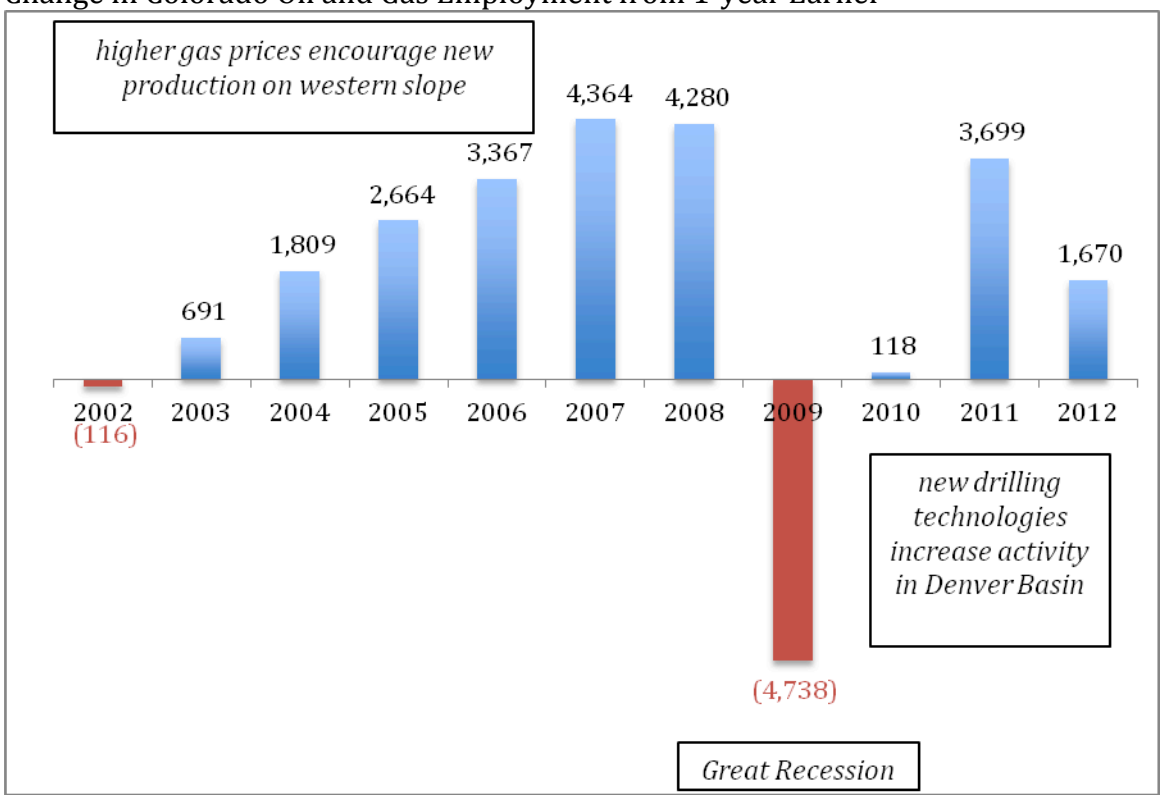


Source: Colorado Department of Labor and Employment/QCEW

Over the past five years three major forces have impacted the state's oil and gas industry. First, increases in U.S. natural gas production nationwide resulted in substantial price declines beginning in 2008, affecting the state's competitive position. Second, reduced energy demand during the Great Recession exacerbated these price trends. Third, higher oil prices and recent technological innovations have made new oil well drilling more profitable in Colorado's Wattenberg Field.

Looking closer at statewide industry employment year-to-year changes provides more insight into these trends. The state saw robust employment growth beginning in 2003 that persisted through 2008. The recession eliminated some of these gains. Between 2011 and 2012, new activity in the Denver Basin has helped the industry add jobs.

Change in Colorado Oil and Gas Employment from 1-year Earlier[3]

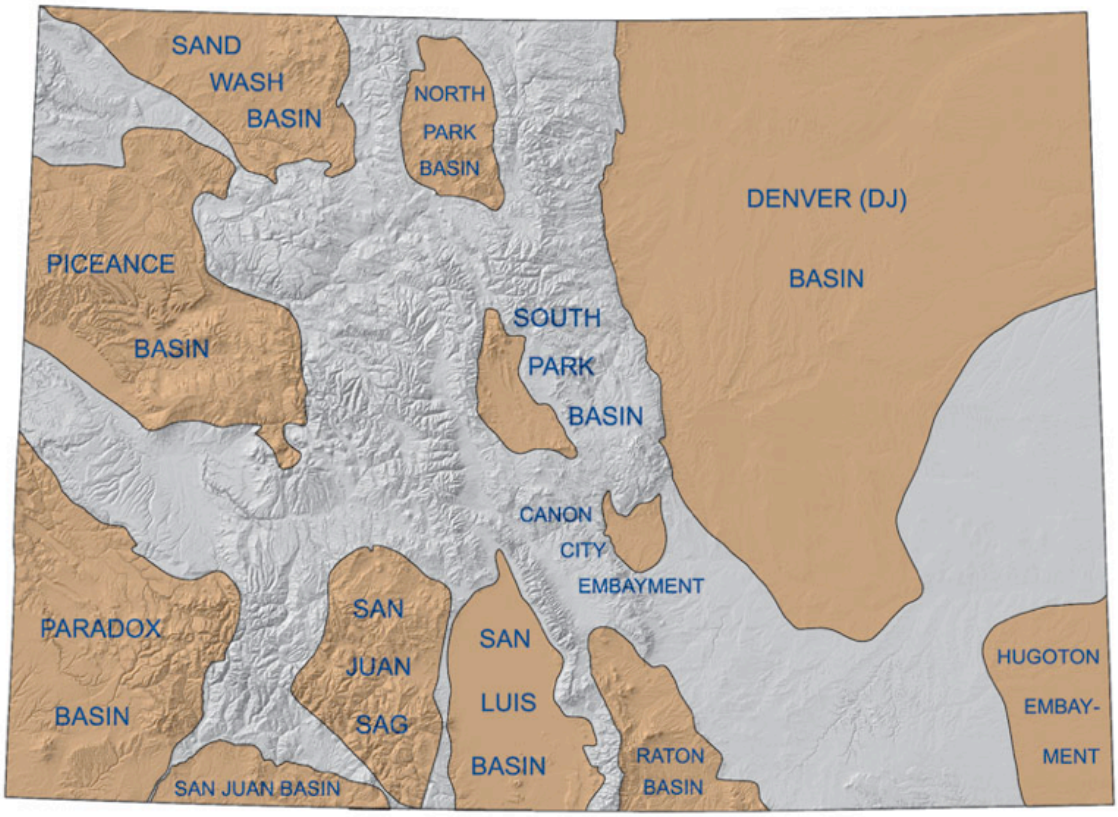


Source: Colorado Department of Labor and Employment/QCEW

Despite the strong overall upward industry trend over the past decade, Colorado continues to see cyclical aspects at both the commodity and regional level. For example, much of the growth over the past three years has been driven by additional oil production in the Wattenberg Field, just northeast of the Denver Metro area (primarily Weld County).

[3] 2012 employment totals are for 3rd quarter. All other employment totals are annual.

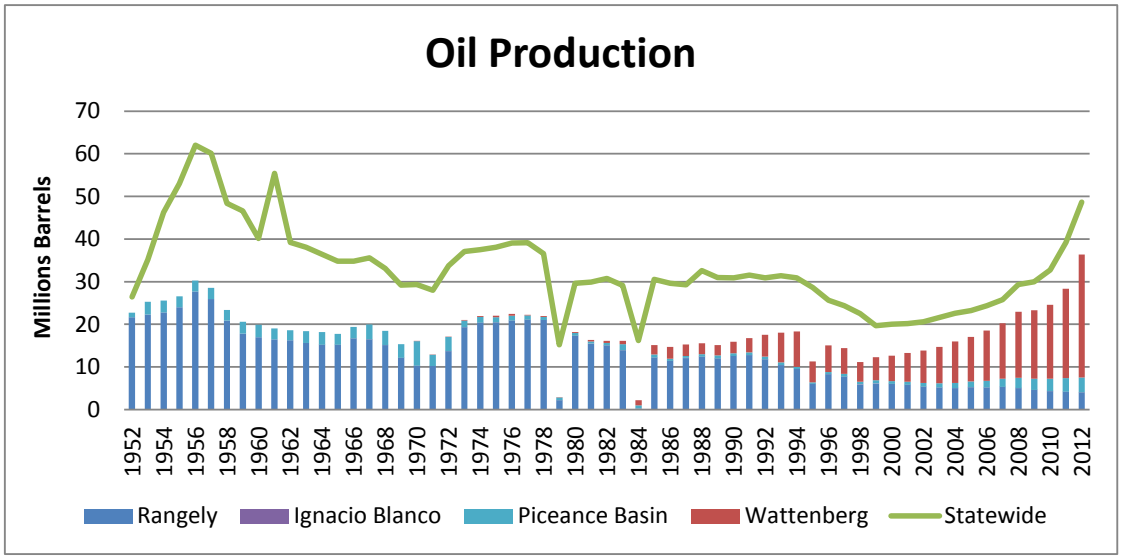
Colorado's Oil and Gas Basins



Source: Colorado Geological Survey

This growth is usually attributed to the increased adoption of "unconventional drilling" techniques, such as horizontal drilling and hydraulic fracturing, a process that involves forcing water, sand and chemical mixes deep into the ground under very high pressure to create small fractures in the underlying rock. Such techniques increase the amount of oil and gas that can be extracted from tight sand, coalbed, and shale formations, making the extraction process economically feasible. Prior to the widespread adoption of these technological advances, state oil production levels differed very little from 40 years earlier.

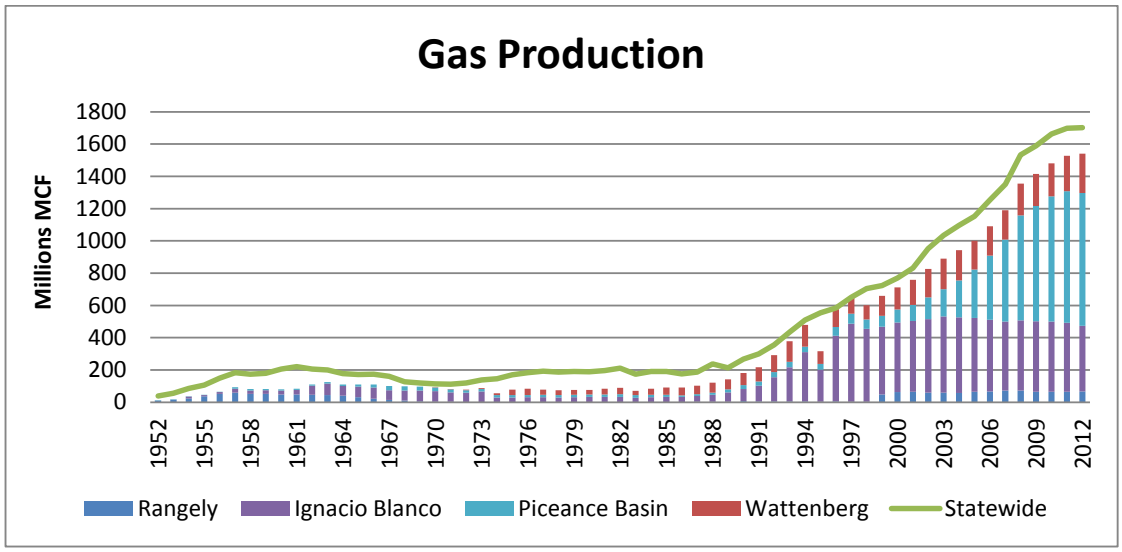
State Oil Production: 1952-2012



Source: Colorado Oil and Gas Conservation Commission

Meanwhile, Colorado gas production has recently plateaued after more than 20 years of rapid growth. Starting in the late 1980s, production in the Ignacio Blanco Field (IBF) in the San Juan Basin expanded for several years, creating jobs primarily in La Plata and Archuleta Counties. Although IBF output leveled off in 2000, rising national wellhead prices from 2000 to 2005 helped encourage new production from the Piceance Basin (primarily Garfield and Rio Blanco Counties), eventually more than doubling the state's gas output from the start of the millennium.

State Gas Production: 1952-2012

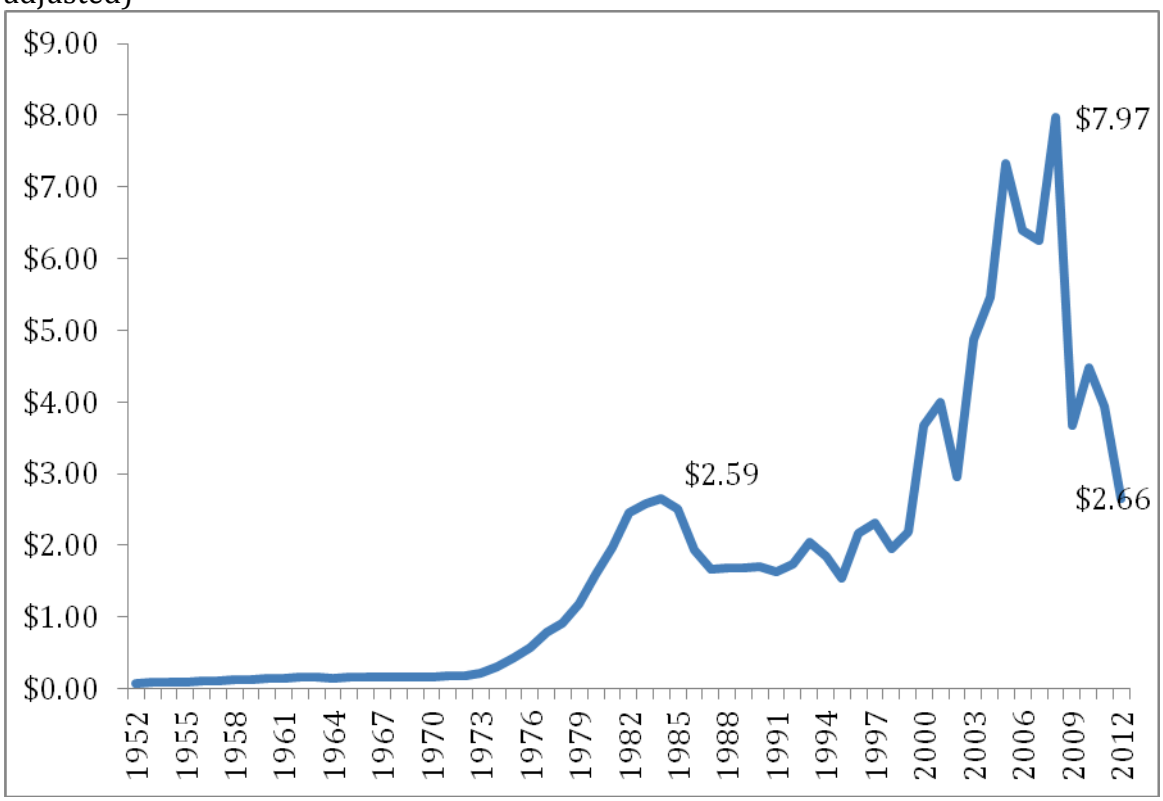


Source: Colorado Oil and Gas Conservation Commission

Prices play an important role in production decisions. Climbing natural gas prices in the early 2000s encouraged exploration and production. However, later in the

decade national supply increased and the U.S. economy went into a recession. Consequently, natural gas prices fell significantly, causing producers to drill less. As the economy began its recovery natural gas prices remained low, but oil prices increased, and new drilling practices emerged. Thus, the state saw an increase in oil exploration and production.

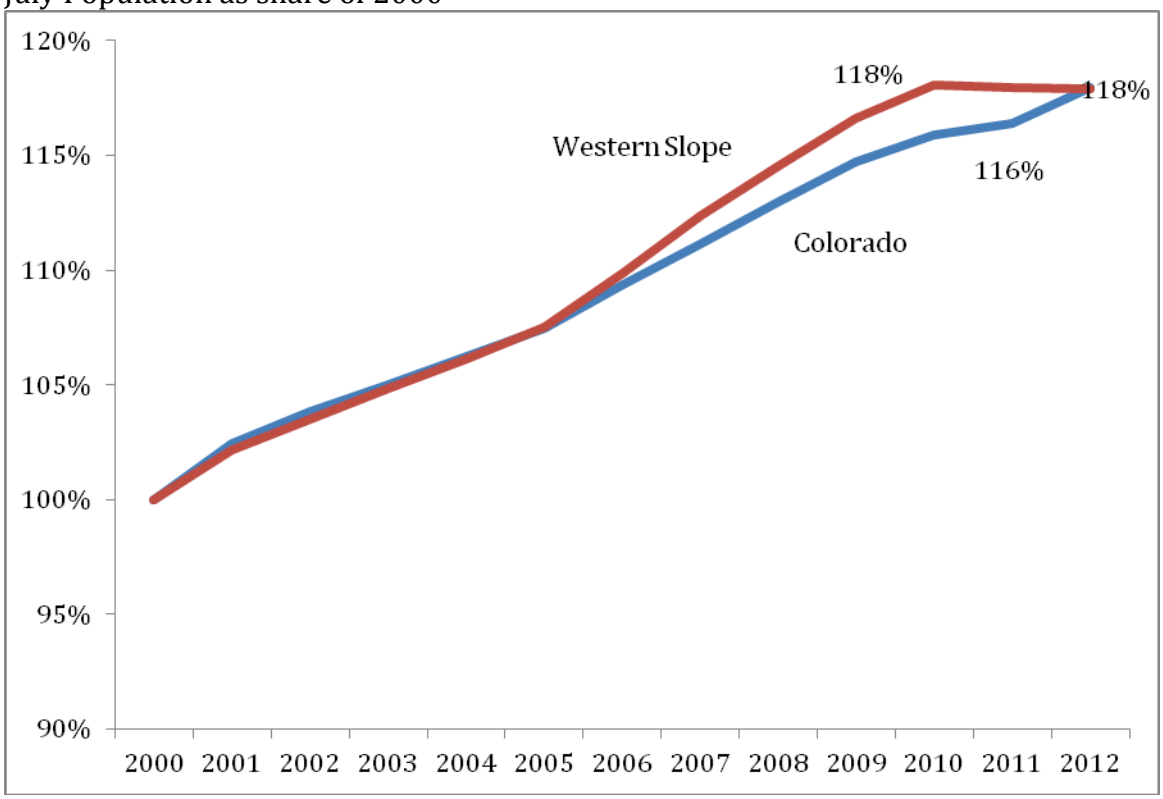
U.S. Natural Gas Wellhead Price (Dollars per Thousand Cubic Feet) (not inflation adjusted)



Source: U.S. Energy Information Agency

From a regional perspective these trends have important implications. Gas development during much of the 1990s and 2000s led to substantial employment (and population) growth on the Western Slope, leading to higher income and lower unemployment. More recently, however, the region has seen less exploration and drilling activity, resulting in fewer jobs. This has helped contribute to higher unemployment rates across many of the state's western counties and net out-migration in some. For example, Garfield County's August 2013 unemployment rate stood at 6.3 percent, up 4.0 percentage points from six years earlier. In 2011, nearly 500 more people moved out of the County than into it, according to the State Demographer's office.

July Population as share of 2000



Source: Colorado Demographer's Office

The recent increase in oil production in the Wattenberg Field has had the opposite impact, especially in Weld County. The housing market bust hit Weld County particularly hard, with more than 1,200 jobs lost in the construction sector between 2008 and 2012. Yet the county unemployment rate now stands at 7.5 percent, "only" 3.1 percentage points higher than at the start of the recession. This can be attributed to job losses in construction being offset by gains in the oil and gas industry since 2009.

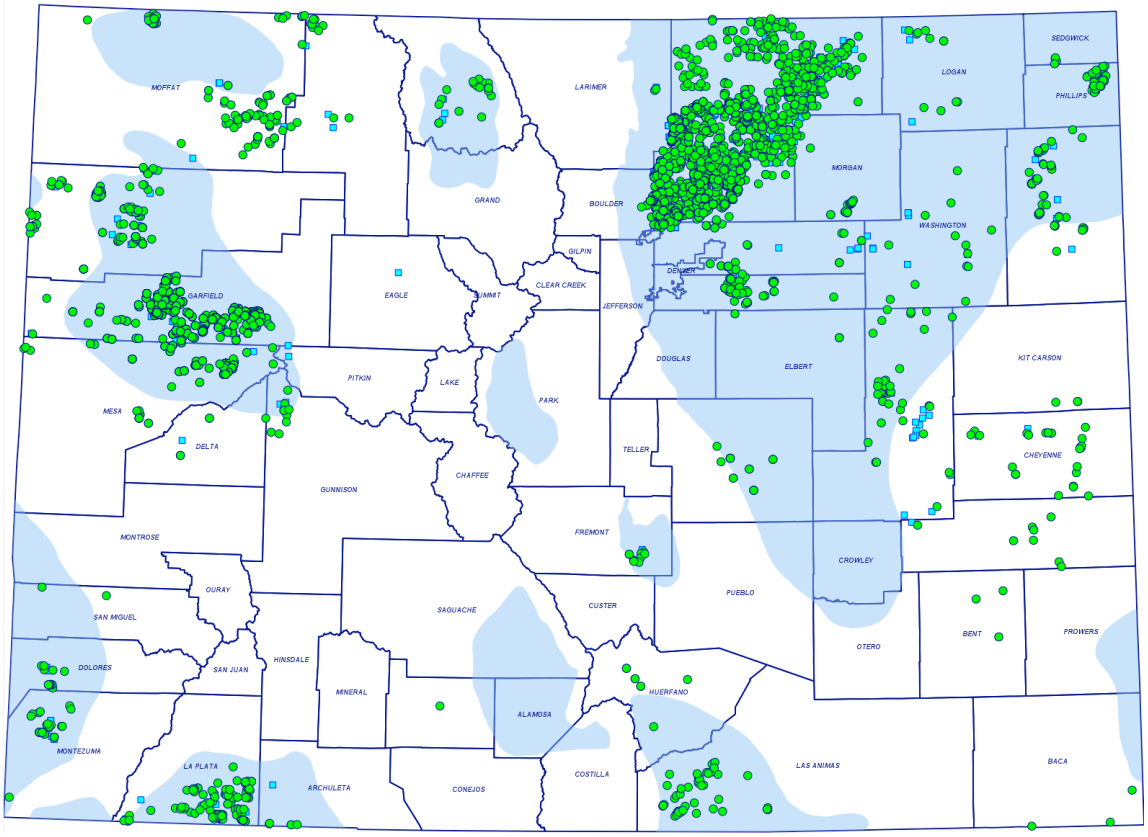
Although the state provides estimates of county-level oil and gas industry employment, data collection issues make it difficult to accurately quantify these sub-state changes. In particular, because many of the state's oil and gas industry businesses are headquartered in the Denver metropolitan area, the reported jobs data often (but not always) reflect the location of the main office, rather than where the exploration and drilling actually take place. For this reason, we do not provide county job totals and changes here.

The total 2010 value of Colorado produced oil and gas was estimated to be $9.2 billion. This represents a 26 percent increase over the 2009 value of $7.3 billion, but is still short of the nearly $14 billion that the state generated in 2008 when natural gas prices were elevated. Garfield and La Plata counties were the largest contributors to the state's $6.8 billion in natural gas production. For oil production,

more than 75% of the total $2.2 billion value comes from Weld and Rio Blanco counties.

To give some further feel for changing sub-state dynamics, we do provide some information about recent trends in regional permitting and drilling. According to the Colorado Oil and Gas Commission, in 2012, 3,775 drilling permits were approved in 37 of Colorado's 64 counties. Nearly half of these were (1,826) in Weld County, and more than 1,000 were in Garfield County. Additional concentrations included Mesa, Rio Blanco and Moffatt Counties.

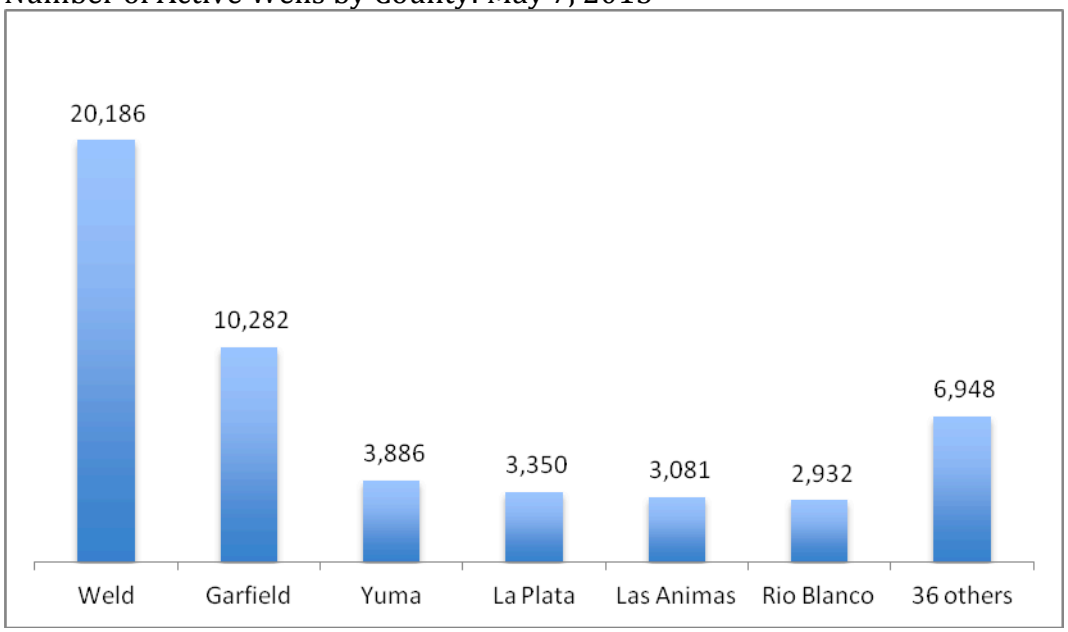
Oil and Gas Permits and Pending Permits: May 11, 2013



Source: Colorado Oil and Gas Conservation Commission—GIS Online

Of all active wells, Weld and Garfield Counties dominate, with more than 60 percent. Over all, the top-6 counties account for 87 percent of the state's 50,665 active wells.

Number of Active Wells by County: May 7, 2013



Source: Colorado Oil and Gas Conservation Commission

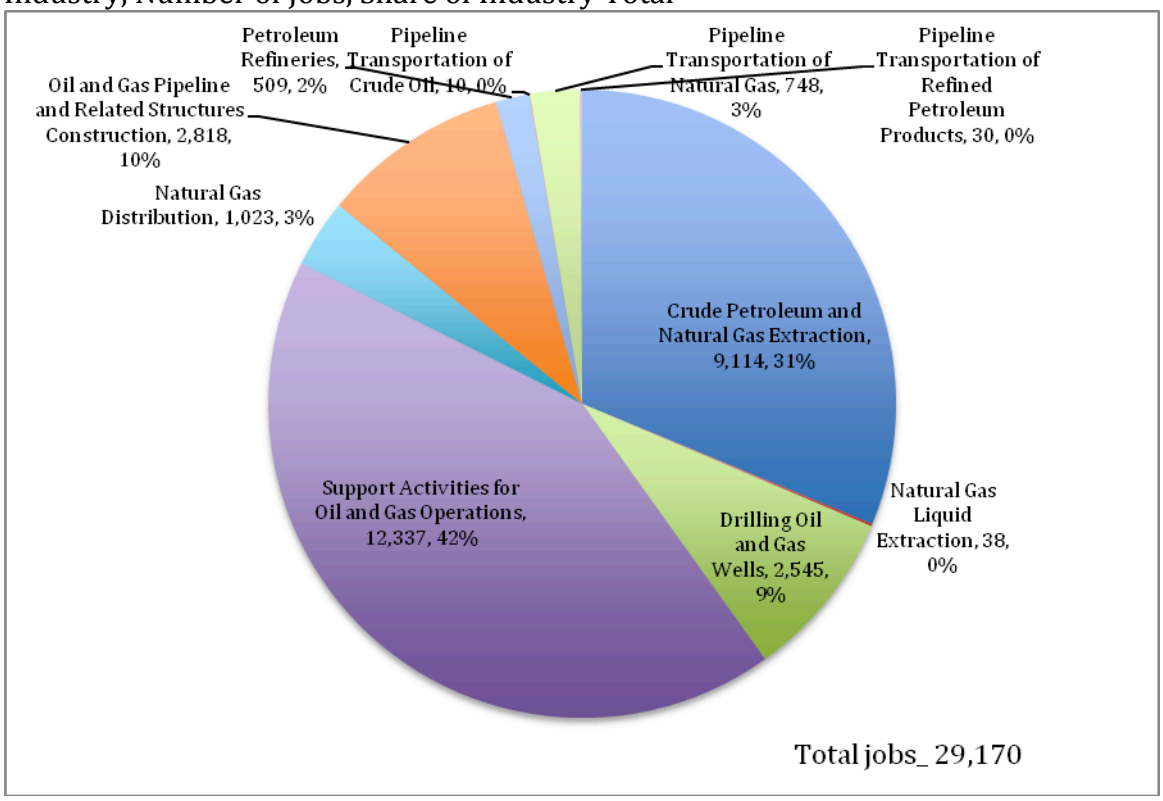
Oil and gas production has an interesting employment dynamic, with labor needs changing over various stages of the production cycle. For example, geologists and surveyors play important roles in the discovery and exploration phases. Once potential fields are identified, land and mineral right acquisition becomes a critical activity, involving banks, land title and real estate companies. The early stages of production require site preparation, drilling operations and supporting infrastructure development, including storage and transportation. Wells are subsequently installed.

Once a well is fully operational, labor demands for a particular site tend to focus primarily on well and line maintenance, and any product transportation needs. Because of this cycle, industry crews are often highly mobile, and the number of jobs created in any region depends largely on the number of wells drilled.[4]

[4] According to the Census Bureau (2008), more than three-quarters of national oil and gas employment is associated with drilling and exploration, on average. In a study of southwest Pennsylvania, Brundage et al (2011), found that each wet gas well requires the equivalent of 13.1 full time jobs, spread across almost 150 occupations and 420 individuals, during the year when drilling and well completion occur on the well site, but only 0.18 full time job equivalents during each of that well's subsequent producing years.

Refineries are usually next in the value chain, creating short-term jobs in construction and longer-term employment in operation and maintenance.[5]

Industry, Number of Jobs, Share of Industry Total

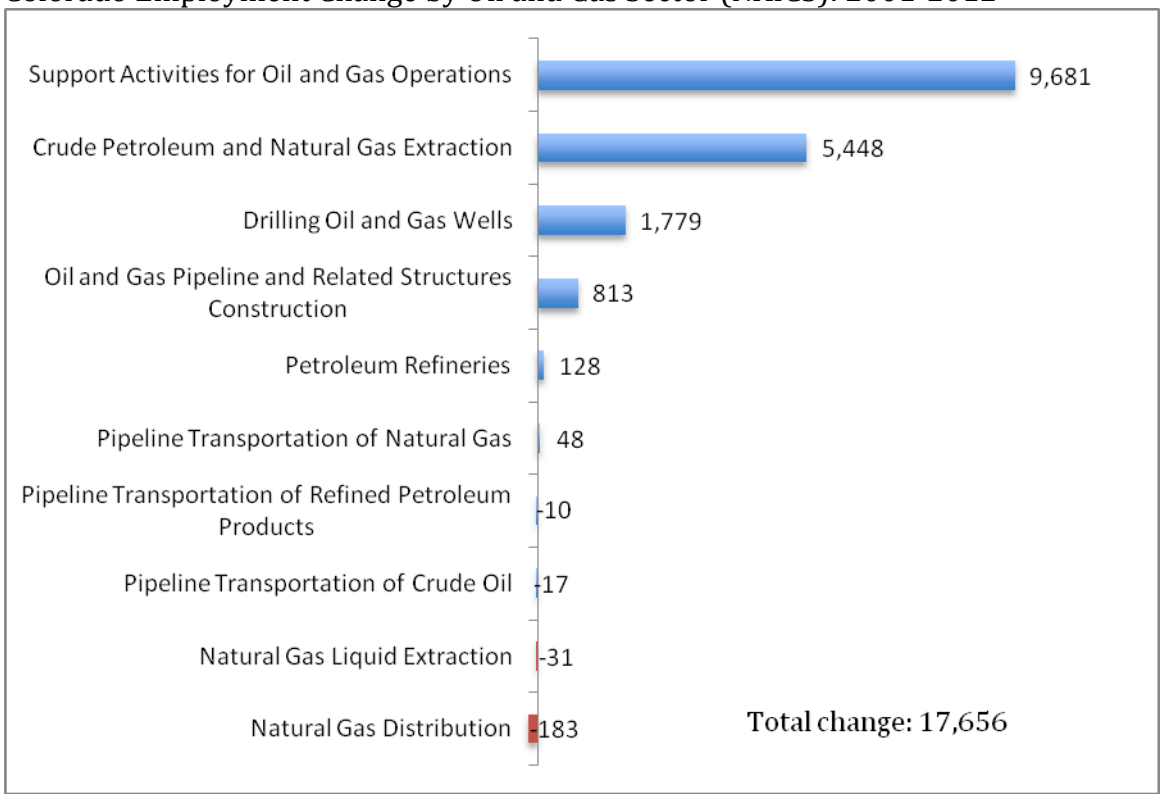


Source: Colorado Department of Labor and Employment/QCEW

In the following chart we show changes in jobs by various industries within the oil and gas industry over the period 2001-2012. More than half of the additional jobs were created in support activities for oil and gas operations (9,681), with oil and gas extraction and drilling oil and gas wells accounting for most of the remaining job growth (5,448).

[5] Other industries include distributing products from the refinery; using petroleum as inputs to other products, such as asphalt and plastics; and selling gasoline and diesel fuels to vehicle operators.

Colorado Employment Change by Oil and Gas Sector (NAICS): 2001-2012



Source: Colorado Department of Labor and Employment/QCEW and Economic Modeling Specialists International

Top Occupations

When thriving, the oil and gas industry sees growth in high-paying jobs that offer opportunities across the education spectrum. Geologists help discover new fields, engineers develop new drilling techniques and environmental practices, accountants help companies pay their bills, and highly skilled "blue collar" workers with on the job training operate and maintain rigs, pipelines and refineries. The following table identifies the top-15 occupations in the industry, along with their median hourly earnings and educational level requirements. Top occupations with respect to number of positions are primarily concentrated in site preparation and rig operation. Most positions require a high school degree or less and pay higher average wages than many other opportunities available to workers with similar education levels.

When considering career opportunities in the industry it is important to recognize that 1) many of the jobs are physically demanding, 2) the jobs are often migratory, and 3) the number of available jobs is highly impacted by price volatility.

15 Leading Colorado Oil and Gas Sector Occupations by 2012 Job Total

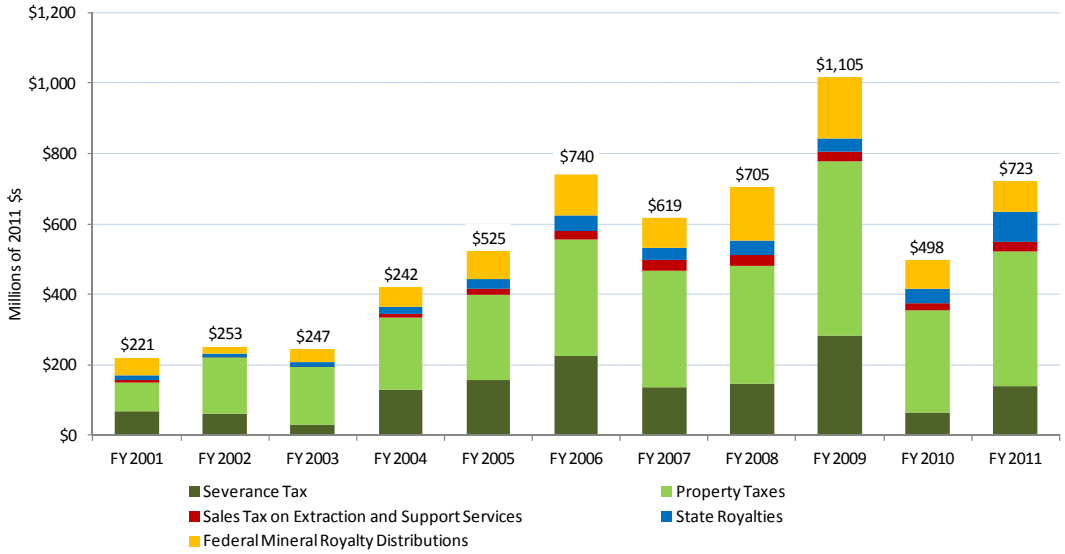
SOC	Occupational Title	Grand Total	Average Hourly Wage	Education
47-5013	Service unit operators, oil, gas, and mining	2,734	$23.30	Less than high school
47-5071	Roustabouts, oil and gas	2,143	$19.27	Less than high school
47-2061	Construction laborers	1,673	$15.29	Less than high school
47-1011	First-line supervisors/managers of construction trades and extraction workers	1,467	$37.12	High school diploma or equivalent
43-6014	Secretaries, except legal, medical, and executive	1,203	$19.14	High school diploma or equivalent
47-2073	Operating engineers and other construction equipment operators	1,113	$22.70	High school diploma or equivalent
11-1021	General and operations managers	1,000	$73.07	Associate's degree
47-5012	Rotary drill operators, oil and gas	971	$28.42	Less than high school
17-2171	Petroleum engineers	969	$66.44	Bachelor's degree
13-2011	Accountants and auditors	882	$39.89	Bachelor's degree
53-3032	Truck drivers, heavy and tractor-trailer	784	$20.53	High school diploma or equivalent
49-9051	Electrical power-line installers and repairers	746	$29.60	High school diploma or equivalent
13-1199	Business operations specialists, all other	745	$44.14	High school diploma or equivalent
53-7073	Wellhead pumpers	521	$25.45	Less than high school
47-5011	Derrick operators, oil and gas	489	$24.64	Less than high school

Source: Colorado Department of Labor and Employment/Labor Market Information

Fiscal Trends

Oil and gas also play an important part in state and local government finances. *Headwaters Economics* reports Colorado's oil and natural gas tax and royalty revenue totaled $723 million in 2011. *Headwaters* reports that in 2009 the combined total of severance, property, and sales taxes, and federal and state royalties made up 2.8 percent of total state and local government tax revenue. According to the Colorado Oil and Gas Association, the industry paid more than $163 million in severance taxes to the state in 2012.

Colorado Oil and Natural Gas Tax and Royalty Revenue: FY 2001–FY 2011



Source: Headwaters Economics

Discussion

The oil and gas industry has always played an important part in Colorado's history. When the state's economy was smaller and the industry more labor intensive, oil and gas was a major economic driver, and industry booms and busts reverberated statewide. Over the past 30 years Colorado's economy has both grown and diversified, and today the sector (as defined here) represents slightly more than 1 percent of total state employment.

Advances in exploration and drilling practices, demand for cleaner energy resources and an increased drive for national energy independence have all had important effects over the past decade. Although the sector has added more than 17,600 jobs since 2001, this growth has been marked by dramatic fluctuations at both the regional and commodity level.

Looking first at gas, Colorado's production grew rapidly in the early and mid-2000s, as higher prices and new markets bolstered industry revenues. By late 2008 and early 2009, however, "unconventional drilling" techniques such as horizontal drilling and hydraulic fracturing brought new fields into play across the country.

The subsequent growth in national supply, coupled with reduced demand during the recession, pummeled producer prices. These national forces contributed to the state's industry shedding more than 4,700 jobs in one year. Most of the impacts were felt along the Western Slope, which saw a dramatic increase in unemployment. One related industry characteristic is that many of the industry workers are necessarily migratory.

Over the past few years, the state's oil and gas industry has grown again, with 2012 employment totals surpassing their pre-recessionary peak. Most of the new activity is in oil production in the Wattenberg Field, and largely driven by the adoption of the same "unconventional drilling" techniques that led to new gas field development elsewhere.

Despite its substantial economic contributions, some aspects of the oil and gas industry remain controversial. For example, the new drilling practices have come under scrutiny from both citizens groups and local governments. Indeed, the City of Longmont made national news when voters approved a ban on hydraulic fracturing within the city limits. Voters in Fort Collins, Boulder and Lafayette passed similar bans this November. Much of the concern stems from uncertainty and debate about the potential long-run environmental and health effects of the new drilling practices.

The public and industry are debating other issues as well. For example, some people are concerned about potentially adverse effects of drilling operations on nearby residents, such as air, noise and light pollution. Other concerns include the practices' strong reliance on water, how the industry impacts state and local transportation infrastructure, and how the industry affects local businesses by luring workers to the fields with higher wages.

Another question is how much of the benefit actually remains within the community; this is particularly an issue in places with much state or federally owned land, and/or many non-resident property owners – whereby the leasing and royalty dollars immediately leave the community. Further, because industry workers are often migratory, there are questions about how many of the jobs are filled by "locals" versus people living outside of the community.

Industry Definition

The oil and gas industry can be defined in several ways. For the purposes of this report we focus primarily on exploration, site preparation, drilling, extraction, transportation and refining. Others may define the industry more broadly, looking both upstream (e.g., retailing of final products), and downstream (manufacturing of drilling equipment). Some other studies also consider multiplier effects, such as jobs created by employee spending. Still others look at the economic impacts of lease and royalty payments to households. Such considerations are beyond this study's scope.

The specific industries (and their NAICS code) we look at are:[6]

Oil and Gas Extraction (211). Industries in the Oil and Gas Extraction subsector operate and/or develop oil and gas field properties. Such activities may include exploration for crude petroleum and natural gas; drilling, completing, and equipping wells; operating separators, emulsion breakers, desilting equipment, and field gathering lines for crude petroleum and natural gas; and all other activities in the preparation of oil and gas up to the point of shipment from the producing property. This subsector includes the production of crude petroleum, the mining and extraction of oil from oil shale and oil sands, and the production of natural gas, sulfur recovery from natural gas, and recovery of hydrocarbon liquids.

Drilling Oil and Gas Wells (213111). This U.S. industry comprises establishments primarily engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, re-drilling, and directional drilling.

Support Activities for Oil and Gas Operations (213112). This U.S. industry comprises establishments primarily engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related construction activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars, well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.

Natural Gas Distribution (2212). This industry comprises: (1) establishments primarily engaged in operating gas distribution systems (e.g., mains, meters); (2) establishments known as gas marketers that buy gas from the well and sell it to a distribution system; (3) establishments known as gas brokers or agents that arrange the sale of gas over gas distribution systems operated by others; and (4) establishments primarily engaged in transmitting and distributing gas to final consumers.

[6] Descriptions are drawn verbatim from www.census.gov/econ/industry/index.html.

Oil and Gas Pipeline and Related Structures Construction (23712). This industry comprises establishments primarily engaged in the construction of oil and gas lines, mains, refineries, and storage tanks. The work performed may include new work, reconstruction, rehabilitation, and repairs. Specialty trade contractors are included in this group if they are engaged in activities primarily related to oil and gas pipeline and related structures construction. All structures (including buildings) that are integral parts of oil and gas networks (e.g., storage tanks, pumping stations, and refineries) are included in this industry.

Petroleum Refineries (32411). This industry comprises establishments primarily engaged in refining crude petroleum into refined petroleum. Petroleum refining involves one or more of the following activities: (1) fractionation; (2) straight distillation of crude oil; and (3) cracking.

Pipeline Transportation (486). Industries in the Pipeline Transportation subsector use transmission pipelines to transport products, such as crude oil, natural gas, refined petroleum products, and slurry. Industries are identified based on the products transported (i.e., pipeline transportation of crude oil, natural gas, refined petroleum products, and other products). The Pipeline Transportation of Natural Gas industry includes the storage of natural gas because the storage is usually done by the pipeline establishment and because a pipeline is inherently a network in which all the nodes are interdependent.

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