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# Employment Outlook for African Americans and Latinos in the Upstream Oil and Natural Gas Industry



Prepared for:



AMERICAN PETROLEUM INSTITUTE





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Prepared for:

American Petroleum Institute



By:

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**DISCLAIMER: THE EMPLOYMENT PROJECTIONS ESTIMATED HEREIN ARE BASED UPON PUBLIC DATA AND IHS GLOBAL INSIGHT DATA AND MODELS AND CONFORM TO ESTABLISHED METHODOLOGY CONSISTENT WITH STANDARD INDUSTRY PRACTICES. ALL RESULTS AND OBSERVATIONS ARE BASED UPON INFORMATION AVAILABLE AT THE TIME OF THIS REPORT. TO THE EXTENT THAT ADDITIONAL INFORMATION BECOMES AVAILABLE OR THE FACTORS UPON WHICH OUR ANALYSIS IS BASED CHANGE, OUR RESULTS COULD BE SUBSEQUENTLY AFFECTED. NO EXPRESS GUARANTEE OF EMPLOYMENT, EITHER DIRECT OR INDIRECT, IS IMPLIED BY THESE FORECASTS.**

## Executive Summary

This report examines the employment outlook of African American and Hispanic workers in the upstream oil and gas industry over the period 2010 to 2030. Three types of job growth are considered:

- New jobs that are projected to be created under a baseline forecast of the industry's expected growth,
- Jobs that will likely be created due to the need to replace workers who retire or otherwise leave the industry over this period, and
- Jobs that are projected to be created under a scenario for more accelerated development of U.S. oil and natural gas resources.

A starting point for our analysis is a baseline forecast of employment growth in the upstream oil and natural gas industry and an alternative forecast based on a scenario for accelerated development of oil and natural gas resources, which were projected in a study conducted by Wood Mackenzie for the American Petroleum Institute (API) in the fall of 2011.<sup>1</sup> The Wood Mackenzie study projected total employment growth under its baseline and accelerated growth scenarios, nationally and by state, through 2030. Wood Mackenzie's Pro-development Scenario includes the potential economic impacts of opening access to key U.S. regions that are currently closed to development such as the U.S. Atlantic and Pacific offshore, the Eastern Gulf of Mexico, and Arctic National Wildlife Refuge (ANWR). The scenario also assumes a return to historical levels of development in existing U.S. producing areas (including onshore U.S., the Gulf of Mexico and Alaska).

API asked IHS Global Insight to estimate and forecast the employment outlook for African American and Hispanic workers under these two cases and to consider job growth associated with replacement demand in the industry as well.<sup>2</sup> To develop these forecasts, we produced projections of the growth of population, labor force and employment for these two minority groups through 2030, taking into account expected trends in their labor force participation rates, educational attainment, and unemployment rates. We then projected trends in employment by occupation of African American and Hispanic workers, economy-wide and in the upstream oil and gas industry. Our principal findings are as follows.

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<sup>1</sup> Wood Mackenzie, "U.S. Supply Forecast and Potential Jobs and Economic Impacts (2012 – 2030)," September 7, 2011. Available at: [http://www.api.org/Newsroom/upload/API-US\\_Supply\\_Economic\\_Forecast.pdf](http://www.api.org/Newsroom/upload/API-US_Supply_Economic_Forecast.pdf).

<sup>2</sup> These two minority groups form the basis of this study as they comprise very large underutilized segments of the U.S. labor supply. Similar analysis for other minority groups was beyond the scope of this work.

## Potential Job Creation in the Upstream Oil and Natural Gas Industry

	Minority	Total Industry
<b><u>Increment 2010 to 2020</u></b>		
Baseline Growth and Replacement Requirements	79,931	226,986
<u>Pro- Development Policy</u>	<u>86,355</u>	<u>298,290</u>
Total Potential	166,286	525,276
<b><u>Increment 2010 to 2030</u></b>		
Baseline Growth and Replacement Requirements	171,905	479,794
<u>Pro- Development Policy</u>	<u>113,490</u>	<u>330,999</u>
Total Potential	285,395	810,793

Minority totals are the sum of projected jobs for African American and Hispanic workers.

### Baseline Industry Growth

- Baseline growth in the Upstream Oil and Natural Gas Industry could result in the creation of an estimated 227 thousand jobs (including replacements) over the 2010 to 2020 period. Of this total, we project approximately 80 thousand jobs (35%) to be held by minorities, 20 thousand by African Americans and 60 thousand by Hispanics.
- Part of this increase in minority employment will be due to the baseline growth of the industry and part will be due to African Americans and Latinos increasing their shares of employment in the industry as current workers retire over this 10-year period.

### Accelerated Oil and Natural Gas Development Policy

- We estimate that of the nearly 300 thousand jobs that Wood Mackenzie projects would be created by 2020 due to accelerated development of U.S. oil and natural gas resources, over 86 thousand (or 29 percent) would be held by African American and Hispanic workers.
- By 2030, we estimate that more than 113 thousand of the new jobs in the industry created by pro-development energy policy would be held by African American and Hispanic workers (34 percent of the 331 thousand total new jobs projected by Wood Mackenzie).



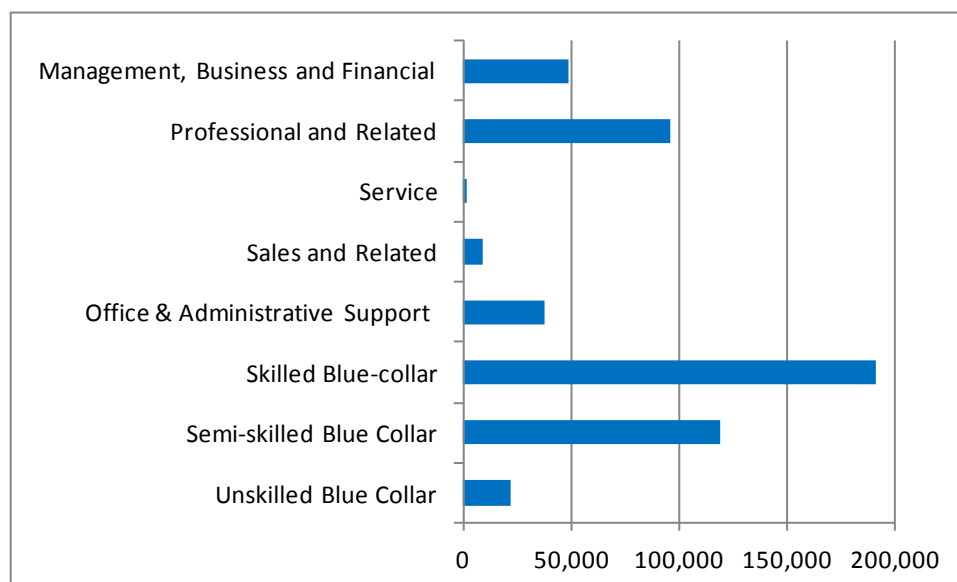
### Potential Job Creation from All Sources

- Combining the 86 thousand jobs that could be created through 2020 by accelerated exploration and development with the roughly 80 thousand job opportunities in the industry from baseline growth and replacement requirements yields an estimated total of 166 thousand potential job opportunities that we project would be held by African Americans and Latinos over this period. More specifically, we project employment to increase by 126 thousand for Hispanic workers and by 40 thousand for African American workers through 2020.
- Hispanic employment growth in the industry is projected to show larger gains due to the much faster growth of the Hispanic population and the higher labor force participation rate and lower unemployment rate of Hispanics relative to African Americans over the forecast period.
- Some portion of the job opportunities could be in geographic locations (e.g., the Rockies and/or Alaska) away from segments of minority populations and could require relocation.

### Job Potential by Occupation

- Our estimates of job potential by occupation suggest that over one-half of all jobs would be skilled and semi-skilled blue collar jobs. In addition, a significant share of the potential jobs would be at the scientific/managerial level, e.g., petroleum engineers, most of which require a college degree.

### **Potential Job Creation in the Upstream Oil and Natural Gas Industry, 2010-2030, by Broad Occupational Category (Combining Pro-Development Policy with Baseline Growth and Replacement)**



**Potential Job Creation in the Upstream Oil and Natural Gas Industry,  
2010-2030, by Selected Detailed Occupational Category  
(Combining Pro-Development Policy with Baseline Growth and Replacement)**

	<b>Minority</b>	<b>Total</b>
Derrick, Rotary Drill and Service Unit Operators	36,717	107,390
Roustabouts, Oil and Gas	24,073	63,263
Operating Engineers and Other Construction Equipment Operators	13,838	46,323
Construction Laborers	32,253	43,565
First-Line Supervisors/Managers of Construction and Extraction Workers	9,838	34,835
Truck Drivers, Heavy and Tractor-Trailer	14,271	29,028
Pump Operators and Wellhead Pumpers	5,342	23,935
Helpers and Other Extraction Workers	9,421	22,084
Petroleum Engineers	2,842	20,621
Secretaries	4,977	15,008

Minority totals are the sum of projected jobs for African American and Hispanic workers.

Educational Attainment and Job Opportunities

- A high school education combined with some additional amount of post-high school vocational training could establish the competitiveness of workers for many of these well-paid jobs.
- The rate at which African Americans and Latinos attain oil and natural gas employment in the industry, is in part related to the choice of the field of study for college degrees (4-year, 2-year) and vocational certificates.
- Data from the National Center for Education Statistics suggest that over the 2001-2010 period African American and Hispanic students chose and completed 4-year college degrees applicable to oil and natural gas industry employment at rates one-fifth and one-half, respectively, the rates of the total student population.
- With respect to 2-year associate degrees and certificates, the data suggest that over the same time period, African American and Hispanic students chose and completed programs of study/training applicable to oil and natural gas industry employment at rates roughly one-tenth above and one-third below, respectively, the rates of the total student population.
- Improving minority preparation in Science, Technology, Engineering and Mathematics (STEM) related disciplines at the primary and secondary school

levels is crucial to increasing the share of minority science-based degree attainment in 4-year and 2-year programs of higher education, as well as for increasing attainment of vocational certificates.

- Both challenges and opportunities exist going forward. Raising educational achievement for large segments of the upcoming generation is resource intensive and will take decades to achieve. However, the payoff of an increased skilled labor pool would be enormous to society in general and U.S. industry in particular. This report illustrates that there are significant opportunities for African Americans and Hispanics throughout the petroleum industry currently and well into the future at each level of education and training.

## I. Introduction

In the fall of 2011 the consulting firm Wood Mackenzie conducted a study for the American Petroleum Institute (API) of the economic impact of a set of proposals for accelerated exploration and development of oil and natural gas resources in North America.<sup>3</sup> Wood Mackenzie first developed a set of baseline forecasts of the expected growth of output and employment in the upstream oil and gas industry consistent with the current policy environment, nationally and by state, through 2030. They then estimated the number of jobs that would be created over this period by a set of pro-energy exploration and development activities.

The pro-development policies assumed in Wood Mackenzie's alternate scenario include commencement of leasing, drilling and development activity in currently closed regions. Regions assumed to be opened include: Eastern Gulf of Mexico, portions of the Rocky Mountains, Atlantic OCS, Pacific OCS, Alaska National Wildlife Refuge (ANWR) – 1002 Area, National Petroleum Reserve, Alaska (NPRA), Alaska offshore and the Marcellus formation in New York State. In addition, drilling and permitting in the offshore Gulf of Mexico is assumed to return to pre-moratorium levels. With respect to the onshore, future environmental regulation of shale gas and tight oil plays are assumed not to be duplicative or unduly burdensome. On and offshore permitting levels are at sufficient rates to develop resources in a timely manner.

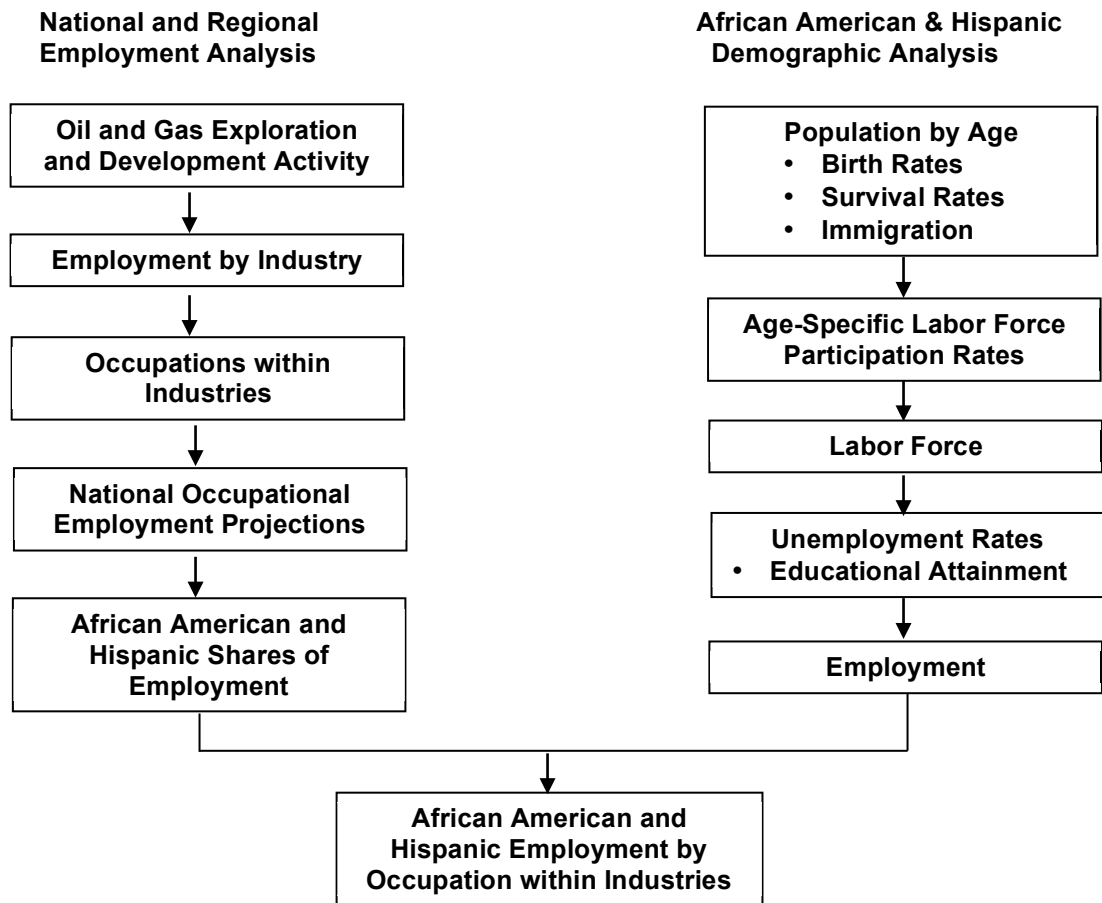
API engaged IHS Global Insight to utilize our expertise in demographic and economic analysis and forecasting to estimate employment levels of African American and Hispanic workers in the upstream oil and gas industry and to project employment growth for these two minority groups under Wood Mackenzie's baseline and accelerated development scenarios. In addition to preparing these two sets of forecasts, we have examined the employment outlook for African American and Hispanic workers associated with the need to replace workers who will retire or leave the industry over this forecast period.

To estimate and forecast employment levels of Hispanic and African American workers, we gathered information on the occupational mix of jobs in the set of upstream oil and gas industry activities analyzed by Wood Mackenzie and analyzed the shares of African American and Hispanic workers in employment in these occupations. To produce long-term projections of the number of African American and Hispanic workers in these occupations, we prepared forecasts of national employment by industry and occupation and long-term projections of population, workforce and employment for both African Americans and Latinos. Figure 1 provides a schematic view of the steps in the analysis.

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<sup>3</sup> [http://www.api.org/newsroom/upload/api-us\\_supply\\_economic\\_forecast.pdf](http://www.api.org/newsroom/upload/api-us_supply_economic_forecast.pdf)

**Figure 1  
Steps in the Analysis**



In Section II, we describe the data sources and methods used to produce projections of the population and total employment of African Americans and Latinos through 2030. We develop forecasts of:

- The total population of the U.S. and the population of Latinos and African Americans, in 5-year age groups.
- The U.S. labor force and the number of Latinos and African Americans in the labor force, in 10-year age groups.
- Total U.S. employment and total employment of Latinos and African Americans.

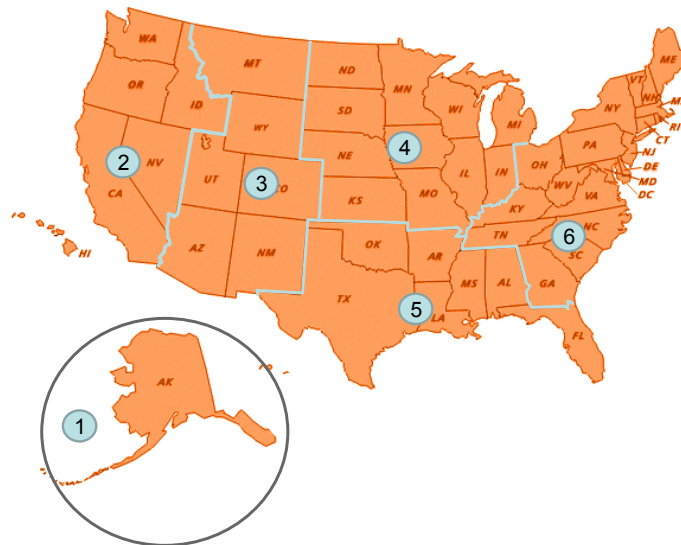
To produce these forecasts, we developed estimates and projections of some related labor force measures for these two minority groups, linked to forecasts for the U.S. economy as whole from IHS Global Insight's U.S. Economic Service:

- Labor force participation rates in 10-year age groups, and
- The unemployment rate.

Race/ethnicity categories are defined as follows in this report. The Hispanic population includes persons of Hispanic origin of all races. The African American population includes persons not of Hispanic origin reporting African American as a single response to the Census Bureau’s question regarding race.

This set of population and labor force estimates and projections was developed at the national level and for each of six regions. The states included in each region are shown in Figure 2.

**Figure 2.  
Regions**



#### States in Regions

Alaska	Alaska
West	California, Hawaii, Idaho, Nevada, Oregon, Washington
Rockies	Arizona, Colorado, Montana, New Mexico, Utah, Wyoming
Gulf	Alabama, Arkansas, Florida, Louisiana, Mississippi, Oklahoma, Texas
Central	Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin
East	Connecticut, DC, Delaware, Georgia, Kentucky, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Vermont, West Virginia

In Section III we describe the process of classifying the oil and gas exploration and development activities identified by Wood Mackenzie into industry categories based on the North American Industry Classification (NAICS). We discuss the availability of data on employment by occupation within industry and describe the process of selecting a set of 45 detailed and 8 broad occupational categories for use throughout the study.

In Section IV we develop estimates and forecasts of the occupational distribution of employment in these industries. We then estimate employment levels within each occupation and industry for African American and Hispanic workers. We develop these occupational employment estimates by race/ethnicity – nationally and in each of six regions – for:

- Total baseline employment in the upstream oil and gas industry in each year 2010, 2015, 2020, 2025 and 2030.
- Job opportunities created by the requirement to replace workers due to retirement and other reasons for leaving the industry, 2010-2030, and
- The new jobs that would be created through 2030 by the energy development policies analyzed in the Wood Mackenzie study.

To estimate employment levels of minority workers, we project a baseline case of growth and change in the occupational mix of the African American and the Hispanic workforce, which is tied to trend projections of basic indicators of the educational attainment of these two minority groups.

In Section V, we present data on the number of degrees (4-yr, 2-yr, and certificate) awarded over the period 2001-2010 to examine the level of participation of African Americans and Latinos in fields that provide a path to employment in the oil and natural gas industry.

## **II. African American and Hispanic Labor Supply Projections**

To forecast employment levels in the upstream oil and gas industry that could be realized by Hispanic and African American workers, we first produced projections of the growth of the U.S. labor force by occupation, with separate estimates for the African American and Hispanic populations. In this section we describe the following steps that were required to make these projections.

- We developed projections of the U.S. population by age and race/ethnicity categories through 2030.
- We developed projections of the labor force participation rate by age group for the U.S. population and for the African American and Hispanic populations separately.
- Combining these two sets of projections, we produced forecasts of the growth of the African American labor force and the Hispanic labor force.
- Using as a baseline the forecast of the unemployment rate by IHS Global Insight's U.S. Economic Service, we developed models to produce long-term forecasts of the unemployment rates for African American and Hispanic workers.
- Using these labor force and unemployment rate forecasts, we projected total employment of African Americans and Latinos through 2030.

This set of population and work force estimates was developed for each of six regions identified in the Wood Mackenzie study as well as for the U.S.

### ***Population***

To produce long-term forecasts of the African American and Hispanic populations, we used a cohort component method, similar to the approach used by the U.S. Census Bureau to produce long-term population projections. Our model produces estimates of the target populations at 5-year intervals, 2015 through 2030, starting with base year 2010 estimates of the population in 5-year age groups, 0-4 through 85+, as follows:

- In each 5-year period, age-specific survival rates are applied to the initial population in each 5-year age category to make preliminary estimates of the population in each higher 5-year age category in the forecast year.
- The population of age 0-4 in the forecast year is estimated by applying age-specific fertility rates to the female population in six 5-year age categories, 15-19 through 40-44.
- Estimates of net international migration – total and by 5-year age category are added to the preliminary estimates.



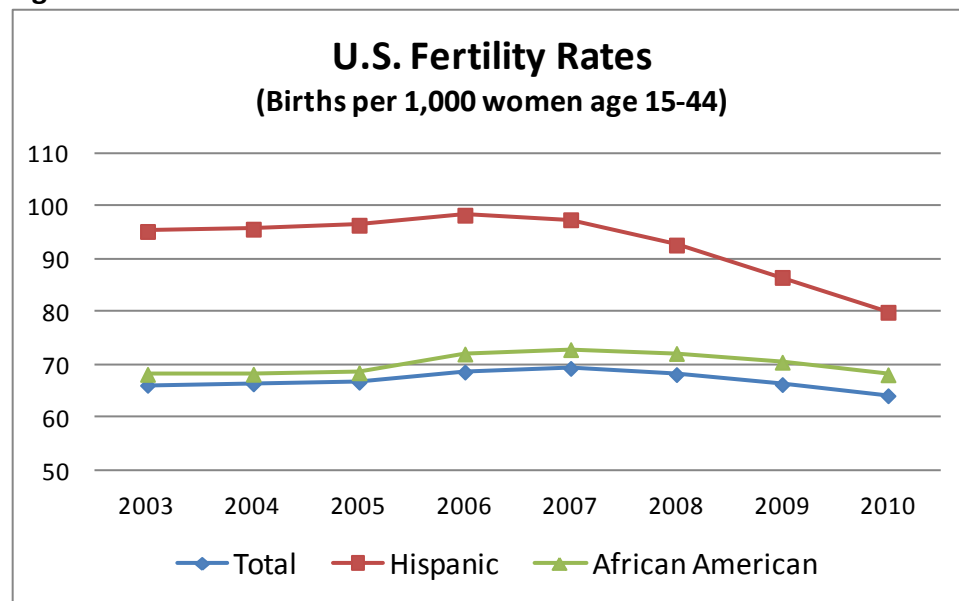
- For regional estimates, the final step is an adjustment for interregional migration – total and by 5-year age groups.

Our base year population estimates are the Census Bureau's mid-year (July 1) 2010 population estimates. The survival rates used in our projections are average probabilities of survival of persons in each 5-year category for a period of five years. These calculations are based on single-year survival rates from past Census Bureau population projections. Separate sets of survival rates were developed for each future five-year period. Survival rates for the African American and Hispanic populations differ from the U.S. average. Survival rates were not differentiated by region.

### Fertility Rates

The fertility rate (births per 1,000 women age 15-44) for the Hispanic population is about 25 percent higher than the U.S. average. Prior to the recent recession this differential was 40 percent or more. The fertility rate for the African American population is about 6 percent above the U.S. average. U.S. birth rates began a sharp decline with the onset of the recession in 2008. The U.S. average fertility rate in 2010 was 7.5 percent below its level in 2007 (see Figure 3). Hispanic fertility rates declined even more sharply. Preliminary data for 2011 indicate that the rate of decline in birth rates has slowed.

**Figure 3**



As the experience of the last several years reconfirmed, birth rates are indeed sensitive to economic conditions. We expect that birth rates will stabilize in 2012 and increase slightly over the next two years. Following this cyclical recovery, we project longer term

trends, which vary considerably by race/ethnicity and age, to generally continue. Fertility rates among women in younger age categories have been falling, while those among the 30-34 and 35-39 year categories have trended up slightly.

Fertility rates also differ regionally (see Table II.1). Our fertility rate forecasts generally preserve these regional differences.

**Table II.1**  
**Fertility Rates by Region**  
(Births per 1,000 women age 15-44)

	<b>Total</b>	<b>Hispanic</b>	<b>African American</b>
U.S.	64.1	79.9	68.1
East	60.8	79.9	65.0
Central	64.4	82.9	74.3
Gulf	67.3	80.3	70.0
Rockies	71.1	81.6	81.3
West	64.8	78.4	67.9
Alaska	79.7	71.7	90.5
As percent of U.S. average			
East	95	100	95
Central	101	104	109
Gulf	105	100	103
Rockies	111	102	119
West	101	98	100
Alaska	124	90	133

### Net International Migration

In addition to affecting birth rates, the recent recession also had a dramatic impact on the pace of immigration into the U.S. In particular, numerous reports over the past two years have documented a slowdown in the net flow of Hispanic immigrants to the U.S. as job prospects disappeared and border enforcement efforts increased.<sup>4</sup> The most recent Census Bureau estimates show that Hispanic immigration slowed to 353 thousand between July 2010 and July 2011 – about one-half total net international migration and sharply lower than the levels seen prior to the recession.

We expect the pace of net international immigration to continue below trend over the next 2-3 years as U.S. economic growth remains subpar. However, slow growth of the U.S. labor force associated with demographic trends discussed below will create incentives for a reacceleration of immigration flows over the next two decades.

<sup>4</sup> See, for example, Jeffrey Passel, D’Vera Cohn and Ana Gonzalez-Barrera, “Net Migration from Mexico Falls to Zero—and Perhaps Less,” Pew Hispanic Center, May 2012.

Hispanic as well as total U.S. immigration will rebound. However, our assumptions about the size of the annual inflow of immigrants are below those in the most recent Census Bureau long-term population projections, which were produced prior to the recession and prior to the availability of data from the 2010 Census of Population.

Assumptions about the distribution of immigrants by age, race/ethnicity and region were developed based on analysis of recent trends in immigration using the American Community Survey (ACS). Both the ACS and the Census Bureau's Current Population Survey (CPS) provide data on migration. The ACS has a larger sample and should provide better estimates of small demographic cells defined simultaneously by age, race/ethnicity and region.

The ACS asks all respondents whether they lived in the same house one year ago and, if not, where they lived one year ago. Response categories permit identifying movers within the U.S. as well as immigrants. We analyzed data on this question from the Public Use Microdata Sample (PUMS) from ACS surveys conducted during 2006-2010. Both international immigration and moves within the U.S. slowed over the last three years covered by this database. However, 2006-2007 were years of above average immigration and domestic migration. So the five-year period provides a useful benchmark for developing estimates of the distribution of immigrants by age, race/ethnicity and region.

The ACS provides data on the number and distribution of immigrants. Our population estimates and projections adjust these figures for the number of migrants out of the U.S. to yield net immigration. These adjustments were developed by simulating our cohort component model to project 2010 population from a base of 2005 and comparing the results with actual 2010 population.

### **Domestic Migration**

ACS data show that each year about one in six people were living in a different house one year prior to the date they were surveyed. However, a large percentage of these moves are within the same county or within the same state. With the country divided into the six large regions analyzed in this study, the proportion of the population involved in interregional moves is small – about 1.3 percent per year. On a net basis, interregional moves have only a small effect on the populations of our six regions, with the exception of Alaska, which is the only region defined as a single state. Alaska shows some extreme ratios in the tables below but these represent relatively small flows in absolute terms.

Table II.2 shows the net change in the population of the six regions annually due to moves into and out of each region over the 2006-2010 period covered by the ACS database used in our analysis. Alaska experienced a net out flow of 5.5 percent per year (27.5 percent over five years). The Rockies region experienced the largest population inflow on a percentage basis – 0.6 percent, or approximately 3 percent over five years.

**Table II.2**  
**Total Net Interregional Migration per Year, 2006-2010**

<b>Region</b>	<b>Net Population Change Due to Movement Between Regions</b>	<b>Percentage of the Region's Population</b>
East	-9,092	0.0%
Central	-150,083	-0.3%
Gulf	172,448	0.3%
Rockies	101,344	0.6%
West	-76,944	-0.1%
Alaska	-37,673	-5.5%

Data like those in Table II.2 were also tabulated separately for the Hispanic (Table II.3) and African American (Table II.4) populations. Data for the Hispanic population reflect an outflow from the West region, consistent with other data for the period that reflect a dispersal of the Hispanic population across the country – boosting the Hispanic population growth rates of many areas that historically have had smaller Hispanic populations. The primary beneficiaries of this flow were the Gulf and Rockies regions. However, with the exception of the single-state region of Alaska, the percentage impact on the population of both net gainers and net losers of population was minimal.

**Table II.3**  
**Hispanic Net Interregional Migration per Year, 2006-2010**

<b>Region</b>	<b>Net Population Change Due to Movement Between Regions</b>	<b>Percentage of the Region's Population</b>
East	-7,572	-0.1%
Central	1,685	0.0%
Gulf	37,113	0.3%
Rockies	23,331	0.6%
West	-48,047	-0.3%
Alaska	-6,510	-16.9%

Net interregional migration flows were also proportionally small for the African American population. Other than Alaska, the Central region was the largest net loser and the Gulf region the largest net gainer.

The ACS also permitted analysis of the age distribution of interregional movers. Data were tabulated for each five-year age group defined in our cohort component model to

provide a basis for developing assumptions about the age distribution of net population change due to interregional migration for use in projecting the population of regions.

**Table II.4**  
**African American Net Interregional Migration per Year, 2006-2010**

<b>Region</b>	<b>Net Population Change Due to Movement Between Regions</b>	<b>Percentage of the Region's Population</b>
East	7,174	0.0%
Central	-27,232	-0.5%
Gulf	29,113	0.3%
Rockies	5,340	1.1%
West	-7,445	-0.3%
Alaska	-6,950	-32.8%

### Projections

Historical estimates and projections of U.S. population by region are presented in Table II.5. U.S. population growth will average just under 1 percent over the 20-year forecast period. Lower immigration and fertility rates will hold growth to 0.8 percent per year in 2010-2015. The fastest growth is expected in the Rockies region, at 1.7 percent per year. Growth will be slowest in the Central region.

**Table II.5**  
**Projected Total Population by Region, 2010-2030**  
**(x1,000; 5-year average annual growth rates in percent)**

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Change 2010-2030</b>
U.S.	309,350	322,392	338,128	353,855	369,397	60,047
	0.9%	0.8%	1.0%	0.9%	0.9%	
Alaska	714	759	810	858	903	189
	1.4%	1.2%	1.3%	1.2%	1.0%	
West	53,573	56,112	59,156	62,179	65,149	11,576
	1.0%	0.9%	1.1%	1.0%	0.9%	
Rockies	17,861	19,447	21,274	23,172	25,142	7,281
	1.8%	1.7%	1.8%	1.7%	1.6%	
Gulf	63,083	67,143	71,900	76,793	81,794	18,711
	1.3%	1.3%	1.4%	1.3%	1.3%	
Central	55,440	56,413	57,736	58,945	60,026	4,586
	0.4%	0.3%	0.5%	0.4%	0.4%	
East	118,680	122,518	127,253	131,908	136,382	17,702
	0.7%	0.6%	0.8%	0.7%	0.7%	

Projections of the Hispanic population by region are presented in Table II.6. Growth is expected to slow to 2.2 percent per year in 2010-2015 – down from the 3.4 percent annual growth of 2005-2010. Over the following 15 years, however, we expect growth averaging 2.5 percent. Hispanic population growth will be fastest in the Gulf region, averaging just under 3 percent per year. The Hispanic share of the U.S. total population will rise from 16.4 percent in 2010 to 22.2 percent in 2030. The Hispanic share of population is highest in the West region. There it will rise from 30.5 percent in 2010 to 36.6 percent in 2030.

**Table II.6**  
**Projected Hispanic Population by Region, 2010-2030**  
**(x1,000; 5-year average annual growth rates in percent)**

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Change 2010-2030</b>
U.S.	50,810	56,754	64,345	72,857	82,289	31,479
	3.4%	2.2%	2.5%	2.5%	2.5%	
Alaska	40	43	46	51	56	16
	2.6%	1.3%	1.8%	1.9%	1.9%	
West	16,322	17,834	19,700	21,724	23,873	7,551
	2.6%	1.8%	2.0%	2.0%	1.9%	
Rockies	4,358	4,918	5,613	6,394	7,265	2,907
	3.4%	2.5%	2.7%	2.6%	2.6%	
Gulf	14,775	16,956	19,679	22,779	26,280	11,505
	3.8%	2.8%	3.0%	3.0%	2.9%	
Central	4,334	4,790	5,388	6,072	6,849	2,515
	3.5%	2.0%	2.4%	2.4%	2.4%	
East	10,981	12,214	13,919	15,837	17,965	6,984
	4.0%	2.2%	2.6%	2.6%	2.6%	

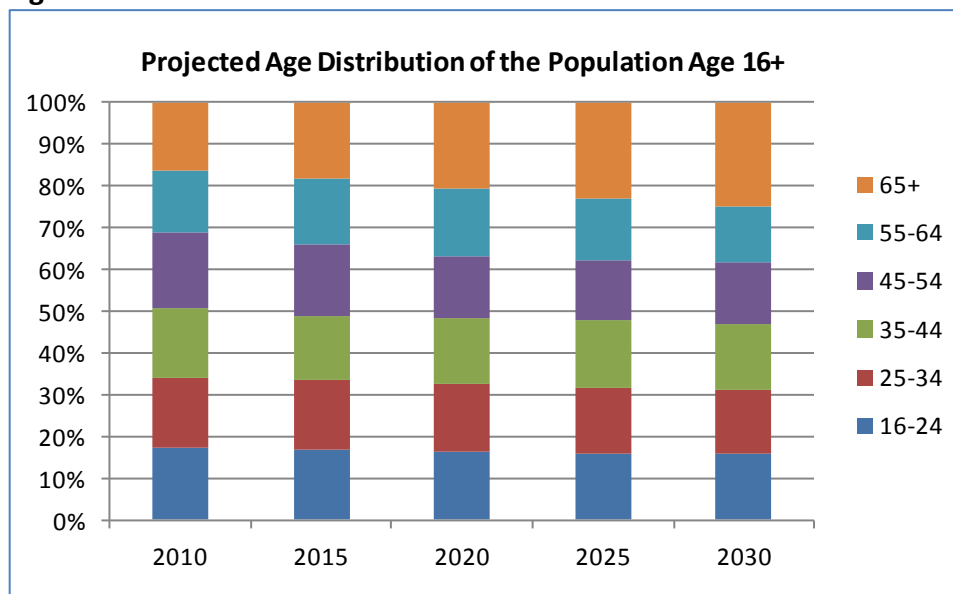
Projections of the African American population by region are presented in Table II.7. Growth is expected to average 1 percent per year through 2030 – near the U.S. average. As a result, the African American share of the U.S. total population will show little change – 12.3 percent in 2010 and 12.5 percent in 2030. The fastest growth is projected for the Rockies region – the region that currently has the smallest African American share of total population, at 2.8 percent. Growth of the African American population in the West region is projected to slow and turn negative by the end of the forecast period due to low birth rates and net outmigration.

**Table II.7**  
**Projected African American Population by Region, 2010-2030**  
 (x1,000; 5-year average annual growth rates in percent)

	2010	2015	2020	2025	2030	Change 2010-2030
U.S.	38,013	40,148	42,288	44,354	46,223	8,210
	1.0%	1.1%	1.0%	1.0%	0.8%	
Alaska	22	22	21	21	20	-2
	-0.9%	-0.5%	-0.4%	-0.7%	-0.9%	
West	2,727	2,786	2,844	2,894	2,820	93
	0.3%	0.4%	0.4%	0.3%	-0.5%	
Rockies	503	590	686	793	911	408
	3.0%	3.2%	3.1%	2.9%	2.8%	
Gulf	10,309	11,038	11,776	12,499	13,204	2,895
	1.3%	1.4%	1.3%	1.2%	1.1%	
Central	5,485	5,639	5,784	5,909	6,015	530
	0.4%	0.6%	0.5%	0.4%	0.4%	
East	18,966	20,074	21,176	22,239	23,253	4,287
	1.1%	1.1%	1.1%	1.0%	0.9%	

With the Baby Boomer generation entering retirement years, the aging of the U.S. population will play a major role in the evolution of the U.S. labor force over the next 20 years. The share of persons age 65 and over in the total population of age 16 and over will rise from 16 percent in 2010 to 25 percent in 2030 (see Figure 4).

**Figure 4**



The African American population will undergo a similar demographic shift. However, the Hispanic population will remain a much younger group with only 13 percent of the population of 65 and over in the oldest age group in 2030 (Table II.8).

**Table II.8**  
**Projected Age Distribution of the Population of Age 16 and Over: 2030**

	<b>U.S. Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	100%	100%	100%
16-24	16%	17%	22%
25-34	15%	15%	21%
35-44	16%	17%	17%
45-54	15%	15%	15%
55-64	14%	14%	12%
65+	25%	22%	13%

## ***Labor Force and Employment***

### **Labor Force Participation Rates**

The substantial job losses experienced during the 2008-2009 recession and the weak employment growth during the recovery to date have been accompanied by a steady decline in the nation's labor participation rate as discouraged workers leave the labor force. But the labor force participation rate had already been trending downward since around 2000 due to longer term demographic shifts. The African American and Hispanic populations have experienced similar declines in labor force participation. However, the Hispanic labor force participation rate remains 2.5 points above the U.S. average, while the African American rate is 2.2 points below (Figure 5). The higher labor force participation rate of the Hispanic population is due largely to the very low share of the Hispanic population in older age groups where labor force participation is much lower.

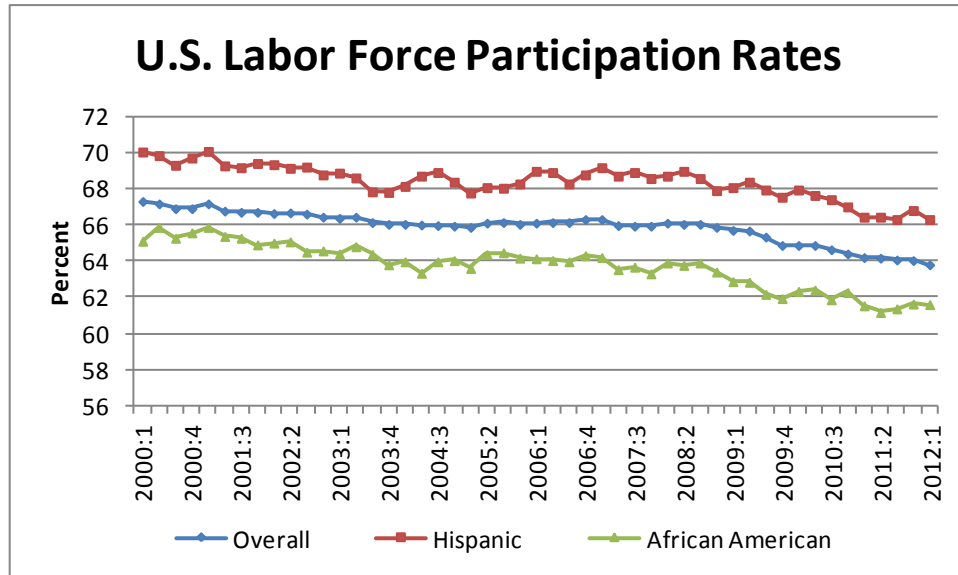
IHS Global Insight's U.S. Economic Service forecasts national labor participation rates separately for the population of ages 16-64 and those 65 and over. The 65 and over series shows a continuing gradual increase through 2030. However, after stabilizing at the current level of 62 percent for the next several years, the overall labor force participation rate is expected to continue a gradual decline to 59 percent in 2030.

To project labor force participation rates for the African American and Hispanic populations nationally and regionally, we compiled time series data on their labor force participation rates in 10-year age categories using public use microdata files from the CPS. Much of the difference in overall labor force participation rates across regions can



be explained by differences in labor force composition with respect to age, race and ethnicity. We projected trends in age-specific labor force participation rates by region to mirror the national trends that we forecasted. By applying these forecasts of age-specific labor force participation rates to our projections of population by age we produced forecasts of the Hispanic and African American labor force.

**Figure 5**



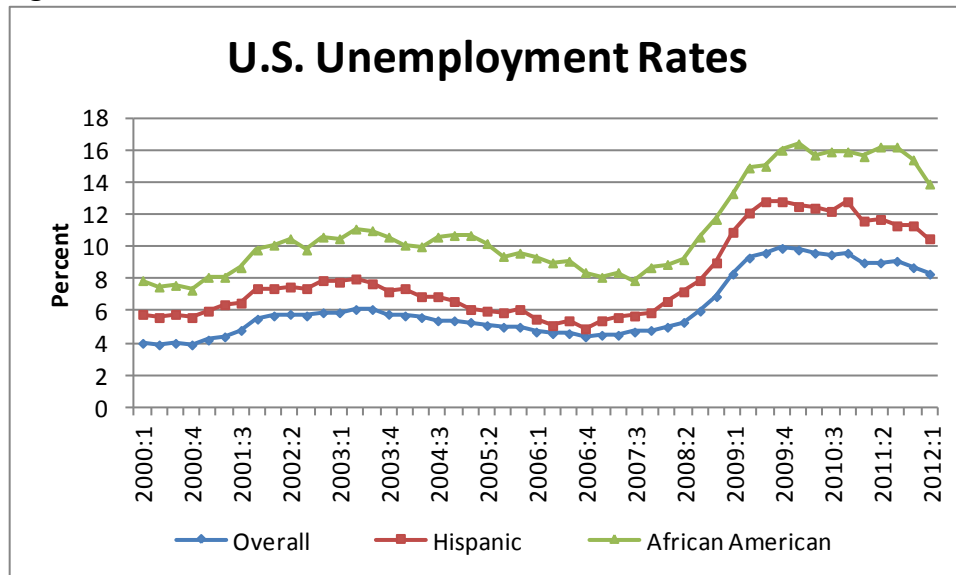
### Unemployment Rates

The final step in forecasting total employment of the Hispanic and African American populations through 2030 was to model and forecast the unemployment rate of each of these groups. For each of the two demographic groups, we estimated an econometric model to forecast the differential between the unemployment rate for the group and the overall U.S. unemployment rate.

Historically, the Hispanic unemployment rate has exceeded the overall U.S. rate – in the early 1990s by as much as 4 percentage points. During the period of strong economic growth following the 2001 recession, the gap between the Hispanic unemployment rate and the overall U.S. unemployment rate steadily narrowed from about 2 percentage points to less than 1 percentage point in 2006. The gap widened during the 2008-2009 recession to exceed 3 percentage points, but it has begun to narrow again (see Figure 6).

We expect the Hispanic unemployment rate to remain at least 2 percentage points above the overall rate over the next three years due to the weak outlook for residential and nonresidential construction. However, the Hispanic unemployment rate gap is then projected to steadily narrow over the forecast period to 0.8 percentage points by 2020 and 0.4 points in 2030.

Figure 6



The unemployment rate for African Americans exceeded the overall rate by 4-5 percentage points for much of the last decade, and this gap grew to over 7 percentage points last year, even as the overall unemployment rate began to fall. We expect this gap to narrow more slowly. The African American unemployment rate is projected to remain 3.6 points above the national average in 2020 and 2.9 points in 2030.

### Employment Forecasts

Our forecast of employment growth, nationally and by region, is shown in Table II.9. Employment growth is projected to slow to 0.6 percent per year during 2020-2030. The Central region is projected to experience zero growth over this decade. The Rockies is projected to remain the fastest growing region over the forecast period.

Employment estimates and forecasts for the Hispanic and African American populations are presented in Tables II.10 and II.11. Employment growth of the Hispanic population is projected to average 3.3 percent annually from 2010 to 2020 and 2.4 percent the following decade – 2 percentage points faster than total U.S. employment growth. The Gulf region is projected to show the fastest growth over the 20-year forecast period and is projected to pass the West region in size of Hispanic employment.

African American employment is projected to grow just slightly faster than the U.S. average over the 20-year forecast period, at 1.1 percent per year. Growth in the Rockies is projected to outpace all other regions. In the West region, the projected decline in population at the end of the forecast period leads to a decline in African American employment.

**Table II.9**  
**Total Employment by Region, 2005-2030**  
(x1,000; 5-year average annual growth rates in percent)

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Change 2010-30</b>
U.S.	139,396	148,430	155,850	160,541	165,371	25,975
		1.3%	1.0%	0.6%	0.6%	
Alaska	335	351	366	381	401	66
		0.9%	0.9%	0.8%	1.0%	
West	23,488	24,745	26,185	27,049	27,981	4,493
		1.0%	1.1%	0.7%	0.7%	
Rockies	8,117	8,952	9,797	10,490	11,257	3,141
		2.0%	1.8%	1.4%	1.4%	
Gulf	27,332	30,228	32,413	34,217	36,015	8,683
		2.0%	1.4%	1.1%	1.0%	
Central	25,931	26,508	26,798	26,844	26,909	978
		0.4%	0.2%	0.0%	0.0%	
East	54,194	57,646	60,291	61,560	62,809	8,615
		1.2%	0.9%	0.4%	0.4%	

**Table II.10**  
**Hispanic Employment by Region, 2005-2030**  
(x1,000; 5-year average annual growth rates in percent)

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Change 2010-30</b>
U.S.	20,605	24,382	28,505	32,336	36,243	15,638
		3.4%	3.2%	2.6%	2.3%	
Alaska	16	18	20	22	24	8
		1.9%	2.4%	2.0%	1.8%	
West	6,554	7,613	8,728	9,638	10,506	3,952
		3.0%	2.8%	2.0%	1.7%	
Rockies	1,646	2,045	2,401	2,744	3,099	1,452
		4.4%	3.3%	2.7%	2.5%	
Gulf	6,004	7,338	8,741	10,132	11,572	5,568
		4.1%	3.6%	3.0%	2.7%	
Central	1,770	1,986	2,327	2,648	2,968	1,198
		2.3%	3.2%	2.6%	2.3%	
East	4,614	5,382	6,289	7,152	8,075	3,460
		3.1%	3.2%	2.6%	2.5%	

**Table II.11**  
**African American Employment by Region, 2005-2030**  
(x1,000; 5-year average annual growth rates in percent)

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>	<b>Change 2010-30</b>
U.S.	15,029	16,507	17,588	18,282	18,826	3,797
		1.9%	1.3%	0.8%	0.6%	
Alaska	9	10	9	9	9	0
		0.4%	-0.3%	-0.8%	-0.8%	
West	1,061	1,155	1,202	1,210	1,160	99
		1.7%	0.8%	0.1%	-0.8%	
Rockies	205	249	294	339	387	182
		4.0%	3.4%	2.9%	2.7%	
Gulf	3,934	4,504	4,861	5,130	5,367	1,433
		2.7%	1.5%	1.1%	0.9%	
Central	2,055	2,272	2,354	2,376	2,397	342
		2.0%	0.7%	0.2%	0.2%	
East	7,765	8,317	8,867	9,217	9,505	1,740
		1.4%	1.3%	0.8%	0.6%	

### III. Occupations in the Upstream Oil and Gas Industry

The economic impact study produced by Wood Mackenzie for API identified job creation in the following four development activities that are central to the upstream oil and gas industry:

- Leasing & Seismic
- Exploration Drilling
- Construction
- Operations

In addition, the Wood Mackenzie study estimated the number of jobs that would be generated indirectly as the effects of these energy development activities ripple through the economy. In our analysis of these energy policy initiatives, we include, in addition to the four development activities listed above, the impacts on two selected indirect economic activities that are most closely linked with the upstream oil and gas industry:

- Mining and Oil and Gas Field Machinery Manufacturing
- Maintenance and Repair Construction of Nonresidential Structures

These two industry activities account for only 3-4 percent of all jobs that would be created indirectly by the proposed energy development initiatives, but they are two primary suppliers to the upstream oil and gas industry, and serve as an illustration of the types of indirect jobs that would be created. Separate estimates of these indirect impacts are provided in Appendix C.

This section describes the approach we used to develop estimates of employment by industry and occupation that are consistent with the total employment effects estimated by Wood Mackenzie in the six energy development activities listed above. To determine the current mix of jobs by occupation in each of these activities, we analyzed data from the Bureau of Labor Statistics' Occupational Employment Statistics (OES), the Current Population Survey (CPS), and the American Community Survey (ACS). The OES contains detailed data on employment and wages by occupations within individual industries. Data on employment by occupation within industry are published at various levels of occupational and industry detail down to five-digit NAICS industries. The CPS and ACS both identify employment by occupation on a somewhat less disaggregated basis but provide the necessary additional dimension of jobs by race and Hispanic ethnicity within occupations.

To identify the appropriate industry data to correspond to the energy development and indirect industry activities listed above and to determine where the occupational mix of energy development activities differs from broader industry categories for which data are published, we drew on the expertise of colleagues from IHS CERA.

## ***Identifying Industries***

The first step in the process of identifying occupations for our analysis was to determine the industry responsible for carrying out the work associated with each energy development activity identified in the Wood Mackenzie study. The industry assignment process took into account the level of industry detail for which the occupational data used in the study are available. The OES data are comprehensive in their coverage of the economy at the 3-digit level of industry detail. At the 4-digit and 5-digit levels, data are published on employment by detailed occupation for only selected industries at each level. The industry classification used in the CPS and in the ACS identifies approximately 260 industries, generally at the 3-digit or 4-digit level of the NAICS. The occupational classification in the CPS and ACS identifies approximately 500 occupations.

The industries where the energy development activities identified in the Wood Mackenzie study were recorded are as follows:

<b>Direct Employment</b>	
Exploration Drilling	Drilling Oil and Gas Wells, NAICS 213111, and Support Activities for Oil and Gas Operations, NAICS 213112
Construction	Site Preparation Contractors, NAICS 23891
Operations	Crude Petroleum and Natural Gas Extraction, NAICS 211111
Leasing & Seismic	Engineering Services, NAICS 54133, and Geophysical Services and Mapping Services, NAICS 54136
<b>Indirect Employment</b>	
Oil Field Machinery	Oil Field Machinery
Nonresidential Construction Maintenance & Repair	Nonresidential Construction Maintenance & Repair

The maintenance and repair of nonresidential buildings is done by businesses (establishments) that may also do new nonresidential construction. The NAICS does not distinguish new construction and maintenance/repair separately. Estimates of maintenance and repair activities are made separately in the construction of the U.S. input-output accounts.

In all instances above, the occupational data are published at a somewhat broader level of industry detail. The corresponding industries for which OES data are available are shown in Table III.1.

**Table III.1**  
**Industries with BLS Occupational Employment Data**

Exploration Drilling	Support Activities for Mining, NAICS 2131
Construction	Other Specialty Trade Contractors, NAICS 2389
Operations	Oil and Gas Extraction, NAICS 2111
Leasing & Seismic	Architectural, Engineering and Related Services, NAICS 5413
Oil Field Machinery	Agriculture, Construction and Mining Machinery Manufacturing, NAICS 3331
Nonresidential Construction Maintenance & Repair	Nonresidential Building Construction, NAICS 2362

These 4-digit industry categories are also identified in the CPS and ACS data, with the exception of Construction. Only a single category for the construction industry is identified in the CPS and in the ACS. In none of these instances does the CPS or ACS provide greater industry detail than the OES data.

To evaluate the use of CPS and ACS data for the analysis of the relevant construction activity, we used OES data to compare the occupational mix of NAICS 2389 and NAICS 2362 with the occupational mix of the overall construction industry. In general, the two compare closely, e.g., 63 percent of employment in NAICS 2389 is in "Construction and Extraction" occupations, compared with 64 percent for the construction sector as a whole. But at the level of detailed occupations there are some important differences. For example, the share of construction laborers in total employment in the Other Specialty Trade Contractors industry is about twice as large as in the overall construction sector (21.6 percent vs. 10.8 percent). Therefore, in processing the CPS and ACS data to tabulate employment by race/ethnicity in the construction industry, we adjusted the weights assigned to construction industry workers to more closely reflect the occupational mix of NAICS 2389 and NAICS 2362.

### ***Identifying Occupations***

The jobs to be created by the energy development activities projected in the Wood Mackenzie study are viewed as an expansion of the output of the industries identified above. Jobs will be created across the full spectrum of occupations in each industry. Therefore, information is needed on the overall occupational distribution of each industry.

The occupational classification used in the annual BLS OES matrix of employment by occupation within industries identifies over 850 occupations. However, a large share of employment in each of these industries is concentrated in a small number of

occupations. For example, at this level of occupational detail in the industry for drilling oil and gas wells, the top 20 occupations account for 70 percent of all employment.

Our estimates of the number of jobs that are held by African Americans and Latinos by occupation within each industry were based on an analysis of microdata files of the ACS and CPS, that is, weighted tabulations of the actual survey responses. Even when the survey samples for multiple years are combined, the number of observations available to reliably estimate the share of employment by race/ethnicity within an occupation and industry is sometimes not sufficient if the occupational cells are very narrowly defined. Since our analysis involves further disaggregation by region, this puts additional constraints on the level of occupational detail that can be used. Therefore, in order to make comprehensive estimates of job creation across all occupations in each industry, we grouped occupations that individually contribute very few jobs into broader occupational categories. That is, in addition to identifying the most important occupations on a detailed basis, we grouped all remaining detailed occupations into the following eight broad occupational categories:

- Management, business and financial
- Professional and related
- Service
- Sales and related
- Office & administrative support
- Skilled blue-collar
- Semi-skilled blue collar
- Unskilled blue collar

The first five broad occupational categories are standard groupings of jobs used in the tabulation of employment from the CPS. To provide a more direct distinction of the skill level of blue-collar jobs, the remaining broad occupational categories typically used in the CPS were recast to distribute blue-collar jobs into categories of skilled, semi-skilled and unskilled jobs. Most jobs in the "Installation, maintenance and repair" group in the CPS are skilled jobs; most in the "Production" category are semi-skilled; and most "Material moving" jobs are unskilled. But there are exceptions in each of these categories. Therefore, the occupations in all of these categories, as well as those in agricultural, construction and transportation occupations were distributed into the three skill-based groupings. Assignments were based on average wages of the detailed occupations and their average skill rating as evaluated within the Department of Labor's O\*NET (Occupational Information Network) database.

In each of the six industry categories identified in Table III.1, the list of the detailed occupations with the greatest number of employees differs. For each of these six industries, using OES data, we ranked all detailed occupations based on employment in 2010 to identify the top 20 occupations. In some instances, occupations near the top



20 that are specific to oil industry development and operations were also flagged to be included as detailed occupations in our analysis. In all six industries, the detailed occupations identified to be included in our analysis account for the majority of employment in the industry, as shown in Table III.2.

**Table III.2**  
**Share of Employment in Detailed Occupations**

<b>Industry</b>	<b>Share of Detailed Occupations</b>
Support Activities for Mining	70%
Other Specialty Trade Contractors	81%
Oil and Gas Extraction	61%
Architectural, Engineering and Related Services	55%
Oil and Gas Field Machinery Manufacturing	60%
Repair and Maintenance of Nonresidential Buildings	80%

There was overlap in the detailed occupations selected to be included in the analysis using this method. A total of 45 detailed occupations were selected. Since we will identify all 45 detailed occupations in tabulating the data for each individual industry, the share of total employment in each industry accounted for by detailed occupations is higher than the figures cited above. Approximately three-quarters of all employment is accounted for by the 45 detailed occupational categories. These occupations are listed in Table III.3 (grouped into the eight broad occupational categories). Descriptions of these 45 occupations are provided in Appendix A.

**Table III.3**  
**Detailed Occupations for Employment Analysis**

<b>Management, Business and Financial</b>
General and Operations Managers
Construction Managers
Engineering Managers
Cost Estimators
Accountants and Auditors
<b>Professional and Related</b>
Architects, Except Landscape and Naval
Surveyors
Civil Engineers
Electrical Engineers
Mechanical Engineers

**Table III.3 (continued)**

**Detailed Occupations for Employment Analysis**

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Petroleum Engineers

Engineers, all other

Architectural and Civil Drafters

Civil Engineering Technicians

Surveying and Mapping Technicians

Geoscientists, Except Hydrologists and Geographers

Geological and Petroleum Technicians

**Service**

None

**Sales & Related**

Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products

**Office & Administrative Support**

First-Line Supervisors/Managers of Office and Administrative Support Workers

Bookkeeping, Accounting, and Auditing Clerks

Secretaries and Administrative Assistants

Office Clerks, General

**Skilled Blue Collar**

First-Line Supervisors/Managers of Construction Trades and Extraction Workers

Carpenters

Cement Masons and Concrete Finishers

Paving, Surfacing, and Tamping Equipment Operators

Operating Engineers and Other Construction Equipment Operators

Electricians

Plumbers, Pipefitters, and Steamfitters

Derrick Operators, Rotary Drill Operators and Service Unit Operators, Oil and Gas

Mobile Heavy Equipment Mechanics, Except Engines

Industrial Machinery Mechanics

Maintenance and Repair Workers, General

Petroleum Pump System Operators, Refinery Operators, and Gaugers

Crane and Tower Operators

Pump Operators and Wellhead Pumpers

**Semi-skilled Blue Collar**

Roustabouts, Oil and Gas

Helpers--Extraction Workers and Other Extraction Workers

Welders, Cutters, Solderers, and Brazers

Inspectors, Testers, Sorters, Samplers, and Weighers

Truck Drivers, Heavy and Tractor-Trailer

Excavating and Loading Machine and Dragline Operators

**Unskilled Blue Collar**

Construction Laborers

Fence Erectors

Laborers and Freight, Stock, and Material Movers, Hand

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## IV. Upstream Oil and Gas Industry Employment Demand Forecasts

### *Economy-wide Occupational Employment Trends*

As described above, the primary source for historical estimates of employment by occupation within each industry is the Bureau of Labor Statistics' Occupational Employment Statistics. These data were used to develop current (2010) estimates of employment by occupation in the industries identified in Section III. However, the energy development activities analyzed in the Wood Mackenzie study include both onshore and offshore oil exploration and development activity. The OES data on occupational employment provide no information about how the mix of occupations might differ between onshore and offshore activity. Therefore, with the assistance of oil industry experts from IHS CERA, we reviewed the occupational mix of the 'Oil and gas extraction' and 'Support activities for mining' industries to assess the need to adjust the employment shares of selected occupations to account for these differences.

Our forecasts of employment by occupation within detailed industries relied in part on long-term trends in occupational employment reflected in the Bureau of Labor Statistics' Occupational Outlook projections. The shares of occupations in the employment in any single industry are generally quite stable. However, BLS identifies certain long-term trends associated with expected technological change or change in the organization of work within individual industries. For example, the share of secretaries declines in almost all industries. For most occupations, trends of change in the share of particular occupations projected by BLS for the period through 2020 were assumed to continue over the following decade.

All of our estimates and forecasts of employment by occupation within industries are tied to Wood Mackenzie's projections of the number of net new jobs that would be created by the proposed upstream oil and gas development activities. For each industry identified in Section III in each year of the forecast period, we applied the percentage distribution of employment by occupation from our occupation-by-industry forecasts to a corresponding total employment figure from Wood Mackenzie.

This process is illustrated in Table IV.1 with the estimates made to disaggregate Wood Mackenzie's data on baseline employment in the upstream oil and gas industry in 2010. The table includes the 45 occupations that are identified individually and the eight broad categories created to capture all other employment. Table IV.2 shows the same estimates aggregated to the level of the eight broad occupational categories, i.e., each of the 45 detailed occupational categories has been put into the appropriate broad occupational category and combined with the estimates in the last eight rows of Table IV.1. The industries identified in these two tables are as follows:

NAICS 2111: Oil and Gas Extraction  
NAICS 2389: Construction

NAICS 2131: Support Activities for Mining  
NAICS 5413: Leasing and Seismic

**Table IV.1**  
**Baseline Employment in the Upstream Oil and Gas Industry by**  
**Detailed Occupation: 2010**

	<b>Total</b>	<b>NAICS 2111</b>	<b>NAICS 2131</b>	<b>NAICS 2389</b>	<b>NAICS 5413</b>
Total	720,911	188,853	347,004	129,538	55,516
Derrick, Rotary Drill and Service Unit Operators	89,437	12,262	77,104	69	2
Roustabouts, Oil and Gas	55,873	11,435	44,346	92	0
Construction Laborers	34,193	43	6,552	27,468	131
First-Line Supervisors/Mgr of Constr. & Extraction Workers	29,818	5,091	17,214	7,407	105
Operating Engineers & Other Construction Equip Operators	27,252	791	7,759	18,665	36
Truck Drivers, Heavy and Tractor-Trailer	25,460	1,240	15,711	8,481	28
Helpers and Other Extraction Workers	21,683	4,158	17,278	229	17
Pump Operators and Wellhead Pumpers	21,231	11,600	9,571	60	0
Petroleum Engineers	21,186	15,676	5,421	0	90
Secretaries and Administrative Assistants	20,414	7,690	6,847	3,414	2,463
General and Operations Managers	18,929	5,800	9,442	2,356	1,330
Office Clerks, General	14,904	4,796	5,126	3,679	1,303
Bookkeeping, Accounting, and Auditing Clerks	13,194	4,465	5,473	2,496	760
Petroleum Pump System & Refinery Operators, and Gaugers	10,903	7,619	3,276	0	7
Accountants and Auditors	9,595	6,214	2,338	494	549
Geoscientists, Except Hydrologists and Geographers	9,504	7,548	1,657	0	299
Geological and Petroleum Technicians	8,988	4,406	4,483	0	98
Laborers and Freight, Stock, and Material Movers, Hand	8,289	567	5,614	1,822	286
Industrial Machinery Mechanics	8,058	2,363	5,601	59	36
Welders, Cutters, Solderers, and Brazers	6,542	921	4,792	764	65
Cement Masons and Concrete Finishers	6,501	0	0	6,499	2
Maintenance and Repair Workers, General	6,264	2,103	3,199	854	109
Civil Engineers	6,137	520	385	66	5,166
Engineers, all other	5,861	4,678	373	23	787
Crane and Tower Operators	4,737	63	3,147	1,526	2
Excavating and Loading Machine and Dragline Operators	4,455	0	1,477	2,974	4
Mobile Heavy Equipment Mechanics, Except Engines	4,362	248	2,454	1,625	35
First-Line Supervisors/Mgr of Office and Admin Workers	4,114	1,358	1,760	599	397
Fence Erectors	4,090	0	0	4,090	0
Inspectors, Testers, Sorters, Samplers, and Weighers	4,019	343	3,019	14	643
Electricians	3,897	980	2,608	251	58
Construction Managers	3,833	295	886	2,281	370
Sales Representatives, Wholesale and Manufacturing	3,740	449	2,107	1,114	70
Paving, Surfacing, and Tamping Equipment Operators	3,653	0	77	3,575	1
Mechanical Engineers	3,369	354	951	24	2,040
Carpenters	3,121	0	424	2,676	21

**Table IV.1 (continued)**  
**Baseline Employment in the Upstream Oil and Gas Industry by**  
**Detailed Occupation: 2010**

	<b>Total</b>	<b>NAICS 2111</b>	<b>NAICS 2131</b>	<b>NAICS 2389</b>	<b>NAICS 5413</b>
Engineering Managers	3,095	904	642	14	1,535
Architects, Except Landscape and Naval	3,054	0	0	0	3,054
Architectural and Civil Drafters	2,897	0	0	38	2,859
Cost Estimators	2,836	35	347	2,259	195
Plumbers, Pipefitters, and Steamfitters	2,836	142	2,171	494	29
Electrical Engineers	2,090	177	540	16	1,357
Surveying and Mapping Technicians	1,681	224	77	9	1,370
Surveyors	1,660	154	116	50	1,341
Civil Engineering Technicians	1,476	0	45	11	1,420
Other Management, Business and Financial	33,621	18,469	10,215	910	4,027
Other Professional and Related	45,251	19,946	8,915	242	16,147
Other Service	2,751	400	1,001	934	416
Other Sales and Related	7,568	2,904	3,042	1,115	507
Other Office & Administrative Support	14,608	4,150	7,347	1,712	1,400
Other Skilled Blue-collar	49,217	12,732	25,779	8,840	1,867
Other Semi-skilled Blue Collar	12,402	2,071	3,928	5,837	565
Other Unskilled Blue Collar	6,262	468	4,369	1,310	114

**Table IV.2**  
**Baseline Employment in the Upstream Oil and Gas Industry by**  
**Broad Occupation: 2010**

	<b>Total</b>	<b>NAICS 2111</b>	<b>NAICS 2131</b>	<b>NAICS 2389</b>	<b>NAICS 5413</b>
Total	720,911	188,853	347,004	129,538	55,516
Management, Business and Financial	71,910	31,717	23,871	8,314	8,007
Professional and Related	113,155	53,683	22,963	479	36,029
Service	2,751	400	1,001	934	416
Sales and Related	11,308	3,352	5,149	2,230	577
Office & Administrative Support	67,233	22,460	26,552	11,898	6,323
Skilled Blue-collar	271,287	55,994	160,383	52,600	2,311
Semi-skilled Blue Collar	130,433	20,168	90,551	18,392	1,322
Unskilled Blue Collar	52,834	1,077	16,535	34,691	532

## ***Baseline Hispanic and African American Employment, 2010***

To estimate the shares of African American and Hispanic workers in current (2010) employment in the oil and gas industry by occupation, we analyzed two Census Bureau datasets – the American Community Survey (ACS) and the Current Population Survey (CPS). To obtain data at the level of detail by industry, occupation and race/ethnicity required for our analysis, we produced special tabulations of the public-use microdata files from these two data sources.

The advantage of the CPS for this type of analysis is that it is possible to develop annual employment estimates over a long period of time in order to analyze changes in the composition of employment. However, the CPS has a much smaller sample size than the ACS. Therefore, while we use the CPS below to analyze broad trends in the employment by occupation of the African American and Hispanic populations, we relied primarily on the ACS to estimate the current levels of their employment in the upstream oil and gas and related industries.

About 3 million households per year are interviewed in the American Community Survey. However, even a sample of this size is not sufficient to reliably estimate very small populations such as employment by a single race group in some detailed occupations within one industry. Therefore, to produce estimates of the African American and Hispanic shares of employment within each occupation/industry cell analyzed, we relied on the ACS public-use microdata file that pools data for years 2006-2010. This was the most current data available, and it spans years of both strong and weak economic conditions.

Total baseline employment in 2010 in the upstream oil and gas and related industries as estimated in the Wood Mackenzie study is 720,911 (see Tables IV.1 and IV.2). This number represents employment in the oil and gas extraction industry, the support activities for mining industry, and other industries that are involved in oil exploration and site preparation. Hereafter, in describing our baseline employment estimates, we refer to this complex of industries as the upstream oil and gas industry. Wood Mackenzie also estimated baseline employment in these energy development activities by state. We aggregated the Wood Mackenzie state data to the six regions defined in Section I to create control totals for estimating African American and Hispanic employment by region.

Table IV.3 shows our estimates of the breakdown of the Wood Mackenzie national total for baseline employment in 2010 by occupation of African Americans and Latinos at the level of eight broad occupational categories.

**Table IV.3**  
**African American and Hispanic Employment in the Upstream Oil and Gas Industry by Broad Occupation: 2010**

	<b>African American</b>	<b>Hispanic</b>	<b>Industry Total</b>
Total	57,886	136,265	720,911
Management, Business and Financial	5,091	7,932	71,910
Professional and Related	8,010	10,053	113,155
Service	453	665	2,751
Sales and Related	952	1,706	11,308
Office & Administrative Support	7,562	10,697	67,233
Skilled Blue-collar	18,900	54,993	271,287
Semi-skilled Blue Collar	11,775	30,680	130,433
Unskilled Blue Collar	5,143	19,539	52,834

Of the estimated 721 thousand that were employed in the upstream oil and gas industry in 2010, approximately 58 thousand were African Americans. Hispanics accounted for over 136 thousand of the industry's labor force. These estimates of African American and Hispanic labor participation in baseline employment in the upstream oil and gas industry take into consideration the geographical distribution of this industry activity.

Summary data on baseline employment in 2010 by region are presented in Table IV.4. Table IV.5 presents baseline employment in the 10 detailed occupational categories that account for the largest number of jobs.

**Table IV.4**  
**Baseline Employment in the Upstream Oil and Gas Industry by Region: 2010**

<b>Region</b>	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
U.S.	720,911	57,886	136,265
Alaska	10,162	179	504
West	34,217	1,085	10,278
Rockies	84,861	1,404	18,922
Gulf	449,791	44,219	95,479
Central	55,898	2,663	3,514
East	85,981	8,336	7,568

**Table IV.5**  
**Baseline Employment in the Upstream Oil and Gas Industry,**  
**Top 10 Detailed Occupational Categories: 2010**

	<b>African American</b>	<b>Hispanic</b>	<b>Industry Total</b>
Derrick, Rotary Drill and Service Unit Operators	5,339	20,597	89,437
Roustabouts, Oil and Gas	3,342	12,869	55,873
Construction Laborers	2,528	13,737	34,193
First-Line Supervisors/Mgr of Constr. & Extraction Workers	1,234	5,472	29,818
Operating Engineers & Other Construction Equip Operators	1,898	4,831	27,252
Truck Drivers, Heavy and Tractor-Trailer	3,858	5,437	25,460
Helpers and Other Extraction Workers	1,419	5,205	21,683
Pump Operators and Wellhead Pumpers	647	2,821	21,231
Petroleum Engineers	1,093	1,370	21,186
Secretaries	1,722	2,858	20,414

### ***Trends in African American and Hispanic Employment by Occupation***

To produce a long-term forecast of the number of African American and Hispanic workers by occupation in the upstream oil and gas industry, we undertook two types of analysis of historical trends:

- We analyzed historical trends of the employment of African Americans and Latinos in each of the eight broad occupational categories, and
- We analyzed and projected historical trends in the educational attainment of the African American and Hispanic populations.

To analyze trends over time in the employment by occupation of the African American and Hispanic populations, we produced tabulations from public-use files of the Annual Social and Economic Supplement to the CPS for a period in the mid-1990s and recent years. Although the focus of our analysis here is broad occupational categories, given the smaller sample size of the CPS compared to the ACS we again pooled multiple years of data for the analysis. We tabulated data for the four-year periods 1994-1997 and 2008-2011.

Table IV.6 presents the results of these tabulations. The top line indicates, for example, that nationwide African American employment grew at approximately the growth rate of employment economy-wide, while Hispanic employment grew at a much faster pace. African American employment in the management and professional occupational categories matched or exceeded the corresponding economy-wide growth rate, while



African American employment in skilled and unskilled blue collar jobs has declined over time more than the economy-wide average. The Hispanic labor pool in the U.S. grew significantly faster over this period relative to the nation as a whole. Hispanic employment showed positive growth in blue-collar jobs over this period, even as economy-wide employment in these categories was declining.

**Table IV.6**  
**African American and Hispanic Employment Growth by**  
**Broad Occupational Category**  
**(average annual growth rates, 1996-2011)**

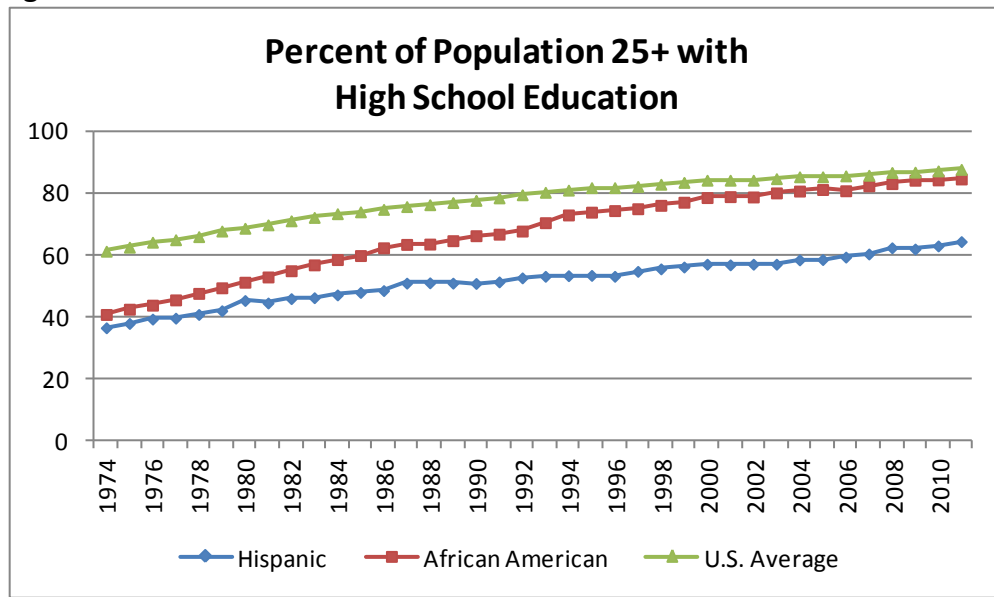
	African American	Hispanic	Total
Total	0.8	4.3	0.9
Management, Business and Financial	1.7	4.9	1.7
Professional and Related	3.6	6.2	2.4
Service	1.7	5.9	2.5
Sales and Related	2.1	4.3	0.3
Office & Administrative Support	-0.2	4.0	-0.1
Skilled Blue-collar	-2.7	4.1	-0.7
Semi-skilled Blue Collar	-0.4	3.5	-0.8
Unskilled Blue Collar	-3.0	0.7	-2.1

### ***Educational Attainment***

Educational attainment indicators enter directly into our models of the unemployment rate for the Hispanic and African American populations. As an input into our long-term projections of the occupational mix of these minority groups, we assembled time series data on educational attainment from published Census Bureau reports and from our own tabulations of CPS public-use microdata files.

Summary measures of the educational attainment of the African American and Hispanic populations are shown in Figures 7 and 8. The share of the African American population of age 25 or more that has completed high school has risen steadily over the last 30 years and converged to near the nationwide average (84.5 percent in 2011, compared to the U.S. average of 87.6 percent). The share of the Hispanic population with a high school education has risen more slowly and still lags the national average by a large margin (23 percentage points in 2011).

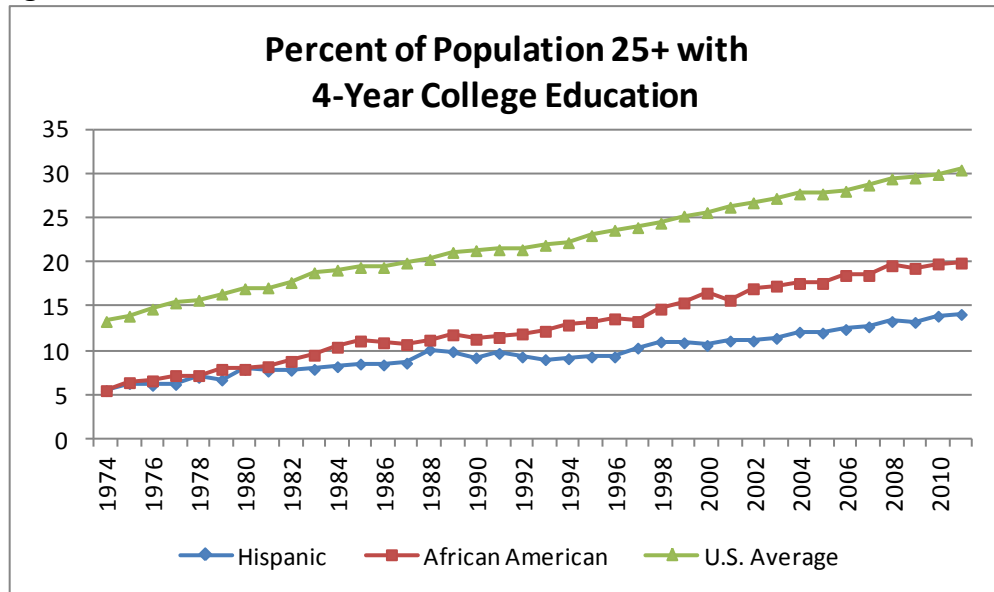
**Figure 7**



<http://www.census.gov/hhes/socdemo/education/data/cps/historical/index.html>

Prior to 1993, these data reflect the share that “Completed 4 Years of High School or more.” Since 1993, data are collected by the category “High School Graduate,” which includes persons who have received a high school diploma or the equivalent.

**Figure 8**



<http://www.census.gov/hhes/socdemo/education/data/cps/historical/index.html>

Prior to 1993, these data reflect the share that “Completed 4 Years of College or more.” Since 1993, data are collected by the category “Bachelor’s degree.”

Looking at educational attainment rates on an age-specific basis over time shows that the share of a five-year age cohort generally changes little after that cohort reaches age 25-29. (In Table IV.7, follow a single age cohort diagonally downward, such as those age 25-29 in 1995, who are 30-34 in 2000, 35-39 in 2005, etc.). As an age cohort ages beyond this point, its educational attainment may rise slightly as a small fraction of the group completes additional education (or more educated immigrants join the group) or educational attainment may drop if less educated immigrants join the group.

**Table IV.7**  
**Share of the Hispanic Population That Has**  
**Completed Four Years of High School**  
**(percent)**

<b>Age</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>
25 to 29	57	63	63	69
30 to 34	59	60	60	66
35 to 39	62	63	61	65
40 to 44	61	60	62	64
45 to 49	54	58	60	65
50 to 54	48	56	57	64
55 to 59	44	49	60	61
60 to 64	37	44	53	56
65 to 69	33	43	43	53
70 to 74	27	37	42	52
75 to 79	33	40	42	40
80 to 84	22	24	32	39
85 plus	23	25	26	36
<b>Total</b>	<b>54</b>	<b>57</b>	<b>58</b>	<b>63</b>

IHS Global Insight Tabulation of CPS data. See note to Figure 7.

To forecast the future educational attainment of the Hispanic population, we projected the educational attainment of each 5-year age cohort ahead five years at a time – to 2015, 2020, 2025 and 2030 – assuming an increment to educational attainment as the cohort ages which is consistent with that observed over the past 15 years. For the group of age 25-29 in each of these forecast years, our baseline projection assumes a gradual increase in educational attainment consistent with the trend of the last 15 years – an improvement of 3 percentage points in each five-year period, to reach 81 percent in 2030. We followed a similar procedure to produce baseline projections of educational attainment for the overall U.S. population and the African American population. The national average share of the population of age 25-29 with a high school education rises from 89 percent to 92 percent, and the percentage for African

Americans, which is already close to the national average, tracks this increase. The results of these projections are presented in Table IV.8.

**Table IV.8**  
**Projections of Educational Attainment: Share of the Population**  
**That Has Completed Four Years of High School**  
**(percent)**

	2010	2015	2020	2025	2030
U.S. average	87	88	89	90	91
Hispanic	63	66	68	71	74
Difference from US Average	24	23	21	19	17
African American	85	87	88	90	91
Difference from US Average	2	1	1	0	0

Our models of the unemployment rates of the Hispanic and African American populations include variables to capture the effects of educational attainment. The models are estimated to explain the difference between each demographic group's unemployment rate and the national average unemployment rate. Each model includes variables for the difference between a demographic group's share of the population that has a high school education and the national average. A second variable measures the difference in the share of the population that has completed four years of college. The educational attainment projections in Table IV.8 were used to produce our baseline forecast of total employment of the Hispanic and African American populations.

### ***Baseline African American and Hispanic Employment Forecasts***

#### **U.S. Employment by Broad Occupation**

At the level of the eight broad occupational categories used in our analysis, the economy will not see big changes in the mix of jobs over the next 20 years. Table IV.9 shows our projections of total U.S. employment in these eight categories through 2030. Our forecasts of changes in occupational mix through 2020 are based on projections from the BLS Occupational Outlook database. These forecasts show increases in shares of the "Professional and Related," "Service" and "Skilled Blue-collar" categories and small declines in the remaining categories. We project these trends to continue over the following decade.

**Table IV.9**  
**Projected U.S. Economy-wide Employment by Occupation: 2010-2030**  
**(thousands)**

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
Total	139,396	148,430	155,850	160,541	165,371
Management, Business and Financial	21,297	22,478	23,393	23,881	24,378
Professional and Related	30,716	33,312	35,614	37,340	39,138
Service	24,084	25,977	27,624	28,815	30,053
Sales and Related	15,504	16,388	17,081	17,465	17,857
Office & Administrative Support	18,297	19,075	19,601	19,750	19,890
Skilled Blue-collar	11,392	12,205	12,893	13,361	13,846
Semi-skilled Blue Collar	12,540	13,140	13,573	13,751	13,928
Unskilled Blue Collar	5,566	5,855	6,072	6,176	6,282

To forecast employment by occupation of the African American and Hispanic populations in these broad occupational categories, we took into account their current occupational mix, their current U.S. employment in each of the eight occupations, their total employment growth in each period, and national employment growth in each occupation. Table IV.10 presents summary results of this forecast of economy-wide employment by occupation for African American and Hispanic workers.

**Table IV.10**  
**Projected Economy-wide Employment by Occupation of the**  
**African American and Hispanic Populations: 2010-2030**  
**(thousands)**

	2010	2015	2020	2025	2030
<b>African American</b>					
Total	15,029	16,253	17,194	17,793	18,326
Management, Business and Financial	1,503	1,618	1,704	1,756	1,801
Professional and Related	2,836	3,095	3,304	3,449	3,583
Service	3,773	4,106	4,371	4,552	4,717
Sales and Related	1,464	1,577	1,663	1,715	1,760
Office & Administrative Support	2,316	2,479	2,596	2,658	2,709
Skilled Blue-collar	804	872	925	960	992
Semi-skilled Blue Collar	1,652	1,773	1,861	1,911	1,952
Unskilled Blue Collar	681	733	770	793	811
<b>Hispanic</b>					
Total	20,605	23,144	25,744	27,968	30,269
Management, Business and Financial	1,661	1,860	2,062	2,234	2,412
Professional and Related	2,267	2,570	2,883	3,155	3,438
Service	5,281	5,973	6,684	7,300	7,940
Sales and Related	1,961	2,197	2,438	2,643	2,854
Office & Administrative Support	2,508	2,791	3,079	3,320	3,568
Skilled Blue-collar	1,922	2,166	2,417	2,634	2,858
Semi-skilled Blue Collar	3,027	3,377	3,734	4,034	4,344
Unskilled Blue Collar	1,978	2,210	2,447	2,648	2,855

#### **African American and Hispanic Employment by Broad Occupation**

These economy-wide trends in employment by occupation for the African American and Hispanic populations provided one input into our forecasts of employment in the upstream oil and gas industry of each of these demographic groups. In Tables IV.3, IV.4 and IV.5 we presented summary results of our estimates of the current (2010) number of African American and Hispanic workers in the upstream oil and gas industry (the baseline level of employment in the industries that would be directly affected by the energy development scenarios analyzed in the Wood Mackenzie study). To forecast baseline employment in the upstream oil and gas industry of each demographic group

(African Americans and Latinos) in each region, we projected their employment for each occupation in each region. These employment forecasts were driven by:

- Economy-wide changes in the demographic group's employment in broad occupations (the data summarized in Tables IV.9 and IV.10) and
- The change in the demographic group's total employment within a region.

Over the 20-year forecast period, baseline African American total employment in the upstream oil and natural gas industry is expected to grow faster than total industry employment, 1.2 percent per year versus 0.9 percent per year. Hispanic industry employment growth is projected to be significantly higher, at an average of 2.5% per year (see Table IV.11). Together African Americans and Latinos are projected to account for over one-third of baseline employment in the upstream oil and gas industry in 2030.

**Table IV.11**  
**Projected African American and Hispanic**  
**Total Baseline Oil and Gas Industry Employment: 2010-2030**

	<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2030</b>	<b>Annual Growth Rate</b>
Total	720,911	746,135	796,662	864,974	0.9%
African American	57,886	62,160	67,612	73,740	1.2%
Hispanic	136,265	155,772	180,609	224,965	2.5%

Additional detailed results of the baseline employment forecast are presented in Tables IV.12, IV.13, and IV.14. The national totals in Table IV.12 reflect the importance of blue collar jobs in the upstream oil and gas work force (63 percent of the total in 2010, rising to 65 percent in 2030). Most of these jobs are in the skilled and semi-skilled categories. The blue collar share of employment for African American workers is close to the industry average, but for Hispanic workers the blue collar share is higher (77-79 percent) over the forecast period. At the same time, there is a large core of scientific/management jobs in the upstream oil and gas workforce. About 15 percent of the total is in professional and related occupations (e.g., petroleum engineers, several other types of engineers, geoscientists and technicians) and 10 percent is in management, business, and financial occupations.

**Table IV.12**  
**Projected Baseline Employment in the Upstream Oil and Natural Gas**  
**Industry by Broad Occupation: 2010-2030**

	2010	2015	2020	2030	Change 2010-2030
<b>Total</b>					
Total	720,911	746,135	796,662	864,974	144,063
Management, Business and Financial	71,910	73,316	75,908	79,318	7,408
Professional and Related	113,155	105,872	115,824	132,340	19,185
Service	2,751	2,430	2,714	3,341	590
Sales and Related	11,308	11,496	12,129	13,013	1,705
Office & Administrative Support	67,233	67,356	70,683	75,269	8,036
Skilled Blue-collar	271,287	295,623	314,812	336,330	65,043
Semi-skilled Blue Collar	130,433	151,578	159,183	162,905	32,472
Unskilled Blue Collar	52,834	38,467	45,410	62,458	9,624
<b>African American</b>					
Total	57,886	62,160	67,612	73,740	15,854
Management, Business and Financial	5,091	5,706	5,994	6,153	1,062
Professional and Related	8,010	7,814	8,586	9,574	1,564
Service	453	423	477	576	123
Sales and Related	952	1,038	1,116	1,190	238
Office & Administrative Support	7,562	8,108	8,769	9,562	2,000
Skilled Blue-collar	18,900	20,852	22,579	24,179	5,279
Semi-skilled Blue Collar	11,775	13,705	14,837	15,773	3,998
Unskilled Blue Collar	5,143	4,514	5,254	6,733	1,590
<b>Hispanic</b>					
Total	136,265	155,772	180,609	224,965	88,700
Management, Business and Financial	7,932	9,692	10,413	11,445	3,513
Professional and Related	10,053	10,696	12,215	14,982	4,929
Service	665	773	868	1,071	406
Sales and Related	1,706	2,207	2,390	2,646	940
Office & Administrative Support	10,697	12,506	14,075	16,772	6,075
Skilled Blue-collar	54,993	64,701	74,270	89,213	34,220
Semi-skilled Blue Collar	30,680	39,107	45,686	55,701	25,021
Unskilled Blue Collar	19,539	16,090	20,692	33,135	13,596



**Table IV.13**  
**Projected Baseline Employment in the Upstream Oil and Natural Gas**  
**Industry, Top 10 Detailed Occupations: 2010-2030**

	2010	2015	2020	2030	Change 2010-2030
	Total				
Derrick, Rotary Drill and Service Unit Operators	89,437	116,512	123,166	121,889	32,452
Roustabouts, Oil and Gas	55,873	71,973	75,167	73,386	17,513
Construction Laborers	34,193	20,973	26,374	40,285	6,092
First-Line Supervisors, Constr. & Extraction	29,818	30,477	32,046	34,319	4,501
Operating Engineers & Constr Equip Operators	27,252	19,513	23,947	34,924	7,672
Truck Drivers, Heavy and Tractor-Trailer	25,460	25,049	26,678	29,276	3,816
Helpers and Other Extraction Workers	21,683	27,559	28,087	26,510	4,827
Pump Operators and Wellhead Pumps	21,231	26,238	26,507	25,131	3,900
Petroleum Engineers	21,186	24,813	26,136	25,812	4,626
Secretaries	20,414	20,371	20,917	21,399	985
	African American				
Derrick, Rotary Drill and Service Unit Operators	5,339	7,161	7,661	7,542	2,203
Roustabouts, Oil and Gas	3,342	4,484	4,795	4,767	1,425
Construction Laborers	2,528	1,661	2,153	3,321	793
First-Line Supervisors, Constr. & Extraction	1,234	1,329	1,417	1,494	260
Operating Engineers & Constr Equip Operators	1,898	1,465	1,803	2,530	632
Truck Drivers, Heavy and Tractor-Trailer	3,858	4,063	4,440	4,878	1,020
Helpers and Other Extraction Workers	1,419	1,856	1,930	1,857	438
Pump Operators and Wellhead Pumps	647	842	860	803	156
Petroleum Engineers	1,093	1,289	1,362	1,322	229
Secretaries	1,722	1,834	1,940	2,032	310
	Hispanic				
Derrick, Rotary Drill and Service Unit Operators	20,597	27,357	31,444	35,613	15,016
Roustabouts, Oil and Gas	12,869	17,528	20,679	24,773	11,904
Construction Laborers	13,737	9,206	12,717	22,772	9,035
First-Line Supervisors, Constr. & Extraction	5,472	6,040	6,925	8,396	2,924
Operating Engineers & Constr Equip Operators	4,831	3,784	4,884	7,758	2,927
Truck Drivers, Heavy and Tractor-Trailer	5,437	5,972	7,096	9,206	3,769
Helpers and Other Extraction Workers	5,205	7,038	8,093	9,322	4,117
Pump Operators and Wellhead Pumps	2,821	3,802	4,340	5,008	2,187
Petroleum Engineers	1,370	1,718	2,017	2,369	999
Secretaries	2,858	3,165	3,594	4,319	1,461

Upstream oil and gas jobs are heavily concentrated in the Gulf region – 62 percent of the total in 2010 and expected to remain near that share over the forecast period. The East and Rockies regions each have about one-eighth of the total. The Rockies’ share will remain near this level, while the share of the East is expected to rise to 15 percent by 2030 with the impact of shale gas development.

**Table IV.14**  
**Projected Baseline Employment in the Upstream Oil and Natural Gas**  
**Industry by Region: 2010-2030**

	2010	2015	2020	2030	Change 2010-2030
<b>Total</b>					
U.S.	720,911	746,135	796,663	864,974	144,063
Alaska	10,162	9,374	8,964	12,531	2,369
West	34,217	32,203	31,078	30,214	-4,003
Rockies	84,861	80,051	88,268	96,594	11,733
Gulf	449,791	476,064	506,986	530,356	80,565
Central	55,898	55,010	50,761	64,811	8,913
East	85,981	93,432	110,605	130,469	44,488
<b>African American</b>					
U.S.	57,886	62,160	67,612	73,740	15,854
Alaska	179	166	153	179	0
West	1,085	1,079	1,017	871	-214
Rockies	1,404	1,453	1,722	2,149	745
Gulf	44,219	47,952	51,436	53,811	9,592
Central	2,663	2,919	2,743	3,503	840
East	8,336	8,591	10,541	13,227	4,891
<b>Hispanic</b>					
U.S.	136,265	155,772	180,609	224,965	88,700
Alaska	504	501	528	834	330
West	10,278	10,678	10,956	11,954	1,676
Rockies	18,922	20,018	23,904	30,179	11,257
Gulf	95,479	113,976	131,055	157,687	62,208
Central	3,514	3,478	3,851	6,721	3,207
East	7,568	7,121	10,315	17,590	10,022

### ***Job Creation Due to Replacement Requirements***

The growth of baseline employment in the upstream oil and natural gas industry projected above represents an increase in the total number of workers in the industry. However, job opportunities also arise when workers leave their occupations and need to be replaced. The Occupational Projections unit of the Bureau of Labor Statistics (BLS)

estimates the number of job openings that will result from workers retiring from or permanently leaving an occupation. For each detailed occupation in the U.S. economy, BLS has projected the share of employees who were at work in 2010 that will have to be replaced over the following 10 years, 2010-2020.

To develop estimates of the number of jobs that will be created in the upstream oil and gas industry due to replacement, we applied these BLS occupation-specific replacement rates to our baseline estimates of employment in the upstream oil and gas industry by occupation in 2010. These projections assume that the economy-wide replacement rates are reflective of conditions in the upstream oil and gas industry. To the extent that this is not the case, our results could be materially affected. Table IV.15 illustrates this calculation for the 45 detailed occupations used in our analysis. Column 2 of this table shows the percentage of 2010 employees that are projected to be replaced by 2020 in each occupation. Retirements and other replacement needs are projected to create jobs for about 19 thousand derrick, rotary drill and service unit operators, 12 thousand roustabouts and over 8 thousand engineers.

**Table IV.15**  
**Incremental Employment Outlook Due to Replacement Requirements in**  
**the Upstream Oil and Gas Industry, 2010-2020: Detailed Occupations**

<b>Occupation</b>	<b>Replacement Rate</b>	<b>Potential Job Openings</b>
Derrick, Rotary Drill and Service Unit Operators	21.1	18,870
Roustabouts, Oil and Gas	21.1	11,789
First-Line Supervisors/Mgr of Constr. & Extraction Workers	23.0	6,858
Operating Engineers & Other Construction Equip Operators	23.2	6,323
Pump Operators and Wellhead Pumps	29.6	6,284
Truck Drivers, Heavy and Tractor-Trailer	19.9	5,067
Petroleum Engineers	22.0	4,661
Helpers and Other Extraction Workers	21.1	4,575
Petroleum Pump System & Refinery Operators, and Gaugers	32.6	3,555
General and Operations Managers	18.6	3,522
Geological and Petroleum Technicians	33.7	3,028
Geoscientists, Except Hydrologists and Geographers	29.6	2,812
Secretaries	13.4	2,736
Construction Laborers	8.0	2,735
Laborers and Freight, Stock, and Material Movers, Hand	32.0	2,652
Office Clerks, General	17.7	2,639

**Table IV.15 (continued)**  
**Incremental Employment Outlook Due to Replacement Requirements in**  
**the Upstream Oil and Gas Industry, 2010-2020: Detailed Occupations**

<b>Occupation</b>	<b>Replacement Rate</b>	<b>Potential Job Openings</b>
Accountants and Auditors	21.5	2,063
Welders, Cutters, Solderers, and Brazers	26.7	1,747
Industrial Machinery Mechanics	19.2	1,548
Bookkeeping, Accounting, and Auditing Clerks	11.0	1,452
Excavating and Loading Machine and Dragline Operators	29.6	1,320
Engineers, all other	22.0	1,289
Crane and Tower Operators	27.2	1,288
Civil Engineers	20.3	1,246
Maintenance and Repair Workers, General	18.4	1,153
Mobile Heavy Equipment Mechanics, Except Engines	26.0	1,135
Fence Erectors	27.5	1,125
First-Line Supervisors/Mgr of Office and Admin Workers	26.7	1,099
Mechanical Engineers	32.2	1,085
Electricians	27.0	1,053
Cement Masons and Concrete Finishers	15.8	1,027
Sales Representatives, Wholesale and Manufacturing	23.5	878
Inspectors, Testers, Sorters, Samplers, and Weighers	21.8	876
Plumbers, Pipefitters, and Steamfitters	28.9	820
Paving, Surfacing, and Tamping Equipment Operators	20.6	754
Carpenters	21.2	662
Architects, Except Landscape and Naval	20.3	619

Table IV.16 presents summary results of these estimates at the level of eight broad occupational categories. Over 150 thousand jobs are projected to become available in the upstream oil and natural gas industry due to retirement and other permanent job separations over the 2010 to 2020 period. Over 90 thousand of these jobs are projected to be skilled and semi-skilled blue collar jobs. Nearly 40 thousand job openings are projected to become available in management and professional occupations.

The need to replace workers due to retirement and other reasons will differ by region due to differences among regions in the share of the working age population that is approaching retirement. To approximate the number of job opportunities that will be created by region in the upstream oil and natural gas industry due to replacement requirements, we estimated replacement rates separately for each region. We adjusted the national replacement rates for 2010-2020 by the ratio of a region's share of the workforce age 55-64 relative to the corresponding national share.

**Table IV.16**  
**Incremental Employment Outlook Due to Replacement Requirements in**  
**the Upstream Oil and Natural Gas Industry, 2010-2020**

	<b>Potential Job Openings</b>
Total	151,235
Management, Business and Financial	12,393
Professional and Related	26,866
Service	614
Sales and Related	2,656
Office & Administrative Support	10,410
Skilled Blue-collar	43,370
Semi-skilled Blue Collar	46,898
Unskilled Blue Collar	8,028

Job openings due to replacement demand will likely be even greater in the following decade, 2020-2030. The second decade of baby-boomers approaching retirement (those age 45-55 in 2010) is about 22 percent larger than the first wave (those 55-65 in 2010). To approximate job opportunities due to replacement demand in the period 2020-2030, we adjusted the BLS replacement rates for 2010-2020 to reflect a correspondingly higher retirement rate. That is, all occupation-specific replacement rates for 2020-2030 were assumed to be 22 percent higher than in 2010-2020. With this simplifying assumption, total replacement hiring in the period 2020-2030 is projected to be 184,500. Thus, cumulative job openings due to replacement in the upstream oil and gas industry over the 20-year forecast period, 2010-2030, is estimated to total nearly 336 thousand. This is roughly on par with the 331 thousand new jobs that Wood Mackenzie projects would be created by 2030 as a result of the energy development scenarios that they analyzed.

Since the share of African Americans and Latinos among those retiring will be much smaller than their share of the workforce available to fill these jobs, this job turnover could be a significant source of the net gain in the employment of these two minority groups in the upstream oil and gas industry. If we assume that the shares of the two minority groups in filling these job openings due to replacement hiring are equivalent to their shares of employment in the upstream oil and gas industry overall, this will represent an additional 28 thousand jobs in the industry for African American workers and an additional 75 thousand for Hispanic workers, or a total of approximately 103 thousand for both groups over the period 2010-2030. However, a portion of this total will be replacement of retiring African American and Hispanic workers. Therefore, not all of these jobs result in a net increase in minority employment.

## ***Total Employment Outlook from Baseline Growth and Replacement***

Above we estimated the number of additional jobs in the upstream oil and gas industry that could be held by minority workers under projected baseline growth of the industry by comparing employment levels in 2010 and 2030 – an increase of approximately 16 thousand jobs for African Americans and 89 thousand jobs for Latinos, or a total of 105 thousand for the two minority groups. This total represents the combined result for these minority groups of (1) taking new jobs that are created in the industry and (2) replacing non-minority workers who retire or otherwise leave the industry over this 20-year period. The total of 105 thousand includes a portion, but not all, of the job opportunities for minority workers associated with the need to replace workers who will retire from the industry. To get a complete accounting of job opportunities for African Americans and Latinos who were not in the industry at the beginning of the period, we must take into account the minority workers who replace other minority workers who retire from the industry between 2010 and 2030.

To estimate this component of minority job opportunities, we separately estimated the number of African American and Hispanic workers who will likely retire from the industry between 2010 and 2030. The starting point for these estimates was the national occupation-specific replacement rates shown in Table IV.15. We do not have information on the age distribution of African American and Hispanic workers in these detailed occupations. However, it is clear based on the demographic estimates made in Section II that the shares of African American and especially Hispanic workers who are nearing retirement age are lower than the national average. To capture this basic difference, we adjusted the national replacement rates for the differences in the age distribution of the overall African American and Hispanic workforces in each of the six regions identified in this study. That is, for each minority group in each region, we adjusted the national replacement rates for 2010-2020 by the ratio of that group's share of the workforce age 55-64 in the region divided by the corresponding national share. We adjusted the national replacement rates for 2020-2030 using ratios based on the share of the workforce age 45-54.

We applied these adjusted replacement rates for each minority group to employment by occupation for each group in 2010 to estimate the number of workers that would need to be replaced over the period 2010-2030. We project that this additional component of replacement demand will create 24 thousand jobs in the upstream oil and gas industry for African American workers and 43 thousand jobs for Hispanic workers from 2010 to 2030. Combining these 67 thousand job opportunities with the 105 thousand jobs due to baseline industry growth and replacement of non-minority workers yields a combined total of 172 thousand jobs associated with baseline growth and replacement requirements in the industry over these 20 years, including 40 thousand for African Americans and 132 thousand for Latinos. Summary results for these combined job totals are presented in Tables IV.17, IV.18, and IV.19. Detailed results for occupations in each region are presented in Appendix B.

**Table IV.17**  
**Incremental Employment Outlook Due to Baseline Projected Growth and Replacement Requirements in the Upstream Oil and Natural Gas Industry over the Period 2010-2030 by Broad Occupation**

	Potential Job Openings		
	Industry Total	African American	Hispanic
Total	479,794	39,940	131,965
Management, Business and Financial	34,921	2,825	5,648
Professional and Related	78,831	5,295	8,693
Service	1,952	325	635
Sales and Related	7,603	683	1,569
Office & Administrative Support	31,139	4,432	8,733
Skilled Blue-collar	161,316	11,629	46,664
Semi-skilled Blue Collar	136,584	11,245	42,253
Unskilled Blue Collar	27,448	3,506	17,770

**Table IV.18**  
**Incremental Employment Outlook Due to Baseline Projected Growth and Replacement Requirements in the Upstream Oil and Natural Gas Industry over the Period 2010-2030 in Selected Detailed Occupations**

	Potential Job Openings		
	Industry Total	African American	Hispanic
Derrick, Rotary Drill and Service Unit Operators	74,344	4,451	21,881
Roustabouts, Oil and Gas	43,684	2,835	16,197
Operating Engineers & Other Construction Equip Operators	21,709	1,512	4,672
First-Line Supervisors/Mgr of Constr. & Extraction Workers	19,728	826	4,901
Pump Operators and Wellhead Pumpers	17,850	538	3,504
Truck Drivers, Heavy and Tractor-Trailer	15,066	2,553	5,461
Helpers and Other Extraction Workers	14,981	1,037	5,854
Petroleum Engineers	14,973	709	1,477
Construction Laborers	12,164	1,196	10,714
Geoscientists, Except Hydrologists and Geographers	8,799	366	675
Industrial Machinery Mechanics	8,674	925	2,468
Geological and Petroleum Technicians	8,254	441	1,070
Office Clerks, General	7,936	1,284	2,219
Petroleum Pump System & Refinery Operators, and Gaugers	7,193	786	1,404
Laborers and Freight, Stock, and Material Movers, Hand	7,112	1,354	2,790

**Table IV.18 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry**  
**over the Period 2010-2030 in Selected Detailed Occupations**

	Potential Job Openings		
	Industry Total	African American	Hispanic
Secretaries	7,058	772	2,062
General and Operations Managers	6,899	466	1,103
Accountants and Auditors	6,384	584	955
Bookkeeping, Accounting, and Auditing Clerks	5,251	534	1,501
Welders, Cutters, Solderers, and Brazers	5,097	467	1,974
Excavating and Loading Machine and Dragline Operators	4,540	288	1,192
Civil Engineers	4,223	204	358
Mobile Heavy Equipment Mechanics, Except Engines	3,710	205	792
Maintenance and Repair Workers, General	3,511	334	913
Mechanical Engineers	3,291	137	303
Electricians	3,062	215	828
Fence Erectors	3,012	140	1,325
Crane and Tower Operators	3,011	427	584
First-Line Supervisors/Mgr of Office and Admin Workers	2,811	337	595
Engineers, all other	2,783	127	327
Inspectors, Testers, Sorters, Samplers, and Weighers	2,720	393	960
Sales Representatives, Wholesale and Manufacturing	2,467	94	430
Cement Masons and Concrete Finishers	2,346	354	1,261
Paving, Surfacing, and Tamping Equipment Operators	2,285	220	743
Architects, Except Landscape and Naval	2,168	62	257
Plumbers, Pipefitters, and Steamfitters	2,039	146	590
Carpenters	2,013	92	701
Engineering Managers	1,803	56	186
Cost Estimators	1,542	31	161
Surveying and Mapping Technicians	1,360	46	160
Electrical Engineers	1,288	72	124
Surveyors	1,183	52	105
Construction Managers	1,168	55	236
Civil Engineering Technicians	965	100	118
Architectural and Civil Drafters	446	20	40



**Table IV.19**  
**Incremental Employment Outlook Due to Baseline Projected Growth and Replacement Requirements in the Upstream Oil and Natural Gas Industry over the Period 2010-2030 by Region**

Region	Potential Job Openings		
	Industry Total	African American	Hispanic
U.S.	479,794	39,940	131,965
Alaska	7,295	64	483
West	10,809	230	4,587
Rockies	50,509	1,301	17,259
Gulf	292,556	28,334	93,753
Central	34,718	1,859	4,059
East	83,908	8,152	11,824

### ***Employment Impacts of Energy Development Policy***

The Wood Mackenzie study of the economic impact of accelerated development of oil and natural gas resources in the U.S. projected the number of jobs that would be created nationally and by state through 2030. The pro-development policies assumed in Wood Mackenzie's alternate scenario include commencement of leasing, drilling and development activity in currently closed regions. Regions assumed to be opened included: Eastern Gulf of Mexico, portions of the Rocky Mountains, Atlantic OCS, Pacific OCS, Alaska National Wildlife Refuge (ANWR) – 1002 Area, National Petroleum Reserve, Alaska (NPRA), Alaska offshore and the Marcellus formation in New York State. In addition, drilling and permitting in the offshore Gulf of Mexico is assumed to return to pre-moratorium levels. In the onshore, future environmental regulation of shale gas and tight oil plays are assumed not to be duplicative or unduly burdensome. On and offshore permitting levels are assumed to be at sufficient rates to develop resources in a timely manner.

IHS Global Insight estimated the occupational mix of the new jobs that potentially would be created with such pro-development policies over this forecast period, nationally and for six regions as described at the beginning of this section. To estimate the number of these newly created jobs that could be held by African American and Hispanic workers, we followed the methodology described above for estimating the African American and Hispanic shares of baseline employment in the industry. We projected the employment share of each demographic group within each occupation in each region. These employment share forecasts were based on:

- The current share of each demographic group in employment within each region in the 53 occupational categories used in projecting baseline employment,
- National changes in the demographic group's share of employment in broad occupations, and
- The change in the demographic group's share of total employment within a region.

Combining the jobs that would be created directly in the upstream oil and gas industry with the small number of additional jobs that would be created indirectly in two additional industries (oil field machinery and nonresidential construction maintenance and repair), Wood Mackenzie projects that approximately 180 thousand jobs would be created by 2015 by the pro-development policies they analyzed. We estimate that of that total, over 47,700 (or 27 percent) could be held by African American and Hispanic workers. By 2030, more than 113 thousand new jobs could be held by African American and Hispanic workers (34 percent of the 331 thousand total new jobs projected by Wood Mackenzie).

Summary results of our forecast are presented in Tables IV.20, IV.21 and IV.21. Each of these tables show combined results for jobs created directly in the upstream oil and gas industry and indirectly in the two industries indicated above.

Complete results for U.S. jobs created, 2015-2030, are in Appendix C. Tables C-1 to C-4 contain data for jobs created directly in the upstream oil and gas industry. Table C-5 shows results for indirect job creation in the oil field machinery and nonresidential construction maintenance and repair industries.

Although the Gulf region currently accounts for over 60 percent of employment in the upstream oil and gas industry as noted in the previous section, its share of new jobs created are projected to be considerably lower under the energy development scenario assessed by Wood Mackenzie – 44 percent in 2015 and 38 percent in 2030.<sup>5</sup> In contrast, 11 percent of new jobs are projected to be created in Alaska, while its current share of industry employment is near 1 percent. And by 2030 12 percent of new jobs are projected to be in the Western region, while it currently has only 5 percent of industry employment, and 20 percent of new jobs are projected to be in the Rockies region – almost double its current projected baseline employment in that year.

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<sup>5</sup> This outcome is highly dependent upon the energy development scenario analyzed which in this case opened up the Atlantic OCS, the Eastern GOM, parts of the Rockies, the Pacific OCS and parts of Alaska.

**Table IV.20**  
**Projected Job Creation in the Upstream Oil and Natural Gas**  
**Industry through Pro-Energy Development Policy by Broad Occupation**

	2015	2020	2025	2030
	<b>Total</b>			
Total	179,868	298,290	312,456	330,999
Management, Business and Financial	15,488	25,606	26,537	27,044
Professional and Related	32,651	47,500	45,942	37,412
Service	935	1,555	1,593	1,608
Sales and Related	2,587	4,412	4,667	5,063
Office & Administrative Support	16,061	26,668	27,552	28,454
Skilled Blue-collar	63,447	108,192	116,238	130,632
Semi-skilled Blue Collar	31,683	50,272	52,952	57,921
Unskilled Blue Collar	17,017	34,084	36,973	42,865
	<b>African American</b>			
Total	11,885	20,272	21,729	22,252
Management, Business and Financial	817	1,395	1,516	1,488
Professional and Related	1,856	2,693	2,809	2,104
Service	126	213	225	212
Sales and Related	169	298	324	337
Office & Administrative Support	1,514	2,640	2,853	2,866
Skilled Blue-collar	3,591	6,281	6,759	7,378
Semi-skilled Blue Collar	2,377	3,943	4,211	4,551
Unskilled Blue Collar	1,435	2,808	3,032	3,316
	<b>Hispanic</b>			
Total	36,850	66,083	76,134	91,238
Management, Business and Financial	1,619	2,785	3,143	3,479
Professional and Related	2,975	4,492	4,719	4,004
Service	251	434	484	529
Sales and Related	389	690	797	944
Office & Administrative Support	2,674	4,629	5,273	5,995
Skilled Blue-collar	14,727	25,570	29,130	35,412
Semi-skilled Blue Collar	6,647	11,867	13,904	17,254
Unskilled Blue Collar	7,568	15,617	18,684	23,621

**Table IV.21**  
**Projected Job Creation in the Upstream Oil and Natural Gas Industry**  
**through Pro-Energy Development Policy in 10 Detailed Occupations**

	2015	2020	2025	2030
	<b>Total</b>			
Derrick, Rotary Drill and Service Unit Operators	20,171	29,081	30,603	33,045
Construction Laborers	11,597	24,475	26,747	31,401
Operating Engineers & Other Construction Equip Operators	8,758	18,661	20,674	24,614
Roustabouts, Oil and Gas	11,713	17,132	18,073	19,578
First-Line Supervisors/Mgr of Constr. & Extraction Workers	7,221	12,516	13,398	15,107
Truck Drivers, Heavy and Tractor-Trailer	6,776	11,741	12,432	13,962
Secretaries	5,000	8,089	8,099	7,950
Helpers and Other Extraction Workers	4,511	6,430	6,650	7,103
Pump Operators and Wellhead Pumpers	3,064	4,976	5,414	6,085
Petroleum Engineers	1,918	3,999	4,684	5,648
	<b>African American</b>			
Derrick, Rotary Drill and Service Unit Operators	748	975	1,033	1,138
Construction Laborers	824	1,777	1,934	2,147
Operating Engineers & Other Construction Equip Operators	622	1,261	1,374	1,541
Roustabouts, Oil and Gas	432	573	616	689
First-Line Supervisors/Mgr of Constr. & Extraction Workers	241	439	472	514
Truck Drivers, Heavy and Tractor-Trailer	876	1,554	1,658	1,811
Secretaries	356	615	650	614
Helpers and Other Extraction Workers	190	277	290	320
Pump Operators and Wellhead Pumpers	77	136	154	171
Petroleum Engineers	66	143	175	214
	<b>Hispanic</b>			
Derrick, Rotary Drill and Service Unit Operators	4,901	7,386	7,947	9,247
Construction Laborers	5,580	11,911	14,312	18,196
Operating Engineers & Other Construction Equip Operators	2,000	3,938	4,735	6,113
Roustabouts, Oil and Gas	1,476	2,805	3,384	4,352
First-Line Supervisors/Mgr of Constr. & Extraction Workers	1,482	2,559	2,937	3,597
Truck Drivers, Heavy and Tractor-Trailer	1,633	2,986	3,517	4,446
Secretaries	737	1,261	1,406	1,529
Helpers and Other Extraction Workers	1,105	1,682	1,861	2,210
Pump Operators and Wellhead Pumpers	406	758	900	1,129
Petroleum Engineers	113	259	334	442

**Table IV.22**  
**Projected Job Creation in the Upstream Oil and Natural Gas Industry**  
**through Pro-Energy Development Policy by Region**

	2015	2020	2025	2030
<b>Total</b>				
U.S.	179,868	298,290	312,456	330,999
Alaska	15,290	30,070	28,439	36,014
West	6,499	23,066	30,679	39,442
Rockies	53,677	70,197	64,215	65,177
Gulf	78,403	111,306	117,389	125,149
Central	4,695	6,020	9,866	9,854
East	21,304	57,630	61,868	55,365
<b>African American</b>				
U.S.	11,885	20,272	21,729	22,252
Alaska	247	485	435	502
West	229	727	938	1,103
Rockies	929	1,339	1,302	1,399
Gulf	8,473	12,212	12,908	13,728
Central	240	320	523	527
East	1,767	5,189	5,623	4,993
<b>Hispanic</b>				
U.S.	36,850	66,083	76,134	91,238
Alaska	815	2,021	2,194	2,933
West	1,186	7,934	11,398	16,983
Rockies	12,420	17,167	17,464	19,328
Gulf	20,771	32,829	37,532	44,171
Central	293	430	826	933
East	1,365	5,702	6,720	6,890

### ***Combining Baseline Growth and Pro-Development Policy***

Combining the estimated 172 thousand job opportunities in the industry projected through 2030 for African Americans and Latinos from baseline growth and replacement requirements with the estimated 113 thousand jobs for these groups that could be created through accelerated exploration and development yields a total of 285 thousand potential job opportunities for African Americans and Latinos over this period. Summary results for these combined job totals are presented in Tables IV.23, IV.24, and IV.25. Detailed results for occupations in each region are presented in Appendix D.

**Table IV.23**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas**  
**Industry Due to Baseline Projected Growth and Replacement**  
**Requirements and Pro-Development Policy over the Period 2010-2030**  
**by Broad Occupation**

	Potential Job Openings		
	Industry Total	African American	Hispanic
Total	810,793	62,192	223,203
Management, Business and Financial	61,965	4,313	9,127
Professional and Related	116,243	7,399	12,697
Service	3,560	537	1,164
Sales and Related	12,666	1,020	2,513
Office & Administrative Support	59,594	7,298	14,728
Skilled Blue-collar	291,947	19,007	82,076
Semi-skilled Blue Collar	194,506	15,796	59,507
Unskilled Blue Collar	70,313	6,822	41,391

**Table IV.24**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas**  
**Industry Due to Baseline Projected Growth and Replacement**  
**Requirements and Pro-Development Policy over the Period 2010-2030**  
**by Region**

Region	Potential Job Openings		
	Industry Total	African American	Hispanic
U.S.	810,793	62,192	223,203
Alaska	43,308	566	3,416
West	50,251	1,333	21,570
Rockies	115,685	2,700	36,587
Gulf	417,705	42,062	137,924
Central	44,571	2,386	4,992
East	139,273	13,145	18,714

**Table IV.25**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas**  
**Industry Due to Baseline Projected Growth and Replacement**  
**Requirements and Pro-Development Policy over the Period 2010-2030**  
**in Selected Detailed Occupations**

	Potential Job Openings		
	Industry Total	African American	Hispanic
Derrick, Rotary Drill and Service Unit Operators	107,390	5,589	31,128
Roustabouts, Oil and Gas	63,263	3,524	20,549
Operating Engineers & Other Construction Equip Operators	46,323	3,053	10,785
Construction Laborers	43,565	3,343	28,910
First-Line Supervisors/Mgr of Constr. & Extraction Workers	34,835	1,340	8,498
Truck Drivers, Heavy and Tractor-Trailer	29,028	4,364	9,907
Pump Operators and Wellhead Pumpers	23,935	709	4,633
Helpers and Other Extraction Workers	22,084	1,357	8,064
Petroleum Engineers	20,621	923	1,919
Secretaries	15,008	1,386	3,591
Office Clerks, General	14,904	2,145	3,856
General and Operations Managers	13,180	797	1,885
Industrial Machinery Mechanics	12,221	1,212	3,370
Geoscientists, Except Hydrologists and Geographers	11,445	461	851
Laborers and Freight, Stock, and Material Movers, Hand	11,146	1,957	4,384
Bookkeeping, Accounting, and Auditing Clerks	11,092	945	2,537
Geological and Petroleum Technicians	10,765	549	1,348
Petroleum Pump System & Refinery Operators, and Gaugers	9,490	994	1,827
Accountants and Auditors	9,459	806	1,322
Excavating and Loading Machine and Dragline Operators	8,478	492	2,295
Cement Masons and Concrete Finishers	8,231	1,046	4,410
Welders, Cutters, Solderers, and Brazers	8,017	679	3,043
Civil Engineers	7,212	325	631
Fence Erectors	7,048	297	3,312
Mobile Heavy Equipment Mechanics, Except Engines	6,410	319	1,381
Carpenters	6,039	251	2,270
Maintenance and Repair Workers, General	6,013	517	1,484
Paving, Surfacing, and Tamping Equipment Operators	5,967	569	2,218
Crane and Tower Operators	5,416	699	1,057
Mechanical Engineers	4,810	191	470
Electricians	4,522	298	1,206
Construction Managers	4,487	158	709
First-Line Supervisors/Mgr of Office and Admin Workers	4,470	500	925

**Table IV.25 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas**  
**Industry Due to Baseline Projected Growth and Replacement**  
**Requirements and Pro-Development Policy over the Period 2010-2030**  
**in Selected Detailed Occupations**

	<b>Potential Job Openings</b>		
	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Sales Representatives, Wholesale and Manufacturing	4,414	155	739
Engineers, all other	4,202	184	462
Cost Estimators	4,180	73	471
Inspectors, Testers, Sorters, Samplers, and Weighers	4,180	549	1,392
Architects, Except Landscape and Naval	3,677	97	433
Plumbers, Pipefitters, and Steamfitters	3,377	223	1,019
Engineering Managers	2,951	85	284
Surveying and Mapping Technicians	2,197	68	274
Electrical Engineers	2,100	108	209
Surveyors	1,974	84	187
Civil Engineering Technicians	1,676	158	226
Architectural and Civil Drafters	1,298	50	162



## **V. Education and Training – Key to Attracting Greater Minority Workforce Participation**

A key element in achieving a growing level of African American and Hispanic employment in the upstream oil and natural gas industry is to increase the education and training of these groups needed for many of the skilled and semi-skilled positions in the industry as well as strengthening overall skills in the critical Science, Technology, Engineering, and Mathematics (STEM) disciplines. In this section, we present a snapshot of the number of 4-year and 2-year degrees and vocational certificates awarded by discipline over the period 2001-2010 to gauge the level of participation of African Americans and Latinos in fields of study that could provide a path to employment in the oil and natural gas industry.<sup>6</sup>

### ***Four-Year Bachelor's Degrees***

Data on the number of four-year Bachelor degrees awarded during the period 2001 to 2010 are presented in Table V.1. For all disciplines, industry and non-industry related, African Americans accounted for 9.6 percent of all Bachelor degrees awarded and Hispanics accounted for 8.6 percent.

For disciplines that are directly applicable to the oil and natural gas industry, such as Petroleum Engineering and the Earth Sciences, African Americans and Hispanics accounted for roughly 1.9 percent and 4.6 percent, respectively, of these degrees awarded during this time frame. This is significantly lower than their respective percentage of all Bachelor degrees attained during this time frame.

These two minority groups accounted for a higher percentage of degrees in fields that are related to the oil and natural gas industry, i.e., degrees such as Civil and Electrical Engineering, the skills of which are needed in the oil and natural gas industry but also in demand by other industries. It is estimated that African Americans accounted for 6.5 percent and Hispanics 9.3 percent of Bachelor degrees awarded in this category. For the combined total of industry applicable and related disciplines, African Americans accounted for an estimated 6.0 percent of the Bachelor degrees awarded from 2001 to 2010 and Hispanics accounted for 8.8 percent.

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<sup>6</sup> No claim is made or implied herein that the academic disciplines analyzed represent a comprehensive list of fields of study applicable to oil and natural gas industry employment. In addition, examination of broad categories of disciplines, as undertaken here, does not account for the fact that some specific disciplines impart skills that are a better fit for the petroleum industry than others.

**Table V.1**  
**Total 4-Year Bachelor Degrees Awarded by Discipline by Race - Cumulative 2001-2010**

Discipline or Field of Study	Racial Group				Percent of Degrees by Discipline	
	African American	Hispanic	Other	Total	African American	Hispanic
<b><u>Oil, Natural Gas, Mining Industry Applicable</u></b>						
Petroleum Engineering	106	243	2,799	3,148	3.4%	7.7%
Geological and Earth Sciences/Geosciences	553	1,389	29,778	31,720	1.7%	4.4%
Geological/Geophysical Engineering	17	31	1,045	1,093	1.6%	2.8%
<u>Mining and Petroleum Technicians</u>	<u>8</u>	<u>2</u>	<u>129</u>	<u>139</u>	<u>5.8%</u>	<u>1.4%</u>
<b>Sub Total - Industry Specific Degrees</b>	<b>684</b>	<b>1,665</b>	<b>33,751</b>	<b>36,100</b>	<b>1.9%</b>	<b>4.6%</b>
<b><u>Oil, Natural Gas, Mining Industry Related</u></b>						
Civil Engineering	3,154	8,787	73,787	85,728	3.7%	10.2%
Civil Engineering Technician	460	174	3,702	4,336	10.6%	4.0%
Electrical and Communications Engineering	9,202	10,992	92,996	113,190	8.1%	9.7%
Electrical Engineering Technicians	4,196	3,940	16,954	25,090	16.7%	15.7%
Construction Engineering	28	97	2,102	2,227	1.3%	4.4%
Construction Engineering Technician	577	1,115	14,004	15,696	3.7%	7.1%
Surveying Engineering	2	1	180	183	1.1%	0.5%
Architectural Engineering Technicians	214	177	5,141	5,532	3.9%	3.2%
<u>Geography and Cartography</u>	<u>1,105</u>	<u>2,082</u>	<u>37,720</u>	<u>40,907</u>	<u>2.7%</u>	<u>5.1%</u>
<b>Subtotal - Industry Related Degrees</b>	<b>18,938</b>	<b>27,365</b>	<b>246,586</b>	<b>292,889</b>	<b>6.5%</b>	<b>9.3%</b>
<b>Subtotal Industry Applicable and Related</b>	<b>19,622</b>	<b>29,030</b>	<b>280,337</b>	<b>328,989</b>	<b>6.0%</b>	<b>8.8%</b>
<b><u>Other Degrees</u></b>						
Other STEM	149,895	142,361	1,721,432	2,013,688	7.4%	7.1%
Professional	590,681	488,639	4,651,686	5,731,006	10.3%	8.5%
Social Science and Humanities	339,300	322,829	2,762,464	3,424,593	9.9%	9.4%
<u>Other Disciplines</u>	<u>167,056</u>	<u>157,016</u>	<u>1,427,507</u>	<u>1,751,579</u>	<u>9.5%</u>	<u>9.0%</u>
<b>Total All Degrees</b>	<b>1,266,554</b>	<b>1,139,875</b>	<b>10,843,426</b>	<b>13,249,855</b>	<b>9.6%</b>	<b>8.6%</b>

National Center for Education Statistics, "The Integrated Postsecondary Educational Data System Completion Survey by Race," <http://nces.ed.gov/ipeds/resource/>

The rate at which African Americans and Latinos attain oil and natural gas related degrees, and subsequently employment in the industry, is related in part to the choice of the field of study. Table V.2 shows the percentage breakdown of which degrees were chosen and completed by group. It is estimated that from 2001 to 2010, oil and natural gas industry applicable degrees accounted for 0.27 percent of total Bachelor degrees awarded in the U.S. African American and Hispanic students chose and completed such degrees at rates roughly one-fifth and one-half the rate, respectively, of the student population as a whole.

Approximately 1.5 percent of all Bachelor degrees obtained by African Americans from 2001 to 2010 were in fields directly applicable or related to the oil and natural gas industry. This is a rate 40 percent lower than the population as a whole. Other STEM related degrees were chosen and completed at lower percentages by African Americans relative to other groups. Relative to national averages, African Americans are more likely to choose and complete degrees in other disciplines such as Professional degrees in Business Management, Pre-Med or Pre-Law or the Humanities and Social Sciences.

**Table V.2**  
**Total 4-Year Bachelor Degrees Awarded by Discipline by Race - Cumulative 2001-2010**

Discipline or Field of Study	Percent of Disciplines by Race (Columns add to 100%) Indicator of Choice of Degree to Complete			
	African American	Hispanic	Other	Total
<b><u>Oil, Natural Gas, Mining Industry Applicable</u></b>				
Petroleum Engineering	0.008%	0.021%	0.026%	0.024%
Geological and Earth Sciences/Geosciences	0.044%	0.122%	0.275%	0.239%
Geological/Geophysical Engineering	0.001%	0.003%	0.010%	0.008%
<u>Mining and Petroleum Technicians</u>	<u>0.001%</u>	<u>0.000%</u>	<u>0.001%</u>	<u>0.001%</u>
<b>Sub Total - Industry Specific Degrees</b>	<b>0.054%</b>	<b>0.146%</b>	<b>0.311%</b>	<b>0.272%</b>
<b><u>Oil, Natural Gas, Mining Industry Related</u></b>				
Civil Engineering	0.249%	0.771%	0.680%	0.647%
Civil Engineering Technician	0.036%	0.015%	0.034%	0.033%
Electrical and Communications Engineering	0.727%	0.964%	0.858%	0.854%
Electrical Engineering Technicians	0.331%	0.346%	0.156%	0.189%
Construction Engineering	0.002%	0.009%	0.019%	0.017%
Construction Engineering Technician	0.046%	0.098%	0.129%	0.118%
Surveying Engineering	0.000%	0.000%	0.002%	0.001%
Architectural Engineering Technicians	0.017%	0.016%	0.047%	0.042%
<u>Geography and Cartography</u>	<u>0.087%</u>	<u>0.183%</u>	<u>0.348%</u>	<u>0.309%</u>
<b>Subtotal - Industry Related Degrees</b>	<b>1.495%</b>	<b>2.401%</b>	<b>2.274%</b>	<b>2.211%</b>
<b>Subtotal Industry Applicable and Related</b>	<b>1.5%</b>	<b>2.5%</b>	<b>2.6%</b>	<b>2.5%</b>
<b>All Other Degrees</b>				
Other STEM	11.8%	12.5%	15.9%	15.2%
Professional	46.6%	42.9%	42.9%	43.3%
Social Science and Humanities	26.8%	28.3%	25.5%	25.8%
<u>Other Disciplines</u>	<u>13.2%</u>	<u>13.8%</u>	<u>13.2%</u>	<u>13.2%</u>
<b>Total All Degrees</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

National Center for Education Statistics, "The Integrated Postsecondary Educational Data System Completion Survey by Race," <http://nces.ed.gov/ipeds/resource/>

Approximately 2.5 percent of all Bachelor degrees awarded to Hispanic students were directly applicable or related to the oil and natural gas industry. This is nearly identical to the percentage across the total student population. Lower Hispanic attainment of oil and natural gas applicable and related degrees relative to their representation in the U.S. labor force is due to their overall lower rate of college attendance, not to the chosen field of study to complete.

### ***Vocational Training – Associate Degrees and Certificates***

Many oil and natural gas industry occupations do not require a 4-year college degree but generally require a high school education and some amount of on-the-job training to attain competency. This group includes some semi-skilled occupations such as

derrick, rotary drill and service unit operators. These occupations account for roughly 30 percent of jobs estimated to be created in 2015 and 33 percent in 2030. There are numerous skilled labor occupations that are rated as requiring a high school diploma and a vocational certificate. Our estimates of jobs created by occupation in Section IV (Table IV.20) show that over one-half of all jobs created could be skilled and semi-skilled blue-collar jobs (53 percent of the total in the initial year of the forecast period, 2015, and 57 percent in 2030).

Vocational training may increase the competitiveness of potential applicants for many of the skilled and semi-skilled blue-collar jobs in the oil and natural gas industry. Data on the number of certificates and Associate degrees (less than 4-years) awarded in the U.S. for the period 2001 to 2010 are presented in Table V.3.

**Table V.3**

<b>Associate Degrees and Certificates by Discipline by Race - Cumulative 2001-2010</b>						
<b>Discipline or Field of Study</b>	<b>Racial Group</b>				<b>Percent of Degrees by Discipline</b>	
	<b>African American</b>	<b>Hispanic</b>	<b>Other</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
<b>Building Trades - Potentially Industry Related</b>						
Electrician / Electrical Related	10,526	10,530	37,475	58,531	18.0%	18.0%
Welding Technology/Welder	14,393	5,542	57,781	77,716	18.5%	7.1%
Carpentry/Carpenter	6,535	1,686	18,322	26,543	24.6%	6.4%
Pipefitting/Pipefitter	180	390	1,409	1,979	9.1%	19.7%
General Construction / Construction Management	2,584	1,840	7,316	11,740	22.0%	15.7%
<b>Sub Total Building Trades</b>	<b>34,218</b>	<b>19,988</b>	<b>122,303</b>	<b>176,509</b>	<b>19.4%</b>	<b>11.3%</b>
Construction/Heavy Equipment Operator	459	175	3,411	4,045	11.3%	4.3%
Truck Commercial Vehicle Operator	27,242	3,900	63,790	94,932	28.7%	4.1%
Heavy Truck and Equipment Maintenance Related	4,787	765	17,673	23,225	20.6%	3.3%
<b>Subtotal Truck / Equipment Related</b>	<b>32,488</b>	<b>4,840</b>	<b>84,874</b>	<b>122,202</b>	<b>26.6%</b>	<b>4.0%</b>
<b>Other Applicable Disciplines</b>						
Mechanical / Architectural / Civil Drafting Related	3,228	5,560	30,824	39,612	8.1%	14.0%
Geography Related	86	106	2,157	2,349	3.7%	4.5%
Survey Technology/ Surveying	60	196	2,085	2,341	2.6%	8.4%
Civil Engineering / Geology / Petroleum Certificates	155	89	1,524	1,768	8.8%	5.0%
Accounting and Related Services	11,449	7,818	52,109	71,376	16.0%	11.0%
Administrative and Secretarial	21,556	13,378	62,990	97,924	22.0%	13.7%
<b>Total Other</b>	<b>36,534</b>	<b>27,147</b>	<b>151,689</b>	<b>215,370</b>	<b>17.0%</b>	<b>12.6%</b>
<b>Total Applicable Disciplines</b>	<b>103,240</b>	<b>51,975</b>	<b>358,866</b>	<b>514,081</b>	<b>20.1%</b>	<b>10.1%</b>
<b>All Other Associate Degrees and Certificates</b>	596,576	504,941	2,271,285	3,372,802	17.7%	15.0%
<b>Total Associate Degrees and Certificates</b>	<b>699,816</b>	<b>556,916</b>	<b>2,630,151</b>	<b>3,886,883</b>	<b>18.0%</b>	<b>14.3%</b>

National Center for Education Statistics, "The Integrated Postsecondary Educational Data System Completion Survey by Race," <http://nces.ed.gov/ipeds/resource/>

Approximately 3.9 million Associate degrees and certificates were issued during this time period. A little over 500 thousand of them were for training in skills that could be applicable to the oil and natural gas industry. However, nearly all of these skills are also applicable to other parts of the economy, especially the construction sector. Therefore, the oil and natural gas industry must compete for this labor pool.

From 2001 to 2010 African Americans obtained 18% of all Associate degrees and certificates. They obtained an even greater share, over 20%, in disciplines where skills attained would be potentially applicable to the oil and natural gas industry. They were especially represented in certification related to heavy truck or equipment operations and maintenance. Although a larger demographic of the U.S. population, Hispanics' Associate degree and certificate attainment was lower than that of African Americans. Latinos accounted for 14.3% of the total of all Associate degrees and certificates. In disciplines where skills could be applicable to the oil and natural gas industry, they accounted for 10.1%.

Table V.4 shows the percentage breakdown of which Associate degrees and certificates were chosen and completed by group. For African Americans that completed Associate degrees or certificates from 2001 to 2010, 14.7 percent were in disciplines that were potentially related to the oil and natural gas industry, slightly higher than the total student population as a whole at 13.2 percent. The share of potentially related degrees and certificates for Hispanics was 9.3 percent, lower than the student population as a whole.

**Table V.4**  
**Associate Degrees and Certificates by Discipline by Race - Cumulative 2001-2010**

Discipline or Field of Study	Racial Group			
	<u>African American</u>	<u>Hispanic</u>	<u>Other</u>	<u>Total</u>
<b>Building Trades - Potentially Industry Related</b>				
Electrician / Electrical Related	1.50%	1.89%	1.42%	1.51%
Welding Technology/Welder	2.06%	1.00%	2.20%	2.00%
Carpentry/Carpenter	0.93%	0.30%	0.70%	0.68%
Pipefitting/Pipefitter	0.03%	0.07%	0.05%	0.05%
<u>General Construction / Construction Management</u>	<u>0.37%</u>	<u>0.33%</u>	<u>0.28%</u>	<u>0.30%</u>
<b>Sub Total Building Trades</b>	<b>4.89%</b>	<b>3.59%</b>	<b>4.65%</b>	<b>4.54%</b>
Construction/Heavy Equipment Equipment Operator	0.07%	0.03%	0.13%	0.10%
Truck Commercial Vehicle Operator	3.89%	0.70%	2.43%	2.44%
<u>Heavy Truck and Equipment Maintenance Related</u>	<u>0.68%</u>	<u>0.14%</u>	<u>0.67%</u>	<u>0.60%</u>
<b>Subtotal Truck / Equipment Related</b>	<b>4.64%</b>	<b>0.87%</b>	<b>3.23%</b>	<b>3.14%</b>
Mechanical / Architectural / Civil Drafting Related	0.46%	1.00%	1.17%	1.02%
Geography Related	0.01%	0.02%	0.08%	0.06%
Survey Technology/ Surveying	0.01%	0.04%	0.08%	0.06%
Civil Engineering / Geology / Petroleum Certificates	0.02%	0.02%	0.06%	0.05%
Accounting and Related Services	1.64%	1.40%	1.98%	1.84%
<u>Administrative and Secretarial</u>	<u>3.08%</u>	<u>2.40%</u>	<u>2.39%</u>	<u>2.52%</u>
<b>Total Potentially Industry Related Degrees</b>	<b>14.75%</b>	<b>9.33%</b>	<b>13.64%</b>	<b>13.23%</b>
<b>All Other Associate Degrees and Certificates</b>	<b>85.25%</b>	<b>90.67%</b>	<b>86.36%</b>	<b>86.77%</b>
<b>Total Associate Degrees and Certificates</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

## Summary

In summary, over the period 2001-2010:

- 1) For 4-year degrees directly applicable to the oil and natural gas industry, African Americans and Hispanics are under-represented relative to the percentage of overall degrees obtained by each respective group. The gap is larger for African Americans relative to Hispanics.
- 2) For 4-year degrees applicable and related to the oil and natural gas industry, African Americans are under-represented relative to their percentage of overall degrees obtained, and Hispanics are roughly on par with their percentage of overall degrees earned.
- 3) African American and Hispanic students chose and completed oil and natural gas applicable 4-year degrees at rates one-fifth and one-half the rate, respectively, of the student population as a whole.
- 4) African Americans earned roughly twice the number of Associate degrees and certificates applicable to oil and natural gas industry employment than did Hispanics.
- 5) Skills associated with many of these degrees and certificates are in demand by a wide array of industries, and the oil and natural gas industry must compete for this labor.

Employment levels and types of jobs of minority groups could be improved through improvements in educational attainment. However, this will require a sustained effort over decades focusing on STEM related disciplines starting in primary education and continuing through secondary school, vocational training and 2-year and 4-year college programs.

## Appendix A. Occupation Descriptions

General and Operations Managers	Plan, direct, or coordinate the operations of public or private sector organizations. Duties and responsibilities include formulating policies, managing daily operations, and planning the use of materials and human resources, but are too diverse and general in nature to be classified in any one functional area of management or administration, such as personnel, purchasing, or administrative services.
Construction Managers	Plan, direct, or coordinate, usually through subordinate supervisory personnel, activities concerned with the construction and maintenance of structures, facilities, and systems. Participate in the conceptual development of a construction project and oversee its organization, scheduling, budgeting, and implementation. Includes managers in specialized construction fields, such as carpentry or plumbing.
Engineering Managers	Plan, direct, or coordinate activities in such fields as architecture and engineering or research and development in these fields.
Cost Estimators	Prepare cost estimates for product manufacturing, construction projects, or services to aid management in bidding on or determining price of product or service. May specialize according to particular service performed or type of product manufactured.
Accountants and Auditors	Examine, analyze, and interpret accounting records to prepare financial statements, give advice, or audit and evaluate statements prepared by others. Install or advise on systems of recording costs or other financial and budgetary data.
Architects, Except Landscape and Naval	Plan and design structures, such as private residences, office buildings, theaters, factories, and other structural property.
Surveyors	Make exact measurements and determine property boundaries. Provide data relevant to the shape, contour, gravitation, location, elevation, or dimension of land or land features on or near the earth's surface for engineering, mapmaking, mining, land evaluation, construction, and other purposes.
Civil Engineers	Perform engineering duties in planning, designing, and overseeing construction and maintenance of building structures, and facilities, such as roads, railroads, airports, bridges, harbors, channels, dams, irrigation projects, pipelines, power plants, and water and sewage systems.
Electrical Engineers	Research, design, develop, test, or supervise the manufacturing and installation of electrical equipment, components, or systems for commercial, industrial, military, or scientific use.
Mechanical Engineers	Perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of equipment such as centralized heat, gas, water, and steam systems.
Petroleum Engineers	Devise methods to improve oil and gas extraction and production and determine the need for new or modified tool designs. Oversee drilling and offer technical advice.
Engineers, all other	Miscellaneous engineers not listed separately in the occupational classification.
Architectural and Civil Drafters	Prepare detailed drawings of architectural and structural features of buildings or drawings and topographical relief maps used in civil engineering projects, such as highways, bridges, and public works. Use knowledge of building materials,

	engineering practices, and mathematics to complete drawings.
Civil Engineering Technicians	Apply theory and principles of civil engineering in planning, designing, and overseeing construction and maintenance of structures and facilities under the direction of engineering staff or physical scientists.
Surveying and Mapping Technicians	Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist to obtain data used for construction, mapmaking, boundary location, mining, or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data, or other maps to show topographical features, political boundaries, and other features. May verify accuracy and completeness of maps.
Geoscientists, Except Hydrologists and Geographers	Study the composition, structure, and other physical aspects of the Earth. May use geological, physics, and mathematics knowledge in exploration for oil, gas, minerals, or underground water; or in waste disposal, land reclamation, or other environmental problems. May study the Earth's internal composition, atmospheres, oceans, and its magnetic, electrical, and gravitational forces. Includes mineralogists, crystallographers, paleontologists, stratigraphers, geodesists, and seismologists.
Geological and Petroleum Technicians	Assist scientists or engineers in the use of electronic, sonic, or nuclear measuring instruments in both laboratory and production activities to obtain data indicating potential resources such as metallic ore, minerals, gas, coal, or petroleum. Analyze mud and drill cuttings. Chart pressure, temperature, and other characteristics of wells or bore holes. Investigate and collect information leading to the possible discovery of new metallic ore, minerals, gas, coal, or petroleum deposits.
Sales Representatives, Wholesale and Manufacturing	Sell goods for wholesalers or manufacturers where technical or scientific knowledge is required in such areas as biology, engineering, chemistry, and electronics, normally obtained from at least 2 years of post-secondary education.
First-Line Supervisors/Managers of Office and Administrative Workers	Directly supervise and coordinate the activities of clerical and administrative support workers.
Bookkeeping, Accounting, and Auditing Clerks	Compute, classify, and record numerical data to keep financial records complete. Perform any combination of routine calculating, posting, and verifying duties to obtain primary financial data for use in maintaining accounting records. May also check the accuracy of figures, calculations, and postings pertaining to business transactions recorded by other workers.
Secretaries	Provide high-level administrative support by conducting research, preparing statistical reports, handling information requests, and performing clerical functions such as preparing correspondence, receiving visitors, arranging conference calls, and scheduling meetings. May also train and supervise lower-level clerical staff. Perform routine clerical and administrative functions such as drafting correspondence, scheduling appointments, organizing and maintaining paper and electronic files, or providing information to callers.
Office Clerks, General	Perform duties too varied and diverse to be classified in any specific office clerical occupation, requiring knowledge of office systems and procedures. Clerical duties may be assigned in accordance with the office procedures of individual establishments and may include a combination of answering telephones, bookkeeping, word processing, stenography, office machine operation, and filing.



<b>Skilled Blue Collar</b>	
First-Line Supervisors/ Managers of Construction Trades and Extraction Workers	Directly supervise and coordinate activities of construction or extraction workers.
Carpenters	Construct, erect, install, or repair structures and fixtures made of wood, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors. Includes brattice builders who build doors or brattices in underground passageways.
Cement Masons and Concrete Finishers	Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, roads, or curbs using a variety of hand and power tools. Align forms for sidewalks, curbs, or gutters; patch voids; and use saws to cut expansion joints.
Paving, Surfacing, and Tamping Equipment Operators	Operate equipment used for applying concrete, asphalt, or other materials to road beds, or equipment used for tamping gravel, dirt, or other materials. Includes concrete and asphalt paving machine operators, form tampers, tamping machine operators, and stone spreader operators.
Operating Engineers and Other Construction Equipment Operators	Operate one or several types of power construction equipment, such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, tractors, or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement. May repair and maintain equipment in addition to other duties.
Electricians	Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.
Plumbers, Pipefitters, and Steamfitters	Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases. May install heating and cooling equipment and mechanical control systems. Includes sprinkler fitters.
Derrick, Rotary Drill, and Service Unit Operators, Oil and Gas	Rig derrick equipment and operate pumps to circulate mud through drill hole. Set up or operate a variety of drills to remove underground oil and gas, or remove core samples for testing during oil and gas exploration. Operate equipment to increase oil flow from producing wells or to remove stuck pipe, casing, tools, or other obstructions from drilling wells.
Mobile Heavy Equipment Mechanics, Except Engines	Diagnose, adjust, repair, or overhaul mobile mechanical, hydraulic, and pneumatic equipment, such as cranes, bulldozers, graders, and conveyors, used in construction, logging, and surface mining.
Industrial Machinery Mechanics	Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems.
Maintenance and Repair Workers, General	Perform work involving the skills of two or more maintenance or craft occupations to keep machines, mechanical equipment, or the structure of an establishment in repair. Duties may involve pipe fitting; boiler making; insulating; welding; machining; carpentry; repairing electrical or mechanical equipment; installing, aligning, and balancing new equipment; and repairing buildings, floors, or stairs.
Petroleum Pump System Operators, Refinery Operators, and Gaugers	Operate or control petroleum refining or processing units. May specialize in controlling manifold and pumping systems, gauging or testing oil in storage tanks, or regulating the flow of oil into pipelines.

Crane and Tower Operators	Operate mechanical boom and cable or tower and cable equipment to lift and move materials, machines, or products in many directions.
Pump Operators and Wellhead Pumpers	Tend, control, or operate power-driven, stationary, or portable pumps and manifold systems to transfer gases, oil and other liquids to and from various vessels and processes. Operate power pumps and auxiliary equipment to produce flow of oil or gas from wells in oil field.
<b>Semi-skilled Blue Collar</b>	
Roustabouts, Oil and Gas	Assemble or repair oil field equipment using hand and power tools. Perform other tasks as needed.
Helpers and all other Extraction Workers	Help extraction craft workers, such as earth drillers, blasters and explosives workers, derrick operators, and mining machine operators, by performing duties requiring less skill. Duties include supplying equipment or cleaning work area. All oil and natural gas extraction workers not listed separately.
Welders, Cutters, Solderers, and Brazers	Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.
Inspectors, Testers, Sorters, Samplers, and Weighers	Inspect, test, sort, sample, or weigh nonagricultural raw materials or processed, machined, fabricated, or assembled parts or products for defects, wear, and deviations from specifications. May use precision measuring instruments and complex test equipment.
Truck Drivers, Heavy and Tractor-Trailer	Drive a tractor-trailer combination or a truck with a capacity of at least 26,000 pounds Gross Vehicle Weight (GVW). May be required to unload truck. Requires commercial drivers' license.
Excavating and Loading Machine and Dragline Operators	Operate or tend machinery equipped with scoops, shovels, or buckets, to excavate and load loose materials.
<b>Unskilled Blue Collar</b>	
Construction Laborers	Perform tasks involving physical labor at construction sites. May operate hand and power tools of all types: air hammers, earth tampers, cement mixers, small mechanical hoists, surveying and measuring equipment, and a variety of other equipment and instruments. May clean and prepare sites, dig trenches, set braces to support the sides of excavations, erect scaffolding, and clean up rubble, debris and other waste materials.
Fence Erectors	Erect and repair fences and fence gates, using hand and power tools.
Laborers and Freight, Stock, and Material Movers, Hand	Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified.

Source: Bureau of Labor Statistics, Occupational Employment Statistics

## Appendix B. Employment Outlook Due to Baseline Growth and Replacement Requirements

Table B.1

### Incremental Employment Outlook Due to Baseline Projected Growth and Replacement Requirements in the Upstream Oil and Natural Gas Industry, 2010-2030: Gulf

	Industry Total	African American	Hispanic
Total	292,556	28,334	93,753
Management, Business and Financial	21,862	2,028	4,280
Professional and Related	47,509	3,670	6,458
Service	970	191	385
Sales and Related	4,593	484	1,164
Office & Administrative Support	18,350	2,902	6,332
Skilled Blue-collar	96,559	8,275	34,142
Semi-skilled Blue Collar	90,936	8,710	32,194
Unskilled Blue Collar	11,778	2,074	8,798
General and Operations Managers	4,246	311	829
Construction Managers	423	21	127
Engineering Managers	910	29	132
Cost Estimators	458	11	78
Accountants and Auditors	4,424	452	772
Architects, Except Landscape and Naval	647	19	123
Surveyors	408	24	61
Civil Engineers	1,434	83	203
Electrical Engineers	515	32	70
Mechanical Engineers	1,431	75	194
Petroleum Engineers	11,143	638	1,248
Engineers, all other	1,805	92	256
Architectural and Civil Drafters	123	5	23
Civil Engineering Technicians	298	37	54
Surveying and Mapping Technicians	538	19	104
Geoscientists, Except Hydrologists and Geographers	6,491	304	552
Geological and Petroleum Technicians	6,013	354	934
Sales Representatives, Wholesale and Manufacturing	1,403	59	320
First-Line Supervisors/Mgr of Office and Admin Workers	1,683	224	431
Bookkeeping, Accounting, and Auditing Clerks	3,080	341	1,119
Secretaries	4,049	465	1,500
Office Clerks, General	4,561	817	1,568
First-Line Supervisors/Mgr of Constr. & Extraction Workers	11,628	573	3,550

**Table B.1 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Gulf**

	Industry Total	African American	Hispanic
Carpenters	612	33	296
Cement Masons and Concrete Finishers	512	89	332
Construction Laborers	3,687	439	4,352
Paving, Surfacing, and Tamping Equipment Operators	593	104	271
Operating Engineers & Other Construction Equip Operators	8,219	876	2,824
Electricians	2,076	170	654
Plumbers, Pipefitters, and Steamfitters	1,228	104	419
Fence Erectors	780	49	486
Derrick, Rotary Drill and Service Unit Operators	52,114	3,725	17,467
Roustabouts, Oil and Gas	30,748	2,378	13,128
Helpers and Other Extraction Workers	10,562	905	4,768
Mobile Heavy Equipment Mechanics, Except Engines	2,044	143	557
Industrial Machinery Mechanics	6,153	772	1,923
Maintenance and Repair Workers, General	2,257	257	709
Welders, Cutters, Solderers, and Brazers	3,311	361	1,508
Petroleum Pump System & Refinery Operators, and Gaugers	5,324	681	1,169
Inspectors, Testers, Sorters, Samplers, and Weighers	1,736	295	717
Truck Drivers, Heavy and Tractor-Trailer	8,194	1,727	3,780
Crane and Tower Operators	1,600	295	368
Excavating and Loading Machine and Dragline Operators	1,986	199	769
Laborers and Freight, Stock, and Material Movers, Hand	4,172	997	1,957
Pump Operators and Wellhead Pumpers	12,964	421	2,855
Other Management, Business and Financial	11,401	1,204	2,342
Other Professional and Related	16,663	1,988	2,636
Other Service	970	191	385
Other Sales and Related	3,190	425	844
Other Office & Administrative Support	4,977	1,055	1,714
Other Skilled Blue-collar	19,348	2,015	6,056
Other Semi-skilled Blue Collar	4,286	862	2,216
Other Unskilled Blue Collar	3,138	589	2,003

**Table B.2**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: East**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	83,908	8,152	11,824
Management, Business and Financial	6,319	545	451
Professional and Related	15,288	1,158	786
Service	512	101	106
Sales and Related	1,342	135	118
Office & Administrative Support	6,490	1,077	778
Skilled Blue-collar	29,154	2,406	3,308
Semi-skilled Blue Collar	15,645	1,613	1,498
Unskilled Blue Collar	9,158	1,117	4,779
General and Operations Managers	1,290	105	91
Construction Managers	524	29	52
Engineering Managers	506	18	19
Cost Estimators	664	18	35
Accountants and Auditors	768	85	48
Architects, Except Landscape and Naval	967	32	85
Surveyors	475	19	17
Civil Engineers	1,735	98	75
Electrical Engineers	455	31	25
Mechanical Engineers	1,001	41	40
Petroleum Engineers	1,212	11	16
Engineers, all other	461	23	24
Architectural and Civil Drafters	300	15	16
Civil Engineering Technicians	428	53	32
Surveying and Mapping Technicians	493	27	18
Geoscientists, Except Hydrologists and Geographers	725	40	23
Geological and Petroleum Technicians	653	55	6
Sales Representatives, Wholesale and Manufacturing	490	23	28
First-Line Supervisors/Mgr of Office and Admin Workers	505	78	47
Bookkeeping, Accounting, and Auditing Clerks	1,151	138	111
Secretaries	1,696	236	192
Office Clerks, General	1,711	324	232
First-Line Supervisors/Mgr of Constr. & Extraction Workers	3,600	189	377
Carpenters	828	50	227
Cement Masons and Concrete Finishers	1,245	248	568

**Table B.2 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: East**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	5,782	644	3,802
Paving, Surfacing, and Tamping Equipment Operators	1,028	96	251
Operating Engineers & Other Construction Equip Operators	7,417	547	649
Electricians	340	28	35
Plumbers, Pipefitters, and Steamfitters	335	29	52
Fence Erectors	1,306	73	452
Derrick, Rotary Drill and Service Unit Operators	6,640	336	175
Roustabouts, Oil and Gas	3,911	211	0
Helpers and Other Extraction Workers	1,404	47	80
Mobile Heavy Equipment Mechanics, Except Engines	761	48	61
Industrial Machinery Mechanics	754	96	124
Maintenance and Repair Workers, General	531	50	21
Welders, Cutters, Solderers, and Brazers	660	77	103
Petroleum Pump System & Refinery Operators, and Gaugers	553	60	26
Inspectors, Testers, Sorters, Samplers, and Weighers	400	66	53
Truck Drivers, Heavy and Tractor-Trailer	3,326	621	515
Crane and Tower Operators	665	88	53
Excavating and Loading Machine and Dragline Operators	1,301	64	130
Laborers and Freight, Stock, and Material Movers, Hand	1,235	242	205
Pump Operators and Wellhead Pumpers	1,427	67	64
Other Management, Business and Financial	2,567	290	206
Other Professional and Related	6,384	713	409
Other Service	512	101	106
Other Sales and Related	852	112	90
Other Office & Administrative Support	1,427	301	196
Other Skilled Blue-collar	5,438	578	649
Other Semi-skilled Blue Collar	2,236	423	593
Other Unskilled Blue Collar	834	158	320

**Table B.3**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Central**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	34,718	1,859	4,059
Management, Business and Financial	2,245	115	152
Professional and Related	5,489	234	259
Service	189	22	31
Sales and Related	568	33	43
Office & Administrative Support	2,272	241	261
Skilled Blue-collar	12,555	507	1,269
Semi-skilled Blue Collar	8,665	518	960
Unskilled Blue Collar	2,735	189	1,084
General and Operations Managers	486	21	35
Construction Managers	103	4	17
Engineering Managers	161	5	4
Cost Estimators	205	1	9
Accountants and Auditors	322	20	18
Architects, Except Landscape and Naval	288	7	18
Surveyors	149	3	7
Civil Engineers	530	15	18
Electrical Engineers	151	6	7
Mechanical Engineers	377	14	15
Petroleum Engineers	576	17	22
Engineers, all other	164	5	6
Architectural and Civil Drafters	35	1	3
Civil Engineering Technicians	125	7	11
Surveying and Mapping Technicians	154	0	9
Geoscientists, Except Hydrologists and Geographers	344	5	6
Geological and Petroleum Technicians	373	13	17
Sales Representatives, Wholesale and Manufacturing	209	5	11
First-Line Supervisors/Mgr of Office and Admin Workers	215	19	18
Bookkeeping, Accounting, and Auditing Clerks	375	30	36
Secretaries	505	41	53
Office Clerks, General	602	74	72
First-Line Supervisors/Mgr of Constr. & Extraction Workers	1,578	39	102
Carpenters	275	7	47
Cement Masons and Concrete Finishers	301	13	159

**Table B.3 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Central**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	1,276	79	756
Paving, Surfacing, and Tamping Equipment Operators	329	17	46
Operating Engineers & Other Construction Equip Operators	2,741	49	141
Electricians	186	7	13
Plumbers, Pipefitters, and Steamfitters	164	7	12
Fence Erectors	461	12	84
Derrick, Rotary Drill and Service Unit Operators	4,309	233	370
Roustabouts, Oil and Gas	2,474	144	231
Helpers and Other Extraction Workers	825	49	114
Mobile Heavy Equipment Mechanics, Except Engines	333	11	18
Industrial Machinery Mechanics	461	24	52
Maintenance and Repair Workers, General	230	10	28
Welders, Cutters, Solderers, and Brazers	350	16	54
Petroleum Pump System & Refinery Operators, and Gaugers	295	9	15
Inspectors, Testers, Sorters, Samplers, and Weighers	190	18	36
Truck Drivers, Heavy and Tractor-Trailer	1,341	100	158
Crane and Tower Operators	288	33	44
Excavating and Loading Machine and Dragline Operators	533	16	48
Laborers and Freight, Stock, and Material Movers, Hand	598	61	102
Pump Operators and Wellhead Pumpers	834	15	45
Other Management, Business and Financial	968	64	69
Other Professional and Related	2,224	141	120
Other Service	189	22	31
Other Sales and Related	359	28	32
Other Office & Administrative Support	574	77	82
Other Skilled Blue-collar	2,354	121	236
Other Semi-skilled Blue Collar	827	87	260
Other Unskilled Blue Collar	400	37	142



**Table B.4**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Rockies**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	50,509	1,301	17,259
Management, Business and Financial	3,435	127	616
Professional and Related	7,638	187	913
Service	190	8	79
Sales and Related	794	25	187
Office & Administrative Support	3,048	183	1,067
Skilled Blue-collar	16,860	366	6,271
Semi-skilled Blue Collar	15,937	303	6,036
Unskilled Blue Collar	2,608	102	2,090
General and Operations Managers	684	27	124
Construction Managers	96	1	29
Engineering Managers	162	4	22
Cost Estimators	129	1	22
Accountants and Auditors	657	24	94
Architects, Except Landscape and Naval	162	2	17
Surveyors	93	4	14
Civil Engineers	328	6	36
Electrical Engineers	109	3	15
Mechanical Engineers	293	5	36
Petroleum Engineers	1,577	32	153
Engineers, all other	263	7	33
Architectural and Civil Drafters	25	0	6
Civil Engineering Technicians	73	2	14
Surveying and Mapping Technicians	112	0	21
Geoscientists, Except Hydrologists and Geographers	936	15	76
Geological and Petroleum Technicians	924	15	98
Sales Representatives, Wholesale and Manufacturing	261	5	53
First-Line Supervisors/Mgr of Office and Admin Workers	290	13	75
Bookkeeping, Accounting, and Auditing Clerks	500	23	184
Secretaries	644	28	252
Office Clerks, General	778	57	263
First-Line Supervisors/Mgr of Constr. & Extraction Workers	2,102	18	680
Carpenters	174	1	77
Cement Masons and Concrete Finishers	181	3	133

**Table B.4 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Rockies**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	1,003	30	1,140
Paving, Surfacing, and Tamping Equipment Operators	189	3	94
Operating Engineers & Other Construction Equip Operators	2,010	24	657
Electricians	347	9	105
Plumbers, Pipefitters, and Steamfitters	225	5	85
Fence Erectors	250	4	172
Derrick, Rotary Drill and Service Unit Operators	8,786	132	3,310
Roustabouts, Oil and Gas	5,105	83	2,409
Helpers and Other Extraction Workers	1,700	21	763
Mobile Heavy Equipment Mechanics, Except Engines	397	2	113
Industrial Machinery Mechanics	1,010	28	307
Maintenance and Repair Workers, General	372	15	123
Welders, Cutters, Solderers, and Brazers	579	10	246
Petroleum Pump System & Refinery Operators, and Gaugers	780	29	159
Inspectors, Testers, Sorters, Samplers, and Weighers	298	12	125
Truck Drivers, Heavy and Tractor-Trailer	1,564	84	733
Crane and Tower Operators	314	7	86
Excavating and Loading Machine and Dragline Operators	450	7	156
Laborers and Freight, Stock, and Material Movers, Hand	782	40	394
Pump Operators and Wellhead Pumpers	2,016	27	431
Other Management, Business and Financial	1,707	70	325
Other Professional and Related	2,743	96	394
Other Service	190	8	79
Other Sales and Related	533	20	134
Other Office & Administrative Support	835	62	293
Other Skilled Blue-collar	3,351	109	1,039
Other Semi-skilled Blue Collar	850	40	476
Other Unskilled Blue Collar	573	28	384

**Table B.5**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: West**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	10,809	230	4,587
Management, Business and Financial	569	9	133
Professional and Related	1,960	44	256
Service	71	3	33
Sales and Related	194	6	54
Office & Administrative Support	547	24	266
Skilled Blue-collar	3,667	59	1,496
Semi-skilled Blue Collar	2,892	65	1,367
Unskilled Blue Collar	909	20	982
General and Operations Managers	83	2	21
Construction Managers	13	0	11
Engineering Managers	47	0	8
Cost Estimators	82	0	17
Accountants and Auditors	117	3	20
Architects, Except Landscape and Naval	100	2	14
Surveyors	54	2	6
Civil Engineers	183	2	26
Electrical Engineers	51	0	7
Mechanical Engineers	165	2	18
Petroleum Engineers	223	10	31
Engineers, all other	55	0	7
Architectural and Civil Drafters	-37	-1	-8
Civil Engineering Technicians	39	1	7
Surveying and Mapping Technicians	56	0	8
Geoscientists, Except Hydrologists and Geographers	166	2	15
Geological and Petroleum Technicians	146	4	12
Sales Representatives, Wholesale and Manufacturing	68	2	17
First-Line Supervisors/Mgr of Office and Admin Workers	79	3	22
Bookkeeping, Accounting, and Auditing Clerks	71	2	46
Secretaries	71	1	58
Office Clerks, General	182	10	77
First-Line Supervisors/Mgr of Constr. & Extraction Workers	518	6	174
Carpenters	117	1	54
Cement Masons and Concrete Finishers	106	1	69

**Table B.5 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: West**

	Industry Total	African American	Hispanic
Construction Laborers	357	4	651
Paving, Surfacing, and Tamping Equipment Operators	143	0	81
Operating Engineers & Other Construction Equip Operators	1,177	15	393
Electricians	57	1	18
Plumbers, Pipefitters, and Steamfitters	54	1	20
Fence Erectors	210	2	131
Derrick, Rotary Drill and Service Unit Operators	952	11	450
Roustabouts, Oil and Gas	555	9	333
Helpers and Other Extraction Workers	197	9	108
Mobile Heavy Equipment Mechanics, Except Engines	121	1	40
Industrial Machinery Mechanics	128	3	52
Maintenance and Repair Workers, General	62	2	29
Welders, Cutters, Solderers, and Brazers	104	2	55
Petroleum Pump System & Refinery Operators, and Gaugers	118	5	29
Inspectors, Testers, Sorters, Samplers, and Weighers	46	1	25
Truck Drivers, Heavy and Tractor-Trailer	425	17	254
Crane and Tower Operators	102	4	31
Excavating and Loading Machine and Dragline Operators	227	1	86
Laborers and Freight, Stock, and Material Movers, Hand	215	11	121
Pump Operators and Wellhead Pumpers	284	5	93
Other Management, Business and Financial	227	4	56
Other Professional and Related	758	20	113
Other Service	71	3	33
Other Sales and Related	126	4	37
Other Office & Administrative Support	145	8	63
Other Skilled Blue-collar	754	19	274
Other Semi-skilled Blue Collar	312	10	195
Other Unskilled Blue Collar	127	3	79

Note: Negative numbers indicate a decline in baseline employment in an occupation over the period.

**Table B.6**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Alaska**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	7,295	64	483
Management, Business and Financial	491	1	16
Professional and Related	947	2	21
Service	20	0	1
Sales and Related	111	0	3
Office & Administrative Support	433	5	29
Skilled Blue-collar	2,521	16	178
Semi-skilled Blue Collar	2,510	36	198
Unskilled Blue Collar	261	4	37
General and Operations Managers	111	0	3
Construction Managers	8	0	0
Engineering Managers	16	0	1
Cost Estimators	4	0	0
Accountants and Auditors	95	0	3
Architects, Except Landscape and Naval	3	0	0
Surveyors	4	0	0
Civil Engineers	13	0	0
Electrical Engineers	8	0	0
Mechanical Engineers	25	0	0
Petroleum Engineers	242	1	7
Engineers, all other	35	0	1
Architectural and Civil Drafters	0	0	0
Civil Engineering Technicians	2	0	0
Surveying and Mapping Technicians	7	0	0
Geoscientists, Except Hydrologists and Geographers	137	0	3
Geological and Petroleum Technicians	145	0	3
Sales Representatives, Wholesale and Manufacturing	36	0	1
First-Line Supervisors/Mgr of Office and Admin Workers	39	0	2
Bookkeeping, Accounting, and Auditing Clerks	73	0	5
Secretaries	92	1	7

**Table B.6 (continued)**  
**Incremental Employment Outlook Due to Baseline Projected Growth and**  
**Replacement Requirements in the Upstream Oil and Natural Gas Industry,**  
**2010-2030: Alaska**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Office Clerks, General	102	2	7
First-Line Supervisors/Mgr of Constr. & Extraction Workers	302	1	18
Carpenters	7	0	0
Cement Masons and Concrete Finishers	1	0	0
Construction Laborers	58	0	13
Paving, Surfacing, and Tamping Equipment Operators	4	0	0
Operating Engineers & Other Construction Equip Operators	146	1	8
Electricians	56	0	3
Plumbers, Pipefitters, and Steamfitters	34	0	2
Fence Erectors	5	0	0
Derrick, Rotary Drill and Service Unit Operators	1,543	14	109
Roustabouts, Oil and Gas	892	10	96
Helpers and Other Extraction Workers	293	6	21
Mobile Heavy Equipment Mechanics, Except Engines	53	0	3
Industrial Machinery Mechanics	169	2	10
Maintenance and Repair Workers, General	59	0	3
Welders, Cutters, Solderers, and Brazers	93	1	8
Petroleum Pump System & Refinery Operators, and Gaugers	122	2	6
Inspectors, Testers, Sorters, Samplers, and Weighers	49	1	4
Truck Drivers, Heavy and Tractor-Trailer	216	4	21
Crane and Tower Operators	42	0	2
Excavating and Loading Machine and Dragline Operators	43	1	3
Laborers and Freight, Stock, and Material Movers, Hand	112	3	11
Pump Operators and Wellhead Pumpers	324	3	16
Other Management, Business and Financial	257	1	9
Other Professional and Related	325	1	7
Other Service	20	0	1
Other Sales and Related	75	0	2
Other Office & Administrative Support	126	2	8
Other Skilled Blue-collar	488	4	33
Other Semi-skilled Blue Collar	94	2	10
Other Unskilled Blue Collar	86	1	13

## Appendix C. Employment Outlook Associated with Pro-Development Policy

**Table C.1**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2015**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	176,033	12,527	31,992
General and Operations Managers	3,998	139	211
Construction Managers	1,257	48	127
Engineering Managers	1,226	41	51
Cost Estimators	962	18	86
Accountants and Auditors	1,368	76	111
Architects, Except Landscape and Naval	2,224	50	183
Surveyors	1,039	21	61
Civil Engineers	3,748	143	238
Electrical Engineers	1,028	53	69
Mechanical Engineers	1,683	75	112
Petroleum Engineers	1,917	86	168
Engineers, all other	838	27	52
Architectural and Civil Drafters	1,727	75	200
Civil Engineering Technicians	1,025	66	118
Surveying and Mapping Technicians	1,105	25	78
Geoscientists, Except Hydrologists and Geographers	947	41	52
Geological and Petroleum Technicians	1,235	25	90
Sales Representatives, Wholesale and Manufacturing	930	40	90
First-Line Supervisors/Mgr of Office and Admin Workers	927	78	92
Bookkeeping, Accounting, and Auditing Clerks	2,847	197	296
Secretaries	4,905	419	518
Office Clerks, General	3,476	425	530
First-Line Supervisors/Mgr of Constr. & Extraction Workers	6,970	240	1,142
Carpenters	1,055	48	297
Cement Masons and Concrete Finishers	2,154	262	964
Construction Laborers	11,266	800	4,779
Paving, Surfacing, and Tamping Equipment Operators	1,263	141	516
Operating Engineers & Other Construction Equip Operators	8,716	487	1,462
Electricians	804	66	135
Plumbers, Pipefitters, and Steamfitters	658	44	138
Fence Erectors	1,372	56	524
Derrick, Rotary Drill and Service Unit Operators	20,170	1,427	4,389
Roustabouts, Oil and Gas	11,712	847	3,471
Helpers and Other Extraction Workers	4,511	741	421

**Table C.1 (continued)**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2015**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Mobile Heavy Equipment Mechanics, Except Engines	1,269	66	170
Industrial Machinery Mechanics	1,653	136	237
Maintenance and Repair Workers, General	1,222	110	210
Welders, Cutters, Solderers, and Brazers	1,531	127	374
Petroleum Pump System & Refinery Operators, and Gaugers	1,011	89	115
Inspectors, Testers, Sorters, Samplers, and Weighers	1,165	110	189
Truck Drivers, Heavy and Tractor-Trailer	6,760	853	1,406
Crane and Tower Operators	1,134	127	148
Excavating and Loading Machine and Dragline Operators	1,586	69	247
Laborers and Freight, Stock, and Material Movers, Hand	2,152	317	450
Pump Operators and Wellhead Pumpers	3,064	157	451
Other Management, Business and Financial	6,169	277	516
Other Professional and Related	13,871	779	1,066
Other Service	920	140	236
Other Sales and Related	1,587	65	120
Other Office & Administrative Support	3,543	340	422
Other Skilled Blue-collar	11,020	808	2,260
Other Semi-skilled Blue Collar	3,566	441	922
Other Unskilled Blue Collar	1,747	189	682



**Table C.2**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2020**

<b>Occupation</b>	<b>Total</b>	<b>African</b>	
		<b>American</b>	<b>Hispanic</b>
Total	291,323	21,164	62,135
General and Operations Managers	6,026	228	401
Construction Managers	2,405	93	268
Engineering Managers	1,685	58	89
Cost Estimators	1,980	41	199
Accountants and Auditors	2,519	131	231
Architects, Except Landscape and Naval	2,901	67	263
Surveyors	1,382	28	93
Civil Engineers	5,030	195	362
Electrical Engineers	1,360	70	103
Mechanical Engineers	2,302	103	172
Petroleum Engineers	3,998	174	406
Engineers, all other	1,431	54	101
Architectural and Civil Drafters	1,931	85	239
Civil Engineering Technicians	1,341	88	165
Surveying and Mapping Technicians	1,471	35	116
Geoscientists, Except Hydrologists and Geographers	1,934	79	143
Geological and Petroleum Technicians	2,040	47	174
Sales Representatives, Wholesale and Manufacturing	1,601	72	182
First-Line Supervisors/Mgr of Office and Admin Workers	1,514	138	186
Bookkeeping, Accounting, and Auditing Clerks	4,959	373	625
Secretaries	7,904	709	997
Office Clerks, General	6,091	788	1,035
First-Line Supervisors/Mgr of Constr. & Extraction Workers	11,951	437	2,208
Carpenters	2,269	103	687
Cement Masons and Concrete Finishers	4,597	563	2,152
Construction Laborers	23,766	1,772	11,359
Paving, Surfacing, and Tamping Equipment Operators	2,819	318	1,213
Operating Engineers & Other Construction Equip Operators	18,572	1,012	3,518
Electricians	1,223	97	232
Plumbers, Pipefitters, and Steamfitters	1,052	69	243
Fence Erectors	3,085	135	1,330
Derrick, Rotary Drill and Service Unit Operators	29,080	2,062	6,903
Roustabouts, Oil and Gas	17,130	1,249	5,627
Helpers and Other Extraction Workers	6,430	1,077	819

**Table C.2 (continued)**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2020**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Mobile Heavy Equipment Mechanics, Except Engines	2,228	108	349
Industrial Machinery Mechanics	2,650	220	435
Maintenance and Repair Workers, General	2,053	178	401
Welders, Cutters, Solderers, and Brazers	2,330	201	654
Petroleum Pump System & Refinery Operators, and Gaugers	1,765	159	238
Inspectors, Testers, Sorters, Samplers, and Weighers	1,576	155	307
Truck Drivers, Heavy and Tractor-Trailer	11,709	1,481	2,846
Crane and Tower Operators	1,985	224	295
Excavating and Loading Machine and Dragline Operators	3,123	146	599
Laborers and Freight, Stock, and Material Movers, Hand	3,488	512	849
Pump Operators and Wellhead Pumpers	4,976	270	831
Other Management, Business and Financial	10,002	436	951
Other Professional and Related	19,944	1,086	1,655
Other Service	1,529	218	452
Other Sales and Related	2,702	115	251
Other Office & Administrative Support	5,549	555	784
Other Skilled Blue-collar	18,433	1,359	4,176
Other Semi-skilled Blue Collar	6,723	891	1,995
Other Unskilled Blue Collar	2,781	300	1,226

**Table C.3**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2025**

<b>Occupation</b>	<b>Total</b>	<b>African</b>	
		<b>American</b>	<b>Hispanic</b>
Total	304,827	22,548	73,080
General and Operations Managers	6,056	239	471
Construction Managers	2,557	100	311
Engineering Managers	1,561	55	99
Cost Estimators	2,134	46	238
Accountants and Auditors	2,747	141	279
Architects, Except Landscape and Naval	2,558	59	252
Surveyors	1,239	26	93
Civil Engineers	4,564	177	365
Electrical Engineers	1,227	63	103
Mechanical Engineers	2,150	97	178
Petroleum Engineers	4,683	202	519
Engineers, all other	1,482	59	116
Architectural and Civil Drafters	1,553	69	205
Civil Engineering Technicians	1,187	78	156
Surveying and Mapping Technicians	1,321	32	115
Geoscientists, Except Hydrologists and Geographers	2,248	90	190
Geological and Petroleum Technicians	2,233	52	211
Sales Representatives, Wholesale and Manufacturing	1,699	79	221
First-Line Supervisors/Mgr of Office and Admin Workers	1,567	149	226
Bookkeeping, Accounting, and Auditing Clerks	5,263	416	773
Secretaries	7,896	734	1,159
Office Clerks, General	6,413	859	1,218
First-Line Supervisors/Mgr of Constr. & Extraction Workers	12,739	475	2,609
Carpenters	2,481	113	801
Cement Masons and Concrete Finishers	4,948	608	2,415
Construction Laborers	25,939	1,988	13,679
Paving, Surfacing, and Tamping Equipment Operators	3,098	351	1,395
Operating Engineers & Other Construction Equip Operators	20,573	1,123	4,312
Electricians	1,283	102	269
Plumbers, Pipefitters, and Steamfitters	1,103	72	277
Fence Erectors	3,394	156	1,628
Derrick, Rotary Drill and Service Unit Operators	30,602	2,177	7,867
Roustabouts, Oil and Gas	18,071	1,348	6,543
Helpers and Other Extraction Workers	6,650	1,130	1,074

**Table C.3 (continued)**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2025**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Mobile Heavy Equipment Mechanics, Except Engines	2,375	115	420
Industrial Machinery Mechanics	3,005	250	553
Maintenance and Repair Workers, General	2,193	190	474
Welders, Cutters, Solderers, and Brazers	2,431	216	767
Petroleum Pump System & Refinery Operators, and Gaugers	1,987	180	308
Inspectors, Testers, Sorters, Samplers, and Weighers	1,542	159	354
Truck Drivers, Heavy and Tractor-Trailer	12,396	1,593	3,439
Crane and Tower Operators	2,114	239	356
Excavating and Loading Machine and Dragline Operators	3,382	166	764
Laborers and Freight, Stock, and Material Movers, Hand	3,646	541	1,056
Pump Operators and Wellhead Pumpers	5,414	299	1,010
Other Management, Business and Financial	10,376	450	1,102
Other Professional and Related	19,036	1,010	1,716
Other Service	1,565	221	509
Other Sales and Related	2,853	125	313
Other Office & Administrative Support	5,707	586	926
Other Skilled Blue-collar	19,472	1,442	4,826
Other Semi-skilled Blue Collar	7,202	983	2,392
Other Unskilled Blue Collar	2,912	318	1,428

**Table C.4**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2030**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	322,603	24,253	88,295
General and Operations Managers	6,129	250	544
Construction Managers	2,830	109	373
Engineering Managers	1,118	39	84
Cost Estimators	2,434	54	298
Accountants and Auditors	2,998	149	333
Architects, Except Landscape and Naval	1,494	33	158
Surveyors	784	16	64
Civil Engineers	2,859	110	251
Electrical Engineers	803	41	74
Mechanical Engineers	1,472	65	134
Petroleum Engineers	5,647	237	677
Engineers, all other	1,398	61	120
Architectural and Civil Drafters	835	36	116
Civil Engineering Technicians	706	46	98
Surveying and Mapping Technicians	836	20	80
Geoscientists, Except Hydrologists and Geographers	2,644	102	253
Geological and Petroleum Technicians	2,511	57	259
Sales Representatives, Wholesale and Manufacturing	1,895	89	278
First-Line Supervisors/Mgr of Office and Admin Workers	1,609	159	265
Bookkeeping, Accounting, and Auditing Clerks	5,712	474	965
Secretaries	7,725	740	1,303
Office Clerks, General	6,832	953	1,429
First-Line Supervisors/Mgr of Constr. & Extraction Workers	14,322	535	3,212
Carpenters	2,921	131	999
Cement Masons and Concrete Finishers	5,753	705	2,920
Construction Laborers	30,462	2,361	17,580
Paving, Surfacing, and Tamping Equipment Operators	3,680	416	1,729
Operating Engineers & Other Construction Equip Operators	24,496	1,321	5,614
Electricians	1,386	109	318
Plumbers, Pipefitters, and Steamfitters	1,209	78	327
Fence Erectors	4,036	189	2,134
Derrick, Rotary Drill and Service Unit Operators	33,044	2,334	9,124
Roustabouts, Oil and Gas	19,577	1,466	7,751
Helpers and Other Extraction Workers	7,103	1,216	1,392

**Table C.4 (continued)**  
**Projected Jobs Created in the Upstream Oil and Gas Industry: 2030**

<b>Occupation</b>	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
Mobile Heavy Equipment Mechanics, Except Engines	2,681	126	527
Industrial Machinery Mechanics	3,486	289	709
Maintenance and Repair Workers, General	2,431	207	577
Welders, Cutters, Solderers, and Brazers	2,631	237	923
Petroleum Pump System & Refinery Operators, and Gaugers	2,298	208	401
Inspectors, Testers, Sorters, Samplers, and Weighers	1,404	156	376
Truck Drivers, Heavy and Tractor-Trailer	13,921	1,795	4,347
Crane and Tower Operators	2,390	270	447
Excavating and Loading Machine and Dragline Operators	3,925	198	1,024
Laborers and Freight, Stock, and Material Movers, Hand	3,955	586	1,317
Pump Operators and Wellhead Pumpers	6,085	338	1,251
Other Management, Business and Financial	10,281	425	1,218
Other Professional and Related	14,938	723	1,443
Other Service	1,578	217	570
Other Sales and Related	3,050	134	387
Other Office & Administrative Support	5,807	598	1,073
Other Skilled Blue-collar	21,210	1,567	5,745
Other Semi-skilled Blue Collar	8,097	1,132	2,986
Other Unskilled Blue Collar	3,177	346	1,718

**Table C.5**  
**Illustration of Indirect Impacts of Pro-Energy Development Policy:**  
**Projected Jobs Created in Two Industries by Region**

	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
<b>Total</b>				
U.S.	3,835	6,967	7,629	8,396
Alaska	180	475	654	949
West	84	287	480	686
Rockies	489	828	644	544
Gulf	2,599	4,206	4,519	4,932
Central	59	97	133	109
East	424	1,073	1,198	1,177
<b>African American</b>				
U.S.	295	541	574	608
Alaska	0	7	6	8
West	1	8	9	15
Rockies	5	15	9	9
Gulf	254	406	435	463
Central	0	5	4	3
East	35	100	111	110
<b>Hispanic</b>				
U.S.	895	1,873	2,231	2,666
Alaska	12	35	51	75
West	23	112	203	311
Rockies	133	255	207	183
Gulf	683	1,326	1,586	1,897
Central	3	11	14	11
East	41	134	170	189

Jobs created in the 'Mining and Oil & Gas Field Machinery Manufacturing' and 'Maintenance and Repair Construction of Nonresidential Structures' industries.

**Table C.6**  
**Illustration of Indirect Impacts of Pro-Energy Development Policy:**  
**Projected Jobs Created in Two Industries by Broad Occupation**

	2015	2020	2025	2030
	Total			
Total	3,835	6,967	7,629	8,396
Management, Business and Financial	508	990	1,108	1,256
Professional and Related	265	435	461	485
Service	15	26	28	30
Sales and Related	70	110	115	118
Office & Administrative Support	362	651	706	770
Skilled Blue-collar	1,284	2,539	2,850	3,241
Semi-skilled Blue Collar	852	1,251	1,278	1,262
Unskilled Blue Collar	479	964	1,082	1,234
	African American			
Total	295	541	574	608
Management, Business and Financial	19	40	43	47
Professional and Related	13	25	24	23
Service	1	3	3	3
Sales and Related	2	4	4	4
Office & Administrative Support	36	69	70	79
Skilled Blue-collar	74	150	166	177
Semi-skilled Blue Collar	109	163	167	166
Unskilled Blue Collar	41	86	97	109
	Hispanic			
Total	895	1,873	2,231	2,666
Management, Business and Financial	51	116	140	175
Professional and Related	23	43	44	52
Service	5	10	11	14
Sales and Related	7	14	19	21
Office & Administrative Support	51	113	138	168
Skilled Blue-collar	341	736	881	1,071
Semi-skilled Blue Collar	187	331	389	449
Unskilled Blue Collar	230	511	609	716

Jobs created in the 'Mining and Oil & Gas Field Machinery Manufacturing' and 'Maintenance and Repair Construction of Nonresidential Structures' industries.



## Appendix D. Employment Outlook Combining Pro-Development Policy with Baseline Growth and Replacement Requirements

Table D.1

### Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry Due to Baseline Growth and Replacement and Pro-Development Policy, 2010-2030: Gulf

	Industry Total	African American	Hispanic
Total	417,705	42,062	137,924
Management, Business and Financial	32,288	2,840	6,064
Professional and Related	60,603	4,802	8,352
Service	1,585	317	621
Sales and Related	6,544	677	1,632
Office & Administrative Support	29,241	4,464	9,222
Skilled Blue-collar	145,890	13,100	50,733
Semi-skilled Blue Collar	112,282	11,678	40,754
Unskilled Blue Collar	29,271	4,184	20,546
General and Operations Managers	6,594	485	1,224
Construction Managers	1,820	84	387
Engineering Managers	1,291	42	178
Cost Estimators	1,565	37	242
Accountants and Auditors	5,634	577	974
Architects, Except Landscape and Naval	1,091	32	208
Surveyors	652	39	96
Civil Engineers	2,367	142	328
Electrical Engineers	764	49	105
Mechanical Engineers	1,916	102	266
Petroleum Engineers	13,385	776	1,479
Engineers, all other	2,353	124	332
Architectural and Civil Drafters	381	20	74
Civil Engineering Technicians	509	64	92
Surveying and Mapping Technicians	795	29	154
Geoscientists, Except Hydrologists and Geographers	7,545	357	640
Geological and Petroleum Technicians	6,937	413	1,101
Sales Representatives, Wholesale and Manufacturing	2,158	91	480
First-Line Supervisors/Mgr of Office and Admin Workers	2,311	310	588
Bookkeeping, Accounting, and Auditing Clerks	5,340	570	1,647
Secretaries	7,091	787	2,236
Office Clerks, General	7,267	1,289	2,374
First-Line Supervisors/Mgr of Constr. & Extraction Workers	17,488	880	5,274

**Table D.1 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Gulf**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Carpenters	2,416	137	1,204
Cement Masons and Concrete Finishers	2,984	546	1,963
Construction Laborers	16,691	1,819	13,571
Paving, Surfacing, and Tamping Equipment Operators	2,127	384	982
Operating Engineers & Other Construction Equip Operators	18,258	1,996	6,240
Electricians	2,610	216	830
Plumbers, Pipefitters, and Steamfitters	1,741	149	615
Fence Erectors	2,465	158	1,514
Derrick, Rotary Drill and Service Unit Operators	63,007	4,536	20,986
Roustabouts, Oil and Gas	37,305	2,889	15,599
Helpers and Other Extraction Workers	12,996	1,116	5,740
Mobile Heavy Equipment Mechanics, Except Engines	3,085	220	836
Industrial Machinery Mechanics	7,398	934	2,289
Maintenance and Repair Workers, General	3,210	370	968
Welders, Cutters, Solderers, and Brazers	4,439	489	2,011
Petroleum Pump System & Refinery Operators, and Gaugers	6,212	807	1,378
Inspectors, Testers, Sorters, Samplers, and Weighers	2,233	378	891
Truck Drivers, Heavy and Tractor-Trailer	13,543	2,854	5,826
Crane and Tower Operators	2,524	478	566
Excavating and Loading Machine and Dragline Operators	3,569	361	1,380
Laborers and Freight, Stock, and Material Movers, Hand	5,686	1,373	2,661
Pump Operators and Wellhead Pumpers	15,188	498	3,342
Other Management, Business and Financial	15,384	1,615	3,059
Other Professional and Related	21,908	2,655	3,477
Other Service	1,585	317	621
Other Sales and Related	4,386	586	1,152
Other Office & Administrative Support	7,232	1,508	2,377
Other Skilled Blue-collar	27,756	2,932	8,568
Other Semi-skilled Blue Collar	8,083	1,608	3,999
Other Unskilled Blue Collar	4,430	834	2,800

**Table D.2**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: East**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	139,273	13,145	18,714
Management, Business and Financial	10,949	949	740
Professional and Related	22,587	1,729	1,126
Service	781	157	160
Sales and Related	2,178	221	190
Office & Administrative Support	11,280	1,841	1,250
Skilled Blue-collar	50,489	3,876	5,348
Semi-skilled Blue Collar	25,265	2,477	2,382
Unskilled Blue Collar	15,744	1,895	7,518
General and Operations Managers	2,352	192	155
Construction Managers	1,038	55	88
Engineering Managers	740	26	27
Cost Estimators	1,067	29	55
Accountants and Auditors	1,297	145	79
Architects, Except Landscape and Naval	1,307	44	113
Surveyors	645	27	23
Civil Engineers	2,381	136	102
Electrical Engineers	627	43	34
Mechanical Engineers	1,319	55	54
Petroleum Engineers	2,183	20	28
Engineers, all other	724	37	37
Architectural and Civil Drafters	488	26	24
Civil Engineering Technicians	587	74	43
Surveying and Mapping Technicians	675	37	24
Geoscientists, Except Hydrologists and Geographers	1,185	67	38
Geological and Petroleum Technicians	1,089	95	10
Sales Representatives, Wholesale and Manufacturing	803	38	46
First-Line Supervisors/Mgr of Office and Admin Workers	787	123	73
Bookkeeping, Accounting, and Auditing Clerks	2,117	247	183
Secretaries	3,052	416	310
Office Clerks, General	2,864	541	366
First-Line Supervisors/Mgr of Constr. & Extraction Workers	6,023	322	626
Carpenters	1,424	87	373
Cement Masons and Concrete Finishers	2,128	428	897

**Table D.2 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: East**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	10,548	1,143	6,008
Paving, Surfacing, and Tamping Equipment Operators	1,582	151	376
Operating Engineers & Other Construction Equip Operators	11,181	836	970
Electricians	586	50	61
Plumbers, Pipefitters, and Steamfitters	551	48	87
Fence Erectors	1,913	109	663
Derrick, Rotary Drill and Service Unit Operators	12,393	371	321
Roustabouts, Oil and Gas	7,314	211	0
Helpers and Other Extraction Workers	2,633	89	146
Mobile Heavy Equipment Mechanics, Except Engines	1,191	76	96
Industrial Machinery Mechanics	1,367	175	219
Maintenance and Repair Workers, General	945	90	37
Welders, Cutters, Solderers, and Brazers	1,143	135	179
Petroleum Pump System & Refinery Operators, and Gaugers	949	107	46
Inspectors, Testers, Sorters, Samplers, and Weighers	666	111	86
Truck Drivers, Heavy and Tractor-Trailer	5,552	1,041	826
Crane and Tower Operators	1,047	142	84
Excavating and Loading Machine and Dragline Operators	1,908	95	192
Laborers and Freight, Stock, and Material Movers, Hand	1,895	378	323
Pump Operators and Wellhead Pumpers	2,477	119	113
Other Management, Business and Financial	4,455	502	336
Other Professional and Related	9,377	1,068	596
Other Service	781	157	160
Other Sales and Related	1,375	183	144
Other Office & Administrative Support	2,461	514	318
Other Skilled Blue-collar	9,053	978	1,066
Other Semi-skilled Blue Collar	3,643	691	929
Other Unskilled Blue Collar	1,387	265	524

**Table D.3**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Central**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	44,571	2,386	4,992
Management, Business and Financial	2,988	150	188
Professional and Related	6,799	295	318
Service	231	27	37
Sales and Related	708	41	52
Office & Administrative Support	3,058	315	324
Skilled Blue-collar	16,586	687	1,603
Semi-skilled Blue Collar	10,718	635	1,193
Unskilled Blue Collar	3,483	236	1,277
General and Operations Managers	684	29	45
Construction Managers	162	5	20
Engineering Managers	207	6	5
Cost Estimators	244	1	10
Accountants and Auditors	398	25	22
Architects, Except Landscape and Naval	357	9	22
Surveyors	183	4	8
Civil Engineers	658	19	22
Electrical Engineers	188	8	9
Mechanical Engineers	443	17	18
Petroleum Engineers	713	21	27
Engineers, all other	199	6	7
Architectural and Civil Drafters	72	2	5
Civil Engineering Technicians	157	9	13
Surveying and Mapping Technicians	190	0	11
Geoscientists, Except Hydrologists and Geographers	405	6	7
Geological and Petroleum Technicians	461	16	22
Sales Representatives, Wholesale and Manufacturing	262	6	13
First-Line Supervisors/Mgr of Office and Admin Workers	264	24	22
Bookkeeping, Accounting, and Auditing Clerks	529	40	45
Secretaries	719	55	66
Office Clerks, General	774	94	87
First-Line Supervisors/Mgr of Constr. & Extraction Workers	1,997	50	128
Carpenters	332	9	56
Cement Masons and Concrete Finishers	371	16	181

**Table D.3 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Central**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	1,741	101	880
Paving, Surfacing, and Tamping Equipment Operators	373	17	51
Operating Engineers & Other Construction Equip Operators	3,138	56	160
Electricians	242	9	17
Plumbers, Pipefitters, and Steamfitters	206	9	15
Fence Erectors	509	13	93
Derrick, Rotary Drill and Service Unit Operators	5,964	325	502
Roustabouts, Oil and Gas	3,415	199	310
Helpers and Other Extraction Workers	1,144	51	153
Mobile Heavy Equipment Mechanics, Except Engines	403	13	22
Industrial Machinery Mechanics	616	32	68
Maintenance and Repair Workers, General	306	13	36
Welders, Cutters, Solderers, and Brazers	453	21	69
Petroleum Pump System & Refinery Operators, and Gaugers	360	11	19
Inspectors, Testers, Sorters, Samplers, and Weighers	258	25	47
Truck Drivers, Heavy and Tractor-Trailer	1,716	127	194
Crane and Tower Operators	352	41	54
Excavating and Loading Machine and Dragline Operators	606	18	55
Laborers and Freight, Stock, and Material Movers, Hand	724	75	125
Pump Operators and Wellhead Pumpers	1,055	19	58
Other Management, Business and Financial	1,292	84	86
Other Professional and Related	2,772	178	147
Other Service	231	27	37
Other Sales and Related	446	35	39
Other Office & Administrative Support	772	102	104
Other Skilled Blue-collar	2,996	155	295
Other Semi-skilled Blue Collar	1,002	106	306
Other Unskilled Blue Collar	509	47	179

**Table D.4**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Rockies**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	115,685	2,700	36,587
Management, Business and Financial	8,327	253	1,332
Professional and Related	16,323	372	2,002
Service	463	19	190
Sales and Related	1,719	50	387
Office & Administrative Support	8,245	394	2,405
Skilled Blue-collar	43,502	791	15,179
Semi-skilled Blue Collar	29,575	595	9,824
Unskilled Blue Collar	7,531	226	5,268
General and Operations Managers	1,996	64	303
Construction Managers	467	3	96
Engineering Managers	466	10	53
Cost Estimators	377	1	59
Accountants and Auditors	1,164	40	159
Architects, Except Landscape and Naval	620	8	59
Surveyors	317	11	47
Civil Engineers	1,171	19	116
Electrical Engineers	353	7	46
Mechanical Engineers	736	12	95
Petroleum Engineers	2,486	49	227
Engineers, all other	496	12	58
Architectural and Civil Drafters	273	2	50
Civil Engineering Technicians	287	8	57
Surveying and Mapping Technicians	351	1	65
Geoscientists, Except Hydrologists and Geographers	1,340	21	108
Geological and Petroleum Technicians	1,509	15	166
Sales Representatives, Wholesale and Manufacturing	613	11	115
First-Line Supervisors/Mgr of Office and Admin Workers	612	26	154
Bookkeeping, Accounting, and Auditing Clerks	1,512	51	400
Secretaries	2,058	63	590
Office Clerks, General	1,914	120	581
First-Line Supervisors/Mgr of Constr. & Extraction Workers	4,847	40	1,534
Carpenters	504	4	223
Cement Masons and Concrete Finishers	637	8	461

**Table D.4 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Rockies**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	4,051	81	3,213
Paving, Surfacing, and Tamping Equipment Operators	483	3	244
Operating Engineers & Other Construction Equip Operators	4,643	52	1,494
Electricians	710	17	218
Plumbers, Pipefitters, and Steamfitters	503	11	203
Fence Erectors	564	4	391
Derrick, Rotary Drill and Service Unit Operators	19,762	279	7,378
Roustabouts, Oil and Gas	11,343	171	3,233
Helpers and Other Extraction Workers	3,816	44	1,576
Mobile Heavy Equipment Mechanics, Except Engines	864	4	244
Industrial Machinery Mechanics	2,037	53	595
Maintenance and Repair Workers, General	873	30	264
Welders, Cutters, Solderers, and Brazers	1,268	21	528
Petroleum Pump System & Refinery Operators, and Gaugers	1,211	45	249
Inspectors, Testers, Sorters, Samplers, and Weighers	752	28	282
Truck Drivers, Heavy and Tractor-Trailer	4,045	191	1,676
Crane and Tower Operators	738	16	200
Excavating and Loading Machine and Dragline Operators	935	7	317
Laborers and Freight, Stock, and Material Movers, Hand	1,621	81	820
Pump Operators and Wellhead Pumpers	3,483	46	736
Other Management, Business and Financial	3,856	135	662
Other Professional and Related	6,386	207	908
Other Service	463	19	190
Other Sales and Related	1,106	39	272
Other Office & Administrative Support	2,148	134	680
Other Skilled Blue-collar	7,599	229	2,264
Other Semi-skilled Blue Collar	2,024	87	1,084
Other Unskilled Blue Collar	1,295	60	844



**Table D.5**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: West**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	50,251	1,333	21,570
Management, Business and Financial	3,839	99	688
Professional and Related	5,938	178	795
Service	281	13	134
Sales and Related	819	26	228
Office & Administrative Support	4,055	211	1,333
Skilled Blue-collar	18,969	363	7,981
Semi-skilled Blue Collar	9,023	267	4,689
Unskilled Blue Collar	7,326	176	5,722
General and Operations Managers	801	22	137
Construction Managers	485	7	99
Engineering Managers	159	1	19
Cost Estimators	487	3	90
Accountants and Auditors	496	16	74
Architects, Except Landscape and Naval	240	4	29
Surveyors	132	3	12
Civil Engineers	471	8	60
Electrical Engineers	125	1	14
Mechanical Engineers	303	4	35
Petroleum Engineers	912	51	127
Engineers, all other	229	3	23
Architectural and Civil Drafters	45	0	8
Civil Engineering Technicians	106	3	20
Surveying and Mapping Technicians	137	1	19
Geoscientists, Except Hydrologists and Geographers	496	8	45
Geological and Petroleum Technicians	402	9	39
Sales Representatives, Wholesale and Manufacturing	312	7	75
First-Line Supervisors/Mgr of Office and Admin Workers	276	13	78
Bookkeeping, Accounting, and Auditing Clerks	811	26	223
Secretaries	1,063	46	339
Office Clerks, General	1,096	75	391
First-Line Supervisors/Mgr of Constr. & Extraction Workers	2,383	33	807
Carpenters	693	9	352
Cement Masons and Concrete Finishers	1,068	24	762

**Table D.5 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: West**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Construction Laborers	5,257	121	4,390
Paving, Surfacing, and Tamping Equipment Operators	747	0	481
Operating Engineers & Other Construction Equip Operators	4,975	73	1,661
Electricians	200	5	69
Plumbers, Pipefitters, and Steamfitters	204	5	87
Fence Erectors	876	7	547
Derrick, Rotary Drill and Service Unit Operators	3,414	48	1,735
Roustabouts, Oil and Gas	2,088	34	1,215
Helpers and Other Extraction Workers	798	38	400
Mobile Heavy Equipment Mechanics, Except Engines	474	4	161
Industrial Machinery Mechanics	429	13	177
Maintenance and Repair Workers, General	352	10	158
Welders, Cutters, Solderers, and Brazers	389	8	224
Petroleum Pump System & Refinery Operators, and Gaugers	381	17	117
Inspectors, Testers, Sorters, Samplers, and Weighers	161	5	78
Truck Drivers, Heavy and Tractor-Trailer	2,233	107	1,215
Crane and Tower Operators	415	16	136
Excavating and Loading Machine and Dragline Operators	814	4	305
Laborers and Freight, Stock, and Material Movers, Hand	687	36	411
Pump Operators and Wellhead Pumpers	892	18	339
Other Management, Business and Financial	1,409	50	269
Other Professional and Related	2,340	83	364
Other Service	281	13	134
Other Sales and Related	507	19	153
Other Office & Administrative Support	810	51	302
Other Skilled Blue-collar	3,367	104	1,250
Other Semi-skilled Blue Collar	1,514	55	941
Other Unskilled Blue Collar	507	12	374

**Table D.6**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Alaska**

	<b>Industry Total</b>	<b>African American</b>	<b>Hispanic</b>
Total	43,308	566	3,416
Management, Business and Financial	3,574	22	115
Professional and Related	3,991	23	104
Service	219	4	22
Sales and Related	698	5	24
Office & Administrative Support	3,716	73	194
Skilled Blue-collar	16,511	190	1,232
Semi-skilled Blue Collar	7,642	144	665
Unskilled Blue Collar	6,957	105	1,060
General and Operations Managers	753	5	21
Construction Managers	515	4	19
Engineering Managers	87	0	2
Cost Estimators	440	2	15
Accountants and Auditors	469	3	14
Architects, Except Landscape and Naval	61	0	2
Surveyors	45	0	1
Civil Engineers	164	1	3
Electrical Engineers	43	0	1
Mechanical Engineers	93	1	2
Petroleum Engineers	943	6	31
Engineers, all other	200	2	5
Architectural and Civil Drafters	39	0	1
Civil Engineering Technicians	30	0	1
Surveying and Mapping Technicians	49	0	1
Geoscientists, Except Hydrologists and Geographers	474	2	13
Geological and Petroleum Technicians	368	1	10
Sales Representatives, Wholesale and Manufacturing	266	2	10
First-Line Supervisors/Mgr of Office and Admin Workers	220	4	10
Bookkeeping, Accounting, and Auditing Clerks	784	11	39
Secretaries	1,026	19	50

**Table D.6 (continued)**  
**Incremental Employment Outlook in the Upstream Oil and Natural Gas Industry**  
**Due to Baseline Growth and Replacement and Pro-Development Policy,**  
**2010-2030: Alaska**

	Industry Total	African American	Hispanic
Office Clerks, General	989	26	57
First-Line Supervisors/Mgr of Constr. & Extraction Workers	2,096	15	129
Carpenters	670	5	62
Cement Masons and Concrete Finishers	1,043	24	146
Construction Laborers	5,277	78	848
Paving, Surfacing, and Tamping Equipment Operators	655	14	84
Operating Engineers & Other Construction Equip Operators	4,128	40	260
Electricians	174	1	11
Plumbers, Pipefitters, and Steamfitters	172	1	12
Fence Erectors	722	6	104
Derrick, Rotary Drill and Service Unit Operators	2,850	30	206
Roustabouts, Oil and Gas	1,798	20	192
Helpers and Other Extraction Workers	697	19	49
Mobile Heavy Equipment Mechanics, Except Engines	392	2	22
Industrial Machinery Mechanics	375	5	22
Maintenance and Repair Workers, General	326	4	21
Welders, Cutters, Solderers, and Brazers	325	5	32
Petroleum Pump System & Refinery Operators, and Gaugers	378	7	18
Inspectors, Testers, Sorters, Samplers, and Weighers	109	2	8
Truck Drivers, Heavy and Tractor-Trailer	1,940	44	170
Crane and Tower Operators	341	6	17
Excavating and Loading Machine and Dragline Operators	646	7	46
Laborers and Freight, Stock, and Material Movers, Hand	533	14	44
Pump Operators and Wellhead Pumpers	840	9	45
Other Management, Business and Financial	1,311	8	44
Other Professional and Related	1,482	10	33
Other Service	219	4	22
Other Sales and Related	433	3	14
Other Office & Administrative Support	697	13	38
Other Skilled Blue-collar	2,901	38	212
Other Semi-skilled Blue Collar	1,296	36	133
Other Unskilled Blue Collar	425	7	64





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