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March 2014

# Minority and Female Employment in the Oil & Gas and Petrochemical Industries



Prepared for:



AMERICAN PETROLEUM INSTITUTE



## Minority and Female Employment in the Oil & Gas and Petrochemical Industries

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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 and employment by gender in the oil and natural gas and petrochemical industries over the period 2010 to 2030. Four types of job opportunities are considered:

- New jobs that are projected to be created under a baseline forecast of the expected growth of these industries,
- Job opportunities that will likely be created due to the need to replace workers who retire or otherwise leave these industries over this period,
- Jobs created by projected capital investment in the transportation and storage infrastructure of the oil & gas industry and in the petrochemical industry, and
- Jobs that would be created under a scenario for more accelerated development of the upstream oil and gas industry.

The report first presents data on employment by occupation, race/ethnicity, gender, and region in the upstream, midstream and downstream segments of the oil & gas industry and in the petrochemical industry in the base year of our forecast period (2010).<sup>1</sup> Principal findings of this analysis are as follows:

- The three segments of the U.S. oil & gas industry and the petrochemical industry together employed a total of 1.2 million people in 2010.
- The upstream segment, with employment of 721 thousand, accounted for 60% of the total, followed by the downstream segment with 23%.
- African American workers held 98 thousand jobs in these industries in 2010, accounting for 8.2% of total employment.
- Hispanic workers held 188 thousand jobs across all four industry segments – 15.7% of the total. They accounted for a higher share of employment in the upstream segment than in the other segments.
- Women accounted for 19% of total employment in the combined oil & gas and petrochemical industries. Their shares are higher in the downstream and petrochemical segments (25%) and lower in the upstream and midstream segments (15-16%).

We next present forecasts of the employment outlook in these industries by occupation, race/ethnicity and gender; we also consider job opportunities associated with replacement demand. The forecasts presented here rely on projections of the growth of

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<sup>1</sup> The upstream segment includes oil and gas exploration and production; midstream is pipeline transportation; and downstream includes refining, wholesale distribution and petroleum products manufacturing. Note that we do not include retail gasoline stations in our analysis of the downstream segment – an industry with employment of over 800 thousand in 2010.

population, labor force and employment for these two minority groups through 2030 that we produced in our 2012 report for API, taking into account expected trends in their labor force participation rates, educational attainment, and unemployment rates. We supplement that analysis here with an analysis of trends in female employment by occupation, in total and in the two minority groups. We present only direct employment impacts in this report. If indirect and induced effects were considered, the total job impacts would be significantly larger. Our principal findings are as follows:

Projected Job Growth in the Oil & Gas and Petrochemical Industries

- We project a total of nearly **1.3 million direct job opportunities over the 2010-2030 period**, considering all types of job growth.
- Of those job opportunities, we project that African American and Hispanic workers will account for nearly 408 thousand jobs, or 32%, in 2030.
- We project women could account for 185 thousand of these job opportunities in the oil & gas and related industries through 2030 when growth through pro-development policy is combined with baseline growth, replacement requirements, and the impact of capital investment.

**Projected Job Opportunities in the Oil & Gas and Petrochemical Industries \***

	African American	Hispanic	Minority	Total Jobs	Female
<b><u>Increment 2010 to 2020</u></b>					
Baseline (Growth, Replacement Requirements, and Capital Expenditures)	53,709	138,198	191,907	664,036	100,586
Total (Baseline plus Pro-Development Policy)	73,440	202,408	275,848	955,359	142,932
<b><u>Increment 2010 to 2030</u></b>					
Baseline (Growth, Replacement Requirements, and Capital Expenditures)	78,584	218,738	297,322	941,535	142,600
Total (Baseline plus Pro-Development Policy)	100,228	307,310	407,538	1,264,138	184,970

\*"Minority" here and throughout the study refers to the sum of African American and Hispanic. African American, Hispanic, Minority and Total columns include females.

### Job Opportunities for Minorities

- Hispanic employment growth in the oil & gas industry is projected to show larger gains due to the 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.
- African American and Hispanic workers are projected to make up nearly 20% of the management, business, and financial job opportunities through 2030.
- There will be tremendous opportunities for workers in blue collar occupations as these jobs will make up the bulk of job opportunities through 2030.
- The share of minorities employed in the upstream, midstream, and downstream oil and gas and petrochemicals industries is rising. Minority employment will rise from one-quarter of the total in 2010 to one-third of the total in 2030.

### Female Employment Growth in the Industry

- Women will share in the growth of more skilled white collar jobs in the industry. Opportunities will exist for female petroleum engineers, managers, and other professionals, with the number of job opportunities projected for women in these areas growing by almost 70 thousand from 2010-2030.
- The already-low shares of women in the semi-skilled and unskilled blue-collar occupational groups are projected to decline further, which will hold down the overall increase in female employment in the industry. However, there is significant potential for female blue collar employment due to the large number of job opportunities projected in blue collar positions; interest and training need to exist to increase female participation in these areas.
- The share of women in the traditionally female-dominated 'Office and Administrative Support' (OAS) category in the oil and gas industry will fall over the forecast period, although this category remains a large source of potential job opportunities for women
- Nearly as many jobs will be added for women in the 'Management, Business and Financial' and 'Professional and Related' occupational categories as in the OAS category over this period.

### Job Growth by Occupation

- Our estimates of job growth by occupation suggest that 63% of all job opportunities created over the forecast period will be blue collar jobs. This suggests tremendous opportunity for workers with a high school diploma and some post-secondary training.
- A significant share of the potential jobs—about 23%—would be in scientific and managerial occupations, e.g., petroleum engineers, most of which require a college degree.



**Total Projected Minority and Female Job Opportunities in the Oil & Gas  
and Petrochemical Industries, 2010-2030,  
by Broad Occupational Category\***

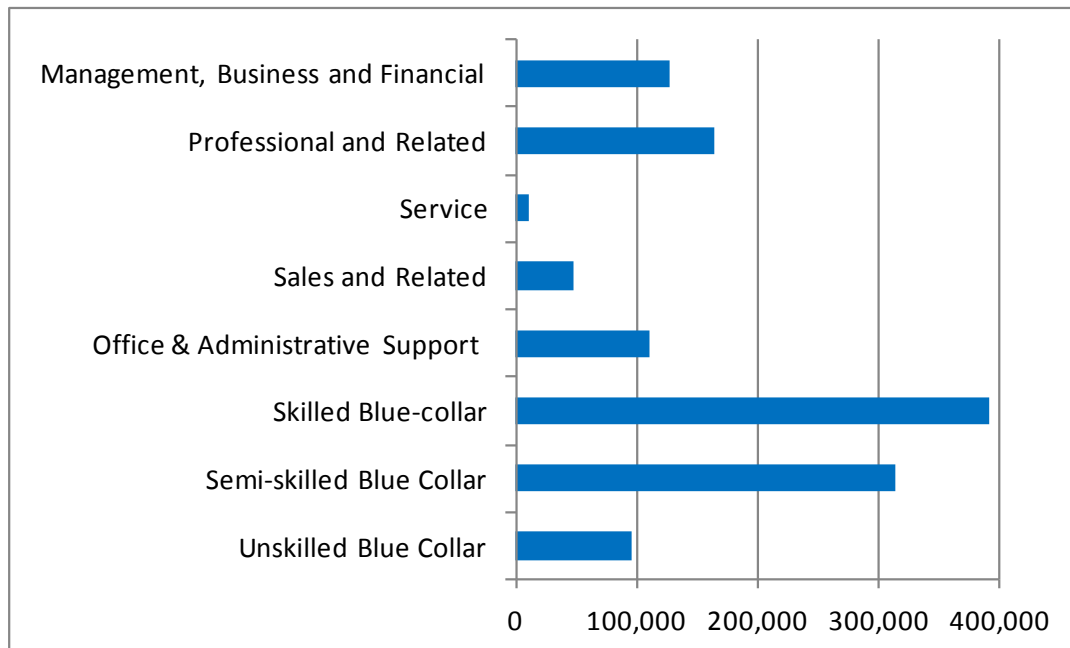
**(Combining Pro-Development Policy with Baseline Growth, Replacement, and Capital Investment)**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>	<b>Female</b>
<b>Total</b>	100,228	307,310	1,264,138	184,970
Management, Business and Financial	7,876	15,433	127,157	34,863
Professional and Related	10,006	16,792	164,946	33,965
Service	1,684	2,769	11,912	3,135
Sales and Related	3,325	6,350	48,043	9,782
Office & Administrative Support	12,633	22,062	110,293	73,362
Skilled Blue-collar	25,769	100,197	391,434	8,133
Semi-skilled Blue Collar	28,863	92,721	314,861	16,382
Unskilled Blue Collar	10,072	50,986	95,492	5,348

\* African American, Hispanic and Total columns include females.

**Projected Job Opportunities in the Oil and Natural Gas and Petrochemical  
Industries, 2010-2030, by Broad Occupational Category**

**(Combining Pro-Development Policy with Baseline Growth, Replacement, and Capital Investment)**



Specific occupational categories with the largest number of jobs in the oil & gas and related industries are listed on the following page. Job descriptions for these occupations are provided in Appendix G.

## Top Occupations in the Oil & Gas and Related Industries

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### Management, Business and Financial

General and Operations Managers  
Construction Managers  
Engineering Managers  
Cost Estimators  
Accountants and Auditors

### Professional and Related

Architects  
Surveyors  
Civil Engineers  
Electrical Engineers  
Mechanical Engineers  
Petroleum Engineers  
Engineers, all other  
Architectural and Civil Drafters  
Civil Engineering Technicians  
Surveying and Mapping Technicians  
Geoscientists  
Geological and Petroleum Technicians

### Service

Security Guards  
Janitors and Building Cleaners

### Sales & Related

Sales Representatives, Wholesale & Manuf.

### Office & Administrative Support

First-Line Supervisors, Office and Admin. Support  
Bookkeeping, Accounting, and Auditing Clerks  
Secretaries and Administrative Assistants  
Office Clerks, General

### Skilled Blue Collar

First-Line Supervisors of Constr. & Extraction Workers  
Carpenters  
Cement Masons and Concrete Finishers  
Paving, Surfacing, and Tamping Equipment Operators  
Operating Engineers & Other Constr. Equipment Operators  
Electricians  
Plumbers, Pipefitters, and Steamfitters  
Derrick, Rotary Drill and Service Unit Operators  
Mobile Heavy Equipment Mechanics, Except Engines  
Industrial Machinery Mechanics  
Maintenance and Repair Workers, General  
Petroleum Pump System Operators, Refinery Operators  
Crane and Tower Operators  
Pump Operators and Wellhead Pumps

### Semi-skilled Blue Collar

Roustabouts, Oil and Gas  
Helpers, 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  
Freight, Stock & Material Movers, Hand

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## I. Introduction

In 2012 IHS Global Inc. (IHS) prepared a report for API on the number and types of jobs that could be created by the accelerated development of North American hydrocarbon resources over the next 20 years for African American and Hispanic workers. That analysis focused on the upstream oil and natural gas industry. In this report, we expand that analysis to include the midstream and downstream segments of the oil and gas industry, the petrochemical industry, and the employment impact of capital investment in the transportation and storage infrastructure for the oil & gas industry and in the petrochemical industry. In addition, we develop estimates and projections of employment by gender in all segments analyzed.

We consider four types of job growth:

1. New jobs that are projected to be created under a baseline forecast of the expected growth of these industries. We present projections of employment by occupation, race/ethnicity, and gender in three industry segments: upstream oil and gas industry, midstream oil and gas industry, and petrochemical industry. We present estimates of current (2010) employment but no projections for the downstream oil and gas industry, because employment in this segment is expected to be stable.
2. Jobs that will likely be created due to the need to replace workers who retire or otherwise leave these industries over this period. We present projections of replacement requirements for the upstream, midstream and downstream oil and gas industry and for the petrochemical industry. (Since we estimate only net new job creation when we analyze the employment impacts of capital investment in various sectors, analysis of replacement requirements is not relevant in these instances.)
3. Jobs created by capital investment in the transportation and storage infrastructure for the oil and gas industry and in the petrochemical industry. In each case, we project employment by occupation, race/ethnicity, and gender in the industries that contribute directly to these capital expenditures.
4. Jobs that would be created under a scenario for more accelerated development of the upstream oil and gas industry. We present estimates that were developed in our 2012 report for API on occupational employment in the oil and natural gas industry and extend that analysis with projections of employment by gender.

Our analysis and projections of employment in the oil and gas and related industries spans six industry segments. However, as is evident from the summary above, not all four types of employment estimates are made for each industry segment.

The six industry segments and the data we present for each are as follows:

Upstream oil and natural gas industry:

- estimates of base-year (2010) employment
- projections of baseline employment growth through 2030
- projections of replacement requirements through 2030
- projections of additional jobs that would be created under a scenario for more accelerated development of U.S. oil and natural gas resources

Midstream oil and natural gas industry:

- estimates of base-year (2010) employment
- projections of employment growth through 2030
- projections of replacement requirements through 2030

Downstream oil and natural gas industry:

- estimates of base-year (2010) employment
- projections of replacement requirements through 2030

Petrochemical industry:

- estimates of base-year (2010) employment
- projections of baseline employment growth through 2030
- projections of replacement requirements through 2030

Capital Investment in oil and natural gas transportation and storage infrastructure:

- projections of employment growth from 2015 through 2030

Capital Investment in the petrochemical industry:

- projections of employment growth from 2015 through 2030

In the following section, we provide an overview of the sources and methods used in the analysis. This is followed by sections devoted to the base-year (2010) estimates and the employment projections to 2030. Additional detailed results are presented in appendices to the report.

## **II. Sources and Methods of Employment Estimates**

The employment estimates presented in this report include only the direct employment in oil & gas and petrochemical industry operations and the direct employment stimulated by capital expenditures in these industries. If indirect and induced effects were considered, the total job impacts would be significantly larger.

Our benchmark employment estimates for industries that comprise the various segments of the oil & gas and related industries are drawn from government surveys of establishments and, thus, exclude the self-employed. In the upstream oil and gas industry in particular, including the self-employed would boost employment totals. Employment figures include both full-time and part-time workers.

### ***Definition of Industry Segments***

Each of the segments of the oil and gas and related industries analyzed in this report is defined as a group of industries based on the North American Industry Classification System (NAICS). To develop estimates of employment by occupation, minority group and gender for the three segments of the oil and natural gas industry and for the petrochemical industry, we first gather data on total employment, nationally and by region, in the industries that make up that industry segment for 2010 – the base historical year for data presented in our 2012 report for API.

The primary source of these 2010 employment data is the IMPLAN model. However, IMPLAN employment in each industry was also cross-checked against the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages, and where IMPLAN industry definitions are not sufficiently detailed to measure an industry segment, we use the BLS data.

We then use data from the 2007-2011 public-use microdata file of the American Community Survey (ACS) to estimate the distribution of employment by minority group and gender within occupations in each NAICS industry within a segment of the oil and gas industry. The composition of employment across these demographic dimensions generally changes only slowly, and this five-year database provides a very large survey sample, which is necessary in order to estimate employment in narrowly defined cells of the labor force like those we seek to measure.

The IMPLAN model and the ACS both use industry classification systems that are based on the NAICS, but each uses its own industry numbering system, and they define industries at different levels of detail (e.g., 4-digit, 3-digit and 2-digit NAICS). Below we list the NAICS industry definition for each industry segment and indicate the ACS Census Bureau industry code that we use to estimate the distribution of employment by occupation, race/ethnicity and gender.

The identification of the NAICS industries used to define each industry segment was guided by several other studies of the impact of oil and natural gas industry activity. For all industry segments, the projections of employment by occupation, race/ethnicity, and gender that we develop are linked to projections of total employment at the industry level from one of these economic impact studies. The discussion of each segment below identifies the source of these industry level employment estimates and projections.

## 1. Upstream Oil and Gas Industry

- NAICS 2111, Oil and Gas Extraction
  - Census Code 0370 in ACS
- NAICS 2131, Support Activities for Mining [Drilling Oil and Gas Wells (213111), and Support Activities for Oil and Gas Operations (213112)]
  - Census Code 0490 in ACS
- NAICS 2389, Construction, Site Preparation Contractors (23891)
  - Census Code 0770 in ACS
- NAICS 5413 Architectural, Engineering, and Related Services [Engineering Services (54133) and Geophysical Surveying and Mapping Services (54136)]
  - Census Code 7290 in ACS

All estimates and projections of employment in the upstream oil and gas industry reported here, except data on employment by gender, are drawn from our 2012 occupational employment report for API. There, we developed employment estimates consistent with 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 API in the fall of 2011.<sup>2</sup>

Note that the analysis in our 2012 report for API included two industries where there are indirect employment impacts of oil and gas industry development – “Mining and Oil and Gas Field Machinery Manufacturing” and “Maintenance and Repair Construction of Nonresidential Structures.” Data for these two industries are not included in this report. As noted above, we present only direct employment impacts.

## 2. Midstream Oil and Gas Industry

- NAICS 486, Pipeline Transportation
  - Census Code 6270 in ACS

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<sup>2</sup> Wood Mackenzie, *U.S. Supply Forecast and Potential Jobs and Economic Impacts (2012–2030)*,” September 7, 2011.

In a recent study for API, IHS developed comprehensive estimates and projections of the investment in oil and gas transportation and storage infrastructure that will be required through 2025 to support the expected growth in U.S. natural gas, natural gas liquids, and crude oil production over this period.<sup>3</sup> We extended these projections of capital investment in transportation infrastructure to 2030 for this report. We then developed forecasts of employment in pipeline operations in selected years through 2030 based on the growth of pipeline capacity that will result from the projected capital expenditures.

### 3. Downstream Oil and Gas Industry

- NAICS 32411, Petroleum Refineries
  - Census Code 2070 in ACS
- NAICS 32412, Asphalt Products, and 324191, Miscellaneous Petroleum Products
  - Census Code 2090 in ACS
- NAICS 4247, Petroleum and Petroleum Product Merchant Wholesalers
  - Census Code 4490 in ACS
- NAICS 45431, Fuel Dealers
  - Census Code 5680 in ACS

Industries that make up the downstream oil and gas industry are identified in an economic impact report prepared for API by PWC.<sup>4</sup> In our analysis, we exclude retail gasoline stations – an industry with employment of over 800,000 in 2010.

We report employment in 2010 in the downstream industry segment by gender within each minority group for the eight broad occupational categories in six major regions and nationally. Estimates of total employment for two industries, Petroleum Refineries and Miscellaneous Petroleum and Coal Products, were drawn from IMPLAN data for 2010. Employment estimates for Fuel Dealers and Petroleum and Petroleum Product Merchant Wholesalers were based on BLS QCEW data, since the IMPLAN model includes these industries within more broadly defined industries.

### 4. Petrochemical Industry

- NAICS 325211, Plastic Material and Resin Manufacturing
  - Census Code 2170 in ACS
- NAICS 32531, Fertilizer Manufacturing
  - Census Code 2180 in ACS

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<sup>3</sup> IHS, *Oil & Natural Gas Transportation & Storage Infrastructure: Status, Trends, & Economic Benefit*, report prepared for American Petroleum Institute, December 2013.

<sup>4</sup> PWC, *Economic Impacts of the Oil and Natural Gas Industry on the US Economy in 2011*, report prepared for American Petroleum Industry, July 2013.

- NAICS 32511, Petrochemical Manufacturing [Alkalies and Chlorine Manufacturing (325181) and Other Basic Chemical Manufacturing (32519)]
  - Census Code 2290 in ACS

Our analysis of occupational employment in the petrochemical industry is based on data drawn from a study of the unconventional oil and natural gas value chain conducted by IHS in 2013, which assessed the economic contributions associated with the capital and operational expenditures required to build out midstream and downstream energy and the energy-related chemicals industrial base to support the expansion of unconventional oil and gas.<sup>5</sup> We report employment in the petrochemical industry segment by gender within each minority group for eight broad occupational categories in six major regions and nationally. Employment estimates for 2010, which were not included in the IHS Manufacturing Renaissance report, are based on IMPLAN data.

## 5. Capital Investment in the Petrochemical Industry

- NAICS 23, Construction of Nonresidential Structures
  - Census Code 0770 in ACS
- NAICS 326122, Plastic Pipe and Fitting Manufacturing
  - Census Code 2370 in ACS
- NAICS 3273, Cement and Concrete Products
  - Census Code 2570 in ACS
- NAICS 3324, Metal Tank Manufacturing
  - Census Code 2870 in ACS
- NAICS 3329, Pipe, Valves and Fittings Manufacturing
  - Census Code 2980 in ACS
- NAICS 3333, Commercial Industry Machinery Manufacturing
  - Census Code 3090 in ACS
- NAICS 333611 Turbine and Turbine Generator Sets Manufacturing
  - Census Code 3180 in ACS
- NAICS 334513, Machinery Manufacturing
  - Census Code 3190 in ACS
- NAICS 3345, Instruments and Controls
  - Census Code 3380 in ACS
- NAICS 5413 Architectural, Engineering, and Related Services
  - Census Code 7290 in ACS

In the August 2013 *Manufacturing Renaissance* study, IHS estimated that by 2025, as much as \$100 billion will have been invested in new chemical, plastics, and related derivative manufacturing facilities in the United States. While the unconventional

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<sup>5</sup> IHS, *America's New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy, Volume 3: Manufacturing Renaissance*, August 2013



revolution will affect all parts of the petrochemical industry, the impact will be most profound in four segments: Ethylene (olefins), Propylene (olefins), Methanol, and Nitrogen Fertilizers (Ammonia).<sup>6</sup>

Much of this new investment will involve foreign production shifting back to the U.S. Ethylene producers, confident of an extended period of low natural gas prices, have already signaled their intentions to increase capacity, reversing the trend of closing plants in the United States during the first decade of this century.<sup>7</sup> The Canadian producer Methanex Corp. based in Vancouver, British Columbia, is moving two 1 million ton methanol units from Chile to Louisiana, and Orascom Construction Industries of Egypt is building a new nitrogen fertilizer plant in southeast Iowa — the first world scale natural gas-based fertilizer plant built in the United States in nearly 25 years.<sup>8</sup>

However, these projected investments in the petrochemical industry do not encompass the full potential of increases in domestic production associated with cheap natural gas supplies. Over the long term, given expectations that North America will remain a low-cost energy and feedstock source for the chemical industry, the region could return to more downstream manufacturing of durable and non-durable goods based on these low-cost chemicals and plastics. The result will be stronger growth in domestic consumption of basic chemicals and plastics as a result of the “on-shoring” of the manufacturing of certain products produced from polyethylene.<sup>9</sup>

## **6. Capital Investment in Oil & Gas Industry Transportation and Storage Infrastructure**

In the December 2013 study for API cited above, IHS estimated future capital investment needs for oil and gas transportation and storage infrastructure in 20 asset classes, which can be grouped into the following five broad categories:

- Natural Gas
- NGL & LPG
- Crude Oil and Condensate
- Refineries and Refined Products
- Common Infrastructure

The capital investments projected in each of these five categories involve expenditures for the output of the following industries:

- NAICS 221, Utilities (power generation)
  - Census Code 0580 in ACS

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<sup>6</sup> Ibid., p. 40.

<sup>7</sup> Ibid., p. 46.

<sup>8</sup> Ibid., pp. 50,53.

<sup>9</sup> Ibid., p. 39.

- NAICS 236pt, Oil & Gas Pipeline and Related Structures Construction
  - Census Code 0770 in ACS
- NAICS 331, Iron & Steel Mills (pipe manufacturing)
  - Census Code 2670 in ACS
- NAICS 332, Metal Products Manufacturing (valves & fittings, and compressor manufacturing)
  - Census Codes 2870 and 2980 in ACS
- NAICS 333, Machinery Manufacturing (mining and oil field machinery)
  - Census Code 3080 in ACS
- NAICS 541 Professional and Technical Services (architectural, engineering, and related services)
  - Census Code 7290 in ACS

The IHS infrastructure study includes projections of the total direct employment in each of these industries that will be stimulated by the expected capital expenditures. Using these projections as a starting point, we developed corresponding projections of the distribution of employment by gender and for the African American and Hispanic populations. We report employment by gender within each minority group for the eight broad occupational categories and for 20 occupations that account for the largest share of employment in these industries.

### ***Occupational Categories***

The industries to be analyzed here in the midstream and downstream segments of the oil and gas industry and in the petrochemical industry have a different occupational mix than the upstream oil & gas industry, which we analyzed in our 2012 report. Therefore, in each industry segment to be analyzed we identified a different set of detailed occupations that account for a large share of total employment. Since the total employment counts in some segments may not be large, we present data for a smaller number of detailed occupations than were identified in our 2012 report. However, for completeness, as in our 2012 report, all occupations have been grouped into eight aggregate categories, including separate categories for skilled, semi-skilled and unskilled production jobs. Summary tables that show data for all segments of the industry are presented at the level of these eight broad occupations.

As we developed our estimates of employment in all demographic groups using the ACS data, we maintained full detail by gender within each race/ethnicity group within each occupation and industry for each region. However, the small amounts of total oil & gas industry employment in some industries and regions (and, thus, the small sample sizes in the ACS data) limit the extent of detail we can report by gender within minority groups. Nonetheless, across all industry segments, we provide estimates of the overall male/female breakdown of employment at the level of eight major occupations and separately for each region.

## ***Trends in Minority Employment Growth***

The minority categories for which employment estimates are presented here are defined as they were in the report IHS prepared for API in 2012:

- The Hispanic population includes persons of Hispanic origin of all races and citizenry.
- The African American population includes self-identified persons not of Hispanic origin reporting African American or Black alone as a single response to the Census Bureau's question regarding race.

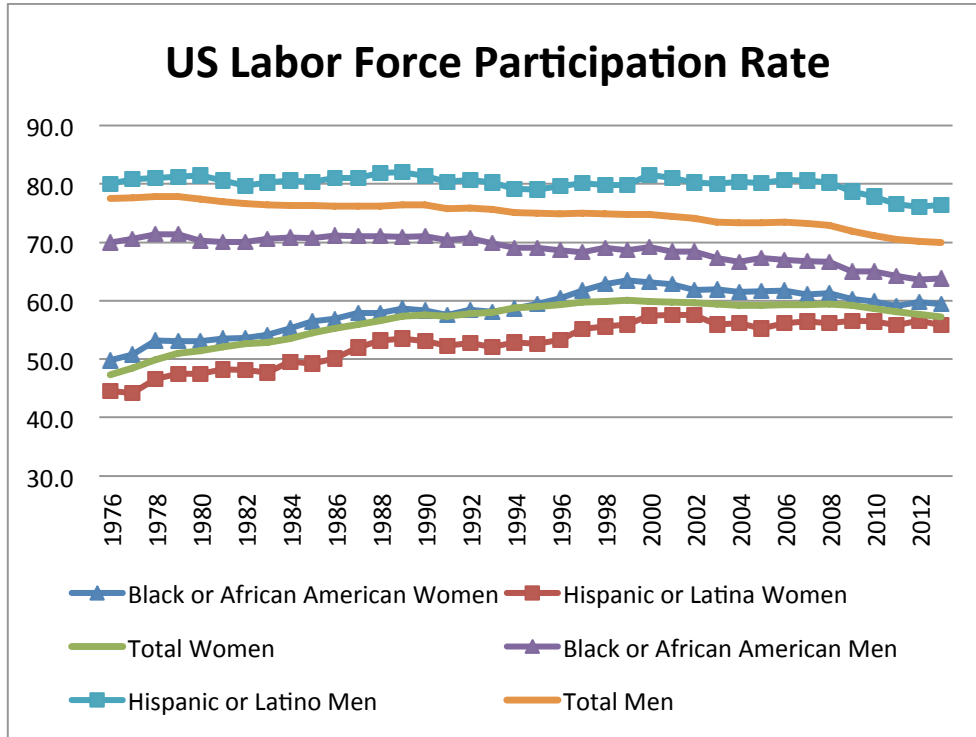
For each of the six segments of the oil and gas and related industries analyzed here, we compiled detailed current data on the incidence of minority employment by occupation using public-use microdata files from the American Community Survey. Our forecasts of the growth of employment of African Americans and Hispanics in all segments of the industry rely on the projections of the population, labor force, unemployment rates, and occupational employment trends for these two minority groups that we produced in our 2012 report for API.

Recent growth in the oil and gas and related industries has been significant in regions where American Indians and other Native populations constitute a larger portion of the population, such as Alaska (20 percent of the population), Oklahoma (13 percent of the population), and the Dakotas (less than 10 percent of the population). The data were not sufficient to develop comprehensive estimates and projections of the employment of American Indians and other Native populations in the oil and gas industry, but in certain regions the growth of the industry will create significant job opportunities for them.

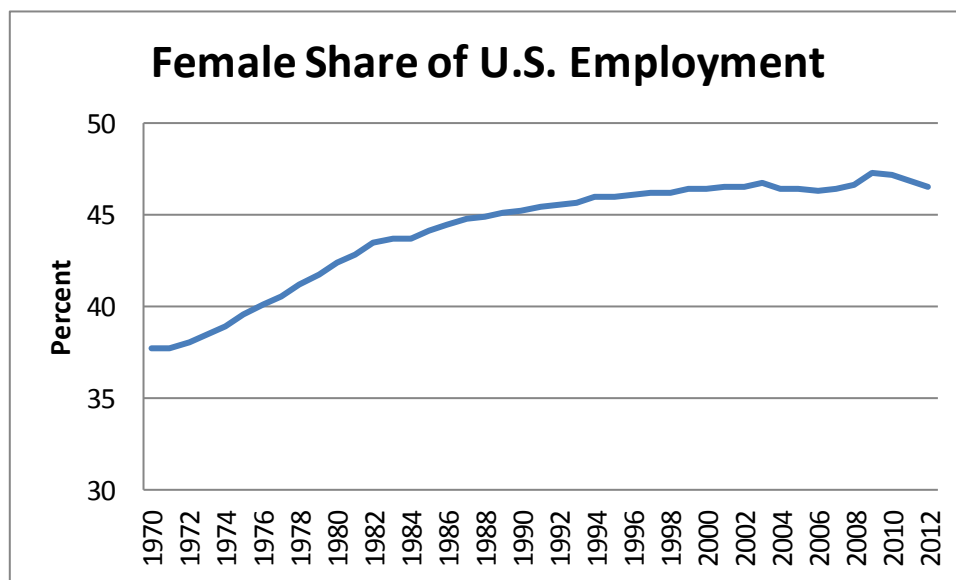
The Asian population is also not analyzed here, although they could have significant employment opportunities in the industry, especially in certain professional and technical occupations given their high incidence of college degrees and in certain regions such as the Monterey Shale.

## ***Trends in Female Employment***

The female labor participation rate rose steadily from the early 1970s through the mid-1990s, but for the next 15 years it was quite stable at a level near 60 percent. The 2008-2009 recession caused a decline to near 58 percent in 2011, but this was likely temporary. At the same time, the male labor participation rate has trended downward – leading to a long-term decline in the overall labor participation rate.



Given these opposing trends, the share of women in total U.S. employment rose steadily from 38 percent in 1970 to 46 percent in the mid-1990s and varied little in a range of 46.5-46.8 percent between 1999 and 2007. Male employment declined more sharply during the recession – boosting the female share of total employment to 47.3 percent in 2009. But that pattern has reversed as the recovery has progressed.



The dynamics of change in female labor participation across different demographic dimensions such as changes in education levels and working mothers with children has been documented extensively.<sup>10</sup> Of most interest for our purposes is identifying trends in the share of women within individual occupational groups. Changes in the Standard Occupational Classification – even at the broadest level – complicate the task of analyzing long-term changes. However, the relative stability of the overall female share of employment over the last 15 years suggests that an analysis focusing on this period should give good clues to possible future trends.

We compiled data on the female shares of employment at the level of 10 broad occupations over the period 2003-2013 using data from public-use microdata files of the March Supplement of the Current Population Survey. Economy-wide, no occupational category showed an increase of the female share of employment of more than 1.1 percentage points over this period. The “Management, Business and Financial Occupations” group showed the biggest gain. The female share of employment fell by 3 percentage points over this period in two occupational groups – “Office and Administrative Support Occupations” and “Production Occupations.”

**Table II.1**  
**Change in the Female Share of Employment by Occupation**  
**Between 2003 and 2013**

<b>Occupational Group</b>	<b>Economy- wide</b>	<b>African American</b>	<b>Hispanic</b>
Management, business, & financial occupations	+1%	0%	+4%
Transportation and material moving occupations	+1%	+2%	0%
Sales and related occupations	+1%	+2%	-1%
Professional and related occupations	0%	0%	+6%
Construction and extraction occupations	0%	-1%	0%
Farming, fishing, and forestry occupations	0%	+3%	-1%
Installation, maintenance, & repair occupations	-1%	-2%	-2%
Service occupations	-1%	-2%	+2%
Office and administrative support occupations	-3%	-5%	+1%
Production occupations	-3%	-3%	-3%

Among all African American workers, women also showed a drop in the latter two occupations. African American women gained share relative to African American men in “Transportation and Material Moving Occupations” and “Sales and Related Occupations.”

<sup>10</sup> BLS, *Women in the Labor Force: A Data Book*, BLS Report 1040, February 2013.

Among Hispanic workers, women posted big gains in the shares of jobs in “Professional and Related Occupations” (up from 55% to 60%) and “Management, Business and Financial Occupations” (up from 44% to 48%).

To project trends in female employment, we extrapolated some of the trends observed in CPS data for the past decade, while maintaining stable shares where little movement was seen over this period.

### ***Replacement Employment***

In addition to projecting the growth of baseline employment in the oil and gas and petrochemical industries, we also project the number of job opportunities that 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 projects the share of employees who were at work in a recent base year that will have to be replaced over the following 10 years.

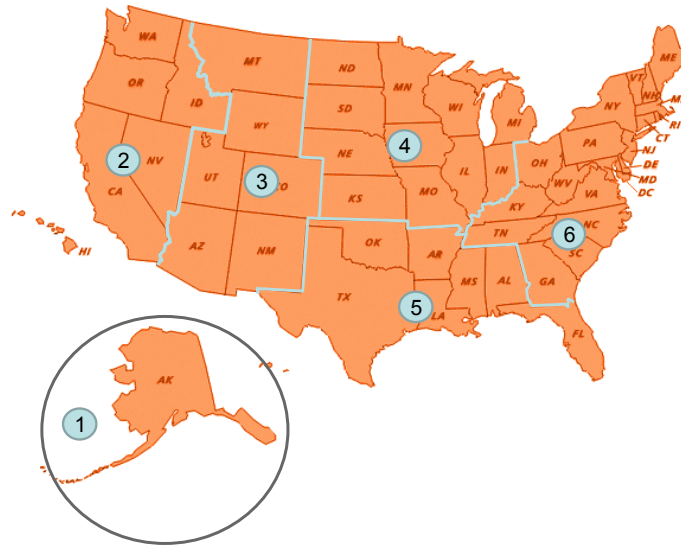
To estimate the number of jobs that will be created in the oil and gas and petrochemical industries due to replacement in 2010-2020, we applied BLS occupation-specific replacement rates to our baseline estimates of employment in the oil and gas and petrochemical industries by occupation in 2010. Job openings due to replacement demand will be even greater in the following decade, 2020-2030, because the wave of baby-boomers approaching retirement in those years (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. The report on employment of minorities in the oil and gas industry that IHS prepared for API in 2012 provides a more detailed description of our replacement employment forecast methodology.

### ***Definition of Regions***

In our 2012 report for API we developed employment estimates by occupation and race/ethnicity for six regions of the country as well as at the national level. Here we present regional estimates of employment in 2010 on the same basis for three other segments of the industry – midstream, downstream and petrochemical. The states included in each region are listed below.

No regional detail was developed in producing the employment projections for any industry segment, because benchmark projections of total employment by region on a comparable basis were not available.

**Figure 1.  
Definition of Regions**



**States in Regions**

Alaska	Alaska
West	California, Hawaii, Idaho, Nevada, Oregon, Washington
Rockies	Arizona, Colorado, Montana, New Mexico, Utah, Wyoming
Central	Iowa, Illinois, Indiana, Kansas, Missouri, Michigan, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin
Gulf	Alabama, Arkansas, Florida, Louisiana, Mississippi, Oklahoma, Texas
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

### III. Minority and Female Employment in the Oil & Gas and Petrochemical Industries in 2010

#### *Employment by Industry*

The three segments of the U.S. oil and gas industry and the petrochemical industry together employed a total of 1.2 million people in 2010 (see Table III.1).

- The upstream segment, with employment of 721 thousand, accounted for 60% of the total, followed by the downstream segment with 23%.
- African American workers held 98 thousand jobs in these industries in 2010, accounting for 8.2% of total employment. Their share within the petrochemical industry was 11.2%.
- Hispanic workers held 188 thousand jobs across all four industry segments – 15.7% of the total. They accounted for a higher share of employment in the upstream segment than in the other segments.

**Table III.1  
African American and Hispanic Employment in the  
Oil & Gas and Petrochemical Industries by Segment: 2010**

	<b>Total</b>				
	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Total</b>	1,198,590	720,911	42,079	279,162	156,438
African American	97,789	57,886	2,262	20,043	17,598
Hispanic	188,088	136,265	4,440	28,426	18,957

#### **Minority Shares by Segment**

	<b>Total</b>				
	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100.0%
African American	8.2%	8.0%	5.4%	7.2%	11.2%
Hispanic	15.7%	18.9%	10.6%	10.2%	12.1%

#### **Shares by Segment in Each Occupation**

	<b>Total</b>				
	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- chemicals</b>
<b>Total</b>	100.0%	60.1%	3.5%	23.3%	13.1%
African American	100.0%	59.2%	2.3%	20.5%	18.0%
Hispanic	100.0%	72.4%	2.4%	15.1%	10.1%



## Employment by Gender

Women accounted for 19% of total employment in the combined oil and gas and petrochemical industries. Their share is higher in the downstream and petrochemical segments (25%) and lower in the upstream and midstream segments (15-16%). (See Table III.2.)

- The female share of employment in these industries is much lower for the Hispanic population – only 13%.
- The incidence of female employment for the African American population in the oil & gas industry generally mirrors the nation-wide pattern for the industry, at a share of 19%. In the midstream industry there is a higher female share.

**Table III.2**  
**Female Employment in the Oil & Gas and Petrochemical Industries by Segment: 2010**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Total</b>	1,198,590	720,911	42,079	279,162	156,438
Female	225,687	110,350	6,840	69,140	39,357
Male	972,903	610,561	35,239	210,022	117,081
Percent Female	19%	15%	16%	25%	25%
	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>African American</b>	97,789	57,886	2,262	20,043	17,598
Female	18,953	9,239	594	4,806	4,314
Male	78,836	48,647	1,668	15,237	13,284
Percent Female	19%	16%	26%	24%	25%
	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Hispanic</b>	188,088	136,265	4,440	28,426	18,957
Female	25,335	13,648	554	5,647	5,486
Male	162,753	122,617	3,886	22,779	13,471
Percent Female	13%	10%	12%	20%	29%

Note: In the detailed tables presented below, some employment cells are not reported because employment levels are small and result in very small sample sizes in the American Community Survey. These cases are identified by a "\*\*\*" entry in the tables.

## ***Employment by Occupation***

The distribution of employment in eight major occupational categories in each of the four segments of the oil & gas and petrochemical industries is shown in Table III.3.

- Across all four industry segments, blue-collar jobs accounted for 57.2% of total employment. More than one-half of these blue-collar jobs were skilled blue-collar jobs.
- The upstream segment has the highest share of blue collar jobs (63% of the segment total) and the highest share of skilled blue-collar jobs (37.6% of all upstream jobs).
- The downstream and petrochemicals segments have higher shares of semi-skilled blue-collar jobs (such as production workers and truck drivers) – 25-30% of the total.

Similar distributions of employment in eight major occupational categories for the African American and Hispanic populations are shown in Tables III.4 and III.5.

- On average across all four segments of the oil & gas and petrochemical industries, the African American population has a slightly lower share of skilled blue-collar jobs and a higher share of semi-skilled blue-collar jobs.
- This difference is related to the African American population's high incidence of semi-skilled employment in the downstream and petrochemical segments.
- Nearly three-quarters of Hispanic workers employed in the oil & gas and petrochemical industries are in blue-collar occupations, with the largest share (35%) in skilled blue-collar jobs.

Table III.6 shows the wide variation in female shares of employment by occupation that underlies the overall female share of 19%.

- Female shares of employment are very low in the blue-collar occupation categories – the categories with the highest shares of total employment in the industry. (An exception is the high share of women in semi-skilled and unskilled blue-collar occupations in the petrochemical segment. Women occupy high shares of various production, assembly and inspector occupations in this segment.)
- Women have higher employment shares in the Office and Administrative Support category and in all management and professional occupational categories.

Data on employment by occupation in individual industries within the oil and gas industry at the level of eight broad occupations and in detailed occupational categories are provided in the appendices.

**Table III.3**  
**Employment in the Oil & Gas and Petrochemical Industries**  
**by Segment and Broad Occupation: 2010**

**Total**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	1,198,590	720,911	42,079	279,162	156,438
Management, Business and Financial	146,229	71,910	7,131	41,898	25,290
Professional and Related	164,441	113,155	5,021	23,246	23,019
Service	12,478	2,751	984	5,124	3,619
Sales and Related	53,780	11,308	436	36,844	5,192
Office & Administrative Support	135,130	67,233	5,125	46,739	16,033
Skilled Blue-collar	354,082	271,287	13,228	43,633	25,934
Semi-skilled Blue Collar	255,457	130,433	6,644	70,993	47,387
Unskilled Blue Collar	76,993	52,834	3,510	10,685	9,964

**Shares by Occupation within Segment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100.0%
Management, Business and Financial	12.2%	10.0%	16.9%	15.0%	16.2%
Professional and Related	13.7%	15.7%	11.9%	8.3%	14.7%
Service	1.0%	0.4%	2.3%	1.8%	2.3%
Sales and Related	4.5%	1.6%	1.0%	13.2%	3.3%
Office & Administrative Support	11.3%	9.3%	12.2%	16.7%	10.2%
Skilled Blue-collar	29.5%	37.6%	31.4%	15.6%	16.6%
Semi-skilled Blue Collar	21.3%	18.1%	15.8%	25.4%	30.3%
Unskilled Blue Collar	6.4%	7.3%	8.3%	3.8%	6.4%

**Shares by Segment in Each Occupation**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-Chemicals</b>
<b>Total</b>	100.0%	60.1%	3.5%	23.3%	13.1%
Management, Business and Financial	100.0%	49.2%	4.9%	28.7%	17.3%
Professional and Related	100.0%	68.8%	3.1%	14.1%	14.0%
Service	100.0%	22.0%	7.9%	41.1%	29.0%
Sales and Related	100.0%	21.0%	0.8%	68.5%	9.7%
Office & Administrative Support	100.0%	49.8%	3.8%	34.6%	11.9%
Skilled Blue-collar	100.0%	76.6%	3.7%	12.3%	7.3%
Semi-skilled Blue Collar	100.0%	51.1%	2.6%	27.8%	18.5%
Unskilled Blue Collar	100.0%	68.6%	4.6%	13.9%	12.9%

**Table III.4**  
**African American Employment in the Oil & Gas and Petrochemical Industries**  
**by Segment and Broad Occupation: 2010**

**Total**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	97,789	57,886	2,262	20,043	17,598
Management, Business and Financial	8,875	5,091	233	2,362	1,189
Professional and Related	11,690	8,010	267	1,503	1,910
Service	1,696	453	64	673	506
Sales and Related	2,357	952	**	1,267	135
Office & Administrative Support	12,169	7,562	615	2,435	1,557
Skilled Blue-collar	25,453	18,900	549	3,499	2,505
Semi-skilled Blue Collar	27,208	11,775	351	6,906	8,176
Unskilled Blue Collar	8,341	5,143	182	1,398	1,618

**Shares by Occupation within Segment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100.0%
Management, Business and Financial	9.1%	8.8%	10.3%	11.8%	6.8%
Professional and Related	12.0%	13.8%	11.8%	7.5%	10.9%
Service	1.7%	0.8%	2.8%	3.4%	2.9%
Sales and Related	2.4%	1.6%	**	6.3%	0.8%
Office & Administrative Support	12.4%	13.1%	27.2%	12.2%	8.8%
Skilled Blue-collar	26.0%	32.7%	24.3%	17.5%	14.2%
Semi-skilled Blue Collar	27.8%	20.3%	15.5%	34.5%	46.5%
Unskilled Blue Collar	8.5%	8.9%	8.1%	7.0%	9.2%

**Shares by Segment in Each Occupation**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	100.0%	59.2%	2.3%	20.5%	18.0%
Management, Business and Financial	100.0%	57.4%	2.6%	26.6%	13.4%
Professional and Related	100.0%	68.5%	2.3%	12.9%	16.3%
Service	100.0%	26.7%	3.8%	39.7%	29.8%
Sales and Related	100.0%	40.4%	**	53.8%	5.8%
Office & Administrative Support	100.0%	62.1%	5.1%	20.0%	12.8%
Skilled Blue-collar	100.0%	74.3%	2.2%	13.7%	9.8%
Semi-skilled Blue Collar	100.0%	43.3%	1.3%	25.4%	30.1%
Unskilled Blue Collar	100.0%	61.7%	2.2%	16.8%	19.4%

**Table III.5**  
**Hispanic Employment in the Oil & Gas and Petrochemical Industries**  
**by Segment and Broad Occupation: 2010**

**Total**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	188,088	136,265	4,440	28,426	18,957
Management, Business and Financial	12,753	7,932	410	2,974	1,437
Professional and Related	13,618	10,053	239	2,005	1,321
Service	2,097	665	123	916	393
Sales and Related	4,042	1,706	**	2,139	189
Office & Administrative Support	16,486	10,697	474	3,886	1,429
Skilled Blue-collar	64,908	54,993	1,278	5,852	2,785
Semi-skilled Blue Collar	49,174	30,680	897	8,191	9,406
Unskilled Blue Collar	25,010	19,539	1,011	2,463	1,997

**Shares by Occupation within Segment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100.0%
Management, Business and Financial	6.8%	5.8%	9.2%	10.5%	7.6%
Professional and Related	7.2%	7.4%	5.4%	7.1%	7.0%
Service	1.1%	0.5%	2.8%	3.2%	2.1%
Sales and Related	2.1%	1.3%	**	7.5%	1.0%
Office & Administrative Support	8.8%	7.9%	10.7%	13.7%	7.5%
Skilled Blue-collar	34.5%	40.4%	28.8%	20.6%	14.7%
Semi-skilled Blue Collar	26.1%	22.5%	20.2%	28.8%	49.6%
Unskilled Blue Collar	13.3%	14.3%	22.8%	8.7%	10.5%

**Shares by Segment in Each Occupation**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
<b>Total</b>	100.0%	72.4%	2.4%	15.1%	10.1%
Management, Business and Financial	100.0%	62.2%	3.2%	23.3%	11.3%
Professional and Related	100.0%	73.8%	1.8%	14.7%	9.7%
Service	100.0%	31.7%	5.9%	43.7%	18.7%
Sales and Related	100.0%	42.2%	**	52.9%	4.7%
Office & Administrative Support	100.0%	64.9%	2.9%	23.6%	8.7%
Skilled Blue-collar	100.0%	84.7%	2.0%	9.0%	4.3%
Semi-skilled Blue Collar	100.0%	62.4%	1.8%	16.7%	19.1%
Unskilled Blue Collar	100.0%	78.1%	4.0%	9.8%	8.0%

**Table III.6**  
**Female Employment in the Oil & Gas and Petrochemical Industries**  
**by Major Occupation and Industry Segment: 2010**

**Female Employment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Total</b>	225,687	110,350	6,840	69,140	39,357
Management, Business and Financial	41,181	18,883	1,789	13,474	7,035
Professional and Related	35,548	23,601	1,204	5,520	5,223
Service	2,741	801	97	1,027	816
Sales and Related	12,419	2,381	96	8,702	1,240
Office & Administrative Support	99,783	51,602	2,717	35,465	9,999
Skilled Blue-collar	8,999	5,476	410	1,520	1,593
Semi-skilled Blue Collar	19,605	5,187	379	2,665	11,374
Unskilled Blue Collar	5,411	2,419	148	767	2,077

**Female Share in Each Occupation by Industry Segment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro- Chemicals</b>
<b>Total</b>	19%	15%	16%	25%	25%
Management, Business and Financial	28%	26%	25%	32%	28%
Professional and Related	22%	21%	24%	24%	23%
Service	22%	29%	10%	20%	23%
Sales and Related	23%	21%	22%	24%	24%
Office & Administrative Support	74%	77%	53%	76%	62%
Skilled Blue-collar	3%	2%	3%	3%	6%
Semi-skilled Blue Collar	8%	4%	6%	4%	24%
Unskilled Blue Collar	7%	5%	4%	7%	21%

## ***Employment by Region***

Summary data on employment by region are presented in Table III.7 through Table III.9. As noted above, some employment cells in these tables are not reported because employment levels are small and result in very small sample sizes in the American Community Survey. These cases are identified by a “\*\*” entry in the tables. In particular, Alaska is identified as a separate region here, as in our 2012 report for API, and total employment across the four segments of the oil & gas and petrochemical industries in 2010 was only 12 thousand. Thus, many employment cells are too small to report in this region.

The national employment shares for minorities and females summarized above are affected by the fact that employment opportunities in the oil and gas industry are not uniformly distributed across regions or states. The mix of employment by race/ethnicity and gender is also affected by the educational attainment levels of the population in the regions with heavy concentrations of industry employment.

- The Gulf region accounts for over half of all oil & gas and petrochemical industry employment – including 62% in the upstream segment.
- The Gulf region also has the highest concentrations of minority employment in these industries. Approximately 64-65% of both African American and Hispanic workers employed in the industries work in the Gulf region.
- The shares of female employment in these industries (combining all four segments) vary little across regions, but are slightly above average in the Eastern and Central Regions – areas where the upstream segment represents a smaller share of the industry total.

Additional data on the distribution of employment in the oil & gas and petrochemical industries by occupation, race/ethnicity, gender and region are presented in separate appendices for each of the four industry segments.

**Table III.7  
Employment in the Oil & Gas and Petrochemical Industries  
by Region and Industry Segment: 2010**

**Total**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
US	1,198,590	720,911	42,079	279,162	156,438
Alaska	11,926	10,162	789	883	92
West	81,337	34,217	3,016	35,741	8,363
Rockies	103,600	84,861	2,997	12,995	2,747
Gulf	611,370	449,792	22,016	80,401	59,161
Central	138,609	55,898	5,331	45,388	31,992
Eastern	251,748	85,981	7,930	103,754	54,083

**Regional Shares by Industry Segment**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
US	100.0%	100.0%	100.0%	100.0%	100.0%
Alaska	1.0%	1.4%	1.9%	0.3%	0.1%
West	6.8%	4.7%	7.2%	12.8%	5.3%
Rockies	8.6%	11.8%	7.1%	4.7%	1.8%
Gulf	51.0%	62.4%	52.3%	28.8%	37.8%
Central	11.6%	7.8%	12.7%	16.3%	20.5%
Eastern	21.0%	11.9%	18.8%	37.2%	34.6%

**Shares by Industry Segment in Each Region**

	<b>Total</b>	<b>Upstream</b>	<b>Midstream</b>	<b>Downstream</b>	<b>Petro-chemicals</b>
US	100.0%	60.1%	3.5%	23.3%	13.1%
Alaska	100.0%	85.2%	6.6%	7.4%	0.8%
West	100.0%	42.1%	3.7%	43.9%	10.3%
Rockies	100.0%	81.9%	2.9%	12.5%	2.7%
Gulf	100.0%	73.6%	3.6%	13.2%	9.7%
Central	100.0%	40.3%	3.8%	32.7%	23.1%
Eastern	100.0%	34.2%	3.1%	41.2%	21.5%



**Table III.8  
Employment of Minority Groups in the Combined Oil & Gas  
and Petrochemical Industries by Region: 2010**

**Total Employment**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
US	1,198,590	97,789	188,088
Alaska	11,926	**	**
West	81,337	3,987	21,608
Rockies	103,600	1,761	21,949
Gulf	611,370	63,207	121,199
Central	138,609	6,254	8,755
Eastern	251,748	22,382	14,062

**Regional Shares of Each Minority Group**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
US	100.0%	100.0%	100.0%
Alaska	1.0%	**	**
West	6.8%	4.1%	11.5%
Rockies	8.6%	1.8%	11.7%
Gulf	51.0%	64.6%	64.4%
Central	11.6%	6.4%	4.7%
Eastern	21.0%	22.9%	7.5%

**Minority Group Shares in Each Region**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
US	100.0%	8.2%	15.7%
Alaska	100.0%	**	**
West	100.0%	4.9%	26.6%
Rockies	100.0%	1.7%	21.2%
Gulf	100.0%	10.3%	19.8%
Central	100.0%	4.5%	6.3%
Eastern	100.0%	8.9%	5.6%

**Table III.9**  
**Female Employment of Minority Groups in the Combined**  
**Oil & Gas and Petrochemical Industries by Region: 2010**

**Female Employment**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
US	225,687	18,952	25,335
Alaska	1,737	**	**
West	16,519	858	3,301
Rockies	16,783	245	2,158
Gulf	105,245	11,683	15,319
Central	29,489	1,385	2,043
Eastern	55,914	4,752	2,463

**Female Shares of Minority Employment in Each Region**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>
US	18.8%	19.4%	13.5%
Alaska	14.6%	**	**
West	20.3%	21.5%	15.3%
Rockies	16.2%	13.9%	9.8%
Gulf	17.2%	18.5%	12.6%
Central	21.3%	22.2%	23.3%
Eastern	22.2%	21.2%	17.5%

## **IV. Estimated Minority and Female Job Gains to 2030 in the Oil & Gas and Petrochemical Industries**

As described in the Introduction, we consider four sources of future job opportunities in the oil & gas and related industries in this study:

- New jobs that are projected to be created under a baseline forecast of the growth of the oil & gas and petrochemical industries,
- Jobs that would be created under a scenario for more accelerated development of the upstream oil and gas industry,
- Jobs created by projected capital investment in the transportation and storage infrastructure of the oil & gas industry and in the petrochemical industry, and
- Job opportunities that will likely be created due to the need to replace workers who retire or otherwise leave the oil & gas and petrochemical industries.

Baseline employment growth is measured as the sum of projected growth in the upstream and midstream oil and gas industry and the petrochemical industry from 2010 in five-year increments through 2030. (We do not project employment growth in the downstream segment of the oil and gas industry.)

Growth from all sources over the period 2010-2030 is projected as follows:

- In our baseline forecast, employment in these industries in 2030 will be 202 thousand higher than in 2010.
- Under pro-development policies for the upstream oil and gas industry, an additional 323 thousand jobs would be added, bringing the total employment gain, 2010 to 2030, to 525 thousand jobs.
- Projected capital investments in the oil and gas industry infrastructure and in the petrochemical industry would stimulate another 160 thousand jobs in 2030.
- Combining the job creation from these three sources will result in a net increase of 685 thousand jobs in 2030 compared to our base-year of 2010.
- We estimate that the need to replace current workers who retire from the oil & gas and petrochemical industries over the 20-year period from 2010 to 2030 will create an additional 579 thousand job opportunities.
- Combining job opportunities due to replacement requirements with the net increase in employment from all sources, we project a total of 1.264 million job opportunities in these industries over these 20-years.

Table IV.1 summarizes our projections of the distribution of this total for minority and female job opportunities. The remainder of this section provides details on each component of the projections.

**Table IV.1**  
**Potential Job Opportunities in the Oil & Gas and Petrochemical**  
**Industries to 2030: Combining Baseline Growth and Replacement,**  
**Capital Expenditures, and Pro-Development Policy**

	<b>Total</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	100,228	307,310	1,264,138
Management, Business and Financial	7,876	15,433	127,157
Professional and Related	10,006	16,792	164,946
Service	1,684	2,769	11,912
Sales and Related	3,325	6,350	48,043
Office & Administrative Support	12,633	22,062	110,293
Skilled Blue-collar	25,769	100,197	391,434
Semi-skilled Blue Collar	28,863	92,721	314,861
Unskilled Blue Collar	10,072	50,986	95,492

	<b>Female Employment</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	16,080	31,847	184,970
Management, Business and Financial	2,195	4,028	34,863
Professional and Related	1,945	3,453	33,965
Service	322	800	3,135
Sales and Related	261	334	9,782
Office & Administrative Support	7,166	13,589	73,362
Skilled Blue-collar	863	1,480	8,133
Semi-skilled Blue Collar	2,480	6,346	16,382
Unskilled Blue Collar	848	1,817	5,348

	<b>Female Share within Each Occupation</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	16%	10%	15%
Management, Business and Financial	28%	26%	27%
Professional and Related	19%	21%	21%
Service	19%	29%	26%
Sales and Related	8%	5%	20%
Office & Administrative Support	57%	62%	67%
Skilled Blue-collar	3%	1%	2%
Semi-skilled Blue Collar	9%	7%	5%
Unskilled Blue Collar	8%	4%	6%

## ***Oil & Gas and Petrochemical Industry Operations***

Table IV.2 provides a summary of projected baseline employment growth in the upstream and midstream oil and gas industry and the petrochemical industry, in total and for minority groups and women.

**Table IV.2a**  
**Baseline Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries**

	2010	2020	2030	Change 2010-2030
Total	919,428	1,034,659	1,121,588	202,160
Upstream Oil & Gas Industry	720,911	796,662	864,974	144,063
Midstream Oil & Gas Industry	42,079	50,777	53,188	11,109
Petrochemical Industry	156,438	187,220	203,426	46,988

- Over the period 2010 to 2030, combined employment in these three segments is projected to increase by 202 thousand to reach 1.12 million.

**Table IV.2b**  
**Baseline African American Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries**

	2010	2020	2030	Change 2010-2030
Total	77,746	93,038	101,908	24,162
Upstream Oil & Gas Industry	57,886	67,612	73,740	15,854
Midstream Oil & Gas Industry	2,262	2,868	3,046	784
Petrochemical Industry	17,598	22,558	25,122	7,524

**Share of Industry Totals Shown in Table IV.2a**

Total	8%	9%	9%
Upstream Oil & Gas Industry	8%	8%	9%
Midstream Oil & Gas Industry	5%	6%	6%
Petrochemical Industry	11%	12%	12%

- African American employment is projected to increase by 24 thousand – from 78 thousand to 102 thousand.

**Table IV.2c**  
**Baseline Hispanic Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries**

	2010	2020	2030	Change 2010-2030
Total	159,662	216,215	271,861	112,199
Upstream Oil & Gas Industry	136,265	180,609	224,965	88,700
Midstream Oil & Gas Industry	4,440	6,641	8,354	3,914
Petrochemical Industry	18,957	28,965	38,542	19,585
<b>Share of Industry Totals Shown in Table IV.2a</b>				
Total	17%	21%	24%	
Upstream Oil & Gas Industry	19%	23%	26%	
Midstream Oil & Gas Industry	11%	13%	16%	
Petrochemical Industry	12%	15%	19%	

- Hispanic employment is projected to increase by 112 thousand – from 160 thousand to 272 thousand.
- Combined minority employment in these industries will rise from one-quarter of the total in 2010 to one-third of the total in 2030.

**Table IV.2d**  
**Baseline Female Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries**

	2010	2020	2030	Change 2010-2030
Total	156,547	167,862	179,442	22,895
Upstream Oil & Gas Industry	110,350	113,432	121,461	11,111
Midstream Oil & Gas Industry	6,840	8,133	8,472	1,632
Petrochemical Industry	39,357	46,297	49,509	10,152
<b>Share of Industry Totals Shown in Table IV.2a</b>				
Total	17%	16%	16%	
Upstream Oil & Gas Industry	15%	14%	14%	
Midstream Oil & Gas Industry	16%	16%	16%	
Petrochemical Industry	25%	25%	24%	

- Female employment is projected to increase by 23 thousand to 179 thousand.
- The overall share of female employment will decline slightly, in part because much of the employment growth in the industry will occur in the upstream segment, where the share of female employment is lowest due to the high shares of blue-collar production jobs.

As reported above, employment in the oil and gas and petrochemical industries is projected to grow by 202 thousand jobs between 2010 and 2030. Tables IV.3 and IV.4 provide data on the distribution of these additional 202 thousand jobs by industry, occupation, gender and minority group.

Among the eight broad occupations identified in this study, the greatest job growth will occur in skilled blue collar jobs – a net increase of 77 thousand jobs or 38 percent of the 202 thousand total. This growth of the demand for skilled blue-collar jobs is driven largely by the expansion of the upstream oil and natural gas industry, where we project 65 thousand new skilled blue collar jobs to be created (45 percent of the 144,000 net new jobs projected for the industry). An additional 53 thousand semi-skilled jobs will be added across the three industries.

Over 41 thousand jobs will be created in the ‘Management, Business and Financial’ and ‘Professional and Related’ occupational categories.

As noted above, because so much of the job growth will be concentrated in blue-collar occupations where female shares of employment have historically been low and are not projected to increase, the overall female share of projected job gains across the three industries is low – only 11 percent of the 202 thousand jobs that will be added. Female job gains will be greatest in the ‘Management, Business and Financial’ category, where women will account for one-third of the 16 thousand jobs to be added.

Women will also account for 33 percent of the jobs added in the ‘Office and Administrative Support’ group, but this is well below the current female share of employment in that category (74 percent as shown in Table III.6). Thus, the female share of employment in ‘Office and Administrative Support’ jobs will decline over the forecast period.

African Americans and Hispanics combined will account for 136 thousand (or two-thirds) of the 202 thousand net new jobs projected in the three industries between 2010 and 2030 (Table IV.4). The Hispanic population alone is projected to account for over half of the job gains.

Data on the distribution of employment by occupation, minority group and gender for the combined oil and gas and petrochemical industries at the beginning and end of the forecast period are shown in Tables IV.5 and IV.6.

**Table IV.3**  
**Jobs Projected to be Added in the Oil & Gas and**  
**Petrochemical Industries Between 2010 and 2030:**  
**Distribution by Industry, Occupation and Gender**

	Total			Total
	Upstream	Midstream	Petro-chemical	
<b>Total</b>	144,063	11,109	46,988	202,160
Management, Business and Financial	7,408	1,924	6,853	16,185
Professional and Related	19,186	1,390	4,622	25,198
Service	590	262	1,256	2,108
Sales and Related	1,705	166	972	2,843
Office & Administrative Support	8,035	1,208	3,173	12,416
Skilled Blue-collar	65,043	3,629	8,103	76,775
Semi-skilled Blue Collar	32,472	2,028	18,444	52,944
Unskilled Blue Collar	9,624	502	3,565	13,691

	Female Employment			Total
	Upstream	Midstream	Petro-chemical	
<b>Total</b>	11,111	1,632	10,152	22,895
Management, Business and Financial	2,446	611	2,210	5,267
Professional and Related	4,121	346	1,046	5,513
Service	145	**	286	447
Sales and Related	143	32	207	382
Office & Administrative Support	2,282	479	1,294	4,055
Skilled Blue-collar	1,043	91	463	1,597
Semi-skilled Blue Collar	641	65	3,701	4,407
Unskilled Blue Collar	290	**	945	1,227

	Female Share of Growth within Each Occupation			Total
	Upstream	Midstream	Petro-chemical	
<b>Total</b>	8%	15%	22%	11%
Management, Business and Financial	33%	32%	32%	33%
Professional and Related	21%	25%	23%	22%
Service	25%	**	23%	21%
Sales and Related	8%	20%	21%	13%
Office & Administrative Support	28%	40%	41%	33%
Skilled Blue-collar	2%	3%	6%	2%
Semi-skilled Blue Collar	2%	3%	20%	8%
Unskilled Blue Collar	3%	**	27%	9%



**Table IV.4**  
**Jobs Projected to be Added in the Oil & Gas and**  
**Petrochemical Industries Between 2010 and 2030:**  
**Distribution by Minority Group, Occupation and Gender**

	<b>Total</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	24,162	112,199	202,160
Management, Business and Financial	1,584	5,231	16,185
Professional and Related	2,070	6,064	25,198
Service	338	878	2,108
Sales and Related	275	1,100	2,843
Office & Administrative Support	2,730	7,772	12,416
Skilled Blue-collar	6,383	37,897	76,775
Semi-skilled Blue Collar	8,385	36,742	52,944
Unskilled Blue Collar	2,397	16,515	13,691

	<b>Female Employment</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	3,840	13,028	22,895
Management, Business and Financial	468	1,520	5,268
Professional and Related	438	1,248	5,513
Service	80	237	447
Sales and Related	28	76	382
Office & Administrative Support	1,334	4,708	4,055
Skilled Blue-collar	186	511	1,596
Semi-skilled Blue Collar	1,002	3,858	4,407
Unskilled Blue Collar	304	870	1,227

	<b>Female Share of Growth within Each Occupation</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	16%	12%	11%
Management, Business and Financial	30%	29%	33%
Professional and Related	21%	21%	22%
Service	24%	27%	21%
Sales and Related	10%	7%	13%
Office & Administrative Support	49%	61%	33%
Skilled Blue-collar	3%	1%	2%
Semi-skilled Blue Collar	12%	10%	8%
Unskilled Blue Collar	13%	5%	9%

**Table IV.5  
Baseline Employment in the Upstream and Midstream Oil & Gas and  
Petrochemical Industries: 2010**

**Total**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	77,746	159,662	919,428
Management, Business and Financial	6,512	9,779	104,331
Professional and Related	10,188	11,612	141,195
Service	1,023	1,181	7,354
Sales and Related	1,087	1,903	16,936
Office & Administrative Support	9,734	12,600	88,392
Skilled Blue-collar	21,956	59,057	310,450
Semi-skilled Blue Collar	20,303	40,983	184,462
Unskilled Blue Collar	6,943	22,547	66,308

**Female Employment**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	14,147	19,688	156,547
Management, Business and Financial	1,816	2,481	27,708
Professional and Related	2,135	2,414	30,027
Service	268	326	1,715
Sales and Related	94	140	3,717
Office & Administrative Support	5,912	7,921	64,318
Skilled Blue-collar	965	1,046	7,479
Semi-skilled Blue Collar	2,403	4,341	16,939
Unskilled Blue Collar	554	1,019	4,644

**Female Share within Each Occupation**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	18%	12%	17%
Management, Business and Financial	28%	25%	27%
Professional and Related	21%	21%	21%
Service	26%	28%	23%
Sales and Related	9%	7%	22%
Office & Administrative Support	61%	63%	73%
Skilled Blue-collar	4%	2%	2%
Semi-skilled Blue Collar	12%	11%	9%
Unskilled Blue Collar	8%	5%	7%

**Table IV.6  
Baseline Employment in the Upstream and Midstream Oil & Gas and  
Petrochemical Industries: 2030**

	<b>Total</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	101,908	271,861	1,121,588
Management, Business and Financial	8,096	15,010	120,516
Professional and Related	12,258	17,676	166,393
Service	1,361	2,059	9,462
Sales and Related	1,362	3,003	19,779
Office & Administrative Support	12,464	20,372	100,808
Skilled Blue-collar	28,339	96,954	387,225
Semi-skilled Blue Collar	28,688	77,725	237,406
Unskilled Blue Collar	9,340	39,062	79,999

	<b>Female Employment</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	17,987	32,716	179,442
Management, Business and Financial	2,284	4,001	32,976
Professional and Related	2,573	3,662	35,540
Service	348	563	2,162
Sales and Related	122	216	4,099
Office & Administrative Support	7,246	12,629	68,373
Skilled Blue-collar	1,151	1,557	9,075
Semi-skilled Blue Collar	3,405	8,199	21,346
Unskilled Blue Collar	858	1,889	5,871

	<b>Female Share within Each Occupation</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	18%	12%	16%
Management, Business and Financial	28%	27%	27%
Professional and Related	21%	21%	21%
Service	26%	27%	23%
Sales and Related	9%	7%	21%
Office & Administrative Support	58%	62%	68%
Skilled Blue-collar	4%	2%	2%
Semi-skilled Blue Collar	12%	11%	9%
Unskilled Blue Collar	9%	5%	7%

## **Replacement Employment**

In addition to projecting the growth of baseline employment in the oil & gas and petrochemical industries, we also projected the number of job opportunities that will arise when current workers retire or leave the industry over the forecast period and need to be replaced. Replacement employment is projected for all four segments of the oil and gas and petrochemical industries.

- Across all four industry segments, we project that there will be a need to replace 261 thousand workers over the period 2010-2020. Replacement requirements increase in the second decade of the forecast period as a larger cohort of current workers approaches retirement age.
- Cumulative replacement employment over the 20-year period, 2010-2030, is estimated to be 579 thousand. Thus, replacement requirements will generate nearly three times as many job opportunities in these industries as net employment growth over the 20-year forecast period.

**Table IV.7**  
**Replacement Employment in the Oil & Gas and**  
**Petrochemical Industries**

	<b>2010-2020</b>	<b>2020-2030</b>	<b>Total</b> <b>2010-2030</b>
Total	260,966	318,360	579,326
Upstream Oil & Gas Industry	151,235	184,496	335,731
Midstream Oil & Gas Industry	10,223	12,471	22,694
Downstream Oil & gas Industry	65,119	79,442	144,561
Petrochemical Industry	34,389	41,951	76,340

Table IV.8 provides estimates of the additional potential job gains by minority groups and women due to replacement requirements in the oil & gas and petrochemical industries. Note that baseline job gains for African American and Hispanic workers shown in the previous section effectively include some job gains associated with replacement requirements. Those data show total absolute job gains for the two minority groups over the forecast period, and part of that increase is due to minority workers replacing nonminority workers who retire. Therefore, estimates of potential additional jobs for African American and Hispanic workers due to replacement requirements in Table IV.8 include only the net amount of additional replacement gains for minority workers associated with replacing other minority workers who are projected to retire during the 20-year forecast period.

**Table IV.8**  
**Potential Job Gains for Minority Groups and Women from Replacement Requirements in the Oil & Gas and Petrochemical Industries: 2010-2030**

	<b>Total</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	42,627	73,635	579,326
Management, Business and Financial	3,956	4,791	61,744
Professional and Related	5,311	5,358	84,906
Service	958	1,087	6,463
Sales and Related	2,626	3,712	34,802
Office & Administrative Support	5,786	6,324	54,971
Skilled Blue-collar	9,701	19,011	147,080
Semi-skilled Blue Collar	11,143	26,497	160,089
Unskilled Blue Collar	3,146	6,855	29,271

	<b>Female Employment</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	6,846	8,156	94,540
Management, Business and Financial	1,027	1,154	16,757
Professional and Related	981	1,128	17,813
Service	157	332	1,858
Sales and Related	179	169	7,552
Office & Administrative Support	3,444	3,986	40,380
Skilled Blue-collar	351	263	2,955
Semi-skilled Blue Collar	490	946	5,649
Unskilled Blue Collar	217	178	1,576

	<b>Female share within Each Occupation</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	16%	11%	16%
Management, Business and Financial	26%	24%	27%
Professional and Related	18%	21%	21%
Service	16%	31%	29%
Sales and Related	7%	5%	22%
Office & Administrative Support	60%	63%	73%
Skilled Blue-collar	4%	1%	2%
Semi-skilled Blue Collar	4%	4%	4%
Unskilled Blue Collar	7%	3%	5%

## ***Baseline plus Replacement Employment***

The overall job potential for minority and female workers in the oil and gas and petrochemical industries is best measured by combining baseline and replacement job possibilities.

- Combined job potential over the 20-year period is 781 thousand, including 480 thousand in the upstream oil and gas industry.

**Table IV.9**  
**Estimated Job Opportunities from Baseline Employment**  
**Change plus Replacement Requirements in the Oil & Gas and**  
**Petrochemical Industries**

	<b>2010-2020</b>	<b>2020-2030</b>	<b>Total 2010-2030</b>
Total	376,197	405,289	781,486
Upstream Oil & Gas Industry	226,986	252,808	479,794
Midstream Oil & Gas Industry	18,921	14,882	33,803
Downstream Oil & Gas Industry*	65,119	79,442	144,561
Petrochemical Industry	65,171	58,157	123,328

\*Replacement only

- We estimate that the 781,000 jobs created will include 67 thousand potential jobs for African American workers and 186 thousand for Hispanic workers.
- The combined total of 253 thousand minority jobs represents 32 percent of all projected job openings.
- The share of the total projected potential jobs that will be filled by women will be held down by the limited job gains projected for women in blue collar occupations where a substantial fraction of job growth in the oil & gas and petrochemical industries is expected.
- However, women will maintain or increase their shares of all jobs in the 'Management, Business and Financial' and service-related occupations.

**Table IV.10**  
**Estimated Job Opportunities from Baseline Employment Change**  
**plus Replacement Requirements in the Oil & Gas and Petrochemical**  
**Industries: 2010-2030**

	<b>Total</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	66,789	185,834	781,486
Management, Business and Financial	5,540	10,022	77,929
Professional and Related	7,381	11,422	110,104
Service	1,296	1,965	8,571
Sales and Related	2,901	4,812	37,645
Office & Administrative Support	8,516	14,096	67,387
Skilled Blue-collar	16,085	56,908	223,855
Semi-skilled Blue Collar	19,528	63,239	213,033
Unskilled Blue Collar	5,542	23,370	42,962

	<b>Female Employment</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	10,686	21,184	117,435
Management, Business and Financial	1,495	2,674	22,025
Professional and Related	1,419	2,376	23,326
Service	237	569	2,305
Sales and Related	207	245	7,934
Office & Administrative Support	4,778	8,694	44,435
Skilled Blue-collar	537	774	4,551
Semi-skilled Blue Collar	1,492	4,804	10,056
Unskilled Blue Collar	521	1,048	2,803

	<b>Female Share within Each Occupation</b>		
	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	16%	11%	15%
Management, Business and Financial	27%	27%	28%
Professional and Related	19%	21%	21%
Service	18%	29%	27%
Sales and Related	7%	5%	21%
Office & Administrative Support	56%	62%	66%
Skilled Blue-collar	3%	1%	2%
Semi-skilled Blue Collar	8%	8%	5%
Unskilled Blue Collar	9%	4%	7%

## ***Employment Impacts of Capital Investment***

As described in section II, in addition to projecting job growth within the oil & gas and petrochemical industries, we examine the employment impacts of capital expenditures to expand the capacity of these industries and to develop the transportation and storage infrastructure that supports them. We look separately at capital investment in the transportation and storage infrastructure for the oil and gas industry and at investments to expand the capacity of the petrochemical industry.

The employment estimates reported here are for employment stimulated in the industries directly impacted by the corresponding capital expenditures, which include the construction of pipelines and other facilities, manufacturing of the pipe, machinery and other metal products required, and supporting engineering services. (Only direct job impacts are considered here – not any indirect or induced employment impacts that will also result from the projected capital investments.)

For both the transportation infrastructure and the petrochemical industry, capital expenditures were projected annually from either 2013 or 2014 through 2030. The employment figures shown here are the numbers of jobs created by the amount of capital spending expected in selected years: 2015, 2020, 2025 and 2030.

For both the transportation infrastructure and the petrochemical industry the forces driving the need for accelerated investment are already well underway. As a result, the highest level of capital expenditures (and the greatest employment impact) occurs at the beginning of our forecast period and then declines over time.

- Capital investment in the oil & gas industry transportation and storage infrastructure in 2015 will create 311 thousand jobs in that year. Investment in the petrochemical industry will stimulate over 40 thousand additional jobs in 2015. The combined impact of these capital investment programs will be to create 351 thousand jobs in 2015.
- Over the next 15 years, the level of capital spending in both areas will gradually decline. Yet in 2030, these investment efforts together will still contribute an additional 160 thousand jobs.

**Table IV.11**  
**Employment Impacts of Investment in Oil and Gas Infrastructure**  
**and the Petrochemical Industry by Year**

	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
Total	351,174	287,839	216,429	160,048
Oil & Gas Transportation Infrastructure	310,615	260,511	196,585	146,157
Petrochemical Industry	40,559	27,328	19,844	13,891



Tables IV.12 and IV.13 provide additional detail on the employment impact of these capital investment initiatives by occupation for minority groups and women in the peak year of activity – 2015.

These jobs are in industries that support investment activity and, thus, their occupational mix differs somewhat from core oil & gas industry jobs. Among the blue-collar jobs in construction and machinery and metal products manufacturing, the share of skilled blue-collar jobs is slightly lower than in the oil & gas industry, and the semi-skilled and unskilled shares higher. Nonetheless, the share of blue-collar jobs overall in these investment-related industries (61 percent of the total) is quite similar to core oil & gas industry jobs (57 percent). Thus, the female share of employment in these investment-related jobs is very near the share observed on average for the oil & gas and petrochemical industries.

**Table IV.12**  
**Employment Stimulated by Investment in Oil & Gas Transportation**  
**Infrastructure and the Petrochemical Industry: 2015**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	351,174	25,198	59,656	24%	56,335	16%
Mgmt, Business and Fin'l	48,469	1,786	3,395	11%	11,783	24%
Professional and Related	42,963	1,496	2,861	10%	7,233	17%
Service	3,944	431	598	26%	882	22%
Sales and Related	8,774	192	703	10%	1,585	18%
Office & Administrative Support	31,846	2,452	3,377	18%	20,660	65%
Skilled Blue-collar	94,536	6,062	17,361	25%	2,651	3%
Semi-skilled Blue Collar	89,012	9,276	20,618	34%	9,498	11%
Unskilled Blue Collar	31,629	3,503	10,742	45%	2,044	6%

**Table IV.13**  
**Employment Stimulated by Investment in Oil & Gas Industry**  
**Infrastructure and the Petrochemical Industry: 2015**

	<b>Total</b>		
	<b>African</b>		
	<b>American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	25,198	59,656	351,174
Management, Business and Financial	1,786	3,395	48,469
Professional and Related	1,496	2,861	42,963
Service	431	598	3,944
Sales and Related	192	703	8,774
Office & Administrative Support	2,452	3,377	31,846
Skilled Blue-collar	6,062	17,361	94,536
Semi-skilled Blue Collar	9,276	20,618	89,012
Unskilled Blue Collar	3,503	10,742	31,629

	<b>Female Employment</b>		
	<b>African</b>		
	<b>American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	4,680	6,190	56,335
Management, Business and Financial	647	914	11,783
Professional and Related	372	532	7,233
Service	124	151	882
Sales and Related	71	95	1,585
Office & Administrative Support	1,452	2,068	20,660
Skilled Blue-collar	188	430	2,651
Semi-skilled Blue Collar	1,579	1,617	9,498
Unskilled Blue Collar	247	383	2,044

	<b>Female Share within Each Occupation</b>		
	<b>African</b>		
	<b>American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	19%	10%	16%
Management, Business and Financial	36%	27%	24%
Professional and Related	25%	19%	17%
Service	29%	25%	22%
Sales and Related	37%	14%	18%
Office & Administrative Support	59%	61%	65%
Skilled Blue-collar	3%	2%	3%
Semi-skilled Blue Collar	17%	8%	11%
Unskilled Blue Collar	7%	4%	6%

## ***Pro-Development Policy for the Upstream Oil and Gas Industry***

Our 2012 study of minority employment for API focused on the upstream oil & gas industry. That study included, in addition to baseline employment projections for African Americans and Hispanics, estimates of the additional job potential associated with pro-development policy for the upstream oil and gas industry. The relevant results from this pro-development policy analysis are reproduced here from IHS's 2012 report for API. In addition, we have developed estimates of employment by gender industry-wide and separately for African American and Hispanic workers.

Note also that the figures shown here do not include the small amount of indirect employment in two industries that was included in some tables of the 2012 IHS report.

**Table IV.14**  
**Additional Employment Impact of Pro-Development Policy in the Upstream Oil & Gas Industry**

	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
Total	176,033	291,323	304,827	322,603
African American	11,590	19,731	21,155	21,644
Hispanic	35,955	64,210	73,903	88,572
Minority Share	27%	29%	31%	34%
Female	26,511	42,346	43,126	42,370
Female Share	15%	15%	14%	13%

In Table IV.15 the additional employment gains from pro-development policy are added to baseline employment projections for the upstream and midstream oil & gas and petrochemical industries. In the pro-development policy scenario, total employment in these industries increases by 525 thousand between 2010 and 2030, and we project 247 thousand of these additional jobs would be held by African Americans and Hispanics.

**Table IV.15**  
**Total Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries under Pro-Development Policy**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	919,428	1,325,982	1,444,191	524,763
African American	77,746	112,769	123,552	45,806
Hispanic	159,662	280,425	360,433	200,771
Minority Share	26%	30%	34%	
Female	156,547	210,208	221,812	65,265
Female Share	17%	16%	15%	

## V. Summary

The tables on the following page summarize the components of employment growth in the oil & gas and related industries analyzed in this report.

- Our baseline projection shows employment in oil & gas and petrochemical industry operations increasing by 202 thousand over the period 2010-2030 (row 2).
- Under pro-development policies for the upstream oil and gas industry, an additional 323 thousand jobs would be added, bringing the total employment gain, 2010 to 2030, to 525 thousand jobs (rows 3 and 4).
- Projected capital investments in the oil and gas industry infrastructure and in the petrochemical industry would stimulate another 351 thousand jobs in 2015. As projects are completed, the job impacts of investment decline over time to 160 thousand jobs in 2030 (row 5).
- Combining the job creation from industry operations and capital investment will result in a net increase of 362 thousand jobs in 2030 compared to 2010 in our baseline forecast (row 6) and 685 thousand jobs in the pro-development policy scenario (row 7).
- We estimate that the need to replace current workers who retire from the oil & gas and petrochemical industries over the 20-year period from 2010 to 2030 will create an additional 579 thousand job opportunities (row 8).
- Combining job opportunities due to replacement requirements with the net increase in employment from all sources, we project a total of 942 thousand job opportunities in these industries over these 20 years under the baseline scenario and 1.3 million jobs under the pro-development scenario (rows 9 and 10).
- Of this total 1.3 million job opportunities, we project that there will be over 400 thousand job opportunities for minority workers – 100 thousand for African Americans and 307 thousand for Hispanics (rows 12 and 13).
- We project a net increase of 90 thousand in female employment in these industries between 2010 and 2030 (65 thousand in industry operations and 25 thousand due to capital investment in 2030), and replace requirements will create an additional 94 thousand job opportunities, for a total of 185 thousand (row 14).

**Components of Employment Projections**  
(thousands)

		<b>2010</b>	<b>2015</b>	<b>2020</b>	<b>2025</b>	<b>2030</b>
1	Base line Employment in the Upstream and Midstream Oil & Gas and Petrochemical Industries	919	956	1,035	1,080	1,122
2	Increase Compared to 2010	--	36	115	160	202
3	Additional Employment Projected under Pro- Development Policy in the Upstream Oil & Gas Industry	--	176	291	305	323
4	Total Employment Gain Projected under Pro- Development Policy	--	212	407	465	525
5	Jobs Created in Selected Years by Capital Investment in Oil & Gas Industry Infrastructure and Petrochemical Industry	--	351	288	216	160
6	Baseline Employment Growth plus Jobs Created in selected Years by Capital Investment	--	387	403	277	362
7	Employment Growth under Pro- Development Policy plus Jobs Created in selected Years by Capital Investment	--	563	694	681	685
			<b>2010-2020</b>		<b>2010-2030</b>	
8	Job Opportunities from Replacement Requirements in the Oil & gas and Petrochemical Industries		261		579	
9	Baseline Growth and Jobs Created by Capital Investment in Selected Years plus Replacement Requirements		664		942	
<b>10</b>	<b>Pro-Development Policy Growth and Jobs Created by Capital Investment in Selected Years plus Replacement Requirements</b>		<b>955</b>		<b>1,264</b>	
	<b>Employment Growth under Pro-Development Policy</b>		<b>Industry Operations</b>	<b>Capital Investment</b>	<b>Replacement Requirements</b>	<b>Total</b>
11	Total		525	160	579	1,264
12	African American		46	12	43	100
13	Hispanic		201	33	74	307
14	Female		65	25	94	185

## Appendix A. Upstream Oil & Gas Industry

### National Employment in the Upstream Oil & Gas Industry: 2010

#### Total

	African American	Hispanic	Total
<b>Total</b>	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

#### Female Employment

	African American	Hispanic	Total
<b>Total</b>	9,239	13,648	110,350
Management, Business and Financial	1,316	1,855	18,883
Professional and Related	1,482	2,120	23,601
Service	77	204	801
Sales and Related	63	83	2,381
Office & Administrative Support	4,701	6,822	51,603
Skilled Blue-collar	745	856	5,476
Semi-skilled Blue Collar	540	1,192	5,187
Unskilled Blue Collar	316	516	2,419

#### Female Share within Each Occupation

	African American	Hispanic	Total
<b>Total</b>	16%	10%	15%
Management, Business and Financial	26%	23%	26%
Professional and Related	18%	21%	21%
Service	17%	31%	29%
Sales and Related	7%	5%	21%
Office & Administrative Support	62%	64%	77%
Skilled Blue-collar	4%	2%	2%
Semi-skilled Blue Collar	5%	4%	4%
Unskilled Blue Collar	6%	3%	5%

**National Employment in the Top Detailed Occupations  
in the Upstream Oil & Gas Industry: 2010**

	<b>Employment by Industry</b>				
	<b>Total</b>	<b>NAICS 2111</b>	<b>NAICS 2131</b>	<b>NAICS 2389</b>	<b>NAICS 5413</b>
Derrick, Rotary Drill and Service Unit Operators	89,437	12,262	77,104	69	**
Roustabouts, Oil & Gas	55,873	11,435	44,346	92	**
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	**
Pump Operators and Wellhead Pumpers	21,231	11,600	9,571	60	**
Petroleum Engineers	21,186	15,676	5,421	**	90
Secretaries	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	**	**
Accountants and Auditors	9,595	6,214	2,338	494	549
Geoscientists, Except Hydrologists and Geographers	9,504	7,548	1,657	**	299
Geological and Petroleum Technicians	8,988	4,406	4,483	**	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, Soldiers, and Braziers	6,542	921	4,792	764	65
Cement Masons and Concrete Finishers	6,501	**	**	6,499	**
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	**
Excavating and Loading Machine and Dragline Operators	4,455	**	1,477	2,974	**
Mobile Heavy Equipment Mechanics, Except Engines	4,362	248	2,454	1,625	35

**National Employment in the Top Detailed Occupations  
in the Upstream Oil & Gas Industry: 2010 (continued)**

	Employment by Industry				
	Total	NAICS 2111	NAICS 2131	NAICS 2389	NAICS 5413
First-Line Supervisors/Mgr of Office and Admin Workers	4,114	1,358	1,760	599	397
Fence Erectors	4,090	**	**	4,090	**
Inspectors, Testers, Sorters, Samplers, and Weighers	4,019	343	3,019	**	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	**	77	3,575	**
Mechanical Engineers	3,369	354	951	24	2,040
Carpenters	3,121	**	424	2,676	21
Engineering Managers	3,095	904	642	**	1,535
Architects, Except Landscape and Naval	3,054	**	**	**	3,054
Architectural and Civil Drafters	2,897	**	**	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	**	1,357
Surveying and Mapping Technicians	1,681	224	77	**	1,370
Surveyors	1,660	154	116	50	1,341
Civil Engineering Technicians	1,476	**	45	**	1,420

\*\* = less than 20



## Female Employment in the Top Detailed Occupations in the Upstream Oil and Gas Industry: 2010

	Female Employment by Industry				
	Total	NAICS 2111	NAICS 2131	NAICS 2389	NAICS 5413
Derrick, Rotary Drill and Service Unit Operators	842	180	662	**	**
Roustabouts, Oil & Gas	549	168	380	**	**
Construction Laborers	1,403	**	518	881	**
First-Line Supervisors/Mgr of Constr. & Extraction Workers	761	250	279	224	**
Operating Engineers & Other Construction Equip Operators	516	64	73	377	**
Truck Drivers, Heavy and Tractor-Trailer	782	27	446	306	**
Helpers and Other Extraction Workers	441	115	317	**	**
Pump Operators and Wellhead Pumpers	477	339	137	**	**
Petroleum Engineers	2,762	2,145	608	**	**
Secretaries	19,763	7,504	6,622	3,284	2,353
General and Operations Managers	1,211	268	400	266	277
Office Clerks, General	11,648	3,641	4,050	2,984	973
Bookkeeping, Accounting, and Auditing Clerks	12,164	4,163	4,980	2,315	706
Petroleum Pump System & Refinery Operators, and Gaugers	171	79	93	**	**
Accountants and Auditors	6,204	3,970	1,512	339	384
Geoscientists, Except Hydrologists and Geographers	1,844	1,486	265	**	92
Geological and Petroleum Technicians	2,176	1,404	753	**	20
Laborers and Freight, Stock, and Material Movers, Hand	263	93	138	**	31
Industrial Machinery Mechanics	95	57	36	**	**
Welders, Cutters, Soldiers, and Braziers	79	**	61	14	**
Cement Masons and Concrete Finishers	70	**	**	70	**
Maintenance and Repair Workers, General	197	**	175	**	**
Civil Engineers	738	**	33	**	698
Engineers, all other	1,069	908	52	**	105
Crane and Tower Operators	26	**	**	19	**
Excavating and Loading Machine and Dragline Operators	28	**	**	20	**
Mobile Heavy Equipment Mechanics, Except Engines	56	**	37	**	**
First-Line Supervisors/Mgr of Office and Admin Workers	2,275	678	973	464	160

**Female Employment in the Top Detailed Occupations in the  
Upstream Oil and Gas Industry: 2010 (continued)**

	Female Employment by Industry				
	Total	NAICS 2111	NAICS 2131	NAICS 2389	NAICS 5413
Fence Erectors	67	**	**	67	**
Inspectors, Testers, Sorters, Samplers, and Weighers	255	59	103	**	91
Electricians	**	**	**	**	**
Construction Managers	259	29	**	182	48
Sales Representatives, Wholesale and Manufacturing	407	98	**	309	**
Paving, Surfacing, and Tamping Equipment Operators	103	**	**	103	**
Mechanical Engineers	237	**	90	**	146
Carpenters	41	**	**	38	**
Engineering Managers	304	143	**	**	148
Architects, Except Landscape and Naval	880	**	**	**	880
Architectural and Civil Drafters	634	**	**	**	628
Cost Estimators	251	**	**	205	47
Plumbers, Pipefitters, and Steamfitters	58	**	39	**	**
Electrical Engineers	121	**	**	**	109
Surveying and Mapping Technicians	100	**	**	**	84
Surveyors	212	48	22	**	133
Civil Engineering Technicians	218	**	**	**	211

\*\* = less than 20

## Employment in the Upstream Oil & Gas Industry by Region: 2010

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
US	720,911	57,886	136,265	27%	110,350	15%
Alaska	10,162	179	504	7%	1,426	14%
West	34,217	1,085	10,278	33%	5,628	16%
Rockies	84,861	1,404	18,922	24%	12,553	15%
Gulf	449,791	44,219	95,479	31%	68,703	15%
Central	55,898	2,663	3,514	11%	8,424	15%
Eastern	85,981	8,336	7,568	18%	13,616	16%

**Baseline Employment in the Upstream Oil & Gas Industry by Occupation:  
2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	720,911	796,662	864,974	144,063
Management, Business and Financial	71,910	75,908	79,318	7,408
Professional and Related	113,155	115,824	132,340	19,186
Service	2,751	2,714	3,341	590
Sales and Related	11,308	12,129	13,013	1,705
Office & Administrative Support	67,233	70,682	75,269	8,035
Skilled Blue-collar	271,287	314,812	336,330	65,043
Semi-skilled Blue Collar	130,433	159,183	162,905	32,472
Unskilled Blue Collar	52,834	45,410	62,458	9,624

**Baseline Minority and Female Employment in the Upstream Oil & Gas  
Industry: 2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	720,911	796,662	864,974	144,063
African American	57,886	67,612	73,740	15,854
percent of total	8.0%	8.5%	8.5%	
Hispanic	136,265	180,609	224,965	88,700
percent of total	18.9%	22.7%	26.0%	
Female	110,350	113,432	121,461	11,111
percent of total	15.3%	14.2%	14.0%	

**Potential Job Gains from Replacement Requirements in the  
Upstream Oil & Gas Industry: 2010-2030**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	24,086	43,265	335,731
Management, Business and Financial	1,763	2,135	27,513
Professional and Related	3,731	3,764	59,645
Service	202	229	1,362
Sales and Related	445	629	5,898
Office & Administrative Support	2,432	2,658	23,104
Skilled Blue-collar	6,350	12,444	96,273
Semi-skilled Blue Collar	7,247	17,232	104,112
Unskilled Blue Collar	1,916	4,174	17,824

## Appendix B. Midstream Oil & Gas Industry

### National Employment in the Midstream Oil & Gas Industry: 2010

	Total		
	African American	Hispanic	Total
<b>Total</b>	2,262	4,440	42,079
Management, Business and Financial	233	410	7,131
Professional and Related	267	239	5,021
Service	64	123	984
Sales and Related	**	**	436
Office & Administrative Support	615	474	5,125
Skilled Blue-collar	549	1,278	13,227
Semi-skilled Blue Collar	351	897	6,643
Unskilled Blue Collar	182	1,011	3,510

	Female Employment		
	African American	Hispanic	Total
<b>Total</b>	594	554	6,840
Management, Business and Financial	51	188	1,789
Professional and Related	95	64	1,204
Service	**	**	97
Sales and Related	**	**	96
Office & Administrative Support	428	234	2,716
Skilled Blue-collar	**	**	410
Semi-skilled Blue Collar	**	59	379
Unskilled Blue Collar	**	**	148

	Female Share within Each Occupation		
	African American	Hispanic	Total
<b>Total</b>	26%	12%	16%
Management, Business and Financial	22%	46%	25%
Professional and Related	36%	27%	24%
Service	**	**	10%
Sales and Related	**	**	22%
Office & Administrative Support	70%	49%	53%
Skilled Blue-collar	**	**	3%
Semi-skilled Blue Collar	**	7%	6%
Unskilled Blue Collar	**	**	4%

## Employment in the Top Detailed Occupations in the Midstream Oil & Gas Industry: 2010

	Total Employment	Female Employment	Female Share within Occupation
Pipelayers, plumbers, pipefitters, and steamfitters	3,148	164	5%
Laborers and freight, stock and material movers, hand	2,204	145	7%
Miscellaneous managers	2,056	299	15%
Inspectors, testers, sorters, samplers, and weighers	1,983	127	6%
Supervisors of transportation and material moving workers	1,917	38	2%
Welding, soldering, and brazing workers	1,255	41	3%
Driver/sales workers and truck drivers	1,229	75	6%
Pumping station operators	1,132	**	**
Other production workers	1,099	70	6%
Accountants and auditors	1,034	483	47%
Secretaries and administrative assistants	1,011	917	91%
Maintenance and repair workers, general	1,008	**	**
Civil engineers	911	219	24%
Miscellaneous plant and system operators	863	105	12%

\*\* = less than 20

## Employment in the Midstream Oil & Gas Industry by Region: 2010

	Total	African American	Hispanic	Minority Share	Female	Female Share
US	42,079	2,262	4,440	16%	6,840	16%
Alaska	789	**	**	**	175	22%
West	3,016	179	453	21%	528	17%
Rockies	2,997	58	521	19%	544	18%
Gulf	22,016	1,486	3,043	21%	3,772	17%
Central	5,331	194	178	7%	791	15%
Eastern	7,930	337	245	7%	1,032	13%

\*\* = less than 20

**Baseline Employment in the Midstream Oil & Gas Industry by  
Occupation: 2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	42,079	50,777	53,188	11,109
Management, Business and Financial	7,131	8,626	9,055	1,924
Professional and Related	5,021	6,091	6,411	1,390
Service	984	1,189	1,246	262
Sales and Related	436	550	602	166
Office & Administrative Support	5,125	6,116	6,333	1,208
Skilled Blue-collar	13,227	16,029	16,857	3,629
Semi-skilled Blue Collar	6,643	8,148	8,672	2,028
Unskilled Blue Collar	3,510	4,028	4,012	502

**Baseline Minority and Female Employment in the Midstream Oil & Gas  
Industry: 2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	42,079	50,777	53,188	11,109
African American	2,262	2,868	3,046	784
percent of total	5.4%	5.6%	5.7%	
Hispanic	4,440	6,640	8,353	3,913
percent of total	10.6%	13.1%	15.7%	
Female	6,840	8,133	8,472	1,632
percent of total	16.3%	16.0%	15.9%	

**Potential Job Gains from Replacement Requirements in the  
Midstream Oil & Gas Industry: 2010-2030**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	1,569	2,583	22,694
Management, Business and Financial	215	260	3,355
Professional and Related	195	196	3,113
Service	**	**	**
Sales and Related	26	36	340
Office & Administrative Support	187	204	1,774
Skilled Blue-collar	856	1,677	12,971
Semi-skilled Blue Collar	58	139	840
Unskilled Blue Collar	32	71	302

## Appendix C. Downstream Oil & Gas Industry

### National Employment in the Downstream Oil & Gas Industry: 2010

#### Total

	African American	Hispanic	Total
<b>Total</b>	20,043	28,426	279,162
Management, Business and Financial	2,362	2,974	41,898
Professional and Related	1,503	2,005	23,246
Service	673	916	5,124
Sales and Related	1,267	2,139	36,844
Office & Administrative Support	2,435	3,886	46,739
Skilled Blue-collar	3,499	5,852	43,633
Semi-skilled Blue Collar	6,906	8,192	70,992
Unskilled Blue Collar	1,398	2,463	10,685

#### Female Employment

	African American	Hispanic	Total
<b>Total</b>	4,806	5,647	69,140
Management, Business and Financial	1,254	1,096	13,474
Professional and Related	364	517	5,520
Service	194	199	1,027
Sales and Related	602	620	8,702
Office & Administrative Support	1,625	2,534	35,466
Skilled Blue-collar	168	122	1,520
Semi-skilled Blue Collar	380	356	2,665
Unskilled Blue Collar	218	204	767

#### Female Share within Each Occupation

	African American	Hispanic	Total
<b>Total</b>	24%	20%	25%
Management, Business and Financial	53%	37%	32%
Professional and Related	24%	26%	24%
Service	29%	22%	20%
Sales and Related	48%	29%	24%
Office & Administrative Support	67%	65%	76%
Skilled Blue-collar	5%	2%	3%
Semi-skilled Blue Collar	6%	4%	4%
Unskilled Blue Collar	16%	8%	7%



## Employment in the Top Detailed Occupations in the Downstream Oil & Gas Industry: 2010

	Total Employment	Female Employment	Female Share
Drivers/Sales Workers and Truck Drivers	44,097	719	2%
Secretaries and Admin. Assistants	11,471	10,740	94%
Sales Representatives, Wholesale and Manufacturing	10,975	1,656	15%
Other Production Workers	9,784	943	10%
First-line Supervisors of Non-Retail Workers	9,773	1,762	18%
Accountants and Auditors	8,863	4,982	56%
Laborers and Freight, Stock and Material Movers, Hand	8,040	468	6%
First-line Supervisors of Retail Sales Workers	7,865	1,634	21%
First-line Supervisors of Production and Operating Workers	7,278	444	6%
Bookkeeping, Accounting, and Auditing Clerks	7,203	6,726	93%
Miscellaneous Mangers	7,085	1,297	18%
Customers Service Representatives	6,057	4,811	79%
Miscellaneous Plant and System Operators	5,330	251	5%
Retail Salespersons	4,834	1,366	28%
Maintenance and Repair Workers, General	4,744	**	**
Chemical Engineers	3,573	416	12%
General and Operations Managers	3,544	212	6%
Heating, Air-conditioning, and Refrigeration Mechanics and Installers	3,440	**	**
Inspectors, Testers, Sorters, Samplers, and Weighers	3,355	350	10%
First Line Supervisors of Office and Admin. Support Workers	3,096	2,058	66%
Managers, Chief Executive and Legislators	3,032	261	9%
Office Clerks, General	2,987	2,551	85%
Janitors and Building Cleaners	2,869	499	17%
Cashiers	2,798	2,013	72%
Industrial and Refractory Machinery Mechanics	2,730	51	2%
Pipelayers, Plumbers, Pipefitters, and Steamfitters	2,380	70	3%
Engineering Technician, Except Drafters	1,984	356	18%
Electricians	1,917	**	**
Welding, Soldering, and Brazing Workers	1,890	**	**
Geological and Petroleum Technicians, and Nuclear Technicians	1,877	477	25%

\*\* = less than 20

## Employment in the Downstream Oil & Gas Industry by Region: 2010

	Total	African American	Hispanic	Minority Share	Female	Female Share
US	279,162	20,043	28,426	17%	69,140	25%
Alaska	883	**	**	**	136	15%
West	35,741	2,495	7,920	29%	8,061	23%
Rockies	12,995	225	1,999	17%	3,057	24%
Gulf	80,401	8,918	13,413	28%	20,533	26%
Central	45,388	1,366	1,972	7%	10,895	24%
Eastern	103,754	7,038	3,111	10%	26,458	26%

## Potential Job Gains from Replacement Requirements in the Downstream Oil & Gas Industry: 2010-2030

	Total		
	African American	Hispanic	Total
<b>Total</b>	11,222	18,086	144,561
Management, Business and Financial	1,234	1,494	19,254
Professional and Related	696	703	11,133
Service	443	503	2,989
Sales and Related	1,889	2,670	25,036
Office & Administrative Support	2,359	2,578	22,406
Skilled Blue-collar	1,576	3,088	23,894
Semi-skilled Blue Collar	2,312	5,498	33,218
Unskilled Blue Collar	713	1,553	6,631

## Appendix D. Petrochemical Industry

### National Employment in the Petrochemical Industry: 2010

#### Total

<b>Petrochemical Industry</b>	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	17,598	18,957	156,438
Management, Business and Financial	1,189	1,437	25,290
Professional and Related	1,910	1,321	23,019
Service	506	393	3,619
Sales and Related	135	189	5,192
Office & Administrative Support	1,557	1,429	16,033
Skilled Blue-collar	2,505	2,785	25,934
Semi-skilled Blue Collar	8,176	9,407	47,386
Unskilled Blue Collar	1,618	1,997	9,964

#### Female Employment

<b>Petrochemical Industry</b>	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	4,314	5,486	39,357
Management, Business and Financial	449	438	7,035
Professional and Related	558	230	5,223
Service	191	119	816
Sales and Related	31	57	1,240
Office & Administrative Support	782	865	9,999
Skilled Blue-collar	213	183	1,593
Semi-skilled Blue Collar	1,852	3,090	11,374
Unskilled Blue Collar	238	504	2,077

#### Female Share within Each Occupation

<b>Petrochemical Industry</b>	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	25%	29%	25%
Management, Business and Financial	38%	31%	28%
Professional and Related	29%	17%	23%
Service	38%	30%	23%
Sales and Related	23%	30%	24%
Office & Administrative Support	50%	61%	62%
Skilled Blue-collar	8%	7%	6%
Semi-skilled Blue Collar	23%	33%	24%
Unskilled Blue Collar	15%	25%	21%

## Employment in the Top Detailed Occupations in the Petrochemical Industry: 2010

	Total Employment	Female Employment	Female Share
Other production workers	18,894	4,848	26%
First-line supervisors of production and operating workers	8,935	1,002	11%
Miscellaneous managers	7,078	1,229	17%
Laborers and freight, stock and material movers, hand	6,463	971	15%
Chemical engineers	5,185	677	13%
Chemical technicians	5,105	1,320	26%
Sales representatives, wholesale and manufacturing	4,928	1,124	23%
Chemical processing machine setters, operators, and tenders	4,451	423	10%
Industrial and refractory machinery mechanics	4,038	90	2%
Inspectors, testers, sorters, samplers, and weighers	3,484	1,694	49%
Crushing, grinding, polishing, mixing and blending workers	3,226	220	7%
Miscellaneous assemblers and fabricators	3,167	1,552	49%
Secretaries and administrative assistants	3,136	3,014	96%
Industrial truck and tractor operators	2,864	226	8%
Driver/sales workers and truck drivers	2,693	43	2%
Industrial production managers	2,664	314	12%
Chemists and materials scientists	2,577	675	26%
Janitors and building cleaners	2,436	356	15%
Accountants and auditors	2,396	1,538	64%
Packaging and filling machine operators and tenders	2,387	1,140	48%

## Employment in the Petrochemical Industry by Region: 2010

	Total	African American	Hispanic	Minority Share	Female	Female Share
US	156,438	17,598	18,957	23%	39,357	25%
Alaska	92	**	**	**	**	**
West	8,363	228	2,957	38%	2,302	28%
Rockies	2,747	74	507	21%	629	23%
Gulf	59,162	8,584	9,264	30%	12,238	21%
Central	31,992	2,030	3,091	16%	9,379	29%
Eastern	54,083	6,671	3,137	18%	14,809	27%

**Baseline Employment in the Petrochemical Industry by Occupation:  
2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	156,438	187,220	203,426	46,988
Management, Business and Financial	25,290	29,683	32,143	6,853
Professional and Related	23,019	25,991	27,641	4,622
Service	3,619	4,383	4,875	1,256
Sales and Related	5,192	5,894	6,165	972
Office & Administrative Support	16,033	18,368	19,206	3,173
Skilled Blue-collar	25,934	31,168	34,038	8,103
Semi-skilled Blue Collar	47,386	59,332	65,829	18,444
Unskilled Blue Collar	9,964	12,401	13,529	3,565

**Baseline Minority and Female Employment in the Petrochemical Industry:  
2010-2030**

	<b>2010</b>	<b>2020</b>	<b>2030</b>	<b>Change 2010-2030</b>
Total	156,438	187,220	203,426	46,988
African American	17,598	22,558	25,122	7,524
percent of total	11.2%	12.0%	12.3%	
Hispanic	18,957	28,965	38,542	19,585
percent of total	12.1%	15.5%	18.9%	
Female	39,357	46,298	49,509	10,152
percent of total	25.2%	24.7%	24.3%	

**Potential Job Gains from Replacement Requirements in the  
Petrochemical Industry: 2010-2030**

	<b>African American</b>	<b>Hispanic</b>	<b>Total</b>
<b>Total</b>	5,753	9,700	76,340
Management, Business and Financial	745	902	11,622
Professional and Related	689	695	11,016
Service	313	355	2,111
Sales and Related	266	376	3,528
Office & Administrative Support	809	884	7,686
Skilled Blue-collar	920	1,802	13,943
Semi-skilled Blue Collar	1,526	3,628	21,920
Unskilled Blue Collar	485	1,057	4,514

## Appendix E. Capital Investment in Oil & Gas Industry Infrastructure

### Employment Stimulated by Capital Investment in Oil & Gas Industry Transportation and Storage Infrastructure by Asset Class

	2015	2020	2025	2030
Total	310,615	260,511	196,585	146,157
Natural Gas	127,630	112,842	98,761	73,170
NGL & LPG	20,584	18,988	9,838	7,612
Crude Oil and Condensate	126,423	103,336	74,935	59,050
Refineries and Refined Product	15,129	7,689	5,216	1,914
Common Infrastructure	20,849	17,656	7,835	4,411

### Employment Stimulated by Capital Investment in Oil & Gas Industry Transportation and Storage Infrastructure: 2015

	Total	African American	Hispanic	Minority Share	Female	Female Share
<b>Total</b>	310,615	22,171	52,402	24%	48,499	16%
Management, Business and Financial	42,940	1,581	3,002	11%	10,349	24%
Professional and Related	37,104	1,260	2,454	10%	6,188	17%
Service	3,510	373	513	25%	776	22%
Sales and Related	7,825	160	642	10%	1,365	17%
Office & Administrative Support	28,100	2,194	2,947	18%	18,098	64%
Skilled Blue-collar	84,401	5,375	15,390	25%	2,279	3%
Semi-skilled Blue Collar	78,980	8,129	18,072	33%	7,718	10%
Unskilled Blue Collar	27,756	3,098	9,381	45%	1,725	6%

**Employment Stimulated by Capital Investment in Oil & Gas Industry  
Transportation and Storage Infrastructure: 2020**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	260,511	18,915	48,906	26%	40,762	16%
Management, Business and Financial	37,160	1,394	2,908	12%	8,969	24%
Professional and Related	30,001	1,019	2,181	11%	4,992	17%
Service	2,933	315	476	27%	645	22%
Sales and Related	7,604	157	699	11%	1,315	17%
Office & Administrative Support	24,080	1,935	2,846	20%	15,252	63%
Skilled Blue-collar	68,288	4,414	13,917	27%	1,816	3%
Semi-skilled Blue Collar	69,731	7,349	17,884	36%	6,563	9%
Unskilled Blue Collar	20,714	2,332	7,994	50%	1,210	6%

**Employment Stimulated by Capital Investment in Oil & Gas Industry  
Transportation and Storage Infrastructure: 2025**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	196,585	14,441	37,886	27%	30,569	16%
Management, Business and Financial	28,483	1,081	2,367	12%	7,091	25%
Professional and Related	21,627	672	1,617	11%	3,512	16%
Service	2,178	221	336	26%	464	21%
Sales and Related	6,339	109	657	12%	1,007	16%
Office & Administrative Support	18,420	1,578	2,352	21%	11,059	60%
Skilled Blue-collar	50,654	3,176	10,590	27%	1,393	3%
Semi-skilled Blue Collar	54,510	5,880	14,213	37%	5,063	9%
Unskilled Blue Collar	14,374	1,722	5,753	52%	979	7%

**Employment Stimulated by Capital Investment in Oil & Gas Industry  
Transportation and Storage Infrastructure: 2030**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	146,157	10,715	29,530	28%	22,603	15%
Management, Business and Financial	21,533	821	1,923	13%	5,374	25%
Professional and Related	15,930	464	1,239	11%	2,526	16%
Service	1,606	157	249	25%	336	21%
Sales and Related	5,142	80	589	13%	778	15%
Office & Administrative Support	14,005	1,241	1,943	23%	8,134	58%
Skilled Blue-collar	36,687	2,243	8,048	28%	1,024	3%
Semi-skilled Blue Collar	41,665	4,529	11,453	38%	3,758	9%
Unskilled Blue Collar	9,588	1,179	4,084	55%	673	7%

**Employment in the Top Detailed Occupations for Capital Investment in  
Oil & Gas Industry Infrastructure: 2015**

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
Construction Laborers	18,599	1,739	6,757	46%	601	3%
Welding, Soldering, and Brazing Workers	18,320	1,212	2,722	21%	489	3%
Carpenters	11,975	650	3,507	35%	177	1%
Miscellaneous Assemblers and Fabricators	11,254	1,261	1,505	25%	2,533	23%
Miscellaneous Managers	9,947	312	693	10%	1,721	17%
First-line Supervisors of Production and Operating Workers	9,302	535	1,060	17%	636	7%
First-line Supervisors of Construction Trade and Extraction Workers	7,861	343	1,189	19%	236	3%
Machinists	7,649	497	926	19%	197	3%
Electricians	7,542	471	1,140	21%	145	2%
Mechanical Engineers	7,246	149	288	6%	465	6%
Miscellaneous Metal Workers and Plastic Workers	6,938	815	1,629	35%	803	12%
Secretaries and Administrative Assistants	6,542	236	622	13%	6,275	96%
Construction Managers	6,041	199	540	12%	484	8%
Laborers and Freight, Stock, and Material Movers	5,942	692	685	23%	696	12%
Sales Representatives, Wholesale and Manufacturing	5,243	63	442	10%	846	16%
Inspectors, Testers, Sorters, Samplers, and Weighers	5,214	543	503	20%	985	19%
Painters, Construction and Maintenance	5,099	360	2,200	50%	303	6%



## Appendix F. Capital Investment in the Petrochemical Industry

### Employment Stimulated by Investment in the Petrochemical Industry: 2015

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	40,559	3,028	7,254	25%	7,837	19%
Management, Business and Financial	5,529	205	393	11%	1,434	26%
Professional and Related	5,859	235	407	11%	1,045	18%
Service	434	58	85	33%	106	24%
Sales and Related	949	32	61	10%	221	23%
Office & Administrative Support	3,746	258	431	18%	2,562	68%
Skilled Blue-collar	10,136	687	1,971	26%	371	4%
Semi-skilled Blue Collar	10,033	1,147	2,546	37%	1,780	18%
Unskilled Blue Collar	3,874	405	1,362	46%	318	8%

### Employment Stimulated by Investment in the Petrochemical Industry: 2020

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	27,328	2,081	5,479	28%	5,319	19%
Management, Business and Financial	3,735	141	298	12%	987	26%
Professional and Related	3,927	159	301	12%	728	19%
Service	297	40	64	35%	75	25%
Sales and Related	632	22	45	11%	159	25%
Office & Administrative Support	2,482	175	322	20%	1,779	72%
Skilled Blue-collar	6,841	469	1,478	28%	258	4%
Semi-skilled Blue Collar	6,823	799	1,949	40%	1,244	18%
Unskilled Blue Collar	2,590	277	1,022	50%	89	3%

## Employment Stimulated by Investment in the Petrochemical Industry: 2025

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	19,844	1,533	4,395	30%	3,724	19%
Management, Business and Financial	2,719	104	239	13%	722	27%
Professional and Related	2,846	115	237	12%	516	18%
Service	219	30	52	37%	53	24%
Sales and Related	452	16	36	11%	105	23%
Office & Administrative Support	1,771	128	256	22%	1,178	66%
Skilled Blue-collar	4,986	344	1,179	31%	178	4%
Semi-skilled Blue Collar	4,976	594	1,576	44%	817	16%
Unskilled Blue Collar	1,875	204	820	55%	155	8%

## Employment Stimulated by Investment in the Petrochemical Industry: 2030

	<b>Total</b>	<b>African American</b>	<b>Hispanic</b>	<b>Minority Share</b>	<b>Female</b>	<b>Female Share</b>
<b>Total</b>	13,891	1,078	3,376	32%	2,563	18%
Management, Business and Financial	1,908	73	184	14%	507	27%
Professional and Related	1,986	80	178	13%	361	18%
Service	155	21	40	39%	37	24%
Sales and Related	311	11	27	12%	72	23%
Office & Administrative Support	1,218	89	195	23%	800	66%
Skilled Blue-collar	3,501	241	899	33%	124	4%
Semi-skilled Blue Collar	3,504	421	1,224	47%	555	16%
Unskilled Blue Collar	1,307	143	628	59%	106	8%

## Appendix G. Selected 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.
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



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