

IMPACT
ANALYSIS

CALIFORNIA'S OIL AND GAS WORKERS

An analysis of the fossil fuel workforce,
occupational transition opportunities, and State
support for potentially impacted workers

Executive Summary

California's ambitious climate goals, supported by state and federal investment, will create enormous economic opportunity over the coming decades. To meet the 2045 target of carbon neutrality, a 100% clean electric grid, and a 90% reduction in oil consumption and refinery production, the state will need to modernize its electrical grid and build storage capacity to meet increased demand for electricity. Carbon management techniques, plugging orphan wells, and the development of new energy sources such as geothermal will all come into play, providing economic opportunities to workers and businesses alike. Reducing use of polluting fossil fuels will likewise result in significant health benefits to Californians, especially to communities disproportionately burdened by polluting enterprises and proximity to freeways.¹

Supported by state investment and federal funding through the Infrastructure Investment and Jobs Act and the Inflation Reduction Act, the actions necessary to tackle the challenges of climate change are projected to create 4 million new jobs in the state.² California is investing in developing the clean energy workforce, with an equity commitment to recruit and train historically disadvantaged and under-represented communities.

Decarbonizing the economy and accelerating the adoption of clean energy is necessary if we are to preserve a habitable planet. Progress to a carbon neutral future is already well underway in the state. Wind and solar power are less expensive than natural gas or coal powered electricity. A large majority of Californians are concerned about climate change and support action to address its impacts.³

However, as with all sectoral economic change, some industries will grow and thrive, while others will shrink, leaving some of their workers behind. Labor unions and trades groups are rightly concerned that workers are not forced to abandon skills developed over their careers and thrown into an inhospitable labor market with no support.

Thus, a key challenge in meeting California's climate action goals is to devise a fair, equitable, and empirically-based policy to provide support for workers at risk of unemployment and income loss as many factors combine to reduce demand in state for oil and gas products.

The relevant questions to answer in the design of a worker support policy funded by state dollars are:

- How many California workers employed in oil and gas industries will be negatively impacted by decarbonization?
- What are their future job prospects as oil and gas industries in California contract?
- What is the appropriate scale and scope of assistance to workers at risk of unemployment and income loss?
- What will it cost the state of California to provide support to these impacted workers?

It is vital that policymakers have accurate and unbiased information to answer these questions. Oil and gas industry rhetoric and industry funded studies have produced misleading figures on both the total number of impacted workers, as well as their average salaries. For example, a study commissioned by the Western States Petroleum Association (WSPA) and conducted by the Los Angeles Economic Development Corporation (LAEDC) reported 152,000 jobs in oil and gas as of 2017. But this study included in the total labor force employees at gas stations who, according to the study, make up 40% of the oil and gas labor force. (Eight out of ten of these workers are employed in gas stations with convenience stores attached). The study then excluded these low-paid employees from its analysis of average employee income in oil and gas industries, resulting in both inflated job numbers and inflated incomes.⁴

To assist in scoping the elements and cost of supporting impacted workers, the [Gender Equity Policy Institute](#) undertook an analysis of the California labor force in oil and gas industries and electric power to identify the number and type of workers that could be negatively affected by the shift to a clean energy economy.⁵

Our analysis of the most recent public data finds that oil and gas industries in California employ 45,900 workers in a wide variety of occupations in production, office work, transportation, and sales. In addition, these industries employ 13,200 executives and professionals, in positions such as chief executive, financial and investment analyst, lawyer, and engineer. Including executives and professionals, the total labor force employed in oil and gas industries in California as of 2021 is approximately 59,200 people.⁶

We conduct a novel occupational analysis of the labor force in order to identify job opportunities for oil and gas industry workers in industries active in California.⁷ In contrast to other studies examining the job impacts of decarbonization, we analyze potential employment opportunities for oil and gas workers in all growing occupations, not solely in clean energy or green jobs.

Two-thirds of the total oil and gas labor force have promising employment opportunities outside fossil fuel industries. Our findings show that a sizable majority (56%) of current oil and gas workers are highly likely to find jobs in California in another industry in their current occupation, given demand in the broader California economy for workers with their existing skills. All executives and professionals, likewise, will easily transition into new positions in their fields of expertise.

Still, among oil and gas workers, roughly a quarter (26%) are employed in office, sales, and production occupations that are projected by the U.S. Bureau of Labor Statistics (BLS) to decline nationally over the next decade. Another 18% work in core oil and gas production or extraction occupations. While these core jobs are projected to grow nationally over the next decade, California's more rapid development of a carbon neutral economy makes it likely these jobs will contract more quickly in state.

Therefore, to be assured of finding gainful employment, many in these two groups will need to transition into another occupation. ***Our analysis focuses on identifying new employment opportunities in California that use at-risk workers' existing skills and experience. For all declining occupations in oil and gas industries, there are available jobs in similar occupations in California that would allow workers to transition without the need for retraining.*** One in five at-risk oil and gas workers are projected to earn higher incomes in these new occupations. The remaining 80% are projected to earn lower incomes.

We estimate that there are 16,100 workers in the 2021 oil and gas labor force potentially at risk of displacement into lower-paying jobs over the remaining 22 years of the transition to a carbon neutral economy (2023 – 2045). The Findings section below presents a detailed explanation of our occupational and income analyses and findings.

The final sections of this report provide cost estimates and scenarios for supporting oil and gas workers at risk of displacement. We calculate the cost of supporting at-risk workers in the oil and gas labor force as of 2021, assuming 50% of these workers in declining occupations could be displaced over the next ten years (2023 – 2032).

Based on the numbers, types, and incomes of workers at risk of displacement, GEPI estimates that providing one year of income support would cost, in total, \$208.2 million over the 2023 – 2032 period. Providing up to three years of income support would cost, in total, \$624.6 million. Relocation support for potentially geographically displaced workers would add another \$64.6 million to the ten-year cost.

In summary, assuming 50% of current at-risk oil and gas workers could be displaced over the 10-year period from 2023 – 2032, the cost to the state of California to fund income subsidies and relocation support for these impacted workers is projected to be approximately \$27.3 million - \$68.9 million annually.

Key Findings

California’s oil and gas industries employ 45,900 workers.⁸

- 18% of workers (8,200 people) are employed in core oil and gas extraction and production jobs like riggers, derrick operators, roustabouts, or plant and system operators.
- 37% of workers are employed in office jobs in clerical, sales, or administrative occupations.
- 45% of workers are employed in other production, construction, transportation, and material moving occupations.⁹
- 1 in 5 employees (22%) are union members.¹⁰

More than 1 in 5 employees in oil and gas hold executive or professional positions.¹¹

- High-income executives and professionals make up 22% of the total California oil and gas labor force of 59,200 people. Workers make up 78% of the labor force.
- Nearly one third (32%) of the labor force in Petroleum Refining and one quarter (26%) in Natural Gas Distribution hold executive or professional positions.
- 100% of oil and gas executives and professionals are highly likely to find work in their current occupation in another industry in California.

67% of oil and gas employees are highly likely to find work in their current occupation in another industry in the state of California.

- The remaining oil and gas workers are employed in occupations that are projected to decline in California.
- All oil and gas workers in declining occupations are projected to find employment without retraining in similar occupations.

Assuming 50% of current at-risk workers could be displaced over the 10-year period from 2023 – 2032, the annual cost to the state of California to fund support for displaced oil and gas workers is estimated at \$27.3 million - \$68.9 million.

- An estimated 8,100 workers could face displacement into lower-paying jobs over the 10-year period from 2023 – 2032.
- Support costs include relocation and income subsidies of 1 – 3 years duration.



Findings

Analyzing public data from surveys conducted by the U.S. Census and U.S. Bureau of Labor Statistics (BLS), we estimate the number of people employed in oil and gas industries, the occupational breakdown of workers, executives, and professionals, and the incomes, by occupation, of fossil-fuel industry employees.¹²

There are seven oil and gas industries that account for fossil fuel-based or fossil fuel-related production or distribution in the state of California (see Table 1). In addition, a small share of the electric power industry, 3.7%, is dedicated to power generation from fossil fuels (see Table 4).¹³

TABLE 1: OIL AND GAS INDUSTRIES, CALIFORNIA, 2021

Census code	Industry
370	Oil and gas extraction
490	Support activities for mining
580	Natural gas distribution
2070	Petroleum refining
3080	Construction, and mining and oil and gas field machinery manufacturing
4490	Petroleum and petroleum products merchant wholesalers
6270	Pipeline transportation

Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

In 2021, approximately 59,200 Californians were employed in these seven oil and gas industries, with an additional 1,700 employed in fossil fuel electric power generation in the electric power industry.

Like many industries involved in construction or resource extraction, the oil and gas labor force is dramatically unbalanced by gender. Men make up more than three quarters (78%) of oil and gas industry workers and nearly two-thirds (68%) of executive, senior management, and professional employees (SMP).¹⁴

TABLE 2: EMPLOYMENT IN OIL AND GAS INDUSTRIES, CALIFORNIA, 2021

Employees, Type	Employees (#)	Share of Total
Employees, All	59,178	100%
Senior Management & Professionals (SMP)	13,233	22%
Workers (FFW)	45,946	78%

See Appendix for detailed description of GEPI's classification for Executive, Senior Management, and Professional Employees (SMP). Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

Oil and gas employment is highly geographically concentrated in California. Just six counties account for two-thirds of employment. Nearly one quarter (23%) of oil and gas labor force jobs are located in Los Angeles County, 12% are in Kern County, and 9% are in Orange County. Contra Costa, Riverside, and San Bernardino each account for 5-8% of the state's oil and gas employment.

The racial/ethnic composition of the oil and gas labor force is more in line with California's population. Forty-three percent of oil and gas industry employees are white. Latinos, holding 41% of positions, make up the next largest share. About 11% of are Asian Pacific Islander (API), 5% are Black, and less than 1% are Native American.¹⁵

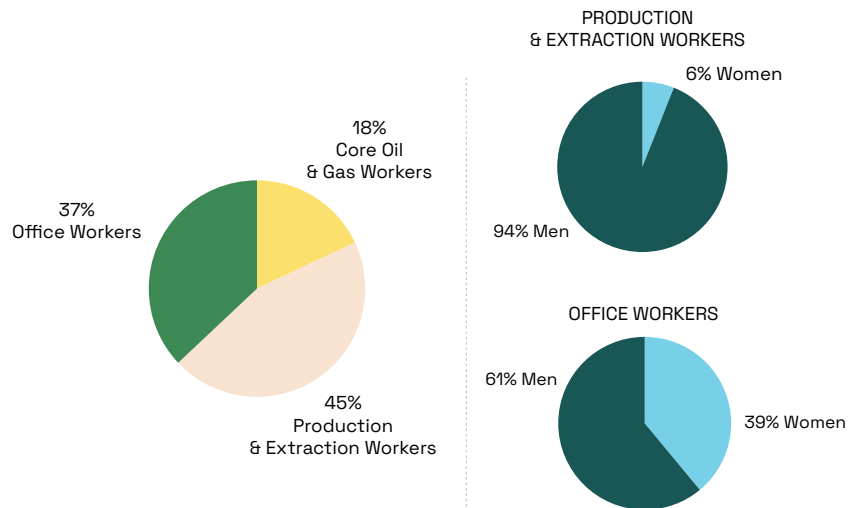
The top positions in the industry, however, are overwhelmingly occupied by white people, particularly white men. Nearly six in ten of oil and gas industry jobs with the highest pay and most managerial authority are held by white people. Among executive, senior management, and professional employees, white men are dramatically over-represented. They hold 44% of SMP positions, while comprising 19% of the state's population. White women hold 15% of SMP positions and API men hold 12%. Latino men and Latina women, respectively, hold 11% and 9% of SMP positions. The lowest representation is among Black men and women, who hold 2% of SMP positions.

API women do only slightly better, holding 6% of SMP positions.

About 13,200 of the people employed in California oil and gas industries hold SMP positions, like chief executive, financial and investment analyst, lawyer, or chemical engineer. Median annual income for SMP employees ranges from a low of \$110,00 for petroleum, mining, and geological engineers to a high of \$571,000 for chief executives in Petroleum Refining.

The remaining oil and gas labor force, approximately 45,900 men and women, work in a wide variety of occupations.

FIGURE 1: OIL AND GAS WORKERS, BY TYPE OF JOB AND GENDER



Figures depict job type among all oil and gas workers. The figure on the gender breakdown among production and extraction workers includes core oil and gas workers. SMP employees excluded. Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

Nearly 4 in 10 (37%) are engaged in clerical, sales, or administrative work, in positions such as secretaries and administrative assistants, sales representatives, and customer service representatives. More than six in ten (63%) are engaged in production, extraction, construction, or materials moving and transportation work, in positions such as pipefitters, machinists, and truck drivers. Within this category are core oil and gas production workers like riggers and derrick, rotary drill, and service unit operators.¹⁶

There is a substantial gender divide between the two categories of work. Men overwhelmingly dominate the production, transportation, and trades occupations, making up 94% of these workers. Office work is more gender balanced, with women making up 39% of these employees.

Union density in the oil and gas industry labor force is 22%.¹⁷

Other studies of the California oil and gas labor force reach different conclusions about how many people are employed in oil and gas industries. The differences in employment estimates between studies appear to be the result of two factors: the study year and decisions about industry inclusion.

In this study, we report employment numbers from the Current Population Survey (CPS) for 2021, the most recent full year for which public data is available. Because our primary research question concerns the current labor force and their incomes, it was important to use the most recent data, especially as oil and gas industries in California have for several years been undergoing transition. (Our review of CPS data over a 10-year period shows a decline in the total labor force in most oil and gas industries.) Other studies, published earlier and focused on different research questions, report employment numbers for the years 2017, 2018, and 2019.¹⁸

A more significant difference in employment estimates results from decisions about what industries properly belong in an analysis to determine who could be displaced by the transition to clean energy. A widely cited study commissioned by the Western States Petroleum Association (WSPA) and conducted by the Los Angeles Economic Development Corporation (LAEDC) reports 152,000 jobs in oil and gas as of 2017. This total includes employees at gas stations, who make up 40% of the labor force. (Eight in ten of these workers are employed in gas stations with convenience stores attached.)¹⁹ After including these workers in their totals, the study then excludes gas station employees from the analysis of average oil and gas industry income, with the rationale that their earnings are low and would “skew” incomes for the oil and gas industry downward. At the same time, they include all executives and professionals in their industry income averages.²⁰ We find these assumptions to be untenable, as well as contradictory. We follow the practice of most other researchers and do not include gas station workers in the analysis of the oil and gas workforce.²¹ Other differences in labor force estimates between our study and others result from their inclusion of industries which are only tangentially impacted by California’s commitment to transition off fossil fuels.²²

The Case of Electric Power: From Oil and Gas Dependence to Clean Energy Growth

California is already far along on transitioning its electricity generation, transmission, and distribution off of coal, oil, and gas. Recently enacted state policies and mandates will accelerate this transition. By 2035, the state has committed to reach a 100% clean electric grid.

Given the projected growth in demand for electricity, the continuing transition to renewable sources will have minimal negative impact on those currently working in electric power transmission and distribution. Instead, the electric power industry is poised to generate many new jobs, as California updates its grid, increases storage capacity, and develops geothermal resources.

To meet the state's increased demand, electric utilities will need to retain and expand their qualified and trained workforce. The large majority of current workers will be able to stay in their jobs, while the rest will have the opportunity to move into other occupations with their employer or in the industry. The fact that electric utilities are highly unionized should provide additional job security for workers in declining occupations.

With the industry's demand for additional workers, workers' possession of transferable skills, and worker representative systems in place, there is little chance any electric utility worker will be forced to change industries or find themselves unemployed.²³

In 2021, the electric power industry in California employed approximately 45,600 people, with over a quarter of those (27%) in executive, senior management, or professional jobs.

TABLE 3: EMPLOYMENT IN ELECTRIC POWER GENERATION, TRANSMISSION, AND DISTRIBUTION, CALIFORNIA, 2021

Employees, Type	Employees (#)	Share of Total
Employees, All	45,629	100%
Senior Management & Professionals (SMP)	12,430	27%
Workers	33,199	73%

Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

There is one small group of electric power industry workers which could be impacted by the transition to renewable energy—those currently working in the industry sub-sector “fossil fuel electric power generation,” which accounts for 3.7% of the industry.²⁴

TABLE 4: EMPLOYMENT IN FOSSIL FUEL ELECTRIC POWER GENERATION, CALIFORNIA, 2021

Employees, Type	Employees (#)	Share of Total
Employees, All	1,688	100%
Senior Management & Professionals (SMP)	460	27%
Workers	1,228	73%

Gender Equity Policy Institute analysis of NAICS (2019), ACS (2019), and CPS (2021).

An occupational analysis of electric power workers reveals that none work in core oil and gas production or extraction occupations. Rather, many are in skilled trades in electrical or power plant operations that are projected by BLS to see high growth in a clean energy economy.²⁵

Identifying Potentially Displaced Workers

Occupations held by oil and gas workers are in most cases found throughout other industries in California. The largest occupational group across the oil and gas industry is “Driver/sales workers and truck drivers” (ACS Code 9130); there are 96 times more of these workers in other California industries than in oil and gas industries. Plumbers, pipe fitters and steamfitters working in oil and gas industries account for 1 in 61 of Californians in this occupation. Only a small proportion of oil and gas industry employment is unique to the industry.²⁶

Most studies seeking to identify new jobs for displaced oil and gas workers limit their analysis to employment prospects in the emerging clean energy and green economy.

Certainly, some workers employed in oil and gas industries may choose to seek opportunities in clean energy and other green industries. But it is equally or more likely that they will choose to continue in their current occupation and seek employment in other industries.

Therefore, it is essential to determine whether other industries in California will have sufficient openings to allow oil and gas workers to find new jobs without retraining or an extended period of unemployment.

This question constitutes the core of our study: to estimate how many workers are at risk of displacement in order to calculate the cost of supporting at-risk workers. To answer this, we conduct an analysis of California employment trends by occupation. First, we analyzed the projected job growth for all occupations in the seven oil and gas industries projected to contract and classified each occupation as high growth, moderate growth, or declining. We then collected California state data by occupation for all industries to determine if there would be demand in California to employ former oil and gas workers.²⁷

More than one in five oil and gas industry employees, or 13,200 people, are in highly paid executive, senior management, and professional occupations. Our analysis finds that there are ample job opportunities for all SMP in their current occupation.²⁸ However, even if some were to be employed in declining occupations, we find it unrealistic to ask California taxpayers to subsidize a career transition for oil and gas executives, lawyers, and engineers who earn well over six figures. It is worth noting that other studies do not distinguish between workers and executives and professionals, resulting in higher estimates of the number and average income

of people negatively impacted by the transition to clean energy and significantly increased costs to the state to provide support to displaced oil and gas workers.²⁹

Turning the focus to workers in oil and gas industries, based on the occupational analysis, we estimate that a large majority of oil and gas workers (56%) will readily find new employment in their current occupation in another California industry. Given demand for their skills and experience, approximately 26,000 oil and gas workers should not experience any period of unemployment.

In sum, 67% of the total oil and gas labor force, or 39,100 workers and SMP, are projected to be able to transition with ease to jobs in other industries without retraining or a period of unemployment.

The remaining 20,100 oil and gas workers (44%) currently work in 29 occupations that are declining; demand for new workers in these occupations in California over the next decade is likely to shrink. Of these at-risk workers, approximately 8,200 work in six core extraction and production occupations that are heavily concentrated in oil and gas industries.

TABLE 5: CORE OIL AND GAS PRODUCTION AND EXTRACTION OCCUPATIONS, CALIFORNIA, 2021

Census code	Occupation
6800	Derrick, rotary drill, and service unit operators, oil & gas
6850	Underground mining machine operators
6950	Other extraction workers
7560	Riggers
8630	Miscellaneous plant and system operators
9650	Pumping station operators

Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

The remaining approximately 11,900 people work in a variety of occupations in administrative support, production, and sales, which are shrinking nationally because of market and technological trends in the broader U.S. economy. For example, several thousand clerks, secretaries, bill collectors, customer service representatives, along with their supervisors, will enter a job market with low demand for their current occupation.

TABLE 6: GROWTH PROJECTIONS BY OCCUPATION, OIL & GAS WORKERS, CALIFORNIA, 2021

Projected Growth Rates	Workers (#)	Share of Workers
High Growth Occupations	18,897	41%
Moderate Growth Occupations	6,951	15%
Declining Occupations	20,097	44%
<i>Office, Sales, Production</i>	<i>11,864</i>	<i>26%</i>
<i>Core Oil & Gas</i>	<i>8,234</i>	<i>18%</i>
TOTAL	45,946	100%

Gender Equity Policy Institute analysis of ACS (2019) and CPS (2021).

The racial and ethnic makeup of the workers most likely to be displaced is similar to that of the state overall: 12% are API (Asian and Pacific Islander), 4% are Black, 45% are Latino, 2% are Native American, and 38% are White. Although more than a third (35%) of workers in declining occupations are women, five of the six core oil and gas occupations are 100% male. In the sixth (other extraction workers), men hold 91% of the jobs.

In sum, our findings show that approximately 20,100 oil and gas workers in 2021 hold jobs in 29 declining occupations that are potentially vulnerable to occupational displacement and income decline.

Assessing Displaced Workers' Career Pathways

Our analysis to this point finds that there are approximately 20,100 impacted fossil fuel workers (IFFW) in oil and gas industries who are at risk of displacement over the next two decades as California transitions to a carbon neutral economy.

Retraining and upskilling for careers in clean energy and other green industries is certainly an option for these workers. Yet, in addition, these men and women possess skills that are transferable to a wide variety of industries and occupations.

To identify and assess the full range of potential employment opportunities for IFFW, we conduct a detailed occupational analysis using the Occupational Information Network (O*NET). Sponsored by the U.S. Department of Labor, O*NET is a comprehensive database of occupational characteristics and requirements. It is based on an analysis of the skills, knowledge, and abilities required for a job, as well as the common tasks and activities performed in that occupation.³⁰

Using the O*NET Career Changers Matrix, it is possible to identify occupations that require similar skills and experience; a change from one occupation to one matched by O*NET requires minimal additional preparation. In short, workers can easily and quickly transition between occupational matches without retraining or extended periods of unemployment.

To identify similar occupations to those held by IFFW, we analyzed the 29 declining occupations with the O*NET Career Changers Matrix and reviewed the occupation returns to select the best matches. First, we applied the same growth brackets as used in the previous step of the occupational analysis and removed all matches in declining occupations. Second, some occupations were removed based on poor fit.³¹ As a final step, where there were many occupational matches, we selected the top replacement occupations based on those with the highest projected growth rate, the largest quantity of jobs in California, and the highest median incomes (see Appendix).

Our occupational matching analysis yields three to five viable substitute occupations for nearly all at-risk occupations. In cases where more than 1,000 people are currently employed in a declining occupation, we retain more substitute matches. There remain

three occupations for which only one or two viable substitute occupations are returned by the O*NET analysis.

The 20,100 oil and gas workers in at-risk occupations will face greater challenges in finding work in California outside the oil and gas industry, compared to their colleagues in growing occupations. Nevertheless, the matched occupations will not require retraining and there are sufficient jobs in California to provide employment to these displaced men and women. The primary issue becomes the potential for income loss and, for a minority, potential relocation.

Income and Relocation Support Analysis

To calculate the cost of providing income support to workers at risk of displacement, we gather data on incomes in current oil and gas occupations and in matched occupations. We then compare median incomes to project whether oil and gas workers are likely to earn less or more in their new jobs.³²

Median incomes in declining oil and gas occupations range from \$20,000 to \$100,400. Given the variability, we group the occupations into income quartiles.

One in five (20%) IFFW are in the high-income group, with current median income of more than \$90,000 annually.

Nearly two-thirds (62%) are in the middle-income group, with current median income of \$53,000 - \$90,000 annually.

About one in six (17%) are in the lower middle-income group, with current median income greater than \$32,000 and less than \$53,000.

Only a fractional percentage of workers (0.7%) are low income, with median income putting them in the lowest income quartile in California.

For the new matched occupations, we find the median income for each match, and use those values weighted by the number of IFFW in that occupation and the projected growth of the matched occupation to estimate the average expected income for matched occupations for each oil and gas occupation. We then calculate the income difference between the weighted average of the matched occupations and the fossil fuel occupation.

For nine of the IFFW occupations, employing approximately 4,000 workers as of 2021, median incomes are projected to be higher in the new matched occupations.

For 20 of the IFFW occupations, employing approximately 16,100 workers as of 2021, median incomes are projected to be lower in the new matched occupations.

For those projected to earn less in matched occupations, we calculate the average income differential, using the income quartile groupings described above.

For IFFW currently making \$90,000 and above, the average deficit in income between workers' current oil and gas job and a job in a matched occupation is \$34,000.

For IFFW currently making \$53,000 - \$89,999, the average deficit in income between the current job and the matched occupation is \$25,000. For IFFW currently making \$32,000 - \$52,999, the average deficit in income is \$12,000.³³

Policymakers may choose to consider additional assistance for oil and gas workers at risk of displacement.³⁴

While our occupational analysis identifies jobs into which impacted workers can transition with minimal or no retraining, policymakers may still wish to create a pool of retraining funds, which impacted workers could access, for upskilling or retraining for a career in clean energy or green industries.

In addition, policymakers should protect the pension benefits of displaced oil and gas workers. However, the public data is insufficient to make reliable estimates of the costs of a pension guarantee.³⁵ The state of California should explore ways to accurately assess current pension benefits and design policies to protect or supplement any lost benefits.

We estimate that approximately 13% of impacted workers could seek to relocate. Our subsidy cost estimates include a one-time, per worker relocation benefit of \$50,000.³⁶

How many years displaced workers should receive income support is likewise a policy decision best left up to the elected leaders of the state in consultation with stakeholders and constituents. In order to provide a cost range to assist in budget planning, we have provided estimates for three scenarios: an income subsidy of one year, two years, or three years. (See Figure 2.)³⁷

Assuming 50% of workers employed in declining occupations as of 2021 could face displacement over the next ten years, we calculate the cost of income and relocation support for approximately 8,100 at-risk workers.³⁸ We estimate that one year of income support would cost, in total, \$208.2 million from 2023 – 2032. Up to three years of income support would raise the cost to \$624.6 million. Relocation support would add another \$64.6 million to the ten-year costs. In sum, the annual cost of worker support over the 10-year period is \$27.3 million to \$68.9 million.

FIGURE 2: SUPPORT FOR AT-RISK OIL & GAS WORKERS, COMPARATIVE COST ESTIMATES FOR ONE, TWO, OR THREE YEARS OF INCOME SUBSIDY, CALIFORNIA, 2023 – 2032

SCENARIO 1	
1 YEAR OF INCOME SUPPORT + RELOCATION	
Average cost per year over 10-year period	\$27.3 million
Total cost over 10-year period	\$272.8 million

SCENARIO 2	
2 YEARS OF INCOME SUPPORT + RELOCATION	
Average cost per year over 10-year period	\$48.1 million
Total cost over 10-year period	\$480.9 million

SCENARIO 3	
3 YEARS OF INCOME SUPPORT + RELOCATION	
Average cost per year over 10-year period	\$68.9 million
Total cost over 10-year period	\$689.1 million

Costs calculated for 2023 – 2032 for 50% of 2021 workers at-risk of being displaced into lower-paying occupations. Includes income subsidy set at average income loss by income quartile. One-time relocation assistance is calculated for 13% of impacted workers and averaged over the ten-year period. See Appendix for more on relocation costs. GEPI estimates based on ACS (2019) and CPS (2021).

Conclusion

As the carbon neutral economy advances, supporting workers at risk of displacement from jobs in oil and gas industries is one important component of creating an equitable and sustainable future for all the people of California.

Through a detailed occupational analysis, we identify the number and types of workers in oil and gas industries as of 2021 and estimate the cost of supporting those at risk of displacement over a ten-year period from 2023 – 2032.

In summary, our findings show that among the current oil and gas labor force, approximately 25,800 workers and 13,200 executives, professionals, and senior managers work in occupations that are growing and abundant in other non-oil and gas industries in the state of California. These men and women are expected to be able to transition with ease to other industries without retraining or a period of unemployment.

We estimate that approximately 20,100 current workers in oil and gas industries (as of 2021) are at risk of displacement over the transition period, because their work is heavily concentrated in oil and gas industries or demand for their occupation is projected to contract.

More than two decades remain for California to meet its 2045 climate targets, and the potential costs of state support for oil and gas workers at risk of displacement will be spread over the entire remaining period of the energy transition.

Assuming 50% of workers in the 2021 oil and gas labor force who are employed in declining occupations could be displaced over the next ten years, we calculate the cost of subsidizing the incomes of those who are projected to earn less in their new jobs.

Twenty percent (20%) of at-risk workers are projected to earn higher incomes in their new occupations. The remaining 80% are highly likely to find employment using their current skills but are projected to earn less in their new occupations.

Thus, approximately 8,100 workers are at risk of displacement into lower-paying jobs from 2023 – 2032. We estimate that the per year cost to the state of California over this 10-year period to fund income subsidies and relocation support for these impacted workers will range from \$27.3 million to \$68.9 million.

These cost projections are meant to be estimates, not exact budget predictions. More rapid transformation of particular sub-industries, for example, retrofitting refinery and natural gas facilities for green hydrogen infrastructure, could mean that many at-risk workers will have the opportunity to continue employment at their current firm. Robust labor standards in publicly funded infrastructure projects will shield many of these impacted workers from income loss, even if they are displaced into new firms and new occupations.

By conducting an occupational analysis of the current oil and gas labor force, we have been able to more accurately identify the types of workers who are at risk of displacement as California transitions to a carbon neutral economy, as well as which of these at-risk workers are likely to see reduced incomes in their new occupations. We have also been able to calculate income differentials based on public data on matched occupations in the state of California, which has enabled us to better estimate income differences and the overall cost to the state to support oil and gas industry workers at risk of displacement.

Appendix: Occupational Classification and Transition Methodology

Identification of Oil and Gas Industries

Fossil fuel-related Census industries, like all Census industries, are broad categories; several of them include sectors unrelated to activities that would be directly impacted by California’s decarbonization goals. We consulted SUSB (2019) to estimate the share of an industry dedicated to core oil and gas work. First, we used 2017 Census – NAICS crosswalks provided by the Census to obtain a more granular detail of subcategories within industries. Second, we obtained employment information for California in 2019 by NAICS codes (6-digits). Third, based on the crosswalk correspondence, we estimated proportions of oil and gas workers within these codes.

Once the calibration weights were defined, we adjusted the CPS industry sizes and employment estimates. In addition, our employment estimates for Natural Gas Distribution represent an average from CPS 2018 to 2021, as CPS 2021 employment estimates for the industry were very low and appeared to be an outlier.

Five of the seven Census industries are fully or almost fully engaged in oil and gas activity. For these, we attributed all or nearly all employment to oil and gas. Two of the industries include substantial levels of activity unrelated to California’s decarbonization. Employment shares were adjusted as shown in the table below:

Table 7: Industry Adjustment Factors

Industry	Fossil fuel share
Support activities for mining	98.60%
Petroleum refining	100%
Petroleum and petroleum products merchant wholesalers	61.90%
Oil and gas extraction	100%
Construction, and mining and oil and gas field machinery manufacturing	43.60%
Pipeline transportation	100%
Natural gas distribution	100%

Classifying Executive, Senior Management, and Professional Employees (SMP)

We identified employees as executive, senior management and professionals (SMP) by a detailed analysis at the occupational level within each oil and gas industry. To be classified as SMP, the occupation had to meet several criteria. One, the work is characterized by professional or high-level managerial responsibilities. Two, annual median income exceeds \$110,000. Three, the occupation employs a high proportion of people with college or advanced degrees. Professional or managerial occupations that fell in an unclear zone were analyzed using the O*NET occupations outlook, which more clearly describes tasks, educational requirements, and managerial responsibilities by occupation.

It is important to note that some occupations pay substantially more than \$110,000, but mostly employ people without a college degree. These occupations were excluded from the SMP category and categorized as oil and gas workers.

After this multi-step analysis, 10 occupations remained with mixed results across the various oil and gas industries. In some industries, occupational incomes and degree holding were high, while in others, few held advanced degrees or median incomes were below \$100,000.

We then analyzed the growth rate in all SMP occupations, as well as in the 10 occupations with mixed results. All 10 occupations are growing or stable and there are ample jobs in other industries to provide employment for SMP employees leaving oil and gas industries. Ultimately, five of the ten were excluded from SMP and five were categorized as SMP.³⁹

Assuming that the proportions of SMP occupations in each industry remain relatively constant across surveys and years, we then apply proportions found in 2019 ACS to 2021 CPS to calculate the number of SMP employees in oil and gas industries.

Occupational Transition

To analyze the projected job growth by occupation, we consulted the BLS Employment Projections Program, which estimates changes in employment for the entire United States. We linked to ACS codes using a BLS crosswalk. Where an ACS code returned matches for more than one code, we averaged the projection rates.⁴⁰

To classify occupations as high growth, moderate growth, or declining, we adapted O*NET thresholds. (O*NET includes additional detailed thresholds at each of the three

levels.) Occupations projected to increase by 5% or more were classified as high growth. Occupations projected to increase by less than 5% or decrease by less than 1% were classified as moderate growth. At risk, or declining occupations were those projected to shrink by more than 1%.

Our next step was to confirm that there were sufficient jobs in California in other industries to absorb oil and gas workers in growing and stable occupations. We did this by collecting California data on the number of workers by occupation. All occupations showing stable or growing demand had ample jobs in other California industries into which oil and gas workers would be able to transition.

The BLS Employment Projections Program projects growth rates for the U.S. overall. Yet the energy transition in California is moving more rapidly than in other states, and a few core oil and gas production jobs that are growing nationally are certain to decline in California.

Our final step was to identify core oil and gas occupations based on the share of workers in an occupation employed in one of the seven oil and gas industries studied. Where at least 50% of California workers in an occupation were employed in an oil and gas industry, we categorized these workers as at risk and likely to be displaced, even if BLS shows the occupation growing nationally. Six occupations fell into this category (See Table 5).

Calculation of Relocation Costs

Oil and gas workers in California counties where jobs are particularly concentrated in oil and gas or where the population is small may need to relocate due to fewer job opportunities in matched occupations. To support workers who may relocate, we focus on counties with more than 1% of oil and gas employees and with populations of less than 1 million people, and then estimate costs for up to 50% of workers in these counties to relocate.

Notes

1. Drew Shindell et al., "Temporal and Spatial Distribution of Health, Labor, and Crop Benefits of Climate Change Mitigation in the United States," *Proceedings of the National Academy of Sciences* 118, no. 46 (November 16, 2021): e2104061118, <https://doi.org/10.1073/pnas.2104061118>.
2. "Governor Newsom Signs Sweeping Climate Measures, Ushering in New Era of World-Leading Climate Action," California Governor, September 16, 2022, <https://www.gov.ca.gov/2022/09/16/governor-newsom-signs-sweeping-climate-measures-ushering-in-new-era-of-world-leading-climate-action/>.
3. "PPIC Statewide Survey: Californians and the Environment - Public Policy Institute of California," July 2022, <https://www.ppic.org/publication/ppic-statewide-survey-californians-and-the-environment-july-2022/>.
4. Shannon Sedgwick et al., "Oil & Gas in California: The Industry, Its Economic Contribution and User Industries at Risk in 2017" (Los Angeles: Los Angeles County Economic Development Corporation Institute for Applied Economics, July 2019), 18-20, A-15. Establishments with convenience stores account for 82% of employment in NAICS code 447 "Gas Stations". (GEPI analysis of Statistics of US Businesses (SUSB) 2019.)
5. A number of U.S. Census and U.S. Bureau of Labor Statistics (BLS) data sources were consulted for this report, including the Current Population Survey (CPS), the American Community Survey (ACS), the Statistics of U.S. Businesses (SUSB), the BLS Employment Projections Program, and others. For more information on sources and methods, see Appendix.
6. Throughout this report, numbers in the text are generally rounded and may not sum due to rounding. Our primary sources for employment data are ACS and CPS for multiple years. Data was accessed through IPUMS USA and IPUMS CPS (University of Minnesota, www.ipums.org.) All estimates and calculations contained herein were done by GEPI, unless otherwise noted.
7. GEPI analysis of ACS (2019) and CPS (2021).
8. See Table 1. GEPI analysis of ACS (2019), CPS (2010-2021), and SUSB (2019).
9. Office jobs are in occupations that fall under Standard Occupational Classification (SOC) Major Group codes Office and Administrative Support Occupations (43-0000) and Sales and Related Occupations (41-0000). The remaining jobs are in occupations that fall under the following SOC codes: Construction and Extraction Occupations (47-0000); Installation, Maintenance, and Repair Occupations (49-0000); Production Occupations (51-0000); Transportation and Material Moving Occupations (53-0000). <https://www.bls.gov/soc/2018/home.htm>.
10. At the 95% CI level, the average MOE for occupations with any union membership is 24%. (GEPI analysis of CPS 2010-2019.)
11. See Appendix on the method for classifying executive, senior management, and professional employees.
12. Current employment numbers are based on data from CPS 2021, the most recent data on a sector that is already experiencing substantial transformation. The ACS dataset is larger and occupational information is more detailed in it, but 2019 was the most recent year for which reliable data was available in it. Detailed occupational and income analysis in this report is based on ACS 2019. When conducting any analysis with ACS 2019 data, we applied percentages within ACS to then calculate and report

the number of workers in CPS. See Appendix for a more detailed discussion of datasets and the various crosswalks conducted between datasets.

13. Some studies of fossil fuel employment base their analysis on data reported in North American Industry Classification System (NAICS) codes, which are more detailed than Census codes. We reviewed NAICS to ensure we had accounted for employment in all NAICS subcategories. For example, the NAICS industries “pipeline transportation of Crude oil” and “pipeline transportation of Natural gas” and “other pipeline transportation” are all included in Census code “Pipeline Transportation.” (For more information, see <https://www.census.gov/naics/> .)

14. GEPI Analysis of ACS 2019.

15. Inclusive of SMP employees. (GEPI Analysis of ACS 2019.)

16. See note 9 above.

17. At the 95% CI level, the average MOE for occupations with any union membership is 24%. There were too few observations to report union membership by occupation or industry. (GEPI Analysis of CPS 2011-2019.)

18. Sedgwick et al., “Oil & Gas in California.” Robert Pollin et al., “A Program for Economic Recovery and Clean Energy Transition in California” (Political Economy Research Institute, University of Massachusetts-Amherst, June 2021). Adie Tomer, Joseph W. Kane, and Caroline George, “How Renewable Energy Jobs Can Uplift Fossil Fuel Communities and Remake Climate Politics,” Metropolitan Infrastructure Initiative (Washington, D.C: Brookings, February 19, 2021), <https://www.brookings.edu/research/how-renewable-energy-jobs-can-uplift-fossil-fuel-communities-and-remake-climate-politics/>. The LAEDC report is based on 2017 data from IMPLAN. The PERI report is based on 2018 data from IMPLAN. The Brookings report is based on 2019 national data from Emsi, a labor market data company. Both IMPLAN and Emsi are proprietary fee-based data aggregators. Because the data used by these other researchers is not public, we are unable to replicate their results or identify exactly the sources of the difference in employment estimates.

19. Sedgwick et al., “Oil & Gas in California,” A-15. Establishments with convenience stores account for 82% of employment in NAICS code 447 “Gas Stations”. (GEPI analysis of Statistics of US Businesses (SUSB) 2019.)

20. Sedgwick et al. 20, 35.

21. See for example, Tomer, Kane, and George, “How Renewable Energy Jobs Can Uplift Fossil Fuel Communities and Remake Climate Politics.”

22. For example, one study includes “Construction of other new residential structures.” It also includes “coal mining,” while acknowledging that there is no coal mining production remaining in California. (Pollin et al., “Clean Energy Transition,” 146.)

23. On unionization rates in the utility industry, see “Wages, Benefits, and Change: A Supplemental Report to the 2020 Annual U.S. Energy and Employment Report” (National Association of State Energy Officials (NASEO), The Energy Futures Initiative, 2020), usenergyjobs.org.) See Appendix for a detailed discussion of the analysis of workers’ transferrable skills.

24. The Census industry category, Electric Power Generation, Transmission, and Distribution, encompasses several NAICS six-digit codes, including “Fossil Fuel Electric Power Generation,” which

accounts for 3.7% of the total in the broader electric power industry.

25. "Green Occupations - O*NET 20.3 Data Dictionary at O*NET Resource Center," n.d., https://www.onet-center.org/dictionary/20.3/excel/green_occupations.html.

26. GEPI Analysis of ACS 2019.

27. See Appendix.

28. The only SMP occupation projected to decline is "Engineers, all other." The 900 engineers in oil and gas industries account for only 0.9% of Californians in this occupation, so there remain ample jobs to absorb those working in oil and gas industries. (GEPI Analysis of ACS 2019.)

29. Other studies, additionally, report average incomes for the entire labor force, including high paid executives, resulting in substantially higher estimates of industry income. See Pollin et al., "Clean Energy Transition," 98-99.

30. As ACS and O*NET occupational classifications differ, we carried out a series of crosswalks to merge the data. Specifically, we first matched ACS with Census SOC codes, and then matched Census SOC Codes to the more detailed O*NET SOC Codes. Conducting these crosswalks yielded 7 – 32 occupational matches for each declining occupation.

31. For example, "film and video editor" is returned as a fit for "office and administrative and support workers, all other," but given the specialized training required for editing, it is unlikely to be a viable replacement job.

32. To ensure sufficient sample sizes, the income analysis is based on pooled ACS 2015 – 2019 microdata. Even with pooled data, for several occupations there were insufficient observations to accurately analyze income and work hours. Therefore, in order to calculate income replacement for workers in these occupations, we add the estimated number of workers to the middle-income group.

33. GEPI Analysis of ACS 2019.

34. "Putting California on the High Road: A Jobs and Climate Action Plan for 2030," June 2020. <https://laborcenter.berkeley.edu/putting-california-on-the-high-road-a-jobs-and-climate-action-plan-for-2030/>.

35. Because of data limitations, other reports pool California with Alaska, Hawaii, Oregon, and Washington to analyze pension benefits in the fossil fuel labor force. (Pollin et al., "Clean Energy Transition," 144.)

36. Moving expenses were calculated at the mid-range of \$50,000 per worker. <https://moneyzine.com/finding-a-job/job-relocation-expenses/>.

37. Three years of income support was the length of time for support calculated in Pollin et al., "Clean Energy Transition."

38. GEPI Analysis of ACS 2019 and CPS 2021.

39. With the exception of one occupation that is clearly SMP, all SMP occupations, as well as the five ultimately assigned to the oil and gas workers category, are growing or stable. (GEPI Analysis of ACS 2019.)

40. National Employment Matrix/SOC to ACS Crosswalk, available at <https://www.bls.gov/emp/data/occupational-data.htm>.

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Gender Equity Policy Institute is a nonprofit organization dedicated to advancing opportunity, fairness, and well-being for all people through research and education exposing the gender impacts of the policies, processes, and practices of government and business.

Our Work

We conduct and publish research on the best practices for accelerating gender equity. We analyze and rate public policies and business practices to identify the effects on people of all genders, with particular attention to the impacts on groups, such as women, people of color, and LGBTQ+ people, who have been systematically disadvantaged by discrimination, bias, and structural inequality. By educating policymakers, business leaders, and advocates about the inequities embedded in seemingly neutral economic and political processes, we provide the tools and knowledge that leaders need to rebalance systems, guarantee equal benefits and opportunities, and secure a just and sustainable future for all people.

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