

# Putting California on the High Road: A Jobs and Climate Action Plan for 2030

edited by Carol Zabin • June 2020

## Chapter 8: Industrial Sector

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*Special thanks to Robert Collier for his assistance  
on this chapter.*

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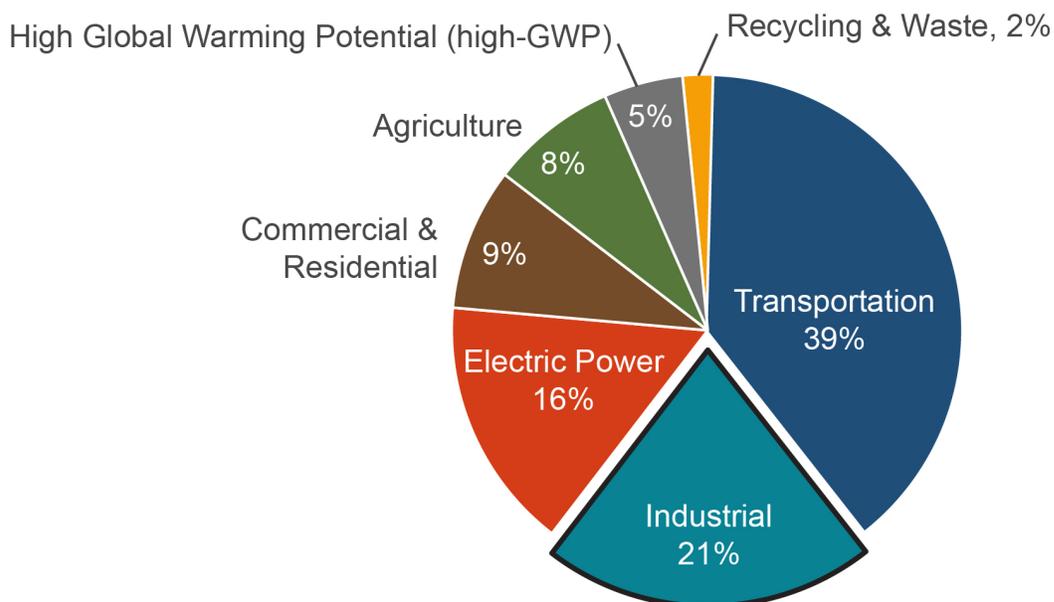
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## I. Overview of Sector and Key Climate Policies

The industrial sector is a major source of greenhouse gas emissions, comprising 23 percent of statewide emissions in 2017. The Scoping Plan industrial sector includes manufacturing industries as well as oil and gas extraction, distribution, and refining. **Exhibit 8.1** shows the importance of industrial emissions as a share of total emissions.

**Exhibit 8.1. Industrial Sector Emissions (MMTCO<sub>2</sub>E) as of 2017**



Source: California Air Resources Board, “California Greenhouse Gas Emissions for 2000 to 2017: Trends of Emissions and Other Indicators,” 2019, [https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2017/ghg\\_inventory\\_trends\\_00-17.pdf](https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf).

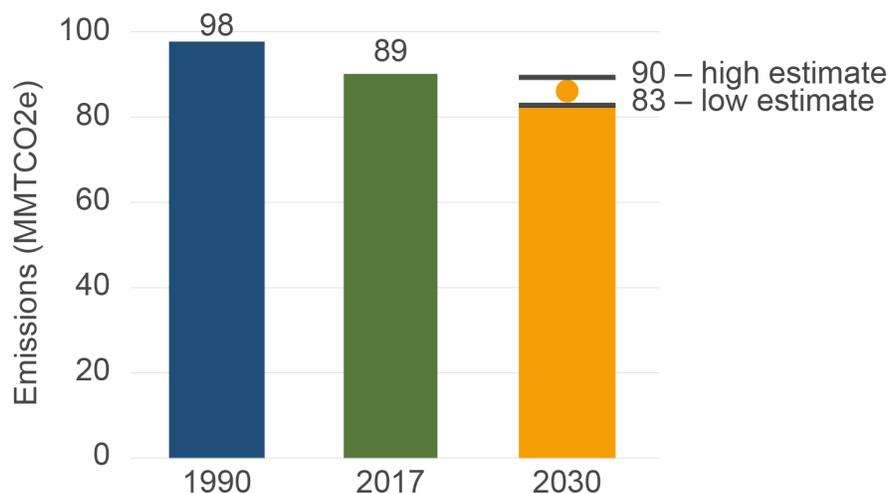
The Scoping Plan identifies emission reductions for the industrial sector of approximately 8-15 percent below 1990 levels by 2030 from direct regulations and mandates implemented to achieve the SB 32 target.<sup>1</sup> In addition, the Cap-and-Trade Program is expected to reduce greenhouse gas emissions by up to 236 MMTCO<sub>2</sub>e from all covered sectors from 2021-2030, as much as approximately 38 percent of the emissions reductions needed to meet the state’s 2030 target. A portion of this reduction is expected to come from emissions reductions in the industrial sector.<sup>2</sup>

**Exhibit 8.2** shows emissions from the industrial sector in 1990 and 2017 and finally, the estimated range of emissions for the sector in 2030 from implementing the measures



identified in the Scoping Plan. Missing from this figure are the expected emission reductions from the Cap-and-Trade Program. Since this market-based program covers all large sources of greenhouse gas emissions across sectors and does not predetermine where emission reductions will occur, its projected impact in each sector cannot be specified.

**Exhibit 8.2. Industrial Sector Emissions, 1990 and 2017, and Expected Range of Emissions in 2030 after Implementation of Scoping Plan Measures (excluding reductions from the Cap-and-Trade Program)**



Sources: 1990 levels and 2030 GHG emissions targets: California Air Resources Board, “California’s 2017 Climate Change Scoping Plan,” page 31, table 3, November 2017, [https://ww3.arb.ca.gov/cc/scopingplan/scoping\\_plan\\_2017.pdf](https://ww3.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf) 2017 levels from: California Air Resources Board, “California Greenhouse Gas Inventory for 2000-2017—by Category as Defined in the 2008 Scoping Plan,” August 12, 2019, [https://ww3.arb.ca.gov/cc/inventory/data/tables/ghg\\_inventory\\_scopingplan\\_sum\\_2000-17.pdf](https://ww3.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-17.pdf).

Industrial emissions are mainly caused by fossil fuel combustion, hence the industries that use a large quantity of energy also have the highest greenhouse gas emissions. For these industries, the principal opportunities to reduce emissions are lowering overall energy use, decarbonizing fuels, and switching equipment from using petroleum-based fuels (e.g., natural gas) to electricity from renewable sources (addressed in Chapter 6).

In the California Air Resources Board (CARB) economic sector categorization of emissions, petroleum refining and hydrogen production were responsible for 29 percent of the industrial sector’s greenhouse gas emissions in 2017, followed by manufacturing



(24 percent, with cement as a very large emitter), oil and gas extraction (17 percent), and cogeneration<sup>3</sup> (combined heat and power, 8 percent).<sup>4</sup> Other emissions that are classified in the economic sector emission inventory as industrial include landfills (8 percent) and solid waste and waste water treatment (2 percent); these are addressed in the waste and water chapters.

Averting climate catastrophe necessitates profound transformations in the industrial sector. Oil and gas extraction and refining are large emissions sources, and the use (i.e., fuel combustion) of finished petroleum products is an even greater source of the state's GHG emissions. In addition to the policies described in this chapter, which directly impact the petroleum industry, many climate policies identified in the other chapters are intended to reduce demand for petroleum, which is likely to eventually lead to a decline in sales and production.<sup>5</sup> This contraction in demand for petroleum presents a risk of job loss in the petroleum industry.

Workforce policy can help protect workers during this transition of the petroleum industry. A phase-down in petroleum demand can both limit greenhouse gas emissions and sustain or grow employment through continued investments in emissions reductions in petroleum extraction and refining. In addition, with advanced planning the state can develop worker transition strategies if jobs are lost or require new skill sets as the industry evolves in the low-carbon economy. Workforce assistance can help place workers in jobs at comparable wages in other industries or maintain workers' living standards through other forms of assistance, including for example, bridges to retirement or wage insurance (see Chapter 4 for a full discussion of just transition). Investment in low-carbon manufacturing can also create jobs, but not all of these jobs will be in or stay in California.

The complexities of the industrial sector make it difficult to predict job impacts of implementing climate policies. The following analysis provides a general assessment of the ways in which each major policy is likely to affect jobs and identifies where workforce interventions may be necessary or possible.

Policies to reduce emissions in the industrial sector fall into three categories:

1. Market-based policies;
2. Emissions standards and mandates; and
3. Incentives, procurement, and other public investments to support emissions-reduction programs and measures and/or promote low-carbon technologies.



## ❖ Market-Based Mechanisms

### ➤ **Cap-and-Trade (Assembly Bill 398, E. Garcia, Chapter, Statutes of 2017)<sup>6</sup>**

Codified the state's Cap-and-Trade Program through 2030. The Cap-and-Trade Program is a market-based mechanism that places a declining cap on greenhouse gas emissions for all entities that emit more than 25,000 metric tons of carbon dioxide equivalent (CO<sub>2</sub>e) per year. It requires all these entities to either purchase emission allowances, or a limited number of offsets, for every ton of carbon emitted, or reduce emissions, and allows the buying and selling of these allowances to achieve emission reductions at overall least cost.

## ❖ Emissions Standards and Mandates

### ➤ **Mandatory Reductions of Short-Lived Climate Pollutants**

California recently prohibited the use of hydrofluorocarbons (HFCs) in new refrigeration equipment or foams and implemented a comprehensive strategy to reduce HFC emissions. Senate Bill 1383 (Lara, Chapter 395, Statutes of 2015)<sup>7</sup> requires reduction in short-lived climate pollutants (SLCPs) to achieve a 40-percent reduction in methane emissions, a 40-percent reduction in HFC gases, and a 50-percent reduction in anthropogenic black carbon below 2013 levels by 2030.

### ➤ **Mandates on Fugitive Methane Emissions from Oil and Gas Facilities**

These are regulations to capture fugitive emissions from natural gas pipelines and from oil and gas extraction and refining. Senate Bill 1371 (Leno, Chapter 525, Statutes of 2014)<sup>8</sup> required the development of regulations to abate leakage in natural gas infrastructure. In 2017, CARB adopted a rule to reduce fugitive and vented emissions of methane from both new and existing oil and gas facilities.<sup>9</sup>

## ❖ Incentives, Procurement, and Other Public Supports

### ➤ **Combined Heat and Power (CHP) Procurement**

Governor Brown's Clean Energy Jobs Plan (2010) set a goal of 6,500 MW of new CHP capacity by 2030.<sup>10</sup> To achieve this goal, the "Qualifying Facilities and CHP Program Settlement Agreement" requires the state's three largest Investor Owned Utilities (IOUs) to procure a minimum of 3,000 MW of CHP.<sup>11</sup> Another



smaller program, the Waste Heat and Carbon Emissions Reduction Act, Assembly Bill 1613 (Blakeslee, Chapter 713, Statutes of 2007),<sup>12</sup> created a feed-in-tariff to incentivize small CHP generation facilities of less than 20 MW.

### ➤ **Utility Incentives for Industry**

IOUs provide incentives for their industrial customers—including customized incentives for energy efficiency retrofit and new construction projects involving the installation of high-efficiency equipment or systems in the industry sector—and rebates for energy efficiency measures that have been identified through standard energy efficiency audits.

### ➤ **Grant Programs for Efficiency in Specific Industries**

Examples include the Food Production Investment Program, funded with \$66 million from the Budget Act of 2017 (Assembly Bill 109, Ting, Chapter 249, Statutes of 2017<sup>13</sup>) and administered by the California Energy Commission (CEC). The program provides grants, loans and other incentives to promote implementation of projects in the food processing industry that reduce greenhouse gas emissions.

### ➤ **Research and Development for Emerging Technologies**

The state is providing a variety of R&D support for emerging industrial technologies that reduce emissions, including industrial carbon capture and sequestration systems to reduce greenhouse gas emissions in the atmosphere by capturing them and sequestering them in land. These technologies are still under development and not market ready.

### ➤ **Support for Low-Carbon Manufacturing Through Procurement—The Buy Clean California Act (Assembly Bill 262, Bonta, Chapter 816, Statutes of 2017)<sup>14</sup>**

This law requires contractors that bid on state infrastructure and construction projects to disclose the greenhouse gas emissions for certain materials, including concrete and steel, and requires the Department of General Services to develop a method for agencies to include this emission data in their review process for bid selection. Reporting emission data can incentivize low-carbon procurement to reduce the greenhouse gas emissions of supply chains and could increase domestic and local manufacturing.



## II. Industries and Occupations

The main industries within this sector that will be directly impacted by climate policy are: 1) manufacturing industries; 2) petroleum production and refining industries.

California leads the nation in employment in manufacturing, with about 1.3 million workers in 2017.<sup>15</sup> Heavy-GHG emitting industries include manufacturers of cement and lime, paper and wood products, glass, petroleum refining and petroleum products, iron and steel, chemicals, certain food processing, and oil and gas extraction.<sup>16</sup> The state is an important producer of petroleum products, ranking fourth among U.S. states in crude oil production, third in refining capacity, and 15<sup>th</sup> in natural gas production.<sup>17</sup> California is also home to a growing segment of low-carbon substitutes for traditionally high-emitting manufacturing products. Hundreds of billions of dollars in private-sector investment are developing California industries such as electric vehicles, advanced batteries, and other lower carbon components and final products.<sup>18</sup>

## III. Workforce Issues in Key Subsectors and Policies

The following sections analyze the subsectors addressed in the industrial sector of the Scoping Plan. The first section presents analysis of manufacturing industries. The next section presents a supplementary discussion of the petroleum industry due to its impact on emissions through fuel combustion in end uses, in addition to its emissions from the production process.

For each subsector, the analysis describes the main climate policies identified in the Scoping Plan, assesses the possible workforce implications, and provides recommendations on how to ensure the best possible outcomes for workers while delivering on climate goals.

### A. Manufacturing Sector

#### 1. Cap-and-Trade Program

The primary policy that incentivizes emission reductions in the industrial sector is the state's Cap-and-Trade Program, which establishes a cap on greenhouse gas emissions that declines over time, puts a price on carbon, and creates a market for allowances and



limited offsets that are used to cover greenhouse gas emissions. The program requires major emitters of greenhouse gases to obtain one allowance for each metric ton of CO<sub>2</sub>e that they emit. The buying and selling of emissions allowances is expected to result in the lowest cost solutions to emissions reductions. As opposed to direct regulations which specify where and how emissions reductions will take place, the Cap-and-Trade Program does not predetermine the specific industries or locations where reductions will occur. This makes it difficult to predict employment impacts, but the following discussion sheds light on the factors determining possible employment outcomes.

Since the passage of the California Global Warming Solutions Act (Assembly Bill 32, Núñez, Chapter 488, Statutes of 2006),<sup>19</sup> the Cap-and-Trade Program has been a key component of California's suite of climate policies.<sup>20</sup> For the upcoming period of 2021-2030, Senate Bill 32 (Pavley, Chapter 32, Statutes of 2016)<sup>21</sup> set the state's target to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030, and AB 398 codified the Cap-and-Trade program as a key strategy to achieving the 2030 GHG target.

In its first iteration, which will end in 2020, the Cap-and-Trade Program was anticipated to contribute only about 20 percent of the total emissions reductions needed, with the rest being driven by mandates, public investments, and other policies. From 2021 to 2030, the program is anticipated to be responsible for a greater share of emission reductions, up to about 38 percent of total emission reductions, according to the 2017 Scoping Plan.<sup>22</sup>

California's Cap-and-Trade Program is comprehensive, covering roughly 420 entities in electricity generation, natural gas, transportation fuels, and large industrial sources in California.<sup>23</sup> With the inclusion of suppliers of transportation fuels in the public auction in 2015, these covered sources are collectively responsible for approximately 80 percent of greenhouse gas emissions in the state, but as noted above many of them are also subject to direct air quality and other climate regulations as well.<sup>24</sup> Firms in industries above the 10,000 metric tons of CO<sub>2</sub>e threshold are required to submit annual emission reports, and any entity that emits more than 25,000 metric tons of CO<sub>2</sub>e is required to comply with the Cap-and-Trade Program.<sup>25</sup> Quantifying the share of reductions that will be generated in the industrial sector from the Cap-and-Trade Program is not possible, because the Program does not predetermine how entities will reduce emissions and instead lets individual firms choose between lowering emissions, obtaining the required number of emissions allowances and limited offsets, or a combination of the two.

About one-half of the emission allowances are sold in quarterly auctions administered by CARB. These funds are deposited in the Greenhouse Gas Reduction Fund (GGRF), discussed in Chapter 5, and allocated by the legislature to projects in all six Scoping Plan sectors, as described in the other sector chapters of this report.<sup>26</sup>



CARB allocates the other approximately one-half of the allowance value, free of cost, to specified entities covered by the Cap-and-Trade Program. Allowances are freely allocated to industrial covered entities to reduce cost impacts to consumers, prevent emissions leakage, and to help businesses adapt to a carbon price. CARB also distributes free allowances to electricity distribution utilities and natural gas suppliers to benefit their ratepayers.

### Prevention of Leakage

Allowances are allocated freely to the industrial sector partly to prevent emissions leakage. Leakage is a reduction in greenhouse emissions within a jurisdiction with a mandate on emissions reductions that is offset by an increase in emissions in jurisdictions without such a mandate in place. AB 32 and SB 32 required CARB to design measures to minimize leakage to the extent feasible. Providing free allowances for leakage-prone industries can be considered a workforce policy, because they are an intervention designed to prevent businesses from leaving the state due to the Cap-and-Trade Program which may mitigate the risk of job loss.

In 2017, 50 percent of the free allowances were distributed to the petroleum refineries and hydrogen processing industry, 23 percent to oil and gas extraction, 16 percent to cement manufacturing, and the rest distributed among a number of other industries.<sup>27</sup>

#### ***a. Workforce Outcomes in the Industrial Sector from the Cap-and-Trade Program***

##### ***i. Employment in Manufacturing Industries***

**Exhibit 8.3** presents estimates of the number of employees at covered entities that receive free allowances in 2017, by industry, using Dun and Bradstreet data.<sup>28</sup> The approximately 40,000 jobs in the covered entities represents 0.2 percent of the 17 million jobs that currently exist in California,<sup>29</sup> and since only a small percentage of the jobs in covered entities are at risk, the maximum number of workers potentially at risk of job loss is an even smaller share of the California workforce.



**Exhibit 8.3. Employment, Blue-Collar Share, and Wages at Leakage-Prone Firms Covered by California’s Cap-and-Trade Program, 2017**

Industrial Sector	Estimated # of Employees at Covered Facilities	Percent in Blue-Collar Occupations	Mean Hourly Wage of Blue-Collar Workers
Petroleum Refining and Hydrogen Production	4,354	55%	\$35.58
Crude Petroleum and Natural Gas	2,955	41%	\$22.82
Cement, Lime, and Gypsum Product Manufacturing	1,557	80%	\$15.08
Fruit and Vegetable Canning	3,005	80%	\$11.63
Other Food Manufacturing	6,957	70%	\$12.13
Dairies	1,458	76%	\$13.67
Glass Manufacturing	3,055	72%	\$12.42
Paper Manufacturing	2,153	73%	\$17.80
Metal Processing and Manufacturing	1,573	74%	\$13.00
Chemical, Biological, and Pharmaceutical Manufacturing	9,684	35%	\$12.85
Miscellaneous Industrial Facilities	2,528	51%	\$14.81
<b>Total</b>	<b>39,279</b>	<b>58%</b>	<b>\$13.90</b>

Sources: Jesse Strecker et al., “Protecting California Workers in Cap and Trade,” unpublished (UC Berkeley Goldman School of Public and UC Berkeley Labor Center, 2018). Employment in covered facilities based on queries of the Dun & Bradstreet database, done in December of 2017. All industry sectors except for Paper Manufacturing were missing data on some facilities. “Estimated # of Employees at Covered Facilities,” then, represents a minimum employment level. However, this is a more accurate count than estimating employment from the BLS NAICS code because only those facilities that emit more than 25,000 metric tons of CO<sub>2</sub>e in a specific time period are covered by cap-and-trade. For a full list of firms receiving free industrial assistance allowances, see California Air Resources Board, “Public Data on Allocation,” December 5, 2017, <https://ww3.arb.ca.gov/cc/capandtrade/allowanceallocation/v2018allocation.pdf>; wage and occupation data is calculated for the entire industry in California, not just the covered businesses, and extracted from U.S. Department of Labor, Bureau of Labor Statistics, “OES Research Estimates by State and Industry,” (for May 2017) Occupational Employment Statistics, March 30, 2018, [https://www.bls.gov/oes/current/oes\\_research\\_estimates.htm](https://www.bls.gov/oes/current/oes_research_estimates.htm).



This discussion of the Cap-and-Trade Program illustrates the difficulty of predicting the job impacts of the Program on industrial jobs through 2030. Given California's free allowance allocation to maintain industrial competitiveness and to prevent leakage, it may be that no workers will be displaced. However, there is a credible risk that a small number of workers could lose their jobs relative to a Business-as-Usual projection of California employment in the absence of Cap-and-Trade Program.<sup>30</sup>

**For the small number of individual workers in manufacturing whose may face job loss as climate policies are implemented, the consequences of job loss can be devastating.** Chapter 4 reviews just transition strategies that can be implemented to avoid placing disproportionate economic burdens on a small number of displaced workers. Although job loss has not yet occurred and may not occur, the recommendations in Chapter 4 and at the end of this chapter suggest steps to begin just transition planning now, in anticipation of future risk, particularly as climate policies require deeper and deeper emissions reductions and involve more significant changes to Business-as-Usual.

Finally, it is also important to note that there is wide variation in job quality for California production workers in the industrial sector as noted in **Exhibit 8.3**. While manufacturing was once assumed to produce middle-class jobs for blue-collar workers, recent research shows that manufacturing employment is increasingly generating low-wage jobs. More than one-third of manufacturing workers in the United States are now on some form of public assistance because their wages are so low that they qualify for safety net programs.<sup>31</sup> Unions now represent less than 10 percent of the manufacturing workforce, and the use of workers employed by temporary agencies in manufacturing has risen sharply.<sup>32</sup> In the industrial sectors in California, food processing production workers receive low wages on average, with a mean hourly wage in 2017 of \$11.63 (the state minimum wage in 2017 was \$10.00). Blue-collar oil refinery workers in contrast, had a mean wage of \$36.58 in the same year, representing solidly middle-class jobs.

## 2. Mandates and Incentives to Reduce Emissions, Including High Global Warming Potential Gases

In addition to the Cap-and-Trade Program, the Scoping Plan also includes mandates that require industrial facilities to lower emissions of non-CO<sub>2</sub> greenhouse gases, particularly high global warming potential (high-GWP) gases (i.e., hydrofluorocarbons, methane, and black carbon). The state also has a wide variety of programs to reduce costs to businesses as they adapt stricter emissions controls and mandates. These supports include incentives and rebates for energy efficiency measures and pollution abatement, research and development grants for emerging low-carbon technologies, and procurement policies that provide market guarantees for lower carbon products and services.



## ❖ Direct Climate Mandates

### ➤ Mandatory Reductions of Hydrofluorocarbons

California is leading the global effort to reduce hydrofluorocarbons (HFCs) through direct regulations of their use. HFCs account for 97 percent of all high-GWP gas emissions in the state.<sup>33</sup> In 2016, the state enacted SB 1383, which requires the reduction of emissions of short-lived climate pollutants (SLCPs), including methane, HFCs, and anthropogenic black carbon.<sup>34</sup> SB 1383 directs CARB to develop and then implement a plan to achieve a 40-percent reduction in HFCs by 2030.

To that end, in 2016 CARB mandated a ban on HFCs for certain equipment, especially refrigeration and air conditioning equipment, which commonly use HFCs. Fugitive refrigerants used in commercial and industrial refrigeration and air conditioning systems account for 48 percent of HFC emissions.<sup>35</sup> CARB banned HFCs in new refrigeration equipment and foams, including those used in supermarkets and remote condensing units used by convenience stores, refrigerated food processing dispensing equipment, stand-alone or small self-contained refrigeration units, refrigerated vending machines, and foams used in buildings and elsewhere.<sup>36</sup>

These mandates require businesses to purchase new equipment, creating jobs in manufacturing and installation. Installation of refrigeration and HVAC equipment is generally carried out by workers in the skilled construction trades occupations, particularly plumbers and pipefitters, insulators and sheet metal workers, where training through apprenticeship is available.<sup>37</sup> Manufacturing of equipment may or may not be in California; see Section III.A in this chapter for an overview of strategies to encourage in-state manufacturing. Purchases of new equipment generally raise costs for businesses, which may affect the competitiveness of industries such as food processing, but are unlikely to impact output or jobs in retail businesses such as supermarkets.

### ➤ Mandatory Reductions of Fugitive Methane Emissions from Oil and Gas Facilities

Fugitive methane emissions from oil and gas facilities are a critical target for climate policy because of methane's high global warming potential. The majority of the state's oil wells are located in Southern California, and crude oil is transported within the state through an extensive network of oil and gas pipelines from import terminals and on-shore and offshore oil fields to the refineries that distribute finished fuels to more than 70 product terminals throughout California.<sup>38</sup> Natural gas is California's largest source of fuel for electricity generation and



supplies most of the energy used for industrial operations. It is also the largest source of fuel for heating and cooling in residential and commercial buildings. The majority of gas fields are in Northern California, but most natural gas consumed in California (about 90 percent) comes from out of state.

The state aims to reduce methane emissions from oil and gas infrastructure by 40 to 50 percent by 2025. The two main policies for reducing methane emissions are CARB's 2017 regulation, Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities, and SB 1371, which aims to minimize natural gas leaks from CPUC-regulated intrastate transmission and distribution gas pipelines and facilities.<sup>39</sup> The CARB regulation promotes statewide uniformity in methane emission controls, specifies the measures that companies are required to adopt to capture methane emissions, establishes quarterly leak detection and repair requirements, and requires enhanced leak-monitoring and alarm systems for underground natural gas storage facilities.<sup>40</sup> SB 1371 is focused on minimizing methane leaks from in-state gas pipelines and distribution facilities. The bill includes heightened leak-reporting requirements and directs the CPUC to adopt rules and procedures for avoidance, reduction, and repair of leaks and leaking components. The bill also mandates leaks to be repaired as soon as possible after discovery, and it establishes and requires best practices for leakage monitoring, prevention, and reduction. These mandates will induce investment in leakage abatement.

These mandates create work hours for the skilled construction trades that specialize in leakage abatement in pipelines and extraction and storage facilities. This work is carried out mainly by pipefitters, utility workers and related trades workers. Leakage abatement also creates work for engineering and technical workers who design and manage leakage prevention and monitoring systems.

### ➤ **Mandatory Technology Upgrades: Best Available Retrofit Control Technology in Refineries**

Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017),<sup>41</sup> the companion bill to AB 398, requires refineries to install industry-standard pollution control mechanisms, known as “best available retrofit control technology” (BARCT), no later than the end of 2023.<sup>42</sup> The law also mandates tighter monitoring and reporting of refineries' criteria air pollutants and toxic air contaminants by local air districts. AB 617 also requires CARB to develop a statewide strategy to reduce emissions of toxic air contaminants and criteria air pollutants in communities affected by a high cumulative exposure burden.<sup>43</sup>

Installation of BARCT requires upgrades of equipment and processes in refineries and is carried out by boiler-makers, plumbers and pipefitters, ironworkers, and related skilled construction trades.



## ❖ Public and Ratepayer Incentives and Supports

While incentives cannot be used for compliance with existing mandates and regulations, assistance is available to lower the costs of transition for businesses subject to upcoming and stricter mandates. For example, along with the mandates to ban HFCs just discussed, a number of programs provide incentives for low-GWP refrigeration systems in retail food stores. One of these, a Sacramento Municipal Utility District (SMUD) pilot program, incentivizes low-GWP natural refrigerant technologies by offering up to \$150,000 in rebates for avoided greenhouse gas emissions.<sup>44</sup> Participants receive \$25 per metric ton CO<sub>2</sub>e reduction from refrigerants and a 25-percent incentive bonus for projects located in Disadvantaged Communities (DACs, as defined by CalEnviroScreen) and implemented by small businesses.<sup>45</sup>

The following section describes some of the assistance that the state is providing to help businesses in the industrial sector reduce greenhouse gas emissions.

### ➤ IOUs' Statewide Industrial Energy Efficiency Program

The investor-owned utilities' statewide Industrial Energy Efficiency Program provides audits, energy planning, rebates, and incentives to adopt energy efficiency measures.<sup>46</sup> The IOUs' statewide program offers an energy advisor program for benchmarking, pump efficiency services, nonresidential audits, and retro-commissioning assessments.<sup>47</sup> The program also includes "calculated incentives," which are customized incentives for nonresidential energy efficiency retrofit and new construction projects based on the energy savings captured by the user, as well as "deemed incentives," which are fixed rebates for standard efficiency measures. CPUC-affiliated "third-party programs" are undertaken by contractors and offer targeted efficiency planning for different industry subsectors.<sup>48</sup> The combined budget for these industrial energy efficiency programs overseen by the CPUC was over \$120 million in 2013.<sup>49</sup> Industrial efficiency is among the lowest cost options for electricity savings, with lower variability in outcomes<sup>50</sup> and longer average lifetime savings than other types of efficiency programs.<sup>51</sup> Industrial efficiency improvements for deep retrofits can have a projected payback period of three to six years, although case study evidence indicates the payback may be shorter.<sup>52</sup>

Industrial energy efficiency retrofits are carried out by skilled construction trades workers, predominantly those involved in energy systems installation, maintenance and operations. This includes electricians, plumbers and pipefitters, and sheet metal workers, who are primarily responsible for electrical equipment including lighting, and heating, cooling, and ventilation systems (HVAC).<sup>53</sup>



### ➤ **Incentives to Support Combined Heat and Power Generation**

Supports for Combined Heat and Power (CHP) are an important strategy in the industrial sector because CHP lowers the demand for externally supplied energy and fuel use in production processes. CHP is an integrated system that generates electricity as well as thermal energy that can be used on site for heating, cooling, and steam production. Various industrial equipment can use CHP, including reciprocating engines, combustion or gas engines, steam turbines, micro-turbines, and fuel cells. CHP is a mature and successful technology already in widespread use.

California is supporting CHP generation through a combination of incentives and procurement policies that guarantee markets for CHP. Governor Brown's 2010 Clean Energy Jobs Plan set a goal of 6,500 MW of new CHP capacity by 2030. The state has exceeded this goal: by 2016, approximately 7,800 MW of CHP were installed, with an additional 6,300 MW under development.<sup>54</sup> Support for CHP is driven by the procurement policy in the "Qualifying Facilities and CHP Program Settlement Agreement", which mandates that the three largest IOUs procure a minimum of 3,000 MW of CHP.<sup>55</sup> Another program, the Waste Heat and Carbon Emissions Reduction Act, AB 1613, created a feed-in-tariff to incentivize small CHP generation less than 20 MW. As a result of these policies, in 2017, the amount of installed CHP increased to 8,590 MW, with 4,097 MW in the industrial sector.<sup>56</sup>

Among all industrial subsectors, oil and gas extraction have by far the largest potential to expand the use of CHP with a combined additional capacity of almost 3,700 MW, followed by food processing (1,418 MW), primary metals (576 MW), and wastewater treatment (392 MW).<sup>57</sup>

CHP installation and maintenance is carried out by skilled construction trades-workers, including boiler makers, electricians, pipefitters, stationary engineers and related trades.<sup>58</sup>

### ➤ **Food Production Investment Program**

The state and the IOUs also have programs that are customized to specific industries. One target for assistance is the food processing industry, a large energy user in the state.<sup>59</sup> In 2015, the food processing industry consumed approximately 7 million MWh and 500 million therms; it also emits more than 3.3 million metric tons of CO<sub>2</sub>e every year, about 4 percent of all industrial emissions.<sup>60</sup> Food processors with GHG emissions over 25,000 CO<sub>2</sub>e annually are also subject to the Cap-and-Trade Program.



In 2017, the state passed AB 109 to provide the CEC with \$66 million from the GGRF to establish the Food Production Investment Program (FPIP), which promotes implementation of projects that reduce greenhouse gas emission by providing grants, loans, or financial incentives to food processors.<sup>61</sup> Administered by the CEC, the FPIP aims to: 1) help replace high energy-consuming equipment and systems; and 2) accelerate the adoption of advanced energy technologies that can substantially reduce energy use and greenhouse gas emissions, and subsequently compliance obligations under the Cap-and-Trade Program.<sup>62</sup> Installing new equipment or establishing new manufacturing processes under these grants may lead to increased employment in the skilled construction trades.

### **a. Workforce Outcomes**

#### **i. Changes in Direct Employment**

The mandates on high-GWP gases and the funding for incentives and supports to increase industrial energy efficiency and CHP are expected to result in new investments which could lead to job growth in skilled construction trades. CHP generation is an area that could also provide significant job growth. Previous analysis found that for every \$1 million invested in CHP construction, installation, and manufacturing, 4.4 direct jobs are created or maintained.<sup>63</sup> For industrial energy efficiency, estimates show that approximately 4.7 direct jobs are created for every \$1 million dollars of investment.<sup>64</sup>

As noted above, the majority of the jobs generated by these mandates are for skilled blue collar construction trades workers who carry out the retrofits and install new equipment and components.<sup>65</sup> In addition, these investments generate jobs for engineers and technical workers who design, manage, and administer these projects, as well as a mix of workers who do not need specialized knowledge in industrial energy systems, such as administrative and other personnel (see Chapter 6).

#### **ii. Job Quality and Job Access**

Specialized skills in the construction trades are needed to carry out industrial energy efficiency, CHP, HFC retrofits or related work resulting from mandates and incentives in the industrial sector. **Exhibit 8.4** shows 2017 wages for workers employed in several key occupations in the manufacturing sector in California, at the 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> percentile of workers.



**Exhibit 8.4. Wages for Key Occupations Involved in Emissions Reducing Retrofits in Manufacturing in California, 2017**

Occupational Title	25th Percentile Hourly Wage	50th Percentile (Median) Hourly Wage	75th Percentile Hourly Wage
Electricians	\$24.32	\$29.80	\$37.22
Plumbers, Pipefitters, and Steamfitters	\$19.98	\$26.71	\$31.07
Sheet Metal Workers	\$15.36	\$21.41	\$30.28
Boilermakers	\$18.74	\$23.51	\$29.44

Source: May 2017 OES Research Estimates by State and Industry, [[https://www.bls.gov/oes/current/oes\\_research\\_estimates.htm](https://www.bls.gov/oes/current/oes_research_estimates.htm)]; occupational wages for the manufacturing sector only.

State-certified apprenticeship training is available for all the skilled trades involved in these activities, but no information is available to quantify the share of these workers who are current apprentices or have a journey card (See Chapter 3 for details about the apprenticeship system). However, these state-wide average wages are significantly lower than prevailing wages for workers with journey cards in these occupations,<sup>66</sup> suggesting that a substantial share of workers are not trained through apprenticeship nor represented by a trade union. Very few skill standards are currently required in IOU or other incentives programs (see Chapter 6, Section III.A for a discussion of skill standards in energy efficiency programs). For the refinery sector, only, Senate Bill 54 (Hancock, Chapter 795, Statutes of 2013)<sup>67</sup> requires refiners to pay a modified prevailing wage and employ a “skilled and trained workforce” for all major maintenance, upgrade and modernization projects, known as turnaround or change-out work. See Chapter 2 for an explanation of the skilled and trained workforce standard and Section III.B of this chapter for more information on the training that has been developed.

No specific information is available about the demographic profile of workers involved in the industrial energy efficiency, CHP, or related work that has been generated by the mandates and incentives affecting emissions-intensive industries.



## ***b. Workforce Recommendations***

### **❖ Use skill standards in incentive programs for industrial energy efficiency, CHP, and other industry emission reductions measures to ensure safe and proper performance in the installation, operation, and/or maintenance of low-carbon measures and good jobs.**

SB 54 offers a model for how to incorporate skill and training requirements in climate and air quality programs. As legislated by SB 54, oil refineries have specific worker protections and training requirements for workers responsible for retrofits and major maintenance and upgrades—commonly known as change-outs.<sup>68</sup> SB 54 requires refineries to file a risk management plan (RMP) under federal and/or state environmental protection and air quality acts and to comply with a modified prevailing wage, apprenticeship and journeyperson qualifications, and training requirements on private refinery construction. The rationale for workforce specifications is to prevent the use of unskilled and untrained workers at facilities that generate, store, treat, transport, and otherwise deal with hazardous materials that pose a risk to public health and safety.<sup>69</sup> SB 54 standards could be incorporated into all the climate programs for the emissions-intensive industries discussed in this section. See Chapter 2 for more explanation of the “skilled and trained” labor standard.

In addition to the skilled and trained workforce requirements, specialized certifications may be needed for emerging or advanced technologies that require enhanced skills. Certifications are most effective when they build upon an existing occupation training pathway rather than stand-alone trainings with no prerequisites, when they are validated by subject matter experts and are industry-recognized. See Chapter 6, Section III.C for a discussion of skill certifications in the context of utility-administered energy efficiency incentives, and Chapter 2 for a discussion of certification requirements under SB 54.

### **❖ Support high-road industry training partnerships via apprenticeship and journey-upgrade training.**

As noted above, much of the work generated by the measures discussed in this section is carried out by the skilled construction trades who install and maintain industrial equipment. Retrofit, replacement, and process improvement work can be done with current or new workers trained through existing certified apprenticeship programs in the skilled construction trades. As emerging low-carbon technologies, equipment, and processes develop, curriculum updates can be incorporated in apprenticeship and journey upgrade training.



### ❖ Support a statewide initiative for pre-apprenticeship for construction careers.

Support for pre-apprenticeship is critical to improving inclusion in the skilled construction trades. Although there is no specific information about inclusion in the jobs that are supported by the incentives and mandates discussed in this section, pre-apprenticeship is critical throughout the skilled trades. Any investments related to pre-apprenticeship should connect to, align with, or feed into the emerging statewide infrastructure that is being modeled by the CWDB High Road Construction Careers (HRCC) initiative, described in Chapter 3. This initiative is developing a statewide pre-apprenticeship strategy that links to all state and local agencies that award public works contracts.<sup>70</sup> Pre-apprenticeship programs should not be developed to prepare workers for projects in particular climate programs, but rather increase access to high-quality career pathways in all construction.

## B. Oil and Gas Industries

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The oil and gas industries comprise extraction, refining, and pipeline distribution. While extraction and refining are included in the analysis on industries above, the petroleum sector merits supplemental discussion because California's overarching strategy to avert climate catastrophe is to wean the economy off petroleum-based fuels. All the major climate policies—from the Renewables Portfolio Standard, to the Low Carbon Fuel Standard, to the Cap-and-Trade Program to regulations on high-GWP gases—are designed to provide low-carbon alternatives to our energy, transportation and other fuel needs. Whereas manufacturing industries, that consume but do not produce petroleum-based fuels, can switch to cleaner sources over time, the fossil fuel producers face a more fundamental challenge of reduced demand for the main product they produce.

Californians use 39 million gallons of gasoline daily, about 11 percent of the national total, and the state's consumption has not yet declined.<sup>71</sup> But if California is to meet the statewide targets for a 40-percent reduction in greenhouse gas emissions below 1990 levels by 2030 and an 80-percent reduction by 2050, this will be accomplished largely by lowering combustion of and demand for fossil fuels.<sup>72</sup> CARB's Scoping Plan shows demand for fossil fuels will decrease by more than 45 percent by 2030.<sup>73</sup> This drop in demand and production, while necessary to combat climate change, increases the likelihood of reductions in employment in this sector. It therefore presents a credible risk for workers employed in petroleum extraction and refining and affirms the need for advanced planning for a just transition.



In 2017 there were approximately 57,000 workers in the petroleum sector in California, including approximately 11,000 employed in refineries (these figures do not include the skilled trades workers employed by contractors on refinery modernization and upgrade projects), 9,000 in oil and gas extraction, and 2,000 in oil and gas pipeline work, and about 32,000 in natural gas distribution.<sup>74</sup>

However, direct employment in the petroleum sector has declined over the last twenty five years. Employment in petroleum refining, for instance, is only half what it was in 1992, even though total refining capacity is nearly unchanged from 1992 to now.<sup>75</sup> The rate of employment decline was mostly gradual through the years, with no acceleration after the implementation of any of California's climate policies.<sup>76</sup> This finding suggests that modernization and industrial efficiency have been the prime drivers of job loss, not climate policy. For any industry, there are many factors beyond climate policy that impact trajectories of growth or decline in employment, and these other factors often have much greater impact than the state's efforts to combat climate change catastrophe.

### *a. Workforce Outcomes of Climate Policies in Refineries*

#### *i. Changes in Direct Employment*

For the period through 2030, it is difficult to predict the impact of climate policy on employment in refineries due to the complexities of the policies as well as global market trends that affect this industry. In the longer run the risk of job loss is likely to grow, if and when California and the rest of the world are successful in thoroughly replacing petroleum with low-carbon substitutes.<sup>77</sup>

For the period through 2030, contraction in the petroleum industry is by no means the only inevitable outcome for the petroleum industry in California. Even if production declines, actual job loss depends on many factors, including whether employment is reduced at the same pace as production, whether attrition and retirement can be used to avoid lay-offs, and whether employers provide jobs for their incumbent workers in non-petroleum components of their businesses.

While there is uncertainty in the impact of reduced demand for fossil fuels on the petroleum sector, **averting climate catastrophe does increase the risk of job loss in the sector. Addressing this credible risk directly and early is critical for the planning of a smooth and equitable transition away from fossil fuel consumption.** Planning is particularly challenging because policymakers also face the difficulty of predicting the cumulative impact of climate policies on petroleum industries over time. Understanding the timing and intensity of the decline and designing and implementing processes to manage it are key workforce challenges for this sector.



## *ii. Job Quality and Workforce Demographics*

Average annual wages for workers in California refineries in 2017 were almost \$157,000, with blue-collar workers earning a mean hourly wage of about \$36.00 per hour.<sup>78</sup> The sector is characterized by high levels of unionization, with the United Steelworkers union representing operations workers at 11 of the state’s 18 refineries. Various building trades unions represent about 60 percent of the external contract workers, who are brought in to refineries for modernization and upgrades.<sup>79</sup>

Refineries employ predominately white and male workers. In 2017, 76 percent of workers were white, and 81 percent were male.<sup>80</sup> The share of Latinx workers (of all races) has increased markedly over the past decade, accounting for 24 percent of workers in 2017.<sup>81</sup>

The refineries’ workforce is aging. In 1992, 66 percent of workers were under 35, and only 10 percent were over 55, while in 2017, 21 percent were under 35, and 29 percent were over 55.<sup>82</sup> This shift means a significant portion of the refineries’ workforce is near retirement age, a characteristic that needs to be considered in the design of a worker transition package. Older workers face greater challenges in finding comparable work, suggesting that transition assistance should consider a bridge to retirement, as discussed in Chapter 4.

## *iii. New Training Investments*

New training programs in the refinery sector were initiated in 2017 in response to SB 54 and a new refinery Process Safety Management (PSM) regulation, both of which were created in the aftermath to the explosion at Chevron’s refinery in Richmond in 2012. Both are industry-led labor management partnerships.

Under SB 54, refiners are required to pay prevailing wage and employ a skilled and trained workforce for all major maintenance, upgrade and modernization projects, known as turnaround work.<sup>83</sup> This has created new demand for high-quality apprenticeship training in refinery-related trades. Local 342 of the United Association of Plumbers, Pipefitters and Sprinkler Fitters (UA) in Concord, for example, is expanding their apprentice programs to meet the demand for this new work, building a large new training facility to accommodate an influx of apprenticeships in pipefitting and welding.<sup>84</sup> All of the apprenticeships related to refinery turnaround work now include a minimum of 20 hours of advanced training in refinery safety, as required under SB 54.<sup>85</sup>

The new PSM regulation requires refiners to develop and implement comprehensive engineering and management programs to prevent major chemical releases, fires and explosions.<sup>86</sup> In most cases, these programs require highly specialized knowledge and experience, and now—for the first time in California—the regulation requires refiners to involve employees and their representatives “throughout all phases” of



PSM decision-making, with representatives selected by the employees.<sup>87</sup> To ensure effective implementation, the regulation requires refiners to train employees in the PSM elements in which they will be involved.<sup>88</sup> For example, employees at Chevron who serve on a Damage Mechanism Review committee must be trained in assessing and correcting damage mechanisms, such as corrosion, that could affect—and possibly weaken—the refinery’s piping systems, as occurred at the Chevron, Richmond refinery in 2012, resulting in a catastrophic vapor cloud explosion and fire.<sup>89</sup> The training must be continually updated to keep pace with changing conditions in the refineries.

### ***b. Workforce Recommendations***

California climate policy has embarked on a transition path that supports emissions reductions and pollution abatement of the petroleum industry immediately, and phase-out of petroleum as low- and zero-carbon substitute technologies and products become available, with an eventual full shift away from petroleum. Worker protections can be incorporated throughout this transition. This will ensure that all avenues for retaining jobs are maximized while lowering emissions. Lowering emissions through implementation of Best Available Retrofit Technology, the mandates for fugitive methane emission capture, and IOU and other industrial energy efficiency incentive programs all create jobs. The recommendations for labor standards below ensure the work is done by skilled workers, jobs are family-supporting and pathways into good jobs are created. Planning for possible job loss is also critical, and can be carried out early and throughout the transition process.

#### **❖ Use skill standards in incentive programs to ensure safe and proper performance in the installation, operation, and/or maintenance of low-carbon measures, and in decommissioning of facilities if they close.**

Apply workforce standards to investments in pollution abatement, which creates jobs. In the refining sector, skilled and trained workforce requirements are already required for upgrades and modernization. These workforce standards can be applied to all major emission reduction investments throughout the petroleum and natural gas industries, to ensure skill delivery and family-supporting jobs. Within SB 1371, section 977 suggests that the CPUC consider, “providing an adequate workforce to achieve the objectives of reducing hazards and emissions from leaks, including leak avoidance, reduction, and repair.”<sup>90</sup> This language could be made stronger, creating a requirement similar to SB 54 and explicitly requiring prevailing wage, apprenticeship utilization, journeyperson qualification, and training requirements on work affecting natural gas infrastructure and decommissioning work. See discussion in Section III.A above on mandates and incentives and Chapter 2 for more details on the skilled and trained labor standards in SB 54.



### ❖ **Support high road training partnerships in refineries.**

Support industry-led, labor-management training partnerships in the refinery-related trades to upgrade incumbent worker skills involved in turnaround work, including upgrades for pollution abatement, and explore the opportunity to expand the industry-led labor-management training partnership at Chevron for process safety decision-making and related training to other refineries across the state. See Chapter 3 for an explanation of high road training partnerships.

### ❖ **Plan for fossil fuel industry changes via an interagency task force charged with developing a blueprint for transition.**

This task force should engage stakeholders from labor and affected communities in all stages of transition planning and lead a process to:

- Use research and stakeholder engagement to identify the most vulnerable communities, industries, and localities. Research should include cost estimates for employment transition incorporating factors such as alternative worker transition assistance packages, options for retraining and job placement, policy options that affect speed of industry decline, and firm and worker characteristics, including age of workforce, availability of pension plans, attrition and rehiring patterns, layoff and severance policies, and other factors. Decommissioning of industrial facilities and site clean-up should be included in the analysis and planning, with efforts to redeploy the incumbent workers in the decommissioning process.
- Develop a proposal for a transition package, using existing resources and identifying new sources of revenues, like the GGRF, based on the research and stakeholder engagement just described.
- Facilitate longer-term regional planning focused on the economic and societal transformations that are necessary to diversify and support sustainable regional economies. This plan should consider economic development and job-creation strategies to help move displaced workers into comparable jobs. Such employment may be found in clean energy and other low-carbon work, but also in a variety of occupations that use similar skills and require similar experience.



## C. Low-Carbon Goods Manufacturing Opportunities

The growth of manufacturing of low-carbon substitutes for traditionally high-emitting manufactured goods has been significant. Billions of dollars in private-sector investment are developing California industries such as electric vehicles, advanced batteries, HVAC technologies for buildings, solar photovoltaic and solar thermal design, advanced metering, distributed power management, and countless others.<sup>91</sup> California has generated more than \$22 billion in clean technology venture capital investment from 2007 to 2017, and 5.4 percent of global clean technology patents.<sup>92</sup>

Markets for low-carbon manufactured goods are created by the full gamut of climate policies. However, it is difficult to assess the impact or significance of individual policies and programs, and likewise to disentangle climate measures from market factors and technological innovations that may have occurred even with no climate policy.

Although California leads the nation in terms of the number of patents and venture capital funds for clean technologies, there is no guarantee that manufacturing will expand and stay in the state as products move from design to mass production. There is a vast body of research on the strategies that local and regional governments have used to promote and retain manufacturing jobs, with a mixed record of success.<sup>93</sup> These strategies include targeted investments in infrastructure and workforce training, assistance with access to markets, streamlining of zoning and permitting and tax credits, and incentives and subsidies.<sup>94</sup> Often, success depends on customized approaches that are designed to exploit particular locational advantages and overcome obstacles that might be preventing investment.

The development of off-shore wind for electricity generation in California presents a pertinent example of how customized supports might be able to encourage local manufacturing. As noted in Chapter 6 on energy, the state often supports emerging low-carbon energy technologies, funding research and development and providing a guaranteed market for investors through pilot procurement policies. A recent report argues that California could design a more comprehensive strategy for off-shore wind technology that could capture not only the final production of electricity from assembled wind generators, but also the in-state manufacturing and final assembly of component parts for wind turbines. In this case, the report identifies a number of customized strategies to root a greater share of the off-shore wind supply chain in California. These include investments in port infrastructure needed to site manufacturing and assembly facilities close to the enormous wind turbines, as well as more common approaches such as procurement, transmission upgrades, and other regulatory actions.

Procurement is a particularly powerful tool that governments have to support job creation in manufacturing, and California policy-makers are taking steps to expand its use, as described below.



## 1. Programs to Support Clean Technology Development and Low-Carbon Goods Manufacturing

### ❖ Low-Carbon Procurement through Buy Clean California Act

The state government is a large and therefore important buyer of many goods and products, some of which are emission-intensive to produce. California is taking steps to lead by example, by purchasing goods and products with a lower carbon footprint.

A key new law is the Buy Clean California Act (AB 262, Chapter 816, Statutes of 2017), which requires contractors that bid on state infrastructure and construction projects to disclose the greenhouse gas emissions for certain materials, including concrete and steel, and requires the state's Department of General Services (DGS) to develop a method for agencies to include this emission data in their review process for bid selection.<sup>95</sup> DGS is also required to establish and publish threshold levels for the maximum-acceptable global warming potential for each category of eligible materials in the State Contracting Manual by January 1, 2019. Over time, the levels may be adjusted downward to reflect industry improvements. The Act leverages the state's buying power to shape procurement to encourage purchasing of low-carbon goods. In doing so, this mandate signals to manufacturers that there is significant demand for low-carbon goods.

#### A. Workforce Outcomes

By accounting for supply-chain greenhouse gas emissions, the law will incentivize purchasing manufactured goods whose production process, including production of components, is less carbon intensive. These goods and their components can be sourced in California or elsewhere, so this will not necessarily create jobs in the state. However, even if there is not an explicit incentive for in-state manufacturing, the policy positions California manufacturers on a more level playing field against out-of-state manufacturers who are often subject to less strict emissions controls.<sup>96</sup> Therefore, the Buy Clean California Act is expected in many (but not all) cases to favor California production and employment within the state because businesses in California have led the nation in clean technology development.

This policy might or might not favor high-road employers, however. This report has documented a number of examples of firms and industry segments that produce innovative low-carbon products or use low-carbon processes, but also have low-road employment practices. Moreover, while manufacturing jobs paid significantly higher than average wages in past decades, recent research shows that is no longer the case. In 2013, the typical manufacturing production worker made 7.7 percent below the median wage for all occupations nationwide.<sup>97</sup>



## ***B. Workforce Recommendations***

### **❖ Incorporate workforce and job criteria into the Buy Clean procurement policy for public procurement of manufactured goods and equipment.**

Buy Clean is a strong start to encouraging local clean manufacturing, and procurement practices can also be used in a targeted manner to specifically encourage family-sustaining jobs and access into them for disadvantaged workers. Chapter 7 on transportation documents the U.S. Employment Plan for instance, which addresses job creation, job quality, and job access in the procurement of transit vehicles. Procurement policies to advance job quality and inclusion are most feasible for purchases of large capital equipment (e.g., zero-emission buses) and where the government is the main buyer and has the market power to ensure public investment creates public benefits. These policies face similar challenges to Buy Clean—the higher the number of small inputs, the harder it is to document and influence their production and labor practices.

The state has the opportunity to incorporate disclosure of workforce impacts, as described in the inclusive procurement policies of Chapter 2 and Chapter 7, along with disclosure of greenhouse gas emissions in the Buy Clean procurement policy.<sup>98</sup>



## IV. Summary Recommendations

**Exhibit 8.5. Key Recommendations for the Industrial Sector**

<p><b>Manufacturing and Fossil Fuel Industries</b></p>	<ul style="list-style-type: none"> <li>❖ Use skill standards in incentive programs for industrial energy efficiency, CHP, and other emission reductions measures to ensure safe and proper performance in the installation, operation, and/or maintenance of low-carbon measures.</li> <li>❖ Plan for industry transition away from fossil fuels and the risk of job loss in the petroleum sector and manufacturing, and develop just transition programs.</li> <li>❖ Support High-Road Industry Partnerships.             <ul style="list-style-type: none"> <li>● Support the development of skill-upgrade programs for incumbent workers through journey-upgrade programs for the skilled trades who carry out pollution abatement and emission upgrades in refineries and other emission-intensive industries.</li> <li>● Support the development of industry-led labor-management training partnerships in operations in refineries.</li> </ul> </li> <li>❖ Support the state-wide pre-apprenticeship strategy to broaden opportunities for workers from disadvantaged communities to access family-supporting careers in the skills trades.</li> </ul>
<p><b>Clean-Tech Development and Low-Carbon Goods Manufacturing Opportunities</b></p>	<ul style="list-style-type: none"> <li>❖ Incorporate workforce and jobs criteria in Buy Clean responsible procurement policies for state purchases of goods and services.</li> </ul>
<p><b>All Industrial Subsectors</b></p>	<ul style="list-style-type: none"> <li>❖ Use job impact metrics to measure the impact of climate incentive and investment programs on quantity of jobs, job quality and job access.</li> <li>❖ Incorporate workforce analysis into emerging technology support programs.</li> <li>❖ Track training program outcomes for graduation rates, attainment of industry-recognized credentials, job placement, retention, wages and wage progression.</li> </ul>



## Endnotes

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