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A PROGRAM FOR ECONOMIC RECOVERY AND CLEAN ENERGY TRANSITION IN CALIFORNIA

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Sections of Study

1. Pandemic, Economic Collapse and Conditions for Recovery
2. California's Clean Energy Transition Project
3. Clean Energy Investments and Job Creation
4. Investment Programs for Manufacturing, Infrastructure, Land Restoration and Agriculture
5. Total Job Creation through Combined Investment Program
6. Contraction of California's Fossil Fuel Industries and Just Transition for Fossil Fuel Workers
7. County-level Job Creation, Job Displacement and Just Transition
8. Achieving a Zero Emissions California Economy by 2045
9. Financing California's Recovery and Sustainable Transition Programs

California as U.S. and Global Leader on Climate Policies

- **Main California policy goals:**
  - 40% CO2 emissions reduction by 2030—(Gov. Brown, 2018)
  - Emissions-free vehicles by 2035–(Gov. Newsom, 2020)
  - Carbon neutrality by 2045– (Gov. Brown, 2018)
- **Significant progress, but…**
  - Nearly 60% of electricity in 2020 came from renewables and nuclear
    - But 80% of energy consumption for non-electricity production
    - Nearly 50% of energy in electricity production is wasted

TABLE 3.5

Annual Job Creation in California through Combined Clean Energy Investment Program

Average annual figures for 2021 – 2030

Industry	Number of direct and indirect jobs created	Number of direct, indirect and induced jobs created
$9.3 billion in energy efficiency		
1) Building retrofits	21,090	28,490
2) Industrial efficiency, including combined heat and power	7,600	10,830
3) Electrical grid upgrades	5,040	7,140
4) Public transportation expansion/upgrades, including rail	19,040	22,960
5) Expanding high efficiency automobile fleet	651	930
6) Total energy efficiency job creation	*53,421*	*70,350*
$66.4 billion in clean renewables		
7) Solar	99,600	146,080
8) Onshore wind	35,640	51,480
9) Low emissions bioenergy	38,000	54,000
10) Geothermal	31,000	44,500
11) Small-scale hydro	37,000	51,500
12) Total job creation from clean renewables	*241,240*	*347,560*
13) TOTALS *(= rows 6+12)*	**294,661**	**417,910**
14) TOTAL AS SHARE OF 2019 CALIFORNIA LABOR FORCE *(Labor force at 19.4 million)*	**1.5%**	**2.2%**

Sources: Tables 3.2 and 3.4, U.S. Department of Labor.

TABLE 3.6
Indicators of Job Quality in California Clean Energy Industries: Direct Jobs Only

	Energy Efficiency Investments				
	1. Building retrofits *(13,690 workers)*	**2. Industrial efficiency** *(5,510 workers)*	**3. Grid upgrades** *(3,920 workers)*	**4. Mass transit** *(16,800 workers)*	**5. High-efficiency autos** *(279 workers)*
Average total compensation	$73,700	$91,900	$83,300	$37,600	$88,700
Health insurance coverage, percentage	37.2%	49.5%	47.8%	34.4%	67.9%
Retirement plans, percentage	24.4%	32.7%	28.1%	20.1%	51.1%
Union membership, percentage	18.7%	7.5%	15.7%	17.2%	7.2%

	Clean Renewable Energy Investments				
	6. Solar *(69,720 workers)*	**7. Onshore wind** *(23,760 workers)*	**8. Low-emissions bioenergy** *(30,000 workers)*	**9. Geothermal** *(23,000 workers)*	**10. Small-scale hydro** *(29,500 workers)*
Average total compensation	$96,500	$94,000	$83,500	$92,600	$79,700
Health insurance coverage, percentage	46.2%	46.8%	37.4%	43.4%	40.0%
Retirement plans, percentage	31.6%	32.0%	24.4%	29.4%	26.5%
Union membership, percentage	13.1%	17.7%	17.2%	14.9%	18.5%

Sources: See Appendix 2

TABLE 5.1
Annual Job Creation in California through Combined Investment Programs

- Clean Energy
- Manufacturing/Infrastructure
- Land Restoration/Agriculture

Estimates are annual averages for 2021 – 2030

Overall Investments at $137.6 billion/year; 3.8% of California $3.61 trillion mid-point GDP

	Number of direct and indirect jobs created	Number of direct, indirect and induced jobs created
1) $66.4 billion/year in clean renewable energy	241,240	347,560
2) $9.3 billion/year in energy efficiency	53,421	70,350
3) $39.2 billion/year in manufacturing/public infrastructure	298,202	384,676
4) $22.6 billion/year in land restoration/agriculture	187,509	241,400
5) Total for all investment areas *(= rows 1 – 4)*	780,372	1,043,986
13) TOTAL AS SHARE OF 2019 CALIFORNIA LABOR FORCE *(labor force at 19.4 million)*	**4.0%**	**5.4%**

Sources: See Tables 3.5 and 4.6.

TABLE 6.1

Number of Workers In California Employed in Fossil Fuel-Based Industries, 2018

Industry	2018 Employment levels	Industry share of total fossil fuel-based employment
Natural gas distribution	32,290	28.7%
Oil and gas extraction	27,720	24.6%
Petroleum refining	11,203	10.0%
Support activities for oil/gas	10,259	9.1%
Wholesale -petroleum and petroleum products	8,751	7.8%
Fossil fuel electric power generation	8,658	7.7%
Drilling oil and gas wells	5,288	4.7%
Pipeline transport	2,660	2.4%
Construction of other new residential structures	2,309	2.1%
Other nonmetallic minerals services	1,571	1.4%
Coal mining	971	0.9%
Oil and gas field machinery and equipment manufacturing	693	0.6%
Mining machinery and equipment manufacturing	74	0.07%
All other petroleum and coal products manufacturing	35	0.03%
Fossil fuel industry total	**112,482**	**100.0%**
TOTAL FOSSIL FUEL EMPLOYMENT AS SHARE OF CALIFORNIA STATE EMPLOYMENT *(California 2018 employment = 18,460,725)*		**0.61%**

Source: IMPLAN 3.1, U.S. Department of Labor.

TABLE 6.2
Characteristics of Workers Employed in California's Fossil Fuel-Based Sectors

	Fossil fuel-based industries
Average total compensation	$129,800
Health insurance coverage*	70.0%
Retirement benefits*	64.7%
Union membership coverage	22.7%
Educational credentials	
Share with high school degree or less	29.5%
Share with some college or Associate degree	35.3%
Share with Bachelor's degree or higher	35.2%
Racial and gender composition of workforce	
Pct. Black, Indigenous and People of Color	44.6%
Pct. female workers	21.5%

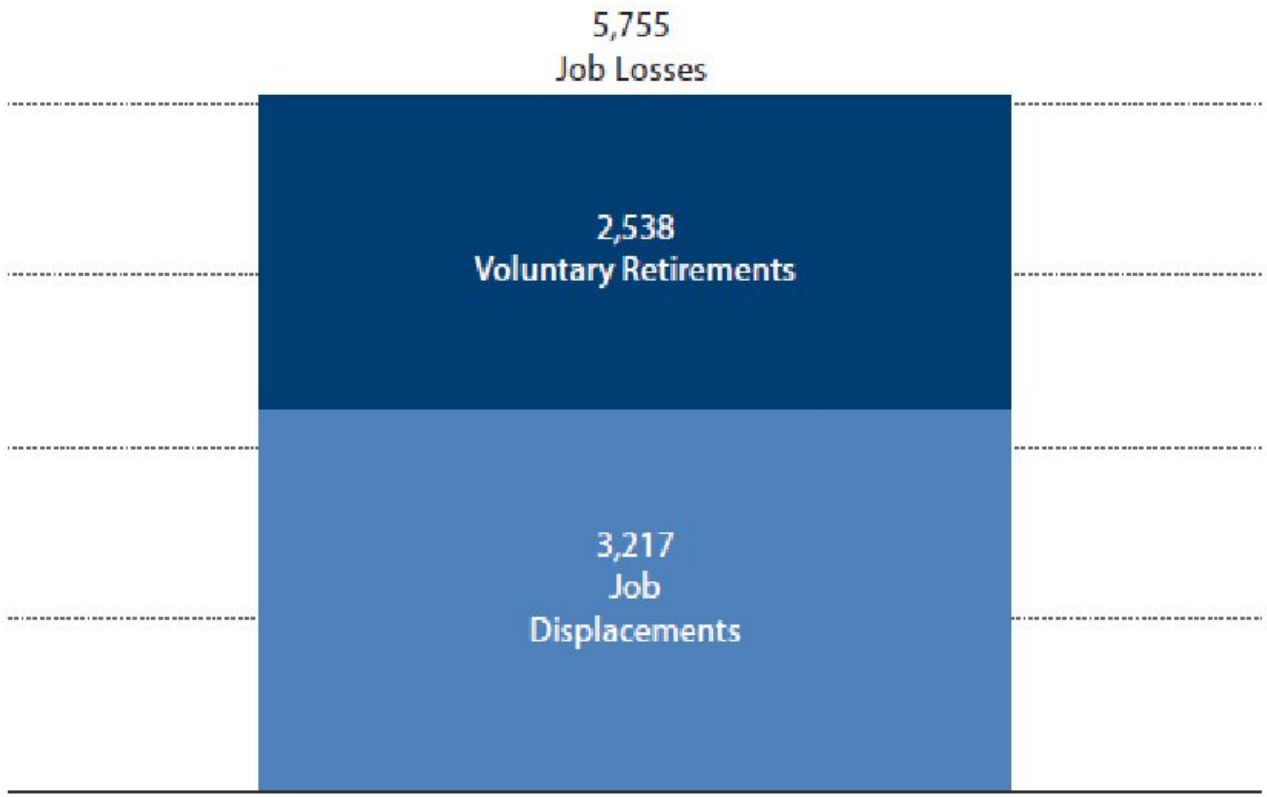
Source: See Appendix 2.
Note: *Due to small sample sizes, these figures are based on the Pacific region rather than California only.

TABLE 6.4
Policy Package for Displaced Workers in California's Fossil Fuel-Based Industries

Pension guarantees for workers (65+) voluntarily retiring	– Legal pension guarantees
Employment guarantee	– Jobs provided through clean energy and public infrastructure investment expansions
Wage insurance	– Displaced workers guaranteed 3 years of total compensation at levels of fossil fuel-based industry jobs
Retraining support	– 2 years of retraining, as needed
Relocation support	– $75,000 for one-half of displaced workers

Source: Assumptions described in text.

FIGURE 1: Estimated Annual Job Losses, Voluntary Retirements and Workers Displaced in California's Fossil Fuel-Based Industries, 2021–2030



Source: Table 6.5.

TABLE 6.8
Total and Annual Average Costs for Just Transition Support for Displaced Fossil Fuel-Based Workers in California, 2021 – 2032
STEADY TRANSITION

Year	Income support *(3 years of support for 3,217 workers)*	Retraining support *(2 years of support for 3,217 workers)*	Relocation support *(1 year of support for 1,609 workers)*	Total *(cols. 1+2+3)*
2021	$143.2 million (1 cohort)	$6.4 million (1 cohort)	$120.7 million	$270.3 million
2022	$286.3 million (2 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$419.9 million
2023	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2024	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2025	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2026	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2027	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2028	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2029	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2030	$429.5 million (3 cohorts)	$12.8 million (2 cohorts)	$120.7 million	$563.0 million
2031	$286.3 million (2 cohorts)	$6.4 million (1 cohort)		$292.8 million
2032	$143.2 million (1 cohort)			$143.2 million
Total	**$4.3 billion**	**$128.4 million**	**$1.2 billion**	**$5.6 billion**
Average annual costs	**$357.9 million** *(12 years of support)*	**$11.7 million** *(11 years of support)*	**$120.7 million** *(10 years of support)*	**$469.2 million** *(12 years of support)*

Sources: Tables 6.4, 6.5 and 6.7.

Steady vs. Episodic Transition

- **Transition program costs double under episodic transition**
  - $833 million/year vs. $469 million/year
  - Not benefiting as much from voluntary retirements under episodic transition

- **Still costs are low as share of California GDP, 2021 - 2030**
  - ***Steady transition:*** 0.01% of GDP
  - ***Episodic transition:*** 0.02% of GDP

TABLE 7.1
Fossil Fuel-Based Employment in Kern, Contra Costa and Los Angeles Counties, 2018

	Fossil fuel-based employment	Share of statewide fossil fuel employment *(total fossil fuel-based employment = 112,482)*	Share of total county employment
Kern County	13,651	12.1%	3.2%
Contra Costa County	12,972	11.5%	2.2%
Los Angeles County	29,003	25.8%	0.4%
TOTALS	**55,626**	**49.5%**	---

Source: IMPLAN 3.1.

Note: County employment levels are as follows: Kern County: 427,257; Contra Costa County: 584,726; and Los Angeles County: 6,515,598.

TABLE 7.2

Kern County 1: Job Creation Summary through Clean Energy, Manufacturing/ Infrastructure and Land Restoration/Agriculture Investment Programs

- Kern County share of California population = 2.3%
- Kern County share of overall $137.6 billion investment budget = 4.6%

Average Annual Job Creation, 2021 – 2030

	Annual investment budget	Annual total job creation: *direct, indirect and induced jobs*
Energy efficiency	$330 million	1,992
Clean renewable energy	$3.8 billion	12,416
Manufacturing/infrastructure	$1.4 billion	7,760
Land restoration/agriculture	$770 million	5,543
TOTALS	**$6.3 billion**	**29,711**

Source: Table 5.1. U.S. Census.

TABLE 7.3
Kern County 2: Job Losses through Fossil Fuel-Based Industry Contraction

A) Steady Contraction

	Fossil fuel workers
1) Total workforce as of 2018	13,651
2) Job losses over 10-year transition, 2021 – 2030	6,963
3) Average annual job loss over 10-year production decline *(= row 2/10)*	696
4) Number of workers reaching 65 over 2021 – 2030 *(= row 1 x % of workers 54 and over in 2019)*	3,850 *(28.2% of all workers)*
5) Number of workers per year reaching 65 during 10-year transition period *(= row 4/10)*	385
6) Number of workers per year retiring voluntarily	308 *(80% of 65+ workers)*
7) Number of workers requiring re-employment *(= row 3 – row 6)*	388

How to Pay for Full Program?
One example

- Total program at ~ $140 billion per year = 3.8% of California GDP
- Assume public/private sectors split total investment equally
  - Public investment at $70 billion/year
- If federal government provides $30 billion annually, state budget is at $40 billion
  - Roughly equal to current state budget surplus
  - With 2% borrowing rate, annual interest payments = $800 million
    - 0.4% of state's 2022 general revenues
    - 0.02 percent of state's average GDP