CCUS TECHNOLOGY AND WORKFORCE PROSPECTS

HOW WE TRANSITION MATTERS
WHY CCUS MATTERS TO US

ATOMIC
CHEMICAL
EDUCATION
ENERGY AND UTILITIES
GMP COUNCIL: GLASS, MOLDERS, POTTERY, PLASTICS AND ALLIED WORKERS
HEALTH CARE, PHARMACIES AND PHARMACEUTICALS MANUFACTURING
METALS (STEEL, ALUMINUM, ETC.)
MINING
OIL AND PETROLEUM
PAPER AND FORESTRY
PUBLIC EMPLOYEES
RUBBER AND TIRES
TRANSPORTATION
NEW ENERGY TECHNOLOGY AND JOBS

INFLUENCES UPON:

• Communities
• Industries
• Employment
• Equitable Transition
• Manufacturing
California: Carbon Capture Potential

Near and medium-term retrofit opportunities in the industrial and electric power sector

**Carbon Capture Opportunity by Industry**

<table>
<thead>
<tr>
<th>Industry</th>
<th>CO₂ Capture (MMt)</th>
<th>Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Cement</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Refineries</td>
<td>5</td>
<td>7</td>
</tr>
</tbody>
</table>

**State Summary**

- If all near to intermediate term opportunities in California are pursued, $2.8 to $4.2 billion in investment will be required to support these projects.

- Jobs associated with carbon capture capital investment in California total 890 to 1,340 on average per year over the next 15 years.

- Annual jobs to operate carbon capture retrofits total 880 to 1,200 ongoing jobs.

- In addition, $1.2 billion in transport infrastructure will be required to support these projects. This investment will create 540 jobs on average each year over a 15-year deployment period.

Source: Rhodium Group analysis, The Great Plains Institute
California: Industrial Facilities

Carbon capture opportunities

**Capital Investment Requirement**
Million $ USD

- **Ethanol**: $70
- **Hydrogen**: $40
- **Cement**: $950
- **Refineries**: $940
- **Total**: $1,290

**Jobs Associated with Capital Investment**
Average Jobs Each Year, 2021-2035

- **Ethanol**: 20
- **Hydrogen**: 420
- **Cement**: 420
- **Refineries**: 480

**Ongoing Jobs**
Annual Operation Jobs

- **Ethanol**: 25
- **Hydrogen**: 310
- **Cement**: 360
- **Refineries**: 390

Source: Rhodium Group analysis. Note: The values above are not cumulative. The actual jobs associated with capital investment in any given year will depend on the pace of project development. Capital investment job values above reflect the average over the 15-year study period. Ongoing jobs include on-site and off-site jobs.
RESOURCE INFO/REPORT LINKS

https://rhg.com/research/state-ccs/

Getting_to_Neutral.pdf (llnl.gov)

Net Zero by 2050 – Analysis - IEA

PERI - A Program for Economic Recovery and Clean Energy Transition in California (umass.edu)