Impacts of SB 467 and Other Restrictive Oil Production Policies on Jobs and Retail Prices

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Impacts of SB 467 and Other Restrictive Oil Production Policies on Jobs and Retail Prices

On February 17, 2021, Senators Scott Wiener and Monique Limón introduced SB 467, which would prohibit the issuance of new permits or renewal of existing permits to conduct hydraulic fracturing, acid well stimulation treatments, steam flooding, water flooding, or cyclic steam operations beginning January 1, 2022. The measure would prohibit all hydraulic fracturing, acid well stimulation treatments, steam flooding, water flooding or, cyclic steam operations under existing permits beginning January 1, 2027. Senator Wiener also indicated his intention to add 2,500 foot well set-back requirements to SB 467 through future amendments.

While by far the most draconian measure introduced so far, SB 467 is but one of several measures under consideration in California that would seriously diminish oil production in this state. Other measures include statewide well setback requirements as well as proposed and enacted local ordinances that place numerous restrictions on oil production-related activities.

In this brief, we evaluate the impacts that SB 467 and other policies that eliminating California oil production would have on (1) jobs, income, taxes and other measures related to crude oil production, and (2) retail prices paid at the pump for gasoline and other refined petroleum products. We also look at the effects that higher prices would have on households at varying income levels, as well as jobs in California.
Summary

Our key findings are:

- SB 467 would result in the rapid phase-out of virtually all crude oil production in California by 2027. This is because 95 percent of California oil production relies on water flooding, steam flooding, or cyclic steam operations to maintain flow of oil into wells. If a statewide 2,500-foot oil well setback requirement is added to the bill, 97 percent of production would be eliminated. Because of the integrated nature of oil operations and the devastating impacts the measure would have on all operators in California, such a ban would likely end investments in much of the remaining production as well.

- The rapid production phase-out would result in the elimination of virtually all of the 50,000 jobs and $1.5 billion in state and local revenues tied to crude oil production. A production phase-out would also put at risk tens of thousands of jobs in mid-stream and downstream industries that are involved in the transportation, refining, and distribution of petroleum products.

- We estimate the total economic value of proven oil reserves in California is between $20 billion and $30 billion, with the actual amount depending mainly on future crude oil prices. This total is related to producing fields only. It does not include the additional value associated with mineral rights held on several millions of acres of undeveloped lands held by producers and investors in the state. SB 467 or other measures restricting production would result in a major loss in wealth to mineral rights owners and producers. Such measures could also result in a major liability to the state if mineral rights owners and producers were to prevail in “takings” lawsuits.

- The affected oil-industry and allied construction jobs, many held by union members, are high-paying with benefits, and are available to workers without college degrees. They would be extremely difficult to replace even if the state provides major support for job training and related employee assistance programs.

- Beyond the major impacts on crude oil production industry jobs and income, the rapid phase-out of production will make California almost 100 percent dependent on waterborne imports for petroleum products. This will put California at more risk of supply disruptions, and it will put upward pressures on transportation fuel prices paid at the pump by Californians. This is because:
Even under the best of circumstances, the loss of reliable supplies of California crude oil would require refiners to build and maintain larger inventories, build more storage capacity, and re-configure operations to accommodate increases in foreign crude oil. In California’s isolated fuel markets, such costs would likely be passed along to consumers, since there are no crude oil or refined products pipelines that link California to other U.S. supply sources.

More importantly, refiners do not currently have adequate port access to accommodate more than about one-half of the 400 additional tankers that would need to be offloaded each year. If past experience is any indication, it is highly unlikely that enough capacity and related infrastructure could be added in time (if ever) to offset the decline in domestic production. This would lead to supply shortfalls of crude oil or refined petroleum products needed to meet California’s demand for petroleum products.

Because demand for petroleum is inelastic, large increases in gasoline and related transportation fuel prices would be required to bring markets back into balance.1

- Based on assumptions and methodologies described in this brief, we estimate that gasoline and diesel prices would likely rise 70 cents per gallon due to the pass-forward of refinery costs – even if port constraints do not become a factor.

- If waterborne port constraints were to become a factor, which we believe is especially likely given the quick phase-out of California crude oil supplies mandated by SB 467, then gasoline prices could easily rise by between $1 and $2 dollars per gallon, and they could briefly soar by $10 dollars or more per gallon.

- Even a $1.00 per gallon increase would raise household expenditures on gasoline and diesel by $10 billion per year (an average of $733 per household). A $2.00 per gallon increase would raise annual household expenditures by $20 billion ($1,466 per household). Households would also face higher costs for other purchases, which we estimate would range from $2.5 billion to $5 billion annually in the case of a $1.00 increase in gasoline prices. This is due to the impact of higher transportation fuel prices on the costs to produce and distribute virtually all products and services throughout the California economy.2

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1 The overwhelming majority of goods movement (whether by aircraft, truck, rail, or ship), food production and delivery, and personal transportation relies on petroleum fuels, and the majority of travel is relatively nondiscretionary. Therefore, the demand for petroleum fuel is inelastic, meaning that it does not vary significantly despite price changes.

2 As one example, higher transportation fuel costs – whether from regulatory constraints on in-state petroleum production or from mandated electrification of trucks and construction vehicles – decreases competitiveness of California farmers and manufacturers by driving up cost relative to competitors in other states and other countries like Mexico and China.
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- The price increases would have a disproportionate impact on low- and moderate-income households, who spend a greater share of their incomes on motor fuels than their higher-income counterparts. Low- and moderate-income households in California are already struggling with rents and energy costs that are among the highest in the country.

- The higher petroleum-related costs would also leave households with less disposable income to spend on other goods and services, which will depress business sales and employment throughout the economy. We estimate that a $1.00 increase in retail gasoline prices would result in a loss of between 80,000 and 95,000 jobs when direct and multiplier impacts are included.

- A rapid phase-out of oil production would have intense impacts in the San Joaquin Valley, where 75 percent of statewide crude oil production occurs. Such a phase-out would also have substantial impacts on the City of Long Beach where 1,000 public and private sector employees are tied to the City's operations in the Wilmington oilfield, which would be shut down under SB 467.

Introduction

California is the 7th largest producer of crude oil in the U.S. In addition to supporting over 50,000 jobs, California’s oil and gas exploration and production (E&P) industry supplies about one-quarter of the petroleum-related energy needs of this state’s people, businesses, and governments. These positive contributions would be virtually eliminated within six years by SB 467 (Wiener and Limón), a measure introduced on February 17, 2021, which would:

- Prohibit the issuance of new permits or renewal of an existing permit for hydraulic fracturing, acid well treatments, water flooding, steam flooding, or cyclic steam operations, beginning on January 1, 2022; and

- Prohibit all hydraulic fracturing, acid well treatments, water flooding, steam flooding, or cyclic steam operations, beginning on January 1, 2027.
SB 467 would eliminate almost all California crude oil production in a very compressed time frame. This is because producers have, for many years, relied on enhanced oil recovery (EOR), such as waterflooding or thermal steam injection, to maintain oil flow in California’s mature oil fields. According to estimates produced by Catalyst Environmental Consulting using well production data from the California Geologic Energy Management Division, 95 percent of oil produced in California during 2019 utilized either waterflooding, steam flooding, or thermal steam – the types of operations that would be eliminated under SB 467. If the authors add a 2,500-foot oil well setback requirement to SB 467, about 97 percent of current oil production would be eliminated. Further, given the common infrastructure involved in power, oil gathering, and pipeline transportation systems, the shut-down of 95 to 97 percent of oil production would also threaten the ability of operators to continue the remaining production as well.

We note that while SB 467 is by far the most restrictive measure currently circulating, there are many policies under consideration that individually would have moderate to major impacts on oil production in the state. When combined, these policies would eliminate the majority of California oil production over a relatively short period of time. These are also highlighted in Figure 1.

**Figure 1**
**Policies Aimed at Reducing or Eliminating California Crude Oil Production**

<table>
<thead>
<tr>
<th>Policy</th>
<th>Approximate Amount of Production Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB 467 – Elimination of oil production water-flooding, steam-flooding, cyclic steam, hydraulic fracturing, and acid well treatments by 2027</td>
<td>148 million (out of a total of 156 million) barrels; 151 million barrels if a 2,500 foot well setback requirement is added to the bill.</td>
</tr>
<tr>
<td>Ban on hydraulic fracturing</td>
<td>27 million barrels</td>
</tr>
<tr>
<td>Moratorium and potential ban on high-pressure cyclic steam</td>
<td>11-13 million barrels</td>
</tr>
<tr>
<td>Well setback requirements</td>
<td>25 million barrels assuming 2,500-foot setback</td>
</tr>
<tr>
<td>Various local restrictions*</td>
<td>Potentially 25 million barrels</td>
</tr>
</tbody>
</table>

* Includes production phase-out required by the Los Angeles County Sustainability Plan, restrictions included in the Ventura County revised General Plan, and similar proposals in other jurisdictions.  

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3 Catalyst Environmental Solutions is a diversified environmental consulting firm with considerable experience in the energy sector. Catalyst specifically estimates that 38 percent of California oil production is tied to steam flooding, 30 percent is tied to water flooding, and 27 percent is tied to cycle steam. This leaves just 5 percent attributable to conventional production using no EOR. Hydraulic fracturing and acid well treatments, which are also banned by SB 467, largely take place in fields that rely on EOR.
Job and Revenue Impacts of an Oil Production Phase-out

As indicated in Figure 2, in 2019 the oil and gas (O&G) production industry was responsible for 50,100 jobs, $19 billion in economic output, and $4.4 billion in labor income. It also provided $1.5 billion in taxes, fees, and other revenues to state and local governments in the 2019-20 fiscal year.

Figure 2

CMC Estimates: Key Contributions of the Oil Production Industry in California (2019)

<table>
<thead>
<tr>
<th>Oil Production</th>
<th>156.1 million barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Output (direct and multiplier effects)</td>
<td>$19.1 billion</td>
</tr>
<tr>
<td>Employment (direct and multiplier effects)</td>
<td>50,100 jobs</td>
</tr>
<tr>
<td>Labor Income (direct and multiplier effects)</td>
<td>$4.4 billion</td>
</tr>
<tr>
<td>State/ Local Taxes and other revenues (direct and multiplier effects)</td>
<td>$1.5 billion</td>
</tr>
</tbody>
</table>

Average pay in the O&G industry was $139,000 in 2019, nearly double the statewide private-sector average. Many high-paying jobs in the industry are available to workers with less than college degrees.

Revenues from oil and natural gas sales are plowed back into the local economies, as companies invest in developing their reserves to replace the barrels of oil and cubic feet of gas they produce. These investments further add to jobs, income, and economic activity in California. About three-

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4 Our estimates of jobs, labor income, and average wages are based on North American Industry Classification Codes (NAICS) which include jobs attributable to both crude oil and natural gas production. While operations banned by SB 467 would directly apply to only California oil production, the bill’s restrictions would indirectly eliminate most natural gas production as well. This is because 90 percent of natural gas production in California is “associated gas,” which is extracted as a byproduct of oil production.

5 The crude oil production industry has been negatively affected by the economic fallout of the COVID-19 pandemic; partial year data indicates that production and jobs fell significantly during 2020. As oil markets stabilize over the next couple of years, the California oil and gas industry holds considerable potential to be an economic leader in terms of investment and job growth in this state. The extent to which this potential is realized, however, depends partly on economic factors, but also, to a large degree, on whether state and local legislative and regulatory policies will facilitate new oil industry investment.
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quarters of the production and industry jobs are located in the San Joaquin Valley, an area that otherwise faces high unemployment and lagging household incomes.

Virtually all of the contributions shown in Figure 2 would be eliminated by SB 467, and a significant portion of production would also be eliminated by other policies under consideration (and shown in Figure 1). These policies would also put at risk tens of thousands of jobs involved in the transportation, storage, and refining of crude oil. The downstream impacts would be even more pronounced if some refiners were not able to replace California production with foreign-sourced crude, or if the crude oil were replaced with refined products from abroad.

Impacts on royalty owners, mineral rights owners, and producers. Aside from the economic activity associated with annual production, the oil reserves themselves represent a major source of wealth to California. The value of these reserves can be measured by estimating the present value of after-tax cash flows (i.e., annual revenues minus operational and investment costs) generated from all future extraction of oil from these reserves. We estimate that the value is in the range of $20 billion to $30 billion, depending on the future price of crude oil. These estimates relate to the extraction from producing reserves. They do not include any future value from the resources in the several million mineral acres that are currently undeveloped in California and that hold significant potential for future production. While the value of these non-producing assets is difficult to ascertain, we believe that they are worth, in aggregate, several billions of dollars.  

A ban on oil production would greatly diminish the value of both producing and undeveloped reserves. This would result in a major loss in wealth to royalty owners, mineral rights owners and producers in California. It could also result in a major liability to the state if the affected entities were to prevail in “takings” lawsuits. At a minimum the state would face millions – perhaps tens of millions - of dollars in litigation costs defending against such lawsuits. If the plaintiffs were to prevail in one or more of these lawsuits, the state would be required to pay the companies and owners of the mineral rights affected by the ban the present value of the lost profits from the oil that would no longer be recovered in these fields.

Local impacts. The economic impacts would be particularly intense in the San Joaquin Valley, where three-quarters of statewide production is located, and wages paid outside of the oil production industry are, on average, one-third lower than the statewide average. The phase-out will also

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6 In addition to losses related to oil reserves that could no longer be accessed, the enactment of SB 467 or other measures banning oil production would also eradicate the value of hundreds of millions or even billions of dollars worth of investments in pipelines and related infrastructure, which would no longer be needed to transport and store oil produced in California fields.

7 Under the “takings” theory, a legislatively mandated ban on production would result in the “taking” by government of a valuable asset owned by oil and gas producers and mineral rights owners. As compensation, the state would be required to pay the affected entities an amount equal to the present value of the lost profits from the oil and gas that would no longer be recovered from the California fields. In December 2017, the Monterey County Superior Court ruled that a 2016 Monterey County ballot initiative banning oil production (Measure Z), if applied, would constitute an unlawful taking of the property of certain royalty and mineral rights owners.

8 As an indication of potential litigation costs, in May 2018 Monterey County dropped its appeal of the December 2017 Superior Court ruling overturning a substantial portion of Measure Z (see footnote 7), citing the potential for “millions of dollars in attorney fees and costs, potentially tens of millions of dollars.” http://www.co.monterey.ca.us/Home/Components/News/News/1421/1336
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have negative impacts on the City of Long Beach, which is the working interest owner of the giant Wilmington oilfield. Virtually all oil production in the Wilmington field is aided by waterflooding, and thus would be shut down under SB 467. The shutdown would eliminate tens of millions in annual revenues to the city, as well as over 1,000 public sector and private sector jobs currently associated with oil extraction from the Wilmington oilfield.

In sum, SB 467 or similar measures eliminating California oil production will put tens of thousands of working-class families and their communities at risk. The loss of oil-industry and allied construction jobs, many held by union members, would subject these families to potentially extended periods of unemployment as well as likely reductions in future pay and benefits, even after going through job retraining programs.

Restrictive policies will have pronounced impacts even if only applied to new wells and projects ...

While SB 467 would ban all EOR and hydraulic fracturing by 2027, some other proposals under consideration would “only” apply directly to new drilling, facility or pipeline construction, and other new industry investments. Proponents often claim that such proposals would have limited near-term impacts because existing production would be able to continue. This assertion ignores three important features of the oil production industry:

• The first is declining production that naturally occurs over time as reservoirs are depleted.

• The second is the substantial amount of sustained investment that is required to counter the natural decline.

• The third is that operators develop existing fields in phases to ensure the efficient use of surface well pads, as well as active and idle well bores. Much infrastructure currently in place was designed to process the production from new or recompleted wells as well as currently active wells.

We estimate that, without continued drilling and other investments, the base decline rate for California oil fields is up to 15 percent per year. This implies that without investment, most production would be gone within a decade. The production decline is only countered through development of new fields, drilling of replacement wells in currently producing fields, recompletion of existing wells in different oil-bearing zones, or other investments in field operations, including EOR. Restricting drilling in existing fields interferes with the efficient operation of wells and infrastructure, increases the unit cost of production, and negatively impacts the productivity and returns on investment for both operators and royalty owners. These impacts would further drive downward production and investment in California.

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9 Proposals placing limits on new drilling have been vague regarding the extent to which their restrictions would affect recompletions or deepening of existing wells.
Investments in new and replacement production are also responsible for a substantial proportion of the jobs and income generated by the E&P industry. Policies that restrict new drilling and other investments will result in an immediate and sharp decline in oil industry related jobs, and a relatively quick phase-out of production.

Impact on Prices at the Pump

Beyond the negative impacts on industry jobs, policies leading to a phase-out of crude oil production could have major impacts on all California households and businesses by creating more instability in petroleum markets, potential supply shortages, and almost-certain increases in retail prices for gasoline and other petroleum products. In this section, we discuss (1) the impacts that falling in-state production would have on prices of gasoline and other refined petroleum products, and (2) the impacts that these higher prices will have on household budgets and the broader economy.

Background – California is an “Energy Island”

California crude oil production is crucial to the stable operations of California’s petroleum markets. This is because unlike most states, which are interconnected to petroleum supplies through networks of pipelines and rail, and short distance shipments, California is an “energy island,” relying almost exclusively on in-state production and waterborne imports mostly from foreign countries in the Middle East, South America, and Africa to meet petroleum demand. California receives declining amounts of oil from Alaska and very little crude oil from the other “lower-48” states. This is primarily due to the lack of interstate crude oil pipelines reaching from mid-continent regions to California, and the high costs, safety concerns, and strong public resistance to rail shipments. Similarly, California imports only small amounts of refined motor vehicle fuel from other states. This reflects (1) the lack of interstate refined petroleum pipelines extending from mid-continent or the Gulf Coast to California, and (2) the lack of out-of-state refineries that produce sufficient quantities of motor vehicle fuel that meets California’s special fuel formulation requirements.

Given California’s isolation from other U.S. markets, in-state production plays a crucial role in ensuring a steady and reliable supply of crude oil to help refiners meet California’s energy needs. The loss of these supplies will make California highly dependent on waterborne imports of crude oil or re-

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10 Total shipments into California by rail were 8.2 million barrels in 2019, representing only 1.2 percent of total crude oil demand in the state. See “Oil Imports by Rail, 2019,” California Energy Commission. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries-1

11 According to the California Energy Commission, refineries capable of producing gasoline meeting California’s stringent fuel standards are located in the State of Washington and the Gulf Coast. However, imports from these sources are limited by transportation and capacity constraints; thus, California has relied on imports from abroad to cover shortfalls in gasoline meeting the state’s fuel specifications. (See “California gasoline imports increase 10-fold after major refinery outage.” U.S. Energy Information Administration, October 13, 2015. https://www.eia.gov/todayinenergy/detail.php?id=23312.)
fined products from remote foreign sources, as far as 14,000 nautical miles away, to meet its energy needs.

The lack of access to U.S. supplies implies that the state will not be able to rely on a quick influx of crude oil or refined products to offset supply shortages that would be more likely to emerge if California became even more dependent on imported oil. It takes up to three weeks for shipments from Africa or the Middle East to arrive at California ports.

**Loss of California Production Would Increase Retail Prices Through Two Main Channels**

SB 467 or other state and local policies restricting in-state oil production would increase retail prices by (1) raising costs to refiners, who would need to reconfigure operations and expand inventories as they become 100 percent reliant on imported crude oil, and (2) creating potentially large supply shortages as refiners’ access to ports and related storage facilities is constrained by capacity limits.

**Higher Refinery Costs**

Petroleum refineries are complex industrial facilities that are intricately designed to handle specific types of crude oil. California refineries are designed and built to process the heavy crude oil (with relatively less than average amounts of sulfur) that come from California oilfields. Replicating the chemical characteristics of California crudes with foreign-sourced oil will pose a significant challenge to producers. If it is not possible to find suitable crude replacement, refineries would need to incur major costs to reconfigure their refining processes.

In addition, California refineries would be competing in global markets for these crudes. As such, they would face additional risks and challenges associated with foreign supply disruptions, volatile market conditions, and intense competition from China and other major oil importers. Managing these challenges, as well as supply chains as long as 14,000 miles, will become more difficult and expensive if California supplies are curtailed by state and local government mandates. The loss of dependable local supplies will require refiners to make major investments in coastal tankage and pipelines for the purpose of increasing inventories to guard against supply fluctuations.

One indication of the price impacts of dwindling in-state supplies can be found by looking at the increase in the relative price of California-produced oil compared to international benchmarks that occurred as in-state supplies declined over the past three decades. In 1994, in-state production covered 47 percent of California demand for petroleum products, and the price of Midway-Sunset crude lagged the Brent spot price by 26 percent. (The lower price reflects the higher density and viscosity of Midway-Sunset oil, which makes it more expensive to transport and refine.) By 2019, in-state production had fallen by nearly half, to 25 percent of California consumption, and the price gap had narrowed to just 5 percent.
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The narrowing price difference reflects a premium that refiners are willing to pay in the short term to continue using stable supplies of California-produced crudes to optimize fuel inputs and avoid added investment and inventory costs.  

If the historical relationships between California crude oil production, consumption, and prices were to hold in the future, elimination of California production would raise gasoline prices at the pump by 70 cents per gallon. This is a conservative estimate that assumes a smooth transition with no bottlenecks or supply shortfalls. It is also based on a relatively long-term linear relationship between California supplies and prices. There is evidence that the price effect has accelerated in recent years as California production has declined below 30 percent of California demand. If we base our estimates on the relationship between prices and California supplies during just the 2014 through 2019 sample period, the estimated price increase associated with elimination of California supplies would be $1.40 per gallon.

Supply Shortages

In addition to the refinery-related costs discussed above, the elimination of virtually all in-state oil production would make California nearly 100 percent dependent on waterborne imports. A major concern is that California refiners do not have access to adequate port and related infrastructure capacity needed to accommodate the additional 400 medium-sized tankers of oil that would be needed to replace the loss of California crude oil production.

In a past study we completed in 2019, we estimated that refiners could replace about one-half of crude oil supplies from California production without having to make major new investments in ports or on-site facilities. Replacement of the other half would require major investments in port expansions, additional tankage and pipelines, and refinery reconfgurations. As noted in the previous section, these and related investments would cost multiple billions of dollars and would likely be passed along to consumers.

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12 See for example, the California Resources Corporation Annual Report, 2018. On page 29, the company cited two reasons for the increases in California crude prices relative to the Brent benchmark during 2017 and 2018: “(S)trong demand for California crude oil to optimize local refinery yields as well as a decline in overall California crude oil production.” (Italics added for emphasis.)

13 This estimate is specifically based on a regression analysis of the relationship between (a) the percentage of California crude oil consumption supplied by California production and (b) the relative price of Midway-Sunset as compared to the price of Brent crude oil. We found that during the 1994 through 2019 sample period, each one percentage point decline in the share of California consumption supplied by California production was associated with a 0.8 percentage point increase in the relative price of Midway-Sunset crude.

14 This calculation is based on an “LR 1” class tanker carrying an average of 390,000 barrels of crude oil. (Source: U.S. Energy Information Administration, London Tanker Brokers’ Panel).

The bigger challenge for refiners, however, would be in securing the multiple permits and related environmental and land use approvals needed by California ports, storage terminal operators, and the refiners themselves to move forward on the investments. We indicated in the 2019 report that California's history of major delays and permit denials for oil-related capital projects in and around California ports bodes poorly for the prospects of new investments being approved.\textsuperscript{16} Nothing has occurred during the intervening 18 months to change our view. Absent these capacity-building investments, California would face chronic supply shortages and much higher transportation fuel prices. These shortages would be likely to occur under SB 467. This is because (1) demand for petroleum products is unlikely to decline significantly over the next several years given the mix of motor vehicles on the road, and (2) the state and local permitting process for needed port expansions would almost certainly extend for years beyond 2027, when in-state production would cease and foreign demand would soar under SB 467.

\textbf{Demand for motor-fuels is inelastic.} In normal markets, where both supply and demand can adjust, a supply shortage is resolved through responses by both consumers (through reduced demand) and producers (through increased supply). If supply is constrained, however, then all of the price adjustment will depend on how much (and how quickly) consumers reduce demand in response to higher prices. The challenge is that much travel and product-movement are non-discretionary, leaving consumers and businesses with few options to curtail purchases, particularly in the short term. As a result, demand for transportation fuels has been found to be \textit{price-inelastic}.

For example, an often-cited study of gasoline demand in the U.S. conducted in the mid-1990s found that the short-term elasticity of demand was about -0.2 and the long-term elasticity was about -0.6.\textsuperscript{17} An elasticity of -0.2 implies that a 10 percent increase in the price of gasoline will reduce consumer demand by just 2 percent. Recent studies have found the short-term price-elasticity to be even lower. The U.S. Department of Energy's Energy Information Administration (EIA) estimates a short-term price elasticity in the range of -0.02 to -0.04 for vehicle miles traveled in response to changes in gasoline prices. This means that a 100 percent increase in gasoline prices would reduce travel by just 4 percent or less.\textsuperscript{19}

\begin{itemize}
  \item \textsuperscript{16} Ibid.
  \item \textsuperscript{18} Long-term price elasticity is defined in many studies to be the consumption effect after one year. Long-term price elasticities are higher than short-term price elasticities because consumers have more opportunity in the longer term to adjust behavior — such as by moving closer to jobs or nearer to public transit or by purchasing a more fuel-efficient car. It should be noted that these forced adjustments make consumers worse off, in terms of having to trade in a car earlier than had been financially optimal prior to the gas price increase and/or being forced to drive smaller vehicles with less-than-optimal passenger or storage capacity.
\end{itemize}
The key implication of the inelastic demand for gasoline is that even modest supply shortfalls will result in substantial increases in retail prices. Californians have experienced the dramatic impacts of supply shortfalls in recent years. For example, in the months following the February 2015 outage at the Torrance refinery (which supplies about 10 percent of gasoline consumed in California markets), wholesale gasoline prices spiked as much as $1.35 per gallon before increased supplies of gasoline from abroad alleviated shortfalls in the California markets. Policies that drive down domestic supplies and drive-up dependence on waterborne imports will result in potentially larger and more persistent supply shortfalls than the one that occurred in 2015.

**Price Impacts**

To provide a general indication of the magnitude of retail price increases that would result from a government-mandated elimination of oil production, we developed estimates taking into account the various factors discussed above. These estimates are based on our statistical analysis, discussed above, regarding the long-term relationship between declining California production and rising prices refiners pay for California crude oil, as well as calculations of price impacts of shortages that would likely emerge due to port-related capacity constraints, using short-term and long-term price elasticities of demand.

In both cases, we assume that given California’s isolated petroleum markets, the cost increases will be passed along to consumers in the state. Importantly, these estimates assume that foreign crude oil supplies are not disrupted. Our results are summarized in Figure 3, which shows:

- If refineries were able to replace all of the lost California production through higher imports, prices at the pump would rise by about 70 cents per gallon. The cost increases under this scenario would be related solely to the pass-through of higher refinery costs associated with reconfigurations and larger inventories needed because of increased reliance on imports.
- If, because of port capacity constraints, refineries were able to replace only 75 percent of the lost in-state production, the estimated price increase would be $1.00 per gallon. Over a multiple-year period, the price increase would eventually diminish to 70 cents per gallon, as consumers make adjustments (such as purchasing more fuel-efficient automobiles or moving closer to where they work, or by working remotely.)
- If refineries were only able to replace 50 percent of the lost California production, the price impact could reach $2.00 per gallon in the near term, declining to 70 cents per gallon as consumers make longer term consumption adjustments to gasoline price increases.

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20 Supra 6.

21 For purposes of these calculations, we use the short-term price elasticity of demand of -0.2 and a long-term price elasticity of -0.6, both consistent with Espey’s 1996 analysis (see footnote 10). We also used a starting retail price of $3.41 per gallon of gasoline, consistent with price levels found in late January 2021.
These estimates do not encompass the full range of price effects that could occur. Price increases could be less if refiners or terminal operators were able to quickly secure approvals for port-expansion projects, or if California demand falls by more than expected. Large price increases could develop if supply shortfalls emerge, or if consumers are unable to reduce consumption by as much as we are assuming in response to price increases. For example, using the EIA short-term elasticity estimates, prices could temporarily spike to $10 per gallon or more. Of even greater concern is the risk to California families and the broader economy from increased dependency on foreign energy imports. Effects could be catastrophic if California is exposed to abrupt foreign supply cutbacks due to international turmoil, regional skirmishes, disruption of supertanker transport routes, accelerated demand increases in China and India, or other factors.

**Impact of Petroleum Price Increases on Consumers**

Price increases of these magnitudes would have major impacts on households and businesses in California. A $1.00 per gallon price increase (which would occur if refiners were able to replace 75 percent of lost California oil production) would translate into additional California expenditures of $20 billion on gasoline and diesel. Full elimination of California production would raise expenditures on gasoline and diesel by $40 billion.
Households would directly pay about one-half of those extra expenses, through higher prices at the pump for gasoline or other petroleum products. They would indirectly pay for a portion of the other half. The exact amount would depend on how much of the higher transportation fuel costs incurred by businesses and government are passed along to consumers in the form of higher prices for products and services (and, in the case of government, higher taxes).

**Direct Effects from Higher Motor Vehicle Fuel Prices**

Higher prices at the pump would act much like a regressive tax, hitting low- and moderate-income families especially hard.\(^{22}\) According to the Consumer Expenditure Survey (CES) produced by the U.S. Bureau of Labor Statistics, average expenditures of all California households for gasoline and other motor vehicle fuels were $2,475 annually, or 2.9 percent of average household income in 2017-18.

We estimate that if gasoline prices rose $1.00 per gallon average motor vehicle fuel expenditures for a typical household would increase by $732 per year to $3,207. This would raise motor vehicle fuel expenditures from 2.4 percent to 3.7 percent of a typical household’s annual income.

If prices rose by $2.00 per gallon, a typical household would face a $1,465 per year increase in annual motor vehicle fuel costs – raising its expenditures from $2,475 to $3,940 per year. This would raise spending on motor fuels from 2.9 percent to 4.5 percent of average household income.

However, as indicated in Figure 4, the impacts would be uneven. The percent of income spent on motor vehicle fuels is much greater for low- and moderate-income households than for their high-income counterparts; hence, the impacts of retail price increases would likewise fall more heavily on low- and moderate-income families. Specifically:

- A $1.00 increase in gasoline prices would raise annual spending for the bottom 20 percent of households (those having incomes up to about $22,000) by $358, from 9.4 percent of income to 12.2 percent of income. A $2.00 increase would raise average spending for this group by $716, from 9.4 percent up to 15 percent of their total budget.

- In contrast, the same $1.00 increase in gasoline prices would raise annual spending for the top 20 percent of households (those with incomes above $140,000) by $1,026 in dollar terms; but as a percent of household income, the increase would be small, going from 1.6 percent to 2.0 percent of annual income. A $2.00 increase would raise expenditures by $2,052, or from 1.6 to 2.5 percent of their total household budget.

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These price increases would come on top of California’s much above-average costs for rents (which are currently 50 percent or more above the national average), and energy. With regard to energy costs, Figure 4 shows that residential prices for electricity are two-thirds higher than the national average, and roughly double those of California’s western state neighbors. Gasoline is 41 percent higher than the national average, and between 20 percent and 40 percent higher than its western neighbors. Natural gas is 30 percent higher than the national average, and between 6 percent and 56 percent higher than its western neighbors.  

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Critically, the bottom 45 percent of California households typically spend their entire annual income on necessities such as food, rent, transportation, healthcare, and utilities. These households have no room to absorb the increases in gasoline prices that would result from state policies eliminating California oil production.

### Indirect Effects on Prices of Other Goods and Services

In addition to the direct costs associated with higher pump prices for transportation fuel, households would face price increases on other products and services they purchase. This is because transportation fuel expenses are a significant component of the overall costs of food, consumer goods, air travel, public transportation, and many other products and services that households purchase. The pass-through of these indirect costs would have substantial, though perhaps less visible, impacts on household budgets. We estimate these effects could be between one-quarter and one-half of the direct (price at pump) impacts.

<table>
<thead>
<tr>
<th></th>
<th>California</th>
<th>U.S.</th>
<th>Nevada</th>
<th>Arizona</th>
<th>Oregon</th>
<th>Washington</th>
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<tbody>
<tr>
<td><strong>Gasoline (1/30/2021)</strong> (Per Gallon)</td>
<td>$3.411</td>
<td>2.422</td>
<td>$2.763</td>
<td>$2.431</td>
<td>$2.701</td>
<td>$2.834</td>
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<tr>
<td><strong>Electricity (11/2020)</strong> (Cents per kilowatt hour)</td>
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<td>13.35</td>
<td>11.61</td>
<td>11.69</td>
<td>11.12</td>
<td>9.84</td>
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<tr>
<td><strong>Natural Gas (11/2020)</strong> (Per thousand cubic ft)</td>
<td>$14.38</td>
<td>$11.07</td>
<td>$9.20</td>
<td>$13.51</td>
<td>$10.38</td>
<td>$10.59</td>
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</tbody>
</table>
Broader Impacts of Higher Petroleum Prices in the Economy

Taking into account both the direct and indirect impacts of higher petroleum prices, we estimate that a $1.00 increase in average gasoline and diesel prices would raise consumer costs by between $12.5 billion and $15 billion annually. This would reduce the amount of discretionary income that households would have to spend on other goods and services. This would have negative impacts on businesses throughout the economy, resulting in losses of between 80,000 and 95,000 jobs. These losses would be above and beyond the losses incurred by the oil production industry and its suppliers.

Conclusion

SB 467 as well as other state and local policies under consideration that would curtail or eliminate California oil production would have far-reaching impacts that extend well beyond the multiple tens of thousands of workers in the oil production industry and its suppliers. A significant decline in California oil production will put upward pressure on retail prices paid by California consumers for gasoline and other petroleum products. This is due to both (1) major refinery costs that will be incurred as they shift to nearly 100 percent dependence on imported oil, and (2) the very real risk of supply shortfalls that will arise if California is unable to adequately expand port and storage terminal capacity to accommodate the additional 400 tankers that will be required to unload crude oil or refined products through California ports each year. The higher prices, which we believe could range up to $2.00 per gallon of gasoline (and spike even higher for brief periods), would act like a regressive tax, raising costs substantially on low- and moderate-income households that are already facing rents and energy costs that are among the highest in the nation. The decline in household discretionary incomes would also impact spending on other goods and services in the economy, depressing jobs and incomes throughout California.

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24 Multiplier estimates are based on the IMPLAN input-output model and database for the California economy, using an allocation of the $12.5 billion and $15 billion disposable income losses to households of varying income levels based on data from the Consumer Expenditure Survey for California (see footnote 17).