

*Comment Received From: CBE/Julia May
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Docket Number: 23-OIIP-01*

Attachment to APEN & CBE Comments re SBX1-2 Max Margin and Penalty April Workshop Docket # 23-OIIP-01

Additional submitted attachment is included below.

Attachment A

4/25/2024

From: Julia May, Senior Scientist, Communities for a Better Environment

To: The California Energy Commission (CEC)

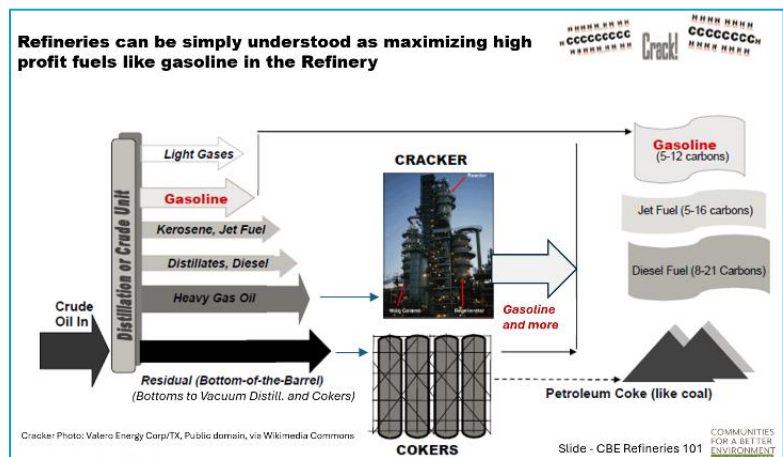
Re: A ***‘Partial Refinery Shutdown Pathway’*** of individual units and other production lowering could allow gradual progress toward complete refinery phaseout in California, cutting emissions, and avoiding price spikes and sudden whole-refinery shutdowns

Many California refineries have duplicate production units that could be individually phased out to more effectively smooth gasoline supply to match gradually declining demand. A partial shutdown approach could also be used at smaller refineries without duplicate units, where refineries would essentially work as part of a regional refining system (buying and selling intermediate products). A third, iterative approach for lowering production at all refineries is described, also allowing more gradual phaseout. **CEC should evaluate such opportunities and new reporting, modeling, and planning needed, and should consider a “Partial-Refinery Shutdown Pathway” in the Transportation Fuels Assessment, within planning a gradual full refinery phaseout.**

1. A simplified description of the biggest gasoline producing units in Oil Refineries:

Crude Oil Distillation Units are the front end of Refineries, producing some gasoline. Crude oil (a mix of heavy and light hydrocarbons) is heated, evaporating and rising up the distillation tower, falling out in trays at various heights. The heaviest hydrocarbons are at the bottom, liquids such as gasoline, diesel, and jetfuel in the middle, and gases at the top. Gas oils (heavier than gasoline, diesel, jet) are sent to the cracker.

Cracking units are the Heart of the Refinery, maximizing gasoline production by breaking longer Gas Oil molecules into gasoline-sized molecules. This is done in Fluid Catalytic Cracking Units (FCCUs) and Hydrocrackers.



Crude Units and Cracking Units also produce diesel, jet, and other products, but gasoline dominates, with diesel the next highest volume. Other units include Vacuum Distillation (further distilling the bottoms from the main Crude Unit (which is at atmospheric pressure)), Cokers (high-temperature, intensive cracking for heaviest bottoms), also Reforming and Alkylation of molecules for higher octane gasoline components, Hydrotreating and Sulfur Recover Units for removal of sulfur contamination, blending and storing products, and more. Refineries usually maximize gasoline but can be also adjusted to increase diesel or jet fuel produced by cracking units. **To simplify the discussion, we can look mainly at Crude Distillation and Cracking Units.**

2. Multiple Crude Distillation and Cracking units within single large refineries provide duplication that could be individually phased out, to smooth out lowering supply.

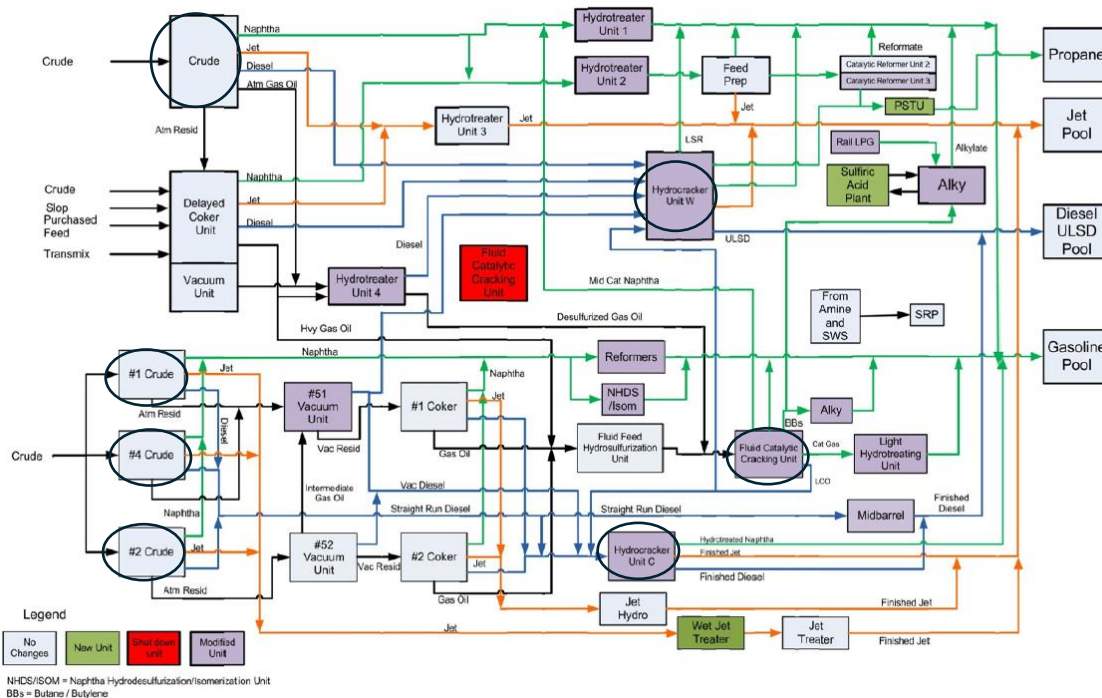
Information collected via different regulatory sources can help us tally duplication in oil refineries that could become redundant before a whole refinery does, as California gradually reduces demand for gasoline (and diesel) through increasing sales of Zero Emission Vehicles (ZEVs). Sources include Title V permits (under the Clean Air Act¹), Environmental Impact Reports (EIRs), US EIA (Energy Information Administration) data, and CEC data (e.g. weekly gasoline production), and others.

¹ [BAAQMD on Title V](#): “. . . (Title V) requires large industrial facilities to issue a single comprehensive operating permit that shows all federal, state, and local air quality requirements.” SCAQMD Title V permits available [here](#), BAAQMD [here](#).

The following largest California oil refineries provide examples of multiple distillation and cracking units in a single refinery that could eventually be shut down in stages, rather than all at once.

Marathon (formerly Tesoro) is the largest Oil Refinery in California, with multiple Distillation and Cracking Units, refining 365,000 barrels per day of crude oil.² Tesoro Wilmington bought the BP Carson refinery in 2013³ and combined the two after 2017 (without being required by the State of California to sell off other assets, further unnecessarily concentrating market profits within fewer companies), adding millions of barrels of storage tanks, and expanding many operations. Marathon bought the entire refinery in 2018. South Coast Air Quality Management District (SCAQMD) permits frequently still use the Tesoro name. Marathon /Tesoro Los Angeles has the most duplication of Crude Distillation and Cracking (plus Coking and more) in the state, as shown in Tesoro’s 2016 EIR process diagram for the integrated refinery,⁴ also shown in Title V permits.

- **4 Atmospheric Crude Units** (3 in the Carson half, 1 in Wilmington next door)
- **3 Crackers** (1 Fluid Cat. Cracker & 1 Hydrocracker in Carson, + 1 Hydrocracker in Wilm.)
- In addition there are multiple units for Vacuum Distillation, Coking, etc. needed to complete gasoline production and meeting CARBOB standards (California’s reduced emission gasoline):



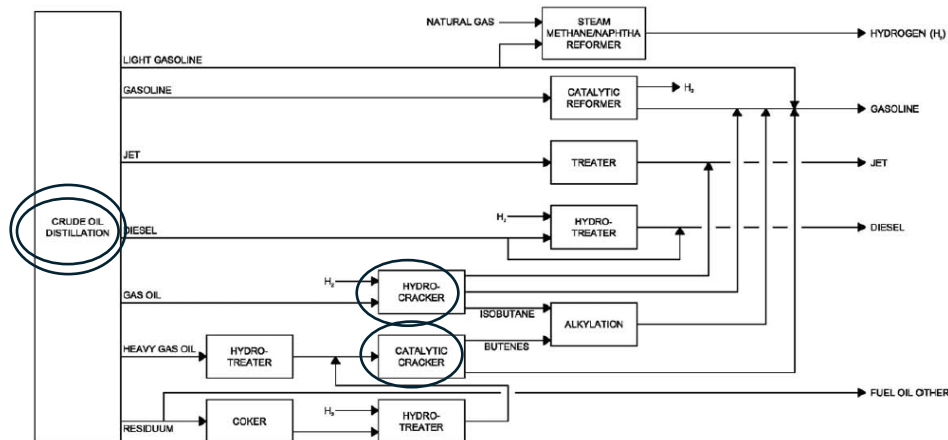
Title V Permits list the individual units above, though they don’t provide throughput (barrels per day). Other indicators in the permits may help identify relative size (such as firing rates of crude oil heaters, actual physical size of distillation towers, and other parameters).

Other large refineries in California also have multiple distillation and cracking units.

² https://www.marathonpetroleum.com/content/documents/fact_sheets/Los_Angeles_Refinery_fact_sheet.pdf
³ <https://www.hydrocarbonprocessing.com/news/2013/06/tesoro-formally-acquires-bp-refinery-in-carson#:~:text=Tesoro%20formally%20acquires%20BP%20refinery%20in%20Carson&text=BP%20has%20completed%20the%20previously%20announced%20sale%20of,%2.4%20billion%2C%20the%20companies%20said%20on%20Monday.>
⁴ Circles added above to *Tesoro Los Angeles Refinery Proposed Integration and Compliance Project, Chapter 2, Project Description*, Figure 2-10, p. 2-29, <https://www.aqmd.gov/docs/default-source/ceqa/documents/permit-projects/2006/bp-carson-safety/ch2.pdf?sfvrsn=2>

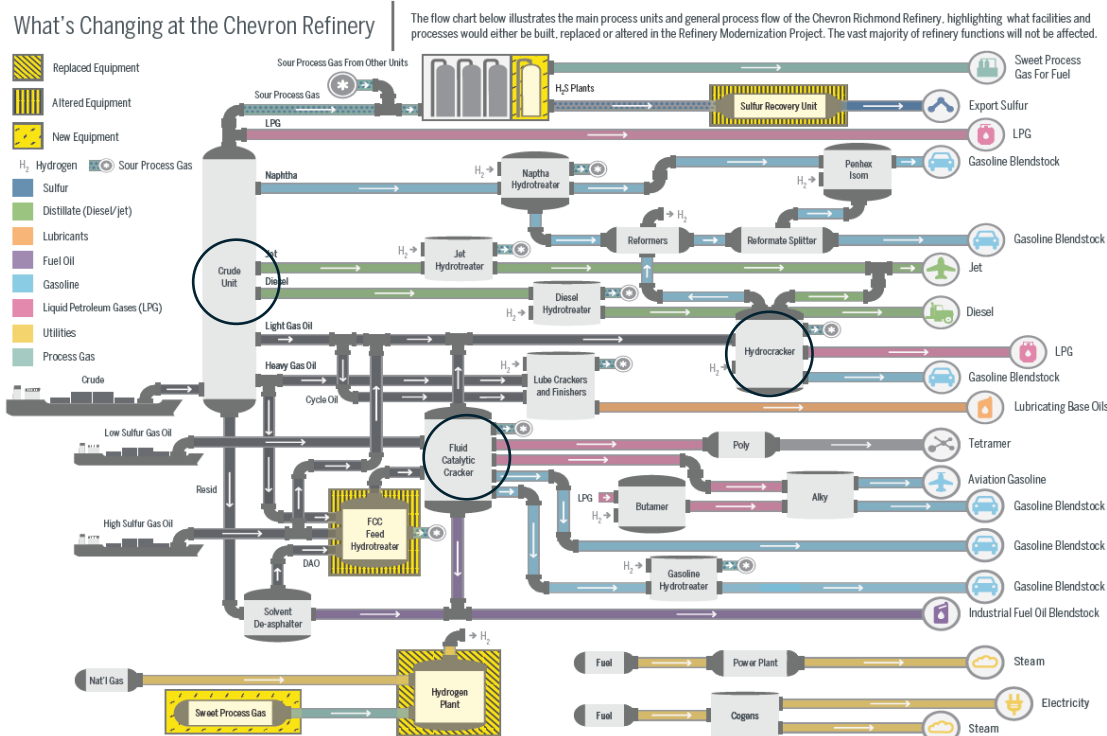
Chevron El Segundo is the 2nd largest refinery in the State, at 290,000 barrels per day⁵:

- **2 Crude Units** (larger No. 4, plus No. 2 – about a third No. 4 capacity) – not clearly shown in diagram below, but described in Heavy Crude Project EIR⁶ and in Title V permits (SCAQMD Facility ID 800030⁷)
- **2 Cracking Units** (One Catalytic Cracker, and one Hydrocracker):⁸



Chevron Richmond is the third-largest refinery in the State, at 250,000 barrels per day⁹:

- **One Crude Unit, Two cracking units (FCCU and Hydrocracker)**¹⁰



⁵ <https://elsegundo.chevron.com/our-businesses>

⁶ Information needs update – comes from Chevron El Segundo – Refinery Heavy Crude Project, Aug. 2006 EIR, p. 2-1, <https://www.aqmd.gov/docs/default-source/ceqa/documents/permit-projects/2006/chevron/finaleir.pdf?sfvrsn=4>

⁷ <http://onbase-pub.aqmd.gov/publicaccess/DatasourceTemplateParameter.aspx?MyQueryID=254>

⁸ This Chevron diagram may be outdated – it is from a 2008 EIR - Chevron Products Company, El Segundo Refinery, Project Reliability and Optimization Project, p. 2-6, Refinery Block Flow Diagram, at <http://www.aqmd.gov/docs/default-source/ceqa/documents/permit-projects/2008/feir-chevron/volume-i-final-environmental-impact-report.pdf>

⁹ <https://richmond.chevron.com/our-businesses/the-refining-process>

¹⁰ Chevron Refinery Modernization Project EIR, Figure 3-2, 2014, circles added

Other data includes US EIA’s Table 3 - Capacity of Operable Petroleum Refineries by State. Each year it provides total capacity for each refinery of each of the following:¹¹

- Atmospheric and Vacuum Crude Oil Distillation
- Catalytic Cracking and Hydrocracking
- Delayed Coking, Reforming, Desulfurization, and more

This is also useful data on *total* capacity of each of these process areas within each refinery, but it does not identify how many of each type of unit is present.

In summary, for large refineries a *Partial Refinery Shutdown Pathway* can include closing portions of duplicate processes in steps as California demand lowers, instead of shuttering whole refineries at once.

In reality, such process changes require more complex process design, balancing, and modeling, and include other refinery units. This is intricate but doable, just as the many refinery *expansions* in California over the last decades have been doable. Partial shutdowns essentially *reverse* the previous steady expansions. **This reverse expansion of oil refineries is necessary** – there is no other way to meet smog standards or climate goals without such phaseout of refineries and the gasoline and diesel fuels they make. We cannot meet these goals by waiting for refineries to economically fail or export large parts of their product out of the country.

3. Even smaller refineries without duplicate units could partially shut down and still operate as part of *regional refining systems*, by buying or selling partially refined intermediate products to other refineries in the region, as demonstrated historically.

Some refineries in California have already operated as partial refineries, in tandem with their other halves owned by the same company. For example, Phillips 66 Rodeo and Santa Maria, many miles apart, worked as one refinery. Phillips 66 Wilmington and Carson (partial refineries) operate together as a complete refinery.

We can envision a pathway of regional markets where refineries sell intermediate products to other refiners that are not owned by the same company. This is also already done to a much lesser extent, where Refineries buy and sell intermediate, partially refined products when their own systems are not internally perfectly balanced.

4. Gradual lowering of *all* California refinery production together can be another part of a path of gradual lowering of production to minimum operating levels (~65-70%), before individual refinery units would have to shut down.

During the pandemic, refineries gained experience on the lower limits of operation. This is still relatively high – ~65 to 70%, as found for example by the American Fuels and Petrochemicals Manufacturers (AFPM):¹²

Q: Is there a minimum utilization rate for refineries?

Yes, it’s called the “turndown rate.” It’s the lowest volume of crude a refinery can process and still safely keep all units operating. In terms of refinery utilization, that’s about 65% to 70% of a facility’s total capacity. Early on in the COVID lockdowns, U.S. refineries dropped utilization to 68%, right at that level.

As part of a *Partial Refinery Shutdown Pathway*, all refineries in California could:

- Gradually lower production while demand lowers, down to ~65 or 70%

¹¹ <https://www.eia.gov/petroleum/refinerycapacity/table3.pdf> In addition, Excel data is available providing a spreadsheet form of Refinery Capacity Data by individual refinery - here: <https://www.eia.gov/petroleum/refinerycapacity/>

¹² *Refinery Utilization 101: The Other Half of the Capacity Story*, July 8, 2022, <https://www.afpm.org/newsroom/blog/refinery-utilization-101-other-half-capacity-story>

- Next, some refinery units would have to shut down entirely, while others would increase production up to high levels (~90%), landing at total production slightly lower than the previous step.
- Then lowering of all remaining process units in the state could continue until they all reach minimum levels (65-70% utilization), when additional units would have to shut down.
- This could repeat until whole refineries are shuttered.

Planning such a gradual reduction with occasional unit closures can be used in tandem with logistics involving duplicate units at large refineries, or with partial operation of smaller refineries selling and buying intermediate products.

5. Conclusion and Recommendations

The advantage of a Partial Refinery Shutdown Pathway is to avoid premature and sudden whole refinery shutdowns, which occur faster than clean alternatives are available, constraining gasoline and other product supplies and causing price spikes that particularly harm low income people and small businesses. Partial shutdowns provide a smoother, more gradual lowering of hydrocarbon fuel production, more in line with the gradual increase in Zero Emission Vehicle use, and less disruptive.

The difficulty with this pathway is the complexity of planning and projecting needs in new ways, based on regional and statewide demand. This would require new specialized and detailed refinery modeling and planning on a regional level, and new regulatory methods to promote or require such steady phase out.

CEC’s Draft Transportation Fuels Assessment¹³ looks at 3 scenarios (rapid, fast, and slow) for refinery phaseout, which envisions shutdown of entire refineries, shown in its Table 1 at right.

The Commission should also evaluate options for a Partial Refinery Shutdown Pathway in the transition toward refinery phaseout as described in 2, 3, & 4 above:

- Shutting duplicate units within large refineries,
- Shutting portions of smaller (or any) refineries, which could still operate by buying or selling partially refined products within the region,
- Gradually reducing production at all refineries to minimum levels, followed by some shutdowns, other units increased back to maximum levels
- All these require evaluation beyond Distillation and Cracking units, to meet CARBOB requirements and other regulatory and logistical needs.
- New modeling and planning tools are needed to balance refinery products *regionally* and *statewide*.

The Commission should also require additional reporting on production of gasoline, diesel, and jet fuel at a more granular level within refineries, including at minimum at individual Crude and Cracking Units (and preferably all units). This information must surely already be tracked by refiners. There are many other important

Table 1. Possible Gasoline Refineries Remaining Under Each Demand Scenario Under Pathway One

| Year | Rapid Scenario | Fast Scenario | Slow Scenario |
|--------------------------|--|-----------------------|-----------------------|
| 2027 3 years | 620 TBD Demand | 780 TBD Demand | 785 TBD Demand |
| | 3 Northern refineries | 4 Northern refineries | 4 Northern refineries |
| | 4 Southern refineries | 5 Southern refineries | 5 Southern refineries |
| 2031 7 years | 420 TBD Demand | 670 TBD Demand | 720 TBD Demand |
| | 2 Northern refineries | 4 Northern refineries | 4 Northern refineries |
| | 3 Southern refineries | 4 Southern refineries | 4 Southern refineries |
| 2034 10 years | 310 TBD Demand | 555 TBD Demand | 660 TBD Demand |
| | 1 Northern refinery | 3 Northern refineries | 4 Northern refineries |
| | 2 Southern refineries | 3 Southern refineries | 4 Southern refineries |
| 2044 20 years | 70 TBD Demand | 250 TBD Demand | 540 TBD Demand |
| | Extremely low demand, possibly no refineries | 1 Northern refinery | 3 Northern refineries |
| | | 1 Southern refinery | 3 Southern refineries |

¹³ 4/12/2024, available at: <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-SB-02>

issues not addressed here regarding refinery phaseout, some submitted in earlier comments by CBE, APEN, and other Environmental Justice commenters, requiring attention during partial, and ultimately, full refinery phaseout.

- **One is the need for interagency cooperation for the re-assessment of and remediation of defunct refinery lands over time** as a part of a clearer commitment to safeguard communities as oil refineries phase out. We need to avoid the abandonment of contaminated lands.
- **We also need to connect the phaseout to a steady reduction in emissions, with hard, guaranteed limits at specified milestones to prioritize community interests over Big Oil's profit interests, as described in our earlier comments.**