

Benicia Refinery
Benicia, California



Community Presentation

Valero Benicia Refinery

Agenda

- Valero Energy Corporation
- Basics of Refining
- Benicia Refinery
- Emissions and Energy Use
- Being a Good Neighbor

Valero Energy Corporation

[Click here to watch the Valero Energy Corporation video](#)

REFINING

WORLD'S LARGEST INDEPENDENT
REFINER

RENEWABLE DIESEL

WORLD'S 2ND LARGEST RENEWABLE DIESEL
PRODUCER

ETHANOL

WORLD'S 2ND LARGEST CORN ETHANOL
PRODUCER



GROWTH PROJECTS FOCUSED ON COST CONTROL, OPTIMIZATION AND MARGIN EXPANSION

15 lowest
cost
refineries

3.2 million barrels per day
of high-complexity
throughput capacity

advantaged refining and logistics
assets well positioned for feedstock
and product optimization

ratable wholesale supply of
1.2 million barrels per day or
over 50% of our light products

2021
BEST YEAR EVER FOR
EMPLOYEE & PROCESS
SAFETY

EXECUTING A VIABLE PATH TO REDUCE AND OFFSET GREENHOUSE GAS (GHG) EMISSIONS



HIGH RETURN PROJECTS WITH PRODUCTS PLACED INTO HIGH GROWTH, LOW-CARBON MARKETS

700 million
gallons
per year

1.2 expanding to
billion gallons
per year

low-carbon intensity renewable diesel
produced from recycled animal fats, used
cooking oil and inedible corn oil

up to 80% reduction
in GHG
emissions

100% compatible with
existing engines
and infrastructure

CONTINUE TO DEVELOP ADDITIONAL LOW-CARBON GROWTH OPPORTUNITIES

Best-in-class
producer of fuels
and products that
are **essential to**
modern life



DEVELOPING ECONOMIC PROJECTS TO FURTHER REDUCE CARBON INTENSITY

12 ethanol
plants

1.6 billion gallons per year
production capacity

high-octane renewable
fuel with lower CO₂
emissions

at least 30% reduction in
GHG emissions

existing logistics assets well
positioned to support export
growth

REDUCING CARBON INTENSITY THROUGH ANNOUNCED CARBON SEQUESTRATION PROJECT

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Refining Capacity and Nelson Complexity

Refinery	Capacities (mbpd) ⁽¹⁾		Nelson Complexity Index
	Throughput	Crude	
Corpus Christi ⁽²⁾	370	290	14.4
Houston	255	205	8.0
Meraux	135	125	9.7
Port Arthur	395	335	12.7
St. Charles	340	215	17.4
Texas City	260	225	11.1
Three Rivers	100	89	13.2
U.S. Gulf Coast	1,855	1,484	12.6⁽³⁾
Ardmore	90	86	12.1
McKee	200	195	8.3
Memphis	195	180	7.9
U.S. Mid-Continent	485	461	8.9⁽³⁾
Pembroke	270	210	10.1
Quebec City	235	230	7.7
North Atlantic	505	440	8.8⁽³⁾
Benicia	170	145	16.1
Wilmington	135	85	15.8
U.S. West Coast	305	230	16.0⁽³⁾
Total	3,150	2,615	11.6⁽³⁾

⁽¹⁾ Capacities and Nelson complexity indices as of December 31, 2020.

⁽²⁾ Represents the combined capacities of two refineries—Corpus Christi East and Corpus Christi West.

⁽³⁾ Weighted average.

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Map of Operations

Map of Operations

REFINING

Assets: 15 petroleum refineries in the U.S., Canada and the U.K.

Products: Gasoline, diesel, jet fuel and other specialty products, including asphalt and petrochemicals, that fuel modern life

Throughput Capacity: 3.2 million barrels per day of crude oil and other feedstocks

RENEWABLE DIESEL

Assets: Diamond Green Diesel (joint venture), Norco, Louisiana

Products: Renewable diesel fuel

Capacity: 290 million gallons per year

ETHANOL

Assets: 13 plants in the Midwest U.S.

Products: Ethanol, distillers grains and fuel-grade corn oil

Capacity: 1.7 billion gallons per year of ethanol; 4.5 million tons of distillers grains



LOGISTICS ASSETS

- ~3,000 miles of active pipelines
- ~130 million barrels of active shell capacity for crude oil and products
- 200+ truck rack bays
- ~5,200 railcars
- 50+ docks
- 2 Panamax-class vessels

Includes assets that have other joint venture or minority interests. Does not include ethanol assets, except for railcars.

ALTERNATIVE ENERGY GENERATION

- Adjacent to the McKee refinery in the Texas Panhandle, 33 wind turbines with 50 megawatts of electricity capacity
- 4 cogeneration plants in the U.S. and the U.K.
- Expanders at 6 of our refineries

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Renewables - Ethanol

- Ethanol is an environmentally friendly, high-octane renewable fuel produced by fermenting converted corn starch with yeast. It is used as a blending agent with gasoline & the entire kernel of corn is converted to ethanol or distillers grains. Ethanol lowers life cycle greenhouse gas emissions up to 28% compared to non-blended gasoline. [Click here to learn more about the Basics of Ethanol](#) & [Click here to watch a video about ethanol](#)



12

Ethanol Plants

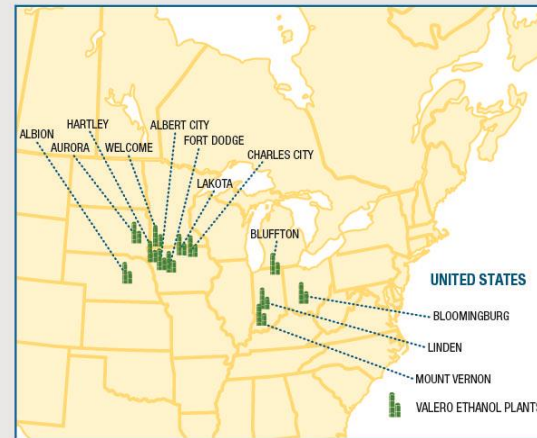


1.6 billion

Gallons per year

Developing **carbon capture and storage projects**
to further reduce carbon intensity

Valero's Ethanol Plants



Low-carbon fuel
well-positioned for
export growth



Ethanol has at least
30%
lower Life Cycle GHG Emissions,
compared with Petroleum Gasoline



~800
Employees



World's
2nd
largest corn
ethanol producer

Valero Energy Corporation

Renewables - Renewable Diesel

- Renewable diesel (RD) is an alternative drop-in fuel that is chemically similar to petroleum diesel while meeting the most stringent of low-carbon fuel standards & does not require infrastructure investments.
- Valero operates Diamond Green Diesel, a joint venture with Darling Ingredients Inc., producing RD fuel from recycled animal fats, used cooking oil and inedible corn oil. [Click here to learn more about the Basics of Renewable Diesel](#)



World's 2nd largest
renewable diesel producer
in joint venture with Darling Ingredients Inc.

Renewable diesel utilizes
recycled animals fats,
used cooking oil and
inedible corn oil to produce
low-carbon intensity
renewable diesel fuel,
sold in **California,**
Canada and Europe.



700 million gallons
production per year



Up to **80% reduction** in
life cycle **GHG emissions**

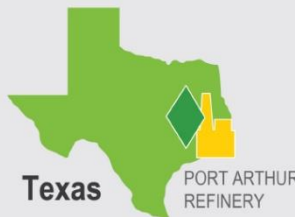
Renewable diesel is **100% compatible**
with existing engines and infrastructure



Louisiana

ST. CHARLES
REFINERY

Strategically located
next to our St. Charles refinery
to capture synergies and
gain access to export markets



Texas

PORT ARTHUR
REFINERY

New **470 million gallons per year**
plant to be built next to our
Port Arthur refinery.

Operations expected to begin in the
first half of 2023, increasing total
annual production capacity to
approximately **1.2 billion gallons**
per year of renewable diesel

Valero Energy Corporation

Vision and Guiding Principles

Safety is our foundation for success.

We view our stakeholders as partners to whom we seek to deliver operational excellence, disciplined management of capital and long-term value on a foundation of strong **governance** and ethical standards.

We consider our **employees** a competitive advantage and our greatest asset. We foster a culture that supports diversity and inclusion, and provide a safe, healthy and rewarding work environment with opportunities for growth.



We are committed stewards of the **environment**.

We will be a good neighbor by sharing our success with the **communities** where we live and work through volunteerism, charitable giving and the economic support of being a good employer.

Basics of Refining

Energy Matters: Refining 101 Series



[Basics of Refining and Optimization](#)

Click on the green hyperlinks to learn more about each subject

[Crude Basics](#)

[Distillation Basics](#)

[Refinery Configurations](#)

Benicia Refinery

Facts

Refinery Overview

- Valero acquired the Benicia Refinery in 2000
- Today it is one of the most high conversion & highly complex refineries in the United States
- Approximately 70 percent of the refinery's product slate is CARB gasoline, California's clean-burning fuel
- Currently, the refinery processes medium-sour crude slates from the San Joaquin Valley in California and the Alaska North Slope, along with foreign sour crudes.
- 165,000 BPD capacity
- ~430 employees
- Green/gold paint scheme intended for refinery to "blend-in" with local landscape
- Youngest refinery in California

City of Benicia

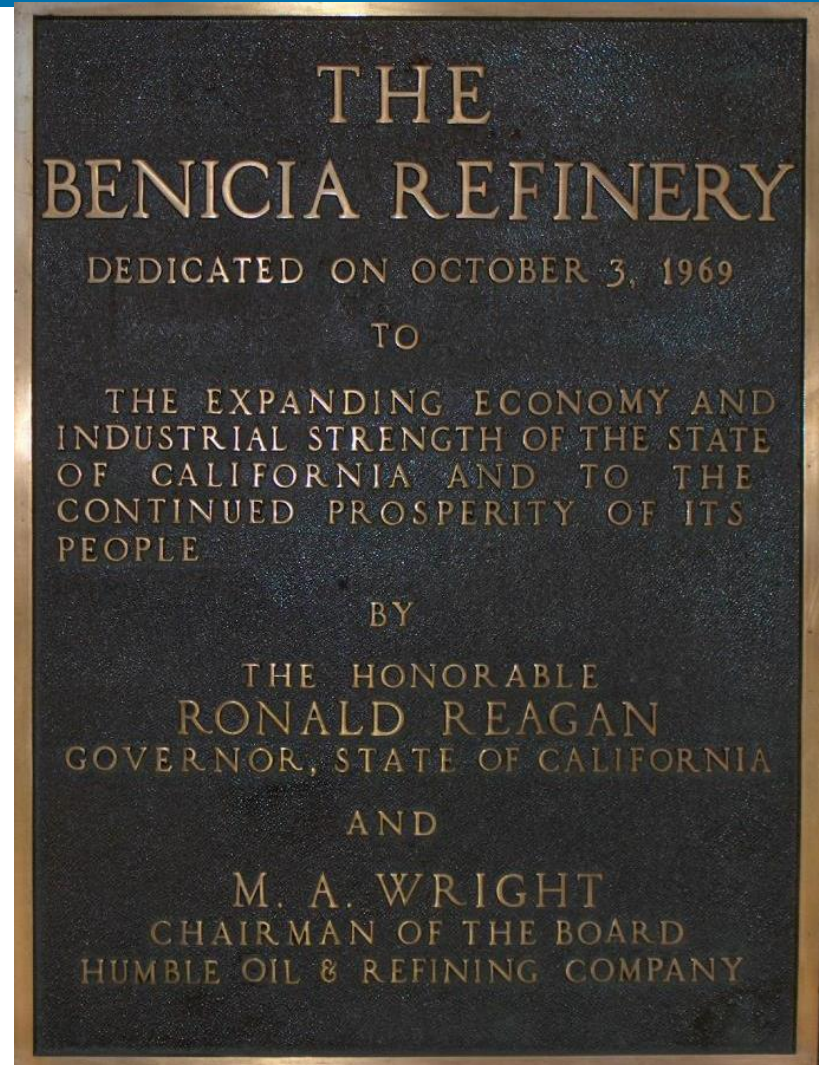
- Population 28,000; former state capital in 1853
- Valero is a major landowner with nearly 900 acres and 400+ acres of buffer
- \$11.5 MM generated in local taxes (2018)
- Refinery and associated BIPA facilities fees and taxes produce 25% of City's General Fund



Benicia Refinery

Timeline

- 1966-8** Refinery built on lands occupied by former U.S. Army arsenal dating back to 1860's. Specifically designed and constructed to process Alaskan North Slope (ANS) crude for a rapidly growing California economy with heavy gasoline demand
- 1969** - First ANS to crude unit; crude unit at 63 MBPD
- 1996** - Installed facilities to produce reformulated gasoline
- 2000** - Valero acquires the refinery and California retail marketing assets from Exxon
- 2001** - Valero acquires adjacent asphalt plant from Huntway
- 2002** - COGEN unit commissioned
- 2006** - Earned VPP STAR Site status
- 2007** - Begin production of Ultra Low Sulfur Diesel (ULSD)
- 2011** - Flue Gas Scrubber begins operation lowering SO₂ emissions by ~5,000 tons/yr and NO_x by ~1,000 tons/yr



Benicia Refinery

Benicia Asphalt Plant (BAP)

Benicia Asphalt Plant (BAP)

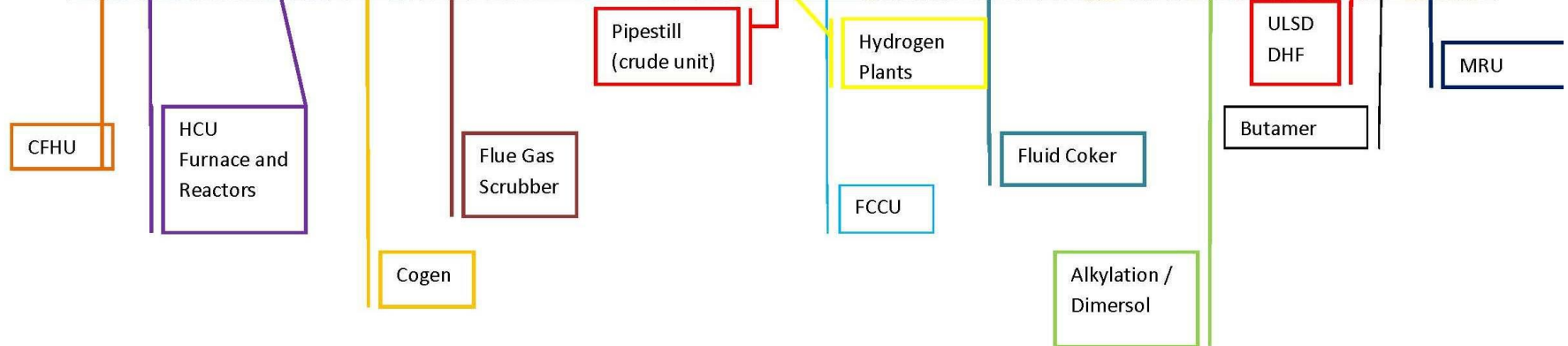
- Asphalt covers about 93% of all roadways and parking lots in CA
- BAP provides about ~50% asphalt on northern California streets, roads & highways
- [“Sustainable asphalt”](#) video developed by the Asphalt Pavement Alliance

[Click on the green hyperlinks to more about each subject](#)



Benicia Refinery

Processing Units



Benicia Refinery

Flue Gas Scrubber

Flue Gas Scrubber

The Flue Gas Scrubber (FGS) unit was designed, reviewed, and permitted as part of the larger project known as the Valero Improvement Project (VIP).

At a cost of over \$700 million, the FGS unit is in place solely for environmental controls. The FGS was designed to reduce emissions of sulfur dioxide (SO_2). Not only has it reduced emissions of SO_2 from the refinery's main stack by 95%, it also reduced nitrogen oxide emissions

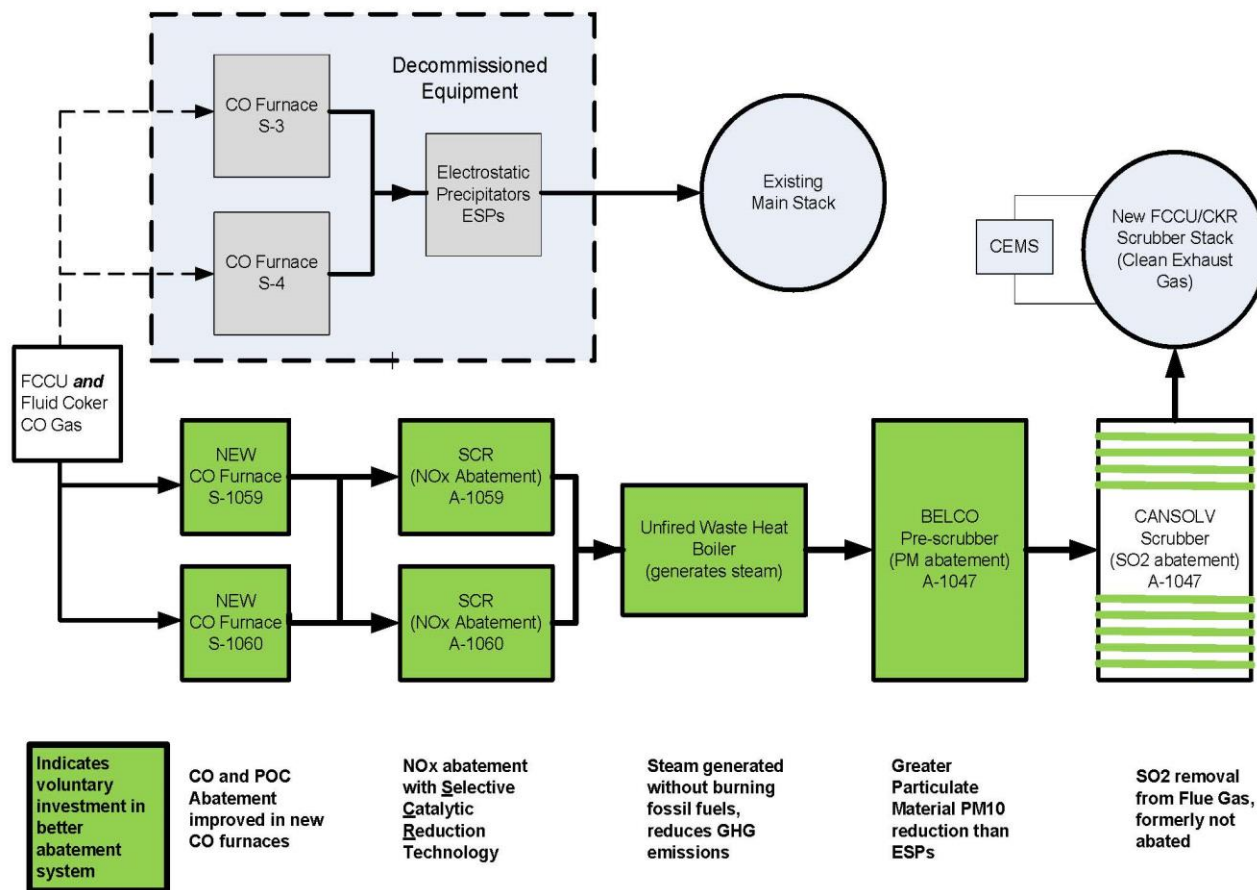


by 55%. In addition the project allowed the refinery to retire existing furnaces in favor of new energy-efficient furnaces with a smaller greenhouse gas footprint.

Investments in this project, along with other VIP projects such as the Butamer unit, two new crude tanks, and the Ultra Low Sulfur Diesel (ULSD) unit, will continue to bring tax benefits to the City of Benicia for years to come.



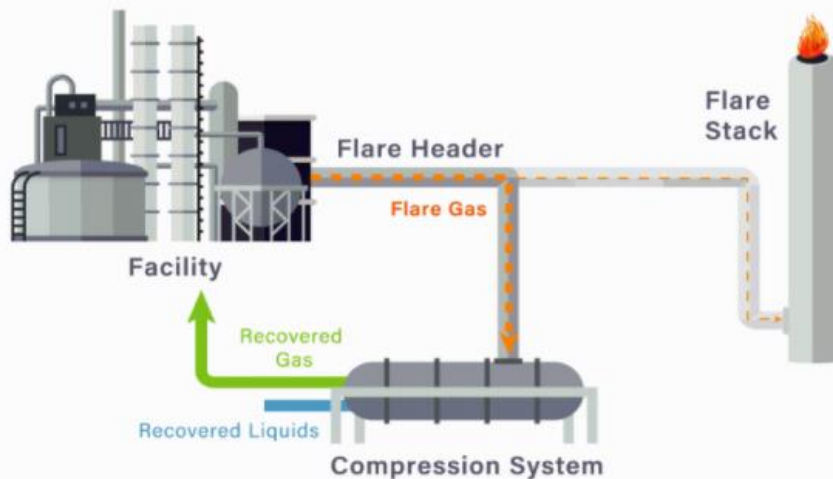
VIP PROJECT FCCU/COKE FLUE GAS SCRUBBER RETIRED SOURCES, NEW SOURCES AND NEW ABATEMENT SYSTEMS



Benicia Refinery

New Flare Gas Recovery Compressor

FLARE GAS RECOVERY SYSTEM

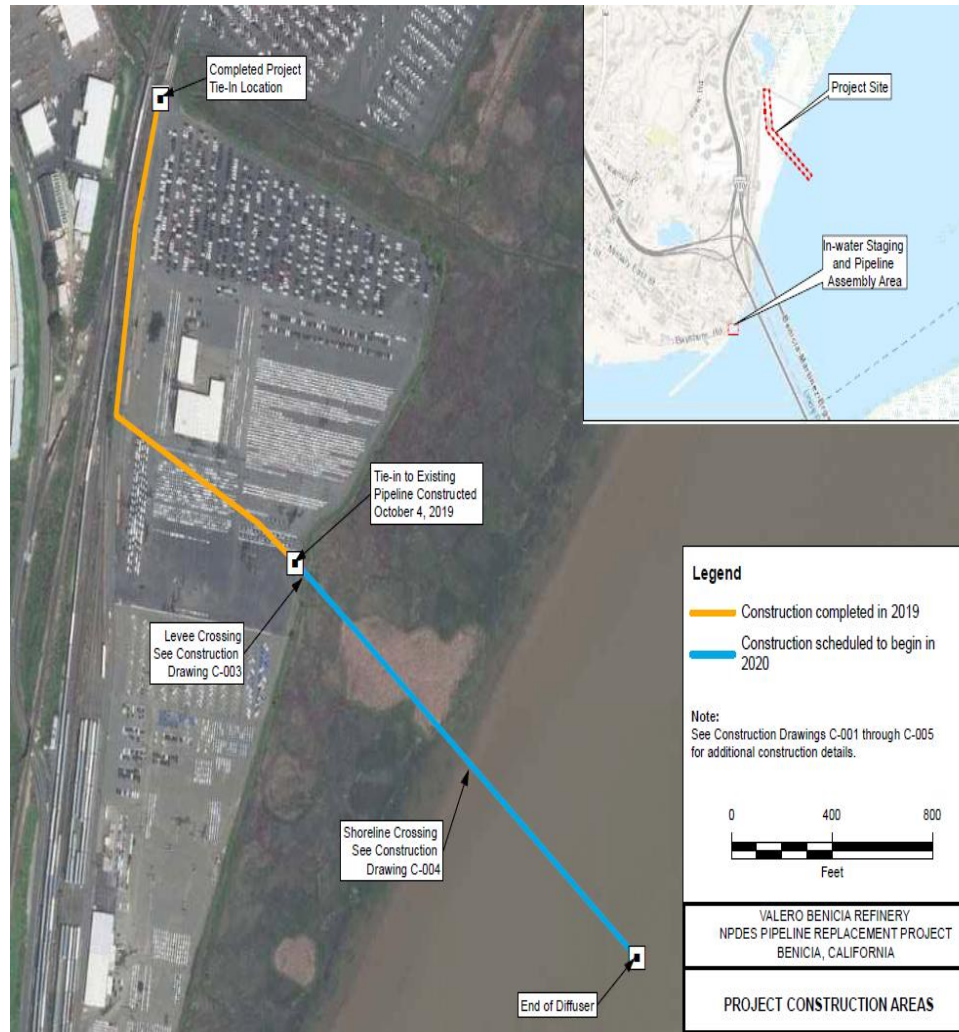


- Replacement of Flare Gas Recovery Compressor installed in 1980. Needed replacement due to reliability and obsolescence
- This unit helps recover and compress gases in the flare gas recovery unit to minimize flaring
- The 220,000 pound structure was installed by local union contractors. Over 60,000 man hours were spent safely working on the project with no injuries.
- Valero appreciates the city's assistance in issuing a building permit for this project

A flare gas recovery system is essentially a way to capture and reuse the relief or excess gas in a refinery. Flare gas leaves the refinery during routine operations and also during shutdowns and start ups and travels via the flare header to the flare, where the gas is burned. When refineries have flare gas recovery systems, the gas mixture that would normally be routed to the flare is captured and put through a compressor system. Depending upon the pressure and temperature after compression, the flare gases can either be recovered as gas or liquid product. Gas collected is used as fuel for the refinery, reducing the need for natural gas. Recovered liquid product will be recycled and re-refined.

Benicia Refinery

New Waste Water Treatment Plant Effluent Line



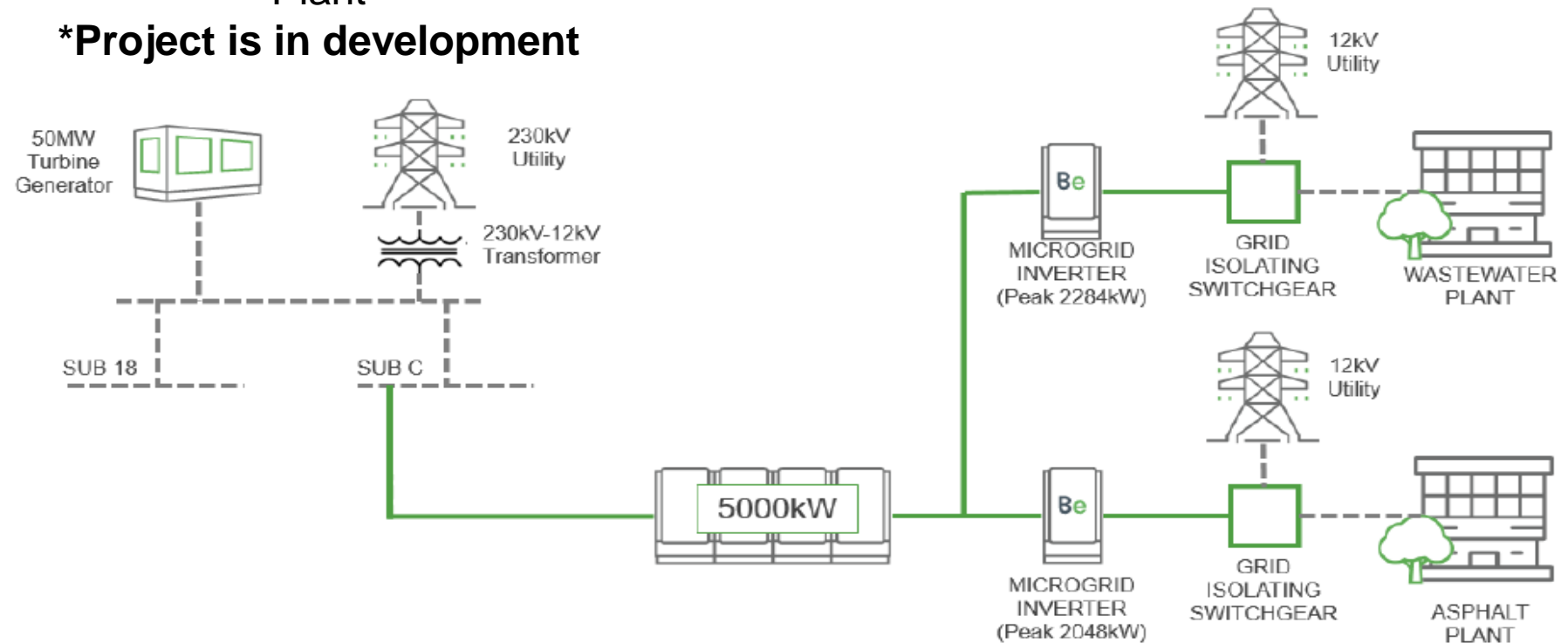
- Project was driven by NPDES requirement after an in-line inspection of the pipe
- Project took years to develop with permitting required from 6 different agencies
- Various environmental work windows & tidal cycles constrained the project and added complexity - the project was split into two parts – an uplands portion & a wetlands portion
- **Project completed in October 2020** with no Health, Safety or Environmental incidents.

Benicia Refinery

Renewable Project - Fuel Cell Microgrid

Providing 5 Mega Watt Fuel Cell Microgrid to provide 100% electricity needs at Benicia Asphalt Plant and Waste Water Treatment Plant

***Project is in development**



Benicia Refinery

Biodiversity & Habitat Conservation



134,000

CUBIC YARDS OF CLEAN
DREDGED MATERIAL

AN AMOUNT
ROUGHLY
EQUAL TO

6.4 million

50-POUND BAGS
OF SAND

The Benicia refinery captures clean sediment dredged from its dock area to raise the elevation of nearby subsided wetlands, which helps **protect and recover wildlife** and plant species. Over the past four years, Valero has contributed approximately **134,000 cubic yards of clean dredged material** – an amount roughly

equal to 6.4 million 50-pound bags of sand – for restoration at the Montezuma Wetlands Restoration Project. The effort not only **protects habitat** but also helps ensure **safe dock operations**, clearing sediment to allow ample underwater clearance for large ships.

Benicia Refinery

Biodiversity & Habitat Conservation

At our Benicia refinery near the San Francisco Bay, Valero placed straw "wattles," or interwoven natural material, over pipelines to allow small mammals, including the threatened **salt marsh harvest mouse**, passage over the pipes. The wattles serve as bridges and provide critical access for the mouse to the dense ground cover and adjoining grasslands it is dependent upon.



Salt marsh harvest mouse



Benicia, California:

Valero has a long-standing partnership with the Benicia Tree Foundation to plant and prune trees annually throughout the area.



Emissions and Energy Use

Air Quality Monitoring Program for the Community

Refinery Monitors (Measures Refinery Operations)

- Routine operations monitored by analyzers
 - Continuous Emissions Monitors or CEMs for NO_x, CO, SO₂, H₂S, TRS, etc.
 - Over 100 devices requiring daily calibration and data recording for NO_x, CO, SO₂, H₂S, etc.
 - Stack testing for non-CEM constituents (PM, SAM, NO_x, CO, etc.)

Ground Level Monitors (Measures Ambient Air from all sources)

- Three ground level monitors (GLMs) were installed and are in continuous operation in the community
- The GLMs measure H₂S and SO₂ in the ambient air from all sources, including mobile sources (e.g. cars and trucks) and stationary sources (e.g. refinery, homes and other businesses)
- Data is also available on the Valero Benicia Refinery Fenceline monitoring website:
www.beniciarefineryairmonitors.org

Fenceline Passive Monitors (Measures Ambient Air from all sources)

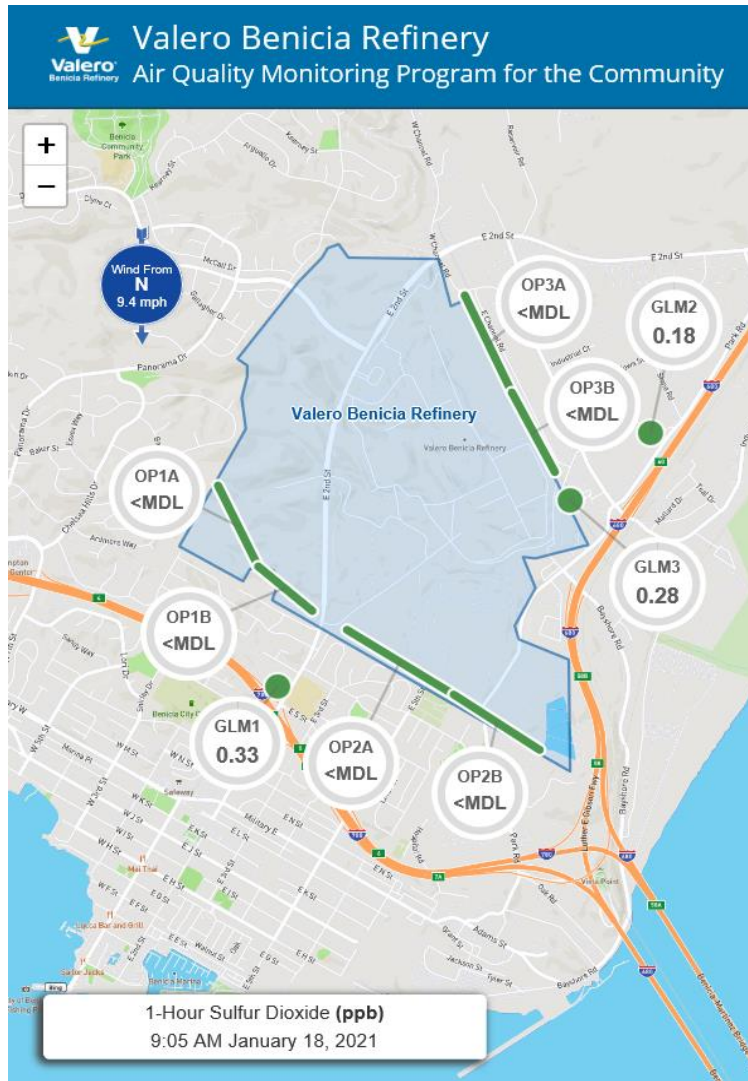
- Under EPA's Petroleum Refinery Sector Rule (RSR), refineries across the United States are required to monitor concentrations of benzene at their property boundary, or fenceline. Data was sent to EPA on a quarterly basis starting in 2018.

Fenceline Open Path Monitors (Measures Ambient Air from all sources)

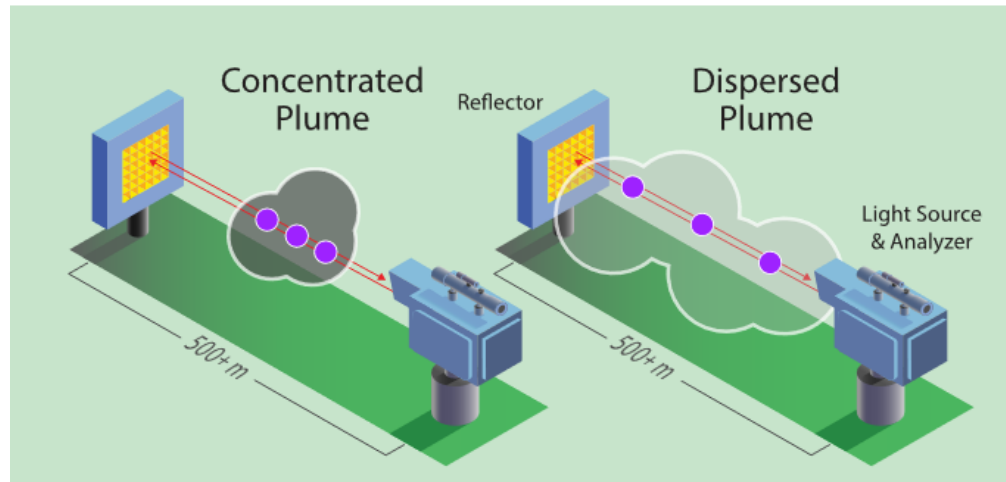
- Fenceline monitors measure specific pollutants that cross the facility's fenceline in real time. This system has the ability to monitor, record and report air pollutant levels of multiple compounds

Emissions and Energy Use

Open-Path Fenceline Monitoring - Pathways 1, 2, & 3



- Local Air District rule requires active, real-time monitors along “fence line” based on prevailing winds and percent of time blowing in a given direction
- Data will be validated and posted on a publicly accessible website in near real-time
 - www.beniciarefineryairmonitors.org



Emissions and Energy Use

Future Capital Improvements – Pathway 4



Emissions and Energy Use

Passive Fenceline Monitoring

US EPA Fenceline Monitoring Program for Benzene

- Under United States Environmental Protection Agency (EPA) Petroleum Refinery Sector Rule, refineries across the United States are required to monitor concentrations of benzene at their property boundary, or fenceline. The specific methods and equipment required to conduct monitoring are prescribed by USEPA.
- Sorbent tubes are placed at each of the prescribed locations. The tubes trap and retain benzene over a two week period. The tubes are then gathered and sent to an accredited lab for processing and analysis. Valero submits that data to EPA on a quarterly basis.
- The USEPA uploads lab results for refineries across the country to their website.
- Valero Benicia Refinery is below the EPA action levels.



Emissions and Energy Use

Maintenance Turnaround Facts

What is a Refinery "Turnaround"?

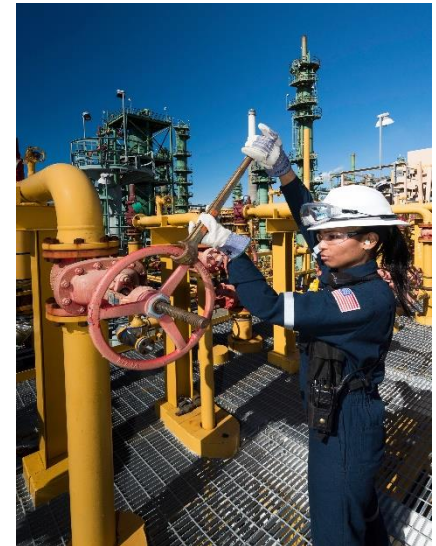
Turnarounds are periodic planned shutdowns of part or all of the refinery in order to conduct routine and preventative maintenance. The turnaround should only impact a few units, while the rest of the refinery will continue to operate. Given the complexity of refining units and the high priority Valero Benicia gives to safety, these turnarounds can last several weeks.

Why do we do it?

Maintenance and upkeep of our facility are crucial to ensure that the refinery continues to meet the highest, most up to date standards in safety and efficiency. During a maintenance turnaround, workers are able to access portions of the refinery that are not accessible during operation. This allows for maintenance, internal inspection and equipment updates that help the refinery run smoothly.

What do you need to know?



As the refinery process units start back up, there may be intermittent and visible flaring. Flaring is the safest and most environmentally sound manner for a refinery to dispose of unusable refinery gases as units are restarted. The planned flaring activities are managed in accordance with Valero's approved Flare Minimization Plan under BAAQMD Regulation 12, Rule 12. Valero, along with the City of Benicia and other regulatory agencies will continue to conduct air monitoring in the area to ensure the protection of the community.



Being a Good Neighbor

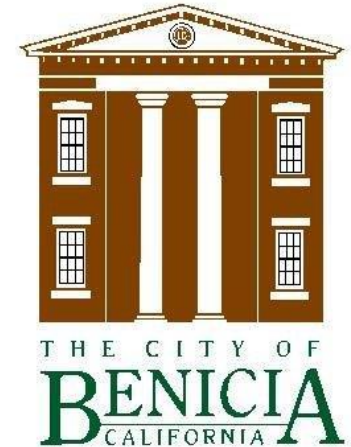
City of Benicia - Noise Ordinance

- In June 2018, the Benicia city council updated the noise ordinance for the Industrial Park.
- The maximum permissible decibel levels are set at 75 dBA, during all time periods, throughout the day.
- Atmospheric conditions, such as wind direction, can increase or decrease sound decibel levels and Valero preforms decimeter readings to make sure operational activities are below the industrial park's noise ordinance threshold.
- Noises associated with the flaring process and sounds such as the release and production of steam coming from our cooling towers, is monitored by refinery personnel & the Benicia Fire Department.

	Source	Sound Level (dBA)	Distance (ft)	Exposure Duration
	Empty / Quiet room	40	-	-
	Normal conversation	60	3	-
	Household shop vacuum	85	10	16 hours
	OSHA Action Level	85	-	-
	Lawn mower	90	-	-
	Diesel compressor / Welder at load	90	10	8 hours
	OSHA PEL	90	-	8 hours
	Loud bar / Dance music	95	-	4 hours
	Router / Radial arm saw / Chop saw	95	3	4 hours
	Monster truck rally / Loud headphones	100	-	2 hours
	Chainsaw / Jackhammer	110	10	30 mins
	Threshold of discomfort	120	-	-
	Loud rock concert	125	100	195 secs
	Threshold of pain	130	-	-
	Pile driving rig on impact	130	30	98 secs
	Jet aircraft engine on takeoff	140	150	24 secs
	Gunshot	140-170	-	-

Being a Good Neighbor

City of Benicia – Valero Cooperation Agreement



- **Public Information Bank**
 - Risk Management Plan
 - Process Safety Performance Indicators Report
 - Hazardous Materials Incident Notification Policy
 - Incident Investigation Reports
- **Emergency Operations Center (EOC) Coordination**
 - Refinery & City representation at each entities EOC
 - Joint Field Training at both the City of Benicia & Valero EOC
 - Activation of the EOC will occur when there is an imminent health risk to our employees, the community or the environment
- **Community Advisory Panel**
 - Public Liaison of Hazardous Materials position



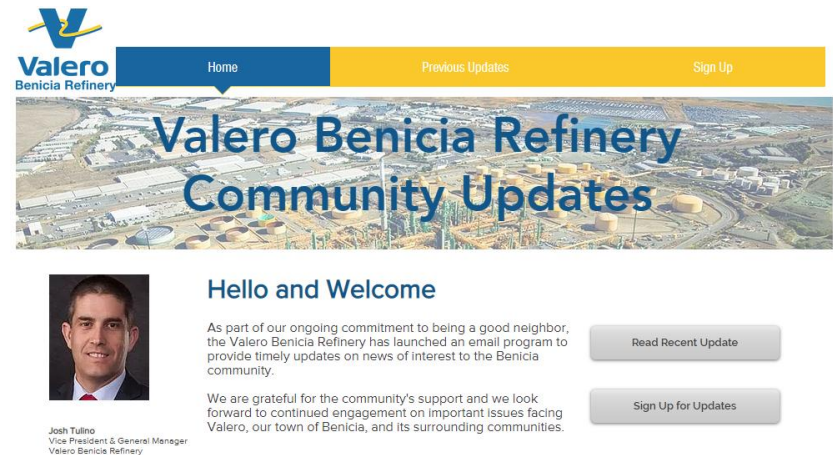
Benicia Refinery CAP

Click on the green hyperlinks to learn more about each subject

Being a Good Neighbor

Benicia Refinery Resource Tools

- [Community Advisory Panel \(CAP\) website](#)
- [Valero Benicia Refinery Community Relations website](#)
- [Air Quality Monitoring Program for Benicia website](#)
- [Alert Solano - Solano County's Regional Emergency Notification website](#)
- Valero Community Relations - 24-Hour Phone Number - **707-745-7534**



Click on the green hyperlinks to learn more about each subject

Being a Good Neighbor Community Contributions

- Sharing our success through volunteerism, charitable giving and being a good employer
 - \$15MM contributed to Northern California charities over the past 10 years
 - \$2.3MM invested in the community during 2021
 - United Way – Employee contributions
 - Valero Texas Open Golf Tournament - Benefit for Children fundraiser
 - Valero Energy Foundation – Corporate contributions
 - Benicia Refinery – Local contributions & Trap Shoot fundraiser
 - Despite COVID-19 restrictions, over 5,000 volunteer hours were donated by employees, family members & friends to non-profit organizations
- Investments in pollution control
 - \$1.6 billion dollars spent in infrastructure upgrades to improve air quality and safety

- Flare reduction
- Air emissions reduction
- Wastewater discharge
- Lower energy consumption



Reference Tools & Websites

- Valero Energy Corporation - ESG Reports & Investor Relations Presentations
<https://investorvalero.com/home/default.aspx>
- U.S. Energy Information Administration – Number & Capacity of Petroleum Refineries
https://www.eia.gov/dnav/pet/pet_pnp_cap1_dc_u_nus_a.htm
- United States Department of Transportation – Motor Fuel Gasoline Consumption
https://www.fhwa.dot.gov/policyinformation/motorfuelhwy_trustfund.cfm
- California Energy Commission – California's Petroleum Market
<https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries>
- Bay Area Air Quality Management District – Air Quality Research & Data
<https://www.baaqmd.gov/about-air-quality>
- American Fuel Petroleum Manufacturers – Price & Availability of Gas
<https://www.afpm.org/newsroom/blog/what-do-refineries-have-do-price-and-availability-gas>
- Western States Petroleum Association – Estimated Impact of California Gasoline Taxes
<https://twitter.com/OfficialWSPA/status/1504147265140666369>
- California Office of Environmental Health & Hazard Assessment – Reference Exposure Levels
<https://oehha.ca.gov/air/general-info/oehha-acute-8-hour-and-chronic-reference-exposure-level-rel-summary>

Questions and Answers

