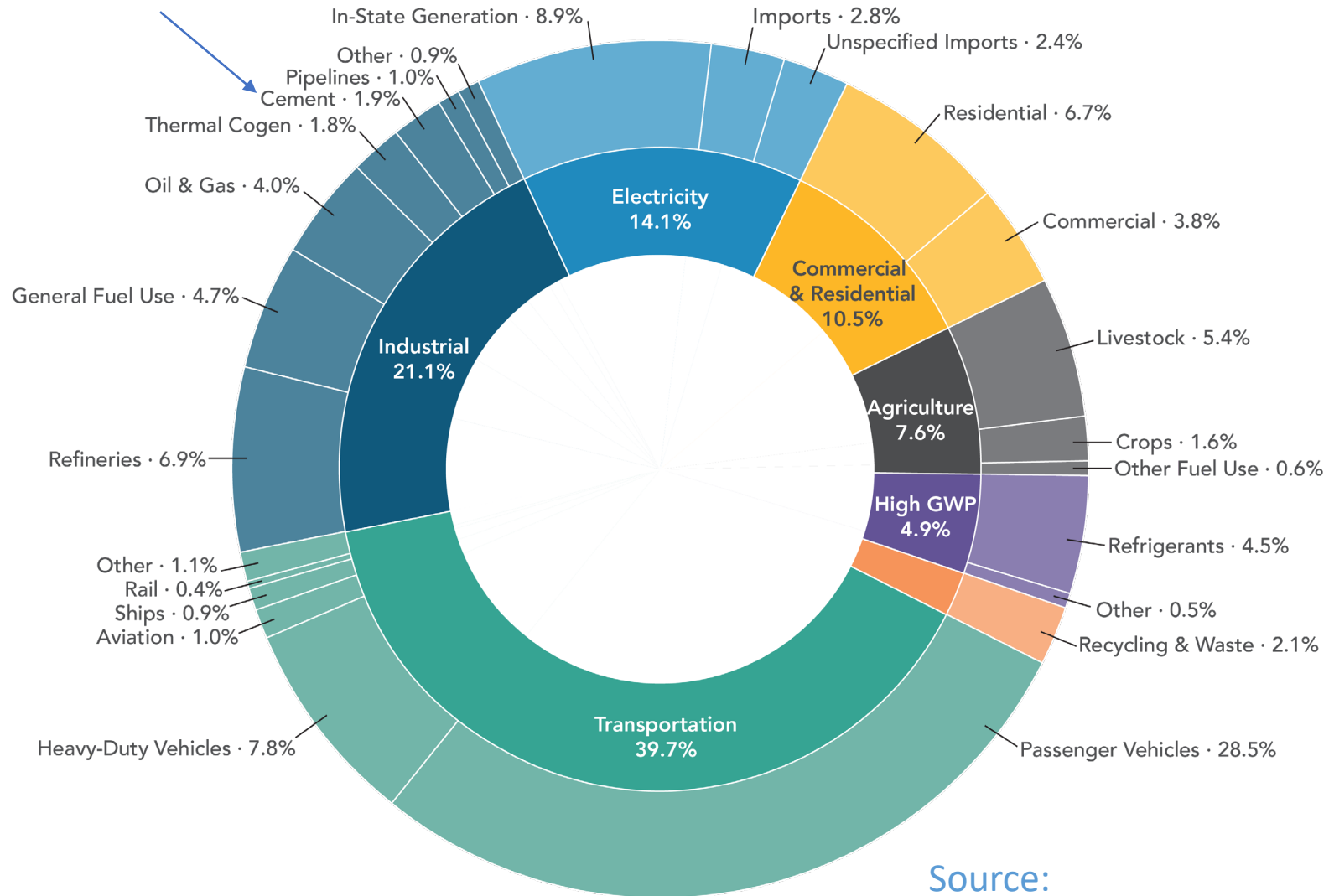


# CARB Senate Bill 596 Workshop

10.20.22

# 2019 GHG Emission by Scoping Plan Sub-Category



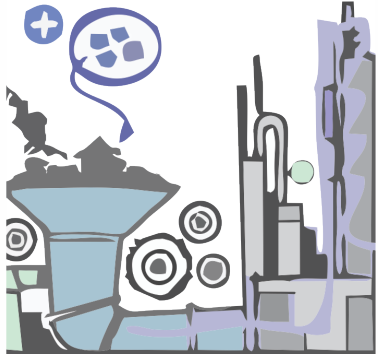
Source:  
<https://ww2.arb.ca.gov/ghg-inventory-graphs>

# Cement Production Process

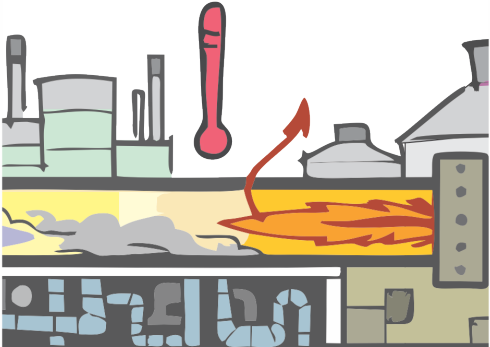
excavate



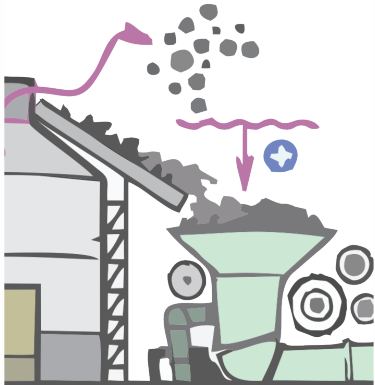
grind



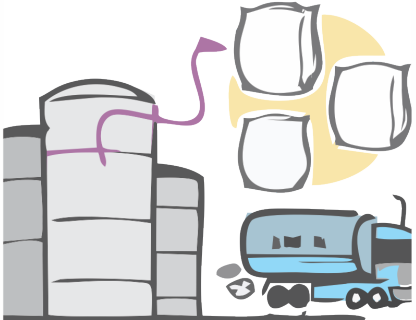
heat



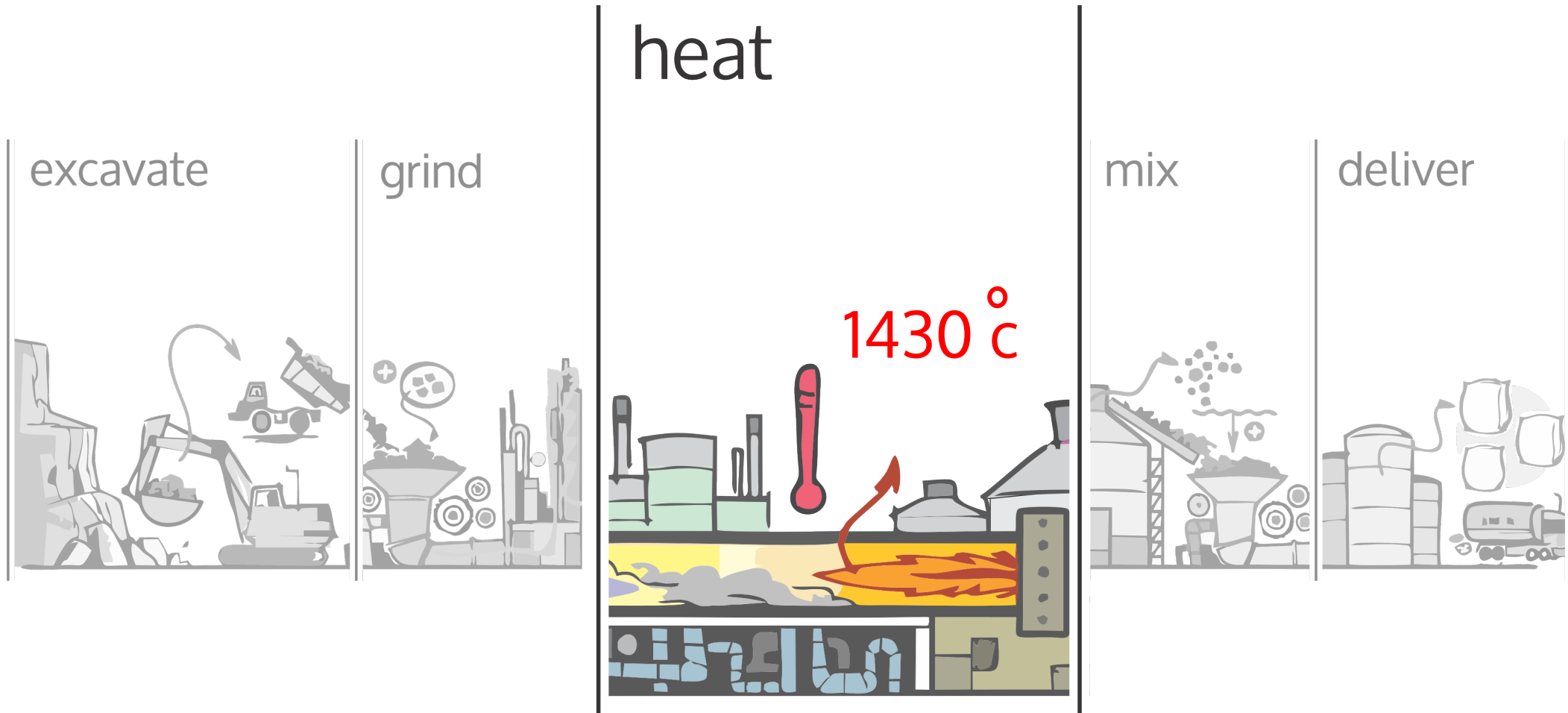
mix



deliver

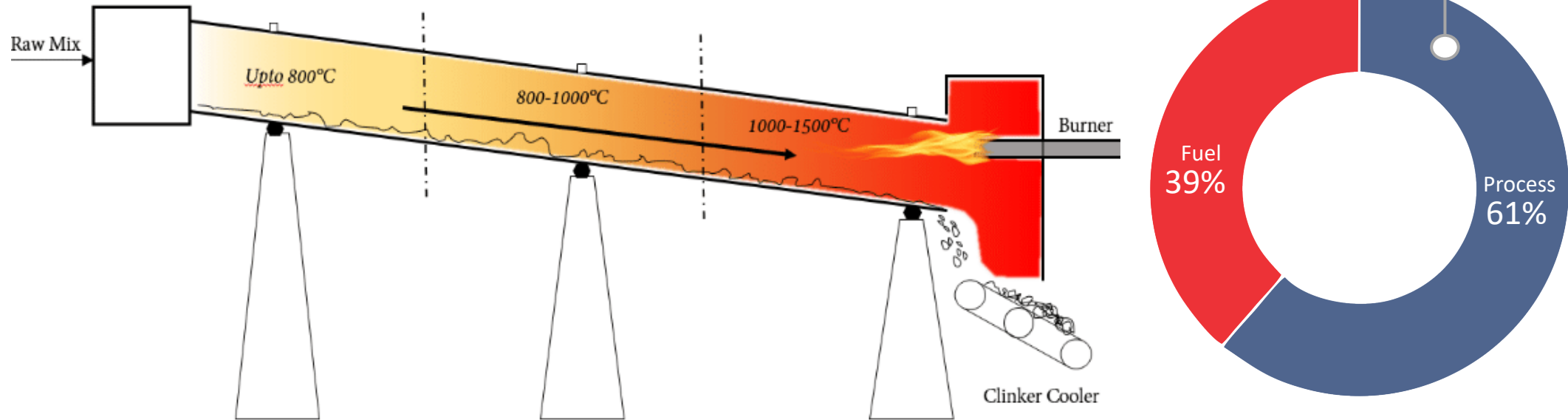


# Creating the Essential Chemical Reaction



# Thermal Process: Two CO<sub>2</sub> Sources

PLC helps reduce process emissions ( $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ )



Turning limestone into manmade lava is necessary to create a chemical reaction to make cement that naturally releases CO<sub>2</sub>. This makes decarbonizing difficult.

**One Bold Goal. Three Pathways. Nine Levers.**

# Three Pathways

✓ = Action is necessary to remove barriers and fully unlock pathway.

Measure	Legislative Assistance	Regulatory Assistance	Public Acceptance	Public Funding	RD&D	Supply Limitations
<b>PATHWAY 1: PROCESS EMISSIONS</b>						
Portland Limestone Cement (PLC)		✓	✓			
Carbon Capture Use & Storage (CCUS)	✓	✓	✓	✓	✓	
Alt Raw Materials (ARM)		✓	✓		✓	✓
Alt Cements & Clinkers					✓	✓
<b>PATHWAY 2: COMBUSTION EMISSIONS &amp; FUEL SWITCHING</b>						
Natural Gas Options	✓	✓	✓			✓
Waste Derived Fuels	✓	✓	✓			✓
Biomass Derived Fuels	✓	✓	✓	✓		✓
<b>PATHWAY 3: ELECTRICITY GENERATION</b>						
Waste Heat Recovery	✓	✓		✓		
On-Site Renewables	✓	✓	-	-	-	-
	<b>6</b>	<b>8</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>5</b>

# Nine Levers.

Levers	Timing <i>If unlocked, time to deploy</i>	Impact <i>GHG abatement potential</i>	Summary of Key Barriers
<b>Process Emissions: 4 Levers</b>			
Portland Limestone Cement	Near-Term	~10%	Caltrans acceptance necessary (completed October 2021).
Carbon Capture Use & Storage	Long-Term	>50%	Extremely capital-intensive, require significant public sector support. Gaps in existing incentives. Time-intensive & contingent permitting.
Alt Raw Materials	Mid-Term	10%-50%	Constrained (and tightening) supply. Testing & investment in natural pozzolans. Public acceptance necessary.
Alt Cements & Clinkers	Long-Term	<10%	Limited supply and specialized production. Not commercially viable or sufficiently tested for large-scale construction. Scarcity of certain materials. Limited substitution potential.
<b>Combustion Emissions &amp; Fuel Switching: 3 Levers</b>			
Natural Gas Options	Near-Term	10-50% <i>(total additive potential)</i>	Not frequently cost-competitive. State-wide storage & supply constraints.
Waste-Derived Fuels	Near-Term		Narrow definition of recycling. Burdensome permitting and public acceptance challenges. Classification of engineered fuels constrains availability and creates costs. Competition w/ landfilling.
Biomass-Derived Fuels	Near-Term		Lack of coordinated & concerted support. Regulatory ambiguity. Burdensome permitting. Limited supply due to insufficient collection and distribution network.
<b>Electricity Generation: 2 Levers</b>			
WHR / Cogeneration	Mid-Term	<10%	Financial penalty from departing load charges. Cumbersome permitting with marginal returns. High cost per installed KW.
Renewable Electricity	Mid-Term	<10%	Financial penalty from departing load charges. Limited incentives from rate schedules & electricity programs. High costs (including fees) & limited return.



# SB 596: First bill in any California sector to focus on achieving net-zero emissions



**JOSH BECKER**  
REPRESENTING SENATE DISTRICT 13

[Home](#)

[About Josh](#)

[News](#)

[District](#)

[Resources](#)

[Contact](#)



## LATEST NEWS

California Enacts Legislation To Slash Cement Emissions

September 24, 2021

**CA GOVERNOR SIGNS STATE SENATOR JOSH  
BECKER'S LANDMARK BILL TO DECARBONIZE  
CEMENT**

## Case Study of Progress on One Lever: Portland Limestone Cement

### SB 596 reference...

(7) Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low greenhouse gas intensity, including, but not limited to, consideration of all of the following measures:

(A) Measures to expedite the adoption for use in projects undertaken by state agencies, including the Department of Transportation, of portland limestone cement and other blended cements.

### Caltrans January 25, 2022 Press Release...

“Using low-carbon cement can cut Caltrans’ concrete-related carbon dioxide emissions annually by up to 10 percent. This is a big step in supporting California’s efforts to achieve carbon neutrality by 2045.” - Toks Omishakin, Caltrans Director

In 2017 alone, Caltrans used 325,000 tons of cement to upgrade the state highway system. Switching to low-carbon cement has the potential to reduce carbon dioxide emissions by 28,000 tons a year — the equivalent of removing more than 6,000 cars off the road.



# PLC Use Growing In Transportation

**1960's:**

Europe started using PLC: proven performance (EN197-1)

**2007:**

Canada approved: market has grown (CSA A3000)

**2008:**

Colorado, Utah, and Oklahoma DOT pavements

**2012/2017  
in USA:**

ASTM and AASHTO Standards (C595 / M240)


**Caltrans 2021**

**June:**

Completed 3-year study of 13 performance characteristics with California materials: **PLC performed equal to or better than portland cement**

**October:**

Revised Standard Specifications includes **PLC as a standard material.**



Also permitted in in FAA P-501; AIA Masterspec; UFGS 03 30 00; ACI and ICC building codes



# PLC Impacts on UCSD North Torrey Pines Living & Learning Center

3367 metric tons of CO<sub>2</sub> saved  
= removing 715 cars/year

CalPortland EPD	Type II/V	PLC (Type IL)	% change
Unit: Kg CO <sub>2</sub> eq.	969	871	-10.1%



1<sup>st</sup> Lever...

Overall Impact of Market Transition from Portland Cement to Portland Limestone Cement in CA

equals a reduction of ~850,000 MtCO<sub>2</sub>e annually

UCSD North Torrey Pines Living & Learning Center



## How SB 596 Can Accelerate other Levers

### **Key excerpts from bill:**

A wide range of commercially available technologies and practices exist to reduce and remove emissions of greenhouse gases throughout the life cycle of cement and concrete production and use, but these technologies and practices face a series of market and regulatory barriers hindering their deployment.

The state board shall document the feasibility constraints the state board has identified and recommend measures and actions, including proposed statutory changes, necessary to overcome those constraints to enable the cement sector to achieve net-zero emissions of greenhouse gases as soon as possible, but no later than December 31, 2045.

Include provisions to minimize and mitigate potential leakage and account for embedded emissions of greenhouse gases in imported cement in a similar manner to emissions of greenhouse gases for cement produced in the state, such as through a border carbon adjustment mechanism.