12/30/2020:
This project will act as an overlay/improvement to the current Cap and Trade system.

How the current system works:

- There is a carbon emission cap of 25,000 metric tons.
- Every year the cap decreases by 3%
- 80% of carbon emitting entities are covered by the c and t system.
- They have an emissions allowance within the cap of that year.
- If a company exceeds the allowance they will either need to pay the fine or buy allowance from other companies
- Companies can also earn offset credits that will act as allowance
- Offset credits are earned through investing in eco friendly projects
- If a company wants to earn more offset credits, it can go invest in companies not covered by the cap and get them to reduce emissions. They will get offsets from this.

Problems with the current system:

- A loophole allows companies to invest in eco projects outside of the state allowing them to earn offsets on the cheap while not actually benefiting the state.
- For especially polluting companies, they just buy allowance from those who don't and continue to pollute at the same rate
- Since eco friendly projects, industry heavy communities have been suffering from the high amounts of pollution.
- Pollution cap decreases too slowly to put pressure on companies.
- Energy companies moving factories out of state to lower emissions logged.
- Companies have been known to outright lie to earn offsets.

Improvements and Fixes:

- A new cryptocurrency based tracker allows for easier and more secure tracking of carbon emissions
- Easier for consumers to track their carbon savings
- The state will be split up into zones based on pollution. They will be classified by zone (1-10) with 1 being the least polluted and 10 being the most in the state.The higher the zone, the more credits will be awarded. This will incentivize companies to help those who need it the most
- Not as many inspectors have to be dispatched to monitor carbon emissions since everything will be measured through meters. This will help prevent corruption.
- The encrypted blockchain technology prevents users from trying to hack the system and helps keep identities private. The account would only be tied to a state issued ID but the relationship between the account and the user would be withheld from public use.
- For companies having trouble with staying within the cap, they have to pay a fine in carbon credits. Using carbon credits to pay for the fine has a cap. At some point, the company will also have to pay for a permit to continue breaching the cap. Permits will be offered in limited quantities every year with a set amount given to each industry determined by the state. The permits will be sold at auction with the funds going to the state.

    - Requires permits to be surrendered for emissions from imported electricity
    - Second largest policy next the the EU's Emissions Trading Scheme (ETS)
    - Legislation allows for both California and EU to link their programs with other systems
- 49%-57% of emissions savings by the RGGI are offset by unconstrained sources
    - These estimates don't take into account all factors like international trade

1/04/2021:

Social accounting matrices, bilateral trade	Global Trade Analysis Project (GTAP, 2012), Version 7
International Regions	IMPLAN (2008) and gravity model
US States	IMPLAN (2008) and gravity model
US state-to -country bilateral trade flows	ORigin of Movement(OM) and State of Destination (SD) US Census Bureau (2010)
Physical energy flows and energy prices: international regions	GTAP (2012)
US states	State Energy Data System(SEDS) EIA (2009)
Trade elasticities	GTAP (2012) and own calibration
Energy demand and supply elasticities	Paltsev et al. (2005)

- GTAP provides consistent global accounts of production, consumption, and bilateral trade as well as physical energy flows and prices.
    - benchmark ed to 2004
    - 113 countries and regions and 57 commodities.
- IMPLAN data specifies benchmark economic accounts for the US
    - Includes input-output tables for each state
    - Identifies 509 commodities as well as tax rates
    - Using 2006
    - To improve characteristics of energy markets we use least-square optimization techniques to merge data with data on physical energy and prices froM department of Energy's State Energy Data System (SEDS) for 2006 (EIA 2009)
- International trade is covered by GTAP database
    - They reflect bilateral flows from the United Nations Commodity Trade Statistics Database
- State-to-state trade data in the IMPLAN database are derived using a gravity approach described in Lindall, Olson and Alward (2006)
    - Results depend on benchmark electricity flows between California and neighboring states

Industry	Allowance Allocation	# of Entities Within
Petroleum refining and hydrogen production	Total Allocation: 28,420,127 True Up: 556,536	27
Crude Petroleum and Natural Gas Extraction	Total Allocation:11,655,008 True Up: 1,605,769	34
Cement, Lime, and Gypsum Product Manufacturing	Total Allocation: 9,063,164 True Up: 1,536,605	12
Metal Ore and Mineral Mining	Total Allocation: 1,938,767 True Up: 55,085	5
Fruit and Vegetable Canning	Total Allocation: 762,161 True Up: 76,497	16
Other Food Manufacturing	Total Allocation: 654, 199 True Up: 168,248	14
Dairies	Total Allocation: 419,158 True Up: 57, 830	8
Glass Manufacturing	Total Allocation: 743,846 True Up: 39,636	10
Paper Manufacturing	Total Allocation: 636,839 True Up: 83,234	7
Metal Processing and Manufacturing	Total Allocation: 583,501 True Up: 156,748	8
Chemical, Biological, and Pharmaceutical Manufacturing	Total Allocation: 630,011 Total True-up Value: 166,818	10
Miscellaneous Industrial Facilities	Total Allocation: 320,656 Total True-up Value: 106,616	8
Universities and Public Services	Total Allocation: 2,623,888 True Up: 1,731,700	14
Natural Gas Allocation	Total Allocation: 45,356,999 True Up: 0	7
Legal Contract Generator	Total Allocation: 4,595,324 True Up: 4,595,324	16
Waste-to-Energy Facilities	Total Allocation: 275,547 True Up:275,547	3

Formula for reduced emissions from reduced travel incentives:

$E * F_c * 0.3 * 0.2 = e_c$

351.751127*0.28*0.3*0.25=7.386773667

Formula for reduced emissions from solar:

$H * 0.1 * R = e_h$

13600000*0.1

Formula for houses installing solar:

$(\frac{0.1 * H_t}{Y_t}) * e_h = e_a$

https://grist.org/article/whats-driving-californias-emissions-you-guessed-it-cars/

https://spot.colorado.edu/~jonathug/Jonathan_E._Hughes/Main_files/PV_Subsidies.pdf

We follow PG&E in assuming an 18 percent capacity factor for PV systems

https://upload.wikimedia.org/wikipedia/commons/a/ab/Duck_Curve_CA-ISO_2016-10-22.agr.png

Solar does not provide the necessary power during peak usage times.

2/28/2021:

https://www.wecc.org/Reliability/2016%20SOTI%20Final.pdf

Rooftop solar installed capacity as of dec 2015 = 3,391MW = 29,705,160 MWh

https://www.caiso.com/TodaysOutlook/Pages/emissions.aspx

0.318 mTCO2/MWh

Emissions saved from 2015 solar rooftop = 29,705,160*.18*0.318 = 1,700,323 mT CO2

If you replace one existing gas or hybrid car with all electric is has a net reduction of ((11435*.91)+(6258*0.07)+(4676*0.02))-2182 = 8755.43 lbs of CO2 per year

8755.43 = 3.971396244 mT CO2

Market share and registrations of electric vehicles and hybrids:

https://www.cncda.org/wp-content/uploads/Cal-Covering-4Q-20.pdf (page 2)

Department of energy chart of vehicle annual emissions by state:

https://afdc.energy.gov/vehicles/electric_emissions.html

If we convert existing non-electric cars to electric, the ratio is 91% gas, 7% hybrid, 2% plugin hybrid