ENVIRONMENTAL DEFENSE
finding the ways that work

Attachment 1: Description of Emissions Reduction Measure Form

Please fill out one form for each emission reduction measure. See instructions on attachment 2.

Title: Inclusion of the California Refining Sector in a multi-sector cap-and-trade program on the basis of combustion emissions, process emissions and feed stock emissions. Include reductions of fugitive methane emissions in a system of emissions offsets.

Type of Measure (check all that apply):

☐ Direct regulation
☐ Monetary Incentive
☐ Voluntary
☐ Other Describe:
☑ Market-based compliance:
☐ Non-monetary incentive
☐ Alternative Compliance Mechanism

Responsible Agency: California Air Resources Board

Sector:

☐ Transportation
☐ Other Industrial
☐ Agriculture
☐ Sequestration
☐ Electricity Generation
☑ Refineries
☐ Cement
☐ Other Describe:

2020 Baseline Emissions assumed (MMT CO2 eq): 39.507 MMTCO2eq (see below)

1990 Emissions from combustion = 28.187
1990 emissions from fugitives = 0.139
1990 emissions from transformation = 2.12
1990 combined emissions= 30.446

2004 emissions from combustion = 30.148
2004 emissions from fugitives = 0.029
2004 emissions from transformation = 0.53
2004 combined emissions = 30.707

2020 emissions from combustion, fugitives and transformation combined: 39.5 MMTCO2 eq. This is assuming an average annual growth rate of 1.5% above the 10 year average for combined emissions from 1995 – 2004. The 1.5 % growth rate is assumed based on refinery creep estimates the 2004 CEC transportation fuels report for California.

Percent reduction in 2020:

See below

Cost effectiveness ($/metric ton CO2E) in 2020:

See below

Description:

Environmental Defense believes that emission reductions from the 25 in-state refineries should be achieved by inclusion in a multi-sector cap and trade program. Under a multi-sector cap and trade program, CARB would set a total allowable limit on emissions from all sectors that are within the cap. Regulated entities would then be required to submit allowances equal to their emissions during each compliance period. Therefore, since the overall cap would be less than the current aggregate emissions, individual plants would be required to either reduce on-site emissions, purchase reductions from other capped facilities, or purchase qualified offsets.

The refining industry is the most energy-intensive industry in California. On average, each facility emits more today than it did in 1990 due to expansion projects and refinery creep. Emissions of GHGs from a refinery generally come from combustion exhaust, direct process gas exhaust, or from fugitive sources.

In 2007, the California Market Advisory Committee recommended that emissions from refineries be included in a multi-sector cap-and-trade system for emissions reductions. However, this recommendation pertained only to combustion emissions, process emissions and feedstock emissions from these facilities. With regard to fugitive emissions, the MAC report stated that difficulty in ensuring the completeness and accuracy of emission estimates warranted non-inclusion of fugitives in the cap-and-trade program. Rather, for these emissions, CARB should consider requiring sources to take measures to capture fugitive emissions, and CARB should explore the potential for developing monitoring and reporting protocols that would allow efforts to reduce fugitive emissions to qualify for offset credits.

Emission reduction calculations and assumptions:

Calculating the overall emissions reductions (cap): The emissions reductions required under a multi-sector cap and trade program are determined by the extent to which the cap is below the actual level of emissions in covered sectors. One of the best aspects of a cap is that it is a limit on the total allowable emissions from sources covered in the cap. Other regulatory approaches, such as performance-based standards, may limit emissions associated with a given activity, but do not limit the amount of activity and thus do not put a limit on total emissions. Furthermore, by observing allowance prices in the marketplace, the real costs of economy wide emissions mitigation can be observed and used to inform future adjustments to the cap.

Similarly, the real costs of ratcheting the cap downward can be observed via changes in allowance prices.

We recommend a stringent multi-sector cap that is derived from an aggregation of sector-specific emissions reductions goals. CARB should also consider factors such as the size of the overall cap and trade market, the percentage of statewide greenhouse gas emissions that are under the cap, and the availability of offsets and linkages to beyond California in setting the cap. Ultimately, of course, the reductions required under the multi-sector cap and trade program, combined with reductions achieved through other measures, must equal or exceed the amount of reductions needed to reduce statewide greenhouse gas emissions to 1990 levels by 2020.

Estimating sector-specific emissions reductions: Several factors affect the calculation of an emissions reductions estimate for each sector. First, the number of emitting entities within each sector and cost curves for potential emissions reductions from that sector will help determine emissions reduction potential. Also, the contribution each sector makes to the overall California emissions inventory and cap-and-trade market is relevant. In addition, any sector-specific estimates rely, in part, on the historic emissions data for that sector. Further, the impact of other regulations applicable to each sector, along with cost and competitiveness factors unique to each sector, must also be assessed.

Cost effectiveness calculation and assumptions:

Economy wide cost effectiveness: There is a difference between a cost-effectiveness metric calculated as the costs per unit of emissions reduced and the idea of a program that is achieving reductions goals as least cost. Cap-and-trade policy ensures the latter. A cap and trade program creates incentives for emissions sources to find the least-cost options to achieve emission reductions. In a multi-sector cap and trade program, emissions sources have the option of pursuing on-site reduction strategies, purchasing emission allowances from other entities in any other sector under the cap that have been able to beat their own targets, or purchasing qualified offsets from entities not within the cap. This means that trading within and between sectors allows for market participants to seek out and implement the most cost-effective reductions strategies. The cost of emissions reductions achieved under a cap-and-trade program will be lower than the cost of those same emissions reductions achieved through an alternative policy instrument.

The total cost to society of meeting an emissions reduction goal is equal to the emissions mitigation costs incurred by the regulated entities plus the regulatory costs of administering and enforcing the program. Cap-and-trade programs typically involve lower regulatory costs than traditional command-and-control programs for at least two good reasons. First, there is no need for regulators to conduct detailed and time-consuming assessments and rulemakings about specific control technologies, such as establishing Best Available Control Technology measures. Second, the regulated entities have a financial incentive to demonstrate compliance because they can sell unused emissions credits.

Individual site and measure cost effectiveness: A major benefit of trading is that no *a priori* calculation of cost effectiveness by CARB will be needed because market participants will be incentivized to do this calculation internally for their unique reductions options and to then compare their internal options with the market-clearing price for emissions allowances. While the cost effectiveness of specific emission reduction strategies can be calculated as the cost of implementation divided by the amount of reductions achieved, with trading it is not clear that a specific reduction strategy will be used. This "flexible compliance strategy" makes moot the need to determine in advance which abatement methods will be best for individual facilities. Also, a cap-and-trade program eliminates the need for government agencies to estimate which strategies will be used at the facility level because the cap-and-trade program allows individual facilities (who are the ones best positioned to have that information) to weigh their options and then act in a manner that is in their best economic interest.

***Creating sector-specific cost curves*:** To determine how trading might evolve and to forecast allowance prices, we are actively researching sector-specific cost curves and will provide this information when complete.

In order to determine what the costs to facilities will be using marginal abatement curves, it is important to understand the relative differences on potential for emissions between the facilities in each sector. One way to achieve this is through the use of benchmark emissions criteria. These benchmarks establish facility level indexes on emissions by using industry wide data. However, as explained below, benchmark criteria have not been developed for any industry.

Implementation barriers and ways to overcome them:

Variable facility characteristics create a challenge to creating marginal cost curves: It is useful to have facility-level knowledge of the marginal costs of emissions abatement. This information can be an important tool for determining emission reduction potential and likely trades between facilities (and sectors). Facility and sector-specific marginal abatement cost curves are also useful for forecasting the economy-wide costs of meeting a reductions goal.

One way to compare facilities to create the range of marginal costs curves is to use benchmark emissions criteria. These benchmarks identify the fundamental differences between refineries (e.g. equipment, processing dynamics, feed stock use, and fuel produced) that make some more emissive than others (on a lbs CO2 / bbl oil refined). Currently, the Solomon EII™ (Emissions Intensity Index) is the benchmark metric used by both the US EPA for the Energy Star Program and by the international refining industry for assessing compliance with the API energy efficiency reduction targets. This index was developed by intensive surveys of over 350 facilities world wide and compares actual energy consumption of a refinery (MMBTU) to a theoretical average refinery comprised of the same processing units.[1] Currently, Solomon is working with

[1] Energy consumption from every unit in each of 350 refineries is determined and put into a database. Energy usage of similar units is averaged, giving an average energy intensity for each type of unit. Then, the refinery being audited is broken out by types of units. The average intensity of each type of unit is then extracted from the database and added together to develop a theoretical refinery comprised of the same type and number of units as the actual

the refining industry to develop a CEI, or Carbon Emissions Index, similar to that of the EEI™. This index will likely assess emissions from processes, discretionary fuel combustion, non-discretionary fuel combustion, flaring and fugitive emissions. The CEI will compare emissions of an audited facility to that of a theoretical refinery comprised of the same processing units and burning only natural gas.

***Lack of industry data**:* Lack of facility-level information about marginal abatement cost curves should not be seen as a barrier to implementing a cap-and-trade program. Under a multi-sector cap-and-trade system, CARB does not choose technology winners or the mitigation strategies at the facility (or for a sector). Rather, the market system allows facilities to determine the most cost effective manner to make reductions and rewards them for beating the standard. Further, under an offsets program, facilities are rewarded for the emissions reductions they can achieve beyond that required under mandatory regulations. This incentive to innovate and go beyond the regulatory mandate is one of the most attractive advantages of cap-and-trade policy over other mechanisms.

Although specific strategies to reduce emissions from refining sources are well known, the extent to which these strategies can be implemented in the state of California is not. The primary reasons for this data gap are the large degree of variability in process equipment type and configuration (as described above), and prior implementation of energy efficiency and GHG reduction across the state. For example, in 2003, the American Petroleum Institute members agreed to reduce their energy use 10% between 2002 and 2012. Since many California refineries are API members, energy efficiency projects have been in place for several years. Further, while the industry has experienced closure of some facilities like the Bakersfield refinery in 2004, other facilities have recently increased production and emissions rates by installing new major units and streamlining / modernizing processes.

***Energy costs are uncertain**:* Refineries purchase a large amount of electricity from utilities. Therefore, being involved in a multi-sector cap could affect the price of electricity sold to refineries. The potential for increased efficiency at regulated facilities in all sectors may ultimately have a positive impact on energy costs. Regardless of the price differentials, energy costs should not be seen as an implementation barrier.

Regulatory Overlaps: There is a need to harmonize requirements of the Low Carbon Fuel Standard (LCFS), which CARB is pursuing as an early action item, with a cap and trade program. The prospect of overlapping regulations on refineries will require CARB to create carefully-integrated system of reporting, tracking and compliance to ensure successful implementation. The intensity-based standard on fuels set in the LCFS can function alongside a multi-sector cap-and-trade program covering process emissions and/or end-use of fuels and/or emissions from oil and gas extraction so long as the relationship between these programs is carefully thought through.

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refinery being studied. The theoretical refinery's emissions creates the benchmark against which the actual refinery being audited is compared.

CARB should consider making refineries be the point of regulation for emissions from the oil and gas extraction sector: Emissions from the oil and gas sector could be incorporated into the cap and trade by regulating crude and gas processing facilities (refineries and gas plants) on the pre-gate (extraction, production and transportation) emissions of the product they import. This point of regulation for the cap and trade would reduce the number of regulated entities and would place the responsibility of holding and surrendering emissions allowances on larger, more economically robust companies. Refineries are also highly likely to be the point of regulation for the LCFS, which provides additional opportunities for California to track and account for emissions associated with the extraction and transport of raw fuels imported into California, thus reducing potential emissions leakage from imports of raw materials via pipeline and tanker.

In order to establish processing facilities (refineries and gas plants) as the point of regulation for the oil and gas extraction sector, CARB must establish reporting regulations for in-state extraction sites as well as a formula for calculating pre-gate emissions for imported raw fuels. The new reporting regulations will furnish refineries and gas plants with the information needed to comply with LCFS and also will generate data on emissions from oil and gas extraction and from the importation of raw fuels into California, should either type of emissions be included in a multi-sector cap-and-trade program. In-state extractors will already be required to report their emissions under the reporting protocol, so this would not be a new requirement. Importers would have to determine the process used to extract and transport the raw material they receive, likely through the use of an emissions estimator.

Leakage may occur: The inclusion of the state refining industry in a multi-sector cap-and-trade program and a price on carbon associated with emissions from facilities may cause a shift towards less production in the state in favor of more fuel imports. CARB must be aware of the potential for this effect and develop methods to limit its occurrence where appropriate.

Potential impacts on criteria pollutants

Emissions from petroleum refinery industry include criteria pollutants, hazardous air pollutants, and global warming pollutants. These pollutants come from the combustion of fuel for heat and steam as well as from processes such as catalyst regeneration, coking, and product storage. As with many other industries, strategies that reduce global warming pollutants (e.g. improved energy efficiency of existing equipment, improved process control, improved maintenance and tuning of equipment, and installing new equipment) lead to reductions of co-pollutants. However, due to the lack of information on the extent to which specific technology has already been implemented in California, quantifying emissions reductions of co-pollutants from specific measures is unknown.

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