

Attachment 3: Analysis of Alternatives to the Proposed In-Use Off-road Diesel Vehicle Regulation Discussed at the July 26, 2007 Board Meeting

Background:

The in-use off-road diesel vehicle regulation brought by Air Resources Board (ARB or Board) staff to the Board on July 26, 2007, requires annual compliance with fleet average emission targets that get stricter over time. The first targets take effect in 2010 for the largest fleets.

In the weeks leading up to the July 26, 2007, meeting, some stakeholders requested that the proposed regulation be changed to require less frequent compliance intervals. During this time, industry stakeholders suggested various alternative proposals. In a July 23, 2007, alternative proposal submitted to ARB staff, Mike Lewis of the Coalition to Build a Cleaner California and the Construction Industry Air Quality Coalition (CIAQC), both construction industry advocacy groups, proposed five-year targets with the first compliance date in 2015 for the largest fleets. Staff responded that having no enforceable targets until 2015 would not be acceptable.

In a July 25, 2007, memo to Board members, Mr. Lewis then requested that the Board consider three-year milestones in lieu of annual compliance, with a requirement to show some interim compliance in between the milestones. In the final communication to staff regarding their proposal, Mr. Lewis requested three-year milestones in 2011, 2014, 2017, and 2020, with a requirement to show 20 percent compliance in 2010 (that is, that fleets had taken 20 percent of the actions required by the ARB staff proposal) and 40 percent compliance in 2013, 2016, and 2019.

Analysis Results:

ARB staff analyzed the final CIAQC proposal and compared the emission benefits expected to those expected from the staff proposal. The Method section below describes how the expected emission benefits of the various proposals were estimated. Staff also analyzed three other possible alternatives – one called “3-yr targets-80%” with 3-yr targets and a requirement to show 80 percent compliance in each of the interim years, one called “3-yr targets” with a 2010 target and 3-yr targets from 2011 through 2020 and a requirement to show 40 percent compliance in 2013, 2016, and 2019, and one called “2/3-yr targets”, where fleets would comply in 2010, 2012, 2014, 2017, and 2020. The emission benefit impacts of the various alternatives relative to the staff proposal are summarized in the table below.

Table 1: Relative Change in Cumulative Benefits for Different Compliance Intervals (Percent Change in 2015)

Compliance Interval	Compliance Years	Interim Year Requirements	2015 Loss in Benefit
3-yr targets-80%	2011, 2014, 2017, 2020	80%	-3%
CIAQC 3-yr targets	2011, 2014, 2017, 2020	20% in 2010, 40% in second yrs	-17% ¹
3-yr targets	2011, 2014, 2017, 2020	100% in 2010, 40% in second yrs	-11% ¹
2/3-yr targets	2010, 2012, 2014, 2017, and 2020	none	-8% ¹

Based on staff analysis, the last proposal from CIAQC (“CIAQC 3-yr targets”) had the greatest emission benefit loss, giving up 17 percent of the cumulative 2015 benefits.

Method:

Staff estimated the emission benefit impacts of the various alternatives using the following method:

- Staff began with the baseline benefits of the ARB proposal for diesel particulate matter (PM) and oxides of nitrogen (NOx), as estimated in the *Staff Report: Initial Statement of Reasons for Proposed Rulemaking* (April 2007) for each year from 2010 to 2015.
- Staff then assumed that for each year that an alternative has a compliance date, the benefits would be equal to those of the ARB proposal. For example, the “3-yr targets-80%,” “CIAQC 3-yr targets,” and “3-yr targets” alternatives, all of which have compliance dates in 2011 and 2014, were assumed to have equal benefits to the ARB proposal in those years.
- Staff then assumed the following for the interim years as an interim percent target:
 - The “3-yr targets-80%” alternative achieves 80 percent of the benefit of the ARB proposal in 2010, 2012, 2013, and 2015.
 - The “CIAQC 3-yr targets” alternative achieves 20 percent of the benefit of the ARB proposal in 2010. The benefits in 2013 are 40 percent of the way between the ARB proposal’s 2011 and 2014 benefits. That is, the 2013 benefits are assumed to be the 2011

¹ In the slide presented at the July 26 Board hearing, staff presented an estimate of a 16% loss in benefits for the “CIAQC 3-yr targets” alternative, a 12% loss for the “3-yr targets” alternative, and a 7% loss for the “2/3-yr targets” alternative. These were based on an interim estimate of benefits for the baseline ARB proposal, before adjustments for losses in benefits due to the captive attainment area, dedicated snow removal, low-use and other provisions were made.

- benefits plus 40 percent of the difference between the 2011 and 2014 benefits.
- The “3-yr targets” alternative achieves 100 percent of the benefit of the ARB proposal in 2010. The benefits in 2013 are 40 percent of the way between the ARB proposal’s 2011 and 2014 benefits.
 - Staff then assumed the following for the interim years with no interim percent target:
 - In years with no interim percent target and for which the next compliance date is two years away, fleets have no incentive or requirement under the regulation to take new compliance actions. Benefits from previous actions would be maintained except that some benefits would be lost due to normal vehicle turnover. For example, if a fleet turned over a vehicle that had been retrofit, the benefits from the retrofit would no longer occur. Staff assumed five percent of the benefits from the previous year would be lost due to vehicle turnover. Therefore, in 2012, the “CIAQC 3-yr targets” and “3-yr targets” alternatives achieve 95% of the benefits achieved in 2011. In 2015, those alternatives and the “2/3-yr targets” alternative achieve 95% of the benefits achieved in 2014.
 - In years with no interim percent target and a compliance date in the following year, fleets maintain the benefit from the previous year. Thus, the “2/3-yr targets” alternative achieves the same benefits in 2011 and 2013 as in 2010 and 2012, respectively.
 - Staff then summed the benefits from 2010 thru 2015 to estimate the total (cumulative) NOx and total diesel PM benefits thru 2015.
 - Staff then converted these benefits to “PM2.5 Equivalent Tons” by summing the diesel PM tons with the NOx tons divided by 27 (which is the NOx/PM 2.5 conversion factor). This conversion is based on the approximate relative health effects of direct diesel PM versus indirect PM formed in the atmosphere from NOx emissions, based on the health impacts for the proposed in-use off-road diesel vehicle regulation estimated in the *Technical Support Document: Proposed Regulation for In-Use Off-road Diesel Vehicles* (ARB, 2007).
 - Staff then compared the PM2.5 Equivalent Tons for each alternative to the baseline benefits of the ARB proposal to get the expected approximate percent loss in health benefits.

Appendix 1 contains the spreadsheets used to estimate the emission benefits, per the method described above.

Appendix 1: Emissions Benefits from Each Scenario (in statewide tons per day)

Calendar Year	NOx benefits from ARB Proposal	3-yr Targets	CIAQC 3-yr Targets, 20%/40%	CIAQC 3-yr Targets, 100%, 40%	2/3-yr targets
2010	12.63	12.63	2.53	12.63	12.63
2011	21.37	21.37	21.37	21.37	12.63
2012	24.99	24.06	20.30	20.30	24.99
2013	25.85	24.53	23.70	23.70	24.99
2014	27.19	27.19	27.19	27.19	27.19
2015	29.52	28.78	25.83	25.83	25.83
Total NOx benefits thru 2015 (tons)	51666	50571	44137	47824	46815

Calendar Year	PM benefits from ARB Proposal	3-yr Targets	CIAQC 3-yr Targets, 20%/40%	CIAQC 3-yr Targets, 100%, 40%	2/3-yr targets
2010	2.34	2.34	0.47	2.34	2.34
2011	4.17	4.17	4.17	4.17	2.34
2012	6.20	5.76	3.97	3.97	6.20
2013	6.50	5.95	5.23	5.23	6.20
2014	6.81	6.81	6.81	6.81	6.81
2015	6.94	6.85	6.47	6.47	6.47
Total PM benefits thru 2015 (tons)	12032	11634	9894	10578	11083

Cumulative PM2.5 equivalent benefits thru 2015 (tons)	13967	13528	11547	12369	12837
Loss in benefits vs. ARB Proposal	NA	3%	17%	11%	8%

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