PART I
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I. INTRODUCTION

This report is Part 1 of the Guidelines for a lower-emission heavy-duty engine incentive program. Through the budget process, $25 million has been allocated to fund the program -- called the Carl Moyer Memorial Air Quality Standards Attainment Program (the Carl Moyer Program). Furthermore, California will receive $20 million in fines as the result of a recent settlement with heavy-duty engine manufacturers for excess emissions. A number of proponents have called for a legislative appropriation to dedicate that funding to the Carl Moyer Program. The purpose of the program is to reduce emissions by providing grants for the incremental cost of cleaner heavy-duty vehicles and equipment such as on-road, off-road, marine, locomotive, stationary agricultural pump, forklift, and airport ground support engines. The grants will be issued locally by air pollution control and air quality management districts that participate in the program.

The Carl Moyer Program is designed to substantially reduce emissions of oxides of nitrogen (NOx), a smog-forming pollutant. The Carl Moyer Program is also expected to reduce the fine particulate component of diesel exhaust, which contributes to particulate air pollution and is a toxic air contaminant. Eligible projects must produce real, quantifiable emission reductions that are not required by regulations or through agreements.

The Air Resources Board (ARB or Board) is responsible for developing program guidelines. The guidelines establish the program requirements for districts that choose to administer a local program. The guidelines also describe the project criteria for the on-road, off-road, marine and locomotive and other projects that can be funded. The guidelines are being released in two parts. This part describes the overall program, and includes general discussions of both the program requirements and the project criteria. Part 2 of the guidelines will give specific program requirements and detailed project criteria.

Part 1 and Part 2 of the guidelines will be considered at a Board hearing in February 1999. If the Board approves the guidelines, ARB will then allocate the funding to participating districts by June 30, 1999. A timetable for implementation of the program is shown in Table 1 below. ARB and the districts are committed to a quick, successful implementation of the program, which is crucial to our efforts to get funding for a continuing program.

Table 1
Timetable for Carl Moyer Program Implementation

January 1999	Release of Part 2 of the Carl Moyer Program Guidelines.
February 25, 1999	ARB hearing to consider approval of guidelines.
April 2, 1999	District applications to administer program due to ARB.
May 1999	ARB review of applications to administer program.
June 30, 1999	ARB award of grants.
June 30, 2000	District report on project status due.
June 15, 2001	Deadline for districts to have spent program funds (purchase order issued.)

II. NEED FOR THE PROGRAM

A. Background

Heavy-duty engines are significant sources of NOx, a smog-forming pollutant. In addition, the fine particulate matter exhaust from heavy-duty diesel engines is a toxic air contaminant and contributes to particulate air pollution. In 1994, ARB worked with industry, environmentalists, government agencies, and experts in the air quality field to put together a long-term plan for bringing clean air to all Californians. That long-term plan is known as our State Implementation Plan, or SIP. Many of the new emission reduction measures in the SIP are heavy-duty engine measures, including standards for new engines, and incentives to introduce even cleaner engines. Funding was needed for the incentive measures. This May, Governor Wilson proposed $50 million to fund a heavy-duty diesel engine replacement program. Through the legislative budget process, the proposed funding was reduced to $25 million.

The incentive program is named after the late Dr. Carl Moyer, in recognition of his work in the air quality field, and his efforts in bringing about this incentive program. The Carl Moyer Program provides grants for the incremental cost of lower-emission heavy-duty engines.

There were two bills before the legislature this year that contained criteria for a heavy-duty engine incentive program. They were Senate Bill 1857 (Brulte) and Assembly Bill 1368 (Villaraigosa). Governor Wilson vetoed both bills in September because of errors in the bills, because they were overly prescriptive on funding per project category, and because they would have allocated some of the limited program funding to infrastructure. Despite the issues that led to the vetoes, many of the criteria in the bills are consistent with the program envisioned by Governor Wilson. ARB staff will be proposing many of those criteria for this program.

B. NOx and PM Emissions

Heavy-duty engines are significant sources of NOx, a smog-forming pollutant. In addition, the fine particulate matter exhaust from heavy-duty diesel engines contributes to particulate air pollution and is a toxic air contaminant. NOx and particulate matter less than 10 microns (PM_{10}) emissions from selected categories of heavy-duty engines are shown in Table 2.

Total NOx emissions statewide are about 3300 tons per day (1996 inventory). Heavy-duty mobile source engines account for about 40 percent of NOx emissions statewide. Light and medium-duty vehicles account for about 40 percent, and stationary sources for roughly 20 percent of statewide NOx emissions.

Table 2 Statewide Emissions from Selected Heavy-Duty Engine Categories				
	Current		**2010**	
	NOx	**PM_{10}**	**NOx**	**PM_{10}**
On-Road Heavy-Duty Vehicle [a]	450	28	267	13
Off-Road Equipment [b]	402	21	316	24
Locomotive [c]	150	3	140	3
Marine [c]	66	9	79	7
Total	948	61	786	47

a) Emissions from gasoline and diesel trucks and buses. Emissions based on MVEI 7G 1.0c model, corrected to account for 2004 standards. Does not include off-cycle emissions.
b) 1996 emissions from off-road equipment, including equipment less than 50 horsepower. The off-road equipment emissions inventory is currently being revised.
c) 1996 emissions.

C. State Implementation Plan (SIP)

The 1994 State Implementation Plan (SIP) is California's plan to attain the federal ambient air quality standard for ozone. The SIP relies heavily on emission reductions from heavy-duty engines. The SIP calls for California to set more stringent emission standards for both on-road and off-road heavy-duty engines. For categories where California is preempted from setting emission standards, the SIP calls for new national or international emission standards. California is preempted from setting emission standards for new farm and construction equipment less than 175 horsepower (hp), for marine vessels, for new locomotives and new engines used in locomotives, and for aircraft.

Significant progress has been made in setting the emissions standards called for in the SIP. In 1995 and 1996, the ARB, the U.S. EPA, and manufacturers of diesel engines signed agreements to reduce emissions from on- and off-road heavy-duty diesel engines. In 1997, based on the agreement with on-road heavy-duty diesel engine manufacturers, U.S. EPA established a more stringent national standard for heavy-duty truck emissions beginning with the 2004 model year. ARB approved a similar California standard in 1998. U.S. EPA recently adopted more stringent standards for off-road diesel equipment and for locomotives. The International Maritime Organization (IMO) adopted a protocol, which will reduce emissions from new ships beginning January 1, 2000, and U.S. EPA has proposed regulations to limit emissions from domestic vessels. ARB has also signed a Memorandum of Understanding (MOU) with two railroads to further reduce in-use emissions from locomotive engines in the South Coast Nonattainment area, and is negotiating a MOU to reduce emissions from airport ground support equipment in the South Coast.

Although the majority of the measures in the SIP call for more stringent emission standards, the SIP also calls for emission reductions from market-based measures. SIP measure M4, for example, calls for incentives for the early (pre-2004) introduction of lower-emission heavy-duty trucks and buses. The SIP also calls for incentives as part of the strategy to meet the longer-term emission reduction commitments in the SIP.

Table 3 shows SIP commitments for reducing NOx emissions for selected categories of heavy-duty engines. The mobile source SIP measures shown in Table 3 are expected to reduce NOx emissions in the South Coast Air Basin by 213 tons per day in 2010. The vast majority of those reductions will be achieved through emission standards and MOUs, and not through incentives. Indeed, between 80 and 90 percent of the emission reductions are expected to occur as a result of emission standards and MOUs, with only 10 to 20 percent of the reductions expected from incentive measures like the Carl Moyer Program.

Table 3
NOx Emission Reduction Commitments in the SIP
(South Coast Air Basin, 2010)

Source Category	NOx (tpd)
On-road heavy-duty vehicles [a]	83
Off-road equipment	78
Marine vessels	9
Locomotives	23
Longer-term commitments	20
Total	213

a) Based on EMFAC 7F model, which was used to develop the 1994 SIP.

D. Need for Incentives

Generally, the industries that generate emissions are responsible for reducing those emissions without the assistance of public funding. As can be seen from Table 3, the industries participating in the Carl Moyer Program will bear almost all of the responsibility for reducing their emissions through new engine standards, and through agreements such as the locomotive MOU.

Stringent emission standards will result in significant emission reductions – in time. But these categories are dominated by large diesel engines that are usually rebuilt two or three times over their service lifetime. To meet the impending federal attainment deadlines, California must retrofit or repower to reduce emissions from existing engines, and introduce new technology (like alternative fuels) in niche markets.

Retrofits, repowers, and alternative fuel technology can be very cost-effective for a particular project. However, they may not be technically feasible and cost-effective for a broad enough segment of the market to justify a regulation. Instead, incentives can be used to take advantage of cost-effective reductions by paying a vehicle or equipment operator for going beyond what's required.

III. PROGRAM REQUIREMENTS

This section of the report explains the program requirements for the Carl Moyer Program. Districts that wish to implement the program locally and issue grants must follow the program requirements. The three major program requirements are: 1) the district must provide $1 in match funding for every $2 of Carl Moyer Program funding, 2) all projects approved for funding must follow the Carl Moyer Program Guidelines, and 3) all projects funded must meet the cost-effectiveness criterion.

A. Matching Fund Requirements

State funding for this program is $25 million. With the required district matching funds, the total program will be about $37 million. Many districts receive funds from a surcharge on motor vehicle registration fees (a.k.a. AB 2766 and AB 434 funds). Most districts will be using the funds from their motor vehicle fees as matching funds for the Carl Moyer Program. In fact, some districts already have active programs to fund grants for lower-emission on-road and off-road motor vehicle projects with the motor vehicle fee money. The Carl Moyer Program funding will augment their programs.

There are some notable differences between district motor vehicle fee programs and the Carl Moyer Program: motor vehicle fee funding can be used for refueling infrastructure – the Carl Moyer Program funding cannot. Motor vehicle fee funds cannot be used for marine or locomotive projects, while the Carl Moyer Program funds can.

B. Project Criteria

All projects funded must follow the Carl Moyer Program Guidelines, or must be approved on a case-by-case basis by ARB's Executive Officer.

C. Cost-Effectiveness

Carl Moyer Program funding plus district match funding can be used for the incremental cost of a project, up to $12,000 per ton of NOx reduced. Outside funding is not included in the cost-effectiveness calculation. Thus, a project that costs more than $12,000 per ton of NOx reduced could be funded, but only if outside funding is used to "buy down" the incremental cost. Funding for infrastructure does not need to be included in the cost-effectiveness calculation.

D. District Monitoring/Reporting

Districts must submit an annual report on the projects funded under this program. ARB will modify existing software currently used for reporting motor vehicle registration fee projects so that Carl Moyer Program projects can be reported electronically.

IV. PROJECT REQUIREMENTS

A. Project Categories

Projects that fit criteria approved by the Board, or projects approved on a case-by-case basis by the ARB's Executive Officer, are eligible for funding through the Carl Moyer Program. ARB staff expects to present project criteria for on-road motor vehicles, off-road equipment, marine vessels, locomotives, and stationary agricultural pump engines to the Board for the Board's consideration in February 1999. ARB staff also plans to expedite development of project criteria for forklifts and airport ground support equipment (GSE) so the criteria will be ready when districts are ready to fund projects.

Special consideration is needed in the development of the project criteria for some of the project categories. Project criteria are designed to ensure real, quantifiable emission reductions that are not otherwise required by regulation or through an agreement. There are no emission benefits to replacing an electric motor with another electric motor. Therefore, special consideration is needed for project categories with significant penetration of electric motors. About 90 percent of stationary agricultural pump engines are reported to be electric, and about 40 percent of forklifts are electric. For airport ground support equipment, restrictions on funding in the South Coast nonattainment area may be needed to ensure that the program does not detract from the benefits of the MOU being negotiated between GSE operators, ARB, and the U.S. EPA. Finally, project criteria for on-road motor vehicles must reflect the excess emissions settlements between ARB, U.S. EPA, and the diesel engine manufacturers. Heavy-duty engine manufacturers have been using multiple injection strategies on their electronically controlled engines. Those multiple injection strategies improve fuel economy, but increase emissions of NOx over allowable levels. Those excess emission levels must be reflected in the heavy-duty vehicle project criteria.

B. Project Types (new purchase, repower, retrofit)

For most of the project categories, three types of projects would be allowed: new engine purchase, repowers, and retrofits. New engine purchase means a new engine in a new vehicle or new piece of equipment. New engine purchases would occur even without this program, as a result of natural fleet turnover. To qualify for incentives, new engine purchases would need to demonstrate NOx emission reductions beyond what is required for new engines. Repowering means putting a new engine in an existing vehicle or piece of equipment, instead of rebuilding the existing engine. Repowering projects would be cost-effective where new engines are substantially cleaner than older in-use engines. Retrofitting means making hardware modifications to the engine to reduce its emissions. Retrofits could involve converting a conventional-fuel engine to an alternative fuel, or adding aftertreatment technology.

Any project that meets the criteria in the guidelines could be approved for funding. Based on current district grant programs, likely types of projects include purchase of new CNG or LNG transit buses, purchase of a new LNG line-haul truck, purchase of electric equipment in lieu of equipment powered by internal combustion engines, repowering off-road equipment such as tractors, balers, and loaders with new diesel engines, and repowering tugboats with new diesel engines.

C. Emission Reductions

The emission reductions from a project are based on how much cleaner the replacement engine is than the baseline engine, and on how much the replacement engine operates. The basic equation is shown below:

Emission reductions = [baseline NOx level – replacement NOx level] ∗ activity level ∗ conversion factor

The factors in the equation vary for different project categories and project types. However, there are some basic concepts that are common to many of the project categories. First, as a normal part of fleet turnover, one expects that new engines meeting the required new engine standards will be purchased. Thus, purchasing a new engine that meets the required standard is considered part of the baseline. In order to reduce emissions, one would have to purchase a new engine that is cleaner than required. This could be a new alternative fuel engine, a new electric engine, or a new engine with innovative technology that is much lower-emitting than required.

Second, the project criteria will call for the use of certified technology where it is available. For example, there are new heavy-duty on-road trucks certified to lower-emissions standards, and those would be required for new truck purchases to qualify for this program. For some project categories, such as marine vessels, certified engines are not available. In that case, the replacement engine must be tested to a lower-emissions level. The testing method and requirements will be specified in the project criteria.

Third, the project criteria will call for significant reductions in NOx levels – on the order of 30 percent.

D. Cost-Effectiveness

Project cost-effectiveness is based on the incremental cost and the project's emission reductions. The Carl Moyer Program will fund the incremental cost of the project, up to $12,000 per ton of NOx reduced. Carl Moyer Program funding plus district match funding are included in the cost-effectiveness calculation. Outside funding is not included in the cost-effectiveness calculation. Thus, a project that costs more than $12,000 per ton of NOx reduced could be funded, but only if outside funding is used to "buy down" the incremental cost.

E. Monitoring/Reporting

To ensure emission reductions are real, the vehicle or equipment operator will be required to keep records of operation, and maintenance and repair. Those records must be made available for district inspection.

V. FREQUENTLY ASKED QUESTIONS

GENERAL PROGRAM

1. What is the purpose of the program?
The purpose of the program is to reduce emissions from heavy-duty engines by providing grants for the incremental cost of lower-emission engines.

2. The program will reduce emissions of which pollutants?
The guidelines will require substantial reductions in NOx emissions. The program is also expected to significantly reduce particulate matter.

3. Who will develop the program?
The ARB is responsible for program development and oversight. ARB will work with the public, local air districts, port authorities, industry, and environmental groups to develop program guidelines. The guidelines will describe what types of projects could be funded, the criteria to evaluate those projects, and how to calculate the emission benefits and cost-effectiveness.

4. Who will implement the program?
Local air districts that choose to participate will implement the program locally according to ARB guidelines. This will include program outreach, soliciting project applications, awarding grants, and monitoring projects to ensure the emission reductions are actually achieved.

5. Who can apply for grants?
Private companies or public agencies that operate heavy-duty engines in California may apply for grants.

6. How do I apply for a grant?
Talk to your local air pollution control or air quality management district – many are participating in the program.

7. What is the timing for the program?
After the Board approves the program guidelines, air pollution control and air quality management districts will submit applications to administer the program to the ARB. The ARB will review and approve the district programs in May of 1999, and award the Carl Moyer Program grants to the districts by June 30, 1999. Potential project applicants should be prepared to submit project applications that are consistent with the approved guidelines to the districts as soon as the funds are awarded to the districts. (Project applicants should be aware that some districts already operate incentive programs with somewhat more limited funds.)

8. What types of projects are outside the scope of the program?

The program is not intended to fund engine research and development, certification testing, training, the incremental cost of fuels or fuel additives, or operational controls.

FUNDING

1. How much funding is available, and what fiscal deadlines apply?

ARB has a $25 million dollar appropriation in our budget for the program. Two percent of that funding is allocated to ARB for administrative costs. The remainder will be used to fund projects. ARB must encumber funds by June 30, 1999, through a subvention to an approved district or port authority program, or by committing them through direct project grants. Districts must spend the funds by June 15, 2001.

2. What is the matching fund requirement?

Districts and port authorities will be required to provide $1 in district/port funding per every $2 in state funding for those projects they approve. Districts can use up to 15 percent in-kind contributions (i.e., administrative costs) as matching funds. In addition, districts and ports can use projects funded this fiscal year (beginning July 1, 1998) that would have qualified for the program as part of their matching funds.

3. What is the cost-effectiveness criterion?

Projects must have a cost-effectiveness of $12,000 per ton of NOx reduced, or better. Cost-effectiveness will be based solely on Moyer program funds and motor vehicle registration fee funds.

4. Can the $25 million be used to fund infrastructure?

No, but motor vehicle registration fee (AB 2766 and AB 434) funds can be used for infrastructure. Infrastructure funding to support a qualifying engine project will count as match funding.

GENERAL PROJECT

1. Which heavy-duty engine categories are eligible for funding?

- On-road motor vehicles over 14,000 pounds gross vehicle weight rating
- Off-road equipment over 50 horsepower
- Marine vessels
- Locomotives
- Stationary agricultural pump engines
- Forklifts
- Airport ground support equipment

2. Will there be an option for funding heavy-duty engine projects that are not included in the guidelines?

Yes. Districts can work with the project proponent to submit heavy-duty engine projects that are not included in the guidelines for ARB's consideration on a case-by-case basis. ARB will evaluate the technological feasibility, the potential for real, quantifiable emission reductions, cost-effectiveness, and the likelihood of other applicants going forward with that type of project. ARB's Executive Officer will determine whether the project is eligible for funding.

3. Are the replacement engines likely to be alternative fuel engines?

That will vary by project category. For some categories, the only technology currently available that can achieve significant, cost-effective emission reductions is alternative-fuel technology. For other categories, baseline (pre-project) emission levels are very high, and substantial emission reductions can be achieved with new diesel engines. For example, new on-road heavy-duty vehicle projects are likely to be alternative fuel. In contrast, marine vessel engine replacement (e.g., replacing a tugboat engine) is likely to be with a diesel engine.

CONTACTS

Who do I call if I have questions?

If you have any questions or comments regarding the overall program, please contact Ms. Renee Kemena, Staff Air Pollution Specialist, at (916) 322-6921. If you have questions regarding the on-road or off-road project categories, please contact Mr. Robert Nguyen, Air Resources Engineer, at (916) 327-2939. For questions pertaining to the marine or locomotive project categories, please contact Ms. Lucina Negrete, Air Pollution Specialist, at (916) 327-2938. If you have questions about stationary agricultural pump engines, please contact Mr. Mike Tollstrup, Senior Air Pollution Specialist, at (916) 323-8473.