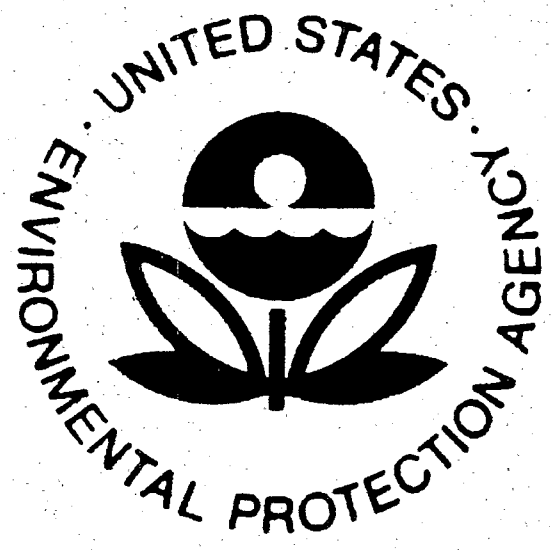
GUIDANCE FOR MOBILE EMISSION CREDIT GENERATION BY URBAN BUSES



January, 1993

PROGRAM FOR GENERATION OF EMISSION CREDITS BY URBAN BUSES

I. Foreword

The Clean Air Act, as amended in 1990, mandates market-based approaches in certain Federal programs and encourages the use of such approaches at the Federal, State, and local levels, as well as by individual sources, to facilitate the attainment of the mandated milestones and goals of Title I of the Clean Air Act Amendments. In response to the Act, the Agency has proposed and issued rules and guidance that incorporate the use of market-based measures in Federal program areas such as acid rain reduction and clean fuel fleet vehicle purchases.

To facilitate the development of market-based programs that go beyond such Federal programs, the Agency is developing comprehensive rules and guidance for States and individual sources to follow in designing and adopting market-based programs in State Implementation Plans (SIP's). The pending Economic Incentive Program (EIP) Rules draw upon the general principles found in the 1986 Emission Trading Policy Statement (see 51 FR 43631 December 4, 1986) while providing a broad framework for the development and use of a wide variety of market-based control strategies. For States to take credit in their SIP's for emission reductions based upon such strategies, reductions must be quantifiable, enforceable, surplus to other Federal and State requirements, permanent within the timeframe specified by the program, and consistent with all other statutory and Federal regulatory requirements. The proposed EIP Rules are applicable to all types of sources including stationary and mobile sources and define general regulatory elements (e.g., program baseline, auditing procedures, enforcement requirements) that should be included in the design of market-based control strategies.

In addition to these broadly applicable general rules, the Agency is also developing a more narrowly focused document entitled "Guidance on the Generation of Mobile Source Emission Reduction Credits" specifically for the development of market-based programs involving the use of emission reduction credits generated by mobile sources. Such mobile source emission reduction credits (MERC's) can be generated from surplus emission reductions over and above Federal mobile source program requirements and can potentially be used to substitute for stationary emission reduction requirements. The general guidance on the generation of MERC's mentioned above addresses issues unique to emission reduction credits generated by mobile sources, including the calculation of emissions baselines for participating sources, the projection of future emissions levels, and the time-averaging of emission reduction credits that vary over time.

To exemplify how MERC's can be generated from a specific category of mobile sources, the following guidance addresses clean technology urban buses, and illustrates how surplus purchases (i.e., beyond Federal program requirements) can be used to generate emission credits in a mobile-stationary source trading program. While market-based mobile source programs must be consistent with the Economic Incentive Program Rules and the Guidance on the Generation of Mobile Source Emission Reduction Credits, EPA does not intend to limit flexibility and innovation beyond the requirements found in these documents. The following guidance is intended to identify key elements in the design of a clean technology urban bus emission credit generation program, not to limit state initiative, creativity, or flexibility in developing a program which best meets the state's needs within the limits of good environmental policy.

II. Introduction

EPA is developing innovative methods to encourage low emitting and clean fuel technologies. As part of this initiative, market-based incentive programs are an effective means to promote this technology and to achieve the accompanying emission reductions. The overall regulatory burden is reduced because participation by industry is voluntary. Furthermore, it is reasonable to believe that in a broad sense the reductions are cost effective since industry would not become involved in the program if participation was not viewed as economically attractive. Finally, by a voluntary shifting of the compliance burden to the party with the lowest cost, market based programs can reduce the cost of compliance for the industry as a whole.

Urban buses represent a significant source of ground level NOx and PM emissions within cities. To help address this problem EPA has two programs to reduce the emissions from urban buses. The first, which applies to urban bus engine manufacturers, involves stringent NOx and PM emission standards for new urban bus engines. These emission standards can be met on an every engine basis or in combination with credit programs such as averaging, banking and trading. The second program, which is presently in the proposal phase, applies to fleet operators and involves in-use urban bus engines. This program requires either application of retrofit technology to reduce emissions of individual rebuilt urban bus engines or a fleet emissions averaging program to reduce overall fleet emissions from in-use urban bus engines through one or more of several approaches.

These emission standards and other program requirements can potentially be met through the use of either improved engine and aftertreatment technology or the use of clean fuels. For ease of reference in this document, these methods will collectively be

referred to as "clean technologies". Both approaches show promise for providing additional emission reductions, but as with most emerging technologies they are somewhat more expensive than current diesel-powered urban buses. In order to provide urban bus operators with incentive to purchase clean technology urban buses, EPA has developed a program which will allow trading of excess urban bus emission reductions (credits) with other sources. As background, this document will describe the regulatory programs and current credit exchange programs for urban buses as mentioned above, and then develop a credit generation program for new urban buses and bus fleets which exceed emission requirements using clean technologies.

III. Description of Current Programs

A. Averaging, Trading and Banking Programs for Certification

The current averaging, banking and trading (AB&T) programs apply to NOx and PM emissions from heavy duty engines (HDEs). Under these programs, credits may be generated and used only by manufacturers of new engines. Urban bus engines meet the same HC, CO, and NOx emission standards as other HDEs and are considered the same as any other HDE within their primary intended service class for NOx AB&T purposes. However, there is a unique PM standard for urban bus engines and PM AB&T programs are thus restricted to that specialized subgroup. Cross-fuel credit exchanges (AB&T) are allowed between petroleum and methanol-fueled urban bus engines and EPA recently proposed to extend this program to the gaseous fuels (CNG, LNG, and LPG). The trading and banking rule lists the equation for calculation of credits:

$$Cr = (Std-FEL)(CF)(UL)(Prod), \quad \text{where}$$

Cr = total mass of emissions credit for family (grams)
Std = NOx or PM emission standard in g/bhp-hr
FEL = Family emission limit in g/bhp-hr
CF = Conversion factor for g/bhp-hr to g/mile;
CF = BSFC x Fuel Economy x Fuel Density
UL = useful life in miles
Prod = Number of engines of the particular family produced

In summary, under this program urban bus engine manufacturers can generate NOx and/or PM credits for use in current or future certification or trading to other engine manufacturers. However, their use is currently limited to new engine certification.

B. Retrofit/Rebuild

EPA has proposed an urban bus retrofit/rebuild program aimed at reducing emissions from older urban buses (57 FR 33141, July 27, 1992). As required by the Clean Air Act (CAA), the proposed urban bus retrofit/rebuild program would apply to 1993 and earlier model year urban buses whose engines are rebuilt or replaced beginning January 1, 1995. The CAA limits the program requirements to urban buses operated in metropolitan areas with a 1980 population of 750,000 or more. EPA estimates that nearly 80 percent of the nation's urban buses in approximately 100 cities could be affected by the program. (See Table 1)

As proposed by EPA, urban bus operators would be allowed to choose between two different retrofit/rebuild options to demonstrate compliance.

Under the first option as proposed, a bus operator's engines would have to meet a 0.10 grams per brake-horsepower (g/bhp-hr) PM emission standard at time of rebuild or replacement, as long as aftertreatment equipment certified to meet the standard can be purchased for no more than $5,000. If no aftertreatment equipment is available that meets the 0.10 g/bhp-hr PM standard at the cost limit requirements, a bus operator would be required to install equipment that has been certified to achieve a 25 percent or greater emission reduction on that engine as long as such equipment can be purchased for no more than $2,000. The 25 percent emission reduction is based on the original certification emission standard for the engine. If not certified to a PM standard, then the engine must be rebuilt to the original configuration. If no equipment is available that meets these requirements, a bus operator would be required to rebuild an engine to its original configuration or a configuration that has lower PM emissions than the original configuration.

The second retrofit/rebuild option would be a fleet average program that is designed to yield an emission reduction equivalent to that expected from the performance based (retrofit technology) option described above. Under the second option, using the approach spelled out by EPA in the aforementioned proposal, a bus fleet operator would calculate an annual target level for his fleet (TLF) for PM emissions based on the fleet makeup and the availability of control options. The fleet operator could then use any combination of certified retrofit technology, replacement with used lower emitting urban bus engines, and early retirement of their urban buses such that the average fleet level attained (FLA) for PM emissions is at or below the required target level (TLF) noted above.

The final rule will include these points, but may make changes to provide for costs other than equipment which transit operators must consider.

These two programs serve as the starting basis for a program to permit credit generation for urban buses. This program is discussed below.

IV. Emission Credit Generation Program for Urban Buses

A. Overview

Under this program, operators of urban buses may generate credits in two ways. The first stems from the averaging, trading and banking regulations and applies to purchases of new urban buses. The second stems from the retrofit/rebuild requirements, and applies to any retrofitted clean technology bus which is used to meet either the performance based option or the TLF option for complying with the retrofit/rebuild requirements. The specifics of these programs are discussed below.

B. Purchase of New Urban Buses

Any clean technology urban bus which is purchased by a fleet operator may receive NOx and/or PM emission credits in the amount that the urban bus has lower emissions than the then applicable NOx/PM urban bus emission standards. As is discussed below, credit calculations would be based on actual VMT for the clean technology bus in any given year. These emission credits would accrue over the bus useful life (until retirement or rebuild). If there are no rebuilds involved, credit generation could not exceed the average urban bus lifetime of fifteen years (see Table 2). However, in most cases the first rebuild occurs after 5 years of use (about 220,000 miles); after this the bus must qualify for credits under the retrofit/rebuild program. Regardless of when retirement or any subsequent rebuild occurs, credit generation is based on the presumption that the bus is meeting the emission standards at all times prior to that point.

An additional provision is suggested to promote the early retirement of higher emitting urban buses. Referring to the data in Table 2, if a new clean technology urban bus is used to replace an older urban bus which is retired early, the clean technology bus could generate emission credits in the amount that the clean technology bus NOx and PM emissions are lower than the retired bus NOx and PM emissions. These benefits would accrue for the years that the old urban bus would have been in operation.

Under this approach, credit generation would be calculated differently for the years when the new bus life overlaps with the presumed remaining life of the old bus than for the years afterward

when the old bus is presumed to have been retired. This method requires reliance on the expected VMT of the old urban bus as shown in Table 2 and the credit calculation methodology as explained in Section VII below. For the overlapping years credit calculation would involve two steps. The first step would depend on the difference between the emission standard applicable to the old bus and the new bus for the overlapping miles of Table 2. The second step, if applicable, would depend on the difference between the emission standard applicable to the new bus and the family emission limit of the new bus and the actual mileage of the new bus. Credits for the remainder of the new bus life (after the old bus is presumed to have been retired), would be calculated as in the first paragraph of this section using actual new bus VMT.

Of course, as is mentioned in element 9 below, credits cannot be generated under this method if the retired bus is also used to achieve compliance under the requirements of the retrofit/rebuild program.

TABLE 2

EXPECTED URBAN BUS VMT BY YEAR OF OPERATION

YEAR OF OPERATION	EXPECTED VMT
1	45,000
2	45,000
3	44,000
4	42,000
5*	41,000
6	38,000
7	36,000
8*	35,000
9	33,000
10	29,000
11*	25,000
12	25,000
13	25,000
14	25,000
15	25,000

* expected rebuild point

C. 1995 Retrofit/Rebuild Urban Buses

As mentioned above, under the CAA 1995 urban bus rebuild/retrofit programs, there are two options for compliance.

The first, the retrofit/rebuild option, is a performance based program which is implemented on a per bus basis. Under this option an urban bus operator may receive emission credits for retrofitting an old urban bus using clean technology. This program would apply to both PM and NOx. Emission credits would be the amount the individual urban bus was below the 1995 retrofit/rebuild emission PM standard and the original configuration NOx emission standard. Credit calculations would use the actual VMT of the bus as it is used, not Table 2.

The second retrofit/rebuild option is an averaging program that is set up to provide the bus fleet operators greater compliance flexibility while still yielding an emission reduction equivalent to that expected from the performance based option outlined above. Under the second option, a bus operator would calculate an annual target level for a fleet (TLF) for PM emissions based on the makeup of the operator's urban bus fleet. The bus operator could use any combination of certified retrofit equipment (clean fuel or low emitting technology) and early retirement of their urban buses such that the average fleet level attained (FLA) for PM emissions is at or below the target level (TLF) noted above.

Under this option, it is possible that a company may elect to surpass their TLF requirement by retrofitting/rebuilding additional urban bus engines using clean technology or other means. If this is the case, and the company is below its TLF, then any clean technology urban buses in the fleet, after the fleet meets the TLF emission level, may be used for credit generation by declaring that the extra clean technology buses are not to be included in the TLF calculation (a TLF opt-out bus). However, the fleet must meet its TLF with the remainder of the buses in the fleet. This is equivalent to allocating credits on a per engine basis as under the performance based option above and credits for opt-out buses will be calculated similarly. As was the case for that option, this program would only apply to PM and NOx emissions.

Under either option, credits are calculated using the appropriate actual VMT and emission differences. Table 2 values will not be used.

In summary, there are three ways in which urban bus engines can potentially generate NOx and PM emission credits:

- purchase of new, clean technology urban bus engines certified to levels below the emission standards.

- retrofit of in-use urban bus engines with clean technology kits certified to levels below the applicable retrofit/rebuild PM emission standards and the original configuration NOx standard.

- TLF opt-out urban bus engines using retrofit clean technology certified to below applicable standards as above for PM and NOx.

V. Program Elements

In an overall sense, credits for urban bus NOx and PM emissions will be generated as discussed above. Suggested elements of a program that would allow clean technology urban buses to generate emission credits are described below. It will be up to the states to develop a proposal to integrate the overall concepts described above and these general elements into a specific program.

ELEMENT 1. Credit-generating urban buses must be in addition to those required to be purchased by statute or must be certified to lower emission standards.

Clean technology urban bus engines may generate emission credits under one of the three options listed above. Emission reductions must be beyond those required by the new bus emission standards or those of the retrofit/rebuild program. This element is necessary to ensure that credits reflect actual excess emission reductions.

ELEMENT 2. Clean technology buses may operate on clean alternative fuels or on petroleum-based fuels

Since the focus of this program is on allowing the use of clean technology urban buses to generate emission credits, it is not necessary to require that the affected urban buses run on any particular fuel. It is only necessary that the urban bus emit at a level lower than the then applicable urban bus PM and/or NOx emission standard or that required in the retrofit/rebuild program. At the same time, it should be noted that urban buses which run on clean alternative fuels (e.g., electricity, gaseous fuels, and neat alcohol) will tend to be inherently cleaner and thus potentially generate more emission credits than those that run on conventional petroleum-based fuels or fuel blends relying more on advanced emission control technology.

ELEMENT 3. Clean alternative fuel vehicles need not be dedicated fuel vehicles.

EPA is not averse to including dual-fuel, flexible-fuel, or hybrid electric urban bus engines in a credit generating program. However, urban buses which operate on more than one fuel complicate the calculation of tradeable credits. Since different fuels

produce different emission rates, it is necessary to verify how much time the urban bus operates on each fuel in order to calculate the correct amount of emission reduction.

Therefore, any program that includes dual-fuel, flexible-fuel, or hybrid electric vehicles must include a provision to ensure that vehicle miles on each fuel can be calculated reliably. This will ensure that the calculation of the credit more closely reflects the actual reduction in emissions from operation on both fuels. One way to ensure accurate reporting is by equipping urban bus refueling facilities with "fuel keys," which act to track, by computer, the fuel type dispensed to each urban bus. Such a system can be expanded to permit coding of appropriate mileage records, to enable accurate calculation of vehicle miles traveled on each fuel. Any system which accurately distinguishes between the different fuels used and vehicle miles travelled would be acceptable. The ideal system would have minimal reliance on human factors. Fuel and/or additive purchase receipts adequate to cover the mileage claimed may also be required.

ELEMENT 4. Urban buses can be new or converted.

New converted urban buses/engines are eligible to generate credits as long as they comply with the same provisions and emission standards which apply to new urban buses. Retrofit/rebuild conversions must be certified in accordance with the provisions of the urban bus retrofit/rebuild program and meet the appropriate emission standards and durability requirements.

ELEMENT 5. Urban buses should pass an annual I/M test.

A test is desirable to insure the vehicle is running correctly in use. Urban buses should pass an annual emissions performance check where available. States may require a decentralized testing program if they desire, or require other means, such as in house testing, to insure compliance.

ELEMENT 6. Credits will be calculated annually, preferably on a calendar year basis.

This element is necessary to ensure that the generation of credits coincides on a time period basis with the purchase, use, and compliance decisions which normally occur. The normal model year for heavy-duty engines is the calendar year and credits for trading can easily be determined on a yearly basis. Furthermore, the parameters for that year should be the same as used in credit use programs to simplify enforcement, ensure consistency, and discourage gaming. Therefore, for the purpose of calculating emission reduction credits, vehicle miles traveled will be measured from January 1 through December 31 of each year for each credit generating vehicle in service, and the credit will be calculated

for that period. However, other annual periods would probably be acceptable depending on state preference.

ELEMENT 7. Credits shall be calculated on a pollutant specific basis.

This program will focus on reductions in emissions from NOx, and PM. Testing must be conducted to show that no other regulated pollutant emission rates increase; in cases of pollutants for which there is no standard, emissions must not be worse than those of urban bus engines of the model year not in the program. Credits may not be generated for urban bus HC and CO emissions due to the fact that HC and CO emissions from current diesel urban bus engines (the dominant technology now in use) are already significantly below the respective standards.

ELEMENT 8. Credits can only be generated by urban buses which states choose to include in the program.

Urban buses are a special sub-category of heavy-duty engines. The federal emission standards apply to all urban buses while the retrofit/rebuild program applies only to urban bus fleets in the larger metropolitan areas. States have the option of choosing whether to participate in the program and whether to extend the credit program to all urban buses used within their state regardless of whether or not they are in an area covered by the retrofit/rebuild program. This potentially increases the pool of credits available.

ELEMENT 9. Urban bus engines used in the certification AB&T programs or in TLF calculations cannot also generate credits for trading.

The AB&T credit exchange programs are designed to be used by engine manufacturers during certification. To avoid double-counting, new clean technology urban bus engines which generate credits for certification cannot also be claimed by the bus fleet operators to generate credits for this trading program. The ownership of these credits must be determined between the engine manufacturer and the bus fleet owner and records kept.

Retrofit clean fuel technology urban bus engines cannot be used in the TLF calculation and also generate credits under this program. To generate credits they must be declared as TLF opt-out engines.

VI. Conversion Factor Requirements

Credit generation and transactions will likely be based on mass emissions. However, heavy-duty engine testing produces emission rates in terms of g/bhp-hr. These emission rates in g/bhp-hr need to be converted into g/mile figures to facilitate

calculating the equivalent mass of emission reductions for purposes of trading with other sources. Thus bhp-hr/mile conversion factors need to be developed for vehicle/engine configurations which are to be used to generate credits. Because the bhp-hr/mile conversion factor is engine specific, it must be developed experimentally by testing. For new or retrofit/rebuild urban bus engines using clean technology, this calculation may be done using the information developed as part of the certification process as is prescribed in the heavy-duty AB&T programs.

VII. Credit Calculation

Credits will be calculated based on the number of miles traveled by each vehicle each year, adjusted by the degree to which the vehicle is cleaner than a conventional vehicle. States may calculate credits in one of two ways: projected or year-end, as described below. A state's choice of method will depend on the needs of its program. However, under either method, the state must have a method to verify that credits given reflect actual emissions savings.

The projection method of credit calculation ensures that credits are used during the same year they are generated. According to this method, credits are estimated and allocated at the beginning of the year they are generated, based on an estimate of how many miles the vehicle will travel that year. Then, at the end of the year, the states must follow up with a verification procedure based on actual vehicle miles traveled, to verify that estimated emission reductions are the same actual emission reductions. States using this method must provide a remedy to correct estimation errors

The year-end method of credit calculation can be used to avoid the extra burden and paperwork associated with the verification procedure required by the first method. In the year-end method, states calculate and allocate credits at the end of the year, based on actual vehicle miles traveled. Under this method, emission credits are used during the year after they are generated.

Under either program, credits are to be calculated according to the following formula, in grams per year of each pollutant. For the two different methods of calculation, VMT represents either estimated or actual mileage, depending on which method is used and, if the first method is used, whether the calculation is the beginning of the year estimate or the year-end verification.

To calculate the credits generated by the purchase of a new urban bus or retrofit/rebuild of an old urban bus, the following formula will be applied for each pollutant.

IU x [(engine imp) x CF x VMT] = credit [grams/year]

where

(engine imp) = (applicable NOx/PM standard) - (Family Emission Limit to which the urban bus is actually certified) applicable standard depends on the model year and whether the engine is generating credits as a new or retrofit/rebuild model

VMT = vehicle miles traveled in one year (actual or estimated, depending on the method of credit calculation adopted)

CF = conversion factor (BSFC x Fuel Econ x Fuel Density), where
BSFC = brake specific fuel consumption

IU = adjustment to account for the emissions difference caused by calculating credits based on standards or FELs rather than in use performance

The heavy-duty engine AB&T program uses the concept of Family Emission Limit (FEL) as a surrogate for the emission standard for credit generating/using engine families. A similar concept will be applied here; credits will be calculated based on the difference between the emission standard and the FEL not the difference between the emission standard and the engine certification level. Presumably, the FEL will be greater than the certification level to account for deterioration, variability, etc.

In these calculations it is necessary to take into account the emissions performance of buses in use relative to the performance predicted by the emission standards/FELs alone. Changes can occur for several reasons. These include differences in low mileage targets with more stringent standards/FELs, unexpected deterioration in the emission control system efficiency, malmaintenance, hardware defects, and tampering. The credits calculation includes a term (IU) to adjust for the effects of these factors. Present best estimates are that IU should have a value of 0.79 for NOx and 0.6 for PM. However, it should be noted that there are only a few certified urban bus engine families and identifying one NOx and PM value to apply to the entire group is problematic especially if the potential exists for a broad range in values depending on the fuel or technology used. As more data becomes available these values are subject to change.

When electric vehicles are used, the credit calculation may need to be adjusted to account for additional NOx and PM emissions related to generating electricity. Such a calculation will need to

take into consideration how electricity is generated in that area. It will be up to the affected states to determine the size of the offset, depending on local electricity generating factors.

VIII. Special Issues

A trading program such as the one described in this document poses at least two special problems. The first is that credits could be given for an urban bus that does not actually have reduced emissions. The second is the case when urban buses are driven additional miles to generate extra credits.

The first case, when an urban bus is given credits even though it does not have reduced emissions, is the more serious problem. This may occur if the bus is not properly maintained and/or it is defective. Since it is proposed that credits be calculated based on the projected in-use emission levels derived in part from the standards to which the engine is certified, and not on actual emissions from an emission test on each engine, this problem would be discovered only as a result of emission tests/inspections of that urban bus configuration.

While urban bus emission failures would seriously undermine the credit program, EPA does not believe it will occur at such a rate that more than annual tests should be required. All new 1994 and later bus engine families will be part of an EPA in use testing program as required by the Clean Air Act. Since urban buses will ideally be subject to some in use test, EPA believes that it is unlikely that credits would be allocated for urban buses that fail to reduce emissions. Credits are calculated annually and most emission failures would be brought to the attention of the owner during that year through the test programs. In cases where an urban bus configuration fails an emission test/inspection, those urban buses would either not be allocated credits for that year, or would be allocated a prorated share of credits based on actual emissions. In cases where a formal state I\M program is not available, a substitute program may be acceptable. Similarly emission credits would need to be adjusted if the engine is involved in an emission recall program.

EPA believes that the second case, where a bus is driven additional miles to generate credits, is unlikely to occur. The additional costs of generating those credits, in both fuel and time, may not be worth the extra credits generated. Furthermore, if urban bus operators allocate more miles to their credit generating bases and fewer to their other buses for the purpose of generating more credits, this is in keeping with the spirit of both programs, which is to generate fewer emissions. Urban bus operators that adopt this strategy are entitled to the extra credits they generate.

However, to ensure against misrepresentations, states may consider comparing miles traveled on a year-to-year basis, to detect unlikely increases in number of miles traveled. Audits of mileage and fuel use records may also be used as a check against tampered odometers on vehicles.

IX. Administration of the Program

As noted above, states would be required to design and administer their own programs. However, EPA advises that all state programs contain elements and methods of calculation similar to those described above to ensure that emission reductions are being achieved. If a state does not follow this guidance, it must demonstrate that the emission reductions are achieved.

Finally, it should be noted that the states in which the program will be run have the ultimate responsibility of ensuring that both the urban bus credit generating provisions and trading programs are implemented in accordance with their respective requirements.

TABLE - 1

Areas Affected by the Urban Bus Retrofit/Rebuild Program

Area	1980 Population
Albany-Schenectady-Troy N.Y.	835,880
Atlanta (Marietta), Ga.	2,138,231
Baltimore, Md.	2,199,531
Birmingham (Bessemer), Al.	883,946
Boston-Lawrence-Salem Ma. -N.H. CMSA - Boston (Cambridge, Framingham, Lynn, Waltham) PMSA - Brockton PMSA - Lawrence-Haverhill PMSA - Lowell PMSA - Nashua N.H. PMSA - Salem-Glouchester PMSA	3,971,376
Buffalo-Niagra Falls, N.Y. CMSA - Buffalo PMSA - Niagra Falls PMSA	1,242,826
Charlotte-Gastonia-Rock Hill N.C.-S.C.	971,391

Chicago-Gary-Lake Ill.-Ind.-Wis. CMSA - Aurora-Elgin Ill. PMSA - Chicago (Evanston, Chicago Heights) Ill. PMSA - Gary-Hammond (East Chicago), Ind. PMSA - Joliet Ill. PMSA Kenosha, Wis. PMSA Lake County (North Chicago, Waukegan only)	7,937,326
Cincinnati, Oh.-Ky.-Ind. CMSA - Cincinnati, Oh.-Ky.-Ind. PMSA - Hamilton-Middletown, Oh. PMSA	1,401,491
Cleveland-Akron-Lorraine, Oh. CMSA - Akron (Barberton, Kent) PMSA - Cleveland PMSA - Lorain-Elyria, PMSA	2,834,062
Columbus, Oh.	1,243,833
Dallas-Forth Worth Tx. CMSA - Dallas (Denton, Irving) PMSA - Fort Worth-Arlington PMSA	2,930,516
Dayton-Springfield Oh.	942,083
Denver-Boulder, Co. CMSA - Coulder-Longmont PMSA - Denver PMSA	1,618,461
Detroit-Ann Arbor, Mi. CMSA - Ann Arbor PMSA - Detroit (Dearborn, Pontiac, Port Huron) PMSA	4,752,820
Greensboro-Winston-Salem-High Point, N.C.	851,851
Hartford-New Britain-Middletown Ct. CMSA - Bristol PMSA - Hartford PMSA - Middletown PMSA - New Britain PMSA	1,013,508
Honolulu, Hawaii	762,565
Houston-Galveston-Brazoria, Tx. CMSA - Brazoria PMSA - Galveston-Texas City PMSA - Houston (Baytown) PMSA	3,101,293
Indianapolis, Ind.	1,166,575
Kansas City, Mo.-Ks. CMSA - Kansas City (Leavenworth, Olathe), Ks. PMSA - Kansas City, Mo. PMSA	1,433,458
Los Angeles-Anaheim-Riverside, Ca. CMSA - Anaheim-Santa Ana PMSA - Los Angeles-Long Beach (Burbank, Pasedena, Pomona, Palm Springs) PMSA - Oxnard-Ventura PMSA - Riverside-San Bernardino PMSA	11,497,568
Louisville, Ky.-Ind.	956,756

Memphis, Tenn.-Ark.-Miss.	913,472
Miami-Fort Lauderdale, Fla. CMSA - Fort Lauderdale-Hollywood-Pompano Beach PMSA - Miami-Haileah (Miami Beach) PMSA	2,643,981
Milwaukee-Facine (Waukesha), Wi. CMSA - Milwaukee PMSA - Racine PMSA	1,570,275
Minneapolis-St. Paul, Mn.-Wi.	2,137,133
Nashville, Tn.	850,505
New Haven-Waterbury-Meriden, Ct.	761,337
New Orleans (Slidell), La.	1,256,256
New York-Northern New Jersey-Long Island, N.Y.-N.J.-Ct. - Bergen-Passaic, N.J. PMSA - Bridgeport-Milford, Ct. PMSA - Danbury, Ct. PMSA - Jersey City (Hoboken), N.J. PMSA - Middlesex-Somerset-Hunterdon (New Bruswick, Perth Amboy), N.J. PMSA - Monmouth-Ocean, N.J. PMSA - Nassau-Suffolk, N.J. PMSA - New York, N.Y. PMSA - Newark, N.J. PMSA - Norwalk, Ct. PMSA - Orange County, PMSA - Stamford, Ct. PMSA	17,539,324
Norfolk-Virginia Beach-Newport News (Hampton, Portsmouth, Suffolk), Va.	1,160,311
Oklahoma City (Norman, Shawnee), Okla.	860,969
Philadelphia-Wilmington-Trenton, Pa.-N.J.-Del.-Md. CMSA - Philadelphia (Norristown), Pa.-N.J. PMSA - Trenton (Camden), N.J. PMSA - Vineland-Milville-Bridgeport, N.J. PMSA - Wilmington, Del.-N.J.-Md. PMSA	5,680,768
Pheonix (Mesa-Scottsdale-Tempe), Az.	1,509,052
Pittsburg-Beaver Valley, Pa. CMSA - Beaver County PMSA - Pittsburg (McKeesport) PMSA	2,423,311
Portland-Vancouver, Or.-Wa. CMSA - Portland, Or. PMSA - Vancouver, Wa. PMSA	1,297,926
Providence-Pawtucket-Fall River, R.I.-Ma. CMSA - Fall River, R.I.-Ma. PMSA - Pawtucket-Woonsocket-Attleboro, R.I.-Ma. PMSA - Providence, R.I. PMSA	1,083,139

Richmond-Petersburg, Va.	761,311
Rochester, N.Y.	971,230
Sacremento, Ca.	1,099,814
St. Louis-East St. Louis-Alton, Mo.-Ill. CMSA - Alton-Granite City, Ill. PMSA - East St. Louis-Belleville, Ill. PMSA - St. Louis (St. Charles), Mo.-Ill. PMSA	2,346,998
Salt Lake City-Ogden, Utah	910,220
San Antonio, Tx.	1,071,954
San Diego (Escondido), Ca.	1,861,840
San Francisco-Oakland-San Jose, Ca. CMSA - Oakland (Berkely, Livermore) PMSA - San Francisco PMSA - San Jose (Palo Alto) PMSA - Santa Cruz PMSA - Santa Rose-Petaluma PMSA - Vallejo-Fairfield-Napa PMSA	3,606,100
Seattle-Tacoma, Wa. CMSA - Seattle (Auburn, Everett) PMSA - Tacoma PMSA	2,093,112
Tampa-St.-Petersburg-Clearwater Fla.	1,613,603
Washington, D.C.-Md.-Va. - Washington D.C. - Frederick Md. - Arlington Vi.	3,250,822

Note: Affected Areas Include all consolidated metropolitan statistical areas (CMSAs) or metropolitan statistical areas (MSAs) with a 1980 population of 750,000 or more.

G:\srpb\passavan\bus.j13
Last reviewed by G. Passavant:1/13/93