DEPARTMENT OF ENERGY

Office of Energy Efficiency and Renewable Energy

10 CFR Part 474

[Docket No. EE–RM–99–PEF]

RIN 1904–AA40

Electric and Hybrid Vehicle Research, Development, and Demonstration Program; Petroleum-Equivalent Fuel Economy Calculation

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE) is revising its regulations on electric vehicles to provide a petroleum-equivalency factor (PEF) and procedures for calculating the petroleum-equivalent fuel economy of electric vehicles. The petroleum-equivalent fuel economy values of an automobile manufacturer's electric vehicles may be included in the calculation of that manufacturer's corporate average fuel economy (CAFE), according to regulations prescribed by the Environmental Protection Agency and the Department of Transportation.

EFFECTIVE DATE: This final rule is effective July 12, 2000.

ADDRESSES: Written comments received in response to the notice of proposed rulemaking, a transcript of oral comments presented at the public hearing on August 17, 1999, and supporting technical information described in the notice of proposed rulemaking are filed at the DOE Freedom of Information Reading Room under docket number EE–RM–99–PEF. You may read and copy any of this docket material at: DOE Freedom of Information Reading Room, Room 1E–190, U.S. Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585, (202) 586–3142. Hours: 9 a.m.–4 p.m., Monday through Friday except Federal holidays.

Additional background materials are also available at the DOE Freedom of Information Reading Room. Copies of the hearing transcript and written comments received regarding the withdrawn February 4, 1994, proposed rule are filed under Docket No. EE–RM–94–101. Earlier materials related to the calculation of the PEF are contained in Docket No. EE–RM–93–301.

FOR FURTHER INFORMATION CONTACT:

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I. Background

In 1975, Congress mandated fuel economy standards for automobiles produced in or imported into the United States in an effort to conserve energy through improvements in the efficiency of motor vehicles. The new law required that every manufacturer or importer of automobiles in the United States meet a corporate average fuel economy standard for the fleet of vehicles produced or imported in any model year. Although certain classes of electric vehicles qualify as ''automobiles'' under the law, they do not consume ''fuel'' as defined in the law. Therefore, inclusion of electric vehicles in a manufacturer's corporate average fuel economy is impossible without a method for expressing the electrical energy consumption rate as an equivalent consumption rate of gasoline. Congress directed the Secretary of Energy to establish a method for determining the petroleum-equivalent fuel economy of electric vehicles.

Congress anticipated that allowing manufacturers to include the expected high equivalent ''fuel economy'' of electric vehicles in corporate average fuel economy calculations would provide an incentive for vehicle manufacturers to produce and sell electric vehicles. Congress anticipated that the existence of such an incentive would help to accelerate the commercialization of electric vehicles.

DOE published a notice of proposed rulemaking (NOPR) on July 14, 1999 (64 FR 37905), describing a revised petroleum-equivalency factor (PEF) and supporting rationale. DOE solicited public comments on the proposed rule and received comments from five organizations representing a cross section of stakeholders. DOE considered these comments carefully before preparing today's final rule. A summary of the comments and DOE's responses are provided in section III of this document. DOE believes that the final rule presented today is responsive to Congressional intent, addresses stakeholder comments and concerns with the proposed rule, is consistent with the regulatory treatment of other types of alternative fuel vehicles, and is straightforward to understand and implement.

Administrative responsibilities for the corporate average fuel economy program are assigned to the Department of Transportation and the Environmental Protection Agency under the Motor Vehicle Information and Cost Savings Act (49 U.S.C., Subtitle VI, Part C). The Secretary of Transportation is responsible for prescribing the corporate average fuel economy standard and enforcing the penalties for failure to meet these standards. The Administrator of the Environmental Protection Agency is responsible for establishing test procedures, for testing the efficiency of vehicles subject to corporate average fuel economy standards, and for calculating a manufacturer's corporate average fuel economy value. DOE is responsible for developing and promulgating the petroleum-equivalency factor, the key component in the calculation of petroleum-equivalent fuel economy values for electric vehicles.

II. Discussion

A. Requirements of the Motor Vehicle Information and Cost Savings Act, as Amended

Section 503(a)(3) of the Motor Vehicle Information and Cost Savings Act (49 U.S.C. 32904(a)(2)) requires DOE to determine the petroleum-equivalent fuel economy values for electric vehicles, taking into account the following parameters:

(i) The approximate electric energy efficiency of the vehicles considering the vehicle type, mission, and weight;

(ii) The national average electricity generation and transmission efficiencies;

(iii) The need of the Nation to conserve all forms of energy, and the relative scarcity and value to the Nation of all fuel used to generate electricity; and

(iv) The specific driving patterns of electric vehicles as compared with those of petroleum-fueled vehicles.

Section 503(a)(3) also provides for revision of such values if necessary.

B. PEF Development Process

The development process of the PEF and the rationale were presented in detail in the notice of proposed rulemaking, and are not repeated in full here. Section C provides a brief description of each of the terms in the PEF equation. Section III also provides an abbreviated discussion of several of the key issues underlying DOE's rationale.

C. PEF Calculation Procedures

The PEF is based on the existing regulatory approach at 49 U.S.C. 32905 for determining the petroleum-equivalent fuel economy of alternative fueled vehicles. The calculation procedure converts the measured electrical energy consumption of an electric vehicle into a raw gasoline-equivalent fuel economy value, and then divides this value by 0.15 to arrive at a final petroleum-equivalent fuel economy value which may then be included in the calculation of the manufacturer's corporate average fuel economy. Two additional factors are present in the equation, but these will usually have a value of unity and thus will not influence the value of the PEF. The terms comprising the PEF and the procedure for applying the PEF are described in greater detail below.

1. General Form of the PEF Equation

The general form of the PEF equation is:

$PEF = E_g * 1/0.15 * AF * DPF$

where:

E_g = Gasoline-equivalent energy content of electricity factor

1/0.15 = ''Fuel content'' factor

AF = Petroleum-fueled accessory factor

DPF = Driving pattern factor

The development of these factors is described below.

2. Gasoline-Equivalent Energy Content of Electricity Factor

When comparing gasoline vehicles with electric vehicles, it is essential to consider the efficiency of the respective ''upstream'' processes in the two fuel cycles. A full description of the differences in the processes is beyond the scope of this rulemaking, but the critical difference is that a gasoline vehicle burns its fuel on-board the vehicle, and an electric vehicle burns its fuel (the majority of electricity in the U.S. is generated at fossil fuel burning powerplants) off-board the vehicle. In both cases, the burning of fuels to produce work is the least efficient step of the respective energy cycles.

Therefore, the PEF includes a term for expressing the relative energy efficiency of the full energy cycles of gasoline and electricity. This term, the gasoline-equivalent energy content of electricity factor, abbreviated as E_g, is defined as:

E_g = gasoline-equivalent energy content of electricity = $(T_g * T_t * C)\ T_p$

where:

T_g = U.S. average fossil-fuel electricity generation efficiency = 0.328

T_t = U.S. average electricity transmission efficiency = 0.924

T_p = Petroleum refining and distribution efficiency = 0.830

C = Watt-hours of energy per gallon of gasoline conversion factor = 33,705 Wh/gal

E_g = (0.328 * 0.924 * 33705)/0.830 = 12,307 Wh/gal

The derivation of these values is straightforward but lengthy and is therefore not discussed in this notice. Details on the assumptions, calculations, and data sources used to derive these values are described in materials contained in Docket No. EE–RM–99–PEF, which may be reviewed at the DOE Freedom of Information Reading Room, at the address and times stated above.

3. ''Fuel Content'' Factor

The fuel content factor has a value of 1/0.15 and is included in the PEF for the reasons described in the notice of proposed rulemaking and the responses to comments section of this notice. Briefly, these reasons are:

(i) Consistency with existing regulatory and statutory procedures;

(ii) Provision of similar treatment to manufacturers of all types of alternative fuel vehicles; and

(iii) Simplicity and ease of use.

The fuel content factor value of 1/0.15 is equivalent to a multiple of 6.67.

4. Petroleum-Powered Accessory Factor

A minority of electric vehicles, primarily those that may be operated in colder climates, may be equipped with auxiliary petroleum-powered accessories, such as cabin heater/defroster systems. DOE addresses the possible use of such petroleum-powered accessories in the PEF calculations by incorporating an Accessory Factor (AF). This factor reduces the PEF by ten percent when an electric vehicle is equipped with any petroleum-powered accessories. This results in two possible accessory factor values:

Petroleum-powered accessories installed?	Accessory factor (AF) value
No	1.00
Yes	0.90

DOE recognizes that there are many variables affecting the actual energy efficiency penalty of petroleum-powered accessories, but believes that the ten percent penalty is a reasonable representative value. DOE has prepared a supporting technical analysis of the magnitude of the actual energy efficiency penalty of petroleum-powered accessories, and placed this analysis in the docket. Because this approach penalizes electric vehicles equipped with petroleum-powered accessories, it provides an incentive for manufacturers to develop vehicles with electrically-powered accessories.

5. Driving Pattern Factor

Congress required that DOE consider the potential that electric vehicles may be used differently than gasoline vehicles, primarily due to its shorter range and longer ''refueling'' times. However, to meet the definition of an ''automobile'' at 40 CFR part 600 and be eligible for inclusion in the calculation of a manufacturer's corporate average fuel economy, a vehicle must be ''manufactured primarily for use on public streets, roads, or highways.'' Thus, DOE believes that electric vehicles eligible for inclusion in CAFE will offer capabilities (perhaps excepting driving range) similar to those of conventional vehicles. For these reasons, DOE is setting the value of the Driving Pattern Factor (DPF) at unity (1.00).

6. Use of the PEF

The value of the PEF is equal to the product of the values of the gasoline-equivalent energy content of electricity (E_g), the fuel content factor of 1/0.15, the petroleum-fueled accessory factor (AF), and the driving pattern factor (DPF):

$PEF = E_g * 1/0.15 * AF * DPF$

substituting values,

PEF = (12,307 Wh/gal)*(1/0.15)*(1.00 *or* 0.90)*(1.00)

or,

PEF = 82,049 Wh/gal (if no petroleum-powered accessories are installed)

PEF = 73,844 Wh/gal (if any petroleum-powered accessories are installed)

Dividing the PEF by the combined (city and highway) energy consumption of an electric vehicle yields the petroleum-equivalent fuel economy of that electric vehicle in miles per gallon:

mpg = PEF (Wh/gal) ÷ combined [electrical] energy consumption (Wh/mile)

7. Sample Calculations

Sample calculations of the petroleum-equivalent fuel economy of hypothetical electric vehicles are presented in the Appendix of the rule.

III. Public Comments Received on the Notice of Proposed Rulemaking and DOE's Responses

The Department encouraged public participation in this rulemaking. DOE, in the NOPR, urged individual vehicle manufacturers, fuel producers and providers, trade associations, vehicle owners and operators, States or other governmental entities, and other affected or interested parties to submit written comments on the proposal and/or to testify at a hearing held on August 17, 1999, in Washington, DC.

You may review the written comments and the hearing transcript, as well as other docket material in the DOE Freedom of Information Reading Room at the address shown at the beginning of this rulemaking. The materials are filed under docket number EE–RM–99–PEF.

DOE received written comments on the proposed rule from five organizations:

1. Alliance of Automobile Manufacturers (AAM—representing BMW, DaimlerChrysler, Fiat, Ford, General Motors, Isuzu, Mazda, Nissan, Toyota, Volkswagen, and Volvo);
2. California Air Resources Board (CARB);
3. Electric Vehicle Association of the Americas (EVAA);
4. Georgia Power; and
5. Virginia Power

EVAA also testified at the public hearing. The common thread through most of the comments was the strong desire to have the final rule in place as soon as possible. Commentors also suggested that DOE only consider changes to the proposed rule if such changes would not delay issuance of the final rule.

Following are summaries of the comments received and DOE's responses. In most cases, similar comments have been grouped together and given a single response. Additional supporting analyses may be found in the docket.

Comment 1: EVAA, Georgia Power, and Virginia Power generally support DOE's revised approach. The PEF value of 81,407 Wh/gal [in the proposed rule] is acceptable, with the modifications described in the provided comments. EVAA specifically believes that the proposed PEF aligns EVs with other alternative fuel vehicles for fuel economy purposes. (EVAA, Georgia Power, Virginia Power)

Response: DOE acknowledges the general support for the revised approach and consistent treatment of Alternative Fuel Vehicles. DOE values the opinions of these informed stakeholders. The suggested modifications are discussed below.

Comment 2: Publishing a final rule should be the top priority—don't delay publication of the final rule.

- The Alliance supports the proposal as is and urges that it be finalized at the earliest possible time. (AAM)
- DOE should make the simple corrections suggested before publication of the final rule. (EVAA, Georgia Power, Virginia Power)
- DOE should attempt to address the larger issues (such as explicitly quantifying the relative scarcity of fuels), but only if it will not delay the publication of a final rule. (EVAA, Georgia Power, Virginia Power)

Response: DOE agrees that under present conditions, timely publication of a final rule is a higher priority than technical hair splitting. DOE will still make several adjustments to the final rule, as described below.

Comment 3: Publish the final rule rapidly; fine-tune it later. DOE should establish a schedule in the final rule for addressing items that could not be quickly resolved at this time. (Georgia Power, Virginia Power)

Response: The NOPR explicitly states (§ 474.5) that DOE will perform a review five years after publication of the final rule to determine whether any updates and/or revisions are necessary. DOE anticipates that better data on many aspects of EV use will be available by that time.

Comment 4: Incorporate a scarcity factor in the equation as required by law. DOE's own analysis shows scarcity and energy security advantages for electricity and that fuels used to produce electricity are abundant, and that reserves of nuclear and renewables are essentially unlimited. By not including a scarcity factor, DOE is not being responsive to this requirement of the Act and is failing to credit electricity for use of these abundant resources. (EVAA, Georgia Power, Virginia Power)

Response: The final rule is based on the relevant factors in Section 503 (a)(3) of the Motor Vehicle Information and Cost Saving Act, including the relevant scarcity of fuel used to generate electricity. As described in the NOPR, DOE performed a careful and thorough analysis of the present and projected availability of energy resources. This analysis showed that fuels (raw resources) used to produce electricity are abundant, as are the raw resources used to produce gasoline and diesel fuel (in fact, ''proved reserves'' of all of these energy resources tend to increase over time as new resources are discovered and better recovery techniques are developed). Since all of these fuels are abundant, the concept of ''relative scarcity'' is difficult to quantify objectively, and in DOE's judgement, should not be an appropriate guiding factor in the rulemaking at this time.

The commentors' claim that electricity is the only vehicle fuel that can be produced from nuclear or renewable sources is incorrect. For example, both hydrogen and ethanol can be produced totally from nuclear and/or renewable sources.

The 1/0.15 factor used in the equation is not intended to be a scarcity factor *per se,* but it does result in a very substantial adjustment to the raw calculated energy efficiency of electric vehicles. It is included to reward electric vehicles' benefits to the Nation relative to petroleum-fueled vehicles, in a manner consistent with the regulatory treatment of other types of alternative fueled vehicles and the authorizing legislation.

Comment 5: Georgia Power and Virginia Power support the use of the 1/0.15 factor in simplifying the calculation, but DOE should provide a technical basis for its application to EVs, or else modify the factor accordingly. (Georgia Power, Virginia Power)

Response: DOE agrees that the replacement of the previously proposed ''scarcity factor'' with the 1/0.15 factor does make the calculation considerably simpler, but this was not the only reason DOE replaced the scarcity factor with the 1/0.15 factor approach.

In the NOPR, DOE describes its assessment of the technical basis for the application of a factor of 1/0.15 to the measured fuel economy of liquid-alternative fueled vehicles (e.g., M85 fueled vehicles) under existing law (64 F.R. 37907). The NOPR also observes that the law applies the same 1/0.15 factor to gaseous-alternative fueled vehicles, even though there is not an obvious technical basis for doing so.

DOE determined that the most equitable and viable approach would be to apply the same 1/0.15 factor to electric vehicles in order to maintain consistency with the existing regulatory treatment of other types of alternative fueled vehicles.

All alternative fuels offer the intrinsic benefit of being substitutes for petroleum, on which nearly 100 percent of the Nation's transportation depends. In other words, any alternative fuel helps the Nation avoid having all of its transportation ''eggs'' in the petroleum

''basket.'' Each mile driven in an alternative fuel vehicle offsets approximately one mile driven in a petroleum-fueled vehicle.

Comment 6: Assigning one fuel content factor (1/0.15) to all alternative fuel vehicles is inappropriate since ''the fuel efficiency benefits of electric vehicles far exceed those of other alternative fuel vehicles.'' DOE should use a fuel content factor that more accurately represents electric vehicle benefits in comparison to other alternative fuels. (CARB)

Response: The efficiency of EVs varies widely as a function of motor and drivetrain efficiency, driving cycle, and the round-trip efficiency of the battery. The energy source which offers the greatest benefits depends on many factors, and the energy source that offers the greatest benefit to one set of users may not be the most beneficial for a different set of users or the general public. These benefits may vary by geography, fuel and generating method.

As noted in the NOPR, DOE invested considerable time and effort in attempting to develop a method that could rigorously account for the advantages to the Nation offered by electric vehicles compared to conventional vehicles, but was unable to identify a method that was sufficiently objective, robust, and consistent with established policy directions.

Thus, DOE stands by its proposal to provide electric vehicles the same reported-fuel-efficiency incentive (the 1/0.15 factor) that other alternative fuel vehicles currently enjoy.

Although electric vehicles and other alternative fuel vehicles will have its energy-equivalent fuel economy adjusted by the same incentive factor, electric vehicles will still enjoy favorable regulatory treatment under DOE's proposal. This is because EVs are specifically exempt from caps on the amount that alternative fuel vehicles are allowed to contribute to raising a manufacturer's overall CAFE (49 U.S.C. 32906(a)).

Comment 7: The U.S. Average Electricity Generation factor (T_g = 0.328) is based only on fossil fuel generation, and does not account for the efficiencies of nuclear or renewable energy generation. Counting the efficiency of these sources relative to fossil fuel generation as 100 percent, the E_g factor should be equal to about 0.53. (EVAA says 0.40 to 0.53 depending on treatment of the nuclear component). (EVAA, Georgia Power, Virginia Power)

Response: DOE reminds the commentors that the E_g factor represents relative efficiency, *not* resource abundance. There are two reasons why DOE chose to use conversion efficiencies for electricity that reflect the typical efficiencies of fossil fuel-fired powerplants. First, existing nuclear and hydroelectric plants are now operated at essentially full capacity. Since no significant additions to U.S. nuclear or hydro-electric capacity are planned, any increase in electricity demand that results from expanded production and use of electric vehicles is very likely to be met by fossil fuel-fired powerplants. Second, although the fuel supply for nuclear, hydro, and renewable generated electricity is plentiful, the process for converting the raw fuel or physical energy to electricity is, in most cases, less efficient than fossil fuel plants. Further, no energy conversion process is 100 percent efficient.

Since several comments were provided on this issue, DOE took a closer look at the relative efficiency of nuclear vs. fossil fuel generation. Nuclear power plants generate steam at lower temperatures than fossil power plants, reducing their relative thermodynamic efficiency. Typically, nuclear plants generate steam at a maximum cycle temperature of about 575 Kelvin (~575 °F), while fossil plants generate steam at temperatures of about 825 Kelvin (~1025 °F). Thus, assuming both cycles reject heat to the surroundings at 294 Kelvin (70 °F), their respective theoretical limiting Carnot efficiencies ($1—(T_L/T_H)$) is 49 percent for nuclear and 64 percent fossil. The E_g factor uses the actual average fossil fuel-to-electricity conversion efficiency, which is 32.8 percent. Scaling the nuclear Carnot efficiency by the same ratio suggests that nuclear plants achieve conversion efficiencies on the order of 25 percent. While this is a very crude analysis, it is likely that a more rigorous analysis would yield qualitatively similar results.

Therefore, including the nuclear component in the calculation of the E_g factor would likely cause the factor to change *downward,* not upward as suggested by the commentors.

Data on the ''efficiency'' of hydroelectric generation are somewhat difficult to obtain, though hydroelectric generation efficiency may be higher than typical fossil fuel-fired powerplants. This is because hydroelectric power generation is based on principles of momentum and/or pressure transfer and not combustion and heat transfer. Without suitable data, and without taking a significant amount of additional time for detailed analysis, DOE notes that the relatively small amount of relatively high-efficiency hydroelectric generation tends to offset the larger amount of relatively less-efficient nuclear power generation. Thus, the two trends tend to cancel each other and the efficiency of fossil generation would continue to dominate.

Therefore, DOE has continued to use the value of E_g = 0.328 in light of: (1) the commentors' clear desire to place a higher priority on timely publication of a final rule, than on performing additional technical analyses; and (2) since the fossil generation component will dominate the marginal electrical generation efficiency for many years.

Comment 8: The U.S. Average Electricity Transmission and Distribution Efficiency factor T_t places a unique and unfair additional penalty on electric vehicles since fuel distribution efficiency is not included in the mileage calculations for any other vehicle energy source. DOE should assign a value of unity to the T_t factor. (Georgia Power, Virginia Power)

Response: As the commentors note, the T_t factor is required by the authorizing legislation. DOE is aware of the potential for such a factor to unfairly penalize EVs; this is the reason why DOE added the U.S. Petroleum Refining and Distribution factor T_p (= 0.830) in the denominator of the E_g factor equation to offset the T_t (= 0.924) factor in the numerator.

Note that T_p includes refining as well as distribution in order to include most of the corresponding steps in the energy chain—just as the equation attempts to do with the electric energy chain. Note that raw resource extraction (mining, drilling, etc.) is not counted. Data that can be used to measure the ''efficiency'' of these processes is difficult to obtain, and varies widely depending on the characteristics of the individual site. DOE believes that the relative difference in ''efficiency'' of resource extraction (i.e., energy expended in recovery relative to the energy content of the resource recovered) between *individual* sites of one type (e.g., coal mines) is probably greater than the difference in the *average* efficiency of different extraction processes (e.g., mining vs. pumping).

Together, the ratio of the factor's T_t / T_p (= 1.113) *increases* the assigned petroleum-equivalent fuel economy of EVs. Therefore, the T_t factor is not an ''unfair penalty'' on EVs, but is in fact a benefit for EVs.

Comment 9: The energy content of a gasoline factor, C = 33,440 Wh/gal, is inconsistent with the ''accepted actual value'' [''physical constant'' in EVAA's oral comments] used by other DOE programs. DOE should use the value of 33,705 Wh/gal (115,000 Btu/gal ÷ 3.412 Btu/Wh) that is reported by the

Alternative Fuels Data Center. (EVAA, Georgia Power, Virginia Power)

Response: DOE disagrees that a single ''actual'' value for the energy content of gasoline exists. Gasoline is a varying blend of hundreds of components, and thus the energy content of individual batches of gasoline varies by several percentage points from grade-to-grade and from brand-to-brand. The energy content also varies regionally, seasonally, and over the long-term in response to changes in available feedstock, regulatory requirements, and economic pressures.

DOE agrees, however, that a consistent ''average'' value should be used across government programs. Since the PEF is attempting to compare the energy efficiency of electric vehicles to the fuel economy of conventional vehicles as measured by the EPA, the energy content of gasoline value used in the PEF should match the energy content of the gasoline used by EPA in testing the fuel economy of gasoline vehicles.

However, EPA has not provided a value for the energy content of its testing gasolines. Therefore, DOE will use the value of 33,705 Wh/gal, obtained by dividing the 115,000 Btu/gal value reported by the Alternative Fuel Data Center, by the (rounded) conversion factor of 3.412 Btu/Wh.

Comment 10: Develop a technical basis for the accessory factors used when the vehicle has petroleum-fueled accessories installed. (CARB, Georgia Power, Virginia Power)

Response: On the basis of the comments received and DOE's additional analysis of the impact of petroleum-fueled accessories, DOE has decided to replace the two accessory factors with a single accessory factor that would be applied if an electric vehicle includes any petroleum-powered accessories. The value of this single accessory factor will be 0.9, i.e., a 10 percent penalty.

A technical analysis of the magnitude of this penalty is now included in the docket. DOE notes that many variables affect the actual energy efficiency impact of petroleum-powered accessories on EVs, including accessory sizing (e.g., heater capacity) and the efficiency of both the vehicle and the accessory. To be truly accurate, it would be necessary to measure the actual consumption of the accessories installed in each vehicle and project this consumption over a suitable duty cycle for the vehicle. This process would add significant complexity, would place a substantial burden on automobile manufacturers and the EPA, and would provide few policy benefits not obtainable with the fixed accessory factor.

DOE expects that very few electric vehicles will be equipped with petroleum-powered accessories, as such accessories contradict many of the motivations and attractions that lead customers to purchase electric vehicles.

Comment 11: DOE should encourage the Environmental Protection Agency (EPA) to rely on the test procedures established by CARB for the testing and certification of EVs (these procedures are based on SAE J1634). The CARB procedures are consistent with current industry practice. (AAM, EVAA)

Response: As the comments suggest, EPA rather than DOE is responsible for selecting and implementing the EV test procedures. DOE suggests that EVAA and AAM offer their recommendations on test procedures directly to EPA.

Comment 12: The 55 percent urban and 45 percent highway weighting factors proposed do not represent the way that electric vehicles are used, particularly, those EVs that are designed for non-highway and/or neighborhood use. (CARB)

Response: There are actually two issues raised by this comment. The first is that the weightings do not reflect the usage patterns of at least a portion of EVs. The second issue, which is not stated but is implied, is that DOE should adjust the factors to accommodate limited performance EVs.

DOE agrees that there are some EVs that perform differently and will be used differently from conventional automobiles. DOE also anticipates that a limited number of customers with suitable ''mission requirements'' will purchase and operate limited performance EVs as replacements for conventional automobiles. However, DOE notes that to be included in CAFE calculations, a vehicle must meet the definition of an automobile at 40 CFR part 600, which states that such a vehicle must be ''manufactured primarily for use on public streets, roads, or highways.'' Limited performance EVs (such as neighborhood electric vehicles) that cannot keep up with highway traffic clearly do not meet this requirement and are categorically ineligible for inclusion in CAFE unless 40 CFR part 600 is appropriately amended.

DOE believes that Congress intended the PEF to be an incentive for manufacturers to produce roadworthy electric vehicles that provide an alternative to conventional petroleum-powered automobiles.

As for the weightings themselves, EPA defines these weightings. DOE used the 55 percent urban and 45 percent highway weighting factors in the sample calculations because these are the factors used by EPA for conventional vehicles. The paragraph in the NOPR that describes the ''city'' and ''highway'' test procedures and the 55/45 percent apportioning of energy consumption values is intended only as an example of how to apply the PEF to determine the petroleum-equivalent fuel economy of an electric vehicle. The 55/45 percent weightings could change if EPA's CAFE calculation procedures are changed in the future.

DOE also notes that the preceding arguments provide a compelling justification for setting the value of the Driving Pattern Factor in the PEF to unity (1.00).

Comment 13: Review how changes in EV driving range and infrastructure availability might affect driving patterns of EVs in the future. (CARB)

Response: As noted in the preceding response, electric vehicles eligible for inclusion in a manufacturer's CAFE calculation must be competitive with conventional vehicles. This strongly suggests that the Driving Pattern Factor should be equal to unity.

DOE intends to monitor developments related to EVs and their use closely. Consideration of modifications to the Driving Pattern Factor and/or the PEF, in general, will be made at the 5-year review specified in the § 474.5.

IV. Procedural Requirements

A. Environmental Protection Agency Review

Pursuant to section 7(a) of the Federal Energy Administration Act of 1974 (15 U.S.C. 766(a)), DOE submitted a copy of this rulemaking to the Administrator of the Environmental Protection Agency for the Administrator's concurrence. The Administrator has concurred.

B. National Environmental Policy Act Review

This rulemaking has been reviewed in accordance with the requirements of the DOE National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), and the DOE regulations in 10 CFR part 1021. This rulemaking amends 10 CFR part 474 so that electric vehicles receive similar treatment to what Congress has required for other alternative fuel vehicles under 49 U.S.C. 32905. The Department has determined that this rule is covered by Categorical Exclusion in paragraph A5 to subpart D, 10 CFR part 1021 (rulemaking, interpreting or amending an existing regulation, no change in environmental effect). Accordingly, neither an environmental assessment nor an environmental impact statement is required.

C. Regulatory Review

Today's final rule has been determined not to be a ''significant regulatory action,'' as defined in section 3(f) of Executive Order 12866, ''Regulatory Planning and Review.'' 58 FR 51735 (October 4, 1993). Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs in the Office of Management and Budget.

D. Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601–612) requires that an agency prepare an initial regulatory flexibility analysis to be published at the time the final rule is published. This requirement (which appears in section 603) does not apply if the agency certifies that the rule will not, if promulgated, have a ''significant economic impact on a substantial number of small entities.''

DOE certifies that this action will not have a significant economic impact on a substantial number of small entities. It is directed at vehicle manufacturers that will be concerned with a mix of petroleum and electric fueled vehicles in their annual production. None of these manufacturers is a small entity.

E. Federalism Review

Executive Order 13132 (64 FR 43255, August 4, 1999) requires that regulations or rules be reviewed for any substantial direct effects on States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among various levels of government. If there are sufficient substantial direct effects, then Executive Order 13132 requires agencies to engage in intergovernmental consultation and take other steps before promulgating such a regulation or rule. This action and 10 CFR part 474 serve only to provide a method of interpreting 40 CFR part 600 (Fuel Economy of Motor Vehicles) for electric vehicles. The action does not involve any substantial direct effects on States or other considerations stated in Executive Order 13132.

F. ''Takings'' Assessment Review

It has been determined that pursuant to Executive Order 12630 (52 FR 8859, March 18, 1988) this final rule would not result in any takings which might require compensation under the Fifth Amendment to the United States Constitution.

G. Review Under Executive Order 12988

With respect to the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, ''Civil Justice Reform,'' 61 FR 4729 (February 7, 1996), imposes on executive agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; and (3) provide a clear legal standard for affected conduct rather than a general standard and promote simplification and burden reduction. With regard to the review required by section 3(a), section 3(b) of Executive Order 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation: (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct, while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting a clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires executive agencies to review regulations in light of applicable standards in section 3(a) and section 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

H. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires each Federal agency to prepare a written assessment of the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million in any one year. The Act also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and tribal governments on a proposed ''significant intergovernmental mandate,'' and requires an agency plan for giving notice and opportunity to timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. The final rule published today does not contain any Federal mandate, so these requirements do not apply.

I. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105–277) requires Federal agencies to issue a Family Policymaking Assessment for any proposed rule or policy that may affect family well-being. Today's final rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

J. Congressional Notification

Consistent with the Small Business Regulatory Enforcement Fairness Act of 1996, DOE will submit to Congress a report regarding the issuance of today's final rule prior to the effective date set forth at the outset of this notice. The report will note the Office of Management and Budget's determination that this rule does not constitute a ''major rule'' under that Act 5 U.S.C. 801, 804.

K. Review under the Paperwork Reduction Act

DOE has determined that this rule does not contain any new or amended record keeping, reporting, or other type of collection of information subject to clearance by the Office of Management and Budget under the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*).

List of Subjects in 10 CFR Part 474

Corporate average fuel economy, Electric (motor) vehicle, Electric power, Energy conservation, Fuel Economy, Motor vehicles, Research.

Issued in Washington, DC, on May 25, 2000.

Dan W. Reicher,

Assistant Secretary, Energy Efficiency and Renewable Energy.

For the reasons set forth in the preamble, DOE revises Part 474 of Chapter II of Title 10 of the Code of Federal Regulations as set forth below:

PART 474—ELECTRIC AND HYBRID VEHICLE RESEARCH, DEVELOPMENT, AND DEMONSTRATION PROGRAM; PETROLEUM-EQUIVALENT FUEL ECONOMY CALCULATION

Sec.
474.1 Purpose and scope.
474.2 Definitions.
474.3 Petroleum-equivalent fuel economy calculation.
474.4 Test procedures.
474.5 Review and update.
Appendix to Part 474—Sample Petroleum-Equivalent Fuel Economy Calculations

Authority: 49 U.S.C. 32901 *et seq.*

§ 474.1 Purpose and Scope.

This part contains procedures for calculating a value for the petroleum-equivalent fuel economy of electric vehicles, as required by 49 U.S.C. 32904(a)(2). The petroleum-equivalent fuel economy value is intended to be used by the Environmental Protection Agency in calculating corporate average fuel economy values pursuant to regulations at 40 CFR Part 600—Fuel Economy of Motor Vehicles.

§ 474.2 Definitions.

For the purposes of this part, the term:

Combined energy consumption value means the weighted average of the Urban Dynamometer Driving Schedule and the Highway Fuel Economy Driving Schedule energy consumption values (weighted 55/45 percent, respectively), as determined by the Environmental Protection Agency in accordance with 40 CFR parts 86 and 600.

Electric vehicle means a vehicle that is powered by an electric motor drawing current from rechargeable storage batteries or other portable electrical energy storage devices, provided that:

(1) Recharge energy must be drawn from a source off the vehicle, such as residential electric service; and

(2) The vehicle must comply with all provisions of the Zero Emission Vehicle definition found in 40 CFR 88.104–94(g).

Highway Fuel Economy Driving Schedule energy consumption value means the average number of watt-hours of electrical energy required for an electric vehicle to travel one mile of the Highway Fuel Economy Driving Schedule, as determined by the Environmental Protection Agency.

Petroleum equivalency factor means the value specified in § 474.3(b) of this part, which incorporates the parameters listed in 49 U.S.C. 32904(a)(2)(B) and is used to calculate petroleum-equivalent fuel economy.

Petroleum-equivalent fuel economy means the value, expressed in miles per gallon, that is calculated for an electric vehicle in accordance with § 474.3(a) of this part, and reported to the Administrator of the Environmental Protection Agency for use in determining the vehicle manufacturer's corporate average fuel economy.

Petroleum-powered accessory means a vehicle accessory (e.g., a cabin heater, defroster, and/or air conditioner) that:

(1) Uses gasoline or diesel fuel as its primary energy source; and

(2) Meets the requirements for fuel, operation, and emissions in 40 CFR part 88.104–94(g).

Urban Dynamometer Driving Schedule energy consumption value means the average number of Watt-hours of electrical energy required for an electric vehicle to travel one mile of the Urban Dynamometer Driving Schedule, as determined by the Environmental Protection Agency.

§ 474.3 Petroleum-equivalent fuel economy calculation.

(a) The petroleum-equivalent fuel economy for an electric vehicle is calculated as follows:

(1) Determine the electric vehicle's Urban Dynamometer Driving Schedule energy consumption value and the Highway Fuel Economy Driving Schedule energy consumption value in units of Watt-hours per mile;

(2) Determine the combined energy consumption value by averaging the Urban Dynamometer Driving Schedule energy consumption value and the Highway Fuel Economy Driving Schedule energy consumption value using a weighting of 55 percent urban/45 percent highway; and

(3) Calculate the petroleum-equivalent fuel economy by dividing the appropriate petroleum-equivalency factor (depending on whether any petroleum-powered accessories are installed; see paragraph (b) of this section) by the combined energy consumption value, and round to the nearest 0.01 miles per gallon.

(b) The petroleum-equivalency factors for electric vehicles are as follows:

(1) If the electric vehicle does not have any petroleum-powered accessories installed, the value of the petroleum equivalency factor is 82,049 Watt-hours per gallon.

(2) If the electric vehicle has any petroleum-powered accessories installed, the value of the petroleum-equivalency factor is 73,844 Watt-hours per gallon.

§ 474.4 Test procedures.

(a) The electric vehicle energy consumption values used in the calculation of petroleum-equivalent fuel economy under § 474.3 of this part will be determined by the Environmental Protection Agency using the Highway Fuel Economy Driving Schedule and Urban Dynamometer Driving Schedule test cycles at 40 CFR parts 86 and 600.

(b) The ''Special Test Procedures'' provisions of 40 CFR 86.090–27 may be used to accommodate any special test procedures required for testing the energy consumption of electric vehicles.

§ 474.5 Review and Update

The Department will review Part 474 five years after the date of publication as a final rule to determine whether any updates and/or revisions are necessary. DOE will publish a notice in the **Federal Register** soliciting stakeholder input in this review. The Department will publish the findings of the review and any resulting adjustments to Part 474 in the **Federal Register**.

Appendix to Part 474—Sample Petroleum-Equivalent Fuel Economy Calculations

Example 1: An electric vehicle is tested in accordance with Environmental Protection Agency procedures and is found to have an Urban Dynamometer Driving Schedule energy consumption value of 265 Watt-hours per mile and a Highway Fuel Economy Driving Schedule energy consumption value of 220 Watt-hours per mile. The vehicle is not equipped with any petroleum-powered accessories. The combined electrical energy consumption value is determined by averaging the Urban Dynamometer Driving Schedule energy consumption value and the Highway Fuel Economy Driving Schedule energy consumption value using weighting factors of 55 percent urban, and 45 percent highway:

combined electrical energy consumption value = (0.55 * urban) + (0.45 * highway) = (0.55 * 265) + (0.45 * 220) = 244.75 Wh/mile

Since the vehicle does not have any petroleum-powered accessories installed, the value of the petroleum equivalency factor is 82,049 Watt-hours per gallon, and the petroleum-equivalent fuel economy is:

(82,049 Wh/gal) (244.75 Wh/mile) = 335.24 mpg

Example 2: The vehicle from Example 1 is equipped with an optional diesel-fired cabin heater/defroster. For the purposes of this example, it is assumed that the electrical efficiency of the vehicle is unaffected.

Since the vehicle has a petroleum-powered accessory installed, the value of the petroleum equivalency factor is 73,844 Watt-hours per gallon, and the petroleum-equivalent fuel economy is:

(73,844 Wh/gal) (244.75 Wh/mile) = 301.71 mpg

[FR Doc. 00–14446 Filed 6–9–00; 8:45 am]

BILLING CODE 6450–01–P