The original documents are located in Box 2, folder "Auto Emissions (2)" of the Loen and Leppert Files at the Gerald R. Ford Presidential Library.

FOR IMMEDIATE RELEASE JUNE 27, 1975

OFFICE OF THE WHITE HOUSE PRESS SECRETARY

THE WHITE HOUSE

PRESS CONFERENCE
OF
FRANK ZARB
ADMINISTRATOR OF THE
FEDERAL ENERGY ADMINISTRATION
JOHN BARNUM
DEPUTY SECRETARY OF THE
DEPARTMENT OF TRANSPORTATION
JOHN QUARLES
DEPUTY ADMINISTRATOR OF THE
ENVIRONMENTAL PROTECTION AGENCY
AND
THEODORE COOPER
ASSISTANT SECRETARY FOR HEALTH
DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

THE BRIEFING ROOM

3:02 P.M. EDT

MR. GREENER: The President today is making recommendations to Congress to amend the Clean Air Act by extending the current automobile emission standards for five years, from 1977 until 1981.

You should have a copy already of the President's statement, a fact sheet and an Energy Resources Council memorandum.

Here today to highlight the President's recommendations and to answer your questions are Frank Zarb, the Administrator of the Federal Energy Administration; John Barnum, the Deputy Secretary of the Department of Transportation; John Quarles, the Deputy Administrator of the Environmental Protection Agency, and Dr. Ted Cooper, Assistant Secretary for Health at HEW.

Frank?

MR. ZARB: Thank you, Bill.

The President today has announced his decision to recommend that the Clean Air Act be amended to maintain the current automobile emission standards through model year 1981.

The President based his decision on an intensive review of complex sets of factors, as you could well imagine, including the impacts on public health, energy goals, consumer prices, environmental objectives and safety.

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While there is an agreement among experts concerning some of the near-term implications of tighter automobile emission controls, there are many unknowns. Thus, the President has decided that we should proceed with caution.

The President's decision, if implemented, with the cooperation of the Congress, will still enable us to achieve almost all of our environmental objectives. At the same time, his decision will not expose the Nation to the danger of unknown risks and costs and will permit us to reach other national objectives, such as greater fuel efficiency.

The fact sheet that you have gotten -- I suspect you have had it for a couple of hours now -- is pretty complicated. We have some experts who will remain here with you after the panel has left for any indepth, technical discussion, but I am sure you may have some questions for those of us who are represented.

Q Mr. Zarb, is this Administration recommending this simply on the basis of the sulfates?

MR. ZARB: I guess the answer to the question is yes and no. The President sent a different set of changes to the Clean Air Act as related to auto emissions in January. You may recall that.

Q Very well.

MR. ZARB: Since that time there has been a great deal of discussion, hearings and EPA recommendations that were brought about because of the sulfate issue. Looking at that set of circumstances, plus working with HEW on health issues and transportation on safety and cost issues, and FEA and others on the energy efficiency question, the President reviewed the whole question and came down on a different decision, which is the one that is before us today.

Q Mr. Zarb, 99 percent of the sulfates in urban areas is the result on the stationary sources, and if this is so difficult, from the point of view of emissions from automobiles to only 1 percent, why is it that you steadily oppose any kind of scrubbers on power plants, which are responsible for 60 percent of the 99 percent of the sulfates coming into the urban area. You have steadily taken that position.

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The answer to your question is that I have not steadily opposed it, as you say. Russ Train and I came to agreement on the question of scrubbers that was, I guess, midway between where he started and where I started.

We both testified before the Congress, and I think that the new scrubber schedule that we proposed will help us with our particular short-range energy questions and will ultimately get us to the ambient air quality that he wanted around stationary sources, so we have not continually resisted the establishment of scrubbers and scrubber technology. I still think it is the long-term answer to burning coal.

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Q Mr. Zarb, you have said that this will still enable us to reach all of our environmental goals. Would you add to that, that it would enable us to reach it at a later date, however? (Laughter)

MR. ZARB: If you would like me to add that, I will. I would point out -- I will ask John Quarles to add to my answer with a great deal more proficiency -- I would ask you to look at the Attachment 1 in the comprehensive fact sheet which gives a comparison of the achievement of specific environmental goals -- ambient air goals -- with this program, with the EPA recommendation, with the last January recommendation, and with the current statutory requirement so that you can judge for yourself area-by-area and almost city-by-city the variations which would occur by virtue of this proposal.

Q Generalized reply to that question, and that is that you have said it still enables us to reach all our environmental goals. My question is, with any change of timetable?

MR. ZARB: With very little change in timetable. I will read again my opening statement which I think I read word-for-word -- will enable us to achieve almost all of our environmental objectives -- and I think many of those, or a good many of those will still be achieved within the previously stated time frame.

Some might take somewhat longer because of this change, but if you will look at the chart city-by-city you will see that many of them will be achieved even with this particular change.

Q You listed a number of things, as I recall, that are involved in the health environment, energy considerations, and so on. Does this not, however, represent some kind of a reorientation of priorities with energy and some of the others taking precedence now over the environment?

MR. ZARB: I don't think that is a fair conclusion, no. When, in January, we put forward the President's program, within it was a provision that requested a change in the Clean Air Act which would bring us to the California standards. Since that moment in time, there has been a great deal of discussion with respect to the sulfur oxide issue, and we had to rethink the entire question based upon the study and the discussion that surrounded that issue.

I don't think this places environmental issues in a different order of priority. I think what it does suggest is that we must continue to look at each of these objectives in the light of others, and create the best possible balance of all to insure that we achieve all of our national goals simultaneously, because they are all required.

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Q Mr. Zarb, is there anything in what you are proposing that the automobile industry is very unhappy with?

MR. BARNUM: I think that what we are proposing here is compatible with what we requested them to consider at the time the President asked for a 40 percent fuel efficiency improvement by the model year 1980.

At that time, the President was talking about 9.9 and 3.1. This is consistent with that. The one unknown to the automobile industry -- and it remains an unknown -- is the requirement that will be imposed at some time in the future for a sulfuric acid emission, and until that is ascertained it is not possible to predict exactly what fuel efficiency improvements will be available with these other standards for carbon monoxide, hydrocarbons and NOx.

Q In discussing these proposals, with them have you found them at all dissatisfied with what you want to do?

MR. BARNUM: I have not discussed these proposals with them and I don't believe anybody else in the Department of Transportation has.

Q Mr. Barnum, are you basically saying that you got a 40 percent fuel improvement commitment by 1980 based on more stringent standards? Now you are giving easier standards but you are not going to ask them for further fuel economy commitments?

MR. BARNUM: No, we have not said that.

Q Do you plan to?

MR. BARNUM: Well, look at the table on the very last page of the fact sheet and it will show you that if indeed these are the only requirements ---

Q We don't have that.

MR. BARNUM: I beg your pardon -- on the Energy Resources Council memorandum.

What that table shows is that with the 1.5 and 15 instead of the 9 and .9, they would be able to attain a 46 percent fuel efficiency improvement by the model year 1980.

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What is unknown is what effect on that ability to attain a 46 percent fuel efficiency improvement will be the consequence of the sulfuric acid requirement that is laid on by EPA regulation when they are prepared to determine what the level should be, and it may very well be that that will force the fuel efficiency improvement back down to 40 percent. If it does not, if a 46 percent fuel efficiency improvement is available with the sulfuric acid standards that is determined to be desirable, yes, of course, we would ask them to meet what we in our judgment conclude they could do, which in this instance is 46 percent.

Q You would ask them in 1979?

MR. BARNUM: No, we would be prepared to do that when we know what the sulfuric acid standard is.

Q Which is the 1979 models?

MR. BARNUM: No, I think they are talking about having a sulfuric acid standard sooner than that. As to when it would be applicable, it has not yet been determined.

Q Mr. Quarles, hasn't the converter resulted in a fuel economy?

MR. QUARLES: Yes.

Q General Motors, in its ad this week, says a 28 percent in city driving. Now, if you arrive at a point where you are going to possibly do away with the converter because they can meet the interim standards on some of the cars without a converter, now what is going to happen to Mr. Zarb's great program for 40 percent saving in fuel economy? Aren't you in a bind here?

MR. QUARLES: One of the questions is not only whether or not a converter is used but how hard you work the converter, and to the extent that you have more strict standards, even though a converter is used as a basic assumption, then the injection of more oxygen into the system to achieve all those standards is going to have an effect in reducing the emissions, but also will have an effect on fuel economy.

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Q I talked to General Motors and Ford this morning, and they said they cannot possibly get this fuel economy without having the converter.

MR. QUARLES: I would assume that they would expect to continue to use converters.

Q But you are setting up a system where you can do away with the converters?

MR. QUARLES: No, I don't believe so.

MR. ZARB: I think the answer to your question is that to maintain current standards does not suggest that the converter or need to be done away with and, as a practical matter in our calculations it would not be.

Until a better fix is made on the sulfur oxide issue, I don't think we will have a definite answer to that question.

I would like to go back to the question that was raised here about the attitude of the automobile makers towards this particular provision and that relates somewhat to the 40 percent requirement. I don't think that 40 percent needs to be set in concrete. In working with the Congress, as we have, they have gone through a good many of the same paces -- in looking at the engineering and technology, talking with people inside and outside the industry, with management and with labor and have come to the conclusion that somewhere in that range is realistically achieveable.

I think we all believe, including many of the folks in Detroit, that that can be beaten between now and 1980, depending upon some other things that occur. So, the answer to your question is that we will continually reassess that goal and if it can be improved, we will.

In answer to your question about the state of mind of the automobile makers with respect to this particular provision, I would just recall back during the days when we were focusing on the 40 percent issue there was a great deal of initial -- I was going to use the word "resistance" but a characteristic similar to that -- difference of view.

Often times we had a difference of view with respect to the Government asking for even that 40 percent given some of the uncertainties that faced them. So, I think the implication that this decision is completely consistent with what they want to have happen is not so.

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Q Mr. Zarb, if you extend existing standards from 1977 to 1981, aren't you in effect saying you are not going to have any improvement in air quality over that period? I mean, you have already backed off the original set of standards. Aren't you in effect saying we are not going to make any progress until 1981?

MR. QUARLES: You phrased it differently the second time and came closer to the truth, but the question you first asked is whether there will be any improvement in air quality, and in that regard, there will be a continuing improvement in air quality in regard to hydrocarbon and carbon monoxide emissions because the cars now coming off the assembly lines meet standards vastly more stringent than the cars manufactured and sold several years or a decade ago, and as the older cars are replaced by newer cars, meaning more stringent standards, they will more than offset the expected increase in numbers of cars and use of cars and there is expected to be significant improvement in the general levels of air quality.

Q This is an improvement over standards which are already set?

MR. QUARLES: This is an improvement over air pollution problems that exist today.

Q Because of action taken by the Congress several years back?

MR. QUARLES: This is correct.

Q But not because of any action by the Ford Administration, indeed the Ford Administration would keep everything static until 1981.

MR. QUARLES: The progress that is being made now in moving ahead to reduce auto pollution results from the basic program established by the 1970 Clean Air Act.

Q The Muskie bill?

MR. QUARLES: The Muskie bill.

The proposals that have been made with respect to modifications of that statute to allow more time for achievement of the original statutory goals all inevitably have a consequence of postponing to some degree the date when there will be a full accomplishment of the clean air goal.

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The issue that must be recognized in regard to any particular proposal is to consider how great an effect it would have. I think, as you are well aware, Russ Train went through a very extensive review of this entire problem back in January and February and in March and made proposals to the Congress for modifications of the deadline which would extend for a number of years the achievement of the ultimate and statutory objectives.

Q Let's go to the back-up from Russ Train.

MR. QUARLES: This proposal would involve a further modification in two respects. It is a delaying of the time when more stringent standards would be put into effect in two respects.

Russ Train's recommendations called for retaining the 1.5 HC standard and the 15 CO standard now in effect through 1977, 1978 1979 and that is the same proposal that the President has made.

Now, there are two respects in which the current proposal by the President changes that. One respect is that Russ Train's proposal would have reduced the HC and CO standards from 1.5 and 15 to .9 and 9 in the years of 1980 and 1981, whereas the current proposal would continue the 1.5 and 15 standard for those two additional years so that insofar as h ydrocarbons and carbon monoxides are concerned, there would be that distinction in the out years.

The other distinction relates to NOx, where Train's proposal called for a 2.0 standard, and this proposal would call for a 3.1 standard.

Q The 1975 interim standard would be continued to the 1982 model year up through 1981?

MR. QUARLES: That is correct.

Q What about the sulfate standard that Mr. Train proposed for 1979 models?

MR. QUARLES: You mean what is the standard development?

Q Yes, where does it stand now?

MR. QUARLES: It is not as far along as we hoped it would be.

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Q Are you still planning to promulgate?

MR. QUARLES: Yes, we are still working on it and we are anticipating that we will promulgate it and it will apply to 1979 model year cars.

Q Is this part of the President's proposal to a sulfate standard?

MR. QUARLES: That is assumed by the President's proposal. There is no expectation that it would be changed one way or the other.

Q Mr. Quarles, can you support these proposals if they are looser than the ones you and Mr. Train proposed a couple of months ago?

MR. QUARLES: Well, let me answer that yes and offer an explanation.

These are tough questions involving many uncertainties and many trade-offs, and EPA conducted intensive investigations of these issues during January and February and addressed the entire problem. At that time, in early March, Mr. Train developed conclusions and recommendations to Congress which he made and those reflected the best judgment that EPA was able to make on these basic issues, and we have subsequently offered testimony in Congress based essentially upon those recommendations.

Insofar as any formal position of the agency is concerned, on a legislative matter, this is, as you are well aware, a matter in which our position on any legislative item is developed through the process that involves a development of an Administration position through the White House and under the President, and this from the President's viewpoint involves a consideration of a range of factors that extend beyond our particular concerns for health and environmental protection as the primary emphasis -- two other factors including energy, safety, the economic factors and the like.

After considering the totality of those factors, the President has reached that position, and, of course, that is therefore a position which is binding upon us and which we would accept and support.

Q So would you continue to testify on the Hill for your earlier proposals, or for these?

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MR. QUARLES: Well, I think that for one thing it is likely we may have no occasion to testify on the Hill on this because the testimony has been offered on these issues and the bills are now in mark-up, both on the House and Senate sides.

Q But no testimony, John, on this particular proposal?

MR. QUARLES: No, there has not, and if there would be hearings called on this particular proposal, then presumably we would testify. The testimony which we would give, or the position which we would have would not be to abandon or necessarily modify the analyses that we have made of the factors that go into these considerations and there are, you are well aware, all sorts of differing perceptions of virtually all of these issues that are involved because of their inherent complexity and I think that is recognized in the President's statement where he says that there are some differences on the data and the conclusion to be drawn from them.

We would defer to the President's judgment on the ultimate balancing and would support these numbers insofar as that ultimate position is concerned, while at the same time offering an attorney who might ask our own analysis of the facts so that Congress could balance these issues ultimately as its responsibility.

Q Could you comment on the National Academy of Science report three weeks ago when they said you could achieve the ultimate standards? Does the agency absolutely disagree with the National Academy of Sciences? Does the Administration disagree with that?

MR. QUARLES: I would take it that the Administration disagrees with that. The agency disagrees, certainly, with some parts of the analysis that underlies that.

I think one of the basic questions that is involved here in the analysis of the technological issues is uncertainties as to what can be achieved and what will be achieved, and from our viewpoint putting a primary emphasis on pushing ahead to achieve a higher degree of pollution control for the health objective.

Our inclination always is, and I think always should be, to push for the most ambitious achievement of improved technology that we feel realistically is possible.

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I think from the viewpoint of others who have different primary objectives it is reasonable and it is natural and I think it has happened that others take a viewpoint that is more conservative as to what technology can be actually used in production on 10 million or 11 million cars by a different year, and so some of the differences as to technological achievement reflect that differing approach.

Q But, John, the industry absolutely disagrees with you.

MR. QUARLES: In what respect?

Q They are saying you are taking the right step in doing what they want to do for the wrong reason.

MR. QUARLES: Could you elaborate on that?

Q Yes. You are taking the step, you said, and Russ Train said and Mr. Zarb said, primarily because of the sulfate issue.

MR. ZARB: I didn't say that.

Q General Motors and Ford says you are doing this, which they agree with, because this is what they have asked for -- the interim standards for a five-year postponement -- but they say you are doing it for the wrong reason; that sulfates are not the reason.

MR. QUARLES: I think that it is important to clarify what Mr. Zarb said, that he did not say that this was done primarily because of the sulfates. As far as I am concerned, this is not something which could be put forward on the basis of the sulfate issue to a substantial extent.

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Q But the statement says so here, John.

MR. QUARLES: The sulfate issue was very much before EPA at a time when we analyzed these issues and made the decisions and recommendations announced in March, and it was our judgment at that time that a significant postponement of the schedule for moving to the more stringent standards was required by the sulfate issue, as you may recall.

Let me take a moment and put in perspective the numbers that we are talking about. Right now we have on the books as statutory requirements standards that would apply to the 1978 model year of .41 grams per mile of hydrocarbons, 3.4 grams per mile of carbon monoxide and .4 grams a mile of NOx.

The recommendations which Mr. Train made in March were that Congress should amend the statute to change the HC standard for at least the first two years from .41 up to 1.5 -- that is almost quadrupling the amount -- to change the CO standard from 3.4 up to 15 and to change the NOx standard from .4 up to 2.0.

Those are very significant changes in the level of control of the basic auto pollutants and any enactment that would modify the standards to that extent is going to have a significant delaying effect on achievement of control of the basic auto pollutants in many of our urban centers where we have severe auto pollution problems.

We recognize that, and we don't like that, but Russ Train recommended that extension primarily because of the sulfate problem. He found as a consequence of the hearing that apart from the sulfate problem, it would be technologically feasible to achieve the statutory standards by the 1978 model year which, of course, was consistent with the Ruckelshaus finding of a year or two before, that it probably could have been done even sooner.

The proposal that is made now is a much narrower change of the standards and would have much more marginal effects on air quality.

I am saying, in other words, if you move from the staturory standards to what Russ Train proposed -- that is, a movement of certainty -- if you move to what the President is now proposing, that is a greater total distance, but a relatively small change from what Russ Train proposed to the proposal of today.

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Q Mr. Zarb, as a matter of policy, I wonder why you would explain why the Administration has decided that it is not necessary to recommend more stringent automobile pollution standards between now and 1982 car models. That is six years. Why?

I mean, how can you defend the policy where you say it is not necessary to improve your pollution standards in the next six years from 1975?

MR. ZARB: Did everbody hear the question?

Q No.

MR. ZARB: The question was, how can I defend an Administration policy which would not improve further air quality standards -- not air quality, but the standards that relate to air quality -- for a five-year period, which would go through model 1981 cars.

There are two reasons I think that are major and the fact sheets have many, many others that you might want to refer to.

The change in standards, as we proposed in January, gave rise to a whole set of issues which were not answerable, and John just described one of the major ones, the sulfur oxide, the sulfur oxide mist problem.

The answers are not here today, so that we can make some judgments with respect to requirements in that particular area.

The proposals that were before us coming from EPA and some Members of Congress are not all that different from where we are with respect to ambient air improvement.

When you looked at the relative improvement from the margin beginning where, let's say, EPA was and where the President is today, looked at the energy efficiency problem in terms of fuel lost -- and that is summed up for you in the fact sheets -- looked at the economics involved and the total cost to the automobile buyer and then came full circle back to the question, do you know what you are doing at this point in setting some standards that have implications on other emissions and other questions, it became clear that the best form of national policy at this moment was to continue to accrue the improvement of air quality that came about, as you properly stated before, from the 1970 act and is now, in effect and during this interim period do some homework to learn some more about some of the issues which are not answerable at the present time, including the oxide question.

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We have said that the oxide standard is assumed here, and it is, and, as you know, it has not turned out to be as easy as some had originally assumed to understand oxides and how to set appropriate standards.

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Q Mr. Zarb, could you discuss briefly the energy considerations of this? How does this help you achieve your energy objective?

MR. ZARB: Irving, when you make these analyses you start with some assumptions so I would urge you to look into the fact sheet where we have carefully laid out some of the assumptions which we have reached and it becomes argumentative because others might use a different set of assumptions.

But as we looked at the improvements that might be required, using either statutory standards or EPA-established standards or recommended standards, knowing what we think we know about engine technology and engine technology change in the two-year time frame, and then in the five-year time frame, using Department of Transportation scientists to help with that issue, it became clear that moving to those standards would have a penalty in fuel, that the adjustments required to get there would have us use more fuel per gallon.

I am going to add quickly, before you add quickly, that there are some who suggest that there will be advanced technology changes in some engines and as a result what you are suggesting here really won't happen.

I can just play the ball from where it is at the moment -- that no one has produced those technology improvements, no one has shown them to us and if they are hidden in somebody's basement and they come out at some later date, then we ought to take a whole new look.

Q What will be the penalty in fuel if you cut off the converters on many of these cars and reach the interim standards which you are now proposing to continue for five years without the converter -- not all of them have to have this, but General Motors and Ford says there will be a tremendous fuel penalty if you do that.

Now, this is part of your program to save fuel.

MR. ZARB: If you are suggesting that the application of the converter is necessary to achieve further fuel savings, I would suggest that is not the whole story.

Q You are disputing General Motors and Ford?

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MR. ZARB: Far be it from me to dispute them here today, but I have been known to do it in the past. It is my view that the application of that particular technology is not the only road to improved engine efficiency, and as you look at the mix and the fleet as it is now changing you can see where that mix change in itself based upon the higher piston engines will provide the improvements that we require without having that added hardware.

I guess the answer to your question is yes.

Q You can do away with the added hardware, then?

MR. BARNUM: Well, the converter itself does not change the efficiency of the engine.

Q I didn't say they did.

MR. BARNUM: But the implication of your questions has been that it does.

Q The implication of my question was, based upon their statements, and I am not making that implication -- is that the addition of the gizmo has added to the fuel economy. Now is that true or not true?

MR. BARNUM: That is not true.

MR. QUARLES: It is not true directly, but having the device on the car permits the avoidance of other pollution control devices which might have an adverse effect on fuel economy, so the net effect of it is that it does help fuel economy.

Q Is that part of the Administration's objective, fuel economy?

MR. ZARB: Yes. None of this proposes that we do away with the converter, and you are reaching that on an extension that I cannot get to yet, but we are not proposing that the converter be eliminated by virtue of what the President has announced today.

MR. GREENER: Two more questions, please.

Q Mr. Zarb, if Congress does not pass this proposal, would the Administration accept anything short of this?

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MR. ZARB: The Administration, as you know, is always interested in looking at the Congress' point of view and if they come to another conclusion in the legislative process it will be looked at and weighed.

I cannot rule it out, Les, nor can I say that anything they come up with would be satisfactory.

Q You really expect them to pass this ---

MR. ZARB: I am hopeful by noting in a letter which I was served with a few moments ago, that Senator Muskie sent to some of his colleagues where he also suggests some modifications to the Act, he also ties those modifications to fuel economy using some of the same kind of language that I might use in a similar letter.

His numbers and his time frames are a little bit different, but I am encouraged that we for the first time are seeing that kind of discussion take place around the Hill.

Q Are you suggesting that you would accept something short of this?

Q On the 20 miles per gallon?

MR. ZARB: I really can't answer that question. It was shown to me on the way into the room and the only paragraph I saw was the one I probably would agree to, so until I read the rest of it ---

Q The ecology plane, for instance, in Denver, sometimes can't land because it is so blue because of the sulfur oxide, and I have done many stories on that. Does this apply to planes, too, or just automobiles?

MR. ZARB: There are emission standards for aircraft and this is not this subject, no.

Q Can we expect new stationary source standards or regulation as Mr. Train has asked for? Given that most or much of the sulfur dioxide comes from stationary sources, can we expect new stationary source regulations?

MR. ZARB: Let me go first and then John will add.

MR. QUARLES: Then I will correct you.

MORE

MR. ZARB: And then John will correct me.

We have up there a set of amendments that apply to the application of scrubber technology. The Administration stands by those amendments. We have had hearings, and as I say that is an area where EPA and FEA have come together to similarly endorse a similar set of amendments.

MR. QUARLES: I think that is a correct answer, and I would agree with that in regard to the power plants. I don't know that this is something that requires legislative action, other than legislative action that Mr. Zarb just referred to which might have an effect of providing some flexibility in establishing specific plant-by-plant requirements.

The need in this area is to push ahead with the plant-by-plant requirements; and secondly, in regard to the entire area, the auto pollutants, one of the things which we are learning is that not only in regard to hydrocarbons, sulfur oxides, but also in regard to the NOx that as control is improved in the autos, not to the degree that we would want but that as it is improved, there is a tremendous need to get more effective control over the stationary sources.

If we cannot solve that problem, we are not going to get clean air.

MR. GREENER: Thank you, gentlemen.

THE PRESS: Thank you.

END (AT 3:44 P.M. EDT)

EMBARGOED FOR RELEASE
UNTIL 12 NOON, EDT

June 27, 1975

ENERGY RESOURCES COUNCIL MEMORANDUM

Congress should amend the Clean Air Act by extending the current automobile emission standards from 1977 until 1981.

While this action will have no significant impact on our attempt to achieve the objectives of the Clean Air Act, the proposed modifications are necessary to (1) avoid certain recently recognized potential health risks associated with the catalytic converter and (2) permit substantially greater fuel efficiencies over the next five years. All of the enforcement, certification and inspection measures contained in the Clean Air Act will be retained.

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Background

This proposal supersedes Section 503, Title V, of the President's Energy Independence Act of 1975 which he sent to Congress on January 30, 1975. At that time, the President proposed emission standards based on a modification of the current California standards.

After submitting the Energy Independence Act to the Congress, the Environmental Protection Agency held public hearings on the manufacturers' requests for a suspension of the 1977 auto emission standards and also took testimony related to five-year emission levels. The hearings established that the catalytic converter, used to meet the HC and CO standards for 1975 and 1976 model year vehicles, produces sulfuric acid in amounts that can pose a significant public health risk.

In addition, because of the technology likely to be used to achieve these tighter standards, automobile emissions of sulfuric acid may double if the more stringent HC and CO standards proposed in the Energy Independence Act are imposed for 1977 and subsequent years.

Accordingly, the President directed an interagency task force to undertake a major review of the public health, energy and consumer cost implications of several widely discussed levels of automobile emission standards.

The President's decision is based upon this review. Some of the more significant considerations which led to the President's recommendation are contained in his statement released today.

Additional information on those considerations is outlined below.

The Interagency Review

The review by Executive Branch agencies considered the implications of a range of alternative automobile emission requirements which might be applied to 1977 through 1981 model automobiles. Specifically, the following standards, applicable to hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NOX) emissions have been considered:

	Emissions in grams per mile		
	HC	CO	NOX
Retain statutory standards which will apply to 1978 models	0.41	3.4	0.4
Energy Independence Act proposal covering 1977-81 models	0.9	9.0	3.1
EPA's March 5 conclusions			
- for 1977-79 models	1.5	15.0	2.0
- for 1980-81 models	.9	9.0	2.0
Continue standards applicable to 1975-76 models for 1977-81	1.5	15.0	3.1
Adopt Canadian 1975-76 standards for 1977-81 models	2.0	25.0	3.1
Reimpose standards applicable to 1973-74 models for 1977-81	3.0	28.0	3.1

Based upon this review, the following conclusions were reached:

1. Controls on automobiles necessary to meet the current standards have reduced ambient concentration levels in those areas that have auto-related HC and CO problems; and have reduced the rate at which NOX concentrations have increased.

2. Through the year 1985, tighter or looser standards for HC, CO and NOX, in the range being considered, will make little difference in the air quality in those areas that have an auto-related pollution problem, although many parts of the country have no auto-related pollution problem.

3. Present data are not sufficient to make specific calculations or final judgments on what sulfuric acid emission levels would be safe from a public health perspective. However, it is believed that sulfuric acid emissions could prove to be a significant public health risk and that emissions could increase substantially if standards more stringent than the 1975 interim standards are adopted.

4. Further mandated reductions in emissions from internal combustion engines may have the effect of increasing or creating pollutants other than CO, HC and NOX.

5. Auto emission standards have had an impact on fuel economy and, therefore, on our nation's total petroleum demands and reliance on foreign sources. Standards tighter than the 1975 interim will result in higher initial car costs and higher operating costs.

6. The basic philosophy and approach to future auto emission controls need to be reconsidered in light of current conditions.

   (a) Significantly tighter standards at this time may preclude continued development of some promising fuel efficient and low emission technologies.

   (b) Actions to reduce auto emissions must take into account other sources of the same pollutant.

7. Prompt Congressional action is needed on auto emission standards in order to establish a five-year emission program which is compatible with a strict fuel efficiency program.

DISCUSSION

1. Controls on automobiles necessary to meet the current standards have reduced ambient concentration levels in those areas that have auto-related HC and CO problems; and have reduced the rate at which NOX concentrations have increased.

2. Many populated areas of the country have no auto-related pollution problem. Through the year 1985, tighter or looser standards for HC, CO and NOX in the range being considered, will make little difference in the air quality in those areas that have an auto-related pollution problem.

The Clean Air Act has imposed increasingly more stringent automobile emission limitations. 1973-74 vehicles produce about 65 percent less HC and CO than uncontrolled (pre-1968) vehicles. 1975 vehicles, meeting the current standards, produce 83 percent less HC and CO and 11 percent less NOX than uncontrolled vehicles. The existing law, however, requires that these automobile emissions be reduced even further beginning with model year 1977 for NOX and model year 1978 for HC and CO.

The attached tables show the direction and magnitude of change in ambient concentration levels for HC, CO and NOX which would result from adopting standards which are less (or more) stringent than those proposed in the Energy Independence Act. The ambient standards are used as criteria because they are the health-related pollutant limits in each air quality region, toward which reductions in both automobile and stationary emissions contribute. Thus the levels shown are the result of mobile and stationary source emissions. Three points should be noted:

- First, though the tables assume that the statutory standards will be in force after the 1981 model year, if any of the options were kept through model year 1990, the concentration levels for each region would change very little and the conclusions reached remain basically the same.

- Second, because the concentration levels are projected through modeling techniques marginal changes in the concentration levels, whether increases or decreases, are often within the range of statistical error.

- Third, the estimates of total auto pollution emitted are based on historical growth rates for vehicles miles traveled and auto fuel economy. No compensation has been made for the higher cost of gasoline which already affected total pollutants through reductions in vehicle miles traveled.

Hydrocarbons

Out of the thirty regions considered to have an HC problem, twenty are projected to exceed the ambient standard in 1985, regardless of the automobile emission level chosen. More importantly, all of the regions projected to have concentration levels below the ambient standard in 1985 at the statutory vehicle limitation level are also projected to be below the ambient standard if any of the other less stringent automobile emission standards shown is chosen instead.

Only 25 percent of total hydrocarbon emissions are generated by automobile exhaust. Therefore, hydrocarbon ambient air concentrations tend to be much less sensitive than carbon monoxide to the level of vehicle emission control.

Attachment 1 shows the limited differential impact that vehicle hydrocarbon limitations more stringent than the 1975 (Interim) standard would have on ambient air quality by 1985 in those areas considered to have a hydrocarbon problem. The measure of air quality is photochemical oxidants to which hydrocarbons are converted and in which form HC most adversely affects air quality.

Carbon Monoxide

Carbon monoxide levels in the atmosphere are much more sensitive to changes in automobile emission controls than either HC or NOX. Unlike those pollutants, the growth of stationary sources over the next ten years will have little effect on CO air quality.

Attachment 2 shows 1985 projected concentration levels for twenty-six problem regions for each of the alternatives presented. The most important conclusion is that air quality is improving rapidly and will continue to improve until 1985 under all of the emission control options presented. This is because older uncontrolled cars are being replaced by newer controlled cars. The regions with asterisks are those which would still exceed the ambient standard if an automobile CO standard were adopted that was less stringent than either the statutory standard or the one proposed in the Energy Independence Act.

First, there is only a limited difference in ambient concentration levels for all of the standards presented, but the difference is particularly small when comparing the statutory standard (3.4 grams/mile) with either the Energy Independence Act proposal (9.0 grams/mile), EPA's recommended standard (15 grams/mile until 1979 and 9.0 grams/mile from 1979 to 1981), or the current standard (15 grams/mile) extended until 1981. By 1985, the average ambient levels for this pollutant will have been reduced about 70 percent below 1970 levels regardless of which option is chosen.

Second, the choice of option will not significantly affect any single area's ability to achieve or maintain the ambient standard by 1985. When comparing all the alternatives (except the 1974 or Canadian Standards), those areas below the ambient standard in 1985 will be below it regardless of the automobile emission standard chosen, with the sole exception of Denver. The adoption of the Canadian Standard would mean that only two additional areas (Portland, Oregon and Puget Sound) would still be above the ambient standard in 1985 by a marginal amount.

Nitrogen Oxides

Federal government and independent scientists predict that a steady increase in ambient nitrogen dioxide concentrations will occur in metropolitan areas over the next ten years regardless of the auto emission limit chosen. This is because stationary sources emit most NOX pollution and the technology for controlling stationary sources is very limited. Attachment 3 (b) shows the average percentage increases in NO2 ambient concentration levels that will occur for each of the auto emission alternatives studied (3.1, 2.0 and 0.4 grams/mile) under varying assumptions about the auto standard after 1981.

When comparing the 2.0 and 3.1 auto emission alternatives, Attachment 3 (B) shows that as long as the 2.0 NOX standard were implemented after 1981, no significant difference in the predicted increases of NO2 concentration levels would occur in either 1980 or 1985, as a result of maintaining the 3.1 grams/mile standard through the 1981 model year (columns 2 and 3).

Though the statutory standard would have a significant effect on the overall predicted increase, the differential effect of a more stringent automobile standard than currently in force on the ambient concentration levels in those areas with nitrogen dioxide problems is much less pronounced. This is shown in Attachment 3 (a), which displays ambient projected concentration levels in the ten problem areas for 1985 under various automobile emission standards.

With the exception of San Francisco, by 1985 all ten regions are predicted to have concentration levels above the ambient standard if either the 3.1 or 2.0 grams per mile limitation is placed on automobiles through the year 1980 (columns 1 and 3). San Francisco would remain below the standard if the more stringent emission limitation is adopted and, in fact, California has the more stringent limitation in force as a State regulation.

It should also be noted that regardless of whether the 3.1 or the 2.0 limitation is imposed through 1981, and even if the statutory standard (.4) is imposed after 1981, only one additional region (Phoenix) would be brought into compliance with the ambient standard (columns 4 and 5). In fact, implementing the statutory standard in 1978 would result in only two additional areas (Phoenix and Baltimore) meeting the standard (column 6).

It is, therefore, clear that the projected increases in nitrogen dioxide cannot be stopped without major technological innovations in stationary source control. Therefore, regardless of how stringent the automobile standard, the future concentration levels in major metropolitan areas will primarily be a function of stationary source emissions.

3. With present data experts generally agree that standards which are tighter or looser than those currently in force would have minimal differential health impacts -- especially for HC and CO. However, present data are not sufficient to make specific calculations or final judgments on what sulfuric acid emission levels would be safe from a public health perspective. It is only known that sulfuric acid emissions could prove to be a significant public health risk and that emissions would increase if standards more stringent than the 1975 interim standards are adopted.

4. <u>Further mandated reductions in emissions from internal combustion engines may have the effect of increasing existing pollutants or creating other pollutants.</u>

<u>Health Impacts</u>:

Based upon existing air quality data, there are no measurable health risks associated with the application of HC and CO emission standards (within the range of options presented) which are less stringent than those in the Energy Independence Act or the statutory standards.

The application of the 3.1 NOX level will not greatly increase health risks nationwide. With an ambient air quality standard of 100 ug/m3 health data suggests that the level at which people would have an increased risk for excess respiratory disease is 200 ug/m3. Los Angeles is the only area which is expected to approach the 200 ug/m3 level by 1985, and California has the lower 2.0 grams/mile level in effect as a State regulation.

<u>Sulfuric Acid</u>:

Though ambient carbon monoxide and hydrocarbon concentration levels are not significantly affected by the range of automobile emission standards presented, the concentrations of sulfuric acid are affected.

Gasoline contains sulfur which, after combustion, is released as sulfur dioxide. In the process of removing other pollutants the catalytic converter changes some of the sulfur dioxide into sulfuric acid mist.

Current estimates indicate that with existing automobile emission technology, emission standards for hydrocarbons and carbon monoxide of .9 and 9.0, will require the use of air-injected oxidation catalysts. This catalyst results in a substantial increase of sulfuric acid emissions. Though there are several catalytic and non-catalytic technologies which can potentially meet the stricter HC, CO and NOX emission limitation without significant sulfuric acid emissions, there is little production potential for using these systems in the near term. (See discussion below).

While all scientists agree that sulfuric acid is a toxic and potentially dangerous pollutant, there is still disagreement on the quantities of emissions needed to pose a health risk and on how long it would take for the buildup in concentration levels to occur.

Major studies by government and industry have already begun in order to resolve some of these uncertainties. Much of the unknown about sulfuric acid results from our current inability to precisely measure how much sulfuric acid is being emitted by vehicles and our inability to precisely measure how much emitted sulfuric acid is being concentrated in the breathing zone.

To improve vehicle measurements, EPA is developing a new test driving cycle which will more accurately reflect emission of sulfuric acid and is jointly working with private industries on the relationship of catalysts and other control options to sulfuric acid. To improve our knowledge of the disposition of sulfuric acid once emitted into the air, EPA has instituted a long run trend study on one major highway and has jointed with State government agencies to measure roadside concentrations on other highways as well. EPA is also working with the State agencies to determine the change in sulfuric acid emissions as catalyst equipped vehicles age and accumulate mileage.

Until these and other studies are completed no final judgments on the potential health impacts of sulfuric acid emissions can be made. However, recent information presented in EPA's "Estimated Public Health Impact as a Result of Equipping Light Duty Motor Vehicles With Oxidation Catalysts" (January 30, 1975) suggested the following estimates of the years in which sulfuric acid emission levels from automobiles could pose a serious threat to public health.

Standard	Model Year 1/ in which Sulfuric Acid could pose a serious health problem: Average Meteorological Conditions	Adverse Meteorological Conditions 2/
1975 Interim Standards	1981	1979
1975 California Standards		
In 49 States	1979	1977
In California 3/	1978	1977

1/ The data assumes that there are no emissions of sulfates from stationary sources, and that 70 percent and 90 percent of the fleet in 1975 and 1976 respectively will utilize catalysts.

2/ Adverse meteorological conditions would occur in large metropolitan areas on an average of 6-7 days a year.

3/ The dates for reaching a critical problem are earlier in California than the remaining 49 States because California utilizes higher sulfur gasoline.

In interpreting the preceding table the following factors should be noted. Data available to date do not take into account "background" emissions of sulfates from stationary sources, e.g., coal-fired generating plants. Therefore, the table represents only the potential health effects of emissions from mobile sources. The extent to which sulfate emissions from stationary sources add to the potential health risk associated with sulfuric acid emissions from automobiles is not known at this time. However, most health analyses treat stationary source and mobile source emissions of sulfates independently. This is primarily because (1) the particle size of sulfates from stationary sources is much larger than sulfuric acid mist and is not absorbed as deeply into the respiratory system; (2) the toxicity of sulfate emissions from stationary sources is generally much less than sulfuric acid; and (3) emissions from stationary sources do not occur in the breathing zone as do automobile emissions.

Under certain adverse meteorological conditions localized sulfuric acid problems could occur. There are two short-term actions available to offset this possibility. While feasible, both have drawbacks.

- Gasoline blending - catalysts equipped vehicles could be provided with lead-free low-sulfur fuel. This would reduce emissions of sulfuric acid, but would impose an allocation problem on the industry. Refiners have also indicated that sufficient quantities would not be available to meet widespread problems beyond 1977 or 1978.

- Desulfurization of oil - technically possible at this time. Desulfurization would require substantial additional capital investment, at a time when refiners are attempting to expand domestic capacity. It would also require an increase in crude oil consumption due to additional refining. Increases in the price of gasoline would occur. Nationwide, the capital cost of desulfurization would range between $2 and $4 billion, crude oil consumption would increase .5 percent and the price of gasoline would increase by 1 to 2 cents per gallon.

Actions That May Increase or Create Pollutants:

It is generally agreed that reducing NOX emissions will result in an increase in the emissions of HC from engines. To reduce that increment manufacturers may increase the use of the air-injected oxidation catalyst -- even to meet the Federal Interim HC and CO standards. If this were the case, then nearly twice as much sulfuric acid would be generated as projected. At this time it is not known definitely whether manufacturers could achieve reductions of the HC increment through the use of engine modifications or modified catalyst equipment instead of the air-injected catalysts in 1977-78. However, if the HC and CO standards are also lowered after model year 1978 there is a high probability that the air-injection catalyst would be retained throughout the entire period.

There are other anecdotal problems with the converters such as potential fire hazards, hydrogen sulfide emissions and the creation of other potentially hazardous compounds, but none of these has been proven a significant risk.

Mandated reductions in the automobile emission standard will also narrow the choice of technological options to abate the three regulated pollutants. For example, if a sulfuric acid standard were set for model year 1979, implementation of the statutory standards for HC, CO and NOX in 1978 would, in essence, dictate the use of either "dual" or "three-way" catalyst technologies on most vehicles. While these catalysts have promise as abatement technologies they are still in the early stages of development and their premature implementation could possibily have adverse health effects far in excess of the benefits of reducing HC, CO and NOX.

Based on existing data, the dual catalyst system appears to be the most promising technology for meeting the statutory emission standards. However, its ability to limit sulfuric acid emissions to low concentrations, and thus meet a sulfuric acid standard, is still in question since an integral component of the dual catalyst system is an oxidation catalyst like those currently in use for 1975 model vehicles. Sulfuric acid emissions would increase if, to meet the statutory HC and CO standards, an air-injected oxidation catalyst were used.

If the statutory standards are in effect in 1978, along with a sulfuric acid standard in 1979, then it appears that the most likely technology to be used is the three-way catalyst -- a single device that simultaneously abates HC, CO and NOX.

However, to achieve these simultaneous reductions, extensive redesign and control of the fuel induction system must be undertaken because the three-way catalyst must be operated at stoichiometric (no excess air) conditions. In fact, the permitted margin of error is so narrow (on the order of ± 0.50 percent of the exact air to fuel ratio needed, as compared to normal production variations of ± 7 to 10 percent) that the use of an oxygen sensor and a feedback system are required to regulate the air mixture for either a carburetor or fuel-injection process.

When operating at the stoichiometric conditions, sulfate emissions would be no greater than emissions from non-catalyst cars. However, if variations from that condition occur, severe adverse health effect may be generated. Three-way catalysts applied to exhausts from engines operated outside the carburetion design limits (variations greater than ± 0.50 percent from stoichiometric) have a potential for emitting dangerous quantities of such toxic pollutants as hydrogen sulfide, carbonly disulfide, carbon disulfide and hydrogen cyanide.

It should be emphasized that only the most preliminary data exists on the total emissions from three-way catalysts and no firm judgment can be made on whether or not such emissions will occur in normal use, or in what quantities they will occur. However, they must be treated as potential risks until there is firm evidence that demonstrates otherwise. The development of this technology has not progressed to the stage where firm conclusions on their long run health impacts are possible.

The long run durability of this technology is also unproven at this time and several more years of testing and development seem needed before full scale introduction of three-way catalysts should be undertaken regardless of the emission standard mandated. Furthermore, the required changes in the fuel induction system would most likely require the use of electronic fuel injection, which is now available from component manufacturers only in very limited quantities. These manufacturers testified at the EPA suspension hearings that, after a decision had been made to use electronic fuel injection systems on a widespread basis, from 3 to 5 years would be required to design, manufacture, and deliver these components.

It seems clear, that given the limited health benefits derived from instituting the statutory standards (see #2 above) and given the unknown but potentially adverse health effects of introducing a technology which has not been thoroughly tested, the wiser choice is to avoid forcing either of these catalyst technologies into mass production at this time.

5. Auto emission standards have had an impact on fuel economy and, therefore, on our Nation's total petroleum demands and reliance on foreign sources.

The options presented will have differential fuel economy impacts.

Impact on 40 percent fuel economy goal

Alternatives	% over 1974	Shortfall (-) or excess (+) over President's goal
Statutory Standards after 1977	14-30%	-10 to -26%
Energy Independence Act	40%	--
EPA Recommendation	36%	- 4%
1975 Standards thru 1981	46%	+ 6%
Canadian & 1974 Standards thru 1981	46%	+ 6%

Alternatives*	Barrels per day (in 1980)
Statutory Standards after 1977	224,000 - 411,000 (loss)
Energy Independence Act	85,000 (loss)
EPA Recommendation	137,000 (loss)
1975 Standards thru 1981	0
Canadian and 1974 Standards thru 1981	0

* Base is 1975 model year automobiles meeting 1975 interim emission standards.

Energy Implications for lowering NOX to 2.0 grams/mile

It is generally agreed that a reduction in the NOX emission levels from 3.1 to 2.0 grams/mile will require engine modifications. It is estimated that these modifications will result in a fuel economy penalty of 3-4 percent on the average in 1980. If a 3 percent fuel penalty is assumed, an additional requirement of 85,000 barrels of oil per day will occur nationwide in 1980.

This estimated fuel penalty figure is the subject of debate, however, on two grounds. First, it has been argued that fuel penalties in 1980 assume that certain advanced engine technologies will be introduced over the next five years. However, these advanced technologies would not be available in the first two years. Therefore, at the year of introduction, initial fuel penalty resulting from lower NOX emission standards would be substantially greater. A range of between 5 and 7 percent, i.e., from 120,000 to 150,000 barrels per day is estimated, if the 2.0 grams/mile standard were adopted.

The second argument revolves around the very sensitive relationship that exists between fuel economy and NOX emissions at more stringent NOX standards than currently required. For a given level of HC emissions a dramatic drop in fuel economy is required to meet a NOX standard below 2.0 grams/mile. Because of mass production variations, to ensure that emission standards are met, manufacturers must design their emission systems well below the Federal standards -- about 23 percent lower. Thus, to meet a 3.1 gram/mile limitation, vehicles are designed to achieve 2.4 grams/mile and to achieve a 2.0 level, vehicles are designed to emit not more than 1.3 to 1.5 grams/mile. (To meet the statutory .4 grams/mile vehicles would have to be designed to meet about .3 grams/mile). Thus, designing vehicles to meet even the 2.0 standard places the fuel economy loss well within the sensitive range at which fuel economy begins to drop most rapidly. Attachment 4 (a) illustrates the general relationship between fuel economy and NOX emissions for all spark ignition engines while 4 (b) shows the situation for a specific class of V-8 engines.

Energy Implications of HC and CO Standards Tighter Than Those Currently In Force

Assuming a 3.1 gram/mile NOX standard, a fuel economy penalty of 3 to 5 percent is associated with emission standards for hydrocarbons and carbon monoxide of .9 and 9.0 grams/mile when compared to extending the current standards of 1.5 and 15 (i.e., 85,000 barrels of oil per day in 1980). Retention of the 1.5 (CO) and 15 (HC) levels until 1979 would avoid most of the penalty. Retention of the current standards through 1981 would allow continued fuel economy improvements as would the adoption of the Canadian standards.

Energy Implications of the Statutory Standards for HC, CO and NOX

With either the dual or three-way catalyst, a single device is used to abate all three regulated pollutants. Thus, at the statutory standards the energy impacts are not measured separately for NOX and HC/CO. On the average, the adoption of the statutory standard in 1978 would result in a fuel penalty of 7 to 17 percent by 1980 over 1975 vehicles. This would mean an energy loss of 224,000 to 411,000 barrels of oil per day in 1980.

Attachment 5 shows the specific fuel economy losses (or gains) associated with each of the options presented (and the anticipated costs) with respect to model year 1974.

Standards Tighter Than the 1975 Interim Will Result in Higher Initial Car Costs and Higher Operating Cost Due to Associated Fuel Penalties

The options presented will impose varying cost burdens on the consumer. Also, separate costs are associated with actions on NOX and actions on HC and CO, except for meeting the statutory standards with a dual or three-way catalyst system.

NOX:

Consumers will face sticker price and operating cost increases over the 1975 model vehicles if a 2.0 gram/mile limitation is imposed. Estimates range from $10-25 for front-end costs per vehicle and from $0-25 in operating costs over 50,000 miles. In addition, the consumers will pay the costs of increased fuel consumption associated with this lower standard, which rough estimates place at $1.7 million per day, or over 600 million dollars per year.

HC and CO:

The costs of adopting the more stringent hydrocarbon and carbon monoxide standards (.9 and 9.0) as proposed in the Energy Independence Act is estimated to be $50 per vehicle over 1975 automobiles. This would represent the additional costs of using the air-injected oxidation catalyst. Additional operating costs, which would result from the increased consumption of gasoline, are estimated at $1.7 million per day, or over 600 million dollars per year.

Statutory HC, CO and NOX:

Adoption of the statutory standards would result in a sticker price increase of $230 to $270 per vehicle over 1975 model cars. This would represent the average costs of using a mix of the dual and three-way catalyst systems. Operating costs resulting from the associated fuel penalties of this alternative would roughly be $4 million per day or over $1.5 billion per year.

6. The basic philosophy and approach to future auto emission controls needs to be reconsidered in light of current conditions

While the choice of emission standards must represent a balance among public health, air quality, esthetic, energy and cost considerations, the problems currently confronting the Nation are different from those prevailing in 1970 when the Clean Air Act was passed. Inflation, unemployment, and the added cost and reduced availability of energy call for reassessment of the relative weights accorded to various factors other than measures necessary to health. The high cost and fuel penalties caused by further tightening of the standards; and the emergence of the sulfuric acid problem, compared to the marginal improvement in HC, CO and NOX air quality also call for careful reconsideration.

(a) Significantly tighter standards at this time may preclude continued development of some technologies

There is substantial evidence that by model year 1981 new "lean-burn" or stratified charge" engines would permit meeting the lower (2.0) NOX standard. However, NOX standards more stringent than 2.0 would preclude introduction of those technologies. In fact, unless application of the current statutory NOX standard (.4 grams/mile) is delayed through at least 1990, the industry will not (and cannot) shift to a lean-burn or stratified charge engine, as far as can be foreseen.

(b) Actions to reduce auto emissions must take into account other sources of the same pollutant

Only 25 percent of total HC emissions are generated by automobile exhaust. Therefore, HC ambient air concentrations tend to be much less sensitive to the level of vehicle emission control than is carbon monoxide.

The projected increases in NOX cannot be stopped without major technological innovations in stationary source control. Therefore, regardless of how stringent an automobile standard is applied, the future concentration levels in major metropolitan areas will primarily be a function of stationary source emissions.

CO levels in the atmosphere are much more sensitive to changes in automobile emission controls than either HC or NOX. Unlike those pollutants, the growth of stationary sources over the next ten years all have little effect on CO air quality.

7. Prompt Congressional action is needed on auto emission standards

In order to meet deadlines for emission testing and certification of 1977 model cars, the automobile industry will need to know 1977 emission standards by early August 1975 so that there will be time to complete designing and engineering, build prototypes, complete emissions testing such as 50,000 mile endurance tests, and finally to produce new cars in adequate quantity to meet the demand from the American public.

Predicted Ambient Oxidant Concentration Levels in 1985
(In parts per million)
Ambient Standard = .08 ppm*

HC Automobile Emission Standard

Region	1974 and Canadian Standards through 1981	Current Stds through 1981	EPA's Recom-mended Stds	Energy Independ-ence Act Proposal	Statutory Stds 1977-1990	Base 1971-73
Birmingham	.12	.12	.11	.11	.11	.22
Mobile-Pensacola	.04	.04	.04	.04	.04	.11
Clark-Mohave	.13	.12	.12	.12	.12	.22
Phoenix-Tucson	.16	.16	.16	.16	.16	.19
Los Angeles	.43	.42	.42	.41	.41	.62
Sacramento Valley	.21	.20	.20	.20	.20	.24
San Diego	.20	.20	.20	.19	.19	.30
San Francisco	.23	.23	.23	.23	.23	.30
San Joaquin	.22	.21	.21	.21	.21	.26
S.E. Desert	.32	.32	.32	.32	.32	.28
Denver	.17	.16	.16	.16	.16	.28
NY-NJ-Conn.	.14	.13	.13	.13	.13	.26
Philadelphia	.10	.10	.10	.10	.10	.20
National Capital	.26	.26	.25	.25	.25	.38
Cincinnati	.12	.11	.11	.11	.11	.17
Indianapolis	.08	.08	.08	.08	.08	.14
S. Lou.-S.E. Texas	.20	.20	.19	.19	.19	.32
Boston	.11	.10	.10	.10	.10	.21
Toledo	.07	.07	.07	.07	.07	.14
El Paso-Las Cruces	.06	.06	.05	.05	.05	.13
Genessee-Finger Lakes	.08	.08	.08	.08	.07	.15
Dayton	.13	.12	.12	.12	.12	.18
Portland, Oregon	.08	.08	.08	.08	.08	.14
S.W. Penn.	.12	.12	.11	.11	.11	.21
Austin-Waco	.07	.07	.07	.07	.07	.16
Corpus-Christi	.14	.14	.14	.14	.14	.19
Dallas-Ft. Worth	.05	.05	.05	.05	.04	.13
Houston-Galveston	.27	.27	.27	.27	.26	.32
San Antonio	.07	.07	.07	.07	.06	.15
Puget Sound	.08	.08	.08	.08	.08	.16

* The projected concentration levels assume the continuance of historic growth rates in the central business districts in each region.

The effect of a higher, areawide or "metropolitan growth rate" on oxidant concentrations was also considered. The metro-growth rate assumes a much higher rate of growth in vehicle miles traveled and includes entire metropolitan areas rather than central business districts alone. However, predicted ambient concentration levels for oxidants using the higher growth rate are only marginally higher than predicted concentration levels using the CBD growth rate for all the HC auto-emission alternatives studied. More importantly, only three areas (Indianapolis, Genesse-Finger Lake and San Antonio) which would achieve the standard using the CBD growth rate, would exceed the standard by a very marginal amount if the higher metro-growth rate were assumed.

Therefore, assumption of the higher growth rate would not change the above analysis or conclusions about the impact of HC auto standards on photochemical oxidant concentration levels.

Predicted Ambient Carbon Monoxide Concentration Levels in 1985
(In parts per million)
Ambient standard = 9 ppm

CO Automobile Emission Standard

Region	1974 and Canadian Standards through 1981	Current Stds through 1981	EPA's Recommended Stds	Energy Independence Act Proposal	Statutory Stds 1977-1990	Base 1971-73
Birmingham	6	5	5	5	4	18
North Alaska	11	11	11	11	11	35
Clark-Mohave	6	6	5	5	5	15
Phoenix-Tucson	16	14	14	13	12	42
Los Angeles	13	12	11	11	10	41
Sacramento Valley	7	6	6	6	5	22
San Diego	5	5	5	5	4	15
San Francisco	6	6	6	6	6	18
San Joaquin	4	3	3	3	3	13
Denver*	11	11	9	9	8	33
Hartford-New Haven	9	9	7	7	7	27
NY-NJ-Conn.	15	13	13	13	11	51
Philadelphia	9	8	8	8	8	32
National Capital	7	6	6	6	6	20
E. Washington-N. Idaho	7	7	6	6	6	18
Chicago	7	6	6	5	5	23
Indianapolis	5	4	4	4	4	15
Kansas City	6	5	5	5	4	15
Baltimore	7	7	7	7	6	18
Boston	6	5	5	5	4	18
Minneapolis-St. Paul	9	8	8	7	7	22
Central New York	5	4	4	4	4	15
Portland, Oregon**	10	8	8	8	7	26
S.W. Penn.	7	6	6	6	5	22
Wasatch Front	15	13	13	13	11	41
Puget Sound**	10	8	8	8	7	24

*Would not meet the ambient standard in 1985 if the Current Interim, 1974 or Canadian CO standard for vehicles were adopted through 1981

**Would meet the ambient standard under all options except the 1974 or Canadian vehicle CO standard

Attachment 3 A&B

Nitrogen Dioxide

Chart A displays ambient concentration levels in 1985 for NO2 in the ten problem regions under various NOX auto-emission standards. For example, column 1 shows that if a 3.0 gr/mile auto-NOX standard were in force from 1977 to 1990, Philadelphia's ambient NO2 concentration levels in 1985 are predicted to be 121 ug/m^3. Column 5 shows that if an NOX standard of 2.0 gr/mile were adopted for the 1977-1981 period, followed by the statutory (.4) standard until 1990, then Philadelphia's ambient NO2 level in 1985 is predicted to be 113 ug/m^3.

Chart B shows the average percentage increases in NO2 concentration levels for all ten regions for each alternative NOX level. For example, column 2 shows that if the NOX emission level were 3.1 gr/mile from 1977-1981 and 2.0 gr/mile from 1982-1990, the NO2 concentration levels are predicted to increase by 16% in 1980 and by 26% in 1985. Column 3 shows that if the NOX standard were 2.0 from 1977 to 1990, NO2 levels are predicted to increase by 12% and 22% in 1980 and 1985 respectively.

A. Predicted Ambient Nitrogen Dioxide Concentrations in 1985
(In micrograms per cubic meter)
Ambient standard is 100 micrograms per cubic meter*

Effective Date of Standard	(NOX Emission Standard (in grams per mile))					
	(1)	(2)	(3)	(4)	(5)	(6)
1977-1981	3.1	3.1	2.0	3.1	2.0	0.4(1978)
1982-1990	3.1	2.0	2.0	.4	.4	0.4
Region						
Phoenix	111	105	100	98	93	87
Los Angeles	194	183	173	167	157	145
San Francisco	102	96	92	89	83	77
Denver	135	129	125	123	117	112
NY-NJ-Conn.	144	139	136	132	129	124
Philadelphia	121	119	117	115	113	109
National Capital	116	111	107	105	101	96
Chicago	152	148	145	143	139	134
Baltimore	116	112	109	107	103	99
Wasatch Front	137	131	124	121	115	108

B. Increases in Concentration Levels in 1980 and 1985

		(1)	(2)	(3)	(4)	(5)	(6)
Average percent increase in air quality concentrations	1980	16	16	12	16	12	6
	1985	32	26	22	19	14	8

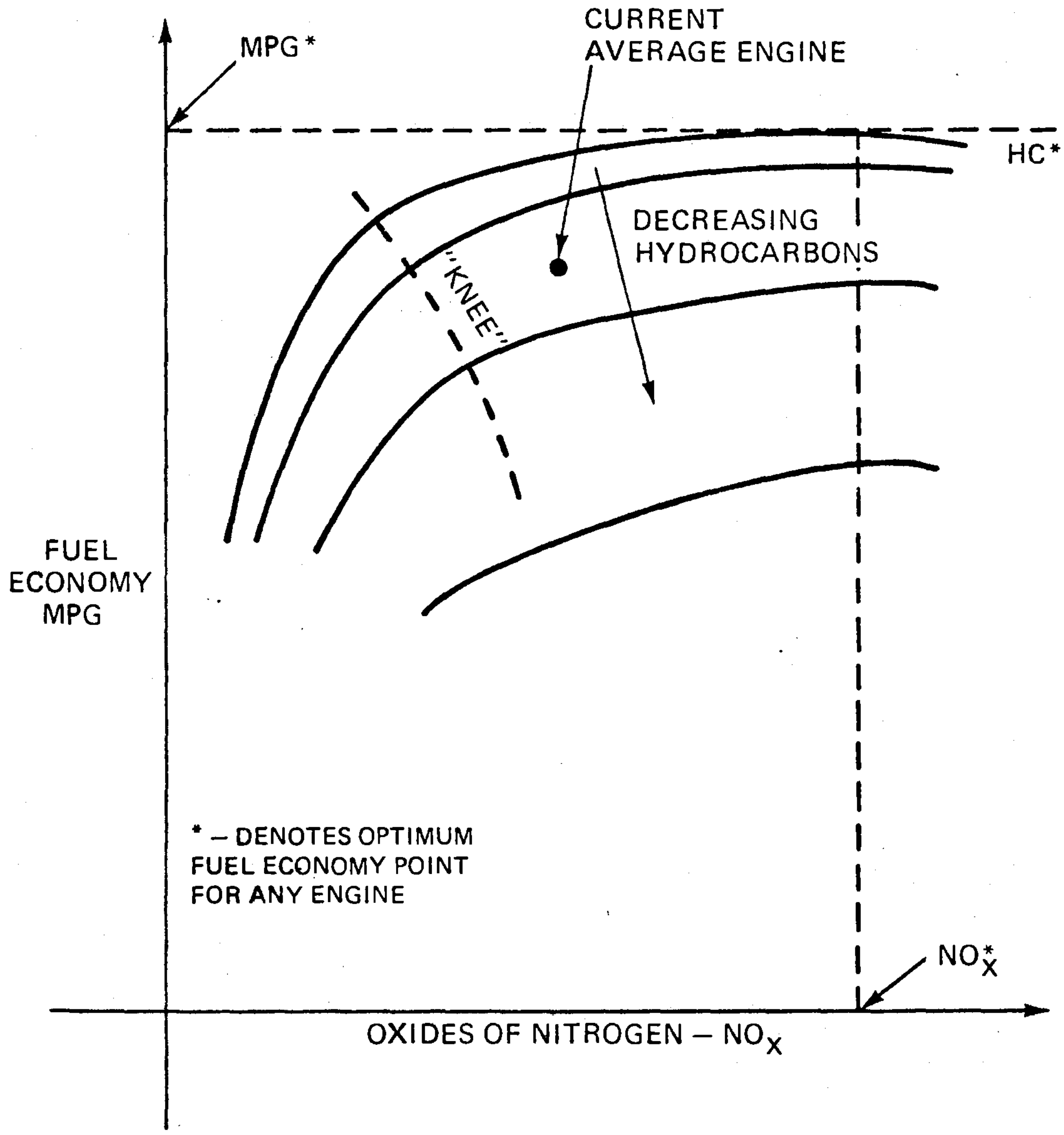
*The projected concentration levels assume the continuance of historic growth rates for the central business districts in each region. The effect of a higher, areawide or "metropolitan growth rate" on NO2 concentrations was also considered. The metro-growth rate assumes a much higher rate of growth in vehicle miles traveled (VMT) and includes entire metropolitan areas rather than central business districts alone. Ambient levels of NO2, using the metro-growth rate were considerably higher under all the auto-emission alternatives presented. When comparing 1985 percentage increases (Chart B) using a metro-growth rate as opposed to the CBD growth rate, average NO2 concentration levels are predicted to increase by 46% as compared to 33% for a long term 3.1 gr/mile NOX standard (Column 1); 33% as compared to 22% for a long term 2.0 gr/mile NOX standard (Column 3) and 16% as compared to 8% for the statutory standard (Column 6).

The higher predicted NO2 concentration levels that result from assuming the metro-growth

Nitrogen Dioxide cont'd.

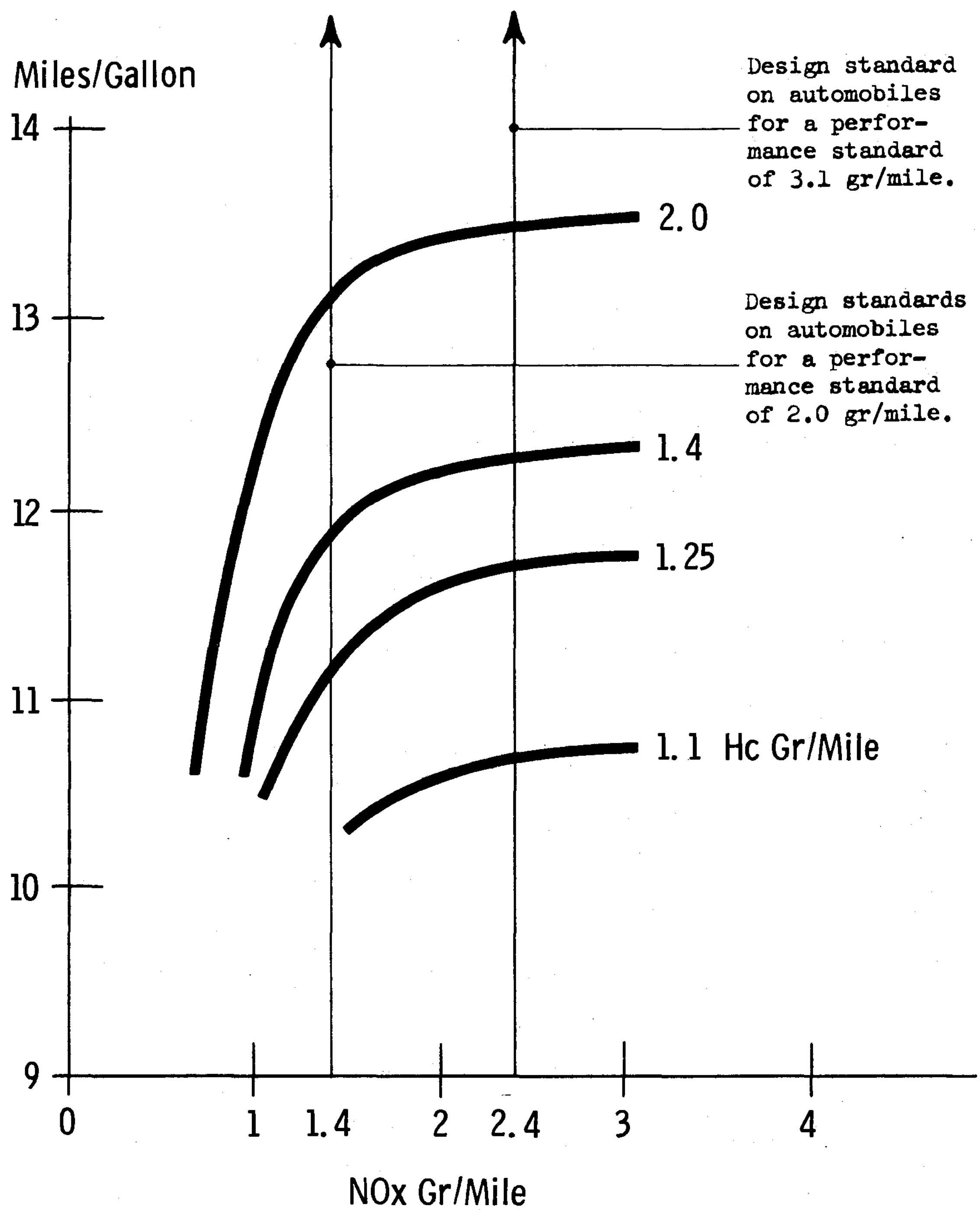
rate strongly suggest that the choice of NOX emission standard for automobiles would have even less impact on the ability of communities to maintain the ambient standard than is the case above, using the CBD growth rate. In fact, if the higher growth rate is assumed, all ten regions are predicted to exceed the ambient NO2 standard by 1985 regardless of the auto emission limit chosen for NOX. The only exception would be San Francisco, which would stay below the standard if the statutory auto standard for NOX were implemented in 1978.

MAXIMUM FUEL ECONOMY POTENTIAL VERSUS EMISSIONS
FOR 1980 ENGINES UNDER OPTIMAL CONTROL



NOTE:
1. CURVE SHAPES ARE REPRESENTATIVE OF MOST ALL SPARK IGNITION ENGINES.
2. STATUTORY NO_X STANDARD IS BELOW THE "KNEE" FOR ALL ENGINES CAPABLE OF LARGE SCALE PRODUCTION THROUGH THE MID 1980's'
3. THE OPTIMUM-MPG* AND RESULTING NO_X^* AND HC* ARE SIGNIFICANTLY GREATER THAN THE ENGINE OUT PERFORMANCE OF 1975 CARS.

FUEL-ECONOMY-NOX EMISSION TRADE OFF



Attachment 5

1980 New Car Fuel Economy and Cost
Versus Emission Standards

Emission Standards For 1977-1981	Cost Per New Car For Emission Controls Compared to 1974 Cars		New Car Average Fuel Economy in 1980			
					Uncertainty Range in % Over 1974 Due to	
	Cost	Uncertainty	MPG	% Over 1974	Engine Technology	Sales Mix
1. Statutory Standards after 1977 (three-way catalyst or dual catalyst)	$350	$215-$450			-4% to + 8%	-4% to +7%
2. Base - 1.5/15/2.0 or 0.9/9.0/3.1						
With Catalysts	120	$ 90-$150	19.6	40%	-3% to + 3%	
No Catalysts	50	$ 40-$100	18.4	31%	-4% to + 8%	-4% to +7%
3. EPA Proposal						
With Catalysts	135	$100-$170	19.0	36%	-5% to + 8%	
No Catalysts	65	$ 50-$110	17.8	27%	-4% to +12%	-4% to +7%
4. 1975 Standards						
With Catalysts	95	$ 70-$110	20.4	46%	-2% to + 2%	
No Catalysts	35	$ 25-$ 65	19.2	37%	-3% to + 7%	-4% to +7%
5. Canadian or 1974 Standards With or Without Catalysts	25	$ 5-$ 35	20.4	46%	-2% to + 1%	-4% to +7%

File

THE WHITE HOUSE

WASHINGTON

July 26, 1975

Dear Mr. Speaker:

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As indicated in that message, I have concluded that automobile emission standards should not be more rigid than those applied to 1975 and 1976 model cars because more rigid standards unnecessarily would increase car prices, reduce gasoline mileage, and increase energy demands. There is also the potential that tighter standards would require emission controls that result in new pollutants with serious health impact.

I am enclosing a draft of a bill which would implement the recommendations described in detail in my June 27th message. I urge prompt passage of this bill.

Sincerely,

Gerald R. Ford

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Washington, D.C. 20515

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Be it enacted by the Senate and the House of Representatives of the United States of America in Congress assembled,

Sec. 2. The Clean Air Act, as amended, is amended as follows:

(a) Section 202(b)(1)(A) is amended to delete therefrom "1977" and insert in lieu thereof "1982."

(b) Section 202(b)(1)(A) is further amended to delete the last sentence therefrom and insert the following sentence in lieu thereof:

"The regulations under subsection (a) applicable to emissions of carbon monoxide and hydrocarbons from light-duty vehicles and engines manufactured during model years 1975 through 1981, inclusive, shall contain standards which are identical to the interim standards which were prescribed (as of December 1, 1973) under paragraph (5)(A) of this subsection for light-duty vehicles and engines manufactured during model year 1975.

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"The regulations under subsection (a) applicable to emission of oxides of nitrogen from light-duty vehicles and engines manufactured during model years 1975 through 1981 inclusive shall contain standards which are identical to the standards prescribed (as of December 1, 1973) under subsection (a) for light-duty vehicles and engines manufactured during model year 1975. The regulations under subsection (a) applicable to oxides of nitrogen from light-duty vehicles and engines manufactured during or after model year 1982 shall be established at such level as the Administrator determines is appropriate considering air quality, energy efficiency, availability of technology, cost, and other relevant factors. The Administrator shall publish for public comment no later than July 1, 1977, proposed standards for 1982 model year light-duty vehicles and engines and his tentative conclusions with respect to the matters he is required to consider under this paragraph and shall publish his final standards and his findings no later than July 1, 1978. Such standards may be revised after appropriate notice following such date based upon substantial changes in any of the factors the Administrator is required to consider under this paragraph.

IMMEDIATE RELEASE July 26, 1975

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FOR IMMEDIATE RELEASE JULY 28, 1975

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THE WHITE HOUSE

FACT SHEET

AUTOMOBILE EMISSION STANDARDS

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The President also asked the Chairmen of the Senate and House Committees which have jurisdiction over the Clean Air Act to hold public hearings so that Administration witnesses can present findings from the executive branch study which led to the President's conclusion that current standards should be continued.

BACKGROUND

- As the Clean Air Act now stands, Federal auto emission standards for 1977 would be tightened from current standards for oxides of nitrogen (NOx), and standards for 1978 model cars would be tightened for hydrocarbons (HC), carbonmonoxide (CO), and still further for oxides of nitrogen (NOx).
- On June 27, 1975, the President sent to Congress a special message which:
  - summarized the findings of an extensive executive branch study of the air quality, public health, consumer cost, gasoline mileage, and other implications of alternative emission standards; and
  - presented his conclusions that the best balance among the various important objectives could be achieved by continuing 1975-76 standards through the 1981 model year.
- Subcommittees of the Senate Committee on Public Works and the House Committee on Interstate and Foreign Commerce are now considering changes in the Clean Air Act.

THE PROPOSED LEGISLATION

The bill proposed by the President would amend the Clean Air Act to continue 1975-1976 auto emission standards for hydrocarbons (HC), carbonmonoxide (CO) and oxides of nitrogen (NOx) through the 1981 model year. The Federal standards, in grams per mile, would be:

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The interagency study considered the air quality, health, consumer cost and energy impacts of various alternative emission standards that could be applied to 1977 and future model cars. The alternative standards considered in the study ranged from standards less stringent than the current ones (i.e., Canadian standards and 1973-74 U.S. Standards) to those now prescribed in the Clean Air Act for 1978 and future years. In summary, the principal conclusions from the interagency study were:

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IMMEDIATE RELEASE July 26, 1975

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FOR IMMEDIATE RELEASE JULY 28, 1975

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# # # #

April 9, 1976

Congressman Broyhill:

Attached is a copy of the auto emissions study that was accomplished at the request of Congressman Dingell.

A copy of this report was delivered to him today.

Since the report was prepared at John Dingell's request, we ask you to withhold distribution of the paper until released by Dingell early next week.

I have advised Congressman Dingell that we are making these copies available.

Charles Leppert, Jr.
Deputy Assistant
to the President

PAT ROWLAND DELIVERED TO REPS. ROGERS, SATTERFIELD, CARTER AND BROYHILL BY HAND ON THIS DATE

CL:kar

FEDERAL ENERGY ADMINISTRATION
WASHINGTON, D.C. 20461

OFFICE OF THE ADMINISTRATOR

April 8, 1976

Honorable John Dingell
Chairman
Subcommittee on Energy and Power
House of Representatives
Washington, D.C. 20515

Dear John:

On March 19, 1976 you asked for a detailed report representing the coordinated views of the Department of Transportation, Environmental Protection Agency and the Federal Energy Administration on the effects of several specific alternative schedules of emission standards for automobiles. In particular, you asked that the effects of each emission control schedule be compared to the effects of a schedule incorporated in the amendment you offered during the Interstate and Foreign Commerce Committee mark-up of the Clean Air Act Amendments of 1976, which includes the same schedule as that suggested by EPA Administrator Russell Train on March 5, 1975. The effects you desired to have compared are: 1) vehicle fuel consumption (percentage of fuel economy penalty by model year), 2) health benefits, 3) consumer purchase cost penalty, 4) added consumer maintenance and replacement costs, 5) total consumer operating costs differential, by model year.

Upon receipt of your request, the technical staff of DOT, EPA and FEA undertook preparation of an analysis and report that is responsive to your request. That analysis and report is attached.

Sincerely,

Frank G. Zarb

Enclosure

ANALYSIS OF SOME EFFECTS OF SEVERAL SPECIFIED ALTERNATIVE AUTOMOBILE EMISSION CONTROL SCHEDULES

April 8, 1976

prepared by

U.S. Department of Transportation
Environmental Protection Agency
Federal Energy Administration

ANALYSIS OF SOME EFFECTS OF SEVERAL SPECIFIED ALTERNATIVE AUTOMOBILE EMISSION CONTROL SCHEDULES

This analysis is the product of a coordinated effort among the U. S. Department of Transportation, the Environmental Protection Agency, and the Federal Energy Administration to compare certain specific effects of several schedules for implementing more stringent automobile emission control standards. This analysis was prepared in response to a request to the Economic Policy Board, Executive Office of the President, by letter of March 19, 1976, from Congressman John D. Dingell.

The specific emission control schedules are set forth in detail in Appendix A. For convenient reference, the schedules are identified in this analysis as follows:

Schedule	Brief Description of Schedule
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in the current Senate Public Works Committee Bill, S.32.9
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Analytical Assumptions

Any analysis of this type must make a number of assumptions. Two assumptions were necessary to permit the comparison of the effects on fuel economy of the various emission control schedules. These assumptions deal with anticipated changes in average vehicle weight and with the mix of vehicle size-classes sold, each of which factors has a significant effect on fuel economy.*

1. It has been assumed that major vehicle weight reduction programs will occur regardless of which emission control schedule is imposed. The projection of vehicle weight trends through model year 1985 used in this analysis is set forth in Appendix B. It is based on the announced plans of manufacturers to introduce lighter weight cars through the end of the 1970's and an assessment of engineering design practicality for the later years. It is not a judgment or prediction that manufacturers will in fact produce cars in accordance with the projection of average weight.

2. Average fuel economy of the new-fleet depends not only on the weight of individual cars offered for sale, but also on the mix in which such models are sold. For the purpose of this analysis it has been assumed that the model mix listed below, (which approximates the anticipated 1976 model year sales), will continue through 1985, i.e.:

40 percent full-size cars (6 passenger capacity)
30 percent medium-size cars (5 passenger capacity)
30 percent small-size cars (4 passenger capacity)

Cars in each size class in 1985 would be lighter in weight than cars in the same size class in 1976 and would accommodate its designated number of passengers in reasonable comfort. The actual sales mix in future years

---

*"Fuel economy" throughout this analysis refers to fuel economy based on the EPA composite city-highway driving schedule.

will be determined by consumer desires, manufacturer's decisions, and actions by the Federal government. Nevertheless, this assumption about the sales mix of cars is reasonable for the purposes of this analysis.

In addition, one must recognize that there is considerable uncertainty in making predictions of the impact of technology that is not currently in use. Thus, with the exception of Schedule E, estimates for all emission control schedules are given in terms of a lower and an upper range, by reference to the fuel economy effects.

For schedule E, which would extend indefinitely the currently applicable emission standards, the assumptions used are spelled out in Appendix C. The low range estimates assume use of technology that is already in production, is being certified for use in 1977 cars, or has otherwise been extensively tested and demonstrated to be feasible by the auto industry. It tends to undervalue the technological improvements that may be made and used in the later years. The high range estimates assume that each manufacturer will be able to make full use of all promising technology that is potentially available even though such technololgy requires further development, comprehensive testing, and reduction to commercial production practice before it can be fully judged to be available, and thus it presents benefits that may not actually be achieved in the years under consideration. Appendix D gives a detailed discussion of emission control technologies assumed to be used for each range of estimates.

Finally, in each case in which a schedule provides for administrative discretion in establishing the NO_x standard that must be met, this analysis has assumed that the least stringent permissable NO_x standard would be established.

Section 1. Fuel Economy Impacts of the Several Schedules for Emission Control

Estimated fuel economy impacts are presented in terms of miles per gallon for the new car fleet for each model year (Table 1a) and of percentage differences of fuel economy for each schedule relative to Schedule DT (Table 1b), rounded to the nearest full percent. New car fleet average fuel economy was 14 mpg in 1974 and 15.8 mpg in 1975.

Table 1c presents the lifetime fuel consumption of the new car fleet by model year for the DT schedule. It also presents the differences in lifetime fuel consumption in each model year for each schedule with the DT schedule as reference. Plus numbers represent consumption greater than Schedule DT and minus numbers represent savings in fuel. The analysis has assumed that the average car is driven 100,000 miles and that the annual new car fleet is 10 million cars. By comparison, the nation's automobile fleet today consumes approximately 75 billion gallons of gasoline annually, or about 5 million barrels of oil per day. As a perspective on the magnitude of these amounts, note that about 2 million barrels per day are expected to flow through the Alaskan pipeline when in full operation.

These tables reflect only the use of gasoline engine powered vehicles. The use of diesel engines in place of a small fraction (10 percent to 20 percent by 1985) of gasoline engines would result in a small but significant improvement in fuel economy and a resulting reduction in fuel consumption of 4 percent to 7 percent by 1985 over the improvements predicted for gasoline engines alone. The corresponding reduction in lifetime new car fleet fuel consumption for the 1985 model year cars ranges between 1.5 and 2.4 billion gallons. Table D-3 of Appendix D shows the impact of diesel vehicle on new car fleet average fuel economy.

TABLE 1a

Estimated Fuel Economy of New Car Fleet in Miles Per Gallon by Model Year, for Each Schedule of Emission Control

Model Year	Low Range DT	Low Range A-C	Low Range B	Low Range D	High Range DT	High Range A-C	High Range B	High Range D	Reference E
1976	17.6	→			17.6	→			17.6
1977	18.4	→			19.0	→			19.0
1978	20.7	19.7	20.7	20.7	21.1	20.9	21.1	21.1	21.1
1979	21.8	20.8	19.8	21.8	22.2	22.2	21.8	21.2	22.2
1980	21.7	20.6	20.2	20.6	23.1	22.9	22.4	22.9	23.1
1981	23.0	22.0	21.6	22.0	24.5	24.5	24.0	24.5	24.5
1982	23.3	23.3	23.0	23.3	25.9	25.9	25.6	25.9	25.9
1983	24.6	24.6	24.2	24.6	27.2	27.2	27.2	27.2	27.2
1984	26.2	26.2	25.6	26.2	28.8	28.8	28.8	28.8	28.8
1985	27.0	25.7	26.6	25.7	29.7	26.7	29.7	26.7	29.7

TABLE 1b

Percentage Fuel Economy Difference of New Car Fleet, by Model Year, Comparing Each Schedule to Schedule DT

Model Year	Low Range A-C	Low Range B	Low Range D	Low Range E	High Range A-C	High Range B	High Range D	High Range E
1976	–	–	–	–	–	–	–	–
1977	–	–	–	+3%	–	–	–	–
1978	-5%	–	–	+2%	-1%	–	–	–
1979	-5%	-9%	–	+2%	–	-2%	–	–
1980	-5%	-7%	-5%	+6%	-1%	-3%	-1%	–
1981	-4%	-6%	-4%	+7%	–	-2%	–	–
1982	–	-1%	–	+11%	–	-1%	–	–
1983	–	-2%	–	+11%	–	–	–	–
1984	–	-2%	–	+10%	–	–	–	–
1985	-5%	-1%	-5%	+10%	-10%	–	-10%	–

TABLE 1c

Lifetime New Car Fleet Fuel Consumption - Total for Schedule DT and Differences for Other Schedules Relative to Schedule DT, for Low Range and High Range, by Model Year. (In billions of gallons)

	Low Range Projections					High Range Projections				
	Fuel Consumption	Consumption Differences				Fuel Consumption	Consumption Differences			
Model Year	DT	A-C	B	D	E	DT	A-C	B	D	E
1976	56.82	0	0	0	0	56.82	0	0	0	0
1977	54.35	0	0	0	-1.72	52.63	0	0	0	0
1978	48.31	2.45	0	0	-0.92	47.39	.46	0	0	0
1979	47.72	0.46	2.89	0	-2.57	45.05	0	.82	0	0
1980	46.08	2.46	3.42	2.46	-2.79	43.29	.38	1.35	.38	0
1981	43.48	1.97	2.82	1.97	-2.66	40.82	0	.85	0	0
1982	42.92	0	.56	0	-4.31	38.61	0	.45	0	0
1983	40.65	0	.67	0	-3.89	36.76	0	0	0	0
1984	38.17	0	.89	0	-3.45	34.72	0	0	0	0
1985	37.04	1.87	.55	1.87	-3.37	33.67	3.78	0	3.78	0

.4 NO_x will cost even with tech. miracle

Section 2. Health Benefits

Tables 2a and 2b present the air quality effects of the emission control schedules while Tables 2c, 2d, and 2e present selected health effect indicators associated with HC, CO, and NO_x, respectively, for the schedules. This analysis draws upon the recent comprehensive report on air quality and health consequences of changing automobile emission standards prepared by EPA for the Air Quality, Noise, and Health Panel of the Task Force on Motor Vehicle Goals Beyond 1980.

A high degree of stringency of stationary source control for automotive related pollutants was assumed in the analysis as was the imposition of programs such as inspection and maintenance to ensure minimum deterioration of emission control over the lifetime of the car. Less optimistic assumptions would have produced less air quality improvement and a higher level of health effects. However, since the same set of assumptions has been applied to all schedules, the relative ranking of the emission control schedules in terms of air quality and health effects would probably not be affected.

There are two points that should be kept clearly in mind in considering the results presented here. First, it should be noted that the health effects indicators represent only a partial listing of the effects from high air pollution levels and are not intended to represent a statement of gross benefits from pollution control. Their primary significance is in the context of relative differences between emission control schedules.

Second, there is a high degree of uncertainty in making both air quality and health impact projections. The data base is limited and in some cases still subject to scientific debate, and the methodologies are subject to additional development. As a result the estimates below may well be too high or too low, and they may vary relative to each other.

Table 2a presents projections of the percentage reduction in ambient concentration of mobile source related air pollutants in 1990 in comparison with base years in the early 1970's for the DT emission control schedule. It also presents the percentage point differences for the other schedules relative to the DT schedule. Plus numbers indicate improvements in air quality while negative numbers indicate relatively poorer air quality. For all schedules, there is improvement in the oxidant and carbon monoxide air quality relative to the base years.

Table 2b summarizes the number of air quality control regions that are projected to exceed the national primary ambient air quality standard for each pollutant in 1990 for each emission control schedule.

Table 2c gives the projected numbers of aggravation of heart and lung disease in elderly patients, incidents of eye irritation, and excess headaches in 1980, in 1990, and for the total period from 1980 through 1990 due to oxidants which is controlled through reductions in hydrocarbon emissions. The effects in 1980 are predominantly due to the cars in use in 1980 which, for the most part, reflect less stringent hydrocarbon emission standards than the standards in the schedules considered in this analysis. The 1990 numbers are associated with the cars that are produced to meet the specific emission control schedule. There are other health effects of oxidants than those listed.

Table 2d presents some health effects indicators of ambient carbon monoxide; specifically, excess cardiac deaths and excess person hours of disability. As with oxidants, the health effects in 1980 are due to the older cars still on the road in that year. The 1990 health indicators reflect the cars that meet the standards in the emission control schedules.

Table 2e gives health effect indicators of oxides of nitrogen emissions in 1980, 1990, and cumulated for the period from 1980 through 1990. The health effect indicators are lower respiratory disease (chest colds, bronchitis, croup, pneumonia) in children and days of restricted activity due to lower respiratory disease in children. Even though the oxides of nitrogen emissions from automobiles decline relative to the peak year, oxides of nitrogen from other sources are projected to increase even more rapidly so that the health effect indicators are projected to increase from 1980 to 1990 for all emission control schedules considered in this analysis.

TABLE 2a. Percentage Reduction in Pollutant Concentrations in 1990 from Base Year for Schedule E and Percentage Point Differences for Other Schedules Relative to Schedule DT (1975)

Pollutant	Percentage Reduction Schedule DT	Differences Relative to Schedule DT Schedules A-C	B	D	E
HC (Oxidant)	41	0	1%	0	-5%
CO	81	0	2%	0	-5%
NO_x	-17%	13%	9%	11%	-12%

TABLE 2b. Number of Air Quality Control Regions Exceeding Ambient Air Quality Standard in 1990 for Each Emission Control Schedule

Pollutant	Emission Control Schedule DT	A-C	B	D	E
HC (Oxidant)	31	31	30	31	32
CO	0	0	0	0	3
NO_x	8	8	8	8	9

Table 2c. Selected Health Effect Indicators for Hydrocarbon Emission (Oxidant Effects) in 1980, in 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

Time Period	Emission Control Schedule	Projected Health Consequences: Aggravation of Heart and Lung Disease in Elderly Patients (in thousands)	Eye Irritation (in thousands)	Headache (in thousands)
Base Year		43	2,160	3,200
1980	DT	35	1,750	2,650
	AC	34	1,725	2,630
	B	33	1,700	2,600
	D	36	1,775	2,680
	E	36	1,800	2,700
1990	DT	9	525	1,000
	AC	9	510	1,000
	B	9	500	1,000
	D	9	510	1,000
	E	13	690	1,200
Cumulative 1980-1990	DT	177	9,700	15,000
	AC	176	9,700	15,100
	B	175	9,400	14,800
	D	177	9,700	15,000
	E	210	10,900	17,100

Selected Health Effect Indicators for Carbon Monoxide Emissions in 1980, 1990, and Cumulative from 1980 through 1990 for each Emission Control Schedule

Time Period	Emission Control Schedule	Projected Health Consequences: Excess Cardiac Deaths (Units)	Projected Health Consequences: Excess Person Hours of Disability
Base Year		20.0	330,000
1980	DT	1.4	32,000
	A-C	1.4	31,000
	B	1.4	20,000
	D	1.4	32,000
	E	2.0	33,000
1990	DT, A-C B, D, E	0	0
Cumulative Impact Between 1980 and 1990	DT	5	83,000
	A-C	5	80,000
	B	5	67,000
	D	5	83,000
	E	5	110,000

TABLE 2e. Selected Health Effect Indicators for Oxide of Nitrogen Emissions in 1980, in 1990, and Cumulative from 1980 through 1990 for Each Emission Control Schedule

		Projected Health Consequences	
Time Period	Schedule	Excess Attacks of Lower Respiratory Disease in Children (in thousands)	Excess Days of Restricted Activity from Lower Respiratory Disease in Children (in thousands)
Base Year		700	1,900
1980	DT	740	2,000
	A-C	740	2,000
	B	740	2,000
	D	740	2,000
	E	760	2,100
1990	DT	880	2,300
	A-C	730	2,000
	B	770	2,100
	D	750	2,000
	E	1,450	3,900
Total Impact Between 1980 and 1990	DT	8,100	21,000
	A-C	7,350	19,800
	B	7,550	20,400
	D	7,450	20,100
	E	11,100	30,000

Section 3. Consumer Cost Impacts

The estimate for impact in terms of consumer costs is presented in terms of differences (in 1975 dollars) between each emission control schedule and schedule DT, for the low range and high range estimates. The cost differences are presented as undiscounted lifetime cost per vehicle, which consists for the sum of additional new car cost (sticker price), lifetime maintenance cost, and lifetime fuel costs at 60 cents per gallon for gasoline, assuming the average car is driven 100,000 miles during its life. Table 3a presents these estimates for the low range; Table 3b presents these estimates for the high range. Negative numbers represent cost savings. Appendix E is a discussion of the assumptions and methodology used in obtaining these results. For perspective, these costs should be compared to the lifetime cost of an average 1976 passenger car of approximately $16,700.

Table 3c presents the undiscounted lifetime costs for the entire new car fleet in each model year, parallel to Tables 3a and 3b, assuming 10 million cars in each model year. Note that the numbers in Table 3c are exactly 10,000,000 times greater than the numbers in Tables 3a and 3b. It is useful to note that the aggregate lifetime cost of the 1976 model year fleet, at 10 million cars, would be about 167 billion dollars. Undiscounted costs tend to over value costs incurred in later years relative to first costs. Discounting at a 10 percent rate and using the typical schedule of miles driven as a function of age of car would change the numbers in all three tables to some extent but probably would not change the relative rankings between emission control schedules.

Comparison of Incremental Lifetime Cost Per Vehicle 1/
for Each Emission Control Schedule Relative to Schedule DT

Emission Control Schedule

TABLE 3a (Low Range) / TABLE 3b (High Range)

Model Year	A-C (Low)	B (Low)	D (Low)	E (Low)	A-C (High)	B (High)	D (High)	E (High)
1976	Base				$ 0	$ 0	$ 0	$ 0
1977	Same as 1976				0	0	0	- 20
1978	$197	$ 0	$ 0	$- 55	83	0	0	- 20
1979	78	223	0	-154	55	124	0	- 20
1980	147	540	147	-217	63	266	63	- 55
1981	118	504	118	-210	40	236	40	- 55
1982	0	369	0	-209	0	217	0	-100
1983	335	375	335	-283	70	190	70	-100
1984	335	388	335	-257	70	190	70	-100
1985	462	368	447	-252	357	190	277	-100

TABLE 3c

Comparison of Incremental Lifetime Cost of New Car Fleet 1/
for Each Emission Control Schedule Relative to Schedule DT
(dollars in billions)

Emission Control Schedule

Model Year	A-C (Low Range)	B (Low Range)	D (Low Range)	E (Low Range)	A-C (High Range)	B (High Range)	D (High Range)	E (High Range)
1976	Base		$ 0	$	$ 0	$ 0	$ 0	$ 0
1977	Same as 1976		0	-1.03	0	0	0	- .20
1978	$1.97	$ 0	0	- .55	.83	0	0	- .20
1979	.78	2.23	0	-1.54	.55	1.24	0	- .20
1980	1.47	5.04	1.47	-2.17	.63	2.66	.63	- .55
1981	1.18	5.04	1.18	-2.10	.40	2.36	.40	- .55
1982	0	3.69	0	-2.09	0	2.17	0	-1.00
1983	3.35	3.75	3.35	-2.83	.70	1.90	.70	-1.00
1984	3.35	3.88	3.35	-2.57	.70	1.90	.70	-1.00
1985	4.62	3.68	4.47	-2.52	3.57	1.90	2.77	-1.00

consumer costs

4.57B

1/ All costs expressed in 1975 dollars, undiscounted.

Emission Control Schedules

The table below presents the emission standards assumed to be applicable to new cars in each model year for the analysis provided in this report.

Schedule	Brief Description of Schedule [1]
DT	Amendment offered by Rep. John D. Dingell, and earlier suggested by EPA Administrator Train
A-C	A combination of two similar schedules considered by House Interstate and Foreign Commerce Committee
B	Schedule contained in current Senate Public Works Committee Bill, S.3219
D	Schedule adopted by House Interstate and Foreign Commerce Committee (Brodhead Amendment) H.R. 10498
E	Extension of present Federal standards indefinitely for analytical purposes.

Model Year	Emission Control Schedule HC/CO/NO_x - gm/mi D(T)	A-C	B	D	E
1976	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1	1.5/15/3.1
1977	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/2	1.5/15/3.1
1978	1.5/15/2	.9/9/2	1.5/15/2	1.5/15/2	1.5/15/3.1
1979	1.5/15/2	.9/9/2	.4/3.4/2	1.5/15/2	1.5/15/3.1
1980	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1981	.9/9 /2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1982	.4/3.4/2	.4/3.4/2	.4/3.4/1	.4/3.4/2	1.5/15/3.1
1983	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.1
1984	.4/3.4/2	.4/3.4/1.5	.4/3.4/1	.4/3.4/1.5	1.5/15/3.1
1985	.4/3.4/2	.4/3.4/ .4	.4/3.4/1	.4/3.4/.4	1.5/15/3.1

[1] As applicable, for purposes this analysis, it has been assumed that in all cases the least stringent NO_x standard would be granted by waiver.

Appendix B

Assumptions for Average Weight of Cars, by Model Year

In this report estimates for fuel economy impacts of different emission standards have been normalized to reflect consistent treatment of the vehicle weight in each emission control schedule. It has been assumed that vehicle weight would successfully be reduced by the auto companies as a part of their ongoing weight reduction programs, and that the model mix of cars sold would remain steady at 40 percent large-size (6 passenger), 30 percent mid-size (5 passenger), and 30 percent small-size (4 passenger).

The average new car test weight in each model year which results from these assumptions is:

Model Year	76	77	78	79	80	81	82	83	84	85
Average test weight	3820	3700	3600	3500	3410	3310	3220	3130	3040	295

N.B. - Test weight is curb weight plus 300 pounds.

Appendix C

Basis for Estimate of New Car Fuel Economy for Emission Control Schedule E

Emission control Schedule E, which assumes an indefinite extention of the present Federal standards of 1.5 g/mi HC, 15 g/mi CO, and e.1 g/mi NO_x, provides the most reliable basis for projecting fuel economy improvements because of the large amount of available test data. Even with Schedule E, there is still a range of estimates for fuel economy in the future because of the uncertainty about the actual choices manufacturers will make as to the technology to be used in their production cars.

The technical staff developed upper range and lower range fuel economy projections for Schedule E. The average, or mid-range, projection was then used as a reference case to estimate the effects of the other emission control schedules. Table C gives the three fuel economy projections. Each projection includes the assumptions about weight changes and model mix describe above. The lower range estimate assumes that engines will be improved by 1985 to the point where all are as good as the best engines produced in model year 1975 and that upgraded transmissions featuring a lock-up clutch on the torque converter will be introduced in the early 1980s and used throughout the new car fleet by 1985. It also assumes some reduction in engine size to increase average efficiency with a corresponding increase in the time required to accelerate from 0 to 60 mph; (that is, 15 seconds as a representative figure for the whole new car fleet) and the phased-in use of oxidation catalysts with 70 percent conversion efficiency at 50,000 miles.

The upper range estimate assumes that the engines are improved to the "best 1975" level by 1978, that there is an increase in the average efficiency of engines, a greater increase in the 0 to 60 mph acceleration time by 1985 than that used in the low range projections, and the use of electronic engine controls.

Table C

Projections of New Car Fleet Fuel Economy by Model Year for Schedule E with Different Technology Assumptions. (Miles per gallon)

	Model Year									
Projection	76	77	78	79	80	81	82	83	84	85
Lower Range	17.6	18.5	19.4	20.3	21.0	22.1	23.1	24.4	25.7	27.[illegible]
Upper Range	17.6	19.4	22.8	24.1	25.2	26.9	29.7	30	32	32.5
Mid-range (used in analysis)	17.6	19.0	21.1	22.2	23.1	24.5	25.9	27.2	28.8	29.7

Appendix D

Assumptions on Utilization of Technology to Meet More Stringent Emission Standards for Low-Range and High-Range Projections

It was noted in the body of the report that different assumptions had been made for the low range and the high range fuel economy projections for each of the increasingly more stringent emission schedules, in each model year, and that these assumptions differed in terms of the degree to which advanced technology that currently may require further development would be utilized and the impacts of that technology on fuel economy.

Substantial additional successful development will be needed before all the technology discussed for the high range will be suitable and available for production. Therefore, the degree of uncertainty associated with the fuel economy projections for the high range is large. There is also a degree of uncertainty associated with the low range since it assumes the use of reasonably well developed and demonstrated technology and makes no allowance for improvements in fuel economy due to emission control technology which is now only in the early stages of development.

This appendix discusses the assumptions about the emission control technology and displays in Figures D-1 and D-2 the differences in application of these technologies for each of the two ranges. Finally, there is a discussion of the impact of diesel powered vehicles.

Technology for the Low Range Projections

The low range fuel economy projections for the various emission control schedules use the concept of Emission Control Impact (ECI), which is defined here as the percentage difference between the fuel economy at one emission standard and the fuel economy at 1.5 HC, 15 CO, 3.1 NO_x (emission control schedule E).* Negative values for ECI indicate a relative loss in fuel economy. Table D-1 displays the ECI values for each emission standard under consideration as a function of model year for cars in the 4000 lb. inertia weight class. (An x in Table D-1 for an emission standard and a model year indicates that no such ECI value was needed for any of the emission control schedules in this analysis.) The procedure used to develop the entries for Table D-1 is discussed below.

The next step in the generation of the low range projections is to generalize the ECI values in Table D-1 for the 4000 inertia weight car to the total new car fleet. This generalization is done by multiplying the ECI value for any model year by the ratio of average test weight for that model year (from Appendix B) to 4000 lb. This process reflects the effect of weight upon ECI. The table of ECI values that results is then matched against the emission control schedules (Appendix A) to produce Table D-2, which presents the Emission Control Impact value for the entire new car fleet in any model year for each emission control schedule other than schedule E, which is the reference schedule. Table D-2 is used with the mid-range fuel economy projection for emission control schedule E from Appendix C to calculate for each model year the low range fuel economy projections presented in Section 1, Table 1a.

The starting point for the Emission Control Impact estimates of Table D-1 was the estimates of the effect of emission standards upon fuel economy reported by GM[1] for their 3500-4500 pound cars. These

[1] Reference GM comments on JPL Report "Should We Have A New Engine?" dated November 1975.

*Note that in the body of the report all comparisons are made with respect to schedule DT. This appendix describes the analytical values were considered to be representative of present practice.

Next, these Emission Control Impacts are adjusted to account for the impact of the recent change in specifications of the durability test fuel. The fuel specification change results in improved oxidation catalyst durability, representing an improvement from 55 percent to about 70 percent oxidation catalyst efficiency at 50,000 miles. A two percent improvement in average fuel economy is assumed to result from the retuning of all engines in the new car fleet at the current emission levels, and a four percent improvement for the lower emission standards. It is assumed that a two-year phase-in period is sufficient for such engine retuning. Additional effects upon fuel economy of further developments in emission control technology beyond those indicated in Figure D-1 are not included in these low range projections. Also, the initial drop in fuel economy and improvement in later years that commonly occurs when emission standard levels are changed has not been included.

The emission control technology assumed representative in this low-range case for each emission standard is shown in Figure D-1. For the .4/3.4/2 case, an option exists to add the switched-out start catalyst to the emission control system. If this is done, it would improve the estimated ECI by two percentage points and increase the incremental automobile retail price by $50. No additional maintenance within 50,000 miles is assumed.

TABLE D1

Low Range
Emission Control Impacts for 4000 Pound Car

Estimated percentage point differences in fuel economy at various emission standards by reference to fuel economy at 1.5/15/3.1 standard in each model year.

Standard \ MY	76	77	78	79	80	81	82	83	84	85
1.5/15/3.1	0	0	→	→	→	→	→	→	→	→
1.5/15/2.0	x*	-3	-2	→	→	→	→	→	→	→
.9/9/2.0	x	x	-7	→	→	→	→	→	→	→
.4/3.4/2.0	x	x	x	-12	→	→	→	→	→	→
.4/3.4/1.5	x	x	x	x	-12	→	→	→	→	→
.4/3.4/1.0	x	x	x	x	-14	→	→	→	→	→
.4/3.4/0.4	x	x	x	x	x	x	x	x	x	-18

*, x- standard not applicable

TABLE D2

Low Range
Emission Control Impacts for New Car Fleet

Estimated percentage point differences in fuel economy for each emission control schedule referenced to the fuel economy for schedule E for the new car fleet in each model year.

Model Year	Emission Control Schedule			
	D(T)	A	B	D
76	0	0	0	0
77	-2.9	- 2.9	- 2.9	- 2.9
78	-1.9	- 6.5	- 1.9	- 1.9
79	-1.8	- 6.3	-10.8	- 1.8
80	-6.2	-10.6	-12.4	-10.6
81	-5.9	-10.1	-11.8	-10.1
82	-9.6	- 9.6	-11.2	- 9.6
83	-9.4	- 9.4	-11.2	- 9.4
84	-9.2	- 9.2	-10.8	- 9.2
85	-9.0	-13.5	-10.5	-13.5

FIGURE D-1

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR LOW RANGE ESTIMATES

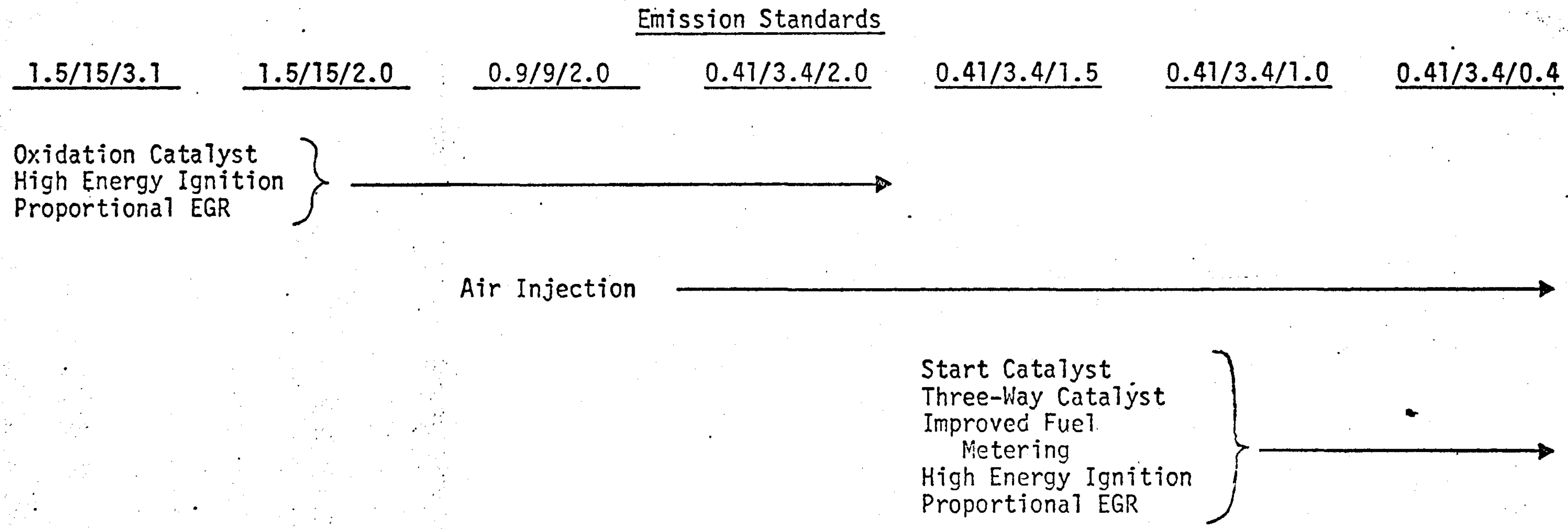
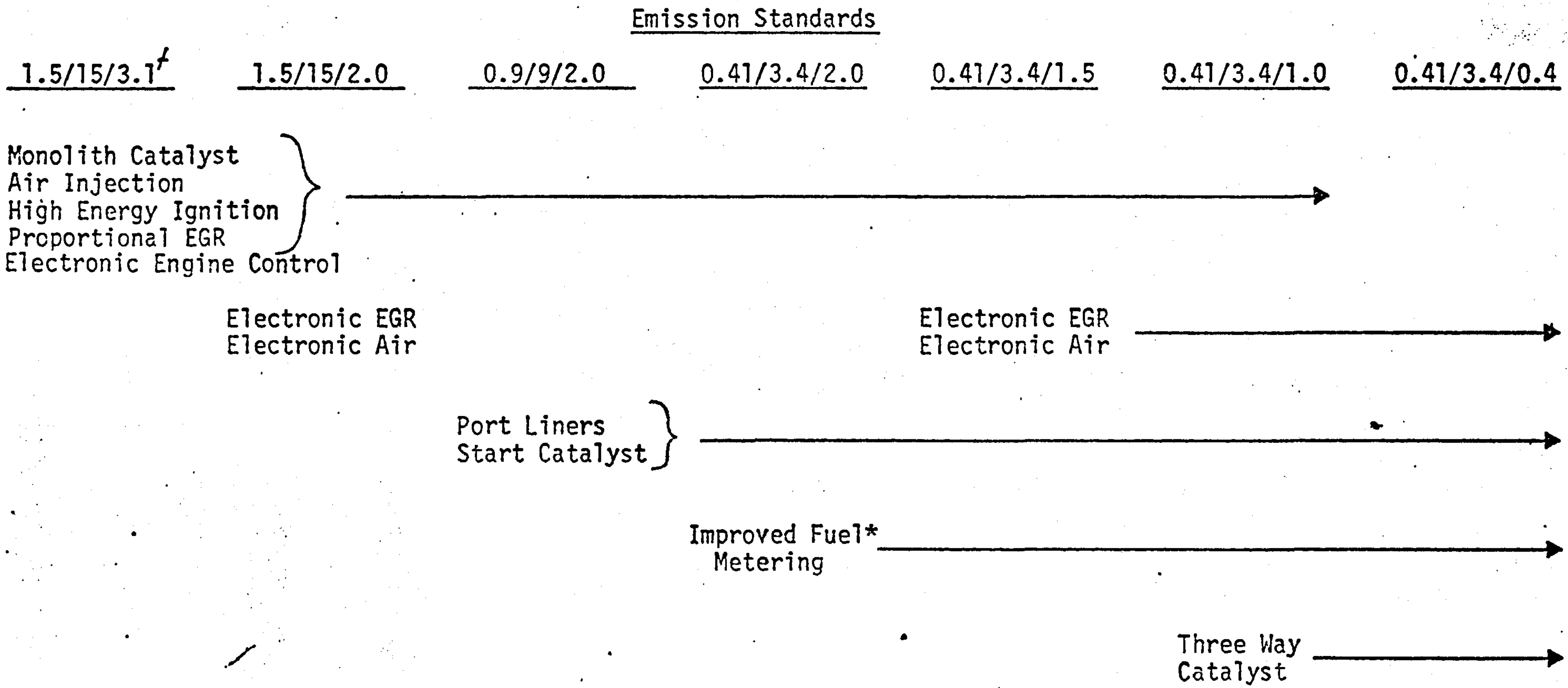


FIGURE D-2

EMISSION CONTROL TECHNOLOGIES ASSUMED FOR HIGH RANGE ESTIMATES



ƒ (in order of $HC/CO/NO_x$))

* Electronic Modulated Carburetor

Technology for the High Range Projections

The underlying assumption for the high range projection of fuel economy for the different emission control schedules is that by 1978 all engine types would be improved in efficiency to the level of the best engine types produced in 1975 and that these engines will be designed and engineered to give their best fuel economy at emission standards of 1.5/15/3.1 and above while using 91 RON unleaded gasoline and the basic emission control system.

The basic emission control system utilized to meet emission standards in the range between 1.5 HC, 15 CO, 3.1 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x consists of monolith oxidation catalyst, air injection, high energy ignition and proportional exhaust gas circulation (EGR). This basic emission control system offers a degree of emission control that is significantly greater than the minimum required to meet the standards at 1.5 HC, 15.0 CO, and 3.1 NO_x, and thereby permits the adjustment of engine parameters for improved fuel economy at the less stringent emission levels within the stated range of standards.

At 1.5 HC, 15 CO, 3.1 NO_x optimal fuel economy may be achieved through the use of the basic technology identified if a good EGR system that is truly proportional to engine load is used, such as back pressure modulated EGR which controls the EGR rate in proportion to the exhaust system pressure. In 1975 and 1976 few vehicles utilized this system (manifold vacuum modulated units were used) and optimum fuel economy was not achieved. The use of the better EGR systems in 1977 and subsequent years is expected to provide for continued fuel economy improvements of up to 10 percent relative to 1976. Additional improvements are possible at this emission control level, and at more stringent levels, with use of electronic engine controls.

To maintain optimal fuel economy calibration in the lower part of the range of standards, additional emission control hardware must be added to the basic system. GM and other investigators have shown that good fuel economy and stringent NO_x control down to 1.0 gm/mile NO_x can be maintained through a delicate balance of EGR rate, air/fuel ratio (A/F) and spark ignition timing, in some specific engines, although HC emissions increase as NO_x decreases. The key to maintaining good fuel economy and NO_x control involves the use of HC control measures that are complementary to the basic catalyst technology. The emission control components useful at various emission standards levels are discussed below. Figure D-2, which displays the emission control technologies used at the different emission standards, may be helpful in understanding the schedules and relationships.

<u>At 1.5 HC, 15 CO, 2.0 NO_x</u> the basic emission control is used, except EGR modulation is accomplished electronically to obtain the optimum fuel economy level. In some cases modulation of the air injection rate electronically may also be required. The development of these techniques is required before they can be used, but it is assumed that development and application is completed within the next few years.

<u>At 0.9 HC, 9.0 CO, 2.0 NO_x</u> the basic emission control system is also used. The recalibrated A/F, EGR rate, and timing needed for NO_x control and optimum fuel economy result in HC emissions that are greater than can be handled by the primary oxidation catalyst, so exhaust port liners and a start catalyst need to be added to the basic technology at this emission control level to treat the excess HC and maintain optimum fuel economy. The port liners conserve heat in the exhaust gas and thus permit continued combustion of HC (and CO) in the exhaust system. The start

catalyst is a small oxidation catalyst located very close to the exhaust mainfold. The size and location of this catalyst permits rapid warm-up during cold-start of the engine (much faster than the larger main catalyst located much further from the engine) which results in more complete oxidation of HC during cold start. (The cold start contributes a significant fraction of the HC emissions.)

At 0.41 HC, 3.4 CO, 2.0 NO_x, more stringent HC control is required. Either improved catalysts with higher conversion efficiencies, or improved fuel metering such as electronically modulated carburetors would provide the more stringent HC control. These carburetors would reduce HC by cutting off fuel during decelerations and more precise fuel metering during accelerations. Since the conventional carburetor goes extremely rich under both these conditions. Such carburetors require development.

At 0.41 HC, 3.4 CO, 1.5 NO_x and 0.41 HC, 3.4 CO, and 1.0 NO_x the same systems as used for 0.41 HC, 3.4 CO, and 2.0 NO_x is employed except that reoptimization of EGR rate, A/F ratio, and ignition timing to keep good fuel economy results in even more excess HC. To simultaneously achieve good fuel economy and emissions control requires the use of improved catalysts (conversion efficiency of 75 percent at 50,000 miles) and improved fuel metering. A catalyst change at 25,000 miles may be required to achieve good fuel economy for some engines that have difficult emission control problems.

At the 0.41 HC, 3.4 CO, 0.4 NO_x level a three-way catalyst system or a dual catalyst would be required. While good fuel economy has been demonstrated for both systems in some prototype test cars, 50,000 mile durability of the catalyst remains to be demonstrated. Fuel economy penalties of up to 10 percent may be expected in the first year of application and catalyst change could be required. However, with maturity (3-5 years) these systems are expected to achieve optimum fuel economy.

Thus, the successful development of the above technologies could significantly minimize, if not eliminate, the emission control impact, at least down to the emission control level of .41/3.4/1.0. The emission control impact of further NO_x reductions to 0.4 gm/mi is more uncertain, but successful development at the 3-way and/or dual catalyst systems could also minimize the fuel economy impact.

Impact of Diesel Powered Vehicles

The technologies described above for both the high and low range and the resultant fleet average fuel economy and fuel consumption do not include consideration of using diesel engine vehicles. Diesel powered vehicles are now being marketed in the U.S. in small numbers. In view of the impetus for greater average fuel economy due to the new fuel economy standards, it is reasonable to assume that diesel vehicles will be used in greater numbers in the future unless their development and use is impeded by low NO_x standards or non-competitive costs.

Assuming 10 percent market penetration by diesel engine powered cars by 1985 and applying this estimate to the low range fuel economy estimates given in Table 1a, average fuel economy would be about 1/3 MPG higher in model year 1980 and about 1 MPG higher in model year 1985. Assuming a 20 percent value for diesel engine market penetration by 1985, and applying it to the high range fuel economy projections given in Table 1a, the average fuel economy in model year 1980 would be 1/2 MPG higher and in model year

1985 about 1.5 to 2 MPG higher. Table D-3 gives the projected new car fleet average fuel economy for each emission control schedule based on these assumptions about diesel engine market penetration.

The lifetime new car fleet fuel consumption figures corresponding to Table 1c would be lower, i.e., about 2% lower in 1980 and 4% to 7% lower in 1985. Fuel savings in the 1985 new car fleet due to the use of diesel engine would range from 1.5 to 2.4 billion gallons. This analysis assumes that diesel vehicle fuel economy will be 25% greater than the improved gasoline engine vehicle fuel economy in 1985 based on the fact that most diesel engine vehicles are presently about 25% better than the best 1976 gas engines. There are other potential problems (such as odor, particulate levels, and noise) which diesel engines may need to overcome before full market penetration can be achieved. In addition, it must be noted that NO_x standards of 1.0 g/mi and below may affect the fuel economy of the heavier cars with diesel engines and may well preclude the development and application of the diesel engine for the heavier cars.

TABLE D-3. New Car Fleet Fuel Economy Projections with Diesel Engine Cars Included, for Emission Control Schedules and Model Years 1976 through 1985 (in miles per gallon)

	Low Range Projection (10% diesel in 1985)					High Range Projection (20% diesel in 1985)				
Model Year	D(T)	A	B	D	E	D(T)	A	B	D	E
76	17.6				17.6					17.6
77	18.4				19.0					19.1
78	20.8	19.8	20.8	20.8	21.2	21.2	21.0	21.2	21.2	21.2
79	22.0	21.0	20.6	22.0	22.4	22.6	22.6	22.1	22.6	22.6
80	22.0	20.9	20.5	20.9	23.3	23.5	23.3	22.8	23.3	23.5
81	23.4	22.4	22.1	22.4	24.8	25.1	25.1	24.6	25.1	25.1
82	23.9	23.9	23.6	23.9	26.3	26.7	26.7	26.5	26.7	26.7
83	25.4	25.4	25	25.4	27.7	28.3				28.3
84	27.1	27.1	26.6	27.1	29.5	30.2				30.2
85	28.0	26.8	27.6	26.8	30.4	31.2	28.8	31.2	28.8	31.2

Appendix E

Assumptions on the Incremental Consumer Cost Impacts of Alternative Emissions Reduction Schedules

Section 3 of this report summarized the impact of total lifetime consumer costs per car and for the total new car fleet for the alternative emissions reduction schedules relative to Schedule DT. As with any estimate of future costs, the estimates are subject to uncertainty, especially concerning periods further in the future.

Table E-1 summarizes the technology assumptions (from Section 3) and estimated equipment and maintenance costs at the different emission levels for the low and high ranges. The major source for the cost estimates was the 1975 Emissions Control Status Report, submitted on April 5, 1976.[1]

Equipment costs were estimated under the assumption that all technologies (and therefore costs) for the 1.5/15/3.1 base case are included in all schedules and thus are not incremental. For the high range case, this means that some advanced technologies (such as electronic spark control) are included in the base case and appear in each of the alternative schedules, including the DT schedule.

1/ Automobile Emission Control - The Current Status and Development Trends As of March 1976, A Report to the Administrator, EPA, April 1976.

TABLE E-1
TECHNOLOGIES AND COSTS ASSUMED FOR ANALYSIS

Emission Levels (HC/CO/NO_x)	Low Range: Technologies Assumed	Low Range: Incremental Cost Estimates[1] Sticker Price $	Low Range: Incremental Cost Estimates[1] Maintenance[2] $	High Range: Technologies Assumed	High Range: Incremental Cost Estimates[1] Sticker Price $	High Range: Incremental Cost Estimates[1] Maintenance[2] $
1.5/15/3.1	Oxidation Catalyst High Energy Ignition Proportional EGR	Base		Monolith Catalyst High Energy Ignition Proportional EGR Electronic Spark Control	Base	
1.5/15/2.0	Same as Base	$0	$0	Base Plus Electronic EGR Electronic Air	$20	$0
0.9/9/2.0	Base Plus Air Injection	$25	$25	Base Plus Port Liners Start Catalyst	$(5) (50) $$55	$0 0 $0
0.41/3.4/2.0	Same as Above	$25	$25	Above Plus Improved Fuel Metering or Improved Catalysts	$ (15) $70	$ (25) $25
0.41/3.4/1.5	Above Plus Start Catalyst Three Way Catalyst (Replaces Ox. Cat.) Improved Fuel Metering Increment	$(50) (30) (15) $(95) $120	$— (150)[3] (40) (30)[4] $(220) $ 245	Above Plus Electronic EGR Electronic Air	$(20) $ 90	$(50) $ 75
0.41/3.4/1.0	Same as Above	$120	$ 245	Above Plus Three Way Catalyst (Replaces Ox. Cat.)	$(30) $ 120	$(50)[5] $125
0.41/3.4/0.4	Same as Above	$120	$ 260	Same as Above	$ 120	$125

TABLE E-1

NOTES:

1/ All costs are incremental to the base case and are expressed in undiscounted 1975 dollars.
2/ Lifetime maintenance costs (100,000 miles)
3/ One 3-way catalyst change
4/ 3 Oxygen sensor changes.
5/ 3-way catalyst change on one-half of the cars.

( ) Indicates unit cost estimates