

BEFORE THE
CALIFORNIA AIR RESOURCES BOARD

COPY

CALIFORNIA AIR RESOURCES BOARD
HEARING ROOM
2020 L STREET
SACRAMENTO, CALIFORNIA

FRIDAY, JULY 9, 1993

8:40 A.M.

Nadine J. Parks

Shorthand Reporter

MEMBERS PRESENT

Jananne Sharpless, Chairwoman
Eugene Boston, M.D.
M. Patricia Hilligoss
Jack Lagarias
Barbara Riordan
Andrew Wortman, Ph.D.

Staff:

Jim Boyd, Executive Officer
Tom Cackette, Chief Deputy Executive Officer
Michael Kenny, Chief Counsel
Dr. John Holmes, Chief, Research Division
Bob Cross, Asst Chief, Mobile Source Division
Steve Albu, Chief, Engineering Studies Branch, MSD
Allen Lyons, Staff, MSD
Mike Terris, Staff Counsel
Patricia Hutchens, Board Secretary
Bill Valdez

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P R O C E E D I N G S

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CHAIRWOMAN SHARPLESS: Good morning. I'd like to call the meeting to order. I'd ask the Board Secretary to please call roll.

MS. HUTCHENS: Bilbray?

Boston?

DR. BOSTON: Here.

MS. HUTCHENS: Hilligoss?

MAYOR HILLIGOSS: Here.

MS. HUTCHENS: Ichikawa?

Lagarias?

MR. LAGARIAS: Here.

MS. HUTCHENS: Riordan?

SUPERVISOR RIORDAN: Here.

MS. HUTCHENS: Wieder?

Wortman?

Madam Chairwoman.

CHAIRWOMAN SHARPLESS: Present.

Okay. Well, welcome to the Air Resources Board.

For those of you who wish to testify on the item before the Board this morning, if you haven't done so, please do so by signing up with our Board Secretary.

Our item today is the consideration of a petition for limited relief from the 1994-1995 on-board diagnostic II

1 provisions from Ford Motor Company.

2 Ford is scheduled to introduce OBD II systems on
3 selected models for the 1994 model year. While most of the
4 monitoring requirements will be successfully implemented,
5 I'm told, Ford's 1994 OBD II system design will not meet the
6 minimum requirements in full.

7 Now, Ford has requested this Board to adopt an
8 amendment to the OBD II regulation, allowing certification
9 of these vehicles based on the diagnostic system being much
10 improved over those designed to meet the previous
11 OBD requirements, and Ford's good-faith effort to achieve
12 timely introduction of fully compliant OBD II systems.

13 So, Mr. Boyd, would you like to begin by
14 introducing the item?

15 MR. BOYD: Thank you, Madam Chairwoman. Good
16 morning, Board members.

17 Nearly four years after the adoption of the so-
18 called on-board diagnostics, Phase II, or as we've
19 affectionately come to call it, OBD II requirements, several
20 manufacturers have indeed finalized monitoring system
21 designs and will be, indeed, introducing OBD II for the
22 first time in the upcoming model year.

23 ~~These systems will be the most effective ever,~~
24 ever seen in production, that is, for detecting emission
25 control system and emission-related malfunctions on motor

1 vehicles, and are significantly more advanced than the
2 diagnostic systems meeting the current requirements, and
3 known as OBD I.

4 Getting to this point, as I think you know, has
5 not been easy on any of us. The OBD II monitoring
6 requirements are very comprehensive. Some requirements,
7 such as those for catalyst efficiency monitoring and engine
8 misfire detection have been considered very much technology
9 forcing by both industry and by your staff at the ARB.

10 However, as a result of innovative and aggressive
11 development efforts by the manufacturers, five of them are
12 expected to certify fully compliant systems for the 1994
13 model year.

14 Ford Motor Company has three models scheduled to
15 be OBD II equipped in model year 1994. And, as you
16 previously stated, Madam Chairwoman, nearly all of the
17 monitoring strategies developed by Ford will meet the
18 requirements of our regulation; however, the diagnostic
19 systems designed to detect misfire and nonfunctioning
20 evaporative purge valves will not be capable of meeting the
21 minimum performance standards. And consequently, Ford has
22 asked the Board to look at the circumstances surrounding its
23 1994 model year monitoring deficiencies and its overall
24 efforts to introduce OBD II as a technology as soon as
25 possible, and considering an amendment that would allow the

1 certification of the Ford OBD II equipped vehicles in '94
2 and '95, i.e. the Ford petition.

3 With that, I think what I'll do is call upon the
4 staff now to give you a more detailed explanation and the
5 technical analysis of our findings. And I'll call upon Mr.
6 Allen Lyons of the Mobile Source Division's Engineering
7 Studies Branch to do that. Mr. Lyons.

8 MR. LYONS: Thank you, Mr. Boyd.

9 Good morning, Chairwoman Sharpless and members of
10 the Board. Before discussing Ford Motor Company's petition
11 to the Board regarding 1994 and 1995 model year OBD II
12 compliance, I'll briefly review the concept of on-board
13 diagnostics and provide some background on the OBD II
14 monitoring requirements.

15 On-board diagnostic systems allow vehicles to
16 conduct system and component self-tests. For emission
17 control purposes, on-board diagnostic systems are used to
18 detect emission control and emission-related malfunctions as
19 they occur. Such malfunctions would otherwise often go
20 unnoticed.

21 By promptly notifying the vehicle operator through
22 an instrument panel warning light, the time between the
23 occurrence of the malfunction and its repair is shortened,
24 resulting in an overall in-use emission reduction.

25 Further, OBD systems can provide technicians with

1 specific diagnostic information that can be used to more
2 effectively repair malfunctions the first time.

3 In 1989, the Board adopted the OBD II requirements
4 for 1994 and later model year vehicles. OBD II replaces
5 California's original on-board diagnostic requirements known
6 as OBD I, which were adopted in 1985, and first implemented
7 in the 1988 model year.

8 Under the OBD II requirements, virtually all
9 emission control devices and computer controlled emission-
10 related components are to be monitored.

11 This includes components and systems not monitored
12 under OBD I. Specifically, new requirements include
13 catalyst efficiency, engine misfire, evaporative and
14 secondary air systems, and emission-related computer output
15 components.

16 Monitoring technology was not available for most
17 of these requirements at the time the OBD I regulation was
18 developed. The requirements for diagnostic information are
19 also expanded under OBD II. In addition to trouble codes
20 required under OBD I, OBD II systems will give technicians
21 access to current engine parameter information and will
22 capture engine operating conditions at the time a
23 malfunction is detected.

24 This captured engine parameter data is referred to
25 as "freeze-frame" information.

1 Both types of information will help technicians
2 better isolate the malfunctioning system or component and
3 will provide a way for repair effectiveness to be verified
4 before the vehicle is returned to the customer.

5 Diagnostic information access is standardized
6 under OBD II according to recommended practices developed in
7 conjunction with the Society of Automotive Engineers.

8 Another issue addressed by OBD II is monitoring
9 system effectiveness. The regulation requires manufacturers
10 to consider a device's impact on emissions when determining
11 the minimum acceptable level of performance.

12 For the most part, a component or system is to be
13 identified as malfunctioning before its performance has
14 degraded to the point that vehicle emissions would exceed
15 one and a half times the standard.

16 Previous on-board diagnostic strategies generally
17 are not capable of detecting deteriorated but still
18 functioning components and systems.

19 To illustrate the differences between the OBD I
20 and OBD II requirements a little further, this slide
21 presents a side-by-side comparison of the respective
22 monitoring and diagnostic information required.

23 ~~At the time the OBD II requirements were adopted,~~
24 manufacturers generally had very little experience with the
25 monitoring technologies identified to meet the regulation.

1 Recognizing that the OBD II requirements were
2 technology forcing, the staff returned to the Board in
3 September of 1991 to present an update regarding
4 manufacturers' progress towards meeting the OBD II
5 requirements by the 1994 model year.

6 The Board found that most manufacturers had made
7 significant progress in developing adequate monitoring
8 strategies and were working to improve monitoring system
9 reliability to a production-ready state.

10 Further, the Board adopted a number of
11 modifications to the regulation to address manufacturers'
12 concerns, improve the effectiveness of the monitoring
13 requirements, and to provide more consistency with proposed
14 Federal on-board diagnostic requirements.

15 The Board directed the staff to further monitor
16 manufacturers' progress and to report back again, if
17 necessary.

18 Despite the improved consistency, the Federal on-
19 board diagnostic requirements, finalized in February of this
20 year, differ somewhat from the OBD II requirements in the
21 way they are structured and applied.

22 In order to minimize the leadtime necessary to
23 implement OBD systems federally, the EPA will accept
24 vehicles certified to the already established California OBD
25 II requirements through the 1988 model year.

1 The Board, in turn, adopted a regulatory amendment
2 to accept Federal OBD systems on vehicles certified to .25
3 gram per mile hydrocarbon standards after the 1988 model
4 year.

5 This will prevent manufacturers from ever having
6 to design both Federal and California OBD systems for the
7 same vehicle model.

8 Along with the four years of leadtime provided,
9 the regulation allows manufacturers to phase in OBD II
10 systems on their product lines over a three-year period
11 based on vehicle on-board computer capability.

12 If significant modifications not consistent with
13 the manufacturer's product plans are necessary to
14 incorporate the additional monitoring hardware and software
15 needed, the manufacturer exemption from the OBD II
16 requirements for that model until the 1995 or 1996 model
17 year.

18 When the OBD II regulation was adopted, probably
19 all on-board computer designs required enhancements to meet
20 the requirements.

21 Therefore, for all practical purposes,
22 manufacturers have been able to design their own phase-in
23 schedules. This flexibility has allowed each manufacturer
24 to balance in-use experience, developmental resources,
25 leadtime, and liability in meeting the requirements, keeping

1 in mind that 100 percent implementation is required by the
2 1996 model year.

3 Manufacturers have used the exemption provision to
4 varying degrees. Some manufacturers plan --

5 CHAIRWOMAN SHARPLESS: Could you -- I don't know
6 if it's my eyes. But that looks a little blurry. Could you
7 focus that, somebody?

8 MR. VALDEZ: We can't get it any better.

9 CHAIRWOMAN SHARPLESS: Okay.

10 MR. BOYD: This time.

11 MR. LYONS: Some manufacturers plan to introduce
12 OBD II systems during the first year of the phase-in and
13 others have requested complete exemption for the 1994 and,
14 in some cases, the 1995 model year.

15 This slide illustrates by manufacturer the staff's
16 estimates regarding the percentage of engine families that
17 will comply with OBD II in the 1994 and 1995 model years.

18 A fairly small percentage of engine families will
19 be OBD II compliant in the 1994 model year, with that
20 percentage increasing in 1995.

21 Breaking down 1994 model year implementation
22 further, the staff expects five manufacturers to
23 successfully certify OBD II-equipped engine families that
24 will meet at least the minimum requirements.

25 Two other manufacturers are expected to first

1 introduce OBD II systems on 1994-1/2 models. 1994-1/2 are
2 defined as those that will go into production before the end
3 of the first quarter of 1994, but which technically must be
4 labeled as 1995 models, because production will run past
5 January 1, 1995.

6 Ford Motor Company is the eighth manufacturer
7 staff has met with regarding 1994 or 1994-1/2 OBD II
8 implementation. After much development Ford has come up
9 with diagnostic strategies to meet most of the monitoring
10 requirements. However, with respect to detecting engine
11 misfire and electronic evaporative purge valve malfunctions,
12 Ford has indicated that it's OBD II system design will not
13 be able to meet the minimum requirements fully.

14 For engine misfire, the regulation requires
15 manufacturers to implement a monitoring system that can
16 detect misfire at levels that will cause vehicle emissions
17 to increase above the standards by more than 50 percent or
18 cause damage to the catalyst due to overheating.

19 To meet this requirement, manufacturers' systems
20 must be able to detect misfire in the range of 1 to 3
21 percent. Ford has indicated that it's 1994 misfire
22 monitoring system can only reliably detect complete cylinder
23 misfire, which translates to approximately 112 to 16 percent
24 misfire.

25 Under the requirement to monitor electronic

1 emission-related computer output components, Ford is
2 required to implement a strategy to verify proper function
3 of the evaporative purge valve; however, Ford has been
4 unable to develop a reliable strategy for the 1994 model
5 year and, therefore, will only implement a circuit
6 continuity check for the valve.

7 Such a check is not effective in detecting
8 mechanical failures of the valve.

9 Ford realized during product development that
10 compliance with all of the OBD II monitoring requirements
11 was in question, but decided to work past the point where it
12 can employ a carry-over on-board computer and request
13 exemption from the OBD II requirements.

14 Ford has indicated that the importance of early
15 in-use experience with OBD II systems was a primary factor
16 in taking such action. However, because the vehicles no
17 longer qualify for an exemption, the vehicles cannot be
18 certified at the present time. OBD II regulation does not
19 provide for the certification of partially complying
20 diagnostic systems unless the engine families in question
21 have been exempted.

22 Faced with having vehicle models excluded from
23 being sold in California, Ford petitioned the Board,
24 requesting it to consider an amendment to the regulation
25 that would permit the certification of nonexempted vehicles

1 not fully meeting all of the OBD II requirements.

2 Ford based its request on demonstrated good faith
3 in attempting to comply with the regulation overall.

4 In developing its recommendation to the Board, the
5 staff considered the available options, including denying
6 certification of such vehicles and assessing a fine for
7 monitoring system shortcomings.

8 Regarding certification, the staff concluded that
9 excluding vehicles from the California market because of one
10 or more OBD II system deficiencies would neither be in the
11 best interest of air quality nor the overall success of the
12 OBD II program.

13 The fact that Ford's vehicles are expected to
14 comply with most of the OBD II monitoring requirements means
15 that the diagnostic systems will be substantially advanced
16 than current OBD I systems. While not fully meeting the
17 minimum OBD II requirements, Ford's OBD system includes
18 major improvements over OBD I systems, such as catalyst
19 efficiency monitoring and oxygen sensor response rate
20 evaluation, EGR flow rate monitoring, standardized
21 diagnostic link, and other features.

22 Also, because 100 percent exemption from the OBD
23 II requirements in the 1994 model year was at one time an
24 option available to manufacturers, including Ford, denying
25 certification based on falling slightly short of meeting the

1 minimum requirements would penalize the manufacturer for
2 maintaining a more aggressive plan to implement OBD II
3 systems.

4 The efforts of the manufacturers that have worked
5 to implement OBD II systems in the 1994 model year have
6 played an important role in more firmly establishing the
7 feasibility of the requirements.

8 As a result, for the 1994 model year, the staff is
9 proposing an amendment that would allow manufacturers to
10 certify nonexempted vehicles that do not fully meet all the
11 minimum OBD II requirements.

12 To qualify under the proposed amendment, the
13 manufacturer would have to show that it has made a good-
14 faith effort to meet the OBD II requirements in full, and
15 that the diagnostic system it plans to implement will be
16 significantly more advanced than current OBD I systems.

17 This relief would be available for 1994 model year
18 vehicles and for 1994-1/2 vehicles.

19 Further, manufacturers would be allowed to carry
20 over the OBD II system designs on these vehicles through
21 the 1995 model year, but would have to correct the
22 monitoring system deficiencies by the 1996 model year.

23 For the 1995 model year vehicles being certified
24 for the first time under the OBD II requirements, the staff
25 is again proposing that such vehicles be granted

1 certification even if one or more of the monitoring system
2 deficiencies exist, but that a fine be assessed per vehicle
3 for such models.

4 By the 1995 model year, a number of OBD II
5 compliant vehicle models will have already been in
6 production. At this point, OBD II compliance will be more a
7 function of employing of resources to implement monitoring
8 technology instead of having the capability to develop it.

9 For example, by the 1995 model year, Ford has
10 indicated that it will be able to overcome the problems
11 encountered with its 1994 OBD II system designs, and plans
12 to comply fully with the OBD II requirements on eight more
13 engine families.

14 The proposed fines would help to maintain equity
15 for those manufacturers that have implemented the necessary
16 resources to produce fully compliant OBD II systems.

17 The staff is proposing that a \$50 fine per vehicle
18 per deficiency be assessed for any major emission control
19 system monitoring strategies that do not meet the minimum
20 requirements.

21 A \$25 per vehicle per deficiency fine is proposed
22 for all other emission-related components that are not
23 monitored according to the minimum acceptable level. The
24 maximum vehicle penalty would be \$500, and the fines would
25 be for vehicles sold in California.

1 To illustrate, if one of Ford's engine families
2 that is to be OBD II equipped for the first time in 1995,
3 had the same monitoring system deficiencies that its 1994
4 applications have, the per vehicle fine would be \$75; that
5 is, \$50 for misfire monitoring noncompliance and \$25 for the
6 evaporative purge valve functional check monitoring
7 deficiency.

8 The proposed amendments to the regulation will
9 help maximum the in-use emission reductions from on-board
10 diagnostic systems during the 1994 and 1995 model years. In
11 order to receive a waiver for one or more of the OBD II
12 monitoring requirements during this period, manufacturers
13 would have to demonstrate that with the identified
14 deficiencies, the on-board diagnostic systems implemented
15 would still be significantly more effective than the OBD I
16 system.

17 Therefore, as mentioned earlier, such vehicles
18 would be equipped with more effective diagnostic systems
19 than OBD II exempted vehicles.

20 Regarding the cost impacts of the staff's
21 recommendation, the benefits of being able to certify
22 vehicles not fully complying with the OBD II regulation
23 should by far outweigh any negative impact associated with
24 potential fines; since, without the proposed modifications
25 to the regulation, manufacturers would not be able to

1 distribute and sell noncomplying 1994 and 1995 model year
2 vehicles and engines in California.

3 The staff is encouraged that numerous
4 manufacturers will meet OBD II requirements in the first
5 year of implementation despite the very challenging
6 engineering requirements presented by the regulation. While
7 there are a few technical issues still remaining for some
8 designs, it appears that industry is well along in fully
9 implementing the requirements in their full product lines by
10 1996.

11 Given that Ford has been moving quickly towards
12 OBD II implementation and has, overall, demonstrated a good-
13 faith problem, staff recommends that the Board adopt the
14 proposed modifications to the regulation.

15 This concludes the staff's presentation. The
16 staff will be glad to answer any questions you may have, and
17 then we'll summarize the written comments submitted from the
18 parties not testifying today.

19 Thank you.

20 CHAIRWOMAN SHARPLESS: Thank you very much. Now,
21 are there questions by members of the Board at this point on
22 the presentation?

23 Dr. Boston?

24 DR. BOSTON: Mr. Lyons, is the OBD II system part
25 of the emission control system that must be warranted for

1 100,000 miles in 1994?

2 MR. LYONS: Yes, it is.

3 DR. BOSTON: Thank you.

4 CHAIRWOMAN SHARPLESS: Dr. Wortman?

5 DR. WORTMAN: I would like to restate my opinion,
6 which I gave several years ago, on the whole subject of on-
7 board diagnostics. This is a fundamentally unsound idea,
8 which is derived from lack of real engineering experience
9 and ignorance of history.

10 Fusion of sensors and diagnostics was tried by the
11 military 25 years ago and proved to be an idiotic concept.
12 But let that be as it may. The whole point is that you do
13 not combine expensive diagnostic equipment with sensors.
14 Sensors go in vehicles; diagnostic equipment stays on bases.
15 Otherwise, you're multiplying expensive equipment.

16 However, more importantly, since we're talking
17 primarily about Ford here, I remember when Ford made a
18 presentation. I asked, "Why not?"

19 And the answer was, "We don't have resources."

20 When I asked what is resources, in view of the
21 fact that Ford had made \$6 billion that year, the person
22 making the presentation didn't know. After a few hours and
23 telephone calls back East, the response was that the
24 resources were experienced engineers.

25 I don't think that Ford came prepared several

1 years ago. Now, about this good faith, I'd like to hear the
2 story.

3 CHAIRWOMAN SHARPLESS: Any other questions by
4 members of the Board? Okay. I'd like to start with the
5 witness list.

6 MR. ALBU: Do you want us to summarize the
7 comments at all at this point?

8 CHAIRWOMAN SHARPLESS: Why don't we go with the
9 witness list first, and then we'll summarize the comments,
10 okay? Thank you.

11 We'll bring forward Kelly Brown from Ford Motor
12 Company.

13 MR. BROWN: I wasn't the witness that Dr. Wortman
14 referred to.

15 (Laughter.)

16 SUPERVISOR RIORDAN: Fortunately.

17 DR. WORTMAN: Do you know what resources means?

18 MR. BROWN: Yes, I do.

19 DR. WORTMAN: Okay.

20 MR. BROWN: Boy, do I!

21 And if you're not careful, I'll tell you.

22 Good morning. My name's Kelly Brown. I'm
23 Director of Ford's Automotive Emissions and Fuel Economy
24 Office. It's been a lot of years since I've addressed this
25 Board -- prior to the time Dr. Wortman talked about. And we

1 appreciate the opportunity to comment on this issue.

2 Our complete written comments have been submitted
3 to the staff, and we'd like them to be part of the record.

4 First of all, we'd sincerely like to thank the
5 staff for their assistance. The cooperation between Ford
6 and the staff allowed Ford to take an aggressive approach in
7 implementing OBD on some of our most important 1994 and 1995
8 vehicles. And it will result in more robust OBD II designs
9 when OBD is fully implemented in '96.

10 We believe this approach has been beneficial to
11 both Ford and the ARB staff, and it has advanced the state
12 of the art.

13 Our 1994 model year proposal regarding the ARB
14 staff's '94 model year proposal, Ford endorses the proposal
15 to give the Executive Officer the authority to waive one or
16 more of the requirements for the '94 model year.

17 We also agree with the staff assessment -- we
18 understand others differ -- that we have demonstrated a
19 good-faith effort in meeting all the requirements in '94.

20 We felt it important to introduce the OBD equipped
21 vehicles as soon as possible in order to gain real world --
22 not one-car laboratory -- real world experience before full
23 implementation is required in 1996.

24 We undertook this effort even in light of the
25 risks and the risk to our most important new products in '94

1 and '94-1/2 due to the technology forcing nature of the
2 regulations.

3 Technology was literally being developed -- and,
4 in fact, is still being developed as we speak here today --
5 for implementation and production.

6 There was no room for errors or incorrect
7 assumptions. The staff's proposed modification of the
8 regulations for '94 model year vehicles avoids additional
9 penalties to Ford Motor Company and other manufacturers who
10 took this aggressive approach in introducing vehicles with
11 OBD as early as possible.

12 Also, excluding these vehicles from the California
13 marketplace would be counterproductive as our partially
14 compliant or nearly compliant OBD II system is much more
15 effective than OBD I in detecting and diagnosing emission-
16 related powertrain malfunctions and deterioration.

17 As a result, Ford recommends that the Board adopt
18 the staff's proposal, which will allow OBD II system
19 deficiencies in one or more areas for the 1994 model year
20 without penalty.

21 We also support the staff's proposal to allow
22 carryover of '94 model year OBD systems into '95, without
23 requiring that they be updated to full compliance without
24 penalty. Such an allowance will permit Ford to commit
25 resources -- and I'll define that later --

1 DR. WORTMAN: Yes.

2 (Laughter.)

3 MR. BROWN: To ensure that we fully implement
4 fully compliant systems in an increased number of vehicle
5 lines in 1995. Allowing manufacturers to devote resources
6 to the conversion of 1995 models from OBD I to OBD II,
7 instead of attempting to rework substantially compliant '94
8 systems, should result in more California vehicles having
9 access to OBD technology and, thus, improving air quality.

10 And in Ford's case, this is about 140,000 units in
11 1995 in California alone.

12 The 1995 model proposal -- Ford has concerns about
13 the staff's approach to impose monetary penalties for each
14 OBD II system deficiency on '95 model year applications.

15 Although we expect to be fully compliant in '95,
16 we feel that penalties may be unfair and counterproductive.
17 Manufacturers who develop a partially compliant system will
18 most likely have incurred the same costs as those who
19 develop a fully compliant system. And that's the case that
20 Ford Motor Company's in in '94.

21 These systems will have the same hardware,
22 software, and development time required for fully compliant
23 systems, which itself is a penalty when compared to the
24 majority of competitors who have only OBD I systems.

25 Further, the variable costs for the hardware of a

1 partially compliant system is likely the same as for a fully
2 compliant system, which is the case of Ford in '94, as
3 compared to the OBD I system on a competitive vehicle that
4 did not even attempt OBD II.

5 Penalties may also be counterproductive as they
6 provide a disincentive for a manufacturer to aggressively
7 phase in OBD II systems. We recognize the absence of
8 monetary penalty threat places -- "threat," I take that in
9 the broad sense -- places a greater burden on the staff's
10 good-faith judgment.

11 However, our experience suggests the staff is very
12 capable in this regard. Therefore, Ford recommends that the
13 Board adopt regulatory language for '95, which is consistent
14 with the modifications for '94, and allow the Executive
15 Officer to approve good-faith, partially compliant OBD
16 systems.

17 Before I close and answer questions, I understand
18 that there may be testimony later that questions our good-
19 faith effort. And, if so, I would like the opportunity to
20 rebut that.

21 With that, I'd close and try and answer questions.

22 CHAIRWOMAN SHARPLESS: Yes. Are there questions
23 by members of the Board? Dr. Boston?

24 DR. BOSTON: I have two questions, Mr. Brown. Can
25 you explain to the Board what the problem is with

1 identifying misfire? It sounds like it's kind of easy. If
2 a spark plug doesn't fire, it should be pretty easy to
3 detect that.

4 MR. BROWN: We thought so, too, at one time.

5 I guess the simplest way to put it is -- and this
6 won't win me any awards at SAE, but I think it makes it a
7 little easier to understand.

8 The brain of the system, what's called the
9 algorithm in the computer that actually does the detecting
10 in Ford's case is -- we feel is very good. It's doing
11 exactly what it's supposed to be doing. And in a laboratory
12 on one vehicle, we can putz with it and get it to learn the
13 nuances of that one car and get it to distinguish between a
14 real misfire and noise which isn't really a misfire.

15 We have a lesser chance of teaching that one car
16 to take out things like road noise. Bumps in the road can
17 also cause the same type of sense, although we have an
18 algorithm to take care of that.

19 What happened in '94, is the brain's working
20 great. It processes all the information exactly the way
21 it's supposed to. Our sensor is on the front of the
22 crankshaft, and we thought that would be capable.

23 It's the same one we use for ignition. We
24 thought that would be capable of giving a good enough signal
25 to the computer to -- for the computer to decide: Is this

1 noise or is it a real misfire?

2 As it turns out, there's too much mush (sic)
3 between the two of them, and there's an area of overlap
4 where a signal to the computer is in the same population of
5 whether it could be good or bad. And the likely outcome of
6 that is very, very shortly after the customer got the car,
7 we'd have a lot of false MIL lights. We know what we have
8 to do, and we're on a crash course right now to put in
9 another algorithm to take that noise out. And we're
10 comfortable we'll be able to do that for '95.

11 So, essentially, we've got -- it's kind of like if
12 you're making a hoist. We've got the best chain in town,
13 but the clasp on the end didn't quite make it, and it ruins
14 the whole chain. But we know how to fix the clasp, and
15 we'll have it done for '95.

16 On evap, I think it really started -- the evap
17 issue -- and we do monitor, if you paid attention in the
18 staff, we monitor the purge valve for opens and shorts,
19 which we feel will cover the most likely failure modes.

20 There was discussion -- the way we read the
21 regulations, we felt that was a compliant system. We
22 learned in a workshop, oh, I think a year or a year and a
23 half ago, that our understanding was not the same as the
24 staff's, and that we also had to make sure there was flow
25 going through there.

1 We looked at all kinds of quick fix and cheap
2 algorithms that would try and detect whether or not you
3 actually have flow through the purge system. We didn't find
4 one that was really reliable and also what we deemed to be
5 safe. Some of them involved rapid increases of idle speed,
6 which we're concerned might put cars through the back of
7 garages.

8 We are implementing a flow sensor for '95, even
9 though it's the most expensive solution we can find. It's
10 the most reliable we can think of, and it's also, we believe
11 the safest.

12 DR. BOSTON: You're educating me here a little
13 bit. So, actually, when you're detecting a misfire, it's
14 not really whether the spark plug is firing or not, it's the
15 roughness of the engine, or the noise that's made from --

16 MR. BROWN: Our technique is very similar to most
17 of them, and some of them you'll hear -- even from private
18 entrepreneurs -- the technique is very, very similar. We're
19 looking at crankshaft torque, and we're looking for negative
20 torque pulses.

21 And, unfortunately, when you do it on the front of
22 the engine as opposed to the back of the engine, the back of
23 the engine has the load on, because the transmission is
24 hooked to it. The front is kind of cantilevered from there.
25 The load is, you know, all the way at the other end of the

1 shaft, which is why you have a damper on the front of it.
2 And it became -- we thought we had enough sensitivity to
3 pick up the minor perturbations and torque on the front.
4 And, as it turned out, we don't.

5 Part of our long-term solution will be to move
6 that sensor to the rear. We understand some of our
7 competitors have it on the rear.

8 DR. BOSTON: The second part of my question was,
9 is your diagnostic equipment prepared to eliminate these two
10 modalities that you don't have ready yet for the 1994, for
11 your mechanics to identify other failures? How will they
12 use their equipment to detect other failures in the OBD II
13 system?

14 MR. BROWN: The fault codes for any of the
15 compliance systems will be stored, and the other systems --
16 like the EGR and catalyst monitors -- don't really care if
17 the misfire detector works or not. They have their own
18 fault codes. Those will be stored properly.

19 DR. BOSTON: So, those others -- those other
20 systems will still be monitored.

21 MR. BROWN: Actually, our misfire detector will be
22 working. It's just the level of misfire would have to be
23 pretty severe before it would store a fault code and turn a
24 light on. So, it works, but it doesn't work well enough,
25 because we had to back out of the region that I mentioned

1 before of overlap, where the same signal could be either
2 good or bad.

3 Since we had to back off from that, we actually
4 desensitized the thing.

5 DR. BOSTON: Do the companies generally intend to
6 have their service departments have this equipment all ready
7 by '94?

8 MR. BROWN: Well, we don't have service
9 departments. And that's an important point. Our dealers
10 do. And we give our dealers all the information. The
11 written and electronic information they need, we have the
12 equipment to monitor the problem. We teach them how to use
13 them. We bring them in for training. We can't force them
14 to do them. There are state laws in all 50 states to
15 prohibit us from doing that. But I can't imagine a dealer
16 who wouldn't want to do it. You're going to have to, even
17 if it's a small dealer out in the middle of nowhere.
18 Customers get just as mad out in the middle -- maybe madder
19 out in the middle of nowhere than they do downtown.

20 DR. BOSTON: Okay. Thank you.

21 CHAIRWOMAN SHARPLESS: Mr. Lagarias?

22 MR. LAGARIAS: Mr. Brown, you described the
23 installation of the OBD II devices on the 19 -- the
24 penalties for putting OBD II devices on the '95 models as a
25 disincentive to aggressive installation of the OBD II

1 models.

2 What do you mean by a disincentive for the
3 penalties?

4 MR. BROWN: Well, most of the -- if you go back --
5 and it was hard to read -- as the Chair noted, it was hard
6 to read. Most of the manufacturers on most of the models,
7 and most of the -- more importantly than the number of
8 models, the majority of the volume of the vehicles sold in
9 the State of California will have waivers.

10 So, any manufacturer who elects to go forward and
11 put OBD on the vehicle, you incur the engineering costs, any
12 tooling costs, because it tears up not just -- you don't
13 just stick some things on there. We have extra sensors that
14 are expensive. We had to do all the new wiring harnesses.
15 It's a whole new computer. It's the most powerful computer
16 we're aware of in the industry. Those are all very costly
17 things.

18 If you bolt those on the car like we're going to
19 do, if you let us, you have to pay for those, even if they
20 don't quite come up to snuff with the rest of the rules.
21 You also have to pay for all the engineering. We're almost
22 getting into the resource issue that I was saving for
23 somebody else.

24 DR. WORTMAN: We'll get there.

25 MR. BROWN: But you have to expend engineering

1 resources, commit to tooling, buy pieces. And you spend a
2 lot of money. We have a variable cost and a fixed cost
3 penalty versus our competitor that has a waiver.

4 If the Air Resources Board is to also give us
5 another penalty for falling short -- in other words, here's
6 a fully compliant -- we're just below that, and most of the
7 industry is down here at zero, not even trying.

8 If we have another penalty on top of that for
9 trying and falling short, we'd be seriously disadvantaged
10 versus our competitors.

11 MR. LAGARIAS: Oh, you're -- what you're saying is
12 that you want to be put in with all the other manufacturers
13 as far as penalties are concerned.

14 MR. BROWN: No. I'm saying we pay the penalty by
15 putting the -- we paid the penalty.

16 MR. LAGARIAS: You made the investment.

17 MR. BROWN: We made the investment, both in terms
18 of fixed resources and also variable costs on the vehicle.
19 Our cars are cost competitive. If you approve our waiver,
20 our cars will be cost competitive -- at a cost disadvantage
21 versus most of our competitors without a penalty.

22 MR. LAGARIAS: Well, won't the penalty apply to
23 the other manufacturers as well?

24 MR. BROWN: Not if the penalty is in terms of
25 productive things, like fixed hardware and engineering

1 costs. The penalty I'm referring to is not a penalty that
2 we're going to write out a check to some government agency.
3 The penalty I'm referring to is we are buying hardware for
4 our vehicles. We have put engineering into our vehicles.
5 We've paid for tooling for our vehicles. We've redesigned a
6 significant number of components, and we've sunk money into
7 those vehicles. It is going to cost us money.

8 And our competitors who took waivers spend zero.

9 MR. LAGARIAS: Well, don't they have to spend that
10 money, too, to come up --

11 MR. BROWN: Some day they will, but they won't in
12 '94. And when a customer goes into the showroom in '94, it
13 doesn't help to say, well, the other car's going to be just
14 as expensive.

15 CHAIRWOMAN SHARPLESS: Mr. Kelly, the penalty is
16 for '95. Right? '94 you don't pay a penalty, unless you're
17 talking about the fact that you decided to go ahead when you
18 didn't have to, because you want some real on-road
19 experience.

20 So, you went ahead, took the risk, as I understand
21 your testimony, to develop this system. You fell short in
22 two areas. And without the Board adopting this petition,
23 you would be unable to sell those model years for which you
24 attempted --

25 MR. BROWN: Correct.

1 CHAIRWOMAN SHARPLESS: -- to buy -- to develop the
2 OBD II. Now, for car companies who don't put the OBD II on
3 their vehicles for '94 and '95, they have no penalty. But
4 in '96, they're going to be starting with a whole new system
5 with no on-road experience.

6 That's even a bigger risk for your competitors, I
7 would think. I would think the way things would operate, is
8 a lot of people are going to come in in 1995, with at least
9 some version of OBD II, hoping that it's going to be
10 compliant.

11 My question to you is, in 1995, it sounds to me
12 like you're expending -- as Dr. Wortman said -- resources
13 to correct the two deficiencies.

14 MR. BROWN: Correct.

15 CHAIRWOMAN SHARPLESS: And by 1995, I suspect
16 that, given your commitment, you are going to have those OBD
17 II systems compliant on the vehicles.

18 So, in that event, you would not necessarily be
19 paying a penalty.

20 Now, look at it from the other perspective. There
21 are car companies out there in 1994, who do have compliant
22 systems. They also have spent resources. They also took a
23 risk. In their case, they happen to not have deficiencies
24 in their systems.

25 It's very easy for other car manufacturers, since

1 you all do it, to buy one another's goods, break them down,
2 and find out how well they work and how they did it.

3 It seems to me that people who come in the market
4 early have a disadvantage from the perspective that their
5 competitors can look at their systems.

6 MR. BROWN: Correct.

7 CHAIRWOMAN SHARPLESS: Without spending the
8 resources. So, in '95, you know, I feel, out of
9 competitiveness and fairness, we ought to be giving
10 something to the guys who came in early, and were
11 successful.

12 MR. BROWN: Yeah. I think there's still confusion
13 when you use the term penalty, as did the staff, in two
14 different terms. And let me try again, because I think I've
15 failed miserably based on your comments and Mr. Lagarias'.

16 MR. LAGARIAS: Well, the way I read your --

17 MR. BROWN: One penalty would be what the staff
18 proposed for 1995, where you take the \$50 times the number
19 of units times the number of problems, and you write out a
20 check and send it in.

21 The other penalty is the cost you incur on the
22 vehicle for trying and for putting the hardware on the
23 vehicle, whether or not it works. That is a penalty in
24 quotes, just -- you're already paying.

25 For example, if you compare Ford in '94 to the

1 companies that were fortunate enough to not have the two
2 small but important deficiencies we had, we put as much into
3 it as they have. And we fell just short in a couple of
4 areas. They managed to hit home runs in all the areas. So,
5 there's a minor difference, but the cost was the same. But
6 versus the people who got waivers across the board, we've
7 sunk a lot of money in our vehicle. So, the facing vehicle,
8 the one with the OBD system -- whether it's fully compliant
9 or not -- it costs us more than the facing car that has
10 just OBD I.

11 CHAIRWOMAN SHARPLESS: I think it's interesting
12 that you use the term penalty for complying costs. What
13 you're doing is you're putting the research and development
14 into complying with OBD II.

15 There are certain advantages of that. In 1994,
16 you will be not paying any kind of penalty from the
17 standpoint of not making it. If you're assuming that you
18 would have spent less money by not doing it in '94 and '95,
19 and just going ahead in '96 -- which, if you use your
20 argument, would be the argument of how you avoid the
21 penalty, the type of penalty that you're talking about -- I
22 assume that Ford is smart enough to know that there's some
23 real danger and risk in that, not only from the perspective
24 that you could fail, but you really want to satisfy your
25 customers. So, you want some on-road experience with your

1 system. And I suspect that's why you did it.

2 MR. BROWN: You betcha.

3 CHAIRWOMAN SHARPLESS: Now, if you define that as
4 a penalty, that's kind of an interesting concept, because
5 everything you do -- developing air bags would have been a
6 penalty.

7 MR. BROWN: It was.

8 CHAIRWOMAN SHARPLESS: Okay. But it also became a
9 huge marketing device.

10 MR. BROWN: It did.

11 (Thereupon, both speakers began to speak
12 simultaneously.)

13 CHAIRWOMAN SHARPLESS: Time out.

14 (Laughter.)

15 MR. BROWN: No. My only point in making that was
16 to respond to Dr. Lagarias' concerns from others, that
17 somehow by our getting the waiver approved that's before the
18 Board, we're getting away with something. We have hundreds
19 of dollars of parts that are on the vehicle that we have to
20 pay for, even though they fall short. We're not getting
21 away with --

22 CHAIRWOMAN SHARPLESS: Mr. Kelly -- or Brown. Mr.
23 Brown, I didn't hear Mr. Lagarias say that at all. I think
24 he was questioning the penalty issue.

25 MR. LAGARIAS: Well, I was questioning the

1 penalty. And the point you're making is, the investment you
2 made in getting the OBD II system, the cost, the engineering
3 is a penalty in itself if you're doing it ahead of your
4 competitors.

5 MR. BROWN: Correct.

6 MR. LAGARIAS: All right.

7 MR. BROWN: Success.

8 CHAIRWOMAN SHARPLESS: Dr. Wortman.

9 DR. WORTMAN: It's not really a penalty that
10 you're talking about. You're talking about front-end
11 loading of a project.

12 MR. LAGARIAS: Uh-huh.

13 MR. BROWN: No, I think -- if a person is
14 comparing two cars, our car and a competitive car with OBD
15 I, the market is very, very price sensitive. And that
16 competitor that doesn't have -- well, let's just talk about
17 the hundreds of dollars of cost. He's got a cost benefit.
18 He's got a cost advantage over us. So, it is.

19 DR. WORTMAN: So, they chose to end load their
20 project; you front loaded your project. That's your
21 management decision.

22 MR. BROWN: It's hard to tell a dealer, a couple
23 of years from now, you'll be competitive.

24 DR. WORTMAN: Anyway. Just a couple of questions.

25 MR. BROWN: It's tough to tell our management.

1 DR. WORTMAN: I think it's front loading your
2 project, which is perfectly all right. It's a management
3 decision.

4 You say that you sense negative torque. What's
5 the sensor?

6 MR. BROWN: The sensor -- there's a sensor that --
7 there's a wheel on the front of the crankshaft. It's a
8 sensor that detects the movement of the sprockets on the
9 front of the crankshaft. And if --

10 DR. WORTMAN: So, it detects changes in velocity.

11 MR. BROWN: Correct. It knows how far it is
12 between teeth.

13 DR. WORTMAN: Okay. So it's an optical system.

14 MR. BROWN: Correct.

15 DR. WORTMAN: All right. Now, how do you
16 differentiate between a true misfire and late detonation,
17 end knock? Or do you?

18 MR. BROWN: We don't.

19 DR. WORTMAN: You think you could?

20 MR. BROWN: With that system? Maybe someday. I
21 don't think we could do it today.

22 DR. WORTMAN: I don't think you can do it at all.
23 But that's all right. I don't think anybody could do it.
24 Tell me about --

25 MR. BROWN: But knock is not an acceptable

1 situation either. We tried that in the seventies.

2 DR. WORTMAN: You haven't experienced knock in
3 your engine?

4 MR. BROWN: Well, you can, but we try very hard to
5 get knock out. If you recall the cars in the seventies when
6 we were --

7 DR. WORTMAN: Oh, I understand.

8 MR. BROWN: -- on California systems. They
9 knocked, and we heard about it.

10 DR. WORTMAN: But sooner or later, every engine
11 will knock.

12 MR. BROWN: Not on all.

13 DR. WORTMAN: Should I get my money back from
14 Mercedes and BMW?

15 MR. BROWN: Sure.

16 (Laughter.)

17 DR. WORTMAN: They knock when provoked. Every
18 engine will knock sooner or later.

19 Anyway, tell me about resources. What have you
20 done?

21 MR. BROWN: We have some very bleary-eyed and
22 tired people working both in research, in Ford Electronics
23 Division, and also in the Ford Powertrain Electronics. In
24 fact, none of them are here with us. They're all home
25 working.

1 The resource issue isn't just money. You can
2 throw money at any project. You can also go out and just
3 hire people and throw it at the project. There are not an
4 overabundance of what we call OBD II literate people walking
5 the streets. And you can't take -- we find that just taking
6 a very high-level engineer -- and this is three or better
7 out of four from the best universities, and bring them into
8 the company. It takes us over two years just to teach them
9 how the base electronic systems work.

10 And from there, in order to work on OBD systems,
11 most of those guys have been working on them since the
12 eighties to get to that point. You can't suddenly go out
13 when you're in trouble and get a bunch of working engineers
14 and offer them -- if money was the issue, trust me, I'd
15 rather be home just throwing money at them than come to this
16 fair city here and take this issue on.

17 It's not an issue of dollars or trying to cut
18 dollars. There's just not enough people that are literate.
19 We're adding people, but it takes a long, long, long time to
20 get them up to speed.

21 Another thing that happens, when they do start
22 getting up to speed, you find some of your competitors from
23 across town -- I won't use any names -- encourage them to go
24 across town, to the other side of town, because they bring
25 two things: One, they're trained; and, two, they know our

1 systems. And so, those issues are problems.

2 DR. WORTMAN: It takes three years to develop a
3 major radar system, which is much more complex. But anyway,
4 after that debacle when Ford didn't know what resources
5 meant, I did get an answer of 80 to 100 man/years. Does
6 that sound right to you?

7 MR. BROWN: 80 to 100 man/years? For what?

8 DR. WORTMAN: OBD II.

9 MR. BROWN: 80 to 100 man/years?

10 DR. WORTMAN: Doesn't sound right to you?

11 MR. BROWN: It depends on when you start and what
12 your assumptions are and --

13 DR. WORTMAN: From the moment that I asked that
14 question --

15 MR. BROWN: What was the context in which the
16 question came?

17 DR. WORTMAN: I asked what resources and whoever
18 was representing Ford --

19 (Thereupon, Mr. Brown spoke simultaneously, and
20 obliterated part of Dr. Wortman's statement.)

21 DR. WORTMAN: What is resources. When I asked, I
22 was told 80 to 100 man/years. All right. Is that a correct
23 estimate?

24 MR. LAGARIAS: 80 to 100 person years?

25 DR. WORTMAN: Person years.

1 MR. BROWN: I'd be glad to take the number back
2 and --

3 DR. WORTMAN: I'm not trying to get any Ford
4 secrets.

5 MR. BROWN: It doesn't seem unreasonable. I'm
6 sure, if you go back through what our Electronics Division
7 spent just on the computer alone, what we spent on the
8 sensors, and what we spent on software development -- the
9 software, just to run the OBD, our not fully compliant
10 OBD system for '94, takes more computer space than just
11 running the engine calibration did a couple years ago.

12 So, software development, we've got guys --
13 bleary-eyed guys that sit in buildings nights and weekends
14 just writing software for this program. That doesn't
15 surprise me at all. I suspect, if anything, that number
16 might be low. And I'd be willing to bet whoever calculated
17 the number for you didn't look into our suppliers. We use
18 some of the same suppliers for some of our components --
19 Bosch -- that some of the German manufacturers that have
20 fully complying systems.

21 I suspect if we go back and figure out how much
22 time they put into it, 80 to 100 might be a very reasonable
23 number.

24 DR. WORTMAN: I thought it was low.

25 MR. BROWN: I said reasonable to low. So --

1 DR. WORTMAN: I thought it was low from the
2 beginning. That's why I think they pulled the number out of
3 thin air. You're not finding out it is much more.

4 Now, on the subject of real penalties, not front
5 end loading of projects, the numbers there on the screen
6 were \$50 and \$25. Automotive News feels that Ford makes
7 between 1,000 and \$10,000 on its vehicles, net. They may be
8 guessing, but I'm just quoting a number that I read.

9 It seems to me that \$50 is insignificant. That's
10 10,000 on a Continental and a thousand on your low-end
11 models. \$50 is nothing. I think it's a very low number.

12 MR. BROWN: Well, I think people with business
13 degrees would differ with you. And they'd also differ with
14 you on your definition of how you treat variable cost.

15 You are talking front loading. Front loading,
16 your argument might be valid with respect to development
17 cost, designing cost, and tooling cost. Variable cost is
18 incurred when you sell a vehicle. It is included in the
19 price of the vehicle when you attempt to sell a vehicle.
20 You don't front end load -- front load those things. Our
21 vehicles in '94 are -- our competitors will never go back
22 and update their '94 profits. That's not a valid
23 comparison.

24 And \$50 a vehicle -- if I ever went into our board
25 room and told my manager that I thought \$50 a vehicle was a

1 "no brainer," I'd be out looking for another job.

2 When you sell two million units a year, \$50 a
3 vehicle's a lot of money. A dollar a vehicle -- I can do
4 that one easier, it comes out to \$2 million a year..

5 DR. WORTMAN: The front end loading --

6 CHAIRWOMAN SHARPLESS: Excuse me.

7 DR. WORTMAN: Excuse me. The front end loading
8 was your decision. You live with it. They will end load in
9 their part of the products. So, in 95-96, it'll catch up
10 with them.

11 MR. BROWN: No.

12 DR. WORTMAN: But I still think that, in terms of
13 penalties, \$50 per vehicle, when the net on a vehicle is
14 1,000 to \$10,000, is not very much.

15 (Thereupon, both speakers spoke simultaneously.)

16 MR. BROWN: My answer is, we agree to disagree,
17 sir.

18 CHAIRWOMAN SHARPLESS: Dr. Boston.

19 DR. BOSTON: Isn't that \$50 per deficiency up to a
20 total of \$500, though, that staff proposed?

21 MR. BROWN: I believe it is, yes.

22 DR. BOSTON: So, it could be \$500 rather than \$50?
23 The other part of my question --

24 CHAIRWOMAN SHARPLESS: Wait a minute.

25 MR. LAGARIAS: No.

1 CHAIRWOMAN SHARPLESS: That's assuming that their
2 whole system is punk. We're talking about two deficiencies
3 here, right?

4 DR. BOSTON: Right. But for other companies, for
5 instance, that didn't have all those systems working and
6 couldn't --

7 CHAIRWOMAN SHARPLESS: But for other companies who
8 don't introduce any system in 1995, they have no penalty.
9 No penalty. If they come in 1996 with systems that
10 hopefully are durable, and work, and they have no testing on
11 the roads, and they don't get penalized, other than the fact
12 that maybe their systems are not going to work too well.

13 DR. BOSTON: Okay. So, the other part of my
14 question in regards to this penalty thing is, it seems that
15 Ford could have put a new mules out there and run those for
16 a hundred thousand miles, and saved an awful lot of money,
17 where you were arguing, Madam Chair, that they're actually
18 saving money by putting their equipment on early and getting
19 a lead on the competition.

20 CHAIRWOMAN SHARPLESS: No, no. No, no.

21 DR. BOSTON: Perhaps their competition could have
22 just put some mules out there and may be testing those, too.
23 But Ford has taken the step of putting this equipment on
24 their cars that cost them several hundred dollars. It's a
25 redeeming experience, yes, but they could have done it

1 another way.

2 CHAIRWOMAN SHARPLESS: Right. I never said saving
3 money, Dr. Boston. What I said is that they made the
4 decision to introduce certain engine models in 1994 to gain
5 road experience. And rather than waiting until 1996, they
6 could have waited until 1996, and tried to install OBD II on
7 all of their engine models and not be facing the situation
8 today, and not talking about penalties in any respect,
9 because the staff -- the staff proposal imposes penalties
10 only for those people who introduce an OBD II system in 1995
11 that does -- that is deficient, that doesn't meet the
12 requirements. And they would only be penalized on those OBD
13 II systems for those elements of the OBD II equipment that
14 were deficient, not for the entire system, but only for
15 those elements that are deficient.

16 So, I wasn't suggesting that Ford Motor Company
17 was saving any money. I was suggesting that they were
18 being prudent.

19 DR. BOSTON: I think the implication was, if they
20 put a system out early, and then had a whole bunch of
21 warranty failures because the system was put out too early,
22 that it would cost them more money in the long run. So, by
23 putting the system out now, they're gaining experience and
24 may save them money down the line.

25 MR. BROWN: Madam Chair, maybe I can make the

1 conversation a little simpler, I hope. But I've been wrong
2 before today.

3 Actually, we're doing both, Dr. Boston. We are
4 putting them in production and, as we speak, we have three
5 "early warning fleets," we call, out there running around.
6 We have some fleet customers that put on a lot of mileage
7 that we gave the vehicles to, and we have our Dearborn test
8 fleet, and we have some other vehicles that are in -- what
9 you call -- real customers' hands, just more every day type
10 people, looking for problems.

11 We have that going on while we're launching the
12 vehicles.

13 CHAIRWOMAN SHARPLESS: Mr. Lagarias.

14 MR. LAGARIAS: Mr. Brown, they referred to your
15 successful experience with air bags, which was a safety
16 requirement. Don't you think that by putting your OBD II
17 system, even though it's not complete, into your 1994
18 models, that becomes a sales incentive. And that not only
19 puts you a step ahead of your competitors, but you can
20 promote what you can do, not carp about what you can't do at
21 the moment, and you could very successfully get a step head
22 of your competitors by promoting those phases of the OBD II
23 system that you're putting in the '94 models.

24 MR. BROWN: Actually, your analogy is a good one
25 on air bags. Our initial attempts -- and we went first with

1 our Tempo program with government services fleet. It was
2 actually a disaster. It was a financial disaster. And when
3 we actually put them in the dealerships, the early years
4 were a real disaster. Again, we had a variable cost penalty
5 versus our competitors. And dealers were afraid to
6 encourage people to buy them, because they didn't want to
7 get sued if something went wrong with them.

8 And people were afraid to buy them, plus even
9 though we weren't charging enough to make money, it -- they
10 didn't want to pay the money for something they were afraid
11 of. And it took very, very easily easing (sic) people into
12 technology. People are afraid of technology a lot.

13 CHAIRWOMAN SHARPLESS: Well, jeez. I don't know.
14 I mean, you think that Chrysler, you know, when they brought
15 in their air bags and didn't make it optional and made them
16 part of the regular package, I think that was a big selling
17 point.

18 Did I misunderstand you?

19 MR. BROWN: Yes, you did. The early years, it was
20 just the opposite of what it is today. The early years,
21 people were afraid of them. Now, today, people are
22 demanding them. If we don't have them, we're not
23 competitive.

24 My point was, it takes a couple of years for
25 people to -- because we've gone through this very thing in

1 the past.

2 CHAIRWOMAN SHARPLESS: Who made people afraid of
3 air bags? Why were people afraid of air bags?

4 MR. BROWN: I don't have any studies to back it
5 up, but I think sometimes technology like that -- new
6 technology makes people nervous sometimes. It's both good
7 news -- there are people -- and we have marketing studies
8 that show there are the early adopters who love technology
9 and will go out and buy the stuff and they'll take the risk.

10 They're a small minority of the people that are
11 the early adopters. We see the same thing in alternative
12 fuels. We've got flexible fueled vehicles that are great
13 vehicles. And there's still some people that are afraid of
14 them. There's absolutely nothing to be afraid of. There's
15 other people who love them.

16 And I think, with time, if we continue to market
17 those carefully and easily, and don't push them on people,
18 and don't scare people, I think it'll be a marketing plus.

19 That's really interesting. Because everytime I
20 drive up to the pump -- I drive one of your cars.

21 MR. BROWN: I know.

22 CHAIRWOMAN SHARPLESS: It's a flexible fuel
23 vehicle. Everytime I drive up to the pump, people come up
24 to me and want to know where they can get them. You know, I
25 mean -- but this is kind of off point.

1 So, I think maybe we ought to reel it back in.
2 Are there any other questions of Mr. Kelly -- Mr. Brown?
3 I'm sorry, Mr. Kelly.

4 MR. BROWN: Call me anything.

5 (Laughter.)

6 CHAIRWOMAN SHARPLESS: Very funny. This is a long
7 day. I'd just like to make maybe one point. We, in
8 California, I think are very proud of our technical
9 capabilities, especially in software. And I don't know what
10 the Ford effort has been to try to come and maybe solicit
11 help from companies in California to resolve these
12 technological problems.

13 Is there any effort to solicit outside your
14 normal, you know, suppliers and other folks to -- perhaps
15 people have solutions to the problems out there that you
16 don't normally have.

17 MR. BROWN: Sure. We've had technical exchanges
18 with a number of companies, like Bosch, and even, in some
19 cases, our competitors, both foreign and domestic. And I
20 don't think any one manufacturer or any one electronics
21 supplier can stand up and say they invented all these pieces
22 by themselves. I defy anybody to say that. It's somebody
23 hit home runs here, somebody hit home runs there, and the
24 data's been shared. And the staff has been a key part of
25 the spreading of data.

1 No, there's no pride of authorship here. We're
2 trying to get the job done.

3 Well, I was just keying on one statement you made
4 about going out and grabbing people and, you know, OBD II
5 experts just don't walk around in the street. And I would
6 agree with that. But we have some real strong technical
7 capability in California. I'm selling the State now, Mr.
8 Brown, and I would hope that maybe on some of these
9 technological issues that the car companies could maybe
10 throw their nets a little wider to look for the expertise to
11 help resolve some of these problems. Maybe it's Dr. Wortman
12 who has the answer.

13 DR. WORTMAN: The Chair is absolutely correct.
14 The software that you need here is primitive compared to
15 aerospace software.

16 But there is a natural reluctance to go out and
17 find a company that has any experience. Your competitor was
18 smart enough to buy one. And I would be very afraid of him.
19 Anybody who has Hughes has software and controls.

20 So, that is a very good point. The software you
21 need for this is nothing compared to control software in a
22 fighter, for instance.

23 But, on the other hand, I realize you have
24 enormous problems, because few people realize that, right
25 now, in the electronics and control systems, software is

1 one-third of the cost. It's not the pieces. It's the funny
2 symbols that go into the computer that cost money.

3 CHAIRWOMAN SHARPLESS: Thank you, Mr. Brown.

4 MR. BROWN: Thank you.

5 CHAIRWOMAN SHARPLESS: We'll call Richard
6 Klimisch, American Automobile Manufacturers Association.

7 DR. KLIMISCH: Thank you. Good morning. My name
8 is Dick Klimisch. I'm Vice President of Engineering Affairs
9 of the American Automobile Manufacturers Association,
10 affectionately known as AAMA.

11 Over the past four years, association member
12 companies have devoted tremendous effort and resources
13 towards developing OBD II systems, which comply with various
14 requirements of this technology forcing regulation, and
15 perform reliably in customer vehicles.

16 To say the least, the challenge that this
17 regulation has given manufacturers has been major,
18 especially in light of the short time period between the
19 development of technology and the implementation of that
20 technology in customer vehicles.

21 This is further complicated by the fact that the
22 feasibility of some of the requirements still needs to be
23 demonstrated.

24 Two prime examples are feasibility of OBD II on
25 low-emission vehicles and expanded misfire monitoring

1 requirements for '97 and beyond. However, member companies
2 have been diligent in evaluating and implementing the best
3 available technology.

4 With regard to the issue being addressed at this
5 hearing today, members fully support the CARB staff's
6 proposed modification to the regulation for the '94 model
7 year; that is, specifically, to give the Executive Officer
8 the authority to waive one or more of the requirements of
9 the regulation. We understand this determination will be
10 based on the manufacturer's demonstration of good-faith
11 effort to meet all the regulation's requirements, and that
12 the resulting system will be a much more effective
13 diagnostic system than OBD I.

14 Association member companies have demonstrated
15 this good-faith effort in evaluating a wide range of
16 technology over the last few years. An example of such
17 efforts include an in-depth evaluation of the
18 magnetostrictive misfire sensor promoted by Technical
19 Advances, Incorporated, in which a direct comparison of the
20 sensor's performance with a manufacturer's system was
21 evaluated over a wide range of operating conditions.

22 An earlier evaluation was conducted on Purdue
23 University's misfire detection algorithm. The USCAR, which
24 is part of a low-emission partnership research consortium,
25 has developed an evaluation procedure for OBD II misfire

1 detection concepts and intends to evaluate misfire detection
2 systems, including an updated version of the Purdue
3 algorithm.

4 Also, member companies have conducted in-depth
5 research on statistical techniques for determining if a
6 component is malfunctioning. Such techniques would not only
7 improve the performance of the monitoring system, but would
8 reduce the likelihood of false illuminations of the "check
9 engine" light, which, as you know, jeopardize the public's
10 acceptance of the light and conditions them to ignore
11 illumination.

12 These are but a few examples of member companies'
13 efforts to evaluate and develop new technologies to comply
14 with these requirements. Under the USCAR umbrella, member
15 companies have been sharing ideas on the various technical
16 issues, and their efforts should definitely be characterized
17 as good faith.

18 With regard to the staff's proposal for the '95
19 model year, member companies are opposed to monetary
20 penalties for OBD II system deficiencies. We oppose this
21 provision for several reasons.

22 First, the requirements in the OBD II regulation
23 are technology forcing, which everyone has recognized.
24 Given this fact, CARB staff has the responsibility to
25 determine the feasibility of the various requirements in the

1 regulation, as well as the responsibility to evaluate a full
2 line manufacturer's ability to implement these requirements
3 across its entire product line. AAMA is concerned that
4 monetary penalties will become a surrogate for the
5 feasibility requirement, in that manufacturers will have to
6 pay penalties to sell their vehicles in California, even
7 though it may not have been feasible for them to meet all
8 the requirements on every engine, given the short leadtime
9 and the complexity of the requirements.

10 Next, the regulation required that manufacturers
11 apply for waivers from OBD II requirements for '94 and '95
12 before October 15, '91. This early waiver decision
13 increases manufacturers' risk of noncompliance. Decisions
14 had to be made with little data on this technology forcing
15 requirement. To penalize a manufacturer for trying
16 will only ensure that manufacturers will always err on the
17 same side by seeking the waiver early should similar
18 circumstances occur in the future.

19 Also, the demonstration of the feasibility of the
20 OBD II requirements on one or a few vehicle applications
21 does not mean that it will be feasible for all vehicle
22 applications. Unique problems may occur on certain engine
23 families which were not present when the same technology was
24 successfully implemented on other engine designs.

25 Next, AAMA does not believe that penalties are

1 necessary. A substantially compliant OBD II system will
2 most likely have the same or similar hardware and software
3 installed on the vehicle as compared to a fully compliant
4 system, and the manufacturer will probably have used the
5 same amount of resources in developing the system.

6 As a result of these concerns, we recommend that
7 the Board modify the requirements for the 1995 model year to
8 be consistent with the proposal for '94, essentially
9 allowing the Executive Officer to approve partially
10 compliant systems on a good-faith effort demonstration by a
11 manufacturer without imposition of monetary penalty.

12 I would just add, on the fairness issue, that it
13 cuts both ways. There is comparison with those who got the
14 waiver and a comparison with those who are fully compliant.
15 The sheer numbers, as you know, are on the side of those who
16 took the waiver option.

17 This concludes our prepared statement. Thank you.

18 CHAIRWOMAN SHARPLESS: Mr. Lagarias.

19 MR. LAGARIAS: Dr. Klimisch, I have a question
20 about the USCAR low-emission partnership concepts. Is this
21 a system whereby the manufacturers get together to evaluate
22 different concepts for OBD II requirements?

23 DR. KLIMISCH: Yes, sir. That's a consortium
24 which we operate under, and they have this low-emission
25 partnership that has specific responsibilities to look at

1 various OBD II technologies.

2 And we can form partnership with others in this.
3 Typically, we form partnerships with various government
4 agencies.

5 MR. LAGARIAS: So, if an outside organization came
6 in, it could offer a technology for you to evaluate; is
7 this correct?

8 DR. KLIMISCH: Yes. It's a place where we can
9 leverage all these resources.

10 MR. LAGARIAS: Would the results that you got in
11 evaluating this system go back to this partnership, to this
12 independent organization?

13 DR. KLIMISCH: They would be protected, at least
14 for some time, I believe, for the members, which are GM,
15 Ford, and Chrysler.

16 But that's negotiated up front.

17 MR. LAGARIAS: I'm trying to find out if you're
18 going to pick the brains of somebody and then kiss them off.
19 Is there a two-way dialogue in this?

20 DR. KLIMISCH: Oh, yes.

21 MR. LAGARIAS: So, they're fully protected in the
22 evaluation?

23 DR. KLIMISCH: Yes. Those things are negotiated
24 up front. It takes some time, but, yes.

25 MR. LAGARIAS: If somebody came in with an

intermittent windshield wiper, for example, would it go through a system like this?

DR. KLIMISCH: Well, that's a very painful example. Yes, it would.

(Laughter.)

MR. LAGARIAS: All right.

DR. KLIMISCH: We weren't able to do this in the past. Some of the reason was the antitrust concerns wouldn't allow us to do this.

MR. LAGARIAS: Aren't there already existing organizations that you could -- or systems where you can evaluate technology other than this one, other arrangements?

DR. KLIMISCH: I'm sorry. I'm not sure what you're getting at.

MR. LAGARIAS: Well, I know auto/oil arrangement is for sharing information. Is this an information transfer or an individual evaluation of concepts by the member companies?

DR. KLIMISCH: Well, it's both. The auto/oil is part of USCAR. In fact, that's one of the consortiums under USCAR.

MR. LAGARIAS: Oh, I see. All right. Thank you.

CHAIRWOMAN SHARPLESS: Okay. Thank you very much. I'd like to call forward David Ferris.

MR. FERRIS: Good morning, Chairwoman Sharpless

1 intermittent windshield wiper, for example, would it go
2 through a system like this?

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4 example. Yes, it would.

5 (Laughter.)

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20 part of USCAR. In fact, that's one of the consortiums under
21 USCAR.

22 MR. LAGARIAS: Oh, I see. All right. Thank you.

23 CHAIRWOMAN SHARPLESS: Okay. Thank you very much.

24 I'd like to call forward David Ferris.

25 MR. FERRIS: Good morning, Chairwoman Sharpless

1 and members of the Board. I'm David Ferris, Senior Project
2 Engineer from General Motors Environmental and Energy staff.

3 I've submitted a written statement for the record
4 here this morning. But rather than read it, I'm going to
5 try and summarize it and focus on the key points.

6 After an introduction, I'll discuss the 1994 and
7 1995 model year issues first, then I'll discuss our
8 demonstration of good faith effort; and, finally, I'll
9 discuss 1996 and later model year issues before closing.

10 GM appreciates the opportunity to comment on the
11 Ford's petition for relief from OBD II requirements for 1994
12 and 1995 model years. We support the statement given
13 previously by the American Automobile Manufacturers
14 Association.

15 And we support the Ford petition for relief based
16 on good-faith effort. Due to the technology forcing nature
17 of the requirements, the proposal to assess fines for the
18 1995 model year is unreasonable. The Board has the
19 obligation to determine that no alternative would be more
20 effective in carrying out the purpose for which the
21 regulations are proposed or would be as effective and less
22 burdensome than the proposed action. Since 1995 model year
23 hardware and software are already finalized, providing
24 relief for the 1995 model year based on a good-faith effort
25 would be as effective and less burdensome than the proposal

1 to assess fines.

2 The staff has acknowledged that the OBD II
3 requirements are technology forcing and has proposed
4 acceptance of 1994 model year vehicles which fail to comply
5 with one or more of the OBD II requirements without fines or
6 penalties for several reasons, which were discussed in the
7 staff report and illustrated earlier.

8 First, to deny certification of these marginal OBD
9 systems would preclude introduction of the more
10 sophisticated OBD II systems. Second, withholding
11 certification would penalize an aggressive plan to implement
12 OBD II before it's required on all vehicles in the '96 model
13 year.

14 Third, manufacturers that are able to comply with
15 OBD II shouldn't complain about wasted efforts, since their
16 early efforts will ensure high reliability for OBD II
17 systems in the future and reduce their workload when a
18 hundred percent implementation is required in '96.

19 Fourth, manufacturers with marginally deficient
20 OBD II systems will not realize any competitive advantage
21 since equal design and development expenses have already
22 been incurred and as much additional hardware will be used.

23 Fifth, the staff is very familiar with the
24 problems and solutions in implementing OBD II technology and
25 will be able to discern a good-faith effort.

1 GM agrees with this logic and supports the staff
2 proposal to waive one or more OBD II requirements for the
3 '94 model year based on a demonstrated good-faith effort.
4 However, a waiver for the '94 model year does not go far
5 enough. All of these five reasons apply equally well to the
6 1995 model year.

7 Fines are not appropriate for 1995 model year,
8 because of the technology forcing nature of the OBD II
9 requirements and the late date of this action. Fines would
10 only be appropriate if the requirements and the compliance
11 technology are well known, and there is ample time to devote
12 the resources necessary to comply.

13 This is not the case for the 1995 model year. GM
14 expects to be able to fully comply with three engines for
15 the '95 model year, but these requirements are very complex
16 and subject to interpretation.

17 For example, for oxygen sensor monitoring, the
18 regulation refers to "any other parameter that can affect
19 emissions."

20 The regulation also refers to any electronic
21 powertrain component which can affect emissions, and the
22 most reliable or best available monitoring method. These
23 requirements are not well defined, and we will not be
24 certain whether we will be able to comply with all engines
25 until we've completed the certification process.

1 Furthermore, this new technology is more difficult
2 to implement on some engines than on others. Just because
3 we've successfully implemented it on one engine, does not
4 mean that we will be able to comply on another engine.

5 If we are found marginally deficient for one of
6 our engines during the certification process, there won't be
7 time to make any change. We'll have no alternative, other
8 than to pay the fines. And for General Motors, that could
9 amount to millions of dollars of fines for the '95 model
10 year.

11 The staff report states that for the '95 model
12 year, manufacturers would have the option to devote
13 necessary resources or pay the fines. This assumption is
14 simply not correct. The '95 hardware and software are
15 finalized to allow hot weather summer validation testing
16 right now. The '95 development is complete. It's too late
17 to devote any additional resources.

18 The comment that Chairwoman Sharpless made earlier
19 about buying a competitor's vehicle, learning the technology
20 is true, but you can't buy a '94 vehicle, learn the
21 technology, and then implement it in '95. It simply isn't
22 enough time.

23 Therefore, all of the reasons previously for
24 waivers based on good-faith effort apply to the '95 model
25 year. The staff proposal to fine marginal OBD II systems,

1 while '95 -- for the '95 model year, while inferior OBD I
2 systems would be allowed without fines, penalizes OBD II
3 introduction before the '96 model year, and creates an
4 unfair competitive situation.

5 Allowing waivers based on good-faith effort for
6 the '95 model year would be as effective and less burdensome
7 than the proposed fines.

8 Therefore, GM recommends that the regulation be
9 amended to allow the Executive Officer to waive one or more
10 of the OBD II requirements for the '95 model year based on a
11 demonstrated good-faith effort without any fine or penalty.

12 Next, I'd like to respond to allegations that
13 industry has not demonstrated a good-faith effort. Like
14 Ford, GM believes that early in-use experience is very
15 important. However, since none of our '94 model year
16 computers were capable of complying with all of the OBD II
17 requirements, GM is implementing partial OBD II diagnostics
18 on certain 1994 model year vehicles. We've made a
19 tremendous effort to do this for the '94 model year,
20 including hardware and software development, modification of
21 production procedures, dealer service training, et cetera.

22 In this way, GM is gaining early experience with
23 the new diagnostics and communication protocol in an
24 aggressive effort to develop reliable OBD II systems. '95
25 model year experience would have been too late to help and

1 benefit the '96 model year introduction.

2 GM has invested millions of dollars and over
3 man/years of effort to develop OBD II diagnostics. Our
4 concept selection teams have brainstormed and evaluated
5 every technique that we could think of. Our development
6 engineers have worked with researchers from GM Research, A.
7 C. Rochester, Delco Electronics, and Hughes -- excellent
8 suggestion. In fact, we have Hughes working on two or three
9 OBD projects right now.

10 We also work with the National Laboratories,
11 various universities, and suppliers. I'd like to use
12 misfire monitoring as an example to illustrate our good-
13 faith efforts. The following is a brief summary of our
14 efforts to evaluate outside misfire monitoring technologies.

15 We worked with Purdue University on crankshaft
16 speed fluctuation technology from 1984 through 1991. This
17 work involved hundreds of thousands of dollars of funding
18 for Purdue and hundreds of man/hours of our time evaluating
19 Purdue's misfire monitoring methods.

20 To date, we have not seen any data from Purdue
21 indicating that their monitoring capability is any greater
22 than GM's.

23 Technical Advances, Incorporated, we're worked
24 with them in 1991 and 1992, spent tens of thousands of
25 dollars funding the effort, and hundreds of man/hours

1 evaluating their misfire monitoring technology.

2 GM is unable to discuss specific results of this
3 evaluation because of a nondisclosure agreement. However,
4 we're not surprised by the results of the Ford evaluation of
5 Technical Advances' capabilities recently submitted to the
6 staff.

7 We'd be happy to present the results of our
8 evaluation if TAI agrees. We've also had a research
9 contract with George Mason University over the past four
10 years involving hundreds of thousands of dollars of funding.
11 We've evaluated the University of Michigan's misfire
12 monitoring technology through conversations with U of M
13 staff and a review of the SAE papers during the last few
14 years. A more detailed evaluation was deemed unnecessary,
15 since the method did not appear to have been demonstrated to
16 meet all the '97 requirements and appeared to require more
17 computing power than was practical for the '94 through '97
18 model years.

19 We also had meetings with Bosch on several
20 occasions during the past few years. An SAE paper presented
21 by Bosch earlier this year demonstrates that their
22 technology is not capable of meeting the 1997 model year
23 misfire monitoring requirements on all engines.

24 In an effort to maximize the capability of GM's
25 crankshaft misfire monitoring method, we've dedicated two to

1 three fulltime engineers doing advanced research and
2 development over the past four years. This work has
3 evaluated over 20 different versions GM's algorithms. After
4 all this effort, GM has concluded that our method is as
5 capable of detecting misfire over a broad range of engines
6 and normal operating conditions as any other method is.

7 Our method is also likely to be more robust and
8 reliable than the other techniques. GM has also
9 participated with Ford and Chrysler in the USCAR low-
10 emission partnership consortium to pool resources and
11 optimize our OBD system development efforts. Further
12 evidence of our continued good-faith efforts is the low-
13 emission partnership consortium evaluation procedure for OBD
14 II misfire detection concepts, which has recently been
15 completed and forwarded to the staff for comment.

16 This procedure should assist the consortium
17 members in further evaluation of outside misfire monitoring
18 methods, and we would like to invite the staff to join our
19 efforts.

20 Purdue and Technical Advances have challenged the
21 industry's demonstration of good-faith effort. GM disagrees
22 with their statements as detailed in our written response.
23 If the staff feels that the low-emission partnership
24 consortium evaluation procedure is unreasonable, we're
25 willing to work with them to modify it.

1 Now that I've addressed the good-faith efforts,
2 I'd like to make you aware of our concerns regarding the
3 1996 and later model years. The staff proposal does not
4 contain any relief from OBD II requirements for '96 and
5 later model years. The staff has stated that the remaining
6 concerns regarding OBD II requirements for low-emission
7 vehicles or enhanced monitoring requirements will be
8 addressed at a spring, '94 Board hearing.

9 GM has three remaining concerns for '96 and later
10 model years. Catalyst monitoring requirement for low-
11 emission vehicles, the one and a half times the standard
12 emission threshold for low-emission vehicles, and the
13 misfire monitoring requirement for '97 and later model
14 years.

15 For low-emission vehicles, the regulation requires
16 that we individually monitor the front catalyst or determine
17 when it is malfunctioning. The front catalyst may also be
18 monitored with the next catalyst as a system, but the MIL
19 must be illuminated before exceeding the one and a half
20 times the standard threshold.

21 GM is currently not able to monitor the front
22 catalyst alone without false MILs. We are evaluating new
23 catalyst wash coats and a new low-speed method in an effort
24 to try and comply with the regulation. We're also testing a
25 system diagnostic to see whether it can meet the one and a

1 half times the standard's threshold for our 1996 model year
2 transitional low-emission vehicles.

3 However, if this issue's not resolved, it could
4 prevent introduction of certain TLEVs for the '96 model
5 year. Our '96 hardware will be finalized this fall, and a
6 spring, '94 hearing may be too late.

7 We plan to meet with the staff as soon as we have
8 new data available; however, we may need to petition the
9 Board for relief on this issue this fall. GM is also
10 concerned about the one and a half times emission standards
11 thresholds for low-emission vehicles. We're currently
12 testing TLEVs to generate data before the spring, '94
13 hearing, and we suggest that the staff work with the USCAR
14 low-emission partnership to define what data are needed.

15 For '97 and later model years, the regulation
16 requires that we monitor for misfire at all positive torque
17 engine speeds. GM cannot reliably detect misfire at high
18 engine speeds with the transmission in neutral on all
19 engines. We are not aware of any malfunctions that occur
20 exclusively at high engine speeds with the transmission in
21 neutral, and our in-use data shows that essentially no time
22 is spent in this region.

23 Therefore, we're not aware of any possible air
24 quality benefit from monitoring for misfire at high engine
25 speed with the transmission in neutral, and we will continue

1 to encourage you and your Board and your staff to modify the
2 requirement.

3 If these issues are not resolved at the spring,
4 '94 hearing, we may need to petition for relief.

5 In closing, when you consider the technology
6 forcing nature of the OBD II requirements, the good-faith
7 effort that has been demonstrated by the industry, the fact
8 that the software and hardware are already finalized for
9 both the '94 and '95 model years, and the unfair competitive
10 situation created by fines, it is clear that the regulation
11 should be modified to allow the Executive Officer to waive
12 one or more OBD II requirements for both the 1994 and 1995
13 model years without monetary penalties based on a
14 demonstrated good-faith effort.

15 I'd like to reemphasize that manufacturers with
16 marginal OBD II systems will not realize any competitive
17 advantage, since equal design and development expenses have
18 already been incurred and as much additional hardware will
19 be used.

20 And finally, providing relief for the 1995 model
21 year based on a good-faith effort would be as effective in
22 achieving the objective of the regulation and would be less
23 burdensome than the proposal to assess fines.

24 This concludes my statement. I'd like to thank
25 you for listening, and I'd be happy to answer any questions

1 you may have at this time.

2 CHAIRWOMAN SHARPLESS: Questions of Mr. Ferris?

3 Dr. Wortman?

4 DR. WORTMAN: Please note, I doubted whether 100
5 man/years was enough.

6 CHAIRWOMAN SHARPLESS: Mr. Ferris, I appreciate
7 your detailed explanation of what GM is doing, and also
8 appreciate the amount of resources that goes into this.

9 I guess I less appreciate the amount of resources
10 you spent in fighting the California waiver, and wished that
11 it could be used for technological development. But that's
12 another issue.

13 I would like to ask staff, if I could, about the
14 language and the criterion for waivers. I've heard you say
15 and the witnesses say one or more deficiencies. What does
16 the "or more" deficiencies mean?

17 MR. ALBU: Basically, we expect that most of the
18 manufacturers coming in 1995 would probably have at most two
19 deficiencies, maybe three, realistically. And so, we're
20 basically providing some latitude in the language to provide
21 the staff to make a judgment that they showed good faith,
22 and that their systems are generally much more capable than
23 OBD I. We really don't expect more than one, two, or three
24 deficiencies at most on any system.

25 We have met with most of the manufacturers on

1 repeated numbers of occasions. And I don't see evidence
2 that there's going to be more problems than that in any one
3 system.

4 CHAIRWOMAN SHARPLESS: Yes, Dr. Wortman.

5 DR. WORTMAN: One more thing. You have pointed
6 out that running at high speed in neutral doesn't happen
7 very often. I think a better statement is: "Any fool who
8 does it will buy a new transmission."

9 And, as far as meeting requirements, you have as a
10 captive the manufacturer of the greatest diagnostic test
11 sets in the world for the aerospace system. You should have
12 no problems.

13 MR. FERRIS: One of the problems when working with
14 a company like Hughes is that they say, "Well, the first
15 thing you need to do is get a whole new computer dedicated
16 to do misfire monitoring," or something like that. They are
17 not -- frequently not in the government (sic) -- the
18 aerospace industry's not used to working with technologies
19 that need to be affordable for every day consumers.

20 DR. WORTMAN: Okay.

21 (Laughter.)

22 CHAIRWOMAN SHARPLESS: But GM owns them. I assume
23 that somehow they could figure out a way to work with the
24 parent company.

25 MR. FERRIS: Oh, we're working with Hughes. As I

1 said, we have at least three different projects with Hughes
2 right now for on-board diagnostics.

3 DR. WORTMAN: Then you have no problems.

4 CHAIRWOMAN SHARPLESS: Mrs. Hilligoss.

5 MAYOR HILLIGOSS: I wanted to ask the staff why we
6 do have that monitoring at high speed with the transmission
7 in neutral? What point is that?

8 MR. ALBU: Basically, that's an outer limit. Our
9 requirement simply is that for all engines, that the entire
10 operating range of the engine be monitored. And that just
11 happens to be the outer limit and the toughest spot for most
12 of the manufacturers to achieve. But misfire can occur only
13 at high speed, not at low speed, and oftentimes when it
14 occurs only at high speed, it can damage the catalyst. And
15 we want to prevent that. It just takes one instance to
16 damage a catalyst, and we want to try to prevent that.

17 We've seen capability, for example, on three of
18 the engines coming in in 1994, where they can monitor in
19 just the range that Mr. Ferris is mentioning. In other
20 words, idle neutral to 6,000 rpm, they can detect a single
21 misfire.

22 And also, if we don't have that overall
23 requirement, then manufacturers can come in to the staff and
24 they can say, well, for my engine, we have a fairly flexible
25 crankshaft, because we have high fuel economy constraints

1 and so forth, or we have resonance conditions in the drive
2 line our other engines don't have; therefore, we need a
3 waiver to not go into this high speed region, or to lop off
4 at least a part of the operating range of that engine.

5 And what that does is it puts the staff in the
6 position of having to determine for every manufacturer
7 what's appropriate. So, what we're really trying to do is,
8 if the capability exists to go to the outer ranges, and we
9 think it does and it's already been demonstrated -- or will
10 be soon on the '94 models, then we would like to require it
11 for all models.

12 So, it's a feasibility issue that we think has
13 been overcome, at least for four cylinder, five, and six
14 cylinder engines, as I said.

15 Now, some of the questions still remain for the
16 eight cylinder, ten cylinder, and twelve cylinder engines.
17 But, primarily, we think that the technology is there, at
18 least for six cylinder and below, and we're working with
19 other persons and companies to make sure we can get the data
20 of range for the larger engines as well.

21 MAYOR HILLIGOSS: And then another question I had
22 is: All of the 1996 models must have this OBD II
23 technology.

24 MR. ALBU: Yes.

25 MAYOR HILLIGOSS: Then why would we penalize them

1 for not having it in 1995?

2 MR. ALBU: Well, the issue is, we would like to be
3 sure that those manufacturers which came in in 1994 with
4 fully complying systems and devoted a large number of
5 resources very aggressively, and worked to meet our intent
6 and our requirements as early as possible, should be
7 accounted for. For example, I've heard testimony so far
8 that says, you know, we're encountering the same expense
9 that they would even if, you know, we don't do the full job.

10 But there's one example I can give where one
11 manufacturer is putting in a sensor to detect purge activity
12 that is going to cost them some money. We're glad they did
13 it. It provides a welcome benefit in terms of air quality
14 on their product, which Ford is not going to encounter, for
15 example, in '94.

16 So, we think, that to protect those manufacturers
17 that are putting in the investment, the extra parts, we
18 should protect that, and we should also protect the concept,
19 I think, that if you try hard, we want to protect you and
20 encourage you in the future to continue to do that kind of
21 work. And we do appreciate it.

22 MAYOR HILLIGOSS: But if we're not requiring them
23 to do it until '96, I just don't think it's right to
24 penalize them if they don't do it -- if they don't do it
25 before '96.

1 MR. CACKETTE: Mayor Hilligoss, the way the
2 regulation that the Board adopted is -- it does have a
3 requirement that you do OBD II the moment that you change
4 the computer to have the capability, have the computing
5 capability to do it. That starts in '94. So, what's
6 triggering a lot of the manufacturers is the fact that they
7 are introducing a new engine or a new control system that
8 has the more powerful computer on it. And under your
9 regulations, that mandates that they do OBD II. So, it's
10 not that the regulation started in '96, and these early
11 volunteers are incurring penalty.

12 In fact, they'd only incur a penalty because they
13 would not meet the letter of the regulations that you
14 adopted. And the reason that the Board adopted the sort of
15 phase-in was, in fact, a provision to try to ease the burden
16 on manufacturers. It was a 1994 regulation for which we
17 said, Okay. Rather than trying to make them do advanced,
18 you know, advanced computer capabilities before they were
19 ready, before they had already planned to do so on a model,
20 we would give them this three-year phase-in. And the way
21 the phase-in has worked is there's just a few people in '94
22 that have to meet the requirements.

23 And for that, we're saying, if they tried and
24 failed, that's okay. But for '95, for most manufacturers
25 with a full product line, it's been clear from Day One that

1 they had to build some complying systems. They simply
2 didn't have the resources to do all of the wide variety of
3 models, everyone requiring a slightly different system, all
4 in one year flat out.

5 And so, I think most manufacturers have known and
6 have planned on doing some '95 models. And I think the
7 chart showed that there was, you know, anywhere from 15 to
8 35 percent of the models in '95 are going to be OBD II
9 systems. And the real policy issue here is you set out a
10 requirement, and some people are going to fail in '95, when
11 they clearly knew what the requirement was. A lot of people
12 are going to fully comply. And is there an equity issue
13 here that should be addressed by a fine?

14 As Steve pointed out, on some cars, they're going
15 to leave a part off that some other manufacturer puts on.
16 And while manufacturers are not, you know, are not signing
17 up on this list to say, "We complied." We think this idea
18 of letting people off the hook is bad. We are hearing that.

19 There are people that are perceiving, gee, there's
20 a requirement out there. Is it going to be the future of
21 the Air Resources Board that if you put a requirement out
22 there and you miss, well, that's okay. Because, in that
23 case, what incentive is there to take the risks that some of
24 the manufacturers -- the seven that have got complying
25 systems in '94 -- took, because they clearly are taking

1 some extra risks. And the majority of them have succeeded.

2 And that's going to amplify in '95, because there
3 are going to be a lot more people that took the risk and
4 fully complied. And they're going to be saying, "Well, gee,
5 maybe we should have cut back, drop this sensor off, only 80
6 percent complied. We could have gotten away with that.
7 That would have been advantageous to us. Maybe we should
8 have left off the system that has the highest risk to us of
9 a light coming on, warning light coming on during -- on a
10 lot of consumers that might cause a recall or something like
11 that."

12 And the way the regulations are now, a lot of them
13 just bit the bullet and said, "We're going to do our best
14 job and build a fully complying system."

15 So, I think that's sort of the policy and
16 principle that's at stake here.

17 MAYOR HILLIGOSS: Thank you.

18 CHAIRWOMAN SHARPLESS: Yes, Dr. Boston, then Dr.
19 Wortman.

20
21 DR. BOSTON: Mr. Albu, in 1995, you had a list of
22 fines to be imposed on the board there. There were two
23 categories. The top seven or eight elements there had a
24 fine of \$50 and the bottom, it said, were \$25 for each
25 deficiency.

1 So, my question is, in 1995, if an engine family
2 has a deficiency of three or more of that top group, would
3 the fine be \$150 for those three, or would it be \$50?

4 MR. ALBU: It would be 150. But I don't know of
5 any manufacturer that would have three deficiencies in that
6 category.

7 And the reason the numbers are so low is really
8 because we're only trying to provide an equitable offset.
9 It's almost not even a fine. It's like Dr. Wortman said.
10 It's very difficult to justify calling this a fine almost,
11 because it's so small. What we were trying to do is
12 establish equity more than anything else, I think, between
13 those who tried and succeeded and those who maybe waited and
14 didn't quite put in the resources up front that the others
15 did.

16 DR. BOSTON: I think Mr. Ferris just said some of
17 his engine families may not meet all of those requirements.
18 Did I misunderstand what you said?

19 MR. FERRIS: That's correct. We are concerned
20 about that.

21 CHAIRWOMAN SHARPLESS: But that's for '96.

22 DR. BOSTON: '95.

23 CHAIRWOMAN SHARPLESS: '95, they don't have to.
24 Unless he's going to change his computer systems in '95.

25 MR. FERRIS: We have three vehicles coming out

1 with new computers in the '95 model year, and we are
2 concerned that those may fall slightly short of meeting the
3 full requirement.

4 CHAIRWOMAN SHARPLESS: But that's the slightly
5 short; does that mean two deficiencies, three deficiencies,
6 nine deficiencies?

7 MR. FERRIS: It could easily be two or three
8 deficiencies.

9 CHAIRWOMAN SHARPLESS: So, we're still talking
10 about a very small sum.

11 MR. FERRIS: But it would be millions of dollars
12 for General Motors.

13 DR. BOSTON: It could be 100, 125.

14 CHAIRWOMAN SHARPLESS: Yeah. But still, when you
15 look at the relationship between the people who have made
16 the effort and have succeeded versus someone who has made
17 the effort -- we're giving them a give in 1994. The only
18 thing at issue here is 1995.

19 MR. FERRIS: Keep in mind that it's easier to do
20 on some engines than others. If you've got a particularly
21 difficult --

22 CHAIRWOMAN SHARPLESS: But you don't have to do
23 them on all your engines. That's the point. In 1995,
24 there's no requirement, unless you change your computer,
25 that you do OBD II.

1 MR. FERRIS: If you have a particularly difficult
2 engine that gets a new computer in '95, you could be in
3 trouble.

4 DR. BOSTON: He's got a V-12 Jaguar with a Lucas
5 (phonetic) that's going to be a problem.

6 MR. FERRIS: Absolutely.

7 CHAIRWOMAN SHARPLESS: That's a special case.
8 Okay. Dr. Wortman.

9 DR. WORTMAN: I'd like to go back to the point
10 raised by Mayor Hilligoss. There are problems, no question
11 about it, and difficulties.

12 And this requirement of transmission in neutral at
13 6,000 rpm, could you give a few examples when this occurs?

14 MR. ALBU: Well, basically, again, that was an
15 outer limit of the requirement. We're basically trying to
16 get the full range monitoring so you don't have to make
17 these partial decisions.

18 But, for example, you could have a downhill
19 situation where you're slightly accelerating and maybe get
20 into some of that light load, higher speed range, especially
21 from your lower gear.

22 DR. WORTMAN: 6,000 rpm?

23 MR. ALBU: Well, it depends. I'm not saying it's
24 a routine thing at all.

25 DR. WORTMAN: In neutral? Downhill? C'mon.

1 MR. ALBU: All we're saying is we would like --

2 DR. WORTMAN: You wouldn't do that. It's against
3 the law anyway.

4 MR. CROSS: Dr. Wortman, I don't think he's saying
5 that that's a typical or even an atypical vehicle operating
6 condition. I think what he's trying to do is say, if you
7 have an engine operating map, the line between sort of
8 positive and negative torque is essentially the transmission
9 in neutral. And so, he's using it as a boundary rather than
10 saying it's a condition that occurs in actual vehicle
11 driving.

12 DR. WORTMAN: But that's a boundary so far beyond
13 any reasonable limit, the question is, is it necessary if
14 it's going to cause a lot of trouble?

15 MR. CROSS: Well, two things. First --

16 DR. WORTMAN: Why 6,000? I have engines that do
17 seven and a half or eight. Set it at eight.

18 MR. CROSS: It would in that case. In other
19 words, the point that I'm trying to make, though, is that
20 when you -- in our workshop process, we tried to define
21 points off of the boundary, between sort of positive and
22 negative torque on a reasonable basis.

23 And then you start looking at powertrain
24 optimization, how is the vehicle driven; does it have an
25 automatic or manual transmission? What are the shift

1 points? I mean, you get into a big mess. Whereas, if you
2 just say, try and monitor the engine in its reasonable
3 positive torque, taking into account that it is achieved
4 already by some researchers. And then, you don't have to --
5 you don't have this regulatory problem of saying, gee, look
6 at every vehicle and figure out what the realm of
7 measurement is.

8 DR. WORTMAN: Tell me. How many times have you
9 operated an automobile with the transmission in neutral and
10 the engine doing 6,000 rpm? Honestly now.

11 MR. CROSS: A few times.

12 DR. WORTMAN: What for?

13 MR. CROSS: To set the timing on a race car, you
14 sometimes do stuff like that.

15 DR. BOSTON: He likes to hear explosions.

16 CHAIRWOMAN SHARPLESS: I think I understand what
17 staff is saying in terms of -- it's not what you consider to
18 be a natural operational mode, but you're using it as a
19 parameter on a mapping.

20 MR. CROSS: And the Board, in its interim
21 requirement, if you will, adopted basically saying,
22 monitoring during all the FTP conditions, which is the very
23 difficult driving conditions.

24 But there's a very broad range operating
25 conditions that happen between FTP and the end of the map,

1 if you will.

2 And the '97 requirement is trying to capture all
3 of that.

4 CHAIRWOMAN SHARPLESS: I know this is not the
5 basis or the issue here at this hearing. But Mr. Ferris
6 took the opportunity to give us an update on where GM was in
7 meeting the later standards. And I think at a later date,
8 we're probably going to be hearing a lot more on this issue.

9 Mr. Ferris, are you saying some concluding remarks
10 here?

11 MR. FERRIS: Well, just to answer a question I
12 think asked previously about the difficulty associated with
13 monitoring for misfire at low speed -- high speeds and low
14 loads.

15 Using the crankshaft speed fluctuation technique,
16 when you have a misfire, there's a fluctuation in the
17 crankshaft velocity. At lower speeds and higher loads,
18 the corner of the map, that signal is on the order of 8 to
19 10 percent, relatively easy to detect. When you get to
20 extremely low loads, such as neutral, and extremely high
21 speeds, that signal is a fraction of a percent, becomes
22 extremely difficult to detect, and the likelihood of false
23 MILs becomes extremely high. And we don't see any air
24 quality benefit associated with that corner of the map.

25 CHAIRWOMAN SHARPLESS: But I think the point that

1 the staff was making was trying to devise a parameter where
2 you didn't have to go through each and every engine family
3 to figure out where to put the mark. Was that not right,
4 Mr. Cross?

5 MR. CROSS: Right.

6 CHAIRWOMAN SHARPLESS: But, again, this is not an
7 issue that's before this Board today. It was an opportunity
8 that this witness took to give us an update on how they're
9 doing overall to meet the future requirements.

10 MR. CACKETTE: Madam Chair, also, I'd like to --
11 just so this issue doesn't cloud the issue that's in front
12 of us, if that was the only condition in which a
13 manufacturer could not monitor misfire, then in -- we'd
14 revise the regulations to eliminate that condition as a
15 requirement. But the clear issue here is not just 6,000
16 rpm idle, the problem is that they're having difficulties,
17 and there's an engineering challenge for doing low load,
18 high speed. So, in all conditions in which the transmission
19 is in gear, and you have high speed, low load conditions,
20 that's what we're looking at.

21 And if it turns out that idle is not the way of
22 best representing that, we'd change the regulation. I think
23 the issue that's facing them is a little bit broader than
24 just this one condition.

25 MR. FERRIS: With the transmission in neutral,

1 it's an extreme condition. Under any kind of load, it
2 becomes much easier to detect a misfire.

3 CHAIRWOMAN SHARPLESS: Mr. Ferris, before you
4 leave us, I just want to underscore one point. You said, in
5 1995, for the cars that you may introduce, that you're
6 having difficulty meeting all of the requirements.

7 MR. FERRIS: How many faults do you think, or
8 deficiencies do you think you would have in those engine
9 models?

10 MR. FERRIS: I would be surprised if it were more
11 than two or three on a given engine. At this point, we're
12 not certain that we have any. But that still could add up
13 to millions of dollars of fines for General Motors for the
14 1995 model year.

15 CHAIRWOMAN SHARPLESS: Two or three deficiencies.

16 MR. LAGARIAS: May I ask? You say three engine
17 families, but what percent of the market would that
18 represent -- of your market would that represent, since you
19 have so many engine families? I don't know what you're
20 going to apply it to.

21 MR. FERRIS: I'm not certain what the exact
22 percentage is. It's a relatively small percentage, I'm
23 sure.

24 MR. LAGARIAS: Well, I would think so. So, you're
25 trying it out on three engine families; is that the idea?

1 MR. FERRIS: Yes. Those three families have new
2 computers in the '95 model year and, thus, they had to
3 comply.

4 MR. LAGARIAS: Thank you.

5 CHAIRWOMAN SHARPLESS: See, my concern for 1995 --
6 I can understand it in 1994, but in 1995, we don't want to
7 set up a situation where if you do allow such a waiver,
8 given a couple of deficiencies, that that's what you design
9 to.

10 MR. FERRIS: Our design is already finished for
11 the '95 model year. Our hardware is already finalized.
12 People are doing hot weather validation testing out there
13 right now.

14 CHAIRWOMAN SHARPLESS: So, you already know -- you
15 already know what the deficiencies in those engine models
16 are going to be.

17 MR. FERRIS: No, because we haven't gone through
18 the certification process and completed the durability
19 demonstration vehicle testing.

20 CHAIRWOMAN SHARPLESS: So, you think that they
21 possibly could meet the certification standards.

22 MR. FERRIS: We anticipate that they will.
23 Although, just recently, we learned from Chrysler, that the
24 staff has challenged their method of monitoring oxygen
25 sensors. And since we're doing essentially the same thing,

1 now, we're concerned about that.

2 And we don't know what else we're going to learn
3 as we go through the certification process.

4 MR. CROSS: Our door is open. The staff would
5 encourage you to come in and talk to us about these
6 concerns. We've certainly been talking with Ford. They
7 already know what their -- what monitoring -- what parts of
8 their monitoring scheme they have to be concerned about.

9 MR. FERRIS: We plan to submit a preliminary
10 application within the next few weeks, and we'll begin that
11 dialogue. But until we go through and complete that
12 process, we won't know for sure whether we perhaps -- you
13 know, if there's any other component that can affect
14 emissions, perhaps we've overlooked one.

15 CHAIRWOMAN SHARPLESS: That just kind of amazes
16 me. You know, I would think if you're developing a system,
17 you would have a fairly good idea if it can meet
18 certification requirements. Because you've set up the task
19 for the resources to figure out how to meet a problem, and I
20 would suspect that you would be trying to design a system
21 that would pass the certification requirements.

22 And if you think you have, you would be fairly
23 certain of it.

24 MR. FERRIS: These requirements are new, and
25 they're complex, and they're not well-defined. Until we go

1 through the process, we really won't know for sure whether
2 we comply.

3 CHAIRWOMAN SHARPLESS: Mr. Cross, do you have
4 anything to say about new, complex, and undefined?

5 MR. CROSS: No. I think our -- we've been having
6 dialogue with all the manufacturers as they certify their
7 systems. And I think that GM has been a little bit slower
8 in terms of coming and asking some of the kinds of
9 questions, which we think Ford has been able to resolve.
10 And I guess I would encourage GM to avail itself of the
11 opportunity to come in and talk to us.

12 I'm not sure why they're coming in late with these
13 concerns. But I certainly think our door is open to try and
14 work with them and resolve them. I just am concerned that
15 it's happening a little later with GM than some of the
16 others.

17 MR. FERRIS: We have had many visits with CARB
18 staff over the past four years, discussed many issues, but
19 they're not all resolved yet.

20 CHAIRWOMAN SHARPLESS: Yes, Dr. Wortman.

21 DR. WORTMAN: Perhaps I could help here. Mr.
22 Ferris is absolutely right. This is a new system. And
23 until it is tested, he cannot predict what is going to
24 happen. I have worked on systems where the taxpayers, with
25 infinite money --

1 MR. LAGARIAS: Not any more.

2 DR. WORTMAN: -- had enormous surprises. Skybolt
3 was perfect. After a billion or so, the first launch, the
4 missile, instead of going up, chose to go down. That was
5 part of development. Something happened to the control
6 system.

7 So, I can see the concern here. You haven't done
8 it, so you have to wait to see for a result. He cannot
9 predict what's going to happen.

10 CHAIRWOMAN SHARPLESS: Dr. Wortman, I would agree
11 with your point, only I think the point is that other
12 manufacturers have been in to talk to the ARB staff on OBD
13 II.

14 MR. FERRIS: So have we.

15 CHAIRWOMAN SHARPLESS: Well, I don't understand
16 then.

17 MR. CROSS: I guess I'm not -- yeah, some are
18 certified already. I think the point is -- I'm not saying
19 that GM has not been dialoging with the staff. I'm saying
20 that they've been maybe a little bit guarded -- more guarded
21 in some of their exchanges than some of the others. And I
22 think that they're expressing concerns today which are
23 probably resolvable through routine communication with the
24 staff.

25 All I'm saying is that they're a little bit behind

1 in the process compared to some of the others in terms of
2 answering some of the questions that they appear to have.

3 CHAIRWOMAN SHARPLESS: Okay. Well, this can be
4 worked out. Mr. Ferris, I'm going to thank you for your
5 testimony and get on to the next witness. Okay?

6 Mr. Frank Krich. How are we doing court reporter?

7 MR. KRICH: Good morning. My name is Frank Krich,
8 and I am a regulatory planning specialist at Chrysler
9 Corporation.

10 Chrysler appreciates this opportunity to comment
11 on the proposed regulatory amendments to California on-board
12 diagnostics' two requirements regarding 1994 and 1995 model
13 year compliance based on a petition request from Ford Motor
14 Company.

15 Our comments are being made in addition to and in
16 support of the American Automobile Manufacturers Association
17 position on this issue.

18 We appreciate the efforts of the Air Resources
19 Board and staff in reviewing the status of OBD II technology
20 and addressing manufacturers' concern on this technology
21 forcing regulation. This includes the proposed amendments
22 that will allow manufacturers the ability to certify
23 vehicles that are not fully compliant with the OBD II
24 requirements in the '94 and '95 model years.

25 Chrysler strongly supports the proposal the grant

1 the Executive Officer the authority to certify without
2 penalty those vehicles that are certified prior to April
3 1st, '94, that do not fully meet the OBD II requirements,
4 provided that the manufacturers have demonstrated a good-
5 faith effort in attempting to meet the regulation.

6 We also support extending this proposal to those
7 '95 model year vehicles that use carryover OBD II systems.

8 Chrysler does not believe it is appropriate to
9 apply monetary penalties as proposed in the '95 model year.
10 In the face of a very aggressive technology forcing
11 regulation, some manufacturers were able to develop
12 compliant systems as we are informed by the CARB staff.

13 However, others may not, despite their best
14 efforts.

15 The fact that OBD II technology will have already
16 been in production for the '95 model year on a number of
17 applications, should not be a measure of other
18 manufacturers' capabilities. Vehicles can exhibit unique
19 characteristics that prevent the universal application of a
20 particular monitoring method. Therefore, we recommend that
21 a demonstration of good-faith effort in lieu of penalties is
22 proper.

23 Sharing of technological advances is one method of
24 holding down development costs of OBD II systems, and to
25 possibly shortening the development time. We have joined

1 with Ford and General Motors in the USCAR low-emission
2 partnership to provide the mechanism for such sharing.

3 We ask that CARB join with such joint efforts;
4 thus, discussions of technological feasibility and cost-
5 effectiveness could be face to face rather than through less
6 fruitful third-party discussion. An example may be helpful.

7 Chrysler has evaluated the misfire monitoring
8 technique developed by Dr. Citron of Purdue University. Our
9 personnel studied previous technical papers and patents from
10 Dr. Citron regarding his technique. Dr. Citron presented
11 his data at a meeting with Chrysler engineers in April of
12 '92. Subsequent to the meeting, an analysis of Dr. Citron's
13 system was conducted.

14 Our evaluation revealed that Chrysler's system is
15 comparable to Dr. Citron's. Recognizing that the
16 possibility existed that we did not have all the details of
17 his method, Chrysler attempted to enter into an agreement
18 with Dr. Citron. The attempt was unsuccessful.

19 The industry, in Dr. Citron's words, is being
20 uncooperative. If this scenario were conducted on the
21 proposed USCAR low-emission partnership methodology, Dr.
22 Citron would not so easily be coming back through CARB for a
23 second try, unless a new significant advance could be shown.

24 In summary, Chrysler fully supports the CARB's
25 proposal for those vehicles that are certified prior to

1 April 1st, 1994, and those 1995 model year vehicles that use
2 carryover OBD II systems.

3 We do not believe it's appropriate to apply
4 monetary penalties on those manufacturers whose vehicles
5 will not fully meet the requirements in '95 model year
6 despite a good-faith effort by the manufacturer. CARB could
7 help in the pursuit of technological solutions by endorsing
8 the review procedure offered by USCAR low-emission
9 partnership.

10 Be assured that Chrysler will continue development
11 work to improve its on-board diagnostic system to the
12 fullest extent that technology allows.

13 This concludes Chrysler's prepared statement.
14 Thank you.

15 CHAIRWOMAN SHARPLESS: Thank you very much. Any
16 questions of this witness? The only question I have is
17 toward the end of his testimony, he talked about the review
18 procedure by USCAR? What procedure are you referring to?
19 If CARB would adopt the procedure established by USCAR --

20 MR. KRICH: The USCAR submitted a draft procedure
21 that would evaluate the other technologies. There's an
22 initial evaluation, which certain things have to be met to
23 see if it's worthwhile going to the second step. And
24 believe that was in their hands, correct me if I'm wrong,
25 last Friday.

1 MR. ALBU: Yes. We did receive a proposal. Our
2 initial reaction is that, in its present form, it's probably
3 not practically workable. But, Mr. Krich indicated they're
4 willing to work with us to develop language that is -- if we
5 can achieve consensus, we're hopeful that that would be a
6 successful process.

7 CHAIRWOMAN SHARPLESS: Okay. That would be
8 encouraging.

9 Thank you very much.

10 MR. KRICH: Thank you.

11 CHAIRWOMAN SHARPLESS: We're going to take a short
12 break here and let the court reporter have a break.

13 (Thereupon, a brief recess was taken.)

14 CHAIRWOMAN SHARPLESS: Okay. Mr. Dale Kardos.

15 MR. KARDOS: Good morning. My name is Dale
16 Kardos. I'm a technical analyst with the Association of
17 International Automobile Manufacturers. Can you hear me
18 okay?

19 CHAIRWOMAN SHARPLESS: No. You're going to need
20 to get a little closer.

21 MR. KARDOS: Okay. How's that? All right. I'd
22 like to just make a brief comment on the -- some of the
23 earlier remarks but penalty and the relationship to the
24 equity issue. AIAM does represent a majority of the other
25 manufacturers marketing cars in the U.S. And we did survey

1 our membership regarding the penalty issue and the testimony
2 provided by the AAMA and the other witnesses that have
3 testified this morning, and we are in support of their
4 testimony.

5 So, with that said, I'd just like to move on with
6 my brief statement.

7 I'm here today to offer AIAM's support for staff's
8 proposed modification to the OBD II regulation for the '94
9 model year. Given that Section 1968.1(m) of the OBD II
10 requirements adopted by the Board on September 4, 1989,
11 provided the Executive Officer the authority to exempt
12 manufacturers from having to implement OBD II requirements
13 for 94-95, it seems only reasonable that the Executive
14 Officer should have similar authority to approve systems
15 which were developed in good faith, designed to satisfy all
16 OBD II requirements, but which do not meet every requirement
17 of the OBD II regulation.

18 Staff's proposal provides manufacturers the
19 flexibility to implement new technologies, so that systems
20 implemented after model year '95, will operate with greater
21 reliability and precision. AIAM must, however, for many of
22 the same reasons provided by AAMA and the other witnesses,
23 oppose staff's proposal to assess monetary penalties for '95
24 model year vehicles possessing OBD II systems not fully
25 compliant with all aspects of the OBD II regulation.

1 As pointed out by the other witnesses, imposing
2 such a penalty punishes the manufacturer for attempting to
3 implement new technologies when legally there's no
4 requirement to do so until '96.

5 We urge the Board to recognize that the OBD II
6 systems provided for model year 1995, though they may not be
7 fully compliant, will nonetheless be far more sophisticated
8 and effective than the previous OBD I systems, which will
9 remain the dominant system throughout that model year.

10 Thus, AIAM, as did the AAMA and the previous
11 witnesses, recommends that the Board modify the requirements
12 for the '95 model year to be consistent with the proposal
13 for '94, allowing the Executive Officer to approve partially
14 compliant systems based on a good-faith effort demonstrated
15 by the manufacturer without imposition of monetary penalty.

16 I'd like to caveat my invitation to answer
17 questions with the preface that I really haven't spoke with
18 our members in great detail about the details of their
19 systems, but that I'd give it a shot, whatever you want to
20 throw at me.

21 CHAIRWOMAN SHARPLESS: I guess I had just a
22 comment to one of your statements, and that is the
23 regulation itself. It was not intended to be a regulation
24 that made the requirement effective in 1996. It was a
25 recognition that the manufacturers would be introducing the

1 newly developed computer systems on different engine
2 families as they change their production for those engine
3 families.

4 So, I don't think it's really a true statement to
5 say that the regulation does not impose a requirement until
6 1996. The more accurate statement was that the regulation
7 recognizes that car manufacturers can phase in the
8 requirement by introducing engine families in 1994 and 1995.
9 So, the regulation really became effective in 1994 and 1995.
10 The catch is that, if the car companies did not introduce
11 any new computer systems, that this regulation would not
12 apply until 1996.

13 So, I think that maybe that's even where this
14 principal debate has been misunderstood. And, you know, you
15 talk about fairness and equity in terms of car companies
16 that come in early. Well, they're not really coming in
17 early. What they're really doing is phasing in as was
18 intended by the regulation. And what we're looking at now
19 is a situation where someone tried and failed in 1994, and
20 we recognize, because these are complicated new systems,
21 that perhaps for 1994, there should be some relief. And
22 also, in 1995, if new systems -- but 1995, being a different
23 situation, because you've had a longer time to meet the
24 requirement. and I think that's what's involved. My
25 concern is that if we don't establish some kind of financial

1 incentive or disincentive in 1995, that we're apt to lose
2 some of the momentum we have in the development of the OBD
3 II system or send a signal that one way to get around the
4 Air Board's standards would be to merely try and fail, and
5 then come in with a petition, and there would be no
6 consequence in that kind of situation.

7 Those are some of my concerns when I grapple with
8 this recognition and appreciation for the amount of
9 resources and time that's being spent. The fact that some
10 companies have come in and have actually certified their OBD
11 II systems, and that some apparently are less far along --
12 and how do you level the playing field between all those
13 various parts?

14 So, those are some of the considerations that I'm
15 having as I try to weigh this testimony with my fellow Board
16 members on what precisely to do on this issue.

17 MR. KARDOS: I think that's a vital comment, but I
18 think we should also recognize that the penalty could have
19 maybe an opposite result, and maybe it could hurt air
20 quality if a manufacturer recognizes that the penalty does
21 exist and that, if a manufacturer were considering offering
22 a vehicle with the new technology -- maybe a vehicle, such
23 as a TLEV, which, you know, would, you know, have further
24 reductions in emissions, they might withdraw such a
25 consideration if they realized that they might fall short in

1 two or three categories of criteria areas, recognizing that
2 they'd be faced with penalties. That's something to think
3 about.

4 CHAIRWOMAN SHARPLESS: Which would be the case if
5 we denied the petition. The regulation would just be what
6 the regulation is now. Ford wouldn't be able to sell the
7 model years that they've tried, and we'd be back to where we
8 were when we originally adopted the regulation.

9 MR. KARDOS: Right. You'd be back to OBD I
10 systems which aren't as good.

11 CHAIRWOMAN SHARPLESS: Right. Right. I
12 appreciate that.

13 MR. KARDOS: So, you know, you might want to think
14 about some sort of compromise, you know, where, you know,
15 maybe more than three deficiencies, you know, maybe you pay
16 a penalty and, you know, maybe three or less, you know, you
17 can live with that.

18 CHAIRWOMAN SHARPLESS: Well, there's always
19 compromises. Thank you very much. Oh, yes, Dr. Boston.

20 DR. BOSTON: Mr. Kardos, maybe I missed it at the
21 start. But who is the Association of International
22 Automobile Manufacturers? How many manufacturers do you
23 represent and --

24 MR. KARDOS: Well, did you get a copy of our
25 testimony?

1 DR. BOSTON: Probably.

2 MR. KARDOS: If you look at the letterhead, it
3 lists the manufacturers. Right now, it's at about 16. And
4 we represent just about everybody, aside from the three
5 year, with the exception of Mercedes and a few others.

6 DR. BOSTON: How many of your companies have met
7 the requirements; do you know?

8 MR. KARDOS: Met the --

9 DR. BOSTON: The OBD II for '94?

10 MR. KARDOS: I really can't answer that question.
11 I just don't know.

12 DR. BOSTON: Okay.

13 CHAIRWOMAN SHARPLESS: Staff, do you have any
14 idea?

15 MR. ALBU: About five from that particular
16 organization, plus the couple more from -- that are not in
17 that organization. Nine total.

18 CHAIRWOMAN SHARPLESS: Have met the certification
19 requirements in 1994?

20 MR. ALBU: Out of nine who are coming in '94,
21 about six of them will be fully compliant with our
22 requirements in that time frame. Maybe as many as three may
23 have a couple deficiencies.

24 CHAIRWOMAN SHARPLESS: Okay. Thank you very much.

25 Our last witness Steve Citron from Purdue

1 University.

2 DR. CITRON: Chairwoman Sharpless, members of the
3 Air Resources Board. My name is Steve Citron, and I am a
4 Professor in the School of Mechanical Engineering at Purdue
5 University. And it is my students and I who have been
6 referenced by the testimony of the previous participants as
7 developers of the Purdue misfire detection process.

8 I thank you for the opportunity to comment on Ford
9 and possibly others' requests for relief from OBD II
10 requirements for 1994 and 1995 model year cars, specifically
11 as related to misfire detection.

12 We've just heard approximately two hours of why
13 fines should not be levied. I'd like to spend some 15
14 minutes from a slightly different point of view, different
15 from that just presented by colleagues from the auto
16 companies and, to some extent, to staff recommendations.

17 Slightly over a year ago, the former MVMA, Motor
18 Vehicle Manufacturers Association, the present -- the
19 predecessor to the AAMA and the current offshoot, USCAR,
20 suggested by letter to the Air Resources Board that
21 manufacturers be judged to have met requirements if they had
22 made, quote, good-faith efforts.

23 The Air Resources Board wisely, in my opinion,
24 rejected that approach to decision making. Good-faith
25 effort is simply too vague a term, simply too slippery a

1 pole. For example, to help demonstrate that good-faith
2 efforts were being made by its members, the MVMA's letters
3 to CARB stated that its members were working with me.

4 Unfortunately, it was not true then and it is not
5 true now, despite my best efforts.

6 Other concerns relate to achieving success while
7 holding down cost. How much should be spent on a component
8 to demonstrate a good-faith effort? If the result were not
9 successful, would CARB know why it was not successful, so as
10 to judge whether a good-faith effort had been made?

11 And then, of course, there is the question of the
12 method used to process the data collected. If you use
13 method A, when method B has been shown to be better, and a
14 good-faith -- has a good-faith effort been made if success
15 is not achieved?

16 Now, Ford is requesting relief from OBD II with
17 respect to misfire detection. The staff report concludes
18 that it is not beneficial to California to delay introducing
19 cars with improved engine families. The report indicates
20 that staff believes that Ford has made good-faith efforts
21 overall, and with regard to misfire, that staff has
22 determined the changes needed to meet OBD II requirements
23 for the 1995 model year.

24 Thus, staff has recommended to the Board that the
25 rules be amended so that fines be levied for the 1995 model

1 year, and that certification without fines be allowed in the
2 1994 model year for those making good-faith efforts.

3 One has to wonder how successful companies who
4 made a somewhat better effort feel about this
5 recommendation.

6 On my part, I am here to state in the strongest
7 possible terms that Ford and others have not come close to
8 providing a demonstrated good-faith effort, in quotes, to
9 meet misfire detection, in quotes, requirements in full by
10 evaluating and considering the best available monitoring
11 technology. The quote is from the proposed modification to
12 1968.1, Section 6.0.

13 It is stated that to be given a waiver, a number
14 of factors be considered, end quote, and a demonstrated
15 good-faith effort is an absolute requirement. Thus, as I
16 believe Ford has not made a good-faith effort relative to
17 misfire detection by my standards, Ford does not meet the
18 proposed requirement for a waiver for the 1994 model year.

19 I have no basis to doubt that Ford's internal
20 effort was extensive. It is with regard to their
21 willingness to evaluate outside effort that I comment.

22 Should the Board agree that Ford has not made,
23 quote, good-faith efforts in misfire detection, I would
24 suggest the Board impose for 1994 model year cars the same
25 fines as suggested for 1995 model year cars. Clearly, funds

1 spent paying fines are not available to advance the state of
2 the art.

3 However, I've reached the conclusion that nothing
4 less will motivate the company and others to meet its
5 responsibility to consider the best available monitoring
6 technology, even if it comes from outside the company.

7 Let me attempt to establish my credentials with
8 the Board. The area of detection control of engine
9 roughness is one I and my students have been working on for
10 over 13 years and the detection process is that of
11 crankshaft speed fluctuations, which is almost, without
12 exception, that chosen by the auto manufacturers.

13 Our earliest patent in this area was filed in
14 1982. A 1989 paper on misfire detection won the Society of
15 Automotive Engineers Vincent Bendix Automotive Electronics
16 Engineering Award as the best paper presented to the society
17 in the area during the year.

18 My students and I are the only university-based
19 group to ever win this award. I have organized the sessions
20 on sensors and actuators at the annual Congress of the SAE
21 for the last 17 years.

22 I am an insider as far as the automotive field
23 goes, except I am not employed by the automotive companies.

24 To continue, in March, 1992, ARB staff held a
25 workshop to address industry concerns on misfire and

1 evaporative system requirements. At this workshop, as
2 described in ARB mailout, none -- none of the manufacturers
3 testifying indicated that monitoring misfire under all speed
4 and loads would be feasible in the foreseeable future.

5 A major concern was that of high speed and low
6 load engine operation, as it is -- as it has been expressed
7 today. Manufacturers expressed the need for more precisely
8 manufactured components, among other difficulties. At this
9 workshop, Technical Advances presented data showing the
10 capability of their hardware, and I presented data on our,
11 Purdue's, software solution.

12 The results I presented at the workshop showed our
13 capability to detect isolated single and dual misfire of
14 cylinders at speeds from idle to 5,000 rpm, which was just
15 below the red line on this engine, with the transmission in
16 neutral; i.e. a high speed and low load point. A difficult
17 operating point.

18 The data was collected on a 1990 Buick Regal from
19 the front of the engine, using the existing Buick 18-tooth
20 wheel and the existing sensor. All induced misfires were
21 detected, no false indications of misfire were obtained.

22 We have subsequent data taking this vehicle down
23 the road in second gear at over 70 miles per hour, 4500 rpm,
24 and forcing a shift into overdrive without any false
25 indications of misfire from the process.

1 Several Board members have mentioned the
2 difficulty and, indeed, even the question of the need for
3 detecting misfire at high speeds in neutral. Granted, it's
4 simply a boundary point. But it does give a clear
5 indication of the capability of a method when you are able
6 to achieve that. When you can achieve misfire detection at
7 a difficult operating point, reason leads you to believe
8 that you will have success at the easier operating points.

9 At this workshop, I noted that putting our data
10 through the Ford detection process, as described in Ford's
11 two 1991 patents, led to the conclusion that Ford could not
12 adequately detect isolated misfires on this vehicle with its
13 six cylinder engine at 4,000 and 5,000 rpm.

14 Thus, Ford knew 15 months ago that our detection
15 capability was greatly superior to theirs..

16 I must say that I really do appreciate the point
17 raised by Mr. Brown in not claiming to have evaluated our
18 techniques. He hasn't. I wish they would. But at least he
19 had the good grace not to claim that he did.

20 What did occur is that within approximately --
21 having presented the results, which indicated Purdue had the
22 capability of meeting industry's concerns, I expected to
23 have a reasonable opportunity to demonstrate the capability
24 to companies who had stated that the task could not be
25 accomplished. That is not what has occurred. What did

1 occur is that within approximately a month, major German and
2 Japanese concerns now said they could meet the Air Resources
3 Board's misfire detection requirements using speed
4 fluctuation methodology.

5 Giving the timing, I take some pleasure in
6 claiming that our demonstrated capability encouraged others
7 to make their own capability known.

8 It is quite possible, in my view at least, that
9 without our presentation, this would not have occurred. To
10 come back within a month, and now say you can do it, implies
11 you could do it a month earlier. It's not a miracle pill
12 that you take and then you achieve a result.

13 In the U.S., the situation was different. In May
14 of '92, I sent a proposal to Ford at their request. The
15 cost was approximately \$60,000, plus a \$15,000 patent
16 license option fee for six-month interaction.

17 No response. My last proposal was sent at their
18 request on December 29, 1992. The cost was approximately
19 \$80,000, plus a \$15,000 patent license option fee for a six-
20 month interaction beginning February 1, '93.

21 The response on February 10, '93, was that while
22 the money was available, it had now been decided not to
23 proceed with Purdue directly, but rather to work through
24 USCAR. Contact from USCAR to date, none.

25 Ford had indicated to ARB staff that they could

1 not work with Purdue because we would not agree to
2 conditions which Technical Advances had agreed to. Since I
3 knew of no conditions where we were in disagreement, I
4 contacted Ford. The Ford representative noted that the
5 condition referred to was Purdue's request for a \$15,000
6 patent license option fee. I mean, given the sums that we
7 have been talking about here, that's simply not believable.

8 Purdue is more than justified in requesting such a
9 nominal fee, given the years we have been involved in the
10 area, the costs involved, and the need to ensure that, in
11 working with the automotive industry, that the task is
12 recognized as technology evaluation and not joint technology
13 development.

14 The difficulty is obviously not the \$15,000 fee,
15 but rather the implication that if we were successful,
16 license fees to Purdue would be required. I believe Ford
17 felt at the time of the March workshop, that despite our
18 demonstrated better results, it could meet the misfire
19 requirements using its in-house technology. Ford gambled on
20 its in-house capability and lost.

21 Ford now comes to the ARB requesting relief. They
22 say they know what needs to be done. Once again, as in
23 March, '92, they may or may not be correct. However,
24 whatever that outcome, for the ARB to be successful in
25 meeting its long-term goals, every resource must be brought

1 to bear on the problems that arise, not only misfire
2 detection.

3 Assurance must be given too those who are outside
4 contributors that the meaning of the words, quote, good-
5 faith effort and, quote, best available technology will be
6 upheld. Our universities and small entrepreneurial
7 companies need to be encouraged to participate, not stiff-
8 armed.

9 As other companies may fall under the waiver, I
10 call the Board's attention to Chrysler's handling of this
11 matter. A proposal was sent to Chrysler on May -- in May of
12 1992, comparable to that first sent Ford. In August,
13 Chrysler indicated that it had difficulty accepting Purdue's
14 request for the \$15,000 patent license option fee. After
15 that, the representative simply did not return phone calls.

16 Chrysler has never evaluated Purdue's capability,
17 except to have made available to it the results of the
18 presentation given to CARB's workshop in March of '92. At
19 the high speed and low load test points, they did not have
20 the same capability we have at the time of the workshop.
21 And from informal comments and conversations, they did not
22 have it later, either on the six or comparably even on the
23 four cylinder engine.

24 By way of a reference point with regard to
25 implementation timing, Chrysler indicated in May, 1993, that

1 they had just finished their 1994 software. This followed
2 my expressed concern over the need to get started if we were
3 able to meet upcoming model year requirements. The auto
4 companies tell CARB there's no time left to implement
5 changes and tell us there is no need to rush.

6 The timing of the USCAR document evaluating
7 misfire detection by outside vendors dated July 2nd, 1993,
8 is a case in point. Only seven days before this meeting.

9 The manner in which the Purdue detection
10 methodology avoids the need for precisely manufactured parts
11 is by employment a learning process to determine the
12 manufacturing and other errors and to then provide
13 compensation for these errors. Such an adaptive process was
14 reported by Bosch in an SAE paper in February of 1993, as
15 required for their success.

16 Letters -- in a letter from Bosch to me, they have
17 indicated that based only on the CARB presentation workshop
18 data, that our capability is comparable and that, quite
19 possibly, we might have more monitoring.

20 Our initial work in this area was done as part of
21 a research contract with General Motors from January, '84 to
22 June, 1991. We have been interacting with the automotive
23 industry -- when I say "we," I mean I and my students. But
24 I have been interacting with the automotive industry for a
25 very long time. This contract from 1984 to June of '91,

1 involved not hundreds of thousands of dollars, but very
2 generously on GM's part, approximately \$1,800,000 of support
3 over the years, with myself as the principal investigator.

4 It involved original contract with two different
5 divisions -- Delco Remy and AC Spark Plugs -- recently A.C.
6 Rochester -- involving eight or more renewals. This is a
7 long-term good, excellent relationship.

8 Prior to that, we had support from Chrysler for
9 four years till they ran into a small amount of financial
10 difficulty in approximately 1980.

11 And prior to that, I have served as a consultant
12 and expert witness for Ford on the Ford Pinto case. I have
13 been involved with the automotive companies for some time.

14 Returning, groups other than the group at GM now
15 involved with misfire technology, were responsible for our
16 interaction with GM. At the March, 1992, a GM
17 representative noted difficulty existed in achieving
18 satisfactory results with a particular vehicle. The
19 implication that Purdue was just lucky in having been able
20 to obtain successful results because of the particular
21 vehicle we had tested.

22 To examine this possibility, I wrote GM requesting
23 permission to test the car referenced by GM at the workshop.
24 GM declined, and stated that the only purpose of their
25 presentation was to underscore the point that a limited set

1 of data is not a sufficient base on which to draw broad
2 conclusions. That is certainly true.

3 On the other hand, when everyone is saying
4 something can't be done, results that show it can be
5 accomplished do provide a valid justification for further
6 evaluation of the proposed method. To not allow such
7 testing raises obvious questions. It only takes one failure
8 on my part, and I'm out of the game.

9 You can never prove that this system works on
10 every car that you would care to have it work on. There may
11 be cases where it doesn't work, because the methodology does
12 not include -- is not meant to cover everything that can
13 occur. But the best system will be the system with the
14 widest margin -- safety margin. And you go looking for,
15 where does it fail? Does it fail in any reasonable case?
16 And that's why I asked to test this GM car.

17 GM did not permit that. If we had succeeded,
18 their position would have been untenable. They chose not to
19 take the risk that I did in offering to test the car; i.e. I
20 could have failed.

21 Clearly, they cannot say now that they know we had
22 nothing to add to their capability, since it seems they were
23 concerned that we might succeed where they had not.

24 GM's evaluation of our technique, which I heard
25 Mr. Ferris make reference to, occurred immediately following

1 the end of our contract. A graduate student from Purdue was
2 assigned to do this, and worked with me over the phone. I
3 never saw the results. I never saw the data. I don't know
4 what he did.

5 CHAIRWOMAN SHARPLESS: Mr. Citron, I'm going to
6 ask you to try to --

7 MR. CITRON: Yeah. I'm sorry. I'm on the last
8 stage.

9 CHAIRWOMAN SHARPLESS: Okay.

10 MR. CITRON: And I appreciate the Board's
11 patience, and I apologize. It's just, as I tried to
12 indicate at the beginning, it's two hours and I'm the tail-
13 end of the dog here.

14 It's really not just Purdue that is having this
15 difficulty. And I quoted in my letter to you the letter
16 from Technical Advances to Mr. Albu of ARB staff just two
17 months ago... Now, quoting:

18 "Having experienced the remarkably slow
19 pace and surprisingly strong reluctance of
20 industry members to actively pursue
21 technologies developed by others, we applaud
22 this position of CARB to require full range
23 detection. Our investor believes that industry's
24 attention and effort to date has been more in
25 trying to relax the regulations than on trying to

1 meet them."

2 You have the rest of the quote there. To
3 summarize, at the workshop of March, 1992, we presented
4 misfire detection results that were claimed by all prior to
5 the presentation to be impossible to obtain using crankshaft
6 speed fluctuations.

7 We demonstrated capability the auto manufacturers
8 said they didn't have. Following the workshop, Ford
9 actively avoided testing our methodology. Thus, Ford has
10 not met the good-faith waiver requirement on the proposed
11 waiver regulation for the 1994 model year and should not be
12 given a waiver.

13 The same fine should be imposed for the 1994 model
14 year as are suggested for the '95 model year. The funds
15 thus collected might be used to support the testing the
16 company should have done if it had met its obligations
17 without the need for fines.

18 I suspect the amount of the fines is not
19 monumental, and imposing the fines would demonstrate that
20 ARB is serious. The goal of such action is to encourage in
21 the future industry to accept responsibility to evaluate
22 outside contributions in good faith in deciding what is best
23 available technology.

24 The foot-dragging has gone on for quite a while.
25 It's always -- the next deadline is always upcoming. Having

1 USCAR involved in this activity has not been helpful, but
2 has delayed action that would have been taken by individual
3 members individually. This is not an area of
4 precompetition, as USCAR would have you believe, but one of
5 active competition on a worldwide stage.

6 Recognition that some have failed is the reward
7 for those who succeeded, an encouragement to all to take the
8 tasks seriously. I recommend that the Board direct staff to
9 ensure that outside contributors have an opportunity to have
10 their misfire detection methodology fairly evaluated by
11 industry in joint consultation with staff.

12 Thank you. And I do apologize for running on.

13 CHAIRWOMAN SHARPLESS: Thank you very much, Mr.
14 Citron. Are there any questions by members of the Board?

15 Dr. Wortman? Jack?

16 MR. LAGARIAS: I'm interested, Dr. Citron, in your
17 experience with USCAR. When did you contact that
18 organization?

19 DR. CITRON: I was told by Ford, when they
20 rejected the last proposal, our last proposal in February,
21 that -- as I indicate in my letter -- that they did have the
22 funds, but it was now decided that the automotive companies
23 would work jointly. I have never heard from USCAR.

24 MR. LAGARIAS: When did contact them? In
25 February, you say?

1 DR. CITRON: That was from Ford to me in February.
2 The Ford representative indicated that USCAR would now pick
3 up this responsibility.

4 MR. LAGARIAS: So, have you contacted USCAR?

5 DR. CITRON: No. The ball is in their court.

6 I received from -- a copy just last week of the
7 document proposed by USCAR. It was not to me, Mr. Lagarias,
8 to contact USCAR. The Ford representative clearly stated
9 that they --

10 MR. LAGARIAS: They have turned your contact over
11 to USCAR.

12 DR. CITRON: They needed to first develop a
13 proposal. USCAR needed to first develop a means of handling
14 proposals, and so on. And when that was all done, they
15 would get in touch with the appropriate individuals.

16 MR. LAGARIAS: So, that's in suspense yet. Have
17 you seen what they are suggesting?

18 DR. CITRON: Yes. Mr. Albu was kind enough to fax
19 me a copy of that just last week.

20 MR. LAGARIAS: Does that sound like a possible
21 means of interacting?

22 DR. CITRON: It's certainly a basis. I find it a
23 very unfriendly document. What one needs to be developing
24 is a partnership. How do we proceed? I found this a hands-
25 off document with serious deficiencies.

1 MR. LAGARIAS: I see. And this in no way detracts
2 from all your long record of performance and experience.
3 I'm just trying to see what --

4 DR. CITRON: Certainly.

5 MR. LAGARIAS: It's like a lease that's written by
6 the owner of the property rather than the renter.

7 DR. CITRON: Dealing with any one of the
8 automotive companies is a wonderful experience. Dealing
9 with all three of them together doesn't -- it just brings
10 three legal departments to bear.

11 MR. LAGARIAS: Thank you very much.

12 CHAIRWOMAN SHARPLESS: Now Dr. Wortman.

13 DR. WORTMAN: I'm not sure that I understand your
14 presentation. What is it that you want? That they give you
15 \$95,000? We can't do that.

16 DR. CITRON: Not at all, sir. What I believe
17 should be the result of the Board's action is that the
18 proposal made by ARB staff to the Board be modified so that
19 the same provisions hold in '94 as had been recommended for
20 1995. That is, fines should be imposed for '94 as they
21 would be in '95, under the ARB staff recommendation,
22 because, in my experience dealing strictly with the matter
23 of Ford's compliance, good faith was not exercised.

24 DR. WORTMAN: Well, the sense of your letter is,
25 they did not give you this contract for \$94,557; therefore,

1 they did not demonstrate a good faith effort. This goes
2 paragraph by paragraph, and I don't understand that.

3 DR. CITRON: May I try?

4 DR. WORTMAN: Go ahead.

5 DR. CITRON: Okay. The Board has proposed that
6 the State of California has certain requirements to limit
7 emissions, one of those is on-board misfire detection. This
8 is a difficult area.

9 The automotive companies, Ford, acknowledged that
10 they did not have this capability, in particular, what I
11 call the checkpoint of high speed and low load, they did not
12 have this capability.

13 Using our data, they did not do as well as we did.
14 Therefore, it seems to me that they were under an
15 obligation to attempt to evaluate our methodology before
16 saying it couldn't be done, or they could not do it in time
17 for this time -- in this time frame.

18 That is, we demonstrated capability that was
19 needed to meet ARB's requirements.

20 DR. WORTMAN: But you had almost \$2 million in
21 contracts from GM, and they state here they analyzed your
22 system, Chrysler analyzed your system, and they didn't want
23 it. So, it has been looked at.

24 DR. CITRON: I beg your pardon. What I --

25 DR. WORTMAN: That's a statement from Chrysler.

1 There's a statement from GM.

2 DR. CITRON: That's good. And now you have my
3 statement. Chrysler has never evaluated our system, except
4 while having the data presented to the ARB workshop in March
5 of 1992, at which point Chrysler was not saying they could
6 do that. They could not duplicate the results we presented
7 to the ARB workshop. So, what evaluation are you referring
8 to? Maybe you want to ask the Chrysler representative what
9 evaluation he's referring to.

10 DR. WORTMAN: We can only go by the statement,
11 "Our evaluation revealed that Chrysler's system is
12 comparable to Dr. Citron's." All right? That's the
13 statement.

14 GM's statement: "GM rejected Purdue's model as
15 offering no significant benefit." They paid money for
16 research, they looked at it, and now we have established
17 that the estimate of a hundred/person years, Jack, is
18 probably low. And, therefore, the sum of \$94,000 is
19 insignificant compared to --

20 DR. CITRON: Absolutely insignificant.

21 DR. WORTMAN: So, apparently, they don't believe
22 in the system. And they claim they have evaluated it. We
23 can't force them to buy it.

24 DR. CITRON: Absolutely not. But you can go a bit
25 further and perhaps we might ask the representative from

1 Chrysler and GM of the circumstances that you find
2 appropriate, whether that is an accurate statement. You
3 have my statement in direct contradiction to that statement.

4 DR. WORTMAN: That's the puzzling part.

5 DR. CITRON: That's why I had some difficulties.

6 CHAIRWOMAN SHARPLESS: This is not an inquisition
7 here. What we're really trying to do is try to weigh
8 whether or not there's enough validity to accept the Ford
9 petition. I think what this witness' testimony is
10 suggesting that based -- as he put it carefully -- on his
11 experience and his opinion, a good-faith effort has not been
12 met.

13 And the other issues concerning whether or not the
14 system, you know, was tested or not tested, and what was
15 found builds into whether or not there's been a good-faith
16 effort here.

17 I really don't want to turn this hearing into, you
18 know, them and us kind of situation. What I'd really like
19 to do is, as much as possible, try to establish a record
20 here on what the implications of this petition would be, and
21 then allow the Board to try to make a decision.

22 I appreciate this witness' testimony, and
23 certainly the hard work that you and your people have done
24 in this area. It sounds very impressive. And I do hope
25 that somehow -- it's not within the authority of this Board

1 to require any of those people that we regulate to deal with
2 people in another sector. That's not within our authority.

3 But, certainly, I would hope -- and I think I made
4 this point earlier -- you know, not only you, but I think
5 there's a lot of capability out there. I would hope that
6 maybe the car companies, in trying to meet these technical
7 requirements, would become open to outside expertise.

8 DR. CITRON: One final comment. Dr. Wortman is
9 most articulate -- for 13 years times four people, that's
10 52, half-time students have to do something else. I may
11 work a bit harder. It's 26 man/years. So, I'm sure the
12 automotive companies are way higher.

13 CHAIRWOMAN SHARPLESS: Okay. Now, Mr. Kelly. I
14 meant Mr. Brown.

15 You asked for some rebuttal time. I hope in the
16 interest of the fact that I'm losing my quorum here, that we
17 can keep this as succinct as possible.

18 MR. BROWN: I hope so, too, and I share the
19 Board's stated dislike for this type of proceeding. But the
20 gentleman from Purdue did state in his letter and made a
21 point of saying that he contacted us and, in his words, no
22 response after his July overture to us until December 29th.
23 We did have phone conversations and one letter back to him
24 with a counterproposal. It was his fault that he didn't
25 response to us until December 29th.

1 In the interim, we started working with one of his
2 competitors, and we don't have time to work with everybody
3 who comes along with an idea. We were also aware that our
4 competitors had sunk -- I didn't realize it was almost \$2
5 million-- a considerable amount of money into this sensor,
6 in his technique only to come up with not much better than
7 what they had before.

8 We can take our system, too, and hand tailor it
9 into a car and get impressive results. The question is, can
10 you do it 60 an hour? If his system was done, ready to go,
11 he'd have a kit here for us to bolt on and not be asking for
12 \$95,000.

13 I don't know how much more I have to say to clear
14 the unfortunate and often misleading testimony that was just
15 brought in. But I stand ready to do that.

16 CHAIRWOMAN SHARPLESS: Well, as one very wise
17 gentleman once told me, 'there's two sides to every story.
18 The truth may lie somewhere in the middle. But I appreciate
19 your records of what has transpired.

20 I think the real point is this, you know,
21 trying to grapple with the good-faith effort issue, and
22 what is good faith effort, and how much good-faith effort
23 has really gone on.

24 I think the staff came to the conclusion to
25 recommend this, because they have been working with you very

1 closely, and I think they felt -- and I don't want to put
2 words in their mouths; they can certainly speak for
3 themselves. But they don't make, as you know, Mr. Brown --
4 our staff doesn't make recommendations very lightly. And
5 so, there had to be some sound reasons on which they felt
6 the Ford Motor Company had made a good-faith effort to try
7 to meet the OBD II standards.

8 You know, I think there's a big world out there, a
9 lot of global competition, a lot of resources being spent on
10 a lot of things, a lot of people with good ideas that maybe,
11 in the future, if you take another look at some of them and
12 test them, you will find that there is some merit to them.

13 But I recognize that a lot of dollars have been
14 spent. And I think the good-faith effort part is how hard
15 that you have made that effort, how close you have come, and
16 the staff's analysis that indicates that there has been, at
17 least in working with us, a good-faith effort to meet the
18 mark.

19 You didn't have to do this. I think that's one
20 point. You didn't have to do this in 1994, but you chose to
21 do it, whether you call it a penalty --

22 MR. BROWN: Never again.

23 (Laughter.)

24 CHAIRWOMAN SHARPLESS: -- or whether you call it
25 an upfront cost, I don't think that's really the point. The

1 point here is that I think that there's benefits to having
2 introduced, then tried in 1994 to get some on-road
3 experience. And we appreciate that. In the future, that's
4 going to benefit the entire program.

5 And I think that's really the case. Are there any
6 other comments?

7 DR. WORTMAN: One more statement. I really do not
8 like the tone of this letter that we got. And while I have
9 absolutely no faith in humanity, I believe in practicality
10 at the corporate level. And I'm sure, to avoid any
11 unpleasantness, they would have gladly paid \$95,000, because
12 this does not help their cause.

13 MR. BROWN: No, sir, it doesn't. It goes beyond
14 the \$95,000. It's the implication, the innuendo on our
15 character that troubles us.

16 DR. WORTMAN: This is what bothers me, to. And
17 that's why I say, to avoid this, if there'd been merit in
18 the presentation here, 95,000 to you is nothing.

19 MR. BROWN: One point, and maybe I'll just leave
20 it at that, we've worked with competitors and other
21 companies, including Bosch and Technical Advances, and we
22 haven't had these kind of problems, and name calling, and
23 ill will. And this is unfortunate that Purdue took that
24 route.

25 CHAIRWOMAN SHARPLESS: Well, this is a public

1 process. And, Mr. Brown, if you were here yesterday, you
2 would note that we allow everybody their day in court. And
3 that is the public process, and there is always opportunity
4 for people to speak.

5 MR. BROWN: I understand that.

6 CHAIRWOMAN SHARPLESS: Appreciate your time.

7 MR. BROWN: Thank you.

8 CHAIRWOMAN SHARPLESS: Okay. We are coming down
9 to the end. I know staff has to enter some correspondence
10 in the record. If you can do that rather quickly, in light
11 of the time, I'm sensitive to Supervisor Riordan having to
12 get out of here in order to make a plane.

13 MR. ALBU: Okay. Very briefly. Subaru submitted
14 comments along the same line as AAMA and AIAM. They would
15 like for any new systems coming in in '95, they also be
16 exempt for '96 for any shortcomings.

17 Volvo feels in their correspondence that since
18 Ford is getting some relief, they deserve some relief as
19 well, since they're coming in fully in '94 with a compliant
20 system, in the area of monitoring for improper malfunction
21 light -- or rather for improper codes when monitoring is
22 occurring where no malfunction light's required in '94. We
23 did indicate that we would investigate the -- reevaluate
24 their monitoring field.

25 Volkswagen of America, they are opposed to the

1 penalty in '95. Technical Advances, they say they're
2 writing reluctantly, but they feel that -- they just want to
3 express the point along the lines that Dr. Citron made, not
4 as strongly perhaps, but they would have hoped that there
5 had been more codevelopment rather than just the atmosphere
6 of trying to evaluate.

7 The Bureau of Automotive of Repair sent a letter
8 saying that if there are deficiencies in the '94 systems,
9 they'd like to know what they are. And we have corresponded
10 with them already to explain why, and their concerns will be
11 met by the ARB staff.

12 And that completes the record.

13 MR. BOYD: Madam Chair, if I might, a couple of
14 quick closing comments. I should note for the Board members
15 what started out really as a hearing on Ford's petition has
16 somewhat become a workshop on manufacturers' progress
17 against plan, with kind of a tilt towards what the problems
18 are. There are an awful lot of success stories, and we
19 didn't parade out all the good news. But I'd just remind
20 the Board members that it was referenced several times that
21 many companies are coming in -- have certified, will
22 certify, and there's a lot of success out there.

23 We're not all doom and gloom. When you adopted
24 the OBD II regs, it really was uncertain as to how many
25 manufacturers would attempt to comply in '94. But I think

1 we said at that time, and it seemed very clear at the time,
2 that most would have fully complying products likely in '95.

3 The proposed fiscal disincentive or penalty, or
4 fine as it's been kicked around here today, is our means of
5 providing equity to those few who may have tried but failed
6 to meet the '95 requirement. And we always expect most who
7 try, you know, will indeed succeed. We have ultimate faith
8 in the auto industry, historically more faith in them than
9 they have in themselves many times.

10 But these noncompliance penalties are not new and
11 unique to this issue today. As you know, your Board has
12 used this concept, and we use this concept in many a
13 program, for instance, in the fuels arena, reformulated
14 fuels in particular.

15 Try, can't make it, there's a way to have a
16 noncompliance penalty, but still be a player. And, as
17 indicated, you know, without penalty, we believe many who
18 frankly might have complied, may well choose to offer a
19 noncompliant system in the absence of this compliance
20 penalty in order just to avoid taking any risks. And that
21 presents an opportunity for backsliding that would send some
22 wrong messages to those who tried so hard and succeeded, as
23 well as those who perhaps tried and failed. And signals are
24 incredibly important in this business, again, particularly
25 to those have tried and succeeded. And we historically try

1 to keep people focused on success, technology forcing, feet
2 to the fire, call it what you want. But we wrestled with
3 the dilemma. We recognize the difficulties this raises for
4 people, but we wanted to recognize the issue that Ford
5 brought forward, while at the same time trying to level the
6 playing field, and trying to provide as much equity as we
7 could. And, thus, we brought you the proposal that we did,
8 and I think I still recommend your positive action on that
9 proposal.

10 Thank you.

11 CHAIRWOMAN SHARPLESS: Okay, Mr. Boyd. I'm trying
12 to recall here. Has the staff recommended any changes to
13 the proposal? Yes?

14 MR. KENNY: Yes, there are.

15 CHAIRWOMAN SHARPLESS: So there is a 15-day
16 comment period.

17 MR. KENNY: Okay.

18 CHAIRWOMAN SHARPLESS: Okay. Well, then, I will
19 make the announcement that the record for this agenda item
20 will be closed, and that the record will be reopened within
21 the 15-day notice period public availability is issued.

22 So, any written or oral comments received after
23 this hearing date, but before the 15-day notice is issued,
24 will not be accepted as part of this official record.

25 And the public may submit written comments on the

1 proposed changes, which will be considered and responded to
2 in the final statement of reasons for the regulation during
3 the 15-day comment period.

4 So, this record stands closed.

5 Now, we have one other little matter of business
6 to deal with, and that's ex parte communications. It's a
7 procedure we go through by law. Anybody have to report?

8 DR. WORTMAN: Nobody talks to me.

9 CHAIRWOMAN SHARPLESS: Nobody talks to Dr.
10 Wortman.

11 (Laughter.)

12 CHAIRWOMAN SHARPLESS: Okay. So, we have no ex
13 parte communications to report for the record. So, we are
14 now at the point in our agenda where we can either entertain
15 a motion or answer questions. What's the pleasure of the
16 Board?

17 Mrs. Hilligoss.

18 MAYOR HILLIGOSS: I'd like to offer a compromise,
19 since it is a phase-in, that we allow two deficiencies with
20 no penalty in '95, but anything over that, they should be
21 penalized.

22 CHAIRWOMAN SHARPLESS: So you are moving to amend
23 the staff proposal, making a motion to amend the staff
24 proposal on the penalty provision.

25 MAYOR HILLIGOSS: Right.

1 CHAIRWOMAN SHARPLESS: Rather than penalties
2 across the board, the penalties would only be applied after
3 two -- what do we call them -- faults, deficiencies?

4 MAYOR HILLIGOSS: Deficiencies, yes.

5 CHAIRWOMAN SHARPLESS: Is there a second?

6 DR. WORTMAN: Second.

7 CHAIRWOMAN SHARPLESS: There's a second. Okay.

8 MR. CACKETTE: A point of clarification. If you
9 had three, would you pay -- and they were all \$50 penalties,
10 would you pay 50 or 150?

11 In other words, once you've hit three, you pay for
12 all deficiencies, or just those over two?

13 MAYOR HILLIGOSS: I was suggesting just starting
14 at the third. But if the Board would rather do it the other
15 way, I'd have no objection.

16 DR. WORTMAN: I think it should start with the
17 third, so there's some leeway there for some problems.

18 MR. BOYD: If I might, though, Dr. Wortman and
19 Mayor Hilligoss, this almost invites two deficiencies
20 automatically to start off, to allow two, but then back down
21 to one in terms of penalties. It provides a little bit of
22 disincentive to just start off with two deficiencies, at
23 least in my opinion.

24 DR. WORTMAN: It's very hard to build in two
25 deficiencies. I think those may happen.

1 CHAIRWOMAN SHARPLESS: Okay. What is your motion,
2 Mrs. Hilligoss, to start with the 50 or the 25, depending on
3 what category?

4 MAYOR HILLIGOSS: Yes.

5 CHAIRWOMAN SHARPLESS: Any further discussion?

6 DR. BOSTON: It was seconded?

7 CHAIRWOMAN SHARPLESS: Yes. Dr. Wortman seconded
8 it.

9 MR. LAGARIAS: Well, I don't like it. I think
10 what will happen is the manufacturers will automatically
11 leave out the most costly one of the devices that goes into
12 OBD II, whether it's a sensor or not, on the matter of cost,
13 and automatically build in the two deficiency limitation on
14 their OBD II equipment.

15 CHAIRWOMAN SHARPLESS: Dr. Boston.

16 DR. BOSTON: Madam Chair, I've been very
17 impressed by the quality of the testimony today, and I do
18 believe that the auto industry has spent millions of dollars
19 trying to comply. And I think there has been a very good-
20 faith effort to comply, and I think they're really bogged
21 down with a lot of other things that we're demanding, such
22 as TLEVs, and ULEVs, and zero-emission vehicles, and flex
23 fueled vehicles. And I don't see any air benefit from this
24 fine that you are proposing. So, I endorse what Mrs.
25 Hilligoss is saying, and I feel that starting with the fine

1 after the third deficiency will be appropriate.

2 I support her recommendation.

3 CHAIRWOMAN SHARPLESS: I don't now that I can add
4 anything to what I've already said. I'm inclined to agree
5 with Mr. Lagarias about why we need to do penalties in 1995.

6 My point of view is that the regulation was not
7 really intended to just be a start date in 1996. The start
8 date was in 1994, and that the Board was serious about OBD
9 II, that some of the companies who came up here asking for
10 relief is on the possibility that they'd fail.

11 Those who haven't gotten into this system yet -- I
12 think Mr. Lagarias is right. We're almost guaranteeing that
13 they're going to come in with a less efficient system to
14 begin with. And there may be some benefits to that. I
15 recognize that there could be some benefits to it. But I
16 think it's really important, I think, to underscore in --
17 not only in this regulation, but as a precedent for other
18 regulations, how we treat these kinds of issues.

19 And so, I would suggest that the Board Secretary
20 call roll.

21 DR. BOSTON: What are we voting on?

22 CHAIRWOMAN SHARPLESS: We're voting on Mrs.
23 Hilligoss' motion.

24 MS. HUTCHENS: The motion, Dr. Boston.

25 DR. BOSTON: I think perhaps more appropriate, we

1 will be voting on the Resolution, as amended.

2 CHAIRWOMAN SHARPLESS: Yes.

3 DR. BOSTON: And this would be only one vote for
4 the whole -- so, we're voting on Resolution 93-50, as
5 amended.

6 MAYOR HILLIGOSS: Right.

7 CHAIRWOMAN SHARPLESS: Right.

8 MS. HUTCHENS: Thank you, Dr. Boston. I was a
9 little confused, too.

10 Boston?.

11 DR. BOSTON: I will vote yes.

12 MS. HUTCHENS: Hilligoss?

13 MAYOR HILLIGOSS: Aye.

14 MS. HUTCHENS: Lagarias?

15 MR. LAGARIAS: No.

16 MS. HUTCHENS: Riordan?

17 SUPERVISOR RIORDAN: Aye.

18 MS. HUTCHENS: Wortman?

19 DR. WORTMAN: Aye.

20 MS. HUTCHENS: Madam Chairwoman?

21 CHAIRWOMAN SHARPLESS: No.

22 MS. HUTCHENS: Passes 4 to 2.

23 CHAIRWOMAN SHARPLESS: Okay. Thank you very much.
24 I appreciate everybody's participation.

25 We have one moment here. Thank you, Barbara, for