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CS FOR HOUSE CONCURRENT RESOLUTION NO. 12(O&G)**IN THE LEGISLATURE OF THE STATE OF ALASKA****EIGHTEENTH LEGISLATURE - SECOND SESSION****BY THE HOUSE SPECIAL COMMITTEE ON OIL AND GAS**

Offered:

Referred:

Sponsor(s): **REPRESENTATIVE FINKELSTEIN****A RESOLUTION****1 Relating to the use of natural gas as a motor vehicle fuel in Alaska.****2 BE IT RESOLVED BY THE LEGISLATURE OF THE STATE OF ALASKA:****3 WHEREAS** Alaska has a large natural-gas resource base; and**4 WHEREAS** natural gas is available to approximately half of the state's population;**5 and****6 WHEREAS** most vehicles are capable of running on natural gas; and**7 WHEREAS** all major automobile, truck, and bus manufacturers in the United States
8 are building and road testing prototype natural-gas vehicles; and**9 WHEREAS** natural gas is a safe fuel that, if leaked, dissipates into the atmosphere;**10 and****11 WHEREAS** natural-gas refueling stations avoid the problem of leaking underground
12 storage tanks; and**13 WHEREAS** the federal Clean Air Act amendments of 1990 impose much tougher
14 vehicle emission standards beginning with model year 1994, and natural-gas vehicles can meet
15 most of those standards; and**16 WHEREAS** natural-gas vehicles produce significantly lower levels of harmful air
17 pollutants such as benzene than do gasoline or diesel vehicles; and

1 **WHEREAS** Anchorage is a nonattainment area for carbon monoxide, and natural-gas
2 vehicles would emit much less carbon monoxide, thus reducing the need for other attainment
3 measures such as oxygenated fuels; and

4 **WHEREAS** on a per-gallon equivalent, compressed natural gas in Alaska costs less
5 than gasoline; and

6 **WHEREAS** natural-gas vehicles require less maintenance than gasoline or diesel
7 vehicles; and

8 **WHEREAS** over 50 natural-gas vehicles currently operate within Alaska; and

9 **WHEREAS** natural gas could benefit the commercial motor carrier industry through
10 the availability of reliable, inexpensive fuel that will meet the pending low-sulphur
11 requirements of the Clean Air Act; and

12 **WHEREAS** natural gas is a proven performer in the Arctic conditions of Alaska,
13 having been in use in the North Slope Borough for more than 10 years on a year-round basis;

14 **BE IT RESOLVED** that the Alaska State Legislature supports and encourages the use
15 of natural-gas vehicles in federal, state, municipal, and private automobile, truck, and bus
16 fleets in Alaska; and be it

17 **FURTHER RESOLVED** that the Alaska State Legislature supports and encourages
18 the rapid development of a natural-gas fueling station infrastructure in Alaska; and be it

19 **FURTHER RESOLVED** that the Alaska State Legislature supports and encourages
20 the cooperative government and industry task force on natural gas vehicles.

21 **COPIES** of this resolution shall be sent to the Honorable Tom Fink, Mayor of the
22 Municipality of Anchorage; to the Honorable Don Gilman, Mayor of the Kenai Peninsula
23 Borough; to the Honorable Ernie Brannon, Mayor of the Matanuska-Susitna Borough; to the
24 Honorable John Williams, Mayor of the City of Kenai; to the Honorable George Carte, Mayor
25 of the City of Palmer; to the Honorable Ken Lancaster, Mayor of the City of Soldotna; to the
26 Honorable John Stein, Mayor of the City of Wasilla; to Mr. Jack Froiland, Acting Field Office
27 Manager, General Services Administration; to the Honorable Jerry Covey, commissioner of
28 education; to the Honorable Bruce Campbell, commissioner of transportation and public
29 facilities; to the Honorable John Sandor, commissioner of environmental conservation; to Mr.
30 R. F. Barnes, President, ENSTAR Natural Gas; to Mr. James B. Blasingame, Vice-President
31 of Corporate Affairs, Alaska Railroad Corporation; to Mr. A. L. Wright, Vice-President,
32 Mapco Alaska Petroleum, Inc.; to Mr. Louis R. Thomason, Vice-President for marketing,

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- 1 Tesoro Alaska Petroleum, Inc.; to Mr. Roy Lyons, Kenai regional manager, Phillips Petroleum,
- 2 Inc.; to Mr. Ray Latchem, President, Norgaso, Inc.; and to Mr. Frank Dillon, Executive
- 3 Director, Alaska Trucking Association.



Representative David Finkelstein

SPONSOR STATEMENT
HCR 12

A resolution relating to the use of natural gas as a motor vehicle fuel in Alaska.

As the nationwide drive toward alternative fuel use accelerates, Alaska's progress appears to be stalled. Yet, our huge, underused natural gas reserves can be put to very beneficial use in fueling motor vehicles, fueling our economy, and reducing pollution.

Currently, natural gas is used in Alaska for electrical generation, heating, and cooking. The resource would be more fully exploited if it were marketed to fuel the approximately 120,000 vehicles operating in southcentral Alaska, where natural gas is widely available.

Alaska's high-quality natural gas is a very viable fuel for motor vehicles. Rich in methane and high in octanes, it creates 90% less health-threatening carbon monoxide than gasoline. The persistent problems in controlling CO emissions in Anchorage and Fairbanks could be solved if more motorists there switched to natural gas.

Using natural gas as a motor fuel would help to eliminate the leaking underground storage tank problems inherent to gasoline and diesel fuels, because if natural gas leaks, it simply dissipates into the atmosphere. It produces significantly lower levels of harmful pollutants such as benzene than do gasoline and diesel vehicles.

Motorists--especially truckers--would save money by using natural gas, since it is much less expensive than gasoline or diesel, and necessitates less maintenance. Natural-gas vehicles have been in use in Alaska for many years, and employ proven technology.

Soon, federal laws will mandate alternative-fuel use and impose much stricter emission standards. It makes sense to anticipate such requirements by drawing on and developing our own rich resources.

This resolution encourages federal, state, municipal, and private fleet operators in Alaska to use natural-gas cars, trucks, and buses, and it encourages the rapid development of natural-gas fueling stations.

SPECIAL HOUSE COMMITTEE ON OIL AND GAS
JOINT PIPELINE BRIEFING
HCR-12

FEBRUARY 14, 1994

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1 PROCEEDINGS

2 FEBRUARY 14, 1994

3 (Tape 94-6 - Side 1)

4 CHAIRMAN GREEN: I call the Special House
5 Committee on Oil and Gas Matters together at five
6 minutes after five. We are on teleconference with
7 Anchorage and Fairbanks.

8 Can you hear us in Anchorage?

9 ANCHORAGE LIO: Anchorage hears you just fine.
10 Fairbanks has not joined the conference as yet.

11 CHAIRMAN GREEN: Is there anybody in Anchorage
12 that will be wanting to testify?

13 ANCHORAGE LIO: Mr. Ottesen is here to answer
14 questions. He is from the Department of
15 Transportation.

16 CHAIRMAN GREEN: Okay. He just wants to
17 answer questions, rather than testify?

18 ANCHORAGE LIO: If you have any of them.

19 CHAIRMAN GREEN: Okay. Thank you.

20 Well, we are going to take up House Concurrent
21 Resolution 12, natural gas as a fuel for motor vehicles
22 first, and then we will be fortunate to actually get an
23 overview from the Joint Pipeline Coordinator's Office
24 to discuss the overview, oversight of the Alyeska
25 Pipeline.

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SPECIAL HOUSE COMMITTEE RE: OIL AND GAS (February 14, 1994)
JOINT PIPELINE BRIEFING (HCR-12)

1 So first we are going to have the -- is there
2 someone here -- okay. If you would like to come up and
3 give us a run through. Please identify yourself for
4 the record, David, and we will be off on House
5 Concurrent Resolution 12.

6 REPRESENTATIVE FINKELSTEIN: Thank you, Mr.
7 Chairman, members of the committee. My name is David
8 Finkelstein.

9 Where we left off last year was, we discussed
10 the resolution. The department and others had a number
11 of suggestions. So the CS that is before you, has a
12 couple added from that hearing that members of the
13 committee showed an interest in.

14 One of them was, "Whereas natural gas could
15 benefit the commercial motor carriage through the
16 availability of reliable inexpensive fuel, meet the
17 pending low sulphur requirements of the Clean Air Act,
18 and whereas natural gas has improved and performed the
19 arctic conditions of Alaska, having been in use in the
20 North Slope Borough for more than ten years on a year
21 round basis. And then there is some other changes made
22 that were comments from committee members, and exactly
23 who the copies of the resolution were sent to, which is
24 getting to be quite a list.

25 Other than that, the situation is basically

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1 the same. I did attend some of the meetings that the
2 state sponsored during the interim on their cooperative
3 approach in trying to advance natural gases as a fuel
4 in vehicles. I think there is a lot of optimism. I
5 just passed out an article from February 7 in the
6 Anchorage Daily News on the same subject. And other
7 than that, I would be glad to answer any questions.

8 CHAIRMAN GREEN: Are there any questions from
9 any of the committee members, for Representative
10 Finkelstein?

11 (No audible response.)

12 Do -- are there currently places that people
13 can get natural gas, if they had the conversion, in
14 Alaska.

15 REPRESENTATIVE FINKELSTEIN: There are some.
16 In Anchorage there is basically a fast fueling spot and
17 a slow fuel spot out. The conclusion of the working
18 group to date, from the meetings I attended, and the
19 minutes I've read, is that is the bottle neck of the
20 system at this point, that -- of private fleets,
21 especially, are not about to convert until they have
22 some minimum level which, I think, the Department, the
23 state views as about four -- four to five in Anchorage,
24 so that it is reasonably convenient.

25 There are other communities, though, that can

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1 operate off of just one fueling spot for the town.
2 It's just the nature of Anchorage, that is relatively
3 inefficient to travel beyond that to get to the fueling
4 spot.

5 The view of those who might be in the business
6 of selling natural gas is -- it's hard for them to make
7 the commitment without any sense that the Department is
8 going to follow through, as well as the municipality,
9 private fleets, and the federal government are going to
10 follow through, that there really will be a market out
11 there, if they make the expenditure.

12 But in all levels that is happening, there is
13 still strong support within the municipality of
14 Anchorage, at least for that one city. And on the
15 federal level, Clinton has recently imposed to a higher
16 level of expectation for natural gas vehicles in the
17 federal fleet. And from my understanding, in talking
18 to the Department of Transportation people, the private
19 fleet managers seem to be as interested as ever.

20 So I've got faith that -- and I've been fairly
21 impressed with the efforts the department has made in
22 trying to work cooperatively with industry, and sort of
23 move together, so that by the time these refueling
24 stations might be put in, there really will be enough
25 demand out there.

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1 CHAIRMAN GREEN: Is there a preferred -- is
2 it, like, a cryogenic compartment that this gas would
3 go into and be stored as a compressed gas, or would it
4 be liquified, or...

5 REPRESENTATIVE FINKELSTEIN: I think all --
6 someone from the department could add to this, once I'm
7 finished. But I don't think they have operated any
8 liquified stations. There is a bit more technology
9 involved there. I think, generally, they unloaded, and
10 they have the transfer station, and from then on out,
11 the distribution system is just compressed gas. But,
12 they can correct me if I'm wrong.

13 CHAIRMAN GREEN: How does it compare economic
14 wise, if you had the conversion? Say, your vehicle was
15 ready to run on natural gas?

16 REPRESENTATIVE FINKELSTEIN: The range of
17 figures that I've seen, and, again, the department's
18 experience is much more relevant here -- but the range
19 of figures that I've seen is anywhere from 40 percent
20 of the cost, up to 80 or 90 percent. That it's always
21 lower per BTU, and lower -- I think BTU is the term
22 used, rather than "thermal unit." And, usually, 50 to
23 60 percent of the figures that I hear.

24 It is very efficient, and it can be argued --
25 if you have refueling available, it can be argued it's

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1 worth the investment for even each of us right now.
2 It's just the refueling station issue, that's, you
3 know, created the problem.

4 It has a variety of other benefits on the
5 engine as well. It's a more clean burning fuel. It
6 doesn't have the tendency to build up deposits.

7 CHAIRMAN GREEN: Do you suppose it would ever
8 be clean enough that you wouldn't have to have a
9 certificate inspection, if you had a gas car?

10 REPRESENTATIVE FINKELSTEIN: Well, those are a
11 lot after carbon monoxide. I don't know how we deal
12 with the particular exemption program, but I don't
13 think you get the variation you get in traditional
14 gasoline powered engines, where it's dependant on a
15 complex technology to reduce the emissions.

16 It's, you know, inherent in the engines, so
17 even the -- a more poorly tuned engine isn't going to
18 be off to the extreme. But all these things, you
19 should ask, again, the department, if they have any
20 thoughts beyond mine, because I would not pretend to be
21 an automotive expert. I can barely keep my car
22 running.

23 CHAIRMAN GREEN: Anybody else have any
24 questions for Representative Finkelstein?

25 (No audible response.)

1 Any questions from Anchorage?

2 JEFF OTTESEN (VIA ANCHORAGE): Mr. Chairman?

3 CHAIRMAN GREEN: Yes, sir.

4 JEFF OTTESEN (VIA ANCHORAGE): This is Jeff
5 Ottesen. I'm with the Department of Transportation,
6 and have been, I guess, spearheading, more or less, the
7 -- our conversion of our fleet -- partial conversion to
8 natural gas for the last few years.

9 It is interesting that your meeting is today.
10 I spent the last three days riding one of our first new
11 CNG vehicles here in Anchorage around. I drove a CNG
12 vehicle to this meeting in the last 15 minutes. And I
13 could tell you that they operate every bit as well as a
14 gasoline vehicle; you can't tell the difference.

15 To answer a couple of questions that were
16 raised. The exemption for I & M. If your vehicle is a
17 dedicated CNG vehicle, that is, it only can burn CNG,
18 yes, it can be exempt. If it's a dual fuel vehicle,
19 which is probably the most practical choice, that is a
20 vehicle that can burn either gasoline or CNG -- it's a
21 switch -- then it has to maintain the I & M, because of
22 the gasoline that is present there.

23 As far as the LNG versus CNG, that's really
24 the same chemical fuel source, it's only a matter of
25 how it is stored. Either being delivered to the

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1 refueler, or, ultimately, to the vehicle.

2 LNG is simply natural gas that has been
3 liquified. It can (indiscernible) many temperatures.

4 CNG is simply natural gas that has been
5 compressed to very high pressures, but it's not being
6 stored at cryogenic temperatures.

7 There are advantage to the LNG that we have
8 available there at Kenai, that's a very economical
9 method of transporting natural gas. It can be put in a
10 truck like gasoline. It can be carried to the
11 refueling location, beyond the range of the current
12 pipelines. To places like Fairbanks. Stored there at
13 refueler, and then loaded into automobiles or heavy
14 trucks, for ultimate use by the vehicle.

15 So I think Representative Finkelstein is
16 right. The problem now is the refueling
17 infrastructure. There is a lot of interest in fleet
18 owners here in Anchorage, from what I hear, in getting
19 into the business of having CNG. They have no place to
20 buy the gas right now.

21 CHAIRMAN GREEN: Would it be a fair
22 assumption, then, that the -- if you were going to a
23 cryogenic system, that you would have a greater range
24 than you would under compression?

25 JEFF OTTESEN (VIA ANCHORAGE): That is

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1 correct. If you go to cryogenic as your source on
2 board, that is beginning to show up more and more in
3 the commercial side of the industry. That is the -- I
4 know the bus system in Seattle has just opted to go to
5 LNG, because they get greater range than tanks.
6 Likewise, the long over-the-road carriers now, around
7 the country, are converting to natural gas.

8 But once the gas is being used by the engine
9 itself, it's the same gas as if it were stored in the
10 compressed form. The LNG is just a more dense form of
11 storage.

12 CHAIRMAN GREEN: And I guess my last questions
13 -- I don't want to monopolize the questions. But how
14 would, say, either a compressed gas, or a liquified
15 gas, be safety wise, as compared to conventional
16 gasoline?

17 JEFF OTTESEN (VIA ANCHORAGE): Well, I'm not
18 an expert, but I've listened to a lot of experts talk.
19 And my own skepticism, I think, has come full circle --
20 or, I should say, half circle. I have come from being
21 a skeptic of safety, and now believing that natural gas
22 is probably safer. And I will give you a few reasons
23 why.

24 One, the tanks, themselves, are much more
25 durable, much stronger than a conventional gasoline

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1 tank. They are capable of withstanding a high velocity
2 of rifle rounds. They are capable of being dropped off
3 a six-story building, and surviving in tact. So just
4 their durability, as compared to sheet metal, which is
5 how gasoline is stored, is much better.

6 Secondly, the fuel has a lower range of
7 ignition. The range that it will ignite, the amount of
8 gasoline versus the atmospheric conditions, has a much
9 narrower band of accountability than gasoline.

10 And then, finally, the gas, if it does have a
11 spill, you do have a break in storage, it's lighter
12 than air. It quickly dissipates and blows away.
13 Where, gasoline, being heavier than air, pools and
14 settles down.

15 But for all those reasons, it's really a safer
16 fuel.

17 CHAIRMAN GREEN: Thank you, Jeff.

18 Any questions from anyone in the audience?

19 (No audible response.)

20 What we need to do, I think, is first adopt
21 the substitute as the bill. I would entertain a motion
22 to that effect.

23 REPRESENTATIVE KOTT: Well, Mr. Chairman, I
24 wonder if I might be able to ask Jeff a question.

25 CHAIRMAN GREEN: Sure.

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1 REPRESENTATIVE KOTT: It seems to be in order
2 at this particular point in time.

3 Jeff, Representative Kott here. I just have a
4 question for you regarding the number of natural gas
5 vehicles that are currently in operation in the state
6 of Alaska. Do you have any estimate as to how many
7 those are?

8 JEFF OTTESEN (VIA ANCHORAGE): I don't have a
9 hard estimate. I think, from what I've heard at the
10 various conferences we've held, I think it's well over
11 100 now, and growing. The state fleet here is just in
12 the process of adding six to its inventory. That will
13 be our first six. We have a variety of vehicle types,
14 as well as some that are dedicated natural gas. That
15 is, that is the only fuel. We also have a Ford Taurus
16 that is a bi-fuel. Some are off the factory assembly
17 line conversions, and some are being converted --
18 after-market conversions. That is, the state has done
19 it itself.

20 So we even have these vehicles available for
21 people that are visiting Anchorage, and need to use a
22 state car for a day or three. They could be made
23 available. Give me a call there in Juneau, and I could
24 put you in touch with people that could schedule that
25 car.

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1 REPRESENTATIVE KOTT: I would be more than
2 happy to oblige you in using one of those vehicles, as
3 long as I don't have to report it on my ethics report.

4 Those numbers that you cited, over 100, are
5 those state owned vehicles, or is that a combination of
6 public and private?

7 JEFF OTTESEN (VIA ANCHORAGE): I believe
8 that's public and private. There are people that own
9 these vehicles as individual citizens. There are
10 various businesses that are using them now. There is a
11 new coalition of public and private fleet managers here
12 in Anchorage that are just this week, I believe, going
13 to sign their resolution as -- basically, their bylaws,
14 and that includes one of the Anchorage taxi cab fleets,
15 the municipality and state fleet, and other fleet
16 owners, basically getting together and trying to work -
17 - get a teamwork environment to make this happen.

18 In the three or four days here in town that
19 I've had a vehicle, driving around, and I have been
20 stopped three times with people wanting to know what
21 this car is all about, and how does it drive. Does it
22 work? There's a lot of difference.

23 REPRESENTATIVE KOTT: Thank you for your
24 comments.

25 CHAIRMAN GREEN: Jeff, I have another comment.

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1 This is Representative Green.

2 How does the maintenance compare on a natural
3 gas engine to a gasoline engine?

4 JEFF OTTESEN (VIA ANCHORAGE): We held a
5 conference a year ago December, where we brought fleet
6 managers from around the country here to talk about
7 that, and they all reported the same thing. The
8 engines simply burn cleaner on natural gas. It doesn't
9 put the contaminants into the oil. It doesn't foul the
10 spark plugs. You don't get the (indiscernible) on
11 valves, and that sort of thing, in the engine, or the
12 rings. They'll last a long time.

13 CHAIRMAN GREEN: Thank you.

14 Any other questions?

15 (No audible response.)

16 Okay. I would entertain a motion to adopt the
17 committee substitute.

18 REPRESENTATIVE KOTT: So moved.

19 CHAIRMAN GREEN: It's been so moved by
20 Representative Kott. Any objections?

21 (No audible response.)

22 So ordered.

23 I would now entertain a motion...

24 UNIDENTIFIED MALE: Mr. Chairman, do we have
25 anybody from the oil and gas industry in the audience

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1 that can give us an estimation as to how many natural
2 gas vehicles are currently in operation on the North
3 Slope Borough, since they've been up there for about 10
4 years or so? Any idea?

5 CHAIRMAN GREEN: I don't know whether industry
6 -- I see, we have a member, Department of Environmental
7 Conservation.

8 Do you happen to know, or have a feel for -- I
9 guess what you're really after, is just kind of an
10 approximation.

11 UNIDENTIFIED SPEAKER: Yes.

12 MEAD TREADWELL: Mr. Chairman, Mead Treadwell,
13 Deputy Commission, ADEC.

14 As I understand it, the firm NORGAS, which is
15 one of the people you are directing this to, has been
16 operating its truck fleet on the North Slope. I don't
17 know how many it is, but it's not a large fleet. My
18 guess is five to 10 vehicles at this point. There has
19 been -- there is also a source of natural gas, as you
20 know, that's not connected to Prudhoe Bay, that
21 operates in Barrow. And we had at the conference last
22 year, a representative of the North Slope Borough, and
23 I believe they had, with that gas utility, maybe three
24 to five vehicles, as well.

25 They actually -- it was kind of an interesting

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1 situation there, because the price of gasoline was far
2 more expensive than the price of natural gas, and you
3 would think that many more vehicles would have
4 converted. But the explanation given at the conference
5 was that the owners -- the people who sold gasoline had
6 a major choice in the decision of what kind of cars
7 were purchased, and that's why they stuck with
8 gasoline.

9 But the utility that controlled its own
10 vehicles, has been running on natural gas for some
11 time, and that's the gas utility fleet there. So the
12 two North Slope gas utilities have it.

13 Mr. Chairman, I had raised my hand when you
14 were asking for questions, and if Jeff is still on the
15 line, I -- perhaps a colloquy between the two
16 departments.

17 Jeff had asked me the other day what
18 additional incentives DEC might be able to come up with
19 to help on this. And as you may be aware, our state
20 implementation plan for clean air is in the Department
21 of Law right now for review. It's a 3,000 page
22 document. It's probably the weightiest set of
23 regulations ever contemplated, much less, had anything
24 to do with developing. But that's what we were
25 required to do, and that's about one-eighth the size of

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1 Oregon's 20,000 page submission on the Clean Air Act.

2 But anyway, that is in the Department of Law
3 right now for review, and as soon as that is adopted,
4 we have the authority to trigger a mechanism that would
5 allow the Department of Transportation to use some of
6 its so-called CMAC funds to help buy a gas refueling
7 station. And if we do that, I know that -- Jeff, you
8 might want to explain the public-private partnership
9 that you have in mind that could help get some greater
10 refueling facilities in the marketplace.

11 JEFF OTTESEN (VIA ANCHORAGE): Would that be
12 appropriate?

13 CHAIRMAN GREEN: Yes, please go ahead.

14 CHAIRMAN GREEN: The notion is, we could give
15 some of our -- some of our highway funds are dedicated
16 to a purpose called CMAC, or Conjunction Mitigation/Air
17 Quality.

18 How we use that money is controlled by the
19 state implementation plan that Mead just talked about.
20 He needs to adjust this plan to make our spending, in
21 this fashion, legitimate. What then happens -- what we
22 are hoping to envision would be, some form of a joint
23 public-private partnership allowing one or more
24 stations to go in the Anchorage area, that would be
25 available to both public fleets and to private fleets.

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1 I think, just in kind of a broad brush
2 thinking proposal, or strong (indiscernible) proposal,
3 we're imagining an RFP, which would basically say, we
4 have this much money available to install the system.
5 We are looking for a private partner to come in, make
6 that installation, operate it and maintain it, and to
7 sell the natural gas automotive fuel back to the
8 state's fleet, on a long term basis, at a discounted
9 cost. So that we would recoup that investment.

10 At the same time, those (indiscernible) system
11 would be available to any other user that would care to
12 come in and get refueled.

13 CHAIRMAN GREEN: Thank you. Thank you, Mead,
14 and thank you, Jeff.

15 Representative Kott?

16 REPRESENTATIVE KOTT: Thank you, Mr. Chairman.
17 I would just call your attention to page 2, line 8,
18 where it talks about the number of natural gas vehicles
19 currently in operation within Alaska. And per the
20 testimony of Jeff, I think we can probably make this --
21 tighten it up a little more, and make it a little more
22 palatable to those who would not seemingly think it's a
23 good idea, by, perhaps, offering a friendly amendment,
24 making that number 50 to 100. Since we do have over
25 600,000 registered vehicles in the state, I think it

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1 would add a little more thrust to the proposal.

2 I'm certainly not wanting to hold this up in
3 this committee, because it does have two additional
4 committees, plus finance, which it probably ought to be
5 away from, but -- I think it would give it a little
6 more teeth in the matter, if we substantiated the
7 number to a higher number.

8 CHAIRMAN GREEN: Do you feel comfortable with
9 that, David, that -- is that still a number that you
10 can live with?

11 REPRESENTATIVE FINKELSTEIN: Actually, Jeff's
12 view is more important. If Jeff thinks it is correct,
13 then that's more correct. I just...

14 REPRESENTATIVE KOTT: I'd offer that as a
15 friendly amendment, then.

16 THE COURT: And the sponsor has no problem
17 with that?

18 (No audible response.)

19 Anybody else have any comment on that?

20 (No audible response.)

21 You're offering that as an amendment?

22 (No audible response.)

23 Okay. That will then read, over 100 natural
24 gas vehicles.

25 REPRESENTATIVE OLBERG: Should we ask for

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1 unanimous consent?

2 CHAIRMAN GREEN: Beg your pardon?

3 REPRESENTATIVE KOTT: And I would ask
4 unanimous consent of this amendment, with no objection.
5 Don't think about it too long.

6 CHAIRMAN GREEN: Any objection to that change?

7 REPRESENTATIVE GARY DAVIS: Good observations.

8 CHAIRMAN GREEN: If not, so ordered.

9 REPRESENTATIVE KOTT: And, Mr. Chairman, I
10 make a motion, I would move this out of committee, with
11 unanimous consent, as amended, to the next committee
12 referral, which is Resources. I think this is a good
13 idea. We've ridden this horse around the corral for a
14 long time, and it's time to open the corral door and
15 let it loose.

16 CHAIRMAN GREEN: Any objection?

17 (No audible response.)

18 So ordered.

19 REPRESENTATIVE FINKELSTEIN: Thank you, sir.

20 CHAIRMAN GREEN: Yes, sir.

21 While the document is being circulated, I
22 would like to now introduce Jerry Brossia, of the
23 Pipeline Coordinator's Office, who will give us an
24 overview, and hopefully we will introduce his federal
25 counterpart, John Santora.

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1 MR. BROSSIA: Thank you, Mr. Chairman, and
2 members of the committee. I am Jerry Brossia, the
3 State Pipeline Coordinator. And with me here today is
4 my counterpart on the federal side, Mr. John Santora.
5 He is the authorized officer for the Bureau of Land
6 Management, and Rob McWhorter, of our office, is also
7 here.

8 Again, I think you recognize Mead Treadwell,
9 of the Department of Environmental Conservation, is
10 here today. And we have a couple of folks with
11 Alyeska, Paul Richards, and Mr. Rob Shoaf, that might
12 be able to answer questions.

13 First of all, I do have some prepared notes
14 here that I will hand out to anyone who wants a copy of
15 those.

16 I think sometimes, as we go through life, it's
17 hard to make my priorities your priorities. And one
18 thing I am pleased about is, you have the interest in
19 hearing a little bit about the Alyeska Pipeline.
20 Because, to me, the Alyeska Pipeline is one of the most
21 important assets that Alaska has. It represents
22 symbolically, the steel backbone of our economy. It
23 affects each and every one of us, if, for some reason
24 that pipeline were to be shut off.

25 And each year Alyeska employs 1800 people, or

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1 so, and they have an operating budget of some half
2 billion dollars.

3 Tonight I would like to briefly talk about the
4 Joint Pipeline's Audit of Alyeska Pipeline Service
5 Company. And before I start, talk a little bit about
6 the Joint Pipeline Office.

7 It's kind of an old idea in industry to form
8 partnerships, and joint ventures, and things, but it is
9 a new idea to government. And over the last four years
10 we have formed a series of objectives to essentially
11 strengthen our relationship with state agencies and
12 federal agencies, to share resources, knowledge -- kind
13 of pull together, if you will, to work our way through
14 difficult problems.

15 Quite often the situation in government is a
16 big tug of war where we all fall in, and one sort of
17 shark, or another, in the water, to capitalize on that.

18 In this case, I believe the Joint Pipeline
19 Office is working as a team. We have a number of state
20 and federal agencies in the office. The Department of
21 Natural Resources, the Department of Labor, the
22 Department of Environmental Conservation, the
23 Department of Fish and Game, the Governor's Division of
24 Governmental Coordination is also in the office.

25 On the federal side, the key lead agency is

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1 the Bureau of Land Management, and then the main
2 federal regulatory agencies in that office are the
3 Department of Transportation's Office of Pipeline
4 Safety, and the Environmental Protection Agency. We
5 also have a member of the U. S. Fish and Wildlife
6 Service in the office.

7 The idea of audits of the Alyeska Pipeline is
8 not new. We have, for some time, taken an in depth
9 look at a variety of problems. We've looked at various
10 weld records, we've looked at corrosion, air issues,
11 oil spill plans, and so on.

12 There are other audits that have gone on as
13 well at Alyeska Pipeline Service Company. You may have
14 recently heard that the owners conducted an audit of
15 Alyeska. And it's our intent, as well as the other
16 government agencies intent, and Alyeska, to put all of
17 the audit findings on the table, categorize them, sort
18 them, and try to work through them in one single
19 process.

20 One might ask, "Well, why do you guys do all
21 these audits?"

22 Because we had a lot of allegations. We had
23 allegations from people inside the company,
24 whistleblowers, if you will. We had allegations from
25 United States Congress, and they held hearings, as you

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1 well know, and it essentially caused us to take a very
2 close look at the operations of the pipeline.

3 One of the main issues that you will
4 repeatedly hear are Alyeska has management problems,
5 they have quality assurance problems, and they have
6 some hardware problems. Now, what does that mean?

7 The quality assurance is essentially a way of
8 establishing what your criteria are for anything,
9 whether it's building a pipeline or any kind of a
10 product. And then setting up a series of systems, and
11 programs, and check lists, to give you some assurance
12 that the original set of specs and engineering criteria
13 are being met.

14 Now, as one increases the risk of some kind of
15 a catastrophe, be it pipeline rupture, or loss of life,
16 or something like that -- the risk. If it were to
17 increase your assurances, should essentially parallel
18 that, and there should be more assurances in a worst
19 case situation.

20 These audit findings have essentially been
21 based on what is called a "vertical slice" of the
22 pipeline. We looked at Pump Station 1, 6, 10 and the
23 Valdez Marine Terminal. We talked to almost 250
24 employees at Alyeska. We've gone through a lot of
25 records to come up with these findings.

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1 Originally, again, at Congress' urging, we had
2 a relatively quick schedule to meet. The schedule
3 started the first of September, and we entered into
4 what we call the findings process. That was two months
5 long. It ended in early November, followed by
6 oversight committee hearings. Those oversight
7 committee hearings ended, and we issued a Phase 2
8 contract to come up with some corrective actions,
9 particularly focusing on management problems at Alyeska
10 and their quality program. Currently, we are looking
11 at solutions for the hardware problems.

12 After the corrective actions are identified,
13 then we will be going into the implementation stage.
14 And that implementation stage is going to run until
15 about December of 1994.

16 So essentially, what did we find in this
17 process. We had a number of positive effects that
18 resulted and affects safety -- worker safety,
19 particularly. The effects on pipeline integrity, from
20 vertical supports, and so on. Seismic design of
21 different issues. And we had some environmental
22 issues.

23 Now one of the main issues, I think, that
24 everyone wants to hear about is: "What are you going
25 to do," and "How are you going to fix it," and "What is

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1 it going to cost?"

2 And I can't really give you definitive
3 answers, but I can tell you the process that we are
4 going through today. And essentially what we are doing
5 is establishing a base line on what the laws, and
6 regulations, and codes, and specs are. And that will
7 become the floor of the minimum amount that Alyeska
8 will have to do to comply with the law.

9 On the other hand, there may be some areas of
10 higher levels of standards that have to be set to
11 enhance the program at Alyeska. And we have recently
12 been going through the drill to decide what those
13 corrective actions are, based on risk and cost
14 benefits. And this phase will probably take us over
15 the next couple months, followed by essentially, again
16 -- we'll come up with the corrective action, and then
17 we will be implementing fixes, and hope to have this
18 implementation stage carried out by December of 1994.

19 The findings have been placed into three
20 different categories, again, based on risk. Class 1
21 being the most severe. They are the kind of problems
22 that break out into management, broadly, and secondly,
23 to hardware problems.

24 Alyeska has suffered, perhaps, from somewhat
25 of a construction mentality, when they should be in

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1 more of a processing mentality, an operation mentality.
2 I think we all recognized that Alyeska is very good at
3 building pipelines, and very good at moving oil, and
4 they need to get out of a construction mentality and
5 into one of more operations oriented, safety oriented.

6 They have recognized that, and they have had
7 their own series of contractors and auditors that have
8 developed a new philosophy, if you will. Some of you
9 may have read the paper recently, and have seen the
10 article by David Pritchard, where he talks about
11 changing attitude, and I believe that's true. They are
12 changing their attitude there.

13 They are interested in having processes in
14 place that protect workers, and give you some assurance
15 that the blueprints are in place, the engineering
16 process are in place, check lists for inspectors in
17 place, and so on.

18 CHAIRMAN GREEN: Can I interrupt you just for
19 a moment.

20 MR. BROSSIA: Certainly.

21 UNIDENTIFIED MALE: As you discussed Alyeska
22 moving into the operations mentality, or safety
23 oriented mentality. It is my understanding that
24 Alyeska has one of the best safety records of any
25 industry, especially the oil industry. Is that

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1 basically...

2 MR. BROSSIA: Oh, I think that's true. I
3 think there are things they can do to improve, but I
4 would agree with you, they have an excellent safety
5 record. And they certainly have a good record, as far
6 as keeping the oil inside the pipe.

7 The main hardware issues and big cost items
8 are going to be evolving around electrical problems.
9 And I can't tell you again what the cost would be, but
10 I can tell you, it's a substantial effort. Several
11 hundred workers will be involved with that electrical
12 repairs at the Valdez Marine Terminal, and then they
13 will follow it up through the pump station, so it is
14 going to be a substantial amount of work.

15 There are some other issues, in the way of
16 hardware issues, vertical support members, where the
17 pipe is slid over next to it. It could cause some
18 structural problems, and again we want to do a careful
19 engineering analysis of that before we just go out and
20 put new VSM's in, and do sidebars, and so on.

21 The second type of finding was called a Class
22 2 finding. Examples would be, drawings not in place.
23 Quite often electrical workers will go into boxes and
24 not know what wires are hot and what wires -- whether
25 they're color coded properly, and so on. Fire safety

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1 programs could be improved at the Valdez Marine
2 Terminal. Some of the emissions at the pump stations
3 aren't being monitored in the relief systems.

4 Class 3 findings. The kind of finding that
5 causes loss of time. Inefficient. They could beef up
6 their training program, to make sure they got the right
7 training for the right job. Alyeska does have a good
8 training program, but in some cases, the right training
9 is not completed for the right individual work.

10 Leak detection. Alyeska, again, probably has
11 a good leak detection system, but it probably can be
12 improved, and they have been working on that for the
13 last year, and they will be working on it to try to
14 improve the accuracy of it, so they could get it down
15 in probably the 1500 barrel size leak right now. It's
16 probably in the 3000 to 5000 barrel size.

17 What have we been doing about all of this? We
18 have essentially tried to verify a lot of work that
19 Alyeska has done. We have brought on a few more
20 people. We hired several consultants to give us
21 technical expertise, so that we know that we are fixing
22 -- or that Alyeska is doing the right fix, if you will,
23 and we will be looking at those fixes, or cost
24 benefits, risk and so on.

25 We stepped up our monitoring program. We

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1 participated in five or six drills in the last six
2 months, and tried to have a more active field presence,
3 in general.

4 In the short term -- it's a bit hard to see,
5 but I think if you follow along in your handout, you
6 could -- we've got sort of a five or six point action
7 plan. We have an audit team that is essentially
8 tracking the design review of each one of these
9 findings. We will then work with Alyeska on approval
10 of the various fixes. We will have an inspection team
11 in the field that will sign off on them, and then they
12 will pass it back, in some cases, to various regulatory
13 agencies for their reviews and approvals.

14 By this time next year, we hope to be able to
15 tell congress, essentially, the status of all these
16 findings, whether they are complete, in progress, or
17 some of them may have regulatory actions that are going
18 on.

19 At this point I would like to turn it over to
20 John Santora, and John is going to talk to you a little
21 bit about the future of the office, and then I will
22 come back and be happy to answer any questions.

23 John?

24 MR. SANTORA: Thank you, Jerry.

25 Mr. Chairman, and members of the committee.

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1 My name is John Santora. I am a Bureau of Land
2 Management employee, and presently I am the authorized
3 officer for the bureau, with reference to the
4 TransAlaska Pipeline.

5 As Jerry has said to you, the TransAlaska
6 Pipeline System is a vital resource to the state of
7 Alaska, for the continued development of proven energy
8 resources within the state. It is also a vital
9 resource for the consideration of future energy
10 resources within the state of Alaska. And it is our
11 intention, within the Joint Pipeline Office, by lessons
12 earned from these audits, to ensure that the pipeline
13 system is not a contentious issue with regard to public
14 safety, worker safety, environmental compliance, and
15 system integrity, and any consideration of future
16 resource development.

17 To achieve that goal, we have taken steps to
18 focus and look at our existing monitoring program and
19 oversight of the TransAlaska Pipeline System
20 activities, and to strengthen that program, and to
21 improve it, so that we can ensure that the lessons
22 learned, as a consequence of these audits, are not
23 repeated in the future.

24 Some of the things that we have done to
25 initiate that action is, we've initiated and developed

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1 a memorandum of agreement, which has been signed by six
2 state agencies and five federal agencies. That
3 memorandum of agreement, now, is a formalized method
4 for those people who are in policy level management
5 positions to come together quarterly to discuss areas
6 of concern and consideration, with reference to their
7 oversight and monitoring responsibilities for that
8 TransAlaska Pipeline System. That is the significant
9 step to strengthen the union that has been formed
10 between state and federal agencies, insofar as our
11 joint oversight and monitoring of the TransAlaska
12 Pipeline System.

13 We are also presently reviewing our entire
14 office structure, our organizational structure, our
15 staff composition. We are considering how we can
16 better utilize existing staff, the skill mix that we
17 need permanently within that office, and also, how we
18 can best utilize, in certain situations, consultants to
19 assist and help with very specialized issues, such as
20 seismic concerns, which are now under consideration, as
21 a result of the audit.

22 We have a very positive outlook. We've come a
23 long way in learning how to work together positively
24 and pro-actively. And it is our intention to continue
25 to improve, with the focus on ensuring that that

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1 pipeline system can never be an issue of contention
2 regarding any future development of Alaskan resources.

3 That's all I have to say. Any questions?

4 CHAIRMAN GREEN: Any questions of either of
5 you?

6 (No audible response.)

7 When this pipeline was constructed, it was
8 kind of put up there as one of the major wonders of the
9 world. It was state of the art. Largest private
10 capital -- and all these superlatives. And for years
11 it seemed to work well. You've got an excellent safety
12 record. You've got all these things. What happened
13 two or three years ago to start this unwinding? This
14 situation with the whistleblowers, and subsequently,
15 all of the problems that you have encountered since
16 then?

17 MR. SANTORA: Mr. Chairman, let me try and
18 answer that question using an analogy, if I may. What
19 you say was true. At the time, the pipeline was a
20 state of the art facility, but it was a first of a
21 kind. That type of pipeline, in the Arctic
22 environment, and in the sub-Arctic environment, had
23 never been constructed anywhere else in the world.

24 The best engineering judgments were applied to
25 those unique new areas of consideration, such as the

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1 permafrost conditions, the discontinuous permafrost
2 conditions, the construction of an above-ground
3 pipeline, with some very unique designs for those
4 vertical support members, given what type of supporting
5 soils that they were placed in. And all of the other
6 considerations that had to be taken.

7 The tremendous Delta-T that the pipeline
8 operates at, from oil starting out at around 105
9 degrees, now probably around 100 degrees on an average,
10 down the pipeline, and the extreme winter and summer
11 temperatures. As you are well aware, we can have 90
12 degrees in Fairbanks in the summer, and we can see 40
13 below in the winter, and yet that pipe must stay within
14 an operational range, if you will, on a vertical
15 support member. All of those things.

16 But the analogy I want to draw to you is, the
17 freeways in Los Angeles were designed to the best
18 standards, using what they considered, at the time, the
19 best seismic and earthquake designs that they knew of.
20 But times have changed. Technology has improved.
21 Design methods have improved. The methods of analysis
22 of those particular structures and the stresses they
23 will be subjected to, have improved. And as we saw,
24 there was a retrofit program taken as lessons learned
25 from previous earthquakes, to strengthen those facilities.

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1 The ones that were strengthened survived the
2 last earthquake. The ones that had been designated to
3 be strengthened, but they were unable to get to because
4 of budget and other considerations, those failed.

5 Let me suggest to you that that type of a
6 failure contributes significantly to the cost. It is
7 no longer a retrofit now, it is a total removal, which
8 is extremely expensive, and a total reconstruction,
9 which is far more expensive than a retrofit.

10 Let's look at the pipeline. There are areas
11 right now. The pipeline, as it exists, is safe. There
12 is no threat from the pipeline in the given conditions
13 we have today. But if we were to subject the pipeline
14 to its maximum design considerations for seismic, given
15 some of the lessons we've learned now, there is a
16 question with regard to certain supports and certain
17 other physical features on the line, as to whether it
18 would be prudent to strengthen those, because they do
19 not, at this time, appear to be seismically capable of
20 withstanding the accelerations that they would be
21 subjected to.

22 If we make reasoned retrofits now, and we
23 should, God forbid, have another seismic event of that
24 magnitude in the state of Alaska, I would suggest to
25 you that the remedial actions that might have to be

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1 taken would be far less than if we left the conditions
2 as they are. Because the state of Alaska, for
3 instance, could not do well if we had to shut the
4 pipeline down as a result of some seismic event, for
5 six months, before we could repair it, as opposed to
6 maybe a month. That would be the difference.

7 Think, again, of the work that is going to
8 have to be done in the Los Angeles area because of that
9 seismic event, as opposed to the work that would have
10 been done if they had the means, and were able, within
11 a reasonable time frame, to retrofit those facilities
12 that were so severely damaged.

13 So the design, Mr. Chairman, was good. The
14 design, presently, is good for existing conditions, but
15 we have identified certain areas that need a...

16 (Tape 94-6 - Side 2)

17 MR. SANTORA:... isn't good economics.

18 CHAIRMAN GREEN: You mentioned the word
19 "costs," and that brings a real sensitive nerve to the
20 surface with the state. It's indicted that for every
21 dollar spent, the state, in fact, spends 25 percent on
22 that. What do you foresee as the cost? Can you
23 project what the cost might be, both -- and is that 25
24 cents on a dollar a reasonable figure?

25 MR. SANTORA: The 25 cents, I would have to

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1 defer to Jerry. To answer your question about costs,
2 we just started now to get the data in regarding those
3 concerns. The QTC audit that was done by the Bureau of
4 Land Management, was a very narrow vertical slice, just
5 to look at areas, and see if there was any places where
6 there were concerns. And there were areas of concern
7 identified.

8 The owner companies have now launched their
9 independent audit. That is an all-encompassing audit.
10 It will cover all the pump stations and all facilities
11 at the Valdez Terminal, in addition to pipeline related
12 facilities, such as the valving that is up and down the
13 line, to determine what areas are of concern and need
14 to be considered.

15 Phase 2 is underway. It's not complete. To
16 try to answer your question would just be a guess.
17 And, respectfully, I won't guess.

18 CHAIRMAN GREEN: Is it big, or is it
19 reasonable?

20 MR. SANTORA: Within the order of magnitude of
21 what that facility encompassed when it was originally
22 constructed, and where it is, we intend it to be
23 reasonable. We intend it to be reasonable. They're in
24 business. That is a business. Any decisions you make
25 must be made with a sense of business. You just don't

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1 spend money without considering the consequences of
2 that investment that you are making, and how it will
3 effect your business. If you don't do that, you are
4 going to be out of business, and we do not want to see
5 the pipeline company out of business. It is, again, a
6 very vital resource to this state, and its future.

7 CHAIRMAN GREEN: Well, where I was kind of
8 going with this, and -- if the federal mandates, which
9 -- yeah, it supplies oil to the United States --
10 perhaps the federal view of what might be necessary
11 could vary with what perhaps the Pipeline Coordinator's
12 Office might find, especially considering the fact of
13 how vitally the throughput of the Alyeska line is to
14 the state of Alaska. Proportionately significantly
15 more important to Alaska than it is to the federal
16 government.

17 MR. BROSSIA: I would like to try to answer
18 something. My answer is a bit different than John's,
19 on how did the situation get to where it is, in light
20 of the original construction project.

21 And my analogy is an airplane. And you can
22 fly that airplane as long as you want to maintain it,
23 and that's the way the TransAlaska Pipeline System is
24 going to be made. And several years ago the
25 administration made the decision that we wanted the

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1 pipeline maintained at its maximum design capacity. So
2 that means the airplane can be 30 years old, or it can
3 be 50 years old, but it is maintained properly.

4 Now, why did we get to where we are with the
5 rush of construction, and the intensity of
6 construction. A lot of things to run an operating
7 pipeline were never done. The as-built drawings
8 weren't completed. A good operating pipeline has,
9 essentially, what is called an equipment list, or a Q
10 list, if you read this report. And a Q list is nothing
11 more than a list of all the components that make up
12 that system, from pumps and wires, and stacks, et
13 cetera. And each one of those pieces, then, are
14 entered into a predictive maintenance list. And those
15 predictive models, then, can tell you, compliance
16 checks, maintenance schedules, life cycle of components
17 and parts, and so on. And those processes were never
18 put in place. And as one maintains this old airplane,
19 it becomes very important to know which pumps and which
20 parts, et cetera, need to be maintained if you are
21 going to keep the thing running for a long time.

22 So I think Alyeska -- you should ask this
23 question of Mr. Shoaf -- I think Alyeska has bought
24 into the idea of these management processes, equipment
25 lists, and predictive maintenance models, and field

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1 checks, and as-builts, and so on, because they want to
2 maintain it, too. They have a hope. And after the
3 throughput declined in 1988, from 2.1, it's been going
4 down, and they don't want it to go down, and their
5 attitude should not have that kind of decline to it,
6 also. So they want to maintain it. They want to do a
7 good job. And the same hope that the state has, and
8 that's to bring future oil to market. So we can't get
9 there from here if we don't maintain it, is the short
10 list.

11 As far as the 25 cents, I'm not sure it is
12 precisely 25 percent, it might be 23 percent. It's
13 really a question for the Department of Law, and they
14 regulate the tariff under, I believe, Alaska Statute
15 41. But the concept is, the well head value of the oil
16 is an average of west coast, east coast, and I'm not
17 sure what else is in that basket that makes up the
18 total spot price. But the well head is a total spot,
19 minus cleaning and hydras costs at the field, minus
20 transportation costs. And that deducts down to the
21 well head value of oil.

22 So, yes, Alaska loses money as the tariff goes
23 up, the well head value comes down. As well as in the
24 taxation side of things. And I, quite frankly, don't
25 know the details of how, as the expenses goes up, that

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1 affects the tax. But in theory, those two combined,
2 come up to about a loss to the state in revenues of 23
3 to 25 percent.

4 The ultimate decision maker in those areas,
5 would be the Federal Energy Regulatory Commission.
6 Alaska disputed the additional costs several years ago
7 for corrosion repairs. It is my understanding that we
8 would dispute any unreasonable costs in this operation.
9 So, again, I can sit here and say, "We don't want to
10 pay, but we want it fixed." And the ultimate judge on
11 that will be the Federal Energy Regulatory Commission.

12 CHAIRMAN GREEN: I think you answered a
13 question I was going to ask, that the state has about
14 12.5 percent of royalty, and yet pays about 25 percent
15 -- or, would lose 25 percent. It's through the tax
16 portion that makes that balance?

17 MR. BROSSIA: That is my understanding, and
18 that is a Department of Revenue question.

19 CHAIRMAN GREEN: Sure. Okay. You used an
20 airplane as an example. Now, we've got this 747 in
21 Alaska. How does the oversight of that 747 compare
22 with, maybe, a 727 or a Piper Cub, and the other little
23 planes that are out there? I mean, there is pipelines
24 all over the Lower 48. Do they have anything near this
25 kind of scrutiny?

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SPECIAL HOUSE COMMITTEE RE: OIL AND GAS (February 14, 1994)
JOINT PIPELINE BRIEFING (HCR-12)

1 MR. SANTORA: No. It's my understanding that
2 the Office of Pipeline Safety, which is the main
3 regulator of pipelines in the United States, has about
4 175,000 miles of liquid pipe in the Lower 48, and about
5 3 million miles of gas pipes. And there is no pipeline
6 in the United States that receives the intense scrutiny
7 of this pipeline. And there is no other pipeline that
8 has developed some of the technologies that are used on
9 this pipeline, in the way of smart pigging, and devices
10 to look for corrosion, and so on.

11 So the short answer is, no. There is no other
12 pipeline that I know, that has the scrutiny.

13 CHAIRMAN GREEN: Is that just because of the
14 volume that's handled?

15 MR. SANTORA: That is the answer that has been
16 given. Twenty-five percent of the nation's domestic
17 crude, as you know, flows through that pipeline, and
18 because of it, it has a national security interest, and
19 the government has decided that it needs more scrutiny.

20 CHAIRMAN GREEN: If you didn't have this Joint
21 Pipeline oversight group, what do you think the
22 government might do?

23 MR. BROSSIA: Well, first of all, there would
24 be as many as eight, or 10, or 12 different agencies
25 looking at the pipeline. And one of the topics that

1 have been addressed under the proposed Presidential
2 Task Force, is new legislation. So I guess, if we did
3 not have the Joint Pipeline Office, the biggest
4 potential would be for new federal legislation to
5 create an oversight group.

6 CHAIRMAN GREEN: So it is definitely to our
7 advantage -- "our," being the state's advantage, to
8 have what we've got in place?

9 MR. BROSSIA: I believe so, yes.

10 John, do you want to elaborate on that?

11 MR. SANTORA: No. I would have to agree with
12 Jerry's assessment.

13 One of the criticisms that, in the past,
14 before we had the Joint Pipeline Office, that was
15 levelled, was that we were a splintered group of
16 various regulatory and oversight agencies, and that we
17 did not coordinate our activities at all, therefore, we
18 were not as effective, or, in some people's eyes,
19 ineffective in achieving the expected oversight of the
20 TransAlaska Pipeline System.

21 Being aware of that concern, we -- Jerry and I
22 proposed, and were successful in starting to develop
23 the concept of a Joint Pipeline Office. I have to
24 suggest to you, I don't think there is another one
25 anywhere in the United States, where the state and the

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1 federal government have been able to cooperate on a
2 pro-active basis, with regard to a facility of the
3 complexity and magnitude of the TransAlaska Pipeline.

4 And I would agree with you, Mr. Chairman, I
5 think it is in everyone's interest, that we make that
6 type of an arrangement successful and work.

7 CHAIRMAN GREEN: Let the record reflect that
8 Representative Sanders got here about 10 minutes to
9 6:00, or 5:00, or something like that.

10 REPRESENTATIVE SANDERS: Ten minutes to 5:00
11 is better.

12 CHAIRMAN GREEN: Sorry. Yes.

13 REPRESENTATIVE SANDERS: No, it was about ten
14 minutes to 6:00.

15 UNIDENTIFIED MALE: Is it 10 minutes to 6:00
16 or 5:00?

17 CHAIRMAN GREEN: Ten or five minutes to 6:00
18 is what I meant.

19 If there is a difference of opinion on
20 expenditures, as you had indicated, Jerry, there could
21 be, is there an authoritative structure within the
22 oversight committee?

23 MR. BROSSIA: What we hope to do -- right now
24 John and I are the same size dog. He takes as big a
25 bite out of me as I do out of him. So, to resolve that

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SPECIAL HOUSE COMMITTEE RE: OIL AND GAS (February 14, 1994)
JOINT PIPELINE BRIEFING (HCR-12)

1 issue, we created this memorandum of understanding with
2 the state and federal government, and it would be
3 elevated up to cabinet level on the state side, and a
4 number of the federal heads on the federal side, and
5 they would argue it out.

6 I don't foresee that happening, quite frankly,
7 because, we have a lot of arguments. I wouldn't say we
8 didn't, but usually we have been able to work
9 everything out in the last four years. And sometimes
10 it takes a while. But we have reached an agreement in
11 the past with this process on one oil spill program,
12 one corrosion program. Those are two very big
13 programs.

14 So I would anticipate amicable agreement on
15 corrective actions. But in the event that we can't, we
16 have set an elevation process up.

17 MR. SANTORA: I would like to add to Jerry's
18 view, that with the memorandum agreement, and the fact
19 that we have these policy level people who have signed
20 on that agreement, which is an intent to work together
21 cooperatively and pro-actively. You would not see a
22 unilateral decision made. There would be a vehicle,
23 and there is a vehicle for discussion. And I,
24 personally, would urge your strong support of the
25 continuation of that agreement, and a participation of

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SPECIAL HOUSE COMMITTEE RE: OIL AND GAS (February 14, 1994)
JOINT PIPELINE BRIEFING (HCR-12)

1 those policy level people in that agreement. I think
2 it's to everyone's interest, because it is the first
3 time for that office, we had that kind of vehicle where
4 we could bring those folks together and we can discuss
5 areas of concern, and there will be no unilateral
6 decisions made. They must be discussed. I think it
7 is to everyone's advantage to do that.

8 CHAIRMAN GREEN: Now, at the Dingell hearings
9 back in Washington, the owners -- at least three of the
10 owners -- the bulk of the owners, in other words -- the
11 majority ownership -- that's better -- was very
12 cooperative and indicated that they were going to do
13 everything reasonably in their power to cooperate.
14 Have you found that with your oversight, that you sense
15 that same feeling of cooperation of the owners?

16 MR. BROSSIA: Yes.

17 MR. SANTORA: I would support that.

18 CHAIRMAN GREEN: Now there were some
19 allegations that there was corrosion in the pipeline,
20 and there was, you know, the news media about the
21 stress situations in Atigun Pass. Is it your feeling
22 that those issues are being -- because you indicated
23 there wasn't any. The pipeline is safe. There isn't
24 any immediate danger. Those issues, to your
25 satisfaction, are being handled?

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JOINT PIPELINE BRIEFING (HCR-12)

1 MR. SANTORA: As you, I think, are aware,
2 eight and a half miles of the pipe was replaced at
3 Atigun Pass. Alyeska has an annual program to inspect
4 the pipe in several different ways, for corrosion. We
5 are a part of that program, and we believe that we have
6 a very good understanding of where corrosion is on the
7 pipe, how severe it is, and we're moving towards
8 remedial repairs, in a very cooperative way, with
9 Alyeska right now. That is the entire office, both the
10 regulators within the office, as well as the right-of-
11 way agency. So I believe we are working cooperatively
12 to resolve corrosion.

13 Now, that's not to say that there is not
14 corrosion of the pipe. But, at this point in time, we
15 don't know of any corrosion that presents a safety
16 related problem.

17 CHAIRMAN GREEN: And the last question I would
18 have is, sometime toward the end of last year -- maybe
19 a little earlier than that, even, but certainly toward
20 the end of last year, there were some problems
21 developed with the remote sensing valves, the safety
22 valves. And it appeared, in some cases, that that was
23 not just a natural phenomena. I haven't heard anything
24 more. Was that just a happenstance? Do you feel there
25 was, maybe, disgruntled employee, or whatever? That's

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1 not a concern safety wise?

2 MR. BROSSIA: It is a safety issue, and there
3 are about 160 valves on the pipeline. About a third of
4 those are what you refer to as "remote gate valves,"
5 and they are essentially operable out of the Valdez
6 Marine Terminal.

7 The reason that the valves exist, of course,
8 is they have a systematic and orderly shutdown of the
9 pipe. If one were just to cut the flow off, you could
10 create a hammer, like, you get in your water faucet,
11 and you could literally blow the pipe out of the water
12 and rupture it. So it's important to essentially
13 control the orderly shutdown of the pipeline.

14 Several things have happened: Alyeska did a
15 trend analysis. They had several of those motors and
16 valving regulating devices that did age, needed
17 maintenance, needed repairs. And I think they found
18 some 30 or 40 valves that needed upgrades, and they
19 worked on that.

20 Secondly, they also put a new gearing device
21 into those motors to close them slowly, so that they
22 can't shut down in four minutes. They are now going to
23 close in eight. So that they are taking that
24 precaution.

25 And, thirdly, they are going to renovate the

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JOINT PIPELINE BRIEFING (HCR-12)

1 whole communication control system. I can't really
2 talk to the details of that, but I know that an RFP
3 will be going out in the near future to upgrade the
4 telecommunications system.

5 CHAIRMAN GREEN: One other question I might
6 have for Mr. Santora. Recently the BLM director has
7 left his office. What is the plan there, as far as his
8 replacement, and his working with this whole process?

9 MR. SANTORA: A gentleman by the name of Mr.
10 Mike Donbeck (ph) has been designated by the secretary,
11 to be the acting director. It is my guess that we will
12 not see a permanent replacement until sometime,
13 probably, the end of August or first of September.
14 It's an appointed position, appointed by the president,
15 with concurrence of the senate. And it looks like now,
16 it probably won't happen until late in the summer, but
17 you can always be fooled.

18 CHAIRMAN GREEN: Are there any other questions
19 about the -- yes?

20 REPRESENTATIVE GARY DAVIS: Mr. Chairman,
21 thank you.

22 Every project that is built, and probably
23 every piece of machinery that is built, has a somewhat
24 life expectancy and a maintenance plan to it. Is all
25 that still in place, or is the life expectancy of the

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JOINT PIPELINE BRIEFING (HCR-12)

1 pipeline, quantities of flow, major maintenance
2 problems that were assumed to happen. Is there any
3 major hits anyplace? Of course, if there is,
4 hopefully, more opportunity or more oil finds on the
5 Slope, to maybe double the expected life of the
6 pipeline or the facility, if that should happen. Is
7 that part of any plan now to, how to accept that and
8 prepare for it? See how optimistic I am.

9 CHAIRMAN GREEN: Good man.

10 MR. SANTORA: I think you are actually -- I
11 heard at least three or four questions there. Starting
12 with the last one first. I think that Alyeska is, and
13 the owner companies are thinking about a future plan
14 for TAPS. I can't tell you what that future plan is.
15 I can be hopeful, as you are, of what it might be, but
16 it's something you maybe more appropriately, should ask
17 Mr. Shoaf.

18 But as far as, are there any hits, I think,
19 from the State's perspective, the only real hit we
20 thought would be under better control, would be the
21 corrosion.

22 When the pipeline was originally built, we
23 thought that it had an adequate coating, and then they
24 put a tape on it, and then they put a cathodic
25 protection. We thought that would be good enough.

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1 So if there was any hit or surprise, it came
2 in the area of corrosion, which there has been a fairly
3 significant amount of money, probably 400 or 500
4 million had been spent on that in the last few years,
5 and that's a number out of the newspaper, so I'm not
6 sure how accurate it is.

7 It has been a substantial number, and there is
8 still a fair amount of work to be done over the next
9 five years or so. But I think most of the corrosion is
10 now under control, but that's the main hit.

11 As far as the future plan, you might want to
12 ask Mr. Shoaf.

13 CHAIRMAN GREEN: Please join us.

14 MR. SHOAF: My name is Rob Shoaf. I work for
15 Alyeska in Anchorage. I've been working recently on
16 some of the audit processes that Jerry and John have
17 described to you. Just to answer that one question.

18 As Jerry said earlier, we are trying to
19 maintain the system, so it could transport all the
20 available oil. And as John said, we would like to
21 maintain the system, so that it is not an issue in
22 decisions about what oil is available to transport.

23 What that means in practical terms is, we do
24 have programs for maintenance of the pipeline itself,
25 and of the systems that move the oil through the

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1 pipeline. They are designed to provide a high degree
2 of reliability. But for the current levels of
3 throughput, which are around 1.7 million barrels a day,
4 but also with the maximum established capacity of the
5 system, which was 2.1 million barrels per day.

6 Obviously, in the future we have to continue
7 to look at that, and we talked to the state about it,
8 but at the moment, that's what we are doing.

9 CHAIRMAN GREEN: I know with a car, if you got
10 this new car and it's pretty resistant to any kind of
11 corrosion, then you begin to get little pits. It seems
12 like the corrosion, then, accentuates the --
13 accelerates, perhaps, is a better word.

14 You feel that you've got the corrosion in the
15 pipeline under control. Is this through a treatment.
16 Is it cathodic protection, or corrosion inhibitors that
17 go in the oil, or...

18 MR. SHOAF: Well, I'll start and then Jerry
19 can supplement it, from his perspective. But we really
20 approach the problem from two perspectives. The
21 corrosion on the mainline pipe itself is external. We
22 have coatings on the pipe where it is below ground, to
23 try to minimize the potential fork erosion, and that is
24 supplemented by a cathodic protection system, which is
25 intended to avoid the processes of corrosion itself.

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JOINT PIPELINE BRIEFING (HCR-12)

1 We have found that some areas, like Atigun
2 Pass, that the cathodic protection system has not been
3 sufficient, given the circumstances, to prevent
4 corrosion to the degree where we needed to react to it.
5 And there, as Jerry said, we replaced eight and a half
6 miles of pipe.

7 In other areas we are in discussion with the
8 joint pipeline office, and particularly the United
9 States Department of Transportation Office of Pipeline
10 Safety, about the cathodic protection, and engineering
11 challenges that we face in trying to utilize the
12 cathodic protection system, to eliminate or mitigate
13 corrosion of the pipeline. And we are involved in a
14 very detailed technical review of those types of
15 issues.

16 On the other side, we -- as Jerry explained,
17 we run what we call a "smart pig" through the pipeline.
18 And what that does is use -- we have two different pigs
19 that use different technologies, to basically look at
20 the wall thickness and measure where there is a
21 reduction of wall thickness, and determine whether that
22 is indicative of corrosion or not.

23 The corrosion that is revealed through those
24 inspections, is evaluated, based on the strength of the
25 steel and the necessity for, still thickness, at

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1 various points of the pipeline, to allow the operating
2 pressures that we have to have in the pipeline, to
3 operate it at its capacity.

4 And it's really that evaluation -- the
5 corrosion against the operative pressures that we want
6 that helps us determine where we have to go in and make
7 some sort of repair.

8 CHAIRMAN GREEN: And so far the corrosion has
9 been from the outside in, rather than from the inside
10 out?

11 MR. SHOAF: That's correct.

12 CHAIRMAN GREEN: Any other questions?

13 (No audible response.)

14 CHAIRMAN GREEN: Well, thank you very much.
15 We really appreciate this update, and it s good to know
16 that you are in good hands.

17 MR. BROSSIA: Thank you.

18 CHAIRMAN GREEN: Thank you, very much.

19 MR. SANTORA: Thank you, Mr. Chairman.

20 CHAIRMAN GREEN: Thank you.

21 ***END***

22
23
24
25
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SPECIAL HOUSE COMMITTEE RE: OIL AND GAS (February 14, 1994)
JOINT PIPELINE BRIEFING (HCR-12)

Alaska State Legislature

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WHILE IN SESSION:
STATE CAPITOL
JUNEAU, ALASKA 99801-1182
465-2435 FAX: 465-2864

Representative David Finkelstein

MEMORANDUM

To: Rep. Joe Green, Chairman, House Oil and Gas Committee
From: Rep. David Finkelstein
Date: March 25, 1993
Re: HCR 12

I respectfully request that you schedule a hearing for House Concurrent Resolution 12 in the House Oil and Gas Committee at your convenience. Attached are:

- * Sponsor statement
- * Fiscal note
- * Position paper
- * Back-up and explanatory materials

Thank you for your consideration.

Alaska State Legislature

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WHILE IN SESSION:
STATE CAPITOL
JUNEAU, ALASKA 99801-1182
465-2435 FAX: 465-2864

Representative David Finkelstein

SPONSOR STATEMENT HCR 12

A resolution relating to the use of natural gas as a motor vehicle fuel in Alaska.

As the nationwide drive toward alternative fuel use accelerates, Alaska's progress appears to be stalled. Yet, our huge, underused natural gas reserves can be put to very beneficial use in fueling motor vehicles, fueling our economy, and reducing pollution.

Currently, natural gas is used in Alaska for electrical generation, heating, and cooking. The resource would be more fully exploited if it were marketed to fuel the approximately 120,000 vehicles operating in southcentral Alaska, where natural gas is widely available.

Alaska's high-quality natural gas is a very viable fuel for motor vehicles. Rich in methane and high in octanes, it creates 90% less health-threatening carbon monoxide than gasoline. The persistent problems in controlling CO emissions in Anchorage and Fairbanks could be solved if more motorists there switched to natural gas.

Using natural gas as a motor fuel would help to eliminate the leaking underground storage tank problems inherent to gasoline and diesel fuels, because if natural gas leaks, it simply dissipates into the atmosphere. It produces significantly lower levels of harmful pollutants such as benzene than do gasoline and diesel vehicles.

Motorists--especially truckers--would save money by using natural gas, since it is much less expensive than gasoline or diesel, and necessitates less maintenance. Natural-gas vehicles have been in use in Alaska for many years, and employ proven technology.

Soon, federal laws will mandate alternative-fuel use and impose much stricter emission standards. It makes sense to anticipate such requirements by drawing on and developing our own rich resources.

This resolution encourages federal, state, municipal, and private fleet operators in Alaska to use natural-gas cars, trucks, and buses, and it encourages the rapid development of natural-gas fueling stations.

BILL NO: HCR 12

TITLE: Use of Natural Gas in Motor Vehicles

DATE: March 8, 1993

A further benefit of natural gas is that it is readily suited to heavy duty engines, including highway trucks, which may be facing significant fuel cost increases if the state is not granted an exemption from the low-sulphur diesel fuel requirements of the Clean Air Act. This benefit of natural gas could be addressed with the following clause:

"Whereas natural gas could benefit the commercial motor carrier industry through the availability of reliable, inexpensive fuel which will meet the pending low-sulphur requirements of the Clean Air Act."

A final recommended clause might address the reliability aspects of natural gas in Arctic conditions:

"Whereas natural gas is a proven performer in the Arctic conditions of Alaska having been in use in the North Slope Borough for more than 10 years on a year-round basis."

Finally, in view of the role that might be played by the commercial motor carrier industry, the Phillips Petroleum liquification plant at Nikiski and the Department of Environmental Conservation, I would recommend the addition of the following to the "Copies" paragraph at the end of the resolution:

Mr. Frank Dillon, Executive Director, Alaska Trucking Association
Mr. Roy Lyons, Kenai Region Manager, Phillips Petroleum
Honorable John Sandor, Commissioner, Environmental Conservation

FISCAL NOTE

STATE OF ALASKA
1993 LEGISLATIVE SESSION

BILL NO. HCR 12

Revision Date: _____
 Title: Natural Gas as a motor fuel
 Sponsor: Representative Finkelstein
 Requestor: Representative Finkelstein

Department Affected: Environmental Conservation
 BRU: Environmental Quality
 Component: Air Quality Management

COMPONENT SERIAL NO.

1426

EXPENDITURES/REVENUES:

(Thousands of Dollars)

OPERATING	FY 94	FY 95	FY 96	FY 97	FY 98	FY 99
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND&STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS,CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0

CAPITAL						
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REVENUE						
FUND SOURCE:						

FUNDING:

1002 FEDERAL RECEIPTS	0.0	0.0	0.0	0.0	0.0	0.0
1003 GF MATCH	0.0	0.0	0.0	0.0	0.0	0.0
1004 GF	0.0	0.0	0.0	0.0	0.0	0.0
1005 GF/PROGRAM RECPT	0.0	0.0	0.0	0.0	0.0	0.0
1006 GF/MHTLA	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

POSITIONS: NONE

FULL-TIME						
PART-TIME						
TEMPORARY						

Estimate of current year (FY93) impact: \$ NONE

ANALYSIS: (Attach a separate page if necessary.)

Prepared by: Janice Adair
 Division: Commissioner's Office

Phone: 465-5010

Date: 3/15/93

Approved by Commissioner: Janice Adair for John S. Adair
 Agency: Department of Environmental Conservation

Date: 3/15/93

Distribution (by preparer): Legislative Finance, Legislative Sponsor, Requestor, OMB, & Impacted Agency(ies).



*Department of Transportation
and Public Facilities*

POSITION PAPER

BILL NO: HCR 12

APPROVED:

A handwritten signature in dark ink, appearing to read "Randy J. Jaramila", written over a horizontal line.

TITLE: Use of Natural Gas in Motor
Vehicles

DATE: March 8, 1993

DOT&PF supports and encourages the passage of this resolution. In partnership with the Department of Environmental Conservation (DEC), DOT&PF has actively supported and encouraged the use of natural gas as an automotive fuel, including sponsoring a conference on this topic in December, 1992. The two departments are now embarking on the formation of a joint government-industry panel to address what actions are needed to foster an increased supply and demand of natural gas as a motor vehicle fuel for Alaskan fleet vehicles and the general public.

Aside from our enthusiastic support for this resolution, we would like to offer some friendly amendments.

An additional benefit to Alaska in the development of natural gas as an automotive fuel is the presence of the Phillips Petroleum natural gas liquification plant at Nikiski. It provides an opportunity to economically transport natural gas to locations in the state not presently served by natural gas pipelines. Thus the expanded development of a refueling infrastructure is not geographically bound by the present pipeline system.

We, therefore, recommend an additional "whereas" clause to the effect:

"Whereas the presence of a natural gas liquification plant at Nikiski would allow for the economic shipment of natural gas to regions of the state not currently served by natural gas pipelines."

BILL NO: HCR 12

TITLE: Use of Natural Gas in Motor Vehicles

DATE: March 8, 1993

A further benefit of natural gas is that it is readily suited to heavy duty engines, including highway trucks, which may be facing significant fuel cost increases if the state is not granted an exemption from the low-sulphur diesel fuel requirements of the Clean Air Act. This benefit of natural gas could be addressed with the following clause:

"Whereas natural gas could benefit the commercial motor carrier industry through the availability of reliable, inexpensive fuel which will meet the pending low-sulphur requirements of the Clean Air Act."

A final recommended clause might address the reliability aspects of natural gas in Arctic conditions:

"Whereas natural gas is a proven performer in the Arctic conditions of Alaska having been in use in the North Slope Borough for more than 10 years on a year-round basis."

Finally, in view of the role that might be played by the commercial motor carrier industry, the Phillips Petroleum liquification plant at Nikiski and the Department of Environmental Conservation, I would recommend the addition of the following to the "Copies" paragraph at the end of the resolution:

Mr. Frank Dillon, Executive Director, Alaska Trucking Association
Mr. Roy Lyons, Kenai Region Manager, Phillips Petroleum
Honorable John Sandor, Commissioner, Environmental Conservation

information



PHILLIPS PETROLEUM COMPANY

PUBLIC AFFAIRS BARTLESVILLE, OKLAHOMA 74004

Compressed Natural Gas

- Phillips has entered into an agreement with Oklahoma Natural Gas Company to sell compressed natural gas (CNG) at two Phillips 66 service stations in Oklahoma.
 - CNG, delivered by Oklahoma Natural Gas, has been available at the W.D. Hoback Plaza, a Phillips 66 service station near Stroud on the Turner Turnpike, since May, 1991. This is the first such operation on a U.S. turnpike.
 - A second Phillips 66 outlet, located on Interstate 40 in Oklahoma City, will begin offering CNG in the fall of 1991.
- Governor David Walters, the first to use Phillips' CNG refueling facilities, is working for tax incentives in the state to increase the use of CNG vehicles.
- CNG is an attractive motor fuel because natural gas is cleaner, more efficient and less expensive than gasoline:
 - It costs, on average, 60 to 80 cents per 100 cubic feet, the equivalent of a gallon of gasoline.
 - It burns with almost no toxic emissions.
 - With a high octane rating of 130, it can outperform gasoline.
- CNG is used as a transportation fuel in more than 500,000 vehicles throughout the world in such diverse locations as Canada, Italy, the Soviet Union, China, Australia and New Zealand.
- CNG fuels more than 30,000 vehicles in various parts of the United States.
- CNG appears best suited to fleet vehicles that idle a great deal, run short stop-and-start routes and return to central points for refueling.
- The average cost to convert a vehicle to use CNG ranges from \$1,500 to \$3,000.

FACTS TO KNOW

Natural gas has an octane rating of 130.

Natural gas burns cooler than propane.

Natural gas remains a vapor when compressed.

Natural gas does not contaminate motor oil.

Natural gas starts more easily in cold weather.

Natural gas is not imported.

Natural gas must be odorized.

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our fleets on natural gas.



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SHOULD
YOU USE
NATURAL GAS
AS YOUR
MOTOR
FUEL?



HERE ARE MANY REASONS
TO USE NATURAL GAS
INSTEAD OF GASOLINE TO
FUEL YOUR VEHICLES.

The following are some of the most frequently asked questions:

Q Is natural gas safe as a motor fuel?

A Yes! Natural gas is safe. Here are some reasons why:

At 1100°, the ignition temperature of natural gas is approximately 500 F° higher than gasoline.

There are strict flammable limits for commercial natural gas. If the mixture is leaner than 4% or richer than 14%, natural gas will not ignite.

Natural gas is lighter than air. If a leak occurs, the gas rises in the air to the highest containment level and dissipates. When gasoline, propane and other liquid fuels leak, they often form puddles or settle into storm drains. Natural gas is even safe to use in tunnels and other below-grade facilities.

Q Are natural gas storage cylinders safe?

A Unlike a gasoline fuel tank, natural gas fuel cylinders are *at least* 3/8" thick, depending on the manufacturer's specifications. All natural gas cylinders are constructed to strict D.O.T. regulations.

Q What type of vehicle can be converted to natural gas power?

A Vehicles with either carbureted or fuel injected gasoline engines can utilize natural gas, including buses, trucks, cars, forklifts and stationary engines.

Q What happens to the equipment when a converted vehicle is retired?

A The equipment can be reinstalled on a new

vehicle several times with minor modifications. Thousands of conversion kits sold in the 70s are still in operation on new vehicles today.

Q How long does it take to fill a vehicle?

A A "Quick Fill System" only takes a few minutes. A "Time Fill System" can automatically fill many vehicles overnight while unattended.

Q How many vehicles can be filled with a "Time Fill System?"

A The refueling station can be sized to fill any size fleet in a given time span.

Q Who can install the equipment?

A We can install the equipment for you or train your mechanic to install it.

Q How much will it cost?

A Prices vary for each situation; however, after asking you a few questions about your fleet, fuel consumption and parking arrangements, a firm price can be quoted.

Q How long does it take to recoup my investment?

A Depending on the fuel consumption of the vehicles converted, the pay back period is approximately 30 to 36 months. A higher mileage vehicle has a faster pay back period.

Q Does the refueling station need to be in a building or on a skid?

A No! This equipment is designed to be used in any type of weather. An enclosed building requiring thousands of dollars worth of additional equipment is not necessary. A simple shelter over the equipment, enclosed on three sides, is needed for maintenance personnel protection.

Q What happens if the vehicle runs out of natural gas?

A A fuel selector switch mounted on the dash allows the driver to change from natural gas to gasoline.

As national concern over the environment and energy security increases, more and more vehicles will be running on alternative fuels. Natural gas — the same energy that has safely and comfortably heated homes and cooked meals for more than 100 years — will be used in many of our cars, trucks and buses. Natural gas has multiple advantages over other transportation fuels: it's cleaner, it costs less, it's readily available throughout the country, it's a domestic fuel and it has a proven safety record.

Here are answers to the questions most frequently asked about natural gas vehicles (NGVs):

Q: What kind of vehicles can run on natural gas?

A: Almost all kinds of vehicles, from passenger cars and pickup trucks to school buses and garbage trucks, can run on natural gas. NGVs can be manufactured from the ground up, or existing gasoline or diesel vehicles can be converted by modifying the fuel system.

Q: Is natural gas a safe vehicle fuel?

A: Natural gas has an excellent safety record. There are two primary reasons: the structural integrity of the NGV fuel storage system and the physical properties of natural gas. The tanks used to store the natural gas are made of forged steel or fiberglass-reinforced aluminum one-half to three-quarter inches thick. They can withstand both crashes and heat far better than a standard gasoline tank, which is made of thin sheet metal. In addition, the natural gas tank actually adds to the structural integrity of the vehicle.

NGVs have "closed" fuel systems, which helps eliminate the evaporation characteristic of liquid fuel systems. In the unlikely event that a leak occurs in an NGV, the natural gas dissipates harmlessly into the atmosphere because it is lighter than air.

In addition, natural gas has a high ignition temperature. It ignites at about 1,200 degrees Fahrenheit, compared with about 600 degrees for gasoline. Natural gas also has a very narrow range of flammability; that is, in concentrations in air below about 5 percent and above about 15 percent, natural gas will not burn. The high ignition temperature and limited flammability range make accidental ignition or combustion of natural gas unlikely.

Q: Does the United States have enough natural gas to use in vehicles?

A: The United States has a huge natural gas resource base. The U.S. Department of Energy estimates that, with conventional supplies alone, the nation has at least a 60-year supply of natural gas at today's consumption rates. If so-called nonconventional supplies — some of which are already being produced — are included, the total natural gas resource base can provide more than a 200-year supply. Driving 8 million to 10 million NGVs every year would use about 1 trillion cubic feet (Tcf) of gas — less than 6 percent of our current annual natural gas consumption of 19.4 Tcf.

Q: Is natural gas readily available?

A: The natural gas transportation and storage network, a 1.2 million-mile underground pipeline system, is already in place. All 50 states and all major metropolitan areas have access to gas service.

In addition to its extensive distribution system, natural gas has another key advantage — it's primarily a domestic fuel. About 92 percent of the natural gas used in the United States this year will be produced in the United States. Almost all the rest will come from Canada.

Q: What are the environmental benefits of NGVs?

A: Vehicles fueled with natural gas produce significantly lower levels of harmful pollutants than gasoline or diesel vehicles. For example, NGVs reduce emissions of carbon monoxide by 90 percent and reactive hydrocarbons (which play a major role in the formation of ground-level ozone, the principal ingredient of smog) by 85 percent. Natural gas contains no particulates, such as those associated with diesel fuel, and also reduces emissions of carbon dioxide, the principal "greenhouse" gas.

Q: How do the costs of gasoline, natural gas and other alternative fuels compare?

A: Natural gas as a vehicle fuel actually costs less today than conventional gasoline, and much less than methanol. The price of natural gas sold for vehicle use ranges from 65 cents to 79 cents for the energy equivalent of a gallon of gasoline. The comparable price of methanol (M85, priced on the West Coast) is \$1.43 per gallon equivalent versus \$1.23 for gasoline.

In addition, on-the-road experience with NGVs shows that standard maintenance can be reduced, because natural gas is a very clean-burning fuel.

Q: How much does an NGV cost?

A: It costs from \$2,500 to \$3,500 to convert a car to run on natural gas. Costs are higher for larger vehicles and vary depending on the number of fuel tanks installed. For most vehicles, installation of a natural gas fuel system takes only one or two days. Modified vehicles may run on either natural gas or gasoline since the liquid fueling system remains intact.

"Dedicated" NGVs run only on natural gas and cost slightly more than gasoline or diesel vehicles because of the cost of the sturdy storage tanks. The U.S. Department of Energy estimates that mass-produced NGVs will have a price tag about \$800 higher than conventional vehicles.

Q: Is anyone currently manufacturing original-equipment NGVs?

A: All the major U.S. automobile, truck and bus manufacturers are building and road-testing prototype vehicles that run on natural gas. For example, the GMC Truck Division of General Motors Corp. is building dedicated natural gas light-duty pickup trucks, and Chrysler Corp. is building natural gas vans. Meanwhile, Ford Motor Co.

is field-testing vans, pickups and sedans. United Parcel Service (UPS) is sponsoring development of a natural gas engine for its familiar brown delivery trucks, and a natural gas engine for school buses, made by Tecogen Inc., has been certified by the California Air Resources Board (CARB). The school bus engine is the first alternative-fuel engine to get CARB approval. Heavy-duty engines are under development by Cummins Engine Co., Hercules Engines Inc. and Detroit Diesel Corp. The Flexible Corp. and Bus Industries of America are making natural gas mass-transit buses.

Q: How does an NGV work?

A: The only major difference between a gasoline vehicle and an NGV is the fuel system. For use in an NGV, natural gas is compressed to approximately 3,000 pounds per square inch and stored in high-pressure steel or aluminum tanks installed in the rear or the undercarriage of a vehicle. When the engine requires fuel, the natural gas leaves the tanks and travels through a high-pressure fuel regulator located in the engine compartment. The natural gas enters the carburetor or is injected at atmospheric pressure through a specially designed natural gas mixer, where it is combined with air.

NGVs can be designed to operate in three different modes. A vehicle that runs solely on natural gas is called a "dedicated" vehicle. Vehicles that operate on either natural gas or gasoline at the flip of a switch are "bi-fuel" vehicles. Those that operate on natural gas and diesel fuel at the same time are "dual-fuel" vehicles. Best performance is achieved when a vehicle is designed to run only on natural gas, because the engine can then be set to take full advantage of the fuel's high octane, which exceeds 120. Bi-fuel vehicles typically are equipped to switch automatically to gasoline when the natural gas tank reaches empty. In addition, a simple electronic device is usually added to adjust the engine's timing when a switch is made from one fuel to the other.

Q: How are NGVs fueled?

A: The commercial dispenser that fuels NGVs looks a lot like a gasoline pump. A small hose connects easily to the vehicle's fuel system with a coupling device. When the tank is full, the dispenser automatically shuts off.

NGVs are fueled on a "quick-fill" or "timed-fill" basis. Quick-fill dispensers fuel a vehicle in about five minutes. Timed-fill stations take longer, depending on the number of vehicles being served at one time and the size of the fueling unit. Timed-fill stations are popular with operators of vehicle fleets that return to a central location each night, where the vehicle can be hooked up to a natural gas dispenser overnight or for a specified time period and then fueled unattended.

Home dispensers are also available. They are smaller than commercial dispensers, about the size of an air conditioning compressor, and are connected directly to the home's natural gas line. Home fueling appliances use the timed-fill method, so vehicles usually are fueled overnight.

Q: How many NGV fueling stations are there in the United States?

A: By early 1992, nearly 500 fueling stations for NGVs were operating in 43 states and the District of Columbia. More than one-half of the stations are open to the public or available through special arrangements with the operator. The rest are used by private fleets. Oil companies involved in public fueling stations include Amoco, Exxon, Mobil, Texaco, Unocal, FINA, Shell, Chevron, Conoco and Phillips 66.

Q: Are NGVs used in other countries?

A: Natural gas as a vehicle fuel has a long-established record in Europe, Canada, New Zealand and Australia. Italy has been using natural gas to power vehicles since

the 1940s, and has about 300,000 NGVs and 240 filling stations.

Q: How will NGVs help cities meet the requirements of the Clean Air Act Amendments of 1990?

A: The Clean Air Act Amendments of 1990 have much tougher vehicle emissions standards, beginning with model year 1994. NGVs can already meet these standards.

In 22 urban areas, the new law will require all fleets of 10 or more vehicles that are capable of central fueling to purchase alternative-fuel vehicles, in phased-in percentages beginning in model year 1998. Legislation being considered by Congress would move up that date and broaden the concept to include most major urban areas.

In California, the Amendments require that a special pilot program be adopted, involving the mandated production and sale of clean-fuel vehicles — 150,000 vehicles beginning in model year 1996 and growing to 300,000 vehicles in model year 1999 and thereafter.

Finally, an urban bus initiative in the new law is designed to reduce particulate emissions and to encourage the use of clean-fuel buses for mass transit. Natural gas buses are operating successfully in many American cities, are meeting the standards and are emitting virtually no particulates.

Q: How can NGVs contribute to America's energy security?

A: Although most U.S. economic sectors have diverse energy sources, the transportation sector is currently about 96 percent dependent on oil. The United States is dependent on foreign oil for nearly 50 percent of its energy needs. In 1991, the United States spent \$44 billion dollars to buy imported oil, which is over half the nation's total trade deficit. The best way to increase energy security and reduce the trade deficit — without a

negative environmental or economic impact — is to replace the use of imported oil with domestic natural gas. The most obvious place to begin is in the transportation sector.

Q: Who is likely to be driving NGVs today and in the near future?

A: Auto, truck and bus fleets are particularly well suited for NGVs, because they can share a central fueling station. Since a national network of public NGV fueling stations is still developing, widespread use of natural gas in privately owned, individual vehicles will come later.

Q: Where can I get more information on NGVs?

A: For more information on natural gas vehicles, contact:

American Gas Association
1515 Wilson Boulevard
Arlington, VA 22209
(703) 841-8400

NGV developments — worldwide

by Wally Parker, Jr.

Compressed natural gas is being used as a vehicular fuel in almost every developed nation in the country based on its attraction as a clean-burning, economical, safe and solid performance transportation energy. Although it is difficult to quantify the market growth on a net basis, we estimate that there are more than 800,000 natural gas vehicles worldwide.

Although the worldwide population of NGVs is modest compared to petroleum-fueled vehicles, the growing interest in the NGV market is evident through the increasing number of NGVs on the road, the rapidly developing refueling infrastructure, and the number of utility and gas industry programs supporting this technology. Today the outlook has never been brighter for natural gas vehicles, as concern for the environment, governmental activity regarding alternative fuels for transportation, equipment manufacturer support and investment, and customer response are reaching new heights. The growing level of international communications and conferences on NGVs is indicative of this growing acceptance.

The association level

One of the major players on the worldwide NGV scene is the International Association of Natural Gas Vehicles. It was founded with a grant from the New Zealand Energy Authority for the purpose of developing the NGV market worldwide. Through a series of conferences and expositions, the IANGV has grown from an initial handful of countries to its present status of over 150 members representing more than 30 countries all over the world.

The prime objective of the association

is to increase the use of gas for transportation and to ensure that gas-fueled vehicles and fueling equipment are efficient, safe and durable.

Additional objectives include: dissemination of information; organization of international conference and expositions; developing a liaison with automotive manufacturers; promoting uniform codes and standards; and investigating needs for international research and development.

In essence, the IANGV attempts to foster the worldwide sharing of information and expertise regarding NGVs. These objectives became clearer just this past fall when the IANGV officially opened a new chapter. The development of an international committee on technology has once again proven the industry's commitment to NGV commercialization.

Global status report

Many nations have sought to diversify the mix of fuels used for transportation and much emphasis has been put on the use of natural gas. Today's market finds a concentrated effort by the natural gas industry, the petroleum companies, and the automotive and engine manufacturers. Many countries now have government support and have entered into research and commercialization consortiums with in-

dustry representatives.

Canada. It is probably most important to first discuss our neighbor to the north. Canada, by the end of last year had nearly 30,000 natural gas vehicles on their roads. By 1993, the Canadian Gas Association expects that number to rise to nearly 50,000.

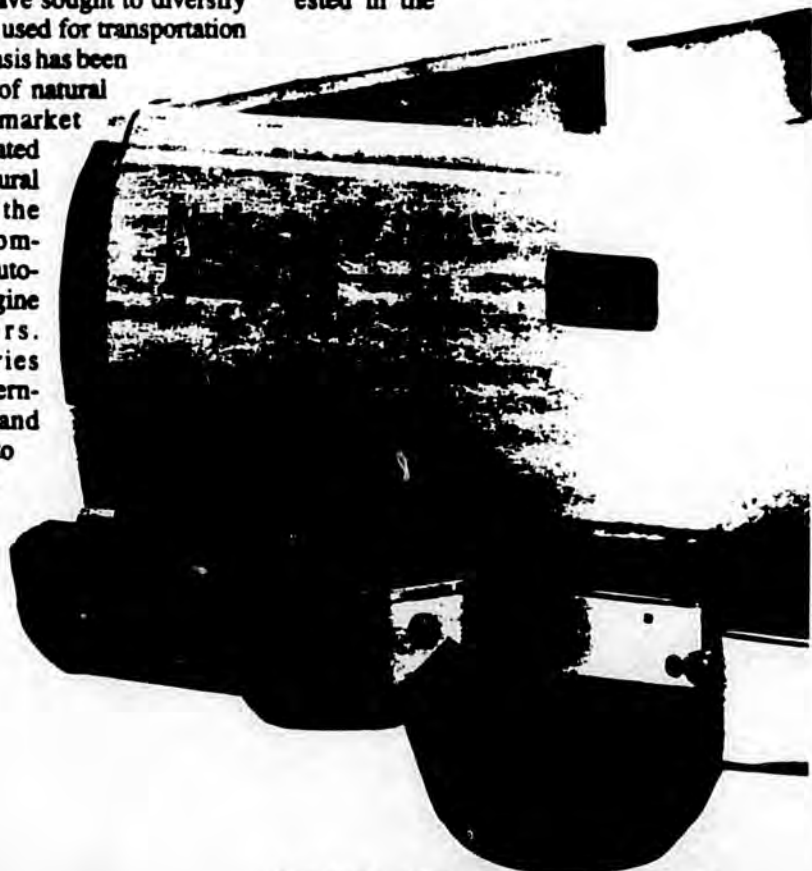
Until 1994, the Canadian government will continue to offer a \$500 conversion incentive. Last year, this program was tied into another government program subsidizing a home refueling device with an entire package worth \$1,500.

Additionally, the government will also give a 25% incentive up to \$50,000 for the development of natural gas fueling stations. As a result, there are over 100 refueling stations in Canada. In five provinces, natural gas vehicles are exempt from road use taxes, again increasing bottom-line incentives.

Japan. All the large Japanese companies have become interested in the

You can avoid conversions by using GMC's natural gas-powered Sierra truck. The truck has complete emissions certification and is fully validated to federal safety standards. The truck carries a 3-yr., 36,000-mi. warranty. The natural gas capabilities add only 156 lbs.

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NGV market. The Japan Gas Association has developed a new section of their organization that deals directly with NGVs. In order to better understand the environmental and economic benefits, the Japanese Agency on Environment is currently leasing several natural gas vehicles from the big natural gas companies.

Currently, there are 21 NGVs in Japan and three quick-fill NGV fueling stations in operation.

New Zealand. New Zealand's program has produced over 60,000 natural gas vehicles, including bus and other heavy-duty applications. The North Is-

land has around 400 well-established public refueling stations. In addition, a number of operators have their own on-site stations — often on a slow-fill system that refuels the vehicles overnight. New Zealand's expertise and working experience with NGV are recognized around the world.

France. The French are now entrenched in a three-year program to investigate the performance of 100 natural gas buses and several heavy-duty trucks. Gaz de France, the French gas industry organization, is undertaking a demonstration project with

Peugeot and Citroen as part of a three-year, 100-vehicle program. Tests will be obtained on the environmental and economic benefits of the fuel by the French government.

While there are only a few NGVs in France currently, if all testing procedures go well, it is expected that mass commercialization could begin as early as next year.

The Netherlands. The use of propane for vehicles is very prevalent in the Netherlands. The bad news is that propane is the only alternative fuel that is exempt from road taxes currently.

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"The city of Buenos Aires has...20,000 buses running on a 24-hr./day basis....By national law, conversion of liquid to gas fuel is in force. We expect that within the next five years, the great majority of vehicles will be converted."

leaving the economics for natural gas very unfavorable.

However, the NGV market continues to grow. The conversion of 10 natural gas buses and several light-duty vehicles is now underway. The federal government is expected to monitor this program and identify the environmental benefit. Hopefully, if the results are positive, the government will reconsider lifting the road taxes for NGVs, potentially opening the door for western Europe's largest holder of natural gas reserves.

Italy. Italy is certainly the leading nation in full-development NGV commercialization, is the most active, and still has the largest NGV population.

In order to take advantage of their own natural gas resources after being embargoed by a mid-east supply of crude oil in post World War II, Italy created man-

dates for NGV development.

Currently, there are nearly 250,000 NGVs in Italy. They are primarily located on the Adriatic Coast and in major northern Italy cities. Italy continues to contribute major advancements to the development of a wide range of conversion equipment and cylinders which are sold to NGV markets all over the world.

A new national energy plan six years ago called for the use of more NGVs and provided economic incentives. New government-funded research resulted from this energy plan.

Improved technology made Italy a

leader in NGV equipment and refueling stations. There are now over 250 NGV stations in Italy. This number is expected to increase to over 500 in the next two years due to new regulations and laws that will lower construction costs and push more companies to enter the market.

Argentina. Since 1983, when the first vehicle was converted to natural gas by the State Gas Company, until mid-March of 1992, Argentina converted some 140,000 NGVs including cars, pickups, and light trucks. The country is now starting to take the next big step in the development of natural gas vehicles,

converting the urban public bus transportation system, which at the present time runs on diesel.

The city of Buenos Aires has an estimated 20,000 buses running on a 24-hour-per-day basis. The amount of distillate consumed is some 2.2 million liters a day. By national law, the conversion of liquid fuel to gas fuel is in force. We expect that within the next five years, the great majority of vehicles will be converted. The number of NGV service stations in March of 1992 was 183 for the whole country, with a total installed capacity of 149,545 cu.m./hr.

Argentina now sells 13.24 BCF of natural gas for vehicles annually; the equivalent of 106 million gal. of gasoline.

Chile. The private sector of the oil and gas industry in Chile has formed a new company called Gas Natural. The company's goal is to gasify the cities of Santiago, Valparaiso, and Vina Del Mar, which are presently not supplied. A feasibility study will be conducted to analyze bringing natural gas from the Argentine gas fields to Santiago across the Andes Mountains. A mandate within the development of the natural gas infrastructure is to use natural gas in vehicles.

Brazil. Brazil has just initiated its NGV efforts. Approximately 900 vehicles have been converted with four stations supplying the natural gas and more to come.

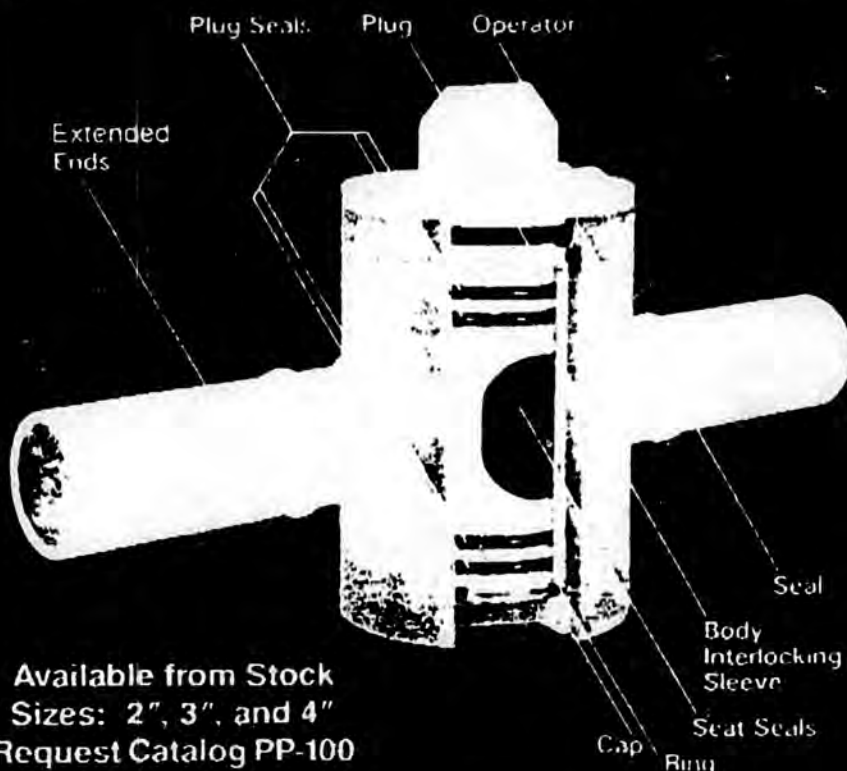
Venezuela. Significant inroads have been made in Venezuela with 2,000 NGVs and 11 refueling stations in operation.

C.I.S. The new Russian Ministry of Energy recently rolled out a long-term energy plan. This program specifies that up to the year 2010 there will be a major emphasis on the use of alternative fuels. Natural gas is their obvious first choice, since Russia currently holds nearly 40% of the entire world's supply of natural gas reserves.

Russian officials have recently announced that they have over 2,150 fueling stations in operation. Future plans include the adoption of mother/daughter fueling station applications. Currently there are 320,000 NGVs on the road. However, a new economic development plan calls for the use of two million NGVs by the year 2000.

Australia. Australia has a major bus demonstration program. This began with a number of urban transit authorities acquiring NGV buses, with the target of converting 5,000 buses in the next 10- to 15 years. Thirty buses are operating on natural gas now, with a plan for 400- to 500 more within three years.

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In addition, Australia is conducting projects on cylinder size and design, NGV codes and standards, and training of conversion personnel. There are now nearly 25,000 NGVs being fueled at over 200 NGV stations.

Sweden. The co-nordic natural gas bus project which resulted in extremely low exhaust emission played a major role in the decision of Volvo Bus Corporation to begin production of natural gas buses. The first two buses were delivered to the City of Goteborg towards the end of 1991, and an additional 18 buses will be delivered late in 1992. After that time, the Volvo Bus Corporation expects to be able to deliver natural gas buses to any customer. Prototype trucks are expected to be available one or two years later.

Denmark. Denmark reports conversions of gasoline cars and diesel trucks, and work in adsorption technology to extend driving range. Together with Sweden, Finland, and Norway, Denmark is involved with the co-nordic bus project.

Nigeria. Nigeria has a huge natural gas supply and has just begun an NGV program with a number of cars and trucks being converted.

Germany. Mercedes Benz, MAN, and BMW are working on NGV utilization in specific engines where they see market opportunities.

Switzerland. Switzerland has a minimal NGV program; however, a number of Swiss companies are involved in the manufacture and export of technology and equipment.

Belgium. An elite group of 35 NGVs are in use in Belgium with nine home compressors. The operating experience has been very positive with over 60,000 kilometers being covered without any technical problems.

On the horizon

Charles Dickens' statement, "It is the best of times; it is the worst of times," can apply to the natural gas vehicle industry today. We have a tough road to hoe to further develop natural gas vehicles, with overcoming mindsets about gaseous vs liquid fuels, regulation restraints, storage limitations, and so on. However, we are also living in a time when the environment has become a number one priority in the minds of governmental officials, business managers, and even the consumer.

All around we see the signs that American consumers are concerned about the environment and reflect that in their buying decisions. The latest

evidence is green consumerism, the idea that people incorporate into their purchasing decision the product's environmental impact.

A recent consumer survey found that 89% of respondents were concerned about the environment, 78% favored buying environmentally benign products, and 53% actively boycotted products considered bad for the environment.

So what happens? We see supermarkets beginning to identify environmentally friendly products on shelf labels. Hamburger chains are eliminating CFC-emitting styrofoam containers. Some even have recycling bins. Europe has developed a national seal for environmental acceptability. A recent bookstore hit is *50 Simple Things You Can Do To Save The Earth*.

Is it worth it? Consider this — recycling just a tenth of the newspapers sold

in the U.S. saves 25,000,000 trees a year. Clearly, consumers are forcing some industries to do the right thing.

It's time to capitalize on that concern. We have the transportation energy that's environmentally benign. When it comes to clean air, CNG is on the side of the angels!

There is a lot of opportunity for us, and we need to capitalize on that opportunity. We've taken many major steps in the last few years, and we need to take a few more. Then, NGVs will finally be truly established in the worldwide transportation sector and this world will be rolling on natural gas! □

Wally Parker, Jr. is vice president of marketing and sales at Brooklyn Union Gas. This article was adapted from a paper presented at this year's AGA Distribution/Transmission Conference.

GRI's Stephan D. Ban on natural gas vehicles

The Gas Research Institute's role in natural gas vehicle development is a big one. Earlier this year, at the annual meeting, GRI President and CEO Stephan D. Ban recapped that role.

"The market," he said, "hasn't fully arrived, but it's coming along."

Many companies put investment dollars on the line — building the fueling infrastructure and marketing NGVs. What has GRI done to help?

"Several years ago, we analyzed the strengths and weaknesses of natural gas as an alternative fleet vehicle fuel," Ban said. "We characterized the size of the real market and quantified the benefits of using natural gas for cleaner transportation. We backed industry efforts to form strategic alliances to develop dedicated vehicles."

"Most of you now know that Chrysler, General Motors, and Ford have NGV developments with GRI and gas industry funding partners. But these programs didn't just happen. GRI was an indispensable member of a gas industry team that awakened the automakers to the advantages and potential for natural gas. Our initial contacts occurred when automakers had already invested heavily in methanol. Gas technology was not an easy sell. It took a cooperative industry effort. Working with AGA, GRI was able to answer questions about market size, safety, engine modifications, fuel composition, on-board storage and control systems."

"We were prepared. We had been addressing these same issues in our engine cogeneration and cooling systems. And we were ready when the effort demanded factual data on gas supply and price. We also represented an industry that was prepared to provide its share of financial support to dedicated vehicle development. We pursued the task of pulling several major projects together and established technical credibility." Bob Hommel, Ford's Powertrain Program Manager, backs this up. He says that GRI's engine experience and vision for NGVs speeded Ford's decision to develop its dedicated gas pickup truck. He also notes that having GRI as a partner has kept Ford committed during its own difficult times.

"We've developed mature programs with all three majors," Ban says. "We're now seeing prototypes under test; new ancillary equipment is being developed. Has GRI impacted the NGV market? It is my view we'll be measuring that impact in hundreds of BCF in a few years." <

NGV News

The independent newsletter about natural gas vehicles
from the publishers of GAS DAILY

September 1992

INSIDE:

Energy bill would boost incentives, p. 5
CNG police fleet growing in Savannah, p. 9
Federal NGV buying strategy detailed, p. 13

Feds seek 1,000 CNG vehicles

The General Services Administration (GSA) has issued a solicitation for its 1993 alternative fuel vehicle fleet, with CNG nabbing about one-fifth of the market share.

Bids are due October 15 for about 1,000 NGVs, including sedans and such light-duty vehicles as pickup trucks, minivans and cargo vans.

The GSA is seeking offers for more than 5,000 alternative fuel vehicles (AFVs), with methanol making up most of the fleet at about 3,000 vehicles. The solicitation is based on a tentative schedule for individual federal agencies to buy AFVs, as compiled by the Energy Dept. (for more information regarding the schedule, see story on page 13).

The GSA expects to make awards in early December. To get a copy of the solicitation, contact Rob Blackstone, GSA contract specialist, at 703-603-1228.

1993 GMC truck options unveiled

For its 1993 model year, GMC Truck will offer more options for its CNG pickups.

To increase driving range, GMC will offer an optional extra fuel tank, mounted in the truck bed behind the cab. Although the option would limit storage space, many customers would rather have the range than extra storage, said Larry Nies, GMC's product line manager for commercial vehicles.

GMC has not settled on a price for the extra tank, but Nies noted that aftermarket cylinders are running about \$750 each.

Some customers had installed an extra cylinder themselves in the '92 trucks, which is believed to have caused some of the problems with metal particles in the fuel lines experienced by those trucks (see story at right). GMC believes it would be better if the extra cylinder were added during the manufacturing process under tighter quality control.

The price for the 3/4 ton Sierra pickup is going up for 1993. The new price will be \$4,875 above the truck's basic cost. For the 1992 trucks, GMC has been discounting

(Continued on next page)

GM pickups don't live up to Uncle Sam's expectations

While General Motors' GMC Truck Division has been busy rolling out its first batch of 2,500 CNG-dedicated pickup trucks this summer amid great fanfare, what's going on behind the scenes hasn't been a cause for celebration.

The General Services Administration (GSA), responsible for buying and doling out federal fleet vehicles, was an initial customer to take delivery of 600 of the first generation of dedicated C2500 Sierra pickups this summer. But by August, the agency was awash with complaints about the first 430 trucks delivered.

Metal filings in the fuel lines of the vehicles were suspected of damaging fuel

injectors and regulators. The problems were causing the trucks to stall or surge after about 200 miles. Others found the driving range to be much less than advertised, with some blaming defective solenoid valves on fuel cylinders that made it impossible to completely refuel the trucks.

But the problems were not unexpected, insist GMC, GSA and private fleet owners involved in the program. There are always glitches to be worked out with the first vehicles of a limited run, they said. And while GM normally takes about five years to develop and test a new product

(Continued on page 7)

Refueling conflict may stall NGV success

Anyone planning to drive an NGV cross-country had better bring plenty of refueling connection adapters, or risk being stuck on empty.

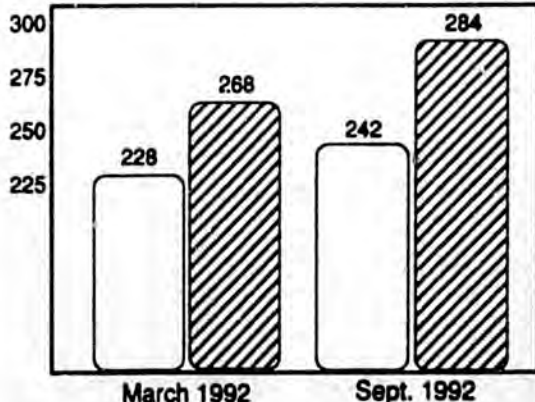
The Natural Gas Vehicle Coalition is trying to solve this compatibility problem with a new standard, NGV1, which is still under development. There are now three major types of nozzles and associated vehicle receptacles, none of which work with the others without an adaptor.

The Sherex nozzle, made in Canada specifically for NGVs, uses a set of "jaws" which grab the receptacle. The Hansen-type nozzle, which is now made by several different manufacturers other than Hansen, uses a "ball-lock" mechanism which locks into a groove on the receptacle. There is also the generic probe-type which uses O-rings and is also made by several manufacturers.

The Hansen and the Sherex appear very similar, and the necessary adapters are relatively simple. Jan Biesiadecki, transportation department manager for Washington

NGV Refueling Stations

The chart at right tracks the total number of refueling stations operating in the U.S. The striped boxes represent public or limited access stations, the solid boxes, private stations.



1993 trucks ... (from page 1)

heavily off its \$3,998 retail price tag to sell the converted pickups at \$3,685, or exactly what the dealers pay for the specially equipped trucks. The discounts were made this year since the vehicle was a brand new product and GMC was experimenting with prices, according to a spokesperson.

The company also plans to offer a half-ton pickup for 1993 with the same CNG system. The extra cost for the CNG option, above the truck's basic cost, will be the same as for the 3/4 ton pickup.

Also look for GMC to expand its model range soon. The company is looking at the possibility of offering vans, 4x4s, higher groundweight vehicles and other models on an incremental basis.

Cummins engine bests Calif. limits

Cummins' L10-240G natural gas bus engine has passed California's stringent emissions standards with flying colors to be certified as one of the least-emitting engines available.

The 10-liter, six cylinder engine uses a catalyst that helps it defeat the most troublesome emissions for CNG engines — nitrogen oxide. The engine features spark ignition, lean burn, is turbo-charged and after-cooled.

The L10 tested at the following emissions levels:

- 2 grams per horsepower (grams/HP) for nitrogen oxides (NO_x);
- 0.6 grams/HP for hydrocarbon (HC);
- 0.4 grams/HP for carbon monoxide (CO); and
- 0.02 grams/HP for particulates.

Under California rules, bus emissions

(Continued on next page)

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Editorial assistant John Montgomery
Reporter Kate Phelan
Reporter Tom Tiernan
Managing editor Daniel Macey
Publisher Tod Sedgwick
Group publisher Joan Henderson
Circulation director Kathy Thome
Marketing manager Delores Baisden
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Gas, said they make their own devices.

The main difference between the equipment is cost. Sherex nozzles start at about \$140 and go up to about \$1,000, a Sherex official said. A Hansen nozzle costs about \$6, according to the company.

About two years ago, the NGV Coalition decided to develop a standard for the connection devices, called NGV1. Paul Swenson of Consolidated Natural Gas and chairman of the NGV Coalition's standards subcommittee, said the standard will require nozzles to make a safe connection with a receptacle very similar, but not identical to the Sherex. Swenson said the standard would give manufacturers a little latitude in their design.

Bill Raymundo, who was recently on loan from Pacific Gas & Electric (PG&E) as director of technology for the Coalition, said the standard receptacle will fit the current Sherex nozzle. He said this was done to prevent companies from having to replace the more expensive of the different nozzles.

Specifically, the current draft of the standard says "any new nozzle submitted for certification to this standard shall not connect in an unsafe fashion to the receptacle..." The draft then adds that this provision "addresses interchangeability concerns with NGV fueling receptacles certified by the Canadian Gas Assn. and currently in use in various provinces in Canada," i.e. Sherex.

Currently, NGV1 is in the validation stage, where manufacturers submit their products for testing to determine if the standard will work and if the nozzles adhere to it. After that, it will go to ballot. Swenson estimated there are between 50 and 60 interested parties, 80% of which must approve NGV1 before it is submitted to the American National Standards Institute (ANSI). It should be approved by around mid-February, Swenson said.

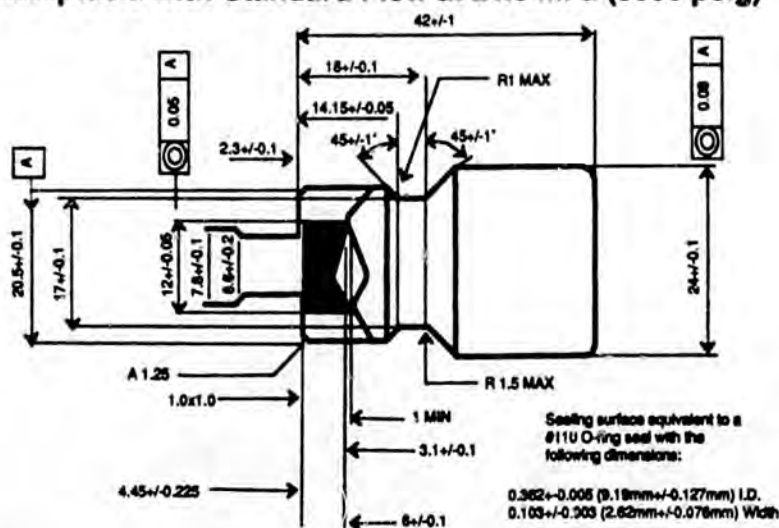
Norm Stone, American Gas Assn. (AGA) manager of NGV marketing (another PG&E executive on loan), said the issue was a stumbling block for the NGV industry, but he and others noted that private ownership of NGVs is just barely off the ground.

He feels the standard is being developed in plenty of time. The vast majority of NGVs are fleet vehicles that refuel at the same pump every time. Raymundo said the standard won't affect these fleets. The major problem Stone sees is that Detroit won't know what to put on NGVs being built.

Chrysler uses Sherex receptacles as the standard, but offers Hansen as an option. GM uses Hansens and offers Sherex as an option. Ford just completed 40 Crown Victorias with the Sherex.

In 1984, Ford used Hansen devices on 27 Ranger pickup trucks. Harvey Klein,

Proposed NGV1 Standard Receptacle with Standard Flow at 24.8 MPa (3600 psig)



Note: not all measurements may be included.

Shaded area represents an area which must be kept free of all components except for the seal.

for 1993 are limited to:

- 5 grams/HP for NO_x
- 1.2 grams/HP for HC
- 15.5 grams/HP for CO; and
- 0.10 grams/HP for particulates.

The Cummins engine tested even lower than a comparable methanol-powered engine for NO_x, noted a spokesman for the California Air Resources Board.

The company also certified that the CNG engine would be soot-free for up to 290,000 miles. Cummins provides limited warranty coverage of 150,000 miles for its catalytic converter, more than the usual 100,000 miles for such equipment.

"As part of Cummins' long-range research and development commitment relating to use of alternative fuels, we have tested methanol and other fuels and found them lacking for a number of economic and environmental reasons. It is clear to us that natural gas is the best choice when users of heavy-duty engines are looking for an alternative to diesel fuel," said Christine Vujovich, vice president for product planning and environmental management at Cummins. About 95% of the inquiries Cummins gets for alternate-fueled transit bus engines specify natural gas, she added.

Cummins has received an initial order for 95 of the new engines from the Sacramento Regional Transit Agency. The engine also will be used by transit authorities in Yolo, San Diego, Los Angeles and Orange County.

In the U.S. and Canada, 170 demonstration L10s are already in operation. Cummins expects to have about 350 of the engines in service by the end of the year.

NGV cab company will expand

Washington D.C.'s Clean Air Cab Co. will be expanding to 20 cabs by 1993, all fueled by natural gas.

At press time, few details were available, but the cab company is working on a deal with Consolidated Natural Gas and General Motors. The American Gas Assn. and Washington Gas Light are also involved.

Clean Cab was founded by Jim Doyle and began operating on Earth Day, April 24, 1992. The first passenger was former presidential hopeful Jerry Brown. Currently, the cab fleet consists of one 1992 Caprice, converted to compressed natural gas by Cleanfuels, a Mesa company.

Many of the customers are government officials, executives of environmental companies and natural gas executives.

Ford's manager of alternative fuels engineering and planning, said his company had no preference and would use whatever standard is adopted. Ford plans high volume production of NGVs some time in the mid-1990s.

Refueling stations wrestle with incompatibility

Many refueling stations using the Hansen-type connector, such as PG&E, named cost as the primary factor in deciding which equipment to use. Eric Debonis with the Gas Co. of New Mexico said the utility began with the slow-fill method, using a Hansen, and stuck with it. He added that if they begin building public stations, they will look into adapters, but would probably end up providing both the Hansen and the Sherex.

Others, such as Hope Natural Gas in West Virginia, agree. Hope has two stations and has been using a Hansen-type connector made by Parker-Hannifin for more than 10 years and said they were very happy with it.

Lezlie Forster, president of CNG Services, a Midland company which designs and constructs natural gas refueling stations, said her company was working on its sixth station and had used all Sherex so far. She said the company would install whatever the customer asked for, but that Sherex seemed to be the most popular in Texas.

Conoco has a refueling station in Mobile, Ala., which uses Sherex. An official said they were considering providing adapters, but currently did not offer them. Southern Union Gas has five stations, all equipped with both the Hansen and the Sherex. One utility uses Hansens and Probes at its five stations, and has one Sherex adaptor they send to different stations as needed. Washington Gas has all three.

In addition to the different types of connectors, there are different sizes which are also incompatible. This is to prevent vehicles from being fueled at the wrong pressure, a goal of the NGV1 standard. There are currently three different service pressures in the U.S.: 2400 psig, 3000 psig and 3600 psig. Washington Gas' Biesiadecki compared it to unleaded versus leaded gasoline.

Leaded gasoline nozzles will not fit an unleaded receptacle. The current NGV1 draft says "the nozzle and receptacle must be designed in a manner which will prevent a vehicle from being fueled by a dispenser station with a service pressure higher than the vehicle."

Biesiadecki said 2400 psig was being phased out, in favor of the higher pressures. The standard adds that "it is desirable that a vehicle can be fueled by a dispenser station with a service pressure lower than the vehicle." JM

1993 student vehicle challenge funds in jeopardy

With all the emphasis on education and being No. 1 in technology in this country, DOE's Robert Larsen wonders why the industry isn't putting more money where its mouth is to provide future leaders in automotive engineering a grounding in NGV technology.

Larsen, director of engineering and research competitions at the Argonne National Laboratory, oversees the Natural Gas Vehicle Challenge. For the past two years, the challenge has brought together about 20 teams of students from U.S. and Canadian universities to compete at converting GM pickup trucks to run on either CNG or LNG.

But the contest, primarily funded by DOE, has always suffered from a lack of funding from the private sector in the U.S., Larsen said. It's been particularly difficult getting funding from such groups

as the American Gas Assn. and the Natural Gas Vehicle Coalition, Larsen lamented.

For instance, in this year's challenge, the teams from Canadian schools each received \$20,000 in funds — \$10,000 from the Canadian government and \$10,000 from the Canadian Gas Assn. In contrast, the U.S. teams received only \$2,500 each.

Larsen finally squeezed another \$2,500 for each of the U.S. teams from DOE, but he is only getting that money in hand now, three months after the contest ended.

It may come as no surprise that the Canadian teams placed higher overall in this year's contest. The Concordia University of Montreal won first place, with the University of Toronto placing third. Second place was nabbed by the

GMI Engineering and Management Institute of Flint, Mich.

Larsen personally thinks the U.S. trade groups may tend to view the challenge more as a publicity stunt. "I can assure you they are not, and were never intended to be publicity stunts," Larsen told *NGV News*.

AGA countered that it has been and will continue to be a supporter of the contest. AGA provided publicity and staffing support for the 1992 contest, picked up the tab for the final dinner and will pay for the winning team to attend the 1992 AGA/NGV Coalition annual NGV conference in Orlando.

Altogether, that put AGA's funding in the vicinity of \$16,000-\$18,000, estimated Carl Ericson, AGA spokesman. And in a time of tight budgets, AGA feels that amount is a significant contribution for a single event.

Ericson added that at the conclusion of the 1992 challenge, AGA understood there wouldn't be a third contest. It's only been in the last two weeks that the group has learned otherwise.

AGA has submitted a supplemental budget request to help the '93 challenge, with the association hoping to contribute at least as much as it did last year, Ericson added.

The NGV Coalition gave \$5,000 directly to the schools for the '92 challenge and is currently negotiating its 1993 budget.

The Coalition emphasized that its goal for the contest reflects the nature of its association: working to drum up as much support from individual members as possible.

Even though Larsen hasn't been

happy with the support from trade groups on a national level, he noted that individual distribution companies have provided key support to local universities in their NGV research efforts.

He also said that companies like GM, which may not be able to provide direct monetary support because of financial straits, still play a big role in providing technical assistance and in donating the trucks that are converted.

Contests provide real-world technology

He ticked off important technological developments that come directly out of these contests. In the 1992 challenge, for example, the Northwestern team developed an on-board fuel quality sensor that allows for engine adjustments based on the level of methane in the gas mixture.

Varying gas quality at different LDC systems across the country is receiving more and more attention as a determining factor in how well NGVs will perform. Such a sensor could prove invaluable for the industry.

The vehicles entered all have ranges of about 250 miles, with several LNG vehicles ranging up to 450 miles.

Larsen claims the challenge provides the only published, third-party, objective information on emissions data from NGVs available.

The information is disseminated through a co-sponsor, the Society of Automotive Engineers, and through special publications associated with each of the contests.

"It's not an event that's designed just for students to come around and play with some cool trucks," Larsen added.

The sponsors believe they are training several hundred bright individuals who will now be very knowledgeable about NGVs, who will go on to become leading engineers by the turn of the century.

Larsen is now planning the third and likely to be the last student NGV challenge, to coincide with the Texas General Land Office's annual alternative fuels conference next June in Austin.

The 1993 challenge needs \$500,000-\$700,000. DOE is again providing a bedrock of about \$250,000. And the Texas General Land Office is taking the lead to drum up sponsors for another \$250,000. So far the Texas agency has come up with about \$50,000 and "time's a wastin'," Larsen said.

\$10,000 wanted for each U.S. school

The sponsors want to get \$10,000 to each of the U.S. schools, at least half of what the Canadians are likely to have.

The school year has already started and professors are asking if the challenge is going to happen again so they can gear up their programs to participate. Larsen hopes to get \$5,000 out to each of the teams next month and to get the other half after January.

There's still plenty left to do to improve NGV technology, Larsen noted, in areas such as lowering emissions and developing more accurate engine controls.

For 1993, the teams will be competing to lower emissions to meet California standards. Previously, the challenge had used proposed EPA emissions standards, and the California standards will be more of a challenge.

Dallas to convert 300 vehicles in first year of plan

The city of Dallas hopes its plan to convert its fleet to compressed natural gas (CNG) is as successful as the television show named after it, with an even longer run.

While Dallas doesn't have the plan in a concrete form, the city council backs the idea of eventually converting the city's 3,000 plus fleet to natural gas, said Bill O'Connor, an aide to Dallas Mayor Steve Bartlett.

O'Connor said the plan calls for the

city to convert about 300 vehicles in the first year. That would create a demand for refueling facilities which the city hopes private industry will build, he said.

In turn, private industry may then consider fueling its fleets with natural gas, O'Connor said. Currently, the city of Dallas doesn't have any CNG refueling stations although Lone Star Gas has one and Fina is putting in four in the Dallas-Fort Worth area.

The mayor's office is working with

the Texas General Land Office to make Dallas a leader in NGV use. Soll Sussman, assistant to Commissioner Garry Mauro, said the land office will start phase two of the plan this fall. The state will work with the local regional council of governments and with private industry to include alternative fuels in the state's implementation plan for compliance with the Clean Air Act.

The land office will tout to the private sector the economical and

environmental benefits of converting to natural gas, Sussman said. The city of Dallas did an early financial study to determine the cost savings of natural gas conversion.

Using the bulk price of gasoline of 82¢/gallon, the costs of converting the 300 vehicles and fueling them with natural gas comes out the same as running the vehicles on gasoline, Sussman said. Since most people

probably pay more for gasoline, he added, fleets can probably convert to natural gas at a cost savings.

While all council members support the conversion plan, some did express concern about converting police cars, O'Connor said.

Some people wondered if performance would suffer, such as a loss of "pick up" and maneuverability due to the weight of the NGV tanks.

Also, O'Connor said, since police cars put on about 70,000 miles a year they need to be refueled frequently. If they have to drive 15-20 minutes out of the way and then wait for a refuel, the time commitment may be too much, he said.

However, Dallas has made its commitment to NGVs clear. It recently ordered 30 dedicated natural gas pickups from General Motors Corp. **KP**

Energy bill portends more incentives for NGVs

The good news for the NGV industry is both the House and Senate versions of the energy bill (HR 776 and S2166) contain some stepped up mandates and incentives for alternative fuel vehicle (AFV) fleets.

The bad news is that compromise negotiations in the joint House-Senate conference committee have been slowed by delays and scheduling conflicts.

For new mandates, the Senate version calls for tougher standards on a broader base of fleets (see chart at right). The mandates would cover fleets with 50 or more vehicles in metropolitan areas with a population of greater than 250,000.

The number of acquisitions in the federal fleet are the same in both bills, while the House asks for only "light duty" AFVs.

Both versions authorize mass transit authorities to demonstrate the commercial use of AFVs in urban bus fleets, with the Senate bill referring specifically to natural gas. Local authorities must provide 25% of funding for the projects in Senate language and 20% in the House version.

The Senate also wants the Energy Dept. (DOE) to give financial assistance to states for converting school buses and installing fueling facilities for those buses.

Both versions contain incentives for AFVs, including parking benefits and restricted lane access on highways. The Senate plan includes a cash award to federal employees committed to using alternative fuels.

As for research and development, House language is a little more comprehensive, requiring a 50-50 split in

costs for joint federal/private ventures.

The House version also directs DOE to come up with a plan for low-interest loans to small businesses that own and operate AFV fleets.

The House bill authorizes tax deductions on AFVs based on vehicle

class and sets a \$100,000 deduction for refueling stations. The Senate version calls for a \$75,000 deduction for stations, and an income tax credit of 15% for electric vehicles only.

The Senate asked to establish a training program for technicians who

ENERGY BILL PROVISIONS

Senate

House

FEDERAL PURCHASES

1993	5,000	1993	5,000 light duty
1994	7,500	1994	7,500 light duty
1995	10,000	1995	10,000 light duty

STATE FLEET REQUIREMENTS

1995	10%	2002	20%
1996	15%	2003	40%
1997	25%	2004	60%
1998	50%	2005	70%
1999	75%		
2000	90%		

PRIVATE FLEET REQUIREMENTS

1998	30%	2002	20%
1999	50%	2003	40%
2000	70%	2004	60%
		2005	70%

EXEMPTIONS

Rental car, construction and emergency vehicle fleets.

Same as Senate provisions.

STATION AVAILABILITY

Authorizes DOE to sign agreements with commercial operators.

Have utilities make stations public within one year.

INCENTIVES

HOV and parking privileges, cash awards to federal employees.

HOV and parking privileges, low-interest loan program.

RESEARCH

Local authorities provide 25% of funding for a project.

Local authorities provide 20% funding, 50-50 cost sharing on private projects with DOE.

FUNDING

\$451 million

\$159 million

Source: Natural Gas Vehicle Coalition

install and convert equipment to run on natural gas and other alternative fuels. The lawmakers authorized \$5 million for the program in fiscal years 1992-94.

The Senate plan would appropriate about \$451 million for five years, while the House version calls for spending \$159 million in the same period.

Other energy provisions slow progress

Johnston blasted conferees recently for not being able to agree on a transmission access proposal he offered

at the first gathering to hammer out a single energy bill. Later, Johnston gave the energy legislation "a 50-50 chance" of being passed before Congress adjourns for the year on Oct. 3. That figure also was mentioned by Deputy Energy Secretary Linda Stuntz.

The conference committee was scheduled to meet at press time to tackle a large assortment of issues, including alternative fuels. In the printed agenda for the committee, fleet mandates were the last item to be addressed.

The Bush administration obviously stands to gain by signing an energy bill in an election year. Several provisions, however, may force the President to veto the bill. Among these would be limiting states' ability to prorate production and restricting outer continental shelf drilling beyond what the President has advised.

Energy Secretary James Watkins recently sent a letter to House and Senate leaders saying President Bush will be advised to veto the bill if it contains restrictive language on several areas. TT

State regulators advised to limit NGV program ratebasing

Given what it sees as a limited short-term market for NGVs, a research group has advised that state regulators exert strict control over forays into the market by local distribution companies (LDCs) and even then with little ratebasing for their expenses.

A study funded by the National Assn. of Regulatory Utility Commissioners (NARUC) found that the concerns over a limited refueling and service infrastructure and the shorter driving range of NGVs cast doubt on the vehicles' long-term viability.

And it is beyond the realm of the state public service commissions (PSCs) to have a big impact on whether a sufficient NGV market develops, according to the report by the National Regulatory Research Institute (NRRI).

But there are some things PSCs can do.

On the issue of LDC involvement in refueling stations, state regulators must first decide whether the station will be considered a captive customer whose supply must be protected or just another transportation customer getting supply from various sources.

The regulators might want to base their decision on whether the station in question is the only one in the area or whether several outlets are available.

Generally, the study recommended that natural gas stations be treated no differently than other transportation-only industrial and commercial customers.

If the state's policy allows transportation by certain customers, then

NGV stations should be allowed to transport as well.

The study also recommended that when a distributor becomes heavily involved in the refueling market, regulators should require a separate subsidiary for those activities.

If PSCs regulate stations as part of their oversight of regular LDC activities, it could "create substantial distortions in a competitive market as other entities'

and would cause the company to avoid the market altogether, the study noted.

Taxpayers, not ratepayers targeted

Another issue the think tank examined is whether LDCs should be allowed to promote NGVs through financial incentives, and who should pick up those costs.

Regulators might want to first determine whether their LDCs want to

promote NGVs as a short-term measure to get the market rolling or whether they want to establish long-term NGV programs.

The study noted that although Pacific Gas &

"In general, ratepayer funding for the financial incentives provided for NGV vehicle purchase and conversion does not appear to be a good public policy even if the social effects of NGVs are considered."

National Regulatory Research Institute

decisions are restricted or protected by the regulated price set on LDC-owned refueling stations," according to the study.

Setting up a separate subsidiary also would leave ratepayers exposed to unexpected losses in the refueling market, the NRRI said.

The study also threw out the possibility that LDCs could use their monopoly powers for anticompetitive effects.

The LDCs might refuse to transport for competing stations or impose difficult terms for transportation, if the LDCs' station activities are not under a separate umbrella.

On the other hand, if the LDCs are just going to be in the refueling station market for a limited time (say three years) until other companies get into the business, requiring a separate subsidiary could be too burdensome for the LDC

Electric has a very aggressive NGV program at the present, the LDC has indicated it does not want to be involved in building NGV stations in the long run and considers its activities a bridge to a more mature market.

After taking a look at who would likely benefit from a widespread NGV market, the study concluded that ratepayer funding for NGV incentives "does not appear to be a good public policy even if the social effects of NGVs are considered."

NRRI didn't buy the argument that NGV incentive costs should be passed through because the programs result in a cleaner environment.

Since not everyone would be footing those costs, the LDCs' ratepayers would essentially subsidize the general public, NRRI said.

It would be better for taxpayers to foot the cost of those incentives, the

study concluded, through petroleum or road taxes.

Specifically in the case of subsidizing new refueling stations, such an incentive package "essentially asks ratepayers as a group to subsidize a subset of ratepayers who are NGV users." The subsidy may be justified on the grounds that increased gas usage would benefit other ratepayers through a higher utilization rate of utility facilities.

But on the other hand the cost of providing the incentives could drive up the price paid by other users, whose use of natural gas might decrease as a result, the study warned.

Another basic argument against subsidization is that natural gas users don't contribute as much to air pollution or energy supply vulnerability as other energy users, and it's not fair to ask them to pay to solve a problem they did not cause.

In conclusion, "LDC ratepayers

should fund only NGVs owned and actually used by the LDC in its gas distribution operation, and possibly a small number of public refueling stations where the NGV infrastructure is in its initial state of development."

The report suggested that more study be done on the behavior of NGV station owners, the full technical and economic potential of NGVs and the exact relationship among the use of NGVs and energy security and environmental protection.

NARUC provides no direct guidance

The study is not intended to reflect NARUC's stance on NGVs, according to a spokesman for the group. Rather, the report could provide "intellectual backbone" for each state as they develop their own policy.

The only official action NARUC has taken on NGVs was adoption of a resolution in 1990 to "encourage the

development and widespread use of NGVs."

The resolution recognized NGVs' potential to clean the air, provide energy security and result in cost savings.

NARUC's executive committee recommended that state PSC programs:

- "Provide commission support for state legislative initiatives allowing financial incentives to governmental, public and private fleet vehicle owners for converting fleets from diesel and gasoline to natural gas, and for utility and non-utility investments in natural gas vehicle fueling stations, and

- "Recognize that sales of natural gas for transportation purposes are in an early state of market development requiring that during such introductory period of 5-10 years, special pricing and tax incentives be provided, especially in view of the reluctance of many vehicles owners to convert from liquid transportation fuels."

GMC grapples with initial production problems ... (from page 1)

before selling it, the company was pressured to bring its CNG Sierra to the market in about 18 months, noted Jack Smith, NGV marketing manager at Southern California Gas (SoCal), a co-sponsor of the GM program.

Larry Nies, GMC's product line manager for commercial vehicles, characterized the problems as a learning experience for an emerging technology. He explained that the problems were a combination of quality control in the manufacturing process, aftermarket retrofits to the trucks by customers and contamination of the CNG itself from some compressor stations.

Customers who installed their own fuel gauges on the trucks, added another fuel cylinder or who made other changes to the system could have inadvertently introduced some metal particles into the fuel system as a result, Nies explained.

Fuel filters should remedy the trouble

To correct the problem, GMC is installing fuel filters on the pickups during production and going out in the field to retrofit those already produced. About 1,000 trucks were sold before the filters were installed, and GMC has retrofitted about half of those.

GMC was surprised in particular to find that the CNG itself might already be contaminated when it's pumped into the vehicles, whether from oil or other matter. The company didn't have that trouble during its durability testing for the trucks, Nies told *NGV News*.

All the work done to the pickups to make them run on CNG is performed by PAS Inc., a Michigan firm that specializes in outfitting limited edition vehicles for automakers. It is also PAS that sends technicians around to GMC and Chevrolet dealerships when problems require specialized repair work.

PAS contracts year to year with GM to outfit the Sierras with a CNG fueling system. PAS will continue to do the work for the 1993

model trucks as well, Nies added.

The truck is fully covered by GMC's standard 36,000 mile

warranty, with sales and service nationwide. And the company has lived up to those service guarantees, sources noted.

By the middle of September, the company had repaired about 60% of

GSA's trucks, said William Rivers, chief of the program and legislative analysis branch at the GSA. PAS technicians had been to several remote locations to do the work.

"We want to get across that if we hear of any problems whatsoever, we will respond immediately. If we have to send someone from the home office, then we'll do it," Nies emphasized.

GSA likes playing guinea pig

John Russell, director of the fuels utilization data and analysis division in the Energy Dept.'s (DOE) alternative fuels division, said he "loved to hear about [the problems]," since that meant the government was fulfilling its role to

"I [love] to hear about this stuff" since it means we're fulfilling our goal of solving problems before the general public gets a hold of these trucks.

John Russell, DOE

smooth out difficulties for other customers down the road. One of the goals of the federal alternative fuel fleet program is to work out those kinks.

Rivers added that the GSA has to deal with problems in new vehicle lines,

and has had as much if not more trouble with some new conventionally fueled vehicles.

But the agency personnel who actually have to use the vehicles in the course of their business don't necessarily like that role. One agency official said he is "really disappointed" by the problems, noting that he thought the big obstacle they would have to face was not with the equipment, but with getting a refueling infrastructure in place.

In the end, the problems won't change the agency's interest in CNG, the official added. "We're in the first wave, and hopefully others won't have to deal with these problems," he said. The ultimate goal is to make NGVs "transparent" to the user.

In mid-September, the GSA's automotive commodity center issued a solicitation for the 1993 federal fleet that included about 1,000 NGVs (see story on page 1).

In the private sector, SoCal Gas has the biggest fleet of the GM Sierras at 130 trucks. Out of those 130, which were just placed into service earlier this month, only six had to go back into the shop, and then just for some minor adjustments, Smith told *NGV News*. Those repairs included some regulator adjustment and tightening down injectors.

Getting advertised range can be tricky

A running complaint about all NGVs, not just the GMC trucks, has been actual versus expected driving ranges. These range problems are something all automakers are facing as they work to build OEMs.

There are several explanations offered for why operators are not able to get the 200-mile range from GMC's trucks, but not all those reasons have to do with the truck's equipment.

The biggest problem for the GMC trucks is that the fuel cylinders, which when full can deliver the 200-mile range, are rated at 3600 psi. But in many areas of the U.S., refueling facilities are equipped to refuel at only 3000 psi or in some cases at 2400 psi. And higher compressor ratings mean more expensive compressors, one source said.

On the positive side, many of the newer refueling stations being opened

have the ability to refuel up to 4500 psi.

Nies emphasized that the industry needs to work together to develop standards for many of the "basic parts" for the vehicles, including fuel tank sizes and pressures and refueling connectors.

Another difficulty lies in the very nature of gaseous fuels. When using a

the last 40 miles, the vehicle made it to the refueling station.

GMC was deliberately conservative in designing its fuel gauge, which might read empty even though there is some CNG left in the tank, Nies added.

Another problem with driving range might come with insufficient training for

"We want to get across that if we hear of any problems whatsoever, we will respond immediately. If we have to send someone from the home office, then we'll do it."

Larry Nies, GMC's product line manager for commercial vehicles

quick-fill facility, the gas heats up as it is rammed into the cylinders, noted Smith. And when gas heats, it also expands. So after the gauge reads that you've filled the cylinders, you may find that a couple of hours down the road when the gas cools and contracts, you've actually lost about 200-400 psi, he explained.

This problem is heightened in areas that experience hot weather as well. But it is easily corrected, Smith added, by adjusting the refueling pressure upwards.

To help combat this problem, GMC is considering installing fuel gauges that would be more temperature sensitive and not read full until an actual 3600 pounds has been pumped, Nies said. Another option is to install pure pressure gauges, which some utilities have done themselves on their pickups.

Fuel gauges have been a thorn in the side of many NGV operators, not just for the GMC trucks. On an NGV for instance, the gauge might move very slowly from full to half-empty, but then drop rapidly from half a tank to an empty reading. And even then, some operators say, you don't know if the reading is accurate.

At Montana-Dakota Utilities, Director of Research and New Product Development Kevin Ringdahl related the first long-range road trip he and a co-worker made in their new Ford Crown Victoria demonstration model.

The last leg of the trip was a distance of 240 miles between refueling stations, and the Crown Vic has an estimated range of 200 miles. Ringdahl had a tow truck waiting "just in case," and even though the fuel gauge registered empty

personnel who are refueling the vehicles. Although it takes about four to five minutes to refuel a vehicle at a fast-fill pump, untrained operators may hear the "chattering noise" typical during CNG refueling and assume the vehicle is full after only a minute, said DOE's Russell.

Russell also noted the problem of varying fuel composition at different utilities. In the Rockies, where the methane content in CNG has been low, the Sierras are ranging only about 120 miles per fill-up, he said. With refueling facilities in the area rated at about 3000 psi, the agency involved had hoped to get about a 150-mile range from the trucks.

Some in the industry have discussed the possibility of filtering impurities out of natural gas before it's pumped into vehicles. But that raises another concern, voiced recently by an insurer to utility fleets. What happens if mercaptan, the odorant for natural gas, is filtered out as well? Leaks would be less noticeable, and that's a big problem for vehicles and compressors stored indoors in particular.

Smith detailed another problem with the GM trucks that is suffered by gasoline engines as well. Since the engine rings next to the cylinder valves are made of chrome, it can take about a 100-mile break-in period before those rings seal to the valves, preventing a loss of fuel. Until those rings are sealed, he estimated a 15-20 mile range loss per vehicle.

Next generation should solve concerns

Steve Takagishi, manager of engine and transportation technologies at the Gas Research Institute, is confident that the long-range development program for

light-duty and medium-duty GM trucks will solve the problems of early-entry.

In the early-entry program, PAS was prohibited from tinkering with the pickup's basic system. The company couldn't move the exhaust system, for instance, and was thus prevented from

using larger cylinders, Takagishi said.

But for the next generation, targeted for the marketplace in 1995-1996, the trucks will use bigger cylinders and the range should be improved, he said.

The fuel gauges will be manipulated to behave more as regular gasoline

gauges do, he added.

The biggest improvement will be that the GM engines will be optimized specifically to run on natural gas. That means increasing compression ratios to prevent knocking, to increase performance and to lower emissions. SG

Case Study

Savannah saves money, keeps larger police cars with conversions

With plans to convert up to 150 police cruisers in the next couple of years, the city of Savannah, Ga., is expected to be a proving ground for how well CNG performs in emergency vehicles.

The cost savings were what first turned city officials' heads to take a closer look at CNG, said Mike Joyner, vehicle maintenance director for the city of Savannah. The city also had a history with alternative fuel vehicles, after fueling its fleet with propane in the early 1980s.

Using local distributor Atlanta Gas Light's (AGL) special vehicular natural gas rate, V-52, Savannah expects to pay about 38-42¢/gallon equivalent for CNG. The result will be a fuel cost savings of about \$1,000 per year per vehicle, Joyner said.

And as one of the first 15 fleets in AGL's territory to convert to CNG, Savannah was eligible for installation of refueling facilities at no up-front cost. The distributor will recover its investment through the V-52 rate. AGL is installing two fast-fill stations on city property with two nozzles each. The vehicles will be able to refuel in seven to 10 minutes.

The city has a three-year contract with AGL to supply gas to the vehicles.

With a material and labor cost for each converted vehicle of about \$3,000, payback is expected in three years, Joyner told NGV News.

The city used \$30,000 in oil overcharge funds dispensed by the EPA and the state energy office to get its program rolling. Savannah has spent another \$186,000 from its own coffers so far on 75 conversion kits.

The kits, from Motorfuelers Inc., include two aluminum composite 13x50,

3000 psi storage cylinders by CNG Cylinder for each vehicle. City mechanics were trained to do the conversion and maintenance work themselves.

Another incentive for the city to convert was that it otherwise would have had to buy smaller, less powerful vehicles for the police fleet. That idea sold the police chief on making the switch, Joyner added.

The first 60 vehicles already converted to dual-fuel systems are mostly 1992 Chevrolet Caprices and some 1990 Caprices. Plans are to convert four new Ford Crown Victorias and other vehicles, reaching the 150 mark by mid-1994.

The program has not been without its bumps, however. A production delay was blamed for not getting the first of two refueling stations installed as expected this summer. Those first 60 vehicles have been operating on gasoline since March, Joyner said.

It was just after Labor Day that the first CNG station was completed and certified to operate. The city then began the task of educating its police officers about alternative fuel vehicles.

The city expected opposition at first, and got it, as some officers expressed fears of "blowing up" in the vehicles. But the city was ready with training material, including videos of crash tests, and is confident it will overcome those concerns.

Senior officers on the force also remember the early 1980s when the fleet

operated on propane for about four years.

At the time, the conversion equipment was recycled into new cars as old cars were taken out of service. But the conversion equipment was designed to work with carbureted engines. And in the mid-1980s, automakers began offering only fuel-injected engines for the vehicles. The city abandoned the program after it estimated any savings would be lost by the cost of replacing the conversion equipment.

The police force was satisfied with using propane from an operational standpoint, and Joyner believes the same or better results will be seen with CNG once the vehicles are rolling.

Another glitch with the CNG conversions arose when the city was first advised by AGL to have Probe connection devices installed on the converted vehicles. After the 60 conversions, AGL then changed its mind and advised Savannah to use Hansen connectors, Joyner said. The refueling

stations themselves were to have Hansen connectors, he added. Joyner has asked that one of the nozzles at each station be converted to a Probe connection and the city plans to

City of Savannah, GA

Number of Vehicles:	150
Conversion Cost:	\$3,000 each
CNG Price:	38-42¢/gallon
Refueling:	2 on-site stations Distributor-installed
Payback:	Recouped through CNG sales 3 years

use Hansen for its future conversions.

The vehicles' performance on CNG has met expectations so far, Joyner said.

Depending on driving conditions, Joyner expected a driving range of 70-100 miles per fill-up with the conversions.

An officer took out one of the cruisers on a long trip recently and drove about 86 miles on CNG before switching over to gasoline.

The officer estimates about a 1/2 mile per gallon difference in driving range per fill-up using CNG versus gasoline. Joyner said the city may install larger tanks in its vehicles scheduled for conversion next year.

Senior officers have already been test driving the vehicles and report little

or no discernable power loss using CNG. The city has no special policy for using CNG during an officer's routine, and leaves it up to the individual whether gasoline will be switched on during high-speed chases, for example, Joyner explained. CNG use will be required as often as possible.

Based on the city's experience with propane, Joyner expects he won't be able to measure any power difference between gasoline and CNG after 20,000 miles.

After that point, gasoline loses its edge in the engine, he added.

There were no complaints about loss of trunk space. Although officers do use some of that space, they don't carry spare tires, Joyner said.

The city also reports getting very good press about the conversions, and has the support of the community. In these days of belt-tightening at the local level, those cost savings are very attractive to area residents.

Mesa does battle to lock in buyers for CNG

Mesa could end up in a position other gas suppliers only dream about if its NGV conversion offer is successful: gas buyers locked into long-term deals with prices ranging far above the going market rate.

Mesa Chairman and CEO Boone Pickens touts his conversion offer as a great way to clean up the nation's air while breathing life into the domestic energy industry.

And the offer holds out promise to fleet owners facing higher costs under strict clean air standards as well. Under the program, now offered in eight cities across the U.S., Mesa would pay the up-front costs of converting fleet vehicles and installing refueling facilities. In return, fleet owners would commit to buy CNG from Mesa at or below the equivalent price for gasoline.

Mesa noted the offer is particularly attractive to state and other public fleets that are being forced to convert to alternative fuels but may not have the budgets to do so.

Mesa has \$200 million for program

Mesa has \$200 million cash in hand to cover the first stages of the offer, according to company spokesman Jay Rosser.

The offer has been extended to Phoenix and Tucson, Ariz.; Oklahoma City and Tulsa, Okla.; New Orleans and Baton Rouge, La.; Kansas City, Mo.; and Las Vegas, Nev. (see map). Mesa has said it wants to extend the offer to at least 10 cities by the end of the year.

Pickens has indicated at various NGV conferences this summer that he thinks vehicles could be a significant demand source for the gas industry. And

with gas prices bottoming out to record summertime lows this year, his message has been well received.

Mesa could get triple or more the price it usually gets for its natural gas if volumes go to fuel vehicles at equivalent gasoline prices rather than to traditional markets.

Mesa concedes that it may take a while to get fleets to actually sign up. In Phoenix, the first city to which Mesa pitched the idea, the company had to work to overturn a state law that only OEMs could be used to meet mandates for alternative fuel vehicles in state fleets.

Mesa cleared another hurdle in the state recently when it signed up for service under a new tariff offered by Southwest Gas, the local distributor in Phoenix. The tariff allows volumes of 5 million cf/year to qualify for transportation service as long as the gas is going to fuel vehicles.

Part of the idea Mesa has in making the offers is to prompt more state regulators to deal with the issues of costs and profits from NGVs for local distributors, said Rosser.

Phoenix is also the only city in which Mesa has had a customer make an initial commitment to the program. Tanner Industries, a highway construction firm and materials producer based in the city, is interested in

converting at least 20 vehicles.

Mesa would train local workers to perform the conversions and conduct maintenance work on vehicles. The company would use Mesa production and third-party gas Mesa buys from other producers to supply the stations. Mesa will try to use the state's own gas supply where feasible, Rosser added.

Subsidiary Mesa Environmental was formed last year to manage the company's NGV activities. Mesa also bought out CleanFuels, a conversion company that operated out of Martinsburg, W.Va.

And just this month, Mesa Environmental announced it had inked a letter of intent to buy equipment supplier Garretson Equipment, based in Mt. Pleasant, Iowa.

Mesa would spend \$800,000 for the acquisition, with closing expected in the fourth quarter of this year. Mesa already had a relationship with Garretson since it used the company's propane kits to help cover Mesa's sale of 2,000 kits to Mexico City.

Mesa Conversion Offer Areas



State Update

Wisconsin advances NGV research

The state of Wisconsin continues to be a leader in the use and promotion of NGVs among non-producing states with more money going to fund conversions and university-level research.

In early September the state approved a request for \$2.2 million in funding to upgrade the alternative fuels laboratory at the University of Wisconsin-Milwaukee.

The money comes from the WISSTAR program, that gives schools money to expand programs that in turn help boost the state's economy. Before this latest grant, the lab was getting about \$25,000/year from the state and the balance of its funding from private companies.

With the money, the university will add a dynamometer and other high-tech equipment to test vehicle emissions streams. The expansion will be made in conjunction with a Dept. of Transportation inspections and maintenance facility, added Kenneth Neusen, associate dean at the university.

Earlier this year, the university completed a study that recommended converting all of the Milwaukee County Transit Authority's buses to CNG. The project would cost about \$35 million, with 80% eligible for funding from the Federal Transit Administration, state officials estimate.

It would take about five years to phase in the conversions. Once complete, the fleet would be the largest of its kind in the nation.

The university did consider LNG options. But plant availability and fuel handling concerns were considered a problem in the long run. The study recommended the Cummins L-10 and Detroit Diesel engines for the conversions.

On another front, the state energy office was expected to soon make awards under the second round of the alternative fuels grant program.

The program allocates oil overcharge funds to state municipalities who present viable plans to convert vehicles to alternative fuels. The winners can get \$2,000 for each vehicle conversion, up to a maximum \$30,000.

In 1991, the state gave out about \$150,000. This year, the state has \$265,000 to award.

N.C. converts first vehicle; waits for fast-fill station

With one conversion to CNG under its belt, the state of North Carolina is eyeing more opportunities once a local distributor opens a new fast-fill refueling station.

The state sent some mechanics to Clearwater, Fla., in August with the state's first conversion candidate, a Chevrolet Caprice, so they could learn first hand how to perform the work from Motorfuels Inc.

The Caprice will serve as an executive staff car for the state Dept. of Administration, said Fries Shaffner, systems consultant for the Division of Motor Fleet Management. Shaffner picked that vehicle so the state's decisionmakers could get some first-hand experience with NGVs.

The car was converted using an Emco kit, with two 3000 psi fuel cylinders. The driving range was estimated at 150 miles on

the highway, and so far the car has been living up to those expectations. Range is more like 110 miles driving in the city, Shaffner said.

Shaffner personally believes NGVs are best suited to vehicles that centrally refuel on a regular basis and aren't subject to extended trips.

The state also has four courier vans converted to propane systems. CNG was impossible for that application, Shaffner said, since the vans travel about 400-500 miles every night. The state plans to continue finding niches for both CNG and propane in its fleet.

The CNG-fueled Caprice will make some regular road trips of 100-200 miles, and the state opted for a dual-fuel system so the drivers could easily switch to gasoline if necessary.

When first put into service, Shaffner noticed the staff wasn't using CNG very much, apparently out of fear of the fuel. He gave some lectures and showed videos of crash tests and the staff has since been using the CNG system more often.

The only drawback is that the state can refuel only at a slow-fill facility owned by Public Service Co. of North Carolina, which takes about eight hours to fill up the car's cylinders.

Since the car is a demo, the state isn't being billed for the CNG, Shaffner said. He estimates the car is filled up with CNG only about twice a week, at \$8-\$9 per fill-up.

The distributor has plans to make a fast-fill station available on its property by Nov. 1, Shaffner said. When that happens, the state will consider adding more NGVs to its fleet.

Although carbon monoxide is a concern in some parts of the state, the department doesn't plan to perform regular emissions tests on the Caprice. Shaffner said he feels there's already a "wealth of data" out there about how emissions have been reduced using the vehicles.

The bulk of the state's money in the future will likely go into OEMs. Shaffner says the department will likely buy a couple of GMC's Sierra pickups in the next step of the program.

Wyoming infrastructure grows with transit fleets

Getting 45 vehicles converted to CNG at local-level Wyoming transit agencies has meant a growing refueling infrastructure in the state as well.

While those stations are strictly on utility property, they are open to private sector fleets with CNG vehicles, noted Rich Douglas, local government coordinator for the Wyoming Dept. of Transportation (DOT).

The state has been using oil overcharge funds funneled through the Energy Dept. and the state energy agency to finance those conversions. All of the vehicles should be converted by the end of October.

To get the ball rolling, state and local transit officials met with the Wyoming Assn. of Natural Gas Utilities to see which distributors might be willing to provide refueling stations.

Based on distributor response, the state planned conversions to CNG in five cities: Cheyenne, Casper, Rock Springs, Cody,

Sheridan and Laramie. CNG is bought at an established tariff.

Most of the vehicles are shuttle buses, converted to dual fuel systems with two CNG storage cylinders installed. The transit authorities have been working with their local distributors for the actual conversion work.

Nearly \$400/month in fuel savings

The Sweetwater County Transit Authority in Rock Springs has had three converted vans operating a little over a year with substantial cost savings, noted Cindy Johnson, director of the authority.

She estimated during the first six months of operation the CNG vans were saving about \$385/month on fuel costs, with payback accomplished during the first year. The authority is paying 63¢/gallon to refuel at stations owned by Mountain Fuel Supply. Mountain Fuel has two stations available in Rock Springs and is planning a third for Green River, where the transit authority also operates buses.

Driving range has been acceptable, since Mountain Fuel installed enough storage capacity so the vans only have to refuel once a day, Johnson added.

The authority opted to lease the fuel cylinders rather than buy them. Although cost is a factor, the biggest reason is a requirement that the tanks be re-certified every three years.

If the authority owned the tanks they would have to be taken off the vehicles for about two days for re-certification, essentially taking the vans out of service during that time. But with the lease program, Mountain Fuel simply exchanges the old tanks for new certified ones in a single visit, Johnson said.

An initial problem the transit authority encountered was when its insurance company balked at the idea of covering NGVs, sending a letter saying it couldn't take the risk.

But Johnson persisted, sending the agents crash test videos and other materials vouching for CNG's safety as a vehicle area. The insurers relented and decided to extend coverage.

Sweetwater is planning to convert a fourth van in the near future, with long-term plans to buy original equipment buses dedicated to CNG.

The only complaint about the conversions so far has been the slight power loss in using CNG, since drivers have to deal with some hilly routes in the Rock Springs area, Johnson added. She doesn't expect to have that problem with the original equipment.

Ohio prepares specs for conversions

With money in hand to fund the conversion of 20 vehicles, the Ohio Dept. of Transportation (DOT) is now deciding what kind of equipment it wants for its fleet.

The vehicles will include light-duty trucks, vans and some other medium-duty trucks. Funding includes the purchase of a compressor to refuel the vehicles.

The DOT is eyeing the specifications other fleets have come up with and what's been certified by the American Gas Assn. before it issues a solicitation, said Gordon Procter in the state's Office of Energy Conservation.

Project managers also had to decide where the vehicles were going to be located. They decided on Garfield Heights outside of

Cleveland — physically the smallest district and best suited to central refueling.

East Ohio Gas has been providing some expertise for the project already and will supply CNG to the vehicles as well.

The DOT should have a solicitation out on the street by the end of the year.

Rhode Island readies for five vehicle conversions

The state of Rhode Island is set to award conversion work for three light-duty vehicles and two heavy-duty trucks this fall.

The state's energy department already had one Jimmy 4x4 converted to a dual-fueled system, using either CNG or gasoline.

This summer the state took bids on a project to convert a Chevrolet Lumina, a Ford Crown Victoria, and a Chevy Blazer to dual-fuel NGVs. Two other medium-duty trucks, a GMC pickup and an F800 dump truck were to be converted to use 80% CNG/20% diesel.

In its solicitation, the state included range figures for those vehicles that the conversion companies should be able to provide.

The Lumina is driven about 50 miles per day; the Crown Vic 20 miles/day; the Chevy Blazer 60 miles/day; the GMC pickup 90 miles/day; and the dump truck about 47 miles/day.

The bid was close since the companies making offers were only about \$125 apart on their proposals, Chapman told *NGV News*. Once the award is made, the vehicles should be converted by the end of October.

The Crown Vic will be driven by the chairman of the Rhode Island Public Utilities Commission; the Blazer will go to the head of the Dept. of Environmental Facilities and the Lumina will go to the Dept. of Environmental Management.

The vehicles will refuel at a fast-fill station operated by Providence Gas. CNG will be priced at a tariff approved by state regulators that equals the utility's weighted average cost of gas. That station is open to the public.

Pennsylvania grant program considered

Legislation for grants to fund alternative fuel vehicle projects in Pennsylvania is still alive, but could be killed as a new state budget is worked out.

The original plan called for .5% of the state's utility gross receipts tax to be earmarked for funding vehicle conversions and refueling facilities.

That bill was axed, but the sponsoring senator amended the language onto another bill concerning the state's vehicle inspection and maintenance program, according to an official in the state energy office. That bill would outline how the state plans to implement new rules under the Clean Air Act Amendments and has to be approved by Nov. 15.

Funding has been cut to .025% of the gross receipts tax in the new language, or about \$3.25 million, the official said.

The legislature was set to reconvene Sept 21. Consideration of the bill may be delayed while a workable state budget is devised and because of election-year politics, the official added.

Utah transit system adds five buses

The Utah Transit Authority (UTA) has put into operation five Orion V CNG-powered buses financed with the help of the state and the local distributor.

The buses, by Bus Industries of America, have fuel tanks mounted on the rooftop. They are powered by Cummins L10 natural gas engines and operate exclusively on CNG.

They are 40 feet long and 102 inches wide with a seating capacity of 43 and are also air-conditioned and equipped with a wheelchair lift.

The new buses operate out of the UTA's central garage in Salt Lake City with a range of 370 miles on a fill-up. They are re-fueled each evening at a nearby Mountain Fuel Supply station designed to accommodate their large size.

The fuel costs UTA 59.7¢ per equivalent gallon.

Mountain Fuel joined with the Utah energy office to match federal funds to buy the buses at a cost of \$230,000 each. The rest of the \$1.4 million outlay will be used for emissions, maintenance and operation studies.

UTA introduced the CNG buses with considerable fanfare, showing them off to the media at the state fair and then using them for two weeks as parking lot shuttles for 100,000 home show visitors.

Now in service on main artery routes, each carries a half dozen signs proclaiming "Powered by Clean Natural Gas."

The transit authority, which serves scores of Wasatch Front communities, also has converted 13 of its supervisory vehicles to operate on CNG.

Upcoming Conferences

Sept. 29-Oct. 2, "Natural Gas Vehicles: The Environment is Right," 10th Annual NGV conference, Natural Gas Vehicle Coalition/American Gas Assn., Walt Disney World Yacht Club, Orlando, Fla. Contact meeting services at 703-841-8446.

Oct. 15, "Fleet Fair," Chesapeake Chapter of National Assn. of Fleet Administrators, Turf Valley Country Club, near Baltimore, Md. Contact Libby Marquardt at 410-796-5300.

Oct. 18-21, "American Gas Conference & Exposition," American Gas Assn., Hyatt Regency Downtown, Chicago. Contact meeting services at 703-841-8692.

Oct. 18-22, "American Public Transit Assn. Annual Meeting," Marriott Hotel, San Diego. Contact Robert Buchanan at 202-898-4030.

Feds favor CNG now, alcohol fuels later on

Although natural gas seems to be the preferred choice for federal fleets in the next couple of years, Uncle Sam's taste for alcohol fuels is heightened in the latter part of the government's five-year plan for alternative fuel vehicle (AFV) purchases.

The Energy Dept. (DOE) has put together a draft report of the federal fleet's buying strategy for AFVs that reveals natural gas and alcohol fuels with a near equal share of the total 5,707 requests for AFVs in 1983.

But by 1997, projections put requests for alcohol-fueled vehicles, mostly methanol and ethanol, at about 9,400, compared to about 4,700 for natural gas.

A total 16,884 natural gas vehicles (NGVs) will be purchased under the plan from 1993-1997, while the number for alcohol vehicles is 28,166.

The five-year plan responds to the 1990 Executive Order 12759, in which President Bush directed federal agencies to expand their purchases of AFVs under the Alternative Motor Fuels Act to the "maximum number practicable."

The idea is to give auto manufacturers and fuel suppliers incentives to make AFVs and associated fuels more available. DOE will ensure agency needs are known to automakers and fuel suppliers will be encouraged to make their stations open to the public.

By fiscal year 1993, 5,000 AFVs are targeted for purchase under the plan. That number rises to 10,000 in 1995; 25% of agency purchases in 1996; and finally 50% of purchases in 1998. DOE said it is working with each agency to increase the number of AFV purchases in the later years.

The report also noted the importance of spurring the development of a refueling infrastructure, and to make stations open to the public whenever possible.

Fuel choice is up to each agency, and vehicle assignment should focus on non-attainment areas for air quality, DOE said.

Each agency has already submitted its initial plans for which types of vehicles it plans to buy and where those vehicles would be placed. The Defense Dept. leads the pack with a total 12,747 AFVs from 1993 through 1997. The General Services Administration follows with 9,286.

Oddly, even in big gas producing states the number of NGV purchases planned is significantly lower than methanol vehicles. In Texas, for example, 562 methanol vehicles would be purchased from 1993-1997, compared to 222 NGVs (*The charts on pages 14-15 detail the number of NGVs by state and by vehicle type*).

Of the types of vehicles chosen, pickup trucks and passenger vans are preferred to run on CNG. The states initially selected for placement take into account refueling station availability, the mission of each agency and of course whether the areas are in non-attainment for air quality.

Unlike some other mandates, the federal plan accepts conversions as a way to get the AFV market rolling until original equipment is available. Converting existing vehicles also could help agencies keep their costs down. Conversions will help establish the refueling infrastructure needed for AFVs as well, the report noted. Those conversions must meet emissions and other regulations.

DOE added that it also wants to begin coordinating its purchases with state and local agencies. DOE will use its regional support offices to begin the task of developing guidance documents and multi-year plans to give automakers and other equipment suppliers more incentives.

DOE noted that these plans may change and will be updated yearly. Future plans should include more vehicles and match OEM availability with agency needs.

NGV information wanted

If you know of a recent or upcoming conversion, public or private station opening, have a product to sell, or are offering a unique service, we want to hear from you. Fax your information to NGV News at 703-528-1253; mail to 1616 North Ft. Myer Drive, Suite 1000, Arlington, Va., 22209; or call Editor Stephanie Gott at 703-816-8626.

Federal Fleet NGV Purchase Plan by State

	1993	1994	1995	1996	1997
Alabama	10	9	13	12	23
Alaska	2	4	7	11	18
Arizona	37	26	42	37	41
Arkansas	1	1	2	2	3
California	760	563	673	666	816
Colorado	108	67	57	120	99
Connecticut	0	0	0	0	0
Delaware	0	0	0	0	0
District of Columbia	93	60	187	172	206
Florida	6	2	5	8	5
Georgia	29	33	28	44	47
Hawaii	2	2	2	4	4
Idaho	10	11	10	21	27
Illinois	25	30	14	19	22
Indiana	2	2	4	4	6
Iowa	6	1	2	2	6
Kansas	4	12	6	6	9
Kentucky	4	10	11	10	22
Louisiana	29	11	45	22	36
Maine	0	0	0	0	0
Maryland	16	26	28	22	35
Massachusetts	14	6	23	33	63
Michigan	1	1	2	2	4
Minnesota	3	9	9	12	21
Mississippi	0	0	0	0	0
Missouri	2	4	6	9	6
Montana	68	61	64	70	64
Nebraska	0	0	4	0	0
Nevada	34	18	23	26	29
New Hampshire	0	0	0	0	0
New Jersey	4	5	15	7	13
New Mexico	14	20	41	41	29
New York	30	16	40	47	94
North Carolina	5	4	6	6	7
North Dakota	3	9	6	14	11
Ohio	1	4	7	2	11
Oklahoma	45	5	6	6	7
Oregon	18	22	48	57	82
Pennsylvania	24	27	31	22	38
Rhode Island	0	0	0	0	1
South Carolina	135	235	229	189	205
South Dakota	5	5	12	3	7
Tennessee	30	6	41	78	176
Texas	44	49	47	50	32
Utah	8	18	13	13	18
Vermont	0	0	0	0	0
Virginia	21	35	23	45	59
Washington	3	6	3	5	12
West Virginia	4	7	1	4	27
Wisconsin	2	4	6	7	13
Wyoming	15	24	14	15	24
Vehicles to be placed	650	1,053	1,298	1,528	2,186
TOTAL	2,327	2,523	3,154	3,473	4,664

Source: Dept. of Energy draft report on alternative fuel vehicle five-year purchase plan

Federal Fleet NGV Purchase Plan by Vehicle Type

Vehicle (# passengers)	1993	1994	1995	1996	1997
Bus	0	1	0	1	5
Carry all - 4x4 Compact	1	3	1	3	5
Carry all - 4x4 Full size	0	0	0	7	5
Carry all - Compact	24	13	0	0	0
Carry all - Full size	5	7	5	0	10
Golf cart	33	38	1	0	0
Pickup - 4x4 Compact	16	19	49	49	45
Pickup - 4x4 Full size	66	66	61	77	86
Pickup - Compact	517	647	638	697	1,302
Pickup - Crew Cab	16	11	17	18	19
Pickup - Full size	635	585	603	733	842
Sedan - Compact	256	142	326	271	269
Sedan - Delivery	1	1	2	0	1
Sedan - Full size	11	21	20	36	39
Sedan - Law enf.	13	0	0	0	0
Sedan - Midsize	13	22	51	34	34
Sedan - Subcompact	2	8	0	3	5
Stat. wagon - Compact	17	6	25	28	13
Stat. wagon - Full size	0	0	0	1	3
Truck - Cargo	10	0	0	13	14
Truck - Heavy duty	12	21	21	24	27
Truck - Light duty	18	23	34	38	37
Truck - Med. duty	155	179	264	299	445
Truck - Panel	9	13	27	29	30
Truck - Util. Light 4x4	18	2	0	18	7
Truck - Utility	49	21	44	71	63
Truck - Util. 4x4	1	1	0	0	0
Truck - Util. Light	0	4	0	7	0
Van (8)	282	506	600	626	908
Van (12)	18	6	5	3	0
Van (15)	244	243	283	313	335
Van - Cargo	1	2	11	9	27
Van - Cargo compact	0	2	0	0	0
Van - Delivery	0	2	2	1	1
Van - Mini	190	42	92	113	143
Van - Panel	13	35	47	13	31
Van - Step	22	1	0	0	0
Van - Utility	0	0	1	3	1
Van - Wagon	0	0	6	0	0
Van - Panel 4x4	3	0	0	0	0
Van - Wagon 4x4	0	0	0	9	0

Source: Dept. of Energy draft report on alternative fuel vehicle five-year purchase plan

Cherry Creek Schools Compressed Natural Gas (CNG) Program

Cherry Creek School District began converting its buses to CNG ten years ago. This was when clean air, the cost of fuel and environmental issues triggered the Districts research on alternative fuels. The district chose CNG because of safety issues and the abundant supply of natural gas.

Cherry Creeks Experience:

In 1982, when gasoline prices jumped to 95 cents a gallon, unleaded was replacing regular gasoline at the pumps and as concern for the environment was being launched, Cherry Creek began converting 18 of its buses to CNG. As the years passed and CNG technology expanded, 35 more buses were converted.

Today 53 vehicles operate on bi-fuel conversions, 14 performed by Cherry Creek's own mechanical staff. Bi-fuel means the vehicle is equipped with both gasoline and CNG, and can operate on either fuel. The advantage to having both fuel options is flexibility. When the CNG system is down, buses can fuel with gasoline, or on trips they have the capability to run on both gasoline and CNG.

The drivers hardly notice the difference on the newer vehicles, on older vehicles the driver can shift to gasoline when the added power is needed. It should be noted that newer fuel injection systems seem to operate with less problems than carbureted fuel delivery systems.

In the beginning the district had to make a demonstrated effort to alleviate the fears of the mechanics and bus drivers about the safety of CNG. The district provides extensive orientation and training for new drivers to erase their fears about the safety of CNG during accidents and in case the CNG tank itself is hit. The safety of the fuel tanks is unquestionable, the district wouldn't have gotten involved if there had been concern about the safety or integrity of the CNG system.

There are four tanks under each bus, which provide a 70 mile driving capacity on CNG. The accelerated speed is equivalent to gasoline-powered buses; however, there is a 15 to 20 percent power loss on CNG. We have found it is easy to compensate for this loss with proper driver training.

Overall, Cherry Creek School District remains pleased with the CNG equipped buses. We are currently experiencing a per gallon savings of 40 cents, since gasoline is now at 82 cents a gallon and CNG costs 42 cents per equivalent gallon.

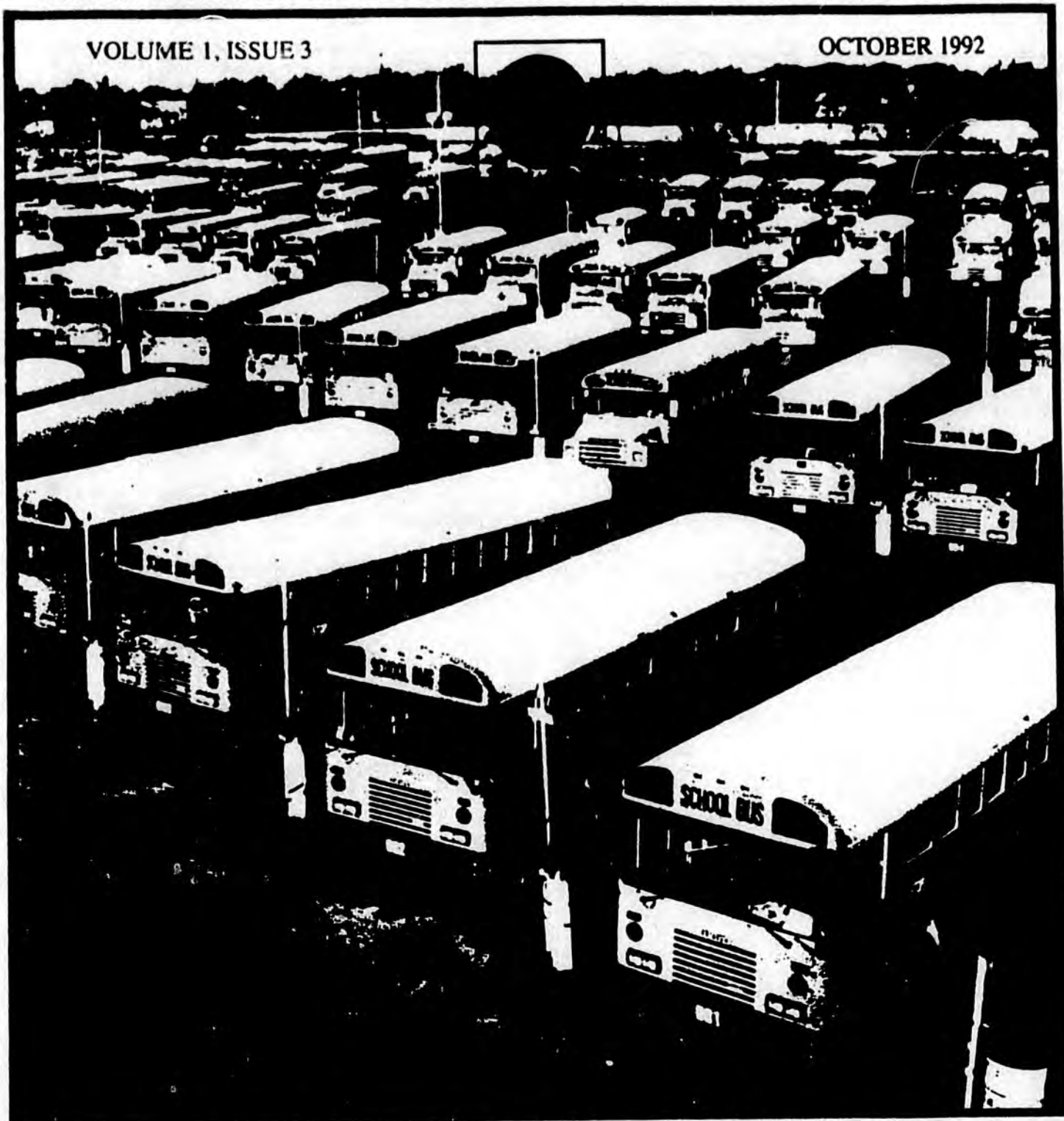
Charles F. Larkin III, Manager of Fleet Services
Cherry Creek School District
16500 E. Smoky Hill Rd. (303) 693-0160 ext. 5118
Aurora, Colorado 80015 FAX # (303) 693-0160 ext. 5130

NATURAL GAS FUELS

A MAGAZINE DEDICATED TO THE USE OF NATURAL GAS AS A TRANSPORTATION FUEL

VOLUME 1, ISSUE 3

OCTOBER 1992



- Putting Words Into Action: NGVs Go Public
- Alternative Fuels on the Campaign Trail
- Vehicle Fill Pressure Q&A

Publisher

Frank Rowe

Editor

Ellen Pollock

Contributors

Ali Reda, P.Eng., U.S. Sen.
Timothy E. Wirth, Brian Hansen

Editorial Advisory Board

Michael Baly III

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Jeffrey M. Seisler

Natural Gas Vehicle Coalition

Leo B. Thomason

California Natural Gas Vehicle Coalition

JC Touhey

BC Gas



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1410 Grant Street, Suite A-201
Denver, Colorado 80203
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Fax: (303) 863-0918

President Frank Rowe
Vice President Ellen Pollock
Treasurer Anne B. Rowe

EDITOR'S NOTES

BACK TO BASICS



At the recent NYSEG convention in upstate New York, I was struck by the importance of communication. Hand-in-hand with the art of communication is understanding, i.e., understanding the needs of the audience, whether that audience is a single individual or a group of 500. Failure to understand the needs of the audience — your customers — can result in the continuing lack of knowledge that for too long has plagued the NGV industry.

During the conference, speaker after speaker offered his or her point of view regarding what is required for the NGV industry to move forward. Much of it has been said numerous times in the past, yet to many of those attending the conference, much of the information was brand new.

What does this tell the industry?

First, it says that both companies marketing NGV equipment and services, and the fleet owners who are their customers, must realize that communication involves listening and understanding, as well as talking. If NGVs are to move forward and successfully establish their place as a widely used and practical fueling solution, an understanding of the basics is fundamental.

While some fleet managers are fairly well up to speed on natural gas vehicles, the majority are just beginning to learn about what it takes to set up an NGV program. In fact, some fleet managers who sat in on the speeches at the NYSEG conference were amazed to learn what the technology has to offer, as well as how accessible natural gas as a transportation fuel is becoming.

Today, a concerted effort is underway to provide as many fleets as possible with fueling alternatives. Fleet owners and managers, however, are not going to jump at the first available option. Instead, they will want a full accounting of successful programs now in place, and will want to ask numerous questions about how these programs relate to their specific fueling requirements. All it takes is a little bit of understanding, and a lot of education. It's hard to make decisions when the issues are not clear, and when the answers are not available.

When trying to market products and services to this growing industry, it is also important to remember that the role of fleet managers and decisionmakers is multifaceted. The fleet manager has many more concerns than how vehicles will be fueled; suppliers should listen to what else is involved in the daily activities of fleet managers and operators, and should communicate how natural gas fueling alternatives can best meet that individual's unique challenges. Take the example of a school district, whose main goal is the education of children. Every day, millions of children travel to school on buses that must meet rigid schedules and conform with tight requirements. While certain factors, i.e., weather conditions, can delay this process, refueling a bus fleet should never be a hindrance.

For new industries to continuously improve and meet the needs of users from both an operational and technological standpoint requires communication. From the time we are young, we are taught that communication is a two-way street involving both talking and, more importantly, listening. In this business, there is much to talk about, and much to learn about. Let's hope that everyone is listening.

Ellen Pollock

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At the end of their shift, Cherry Creek School buses hook up to fueling units located adjacent to parking stalls.

AGONY AND ECSTASY

Cherry Creek School District in Aurora, Colo., has been running buses on natural gas since the early 1980s, yet many parents and children remain unaware of the district's alternative fuels program. The now thriving program got its rocky start in 1982, when a schoolboard member suggested experimenting with natural gas buses. At that time, gas prices in excess of one dollar per gallon prompted the district to explore both propane and natural gas. Natural gas was selected largely because of safety factors, i.e., in the event of a leak, gas would dissipate; propane would pool on the ground.

"In the beginning, our natural gas experience could best be described as agony and ecstasy," says Joe Mirabella, director of transportation for Cherry Creek Schools. "Our program had three elements, and in essence they all combined to make things...interesting." The three elements, Mirabella says, were the compressor, the underground lines to the fuel delivery system and the conversion kits. "Unfortunately, the salesmen around at that time made all sorts of promises that the technology just could not deliver, which led to many problems in keeping the buses running. The buses would die, the compressor would not deliver fuel through the slow-fill system, a leak in the pipeline would alter the compression, or the kits would not function. The technicians were unable to deliver on the salesmen's promises, and until about 1985 or 1986 we were literally hanging by our nails trying to keep the program operational."

Although the industry has long touted the lower maintenance of natural gas vehicles, due to their cleaner-burning composition, Mirabella says that only recently has new technology proven out this claim. "On the older buses, maintenance costs were probably equal because the technology was not as advanced. We experienced several minor problems with CNG systems, such as hard starting in cold weather, problems with power loss, and oil in the second state regulators which resulted in diaphragm problems and affected performance. Compressor maintenance problems also trickled down to the buses via the slow-fill line, whereby small leaks in the compressors resulted in lower compression in the buses. However, we eventually overcame all these problems, primarily through changes in our maintenance procedures as we became more experienced with natural gas vehicles. And with the newer vehicles and equipment, we really don't see these types of problems anymore."

While working out the glitches, the program limped along, assisted by two savvy mechanics who were able to somehow keep things rolling. But what really contributed to the program's ultimate success was strong support from the district, which translated into few if any safety concerns or bouts with negative publicity. "Safety concerns have never been an issue, and the drivers do not think twice about filling their vehi-

cles with natural gas," points out Mirabella. Since its floundering beginning, the program has steadily grown from an initial 10 converted buses that used Dual-Fuel and Canadian Fuel kits. A switchover to ANGI kits, and the purchase of two Mako compressors has helped Cherry Creek to build its natural gas fleet to 53 school buses.

All of the natural gas buses are dual-fuel, with the exception of one dedicated Hercules bus. "The district recently disposed of the 10 originally converted buses, and is now converting 10 new buses right at its transportation facility. "In the past, we've sent the buses to Natural Fuels Corp. to handle the conversions, but now we believe our level of expertise is to the point where we can handle the conversions on our premises. We are up to speed on the installation and most of the diagnostics, and we still can rely on Natural Fuels if we run into problems," Mirabella says.

The originally purchased Mako compressor is being rebuilt, and the system operates exceedingly well. Buses park in a line at the end of their shift, plug into the slow fill compressor, and are ready for work at the beginning of

REGIONAL BREAKDOWN OF STATE TRANSIT AGENCIES WITH CURRENT OR PROPOSED CNG/LNG VEHICLE PROGRAMS

(Information provided by U.S. Department of Transportation, Federal Transit Administration)

Region	No. of Programs
West	175
Rocky Mountain	70
Southwest	310
Midwest	155
Northeast	69
Southeast	38



the next shift. The pressure was raised a bit in the slow-fill compressor to reduce fill time. Buses that run multiple routes during the day have access to a fast-fill compressor, which generally takes between 5-10 minutes.

Now, the district is testing the GFI system, marketed by Stewart & Stevenson. "The driver of the bus it is installed in is very happy with the GFI system. It's so advanced that the driver does not even know when he's running on natural gas or gasoline. The system senses the pressure in the fuel line, so when pressure drops to a certain level, it switches to gasoline and there is no loss of power," says Mirabella.

"CNG is a fuel that works very well for school districts," says Mirabella. "Cherry Creek School buses, for example, travel a range of about 70 miles, leaving early in the morning, traveling routes of about 35-50 miles, returning to base and plugging into the slow-fill compressor. Then, they return in the afternoon, their buses are full, they drive their route, return here and plug into the slow-fill for the night. This is a perfect setup, even for districts with longer routes so long as their vehicles are dual-fuel."

Mirabella, a veteran of the natural gas vehicle marketplace, recognizes both advantages and disadvantages to running buses on alternative fuels such as natural gas. "One big advantage results from the high insurance for underground tanks, and the need to keep in compliance with insurance regulations. So, if a district is looking at getting into alternative fuels, it should consider insurance requirements."

The disadvantage, Mirabella explains, lies in dedicated buses. "I would caution that dual-fuel buses are very important in the event your compressor goes down, so you can continue running vehicles on gasoline with no downtime. If a compressor breaks down, unless there is backup available, generally in the form of another onsite compressor, or unless you have a good working relationship with another agency that could bring in a temporary compressor, you can have a real problem."

Economics were the driving force behind the district's natural gas program, a fact that remains unchanged today. Every two years Mirabella puts out competitive bids for fuel. "Basically, there are three charges with regard to the natural gas vehicles," Mirabella says. "The first is at the port of entry where the gas supplier pumps the gas through the utility's pipelines. Then, there is a charge paid to transport the gas through the pipelines to the compressor, and last there is an electricity fee for running the compressor. If you add up all three charges it comes to about 42 cents per equivalent gallon, versus gasoline which totals about 84 cents."

A 1990 law, no longer on Colorado's books, enabled the district to realize further savings in the natural gas vehicle program. In 1990, the Colorado Department of Health passed a law allowing any agency that converted up to five vehicles to be paid up to \$200 per vehicle, to a maximum of \$1,000. Prior to that, in 1986 and 1987, Public Service Co. and Coastal Gas, the fuel supplier during that time, supplemented the district's program with about \$19,000 for the purchase of new kits.

"One reason they were so generous was that at that time, we were a demonstration district for other districts considering alternative fuel programs," explains Mirabella.

It wasn't particularly easy, and it certainly didn't happen overnight, but today Cherry Creek Schools is reaping the benefits of a natural gas vehicle program that operates with the precision and ease of a finely honed machine. Mirabella, who has seen the program grow and has truly experienced all the growing pains of taking a project from inception to maturity, would not trade it for anything. "Now is a very good time to get involved with alternative fuels. Even before districts are pressured to comply with clean air regulations, the technology is now far enough advanced that it's a worthwhile program to do right now. With the transportation bus manufacturers moving full speed ahead into this area with both bi-fuel and dedicated buses, this is a stone that is rolling downhill and rapidly gaining momentum. The expertise now is available everywhere, and the program can truly succeed."

Department of Transportation
Registration Number

A147

HYDROSTATIC RETEST
DATA SHEET

CHERRY CREEK

SCHOOL Dist. Ziegler Fire Protection, Inc.
(303)-45 3451

NO.	SERIAL NUMBER	IDENT. SYMBOL	DOT/ICC SPEC	DATE MFG.	TEST PRESSURE	VOLUMETRIC EXPANSION				VISUAL INSP		DISPOSITION CODE	TESTED BY	DATE
						TOTAL	PERMANENT	ELASTIC	% PERM	PASS	FAIL			
	Calibrated Cylinder													
1	M0061	(E)	3000	87	5000	800	25	775	3.13	/		A	Joe	6/12/92
2	N1318	(E)	3000	90	5000	1050	25	1025	2.38	/		A		
3	P0371	(E)	3000	90	5000	500	10	490	2	/		A		
4	HS-259881	(TW)	3AA 2400	82	4000	295	5	290	1.69	/		A		
5	HS-229336	(TW)	3AA 2400	81	4000	320	5	315	1.56	/		A		
6	HS-260057	(TW)	3AA 2400	82	4000	285	5	280	1.75	/		A		6/15/92
7	HS-228944	(TW)	3AA 2400	81	4000	320	10	310	3.13	/		A		
8	HS-228948	(TW)	3AA 2400	81	4000	320	5	315	1.56	/		A		
9	HS-260452	(TW)	3AA 2400	82	4000	290	5	285	1.72	/		A		
10	HS-260068	(TW)	3AA 2400	82	4000	280	5	275	1.79	/		A		
11	HS-228912	(TW)	3AA 2400	81	4000	320	5	315	1.56	/		A		
12	HS-228994	(TW)	3AA 2400	81	4000	310	10	300	3.23	/		A		
13	HS-228952	(TW)	3AA 2400	81	4000	305	0	305	0	/		A		
14	HS-229224	(TW)	3AA 2400	81	4000	330	10	320	3.03	/		A		
15	HS-60499	(TW)	3AA 2400	82	4000	275	0	275	0	/		A		
16	HS-229238	(TW)	3AA 2400	81	4000	315	10	305	3.17	/		A		
17	HS-228943	(TW)	3AA 2400	81	4000	305	20	285	6.56	/		A		Feb.
18	HS-259935	(TW)	3AA 2400	82	4000	285	10	275	3.51	/		A		
19	HS-260058	(TW)	3AA 2400	82	4000	280	5	275	1.79	/		A		
20	HS-228907	(TW)	3AA 2400	81	4000	310	10	300	3.23	/		A		6/16
21	HS-229307	(TW)	3AA 2400	81	4000	320	10	310	3.13	/		A		
22	HS-259938	(TW)	3AA 2400	82	4000	300	15	285	5	/		A		
23	HS-259915	(TW)	3AA 2400	82	4000	305	20	285	6.56	/		A		
24	HS-260500	(TW)	3AA 2400	82	4000	280	0	280	0	/		A		
25	HS-228872	(TW)	3AA 2400	81	4000	315	10	305	3.17	/		A		

DISPOSITION CODE

- A - RETURN TO SERVICE
- B - HOLD FOR FURTHER TEST
- C - SCRAPPED
- D - SET ASIDE FOR HEAT TREATMENT
- E - SET ASIDE FOR TUMBLING / CLEANING
- F - OTHER (specify)

I hereby certify that all the above tests were made under my supervision and in accordance with DOT regulations.

J. Sullivan
FACILITY MANAGER

COST COMPARISON DIESEL BUSES VERSES CNG/GAS BUSES

The following cost are for the repair and operation of diesel buses.

	FUEL COST PER MILE	REPAIR COST PER MILE RANGE	AVERAGE REPAIR COST PER MILE	TOTAL COST PER MILE
INTERNATIONAL				
DT 466 DIESEL 42 BUSES	.13	.63 -.14	.37	.50
NEWER DT 466 27 BUSES	.13	.16 -.13	.14	.27
DTA 466 DIESEL 10 BUSES	.13	.17 -.04	.11	.24
9.0 LITER DIESEL 24 BUSES	.13	.87 -.14	.34	.47
CUMMINS				
8.3 LITER DIESEL 2 TRANSITS	.13	.32 -.08	.20	.33
555 V8 DIESEL 1 TRANSIT	.13	.64 -.25	.45	.58
555T V8 DIESEL 2 TRANSITS	.13	.56 -.26	.41	.54
GENERAL MOTORS CORP.				
6.2 LITER DIESEL 3 MINI BUSES	.16	.22 -.18	.20	.36

The following cost are for the repair and operation of CNG buses.

	FUEL COST PER MILE	REPAIR COST PER MILE RANGE	AVERAGE REPAIR COST PER MILE	TOTAL COST PER MILE
GENERAL MOTORS CORP.				
366 GMC GAS/CNG 11 BUSES	.11	.60 -.38	.53	.64
350 CHE GAS/CNG 6 MINI BUSES	.11	.45 -.18	.29	.40
350T CHE GAS/CNG 12 MINI BUSES	★.07	.08 -.07	.07	.14

COST COMPARISON DIESEL BUSES VERSES CNG/GAS BUSES

INTERNATIONAL

392 INT GAS/CNG 24 BUSES	.11	.32 -.21	.27	.38
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The above figures were compiled using selected vehicles from our fleet. The average mileage for each bus is 15,000 a year. This combined with the cost per mile (cpm) will give the average operational cost.

Example: $15,000 \times .27\text{cpm} = \$4,050$ average operational cost

Multiply the number of buses in that group by the average operational cost. That will give you the average group cost.

Example: $\$4,050 \times 27 = \$109,350$ average group cost

You will note that the 366 GMC GAS/CNG bus group has a higher cost. This is due to the age of the vehicles, number of miles on the engine (100,000 and higher) and the type of fuel delivery system that is on the buses. The fuel system used is a carbureted system and as such has more mechanical problems than the newer fuel injection systems.

These cost do not include depreciation or the cost of catastrophic losses (damage due to accidents, acts of God, or vandalism).

Below are the costs used in the calculations to obtain the cost per mile figures:

Diesel fuel, cost per gallon	- .75
Cng fuel cost per gallon	- .42
Miles per gallon, diesel	- 6
Miles per gallon, cng	- 4
Miles per gallon, cng newer engines (350T only)	- *6

DATE 12/18/89
TIME 16:34:11

CNG USAGE

50,513
avg. daily
usage

PAGE 1

DATE FROM 12/11/89 TO 12/15/89

VIN	CNG TYPE	CNG MILEAGE	CNG GAL.S. USED	MILES PER CNG GAL	
			TOTAL MILES	PERCENTAGE VEH. USED CNG	
1051	DUAL FUELS	177.0	402	53.3	447%
1052	DUAL FUELS	32.0	47	6.7	69%
1053	DUAL FUELS	126.0	316	23.3	40%
1054	DUAL FUELS	212.0	235	56.7	90%
1055	DUAL FUELS	374.0	436	87.1	86%
1056	ADVANCE FUELS	298.0	333	58.3	89%
1057	TOTAL FUELS	514.0	414	187.9	124%
1058	ADVANCE FUELS	NO DATA ON FILE FOR THIS PERIOD			
1059	ADVANCE FUELS	217.0	227	46.7	95%
1060	DUAL FUELS	NO DATA ON FILE FOR THIS PERIOD			
1063	ANGI FUELS	379.0	379	110.0	100%
1064	ANGI FUELS	312.0	364	67.3	86%
1065	DUAL FUELS	314.0	315	91.7	97.6%
1066	DUAL FUELS	291.0	307	72.5	94%
1067	TOTAL FUELS	460.0	467	114.2	98%
1068	ANGI FUELS	339.0	337	77.5	100%
1069	DUAL FUELS	186.0	378	40.0	49%
1070	ANGI FUELS	76.0	369	17.5	20%
1071	ANGI FUELS	449.0	468	95.8	96%
1078	DUAL FUELS	264.0	307	70.0	87%
1079	ANGI FUELS	244.0	297	52.9	82%
1080	DUAL FUELS	72.0	72	20.0	100%
1081	ANGI FUELS	426.0	470	94.2	99%
1082	ANGI FUELS	NO DATA ON FILE FOR THIS PERIOD			
1083	DUAL FUELS	152.0	208	34.2	73%
1084	DUAL FUELS	327.0	373	69.2	88%
1085	DUAL FUELS	216.0	366	57.5	54%
1086	DUAL FUELS	291.0	344	70.8	84%
1089	ANGI FUELS	160.0	279	55.8	53%
1090	ANGI FUELS	211.0	265	60.0	80%
1091	ANGI FUELS	284.0	332	103.0	85%
1094	ANGI FUELS	237.0	284	80.0	83%
FLEET TOTALS		7,640.0		1,976.3	MPG AVERAGE 3.9

DATE 01/01/80
TIME 00:03:11

Bob

0001

CNG USAGE

DATE FROM 12/17/84 TO 12/21/84

VIN	CNG TYPE	CNG MILEAGE	CNG GALS. USED	MILES PER CNG GAL
1051	DUAL FUELS	155.7	39.7	3.9
1052	ADVANCE FUELS	419.5	98.2	4.3
1053	ADVANCE FUELS	315.1	67.9	4.6
1054	ADVANCE FUELS	361.7	98.2	3.7
1055	ADVANCE FUELS	358.5	114.3	3.1
1056	ADVANCE FUELS	387.0	90.2	4.3
1057	TOTAL FUELS	440.5	109.8	4.0
1058	ADVANCE FUELS	373.8	81.3	4.6
1059	ADVANCE FUELS	271.6	41.1	6.6
1060	CANADIAN FUEL	213.4	52.7	4.1
1063	ADVANCE FUELS	339.8	72.3	4.7
1064	ADVANCE FUELS	303.8	71.4	4.3
1065	ADVANCE FUELS	252.9	74.1	3.4
1066	ADVANCE FUELS	325.5	86.6	3.8
1067	ADVANCE FUELS	372.8	104.5	3.6
1068	ADVANCE FUELS	209.4	47.3	4.4
1069	TOTAL FUELS	20.2	3.6	5.7
1070	PRIME 21	331.8	92.0	3.6
1071	CANADIAN FUEL	294.0	82.6	3.6
1110	ADVANCE FUELS	131.7	37.5	3.5
1112	ADVANCE FUELS	240.8	48.2	5.0
1113	DUAL FUELS	129.5	30.3	4.3
1114	ADVANCE FUELS	512.7	122.3	4.2
1115	ADVANCE FUELS	198.3	26.8	7.4
1116	ADVANCE FUELS	314.0	73.6	4.3
1131	ADVANCE FUELS	235.1	58.0	4.1
1139	ADVANCE FUELS	294.6	71.4	4.1
1143	ADVANCE FUELS	377.0	92.9	4.1
1146	ADVANCE FUELS	339.9	65.2	5.2
1147	ADVANCE FUELS	117.6	31.3	3.8
1149	ADVANCE FUELS	160.5	32.1	5.0
1152	ADVANCE FUELS	245.0	84.8	2.9
FLEET TOTALS		9,049.7	2,202.1	MPG AVERAGE 4.1

CNG BILLING - JANUARY-DECEMBER 1988

Month	Gallons	MCF	Price	---Cost - Dollars---			Total	Avg
			MCF	Gas	Elect.	Trans.		Cost
							Cost	Gal.
Jan.	6,781.00	891	1.76	1,568.16	-0-	690.68	2,258.84	.33
Feb.	8,929.70	1,166	1.76	2,052.16	809.64	638.66	3,519.55	.39
Mar.	8,570.31	1,122	1.76	1,974.72	539.28	789.74	3,303.74	.39
Apr.	7,937.50	1,043	1.76	1,841.85	684.56	754.70	3,281.11	.41
May	9,578.125	1,254	1.76	2,207.04	697.76	845.55	3,750.35	.39
June	5,281.25	687	1.76	1,209.12	499.54	607.62	2,316.28	.49
July	2,312.50	296	1.76	524.44	329.12	443.23	1,293.31	.56
Aug.	4,367.1875	573	1.76	1,008.48	565.67	557.00	2,131.15	.49
Sep.	8,750.00	1,144	1.76	2,013.44	605.74	799.69	3,418.87	.39
Oct.	7,703.125	1,012	1.85	1,872.20	593.53	741.72	3,207.45	.42
Nov.	7,914.063	1,039	1.76	1,737.56	709.66	753.40	3,200.62	.40
Dec.	5,968.75	781	1.76	1,374.56	580.82	645.69	2,601.07	.44

*November billing reflects rebate for erroneous price increase for October.

TOTALS

GALLONS 84,093.51

MCF 11,008.00

COSTS

NATURAL GAS \$19,380.25

ELECTRICITY \$ 6,615.32

TRANSPORTATION \$ 8,268.68

TOTAL COST \$34,282.96



VEHICLE INSPECTION REPORT 1081

STATE OF COLORADO

THANK YOU FOR PARTICIPATING IN THE
COLORADO A.I.R. PROGRAM

DO NOT DESTROY OR DISPOSE OF THIS REPORT
YOU WILL NEED IT TO REGISTER YOUR VEHICLE

Vehicle Information									
License	VIN	Yr.	Make						
0302	AP	1HVLMEGL2EHA49625	84	INT					
Cyl.	GVW	Mileage	Eng. Size	Dual Exh.	Tech				
6	H26000	78685	5.6 L	NO	0				
Station Name									
CHERRY CREEK SCHOOL DISTRICT 5 - EAST									
Date	Time	Station #	Mechanic #	Test Type	Cost				
04/29/91	01:41 PM	4024	9596	I	0.00				
Inspection Results									
CONGRATULATIONS YOUR VEHICLE PASSED THE COLORADO A.I.R. PROGRAM INSPECTION									
Emissions Control System Inspection									
Catalytic Converter	Air Inj. Sys.	Fuel Filter	Oxygen Sensor						
N/A	N/A	N/A	N/A						
Tailpipe Emissions Inspection AT IDLE									
	Standard	Previous	Measured						
CO%	3.50		0.21	PASS					
HC ppm	1000		34	PASS					
		AT 2500 RPM							
	Standard	Previous	Measured						
CO%	3.50		0.06	PASS					
HC ppm	1000		24	PASS					
Visible Emissions Inspection Exhaust and/or Crankcase Smoke									
				PASS					
Inspection Number									
A02400022C 1									
Retest Information									
Tuned Inspection	Mechanic	Repairs	Parts	Labor					
NO									

VET # 41566113

0414024

PLEASE TAKE THE TIME TO READ THIS REPORT COMPLETELY

HOW TO USE THIS REPORT

Your inspection results are printed just below the "Vehicle Information" block.

If your vehicle passed the inspection, this report and the Certificate of Emissions Control (Emissions Validation Tab) below are your proof of inspection that allows you to proceed with the registration of your vehicle. See registration information at the bottom of this page for details.

When the registration process is complete, this report should be kept in your vehicle, along with the registration and proof of insurance.

If your vehicle failed its first inspection, repairs and/or adjustments will be required. The information on the Vehicle Inspection Report regarding your vehicle's failure is very important to the mechanic that repairs the vehicle. That Report should be made available to the mechanic when having the vehicle repaired. All repairs performed to reduce emissions must be documented on back of the Vehicle Inspection Report and accompanied by repair receipts at time of the reinspection. You must surrender your original repair receipts (copies) at the time of reinspection. If the information on the Certificate of Emissions Control (Emissions Validation Tab) is incomplete or the Certificate contains rows of "X"s or asterisks, the Certificate is invalid and cannot be used for registration. You will be issued a valid Certificate of Emissions Control registration purposes when all inspection requirements are met.

AIR PROGRAM REQUIREMENTS

The vehicle owner is required to show proof of compliance with the Program in order to register the vehicle.

The AIR Program inspection consists of the following:

Tailpipe Emissions Inspection - the vehicle's exhaust gas will be tested for excessive Carbon Monoxide (CO) and Hydrocarbon (HC) emissions. Measurements of these pollutants will be compared to the maximum allowable levels that model year.

and

Visible Emissions Inspection - the vehicle will be inspected for visible smoke emissions. Any visible smoke (excluding water vapor) will cause the vehicle to fail.

and for 1975 and newer model vehicles

Emissions Control Systems Inspection - the catalytic converter, air injection system, fuel filter neck restrictor, and oxygen sensor systems must be installed, intact, and operational on the vehicle. Inspectors are to fail if "Oxygen Sensor" for any service maintenance or malfunction light displayed during the inspection; if applicable.

All vehicles must pass the Visible Emissions Inspection and all 1975 and newer vehicles must pass the Emissions Control System Inspection. However, a waiver may be issued in some cases for a vehicle that continues to fail the Tailpipe Emissions Inspection after appropriate repairs. For further information, refer to "WAIVER" information on the reverse side of this report.

EMISSIONS WARRANTY

If your vehicle fails the AIR Program Tailpipe Emissions Inspection, it may be eligible for warranty coverage for required repairs. Vehicle manufacturers are required to provide Emissions Warranties with various coverages for at least 10 years or 50,000 miles, by federal law. For further information, refer to your vehicle's owners manual under the "Emission Warranty" section.

IMPORTANT IMPORTANT IMPORTANT

THIS TAB IS YOUR PROOF
OF THE EMISSIONS TEST.

Inspection # A02400022C Date 04/29/91
Station 4024 Mechanic 9596
License 0302 AP Make INTE Model Year 84
VIN 1 HVLMEGL2 EHA4 9625

IMPORTANT IMPORTANT IMPORTANT

VEHICLE OWNERS MUST AT THE TIME OF REGISTRATION OR RENEWAL PROVIDE AN EMISSION VERIFICATION TAB. VEHICLES WITHOUT PROOF CANNOT BE REGISTERED OR RENEWED. NO EXCEPTIONS OR EXTENSIONS WILL BE GRANTED. LOST TABS WILL REQUIRE REINSPECTION.

LIFT AND PEEL HERE
TO REMOVE LABEL

0414024

EMISSIONS QUESTIONS: CALL 572-5603

DEDICATED CNB BUS

ANY ATTEMPT TO ALTER, FABRICATE, OR DUPLICATE THE EMISSION VERIFICATION TAB CONSTITUTES FRAUD AND IS PUNISHABLE BY UP TO A \$500 FINE AND UP TO SIX MONTHS IN PRISON.

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER B-10-20
Relating to Conversion of Vehicles to Gaseous Fuels

Vialle USA, Inc.
A SUBSIDIARY OF PACER INDUSTRIES, INC.
VIALLE USA/ANGI D-5 SYSTEM

Pursuant to the authority vested in the Air Resources Board by Section 43004 and Section 43006 of the Health and Safety Code and Section 10753(d) of the Revenue and Taxation Code; and

Pursuant to the authority vested in the undersigned by Section 39515 and Section 39516 of the Health and Safety Code and Executive Order G-45-3;

IT IS ORDERED AND RESOLVED: That Vialle USA/ANGI D-5 gaseous fuel conversion systems manufactured by Vialle USA, Inc., a subsidiary of Pacer Industries, Inc., are approved for all 1992 and older model-year passenger cars equipped with gasoline-powered engines (either carbureted or fuel-injected), as described below.

<u>Conversion System</u>	<u>Fuel Type</u>	<u>Fuel System</u>	<u>Vehicle Application</u>
D-5	compressed natural gas (CNG)/gasoline dual-fuel and CNG only	carbureted & fuel-injected	passenger cars

The heated air intake system may be removed. All other emission control systems and the manufacturer's tune-up label shall be retained. The engine shall be adjusted to original manufacturer's tune-up specifications.

All 1992 and older model-year Ford Motor Company and Chrysler Motor Company vehicles equipped with an on-board diagnostic system must use an oxygen sensor fix.

All 1992 and older model-year Chrysler Motor Company vehicles equipped with fuel injection and an on-board diagnostic system must use an injector fix.

All 1992 and older model-year General Motors vehicles equipped with an on-board diagnostic system must use AN6I Part No. 035A44441 microcomputer, except those with mass flow fuel system.

Navistar International Transportation Corporation
Alternative Fuels Comparison Chart



	Clean Diesel	Reformulated Gasoline	Methanol	Ethanol	Natural Gas Compressed (CNG)	Natural Gas Liquid (LNG)	Propane
Environmental Issues							
Pro	Reduced emissions Reduces particulate material 20%-30% in older engines	Should meet emission regulations through year 2000 Reduced emissions in older engines	Low NOx and particulates Disperses in water and bio-degradable Diverse feed stock	Low NOx and particulates Disperses in water and bio-degradable Renewable resource	Low emissions Smokeless Available from the well... minimum processing	Low emissions Smokeless Available from the well... minimum processing	Low emissions Smokeless
Con	Needs particulates and NOx reduction Still some smoke (cold and high altitude) Spill/leakage contamination Non-renewable resource Few safety problems	Still high in smog-forming emissions Spill/leakage contamination Non-renewable resource	Generates formaldehyde Very toxic	Slight smoking Generates formaldehyde, but less than Methanol Uses about the same energy to produce as it generates	Needs NOx reduction Requires energy to compress	Needs NOx reduction Requires energy to liquefy and cool... more than CNG	Needs NOx reduction Requires energy to liquefy
Operational Issues							
Pro	Readily available by 1994 and uses current distribution Minimal cost increase Very efficient, good mileage Usable in older engines Ample basic worldwide supply	Will be readily available when required Minimal cost increase Usable in older engines Ample basic worldwide supply	High octane for efficient S.I. combustion Liquid, hence easy to distribute Blends well with gasoline	High octane for efficient S.I. combustion Liquid, hence easy to distribute Blends well with gasoline	Gasoline conversions now available Attractive fuel cost Ample basic supply Low engine maintenance Minimum explosion hazard Vapors lighter than air... disperse quickly	Basic engine same as CNG Attractive fuel cost potential Ample basic supply Less than 1/2 tank space of CNG Low engine maintenance Minimal explosion hazard Vapors lighter than air... disperse quickly	Fairly wide distribution Long-term experience in vehicles Good cold starting
Con	Hard cold starting	May require new catalytic converters Over twice the cost per mile vs. diesel	Corrosive Invisible flame Explosive vapors Hard cold starting with spark ignition Limited production capability Limited fuel locations 45% energy of diesel (low range or large fuel tanks)	High cost to produce Limited production capability Limited fuel locations 50% energy of diesel (low range or large fuel tanks)	Slow refueling Limited vehicle fuel distribution Fuel quality variations High-pressure on-board fuel storage...heavy and complex	Slow refueling Limited availability today Cryogenic handling (-280°F) Must vent fuel system after 7 to 10 hours High-pressure on-board fuel storage...heavy and complex	Slow refueling 60% energy of diesel Little fuel cost advantage over diesel Vapors heavier than air... explosion potential

Gas alternatives fuel new debate

The pros and cons of alternative fuels:

METHANOL (Wood Alcohol)

Can be made from many sources, including coal and wood, but the most common and cost-effective source of fuel-grade methanol is natural gas. Mixed with gasoline, it can be made compatible with current automotive engines, fuel tanks, and fuel systems.

PROS:

- ▶ Widely available from foreign and domestic sources.
- ▶ Can be mixed with gasoline or reformulated gasoline.
- ▶ Higher octane than gasoline; reducing engine knock.
- ▶ Burns cleaner than diesel fuel in diesel engines.
- ▶ Cost competitive with gasoline if made from natural gas.

CONS:

- ▶ Provides half the mileage as same amount of gasoline, requiring bigger fuel tank or more frequent fueling.
- ▶ Highly corrosive to plastics and metals.
- ▶ Has a dangerous, invisible flame.
- ▶ Extremely toxic and absorbed easily through the skin.
- ▶ Fumes include formaldehyde, a possible carcinogen.

"If you ask what is going to be the replacement for petroleum-based fuel some day, methanol looks like the best candidate." — Roberta Nichols, Ford Motor Co.

"There are pollution problems. It's highly toxic when absorbed through the skin, so filling your own tank isn't feasible." — Dan Becker, Sierra Club

ETHANOL (Grain, or Ethyl Alcohol)

Key mixing agent in gasohol. Usually produced from corn or sugar cane or their by-products. Farm machinery uses energy to produce the crops.

PROS:

- ▶ Few changes needed to work in present-day cars.
- ▶ Not as toxic as methanol.
- ▶ Higher octane than gasoline, which reduces engine knock.

- ▶ Can be produced domestically.
- ▶ A renewable resource.

CONS:

- ▶ Less mileage than same amount of gasoline.
- ▶ Corrosive to some plastics and metals.
- ▶ Problems starting in cold weather.
- ▶ Expensive, although production from cornstalks or other farm waste could bring price down.
- ▶ Difficult to distribute via pipeline.

"The alcohols cost more. Lots more. People talk about the alcohols having emissions benefits compared with gasoline. Even if that is true, the benefits are going to be so small that you're going to have a hard time coming up with a cost-effective argument saying that alcohol should replace gasoline." — Joseph Colucci, General Motors Corp.

CNG (Compressed Natural Gas)

Converting a conventional engine to run on CNG is relatively simple. But the fuel tanks can add 500 pounds to a vehicle. A different fuel system is also needed. It's a non-corrosive and very powerful fuel.

PROS:

- ▶ Packs a lot of power into a small amount of fuel.
- ▶ Plentiful in the USA.
- ▶ Non-toxic and non-cancer causing.
- ▶ Spillage poses no pollution threat.
- ▶ Lowest price of any alternative fuel.
- ▶ Cuts engine wear.

CONS:

- ▶ Refueling is time-consuming.
- ▶ Would require compressors at refueling stations.
- ▶ Requires awkward vehicle fuel tank and fuel system.
- ▶ Like oil, it's non-renewable.

"Natural gas is the one fuel that cannot be ignored." — Francois Castaing, Chrysler

ELECTRICITY

California laws requiring electric vehicles have automakers scrambling for answers. Any pollution will come from power plants that generate the electricity to charge the cars' batteries. The major problem: developing an efficient battery.

PROS:

- ▶ No tail pipe emissions.
- ▶ Electricity distribution system — the power lines — are already in place.
- ▶ Can be renewable if electricity is not generated from fossil fuels.
- ▶ Vehicles run quietly, without the complexity of an internal combustion engine.
- ▶ Lends itself to production of a hybrid vehicle, which would have a small internal-combustion engine to recharge the batteries and extend the vehicle's range.

CONS:

- ▶ Low range due to battery weight and relative weakness of current batteries.
- ▶ Significant emissions if electricity to charge car batteries is produced from coal or oil.
- ▶ Batteries are expensive.
- ▶ Battery disposal is an environmental concern.

"Ordinary people with a concern for the environment are drawn to this car." — Robert Wragg, manager, California electric vehicle marketing, General Motors.

"When the battery gets there, the vehicle will have arrived." — Robert L. Davis, Chrysler Corp.

REFORMULATED GASOLINE

Major oil companies have announced a willingness to tinker with gasoline's chemistry, to make gasoline that produces fewer pollutants. A leading component is methyl tertiary butyl ether (MTBE), used to cut carbon monoxide.

PROS:

- ▶ Could clean up pollution in older cars.
- ▶ Needs no engineering changes to vehicles.
- ▶ Can use current filling stations.

CONS:

- ▶ Could continue U.S. dependence on foreign oil.
- ▶ Non-renewable.
- ▶ Has most of the negatives of conventional gasoline, such as toxicity, potential groundwater pollution, explosive.

"Since it is likely to result in the production of lower volumes of gasoline per barrel of oil, an increase in the supply of crude oil would be required to maintain the current volume of gasoline, increasing U.S. oil imports." — Deborah Gordon, Union of Concerned Scientists.

"We, the auto manufacturers, have been pushing the oil industry to admit that maybe, at a certain expense, gasoline can be formulated to be cleaner." — Francois Castaing, Chrysler Corp.

FUEL CELLS

Fuel cells look like batteries but have a major advantage: the electricity is produced inside the cell itself from a chemical reaction. Fuels like hydrogen, natural gas, methanol and ethanol can be converted to electricity.

PROS:

- ▶ Extremely efficient.
- ▶ Lower levels of all major pollutants.
- ▶ Very low maintenance cost.

CONS:

- ▶ Technology is expensive today.
- ▶ Cost-efficient cells may be 20 years away.

"We don't see a near-term possibility because of the cost — it's very, very expensive... A set of fuel cells to drive an electric vehicle may be more like \$50,000 instead of \$5,000 (for batteries), so we need to get those down to the realm of reason." — Roberta Nichols, Ford Motor Co.

"They're worth waiting for..." — Deborah Gordon, Union of Concerned Scientists

Compiled by Edward K. Miller

OEM Summary (5/14/92)**Heavy Duty (Transit & Other Heavy Trucks, GVW 7-8)**

Cummins L10, 10.0L, 6 cylinder, dedicated natural gas engine for transit buses. Lean burn, Impco mixer, Approximately 120 engines now in service (Flexile, Gillig, Bus Industries), mainly in Canada, Texas, California, Northeast U.S. Closest location to Atlanta is Miami with 5 buses. Projecting an additional 230 buses by year-end 1992. Output increasing from there, but depends on legislation.

Cummins 6C, transit buses, refuse trucks production in 1994 - 1995.

Stewart & Stevenson, DDC 6V92 dual fuel transit bus engine (diesel/natural gas). Lean burn, diesel pilot ignition, about 20 in service now. Add approximately 100 more in 1992, 400 in 1993, 600 in 1994, up to 1,500 in 1996.

Detroit Diesel, 6V92 dedicated natural gas transit bus engine, lean burn, direct autoinjection. Commercially available in 1993.

Mack Truck, EM7- 300G, 12.0L lean burn dedicated natural gas engine for refuse haulers and HD Trucks. Commercially available in 1994.

Medium Duty (School Bus, Delivery & Other Medium Trucks, GVW 3-6)

General Motors, 427 C.I.D., 7.0L, stoichiometric, Tecogen engine on BlueBird School Buses. Approximately 20 delivered to California School districts. Projections are for 400 - 600 in 1992, 1,000 in 1993, 2,000 in 1994, and 3,000 - 5,000 in 1995-96.

Cummins, 6B, 6 cylinder, 5.9L dedicated lean burn engine for school buses, delivery vehicles, utility vans. Commercially available in 1994.

Hercules, 3.7L 4 cylinder, lean burn, dedicated natural gas engine for shuttle buses, light delivery vehicles. Approximately 10 on road now, produce 50 in 1992, 500 in 1993, and increasing from there.

Hercules, 5.6L 6 cylinder, lean burn, dedicated natural gas engine for school buses, delivery trucks, utility vehicles. Building units for Thomas Bilt, Carpenter, Wayne, Ward/Amtram. Currently about 150 on road now, produce 200 more in 1992, up to 2,000 in 1993, and increase from there.

Navistar, 7.3L, V8 lean burn, dedicated natural gas school bus and other medium duty engine. Commercially available in 1995.

Light Duty

GM, 3/4 ton 5.7L Sierra Pickup

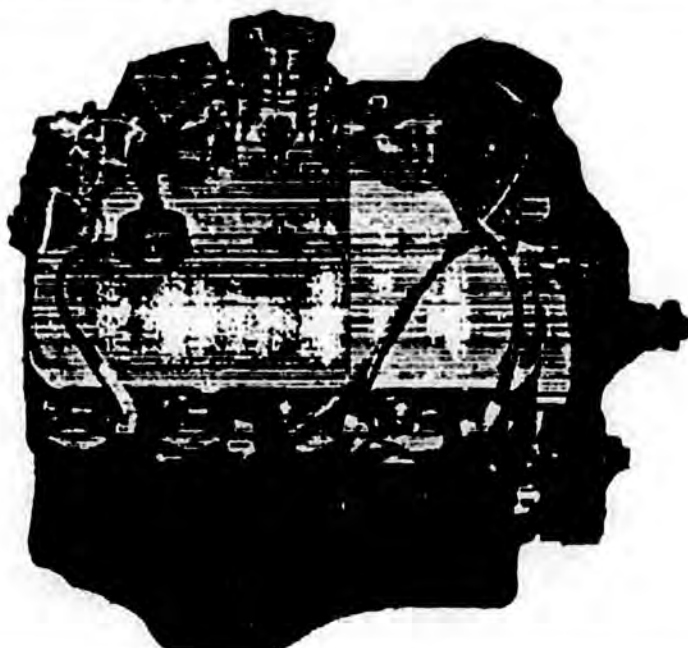
Ford, Econoline van, F150, 3/4 ton pickup, 4.9L engine, demonstration currently, 200 - 600 pilot program by 1994, hopefully up between 10,000 and 50,000 by 1996.

Ford, Crown Victoria, 4.6L dedicated natural gas engine, 40 demonstration vehicles on road now, additional amount depend on Nat. Energy Strategy and other Legislation.

Chrysler, Fullsize B van, 5.2L dedicated natural gas engine. Orders out now for 450, hopefully produce 2500 in 1993, 5,000 in 1994. Intend to add caravan, voyager in 1994.



CLASS 636 LPG FUEL HEAVY DUTY ENGINE



General Specifications

Basic Engine	4 cycle
Model	636L
Number of Cylinders	8
Air System	Naturally Aspirated(NA) or Boosted(B)
Ignition	Electronic Multiple Spark Discharge
Bore and Stroke	4.5 in x 5.0 in (114 mm x 127 mm)
Displacement	636 cu in (10.4 liters)
Compression Ratio	9.0 to 1(NA)(B)
Dimensions: (approx.)	
Length	31.5 in (800 mm)(NA) - 36.0 in (914 mm)(B)
Width	28.5 in (724 mm)
Height	29.6 in (752 mm)(NA) - 39.6 in (1006 mm)(B)
Weight (dry)	830 lbs (377 kg)(NA) - 910 lbs (414 kg)(B)

Rated Power Output

Gross Power	360 BHP (269 kW) @ 2800 RPM(NA)
	520 BHP (388 kW) @ 3000 RPM(B)
Peak Torque	640 lb. ft. (870 N·m) @ 1880 (NA)
	920 lb. ft. (1251 N·m) @ 1880 (B)

Exhaust Emissions (as good as)

CO (Carbon Monoxide) %	Idle - .008	2800 RPM - NIL
HC (Hydro Carbons) PPM	Idle - 15	2800 RPM - 10

Equipment Specifications

Cylinder Head Design - ACE high quality cast iron canted valve wedge utilizing Stellite face chrome stem severe duty valves and Stellite valve seats
- exhaust port bolt flange patterns are available in either large block Ford or Chevrolet configurations.

Quiet, Smooth Operation - ACE tru-balance components and assembly process provides quiet and smooth engine operation from idle through full power.

Piston Rings - ACE severe duty barrel chrome face ductile iron rings provide long life sealing and service.

Oil System - ACE oil control system utilizes a high volume, heavy duty oil pump with chrome moly drive and thermatically controlled filtration and cooling components.

Aluminum Intake manifold and valve covers

Pistons - ACE high silicon forged aluminum pistons

Crankshaft - ACE forged steel billet crankshaft

Rods - ACE 4340 forged steel connecting rods

Distributor

J. D. Ryan
ACE Power Systems, Inc.
4991 South Elmira, Ste. 200
Englewood, CO 80111
Telephone: (303) 694-9684
FAX: (303) 770-8013

DEPARTMENT OF ENERGY HOTLINE

The U.S. Department of Energy (DOE) has established a toll-free telephone hotline that callers may use to obtain answers to questions about alternative-fuel vehicles and to request related publications.

DOE says callers also will have access to information from the federal Alternative Fuels Data Center, located at the National Renewable Energy Laboratory in Golden, Colo. The center collects data on fleet vehicles used in government and in demonstration projects, and identifies filling stations that serve alternative-fuel vehicles in the United states.

The DOE hotline can be reached between 10 a.m. and 6 p.m. eastern standard time. Outside the Washington, D.C., area, dial 1-800-423-1DOE. Local callers may use the toll-free number or telephone 202-554-5047.

FISCAL NOTE

STATE OF ALASKA
1994 LEGISLATIVE SESSION

BILL NO. CS HCR 12 (O&G)

Revision Date: _____
 Title: A Resolution Relating to the Use of
Natural Gas in Alaska
 Sponsor: Representative Finkelstein
 Requestor: House Oil & Gas Committee

Department Affected: Environmental
Conservation
 BRU: Environmental Quality
 Component: Air Quality Management

COMPONENT SERIAL NO. 1428

Expenditures/Revenues:

(Thousands of Dollars)

OPERATING EXPENDITURES	FY 95	FY 96	FY 97	FY 98	FY 99	FY 00
PERSONAL SERVICES	0.0	0.0	0.0	0.0	0.0	0.0
TRAVEL	0.0	0.0	0.0	0.0	0.0	0.0
CONTRACTUAL	0.0	0.0	0.0	0.0	0.0	0.0
SUPPLIES	0.0	0.0	0.0	0.0	0.0	0.0
EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0
LAND&STRUCTURES	0.0	0.0	0.0	0.0	0.0	0.0
GRANTS, CLAIMS	0.0	0.0	0.0	0.0	0.0	0.0
MISCELLANEOUS	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL OPERATING	0.0	0.0	0.0	0.0	0.0	0.0

CAPITAL EXPENDITURES	0.0	0.0	0.0	0.0	0.0	0.0
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CHANGE IN REVENUES ()	0.0	0.0	0.0	0.0	0.0	0.0
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FUND SOURCE

1002 Federal Recei	0.0	0.0	0.0	0.0	0.0	0.0
1003 GF Match	0.0	0.0	0.0	0.0	0.0	0.0
1004 GF	0.0	0.0	0.0	0.0	0.0	0.0
1005 GF/Program Receipt	0.0	0.0	0.0	0.0	0.0	0.0
1006 GF/MHTIA	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0

Estimate of any current year (FY94) cost: \$ _____

POSITIONS:

FULL-TIME	0.0	0.0	0.0	0.0	0.0	0.0
PART-TIME	0.0	0.0	0.0	0.0	0.0	0.0
TEMPORARY	0.0	0.0	0.0	0.0	0.0	0.0

ANALYSIS: (Attach a separate page if necessary.)

Prepared by: Bob Poe, Director
 Division: Information & Administrative Services

Phone: 465-5010
 Date: 2/14/94

Approved by Commissioner: Sam O. Vander
 Agency: Department of Environmental Conservation

Date: 2/14/94

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Copies of minutes listed below were originally included in this file. The minutes are available on the legislative computer database. In order to save space copies of minutes have not been left in the files.

Mary Pagenkopf

4/7/93 - 5:00 p.m. - House Special Committee on Oil & Gas