1 DEPARTMENT OF ENERGY

2 QUADRENNIAL TECHNOLOGY REVIEW

3 VEHICLE EFFICIENCY AND ELECTRIFICATION WORKSHOP

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10 TRANSCRIPT OF PROCEEDINGS

11 May 5, 2011

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21 Location: 401 W. Summit Street, Knoxville, Tennessee

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1 DEPARTMENT OF ENERGY - QUADRENNIAL TECHNOLOGY REVIEW

2 VEHICLE EFFICIENCY AND ELECTRIFICATION WORKSHOP

3 Thursday, May 5, 2011

4 (Proceedings were held off mic')

5 XXX: Our goal is to do a

6 deeper discussion, typically, a bit more

7 focused as a result of yesterday's day. I've

8 got a new set of questions that the team has

9 formulated over night to try to prod

10 discussion. We don't have a projector. Do we

11 have them in hard copy -- or I can just read

12 through them. Maybe we should just go around

13 the table first.

14 (Participants introduce themselves off mic')

15 XXX: And we will be

16 transcribed, but again anonymously and this

17 discussion will get posted also, but an

18 anonymous transcript. I've got a list of

19 questions here and maybe we'll work through

20 them, and again, let the conversation go where

21 it might. Let me put the first two on the

22 table. How much is it the department's job to

23 understand the demand side that clearly was

24 crucial to a lot of what we were talking about

25 yesterday. You are in the demand side

1 business -- most of you -- and how much is the
2 department's responsibility and how much is the
3 industry or the private sector's
4 responsibility, and then what role --
5 related -- what role does market research play
6 in the QTR and the way in which we assess
7 technologies? So how much does the consumer
8 have a voice in this and who gets to elicit
9 that voice or who should be eliciting that
10 voice? Any private sectors? Maybe I'll start
11 with that. Fill the floor open for reactions.
12
13 XXX: Actually, the one thing I
14 had circled coming in, is DOE needs to do a
15 much better job understanding customers. And I
16 don't think you can rely on the private
17 industry for the simple reason that the
18 industry can make a lot of money on niche
19 markets, and I think a lot of what's happening
20 out there is confusion between niche markets
21 and mass markets. They are very different
22 customers. They have very different
23 requirements. And success in a niche market is
24 sometimes -- has almost no relationship to
25 success on a mass market, so I do think it's

1 very important for DOE to understand that rule
2 much, much better. By primary example, these
3 battery electric vehicles and recharge time.
4 This recharge, for a niche market, it's not
5 that big a deal, for a mass market, it's a deal
6 breaker.
7 XXX: So someone made the, to
8 me, surprisingly remark that no technology had
9 ever successfully been demonstrated in a fleet
10 and then transferred to the mass market; is
11 that true?
12 XXX: I think if you define fleet
13 as specialized vehicles, it's true. If you
14 define fleet as the higher volume purchasers of
15 standard vehicles, I believe it's not true.
16 You have natural gas, probably being a good
17 example.
18 XXX: There is no mass market for
19 natural gas vehicles.
20 XXX: There is a growing mass
21 market in other countries. There's a growing
22 market in Canada.
23 XXX: I'm not sure about that.
24 XXX: The only place I know of
25 where natural gas vehicles have been successful

1 is when they have been heavily subsidized.
2 Italy, which is in of their subsidies, the
3 natural gas sales have plummeted.
4 XXX: Certainly the heavy duty
5 market and buses is going --
6 XXX: It's essentially going to be
7 the standard.
8 XXX: And you're going to see it
9 in fleets. I mean, fleets are not going to
10 control their own destiny in natural gas. It's
11 just going to happen.
12 XXX: I see an infrastructure
13 starting to go on in California that's --
14 XXX: If you're a city consuming
15 natural gas --
16 XXX: Consumer clean energy, I
17 think is starting to put in pumps at Pilot
18 stations for natural gas vehicles.
19 XXX: Where I think we may be
20 talking past each other, is I wouldn't suggest
21 that the fleet experience is an indicator of
22 consumer acceptance. The use of the fleet is
23 to have a controlled environment to test and
24 refine the technology. So the fleet experience
25 is not the prove point that it's the right

1 answer for the mass market, but it does provide
2 the opportunity for refinement of the
3 technology in a controlled way whether it began
4 with connected vehicles and the fleet
5 management of routing or, you know, we'll run a
6 certain engine in the fleet just to get miles
7 on it and monitor. I think you're thinking --
8 you know if I can see how you are generally
9 approaching it, I would totally agree with you.
10 The fleet does not represent market acceptance,
11 it doesn't give you consumer acceptance, it's
12 just a place where OEM's can do controlled
13 limited volume runs and wash out the bugs
14 before we hand it to consumers.
15 XXX: I think we have a little bit
16 of a definition issue here, too. For example,
17 in the heavy duty world that Wayne and I live
18 in, the refuse vehicles for example, the entire
19 mass market is 4,000 units. That's just a good
20 size test fleet for General Motors, but that's
21 our entire market, so -- in that particular
22 niche, so I think we probably have to be
23 careful with what we're talking about here.
24 XXX: So why don't we stick to
25 light-duty vehicles and passenger cars.

1 XXX: Taxis, we throw, often
2 because the controlled environment, the
3 maintenance, they can be inspected, you know,
4 we'll put in new material in a taxi fleet just
5 to get miles on it. So think of it as a
6 technology refinement test, not as a what does
7 this mean the consumer is going to pay.
8 XXX: Just a couple of comments on
9 that. I'm observing more electric -- I mean, I
10 watch the natural gas and agree that natural
11 gas, especially in southern Canada move in
12 fleets and never very -- and then you move out
13 of that area of the general market. The
14 electric vehicles in particular, one thing
15 we've seen is fleets, a lot of people have
16 thought, oh, California, fleets are a place we
17 should put electric vehicles. Fleets or
18 plug-in hybrids. We've seen a lot of problems
19 in that area mainly because of the nighttime
20 charging versus daytime charging, as much as
21 many of the fleets we've seen as vehicles get
22 charged -- the vehicle gets charged as soon as
23 it comes in so we don't learn enough about the
24 household market, so that's probably -- also
25 one of the areas that -- you know, you'll see

1 someone like Google get a bunch plug-in
2 hybrids, and then you end up seeing the data
3 come back from those, and it's just not much
4 use to us because people are taking them out to
5 lunch and they're not really driving them very
6 far, and so the fleet market for electric
7 vehicles and plug-in hybrids has often been
8 disappointing. They don't put the miles on
9 them. They aren't in the application, even the
10 demonstration, so that's -- been some
11 disappointments there.
12 XXX: I think that, you know, the
13 question relative to your position is: I know
14 how hard it is, and how few companies are good
15 at, Apple being probably one of the best
16 recent, judging consumer behavior and
17 acceptance of a white space technology. It is
18 one of the hardest things to do. It's hard
19 enough to read our consumers on the changes I
20 do on the next, you know, next model of base
21 vehicles. I would argue consumer acceptance
22 opinion is extremely important. I question the
23 ability of the Department of Energy to study
24 this effective. I just -- I know how hard it
25 is for us and our fortune depends on it,

1 particularly white space. I do see a role or
2 them providing the venue, the infrastructure,
3 the mechanics, the sponsoring of early demo
4 fleets to study, but to pretend to draw
5 conclusions about what the consumer is going to
6 accept, I'd argue five years out depending, 20
7 years out, I think it's laudable, but on the
8 list.
9 XXX: So that would argue for a
10 strategy where we sit, to really, almost
11 technology, not quite agnostic, but very basic
12 research, and the industry will know best what
13 the consumers are doing. We should leave all
14 the rest of them because they --
15 XXX: But there is a sponsorship
16 of the early fleets and --
17 XXX: And we're going to come
18 to that in s minute.
19 XXX: Yeah, but actually, your
20 conclusion I completely agree with. And that's
21 part of the reason I keep trying, I've been
22 doing this for years, every chance I get to try
23 to push DOE to focus more on basic research.
24 And that's because nobody really knows how and
25 when the mass market is going to hold to with

1 technology.

2 XXX: I will say that in other

3 context, DOE has played a very important role

4 in helping in terms of efficiency. You see,

5 that's what energy star do -- the energy star

6 program, the appliance efficiency standards

7 clearly says, and in so doing helps promote the

8 use of --

9 XXX: So that's a regulatory

10 function.

11 XXX: It is a regulatory function,

12 but at the same time, it does suggest that

13 there is a role within the context of

14 understanding and providing information that

15 will help guide the market, so to speak,

16 towards the --

17 XXX: So we have internal

18 review (indiscernible) -- I don't think you've

19 seen it -- been talking about three different

20 kinds of roles for DOE and energy, and one is

21 this informational role which you were just

22 talking about, both to guide regulators,

23 perhaps to educate consumers and where we are

24 talking about when it begins. A second is what

25 we call a capability role, where you do the

1 basic research, will you gain enough knowledge
2 to know what's going on in batteries and
3 hybrids and control, but you do not push very
4 hard in the sense of trying to demonstrate.
5 And then there is a third role, the technology
6 push role, where you say, okay, by God, we are
7 going to facilitate the department of a million
8 hybrids or whatever it is that you want to do.
9 And it's interesting to hear you talking about
10 the same things, and frankly, the different
11 emphases on those things that we hear across
12 the board, et cetera.
13 XXX: I think that there is, in
14 those and in the push, and you're already doing
15 it with the ECOtality demonstrations for
16 example, there is a need as you purported for
17 knowledge about, said this yesterday in our
18 group, travel behavior. Of course, I'm
19 self-serving here, travel behavior researcher,
20 but it's really important for the development
21 of the infrastructure, the details putting
22 together an electrical system and a travel
23 system, and the behavior of people, how people
24 use their cars, when they park them. And I can
25 give you a little piece of information out of

1 yesterday from what I researched that kind of
2 jumped out at me from one of my researchers is,
3 if you have a fast charge system, we have these
4 assumptions how that's going to work, we have
5 to realize ahead of time that it might be used
6 three or four times as much on one day of the
7 week as it is on another day of the week.
8 There is issues for that, there's reasons in
9 travel behavior and the way cars are charged
10 that may lead to that type of system issues and
11 distribution. So we really -- we need those
12 demonstrations -- a lot of careful -- and some
13 of that can't just be received from just GPS
14 data off the vehicles for example. There has
15 to be interview data. If somebody pulls up to
16 a charger and there's somebody else at that
17 charger, they don't use that charger or they
18 park near a charger, and they don't use that
19 charger, we need to know why they're not --
20 XXX: So let me push that over
21 here. Why is it the government's role to do
22 that? The big companies do market research,
23 they do customer behavior research. Obviously,
24 that is important to the projects that I
25 think --

1 XXX: Because it's crossing more
2 than one industry. When it's a single product
3 controlled by one company or industry, I would
4 say it's up to that industry and company to
5 take the risks, test the market. When you're
6 talking about, not how I build my appliance,
7 but how I plug it into the wall and I got to
8 get standards and you are going to have
9 industry investment.
10 XXX: So you've emphasized a
11 lot that you're making the car heavily
12 electronified --
13 XXX: Right.
14 XXX: -- and all kinds of GPS's
15 and COM's and other things, that's certainly
16 crossing industries. The government does not
17 claim a role there.
18 XXX: They are on the leasing
19 spectrum. They are on the infrastructure part.
20 And I would also say other countries,
21 Singapore, China are providing venues for
22 testing experience. The difference is, I would
23 say, in automotive on the input team inside, to
24 date, most of it has been carried over from the
25 consumer electronics world. Where the

1 government does help us is when we set up our
2 911 safety and security lines, so if all we're
3 doing is reapplying, you know, the third party
4 device technology in the vehicle then --
5 XXX: The other issue is relying
6 on industry for information is that if they
7 think there's a competitive element to their
8 data, they're not going to share it.
9 XXX: Yeah, I've experienced that
10 for 25 years of research in this area. My --
11 Dan Sperling is always saying, why don't you
12 work with GM or Ford and do market studies with
13 GM and Ford. I keep telling him for 25 years
14 now that that stuff -- if they find anything
15 interesting, that's the last thing they're
16 going to show anyway. That's really important
17 information. And so I've played this role in
18 California duplicating the best I can with sort
19 of an academic budget, but I don't have the
20 budget, marketing and research budget that a
21 big company does, but to provide some
22 background to, well, what is possible with
23 different types of technology, what's the
24 market going to look like, or what would
25 vehicles look like, how many households are set

1 up, for example, could actually put a charger
2 in their garage or if their driveways are
3 configured properly for where they park the
4 car. So we need that research done for the
5 State of California. To some extent there are
6 such industries that might be willing, but
7 experience so far, some of them like OnStar,
8 they -- the information on board that vehicle,
9 it's proprietary and that's where they make
10 their money.
11 XXX: I think in that case it's
12 because it's confidential in the agreement with
13 the customer.
14 XXX: And there's the
15 confidentiality, but there are probably
16 valuable things in there.
17 XXX: Yeah, we're not going to
18 tell our competitors our --
19 XXX: To the extent we can set up
20 a, you know, one perhaps (indiscernible) and
21 apply to the (indiscernible) to the extent that
22 it addresses market barriers particularly to
23 the alternative vehicle market, I think there
24 is an appropriate role with DOE to help look at
25 their information and symmetry, look at

1 information barriers, barriers in terms of
2 consumer information, and understanding, you
3 know, what those barriers are, is part parcel
4 of, I think, what they're asking, which is, you
5 know, what extent can DOE's role play in
6 understanding those barriers, and that's --
7 part of that's consumer market information.
8 XXX: We talked a little bit about
9 it yesterday during the breakouts. You know,
10 when you look at the DOE portfolios and what
11 you'll find, there's a lot of this towards
12 either basic science or applications, but it's
13 always technical or 98 percent of it. And
14 there's definitely the side of the market that
15 search, that go to the consumer behavior and
16 the social side of it, which really needs to be
17 understood better because it might actually be
18 the Cafe (indiscernible). You know, people
19 feel that's normal (indiscernible) and for me
20 it actually makes (indiscernible) the
21 government to start putting a small chunk of
22 the budget, you know, one percent of one
23 percent or something.
24 XXX: That doesn't do any wonders
25 for somebody keeping those aids, you know,

1 whether they are universities or national labs
2 to come up with something better than that. It
3 doesn't seem to be getting much attraction, you
4 know, I really haven't seen the FOAs (phonetic)
5 in that area.
6 XXX: We have not embraced
7 that.
8 XXX: Yeah, and I think it takes
9 very little, you know, labs -- you know,
10 surveys and stuff --
11 XXX: But people who do this for a
12 living.
13 XXX: It takes quite a bit.
14 XXX: You don't underestimate the
15 market -- the market research budget. It is
16 done well, extensively. Because you're right,
17 the only way to get it is focus groups,
18 interviews, not -- we do online surveys, and we
19 have learned how to cull out of that, but when
20 we want real data, it is expensive. You put
21 people in cars and they --
22 XXX: We tracked -- okay -- so we
23 tracked -- we had a project for two years of
24 the plug-in hybrids. We had 14 vehicles, which
25 included 80 households for eight weeks a piece.

1 XXX: Fourteen vehicles --

2 XXX: We rotated them through

3 households over a two year period and so --

4 well, we had to buy those vehicles and we

5 (indiscernible), that was part of the project.

6 So we had a team of eight researchers who

7 interviewed, so eight hours of interviews per

8 household and all the GPS data. We were

9 working with Idaho National Labs, anyway, we

10 spent over a million dollars.

11 XXX: But, you know, try to

12 compare it with like you buy only a laser for a

13 million dollars to start your research.

14 XXX: Well, yeah, I saw the other

15 day, NASA spent 2 billion dollars on some thing

16 that's looking at antimatter in space, and I

17 thought 2 billion dollars is what we spent on

18 incentive for electric vehicles.

19 XXX: So there's an interesting

20 trade-off when getting into experiment design,

21 but know, do you really need to do 15 really in

22 depth things, or if you had 100,000 less highly

23 resolved data, that might tell you more or less

24 same sort of -- or at least things you would be

25 interested to know.

1 XXX: But I think the fundamental
2 question, XXX, is; Why is that the
3 department's charge?
4 XXX: Well, that's a good
5 question.
6 XXX: Who is the customer for the
7 data? What are you going to do with it? And
8 my experience in this is dabbling, either you
9 do it, and you do it right, which takes a lot
10 of money, a lot of effort, a lot of new core
11 confidences. The worst thing you can do is
12 dabble in the social sciences. I mean, we
13 don't have to follow the sociologist or lots of
14 university partners because this is not physics
15 and chemistry here.
16 XXX: So there's a specific
17 program with both of your reactions here. In
18 the Recovery Act there's the 400 million dollar
19 transport electrification program, and GM won
20 one of those programs and ECOtality and Coola
21 (phonetic) and Marta were major winners. So
22 this would put 13,000 vehicles and 22,000
23 chargers in about 20 states. Oregon, which is
24 the big place here. All the data from this
25 program is supposed to go through Oak Ridge.

1 There will be a dash board that will display
2 driving behavior, charging behavior, and from
3 the DOE standpoint, making this data available
4 allows industry, allows investors, consumers to
5 understand how the technology works, understand
6 he risks, understand the requirements and could
7 ease and accelerate the fall on private sector
8 funding -- private sector funding and consumer
9 purchases. Does this state what you see DOE's
10 role to be?
11 XXX: I have a perspective on
12 that. So let's just talk about the charging
13 station, what piece of that would be
14 (indiscernible). I was at the EDTA conference
15 here last week in Washington D.C. and it was
16 really interesting how small their presence was
17 there, and then I saw GE, Siemens and then my
18 company had these massive booths showing
19 vehicle charging stations, and the take away I
20 have from that is as soon as that money is
21 gone, which I think is at the end of this year,
22 I think it's very likely that those two
23 companies, ECO and (indiscernible) included are
24 going to go bankrupt, are going to go out of
25 business, and the big guys are going to come in

1 and take over that business because they have a
2 business model that doesn't work, and so I
3 would contend that you'll get some good
4 research data on vehicle usage and customer
5 usage, but as far as promoting the industry,
6 you probably slowed it down because if we're
7 going to have to have a complete change of
8 players now, and you get a business model that
9 actually works for the charging stations.
10 XXX: Okay. So if we slowed it
11 down what would've happened if we hadn't -- we
12 would've got money -- do you think the private
13 sector would collect their 2,000 vehicles.
14 XXX: I think because of the way
15 that the money was given that they could do
16 whatever they wanted with it. They -- for
17 example, in this particular case, what they did
18 is, they ended up giving away the charging
19 stations for free to anyone who wanted them,
20 and then they're trying to make their money on
21 this backend business model, and that's not the
22 way it's going to be long term. I'm sure
23 people are going to have to buy the charging
24 stations, and so it's interrupted the actual
25 natural progression of business a little bit.

1 I'm not saying it was a bad thing because I
2 think it did promote electric vehicles and it's
3 going to get the data out there early and --
4 XXX: So as long as you raise
5 the infrastructure issues, let me put another
6 principle on the behavioral issue later.
7 Correct me if I'm wrong, but I think for the
8 grid and for the pipeline and natural gas
9 system, the government (indiscernible)
10 distribution infrastructures, filling stations.
11 The government does not own or operate those
12 aspects. They are in private hands that have
13 been built by the private sector plus, the
14 million bucks to build the station.
15 XXX: Those are two interesting
16 when together because in the case --
17 XXX: Let me get the thought
18 out, okay.
19 XXX: Oh, okay.
20 XXX: Maybe there is a role to
21 getting -- for the government to help getting
22 the first bit of infrastructure out for
23 electricity, for hydrogen, for CNG, but where
24 do you stop. When do you declare victory for
25 the government and say it's in the private

1 sector's hands.

2 XXX: In those two examples you

3 gave, the grid is a federally controlled

4 regulation because for example, you can run

5 electric wires across interstate lines. You

6 cannot do that with natural gas.

7 XXX: No. But the local

8 substations and all the stuff down at the local

9 level is all in private hands.

10 XXX: That's all in private hands.

11 The point I was trying to make is, even on the

12 two that we use as examples, are we --

13 XXX: There is federal

14 principle, yes.

15 XXX: As a country, we are very

16 inconsistent.

17 XXX: There is two barriers to

18 early implementation, when as a combination of

19 an infrastructure in an appliance way. One is

20 the chicken-egg syndrome, where it might be

21 appropriate for the government to play the

22 catalyzing role to overcome the initial

23 investment and uncertainty barriers. The other

24 one is during this early period of what I will

25 call experimentation until the standard is

1 clear. So it's that data gathering learning
2 part where again the experimentation is
3 coordinating a bunch of others and my questions
4 shouldn't have been (indiscernible) for you
5 DOE, I don't really care, but somebody's got to
6 pull that together, and if you're doing
7 something for social good, that is not
8 necessarily a consumer valueful equation in
9 comparison to phone -- you know, cell phones
10 and things, even then, the government
11 (indiscernible), catalyzing that initial
12 investment once those two are accomplished, if
13 the market forces aren't pulling it, it's
14 that -- and so, I think, if you, you know,
15 define the role as facilitating and priming the
16 pump of the experimentation phase. If you want
17 to get into deployment issues, that's where you
18 get to using government vehicles, using taxes,
19 you know, then you're in policy.
20 XXX: Where is the boundary
21 line between demonstration and deployment for
22 your business for vehicles.
23 XXX: When it's clear, it's clear
24 of which -- which are the main approach -- the
25 main approach that's going to work.

1 XXX: So when do we down select
2 to use the jargon of yesterday.
3 XXX: And have had -- having
4 enough initial trial period so that you know
5 where you're going, and it's going to be great.
6 XXX: I'm piling up points here.
7 XXX: All right. You've got
8 the floor for a minute.
9 XXX: I see (indiscernible) at a
10 station between demonstration and deployment of
11 vehicles and infrastructure because I actually
12 don't think that DOE can be very effective on
13 the vehicle deployment side. (Indiscernible) I
14 think, showed us, yeah, we're going to get some
15 valuable consumer information out of these
16 programs we talked about earlier, but you
17 could've gotten that same consumer information
18 out of a much, much smaller program.
19 XXX: Much, much --
20 XXX: Smaller program.
21 XXX: Really. We'll come back
22 to that.
23 XXX: And so where most of the
24 money is gone is to install infrastructure that
25 may or may not be used. Second point, on the

1 infrastructure side, what Germany is doing with
2 hydrogen infrastructure is, they're intending
3 to end their subsidies when they get to a
4 certain number of in-use vehicles per service
5 station, and they actually have a criteria that
6 they've established for when they no longer
7 need subsidies. And so, you know, it is very
8 possible on the infrastructure side to set up
9 criteria for when you start subsidies, when you
10 end them, how you -- where you put them
11 regionally. I mean, it would be a lot of work
12 but it is possible.
13 XXX: No doubt the corn ethanol
14 folks pulled that same story 15 years ago.
15 XXX: Probably, but if we'd
16 actually applied genuine criteria to --
17 XXX: Yeah, all right.
18 XXX: -- E85 refueling stations on
19 how much they're used, we wouldn't be putting
20 anymore money into it because they're not being
21 used.
22 XXX: I just cited as an
23 example where subsidies have not disappeared.
24 XXX: Yes, and so you need
25 criteria for when you -- that happens. And my

1 last point is one that I'm actually cycling way
2 back to the whole reason why DOE needs to
3 understand consumers better. I don't look at
4 it as helping with the plan or anything else,
5 it's really more to help you focus on where you
6 should be putting your research dollars. For
7 example, hydrogen has been written off because
8 it has some enormous challenges, and I'm not
9 going to dispute that. It has enormous
10 challenges, but 30-minute recharge times,
11 you're never going to have a mass market, and
12 that's the one thing fuel cells have, that is
13 fast recharge.
14 XXX: Right. Yeah, I -- when
15 will the extended-range EVs also have fast
16 recharge?
17 XXX: There -- yeah, and the
18 issues with extended-range EVs are completely
19 different.
20 XXX: Yes.
21 XXX: And so that's a whole
22 another discussion so...
23 XXX: Can you really have
24 gotten the same data with the cheaper stuff
25 than your million dollars?

1 XXX: Consumer data.

2 XXX: Yeah, consumer data.

3 XXX: Yeah, volume is kind of

4 interesting. There's sort of these different

5 levels of research that I keep returning to,

6 you know, we have our very detailed ones and a

7 smaller sample and we get some interesting data

8 out of it. Now we're working at its larger

9 level, primarily in San Diego area so I am --

10 so we are going to study the use -- we're in on

11 the ECOtality and study San Diego. I'm

12 thrilled about it, I've got a whole team there

13 looking at how it's -- I think that there is an

14 issue to dabble -- dabbling as XXX says, and

15 that's, you know I've just finished BMW project

16 which was with a small group and another larger

17 group with a mini (indiscernible) so I have a

18 final report on that. We did not get

19 instrument vehicles, and this was the major

20 limitation for us. We did not put data

21 gathering on board the vehicles because of

22 privacy and such, so that --

23 XXX: What you want is location

24 or you want more vehicle performance --

25 XXX: We needed -- yeah, we needed

1 location, you know, there's two ways in which
2 you really need an objective measurement of
3 when people charge, where they charge, how they
4 did it, where they travel, people with recall
5 or even diaries in transportation research are
6 always a distant second best to objectively
7 measurement --
8 XXX: That's because you asked
9 instead of asking Apple for the iPhone --
10 XXX: What we're using -- that's
11 our next thing, we're putting iphones in all of
12 our cars 'cause people like to have an app, so
13 my students have designed these apps for
14 following people on an iPad. So anyway, it's
15 voluntary. Actually we get good compliance.
16 You know, one thing one these projects with the
17 privacy concern, being the University, at
18 least, we can ask, you know, 200 people in the
19 BMW project, will you let us follow you around,
20 and they -- a lot of people agreed with it. So
21 we get a pretty good set that way and we
22 don't -- we don't do it behind their backs at
23 all. So -- we can't. In terms of a sample
24 size, I think that -- I mean that's a
25 challenge. It's moving up sample size and

1 doing a good job like a large company does to
2 be able to say -- I mean, like the State of
3 California needs because we're going to put
4 renewables in our grid, we're trying to do all
5 of these things at the same time for energy,
6 which I think the federal government's thinking
7 about doing -- trying to do some of those same
8 things is we really need to know the best we
9 can how many electric vehicles with what size
10 batteries and what time of the day are going to
11 be recharging in 2020, 2025, 2030, 2035. We
12 need the best shot at understanding that as we
13 try to go for 33 percent renewables to
14 integrate those systems, and meet our goals.
15 Forty percent of our greenhouse gases in
16 California are from the transport sector, and
17 so as for -- I mean, the efficiency is
18 obviously going to be 50 percent of that, but
19 we also want to use this in our grid.
20 XXX: So beyond getting the
21 data, which sounds like a challenge of interest
22 and so on.
23 XXX: Sure but that's what that
24 data is for.
25 XXX: Fine. If you understand

1 it and people already thought about what the
2 contingency responses are. Suppose you find
3 out everybody's charging at two in the
4 afternoon, what are the implications of that?
5 Nobody can find public charging infrastructure
6 because it's all taken every time.
7 XXX: How many will we need at
8 each location and which location site to make
9 the whole thing work. As soon as possible we
10 need to know.
11 XXX: Just for clarification, when
12 I was talking about the demonstration program,
13 I meant the one that gave away the 100,000
14 chargers not what Tom's doing.
15 XXX: Well, so -- we need to
16 clarify that kind of distinction. Giving away
17 100,000 chargers, tracking doesn't strike me as
18 very reasonable, that's priming the market.
19 XXX: That's my point.
20 XXX: All right. Which, you
21 know, the end for business that's great for --
22 that's the government's role. You give away
23 100,000 chargers, you'll be giving away 100,000
24 home reformers for hydrogen.
25 XXX: So you're afraid that

1 that --

2 XXX: You haven't gotten the

3 proposal.

4 XXX: Most of that

5 (indiscernible), you know.

6 XXX: Or 100,000 natural gas

7 compressors.

8 XXX: Right.

9 XXX: The information gathering

10 from DOE, I think, is important to the extent

11 that it can help guide future (indiscernible).

12 DOE's planning to have a longer term

13 involvement in this. I think it -- here's DOE

14 actually, and some point of correction, whether

15 DOE does it, whether it's done through a

16 consortium, or through partnerships, like with

17 UC Davis or other universities, I think that

18 that is appropriate with the intent to address

19 the public concern or the public interest on

20 top of -- as well as help guide DOE's programs

21 going forward. I mean, some of the incentive

22 money, I think, is going to be debated forever,

23 but to the extent that DOE is trying to prime

24 the market to get to early deployment in

25 commercialization, there does need to be some

1 information on the consumer end to help guide
2 that. And then, I think, there's a lot of
3 value to some of the programs actually
4 identifying what -- how consumers are, our
5 behavior. Even if it is the early consumer
6 marketplace.
7 XXX: I'd agree with a lot of that
8 and I think the ECOtality project is a good one
9 and (indiscernible) deployment. And they're
10 actually -- they're not giving away chargers, a
11 lot of the businesses where these are being
12 placed, they're having to pay for it. There's
13 only a certain amount allotted to that
14 particular thing, $2,250 plus the charger, and
15 typically these installations are $8, $10,000
16 for a level 2 in a commercial place. Believe
17 me, I put one in front of our place. It was
18 $8,000 just to put in the conduit and the
19 cable, not counting the charger. So they're
20 not for free, but I think we're beginning to
21 see a business model actually arise out of
22 this, and I think it's going to be these EBSE
23 suppliers and the private businesses where
24 they're placed at. We're starting to see this,
25 and I think you'll see them more like a cell

1 phone type of thing service where you buy so
2 many hours. We're starting to kind of see it,
3 and I don't think we even have a market without
4 this infrastructure going in. So I mean, the
5 one thing I think you'll see is, EVs sells are
6 going to be higher where you've got
7 infrastructure. It's kind of no-brainer. It's
8 like that's just what's going to happen. We'll
9 get a lot of great data out of this, and we're
10 looking forward to that. We're working with
11 Idaho National Labs, and we've got some of our
12 own studies connected to it, but I think it's
13 well worth the money there and another program
14 I think you guys do a really good job that
15 works because I work in that part it, is Clean
16 Cities, and that's really an informational type
17 service you're doing there for fleets, and the
18 general public and so on. We do a lot of
19 outreach, and it's really useful to the public.
20 And we had a large booth at the auto show in
21 Portland where we gave out a lot of
22 information. We had a Volt and a LEAF and a
23 lot of charging equipment there, and we were
24 flooded everyday. People want to know this
25 stuff and that's an avenue for hitting the

1 customer, that as a third party, rather than
2 I'm just, you know, I'm GE or whoever, I'm
3 coming in at it as a third party, and I think
4 people get a lot of information and they
5 respect that information.
6 XXX: Another issue is -- and I
7 know (indiscernible), but there are issues,
8 perhaps more of a (indiscernible) issue or a
9 DOT issue or a governmental issue is this whole
10 business of the window sticker for fuel economy
11 and what should the consumer truly expect from
12 (indiscernible) technologies and naturalistic
13 traffic cycles and the people (indiscernible),
14 so before I go make my $40,000 investment or
15 what ever, it would be nice to know what I
16 would really get. You know, this is falling
17 through the cracks or something. I mean, I may
18 have some work in this, but --
19 XXX: I mean, this is so -- I
20 mean for people who understand numbers and
21 technology, I mean, the answer is
22 straightforward, but what really is, is
23 information display condensation exercise
24 involving psychology (indiscernible) all the
25 things you're worried about in the general

1 public, right?

2 XXX: Uh-huh.

3 XXX: Who's the expert in that.

4 XXX: I think you're asking a good

5 question, you know, where's the line, where

6 does DOE come up to, and then where do you let

7 the market take over from that. Clearly, in

8 basic research, DOE's got a role, but to me the

9 tricky part is in this whole deployment area,

10 I'm thinking of an example of a project that I

11 think would be a fantastic one for DOE, and

12 that is, this whole concept of if we as a

13 nation want to embrace the whole micro grid

14 concept. We're not going to be able to do

15 micro grid across the U.S. over night, you

16 know, so we're going to have to start

17 someplace.

18 XXX: Micro grid across the

19 U.S. sounds like a oxymoron.

20 XXX: If we -- so, you know, I

21 read about this. A possibility maybe take a

22 military base or something -- and we do a test.

23 Yeah. To me, that's a natural thing for DOE to

24 be in charge of.

25 XXX: We are.

1 XXX: Because there's not private
2 company who could take that out, you know, it's
3 going to take cooperation on lots of private
4 companies.
5 XXX: There are universities
6 who want to do that sort of thing also, and
7 they're grants to universities who want to turn
8 the campus into a small instrumentic cities.
9 XXX: Yeah. So my point is that I
10 think those are perfect examples of the kind of
11 projects or demonstration deployment, whatever
12 you want to call it. In our world, the
13 SuperTruck, you know, to be honest with you,
14 that couldn't have happened without DOE money.
15 XXX: Because.
16 XXX: Two reasons. One is, it hit
17 our industry at a point when we were all flat
18 on our back because of economic downturn, so we
19 had no money to do it, and two, it cut across
20 multiple companies, and in order to build a --
21 take a look at the advantage that the synergy
22 between all those technologies working together
23 really took something like a DOE SuperTruck to
24 pull it off. It's a little bit different, I
25 think, than the car company, but in the heavy

1 truck world, that was very valuable to us. I
2 don't think it could've happened without the
3 DOE money.
4 XXX: There is one last element
5 I'd put on the table which is we can debate
6 this in isolation of we've walled off the U.S.,
7 part of what needs to be added to the equation
8 is out of engineering centers, research, we
9 sell more vehicles -- we sell more vehicles
10 than China last year in the United States of
11 America and that -- we're number one in both
12 markets, and that nobody ever sees changing.
13 Other countries use their government
14 capabilities whether it's the offsetting of
15 research costs, the offsetting of initial
16 things and so A: A question and factor that
17 needs to be superimposed on this is, if you
18 want the leading edge technology deployed in
19 the U.S. and the fact that I'm a believer of
20 where you do your deployment tends to be where
21 you do your manufacturing, and that's where
22 your engineering goes, and that's where your
23 jobs go, you have to add to the look at what
24 other places are doing if you want to be at the
25 leading edge of the experimentation of

1 limitations, so a very different answer if you
2 just want to say I'm in a free market and
3 everybody's on this lullaby so I'm going to
4 make a clearer distinction between where I stop
5 and where I go, but the fact is, the United
6 States is now in a competition with other
7 countries for that first deployment, and so
8 that's why I do think you've got to benchmark
9 the --
10 XXX: So do we want to be
11 first? You know, why not -- there's another
12 strategy, stand back, let the rest of the world
13 experiment, they're putting in infrastructures,
14 they're buying lots of vehicles, they will do
15 the experiments.
16 XXX: And, you know, I happen to
17 think there's evidence. I'm not a macro
18 economic physicist that says where I start to
19 do my deployments and where I start to need my
20 high tech -- my bleeding edge technology force,
21 it's where my incipient manufacturing begins
22 because a lot of times that early deployment
23 requires local content and so where I do it
24 first as my General Motors hat is probably
25 secondary. My put on, you know, the country

1 where my kids live, I think it's enforced down
2 the line.
3 XXX: So there's attention
4 there, competitiveness aspects as the DOE move
5 their first mover.
6 XXX: If you want it to be the
7 home of leading edge technology --
8 XXX: If you want -- they're
9 higher technologies --
10 XXX: -- and all the resources and
11 goodness --
12 XXX: If I want to do it with
13 confidence maybe I'm waiting on the second.
14 XXX: Yeah, it's the consequence
15 on the rest. If you're letting another country
16 pay for the experimentation phase it's great,
17 but what do you think the second and the third
18 and fourth experiment will be.
19 XXX: I would actually -- I see
20 this as a separate function of DOE, and a
21 complicating function for DOE because I talked
22 earlier that I don't really think
23 demonstration -- large -- very large-scale
24 demonstration as far as deployment I don't
25 think they're very effective.

1 XXX: Can you try to quantify
2 that in -- I think, a hundred thousand
3 vehicles.
4 XXX: Well, it depends on
5 industry, yeah.
6 XXX: All right. Well, we're
7 doing cars here so.
8 XXX: Right, because to me, the
9 biggest thing you want from demonstration
10 programs is simply the information from them
11 and see, the program needs to be big enough to
12 get good information, but if you extend it
13 beyond that for other reasons, I can't see
14 much. And the same thing with deployment
15 programs, it's so difficult to know when
16 technology is ready and is going to be accepted
17 and leave it to the market. But now, you've
18 got attention between that and another role of
19 DOE which is to help simply domestic
20 manufacturing and jobs, and so -- and I think
21 that's what XXX was getting at, is that there
22 is this role here where you do want to try to
23 establish domestic suppliers and manufacturing
24 abilities. Now, how you differ can possibly
25 (indiscernible) a little bit, I don't care

1 where those companies sell it at, whether we're
2 building here and selling in Europe, you know,
3 I'm fine with that, but yeah, there is a role
4 there for DOE. And my suggestion, you know, I
5 guess, would be is to almost work like a
6 venture capital firm works is that you're here
7 to provide capital that some places can't find
8 anyplace else just to get established and
9 going, but you try to do it on a cost spec
10 basis and try to make sure that there's
11 actually a reasonable business plan.
12 XXX: Well, as you probably
13 know, we have an extensive loan guarantee
14 program, grants, and they're not universally
15 popular any more. Although, I think we
16 actually do a pretty good job.
17 XXX: Yeah, and I think that's,
18 you know, as a critical function of DOE, and a
19 lot of it is just on how you manage it.
20 XXX: I would argue that's a
21 critical function of the U.S. government, and
22 the Department of Energy happens to be right
23 the execution for it.
24 XXX: Well, we have the
25 technical expertise --

1 XXX: Yeah.

2 XXX: -- (indiscernible)

3 business and financing.

4 XXX: So on the purposes of the

5 DOE vehicle demonstrations, we've talked about

6 information, we've talked about jobs, U.S.

7 manufacturing, create a couple of middle demand

8 of U.S. manufactures, there is another piece

9 that we think we're planning and we get to hear

10 the group's reaction, which is we're helping

11 accelerate willful coalitions and break down

12 local barriers to adoption. So the 20 cities

13 that got these vehicles kind of, the dollars

14 help catalyze relationships between our local

15 governments, utilities, employers on the ground

16 that help -- that are helping kind of

17 accelerate the time to perm it, helping create

18 incentives, HOV lanes, and you're almost seeing

19 competition among cities, so there's a race to

20 the top model for education that we're seeing

21 in the cities and for example, like in Oregon,

22 there are several best practices that other

23 cities saw, and they're like, wow, in Oregon

24 you can get a permit in 24 hours, why can't we

25 do it in our city. So does this type of local

1 competition, is this a good role for the
2 federal government, and can we do it --
3 personalize it as a role if it is? Are there
4 more effective ways to do it?
5 XXX: What are the exchanges going
6 on between regions right now? How are those 20
7 cities interacting with each other? In what
8 way do they learn about the other and get best
9 practices from it?
10 XXX: As they learn from each
11 other there are quarterly calls among --
12 between cities, pointers. Last year we had a
13 summit where we actually brought everyone in
14 and we identified eight key activities, you
15 know, you could do to make your city EV ready,
16 and then certain cities were further along than
17 others, so we played a committee role there,
18 but I think the actual -- as much as there is
19 information between the cities, it's just
20 getting players within the local region
21 together that -- that has been -- it's actually
22 a very hard thing to do, five different
23 entities that historically have to work
24 together all get in a room. In Oregon there's
25 a ten year head start, but in some cities -- In

1 Chicago where I'm originally from, they haven't
2 really thought about electric vehicles until
3 this carat of money helped bring people to the
4 table.
5 XXX: Let me second that. It
6 was -- we know how to build a car, design it,
7 get it in someone's hands, we started to
8 understand the problem with them installing,
9 you know, not the 220 charger in their thing to
10 the point where we had to go contract with a
11 company and the role of that program in just
12 getting sort of everybody operating to a common
13 or play book, you know finding the best play
14 book and sort of replicating it. It was
15 unbelievable, and it was going to take longer
16 for someone to get a permit and have a charger
17 installed than the rest of the design and build
18 the car, but again that's where you've got a
19 multi-industry and in that case four regulating
20 agencies.
21 XXX: So how -- the existing
22 systems we have, it spans multiple industries,
23 yet it's somehow (indiscernible) different time
24 in the country of course, but was there an
25 active hand at various levels, local, state,

1 federal bringing that all about?

2 XXX: Well, there had been no

3 regulation or incentive calling for it. We

4 wouldn't be approaching a million vehicles in

5 this time. It just wouldn't.

6 XXX: I think in California where

7 we made this attempt in the 90s about we're

8 going to do this in the 90s with electrics, and

9 there's some lessons from that certainly, and I

10 worked on and held through the International

11 Energy Agency, a project we held, energy is

12 with deployment, everything in the 1990s, and

13 we talked about this. You know in California,

14 it didn't come together, you know, sort of the

15 organization for making this thing happen. I

16 mean, it's amazing, we're going through this

17 all over again in what we actually have to do

18 really, and we're really moving forward the

19 market cut -- caught flatfooted, so it is a lot

20 to be done, and we just have to make sure that,

21 certainly in these demonstration projects,

22 again, I want to pound on that information

23 thing because you would have thought that

24 California would have some inkling of what to

25 do about electric vehicle infrastructure. We

1 in 1,400 of them, there's no data on it. At
2 the end of the 1990s we had no data on
3 behavior, use of chargers or anything. There
4 was nothing left over from the 1990s, no scrap,
5 no reports for the ARB or anyone because there
6 was no public data available to anybody, so we
7 had no lessons from the 90s.
8 XXX: Do the charging points
9 still work?
10 XXX: The charging points, they
11 were still there. They're some of them --
12 well, they've, you know, the charger plugs,
13 they've been used by RAV4 owners and a few
14 others, but there was no data collected on the
15 usage of those, there was no data collected
16 when they were EV1's in the state. We have no
17 data on the way they used the charger system.
18 XXX: And tell me, why is that?
19 Is that because it was set up by SEE and they
20 didn't share data or --
21 XXX: No, it was done OEM's,
22 who -- that's important information to them,
23 but ARB who was running it, who was really
24 pushing it, there's nothing put in place that
25 says the State needs a plan and needs this data

1 for the future.

2 XXX: I mean, I was at Honda

3 towards the tail end of that and Honda was only

4 one of two companies that tried to put the

5 enhance of regular consumers, and after it was

6 done, they actually went out and did extensive

7 interviews with over half of the customers and

8 a unbelievable database, never made it public,

9 you know, it's still all confidential.

10 XXX: We had a similar database,

11 but it was our database.

12 XXX: If the DOE were to

13 require the collection and publication of such

14 data as part of this --

15 XXX: Well, right now, we do --

16 the Volt's being done quite differently.

17 XXX: I think some of these

18 deployment programs, you're just deploying

19 hardware, and we're not doing the other part

20 of --

21 XXX: Capturing.

22 XXX: Well, and part of it's also

23 some education because if you look at all these

24 things, there's a premium on the vehicle, a CNG

25 or if it's electric, there's a premium on it

1 and you really need to teach the public that
2 you need to look at the life cycle costs. We
3 keep talking about that, but, you know, they
4 typically just want to look at the first cost
5 all the time, and that's going to be an effort,
6 that's going to be an ongoing educational
7 effort that we've got to do and that should be
8 part of whatever we're deploying.
9 XXX: You also have to remember,
10 XXX, the ubiquitous kind of activity, the
11 cost of collecting the data, the amount of data
12 you can collect is so much easier now that, you
13 know, it's easier to share, it's easier to --
14 you know, it doesn't take ten million dollars
15 to get the information off the smart chargers.
16 XXX: Although, you still have to
17 interpret, and that's --
18 XXX: Oh, no, I said data.
19 XXX: And you have to know what
20 data's missing for example.
21 XXX: We can create an app for
22 that.
23 XXX: You actually had two
24 questions and we gravitated to the second one.
25 XXX: Why don't you remind me

1 what that first one was. They're are all DOE,
2 they're all in (indiscernible).
3 XXX: You launched two questions,
4 the second of which was consumer, the first of
5 which was more getting baseline data.
6 XXX: Yes.
7 XXX: And, you know, I think I
8 mentioned this yesterday when you have
9 industries that are even non-competing, but
10 synergistic and codependent, unless there is a
11 consortium created which, you know, crossing
12 that many industries tends to get difficult, an
13 agency like DOE could be the neutral clearing
14 house and leveling for that information. The
15 companies themselves can sometimes align within
16 a consortium. The chance you'll get hydrogen
17 and energy, oil, you know, all of that pulled
18 together without an -- without someone like the
19 Department of Energy doing it, it won't happen,
20 not in a credible (indiscernible).
21 XXX: Do I need several
22 separate consortia for electricity, for
23 hydrogen, for CNG, presumably not for the
24 hydrogen.
25 XXX: Where the consortia exists,

1 for example, U.S. government, you can use it.
2 Where they don't, you can agreements with
3 collection to key players. To me, it's more
4 the clearing house role than the who you
5 engage.
6 XXX: That's great, but it
7 naturally leads me to the down select roadmap
8 principle clearly creating each one of those
9 consortia, creates perhaps properly an
10 adversity group, an interest group -- oh, let's
11 see, battery -- you can name them as well as I
12 can. And how or what process do we in the end
13 try to bring some resolution among these
14 different groups or do we just let them
15 co-exist in harmony, or what happens when
16 hydrogen folks, you know, my God, you favored
17 the grid people, they're getting ahead, you
18 better do something for me.
19 XXX: The role is, what does the
20 data say. The policy makers then can interpret
21 it.
22 XXX: The role is, what does the
23 data say the policy makers then can interpret
24 it.
25 XXX: I think the DOE needs to

1 remain neutral in fuel energy, and that the
2 marketplace will more or less play it out --
3 XXX: You know, I think that's
4 an unreasonable, idealistic view. We cannot --
5 we may have the resources to support
6 everything, but there will always be a call for
7 greater involvement by the government, the DOE
8 in any of these.
9 XXX: So if natural gas were to
10 really start to take off, is that what the DOE
11 wants?
12 XXX: I think that DOE is not
13 as monolithic as that question.
14 XXX: If the technology were to
15 take off be it whatever fuel it is, I mean the
16 DOE would embrace that even it's not what
17 exactly the direction --
18 XXX: I think if it moves
19 toward the goals of security emissions, we'd
20 probably say, okay, that's the way it's going.
21 XXX: I actually thought that
22 example you gave yesterday was an excellent one
23 where you said, you know, rightly or wrongly 30
24 years ago France made the decision, we're going
25 to go through pure energy, boom, they've done

1 it, and they have an energy policy and we
2 don't, and we're in trouble with foreign oil
3 and they're not.
4 XXX: Well, it's just not
5 oil --
6 XXX: It's still (indiscernible),
7 but not as bad as ours is, and a lot of it's
8 been because of indecisions.
9 XXX: Yeah.
10 XXX: So I actually disagree, I
11 think that -- I think it could be in DOE's
12 remit as part of the federal government to
13 guide us towards -- maybe it's not one, but
14 instead of having six or eight technologies out
15 there maybe, we pick two or three and say those
16 are the ones we're going to push.
17 XXX: And the thing I'm requesting
18 or suggesting is the data to guide that
19 decision. Let me give a parochial example. I
20 cannot continue to take every proposal and fuel
21 alternative forward in this initial scale. I
22 can't. I feel pretty confident in my internal
23 analysis in cost performance projections of the
24 vehicle. I'm vulnerable to, you know,
25 assumptions as best as we can do it that the

1 grid can handle a hundred million vehicles by,
2 pick your year. That hydrogen is going to be
3 $5 a kilogram. I don't know that with a
4 certainty and so -- and I don't know how to get
5 that data because these advocacy numbers. I
6 know how to level it within my business. These
7 advocacy numbers and the distortion that that
8 brings to the table because I'm getting inputs
9 parochial interests the same way they're
10 getting inputs from me that they consider
11 parochial so it's that -- if we were sitting
12 there and have this model with estimates and
13 technically founded, I could make decisions,
14 the government could make decisions, utilities
15 could make decisions, I find that piece of
16 information lacking.
17 XXX: But XXX, I think you've
18 just outlined the case as to why we can't down
19 select now, the information's lacking.
20 XXX: No, I said the information
21 is lacking in availability. What I don't know
22 is, again, a number from the natural gas
23 industry, and again, a number from the oil
24 industry, for each of the swiv (phonetic)
25 lanes, I don't know that they're leveled.

1 XXX: Right, in terms of
2 credibility.
3 XXX: I just don't know if they're
4 at the same level of assumptions.
5 XXX: So how do we, you know,
6 if you don't have the information, what is a
7 sensible plan to get the information? What do
8 you need? What would be the different
9 implications of information going one way or
10 the other, I mean, how do you get it? Do we --
11 XXX: This is where I keep pushing
12 back because we don't even know what the price
13 of gasoline is going to be in a year or two,
14 much less ten or 20 years from now.
15 XXX: Fine, but again, I can
16 take three levels of prices and ask what
17 happens under different assumptions.
18 XXX: And the other thing that you
19 can't predict is what the basic technology
20 developments going to be.
21 XXX: Yes, but you can't use
22 that as an excuse for not doing anything.
23 XXX: You can when the path is not
24 clear. We've seen this before. This country
25 has a history of trying to pick paths

1 prematurely. You know, electric vehicles,
2 fuel-cell vehicles six years ago, we keep
3 trying to force it and it keeps failing. We
4 should learn from that. What we need to learn
5 from that is that DOE needs to promote
6 technology development and innovation and if
7 some genuine breakthrough occurs, then now we
8 will have our path.
9 XXX: But then how do you
10 handle -- that's a world that would be
11 wonderful to be in, but I have governments
12 around the world, including this one, putting
13 regulations in that require us to start to meet
14 those regulations, require us to start fielding
15 these early generation technologies, and so
16 there's two elements of it. I mean, if there
17 was a world of the regulations will follow the
18 capabilities, then your model's fine. What's
19 happening is the regulations are put in place
20 to accelerate the capability so it's forcing us
21 to make decisions and spend money ahead and bet
22 on certain learning curves. So all I know is,
23 each company is probably very good, and each
24 industry will then (indiscernible). The bigger
25 picture gets distorted, so why can't you have a

1 leveling review by -- you know, I think of DOE
2 and the national labs and the technical
3 expertise, and hopefully a neutral stance --
4 XXX: So I'd like to thank the
5 NPC review, which is underway and your
6 involvement, the DOE is sponsored --
7 XXX: The only limitation was, you
8 will only use external studies of studies. So
9 if it was -- the NPC could've then that, but
10 then it would've been needed to executed to a
11 third, neutral, you know, confidential party.
12 It was set up, but it has a boundary condition.
13 XXX: But you have every -- every
14 company withholding information from DOE
15 because it's confidential, and that's often the
16 most critical information there is.
17 XXX: I have under nondisclosure
18 agreement gone down and shown our roadmaps, and
19 I don't think at this point, I'm alone, I think
20 we are the ones who did it first, down to my
21 third generation of powder on the battery in
22 the cost. So the question is, if people are
23 willing to do that --
24 XXX: Two things I'm hearing
25 here, almost opposites. One is, keep doing the

1 research, we don't have the information yet to
2 decide, and the other is make a decision, maybe
3 it's not perfect, but at least it's certainty
4 and we can proceed forward. So let me phrase
5 it another way, which is one of the questions
6 we have written here, do we have time for a
7 decade of experiment or do we need to move more
8 expeditiously.
9 XXX: You know, I've been doing
10 this a long time, it's like you can down select
11 and make decisions all you want, the consumers
12 reject it, they're dead in the water and that's
13 the problem here. I truly don't think -- we're
14 not even close to having the information we
15 need to know what consumers are actually going
16 to accept and what they're going to want in the
17 future, and in this type of regime, we don't
18 have any choice but to experiment because
19 that's the best we can do.
20 XXX: Is it knowable?
21 XXX: Right now I don't think it's
22 knowable.
23 XXX: It's not knowable.
24 XXX: It's not knowable.
25 XXX: So is that zeb (phonetic)

1 mandate consistent with your statement since we
2 have California sitting in the room?
3 XXX: All I want to say about the
4 zeb (phonetic) mandate, because I'd be a little
5 careful here is that, it failed once before.
6 XXX: But it's in place.
7 XXX: Yeah, but, you know, it
8 could very well fail again. Just because you
9 have mandate --
10 XXX: So we keep saying we don't
11 have all the information or we'll never have
12 all the information, but I think we do have
13 some insights, right? I mean, there are some
14 basic facts out there that at some point, we
15 run out of petroleum, you know, it may not be
16 ten years --
17 XXX: We're not going to run
18 out, it's just going to get more expensive.
19 XXX: -- more expensive, right.
20 There's going to be a difference -- there is a
21 difference, but it would be viable.
22 XXX: All right, relative to
23 others.
24 XXX: Right, relative to others,
25 but there's always going to be sun, there's

1 always going to be wind, but if they're going
2 to use those for low-powered electricity
3 low-level nuclear, then you have really big
4 storage, if you want to try to electrify the
5 (indiscernible), you have really big storage.
6 Now, today (indiscernible) investments are
7 storage? I bet you money you come five or ten
8 years and they won't be any programs to do
9 demonstration or development or anything of
10 that --
11 XXX: (indiscernible).
12 XXX: But now would be the basis
13 of the research, but now would be basic
14 research, but now (indiscernible) basic
15 research in this country, you know, they're
16 won't be a coordinated programs to demonstrate
17 the (indiscernible), those programs will be
18 India and China and --
19 XXX: Oh, that's interesting,
20 okay.
21 XXX: You see what I'm saying?
22 We've got this far (indiscernible), we've never
23 followed through, there's never coordination --
24 XXX: This is the barbell model
25 that somebody had up yesterday.

1 XXX: Then the next administration
2 comes and we change more and that's the
3 problem. I mean, you know you can name so many
4 technologies, look at what's happening with the
5 solar cells.
6 XXX: Well, in fact, that
7 dovetails into the question you asked earlier,
8 XXX, that is, is it important for us to be
9 out there first or should we let another
10 country do it. And that comes back to this
11 notion we had earlier about DOE has this other
12 role where we're try to provide opportunities
13 for jobs in the U.S., and if we decide that
14 we're going to be the second fiddle, then we're
15 going to be giving those jobs away too. Is
16 that the role that we would want in the world?
17 I don't think so. So we do need to make some
18 decisions. We do need to be out there in the
19 lead, and that's going to -- with whatever
20 technology that is going to be based here in
21 the United States we're going to have the job
22 instead of them being off shore. That's
23 critical, to get universities into our --
24 XXX: But if you really want to do
25 that, what it means is that you receive money

1 now for batteries, for motors, for rare earth,
2 for hydrogen storage, for hydrogen creation,
3 you just can't down select now if you actually
4 want to be there.
5 XXX: You could always have a
6 winner -- a running behind because the EV
7 technology is kind of a followup in hybrid
8 technology and Japan already had the lead in
9 hybrids from the mid 90s and we're still
10 playing catch up to Toyota and Honda in terms
11 of hybrid technology, and they're already
12 moving towards -- well, from nickel metal
13 hydride batteries to lithium-ion batteries for
14 EVs, and they have the electric motor
15 technology and the control technology --
16 XXX: Right and electric motors
17 are actually a good thing to focus on because
18 whether you go to electricity or hydrogen you
19 need electric motors.
20 XXX: So and then --
21 XXX: Go ahead.
22 XXX: -- if you say I can't
23 down select now we'll buy that. You also have
24 to say here is a roadmap that gets me the
25 information and to the points where I can down

1 select. I have never seen such a roadmap.
2 XXX: Well, I mean, if the
3 roadmaps could help, but you're really talking
4 about the issues, that's why I keep pushing DOE
5 back towards basic research.
6 XXX: You know, but that's
7 called kicking the can down the road.
8 XXX: No, it's not.
9 XXX: And if you kick the can
10 down the road, I'd like to at least know that
11 there's a goal at the end that I can kick the
12 can into.
13 XXX: And it's because nothing --
14 we don't have anything now that actually
15 accomplishes our goals, and we're in a
16 situation where we have no genuine solution, it
17 doesn't exist and so the first country that
18 actually creates that genuine solution, that's
19 the real competitive damage. Right now we're
20 trying to pick amongst a bunch of options, none
21 of which really accomplish our goals.
22 XXX: But on -- I'm going to
23 push you a little bit because this is important
24 I think, what I'm hearing from you is keep
25 fertilizing all the flowers in the bouquet and

1 then what?

2 XXX: Yeah. Well, I mean, the

3 idea of establishing a roadmap for planning how

4 you move, I completely support that.

5 XXX: Okay.

6 XXX: I think what we're arguing

7 about here is a moon shot issue, you know, back

8 in the 60s we had to put a man on the moon. We

9 didn't know how we were going to get there, but

10 we knew where we were going. Right now, we

11 don't know where we were going, other than we

12 want to reduce our dependency in oil.

13 XXX: Well, there are three or

14 four directions in which we're going now and

15 maybe we can't decide which one is best, but

16 they all seem fine --

17 XXX: We really either put that

18 stake in the ground and assume we're going to

19 get there in one of those paths for sure.

20 XXX: Well, no, it's a

21 different -- the moon shot, the (indiscernible)

22 project, the analogies are different, because

23 as you said, the consumer is king. There were

24 no consumers for the moon shot --

25 XXX: Let me try a -- what I would

1 hope is a trackable questions, narrow it down.
2 There is a large deposit of cell of natural
3 gas. It has an extraction technique that's
4 been demonstrated. There are concerns around
5 that technique, and then once I pump it out or
6 somebody pumps it out, should I use it as
7 compressed gas? Should I use it as natural gas
8 to ethanol? Should I use it as natural --
9 where I think many of those questions, perhaps
10 with the exception of the environmental impact,
11 are straightforward engineering analysis, yes,
12 with some assumptions about the technology
13 progression. So now whether you are the
14 natural gas industry, the federal government or
15 an automaker, how do I -- so let me go -- so if
16 I'm the federal government, should I influence
17 where that stream goes or should I let it be ad
18 hoc? The dilemma of the ad hoc for me is well,
19 should I be, you know, again, chicken-egg
20 syndrome of I need to put vehicles on the road
21 before the infrastructure so I'm going to have
22 another E85 thing. Should I be working on tank
23 technology or on the engine technology for
24 methanol-based fuel?
25 XXX: Or should I, the federal

1 government not be looking at any of that, but
2 simply say on the basis of our analysis, half X
3 is the right thing to do, we're going to tip
4 policy with tax incentives, whatever to move
5 down --
6 XXX: And the question is, if you
7 look, you know, and my experience on those
8 things when the difference between options
9 starts to become clear relative to the arrow
10 bar of, go ahead and make the decision because
11 the difference is now obvious or if they're all
12 sitting like this then it doesn't matter so
13 make a decision.
14 XXX: On secondary with --
15 XXX: So the dilemma is that
16 options space we're presently pursuing, you
17 know, where is that study that shows me at
18 least the best minds in the country coming and
19 saying industry -- and doing it seriously, not
20 the advocacy groups and not non-knowledgeable
21 third parties, so we can all start to make our
22 own closer to fact based decisions, and in the
23 end, if the data's unclear --
24 XXX: I come back again at NPC,
25 I don't know if most of you know that

1 (indiscernible), but yes, it's not original
2 work, but at least it should synthesize what
3 has been done by DOE up-to-date. So -- and
4 we'll just go around the table.
5 XXX: We are part of the National
6 Petroleum Counsel studies, you know, there's
7 been a number of groups out -- question that
8 I've gotten, you know, sort of complaining
9 (indiscernible) analysis (indiscernible) DOE
10 has done it. We've gone through this energy
11 outlook, if DIA has a larger information in
12 terms of cost we could look to. On the NPC
13 study per se, you know, I'm not sure what you
14 meant by advocacy. But one of the issues has
15 been, you know, the environmental concerns
16 regarding some of the -- the production of some
17 of these (indiscernible) and to the extent the
18 NPC represents the view points I think it's
19 important and clear at the stage, I think
20 there's probably about three or four
21 nongovernmental organizations, but there are
22 several hundred -- was it several hundred,
23 XXX?
24 XXX: It was several companies.
25 XXX: It's a very well -- it's a

1 very broad team.

2 XXX: (indiscernible) the NPOs

3 it sounds like, somewhat.

4 XXX: Well, you know the questions

5 will be coming out in that study, I think. It

6 said that it's represented by (indiscernible)

7 and that, you know -- is that going to be a

8 consensus document or is that going to be --

9 XXX: To be determined, right?

10 XXX: Yeah, and we're working on

11 that.

12 XXX: Let's go around the

13 table.

14 XXX: I guess, I've just got

15 another question too, I mean, this is all

16 passenger industry, I'm in the heavy duty

17 industry, do you see one technology or both

18 industries or are we --

19 XXX: I'm, you know, I'm

20 diagnostic there, that heavy duty is

21 sufficiently, a world unto its on it seems to

22 me, but --

23 XXX: Uh-huh, yep.

24 XXX: -- you could optimize in

25 a different way.

1 XXX: Right. And as I hear
2 battery talk, and I don't think we're headed in
3 that direction at all or --
4 XXX: I can't even do that in my
5 SUV --
6 XXX: Right. So just to clear --
7 XXX: So no, that means, at
8 lest, there's one sector that's sort of the
9 same, and that we could see or it would be
10 easier to do optimization --
11 XXX: Well, I mean, a lot of our
12 customers are essentially fuel so especially
13 when you talk on the vocational side, we have
14 basically two segments, we have an
15 over-the-road segment, which we have to have
16 distribution throughout the country and then we
17 have Century fuel which they come back to the
18 same base every night so it's much easier.
19 XXX: But even over the road
20 you can have depots on the way.
21 XXX: Sure. They go depot to
22 depot so it's a little different scenario.
23 XXX: Maybe if they should get to
24 a down selection point, which is, if you look
25 at the specific vehicle category segment, maybe

1 by default that down selection happens among
2 the three or four we're talking about. I
3 mentioned this yesterday, but for heavy duty
4 with regard to alternative fuels, probably
5 natural gas and advanced biofuels --
6 XXX: Natural gas in the heavy
7 duty industry is starting to -- is starting to
8 evolve.
9 XXX: Is that true, I mean,
10 there are other ways to use natural gas of
11 course, we can make FT diesel.
12 XXX: We can make DME.
13 XXX: Or DME, correct.
14 XXX: That seems to be a very --
15 something that we've looked into, DME. We've
16 done some DME research.
17 XXX: I don't know, the people
18 have done the whole chain economics to know
19 whether you should be doing (indiscernible) the
20 natural gas by itself.
21 XXX: Right, and we've looked
22 at -- we've looked at all. We found a natural
23 gas that was in our (indiscernible) at one
24 point. We do have natural gas engines. We've
25 done some DME, also done some DME work.

1 XXX: I guess all I'm saying is
2 the heavy duty over-the-road may be an easier
3 system to optimize once you once you track
4 that.
5 XXX: Well, I mean, there aren't
6 that many pathways. I'm just finding this
7 whole discussion rather odd because I don't
8 think there is that many choices.
9 XXX: For?
10 XXX: Anybody. To be honest with
11 you, I don't think -- there's not 50
12 (indiscernible) --
13 XXX: No, they're about like
14 40.
15 XXX: Yeah, and so you've got to
16 be clear-headed about your (indiscernible) and
17 I just don't think we are. I mean, is the
18 objective to reduce oil imports? Is the
19 objective to reduce greenhouse gases? And
20 because depending on what your objective is,
21 you will get a different answer here.
22 XXX: Well, that's part of the
23 problem.
24 XXX: That is part of the
25 problem, but --

1 XXX: So pick this objective, pick
2 that objective, go down the train, right, and
3 you decide which one you want to go after.
4 XXX: All of the above is the
5 answer you get.
6 XXX: Yeah.
7 XXX: If you list all the
8 objectives for fuel independence, greenhouse
9 gas, then that starts to push them out of the
10 way like natural gas, that doesn't meet the
11 greenhouse effect.
12 XXX: You would never go natural
13 gas with DME if you're worried about greenhouse
14 gases, if you look at what you buy, you
15 wouldn't in a million years, right?
16 XXX: Right, if that's the prereq,
17 that's the objective then natural gas would
18 move out of the way.
19 XXX: But is meeting one of the
20 objectives better than meeting none of them.
21 XXX: Let's have that discussion
22 because I think that --
23 XXX: Okay, but let's not do
24 the study now, but it seems to me that some
25 (indiscernible) of thought about pathways,

1 benefits and disadvantages of each of the
2 pathways, down select points criteria and so
3 on, that that would be not as important as --
4 XXX: Yeah, I want to go back to
5 XXX's example. I thought that was really
6 nice, and I was on board up until the point you
7 talked about what happens when you have --
8 they're kind of equal and --
9 XXX: There at that company,
10 remind me of --
11 XXX: Well, we talked about the
12 three different ways you could use natural gas.
13 XXX: Oh, right, right.
14 XXX: And you know if the on of
15 them is clear superior you try to push it,
16 but --
17 XXX: If you can't tell the
18 difference then what that says to me that DOE's
19 role is to go back and say, what do we need to
20 make this decision. Are there basic research
21 that we can do to try to create a breakthrough
22 that would make the answer clear? Is there
23 information that we can try to gather that will
24 help, for example, we don't even know what the
25 relative benefits are of the three different

1 pathways. Are we even using current
2 technology? I keep if asking people that.
3 Nobody really seems to understand.
4 XXX: What benefits are you
5 referring to?
6 XXX: What it cost, what the
7 greenhouse impacts are --
8 XXX: Oh, no, I think I know
9 that.
10 XXX: I was misinterpreted. My
11 experience is there are certain things normally
12 when you do in a comparison that you just rule
13 out, whether it's a business case, when you're
14 down to -- and then there's normally several
15 that execution is more important than the
16 choice, but it depends on the quality and
17 fidelity of the data about what that is.
18 XXX: If you don't have
19 analyzed world of wheels ad nauseam for
20 Fischer-Tropsch, DME, you know, you can go on
21 and on. Biofuels there's some uncertainty
22 because you can fight about indirect prime use
23 and so on, but all of the fossil fuel pathways
24 that start with natural gas we understand
25 really well.

1 XXX: I mean, just as far as what
2 the cost is, you know, what the impacts are and
3 infrastructure, they're just real basic kind of
4 now.
5 XXX: I think that's being
6 done.
7 XXX: Yeah, I'm just saying, I
8 think that's a role for DOE, but the other role
9 for DOE is to look at it and say where is there
10 a technology breakthrough that's going to
11 sell --
12 XXX: They can make it --
13 XXX: They'll never make it clear
14 and so I was just trying to use that as an
15 example for why I keep pushing these certain
16 roles and I thought it was a good example.
17 XXX: I want to go back to Wayne's
18 point in hopes of the need for down selection,
19 but I don't think so. If again, the country
20 had a consistent (indiscernible) objective we
21 would know better and we would probably reserve
22 whatever liquid fuels we have (indiscernible)
23 and then we would use on the lighter end the
24 other options because those at least the
25 technical option. And so after that --

1 XXX: Last time I fund you. That
2 was a joke.
3 XXX: So here they are, but since
4 we never do that, you know, we never have this
5 big market and never be (indiscernible). So
6 there, that's the reason. So, you know, we
7 just articulate. Something the government
8 needs to say, you know, the next 30 years I
9 want 50 percent of this and the next president
10 should do the same, and the next president
11 should do the same.
12 XXX: I want to read you a
13 sentence. What (indiscernible) merchant will
14 hazard these fortunes in any new branch of
15 congress when he knows not, but that his plans
16 may be rendered on an (indiscernible) before
17 they can be executed, James Madison, Federalist
18 62. A few hundred years ago, same story,
19 right? Consistency in the government.
20 XXX: Yeah.
21 XXX: All right. I'm sorry.
22 Right around the table.
23 XXX: I think politics is --
24 plays -- they set the table for us and as far
25 as DOE you could beat your head against the

1 wall if you think you've got the best thing,
2 but if the policy isn't on your side, you're
3 not going to get anywhere. I'm used to playing
4 that game because I'm from a small state. I'm
5 not going to make business, move in any
6 direction. I don't have enough people there,
7 and so it's whatever the table's set at I'm
8 going to try to play that game, and then, I
9 think we've got clear direction. I don't see
10 it as that murky at all, biofuels are here to
11 stay, and you think you're going to move that
12 thinking down to road and change it, I don't
13 think we can. I think you can make it better.
14 Certainly there's some room to make it better,
15 but you're not going to make it go away. I
16 think the natural gas act, is that enough of a
17 message for you to say, okay, we're going to
18 jump on board, I've got -- I know a lot of
19 incentive's, a lot of money's here and we're
20 going to go down that path. I don't know.
21 XXX: I can't -- you just
22 described two infrastructure changes that I
23 don't know what they're going to do.
24 XXX: But I think there's three, I
25 think there's three and I don't think we down

1 select to one and I don't -- I think that would
2 be a mistake because there's not anyone out
3 there that's going to replace petroleum, and if
4 our game is to --
5 XXX: Look what hydro cars are
6 (indiscernible) control.
7 XXX: Yeah, well, --
8 XXX: Biofuels and hydro
9 cars -- and Fischer-Tropsch out of natural gas
10 is also looking at hydro cars.
11 XXX: But yeah, I think we've got
12 a definite path here to go down I think. I
13 would say CNG just because of the greenhouse
14 gas, a part of that equation I would go towards
15 that side because that's what we're dealing a
16 lot with more (indiscernible) CNG greenhouse
17 gas.
18 XXX: Let me do the follow-up
19 question from my end. There is no public CNG
20 charging infrastructure, there is no public
21 hydrogen charge in infrastructure. I was able
22 to watch the Volt because worse comes to -- not
23 worse comes to worse -- standard in the car to
24 plug it into a 110 and unless three others and
25 two of your other neighbors buy a Volt, plug it

1 in same transformer you'd probably wreck it.
2 Should I be continuing my plan to field the
3 natural gas and the fuel cell consumer vehicles
4 by the middle of this decade when I have no
5 idea whether that infrastructure is going to be
6 in place with my consumer to -- the Volt was a
7 nice play because I became for initial
8 introduction infrastructure agnostic. That's
9 the reason we did the Volt to start instead of
10 the (indiscernible) because I can start. I
11 have to make decisions right now about non --
12 billions of dollars of capitol investment,
13 hundreds of millions of dollars of engineering
14 and research. Now, by the way because of
15 regulation, I don't have consumers knocking at
16 my door telling me I want to buy a natural gas
17 vehicle by the millions.
18 XXX: I mean, and I 'm not saying
19 that. There's a benchmark --
20 XXX: But what do I do in the
21 absence of -- the absence of enough information
22 to guide me or the EPA.
23 XXX: I guess --
24 XXX: Well, yeah, but there's
25 niche markets, I don't think that natural gas

1 is for the light-duty and consumer fleet. I
2 don't think that. I think that it's for the
3 work fleet.
4 XXX: Based on?
5 XXX: Just because -- you know
6 what when you talk about infrastructure
7 though -- let's talk about infrastructure,
8 there's plenty of natural gas infrastructure in
9 this country. We've got pipelines running
10 everywhere, you only need the one point. It's
11 not like biofuels, we don't have pipelines for
12 biofuels.
13 XXX: Says who? I need a
14 compressor.
15 XXX: Yeah, you need a compressor.
16 XXX: But I'm not putting that in
17 so, my question is, you just made a
18 statement --
19 XXX: But I'm saying --
20 XXX: Let me tell you, I have a
21 data set that says, you know what, I can lower
22 the cost per mile based EIA data and the cost
23 of mode will take me to put a natural gas tank
24 on my vehicle, I could lower CO2, not take it
25 to zero, I could lower it, and I could lower

1 the cost per mile of a consumer, and you just
2 said it's a dumb answer for a consumer-like
3 vehicle, so based on what?
4 XXX: No, I think it is, it's just
5 based so much infrastructure for that. Just
6 for long-term that might be a good answer, but
7 for the short-term, it's not. I think we put
8 it in fleets, and we get it started.
9 XXX: Okay, we're sort of doing
10 the study already, and the fact that there's
11 disagreement around the table says that we need
12 the study done.
13 XXX: Says you need the study.
14 XXX: All right. That's a good
15 takeaway.
16 XXX: Okay. So I'm going to
17 switch it to talking about consumers here,
18 because I hear a lot, people find out what
19 consumers will do and doubt and OEM is exactly
20 what consumers are going to do, and having done
21 25 years of research. I started my work
22 talking to natural gas drivers New Zealand in
23 1990. I spent my first two weeks as a
24 researcher standing in natural gas stations in
25 New Zealand talking to every person that came

1 through, so that was my start. My conclusion
2 on natural gas, relative this is like, okay,
3 they save a little money if the government
4 guarantees it, that is what was going on in New
5 Zealand, they were keeping the price of natural
6 gas under gasoline as an incentive. They were
7 going to do $500 for a conversion. They didn't
8 have dedicated vehicles. All of the people who
9 were doing it, were doing it to get the from
10 $500 from the government, and as long as that
11 price at the pump stayed a little below, other
12 than that, there was no interest, and other --
13 they found that sort of on the consumer, the
14 light-duty vehicle. There was just -- why
15 would I do this unless I said, well, it's not
16 interesting to performs just like my other
17 vehicle. This is just not an interesting car.
18 On the other hand, why I got a little bit
19 interested in electricity is early on somewhere
20 people, even poorly performing electric, people
21 were kind of interested. Now, this is kind of
22 cool. This drives different, this is cool,
23 it'll plug in to my house. It's different, the
24 difference was important.
25 XXX: Can I just say, is that

1 because for a car, it's a statement about who
2 you are for many people, whereas for the
3 truckers, it's just a tool. It's a piece of
4 equipment.
5 XXX: There is that involved and
6 it's a drive field.
7 XXX: Yeah, but the difference
8 important is early adapters (phonetic).
9 XXX: Well, I'm going to talk
10 about early adopters (phonetic) because they
11 always talk about early adopters and I have to
12 confront early adopters all the time in all my
13 studies because that's who's bought a car, and
14 by definition, we call them an early adopter.
15 We define them that way. So who are they
16 relative to other buyers and that's a really
17 important issue right now, as we move forward.
18 Those first, you know, how many ECOtality
19 buyers or all those people -- are those --
20 well, yeah, my definition of early adopters,
21 who are they. We've got to go in there and
22 sort them out, and you know, do best
23 anthropology or sociology or psychology to
24 figure out are they genetically different or
25 are they -- what is the difference there?

1 Those people, they're actually a lot more
2 diverse than a lot of people expect. You can
3 always tell when I took German engineers into
4 visit Mini E drivers in LA and give them the
5 (indiscernible) to dock in, they were going
6 away because a lot of those people who bought
7 Mini E's don't believe climate change. They're
8 conservatives. They've got some money.
9 They're in (indiscernible) air quality is why
10 whey bought the vehicle, and they've been
11 convinced of air quality benefits in
12 Los Angeles over their lifetime because they've
13 seen it cleaned up. They've seen what
14 regulation can do very, and they're very
15 supportive of electric technology because that.
16 So the distribution of people within early
17 adopters. It's just quite heartening to see
18 some of that. In terms of making -- whether --
19 and I'm wondering if what you're thinking is,
20 if with research was a really good marketing
21 sociology anthropology research, you could
22 downsize.
23 XXX: Down select.
24 XXX: Down select, I'm sorry. Is
25 that possible? Would the study answer it?

1 XXX: I don't know.

2 XXX: There's too much

3 uncertainty, I mean, like you said, sociology

4 anthropology work is not quite like, you know,

5 if we were talking about the future -- and with

6 consumers a lot of the time and most people I

7 deal with, everybody's looking to the past.

8 They're saying, what have people done when they

9 buy cars. Well, my cousin, Fred, he always

10 buys this, and I don't think cousin Fred's ever

11 going to change what he does. Well, then you

12 find out cousin Fred (indiscernible) will. You

13 know, as we move forward, it's very difficult

14 to see in the future admittedly with consumers.

15 I think there still are some areas of

16 high-value research DOE might do in this area,

17 whether you could actually down select on the

18 fuel level. It could be difficult. I did with

19 natural gas for light-duty vehicles. I just --

20 you put people in them you see -- it's, you

21 know, it's a lukewarm response. You don't want

22 a lukewarm response for car buying. You need

23 to be interested in the technology. People are

24 pretty lukewarm about a lot of these options.

25 Methanol, put people in methanol vehicles,

drive them around, circle, talk about methanol and everything, and they go, why in the world would I buy a car that runs on methanol. There's no interest, you know, it'd have to be a substantial economic savings or they aren't going to drive it, so nobody -- as a bunch of my students said, nobody made a film about who killed a methanol vehicle. So electric vehicles seem to stir sort of a grass roots --

XXX: You had to bring that up, didn't you?

XXX: My guess is, half of the public -- you will know -- half of the public probably thinks gasoline has got methanol in it already. You can't tell the difference.

XXX: Yeah.

XXX: So I'm not sure that will necessarily bring that down selection answer. There could be some issues between -- better look at that, you know, why people might -- hydrogen and not being able to get it out there. We don't have demonstrations. In the public sector I haven't able to have a hundred households who have used a hydrogen fuel cell vehicle.

1 XXX: You should come and share
2 our data.
3 XXX: I'd love to.
4 XXX: No, seriously. I'd be
5 willing to.
6 XXX: Okay. So like the last
7 thing is, there is an area, though I think DOE
8 could and that's human mission interfaces. We
9 do a lot of technology, the interaction of
10 people with the information displays on a
11 vehicle is a big area of innovation now. Most
12 of the OEMs are developing to compete with
13 other OEMs, the design, they really want to
14 make it sexy and useful, but they're not aiming
15 at the exact same targets as the public sector
16 is, and we want to be able to know exactly how
17 people are responding to machine interfaces in
18 terms of energy saving a whole bunch of stuff
19 does. Do they respond, you know, people are
20 going to get a lot more information that could
21 out of these vehicles now about electricity
22 use, gasoline use, and as an area in which
23 public research could be very useful.
24 XXX: All right. This has been
25 good so far. I'm going to take ten minutes or

1 so just to break and we'll come back with a
2 slightly different set of themes.
3 Thanks.
4 (Short Break)
5 XXX: We've spent a lot of time
6 talking about alternative fuels, we didn't talk
7 much about efficiency or fuel economy and
8 lightweight, the conventional pass, and I
9 wonder if we can spend a few minutes on that.
10 And then I thought what I would do is to read
11 through for you some takeaways we thought would
12 be useful and get your reaction to those. I'm
13 going to take this phone call while you all
14 start talking.
15 XXX: I guess the question is,
16 what's the relative value of DOE's efforts in
17 fuel efficiency versus the alternative fuel
18 cell route, or LNG, or electrification. I
19 mean, is that something that we should be
20 spending as much effort on?
21 XXX: Can one be provocative by
22 saying, and I don't know as much about, you
23 know, what goes on in research in efficiency,
24 it's not my area, so my impression from the
25 outside is, isn't this something that the OEMs

1 know so much about, why do you need to work in
2 this area? Efficiency is something that engine
3 division is something that you guys know as
4 much as there should be known. Why would DOE
5 even --
6 XXX: Well, we know they've got a
7 the 100-mile per hour -- 100-mile per gallon
8 carburetor on the shelf.
9 XXX: Are you looking for the
10 answer?
11 XXX: So -- well, no, so that's my
12 question.
13 XXX: The fundamentals of trying
14 to get that last 10 to 15 percent of energy
15 requires knowledge down of the combustion
16 chamber, CFD tools that don't exist,
17 thermochemical tools, and couple that with
18 every alternate fuel that could feed it. If we
19 use our existing toolkit, which is a little too
20 dependent on building and calibrating, it'll
21 take forever, and that's the kind of stuff
22 where, you know, the creation of the models,
23 the tools, the visualization capabilities --
24 well, actually, I should have let Dennis answer
25 that.

1 XXX: Yeah, (indiscernible)
2 university (indiscernible) 10 percent is for
3 that, another 10 to 15 percent or more. Stuff
4 like Genburg's electrified chargers. It's not
5 like we have not known that there's a benefit
6 since the '70s, but we still haven't quite
7 realized it. Because there are still issues,
8 for instance, with things like Lennox traps,
9 you know, which when you look at it together,
10 engine trap systems, controls and all that, in
11 view of issues, we could probably realize this
12 remaining 15 percent. I think sometimes --
13 XXX: I have more confidence right
14 now on the $300 per kilowatt hour battery than
15 I do on the 12 percent stretch target for the
16 combustion.
17 XXX: That's interesting.
18 Conventional technology is much harder to
19 (inaudible) you can make a difference. So much
20 of this is in the competitive realm and you
21 can't match it with the manufacturing they are
22 doing in development. But there are some
23 areas. Carbon fiber, the problem with carbon
24 fiber is the manufacturing techniques -- nobody
25 knows how to mass produce it. If DOE could

1 help find ways to mass produce carbon fiber,
2 that's a huge area. I mentioned yesterday
3 about active aerodynamic aids. Exhaust heat
4 recover, another potential very, very important
5 investment that is certainly not in the hybrid
6 stage. So there are opportunities, but you've
7 got to look for them a little harder. There's
8 certainly opportunities.
9 XXX: Another opportunity that
10 exists, actually, is by synergizing different
11 combustion models, and of course you get
12 petroleum (indiscernible), so I think you
13 shouldn't put the engine only in one regime all
14 the time and, you know, that's something that
15 we're doing effectively right now.
16 XXX: Also remember, in the end, a
17 third of the energy that gets to the wheels
18 goes to heating the tire and the pavement, so a
19 super tire could change the game.
20 XXX: So we talk about all
21 these things, and I can imagine maybe somebody
22 said yesterday, you could imagine or factor
23 into improvement in fuel economy over the next
24 25 years, between the vehicle and --
25 XXX: And at what cost, that's the

1 question.

2 XXX: If you include basic

3 hybridization, I should put that number more at

4 times 3 or times 4.

5 XXX: All right. Great.

6 XXX: At a certain drive site, not

7 a single point.

8 XXX: Again, with the goal in

9 mind of reducing oil consumption, never mind if

10 it's foreign oil.

11 XXX: Energy consumption.

12 XXX: Well, oil. The problem

13 is oil; it's not energy.

14 XXX: But you were talking about

15 the vehicle efficiency side. I have the

16 infrastructure alternatives to replace it.

17 XXX: So I was going to get

18 to -- what I'm asking you is again, a question

19 I asked yesterday and I'm going to push a

20 little harder on it, if we did all that, you

21 could save, I don't know, three million barrels

22 a day? No increase in BMT (indiscernible).

23 That's a lot already. Why do I need to go to

24 hydrogen natural gas?

25 XXX: What does it cost? That's

1 the question to me.

2 XXX: In the end it's economic.

3 You've got to count the infrastructure.

4 XXX: I mean the cost of the

5 infrastructure as compared to the cost of the

6 vehicle. And the caveat I keep putting on

7 this, the vehicle is an annual recurring cost.

8 XXX: For the consumer or for

9 the --

10 XXX: I replace 8 percent of the

11 fleet every year. So if I am putting

12 incremental material cost on, that incremental

13 material cost is recurring. Energy

14 infrastructure hangs out the first five years.

15 XXX: It's recurring, it's just on

16 a longer time scale.

17 XXX: Oh, yeah, but you have to do

18 the multiplying effect when you're figuring the

19 cost.

20 XXX: What I always get confused

21 about is people talk about how expensive

22 improvements to professional technology is, and

23 yet they're willing to jump to fuel cell

24 vehicles or electric vehicles, which are even

25 more expensive. If electric vehicles and fuel

1 cell vehicles are not too expensive, then why
2 is conventional technology too expensive?
3 XXX: That's a good question.
4 XXX: What we do is the dollar per
5 mile per gallon, or per whatever metric you
6 want, CO2 or carb, and it depends how far you
7 want to go up that paradal (phonetic) curve.
8 An internal combustion engine with full
9 hybridization versus an efficient electric or
10 hydrogen production and conversion on vehicle,
11 the latter will win.
12 XXX: So why don't we just
13 crank the CAFE standards and let the industry
14 and the consumer respond?
15 XXX: We're kind of doing that.
16 XXX: That's what we're doing.
17 XXX: Let the approach
18 (indiscernible) short term.
19 XXX: I think that's a great idea.
20 XXX: Why don't you raise the
21 price of fuel and let the market and the
22 consumer respond?
23 XXX: That's also a good idea.
24 XXX: The issue is one gets more
25 directly driven to consumer, the other one is

1 indirect to consumer.

2 XXX: Well, on the electrification

3 of drive trains, doesn't GM now -- I mean, I'm

4 hearing at least that there are other consumer

5 benefits or reasons to go into this industry?

6 XXX: Yeah. Yes, absolutely. I

7 can make a better vehicle. At what cost will

8 the consumer value that improvement?

9 XXX: So I think still the price

10 is, and you're right, when you see these

11 expensive prices, but as we've seen, if we just

12 talked five years ago about battery prices,

13 we'd think it was pie in the sky, but people

14 are talking a little bit different now so

15 prices are --

16 XXX: But those are also

17 ancillary benefits, you know, if my

18 extended-range EV has got a power outlet on it

19 and I can use it as an emergency generator in

20 my house, that's worth a couple thousand

21 dollars of capital investment.

22 XXX: But any conventional hybrid

23 can do the same thing.

24 XXX: Because when we can put the

25 tap on, it should. That's when we can put the

1 tap on it.

2 XXX: Sure.

3 XXX: But the difference is, I'm

4 turning on the engine.

5 XXX: Yeah, you've got to turn on

6 the engine in the conventional hybrid.

7 XXX: In other words, I get 10

8 kilowatt hours or whatever.

9 XXX: Let me try a couple of

10 things that we thought we heard yesterday.

11 I'll take them in groups of three and just try

12 to get some reaction from you-all.

13 Our first one. Many of our policies

14 are based on hope and are not driven by market

15 pact. Policies, broadly. Second, a much

16 stronger impression relative to the workshop

17 that we had in Chicago last week on alternative

18 fuels, is that the Department has an obligation

19 to fund deployment, and that we should avoid

20 down selecting prior to deployment phase

21 efforts. Down selection should only occur

22 after some unarticulated measure of deployment.

23 We've been talking about that quite a bit this

24 morning. Third one, DOE have used

25 demonstration as a way to characterize risks,

1 while the industry seems to think demonstration
2 is a mechanism to establish a market and a way
3 to do market research. Industry doesn't
4 separate demonstration from deployment, or
5 distinguish, really. Three things we thought
6 we heard. I'm not asking for consensus, but
7 I'm asking for reactions to those statements.
8 XXX: Let me just talk about the
9 second one, the biofuel one. I would strongly
10 urge DOE to develop biofuels that are
11 functional with gasoline. I think that's by
12 far the strongest method. If you talk about
13 how many infrastructures are we going to have,
14 are you really going to develop one just for
15 the biofuel. Especially since things like
16 ethanol have much shorter range than suggesting
17 those solutions. So that needs to be the
18 focus.
19 XXX: Any fuel that's fungible
20 with oil will sell at the price of oil. The
21 price of oil is not something we have any
22 control over and is likely to continue to
23 increase. So we're not fixing the price
24 bubble.
25 XXX: You're fixing it to the

1 extent that a reduced demand for conventional
2 oil will help bring the price down.
3 XXX: Global demand for oil is
4 going up faster than we can bring it down.
5 XXX: It's still going to taper
6 the curve off a little bit, which is going to
7 help.
8 XXX: Not a lot though.
9 XXX: The Saudis turned off
10 700,000 barrels a day a couple of weeks ago,
11 right? You know how long it would take us to
12 ramp up -- 700,000 barrels a day is
13 three-quarters of the ethanol production now in
14 the country.
15 XXX: You need to talk to David
16 Green for 10 or 15 minutes when you get a
17 chance. He says that OPEC can do this for
18 awhile, but the more they do it, the more they
19 erode their market share and they can't sustain
20 it. I'm just summarizing. He understands it a
21 lot better than I do.
22 XXX: Let me react to your last
23 line and restate it and see if it's the same
24 statement. I think smart and knowledgeable
25 people can differentiate between a

1 demonstration and an incentivized deployment.
2 Where the debate is whether the government/DOE
3 should be involved in both. The idea that you
4 can't differentiate I think is not accurate.
5 What are the respective roles in both phases?
6 XXX: Let me add something too.
7 You mentioned obligation to deployment. I
8 would add obligation to deployment of
9 alternative fuels consistent with our energy
10 security and environmental goals.
11 XXX: Yeah, I think the
12 assumption is everything we do plays to
13 hopefully all three, but not obviously. And
14 just by the way, the Chicago meeting was not
15 only biofuels but was the whole gas
16 (indiscernible) as well. All right. I saw a
17 number of nodding heads when I said policies
18 based on hope not (indiscernible). That's the
19 discussion we had before the break. Now I'm
20 going to try a few more.
21 Some people said we at the DOE do too
22 much system stuff and need more miracle
23 widgets. There is a notion that we're entering
24 a decade or so of experimentation. And we
25 heard quite a bit about the signaling value of

1 the portfolio, and it's perhaps more important
2 than the actual financial investments we make.
3 XXX: I would, again, try to
4 clarify that as changes in slope are as
5 important as absolute magnitude.
6 XXX: There's always a second
7 river that wasn't made.
8 XXX: I'd like to comment on that
9 whole thing. There was a little thing this
10 last week that I think is the biggest role, to
11 put that in perspective, there was a report put
12 out by J.D. Power saying that we're going to
13 have a million EVs on the road by 2015. And
14 everybody responded to that saying, well, they
15 said that was terrible, that's just not really
16 effective, that's not moving. And then other
17 people responded who are on the hope side
18 saying, No, we think that's pretty good. If we
19 can get there, everybody's pretty excited. So
20 I think there's a perspective on what that is.
21 XXX: That's a (indiscernible)
22 one percent forward (indiscernible), right?
23 XXX: It's not making any
24 progress.
25 XXX: On your -- the widget stuff,

1 what I find amazing is that the pace of
2 technology developments and inventions just
3 keeps accelerating. You'd think after all the
4 things that have happened in the last 20 years
5 that we'd finally start running out of things,
6 but that's not happening; it's just the
7 opposite. And my belief is it's because of
8 computers. Lightweight materials are a prime
9 example. Manufacturers have never been able to
10 systematically implement lightweight materials
11 and take advantage of secondary weight
12 reduction, it's just too complex. Computers
13 are opening that up. They're opening up all
14 kinds of things. And yeah, that's why they --
15 if you need more magic widgets then you have to
16 go find those breakthroughs and find out what's
17 really going to make a difference.
18 XXX: You may not know, but one
19 of the things the Department is trying to do as
20 a foundational technology is to strengthen our
21 capabilities in high-performance computing and
22 simulation, and drive them out into U.S.
23 industry in order to be applied in the ways I
24 think you're focused. We haven't talked about
25 that at all here, but that's certainly a

1 strategy. I was just asked -- on Monday Oak
2 Ridge opened up something called CASL, which is
3 the Consortium for Advanced Simulation of Light
4 Water Reactors and, in an attempt to provide
5 the very best high performance modeling
6 simulation to light water reactors. And it's
7 got industry, it's got the labs, academia.
8 What we'd like to do is internal combustion.
9 XXX: For light duty, the major
10 manufacturers already have (indiscernible)
11 policy.
12 XXX: Not actually. If you look
13 inside what we do in the weapons program and
14 other things, it's not anywhere near what the
15 manufacturers do, it's far end.
16 XXX: Right, but the data that
17 they have to keep.
18 XXX: Oh, yes. No, the domain
19 knowledge. So the challenge is to hook up the
20 computing and simulation difficulties with the
21 domain.
22 XXX: But there are other areas of
23 materials, heavy-duty that there's still a lot
24 to do.
25 XXX: To the extent that we've

1 been focusing on DOE sort of, I would say, our
2 consumer innovations, we didn't spend as much
3 time talking about the technology and industry.
4 I think this is one of them as it speeds up
5 things, innovations like that, prototyping,
6 computational modeling. There was a very
7 interesting comment yesterday on the battery
8 panel about focusing on manufacturing
9 innovations, the fact that (indiscernible)
10 allow different materials to be processed. And
11 maybe not really manufacturing them the very
12 best, very well.
13 XXX: Yeah, the discussion was
14 basically, you know, a lot of times in the
15 battery work we'll focus on the material side
16 and along the TRL chain start developing the
17 processing techniques, and typically those
18 techniques are mirrored by what's in industry
19 today. And the thought was that let's think
20 out of the box on the manufacturing side and
21 develop a manufacturing process that looks very
22 innovative, very cost effective, and then start
23 working our way backwards to develop the
24 materials that would feed into that to make
25 batteries. So a little different approach,

1 starting on one side and working back. Or
2 starting at the TRL level 2 or 3 working
3 forward, and maybe hopefully meeting up
4 somewhere.
5 XXX: It plays a very important
6 role for the DOE. I'd put this under enabling
7 innovations, enabling those consumer
8 innovations.
9 XXX: So if you look at the
10 office of science where some of this
11 (indiscernible) goes on, we've identified three
12 broad areas. The computing and high
13 performance innovation. A second is materials.
14 And the third is the nonmedical biology, which
15 plays directly into the biofuels. So I think,
16 you know, we're making at least the
17 selective -- the differential investments in
18 what we think we hear is relevant.
19 XXX: Another thing to pay
20 attention to, and this is more in the transport
21 research area in particular, but we say -- or
22 maybe I should say suburban because it's
23 talking about the third (indiscernible) BMT
24 reduction.
25 XXX: So what do you guys think

1 that the other two legs are?

2 XXX: The other two legs are

3 fuels, vehicles, BMT. And some people want to

4 add a fourth leg. But anyway, so the BMT

5 reduction is an area which is interesting, I

6 think this is one where we probably will sit

7 back and watch others take the lead, will be

8 sort of smart travel systems which have to do

9 with this computing ability and probably your

10 (indiscernible) already in transit or the

11 Japanese will lead on this in other areas. We

12 don't have that infrastructure to make it all

13 work. But there are some places in some place

14 like Portland. And where I mostly see this is

15 in younger people. They are very connected to

16 this. They are not as connected to their

17 automobiles as my generation is. Their

18 feelings aren't quite the same about vehicles.

19 They're a lot more interested in their

20 computers. They want to move across the space

21 more using their cellphone than using a car.

22 So I think we will see some tremendous

23 innovation in this area and pay attention to

24 how to how quick the energy passes by us. I

25 don't know if that's worth a program or what,

1 but it is something we're paying a lot of
2 attention to at Transport Research, and the
3 human side of that is very interesting.
4 XXX: How much do we get by
5 pushing telecommuting policies?
6 XXX: Telecommuting, well, XXX
7 (indiscernible), if you want that, there's
8 somebody at Davis. I don't know if it's been
9 quantified. We've looked at it for a long
10 time. We haven't seen a big impact to that
11 yet. When people stay home, they end up
12 traveling. They're running errands, they're
13 doing other stuff. But when they're at work,
14 they're sitting at their desk. So that's
15 necessarily clear to us.
16 XXX: I wanted to see if you got
17 this study conducted a study about a year or
18 two ago, (indiscernible) both industry as well
19 as agencies, and I think the potential was
20 about BMT per capita, 15 to 25 percent type
21 range as being possible.
22 XXX: For the working
23 population.
24 XXX: For the U.S. population as a
25 whole.

1 XXX: A lot of that comes down to
2 regional planning issues, how you take care of
3 the growing population, and how you plan for
4 that, but it also has to do with some of these
5 intelligent transportation systems and how we
6 communicate with them.
7 XXX: I want to take it sideways
8 and say that there is a truly transformational
9 technology coming, and that's autonomous
10 vehicles, robot cars that drive themselves.
11 I'm not talking about network vehicles, they
12 can't handle pedestrians, bicyclists, dogs and
13 deer. But literally vehicles that can go down
14 the road by themselves. And my children have
15 convinced me that this is the future, because
16 they do not want to drive. They want to talk
17 to their friends, play video games, they do not
18 want to drive. And they've already asked me,
19 when can they buy this?
20 XXX: It's available today. It's
21 a city bus.
22 XXX: I thought they were already
23 driving partially autonomous by texting.
24 XXX: Yes, unfortunately.
25 XXX: So I can't get my head

1 around what the impacts would be. I could see
2 where you could tie it into mass transit, but I
3 can also see where you can tie them in to
4 two-hour commute trips as who cares. You know,
5 if you're sitting in a comfortable car or --
6 XXX: What difference does it
7 make?
8 XXX: Yeah, but if that was true,
9 Amtrak would be making money hand over fist
10 right now.
11 XXX: It's the inconvenience.
12 Amtrak only runs at a certain time, and from
13 point A to point B. These vehicles will run
14 any time you want, from any place to any place.
15 And they'll be even more convenient than we
16 have now, not less.
17 XXX: Personal Amtrak.
18 XXX: Yeah, everybody will have
19 their own personal Amtrak.
20 XXX: Well, I don't know about
21 autonomous vehicles, but in Portland we are
22 seeing people drop their cars. Registrations
23 in the city have dropped in the last two years,
24 and the population has dropped. And it's
25 primarily because we have free rail downtown,

1 we call it Fareless Square and they get
2 around -- and a lot of bicycle paths, but the
3 younger generation is -- and they all have
4 Zipcar and they use Zipcar. I have a Zipcar
5 account. I use the rail, and then I use my
6 bicycle. And they find they're saving money.
7 They don't have to pay car insurance. There's
8 a whole slew of things. And they have
9 everything they need in that urban center. It
10 only works in Portland. It's not going to work
11 in Salem, it's not going to work in Medford
12 because you don't have the infrastructure
13 around you to make it happen. But we're seeing
14 a change, and it's really the younger
15 generation pushing that.
16 XXX: I think you just hit a real
17 key point, and that is, they're saving money by
18 doing that. Because I'm thinking another
19 example is on the East Coast, and I threw
20 Amtrak out there because it really annoys me
21 how expensive their tickets are. It's cheaper
22 to fly by air from Washington DC to New York
23 City than it is to take Amtrak. It's totally
24 absurd why that's the case.
25 XXX: Or I can get the bus, the

1 Bolt bus.

2 XXX: The Bolt bus is only $18.00.

3 And we're subsidizing Amtrak. So somehow these

4 models are upside-down. But if we can get to a

5 point where the consumer saves money, then that

6 will definitely change behavior. But no one's

7 going to pay $200.00 for a Amtrak ticket when

8 you can ride a Bolt bus for 18 bucks.

9 XXX: Unless the time really

10 matters to you. I have done it on occasion.

11 XXX: But the thing that we're

12 looking at that I think you'd be interested in

13 is how do we tie all this together in real

14 time. In other words, I take my smartphone,

15 say I want to get from Point A to B, and then

16 the whole bus system comes up on my phone and

17 the rail and everything else. And I know where

18 everything is. And we've talked to Ford and

19 Toyota about this and they're coming in and how

20 to put this all in the automobiles and the

21 whole transportation system. But where I could

22 say I want to go to the movie theater, make my

23 reservation, you know, it does everything.

24 XXX: It arranges the bus

25 connections.

1 XXX: You know your connections,
2 you know where the bus is, you know where this
3 is, what bus I can put my bicycle on.
4 XXX: So that works great
5 for -- I don't know what fraction of the
6 country lives in densely urbanized areas.
7 XXX: Exactly and doesn't have
8 children.
9 XXX: Sorry.
10 XXX: And doesn't have children.
11 XXX: That's what the sidecar is
12 for the bicycle.
13 XXX: I'm impressed with this.
14 You know I don't think that way, but when you
15 travel with a couple of grad students and the
16 way they move across the landscape, it's really
17 different than I do. Richard Simmons, I've
18 traveled across Paris with him. You've got
19 your smartphone and you start moving and he
20 just in real time made all the decisions, you
21 know, we'll go there, go down this and it's all
22 just done right here.
23 XXX: And we just follow.
24 XXX: I'm used to thinking I've
25 got to have my car, because if I have my car,

that means I can go wherever I want to go, but they're doing it differently. It's a very different understanding of the landscape.

XXX: Keep in mind that grad students are generally poor.

XXX: But it is an urban versus suburban issue too. I lived in Europe ten years ago and the traffic signals back then ten years ago, we still haven't got to that level here. Because it's not a need like it was over there. And certainly in my little town they're never going to do it.

XXX: As I said, there'll be some places like Portland. Europeans really, they talk about mobility the language at transport conferences and stuff, they talk about things in a very different way than Americans do.

XXX: So coming back to the Department's role or ability in all of this, it seems to me our perch is pretty thin in this particular dimension. This is much more about DOT.

XXX: It is in that kind of realm, transportation.

XXX: It would nice to be involved

1 in understanding energy impasses, that which
2 DOT may not be feel as strongly about.
3 XXX: Any enabling technologies
4 again which you were getting at in the
5 beginning, which is really the interface.
6 XXX: Here in the sheen interface,
7 broadly speaking, so I talked earlier about the
8 dashboard in the cars with also such devices.
9 And these electric vehicles, (indiscernible)
10 and how much will electric vehicles, the use of
11 the interface starts becoming more controlling
12 of the interior environment of the vehicle,
13 charging it and all those things.
14 XXX: All right, let me try a
15 couple more. Industry thinks of infrastructure
16 and vehicle technology in the same breath, and
17 their assessment of course is for one versus
18 the other or combined does a disservice. Maybe
19 I'll ask XXX to just parse that one.
20 XXX: This was a discussion of
21 kind of the roll up of costs and prices and
22 what it costs to establish a market and whether
23 that is a societal cost or a product cost or a
24 technology cost. The lack of delineation
25 between the two sets, at least in the

1 conversations that we heard yesterday, rolls
2 everything up into one really big number where
3 it is uncertain who should be responsible for
4 what aspect of it.
5 XXX: So both how you package
6 the cost and who pays for the different pieces.
7 And two EV related ones. One, the grid can
8 handle EVs, it says here. And then there was
9 vast disagreement on the role of fast charging.
10 The battery folks say it's critical while the
11 grid folks say it will destroy the system.
12 XXX: I don't agree with that at
13 all.
14 XXX: You don't agree with
15 which?
16 XXX: I think the DC charging,
17 fast charging, is going to be critical where
18 we're at because it just makes the cars work
19 better. I've seen it personally. We have some
20 leads in the fleet, we've been using them, and
21 it makes a big difference. We only have one
22 fast charger up in Portland right now, but soon
23 over this next year we'll have 56 around the
24 area. So I think it'll make the cars work a
25 little bit easier. I don't think we'll be

1 using them all the time. I might use it twice
2 a week, but not constantly. But our grid,
3 because of the Northwest, we have cheap
4 hydropower for a long time, and they overbuilt
5 the grid because everyone's got resistance
6 heating. Well, back in early 2000s they
7 decided you guys are not spending enough for
8 electricity, we're going to level the playing
9 field because this is a federal asset. So
10 they've raised our prices up and we're paying a
11 whole ten cents a KWH. I know places are
12 paying a lot more, but for us that's a lot. So
13 now a lot of people are going to heat pumps and
14 so on, and we've got a lot of incentives to do
15 that, both with the utilities and the state and
16 the Federal government. So we've had a lot of
17 change. So we've actually seen our demand on
18 the grid go down the last probably 8 to 12
19 years. Every year it goes down, down, down,
20 and we see more improvement. So I've got
21 capacity out there that most people don't have,
22 and we don't see it as a problem. Now, the
23 only local problem we see is maybe with local
24 transformers, but the utilities are in that
25 business. They're used to doing that. There's

1 a lot of old infrastructure anyway, and it gets
2 replaced on a normal basis. We've had the
3 discussion with PUC who should be paying for
4 that. Well, we've decided that's the utility's
5 job, that's the ratepayer's job, that's going
6 to go there. But they've also decided that the
7 utility can't get into the direct charging of
8 the vehicle. So, you know, they don't feel
9 that that should be spread over the rate of
10 pyramids. So we still have that problem of
11 infrastructure, who's going to put it in, and
12 who's going to own it. But all the other
13 pieces, we don't see the problem, even with the
14 DC quick charges.
15 XXX: That is one unique
16 perspective in a region.
17 XXX: That's a regional
18 perspective.
19 XXX: I guess I would ask if there
20 are other people familiar with the grid around
21 the nation in other regions and their
22 perspective.
23 XXX: We've been very involved in
24 different state PC efforts on electrification,
25 unplugging electric vehicles, and it's true

1 that the grid, and you know, (indiscernible)
2 conducted a study a couple years ago, and it's
3 true that the grid can handle the expected
4 plug-in electric vehicle load and mobile
5 generation level, but I think the issue is at
6 what cost to the local transformer level. And
7 the issues that are coming up now in Northern
8 California and other states is who -- exactly
9 what happened in Oregon -- who pays for those
10 transformer costs? Should private
11 (indiscernible) through the corners and
12 separate it out and charge for those costs. At
13 the same time, you know, NRBC among many other
14 groups are advocating for lower rates for
15 electric drivers, how to reduce pricing for
16 electric drivers. So there is this dichotomy
17 like thing at the same time of not wanting
18 electric vehicle owners to bear the burden of
19 that cost, but at the same time, vehicles
20 owners bear the costs, I don't call it an
21 incentive but an opportunity to charge an
22 available rate.
23 XXX: If you behave in the
24 right way.
25 XXX: That's a key question.

1 Should there be a separation of those who
2 behave the right way through intelligent cars
3 versus those who might want fast charging,
4 maybe one day in a residential space, you know,
5 Tesla sells some of these, you know, DC
6 (indiscernible) longer term, what cost is that.
7 What utilities tell me now is that each of
8 those loads represents -- level two loads
9 represents about two households adding on two
10 households in terms of peak power. A lot of
11 the transformers aren't built to handle that
12 additional (indiscernible).
13 XXX: And I think that gets
14 into -- you could handle that as long as you're
15 moving that off the peak. I think that could
16 be done with any VSE, the supply equipment, and
17 the car. I mean, you could program the car.
18 And we've already seen that many of the people
19 are doing it on their own. We have not -- you
20 know, this is part of -- I think we've talked a
21 lot about is with their phone, you can program
22 a car and you can say, "Okay, I'm going to plug
23 you in as soon as I get home at five, but don't
24 start at --
25 XXX: Midnight.

XXX: You'll start at ten o'clock or whatever. Unless I want you to do it. If I'm going to go to the movies later, yes, charge me up and get me down the road." But these are a lot of the consumer interface things that we want to play with more. And when we talk about quick charging, what we're finding already by playing with it, I don't need maybe the whole 26 minutes. And it's got a curve to it on how it charges. It puts a lot of energy in there in the first ten minutes. I can get up to 50 percent in the first 10 minutes, and that may be all I need. So I don't need that full 20 minutes to charge. I'll plug it in and a lot of people are making these decisions now and they've got apps that they're building. "Oh, I need to go from point A to B, I only need this much." So I think there are a lot of things out there we still need to understand about these vehicles and how they interface and how people will use them.

XXX: A couple points. Quick charging is not quick charging. It's actually quite slow compared to what people are used to. Unless it's less than five minutes, it's not

quick charging. It may be quicker charging, but it's still not quick.

XXX: And quick charging in your vocabulary is 25 minutes?

XXX: Well, the way the lead currently is, in 26 minutes it will do 80 percent charge, and that last 20 percent is very slow.

XXX: Okay, very good.

XXX: But even 80 percent takes 25 minutes.

XXX: And so that's really important. Again, for a lot of consumers, second and third cars, they'd be perfectly happy for it, but mainstream consumers, it's a deal breaker. And that's not just my opinion, I've heard a number of experts in consumer surveys and so on saying the same thing. Recharge time is actually more important than range.

XXX: From the grid question, we just heard that a level two charger, which is not anywhere close to even a 25-minute quick charge, which is not even close to what you just discussed, but even that level two charger

1 represents two households at peak energy
2 consumption.
3 XXX: This is my second point, is
4 that almost all the discussion about
5 infrastructure for electric vehicles focuses on
6 home recharging at fairly low rates. And
7 complete agreement that there's probably not
8 going to be much of an impact. But if you're
9 actually successful with electric vehicles, it
10 means you're actually getting to faster
11 recharges. What do service stations do? If
12 you want to recharge 10 electrical vehicles
13 simultaneously in six minutes, that's five
14 megawatts. That's a literal substation. This
15 is not existing infrastructure, and it's very
16 expensive. And people are tending to ignore
17 that. So to get things going, and if you're
18 satisfied to always stay in the mainstream of
19 electric vehicles, then you don't have an
20 infrastructure issue, not a major one. But if
21 you're talking about taking away from people's
22 mainstream, that's a whole different ballgame.
23 XXX: What would the charging
24 cable look like for a five-minute quick charge?
25 XXX: It's pretty thick.

XXX: 300 kilowatt.

XXX: What he's talking about is a quick charging station, not obviously quick charging at every home. But getting to the point, so compare the battery swapping with a quick charge, which one's better? If you can do a battery swap for 100 percent state of charge in five minutes, is that adequate for a quick charge?

XXX: Yeah, but I've got to keep a second battery around.

XXX: Well, it's a station.

XXX: Somebody's got to pay for it.

XXX: Right, somebody's got to pay for it.

XXX: Again, the problem I have with that is you're taking the single most expensive component in the system and saying you've got to build lots of (indiscernible).

XXX: I'm sorry, John, I didn't hear that.

XXX: You have to build lots of the most expensive component and just leave them lying around.

1 XXX: Not having endorsed the
2 Better Place model, but I will say that there
3 is something to be said about innovative
4 financing models here to the extent that a lot
5 of smart people, investment banks, have
6 invested a ton, and I mean a ton of money into
7 this model, perhaps components of it is
8 something to --
9 XXX: I suspect investment banks
10 don't realize that every vehicle is going to
11 have a unique battery pack. You can't take
12 somebody else's battery and put it in a vehicle
13 because the whole controls button don't work
14 any more.
15 XXX: No, I'm saying you can --
16 even if there were (indiscernible) -- even if
17 (indiscernible) made three different electric
18 vehicles that are different size, there are
19 going to have different sized batteries.
20 XXX: Every manufacturer's
21 batteries are going to have different
22 chemistries. I do want us to go on to one
23 thing that I saw from a DOE presentation last
24 month, and somebody's come up with a concept to
25 do a mini flow battery. Flow batteries have

1 external electrolytes, where you actually pump
2 fluid through the system. And they've been
3 done on very large scales, stationary storage
4 applications. A company out there is talking
5 about trying to do it on a vehicle. I'm
6 actually kind of incredulous, but if you could
7 actually make that work, now for a fast
8 recharge all you have to do is replace the
9 electrolytes.
10 XXX: I can't believe that the
11 energy density in the electrolytes is going to
12 be any better than gas saving. Go through the
13 physics. I don't think that works.
14 XXX: I agree, but all I'm saying
15 that at least this system has the opportunity
16 to be fast charged by replacing the
17 electrolytes instead of trying to recharge
18 (indiscernible).
19 XXX: There's a wide range in
20 volume of stuff. You know, evidently, gasoline
21 pump is 10 to 15 megawatts.
22 XXX: That would be an interesting
23 analysis, but you also have to take into
24 account the same infrastructure issues or
25 similar infrastructure issues with having a lot

1 of electrolyte at a station, right? But that's
2 not simple. One of the major costs of
3 batteries today is the electrolyte itself and
4 shipping it. It's a very caustic substance.
5 So you'd have to take that into account as
6 well. It's interesting. It's certainly worth
7 doing some analysis on.
8 XXX: I'm using it to try to
9 illustrate the problems if you actually have
10 mass markets for electric vehicles.
11 XXX: John, you're assessing a
12 mass market meaning that we won't get there if
13 it's a two car owning family it seems like.
14 But I would almost argue that probably a large
15 fraction, and maybe a majority of households,
16 and maybe, Tom, you know this, owns two cars in
17 the U.S. And we are in some sense, families
18 have the SUV and they have the commuter car.
19 XXX: That's the model we're
20 looking at is that this is a second car. I
21 don't think the fast charging will be used that
22 much. We think it's going to be a confidence
23 booster for people for the most part. It's
24 there when you need it. But most of the time,
25 when you look at the use patterns, most people

1 can get by with one of their cars being
2 electric.
3 XXX: But you have to be able to
4 resell it, and the resale market does not have
5 the access to the chargers. Often it's single
6 car households, and if there's no resale market
7 for these, then you're not going to have new
8 car marketing either.
9 XXX: I don't know if 20 percent
10 of the cars are that, I don't know.
11 XXX: People send emails to me,
12 they know about this, people who buy Volts and
13 Leafs, some fellow he's got a Volt and a Leaf,
14 and that's interesting to see how he
15 distributes his travel now, what are his
16 choices.
17 XXX: So on one hand I'm hearing
18 that kids don't want to buy a car, and on the
19 other hand I'm hearing people buy a second car
20 when they don't need it.
21 XXX: I'm not saying they don't
22 want to buy a car. I'm saying they don't want
23 to drive the car.
24 XXX: Taking that a step further,
25 which means they might not buy one. But now

1 you're telling me you have to buy two of them,
2 buy a spare car, when they could actually just
3 use one car. So I'm hearing two different
4 things here.
5 XXX: The reality of the car
6 market, California has the highest ownership
7 rates. They exceed one car per person. And if
8 you look at new car buying, if you stop looking
9 at the used car market in the mix, those people
10 have even more cars and they buy
11 proportionately more of the cars. So you have
12 this impact in the auto market where people
13 buy -- at least they're replacing cars more
14 often and they tend to have more cars. So they
15 have disproportional impact on the market. So
16 that's where we look at this multi-car
17 household a lot is in new car buying
18 households, and it is more pronounced in
19 California where we have some terrible transit,
20 big distances, and we started putting in
21 drive-in hamburger places a long time ago and
22 that's the way people live their lives. I
23 think we still are totally dependent on them.
24 I am saying that there is within urban
25 populations some movement. Why young people

find Portland really attractive, it's just sort of a new mindset. I started to see it in my own town, where young men are not buying cars as much.

XXX: We see that in Washington also. A lot of young people are moving to Washington because you don't want to own a car, you just want to use mass transit.

XXX: How do these batteries work in cold climates?

XXX: Cold batteries or (indiscernible).

XXX: Can you just run this thing in the summer time? What about Minnesota?

XXX: No. Lithium ion works better in cold temperatures (indiscernible), and what's more is that as you use the batteries they heat up pretty quickly. The biggest issue of winter is heating the cabin and the energy loss from that.

XXX: So can you still get the same range in the winter time?

XXX: No.

XXX: It's depleted, but basically these batteries are plugged in. You're

1 assuming that they're actually at the ambient
2 temperature when you start off. That's
3 typically not the case, unless you're parked
4 somewhere, right?
5 XXX: Unless you do one heck of a
6 job of insulating your car, it's going to cool
7 off really fast after you get home.
8 XXX: Yeah, most of the batteries
9 will be very well insulated.
10 XXX: When I did the lessons
11 learned work and I held workshops in the
12 Northeast, the people in Vermont were
13 completely convinced after their experiences in
14 the 90s, that battery electrics, not plug in
15 electrics of course, had to have small fuel
16 fired heaters on them. And the Swedish have
17 always done this, so there's some precedent.
18 It might be an area of interest of research to
19 make fuel fired heaters, kind of bring them up
20 to date. There were these after market ones
21 they used in Vermont.
22 XXX: And they had far higher
23 emissions than gasoline engines
24 (indiscernible).
25 XXX: The old ways are terrible,

1 but I'm saying there's probably some new modern
2 version of that.
3 XXX: Ford is actually -- I think
4 it was Ford at the EDK marketing, the
5 pre-heating of the vehicle.
6 XXX: You only need this in that
7 part of the States. How many days a year do
8 you need it?
9 XXX: Okay, let me put three
10 more points on the table and maybe we'll wrap
11 it up with some individual closing comments.
12 There was a very different perspective
13 in this meeting, these would be the fuels on
14 the informational role for the DOE. If I could
15 try to paraphrase a number of the fuels people
16 or the prevailing sentiment of consensus. It
17 was we really just need you, DOE, to sort of
18 certify the technologies and tell other folks
19 that a particular technology is viable and
20 economical. And beyond that, we don't really
21 need you. They also needed money. Whereas
22 here we sense from the big companies was we
23 know our business better than you, DOE, so we
24 don't need you and we don't think you're even
25 capable of knowing our business as well as we

1 do. So much less emphasis on that
2 informational role. And then finally, two
3 more. DOE needs to better document both
4 successes and failures in its programs, and we
5 talked about that already. And then we heard
6 yesterday a surprising disparity in the desire
7 for either cost based or time based performance
8 metrics. So do we set metrics according to
9 cost, and many people said the DOE ignores cost
10 and that's fine, that's what it should ignore;
11 or the DOE should be setting milestones based
12 on timely performance, if you don't reach your
13 goal in five years you should be out. So those
14 are just some other things we thought we heard
15 yesterday.
16 XXX: I think time based is just a
17 trap. It leads you to where you're constantly
18 changing your priorities in your programs. You
19 start getting close to that time and, oh, it
20 didn't materialize the way you thought. And so
21 I think that constant change and turmoil is
22 very (indiscernible) and is why I strongly
23 advocate it.
24 XXX: So you would not be an
25 advocate for RPE, for example, which says

1 you've got a three-year grant and you do da,
2 da, da, or that's the end.
3 XXX: I can't see that. DOE's
4 role should be for performance metrics. And if
5 you go for performance metrics you're going to
6 have much more consistent policies and much
7 more consistent success.
8 XXX: I'd like to go back to your
9 information one, I think that DOE plays a vital
10 role. The Energy Star programs have been very
11 successful with appliances.
12 XXX: That's on the appliance
13 side. Let's say on the other side, EPA's got
14 the Smart Way program. We're seeing trucking
15 firms really gravitating towards those trucks.
16 What if there's an Energy Star car out there,
17 something like that, or tires, there's a whole
18 slew of products out there that I think the
19 public could be steered towards, and it's kind
20 of that third party verification. They're not
21 going to always trust the manufacturer because
22 they're trying to sell me something. I think
23 there's a role.
24 XXX: In terms of targets, I think
25 we do have to have some time frame on that

1 because to deliver something you have to show
2 progress. If you don't have a time frame as
3 well as a performance goal, then you get
4 criticized that it's going on forever and
5 should be done, and that's the reason we have
6 it.
7 XXX: I agree there's political
8 pressure.
9 XXX: Yes and no. I'm halfway
10 where you are, but the other half of me says
11 you've got to produce something in some
12 reasonable time, otherwise you're just full of
13 problems. This is not working. It is in the
14 end a program management call, it's a judgment
15 call.
16 XXX: But we have performance
17 metrics for progress that needs to be shown,
18 and then you just dump them if it's not any
19 progress.
20 XXX: Try to use both.
21 XXX: Unfortunately our
22 paymasters have time.
23 XXX: There's always a linear
24 curve.
25 XXX: I'll just throw the floor

1 open for comments on things we might have
2 missed or things that you feel still need to be
3 emphasized.
4 XXX: We talked earlier about
5 demonstration police, electric cables, I think
6 we also need to look at consumer desires.
7 We've looked at consumer studies that say when
8 we asked people, would you be interested in
9 buying a hybrid or a plug in or an EV, and our
10 last study showed 51 percent said they would
11 definitely or probably buy a hybrid vehicle.
12 Then when we look at the actual sales, it's 2.5
13 percent of the light vehicle market. So we
14 need to figure out how we go from 51 percent
15 down to 2.5 percent in the real world.
16 XXX: I heard about an
17 experiment that was discussed over dinner last
18 night in which some major manufacturer took one
19 of their models and priced the hybrid version
20 of the model at exactly the same price.
21 XXX: Yeah, it's the Lincoln MDZ.
22 XXX: Oh, you know, I didn't
23 know which one it was. All right. And the
24 uptake rate was --
25 XXX: 20 percent.

1 XXX: -- 20 percent.

2 XXX: But you've got to be a

3 little careful. If you go to their website

4 they talk about the incentives on the MKZ and

5 (indiscernible) except hybrids. So there still

6 is differential pricing in one sense of it.

7 XXX: One area that we talked a

8 lot about doing this and doing that, and we

9 don't want to lose the fact that there are all

10 those things, but there's also the importance

11 to coordinate the programs. So oftentimes we

12 start a program with a basic (indiscernible) or

13 discovery, and at the same time we deploy the

14 development program, and when the basic

15 research program is done there's not going any

16 (indiscernible) Chinese, Japanese

17 (indiscernible).

18 XXX: So moving smoothly along

19 that chain.

20 XXX: Yes, the whole chain, the

21 whole innovation chain, the whole thing, and it

22 needs to be coordinated ahead of time how we

23 allocate the resources. And the other thing is

24 this business about the social science, which

25 seems to be lost in translation. We're not

1 going to solve every problem. So some small
2 (indiscernible) there would be a good thing.
3 XXX: Do you think we know if
4 we were to put down $30 million dollars a year
5 for social science research, whether it's in
6 vehicles or more broadly energy, do you think
7 we know what the agenda would be and what we
8 would study?
9 XXX: I tell you what I believe.
10 I don't know personally, but the same way we do
11 workshops for combustion science or this or
12 that, social science workshops, they have
13 plenty of those, and then they have
14 (indiscernible).
15 XXX: There is one such
16 workshop scheduled in about two weeks. I'm
17 hesitant because I think invitations are
18 limited at this point, but the American Academy
19 of Arts and Sciences with a little of
20 encouragement and a tiny bit of support from
21 us, who else is involved?
22 Asa, do you remember or XXX?
23 National Science Foundation, DOT, I can't
24 remember. But the question is, what is the
25 social science research agenda.

1 XXX: Your other option is just
2 (indiscernible).
3 XXX: Well, I'm just about to ask
4 that.
5 XXX: There is some caution.
6 Social scientists, that's why people like
7 (indiscernible) economics. They've got a
8 single framework they all operate in and most
9 economists understand each other and all this.
10 But when you get into social sciences, there's
11 a lot of agendas and a lot of approaches.
12 Especially in the social sciences in
13 psychology, but even in psychology there's
14 probably ten different models. I remember
15 getting one of my first books when I studied
16 psychology. 30 models of decision making in
17 there. Economics you sort of have one. So
18 you're opening up to some complexity. So there
19 needs to be a practical mindset about what's
20 going to happen there. You do basic science
21 and social sciences, that's scary stuff.
22 There's all kinds of things going on. So there
23 needs to be a real applied focus to keep the
24 attention. They have some tools.
25 XXX: We had this conversation.

1 I mean, the people who do marketing and
2 branding in the commercial world are applied
3 social scientists, and my sense is their
4 expertise may be for individual corporations,
5 but certainly not for the government, it has
6 not been brought to bear on this.
7 XXX: I'd be cautious with the
8 consulting groups. They tend to want to know
9 what you want like the consultants. I think we
10 need to keep some strong objectivity in the
11 work.
12 XXX: And I would add to that, in
13 the energy efficiency space, we've always had
14 this problem with the upfront costs and the
15 fuel savings over time, and about deployment,
16 there's always been a lot of market barriers to
17 that. I would almost say broaden it out to not
18 just vehicle efficiency, look at other markets,
19 look at other products. Utility efficiency
20 programs, a lot of these that a couple of
21 utilities have energy efficiency programs. For
22 years and years we have spent millions of
23 dollars trying to deploy, get customers to
24 purchase energy efficient. You know, a lot of
25 the light bulbs you see, the fluorescents, are

1 part of that. And there's a lot of work in
2 that area. And to actually pull that together,
3 apply it to energy efficiency, and are there
4 lessons learned across different products. I
5 think that the DOE would be actually helpful,
6 and not just bring in the social scientists,
7 but also the investors who are also thinking
8 about consumers and customers, bringing
9 companies that are deploying energy efficient
10 products and talk to them. I think that would
11 be actually a very useful service.
12 XXX: I worked in these other
13 areas where we were doing market transformation
14 for Windows, for instance, I worked in that
15 area 12 years ago. And it's kind of
16 interesting how we went about it. We really
17 researched the industry and then attacked where
18 we thought the weak points were. I wonder how
19 that would work in the transportation sector?
20 You would have to study that and I have no
21 idea.
22 XXX: I think in efficiency, for
23 example, that's an interesting one. Just look
24 at the dashboard of cars over the last 3 or 4
25 years, and what is the information consumers

1 get about fuel economy? When we went out and
2 did a little bit of work, for example, a lot of
3 the economists assume some things about people
4 making decisions around cars, and David Green
5 asked us to go out and do a little bit of
6 anthropology around that. And just a few
7 simple questions. For example, people don't
8 know their annual fuel costs. They're not even
9 close when they try to estimate it. So there's
10 some basics there that are missing. We can
11 create a system in which the information on
12 board vehicles just tell people that. That
13 would be very simple to tell people what they
14 spend, in the future, on gasoline, over a year,
15 or over the trip they just took.
16 XXX: As long as they remember
17 to reset the counter.
18 XXX: You can reset the counter,
19 or it can all be stored there, you can just
20 look for it, and there's ways to look for it.
21 There's ways it could be broadcast to your
22 blackberry or to your computer. There's a
23 whole bunch of ways this could happen. We're
24 researching the impact of all this and when and
25 where and how it is received.

1 XXX: So just for a personal
2 note. You know, I'm a data guy, integration
3 intense, but even for me, that's just too much
4 information.
5 XXX: People pay attention to car
6 prices, and so there are sort of cultural
7 things. We all are confronted with gasoline
8 prices all the time, on the street I drive by
9 them. It's the one system that's sort of
10 culturally institutionalized is the price of
11 gas. That's one of the reasons people pay so
12 much attention to it, it's all the way out
13 there, it's on the news every night. It's not
14 necessarily the biggest part of people's
15 budget, but it's one that attention is brought
16 to all the time. And so as we look at that,
17 and we look at the systems that are coming on
18 board for vehicles, we need to pay attention,
19 there's some area for progress there in people
20 paying attention to things they didn't pay
21 attention to before.
22 XXX: One other area that we
23 didn't talk much about is DOE education. And
24 even if that's a nice thing to engage programs
25 and some other things at the rotation stage,

1 but, I think we should probably do more of
2 those. From my vantage point I see people
3 coming now from industry to us saying, we want
4 50 graduates (indiscernible), those don't
5 exist. Even in the conventional areas. Other
6 industries go to lots of people who just don't
7 have (indiscernible). A graduate school went
8 to (indiscernible) before the crisis last year
9 and (indiscernible), and so that doesn't work.
10 Along the same lines, probably a closer
11 coordination with the campuses. When you have
12 the demonstration and (indiscernible) programs,
13 that's a great place to put some of that.
14 Students of the future, they're much more ready
15 to (indiscernable).
16 XXX: And that will bring the
17 students in. The ability to not have to just
18 always be in the classroom and be connected to
19 a real world happening, that brings people in,
20 that education, that's an exciting opportunity.
21 XXX: On that note of
22 excitement, thank you all. And we're eager to
23 hear from you individually by email, and no
24 doubt there will be communication from us as we
25 go through the process. Thanks for a good

1 deeper discussion on these topics.

2 XXX: All the slides as well as

3 anonymized transcripts of all this will be on

4 the web within a week. On the Energy.gov/qtr

5 website.

6 (Whereupon this meeting was concluded.)

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1 C E R T I F I C A T E

2 STATE OF TENNESSEE:

3 COUNTY OF MEIGS:

4 I, Alisha J. Armour, Licensed Court

5 Reporter for the State of Tennessee, do hereby certify

6 that I reported in machine shorthand the foregoing

7 proceedings; that the foregoing pages, numbered 1 to

8 144, inclusive, were typed by me using computer-aided

9 transcription and constitute a true and accurate record

10 of said proceedings.

11 I further certify that I am not an

12 attorney or counsel of any attorney or counsel

13 connected with the action, nor financially interested

14 in the action.

15

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18

19 _____

20 Alisha J. Armour

21 Tennessee Licensed Court Reporter

22 TLCR # 325

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