

CEBROWSKI INSTITUTE FOR INNOVATION AND INFORMATION SUPERIORITY

**ENERGY IN THE 21ST CENTURY:
CAN MUIR, PATTON AND GANDHI AGREE?**

WELCOME:

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THE ENERGY CONVERSATION

SPEAKERS:

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MITZI WERTHEIM: We're going to get started now, and I want to thank you all for coming. For those of you who don't know me, I'm Mitzi Wertheim.

And I want to tell you, the turnout tonight is really exciting. The Energy Conversation got sparked by Jim Woolsey, our speaker tonight because back in 2004, in October of 2004, Jim was giving a talk, and he was asked, if you were elected president, what would you do? And Jim said, I'd eliminate our dependence on Mid-East oil. And a friend of mine was in the audience, Marv Langston, who worked at the time for SAIC, called me up, said I'm coming to Washington to take you to lunch, and he told me the story, and then said, we need to do something about this. And I said, Marv, I don't know anything about energy. I'm a social anthropologist by training. So he said, would just bring some people together, which is what I love doing. So I'm so glad to see so many of you here tonight.

We have a group that's been meeting monthly ever since then called the Energy Consensus. It's an embryonic organization that is sort of the foundation for this group. It is interdisciplinary, intergenerational, international, across government, industry, academics and the media. And what made it so successful is that it – people asked different questions. And it's, you know, that problem of if you all come from the same stovepipe, you don't learn anything new. Well, it was the different questions. And part of this conversation is about learning how to make different questions.

I want to thank our original sponsors, first the Office of Force Transformation, and then the director of defense research and engineering. And our new sponsor is the Navy, and we are being hosted out of the Naval Postgraduate School. And Sue Higgins, whom you're going to meet, is now the program manager.

We've held 31 meetings over the last three years. This is the beginning of year four. Our very first meeting we also had with Jim, and we're soon going to have a book out on the web about the three-year history of the Energy Conversation. I'm not quite sure how soon that's going to happen, which CNA has published. And also CNA is putting out a study on energy done by their military advisory board, and I think that's coming out next week.

It is the Cebrowski Institute at the Naval Postgraduate School that is our new home. And Sue, will you come join me? We're going to be doing some new things – and by the way, we have a tiny staff, so if we somehow didn't get your name, I apologize; we'll try to do better the next time. But all of this is about learning and discovery and opening the aperture, and it's this building of community that has been so incredibly important because it's the connections that we make, the different questions that we ask that is helping us to move forward both in understanding about energy and climate, and the impacts of not only national security, but

education, health, agriculture. This is not a simple domain to get in. My view is it's now the most complex set of problems we've ever had to deal with. And I'm glad we have so many people struggling with it.

Sue, the floor is yours.

SUE HIGGINS: Let's see. (Applause.) Hi. I'm so pleased that Naval Postgraduate School is a part of this now. It's just an exciting thing to be a part of. And all of the language that Mitzi used about learning and education and opening and growing certainly is the kind of thing that we're about at a graduate school. So we're thrilled growing new generations of leaders to embrace these very, very complex problems are the core of who we are and what we're about.

At Cebrowski Institute, we are a research institute within the Naval Postgraduate School that focuses on networks and the power of networks, the power of how networks can shape and change the world that we're in. And this is the quintessential network – embryonic, as Mitzi suggested, information still, but the fact that it is so cross-sector, cross-disciplinary, cross-generation is really indicative of where the real power of networks is coming in. So I'm thrilled to be a part of this and thrilled to be able to be here for Naval Postgraduate School and the Cebrowski Institute.

We are going to do something a little bit different than what has occurred in the last three years. Three years and 30 – now 32 conversations is pretty powerful, and a lot of people are doing a lot of great things in this area. And what we would like to start doing is recognizing exemplars, exemplars of those who actually hold this banner up high in the way that they do business, listen, learn, connect, share, and collaborate is core to what the energy conversation is about, and these are the kinds of people that we would like to start recognizing.

And so we would like to tonight recognize two different recipients. And the first, I'm going to just read something here. This is a small – a relatively small project, also embryonic. It is hosted out of the National Defense University, and it is called STAR-TIDES. STAR-TIDES stands for – and I see some heads nodding. That's really nice to see that some people know what this is – sustainable technologies, accelerated research, transportable infrastructure for emergency support. This is known as STAR-TIDES.

The focus here is on providing support to stressed populations. And the reasons that we've selected this particular group is that they exemplified the same things that the energy conversation exemplifies. They've got power issues that they are sharing information about across open networks – they are an exemplar of the way that the world is shifting to share information.

It's an international information-sharing research project hosted at the National Defense University. Doctor Linton Wells who is a former assistant secretary of defense for networks is

now – is the – would you call it a midwife – the one who’s birthing this – helping to birth this STAR-TIDES project. I hate to call it – I have to tell you, I hate to call it a leader because there is something different about leadership in networks that is – that we also are trying to recognize here.

Dr. Wells and his team are breaking ground in sharing information in an open, transparent way across government and across sectors using web tools, open-data formats, and open-source community development platforms. They’re modeling how data and information can be widely and easily shared across organizations. STAR-TIDES is sharing information about low-cost affordable power sources and supplies that are available to those supporting stress populations.

For these achievements, the Naval Postgraduate School, the Cebrowski Institute, and the Energy Conversation are honored to recognize Dr. Linton Wells, the STAR-TIDES team. And accepting for the team is Dr. Mark Drapeau, National Defense University researcher. Mark and Mitzi, can you come up please? (Applause.) We’re going to do – I’m going to have you do a quick presentation here. Here you are. Here you are.

MS. WERTHEIM: We’re giving out kilowatts. Do you know what these are – kilowatts? It’s the cheapest way to save energy by not using it, and this helps you measure the amount of energy that you’re using. So Mark, on behalf of the PG School, the Cebrowski Institute, the Energy Conversation, congratulations. (Applause, chuckles.)

MARK DRAPEAU: Well, I’m very happy to be here. Some of you might recognize my name because NDU has hosted an energy security forum every year, and I’ve been a part of that, and so has Mr. Woolsey, for that matter. So I’m very happy to accept this on behalf of Lin Wells. I encourage you to visit the STAR-TIDES Web site to learn more if you’re not familiar. I think it’s STAR-TIDES.net.

MS. : Dash TIDES.

MR. DRAPEAU: STAR-TIDES. Thank you. And there really is no better catalyst and networker than Lin Wells. He’s extraordinary. So I encourage you to get to know him if you don’t already. Thank you very much.

(Applause.)

MS. HIGGINS: Mark is also a quintessential network. For those of you on Twitter, he is cheekygeeky. (Laughter.) And if you – and he is doing amazing things crisscrossing the federal government lanes with new social networking tools. So thanks.

The next group that we would like to recognize is the Federal Energy Management Program, also known as FEMP. FEMP is housed within the Department of Energy’s Office of Energy Efficiency and Renewable Energy, which has the mission of facilitating energy

management and investment decisions across the federal government in order enhance energy security and environmental protection.

In a relatively short period of time, Richard Kidd and his superb team have shown enormous innovative leadership revitalizing a range of interagency and cross-sector channels of communication helping to strengthen energy conversations between federal agencies and the private sector, as well as federal agencies and the nonprofit community. Success will not be possible if each agency tries to go it alone and is isolated from the learning that may be taking place in other federal agencies or in the private sector. Recent changes in structure, activities, and attitude within FEMP have created avenues for this exchange of information representing the ideals of this forum, the Energy Conversation.

For these achievements the Naval Postgraduate School, Cebrowski Institute, and the Energy Conversation are honored to recognize Richard Kidd and the staff of the Federal Energy Management program. (Applause.) (Off mike) – kilowatts – (off mike). He's doing a fabulous job.

RICHARD KIDD: Thanks, Mitzi; thanks, Sue. It's great to be part of the energy community. I moved to this space and sector about nine months ago where I came from the State Department and 20 years of working conflict and post-conflict issues. And I realized early on in Rwanda and Bosnia and places like that, the resource scarcity was indeed a driver of conflict, whether it's water, land, or energy. And I got tired of being on the response side and I wanted to get on the up-street side of the solution. And I've spent a lot of time working hard with great people here in this room and the energy conversation, but especially with the FEMP staff.

And being relatively new to the job, I really haven't done anything creative or brilliant other than just to do what my staff told me to do. And we've had a great team so far, and we've got a lot going on. And just a few quick tidbits, that since we tracked our Web site – we've redesigned it – we know how people come to our Web site, where they go, how long they've stay – the number of .mil addresses coming to our Web site has doubled on a monthly basis since the first week in November.

MS. HIGGINS: Fabulous.

MR. KIDD: There might be some coincidence there. And we've initiated an open call for proposals for technical assistance across the federal government, and in less than 10 days, we've gotten over 102 requests for assistance from various federal agencies on energy efficiency, renewable, net-zero bases, et cetera.

So the federal government – the largest energy user in America. The federal government uses as much energy as the whole country of Austria, and agencies that make up the federal government, many of whom are represented in the room today, they've embraced this issue. They are responding to the challenge, and they are doing great things. And for those of you who

are not in the federal government, I think you should be proud of your federal servants, whether it's in DOE or the Department of the Navy or wherever the case may be. They are really rising up to this challenge, and I'm pleased to play a supporting role in that. Thanks.

(Applause.)

MS. WERTHEIM: Do you want to do that?

MS. HIGGINS: No, you can do it. And with that, I'd like to now ask Admiral Bill Burke, director of the Navy's Quadrennial Defense Review – long-time champion of the energy conversation to introduce our speaker for the evening. Admiral?

REAR ADMIRAL BILL BURKE: Thanks, Sue.

Okay, we've done a lot of talking tonight. Let me – whoa. Let me make this quick. Welcome to the conversation. But before I introduce tonight's speaker, let me just a few words about Mitzi Wertheim and her extraordinary efforts over the last couple of months to keep the energy conversation going. She found little OSD or service support for this important work, despite the real need for both creative thought and the social networking to address the many facets of complex problems like energy.

Mitzi probably would never expect those words to come out of my mouth about social networking. But not surprisingly, Mitzi has tapped her own social network to keep the conversation on track. Without her tireless efforts, we would not be able to continue the conversation. Please join me in thanking Mitzi for all of our efforts. (Applause.)

Okay, now to my real job. Tonight's speaker is back for a second time, as you've heard. Jim Woolsey is well-known in green circles for practicing what he preaches, and we're fortunate to have him here with us tonight. He earned a bachelor's at Stanford, a master's at Oxford where was a Rhodes Scholar, and a Yale law degree. He's held numerous challenging assignments in the government, including director of the CIA, ambassador to the negotiation on conventional armed forces in Europe, delegate to the U.S. Soviet START talks, and, my favorite, undersecretary of the Navy.

Please note he served under Presidents Carter, Reagan, Bush and Clinton. Between government assignments, he was an associate partner in a D.C. law firm. He has served in various other positions, including senior vice president for global strategic security at Booz Allen Hamilton. He's been part of numerous studies, commissions, panels, and has been a member of a number of boards. Recently he was part of the just-published report to the Congress on the strategic posture of the United States.

He's currently a venture partner with Vantage Point, which is a Silicon Valley venture capital fund specializing in clean-tech investments. He's also an Annenberg distinguished

visiting fellow at Stanford's Hoover Institution. Please join me in a warm welcome for Jim Woolsey.

(Applause.)

JIM WOOLSEY: Thank you, Admiral Burke. I appreciate the kind words.

Clearly we have a number of people here from the government this evening. And I've served in the government actually five times. And don't stop me if you've heard this story before because, frankly, I love it too much. (Laughter.) But we all know why we do the government gigs, right. It's the public appreciation. (Laughter.)

I had a clear example of that when I had been out at the CIA for about eight months. My wife and I who were classmates at Stanford decided we'd take off three or four days and had 24/7 job – fly out to our class reunion, see the homecoming game, see old friends, cash in the frequent flyer miles, go first class, do it right.

First thing that happened is my head of security at the agency said, actually, Mr. Director, we want Mrs. Woolsey to go on a different flight because we can't have anybody named Woolsey on the flight. And I said, but wait a minute; my name is Woolsey. And he said, oh, no sir, you need to fly an alias. And of course my first thought was, uh, oh, there go the frequent flyer miles. (Laughter.)

So my two security men go out to Dulles. As we get on the plane, they stop by the cockpit in those somewhat simpler times, show the chief flight attendant and the captain, the pilot, that they're carrying weapons that they're authorized to by the federal government with our IDs, go back to the back row of coach, the three seats right in front of the bulkhead where you can't even lean back. I'm wedged in between these two big guys for the six hours out to California. (Laughter.)

So we're walking down the jet way in San Francisco International. A flight attendant comes over and whispers something to one of my security guys, and he just cracks up. And since he's a big stolid guy, I was a little surprised. I said, Murph, what's so funny? He said, you know what she just said? She said, you know, I've been on these flights for 20 years, and that is the politest and best-behaved prisoner that we have ever had on. (Laughter.) So like I say, that's why you do the government gigs, right. It's the public appreciation, that sort of thing.

Well, I want to share some thoughts with you this evening about energy, and I'm going to talk a bit about the problems and a bit about some possible solutions. And there are three individuals that I admire a great deal for all sorts of reasons, but for very special reasons with respect to energy since it touches all aspects of our lives. I would like you to try to keep in mind what each might think about both these problems and I'll try to touch on those as we go, and the solutions.

The three individuals – the first one is rather obvious – John Muir, the father of the environmental movement in the United States, the good friend of Theodore Roosevelt, essentially the founder for all practical purposes of the National Park system, founder of the Syria Club, et cetera. Muir was a remarkable individual and he speaks from – and in ghostly tones here – this evening really for the environment and particularly because of his concern about climate change.

My second individual I'd like you to keep in mind is George Paton. And I picked Paton over a lot of other potential great military men, some of whom were real statesmen like Marshall and Eisenhower – I picked Paton because he is all war on totalitarians – polo punches, take them on, kill them, win. And Paton speaks at least in the conversation here for purposes of not just dealing with terrorism – and I think I would have to say he probably would not call it man-caused disasters – but rather winning, doing whatever you need to, to win for the country, for freedom.

The third is Mahatma Gandhi, one of the most remarkable figures in 20th century history. And Gandhi speaks really for two related concerns. One is of course the bottom billion or 2 billion in the world, those who need to move into prosperity, but if they do it the way we did by burning fossil fuels, they are going to cause a lot of trouble for the rest of us, to put it mildly, and themselves. So they are a concern but we are not, we cannot leave them in the kind of poverty they live in now. Gandhi would understand that.

There's another reason I picked Gandhi, which is the chakra, the spinning wheel that is in the middle of the Indian flag. The chakra was really the third leg of Gandhi's beliefs: independence for India, nonviolence. And the chakra stands for essentially spin your own college in the village – self-sufficiency. Don't just pick it and ship it to England and stay poor. Take responsibility for your own life and your own economy.

Basically what Gandhi was saying about the chakra and local self-sufficiency, very similar to what two centuries before Thomas Jefferson was saying in his long argument with Alexander Hamilton about the future of the American economy. Hamilton thought it should be manufacturing. Jefferson wanted to have a major role for what he called the yeoman farmer, and mainly because the farmer could make a good deal of what he needed himself and therefore would be better able to resist tyranny.

So this local self-sufficiency in Gandhi's mind, as it did in Jefferson's is tied in with the idea of improving the lot of those who are not wealthy and also giving them independence against anybody who would push them around.

So keeping in mind those three gentlemen, or at least their ghosts, I want to say a word about the two types of energy systems we have in the country and the two major types of threats to them. The two types there are – there's home heating and so forth, but generally I'm going to

be talking about electricity on the one hand and transportation on the other. Electricity is almost no oil – 2 percent oil in this country; 51 percent coal; the rest largely nuclear, hydro, and natural gas – very complex large-scale electric grid of course. And the transportation system is of course 97 percent petroleum fuel-based – petroleum monopoly over transportation – OPEC plus a couple of other dictators – monopoly over oil.

Those two more or less, today at least, completely separate energy systems face two types of serious threats. My colleague Rachel Kleinfeld out at Booz Allen for several years called them malignant and malevolent threats. A malignant threat is one that nobody is trying to create but it manifests itself by cascading in sometimes catastrophic change like metastasis in the human body from often some kind of a disturbance, sometimes called the butterfly effect – the idea a butterfly flutters its wings on one side of the earth, creates – since the ecosphere is a complex system – creates cascading change tornado on the other side.

Sounds a little theoretical until you realize that in August of '04, in the middle of a summer electrical storm in Cleveland, a tree branch touched a power line. The initial indications at the utility were not dealt with especially well. And after things looked a little bleak for a bit, within a nine – count them – nine-second period, 80 gigawatts, 80 nuclear-power-plants' worth of power were offline in the Northeastern United States on Eastern Canada, 50 million people out of electricity, billions of dollars lost to the economies of Canada and the United States, some of the areas offline for many days.

Now, we tried to take a leaf from the book of the “South Park” kids there and blame Canada. (Laughter.) But the Canadians in their polite way rather reminded us that Cleveland is south of Lake Erie, not north – (laughter) – and we had to confess that it had been our tree branch and our power line. The electrical grid – I feel like Henny Youngman – take the electrical grid, please. The electrical grid is sort of the equivalent of what our highway system would be if the interstate system had never been built. And we were trying to run tens of thousands of 18-wheelers, 20 tons each, at 50, 60, 70, 80 miles an hour over two-lane roads with a just-in-time economy and a lot of one-lane bridges.

The grid, to put it mildly, has some serious problems. And the real problem is that terrorists and foreign government hackers are a great deal smarter than tree branches. That moves us over into Rachel's other category of problem, namely the malevolent problem. A malevolent problem is one somebody is trying to create, and that is something that we need to pay a great deal more attention to.

It looks like finally the government, under the able leadership of those from Booz Allen here tonight and my former colleague Melissa Hathaway, seem to be making some progress on setting up a framework at least for dealing with cyber threats. There are other problems of the electric grid – physical attacks of infrastructure, which we don't really have time to go into. But the electric grid and the vulnerability to both malignant and malevolent problems is a very, very serious difficulty that we have to deal with.

Now, the grid is at least here. If we could get ourselves organized, since this grid is largely managed in 50 separate individual public utility commissions in groups of utilities, if we could get ourselves organized and put this all together – we don't have an imported fuel problem with the grid; we import about 15 percent of our natural gas from Canada, but, you know, they whipped us the two times we tried to conquer them in 1775 and 1812. But we've gotten along reasonably well with them since then.

So we don't have the kind of problem Europe does getting its natural gas from Russia; we're – that's not our problem with the grid. Pretty much everything we really need to deal with is here. It's just that our own lack of organization, our own historic financing mechanisms and the rest make it very difficult for us to deal with it. So there is legislation on the Hill now working dealing with this, but this is a serious problem. The grid is, however, at least here. It's our fault and our problem if we don't fix it.

Oil is different. Oil's infrastructure is not really that much here anymore since we import two-thirds of our oil, and since eight of the nine largest oil exporters in the world are autocratic kingdoms or dictatorships, either in OPEC or Russia. The infrastructure is there. It's where the oil lives. It is vulnerable, and the parts that are here in the U.S. pipelines are vulnerable to some extent to malignant issues – well, for example, the last large hurricane nearly took out the colonial pipeline, which runs up from Louisiana. And had it hit a few miles differently from where it did, we might have been a lot healthier up here because we would have done a lot more walking and a lot more bicycle riding maybe for some substantial period of time.

But those types of vulnerabilities are not the centerpiece of our problem with oil. Our problem with oil is the malevolent problems, and they are legion. Where to begin? Tom Friedman in his very fine book, "Hot, Flat and Crowded" has a wonderful chapter called "Fill Her Up with Dictators" deriving from the fact that the work of Paul Collier at Oxford and others has done a very good job of pointing out how, if a commodity that has a huge amount of economic rent attached to it – income well over and above a reasonable return on capital and labor such as oil that you can pump for \$2 or \$3 in Saudi Arabia and sell for 55 and complain about how poverty-stricken you are – if a commodity has a huge amount of rent attached to it, and it comes into a state that's already autocratic and dictatorial, it tends to augment the central power of the state.

Bernard Lewis says it very well. He says there should be no taxation without representation, but it's also true there's no representation without taxation. If you're so – if you're already a dictatorship and you're so rich that you don't need taxes, you tend not to have real legislators, and eight of the nine largest oil exporters in the world don't have real legislators. Some of them have nominal legislators like Russia, but they don't have real ones.

A country comes into wealth through widespread commercial activity. It tends to build up a middle class, it tends to demand economic reform, and it tends sometimes to demand

political reforms – South Korea, Taiwan. We've seen these kinds of revolutions. But oil tends not to push things that way.

We also, by borrowing something between \$2 or \$3 billion a week when oil is down at \$55 a barrel – it's a few billion a week – when it was up at \$145 a barrel, it was close to 2 billion a day. By borrowing hundreds of billions of dollars from those two whom we ship Treasury bills, of course we substantially make more difficult the operation of our economy. The stimulus package and these huge debts are very big. But in a number of cases, we're going to get the money back or at least some of it by buying shares and insurance companies and then they're buying them back. There's at least a chance. Every billion that you spend on foreign oil goes and stays essentially abroad. Each billion is something on the order of five (thousand) to 7,000 jobs if it's replaced by domestic production of whether it's ethanol or petroleum or whatever.

So we have an economic problem. We have a problem with the nature of the states that we have to deal with. We have the fact that oil, in the hundreds of billions of dollars to which it goes to OPEC countries, is turned around and used for purposes which our presidents tend to state very delicately saying by countries that sometimes don't like us very much. That's putting it mildly.

Have a look at Saudi Arabia. Hundreds of billions of dollars of income from oil and the home of the Wahhabi sect of Islam that is – if you read their fatwas – and that's what you should read, and translated from the Arabic not what they say to us but what they say to each other, the imams. What do you learn? That they are somewhere in doctrine at least between murderous and genocidal with respect to Shiite, Muslims, Jews, homosexuals, and apostates, and massively repressive of everyone else, including particularly women. It is essentially al Qaeda's doctrine.

The only difference between what the Saudi imams, the Wahhabis say when they issue their fatwas about their substantive beliefs and the substantive beliefs of al Qaeda is not substantive but procedural. It's a question of who should be in charge. That's why they hate each other so much. That's why they kill each other – very much like the Trotskyites and the Stalinists in the '20s and '30s. They didn't disagree about wanting to establish a dictatorship of the proletariat, and the Wahhabis and al Qaeda don't disagree about wanting to end up with a worldwide caliphate or religious dictatorship. They don't disagree about that at all. They disagree about who should be in charge of getting there.

Also Lawrence Wright, author of the "Looming Tower," which I think is the best single book on al Qaeda and 9/11 writes that with a little over 1 percent of the world's Muslims, the Saudis control approximately 90 percent of the world's Islamic institutions.

So those facts together should give us an idea of an answer to an important question. If you learn that a little Palestinian boy or a little Pakistani boy has been to a maddrassa and been taught to sow hate – Shiites, Jews, apostates, homosexuals, whomever – and become a suicide

bomber, and you ask yourself who is paying for those schools that teach those little Palestinian and Pakistani kids to become suicide bombers?

I have a tip. Next time you pull into a filling station, before you get out to pump your gas and get your credit card out, try to do what I always try to remember to do, just before you get out, turn that rearview mirror just a couple of inches so you're looking into your own eyes. Now you know who is financing that education of death for those little Pakistani and Palestinian boys. You're looking into their eyes.

Well, that should be enough to suggest that we have some big malevolent problems with oil – huge. And it's not just foreign oil. There's no way that we can fence ourselves off from the world oil market, pump oil for 50, 60, 80, 90, 100 more dollars per barrel, turn it into shale – or whatever – no way we can do that, produce what we need domestically, stay on the oil economy, fence ourselves off, and with some combination of tariffs and subsidies let the rest of the world do what it wants. Anybody who means energy independence by that I have very fundamental disagreements with. We can't do that that way.

What we have to do – and this is an analogy of another wonderful woman that I occasionally write with, Annie Coren (ph) – what we have to do is we have to do to oil what electricity did to salt a little over a hundred years ago. For millennia after millennia, up until the beginning of the 20th century, salt was a strategic commodity. It was the only way to preserve meat, a hugely important part of the human food chain. It mattered whether your country had salt mines. Countries went to war over salt mines. It was a very big deal.

Within a few short years with the coming of the electricity grids, and refrigeration and freezing, technology effectively destroyed salt's strategic role. It happened fairly quickly. It was kind of a surprise to the salt mine owners. They had to find some other way to make very much money. But it happened and it happened fairly thoroughly. We had salt on the table this evening. Does anyone know where it came from? Are we salt-independent? Does anybody care? Of course you don't care. It's just a useful commodity that's bought and sold on international commerce. Nobody goes to war over salt mines anymore, and nobody lords it over his neighbor because I've got salt mines and you don't. Days are gone with the wind. We need to do that to oil.

Oil has some important utility. It's a very good way to carry energy, particularly across oceans – there's a lot of energy density, but because of its other problems, we need to turn it into salt and use it only for what it really is especially important for, and we don't have to propel ourselves around with oil. There are other ways to do it. We'll talk about that in just a sec.

The set of malignant and malevolent problems that we face both with the electricity grid and with the transportation system is augmented by the fact that our fuel – 51 percent of the grid is coal, and – well, as I said, virtually all of transportation is oil – particularly coal and oil contribute, by being burned, to the risk of climate change.

Now, there's a pretty wide range of opinion in the American polity about climate change, from its absolute nonsense to it is going to destroy us all in a relatively few years. I think it's important to realize that just because you believe – and I think it's accurate to believe – that there are other things going on than CO₂ – the earth, for example, probably right now is in the middle of a several thousand-year period of tilting of axis that's gone on throughout the history of the globe – and as it tilts, the way it's tilting now, it tends to warm the northern hemisphere a bit.

But just because some potential climate change steps are not anthropogenic doesn't mean that we can't make the problem worse. And almost all of the extraordinarily leading climatologists believe that by doubling and perhaps even trebling the amount of CO₂ in the atmosphere, we are creating – augmenting some very serious problems.

Look, if you are unlucky enough to have a genetic propensity because of family history to lung cancer, the proper response is not to say, well, hell, I may as well go ahead and smoke five or six packs a day. No. You don't make the problem worse. You don't have to believe that every year's climate is going to get warmer and that everything that happens with the climate is because of CO₂ emissions in order to take this problem seriously. And I think we need to take it seriously. And it is another dimension of the problem of how we use energy.

Now, what might we do about any of this? I'm going to bring in a handful of suggestions and then close down for questions. You may want to explore them – some of these ideas or others. But let me suggest what they might look like – potential solutions – partial solutions, positive steps – mildly positive steps – to the three gentlemen that I mentioned at the beginning – Muir, Patton and Gandhi.

First of all, I would submit – as I said, we need to get off oil for transportation as quickly and as thoroughly as possible. There seem to me to be two steps that are already here, at least embryonically in terms of technology – are already on the road in terms of prototype systems anyway, or even more fully developed systems, and which together could help us move along fairly smartly to this end.

First of all, we can move – whatever our solution, we can move a lot faster than we are now. The average car stays in the American fleet 17 years. If you go to Japan, all of the cars look new. There's a reason. All of the cars are new. (Laughter.) The reason is that Japanese have a series of registration fees and so forth which encourages them to get cars through the fleet, get the clunkers out – relative clunkers – fast, and go to new technology and vehicles quickly. Now, a lot of these get shipped off to South Asia. They don't immediately go out on the fleet. So from a climate-change point of view, it's not rapid change, but it does get new and a lot more efficient technologies into the Japanese fleet, more than twice as fast as we do.

What might those technologies be? I have to confess I have a bias because I drive a plug-in hybrid, a Prius that has been changed by A123 to add a 5-kilowatt-hour battery which I charge

over night for about 40 to 50 cents worth of electricity, and drive the first 30 miles or so the next day virtually all on that. So I drive it something like 2 cents a mile for the first 30 or 40 miles, whereas on gasoline today it's about 10 cents a mile. And last summer, gasoline was up around 20 cents or so a mile.

It works. It's not perfect, but it works. Am I putting more carbon dioxide into the atmosphere because I'm running on electricity that's – from the grid as a whole comes from 51 percent coal? No. Natural Resources Defense Council, the Electric Power Research Institute, Northwest National Laboratories, Pacific Northwest National Laboratory, DOE Laboratory all say you make average about a 20, 25 percent improvement in global warming gas emissions by shifting from a regular vehicle to a plug-in hybrid, and if you're in a clean-grid state like California, you make about an 80 or 90 percent improvement. If you're in a all-coal grid state like West Virginia, you're about awash, maybe slightly negative, but as the car cleans up – as the grid cleans up, the cars clean up.

For that first 30 or 40 miles – and the average car in the U.S. every day goes, as I said, under 30 and the three-quarters go under 40, so 30, 40 miles is kind of a sweet spot. If you charge with electricity the way I described, you're getting over – easily over 100 miles a gallon. You use a little bit of gasoline, but you're in the ballpark of 100-plus miles per gallon. If that car were also a flexible fuel vehicle, it has a slightly different kind of plastic in the fuel line, so it can use ethanol, methanol, butanol – millions on the road, I would be getting approximately – if I were using E-85, when I use alcohol, when I use fuel, liquid fuel, I would be getting about 500 miles per gallon of gasoline, and those technologies are on the road now. They're not perfect, but it's pretty hard to maintain if you can't do it.

How about infrastructure? There's already an infrastructure of filling stations. It's not that big a deal to have one pump of ethanol. There's already an infrastructure called the electric grid. I spoke right after a gentleman who was very enthusiastic about hydrogen, hydrogen vehicles once not long ago, and I happened to have my infrastructure with me for my plug-in. I picked it up at Wal-Mart's for \$19.95 on my way home from having my car converted to be a plug-in. It's orange. It has black things at each end. Even a Washington lawyer can operate it. You plug in one end in the car and the other end in the socket in the garage. And I had my infrastructure in my briefcase. So he talked about – you know, yeah, you need new hydrogen filling stations all over the place, and – hundreds of billions – well, maybe. I said, well, you know, here's the infrastructure for a plug-in hybrid – 1995, 25 feet long, not bad.

So I think that we have a direction we can go with transportation. Part of it is electric. Part of it is increasingly better and better renewable fuels. What would Muir think about that? It's cleaner. And as the grid cleans up, the car cleans up. Even corn-based ethanol is about 20 percent better than gasoline in terms of its global warming gas emissions. So it's a modest improvement for Muir, but it's an improvement. And as you move toward things like cellulosic feed stocks for ethanol or butanol, and as you move toward cleaner and cleaner grids, the cars get cleaner and cleaner and cleaner and cleaner. Muir must love it.

What about Paton? It's not oil. It's not getting us in those problems that he is obsessively concerned about. It sounds good to him. How about Gandhi? Well, if in time it's more affordable, and certain aspects of it are more affordable now, it makes it easier for poor people to drive, and it's – neither of those technologies is absolutely incompatible with local production. When I want to show off a little bit, since my farmhouse has photovoltaic cells on the roof and the basement batteries – I go off grid for a half a day, charge the batteries in the car from the batteries in the basement that themselves have been charged by the photovoltaics on the roof, and drive for about 30 miles a day on sunlight.

Now, it's sort of the equivalent of the \$2,000 cell phone I got for my wife in the 1980s which weighed six pounds and came in its own little suitcase. It's not incredible practical to drive on sunlight from your roof today. But it works. And the people who say forget about it; that costs X – are the same people who said to me in the 1980s why would you want one of these things called a cell phone. Those things are always going to cost \$2,000 and weight six pounds. They didn't – and neither will photovoltaics.

So I would submit that Muir and Paton and Gandhi are all three reasonably likely to think that these paths for transportation aren't a bad idea. Gandhi would probably note that as you move towards cellulosic feed stocks, you can produce your transportation fuel locally, not corn from Iowa, not oil from the Gulf, but either fermented or gasified or otherwise biomassed from somewhere – garbage from somewhere nearby.

How about production of electricity? And I will close with this. What would these three gentlemen think about different ways to go with that? Well, although they realize it's expensive now – and so Gandhi would be a bit put off, Muir would probably very much like distributed generation of electricity – things like photovoltaic cells. Certainly Paton would because Paton is very worried about the electric grid. Paton says, you know, the Maginot Line could at least be defended from – against attacks from one direction. That damn grid, the way they've got it now can't be defended at all.

So Paton is very interested in systems of electricity that can island, that can deal with problems locally within the local distribution grid if other parts of the grid drop off. So he likes distributed generation of electricity by things like solar and wind and heat pump geothermal and so forth too. Gandhi is a little worried about the cost but he likes the local focus very much – chakra.

How about large power plants that are renewable – big solar plants, big wind farms? Muir is happy with these. They're okay. He kind of doesn't like the transmission lines cluttering up national monument parks and things but generally you're not putting carbon into the atmosphere. Paton is a little worried because it relies more on the grid. Paton doesn't want to do anything with the grid. He thinks it's so screwed up that we just got to start moving off of it.

Gandhi, he doesn't know. His friend Muir likes it, so maybe it's okay, but it's not very local and it's not within the control of the village. So he's not sure.

Same way about sequestering – capturing and sequestering the carbon from coal-fired power plants. Paton is worried that it's part of the grid. Muir thinks it's going to be awfully expensive to get there, although they might get there, and if they do get there, they can afford the sequestration, then that's good because it's not carbon. Gandhi continues to be worried about how far away from the consumer – how little control they have over this giant grid. So it doesn't come in first.

Nuclear power to produce electricity. Surprisingly, Muir is reasonably favorably disposed because at least in the operation of the plant, it's pretty clean – quite clean in terms of CO₂ turn. He's a little worried about where to store the spent fuel, but he is worried mainly about carbon and so he's okay with it if it's affordable.

Paton thinks it's the craziest damn thing he's ever heard of, and it's not so much even that it's tied to the grid or that it – spent fuel or anything like that. Paton's problem is proliferation because as long as you're going to deploy light-water reactors in the United States, which is what we have now, he could kind of see maybe that's okay, but he figures any institutional and economic interests that are getting geared up to produce nuclear power plants are going to want to sell them overseas.

And a nuclear power plant under today's treaties is essentially the planting of an apple seed by a nuclear Johnny apple seed because you can't keep people out of the fuel cycle, either the enrichment of the uranium or the reprocessing of the plutonium under the current system, as North Korea and Iran are showing us. And if you want to spread nuclear power plants, and therefore the capacity to enrich fuel, move it to weapons grade fuel and have nuclear weapons either secretly or not secretly, that's the way to go. And Paton is very, very worried about that.

Gandhi just kind of shakes his head at nuclear power plants. His friend Muir likes them but – sort of, but they certainly aren't very local.

Natural gas, all three are a bit easy on because although it does put carbon into the atmosphere, Muir isn't real unhappy with it because it's better than oil and much better than coal. And the main thing Muir likes about it is that it can be used to firm or balance renewables. So if you have a wind farm that's not operating in the day time, or a solar power plant that's not operating at night, if you have natural gas, you can use a natural gas to balance and make it dispatchable as the electric people say, and make it much better integrated into the grid.

So those are some of the views about producing electricity that Muir and Paton and Gandhi have. The main thing is that as they talk through these issues, they begin to find that although they don't agree at all on why they're doing things, there are a number of things to do that they can agree on the action. I had a similar experience some months ago. I was testifying

before a congressional committee, and – on climate change and national security. I was talking about that I thought climate change was a serious issue that we needed to address. I was, I suppose, channeling Muir and Gandhi a bit more than Paton at that point.

And one of the congressmen became very concerned at – since he and I had been on the same sides of various national security debates before, but for me to be saying climate change was a serious issue, he was not pleased, and he kept coming at me and coming at me and coming at me. And finally I said, congressman, set aside climate change. Do you realize that all seven of the things I have suggested would make us less vulnerable to terrorist attacks and more resilient against oil cut-offs? And he said, oh, well, if you do them for that reason it's fine. (Laughter.) We want him on the team. Thank you.

(Applause.)

LAURA MACCOBY: Laura MacCoby. I am part of the Energy Conversation. And I wrote the recent book that will be available online, and you can order copies through CNA. And I think Jim brought up the ultimate common-sense reality of the critical reality that we're facing. And we're going to take some questions, and you can line up on either side here.

Q: Can you hear me?

MR. WOOLSEY: Keep going. I think he just had to turn it up.

Q: So – (inaudible, off mike) – Environmental Energy Study Institute.

And I think your final comment actually anticipated my question, is that – I've been doing some work with the NAFTA security community I would say, I commend the people from the Department of Defense – all armed services that I think they have a future vision and they get this. But there are politicians and other leaders in the political world that – it's almost cultural or psychological if they can't see – you know, they wouldn't refute anything that you just said, that assessment. And I guess I'd like to hear more about how to talk to those folks in ways that – not partisan politics but people who just say – just get – go nuclear; let's make it easy or something like that.

MR. WOOLSEY: I think there's probably more resistance in the political community to the climate change argument and the cap-and-trade as a solution than there is to moving away from oil. A lot of people for different reasons can kind of relate to moving away from oil dependence. But people are worried, and it's an understandable concern, that if your main device for encouraging the moving away of especially coal for electricity generation is cap and trade, and if the legislation or the system has any teeth, it's going to internalize those social costs of carbon going into the atmosphere and therefore it's going to show up on people's utility bills.

And you can make it not show up very fast by giving away the carbon permits, credits, but as our European friends demonstrated, that didn't work very well. They went for years with CO₂ being priced at under a dollar or under a euro a ton, which is ridiculous. It has no effect at all. Or you can – if you charge or auction all of the CO₂ credits, then the financial impact hits pretty hard and right away.

So you probably kind of have – you're ultimately going to have to balance to that in some way and have a safety valve so that it – there's a certain price above which the – those who emit CO₂ can get permits from the government. These compromises are going to be important to work out, but right now, on the CO₂ issue, I think people are really kind of digging in their heels, and I'm not sure what's going to come out of it. But I think that's probably in some ways a lot more contentious issue than oil.

Let me get – yes, there.

Q: Emily Rosley (ph) with Booz Allen.

As you mentioned previously, we import most of our oil from abroad. Have you considered some of the national security implications of becoming energy independent?

MR. WOOLSEY: Well, I mentioned in the remarks that I think the way to become independent is not just to import less from abroad. It doesn't help for us to change the pattern of our imports. If we buy more from Norway and less from OPEC, somebody else is going to buy more from OPEC and less from Norway. And the world oil market will remain the world oil market.

The problem with the world oil market is that the cheap producer and the producer with a lot of – some anyway, access reserve capacity – Saudi Arabia and you have the countries of the Gulf, but mainly Saudi Arabia can, within limits, set the price. And so they've got a – something close to a monopoly, maybe 70, 75 percent or something, on a commodity that itself has essentially a total monopoly on transportation.

My own view is that it's not going to help to change the trading patterns or the import patterns. You've got to break oil as a strategic commodity. And I think the way to do it is, as I said, with the – both electricity and alternative fuels going full board with both tax credits, whatever it takes in order to get people up in the range of 500 miles a gallon of gasoline.

Yes.

Q: I'm Bob Hershey (ph). I'm a consulting engineer.

You mentioned that improvements are needed on the grid. What kinds of things would you suggest to achieve this smart grid that people talk about?

MR. WOOLSEY: Let me suggest that – Jim Schlesinger the overall Defense Science Board Panel last year, year-and-a-half, and I chaired the policy panel with Gita Mezedi (ph). And that report is on the web, on the DSB Web site, and has some ideas in it. There's classified annex, which has a lot more details about the electricity grid in it. And it's worked for those – of whom I'm sure there is a large number here – has secret-level clearance is all it takes to get on the sippernet (ph) and look at that.

But let me just say that we need physical improvements in the grid security, protection of the transformers and the like. Utilities store the big transformers that take several years to build in either South Korea or Northern Europe – the spare transformer right next to the live transformer to make it I guess really hard on the terrorist who would have to take two shots – one at one transformer, one at the other.

It's – from 1865 until 9/11 2001, except for a brief period at the beginning of World War II when we were worried about raids on the Pacific and Atlantic coasts, this country has operated under the assumption that mainland USA – you didn't have to think about security for any of our infrastructure. The only thing we've done anything about security on really is nuclear power plants. We have police guards and, you know, drills, and red teams and things. But it's not just the electricity grid; it's the water system. Everything is put together with the assumption that nobody would intentionally cause any trouble. If anything is fenced, it's there to keep, you know, a drunk teenager from stumbling into a transformer or something. It's not designed, yet, to deal with intentional serious interference.

And so we've got, both in physical terms and in cyber terms, we've got a huge amount of work to do. And the work is the focus I think – or should be the focus because if it goes down, everything else goes down. You're not just back in the 1970s pre-web; you're back in the 1870s pre-electricity without nearly enough plow horses.

Q: Ray Leonards (ph) with Kuwait Energy and formerly with Yukos Oil in Russia.

I have two separate questions and I'll just ask them both and then wait for a response. The first one is with regard to oil supply. And right now the OPEC produces about 1.5 percent of its reserves every year, the former Soviet Union about 3 percent, and the rest of the world about 7 percent. So every year, the proportion of reserves that are left to produce the OPEC portion gets higher and higher so that by 2015 they'll have about 80 percent of the reserves, et cetera. I agree with your point about switching fuels and trying to get off oil, but the question is how long will that take because every year our position gets worse and worse.

And the second question is with regard to greenhouse gases. Possibly the two biggest sources of increasing greenhouse gases are both China and India. They have limited amounts of oil and natural oil and natural gas, but they have large amounts of coal. So the obvious root for them is to use coal as they increase their need for power generation. However, both of those

areas adjacent to them – in the case of China it's East Siberia; in the case of India, it's the Middle East – there are large amounts of gas. And so the question is what can we do or what should we be doing to help facilitate East Siberian gas to China and Middle Eastern gas to India?

MR. WOOLSEY: Well, I think that the approach – first of all, oil and coal aren't going to substitute for one another. Oil is only about 7 percent of world electricity production. It's 2 percent here. So until one starts to electrify transportation, I think we want to kind of keep these – keep these separate. And the developing world – sure, particularly if gas is as low priced as it has been leaning toward recently, and if it stays low priced because the shale formations around the world that people weren't look in for gas before really has a lot of gas. That could help. I mean, gas – most cheaply and easily transmitted by pipeline rather than needing to liquefy it and put it in ships.

But assuming you're talking about pipelines from Siberia or the Middle East, certainly there is I think no reason in environmental concerns for other countries not to use natural gas. Now, if they're buying it from a dictatorship like the Europeans have to buy gas for Russia, they better be a little cautious because not everybody is as nice as the Canadians. Putin may, you know, decide that if you are, like Georgia, dangerously close to opening up a pipeline he doesn't like to, you know, send in the special forces, as he did. So I think that – but environmental terms, in practicality terms, natural gas either from a Siberia or the Middle East I think is not a fundamental problem.

Your first question was about –

Q: It's about timing.

MR. WOOLSEY: Yeah, well, I mean, it depends on whether we are – as I said about the Japanese, if we are as smart as the Japanese and can figure out how to get cars through the system in seven years instead of 17, we can go twice as fast – more than twice as fast as we are now. The cash for clunkers, which they are starting to do on the Hill may be one path to that end. And it also depends on whether we can be as decisive as the Brazilians. We've been fooling around with flexible-fuel vehicles now year after year after year after year, and after great – (inaudible) – Detroit will increase it a percentage or two.

But, you know, the Brazilians finally decided to get serious about going to alternative fuels, and back in the early part of this decade, they said, okay, two years you got; export to us flexible-fuel vehicles. And in two years they went from I think 5 percent to over 75 percent of their new cars being flexible-fuel vehicles that can run on ethanol. And if you have open standard FFVs, it can run ethanol or methanol or in time, when it comes along, butanol or so forth, and mixtures – you can do a lot to move away, but we've got to decide that we're willing to be as smart as the Japanese and as decisive as the Brazilians.

Q: Avi Gobson (ph). I'm a AAAS science policy fellow.

I appreciated your analogy early in your remarks about the electric grid being akin to just-in-time national economic model with all back country and single-lane bridges. And I thought you were going from there to touch on the topic of an extra high voltage transmission backbone or something to that effect, but then through the remainder of your comments, you seem to shy away because of the security implications. And I was wondering from the perspective of Paton if you could address that.

MR. WOOLSEY: Yeah. I think what you call a grid that is as vulnerable as the one we have now, that you put a lot more responsibility on and you let people – let the utility turn up – you're in my air condition or turn it down and demand response and all of that – a grid that can do all of that and is as vulnerable as the one now, I don't call that a smart grid, I call that an idiotic grid.

It is harder to be dumber – (laughter) – than to take the grid we've got and just get enthusiastic about the utility turning up and down your power to save – you know, maybe it's Chinese hackers, maybe it's Russian hackers. Maybe it's Hezbollah hackers that decide to turn your air conditioning up and down. Maybe they'll do as good a job as the utility. Who knows. (Laughter.) But it ain't good public policy. It's really, really, really stupid.

Now, if you make improvements to the grid so that you can get wind power in from the planes and solar power in from the Southwest, and do it more efficiently and do it affordably and do it wisely, and right up front fix the damned grid's vulnerabilities, then you have something you could conceivably call a smarter grid. If you don't do that fixing-vulnerabilities step, you have made the grid really stupid.

Yes.

Q: I'm Joel from – (inaudible).

I've just got two questions here. One is back in the '70s I remember there was a big oil increase when gas prices went from 23 cents a gallon for cars – (inaudible, off mike) – for 75 cents was a big panic. We all decided to go green. And after a couple of years when the gas price just dropped again, the green just disappeared.

MR. WOOLSEY: Yep.

Q: The first question I have is what can we do to make sure that the momentum is sustained because it seems like – it's like rain in the desert – it comes out – (inaudible) – stopped raining, everything goes away again.

MR. WOOLSEY: It's a great question.

Q: Can you do one more real quick?

MR. WOOLSEY: You can ask the second one after – let me answer this so I don't have to remember all of them.

The – what we did in the late '70s by going to the Syn Fuels Corporation of course crashed and burned in '85 when the Saudis turned on the pumps and drove the price of oil down to close to \$5 a barrel, a lot of people think that we might have had an advisory hand in that because we wanted to cause trouble for the Soviet Union. I really hope my predecessor Bill Casey came up with that. I'd be very proud of it if it turned out it did cause very serious problems for the Soviet Union, and four years later they collapsed.

But the ability of OPEC to turn on the pumps, drive the pumps down and do that was certainly demonstrated in '85, and it was demonstrated indirectly to some extent for a more complex series of reasons. They increased their production in the late '90s and oil went down to about \$10 a barrel, and a number of the things that people had gotten started, like some of the ethanol and so forth kind of went away.

So insofar as you are in the same ballpark of price – tens of dollars per barrel, 10 cents or more per gallon, per mile of liquid fuel – unless peak oil is right, you could well still be in a world in which the Saudis especially can turn on the pumps and drive the price down. The thing that keeps them from doing that, if we do what I was suggesting, is electricity. There's no way they beat 2-cent-per mile electricity. They cannot do it. They take – they have to take oil down to just above its lifting cost for them.

And since they're very used to living in such a way off of oil that they lift oil for roughly \$3 a barrel, sell it for 55 and complain about how poor they are because they have all of these very generous welfare programs and all of the rest, and only 20 percent or so of the country works, there is a real barrier for them in terms of taking oil down that far. So although they may be able to take it down enough to cause serious trouble for cellulosic ethanol, which may initial come in at 70, \$80 a barrel, and then head down, one would hope to 30, 40, but unless they – unless they want to only ruin the liquid fuels while electricity keeps taking business from them, they may not get into that again.

In a way, the cheapness of electricity and what's happened to the batteries, and the prospect of using electric power for that first 30 or 40 miles for a vehicle helps protect the alternative liquid fuels from those previous types of Saudi production increases and price cuts.

Q: That leads into my second question, which is – I mean, I just heard you mention cellulosic ethanol. Are you saying you're referring to that instead of corn?

MR. WOOLSEY: Well, I mean, I think corn will be with us for a – corn-based ethanol for a time, and it's not a great deal better than gasoline in global warming terms, but it's a lot

better in terms of avoiding oil use. And coming along, still I think not on the horizon but closer than that, but still not altogether here is a range of alternative liquid fuels from other feed stocks, from algae, from cellulosic biomass, from garbage, with different types of production techniques – fermenting as for the alcohols or gasification. There’s a lot going on out there. And it’s – it is I think not quite as close probably as electricity except for corn-based ethanol, and corn-based ethanol, I’m – it’s not superb but it’s here now, and if it damages gasoline’s market, how bad can it be?

Q: That was my question, though, because corn ethanol, from what I was reading, it uses fertilizer, which is synthetic fertilizer which is made by petroleum products. The net negative is that it takes about two gallons of petroleum products to make one gallon of alcohol. And aside from that, the idea that you have the farm getting subsidies – these small little farms like – the mom-and-pop ones like, let’s say, Archer Daniel Midlands – (laughter) – which they are now clear-cutting in Brazil. And from a personal point of view, I’m kind of curious – I am kind of curious what all of Brazil would look like as a farmland.

MR. WOOLSEY: Well, Brazil does very well with sugarcane. It grows very naturally – double-growing season. They do find.

Q: (Inaudible, off mike) – water, though, too.

MR. WOOLSEY: Sugarcane normally is not irrigated and it takes – it’s about twice as good as corn-based ethanol from the point of view of climate change.

Let me answer your question. If you want to make a speech, you can be here a little later

–

Q: Oh, no – (inaudible, off mike).

MR. WOOLSEY: Ethanol from corn has gotten very bad press recently partly because of the efforts of the Grocery Manufacturers Association and partly because of the efforts of the oil companies. But the Grocery Manufacturers Association has been front and center, and that may seem odd, but they would far prefer that the corn not be shifted from animal feed, which is – by the way about 90, 95 percent of our corn goes for animal feed, not for corn on the cob – they would prefer that an acre not be taken out of growing corn for animal feed and put into growing corn for ethanol because – and there’s a preliminary fact you need to understand.

When you do that and you turn corn into ethanol, the protein goes all the way through the process, comes out the other end and it’s still fed to the animals. They still get the protein, okay. You don’t get rid of it. It’s about half the energy costs of an ethanol plant goes for drying that out – distillers, dry grain, and it’s great animal feed.

So what do you give up when you take an acre of corn from being planted for animal feed and put it in corn that's grown for ethanol? The thing that you give up is the starch. The starch is broken down from into sugar, fermented, turned into ethanol. If you left it in animal feed, what would the starch do?

The starch has three roles: first of all, if you read "Omnivore's Dilemma," you'll learn that the starch mainly goes to CAFOs, combined animal feeding operations, the big factory farms for cattle. Cattle hates starch; it screws up their stomachs. They have to be given massive doses of antibiotics because it makes them so sick. But it has one big advantage from the Grocery Manufacturers Association point of view: it creates cholesterol in humans. It is fat. So you get more fat – fat tastes good. So instead of having range-fed cattle, you have cattle from CAFOs that have the starch jammed down them. Oh, and by the way, you also very seriously damage the effectiveness of antibiotics because they build up a resistance to E coli and other germs, right.

The other thing that you get that the Grocery Manufacturers Association really likes – when you take the starch away from use for ethanol and turn it into animal feed, use it for animal feed, is fructose. Fructose is about four-times cheaper than other sugar for purposes of things like soda pop and candy. Now, there is an epidemic of obesity among American children. About a third of American children are obese. Maybe the Grocery Manufacturers Association figures that there's plenty of room for double-digit growth there since only a third are obese.

But those are the three things that you get when you take an acre of corn out of being used for ethanol and use it entirely for animal feed. You get destroyed antibiotics, you get obesity, and you get cholesterol.

I wrote a sort of satire that's on the web, the National Review online, of a conversation between a friend of Putin's and a gentleman named Dolce Porterhouse who is the chairman of a group called FATTY, a lobby in Washington which stands for Fructose and Trans Fats Tempt, Treat, and Transform you. (Laughter.) So before you buy all of the Grocery Manufacturers Association propaganda about corn ethanol, do a little bit more research.

Q: Adam Siegel, Energy Consensus.

Jim, thank you. That was a perfect lead into the start of this is – for myself but probably for some others in the room, I wanted to compliment you on being someone you can listen to at various of times, and even if you points being the same and being able to laugh even if it was the same story – because you do it so well. And I really appreciate that. I think I'm not the only one.

One of the things – you always are talking about electrification. I virtually never hear you talk about anything other than the car and electrification. Even though it is the principle – electrification of rail, putting aside even high-speed rail, probably could knock 2.5 barrels off the – a day off our needs within a decade. I'm glad you heard – you mentioned algae. But what are

some of the things that you didn't talk about in the conversation that you also think are at least pretty big silver bee-bees that should be part of the change.

And I'm going to ask one other, which is just to point out, you avoided coal. Coal is the one where your three people – you mentioned it, but that's the one where your three people would violently disagree. I think Gandhi might sit it aside, but Paton would say, my god, it's an American fuel and it gets me off. And Muir would be, it's destroying the planet.

MR. WOOLSEY: Well, in this piece I wrote for Brookings that was published about a year ago, I have a dialogue – I haven't added Gandhi to the mix yet – I have a dialogue between Paton and Muir, and the thing they really split on is coal to liquid because Muir hates it because it puts so much carbon out; Paton loves it because it's not oil and it's domestic. And that's one that they really do divide on.

The big thing about electricity, as far as I'm concerned – I really didn't mention except in passing – is storage. Storage changes everything. Now, today, if you store a kilowatt – say, a 10-cent kilowatt hour of electricity with LED-acid batteries, you add about a buck to the cost. They could say a dollar and 10 cents. You store it with compressed air in an industrial circumstance, you may only double the price, up to 20 cents. But there's some things coming along called flow batteries – F-L-O-W batteries – Google it and you'll see – which are inexpensive ways to add a lot of electrolyte to a battery, and for stationary storage. They're not really for transportation but for stationary storage, it may hold a promise of only adding a couple or three cents to that 10 cents.

Once electricity can be stored affordably, a lot changes. The renewables become a lot more attractive and useful because you don't have to match them up with natural gas and so forth they way I described. The potential uses multiply. One really interesting thing about solar and batteries is the solar makes the batteries more useful, and the batteries make the solar more plausible. So they work with one another. And I think that what's happening – there's some interesting new things in compressed air, and there are interesting new things in other types of batteries.

But I tell you as – being in the venture capital business in Silicon Valley now, you guess things are hard everywhere, et cetera, but what's – batteries were really boring. They were kind of like salt until a relatively few years ago. And since everybody wants to not have to plug these things in more than once a day, the batteries kept getting better and better and better and better, and they're still doing it. If you are walking around in Silicon Valley, you want to make sure if you're on a street corner to keep looking over your shoulder, otherwise you may get knocked over by a venture capitalist changing some new Ph.D. from – chasing some new Ph.D. from Stanford who has started a battery company in order to give him money because storage is really moving out smartly. And I think that will change the game with electricity more than almost anything.

MR. WOOLSEY: Yes, sir.

MS. MACCOBY: One more.

MR. WOOLSEY: Okay, this is the last one.

Q: Thank you. We haven't talked much about the demand side of the picture. And –

MS. MACCOBY: Please state your name and organization.

Q: Kip Davis from the Department of Energy.

MR. WOOLSEY: Yeah.

Q: Sorry.

MR. WOOLSEY: That's all right.

Q: I remember in the '70s you could buy a Honda that got about 50 miles per gallon. It was just a regular gasoline engine. I had a Toyota – no, it was a Dotson that got 42 miles per gallon in the late '70s. I can't really buy that car now, but if I could, we'd use a whole lot less oil, perhaps cut our imports in half. Do you have any comments on that?

MR. WOOLSEY: Well, automotive technology with today's gasoline and materials – for example, going to carbon composite materials for construction, you know, Formula One racers, you see them crash, they bounce and roll. The driver is belted in and airbag and so forth – walks away – there's a couple of tiny dents in the car. Some high-end sports cars in Europe are starting to be made out of carbon composites, and some of these are about 10 times the crash resistance of steel and about half the weight. So you break the relationship between size and safety that's in a lot of people's minds.

So one thing is the materials. Another is work on the drive trains, and that's taken place. A lot of it has to do these days with hybridization. But the – if you're doing those at the same time you're doing the fuels, and you're going to electricity and to ethanol or methanol, butanol, you are coming at it – I mean, these things aren't exclusive to one another. If you're doing all of them, you may be able to get well over 500 miles a gallon of gasoline.

I made those – drew that analogy about moving rapidly up on how much – how many miles per gallon of gasoline you could get at some remarks in Washington a few months ago. And a gentleman whom I've known for some years – let's say he's from a Middle Eastern country that produces a great deal of oil – he came up afterward and said, Jim, he said 500 miles a gallon, you're going to destroy my country. And I said we don't want to destroy you, but we do think you ought to get real work. (Laughter.) Thank you.

MS. MACCOBY: Thank you very much.

(Applause.)

Before we all leave to face this critical time and take responsibility for the future, and maybe save the economy as well with new solutions, new markets, and new energy, we ask you to please fill out the forms that are in front of you on the desk. When you leave take off your name tag and put it on the desk. We're going to have three more energy conversations that we know of, where we will address pretty much the framework that Jim has really eloquently established. We will have them the second weeks – the second Monday of July, the second Monday of September, and the second Monday of November. And we really appreciate your feedback, so please come onto the Web site. We just redid it. We're going to be expanding it. We now have a network of over 5,000 people, which is growing.

And I really want to say a shout-out to the services – I'm an Army wife – and you guys are leading this revolution. And you led it with communications with the Internet, and energy advances historically mirror advances in communications from cuneiform writing and the plow in Samaria to coal and the printing press and oil and the telegraph. So now we have come to the Internet, thanks to DARPA, and it's going to be up to you guys to lead this country out of war and into peace. So thank you for coming.

(Applause.)

(END)