Innovation Power

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Russell Yarrow: Welcome to Climate One at Commonwealth Club. I'm Russ Yarrow, General Manager for Corporate Affairs at Chevron and a proud member of the Board of Governors at the Commonwealth Club. Tonight's program is part of innovating California, a series that is a partnership between Chevron and the Club to explore solutions to some of the most critical issues facing the Golden State. Tonight, we're discussing clean energy innovation and job creation. Energy is one of the biggest industries on the planet, and innovation, at this scale doesn't happen overnight but once it takes effect the impacts are profound.

In a moment we'll explore the opportunities and challenges of clean tech, energy efficiency and other innovations competing for a slice of the energy pie. Our discussion tonight will be joined by Greg Dalton, founder of Climate One, and our distinguished panel here in San Francisco which includes Dan Adler, President of the California Clean Energy Fund and a former staff member at the California PUC, Jeff Byron, Vice Chair of the Clean Tech Open, the world's largest business competition for clean tech entrepreneurs, Jeff is also a former commissioner of the California Energy Commission, Matt Scullin, founder and CEO of Alphabet Energy and a former materials scientist at Lawrence Berkeley National Lab, and finally, Cathy Zoi, a partner at Silver Lake Kraftwerk and the former assistant Secretary for Energy Efficiency and Renewable Energy at the U.S. Department of Energy. Please welcome them to the Club.

[Applause]

Greg Dalton: Thank you, Russ, and thanks for being a partner on this program. Welcome all of you. Let's get started. Dan Adler, let's begin with you. Energy innovation, tell us about how that compares to other forms of energy innovation and other industries, the scale and the speed of innovation in energy.

Dan Adler: Thank you, Greg. Thanks for the opportunity to be here. We heard from the introductory comments that energy is one of the biggest businesses in the world. I actually think it's the biggest. The only relevant competitor might be finance but finance actually should enable other industries to exist. So as a standalone undertaking, energy is the largest and most complicated thing that, really, society undertakes. And we in California are in the midst of a great innovation boom particularly in the Silicon Valley area. We're at a fundamental level of science and early stage business development, there's a tremendous amount going on. And we're doing, as an economy, a California wide economy, a great job of stimulating it. But if you step back and look at the real scale of what needs to be achieved, it is much more than just a technical innovation challenge. It's more than just getting the science right. It involves every aspect of social institutions. It involves scale capital redeployment, the likes of which we've really never undertaken as a species. So it's a combination of markets, the way markets are governed, the way policy interacts with the governance of markets and the continuous process of scientific inquiry that really only takes place in the best circumstances of human organization. So it's fundamental to everything that we do and it's deeply challenging. I fully consider it to be my life's work. If I'm here at the end of my life and I can comment positively in what we've achieved, that would be a great boom, but it would be with us, the challenge, throughout that whole period.

Greg Dalton: Matt Scullin, you said that energy innovation involves bridging Silicon Valley,

Pittsburgh and Houston. What do you mean by that?

Matt Scullin: So I think that the way energy differs from other industries, especially ones that we're familiar with in Silicon Valley, is that, first of all, it's extremely technical. And there are few opportunities that I've noticed that are not very technical in origin and nature. The energy industry overall, and I've come from a perspective that's highly slanted towards power, given what Alphabet Energy does, but it is kind of a textbook commodity market. It's driven by very basic economics that you can read about in introductory economics classes. The innovation comes mostly from technical advances and not as much from, say, product market or in some cases it could come from financial advances but it's mostly technical innovation that occurs. And I think when I talk about how clean tech has to bridge the gap between Silicon Valley and other more traditional energy worlds like Pittsburg and Houston, Pittsburg being kind of the traditional area of industrial innovation in the county, and Houston being the traditional area of energy innovation and, I guess, energy power, it's about managing expectations around innovation cycles and how those can be linked between Silicon Valley and other areas that are very conservative and don't adapt technology very quickly.

So in the context that the innovation is technical, Silicon Valley is a great place for technical innovation to happen. But in Silicon Valley we are a little bit spoiled by industries like semiconductors, biotech and software, the internet, where technical innovation can also translate into very rapid societal change or there are very rapid sales cycles that come after rapid technical innovation cycles. And in the energy industry you have very long innovation cycles technically but you also have a very long sale cycles. And so that's been a challenge that I think has hurt clean tech lately because a lot of folks in Silicon Valley weren't expecting there to be such long cycles on both ends of the product innovation course. And I think a lot of the correction that clean tech is currently going through is around understanding clean tech's role in a broader energy economy that exists mostly outside of Silicon Valley.

Greg Dalton: Cathy Zoi and Jeff Byron, you're both nodding your head here. Cathy Zoi.

Cathy Zoi: Yeah. I mean I think that it's important to try to tease out why is the sale cycle longer, why is it different than how quickly a new iPhone can be adapted. And I think it's because energy is an essential service and it's largely controlled by very large utility organizations. So we've looked at companies in the smart grid space and they get very, very excited when they sell a pilot to a utility but the pilot then has to run for so many years. And you guys know, as former regulators, that you have to approve when the utilities has a pilot, and then they have to evaluate the pilot, and then the pilot might get extended but that has to be competed out. What you're talking about is something that is maybe an eight-year sale cycle for something in the smart grid that actually works. Whereas when you talk about -- you know, when I talk to my colleagues in Silicon Valley about some tech product it's like, "Oh, we're going to beta test it, yeah. And that will be for sale by July," you know. And so it's just a different sort of time horizon because it's an essential service that you can't really mess up.

Greg Dalton: Jeff Byron.

Jeff Byron: Yeah. Maybe there's even a couple of other reasons why clean tech is not like high tech. Certainly in many cases there's big iron associated with clean tech. The long lead time is difficult to, as Cathy mentioned, but maybe also because there's a lot of regulatory aspect, everything to do with energy.

Greg Dalton: Whereas a lot of software markets are unregulated, the internet or this wild west where there's very little regulatory friction oversight, also different capital requirements.

Jeff Byron: Right. Exactly. And different expectations with regard to greater return. These are the long hall typically, companies' investments, sales times as you indicated. But I think the regularity aspect can't be underestimated. We get a lot of new entrance into clean tech and they don't appreciate the fact that the, and I learned this from Mr. Adler, the institutional incumbents really do control the game.

Greg Dalton: And people underestimate the speed. And let's talk about the financing. Where is money available right now for clean tech entrepreneurs? We hear a lot about Silicon Valley pulled back because people thought that energy was like software, learned it ain't. So where is the money for entrepreneurs right now?

Jeff Byron: We're not seeing that pull back. For those of you that don't know, the Clean Tech Open is a nonprofit, has about 1,500 volunteers, in fact I see a few of them in the audience here today. And we've helped about I think almost 600 companies over the last six or seven years as an incubator of sorts. We hold our prize money but we really do mentor these companies along the way. We're not seeing any downturn there. We're seeing enormous investment. The surveying of our companies afterwards, both short and long term investments have exceeded. We think conservatively about $460 million so far.

Greg Dalton: Dan Adler, VC's got burned on clean energy, right?

Dan Adler: They did, and I think the true nature of that experience is really yet to be told. And if you look at the normal investment cycle for a venture fund, they started raising the point capital in the middle of the last decade. It's a seven, eight, ten, twelve-year process to really see what kind of exits you're going to get. So we haven't really -- they haven't been forced to monetize their failures entirely. So there's a lot of money left…

Cathy Zoi: What about the successes, Dan?

Dan Adler: Well, I haven't been able to monetize too many of those--

Greg Dalton: We want to get to the successes.

Cathy Zoi: All I'm saying is…

Dan Adler: There is balance. It's a fair point. I will get to that. But the original -- not the original -- but the last waive of venture interest starting in the last decade was a sort of non-specialist venture capitalist. And what seems to be happening now with firms like Cathy's and others is it's coming back to the specialist investor that actually understands the dynamics of this industry best. They're the best position to deploy venture capital in a sensible and efficient manner. Meanwhile what's happening, just a run of thought--

Greg Dalton: Sure.

Dan Adler: --is that the other aspects of the investment process are coming into greater focus as well. The innovation piece is essential but we have to get to infrastructure scale, and there are many different forms of capital that has to be deployed to get there. And we're starting to see more financial innovation, borrowing techniques from other areas in infrastructure finance that can be used to deploy the innovations that we're creating almost largely in California up to the industrial scale. So it requires many more financial techniques than just venture capital.

Greg Dalton: Matt Scullin, the funding void, VC's have pulled back. Where do you see the money coming forth for energy innovation?

Matt Scullin: I think that, you know, on the same note about clean tech successes, I think that if you look at or if I look at the successful clean tech companies that have been out there, and maybe success is a little bit subjective depending on when you invested in the company, but if you look at companies like Amyris which is no longer actually a clean tech company or…

Greg Dalton: The biofuel company.

Matt Scullin: They're not even biofuel company.

Greg Dalton: Doing more cosmetics than…

Matt Scullin: Right. Exactly. So if you look at companies likes Amyris which is now a make up company and…

[Laughter]

Greg Dalton: It's lower volumes, higher margins.

Matt Scullin: Right, right. It's a good business but they're not a clean tech company anymore. But if you look at companies like them, like Tesla or, you know, Better Place or other ones that have been in the news a lot, the one common thing that they all have is corporate strategic investment. And I think that we're seeing that a lot as well, is that, you know, bridging the gap between what we're doing in Silicon Valley in the real world requires some type of partnership with companies that have done this many times.

And one thing that I say to folks who are getting into clean tech is that there's really no such thing as clean tech. Your company probably looks like a semiconductor company, a materials company, car company, fuels company, chemicals company, there are lots of different existing industries that your clean tech company fits into. And that means that the manufacturing cycles and the sale cycles and the scale up time is probably known already. And the closer you can link your clean tech company to an existing industry the better your chance of success in scaling up.

And so I think, you know, there seems to be some kind of void in financing around the series B stage. I think that seems to be the area where, at least I've noticed, venture investors have pulled back a bit just because the return profile getting in, you know, around A or B doesn't seem to be as good. And that's where, I think, strategic investors are coming in and providing some capital to get the scale.

Greg Dalton: Cathy Zoi.

Cathy Zoi: I was just going to -- I was going to bump it up a few levels in terms of like 30,000 feet. The macro of this sector is fantastic. I mean here are the sort of the fundamental principles; you got energy demand growth growing around the world. And again, it's growing more quickly, much more quickly in the emerging economies. I've recently looked at an IEA report that compared the OECD demand growth to the emerging countries, and it's phenomenal. It's growing in these emerging economies hugely. I've looked at the growth of solar in India for example. If you can generate an electron in India, somebody need to buy it, I mean absolutely.

But then when you look and you'll see that the demand is not growing very much in places like United States and Europe, but what's interesting there is that the infrastructure only needs to be updated. So you got a demand growth for new emerging technologies in the developed world, so you got all of that demand growth. And then you have -- there is capital available. When you look at -- again, the IEA says there's going to be $23 trillion that's needed between now and 2035, I think is

their number, but there is capital available. And particularly at the project finance level, that's actually a very, very safe investment. So pension funds are moving towards those sorts of asset classes.

Matt Scullin: But even in the U.S. where project finance wants to see something running for two years before they invest in it -- I mean if you're a brand new technology, how are you going to get project financed?

Cathy Zoi: Right, right, which brings us to policy interventions to reduce the risk which we can talk about.

Greg Dalton: So let's talk about policy and whether -- some of these companies see their earliest markets overseas. If the growth and new innovations are happening overseas -- the start-up companies in Silicon Valley are looking to India, to China as their early markets.

Cathy Zoi: That's certainly -- I see a fair amount of that, you know. Companies that I'm talking to these days, if they are American companies, number one, they probably were venture backed, right, because there's been nearly $50 billion of venture money going to the sector in the past decade or so. So there's lots of institutional backing for the sector over the past ten years. But secondly, they're looking to expand overseas. They're either already, you know, manufacturing overseas but they're certainly looking to those markets. I mean China's 12th five-year plan has put in place a very, very sort of good environment for the growth of LEDs, the growth of solar and those sorts of things. India has policy settings that, you know, 20 gigawatts of solar is going to be backed and supported by government targets. And it's happening around the world. So it's a very, very vital international market, I think.

Greg Dalton: Jeff Byron.

Jeff Byron: It's not just the industrial policies of China, it's the climate polices of Europe. I think many of the Clean Tech Open companies we see-- their initial markets are outside the United States.

Greg Dalton: And are you saying that's because of a price signal on carbon, that some places are pricing carbon and that provides opportunity?

Jeff Byron: I'll go back to what Cathy said about policy. I think we're seeing more receptive policy at the national levels in China and in Europe and some of the developing countries.

Cathy Zoi: The drivers seem to be a little different. I mean in China if you look at what the leadership, the political leaderships has in China, they view this as a strategic competitive investment. Economically they're going to be a powerhouse. They have got to be manufacturing, inventing and innovating in the clean energy arena.

Greg Dalton: Dan Adler, you believe that the price on carbon, those other markets, is not significant, is not driving that innovation.

Dan Adler: I don't think -- well, I could not sustain the argument. One my colleagues would disagree that there is a meaningful difference in business decision making based on the carbon price, really, anywhere in the world right now. Everything is about the commodity, and vertical into which that commodity is being sold. And so you'd have to look at the market design and extent to which that guarantees revenue and off take, and maybe a little bump for an unproven technology to start selling it's product to, say, utility or an industrial incumbent of some sort. But carbon pricing is not changing business behavior at this point. It's an indicator where it has been durable even at a low level that the macro political environment is robust and will sustain the underlying energy

policies. But the carbon price signal to me is too weak to make any difference.

Greg Dalton: By too weak you mean that the price of carbon in Europe is too low, €5 or something. It's not…

Dan Adler: It might be an upside to some investor's prognostications but it's not going to be this positive on where to put their money.

Greg Dalton: Jeff Byron.

Jeff Byron: I agree, Dan. We did some studies at the Energy Commission a number of years ago that indicated we really need to see carbon prices on the order of $140-$150 before we start seeing real behavioral changes.

Cathy Zoi: Wow!

Greg Dalton: Wow!

Cathy Zoi: Wow! That's really high.

Dan Adler: To get the fuels market going you have to get that high, and that would destroy the utility business. So the notion of one carbon price as the global solution to energy policy problems is really pretty difficult to sustain.

Matt Scullin: And I can tell you--

Greg Dalton: Matt Scullin.

Matt Scullin: --that we don't factor any price of carbon into any type of calculations about marketability or financial projections that we do. It's just not something that we can predict. It's not something that we can sell. It can't affect how we're thinking about our business in early stages. So, you know, I think we happen to be positioned in a place right now, Alphabet Energy, where we've had money through this learning cycle and we have more money to take us, hopefully, far enough through the rest of it.

And our focus has been on low cost electricity from the start regardless of whether or not there are carbon prices involved. And that has to drive product innovation. I mean, you know, a carbon price inherently is not going to drive the type of innovation that's necessary. The more competitive the electricity market, the better the technology is going to be, the more competition there's going to be. That's what I believe and that's the stance we've at Alphabet.

Greg Dalton: So California is about to put a price on carbon. Is that a meaningful signal or is it too low here in California? I don't know what it is, $25-$50, somewhere near, Jeff Byron.

Jeff Byron: I don't recall the exact number either but--

Greg Dalton: It's going to be set partly by auctions and by the market but it certainly not $140.

Jeff Byron: No, it's not. But it's a start. And I would like to tip the hat a little bit to California and the policies that we have. They really are innovative policies. I told Cathy just before we came on, I'm not happy with her leaving the DOE. We need good people like her in government at the federal level. Missing a national energy policy -- the AB 32 which was the--

Greg Dalton: Global Warming Solutions Act.

Jeff Byron: --the Solutions Act was really not a solutions act. It was a leadership act, and will continue to provide that leadership in California.

Greg Dalton: But that act was passed in 2006 when the economy was really good. The economy seems to be sputtering right now. Can clean tech continue when sputtering economy -- will it sputter along as well? Dan Adler.

Dan Adler: Nationally over the last seven years there's been 12% increase in employment in clean tech across all various sub-sectors. And compare that to job development, job growth at the macro level, it's prey astounding.

Cathy Zoi: Just to amplify what Dan is saying. I just saw a report data from a report that said that there's like 135 companies that are advertising for jobs in this sector that if they hire all the people that they're asking for there's going to be 46,000 new jobs. And then, you know, think about those terrible, sad job numbers from last Friday and then compare those numbers. This is really -- the tempo may be slowing down just a bit but, again, the macro force of the growth of the sector because of the innovation. I mean companies like Matt's are innovating and they're driving continuous improvement. It is -- this is a -- you should tell us a little bit about your technology.

Greg Dalton: Yeah, tell us what you do, Alphabet Energy.

Matt Scullin: So we make a semiconductor. It's a material that's kind of like a solar panel but it turns heat into electricity instead of light into electricity. So it's a new take on a very old-fashioned technology where we can -- take a material, make one side hot, the other cold, and it generates electricity. And with that, we can do something called waste heat recovery where we can insert it into exhaust flues or other forms of wasted heat energy and generate clean electricity from the wasted heat.

Greg Dalton: So this is -- your pitch is to companies right now that are loosing -- they can make money of their waste, their waste could become a revenue.

Matt Scullin: So it's -- yeah, it's energy efficiency. That's right. So companies who use it whether it goes in a car, on an engine or in a factory or power plant, the idea is you're doing with the resources that you're spending money on. So you're saving money on energy that way. And it -- you know, energy efficiency is challenging because you -- on the one hand it's a great thing because you are saving somebody money when they buy this product, but it's challenging because you're never increasing top line revenue, right?

If we go to a company that produces paper, we're not helping them sell more paper by installing, this but we are lowering their cost of producing the paper.

Greg Dalton: You're helping the bottom line, not the top line.

Matt Scullin: Right. So it helps companies to stay more competitive. But I think that gets to the core of why the sale cycles can be long in the case of what we're doing. And that, you know, you do have to go in and convince people that this is not going to blow up their factory. It's not going to make the car shut down while you're going 80 miles an hour in the highway. And it is going to save you money and be a good thing. And so it seems almost foreign that anyone would not want to adapt a new technology sitting in Silicon Valley, you know, all being used to buying new iPhones when they come out and things like that, but it is a challenge making that sale. And we have to compete on, you know, very simple measures. What's the pay back time? What's the ROI? Is the electricity

regenerating cheaper than other electricity that folks are already buying? We never make a sale based on efficiency. We never make a sale based on carbon. Our customers don't really care. And so they care about how much they're paying for electricity. They care about how much money they can save. So yeah, we're clean tech company but--

Cathy Zoi: What are the other attributes to your technology? Does it reduce the footprint? Does it increase reliability? Does it -- I mean--

Matt Scullin: It can increase reliability but the bottom line is that it will generate very cheap power. And so it really is a spreadsheet driven sale. You know, there might be some emotional aspect if we get to the right person within the organization who has some desire to make the organization greener. But for the most part we're talking about organizations like, you know, Fortune 50 companies that aren't going to make a sale based on decision of one person within the organization. It's going to be something that is very much based on a decision of where to spend capital in one area versus another, and so it comes down to rational factors. And we have to sell based on how we compete with other forms of energy generation, other forms of energy efficiency.

Greg Dalton: Matt Scullin is founder and CEO of Alphabet Energy. Other guests today are Jeff Byron, Vice Chair of the Clean Tech Open, Dan Adler, President of the California Clean Energy Fund and Cathy Zoi, a partner of Silver Lake Kraftwerk. I'm Greg Dalton. Let's talk about some other areas where there's really exciting innovation happening, companies turning waste into money. What are some other companies that really excite you where you think there'd be some real wow breakthroughs in energy? Jeff Byron.

Jeff Byron: Well, I'm sure that Dan and Cathy will share all their great insights on companies they're investing in. But Matt was one of our stars at the Clean Tech Open. His company did not win but they've gone on to get funding and financing.

Matt Scullin: We won four awards though.

[Laughter]

Jeff Byron: In addition to Clean Tech Open.

Matt Scullin: In the Clean Tech Open.

Jeff Byron: In the Clean Tech Open.

Greg Dalton: He's got them in his pocket over there. Okay.

Jeff Byron: I remember when we met, you told me that you hadn't.

Matt Scullin: Well, we didn't win the first prize.

Jeff Byron: You didn't win the big prize.

Greg Dalton: So who are some other exciting ones you'd go wow?

Jeff Byron: Well, so what I wanted to point out was that although what Matt said is absolutely correct, there are other things that drive innovation and companies. And we'd like to think that standards also drive them. Energy efficiency standards do work and they create the need for new companies and businesses.

Matt Scullin: But that's hard to reconcile with being an entrepreneur.

Jeff Byron: Yes.

Matt Scullin: So who -- you know, if you have new standards, if you have policy drivers, who's responsible for innovating around those? How do you time it?

Jeff Byron: Well, what I was going to point out, Matt, was that we've developed in California, we've been doing this for 35 years, both building and appliance efficiency standards which do change the marketplace. We've had a lot of innovation in companies that evolved trying to meet those standards. And those sale cycles tend to be shorter, tend to be a lot more -- I don't want to say easier, but not as difficult as the challenge that you're up against.

Greg Dalton: And that can be fore refrigerators, TV's that sort of thing. Cathy Zoi and Dan Adler, wheat are some real wow?

Cathy Zoi: Just to answer your question, Matt. There is a national law on appliance standards and there's long lead times. So there's -- so essentially a law was passed in 2007 that said that the Department of Energy will pass -- improve efficiency standards for all of these appliances in this time table. And it gives entrepreneurs like you plenty of time to innovate to help meet that standard. So there -- again, it's not tomorrow. I mean years ago we invented this concept called Energy Star which started off at computers, and it was basically taking power management technology from laptops, it conserves the battery, putting it in desktops. We had company sign up to do it and then we didn't allow anybody to use that little Energy Star logo for a year to give more people a chance to actually innovate. And they innovated way beyond the benchmark of what the definition of a low power state was. So that's the way, I think, appropriate proper regulation does. It gives you guys a chance to compete and win on innovation.

Matt Scullin: But who innovates there? Because when I go to Best Buy and buy a fridge that's Energy Star compliance, it's still made by LG or whoever, right? I mean what start ups have actually innovated because of these appliance standards?

Cathy Zoi: But a lot of those companies are going start up -- are buying start up technologies. I mean, you know, I meet with a lot of those big companies now and they say, "Who do you got in your pipeline?"

Jeff Byron: They can help me at the start.

Greg Dalton: But innovation doesn't necessarily mean creating a new company. It could be innovation inside large companies. Dan Adler, what are some wow innovations out there?

Dan Adler: Well, we're spending a lot of time looking at electrical storage in all of its various forms.

Greg Dalton: Good.

Dan Adler: People have known, that's a holy grail for renewables.

Greg Dalton: Right.

Dan Adler: You know, the thing about the grail is that, you know, they never found it, so I'm not sure if that's the right metaphor to use.

[Laughter]

But there area a lot of different ways to do it and a lot of different things, technically, that are interesting and achievable and there's nice market dynamics particularly with batteries. Venture capitalist investors always want to see multiple opportunities for their product to get in the marketplace. So you can start with consumer electronics where everybody's got a heavy battery demand and they're, you know, they're charging through the duty cycles, flow into the car industry and then up to the grid scale. So there are many opportunities to prove your product's merits.

The challenge with storage, and this goes to the notion of standard setting in market design is that it can do so many things but no one specified how you get paid to do all the things that you do, for instance, as a battery company. So the world is your oyster but, you know, you don't know how to open the shell.

Greg Dalton: And we want to talk about some home runs and some failures as we mentioned earlier. Who are -- what are some of the most successful clean energy, clean tech companies so far?

Dan Adler: Well, Tesla was mentioned, a very interesting car company there in our fund to funds portfolio. And if you told me in 2006 that our first exit would be a standalone electric car company in the United States, I'd thought you are crazy. So you have to look at the combination of technical innovation and real business savvy that that company--

Greg Dalton: And a note on Tesla, they've been up 40% since their IPO about two years ago. NASDAQ's has been up about 30%. They beat Ford and GM over the last year. Of course, GM just went public again recently.

Dan Adler: On a side on that, there was an analyst note from some 25-year-old Wall Street watch that said, "Tesla, the fourth great American car company." Well, at that point we had two car companies in this country.

[Laughter]

Greg Dalton: And Tesla has made a total of about 5,000 cars, so they got ways to go.

Dan Adler: So there are a lot of reasons at the data but I think the most exciting things are combination of the technical sophistication but I'm spending more and more time as a advocate as well as an analyst looking at process innovations, business model innovations, things like what Solar City and SunRun are doing. Anytime you can make the upfront cost disappear, for the [00:29:25] technology that you're trying to deploy, it makes the sale that much easier. And again, it's lateral moves from other industries using things like real estate investment trusts, master limited partnerships, getting the debt markets going. Right now, we're fighting for scraps when it comes to finance because we don't use the same financial techniques that industrial society is currently using.

Greg Dalton: Cathy Zoi.

Cathy Zoi: I think if you look at the solar market in its entirety, it's really exciting. When I took up my post at the Department of Energy the prices for solar were about $7 a watt installed. When I left last year it was about $3.50, is the prices that we were seeing again. So that's just astonishing.

Dan Adler: And they're much lower since.

Cathy Zoi: And they're probably much lower since. So there have been some very high profile failures but that's in some ways part of what happens when a market matures, when it becomes more competitive, when some manufacturers are able to cost down and others aren't.

Greg Dalton: And it's not just Solyndra. First Solar had some lay offs. There was another bankruptcy recently in Massachusetts. Konarka Technology Company filed for Chapter Seven recently. So there's lots of blood on the floor because of the -- is that normal?

Cathy Zoi: Yes and similarly, I mean, you know, Google wasn't the first search engine. I really do think that we forget and, you know, we all -- but, you know--

Greg Dalton: Remember .home? Yeah, right.

Dan Adler: It's creative destruction. You just have to make sure that there's creativity going on, not just destruction. In the wake of these business failures we learned something about the way markets work, the way the policy can help markets and, you know, those consolidation to get into scale. We have to consolidate.

Jeff Byron: But consumer in the long run benefit from all of these, lower cost, better products.

Dan Adler: And in the background we've doubled clean energy production in the last decade. California has got 1,500 solar firms that it didn't have 12 years ago. A lot of them are failing and a lot of them aren't.

Cathy Zoi: A momentous thing happened in Germany on Sunday which was -- and some of you may have read this -- is that half of the electricity that entered the market was from solar. And there's been this big thing because -- some time in the last 12 months Germany made a commitment to phase out its nuclear. Oh my gosh. How are they going to do this? Well, they've made a commitment to meet their demand with renewables and efficiency improvements and everything else but then the result is worry from the engineering community saying, "It won't work, it won't work. We can't do it." But on Sunday, half, you know, they signed a policy that supported rooftop solar for many years and it has born fruit for Germany as well as really drove the prices down because it was a big enough market that a lot of innovation manufacturers paid attention.

Greg Dalton: And the German consumers paid dearly for that electricity.

Cathy Zoi: As a part of the mix, Greg, I don't--

Greg Dalton: Very high prices. Per kilowatt hour, 30 cents, right, Jeff?

Jeff Byron: A little bit higher, certainly, but they have a lot of benefit to show for it as well. Remember, Germany had a lot of coal fired power plants they've displaced.

Greg Dalton: A lot of jobs. Germany is exporting clean tech to China and everywhere else.

Jeff Byron: Yup, they make the machines for China.

Greg Dalton: We're talking about clean tech innovation at Climate One. Our Guests are Dan Adler, President of Clean Energy -- California Clean Energy Fund, Jeff Byron, Vice Chair of the Clean Tech Open, Matt Scullin, founder and CEO of Alphabet Energy and Cathy Zoi, partner at Silver Lake Kraftwerk. Let's talk a little bit about the specific jobs. Where are the jobs in California? Are they being created here? Are we going to -- there's been some talk recently about re-shoring of jobs, manufacturing jobs actually coming from China back to the United States. Is that going to happen? Dan Adler.

Dan Adler: Manufacturing has also an exogenous set of factors. It's going to be much bigger than just the energy economy, certainly bigger than clean energy but things like exchange rates and

trade and tariff policies matter a great deal there.

Cathy Zoi: And transportation cost.

Dan Adler: Yes, right. And so the--

Greg Dalton: Which gives, you know, fuel cost underneath that.

Dan Adler: California has a good percentage of these jobs and what the Bureau of Labor statistics considers green. So they did a study earlier this year. They had the National Economy. I think something like 3% of the jobs were green in nature. In some description California is roughly the same percentage, about 390,000 jobs, I think. The subset of that is energy related and subset of that is manufacturing. Manufacturing is tough here. It's going to be tough here, we know that. There are targeted incentives that we're using into some effect. Tesla's in California because the state made a real effort to put them over there in Fremont and it worked. Can America compete on a manufacturing basis? Yes. The evidence is clear that right now we're having a boom but union pay scales are not the same as they used to be the manufacturing pay scale is not what it was. We don't want manufacturing just because we manufacture it but we want good jobs and well paying jobs. That's a much larger problem with globalization.

Greg Dalton: And there's wage -- upward wage pressure in Guangdong and Eastern China, and Eastern China and Mississippi, right?

Dan Adler: That's a good thing, yeah. You want to race at the top.

Cathy Zoi: Yeah. It's interesting. I think I was telling Greg the story before we came on. Over the last, you know, few months when I've been talking to companies to sort of --they were thinking about where to put their manufacturing facility or they just have put their manufacturing facility, many were in Malaysia or some place in China, sometimes in India. But if they weren't in those three places, then they were in Mississippi. And I scratched my head and I remember the conversation that I had with Governor Haley Barbour while I was at the Department of Energy. And he did, probably, with the state of California, for Tesla, there were some economic development incentives. There was a stable workforce that was perfectly suited to do the solar manufacturing, and it was cost competitive for the companies, you know, on balance if they could pay the same amount then they would prefer to be here.

Greg Dalton: Makes a lot of sense. How much of this is relying on subsidies? We haven't talked directly about subsidies. We talked a little bit about Germany, rate payers subsidizing that. Is clean tech too dependent on tax payer subsidies right now?

Dan Adler: Well, everything in energy gets subsidized one way or another. That's not a -- let's say -- I'm not condoning it, it's just an admission of guilt. You can say that the oil industries, they, you know, they get allowances, all the tax credits, et cetera, et cetera. And yes we have created some incentives to spur the development of wind, of solar, the investments that the Department of Energy made as part of the American Recovery and Investment Act. I believe you oversaw $30 billion worth of investments. It needs to be said, and these were good investments. These all come to the bottom line of consumers and eventually save them money, the investments in energy efficiency, et cetera. So I suppose--

Greg Dalton: You don't think we paid too much for it?

Jeff Byron: No, in fact I think just the opposite. The American Energy Council which us a bunch of CEOs got together about a year and a half ago that included some pretty high profile individuals.

Cathy Zoi: Bill Gates came out.

Greg Dalton: John Doerr.

Jeff Byron: John Doerr.

Greg Dalton: Jeff Immelt from GE.

Jeff Byron: Yes. You know we called -- you know what I'm talking about. They called for a $16 billion investment in just energy R&D. Do I have that number right?

Cathy Zoi: Yup, yup.

Greg Dalton: Right.

Jeff Byron: So no, we're not paying nearly as much. Public interest energy research in California is part of whatever rate payer pays, and we're one of the only states that does this kind of program and it was not continued -- well, actually I don't want to confuse the matter. It was just continued by the Public Utilities Commission because our legislature failed to pass it. I'm working with legislators. We said, "Don't just pass this. Double it. These are good investments." So the subsidies have some tremendous benefit but what we all hear about in the news are the subsidies that end in failures such as Solyndra.

Greg Dalton: Jeff Byron, former member of the California Energy Commission. Dan Adler.

Dan Adler: I think if we sort of unpack the role in finance that the government plays and identify some points where -- I think we'd agree that they're under-funded from a public interest perspective, certainly, at the R&D scale. Demonstration where a venture capital runs out and traditional private finances are ready to come in because the risks are too extreme. Huge role for policy both in shaping markets and providing capital. Where I think we have a problem is imagining a future where we can scale to where we need to be in terms of commodity energy production, electrons and fuels, using the same kind of subsidy that we have today even if we didn't have this massive physical problem as a country that we're going to have to get serious about. Do we want our industry out as, you know, the first victim of that conversation or do we think about pulling other private money that can take the place of some of that robust public subsidy as we scale?

Greg Dalton: And that's where you get to large strategic investors who have the scale and capital, the know how.

Dan Adler: And just capital markets generally. So not just industrial partners but -- there are trillions of dollars on the side lines, globally, right now looking for good investments. Cathy mentioned that smart market design leads to long term contracts with proven technology. It's gold. We're only starting now to see that kind of movement from institutional investors towards clean energy infrastructure.

Greg Dalton: Cathy Zoi.

Cathy Zoi: And Greg, your question was about subsidies, and subsidy has a particular connotation. Would you ask the same question about a target? I mean in the policy -- I mean you can deploy the lots of different policy tools in the tool chest. A subsidy is one thing, a grant for R&D is another thing. It target a renewable--.

Greg Dalton: Subsidies -- a subsidy is something someone else gets. A benefit is something that I

get, right. It's always, you know -- subsidies are something that someone else gets.

Cathy Zoi: Well, but to a just point, we're all benefiting from some of these things. It was interesting having spent as much time in Washington as I have is that dollars are easier to sort of vote to support but policies like a target takes much more political capital. So what we tend to see are politicians voting for a little bit of this on wind, a little bit of this on continuing this oil tax break, a little bit of that. And, you know, pure policy folks would argue let's just level the playing field and, you know, create some targets that are based on outcomes to reduce pollution or to create jobs. That's what we're trying to do. But the messiness of actually policy making, whether it's in Sacramento or whether it's in Washington, mean that you have this hodge podge. All I would say is that we should -- that none of these things is a particularly dirty word. We should have an honest conversation about here in 2012, what are our national objectives, what are our state objectives and how can the government most effectively, you know, intervene in that market place to support the goods and not support the bads.

Greg Dalton: So let's take a specific example. The production tax credit for wind energy is said to expire at the end of this year. People involved in the wind energy industry say that's going to cost American jobs this summer because there's a long lead time. It looks like Congress may or may not approve that in a lame duck session. Is that a good policy or a bad policy? Dan Adler.

Dan Adler: I think a volumetric incentive in the form of a cash payment based on production, meaning you're actually getting electrons or you don't pay the subsidy, is good policy design. The way that the production tax credit breaks down is it forces these partnerships with large institutions that have some sort of tax appetite that they want to offset. So basically what you're saying to a corporate entity or a financier, "Don't pay your taxes but support clean energy." I'm not sure that's a sustainable critical message over time. And there aren't that many people -- institutions they can do that so -- and particularly in recession session when people's tax liability goes to the floor then your policy mechanism is worth nothing but the notion of paying a little bit to get more clean power on the grid to make up for all the societal costs that were not monetizing into the equation.

Greg Dalton: Jeff Byron.

Jeff Byron: Well, for those of you that track all this and understand it, the production -- or don't, I should say, the production tax credit for wind has basically been a cliff every couple of years. And it's about two cent -- a little over two cents--

Greg Dalton: Goes down every time--

Jeff Byron: No, it ends--

Greg Dalton: Oh, I see.

Jeff Byron: --unless it's renewed by Congress, and we're facing another one of those cliffs. So it's tough for folks to make orders and to plan production in so many years unless it's renewed. Well, I'm not a fan of artificial markets that are created by subsidies like this. I'm not a fan of cliffs that are in the hands of political entities that really determine business future. But some sort of ramping down would make more sense. Wind is certainly set to become very cost competitive and properly could begin to survive on its own without any subsidies.

Cathy Zoi: Well, except that, again, if you talk to some of big companies that are involved, and they're big international players. They're saying, "All right. Well, if this goes away then -- it's not that my business has gone away, it's just going to go away, it's just that I'm not going to do business

in America anymore."

Jeff Byron: Right.

Cathy Zoi: So that's -- because there are incentives of one shape or another in Europe and in China and in other parts of Asia. And so, again, I think there's another competitive frame from through which we have to think about --

Greg Dalton: Yeah.

Cathy Zoi: --the policy.

Matt Scullin: And I --

Greg Dalton: Matt Scullin.

Matt Scullin: I think what's made things more competitive lately and is something we're also trying to figure out is what's happened with natural gas lately. And--

Greg Dalton: We had -- that's the elephant in the room. We have to talk about how that's affecting everything.

Matt Scullin: Yeah. And it's definitely the elephant in the room because coming back to jobs, I mean the most jobs in the energy world had been created over the past couple of years in natural gas. And the cleanest thing that's happened on the grid is called the gas switching, over the past six months in particular. Capacity factor gas plants is up and the capacity factor coal plants is down. And, you know--

Greg Dalton: Tremendously and quickly. Some people talk about energy doesn't move fast. That move really fast.

Dan Adler: Extraordinarily.

Matt Scullin: Very fast. And so on the one hand I think it is somewhat of a stepping stone to a cleaner energy portfolio because offsetting coal with gas is a good thing but it's not -- it's not good for clean tech and renewables and that cheap gas makes it much harder to compete. Trucks are probably going to move to LNG relatively quickly.

Greg Dalton: Liquefied natural gas.

Matt Scullin: Liquefied natural gas, yes. Sorry. Transportation in general now has -- you know, when you think about electric, you're now thinking also about converting to natural gas. It becomes competitive that way. Electricity prices have gone down because of natural gas, and they may continue to do so if gas stays cheap. So overall having an incredibly abundant resource that has just kind of popped up in the United States over the past couple of years I think makes it harder overall in the U.S. for renewables to compete and I think it, you know just lends itself to the points that we were making earlier about opportunities outside the U.S. looking more attractive and subsidies being, perhaps, more necessary than ever. But also, you know, what does it mean now to have more gas on the grid in terms of the climate? You know, how much do we need to subsidize solar and wind? And what are the effects of these renewables can have with more gas on the grid? And I think what makes it even more complicated is that gas kind of obviates the need for a smart grid. When you have gas on the grid it's much easier to operate the grid which on the one hand enables more solar and wind but on the other hand might deter infrastructure investments. So I think a lot

of things have changed over the past six months and it's, you know, who knows what's going on right now.

Greg Dalton: Gas is a really game changer. Five years ago people thought U.S. would be importing natural gas. Now we're talking exporting natural gas. Anyone else on gas as a game changer before we go to audience question? Cathy Zoi.

Cathy Zoi: I would just sat that one of things that President Obama has proposed is a clean electricity standard that would get -- would basically buy 20%, 35%, 80% of our -- we would reduce our emissions by 80%. When I was still at the Department of Energy and we did the modeling that wasn't a very expensive policy, you know, it was a nice glide path. Then gas prices dropped precipitously so I don't know what the new modeling numbers are, but to get to something that is so ambitious, as an 80% reduction, you know, an 80% clean grid basically with low gas prices is going to be -- is going to be -- is going to be terrific, is going to be really easy because as everybody knows, gas has half the emissions of coal.

Jeff Byron: Half the CO2.

Cathy Zoi: Half the CO2.

Greg Dalton: Dan Adler.

Dan Adler: Well, that just raises the point and going back to the carbon discussion. Where do carbon opinions matter? It matter in the legislative chambers. People have to believe that this is a serious problem and they'll design policies with carbon in mind even if they're not pricing carbon directly. But to maybe more positive notes on gas and Matt's point, it does concern me greatly. Matt mentioned that the capacity factors of plants are increasing, meaning the existing ones are working all across the country. But if you're a utility planner and this is born out in conversations with utility planners and you have to build something new, are you going to bet on $3 natural gas or are you going to look at solar and wind deployments in your neighboring states and in your portfolio that are working for you that you can integrate under your existing demand profiles and make that bet on the free energy resource? So it's not just existing versus new costly renewables, it's you have to do something new and pay for it. It tends to break more favorably for renewables. And the notion of the international market place is starting to get people's attention. In Europe, U.K. in particular, gas is three, four, five times more expensive than what we pay here. Japan is shutting down its nuclear plants looking to import gas. So they will be some global equilibrium well north than what we're seeing.

Greg Dalton: So $3 gas is not here to stay. Jeff Byron.

Jeff Byron: Just to add all of these, there is at least some silver lining to low prices natural gas. It really does benefit consumers in a couple of different ways. We're talking as policy makers and investors and clean technologies and it's certainly affecting us, but the health of individuals will improve tremendously as a result. And I would expect electric prices not overall to be lower but certainly as we move to natural gas, the low cost of that fuel will drive electricity prices lower.

Greg Dalton: Jeff Byron is a former commissioner of the California Energy Commission and a consultant to NRG Energy which is an electric utility.

Jeff Byron: Right. It's certainly hurting NRG Energy. Low price in natural gas is really difficult for us when we do long term gas buys and it keeps getting lower and lower.

Greg Dalton: It's tough on nuclear too. We are going to invite your participation. We'll put a

microphone out here and invite you to come up with -- to join us with one part comment or question. And if you're on this part of the audience, you can please go back there. And the line starts with Jane Ann, our producer who's waiving her hand right there. And invite you to come up. So whoever is the first one can come on up with -- yeah, the line forms back there. Great. This is often -- so let's have our first audience question.

Female Participant 1: Hi. Excellent panel. This is my one part question. I was wondering what you see as the potential for clean tech companies to make sure they're not leaving money on the table by perhaps greening their operations further. Most people -- most innovators come into the clean tech sector from a technical and business background as they should but not necessarily, in my experience, so much of an environmental background. How much do you see that by really "greening their operations" they might be able to get to exit sooner or increase their profits?

Greg Dalton: Matt Scullin.

Matt Scullin: Well, I mean the dirty little secret pun intended in clean tech is that, you know, you're doing a lot with chemicals or other manufacturing processes that aren't necessarily green. And I think green can mean a lot of different things. It's not just about carbon. It could be about water. It could be about, you know, as Jeff eluded to, with health, particulate matter from coal and things like that. So all kinds of things that green can mean. And I'd say that from kind of a pure start up perspective, it's something that we have to think about within the letter of the law but we can't spend money on having the greenest operation in the world. It's not something that is that realistic where--

Greg Dalton: If it saves you money? If it saves you money?

Matt Scullin: If it saves us money, sure, but then it's not a green decision. It's an economic decision. We don't put it under any kind of, you know green umbrella or anything like that. So it's just an economic decision. But, you know, we're trying to be a company that impacts the world, and we think that in order to do that we have to be successful with the products that we launch and so we're not going to let anything get in the way of that. And it's just an approach that we have to take given the resources that we have and what's available but, you know, if there is an opportunity to save money, sure--

Greg Dalton: It's all economics.

Matt Scullin: --and of course, we'll take it.

Greg Dalton: Jeff Byron.

Jeff Byron: I just wanted to add, there's a transformation that's going on. And as I age I notice that more and more that we get young superstars that come up through our educational system now, that are really motivated, I think contrary to the question, by environment issues, by sustainability issues. So yeah, they're creating businesses and starting companies to make money but you notice what areas they're choosing to start businesses. And we've got a whole new crop in the last, I'll say 10 years, of really motivated and bright individuals that have sprung up around energy and clean tech technology, I don't think we had that 20 years ago.

Dan Adler: I'll add a -- just coming on that.

Greg Dalton: Dan Adler.

Dan Adler: Entrepreneurial environment requires venture capital and entrepreneurial spirit. And

venture capitalist wants to scale quickly and a lot of young companies don't know how to manage that and so the scale gets messy and it becomes inefficient. And so whether it's environmental waste or any other kind of waste, it's obviously an opportunity for them to not just get profitable quicker and find their markets quicker, but, frankly, not have to raise more venture capital because the less you're going to have to do that, the more company you keep for yourself and you can focus on your business operations and not giving away your company to people like Cathy and myself, I guess.

[Laughter]

Greg Dalton: Slow down your burn rate. Let's have our next audience question. Welcome.

Male Participant 1: Hi. We're entering a political season. I think there's--

Cathy Zoi: Are we not in it yet?

[Laughter]

Male Participant 1: I think there's real -- very likely chance that we're going to see, you know, Republican president some chance of a Republican controlled senate or have a Republican controlled House, Candidate Romney who's standing outside Solyndra holding a press conference. I'm asking you to don your political caps. What is Republican controlled federal government meaning for the clean tech sector? I'd ask you to speak honestly and maybe not, you know, don't mince words. Is this something we, if we care about clean tech, should we be worried about? Will this affect clean tech investments going forward if federal government becomes even less supportive of clean tech going forward?

Greg Dalton: Cathy Zoi.

Cathy Zoi: Yeah. I get to go first. I think it matters hugely. I think that Candidate Romney calls the sector much ballyhooed, and I take offense to than adjective. Look, I think that President Obama has presided over the largest investment in this sector that has ever happened in history, you know. But my little budget was $38 billion and it is strategic and it competed with the private sector. This wasn't a bunch of sort of ding-dongy government employees investing in funny ways. This was -- this was sector by sector, peer reviewed competitive projects that went -- innovators like Alphabet Energy -- it's just the beginning of a transformation that's happening. And the President, you know, is advocating now for -- what he wants to do when he gets back is a clean electricity standard which as I say, will create the business risk, the settings for this so that sort of business can manage its capital well, I mean create a glide path for capital. I see none of that from the Romney campaign.

Greg Dalton: But Governor Romney of Massachusetts supported solar and did some things that are very different than the political campaign now. Dan Adler.

Dan Adler: Yes. So which version of Candidate Romney will we see if he is installed -- the Etch N' Sketch is you have to really settle on that point. And which version of the Republican Party are we going to see? There are plenty of Republicans in Congress who understand the energy imperative particularly from a security perspective. There's a great movement afoot within the national security establishment to embrace clean technology. And frankly for -- take wind for example, there are wind jobs in all 50 states and some very smart communications going on around "This is your district and I can overlay all the clean tech activity that's going on in it." And we can design markets that are capital efficient, that are good for your local workforce and you're going to have to talk about climate a lot of times. So it really is what the political tenor of the party when it enters.

Greg Dalton: Jeff Byron.

Jeff Byron: Hopefully add a positive note to this. Looking forward is always challenging but we can look back in California and see that the last two or three governors we've had both Republicans and Democrat and really clean technology and renewables are bipartisan issues. They don't have to be polarizing. It's the grid lock. It's the polarization that we've got in D.C. right now and in our own legislature here in Sacramento that's very troubling, you know, the fact that you can't pass anything if it has the word tax associated with it. Then we're going to return to the 1970's in terms of scientific thinking again. So I'm really optimistic regardless who's there. They'll drink the Kool-Aid.

[Laughter]

Greg Dalton: We have just a few minutes left and a long line there so let's go quickly through this questions and answers. Yes, sir.

Male Participant 2: Hi. Gary Malazian. I've heard a lot of good information here this evening. But I'm curious, Greg, how much of the press and the politicians do we have in the room?

Greg Dalton: I don't know but they'll certainly hear about this but--

Male Participant 2: I'm just wondering though because until those people hear about this, it's a very slow process. How are you going to get the media educated and the politicians educated not at the level you're at but at a level where they get on board and move this thing forward because like the young man said before me, if a Republican gets in the office you can kiss a lot of these goodbye. I mean I think the Bush regime set us back two generations regarding climate change. And I'm hoping that doesn't happen again. What are you going to do to the media and politicians involved?

Greg Dalton: Who'd like to tackle that one? Dan?

Dan Adler: Just very briefly on this. You know, we could have a drink afterwards and talk about it.

[Laughter]

I tend to think it's more about defeating Obama than it is about unpacking any piece of his agenda, that cooler heads will prevail if that does transpire, and I certainly hope it doesn't. But I wouldn't indict the whole Republican Party with an anti-clean power agenda.

Jeff Byron: I'm willing indict Ms. Zoi here. I don't think this administration has done enough to really -- to talk about the accomplishments of the American Recovery and Investment Act. These are game changers. The stuff that we've seen in the last six years, the last three or four years, had been extraordinary.

Cathy Zoi: Yeah. It has been extraordinary. It has been extraordinary. I mean and you -- but you do make a very good point. All of the polling even now says the American people support clean energy. Republican, Democrat, independent. So, look, I would wish that cool heads would prevail over the sector but I don't see any, you know -- I don't see any evidence of it right now. I agree with you on the -- the folks that were involved in this in designing the Recovery Act and implementing it. There's a lot of really, really unbelievable data that's come out of that. And in fact there's a book that's coming out in August that I would point you to by a guy who's a reporter for Time Magazine. He was covering -- he covered the Recovery Act kind of all the way through its first couple of years and said, "This is so interesting. I'm going to write a book about it." It's coming out in August and it's -- I think it's called "The New New Deal."

Jeff Byron: I'm sure it'll be a best seller.

Matt Scullin: Alphabet is an example of a company that's benefited from all the public investment over the past few years. I mean you guys have said very nice things about Alphabet, I don't really know why.

[Laughter]

But, you know, we took government money and we needed it to get going initially. I mean our core research was all funded by the Department of Energy. Our core technology is a Department of Energy technology. And in 2009 when the capital markets were closed it was getting government money from the Army, the Air Force and the Department of Energy that opened up private money and opened up that opportunity for us. And so I think, you know, the bad press that the Loan Guarantee Program which I think is a very important program in bridging the gap to scale for clean tech companies, I think the bad press has gotten from Solyndra as a tragedy. And I think that that's a very important program in RPEs and other incredibly important programs in terms of--

Greg Dalton: We could go into that. The Military, Republican governors doing lots of things on clean energy. Let's get to audience question. Yes, sir. Welcome.

Gerald Harris: Hi. Gerald Harris from the Quantum Planning Group and I specialize in scenario planning. It looks like to me that the technology is going to do two things that are in conflict. It's going to increase supply, alternative energy, all those kinds of things, and it's also going to reduce demand through energy efficiency, this means that at some point the price has got to collapse. And this has happened before in the power industry between 1910 and 1970. And what happened was what we call creative used wastage with things like the can openers. So it may seem like in the long term we need to do something on the demand side. And maybe the issue is the solo power washer and dryer. It's similar to under $100 computer. So my question is what are you going to do on the demand side when obviously electric prices have to collapse based on these trends?

Cathy Zoi: It's interesting though. We human beings keep finding more and more things we want to plug in.

Greg Dalton: Can opener is a good thing, yeah.

[Laughter]

Cathy Zoi: No -- right. But the -- but the biggest load in your house right now, if it's not your air conditioner if you're a hot climate it's your desktop box. I mean it's like -- so it's all the combs, and it has this vampire load that's on all the time and stuff like that. So keep finding more and more things to plug in. Electricity demand is the least of my worries.

Matt Scullin: But demand in the United States is flat. Electricity demand has not gone up in the United States lately. Where demand goes up -- yeah, it has even gone down. Where demand is going up is in the developing world. There are some statistics I read, it was a couple of years ago now where, you know, if everyone in China got a toaster, it meant they had to bring online hundreds of coal fired power plants, right. And so that's -- I think that's the important question. It's not about, you know, the TVs that we have or how much power our iPods consume when we plug them in. I mean electricity demand in the United States is not really going up.

Dan Adler: That points out to me the most important question in this whole discussion which is the role of utility going forward. As long as they're incented to continue to build things and put them into their rate base so that they can earn off of it, there's going to be that kind of conflict that you're

talking about. But if we get them in the frame of mind day we've known how to articulate for three decades now, energy as a service where it meet the need, don't provide the commodity. What do people actually want -- cold beers, hot showers? Get them in the business to doing that, not pushing electrons to the wires. And I think your conundrum can be fixed.

Greg Dalton: Let's have our next audience question. Welcome.

Male Participant 3: I teach chemistry at UC Berkeley. A quick question. It's wonderful to hear about natural gas and its availability. How serious is the fracking problem and how much is it connected to the greater availability of gas for Americans?

Matt Scullin: I mean I say pick your poison, you know. I mean it's -- do you want more coal on the grid or do you want a possibility for contaminated ground water? I have no idea. It's very hard to say.

[Laughter]

It could be a problem. I don't know.

Greg Dalton: Done properly -- fracking done properly can be done well.

Matt Scullin: Sure. Like everything, like everything, right?

Greg Dalton: It's not all fracking is bad. There's lots of ways it's done. Cathy Zoi.

Cathy Zoi: No, I absolutely think that can be done well. I mean the development of the resource got a little bit -- it went so quickly that it was a little bit ahead of a regulatory transparent framework that would create comfort in communities that were part of the fracking resource development.

Greg Dalton: Right.

Cathy Zoi: So -- but that will -- I think that will catch up and done appropriately and companies like Chevron that are big and that are here to stay. Well, we welcome that sort of regime. There's a little bit of a worry that some of the up starts might not -- might not be so excited about having a regulatory framework but they need to. And there's certainly room in the economic equation for proper regulations to make sure that it's safe.

Greg Dalton: Dan Adler.

Dan Adler: Fracturing technology is responsible for the boom and supply. And, oh, by the way, that technology is available because it was federally supported for a very, very long time.

Greg Dalton: Jeff Byron, last word.

Jeff Byron: The fracking issue will have to be addressed at least from a public perception point.

Greg Dalton: It is. States like Texas are already doing disclosure, California disclosure.

Jeff Byron: Yes. And fracking is not new. It's something that's been going on for a long time. But I agree completely with my fellow panelists, the industry still has to address it head on or it'll find itself in a similar situation as nuclear power. The public perception was never really addressed head on.

Greg Dalton: They have a little bit catching up there. We have to end it there. Our thanks to our

panelists today. Dan Adler, president of the California Clean Energy Fund, Jeff Byron, vice chair of the Clean Tech Open, Matt Scullin, the founder and CEO of Alphabet Energy, Cathy Zoi, partner at Silvery Lake Kraftwerk. I'm Greg Dalton. Thanks to our partner today on this program, Chevron. Thank you all for coming.

Jeff Byron: Thank you. Thanks, Greg.

[Applause]

Jeff Byron: It's great to see you.

Cathy Zoi: It's nice to see you too.

[END]