

# Solar Flares

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**Greg Dalton:** Welcome to Climate One, a conversation about America's energy, economy, and environment. To understand any of them, you have to understand them all. I'm Greg Dalton.

Today we're looking up at the sun, the original source of all energy on earth. In recent years, solar power has grown by leaps and bounds in the United States, Europe and Asia, driven largely by falling prices and favorable government policies. California and other states are catching the wave of moving ahead with ambitious goals for solar and other forms of clean power. But the forecast is not all clear. European governments formally bullish on solar are slashing subsidies, and the World Trade Organization recently slapped Chinese manufacturers with fines for dumping their panels below cost.

Over the next hour, we'll discuss the prospect of running our homes and businesses on sun power with our live audience here at the Commonwealth Club in San Francisco. We'd like to thank Orrick for generously underwriting this program.

We're pleased to have with us three entrepreneurs who founded companies that finance and install solar systems on residential rooftops, and a banker who funds the industry. Ed Fenster is co-founder and co-CEO of Sunrun, Danny Kennedy is President and founder of Sungevity, Lyndon Rive is co-founder and CEO of SolarCity, and Marco Krapels, is Executive Vice President of Rabobank which finances solar industry including Sungevity and SolarCity. Please welcome them to Climate One.

[Applause]

**Greg Dalton:** Ed Fenster, let's begin with you. After 30 years of development, lots of growth, solar still only accounts for about half a percent of all the electricity supply in the United States.

So while there's been lots of stories about solar this, solar there, it's still only half of percent. So put solar in the context of the overall energy supply for United States then we'll get in the other guys.

**Edward Fenster:** Sure. So, you know, I think one of the reasons that we are in the business we're in is that our perspective is that, you know, one of the really interesting things about solar is it is a very small minimum efficient scale relative to other forms of energy generation. The real place that you want to put solar is on a home or on a business, not in a desert where it has to be transported and distributed in a load center at high cost. So it's much more competitive when you can put it on a home because it avoids all that transmission distribution expense.

**Greg Dalton:** A lot of people would think that it's -- the desert is a good place because it's always sunny and hot in the desert.

**Edward Fenster:** Right. But it turns out, actually, if you're to look at your PG&E bill, two-thirds of the cost that you pay is in getting the energy from the power plant to your home. And so by putting a solar system on your home, you're -- you're able to compete not just with the cost of the energy itself but its delivery.

**Greg Dalton:** Okay.

**Edward Fenster:** So one of the reasons that solar has been scaling more slowly is that, really, its use case is on residential homes and on businesses. But the growth rate of those installations is running, you know, predictably for the -- I think business is represented here, you know, 50 to 100 percent, you know, year over year. And you compound that forward, you know, the numbers get big pretty quickly. And so we have only really enjoyed a competitive cost structure, you know, for the last two or three years but if you draw forward the growth rates that we've been experiencing in the past, I think you'll see it, you know, very quickly growing to be, you know, five to ten percent of the actual load generation.

**Greg Dalton:** Lyndon Rive, does that lead to some hype in the industry? Some people think there's a bubble that solar's been hyped. Is there hype in solar?

**Lyndon Rive:** Oh no. There's no bubble. Ask any solar manufacturer right now --

**Greg Dalton:** Well, not on \_\_\_\_\_ .

**Lyndon Rive:** There's no bubble. And in fact that bubble's been burst long time ago. It's based on pure fundamentals. So you sell electricity. That cost of electricity is an NPV and that determines the value of the system. So there's no bubble here. It is, what is the future cost of electricity? What are you summing in for today? Can you save the customer money? If the answer is yes, then the economics are halt. So unless you view that retail rates will decrease in the future, then you may think it's a bubble. But just show of hands. Who thinks retail rates are going to go down?

[Laughter]

There we go. One guy.

**Greg Dalton:** One person out of the 50 in the audience. Okay.

**Lyndon Rive:** So it's -- you know, if it's the last 100 years of indication of the future which is not always the case, then retail rates will go up.

**Greg Dalton:** Danny Kennedy, it always has been the case, until recently, that people who want to put solar on their own rooftop of their home or business have to put up tens of thousands of dollars to purchase the equipment and install it themselves. And now, there's a model where people can basically rent instead of buy. So explain for us that basic model.

**Danny Kennedy:** So that's the key to the kind of fast growth in the residential space which these three companies are pioneers of. The solar lease or the power purchase agreement, which is the same as you get from the utility that built a coal plant in the desert. They took some debt to do that, they repay it through the revenues they earn by selling electricity to consumers. We've credit finance structures that allow us to put a power plant on your roof. You get it installed for no money down, and it's paid off through the life of the system. So it's a pay-as-you-go electricity service contract. So these are really solar-service businesses, and that's the game we're in. We're service providers of the thing we all know as electricity, which is a really great value. And it has allowed us to grow very quickly in the last four or five years that that opportunity existed in the US. We've gone from zero, they're all cash-up front systems sold in the States, to now about 70 percent of the market share being pay-as-you-go on that basis. And, you know, just to point previously about the growth cost, again, exponential curves surprise people. It may be less than one percent today but the rate of doubling is what's important.

And you know, last year, 2012, there was a lot of hype about gas going into the grid, but actually only 50 percent of new additions in the country were gas, the other 50 percent were wind and solar.

Solar is coming up from this tiny minuscule proportion, but one percent goes to two, goes to four, goes to eight to sixteen very quickly. And even PG&E and the big utilities will tell you we'll be 10 or 20 percent of the grid within the decade. And if we have our way, we'll be more than that. And that's very possible. It's a bit reminiscent of the conversation with landline telephone companies a decade ago. You know, they were sitting around kind of complacent going, "Oh, don't worry about those cellphone things." We've got a similarly disruptive technology governed by the same semiconductor manufacturing process actually. And we provide a better service for less. So we're going to take their lunch.

[Laughter]

**Greg Dalton:** Let's see what they have to say about that.

[Applause]

**Greg Dalton:** Marco Krapels, not many banks lend in this space. Why do you think that lending to solar is good business?

**Marco Krapels:** Well, I just want to elaborate on Lyndon's point that this is -- this is really economic. You know, we bank a lot of agricultural clients that are enormous users of electricity. And in the last 60 years, they've seen their rate go from three cents per kilowatt hour to 12 cents per kilowatt hour. And even if you adjust it for inflation, rates are still significantly higher. So, you know, commercial clients are thinking, "Wait a minute. Is there a way for me to hedge myself against future energy price increases because I do not want to be held hostage for the next 30 years?" Particularly those businesses that are family-owned. These guys, they want to, you know, put their business on a sustainable future. And that's what solar does. I mean, it's been a great business because we finance either through Lyndon and Danny's company, soon probably Ed's as well.

But, you know, we also finance directly our clients that are acquiring solar. And what these guys are basically doing is they're owning solar as a future hedge against energy price increases. And they're effectively fixing their energy cost for the life of the system which is about 30 years. It makes perfect business sense. And that's why we've seen virtually zero default rates.

**Greg Dalton:** And a lot of your clients are Republican conservative, right? They're --.

**Marco Krapels:** Yeah. We bank agricultural clients. I mean, these guys -- and I tell you, one of these guys that I approached three, four years ago is a dairy farmer in Hanford, California, Mike Montero. I said, "Mike, you said" -- because I looked at his, you know, we looked at his cost statements and, you know, we looked -- we basically hedged his interest rates with a derivative. And then we said, "Wait a minute. We should be looking at his energy cost because his energy cost is significantly higher than what he was actually paying on interest on to the bank." So he said, "Well, I can do something about that because I would love to?" And I said, "Absolutely." And so this guy now has a one megawatt solar farm next to his dairy farm powering his entire dairy farm. Dairy farms are huge users of energy because of the movement of water, and they use a lot of water. And so, you know, we've seen our clients particularly in the Valley that are predominantly Republican, indeed, as you say, being huge adoptors of solar because it makes business sense. They always tell me, "Marco, we like the green that you guys think about in San Francisco, but the kind of green that we really care about is the green that ends up in my pocket." And it turns out they can have both.

**Greg Dalton:** Lyndon Rive, speaking of the business case, the IPO, initial public offering, of SolarCity was a big deal in 2012. You cut the price of it then rallied back to that price. A lot of

people have been since shooting that stock, betting that it may not continue. But tell us what you learned about the IPO of SolarCity.

**Lyndon Rive:** The investment community has been beaten up quite significantly when it comes to solar. So when you mention the bubble, that's not the investment community's comment. Even though you can justify and show that you are not a manufacturing business, there's no appetite at all for risk in investing into the solar industry. So we were forced into a situation where we actually had to discount our price, since you take away that risk, and then the market price actually priced at the range that we put in the cover. Imagine that. But the -- we had the choice of pulling it. I think if we pulled it, would have been bad for the industry and bad for us as well. But by coming out, we did not give the investment community opportunity to watch us grow and watch the market grow as, essentially, an energy company selling electricity.

And I think that's important because we need to transform this energy infrastructure that we have. People should not start looking this as panel manufacturers, installers, financiers. This is selling electricity. We're transforming way we deliver electricity. As Danny mentioned earlier, nobody looks at PG&E and goes, "Oh, PG&E is a financing company or a power installation company." It is viewed as an energy company. The innovation is occurring just to get to the end product, and that's to sell electricity.

**Greg Dalton:** I'd like to ask Danny and Ed about the billion dollar evaluation of SolarCity. I've imagined you've noticed that. Is that something that you think can pave the way for other IPO's in the solar sector, Danny?

**Danny Kennedy:** Absolutely. I mean, I think it's fantastic what they've succeeded in doing despite all the naysayers and nabobs of negativism out there with solar. As though one company failed, therefore, you know, it's like, "Oh, Netscape went down. The internet's never going to work," you know.

[Laughter]

So these guys, they went out, tested the market against the odds, and showed that the public has a taste for this, and picked it up 50 percent in the first week. Fantastic.

Proving what we know, which is that people want this. And smart money is flowing into this like nobody's business. Buffett just put his \$7 billion into a solar firm. Now, you know, catch a clue, people. The Saudi's are putting \$100 billion into solar. There's a company that Marco and I sit on the board of called Mosaic which offers retail investors the opportunity to buy community solar projects through debt. And, you know, we resell out in 24 hours. We have a project that offers our -- an offer on the internet through crowd sourcing. That's an indication that the community is going along on solar. They get the dynamics. They know electricity prices go up and also coming down. The professional investor cost may have lost their way.

**Greg Dalton:** Ed Fenster.

**Edward Fenster:** You know, solar is a -- it's a story of almost two types of investors. There are the folks who invest in the companies that, you know, we have here, and then there are folks who actually invest and finance the projects that we build. And, you know, the money came first, you know, to the projects. You know, all of the major money center investment banks, commercial banks now support these projects; JP Morgan Chase, Goldman Sachs, Credit Suisse, US Bank, Rabobank, Citibank. You know, it's a very recognized long term good investment by people who manage risk aggressively. You know, people are investing in these project companies for 20, 25 years, you know,

making the bet that these companies will be around to manage these customers and collect these payments for that duration. So I think it's pretty clear, you know, for the people who are thinking about it and then managing through the cash flows, that this is an asset class they want to invest in.

SolarCity's recent success shows that, you know. People are now willing, in addition, to take that risk, take on the growth dynamics that, you know, our companies are experiencing, you know, potentially a little bit more on the regulatory side and, really, you know, put more fuel on the fire from an equity perspective.

So I think it's just the next logical step in the industry, you know, financing itself and demonstrating the formula of it.

**Greg Dalton:** Marco Krapels, as mentioned earlier, Lyndon mentioned earlier, investors had been burned on solar that it hasn't met past expectations. So what's the downside, what's the risk here?

**Marco Krapels:** Yeah. I just - you know, I think we need to also just debunk the whole Solyndra myth. I mean, these companies are not in the technology business. They're literally installing a proven technology that's been around for 30 years that makes power, and they sell it at a lower price. And they contractually enter into arrangements for a long term to give the off take, whether that's a residential homeowner or an investment-grade Fortune 50 company, the opportunity to buy energy at a low rate for a long term, and that happens to be clean which is fantastic. Now, I think we need to sort of get people to understand that this is not a technology play. This is just you delivering energy, like Lyndon said. You know, this is an energy business just like there are other energy businesses out there. And the default rate, I can tell you -- I mean, I'll tell you right now, default rate on our solar lending portfolio is zero. And so this is an investment-grade asset class like anyone else's. The only benefit for me now is that there are not enough people in this game and there are some great banks involved. Solar Mosaic is looking to open this up to the general public so every American can participate. But because there aren't that many players yet, I get an above market return from what I considered to be --

**Edward Fenster:** I agree.

[Laughter]

**Marco Krapels:** -- an investment from --

**Edward Fenster:** One of the reasons we haven't done business with you.

**Marco Krapels:** -- no -- from -- yeah. No, for what I -- because it will be an investment-grade asset. I mean, you ask any of these guys, "Would you like more than two dozen banks to be involved in this space?"

**Edward Fenster:** Yes, of course.

**Greg Dalton:** So in the past, a lot of the banks and large institutional investors have preferred large projects in the desert, the centralized model, whether it's, you know, whether it's BrightSource or others. And I've had economists sit here who say, "Rooftop solar is one of the most expensive ways to generate electricity. It doesn't scale, it's very labor intensive." Now, this might have been before some of the panel prices came down but let's talk about the distributive versus the centralized model. Lyndon Rive.

**Lyndon Rive:** Yeah. I mean, so we're actually in a situation where we do a lot of residential but we also do a lot of commercial. In fact, we do large scale commercial. We've just announced a 14-megawatt farm in Hawaii. So we understand the cost of both. But when you are looking at your cost

and you're looking at what you're offsetting, so when you look at the cost of utility scale solar, you're competing against wholesale electricity. As I've mentioned, that's one-third of the cost. When you are selling DG, creating -- installing the solar system at the place where it needs electricity, you're competing against retail. The incremental cost increase to install it on the roof is nothing close to the revenue loss of selling, competing against wholesale versus retail. So when they look at -- when the economists look at the pure numbers, can a solar farm generate solar electricity at a lower rate than a rooftop solar? You don't need an economist to figure that out. The answer is absolutely yes.

**Greg Dalton:** And that's the kind of that -- that we're involved and invested in, right, is a large scale project.

**Lyndon Rive:** Yeah, but that's an -- exactly. But can a -- if you look at scale and include transmission distribution, which is the better cost then? In my opinion, rooftop is the better cost.

**Edward Fenster:** Yeah, definitely. I mean, I would -- I mean --

**Greg Dalton:** Ed and then Danny.

**Edward Fenster:** What's really important to understand is this retail and wholesale divide.

And I think the reason that, you know, traditional energy bankers are just used -- to we have a power company as a single customer, you know, it's, in theory, an investment-grade credit, that means the chance that it goes bankrupt isn't much more than two percent. You know, but actually utilities are barely investment-grade credits. And they're just used to not thinking about it. And then you've also got, you know, consumer lending portfolios for people who lend money where people are very good in assessing consumer credit risk. And what's been the challenge about establishing our business over the last five years is you kind of need to draw up from both disciplines. You need someone who can understand consumer credit and someone who can understand energy finance. And the banks that have been faster to marry those two things together have been the first ones into the market, but there is nobody -- you could not find someone who has invested in both a residential pool of customers and in a desert pool who wouldn't tell you that the unit economics and the fundamental underlying value generation is -- everybody would say it's better than residential. That would be a totally non-controversial statement.

**Greg Dalton:** Danny.

**Danny Kennedy:** I think the big picture level, if I may, that's a true statement but we're realizing that in working through how to get there from this regulated monopoly incumbent technology set we've got from basically the 19th Century. I mean, you know, steam turbine technology is really old, and the deals we struck with utilities, you know, to get us powered to keep the lights on in the streets are really old constructional understandings. We're shifting to this new disruptive, distributed model of energy generation and the economics of us all being maybe producers and consumers of electricity at the same time. And that takes time for the banks to get comfortable with what can you finance, which parts of that asset class will be move with, and working it all out. But there-in lies the opportunity. There's a huge economic boom going on which is to fill out that transition, and the ingenuity of America to apply the software in the information layer in the information science to make that all work seamlessly like the one directional central station model, which has worked relatively well, except for the blackout of the Super Bowl last Sunday.

[Laughter]

You know, the fact is there's a big opportunity there for us to create new enterprises to fill up that

void. And the finances will flow with it because the economics tell them they should. It makes more sense to cut out all those middlemen. That's the bottom line. Utilities just stand between us and the households. When you can have it on your own roof, at your point of use, with the fuel flowing free from the sky, that's the best option.

**Greg Dalton:** So let's look at this from a consumer perspective. A typical consumer in California or another state, they want to do this. Will they save money on day one by putting --

**Danny Kennedy:** So 15 cents is about the marker. If the electricity you are paying is more than 15 cents, we can probably beat that. And 13 percent of the US population is currently paying more than 15 cents for their electricity. So we go into houses and we say, "Go solar. You will give us no deposit and pay us a monthly lease agreement or arrangement, plus your old utility bill." But those two things combined will likely be less. For us, it's 80 percent of our customers are paying less than they did previously from month one. So they're saving with no investment. There's no return on investment because they didn't make one. They're just saving money, and that's 80 percent of our customers from the start. All of our customers will save money over the life of the lease.

**Greg Dalton:** Ed Fenster.

**Edward Fenster:** Yeah. So our average customer saves about 22 percent on day one. And then, you know, we have a 1.8 percent escalation on average in our contracts, and that compares to, you know, four to five percent historically in most of the markets in which we operate. So if you have a -- you know, and they're on a south facing-ish roof, you know, that doesn't -- you know, you don't live in a Redwood Grove, you know, absolutely, you know, solar can save you money and it's cost effective from the beginning.

**Greg Dalton:** One of the raps on solar is then, it's kind of elitist endeavor. If you're in Mill Valley or Marin and you have you're Tesla already, then solar is a nice thing to say.

How is this changing that? Is it making it more accessible to different income groups rather than just the brie and chardonnay group?

[Laughter]

**Edward Fenster:** You know, the brie and chardonnay group is such a pain to deal with like -- like when someone calls--

[Laughter]

**Greg Dalton:** Therefore, you --

**Edward Fenster:** I mean most of our -- we have more customers who are Republicans than Democrats. They're more likely to live in the Central Valley than in Atherton. You know, it is a very middle class product now. You know, the utilities will work around all these maps that show where solar was installed like eight years ago and point to like some place in Malibu. But the reality is all the new -- all the new solar is going in, you know, where people really care about their power bills which is more likely going to be Fresno than it is Atherton. I mean, municipal permitting expense in Atherton is so expensive, you know, it's like too painful to operate there anyway.

**Greg Dalton:** But you're assuming that people even understand their power bills. They're looking at these things as really --

**Danny Kennedy:** People understand their power bills. They're pained.

**Greg Dalton:** The dollar amount but not the kilowatt --

**Danny Kennedy:** And they -- but they don't need to. That's one of the advantages of our model, is that they don't need to understand that. They just know this is what the power bill was beforehand, this is what it is after hand, and it's absolutely less.

**Greg Dalton:** Trust you, guys, right? Marco.

**Marco Krapels:** I never believe -- I never believed any of this stuff three and a half years ago. And then I met Lyndon. And I said, "Well, let's put some solar on a few of our branches. And let's just see how it goes." Because I, you know, I got the pitch, and it said, "You're going to save X." And I said, "Well, let's put solar on six, seven of our branches and -- so we can learn. And if we like it, we're going to go big. But first we're going to be our own guinea pig," and lo and behold, you know. We started checking the bills, and it worked out. And so, you know, I think, you know, the best thing to do is be our own guinea pig. But it's proven. I mean, this is not rocket science. It's actually very straightforward.

**Danny Kennedy:** And more proof of the pudding --

**Greg Dalton:** Danny Kennedy.

**Marco Krapels:** \_\_\_\_\_ interrupt.

**Danny Kennedy:** More proof of the pudding is how solar is spreading through the community. It's absolutely true that it's gone from Malibu to the Inland Empire, across Los Angeles.

It's being adapted by people with an income below \$80,000, more than -- above \$80,000 because it's saving them customer energy budget. And then they're telling their friends and neighbors about it. You know, we're all beneficiaries of the word of mouth business model. You know, we see solar as a social network. At Sungevity, we try to feed that. But 78 percent of our business comes from people telling people to get solar because, hey, you can save money. I mean, you know, the Facebook posts and the Tweets and the stuff they're reporting their friends and families about, "Hey I, you know, I'm just not paying any energy bill anymore. I'm just net zero." They love that and they rave about that. And that's what makes it mainstream. I mean, we've definitely gone from the early adoptor, you know, brie and champagne or whatever you said. And by the way, we'd love to serve you at Sungevity if you like brie and champagne too.

[Laughter]

But, you know, it's gone from there to the early adoptors very clearly by the numbers.

**Greg Dalton:** Ed, you mentioned something --

**Lyndon Rive:** Just to make sure that there's no confusion. The middle to low zip codes, the growth there is not on percentage, it's more than triple the number of a unit than in a high income areas. So it's not the fastest growing sector because, you know, you can go from one to two units, that's a 100 percent growth. No, no. Number of units is more than triple the high income areas.

**Greg Dalton:** And those areas pay--a larger percentage of our bill goes to energy. So they're disposing --

**Danny Kennedy:** Right.



**Greg Dalton:** Okay. So let's talk about utilities who are looking at this and saying, all of a sudden their customers are becoming their competitors. That's going to be a disruptive proposition. How are utilities responding to all of us who have solar panels or considering suddenly supplying a product that they -- we used to be captive to them to supply?

**Edward Fenster:** I mean, utilities are being -- are very aggressive about it because they have never faced competition and they have always just earned riskless profits.

You know some examples; you know, Arizona public service, one of the -- one of the -- probably the, you know, the most aggressive anti-solar utility in the country, actually just sent a notice, it's unbelievable they did this to their customers, that said, "Because people are recycling their refrigerators and installing compact fluorescent light bulbs, we need to raise your power bills."

[Laughter]

Like the idea that they might want to reduce their costs when the revenues go down, it was like, "Well, our profit has to stay the same and we can't cut cost, so we must have to raise revenues because, you know, people are buying less power because they're installing compact fluorescent light bulbs or solar systems." And, you know --

**Lyndon Rive:** No, no. It would have been like -- it ensures -- it's a little note that went out that says -- and it was like \$2 a month or so per a customer that it's -- "Because of energy efficiency, because you are doing these things, we're now going to have to charge you more."

**Edward Fenster:** Or for instance, you know -- so SDG&E in San Diego --

**Greg Dalton:** San Diego Gas & Electric.

**Edward Fenster:** San Diego Gas & Electric. You know -- you know, very aggressive about its dislike for distributed solar. You know, made a claim that distributed solar is going to cost its ratepayers \$200 million. The most recent actual third party study showed it was a benefit of about \$80 million. But even if you were to accept their \$200 million figure -- at the same time they are going hard to build a \$1.6 billion transmission line to the desert, you know, for their own solar power because they'll earn money on the capital investment that they make but they don't earn money on the capital investment that we make. So we're fundamentally at odds with the utilities because we're eliminating their ability to grow their business. And so there's a -- there's definitely a little bit of tension coming.

**Greg Dalton:** But, you know -- okay. But I have solar on my roof, as a lot of people do. And they would say that I generate electrons in the day and then -- and send them into the grid, and I get it back from the grid in the evening, that there ought to be a cost for use of that grid, that transmission to send those electrons at different parts of the day. That's fair, right?

**Edward Fenster:** Well, no because that is the cost but there's a benefit that's being provided also.

Because you installed the solar system on your home, less investment in transportation and distribution is required, and ultimately it would be lower. As I said, the last study, actually, that looked at both the costs and the benefits of people installing solar concluded that there is a net benefit to the system of the installation of solar power.

**Greg Dalton:** So utilities should be paying customers? Danny Kennedy.

**Danny Kennedy:** At a high level, the question is really about the utility business model and the fact

that it doesn't make sense to the 21st Century. They've got this deal they struck to get a regulated monopoly, have had no competition, haven't innovated much, still uses the same old steam turbines they did in the 1890's. And now along come us with this disruptive modular technology made out of silicon that just produces stuff from sunlight without any boiling water or transmission systems or any of that, and they're challenged by that. And I get it. And, you know, they're sort of schizophrenic, to answer your question, how are utilities responding. Some are trying to embrace it. Utilities are a big class of companies.

NRG stands out as a company that, rhetorically at least, just had a lot of great things about distributed generation. Others are definitely fighting at tooth and nail. But it's like fighting the tide. It's like being, you know, Rupert Murdoch ten years ago and saying, "Oh, we're going to continue to just shunt media content down a one way pipe, and you're going to suck it like a fire hose as a consumer." Well, no, we don't take it like that anymore. We produce our own content. We have Twitter, we do blogs, YouTube gets more watches. Whatever the, you know, the disruption that has been availed by the technology change is coming to electricity, and utilities better, you know, catch a clue and get with the program.

From our point of view, we need to work with them. And so my personal view is we need not to vanquish them but to make them our friends in the sense of Abe Lincoln, and get them to see their business is about serving electricity consumers whether it comes from up there on the roof or down the road on a community solar project or off at a wind farm in the distance. That will become their business. And then they'll get into the business of transport, in my view, with electric vehicles and start taking that share of wallet which is where their revenue and growth will come from.

**Greg Dalton:** But that's a change to their business model and it's a change to all the investors who buy utility stocks like that nice little dividend revenue stream, it's a disruption also for a lot of people's retirement plan.

**Edward Fenster:** IBM had a business in mainframe computers right? I mean -- I mean, utilities are so used to having their profits protected. I mean you know, SC -- Southern California Edison has a closed nuclear power plant that it's billing its customers a billion dollars for this year because it gets great recovery. PG&E, Pacific Gas & Electric, built a nuclear power plant, true story, on the San Andreas Fault. Okay. The insurance costs for that are pretty significant, taxpayers bear that too. There's just -- there's no -- there hasn't -- hasn't been any accountability or competitiveness in the utility model because they've been monopolies, and that's changing. It's a hard transition for them.

**Marco Krapels:** Remember Kodak? Remember Kodak?

**Greg Dalton:** Marco Krapels. Kodak, yeah.

**Marco Krapels:** Do you remember Kodak? Most people won't ten years from now.

[Laughter]

But listen. You know, I think the train has already left the station. You know, the train has already left the station. I mean this is about -- this is actually about power independence right? I mean, we -- the US has been talking about power independence for a long time. Power independence is not, you know, going and removing mountain tops and drilling and spitting chemicals into the ground and extracting the last drop of energy in a way that we used to know how to do that, which is burn stuff. Now, you know, I think independence is giving people the technology and the tools and the economic wherewithal to be able to make their own power. And that's what is happening right now, and it's good for business, and it makes perfect business sense. And, you know, I can see ten years

from now, I'll be talking to a neighbor and who may or may not have gone solar, and I'm going to talk to him and say, "Hey, what did you pay for power this month?" And he's going to say, "I paid 24 cents per kilowatt hour."

And by the way, this is entirely possible. And he's going to ask me, "What did you pay?" "Oh, I still pay the same thing that I paid ten years ago because that's the day that I decided to go solar." So this is --

**Greg Dalton:** Although Ed just said there are escalations and even the service prior to your contract --

**Lyndon Rive:** But you know what the price is. So whatever the escalation is, you know what the price is. So you know what you're paying for electricity \_\_\_\_\_. There's no debate there.

**Greg Dalton:** Okay.

**Edward Fenster:** But if you own it, it's fixed. But if you own a solar, it's fixed.

**Greg Dalton:** And if - net metering was mentioned earlier. So if people generate more electricity than they buy from a grid, can they get actually cash back from their utility for generating more than they consume?

**Lyndon Rive:** In some utilities you can but it's not good to design it that way. So most of designs that occur in rooftop solar is roughly 80 percent, 60 to 80 percent of the customer's energy needs. You don't want to design the whole thing. You want to leave space for energy efficiency and other improvements that you can do. But just one thing on the utility business model that I think often people overlook, is the utility's position right now is there's a mass of clash up that's occurring. And in the way to describe it is that if you have a hundred users and they're all paying for the infrastructure, if half of them went over, who's going to pay for the infrastructure? So it's an easy one-liner. People go, "Oh, I get that because, you know, we still have to have the infrastructure." It's taken us ten years to get to a half a percent. Let's say we become really good and we can do a half percent, we can do in one year what we do in ten years. The big issue here is that solar is threatening to new utility growth. The average utility grows roughly one to three percent. That extra growth is essentially pure profit. So that growth hides a lot of cents. So if you take away -- let's just say two percent, then what happens --

Historically, utility escalation rates used to be three percent or five percent. They have to now add it on top of it. So now the escalation rate can go from five to seven percent. Now, that sounds high although Southern California Edison just announced three years of an average of six percent increase. But since you -- so we introduce that little bit of growth that they need, that little bit of growth, that's the fight, that's the next ten-year fight is who gets that one to three percent growth. Because if you take that away, then their overall cost is going to increase faster than anyone forecast.

**Greg Dalton:** If you're just joining us, Lyndon Rive is co-founder and CEO of SolarCity. Our other guests today at Climate One are Marco Krapels, Executive Vice President at Rabobank, Danny Kennedy, President and founder of Sungevity, and Edward Fenster, co-founder and co-CEO of Sunrun. I'm Greg Dalton.

Let's talk about jobs in the solar industry. I want to know how many jobs you have in California and how many people you're hiring, you know, because a lot of people talk about clean tech, green collar jobs. Tell us what's happening on the ground. Danny Kennedy.

**Danny Kennedy:** This is my favorite topic. I'm on the board of the Solar Foundation, in full disclosure, which does an annual census. So a headcount, not a full cluster model but who's got employees around the country. We're now in 50 states, companies across the country, employing Americans. And the total number is 120,000 as of last October. And it grew from about a 105,000, you know, October 2011. So it's the only industry that we know of over a 100,000 employees growing by 15,000 through that very hard year despite all the negativity. Around the solar space, double digit growth. Imagine that in America. So a huge success story. But get this, this is really important, 120,000 Americans work in the solar industry. We are at less than one percent of the electricity supplies. That has been mentioned a number of times here. The coal industry, which is crashing from 50 percent to less than a third today, employs a total of 160,000 people, about 80,000 minus a bunch of people in railroads, I think 50 percent of the power fleet in this country is coal, and then the power plant operators.

So a third, 33 percent, they've got a 160,000 people. At one percent, we've got a 120,000 people. Any economic model suggests we will be ten percent of the Californian grid and some significant percentage of the rest of the grid before too long. So we will employ millions of Americans by those numbers. Even if we get lots of scale efficiencies and improve our own businesses, we'll still employ hundreds of thousands or more which is the other reason solar wins is because in this day and age, coming out of recession, employment is a premium, and we create jobs, we are the job creation engine in America.

**Greg Dalton:** Lyndon Rive, you're the public company. Tell us how many you employ and how many you're hiring.

**Lyndon Rive:** So we had 26,000 employees today, a little over 26,000 employees. We are averaging about six people a day, new hires, and that's not fast enough. Our number one constraint is having good people.

**Greg Dalton:** Okay. Ed Fenster.

**Edward Fenster:** So, you know, we directly employ about 250 people but support a network of local companies and they employ about 3,000. And I would -- you know, just to kind of crystalize Danny's point, you know, fundamentally what residential solar does is it eliminates the cost of building big, expensive transmission lines, you know, like those big transmission lines that are strung by helicopter. I mean it's like -- you know, and they're expensive to build and they have to bulldoze homes to build them. And instead of spending the money bulldozing homes and on helicopters --

**Greg Dalton:** And disturbing turtles.

**Edward Fenster:** Disturbing -- you know, instead it's just all -- it's all labor cost. So it's actually a really efficient sort of transition from spending cost on metal and wires and helicopters and moving turtles to just, you know, people.

**Greg Dalton:** And these are jobs that can't be exported to China, so their service and installation jobs?

**Edward Fenster:** It's really hard to do that from China.

[Laughter]

You need very long arms.

[Laughter]

**Danny Kennedy:** Which is a really key point. You know, there's been a lot of weird coverage of the phenomena that is low cost of solar coming out of China and other manufacturing centers but actually that's a boon to us all for a couple of reasons. One is more people can adopt it here. We can offer better electricity rates for that compression in price, and employ more people because three out of four people employed in solar value chain are employed after the factory gate, doing the installations, the sales, the finance, the maintenance. And the other boon from local solar that we should just acknowledge is that China is now going solar. And, you know, we've all been very worried about the climate impacts of China going coal. Well, a third of all PV produced last year was reconsidered in the Chinese economy. And they're taking it up faster than we are at a rate knots. I mean they were at zero about ten years ago in China, and now there's more than there is in the United States after 50 years with the technology.

**Greg Dalton:** And the US slapped some tariffs on Chinese panels because of dumping. Has that had any impact or was that just a little blip in the cost -- in the downward slope of prices?

**Danny Kennedy:** You know, the market is basically ruled right now by oversupply. There was about 60 gigawatts of production capacity, about 30 gigawatts of demand. So a small tariff by a small consumer -- basically the United States is not a big part of the world market. That didn't change at all.

**Greg Dalton:** Ed Fenster.

**Edward Fenster:** It's also the case that -- so most of the solar cells that are going to the solar panels, which is most of the cost in the US, actually come from Taiwan and not China. And you can imagine it's a -- it would be an unusually difficult assertion that the Chinese were subsidizing the Taiwanese.

[Laughter]

And so most of the equipment that comes here is really the Taiwanese equipment, and so, actually, isn't subject to the tariff.

**Danny Kennedy:** Can I just say, you know, people should have a choice and we provide, you know, "made in America" options for our customers. We also do some Chinese product and Korean and German. But, you know, we've got -- I acknowledged the good thing that's coming out of this. And the other point is that, to go back to my thing about ingenuity and the American entrepreneurial ecosystem.

That low cost tool, if you think of the PV module that way, is going to create all these opportunities for smart businesses doing financial engineering, like Ed's, and new business models like SolarCity and Sungevity. And that's the opportunity that's unleashed. We don't criticize Apple, you know, but they're designed in California. They're not made in California, they're made in China. And they just get technology neutral, whatever cheap screen and processor and kit they can to bundle the components to deliver the cool service with a wonderful wrapping and a brand. And we all value that service like we do electricity. And that's what America's great at, is creating these opportunities and companies that, really, just shine at bundling these sort of commodity products into wonderful services with sex appeal like Apple.

**Lyndon Rive:** But the tariff --

**Greg Dalton:** Lyndon Rive.

**Lyndon Rive:** Just the -- on the tariff itself, although it didn't have an effect on our business model - - and the only reason why it did not have an effect is that the effect of using Taiwanese cells increased the cost by roughly five to eight cents a watt. The cost was coming down roughly 10 cents a watt over that period. So it was thought to actually be the cost netting and not coming down to roughly five cents down. But it did increase the cost because it would have gone down ten cents a watt. So although it didn't have a direct effect on our businesses, it does increase the cost. And anything that's increasing the cost, we need to talk cents per watt. We have to reduce the cost in this entire value chain. You know, you take the panels, the inverters, installation, labor, plummeting, everything, we have to take the cost out of the equation. Today, the industry still depends on a 30 percent tax credit. In 2017, that tax credit goes down to ten percent.

If we don't figure out a way to reduce that cost and take out everything, so these annoying little tariffs, although it's -- it doesn't have an immediate effect today, it does have an effect. So my forecast is business models will consolidate, the combining effect that occurs from the creativity that's occurring right now will have to change. And I'm going to start to forecast that for you. My forecast is that special financing companies will need to buy vertical innovative companies, so let's say one of your partners, and start offering a cost at a lower rate in order to do work -- make it work without incentives. I just want to forecast this that the business models will consolidate over time so that you can survive without incentives and still provide a lower cost of electricity.

**Greg Dalton:** Lyndon Rive is co-founder and CEO of SolarCity. Our other guests today at Climate One are Marco Krapels, Executive Vice President of Rabobank, Danny Kennedy, President and founder of Sungevity, and Edward Fenster, co-founder and co-CEO of Sunrun. I'm Greg Dalton.

We're going to invite your participation and put an audience microphone right out here. If you're on this side of the house, we please ask you to go through that door and line up over here with our producer, Jane Ann. And we invite you to join us with a one part question or comment. And I will help you keep that brief if you need some help. And while we're getting that situated, I want to ask each of you what you've done in your own home in terms of your own carbon footprint solar, et cetera, starting with Ed.

**Edward Fenster:** So I was the company's first customer. I paid \$10 a watt for my system.

**Greg Dalton:** Oh, it makes me feel better. I paid about \$7. Okay.

**Edward Fenster:** You know, our market cost right now is \$4, \$4.50. And --

**Greg Dalton:** Electric car?

**Edward Fenster:** And I do not have an electric car because I don't drive. I take the BART. But I did actually --

[Applause]

Thank you. And actually, I have an 1886 Victorian that like it was half heated when I got it, it's now fully heated and the gas goes half as much.

So there's -- I put a lot of effort into making it energy efficient.

**Greg Dalton:** Danny Kennedy.

**Danny Kennedy:** I live in a solar home. I actually live in a co-housing community with a bunch of other families because, you know, semi-dense urban living is actually the lowest climate impact. You know, shared transport for kids. We grow a lot of our own food, we have chickens, we do a lot of

stuff. And you know, also I have all the joys of living in a wonderful city like Oakland. So I think it's a good way to ride to work.

**Greg Dalton:** Lyndon Rive.

**Edward Fenster:** Has a really nice electric car.

**Lyndon Rive:** I have a nice electric car.

[Laughter]

**Greg Dalton:** Inside track in that one. Yes. Okay.

**Lyndon Rive:** That would be number 34, number 34. The solar roof done, full energy efficiency upgrade, and now in process of getting a storage system installed.

**Greg Dalton:** Storage for your solar?

**Lyndon Rive:** Yeah, correct.

**Greg Dalton:** Okay. So you'll store it in the day and then use your own electricity rather than sending back to the grid okay. Marco Krapels.

**Marco Krapels:** My wife and I have a solar home. And I'm eagerly awaiting the arrival of my number 434-40 kilowatt battery vehicle in about five weeks time. And one more closing comments on the tax credits situation that Lyndon just mentioned. After having -- as a taxpayer which I am, having supported the American fossil fuel industry for six years with \$600 billion, I have seen rates increase over the time period. I think it's actually quite ridiculous that we're talking about reducing solar tax credits only three years from now when we're only just getting started. I think we need to think we're all in good term, this makes perfect sense. The industry is driving cost down. The benefits that the industry has received over the last four years have made perfect economic sense.

Costs have gone down by 40, 50, 60 percent. And we need to keep this going. And we will continue this inevitable transition that we are already on.

**Greg Dalton:** We're talking about solar power at Climate One. Let's have our audience question. Welcome.

**John Talbot:** Hi. John Talbot. Thank you very much for your presentation this evening, very interesting, and appreciate the banter. But there's one thing that I want to touch on. You discussed the political ramifications of the utility business model. There is -- there are several different things happening, Marin Clean Energy, several other public power sorts of things. What would you encourage as your companies that we as community do to encourage our governments to embrace different models? What kind of models do you want us to embrace? And what sort of things do you want us to demand of our regulators, the people we vote for?

**Edward Fenster:** I think the most important thing --

**Greg Dalton:** Ed Fenster.

**Edward Fenster:** The most important thing particularly because in the United States we do this on a local level, is ensuring that there is, you know, prompt and speedy permitting and inspection for solar systems where you live. Whether we own them, you build them yourself, it costs -- it adds

cents to the kilowatt hour. The way we do permitting, it's ridiculous. You know, in Germany --

**Greg Dalton:** Cut the red tape.

**Edward Fenster:** Yeah. We just -- in Germany there are -- you don't even have to pull a permit to install solar system. So, you know, that's the most difficult to do because it's local and most important, you know, from our perspective, to other things solar.

**Greg Dalton:** Danny Kennedy.

**Danny Kennedy:** Agree with -- permit reform is a critical thing. It's a real impediment to the scale in the US market, you know. We're 80 cents a watt now in paperwork whereas we're 60 to 70 on module costs, just as a metric to compare it to. So that's one. You know, to the question, I think community choice aggregation and that whole movement of challenging this sort of incumbent technology regulated monopoly thing we've inherited is great, you know. We are -- in the East Bay we just supported the exploration by the council to consider such a thing. (00:48:09).

And, you know, well, it was surprising that someone would even dare ask that, that it's in the electricity business. But we as consumers deserve choice, you know, that's what America's great at is a competitive market. And the electricity space isn't that. So we need to create that and get rid of the red tape.

**Edward Fenster:** Yeah, these business models sound great, gives people more choices.

**Greg Dalton:** I'll just mention that we're doing a whole program on community consumer choice in electricity markets later this spring here at Climate One. You can stay tune for that. Welcome. Let's have our next question.

**Male Speaker:** Great job. You gentlemen, all of you serve the residential market, however, 75 percent of the customers in California, residential and commercial, don't own a roof to put solar on. So the question is, one, would you support a community solar approach like embodies an SP43 that's currently in California legislature? And two, do you support the idea of the CEO of Recurrent, Arno Harris, saying we should increase the export of natural gas as a way to support the development of the renewable energy?

**Greg Dalton:** So gas is a big topic in itself, but what about renters and people who don't own a roof, who'd like to tackle that one? Lyndon.

**Lyndon Rive:** In Sacramento, supporting it --

**Male Speaker:** With Arno.

**Lyndon Rive:** So, no, absolutely. It's -- solar right now is limited to home owners. And when you scale it, you need to make it available to renters. And right now the initial focus for us, personally, is more on the ownership.

**Greg Dalton:** And quickly on gas. Gas is a whole big topic. Some people say it undercuts renewables, some say it helps renewable solar and wind.

**Marco Krapels:** Can I comment on that? Also, by the way, I do support SB43. So there is your answer from my part. And in terms of gas, people have talked about it, that we need a bridge of gas to the renewable energy future. And so I'm sitting here with three leaders who are ready.



They don't need a bridge. This is ready, wind, solar, the technology is ready, the cost is plummeting, and we don't need a bridge to get where we need to be. I'm looking forward to President Obama's remarks at the State of the Union. But I'm going to -- I believe that this country is going to get really serious, to use what we already know is absolutely ready.

**Danny Kennedy:** Can I just say on the community solar and the like? You know, we've got to solve some multi-tenant dwellings and renters and all these people that can't currently get these wonderful solar leases and other opportunities to benefit from solar and save money. And that's why the economic opportunity is so big, you know. We're just looking at the 40 million unit total investment market that is residential solar. Then there's the 100 million market of units that is the rental space and the opportunity for new businesses to inhabit that which is one reason why, not to contradict Lyndon on the forecast. So I don't know what's going to happen. I don't have the crystal ball. But I actually think there'll be a blossoming of businesses, there'll be new jobs created. This theme I'm trying to get into your heads about ingenuity and entrepreneurship is what's needed now more than ever. And that's one legislative setting that will help that happen.

**Greg Dalton:** We got about 15 minutes left. Let's get through as many questions and answers as we can. Yes, sir. Welcome to Climate One.

**Male Speaker:** Okay. I'll pick up the topic of innovation. Lyndon mentioned just a moment ago that he's expecting an energy storage system to go with the solar system in his house. I'm just wondering what you all expect of energy storage in the next three to five years. How will it impact your business models and how will it or should it impact the business models of the utilities?

**Greg Dalton:** Lyndon Rive.

**Lyndon Rive:** And so right now the challenge of energy storage is still very expensive. With the evolution of cellphones and laptops the cost has come down but still not enough. Like now with electric vehicles, it is starting to move the needle. So the cost will come down but we're looking at, before it becomes a viable solution, probably about four to five years.

Today it's going to be more early adoptors testing out the concept and building models where it's not only backup for the house but it's a dispatch for the utility. So I think Danny mentioned that earlier. The utility business model needs to change from where it is today. They need to get to a point where they manage the grid, and that's their responsibility. So you have homes that are generating electricity. How do they facilitate the dispatch of electricity and combine with storage? If you give them access to that, then they can create grid stability. So I think ten years from now, absolutely it will be a viable solution. But for the next five years, it's going to be in pilot mode. We'll see significant adoption but not enough to move the needle.

**Danny Kennedy:** And for our businesses how that has ramifications is we now have, you know, 20-year customer relationships with people that have solar leases with us. We can upsell and onsell to them those services, the sort of EV charging units, the software patch that'll tell their car to discharge now because I can make more money rather than charging or whatever the case may be. The energy efficiency improvements demand management tools that the utility as service manager will start to implement. And so we'll become bundlers, kind of like, you know, the ISP provider that put the broadband in your home ended up bringing in telephony and VoIP and alarm systems and so on.

**Edward Fenster:** One minute to add. I actually just installed 40KW storage. I have an off grid home in the Santa Cruz Mountains, and I'm quite confident that wasn't cost effective.

[Laughter]

But what you do --

**Greg Dalton:** Congratulations.

**Edward Fenster:** Thank you. It is -- you know, I don't make any money.

So -- but the -- but you are seeing big utility scale storage programs for dispatch, for frequency regulation, for, you know, hundreds of megawatts sort of things in early planning stage to help manage the grid, to Lyndon's point. And I think that you'll start to see those over the next five years. And I think on a homeowner level, maybe it is a little more than five years. But there's going to be massive really exciting innovation, I think, in energy storage starting on utility scale basis, you know, over the next five years.

**Greg Dalton:** Okay. Let's go to our next question. Welcome.

**Gary:** Hi. Gary Malaysian. I read that Saudi Arabia and China are going 110 percent towards solar. Are they going photovoltaic or thermal? And how competitive are we going to be with them in five years?

**Greg Dalton:** The symbolism of Saudi Arabia, you know, going solar so they can export oil rather than burn it is quite interesting. Who'd like to tackle that one? Danny Kennedy.

**Danny Kennedy:** Export oil.

**Greg Dalton:** Yeah.

**Danny Kennedy:** Yeah. So the story of Saudi's is simply that they currently burn oil to get electricity. It worked out they're selling themselves that oil for \$4 a barrel. They can do better selling that to us for \$100 a barrel. And there's a bit of saying they know that stuff, they're going to just start making solar panels and put them out in the desert and run their society that way, and ultimately get to the point of energy abundance, use it for desalination, all sorts of things. And likewise China, is, you know, has invested heavily with an export orientation the first decade, you know, building factories to serve California and Germany and markets that were stimulating the solar economy. But now they've made it cheap enough as a commodity product that they're consuming it in multi gigawatt chunks. And will we be competitive as a manufacturer? Maybe as it re-localizes which I think it will as transport cost becomes a big part of the structure or as new generations of technology come through. But the bigger point here is the benefit that like low cost mass manufacturing of silicone chips has created.

We now have micro processing power that so cheap, we can deploy it and all sorts of other devices. So solar cells or silicone cells are a bit like silicone chips. They'll become cheap and ubiquitous through this massive volume of manufacturing still to come online. And then we'll start putting it into all sorts of applications, kind of like we now put microprocessors in phones and cars and other things that won't ever, as a computer 10 or 15 years ago. The place where I think a lot this experimentation and development will happen is in the military. If you look at Department of Defense, one of biggest consumers of solar -- and all power to SolarCity for the SolarStrong, delivering it to service people as well in their homes -- is they're experimenting with, you know, clothing, with tent fabric, with backpacks, with kit that is solar powering because grunts don't want to be carrying batteries for their scope, for their GPS and their communication gear and all the rest of it.

**Lyndon Rive:** But I think it's important for the audience to understand the scope of this. So solar panel is roughly 60 cents a watt. The -- today, if you would buy a system, it's roughly -- let's just say the cost is \$4-\$4.50 a watt. You can make it free. If we don't start solving all these permitting things and other things asked to reduce it, you still end up with a significant cost. So we shouldn't be too fixated on manufacturing and the technology component. It is to be fixated on the local jobs, the local innovation that's occurring, that's all just benefit to us, that's just all accrue to us.

**Greg Dalton:** We're talking about solar power at Climate One. If you're just joining us, you can listen to this another Climate One podcast in the iTunes store. Let's have our next audience question, yes.

**Male Speaker:** Hi. I'm an old time solar power investor. And I sympathize with your IPO because I think a lot of people don't understand the solar power companies. And I remember when LDK Solar was selling for \$40 of share and today it's selling for \$1.60 or something.

And so -- I think one thing that really needs to be done is the public really needs to be educated as to, you know, who's creating the solar panels. And it seems like most of the companies are still Chinese including Canadian Solar, which is Chinese. And so that's one category. Another category is yourselves, you're the installers. And then there's another category of the companies that create very large solar firms like First Solar and SunPower and I think MEMC Electronics is also in that business. So I think that's one thing that really needs to be done is the public really needs to be educated as to what solar is all about. And that's why people are so skittish because when Solar City came out, you know, I wanted to buy it and --

**Lyndon Rive:** You should have.

[Laughter]

**Male Speaker:** Well I did. I have 800 shares.

**Greg Dalton:** So there are categories in different companies. And again, it's going to take a while for the industry to get out from these bad episodes where people got burned.

**Male Speaker:** So the question I have though is what do you think about companies like First Solar who are creating the new solar firms with using salt slurry, for instance? Do you think that's going to be something big in the United States? And it seems like it's going to be bigger.

**Greg Dalton:** Centralized solar?

**Marco Krapels:** If I may comment on just one question.

**Greg Dalton:** Marco Krapels.

**Marco Krapels:** Where do you put your money as a banker? I would put your money in the companies that have a direct relationship with the customer. And whether that customer is a large company contracting for clean energy power or a homeowner signing a lease with any of these companies here, but the client -- I mean, the company that has the end-relationship with the customer is the company where you're going to make your money.

And they're going to find out what the best technology is, and they're going to install the best technology, no doubt on my mind. But the company that has the relationship with the customer, that's the company that's going to win. And the concentration of that is just getting started.

**Greg Dalton:** And you guys think that utilities were not very good at that because they haven't had it, right? Danny Kennedy.

**Danny Kennedy:** What do you guys think? Let's ask the public.

[Laughter]

**Edward Fenster:** You know what's interesting? I was -- my first job was in private equity. And, you know, I'm out of college and I'm trying to build a model. Like 1:00 in the morning, we're looking at buying energy distribution company like PG. And, you know, there's a line in the model where you're supposed to fill out selling expense. And I'm tearing through their financial statements and I can't find it. They don't report it because they've never had to sell anything, right? So you actually can't find selling expense. They don't -- they're the only business in the world that doesn't report it in their financial statements. So it's -- so no, they're not great at acquiring and retaining customers but, you know, that's a competence we'll have to add.

**Lyndon Rive:** So just one -- this is -- in a meeting with the executive, and quote and quote, "We have five customers, the five PUC members. We have five and a half million users, five customers."

**Danny Kennedy:** Public utility commissioners. Can I just say -- this classic thing around industry cycles, we all get fixated on the manufacturing. You remember DEC and Wang? No? Nor do I.

[Laughter]

So they're computer companies that went away. And then there was this great Harvard business review article that said the computerless computer company is going to be the one that crushes it, that works out what the customer wants and delivers the customer the beautiful service of word processing at the time, and then web browsing and micro processing and all the other things that you do with computers, and bundles that in a service that makes sense and maybe finances it as Dell did to innovate and become large, and do all the things that we now associate with computer companies. We don't manufacture. The value is in the customer experience, in the customer relationship. And we at Sungevity, I mean, I'm not afraid to say it, we like to think we're going to be the Apple of solar.

We're making this wonderful customer experience at [sungevity.com](http://sungevity.com). And you can go there and get involved in the solar, the sunshine business.

**Edward Fenster:** What was the website?

**Danny Kennedy:** [sungevity.com](http://sungevity.com)

[Laughter]

**Greg Dalton:** And we have another question.

**Lyndon Rive:** You mean the Apple of solar six months ago?

**Greg Dalton:** All right. We got a couple minutes left. We're going to get through this at the end. And yes, sir. Welcome.

**Male Speaker:** Good evening. I would like to thank the panel for the great presentation. Being in utility business for over 30 year, and I was fortunate enough to start with PG&E and San Francisco steam division. So even I was driving to work, I always look at the stocks, the emission, and could

tell already, you know, if you have a trouble. And so I am the steam guy but I also went for innovation. So I was fortunate enough. As you mentioned energy, energy solar, it's now the leading company in solar. I'm a big fan of all the solar.

**Greg Dalton:** Do you have any question for them?

**Male Speaker:** Yeah, I do. As soon, you know, innovation goes -- innovation goes in the solar panels as well. Now, we have a solar panel which innovation allow us to generate, actually, steam, combine the new, you know, solar system with the old steam system, and they still have the steam turbines. Well, now how -- this innovation --

**Greg Dalton:** So let's get to that. We got to wrap this up. So if you can go question.

**Male Speaker:** Yeah, how this -- how you can compete actually with the solar panels on the roof with the solar panels which they'd be use, let's say for the solar thermo. And is the benefits more of it -- is it like your company or is it the utilities company that get benefits.

**Greg Dalton:** Real quickly then we're going to get to one last question and wrap this up.

**Lyndon Rive:** I think this comes down to wholesale versus retail as we're discussing earlier. So solar thermos is at wholesale versus rooftop at retail.

**Greg Dalton:** Thank you. We have chance for one last question. Talking about solar power at Climate One. Welcome.

**John Bourne:** I'm John Bourne, and I run a residential marketing company called BrightCurrent. And we're at [brightcurrent.com](http://brightcurrent.com).

[Laughter]

**John Bourne:** And I work with all of you guys except for Marco at Rabobank, but I thought I liked the analogy on the --

**Greg Dalton:** Kodak?

**John Bourne:** No, guinea pig, feeling like a guinea pig. And my question for you is simple. How do you explain how 80 percent of the customers that get quotes for the zero down, have savings day one but only 12 percent signed the contract?

**Lyndon Rive:** That's a very good question. Yeah. So I'd say the biggest challenge that we face right now is there is a 20-year commitment. So although you think you're on a month to month commitment to the utility, the fact that you don't have another choice is actually a lifetime commitment, at least for that house. So that -- that's something has to occur over time. We have to prove that you can make it work. But I think the 20-year commitment is the biggest obstacle that we face.

**Danny Kennedy:** And it's also what we went through with cellphones and signing of the contracts. There was the shock of the new and getting used to it. But that too, shall pass because this makes economic sense. And people will become comfortable with it and see their peers doing it. And it will mainstream.

**Greg Dalton:** Well, people don't like the -- people won't love their cellphone contracts either, right?

**Edward Fenster:** But I think maybe another -- I mean, if you were to compare the US market to the German market, the actual value proposition of solar in Germany right now is smaller than it is in the United States, yet close rates are much higher.

Customer acquisition cost is 90 percent lower. And a lot of that is just that they are at five times the scale. It's the side case that you can save money. You know, people are more likely to actually choose a contract if their neighbor has one, you know. It's just -- it's a very, very early stage product. Now it's like one in a thousand people has it. And I'd say, we need to culturally get more comfortable with it, and I think you'll start to see the close rates increase.

**Greg Dalton:** And we have to close it right there. Our thanks to our guests today at Climate One. We've been listening to Danny Kennedy, President and founder of Sungevity. Marco Krapels, Executive Vice President at Rabobank, Lyndon Rive, co-founder and CEO of SolarCity, and Edward Fenster, co-founder and co-CEO of Sunrun. I'm Greg Dalton. Thank you all for coming and listening to Climate One today.

[Applause]

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