

June 21, 2016 Workshop Transcript

Something New Under the Sun: Competition &
Consumer Protection Issues in Solar Energy

Hosted by the Federal Trade Commission

June 21, 2016

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[START OF WORKSHOP]

WELCOME

- **Marina Lao, Director, Office of Policy Planning, Federal Trade Commission**

MARINA LAO: Good morning, everyone. May I have everyone take a seat please? Good morning, and welcome to our workshop on Solar Distributed Generation. My name is Marina Lao and I'm the director of the Office of Policy Planning at the FTC.

First I'd like to thank all our speakers for taking time to come here and share their expertise with us. And I'd also like to thank the workshop team members and the staff for their considerable efforts in putting together this workshop.

Next I need to quickly review some administrative details before we get started. Now this is very interesting. Please make sure your cell phones are off or silenced. And if there's an emergency, please listen for instructions over the building PA system. If we have to evacuate, the door to use is the 7th Street entrance. Make a left for half a block and then cross the street to E Street and wait there until we're told it's OK to return to the building.

If you have to leave the building during the workshop, you'll have to go back through security screening again. So keep that in mind, especially if you're a panelist.

Lunch is on your own. There's a cafeteria on this floor.

The workshop today will be webcast and recorded. I'd like everyone to know that by attending you are agreeing that your image or anything you say or submit may be posted on the FTC website or social media.

So one final quick note on our use of the webcast and social media, and about the Q&A session from the audience. The workshop is being webcast live from the FTC website. We hope that those who are interested in the program but can't be physically present today will take advantage of the webcast.

Whether you're in the audience or watching on the webcast, you can also follow updates from the workshop on Twitter @FTC and using the hashtag #FTCSolar.

If time permits, the moderators of the panels will take a few questions at the end of the panels. So what I've asked you to do is to please write any questions that you may have on the index cards that are available from the registration desk and also from a staff member here in the room. The question cards will then be collected by a staff member and brought to one of the moderators on the panels.

OPENING REMARKS

- **Edith Ramirez, Chairwoman, Federal Trade Commission**

MARINA LAO: So with these housekeeping matters out the way, we turn now to the substance of the program. It is my pleasure to introduce Edith Ramirez, chairwoman of the FTC, to open the workshop today. Chairwoman Ramirez was sworn in as a commissioner of the FTC in April of 2010. She was designated by President Obama to serve as the agency's chairwoman in March 2013. And she has served in that capacity since then. The Chairwoman has strongly supported our efforts in this project throughout and we're extremely grateful to her for that support. So please join me in welcoming Chairwoman Ramirez.

EDITH RAMIREZ: Thank you, Marina. And good morning, everyone and welcome to the FTC's Solar Energy Workshop. Nearly forty years ago, the FTC held a symposium to examine the then developing solar energy industry. And that symposium looked at the emergence of new technologies including photovoltaic arrays for generating electricity and stressed the importance of competition and consumer choice.

Today we're exploring many of the complex issues that arise when consumers generate their own electric power using solar photovoltaic panels. A practice known as solar distributed generation, or simply rooftop solar.

There's a real possibility of a future in which individuals and small communities will generate a growing amount of their electricity needs at or near the point of consumption, instead of drawing that power via the electricity grid. But whether this decentralized future becomes a reality depends on how expensive distributed generation is compared to utility scale generation after factoring in all the costs.

The FTC believes that competition in the marketplace should play a key role. As the nation's competition and consumer protection agency, we want to ensure that rooftop solar, no differently from any other technology or product, develops in an environment of vigorous competition and responsiveness to consumer demand.

For solar power, however that environment is complex and multi-layered. Rooftop solar necessarily competes in a much broader market for the generation and distribution of electric power. That market is regulated to varying extents at the local, state, and federal levels. Consequently, policies and decisions made by utilities and regulators, like those affecting net metering, which gives rooftop solar customers credit for excess electricity that they generate, could render the environment more or less hospitable for the growth of solar distributed generation.

Furthermore, solar power, similar to other renewable sources of electricity generation, receives certain federal and state subsidies, such as investment tax credits. A patchwork of subsidies and incentives, however, may create an environment that leads to uneven or inconsistent growth of solar distributed generation, because they can cause a misallocation of the resources needed to stimulate competition and consumer-focused strategies.

The FTC has convened this workshop to gain a deeper understanding of the complex matrix of laws, regulations, policies, subsidies, and incentives that apply to solar distributed generation. Our hope is this will help policymakers assess how best to protect consumers in connection with their purchase, installation, and use of rooftop solar. Today's discussion will also help us identify and isolate competition concerns, such as use of the regulatory process to block or impede the adoption of rooftop solar.

Now as I noted at the outset, the FTC has had a longstanding interest in electricity markets, including in solar power. In the intervening decades since the FTC held its first workshop on solar power in 1977, the Commission has submitted numerous comments in an effort to inject competition analysis into the dialogue regarding how best to structure wholesale electricity markets. We've also issued reports that detail consumer protection and competition issues in the electric power industry and have held several workshops related to energy and electricity markets.

More recently, states have been exploring ways to reform electricity markets at the distribution and retail levels of the supply chain. The FTC has submitted comments

in connection with a number of these state efforts and regulatory reviews including, most recently, multiple comments to the New York State Public Service Commission in connection with its Reforming the Energy Vision proceeding.

In June of 2015, the FTC issued consumer education guidance on issues related to rooftop solar. The guidance explains solar power options to consumers and provides advice on how to decide if solar power is right for them. It also discusses the issues and questions consumers might ask in connection with purchases, leases, and purchase power agreements for rooftop solar.

In the FTC's Green Guides, we've also provided guidance to businesses concerning marketing claims related to solar and other renewable energy sources.

And finally, where there's evidence of a law violation we will take action. For example, this past March in coordination with the Department of Justice, we brought a federal court action to stop a telemarketing operation that we contend made illegal robocalls promising consumers energy savings in an effort to generate leads to sell to solar panel installation companies. Although our complaint did not directly involve participants in the market for rooftop solar, it does serve as a cautionary reminder to all businesses to exercise care when selecting third parties to assist with their promotional efforts.

In addition to supporting our competition and consumer protection advocacy with respect to electricity markets, my hope is that today's dialogue will yield additional information to the many state legislators, regulators, and attorneys general who are grappling with the complex issues surrounding retail electricity rates and the consumer and competition issues that could arise when consumers turn their homes into sources of distributed generation.

For our program, we've gathered federal and state officials, academics, representatives of electric utility, solar industry, consumer and regulatory associations, and market participants.

We'll begin with a framing presentation by Dr. Severin Borenstein, a professor of Business Administration and Public Policy at the University of California at Berkeley. Who will explain some of the background economics of the electricity industry and the economic implications of incorporating solar distributed generation onto the electricity grid.

Our first set of panelists will discuss how solar electricity generation has grown in recent years and whether we should expect that growth to continue. They will explore the sources of that growth, how consumers and incumbent utilities have reacted, and what we might reasonably expect from the solar industry in the future.

The second panel will discuss some of the issues surrounding net metering and other ways to put a price on the excess electricity that rooftop solar customers generate. In most jurisdictions as you know, retail electricity rates are the product of ratemaking proceedings overseen by state regulators. And there's significant debate about whether the retail price is the appropriate price at which utilities should compensate solar customers for the power that they generate, which our panelists will be delving into.

Then following the two morning panels, we're fortunate to have Chairperson Ellen Nowak, of the Wisconsin Public Service Commission and Commissioner, Ann Rendahl, of the Washington State Utilities and Transportation Commission, join us today to share their experiences relating not only to some of these ratemaking issues but also to competition and consumer protection issues as well.

In the afternoon, two separate panels will explore issues related to competition and consumer protection. During the first afternoon panel discussion, participants will explore the differing viewpoints concerning the roles of regulation, competition, and antitrust in electricity markets and their underlying rationale.

The last panel of the day will examine consumer protection issues raised by rooftop solar. Our panelists will explore existing guidance, the legal and regulatory

environment, the role of industry self-regulation, and what more, if anything, needs to be done and by whom.

With increasing rates of adoption, we want to ensure that rooftop solar develops under conditions of free and fair competition. And that consumers are well informed about its pros and cons and the options that are available to them. As the nation's principal advocate for sound competition and consumer protection policy, the FTC is very well positioned to assist with such efforts. Thank you again for joining us and I look forward to our discussion. Let me turn the microphone back to Marina.

FRAMING PRESENTATION: MARKETS 101: FRAMING FOR SOLAR PV DEBATE

- **Severin Borenstein, E.T. Grether Professor of Business Administration and Public Policy, Haas School of Business, University of California, Berkeley**

MARINA LAO: Thank you, Edith. It is now my pleasure to introduce Professor Severin Borenstein, who will provide a framing presentation to set the stage for today's workshop. Professor Borenstein has also graciously agreed to participate on the panel later this morning.

Professor Borenstein is the E.T. Grether Professor of Business Administration and Public Policy at the Haas School of Business at UC Berkeley. And the director emeritus of the UC Energy Institute at Haas. He's one of the foremost experts on renewable energy.

Professor Borenstein's current research projects include the economics of renewable energy, economic policies which are reducing greenhouse gases, and alternative models of retail electricity pricing.

Professor Borenstein has served on many boards and committees, including the Board of Governors of the California Power Exchange, the California Attorney General's Gasoline Price Task Force, the Emissions Market Assessment Committee, which advises the California Air Resources Board on the operation of California's cap-and-trade market for greenhouse gases. He's currently chair of the California Energy Commission's Petroleum Market Advisory Committee, and is also a member of the advisory board of the Bay Area Air Quality Management District. Please join me in welcoming Professor Severin Borenstein.

SEVERIN BORENSTEIN: Good morning, and thank you for inviting me to participate both to do this framing presentation and to participate in the panel later this morning.

The framing presentation—I was told my job is to cover two areas. One is to give a broad background on electricity markets to people who are not that familiar with electricity markets. And then partially to give a quick background on the solar industry so that we have a common set of facts to start working from.

So let me start by talking about electricity for those of you who are not as deep in electricity markets. There are some things that make electricity unusual, if not completely unique, in thinking about market competition.

To begin with we have to remember that there are, in fact, four different business aspects to the electricity market. The generation side, transmission—that is the high voltage lines that bring electricity around the country—and then the lower voltage lines that run through neighborhoods and that are the distribution lines. Finally, and this is not an engineering part of the business, it's the monetary side. There's a retailing aspect to it. I'm going to come back and talk about those in detail.

First, though, to understand what's really different about electricity is of course that electricity is not storable or is only storable at very high cost. Now that's not really that unusual—service industries generally are selling a product that's not storable. But just like in service industries, that means inter-temporal arbitrage is very difficult to do. And that means that prices, or at least marginal values, of electricity can vary enormously. So we can see days in which the price varies by a factor of 10 to 100, which we, of course, would never see in a storable commodity whether it's oil or oats or corn.

The second thing is electricity transmission is very low cost to transmit up to a capacity constraint. But beyond that, it's actually very expensive. And when those capacity constraints bind, it can be impossible—meaning that inter-locational arbitrage can be very limited. So we can get very different prices in different locations without the ability to smooth those by arbitraging the price differences.

Critically, all producers are delivering electricity over the same system. And they're delivering it in real time. So the electricity grid is a common carrier of the product. And at the same time, that electricity grid has to remain in constant balance—second-by-second supply has to equal demand. So that makes this an unusual industry in that all of the sellers are transmitting their product through the same distribution network. And that network has this public good aspect to it that somebody has to make

sure the total amount extracted from the network equals the total amount injected minute-by-minute, or second-by-second.

This is a figure of the last decade's electricity system, because it is unidirectional. We see generation, a step up in voltage to the high voltage transmission lines, transmission to local areas, a step down in voltage then, to be distributed locally, and then the final use customers.

The model that we saw 20 or 30 years ago of a single vertically integrated utility doing everything is changing. The old utility model was: there was a local company – regulated—that did generation, transmission, distribution, and retailing (that is they were the ones who sent you the bill). And they were also the ones who were your procurement officer, or company. They went out and, on your behalf, procured electricity. Often by building it themselves; sometimes by buying it from other sellers. The old model was that as long as the utility went to the regulator and got permission, they could pass those costs through.

Experimentation began in the '80s and '90s, first with competitive generation. That is other companies did the generation and the utility purchased from them. It's worth noting that natural gas utilities have always had that business model. But in electricity, throughout much of the first 100 years of industry, the same company that did the transmission, distribution, and procurement also did the generation.

In the late '90s and early 2000s we started to see retail competition. So that last function I was talking about of retailing started to be done by other companies. A company would go out and procure electricity on your behalf and then sell it to you. You would become a customer of somebody other than the utility. But that power still had to get across the grid to you physically, and that meant transmission and distribution lines. Those remained regulated, and to this day remain regulated, and are regulated as utilities.

Although that model of the late '90s and early 2000s of competitive retailing, continues in a number of states around the US, it actually was pretty much short-

circuited by the California electricity crisis in 2000-2001. When California ran into a number of problems with its restructured market, the states that weren't already pretty far down the restructuring process just froze the process.

However, in the last five years, we've seen a new form of retail competition. Not by a for-profit companies, but by non-profits. These are generally referred to as community choice aggregators, or community choice electricity suppliers. And they are generally some sort of governmental body, often a city or a collection of cities, that get into the retail business procuring on behalf of customers and selling to those customers. Generally the utility still is competing with those CCAs in most places. But in some places, including California where CCAs have gotten a lot of traction, the CCAs actually have a default opt-in. That is that customers, if they do nothing, are switched over to the CCA.

The incumbent utilities, however, are still providing service in the form of transmission and distribution services—the delivery services. That's really not likely to change any time soon. As long as we need a grid to deliver electricity, it's very unlikely we're going to have competing grids. That is, we're very likely to still have a natural monopoly in that transmission and distribution system. The economies of scale dictate that. And that's something that we have to think about when we think about what's the business model going forward. Those grid services still have to be provided.

Now distributed generation is changing the model further. Some people think that “now you don't need the grid as much” when in fact you need the grid even more. Those grids are now providing two-way distribution services. That could change as storage becomes cheaper. But we're probably many years away from the point that many customers, particularly residential, are ready to cut the cord and actually go off grid.

Finally, and I think this is important to recognize, technology is really changing the way we can actually communicate with the customer. And actually even get the customer to respond. Customers have much greater computing power that can read

prices, or read other aspects of the grid, and actually change behavior automatically. People aren't going to probably flip on and off lights in response to high electricity prices, but their computer very well could or could reset air conditioning by a degree or two.

So you need another slide now to understand the electricity system. This is one I pulled off the web. There are many of them. This is interesting—it shows that there's going to be storage and distributed generation and so forth. It does, as often happens, equate clean with local power. And of course while it is true that solar photovoltaics generate no greenhouse gases and no ambient air pollution, that could also be done at the grid scale. And one of the discussions that's going on that I'll come back to is competition between grid scale renewable power, both wind and solar—and wind at this point really isn't economic at the distributed level—with a local distributed generation and rooftop solar.

So what I want to do is run through some models of electricity generation, distribution, and retailing. The old model of generation, of course, was central station. The new model is some central station generation, some distributed generation at consumer sites.

The value of wholesale power, of course, depends on its location and timing and the impact on the grid. And it's important to remember there are also line losses when you send power across a grid. Some of it is dissipated as heat. Over a standard grid system, it's often seven to nine percent that is lost from generation to the actual usage point.

Distributed generation that is consumed on-site is effectively just reducing demand, which in electricity parlance is known as load. But a lot of distributed generation is actually not consumed on site. In fact, for a typical system being put in today, about half or more of the power that comes off that rooftop actually is being injected into the grid. So there's a real question of how do we value that? And that is one of the big controversies that I'll mention at the end here.

There are many models of electricity retailing. Of course the old model is that you have a utility, the utility does the procurement for you, they go to the regulator, the regulator says, “that was prudently done,” and assures them recovery of their costs through ratemaking.

The new model is these for-profits, or nonprofit, retailers who compete for customers. There is sometimes a default provider if you don't choose one. The retail competition applies only to electricity generation, not to transmission or distribution. Regardless of who your retailer is. You still have to use the utility grid to get power to your location.

There's also a question of—remember I talked about keeping the system in balance that everyone's using—somebody has to be responsible for balancing the system second-by-second. And that is a system operator. In California, it's the California Independent System Operator. There's the System Operator to the Pennsylvania New Jersey—well it's PJM since it's now much larger than Pennsylvania, New Jersey, Maryland. And somebody has to make sure that there are reserves available so that enough generation's always going on to exactly meet demand.

The model of electricity grid services hasn't changed much and is unlikely to change. It's changed only in who is the operator. In the old model they were utilities that also were vertically integrated doing generation, distribution, and retailing. Now the grid operator is generally some independent party that's at least operating the transmission lines. And that's likely to remain because of this natural monopoly aspect of it. And this is one of the rate recovery challenges that the system faces. And that is, that's a natural monopoly. And by definition a natural monopoly is one where it's cheaper to add a customer to your existing system than to build a new system. Or in economic parlance, marginal cost is below average cost.

The efficient price, which I'll come back to talk about in a minute, in markets, is to have price reflect that short-run marginal cost. But if we do that, the utilities are unable to recover all of their costs. So the question is, How do we recover all those

costs? It's made more difficult because in almost every utility system, they're doing things other than running the grid. They're providing what are often termed public purpose programs. These are low-income programs, energy efficiency programs, and so forth. And somebody has to pay for those. Those are essentially fixed costs to your consumption. And so again, price set equal to marginal cost is unlikely to be able to cover all those costs. So the question is how to cover that revenue shortfall?

And then there's the issue of how do grid services change in a system with distributed generation? As Chairwoman Ramirez mentioned, New York is going through a reexamining of these questions—off how the grid should operate and who should be paying for what services in order to incent efficient behavior and efficient competition.

Distributed generation is one aspect that's changing that. Demand side response. More dynamic pricing that changes hour-to-hour. Retail prices historically have just been constant while the wholesale prices and the actual stress on the grid have fluctuated wildly because of the non-storability.

And then there's the question of, “what is distributed generation contributing to the grid or imposing on the grid?” Depending on your view. that is, how much is it actually lowering the cost of operating the grid or potentially raising the costs of operating the grid? And there's some real differences of opinion we will hear today.

So I mentioned retail rate design. This is one of the other areas that's going through significant changes. Of course economic efficiency dictates setting retail price equal to short-run societal marginal cost. Short-run meaning, if in that hour there's a real shortage in the market, the price should go up a lot to reflect that scarcity that's there right now. Societal, meaning it should not only include the cost of the generation and transmission, but also the externalities—the pollution that's generated in that as a result of your consumption.

What that would suggest is time-varying pricing, location-varying pricing, and an inclusion of externalities in the prices. We essentially don't do any of that right now in residential pricing. We're starting to see some time-varying pricing. We almost never

see locational-varying pricing within a utility's area, although there have been some moves to do that. And we see only very slight inclusion of externalities. California does have a carbon market. So does the Northeast. Those costs are included. Those costs are nowhere near the common estimates of the true cost of greenhouse gas emissions.

Even if you did all that, efficient prices are unlikely to cover all the costs. There is a problem that we don't allow generation prices to rise to clear the market. There might be a good reason for that due to the lack of price signals to consumers. But it also means there is what's called the missing money problem when you don't get those very high scarcity prices when the grid is short.

And there's the grid natural monopoly that suggests that saying price equal to short-run marginal cost is still going to be less than average cost. Adding in those externalities may actually cover some of that if the grid doesn't actually have to pay the externalities, but charges for them. But that's unlikely to actually balance the books. And then this need to recover the cost of public purpose programs.

And the reality is prices are far from efficient. There is little time or locational pricing. And the distributed energy resources are making all of this much more complicated. So retail rate design is an important part of thinking about how we incorporate distributed solar into the system in an efficient way.

Now because I know many of the people here today are not economists and there is often skepticism when economists talk about efficiency, I want to just remind you efficiency is not some vague economic concept. It's real value. Or loss of efficiency is a loss of economic value. If the true marginal cost to society of providing a good is nine and we charge 11, then there are some people who value it more than the true marginal cost and don't buy it. Deals that could have created value don't get done. Likewise if the true marginal cost to society is nine and we charge seven, there's too much consumption of the good. People actually value it less than the resources that are going into making it or buying it and using up resources.

Both of those create deadweight loss. Deadweight loss is deals either that shouldn't have been made that were made—and as a result resources were directed into lower value uses—or deals that should have been made but didn't get made because the price was set above societal marginal cost.

That sounds like sort of a vague concept. Let me give you a real application. Let's think about, for a minute, the very realistic scenario that the short-run societal marginal cost of providing electricity is \$0.10 a kilowatt hour. But because we have to pay for the grid, to pay for public purpose programs, et cetera, we're charging customers \$0.20 a kilowatt hour. That's a pretty accurate approximation of California right now.

That is the equivalent, if you're asking people to switch to electric vehicles, of making it cost equivalent at not \$1.75 a gallon but at \$3.50 a gallon. So by charging a price that is vastly greater than short-run societal marginal cost, you're actually giving people an incentive to stay away from consuming electric vehicles. You're making it much less economic to invest in EVs.

Now in California. we are in the process of creating special rates for electric vehicles because that's something we want people to do. But we still want people to conserve, so we're trying to keep rates high on other things. Economists really get nervous when regulators start doing that—deciding which are the good uses and which aren't. Generally we would much rather see prices that just reflect society's marginal cost of consuming the good. And some of the time-varying pricing and location-varying pricing moves have moved us in that direction.

How do we cover these costs if we do have a shortfall? Well the way we've done it historically is just by raising the price—the volumetric price of electricity. We can recover all the additional costs from a volumetric adder. This sort of has an equity appeal because it says, “well, if you're a big consumer. you pay a larger share of those additional costs that have to be recovered.” And I think there's actually something to that—.people find that an attractive notion. But when you start charging a price well

above the short-run marginal cost, you do give these inefficient incentives for people to use the product.

The second approach is a fixed charge independent of quantity consumed. This has great appeal on an efficiency basis because it's very hard to avoid it. It's very hard for people to change their behavior in response. But it really has some equity concerns. And particularly who is included in that fixed charge? Should Severin Borenstein's house pay the same fixed charge as the Google campus on the other side of the Bay when they are consuming millions of times more electricity than I am (or at least hundreds of thousands)? That seems to most people unfair to distribute the cost that way.

We have used increasing block pricing. This is: as a household consumes more, the price goes up. That really has no cost basis whatsoever. But it appeals to some people on equity grounds. I don't have time to do the full rant on that, but I think it's not a very good match.

Minimum bills are often discussed now. Regardless of how much you consume, you have to pay a certain amount. At the levels they're generally discussed these days, they would have almost no effect and raise almost no additional revenue. California is discussing a \$10 minimum bill. If you get up to a much higher level of minimum bills, then it would raise additional revenue from the lowest consuming households. But it also, effectively, is giving away free electricity up to that minimum bill.

And then demand charges, which we probably won't have time to spend much time on, are surprisingly coming back into vogue. This is a charge for your highest single period use. Whether it's an hour or five minutes of usage. They, for the most part, are now being reshaped to look more like time-varying pricing. Because they're starting to shape them to say, "well your demand charge will be based on your usage in a peak period—sometimes even in the highest peak period." And my view is that they are generally trying to use demand charges to move towards dynamic pricing.

All of these have very different implications for DG solar. The solar folks generally love volumetric pricing and hate fixed charges. If you're a DG solar retailer,

your product is more competitive when the volumetric price of electricity is high. And if the customer has to pay a fixed-charge regardless of whether they put in DG solar and that has a lower marginal price, it's less attractive to put in solar.

OK, I've got to move along and talk about residential PV. This slide shows the growth in PV generally. The low part of this—I think this might be a little small for people to see—is residential. Residential is growing very rapidly. Prices have been coming down dramatically. Residential is the highest of these three lines. And you can see as solar panel costs have come down, everything—whether residential or grid scale solar—has all come down.

You'll notice these lines are pretty close to parallel—the gap between them hasn't changed that much. The price of residential and grid scale solar has come down. But proportionally, of course, now the price of residential solar is much higher relative to grid scale than it used to be as solar panel costs came down for everyone.

Prices are continuing to decline both for residential, which is the left hand set of bars—these are the most recent data going into 2016—and for grid scale solar, and in projects in between.

It's important to understand for the discussion today how residential solar works. These panels convert light into electricity—not going through a process of heat. That is they actually change the light that comes into the panels to electricity. That electricity is then converted from DC to the AC that your household can use.

When the household's, consumption is greater than the flow from the panels then all electricity from the panel is used at the household, plus they bring electricity in from the grid. When the household's consumption is less than from the panels, then all the electricity that the household needs comes from the panels plus they export to the grid.

Now if you don't have storage, it means that every second of the day you are either importing or exporting. There's virtually no chance that you are consuming exactly what your panels are producing. And so, distributed generation is still using the

grid. If anything it's using it a little more intensively. Well that's probably not right: either way, you constantly had flow on the grid.

Some facts you need to know about residential solar. First of all, half of all new and installed solar is in California. California's had very aggressive programs and California has good weather for solar. So we in California continue to lead the nation in solar installations. California's not even close in the density of solar installations. Hawaii has over 10% of all households now with solar. And there's some other areas in the country that are equally high.

Prior to 2009, virtually all solar was purchased by the homeowner. Gradually that has changed, and over the last few years about 70% of all new solar installations are not owned by the homeowner. They are either leased from a company that puts them on your roof, or, more commonly, the homeowner signs a power purchase agreement. The company comes and puts them on your roof and I agree to pay x cents per kilowatt hour for the next generally 20 years. And that x rises these days 2 or 3% per year.

There are a lot of incentives for installing solar today. There's a 30% investment tax credit, which has now been extended. There is accelerated depreciation that a company—you can't take it as a residential homeowner—can take. My estimates, and other people's estimates, suggest that that further subsidizes it about 10 to 14%.

There are tradeable renewable energy credits. To the extent that rooftop solar meets a state's renewables goals, they can get credits for that. That further incentivize solar PV.

And there are retail prices that are covering more than social marginal cost. And to the extent that they do, that also increases the incentives for solar PV.

We hear the argument often that there are also tax subsidies for fossil fuels. And there certainly are. They are much larger than the subsidies for solar in aggregate. But on a per kilowatt basis, they're actually very small. In fact, I did a calculation using numbers by a group that is sort of a left-leaning group that did analysis of subsidies for fossil fuels for gas and coal—since we generate almost no electricity with oil—and it

amounts to about 1/10 of a cent per kilowatt hour. So it's probably not the major driver. Of course the biggest subsidy of fossil fuels is they don't have to pay for pollution emissions. And that continues to be the case.

We're going to talk today about electricity tariffs. The second session will be on net metering in particular. The idea here is that the customer sometimes is importing, sometimes is exporting. At the end of the month, or year, when they have to pay their bill, what they pay at the retail level is the net of the imports and the exports. There are variants to that. There's some that say, "well, we're going to do net metering by time periods—there's going to be a peak net metering period and off-peak net metering period." And then there are varying treatments of the customer, if the customer actually is a net exporter. That didn't used to be a big issue because very few customers were installing solar systems so large that they actually generated more electricity than the household uses. As the cost of these systems have come down that's becoming a much bigger concern.

The alternative to net metering is what is largely termed feed-in tariffs—where the customer's compensated for the electricity produced separately from the retail consumption. But there are lots of variants to that.. There is an all-buy all-sell form that is: you've got your panels on your roof that has a meter, you get paid for it it is completely separate from the wire coming into your house, and you pay retail for the wire coming into your house. And then there is what is often termed a net feed-in tariff, in which you pay over very short periods for your net imports. Australia is doing that these days. Where over a five-minute or one-hour period, you are net metered. But you don't carry it over, and you have to pay for your net purchases. In those cases, if you're a net exporter during a period you generally get compensated at a lower rate than the retail rate you have to pay.

So let me conclude by talking about some of the solar residential debates we're going to cover today. One is, what is the value of DG solar electricity production—generally, how should we think about that? Both the value to the grid and the value to the environment.

And then what seems to be a similar question but actually turns out to be quite distinct is, how much value does it does the utility get out of a customer installing solar? The utility loses revenue, of course, when they sell you less electricity. But they also reduce their cost. One of the huge debates that we will revisit today is, how does that balance out? Some people argue that the utility is actually saving more money, at least over the long run, than they are losing in revenue. Other people argue that the utility is losing money relative to the revenue they get. Obviously, if the utility is losing money relative to the revenue—they're losing more revenue than the cost they are reducing—then there's now revenue shortfall and somehow the utility has to make that up. Or the shareholders have to pay for it. And that is one of the big debates.

And then, closely related to that—to the value that solar is bringing—is the question of how rates for residential PV should be designed to create efficient incentives for installing DG. So that DG is actually incentivized when it's bringing net value to society. It is not under-incentivized because the solar household isn't getting fully compensated and it's not over incentivized because they're actually getting compensation greater than the value they bring. And how should we actually compensate the solar household while at the same time making sure that the utility can cover its costs?

So those are the questions that I think are going to come up, at least this morning. This afternoon we're going to face a different set of questions as we talk about the competition aspect of installing solar PV and making sure consumers are well informed. But I'm going to set those to the afternoon. And I think leave it at that. Thank you very much.

MARINA LAO: Thank you, Severin. The first panel will be coming up shortly. I'll just introduce the moderators. Ellen Connelly, attorney advisor with the Office of Policy Planning, and Mark Hegedus, who is an attorney with the Office of General Counsel. So could we have the first panel? Thank you.

PANEL 1: LAYING THE GROUNDWORK: THE PAST, PRESENT, AND FUTURE OF SOLAR POWER

Panelists:

- **Vikram Aggarwal, Founder & CEO, EnergySage**
- **James Critchfield, Director, Green Power Partnership, US Environmental Protection Agency**
- **Tanuj Deora, Chief Strategy Officer & Executive Vice President, Smart Electric Power Alliance**
- **Allen Mosher, Vice President of Policy Analysis, American Public Power Association**
- **Elaine Ulrich, Program Manager, SunShot Balance of Systems/Soft Costs Team, US Department of Energy**

Moderators:

- **Ellen Connelly, Attorney Advisor, Office of Policy Planning, Federal Trade Commission**
- **Mark S. Hegedus, Attorney, Office of the General Counsel, Federal Trade Commission**

ELLEN CONNELLY: Good morning everyone. I am Ellen Connelly, an attorney advisor in the Office of Policy Planning at the FTC. My co-moderator today is Mark Hegedus, an attorney in the FTC's Office of General Counsel. We want to welcome you to our first panel of the day, which is entitled "Laying the Groundwork: The Past, Present, and Future of Solar Power." On this panel, we will explore the development of the solar industry and solar technology, the environmental implications of solar, the operational and cost impacts of solar distributed generation on utilities, and the drivers of consumer demand for solar. Our discussion this morning will provide the foundation for the rest of today's discussion. We have an impressive panel of experts here to discuss these issues.

First, Elaine Ulrich is a program manager at the Department of Energy, where she leads the SunShot Balance of Systems Soft Costs Team. The SunShot Initiative seeks to make solar cost competitive with other forms of electricity by the end of the decade. Doctor Ulrich will discuss the history of solar power in the U.S. and DOE programs to support solar.

Next, we have Vikram Aggarwal, founder and CEO of EnergySage. EnergySage is an online marketplace focused on consumer education. It provides objective information on different solar options and allows consumers to obtain and compare quotes for solar systems. Mr. Aggarwal will discuss consumer demand for solar and trends in solar costs.

Allen Mosher joins us from the American Public Power Association, which is the service organization for the nation's community-owned electric utilities. He is vice president of policy analysis and is an expert in bulk power operations, reliability, and wholesale market operations. He will help us understand the operational and cost impacts of solar on utility systems as well as the role of solar in utility power supply portfolios.

James Critchfield is with us from the Environmental Protection Agency, where he is director of the EPA's Green Power Partnership. The Green Power Partnership, launched in 2001, is a voluntary partnership that encourages businesses to use renewable energy as an environmental alternative to conventional energy sources. Mr. Critchfield will discuss the environmental impact of solar and will describe the role of renewable energy credits in the solar marketplace.

Finally, from the Smart Electric Power Alliance, we have Tanuj Deora. SEPA is an educational nonprofit that provides a neutral space for education, research, and collaboration on energy issues. Mr. Deora serves as SEPA's executive vice president and chief strategy officer, and he will help us look toward the future of solar, in part, by discussing SEPA's 51st State Initiative.

There are more detailed bios of all of our panelists in today's materials. A few procedural points before we get started. Each panelist will make a short presentation. At the end of each presentation, the moderators may ask a follow-up question or two of the panelists. At the end of the series of presentations, we will have some time for additional questions from the moderators and from the audience. If anyone in the audience has a question, please flag down one of our conference staff. They have

comment cards and will collect them for us. And panelists, if you have something you'd like to contribute regarding a particular question during this last segment, please just turn your name card on its side or otherwise signal us that you'd like to speak.

And now I will turn it over to Elaine to start us off.

ELAINE ULRICH: Good morning. Thanks for having me. So, I'm probably not going to go over too much that wasn't already covered by our first speaker. So, very quickly, if you look at the installation of solar over at the past several years, you can see that the growth in the solar markets has been extremely rapid. I think many times when folks are looking at solar deployment in the United States, they often feel that solar is synonymous with residential programs—programs where people are deploying it on their rooftops—but as you can see in the slides here, annual installations are primarily dominated by installations made by utilities at the utility scale—large-scale installations.

In addition to that, the vast majority of solar is being deployed in just a handful of states. You can see that California makes up almost half of the market up to this point, although we see significant growth if you look state by state. As folks put in place policies and programs that allow them to enable solar, we do see rapid growth, but California really got out ahead of things, and it also represents 12% US population. So, it's a fairly large energy consuming state.

Solar is now about 1% of US electricity generation, and the years of 2015 and 2016 have been really huge in growth. When you look at projected deployment of solar, there are a lot of different ranges for what that growth may look like. Much of the projections that have been made in recent years have had a large dependency on federal programs, in particular the investment tax credits. And so again, you can see a huge range in the projections.

In general, most projections that have been made have undershot what the market has actually performed at, and again, there are a number of factors that impact that but probably the biggest factor that has led to the extreme growth in solar deployment has been the lowering of cost in recent years.

At the SunShot Initiative, we have done our own projections. We started doing those back in 2011, when we launched the initiative, and under those initial scenarios, we were looking at growths that would bring the installed capacity to 14% of generation in 2030 and over 20% by 2050.

So just quickly, to go over again a few of the major policies and things that you might be hearing about today. Here is a nice reference table for you. The investment tax credit. There are actually two investment tax credits: one for residential customers and another for commercial customers. That originally was set to expire in 2016. That tax credit has been extended, but it will have a step down as opposed to just a straight expiration.

Another set of policies that are typically put out at the state level are renewable portfolio or renewable electricity standards. These are standards that require a certain percentage of electricity to come from clean energy. Some of those have inclusionary targets specifically for solar, and it's very common to see that the states that have renewable portfolio standards, that's probably one of the most impactful policies that a state can put in place in order to signal that it is open for business when it comes to deployment of renewable resources.

Again, I know there'll be some more in depth discussion of solar renewable energy credits, SRECs. There are also other renewable energy credits that could be applied to other technologies, like wind. So RECS, SRECs, are credits that are awarded to help to account for the clean energy attributes. So, for example, you may install solar on your site, but sometimes folks sell those credits to utilities and others who need to meet compliance to show that they are procuring a certain amount of electricity that is generated by clean sources. And again, when there's an inclusionary target, specifically for solar, it's an SREC.

And then there are also a number of performance-based or cash incentives that have been put in place over time by a variety of states or jurisdictions. Again some of those could be in the form of tax credits or rebates. They have a huge range of

mechanisms that they're put in by. Some of them are performance based; they're based on the number of kilowatt hours that you put in. Others are capacity based—the number of kilowatts, the size the system—or, others, like the investment tax credit are just based on the price of the system.

There are again, a couple of different kinds of solar ownership models that are out there. In one, the host may be owner of the system, and they consume some of the electricity. They may be injecting some electricity back into the grid, and in that case, an installer puts that system in place for the consumer, and then they own it.

There are also third party ownership systems, or TPOs. Those may come under either, what we call power purchase agreements—and that's where folks sign up on a contract to purchase the electricity—or under a leasing model, in which the host has as a lease payment that they're making, basically in contract with the installer.

In addition to that, there's an increasing amount of interest in, what we call, community solar or shared solar programs and projects. And those are projects that may not be located on the same site as the consumer, but where the electricity is credited to the consumer's account, irrespective again of whether it's on their site or not.

And so, again, what is the Department of Energy SunShot Initiative? Where do we fall into things here? And what is the role that we had?

This is an initiative that was launched in 2011. It's a presidential initiative. And the goal of that program was essentially to bring the cost of solar electricity so that it would be cost competitive with conventional forms of electricity by 2020. That, when this program was launched, represented a 75% decrease in cost that was necessary, and the goal was essentially between \$0.05 to \$0.06 per kilowatt hour without subsidies, so not taking into account the investment tax credit—the federal investment tax credit. And again, that goal was to do that within a decade, by 2020.

And we've made some pretty significant progress there. I think within the past quarter, we've seen that there was a utility in northern California—Palo Alto—that

recently signed a power purchase agreement for \$0.03676 per kilowatt hour with the investment tax credit. So there are some isolated instances where these goals are being met, but not something's happening across the U.S.

The SunShot program is again within the Department of Energy, which has traditionally functioned as a technology development institution. We have five separate program areas. One in concentrating solar power, which are the the large mirror systems that concentrate light and heat onto a power tower and drive a steam turbine, much like a conventional power plant. We work also on the development of photovoltaic technologies. And then we have three cross-cutting programs: one on systems integration that focuses on the grid—grid operations, and how we integrate solar into the grid; we have a program that's called Technology to Market that works with companies on innovations and manufacturing; and then I lead the program on soft costs.

Again the overall goal is to reach \$0.06 per kilowatt hour. On the soft cost team the work that we do is primarily—if I was going to sum it up in three terms—connecting people to information. And so the way that we do that is essentially by: 1) generating the information that's necessary to create more transparency in the marketplace. So we do a lot of work on data analysis. We work with our national labs and academics and others to help put that data together.

We do work on finance and business models. So that includes, again, new business models that help to increase the access of solar to the full suite of consumers across the spectrum in the United States.

We do a lot of work on training, education, and workforce, and that includes everything from your solar installer and your power system engineer all the way through folks who work in real estate and finance. Folks who their entire job may not be to do work related to solar, but they need information about solar in order to do their jobs and to make decisions.

And then, finally, we look at best practices in all of those areas and do a huge amount of work in helping to support networks and technical assistance—at the state and local level—on how to design programs and policies, again to increase consumer protection and increase that transparency in the marketplace. So with that, I think I'm ready to hand it over to our next speaker.

MARK S. HEGEDUS: Well, actually I'd like to ask a couple questions. Thank you very much for that informative presentation.

You mentioned the dramatic reduction in cost. So what have been the drivers of the cost reduction? And, also, what do you see in the future in terms of cost reductions?

ELAINE ULRICH: So the drivers of the cost reduction are a couple of different things. One is particularly photovoltaic solar technologies—those are based on semiconductor technology, which had a huge amount of R&D investment was made in the semiconductor space. I know that you all are familiar with computers, and smartphones, and all those chips and things out there. And, so, because it's a fundamentally new technology based on semiconductors, all those advances in the semiconductor field basically have been able to be pulled into what's been happening in solar.

There's also been a scaling of manufacturing capacity globally. In fact, there was some overcapacity for a while in the marketplace, but, overall, that overcapacity has driven a huge amount of competition in the marketplace. And there have just been a lot of strong advances in how to do manufacturing—how to do it in a very inexpensive manner—and also the buildup of supply chains that have made it possible for solar to be very inexpensive in cost for the hardware.

In addition, as we've grown lots of programs, we've seen, for example, that when we study the kinds of policies that are most effective at the state level, some of them we know—for example again, the renewable portfolio standard is incredibly effective and impactful—but, for the most part, the longer a policy is in place, the better that market functions as people learn how to navigate and use that policy. And, so,

having stability in policies has also created a place where people have been able to learn, and to navigate, and reduce their costs when it comes to putting in place programs that support installation.

MARK S. HEGEDUS: Great. Thank you. Let's turn to Vikram Aggarwal. Thank you very much.

VIKRAM AGGARWAL: Hello, everyone. Thank you, Mark. Hello, everyone. I'm Vikram Aggarwal. I'm the founder and chief executive of EnergySage.

Just to set a little bit of context about who we are and what we do, I will give you a little review of the data that I'll be sharing after this slide. So we think about EnergySage as the Expedia or the Kayak for solar. Consumers—whether you're a homeowner or business owner—if you're interested in installing solar, you sign up on our platform. It takes you a couple of minutes. You tell us where your property's located, how much you're spending on energy, and if you have any preferences for equipment or financing options. We send that information to a network of pre-screened high quality solar installation companies. Typically between three and seven installation companies will then custom design a system for you, submit that quote through our platform. We standardize those quotes and present to the consumer those quotes in a matrix format, so people can very easily and quickly compare their options in an apples to apples format.

So that's our platform. We are serving customers in about 31 states—have roughly 350 solar installation companies providing quotes through our platform—and a number of data that I'm going to be sharing with you is collected from what we learned from our consumer behavior, how installers are behaving, what prices are we seeing, what transactions are going through. So that's giving us a very unique insight into what's happening in the solar industry. If you're interested in downloading some of our detailed data, you can check out [EnergySage.com/data](https://energysage.com/data).

So with that context, this is a little bit of a repeat slide. I think our former presenters have talked about the growth of the solar industry. This is a slightly different

view of the growth of just the residential market alone. 2016, as you know is turning out to be quite a milestone year for the industry. We now have more than one million solar installations in the United States. That's a big number. It took us about 40 years to get there. And the industry is expecting the next million to happen in the next two plus years. So very, very fast growth.

By the end of this year, the revenues of residential sector solar installation companies will exceed \$10.5 billion, bigger than that of Major League Baseball. We're about 18 months away from saying that we are bigger than NFL. But it's getting there.

[CHUCKLES]

And the reason for this growth is very simple. It's about economics. The average solar shopper on EnergySage is spending over \$2,000 a year on electricity. They are installing roughly 7.8 kilowatt systems on their roof, which is allowing them to offset about 85% of their annual consumption, and they're able to generate an ROI of about 13% or better, depending on where they are, essentially getting their money back, or payback, in just under 8 years.

So this is a very high level national view. We have additional data on different states—how these numbers vary. But this is one of the key reasons why solar is becoming more popular and more consumers are now interested in installing solar. It's all about economics. I know there's a question coming about environmental impact and environmental reasons why consumers are installing solar. We'll talk about that in a few minutes.

So what we are seeing is the consumer interest in solar is increasing dramatically. As more and more consumers become aware of the benefits that solar energy systems can provide, their interest is peaking. And of course the million installations are causing a significant multiplier or peer effect. Folks are seeing solar installations come up in the neighborhood and getting curious and starting to inquire about that. This chart essentially shows the Google searches for just one key word,

which is “best solar installation companies.” The number of searches has tripled over the last few years.

Based on our research, we determined that in 2015 about 12 million U.S. households were considering going solar. About four to six million of them were actively shopping. Essentially, they had either talked to a solar salesperson or actually received a quote. And another five to seven million consumers were interested in going solar, but were sitting on the sidelines not knowing where to start and how to start their shopping journey.

But even with all this growth, what we find is that this industry—especially the residential solar industry—remains highly inefficient and opaque. Because most consumers who are shopping for solar are doing so for the first time, they have a lot of questions. They are uninformed consumers. They have a number of choices. And I'll talk more in detail about their choices when it comes to equipment, solar installation companies, and of course financing.

And these consumers generally find that they do not have access to a lot of unbiased truly objective information. EnergySage is still pretty young. So in most cases, consumers typically depend on the solar installer—the salesperson—for that information.

And last but not least, there is very limited standardization. Think about when you're going to buy a car. You have somewhat of an understanding what the different models of the cars are and what the relative prices and benefits are. So what this situation is doing is it gives an opportunity for some of the salespeople to embellish their quotes or mislead consumers. So that's one of the issues that we are seeing in the industry.

Let's say if some of you may have actually done this, or if you try to shop for solar, what you'll find is that solar prices are widely dispersed. On our marketplace, we are seeing solar prices range anywhere from \$2.50 a watt to over \$5.50 a watt. That can

be an over \$20,000 difference between the low and the high prices that the consumer may actually see.

Some of these prices can easily be explained by the quality of the solar equipment that is being offered. But at times it also is reflective of the installers' understanding of the consumer's ability to pay. So these prices sometimes are not truly rational. They're still trying to maximize the margin on every deal.

As you know, this industry is very fragmented. There are over 3,000 solar installation companies, over 50 plus solar panel manufacturers who are actively competing for business in the U.S., over 25 solar inverter manufacturers, and over 100 plus financing companies. And I'll go into more detail about each one of these.

When it comes to solar installers, I think there is a very bifurcated market. There is the top five solar installation companies, like SolarCity, Sunrun, Sungevity, Vivint, and then there is everybody else. The top five companies are operating in multiple states, and they are primarily focused on marketing solar leases and power purchase agreements. And the rest of the solar industry—all of the other 2,995 plus solar installation companies—are primarily helping consumers with, or offering consumers, ownership models.

And we believe that, in the long-term, the fragmentation in the solar installation companies is only going to increase. In terms of manufacturers of equipment, most likely we'll see some consolidation.

So not all solar equipment is the same. Just like in keeping with our car example. There are the compact cars, there are the Hondas, and then there are the Mercedes. The different solar equipment that is being offered to the consumer also falls into different categories of either economy or premium. And the solar equipment, again, the drivers of those quality rankings could be based on the product quality, the performance, what kind of warranties these companies are offering, and how these panels or equipment look.

What we're finding is that consumers are now focused quite a bit on the quality of the equipment. On EnergySage marketplace, we are seeing consumers typically going for better quality product than less.

In terms of solar financing, there are now over 100 solar financing companies that are offering solar financing. A little bit complex chart to see. On the x-axis, what we've done is we have listed how difficult is it to apply for a certain financing product. And on the y-axis, is what percentage of the total savings from a solar energy system does the consumer get to keep.

So based on that, if you look at the chart, of course, solar leasing is one of the easiest things that the consumer can apply for and get, but it allows a consumer to keep roughly between 10% and 30% of the solar savings. And then the chart goes up from there. Some of the best options are for consumers to leverage property secured loan options that are generally offered by their local bank, credit union—and Fannie May recently announced the Home Style Mortgage Program, which seems to be very, very exciting. On the EnergySage Marketplace, what we are seeing is when consumers get to compare their financing options, they are increasingly selecting ownership, whether they pay cash or they are financing their installation through a loan.

As several of the previous presenters mentioned that, so far, the majority of the installations have been financed with solar leases and PPAs. On EnergySage Marketplace, we're seeing over 90% of the consumer selecting to own the system.

There are several issues that the consumers are facing as this industry's growing. I have limited time, so I'll flip through them very quickly. Number one, I think some of you may have experienced that misleading advertising. If you're browsing the web or on social media, like Facebook, you'll see ads for free solar panels. The government is giving out free solar panels. Claim your panels. That's one big issue we're seeing.

Number two is pretty high pressure sales tactics. You may have received cold calls or somebody may have knocked on your door and you put a high pressure on you to sign a solar contract right then there. Number three is that is lack of standardization

among quotes. It's very difficult for consumers to actually make sense of what quality of product their being offered and what is the cost and benefits of the different financing options put on the table. There's a lot of opportunity for installers to embellish their quotes.

And last, but not the least, I think we are starting to see some indications of search engines promoting their own proprietary solar products and limiting consumer choices. So I'll stop here and happy to answer any questions.

ELLEN CONNELLY: Thank you very much. I do have one question for you, which I think you gave a little bit of a preview. You mentioned that the key reason that solar seems to be becoming so popular is for cost and economics. And we're wondering what role, or if any, does consumer interest in green energy or renewable energy play in driving demand for solar?

VIKRAM AGGARWAL: I think when the industry got started—I think if you go five or so years ago—a number of consumers were installing solar, because of environmental reasons. It was the right thing to do for the community and the environment. Those were the early adopters. Now, what we're seeing is solar is moving into the mass market arena, and most of the mass market consumers are very much motivated by the economics. They may have a reason—they may have an environmental reason to start shopping—but their final decision is very much based—whether they go solar or not—is based on economics. So very, very important reason.

ELLEN CONNELLY: Thank you. We'll move on to Allen.

ALLEN MOSHER: Good morning, everyone. I'm Allen Mosher, American Public Power Association. Thanks for the FTC for inviting me to speak this morning. It's a great panel. APPA is a trade association for municipal and state-owned electric utilities. We have a very different business model than most of the entities in this room. We're not-for-profit local-owned utilities. Our interest is in reliability and serving our customers at least cost with reasonable environmental consequences.

Just as a background, here's a profile of the electric industry. You can think of it in two different segments. There's the bulk power side of generation and transmission. That's an interstate grid. There's three large grids in the United States.

And then there's local distribution utilities. That's really where APPA members are concentrated. There are about 2,000 public power systems, and they're all in the distribution business, buying most of their power from the bulk power market.

What we see now with solar is really sort of a changing set of relationships between utilities and their customers. There's new expectations of customers on the quality of service. Customers are looking for new options. It's going to have broad reaching consequences on how we service going forward, but solar is just a start of these changes.

When you talk about renewables—if you look at this chart here—hydro is actually the biggest source of renewable energy we have in the United States. Wind is second. Solar, right now, is actually very small portion of the total. Conversely, though, when you go to capacity additions, what we see here is a rapid growth, particularly in the wind capacity, in the last couple years. Solar is picking up along with that, and about half of the solar is at rooftop, and half of it is at the utility scale, with community and commercial installation somewhere in between.

But regardless of how you think about these sources of the solar power, you have to remember that solar is really a non-firm energy product from a utility perspective. It doesn't have on-site storage. It needs to be backed up and replaced when the sun isn't shining by other sources of energy. And solar output is highly variable from day to day.

Let me show the slide here. In terms of prices, one of the things that's most important to remember is that there's about a two to one price differential between utility-scale solar versus the rooftop solar. And we're really trying to drive down what are called the soft costs that Elaine was referring to earlier. Those are actually increasing the cost at the distributed level, both at community solar and at rooftop. The panel

costs are really more or less the same. Inverters, they have some economies of scale, but really it's in the soft costs that make it much, much more expensive.

So from a utility perspective, frankly, it doesn't make a whole lot of sense to pay \$2, when you get something for one, and that's the problem with rooftop solar right now. It really is—for society as a whole—it's not cheapest alternative to get solar energy into operation.

Variability is a big deal. If you look at this chart here, the green line is the chart of a community solar project for River Falls Utilities in Wisconsin. They built a shared solar project for the community here. You notice it has a very peaky attribute in the middle of the afternoon. Well, for River Falls it actually did coincide with the peak load in that system. But they've got to fill in the valley surrounding that load with other sources of resources here.

And by the way, if you look at the actual output of that plant—the chart on the left side—the actual moment to moment variability is much greater. We can have periods where the output of the solar project will go from 100% nearly to zero and back to 100% in a 90-second period. That tends to cause some operational problems.

This is a version of the—we call, the California Duck Curve. How many of you have heard of the California Duck Curve? I'm surprised it isn't 100%, because it is sort of ubiquitous. But it is the example of the intended or unintended consequences of policymakers. It was intended by policymakers to do a number of things to push renewables into the California market, but it has a number of severe consequences.

So here's the normal load shape. And here's the wind output on the bottom. Here's your solar output. Bang. Hits it right in the middle of the day. And this red line shows the net load that the California ISO has to chase. It's sort of the equivalent—I like to think of the electric grid as sort of transitioning from a period of big diesel trucks on the highway that don't change speed very quickly, but are really pretty fuel efficient, to a bunch of Porsche Turbos flipping in and out of the lanes, and everybody has to adjust

to it. You can take your own metaphor, people on their cellphones talking on the freeway, and slowing down, speeding up.

But the point is that, for operational purposes, this is pretty tough for the system operators. And what it leads to actually is negative locational marginal prices in California, where they're actually dumping energy in the middle of the day into other states, into Arizona, and paying them to buy it. And this is a pretty good indicator of some problems in the market assignment we have.

So here's again—just to plot here. The most important part here for the California ISO is we've got about a 12,000 megawatt ramp in the late afternoon. This completely changes the generation mix that California has to have to keep up with the load. It's doable. These problems are all solvable, but they're not least cost for society.

Let's go on now to frequency excursions. And I want to use this to illustrate some of the problems in Hawaii, in particular. But this is a NERC slide that shows what happens on the grid when you have a loss of a large generating unit. Frequency drops very quickly, and then recovers as other generators respond to it. I won't go into the technical details, but it's very important that they respond quickly or else the whole system could collapse.

And they have a safe period where you want to operate within. Here's the recovery period. The recovery state where you want generators to respond and make sure they pick up for the loss of the generator. Down below is where you get into the potential tripping of generators. As some of the generators get to low frequency, they trip off, and that reduces the resiliency of the grid. That is they're getting to an area where they could be damaged.

And here's the red zone. That's where you don't want to be, and that's actually where Hawaii has ended up in some occasions—with actual under frequency load shedding. They've had to trip customers and generation to keep the grid operating.

So all of these factors combine to say that there are a lot of operational problems on the grid for electric utilities. They can have safety problems. These things

are manageable, but again, we need to have an interaction between customers, so that they have reasonable expectations about what compensation they're going to get for their solar panels, and that we as utilities understand what our customers are doing.

One of the things that concerns utilities the most is safety and also the security of the local grid. If we don't have visibility of when solar panels are being installed, there could be actual real safety issues for utility personnel, because if there's a generator that's hooked up, and it hasn't been done to code, when there's an outage on the system, the utility personnel needs to be in a safe zone of operation where the lines are not energized. And we could occasionally have a risk of a solar unit being connected to grid that we don't have visibility of.

Again if you go through the local zoning department and you go through the utility, these are all manageable problems, but what we want to worry about is a wild card. I see Carl over there shaking his head on this. These are manageable problems. But again, it requires an interaction between the utility and the customers to do it at least cost.

In terms of the path forward, APPA has a strategic initiative, which we call Public Power Forward. It's our attempt to respond to the changes and expectations of customers and what our members are looking for. Again, solar is just part of the set of changes. Again, there's a whole group of new technologies that will allow us to better manage the utility load curve, that will allow us to save significant amounts on investment in utility infrastructure.

My simple answer on the question, does solar save utility investment today? The answer's no. It's actually the opposite. It's going to increase our investment, particularly at distribution. One of the examples we have today in this transition is we used to build a megawatt of conventional generation and a megawatt's capability of transmission and some reserves to go with it. Now we build a megawatt of wind, a megawatt of solar, a megawatt of gas combustion turbines, plus all the transmission to tie it together and the distribution grid.

What we're seeing at the distribution level now with larger panels is potentially the need to increase the size of some of the distribution lines and transformers we have. That doesn't have to be the case. With good technology, and if we can flatten the load curve, we can actually produce a lower cost system to serve the public.

So in terms of rate design principles, the next panel's going to talk about that much more, but we have some basic principles that rates need to be fair and cover costs. Severin did a great job explaining the difference between social marginal cost and average cost. That is a dilemma for utilities. We've never been able to get right rates to be economically efficient and cover costs accurately. We have all kinds of social benefits that are included rates.

But the point is right now that with net energy metering, based on an energy only charge, it's never going to be an accurate price signal for customers or recovery utility costs. You can't solve a two variable equation with one variable. It just can't be done. So there are a lot of interesting great designs we want to pursue. Again, it's a matter of sending good price signals and meeting customer expectations.

The last slide on marketing. This is a really important issue and I'm glad the FTC is focused on it. The brochure on the left is one that I got through the mail. It appeals to both making money for my children, putting solar on my rooftop, keeping up with the neighbors, greed. The slide on the right is part of a flyer that one of our member utilities sends out to its customers.

I have real examples of a colleague with a 93-year-old mother, who just signed a solar lease for 20 years. Doesn't make a whole lot of sense. There are other examples of utilities being—in Colton's case, low-income customers being quoted rates based upon the neighboring utilities cost not their cost, when the utility just put in a five year rate freeze. Again, these things can be addressed through good consumer education. And with that I'll end.

MARK S. HEGEDUS: OK. Thank you very much, Allen. That was terrific. Just one question. Is it possible for a retail customer to disconnect from the grid and just rely

upon its solar panels, and enjoy the same level of service that they had when they were connected to the grid?

ALLEN MOSHER: It can be done, but it's not a very economic choice. A friend of mine's actually a solar installer from one of the major companies. He had a customer on 16th Street Northwest in DC. He's an IT guy. He's made lot of money. He's completely off the grid, because he wanted to be. I mean but it's not—with all the tax subsidies there, you could do it with a whole bunch of the storage.

But storage is really the key to it. You've got have energy sinks, energy storage, probably electricity storage combined with the solar panel. So it's like buying the transmission without the rest of the car if you just have solar.

MARK S. HEGEDUS: Right. Great. Thank you very much. Let's now turn to James Critchfield from EPA.

JAMES CRITCHFIELD: Great. Thank you. I just want to thank the FTC for holding today's workshop. It's been a really interesting discussion so far, and I think that it's an important discussion to have, particularly given the importance that I think solar energy is going to play in our future.

I'm going to, in fact, sort of shift gears a little bit. I'm going to be talking a little bit more about the environmental aspects of solar energy and the role, in particular, that Renewable Energy Certificates play in today's market. The U.S. electricity sector represents a significant source of air pollution, which includes greenhouse gas emissions. Roughly about 30% of the U.S.'s total annual emissions comes from the electricity sector. Those emissions range from carbon dioxide, a leading greenhouse gas, carbon monoxide, NOx, SOx; there's also heavy metals.

All of these have profound health impacts, ranging from different types of diseases, cancer, lung disease, bronchitis, chronic bronchitis, those types of things. And so the importance of solar to address those types of issues is an important element to think about.

As it relates to greenhouse gas emissions, the emissions from the electricity sector also have a lot of public health implications. Greenhouse gas emissions have health risks that include heat waves and droughts that involve worsening of smog. As well as the intensity of other extreme events, such as increased precipitation, frequency and intensity of hurricanes—all of those types of things—flooding. All of those have impacts related to public health as well.

To the extent that consumers recognize the environmental implications of their energy use or their electricity use, more specifically, this becomes a prime driver, as it was mentioned before. Economics, of course, often plays the ultimate choice in their decision making process as to whether to choose solar or not, but environmental reasons are a big reason for why a lot of consumers, both organizational as well as residential, are choosing to go with solar.

So as far as solar energy—solar energy is one of the most abundant and reliable renewable resources available. It is also a very clean source of energy in the sense that solar is a zero emitting technology and resource and helps reduce pollution and greenhouse gas emissions associated with the electricity sector.

There are also a lot of other benefits that solar offers that can sometimes be in other areas—environment, water savings, as well as land use benefits. Obviously, if you're deploying solar on rooftops, you're not taking up land resources that could be used for other uses. Water savings: conventional power plants use a lot of water for cooling. To the extent that solar doesn't use as much, in some cases, it is also an advantage. Although, solar does require some water use for cleaning panels on a regular basis.

And then there's the implication of how solar actually reduces emissions. Solar typically aligns with peak demand. And so it tends to reduce the emissions associated with our power sector that are at its most intense including the emissions of marginal units of generation, such as natural gas plants and other peakers that are used to

respond to that peak demand. And so the extent that the value of the emissions themselves tend to be at its highest is another benefit of solar.

Just shifting to a little bit of renewable energy markets here in the U.S. Renewable energy markets are broken into both compliance as well as voluntary markets. Compliance markets are defined through state policies, state RPSs. We talked a little bit earlier about the SREC carve-outs that some states have to incent solar development. These RPSs, or compliance markets, basically set a minimum requirement of how much solar energy or renewable energy that a utility must generate as a percentage of their total generation.

In contrast, voluntary markets are comprised of non-regulated entities or consumers, and these are organizations or households that are doing this through other reasons, oftentimes first and foremost an environmental reason. Sometimes it's economic, or maybe they have some sort of goal or objective in mind to use a certain amount of renewable energy for sustainability objective. These markets interrelate to each other.

Voluntary markets by definition are interested in ensuring that their purchase—the consumers in these markets—that their purchase is above and beyond what would otherwise occur through mandate. So most consumers in the voluntary market are interested, when they make a purchase, that it wouldn't have otherwise occurred because of the mandate. They want it to be incremental to that. That's a concept called regulatory surplus.

And another important concept for voluntary buyers is this issue of double counting. Double counting is demonstrated when you have a single megawatt hour of renewable energy that two parties are counting the same environmental attributes or benefits, and interestingly, compliance markets and voluntary markets use the same type of market instrument to verify both generation and usage claims. And so there's a natural tension that occurs in the market between those two competing market opportunities.

So just a few words about the role of Renewable Energy Certificates. Renewable Energy Certificates are tradable instruments that represent the attributes of renewable energy for every megawatt hour of electricity that is delivered to the grid. They are used by utilities to demonstrate compliance towards the state RPS's. They're used by voluntary consumers to make claims about renewable electricity use, or solar energy use. They also are used for substantiating environmental marketing claims, because the flow of electricity—the actual electrons on a shared grid—tell you very little about where they're from or what generated them. They're indistinguishable from each other. They're not little green electrons and little brown electrons. The Renewable Energy Certificate, which is generated at the power source, is effectively the only way to allocate the benefits that renewables has on a shared grid. So the generation of a Renewable Energy Certificate is produced at the solar array and then can be utilized by participants in the market to validate their ownership of that renewable energy generation on a shared grid.

This is really important simply because most of the organizations and consumers in the market definitely want to be getting something for the money that they're investing in these types of projects. The ability to have a Renewable Energy Certificate that provides you that ownership over the attributes and the claims that can be made from those attributes is an important part of just consumer interest.

RECs have a strong legal standing in our renewable energy markets. Note that there is a really good document that the Center for Resource Solutions publishes called, "The Legal Basis For RECs." It is a soup to nuts type of review of all the case law—all the federal, state, and local jurisdictional policies—that give RECs a legal standing as an instrument for conveying attributes between parties. As I mentioned utilities use them in compliance markets. Voluntary buyers use them for making renewable energy use claims as well as environmental claims.

Now the pricing issue is kind of an interesting one. Under these two markets—the compliance market and the voluntary market—you see a wide range of pricing or cost for these Renewable Energy Certificate instruments. The differences in prices are

driven by obligations placed on certain buyers and penalties that the utilities often have to incur for not meeting their compliance obligations. So those pricing implications play a lot into the decisions that developers, as well as consumers, need to incorporate into their decision making process.

Just quickly—the voluntary market is not insignificant. In fact in 2009, the market was as big or bigger than the RPS compliance markets. RPS compliance markets have since increased beyond that, but they are a significant portion of the development of solar in our country.

These are some consumer motivations. We've touched on a few these already. Environmental motivations, cost stability and energy savings are common particularly amongst homeowners. But I think with respect to consumer issues, there are tensions that occur between this interest of the utility to meet their compliance obligation, and using the REC to substantiate that, versus being able to give that REC to a consumer, who also wants to know that their purchase is doing something more than what the utility is regulated to do.

I think there's issues of having understanding around contract language. Of course understanding the trade-offs of monetizing your RECs. And the types of claims that not only consumers need to make, but developers in the market, who are selling a product have to make sure that the sale of that service or product is, in fact, substantiated by similar instruments.

ELLEN CONNELLY: Thank you very much. I'd like to just give you the opportunity to expand a little bit on those last points—the consumer issues around RECs—and I'm wondering if you could speak a bit about what information you think consumers should have about RECS and the role that they play in decision making process for retail consumers?

JAMES CRITCHFIELD: Sure. Yeah I think, interestingly, a lot of retail consumers don't know what a REC is. I think first and foremost understanding what RECs are and what role they play within not only project economics, but also on the environmental

level. It really represents the solar-ness of the energy that you're using, and without the REC, you are not actually using solar energy. That claim is being sold to somebody else. The REC has value, and so understanding that value, the pricing implications, what options you have, or how those RECs can be handled within a contract are all things that I think consumers need to have better awareness of.

We've, on a number of occasions—particularly with small businesses and in some cases with residential—received questions about just general contract language. It's not particularly clear or standardized of how RECs are described, what the implications of the REC within the contract are—those types of things need to be improved on for the market for consumers to make better informed choices.

ELLEN CONNELLY: Thank you very much. We'll move on to our last presenter, Tanuj.

TANUJ DEORA: All right. Thanks, everyone. For having me here. I'm Tanuj Deora, the chief strategy officer at the Smart Electric Power Alliance. I need to apologize apparently my phone was causing some interference. The reason I was on my phone was, Vikram mentioned Major League Baseball, and since he's a Boston guy and we're a little closer to Baltimore, I was checking out the standings to see how the Red Sox and Orioles were doing. I'm actually a Nat's fan, but we actually all should be 2003 Oakland A's fans, which I'll explain here, to all of us in the room, in a little bit about why that is.

A lot of great panelists. Really appreciated Severin Borenstein's remarks. He's one of the best primers that I've heard in my dozen years in the power industry as far as laying out the foundation. And of course our panelists have provided a lot of interesting information here. Really, really important, critical information. And so I'm going to focus a little more on process and what we're doing with our 51st State Initiative as the FTC has asked me to do.

Before I jump too far in though, I do want to mention our name change. I mentioned I'm from the Smart Electric Power Alliance, which until April, we were known as the Solar Electric Power Association. And a lot about the initiative I'm going to talk

about today, and one of the things I encourage all of us to be thinking about, is not just solar or distributed solar in isolation, but really thinking about distributed energy resources more broadly.

In our organization we really do believe that the solutions to getting an optimal level of deployment of distributed solar really is wrapped up in the solutions around getting an optimal level of DER more broadly, including energy efficiency, including demand response, including energy storage, and perhaps on the commercial scale, things like CHP and other things as well.

So panelists have already talked about—I think multiple folks have already talked about the growth of solar, and I wanted to just add a few bullet points about the typical utility responses. So pretty much any place where utility has seen adoption of solar, or is anticipating adoption of solar, they started some combination of these four activities.

On the bulk power system, they're starting to include procurement of utility-scale solar into their systems, as such increasingly become cost efficient. I think there's a critical mass, if not a broader consensus, that solar, or utility-scale solar, has a place in most utility portfolios across the country.

They're starting to explore community solar options, which has also been mentioned I think by Elaine, as an interesting viable option where utility can get involved in centrally locating a resource that consumers can take an ownership interest in. And of course, they've been talking about redesigning rate structures, which is the bulk of the panels that follow, as well as getting smarter about visibility of deployment. And Allen shared a lot about some of the implications of not having visibility on deployment of PV and not making investments to respond.

But a smaller number, maybe about a dozen or so utilities across the country, are thinking a little more beyond. They're thinking about this from a DER perspective. They're thinking about a new paradigm of engagement with consumers—utilities across the country, so the big California investor-owned utilities, primarily prompted by their Commission, but also on their own initiative. Utilities like Green Mountain Power in

Vermont, Steele-Waseca in Minnesota—a number folks are starting to look at this from a more holistic perspective.

But it's still not be the primary—if you look at all utility employees, and the entire utility perspective, and especially what's being filed at PUCs across the country—it's not the primary perspective. The perspective we have is a little more this—and I think this is where we get into process and our role that we think in helping DER deployment—is trying to help overcome what has developed.

Although utility folks understand that there is some value to distributed generation. And folks in the consumer side, the third party finance companies for solar and the like, aren't saying, let's get rid of the grid. Some of them are, but most of them are not.

What's happened with the existing adversarial processes is that most of the filings have seemed to fall into these camps, where you get utility perspective, which is the grid provides all the value and DGPV just imposes a bunch of costs—we may have heard a little bit of that in a previous presentation—and the consumer perspective, which is, my bill is just a cost. What I really want is empowerment. And so DGPV provides all the value, which creates an inherent conflict.

And of course this is complicated. This conflict is complicated by a laundry list of factors. I've listed some of them there. It's not an exhaustive list. Most fundamental is that fact that we don't have much clarity in the trade-off between the different things we expect from our power system—so low cost, clean, reliable, safe, least risk. Just those are challenging enough, trying reconcile those in the short term and long term. Questions: I think Professor Borenstein mentioned the need to consider both temporal and locational price differentiation for consumers. That's actually very controversial. I think less so the temporal, actually maybe not at all the temporal, but definitely the locational is something that I think a lot of utilities and commissions would say is not something that they would consider.

But there has been a fundamental challenge. We've seen it in places like Arizona, in Nevada, in large parts of the country. And so at SEPA, we've been thinking for a couple years now about how we can make sure that the conversation—that adversarial clearly has its place—but is there a space—because there's lots of smart people in this space who fundamentally want to do the right thing as far as seeing a transformation of a cleaner grid and a more consumer friendly grid that meets all our societal aims—is there another platform that we can provide that helps get those smart folks thinking together about how we can move forward?

And so we developed, a couple years back, our 51st State Initiative. It's a phased approach. As I mentioned, it is a platform. It is primarily crowd-sourced from an insight perspective.

We're in the middle of our phase two of that. So phase one was about building, or starting, a community of subject matter experts to have conversations—starting with a blank slate approach. So saying, if we assumed we had no existing regulatory or statutory infrastructure, what kind of world, what kind of state, what kind of set of rules and market regulations we want to see to help enable an optimal DER future—not a maximal, but an optimal DER future? Recognizing, and the assumption is, that we're not there today.

We actually got a couple of interesting papers—one from Allen and one from out here in the audience—that make the case that maybe you don't have to change—a pretty good case actually. But we wanted to ask that question and get a lot of thoughts out there. And Karl Rábago, who will be speaking later, wrote an excellent paper on that as well. We've got about 14, 15 different visions for what that optimal future might look like in our phase one.

We started workshopping that with a variety of different stakeholder groups, culminating in a summit that we had in April of last year. And that got us ready for our phase two, which is to say, all right, here's some really thought provoking ideas. We don't have consensus on any of these models, but we have some interesting

conversation going and definitely some minds being opened and eyes being opened. Let's think about continuing, resetting that process, but also looking now about how you might transition from where we are today into those future markets. Well, those future market structures. And I'll talk a bit more about that in a second.

And then that's anticipation of a phase three—which we hope to be launching in the fall—which is, OK, we have these visions of the future. We have the tools that have developed out of this phase two. Now do we have a tool kit in which we can actually engage with states about their own transformations? So starting with the end in mind, the blank slate, then thinking about the challenges of how you transition, making sure we're holistic, and measured, and internally consistent in our thinking as we go forward. And now do we have the tools to actually let states, policy-makers, the stakeholders in the industry figure out what that future state will be?

So for phase two, I mentioned we asked—again a crowdsourced effort—we've got about 15 different submissions. Again, APPA, NRECA, Siemens, APS, PSEG, a number of utilities, a number of advocates, unique concerns scientist, other subject matter experts, Accenture, consultancies, the like all came together and provided these road maps.

We asked them to address six different lanes in these road maps to make sure that we had truly comprehensive transition plans, or transition proposals. And we brought that together with an Executive Leadership Council—which again provided a balanced folks of DER technology solution providers, utilities, advocates, other folks together—and had a total of about 120 folks participate—including a few folks in the room—in a summit to discuss these road maps. And we got some key takeaways from that. There's a lot, as you can imagine, with that much expertise, with that many submissions to go through. We're pulling out right now what the key takeaways are in several different formats.

So one of the formats is something we call “No Regrets Moves.” I'll dive into these in a second. Besides these, we're also working on customer and regulatory

journey maps. We're working on some sample lanes, or sample roadmaps, as well. Some guiding principles that we think we have consensus on. But these “No Regrets Moves” were something I thought I'd share here—particularly interesting. You can read through those. The slides will be available. One in particular—this is where *Moneyball* comes in, or the 2003 A's come in.

So as folks who've read the book or seen the movie know, Billy Beane somewhat revolutionized baseball by getting away from evaluating players based on a bunch of heuristics—rules of thumbs, the gray-haired scouts kind of knowing what a good shortstop looks like, or knowing how to assemble a team—and actually moving through to a system that was driven by data analytics.

Well, our distribution systems today are primarily driven by rules of thumb and a level of just the experts kind of know. I think the case in Hawaii is a great case study of that. Whereas HIKO, the Hawaii utilities, said, we only think that we can host 50% or 75% of the minimum daytime load of solar DGPV on our system before we start having problems. And that just politically wasn't feasible, so they blew through that 75% minimum daytime load constraint. We got to 100%. They said, that's a problem. They went up. They want up. There really wasn't a strong sense that we knew for sure what that level of limit would be.

I know I'm out of time, so I'll turn it over to questions, but I do want to encourage everyone to engage with us. Check out the website. Come engage with me afterwards. I'm happy to share where we think this process is going.

MARK S. HEGEDUS: So just one question regarding the role of storage. Can you talk to us about the role of storage in increasing the penetration of solar generation?

TANUJ DEORA: Sure. So I think it is an enabling technology. I mean there are companies that are very compelling business models, or very interesting business models—companies like Sunverge, what SolarCity is offering Hawaii—that are pairing directly solar with storage on a customer site. Those applications are interesting, but we think there's a broader benefit of storage on the grid, thinking more holistically. Right?

So we don't need to firm the solar generation behind each customer's meter. We need the whole system to hang in the balance and work well.

And so if you look at the combination of energy storage, demand response, efficiency, EVs, that portfolio overall needs to balance. There's a bit of danger in thinking about storage just as a way to integrate renewables. Storage provides value, even if we didn't have distributed renewables onto the system, or can provide value. The cost is still pretty high, but as the costs come down, we think storage will be increasingly important regardless of renewables penetration. But because it makes for a stronger, more resilient grid, it will have those benefits to deployment of distributed solar as well.

MARK S. HEGEDUS: Just a follow up on that. Where do you see us on the storage path? Are we at the early stages of the technology? Or are we pretty far along? What might we expect?

TANUJ DEORA: Well, I'm not a technology expert, but we're definitely seeing some very positive signs. Folks are talking about storage being on a similar type of cost to client curve that solar has been on. And so if that's the case—while solar is not cost effective in every market in the U.S., especially at the distributed scale today—we can see that path. And so if storage is on that same path, which there seem to be reasons why that's the case, then it should be a very promising technology for us going forward.

It already is in the money in certain applications. There are folks who've deployed solar grid scale for frequency regulation markets in PJM. We've seen it to replace transmission upgrades in places like Texas. So there are some niche applications where storage is already in the money. And we expect those to continue and potentially be as big a deal as solar.

MARK S. HEGEDUS: Great. Thanks.

ELLEN CONNELLY: OK. Thank you, to all of our panelists. We'll now move to the open question and answer session. And I would like to start that off by asking the panelists whether there's anything you heard from your co-panelists to which you'd like to respond, or whether any of the presentations raised any questions for you that you

would like pose to any of your co-panelists? If you'll just either flag or turn your card up. Yes, Allen?

ALLEN MOSHER: Just for Tanuj's discussion, the 51st State, I thought that was a really interesting dialogue. What it points out is sort of a collaborative enterprise between different market segments, that haven't been used to talking to each other, to work together to build a better integrated grid—as [INAUDIBLE] talks about is really important if we're going to make this whole system work well for consumers.

We got changing customer expectations and lots of different visions, but frankly—that was one of the points I emphasized at the last summit is that there's a role for everybody that was in that room to work together, particularly for my members who are small municipal utilities in general. They can't do it alone. They need partnerships with solution providers in the industry. And that's a very diverse set. We're really early on the technology maturity scale for technologies other than solar.

In terms of smart grid applications, the main benefit for smart grid is in distribution automation, so that we know when our customers are out. But on top of that, that provides a lot of integration possibilities for solar to reduce the cost and again and the solar output.

ELLEN CONNELLY: Thank you. Anyone else?

MARK S. HEGEDUS: OK. Let's turn to some questions from the audience. We've gotten some really terrific questions. We're not be able to get all of them. The FTC, however, is going to make your questions part of the public record of these proceedings. So they will certainly add to the dialogue and conversation that we've continued here today.

So the first question I want to ask—and this is for any of the panelists to take on—we've heard talk about microgrids. What are they and what role do they have in this sort of future electric supply that we've been talking about?

ALLEN MOSHER: I hate to play jeopardy of being the first out. Public power systems are the original microgrid. We were operating in isolation separate from other utilities. Because in the early 1900s, men from small towns in Iowa went to Chicago and saw the lights were on there, and wanted that and brought it home. So they hooked up generators. They pretty soon figured out as soon as they could get interconnected with other utilities, it would rapidly reduce the cost.

In just about every infrastructure, every industry, we see the benefits of integration to larger and larger networks. There are very big network economies for society as a whole and for the economy. I don't think electricity is any different.

The rule of microgrids though, is in power quality for those specific applications where you need a superior power quality. And that's the main benefit. Whether it's a military base that has mission assurance rules that they have to accomplish, or a university that wants to maintain certain levels of power quality and integrate with the combined heat and power on campus for server farms, that's where a microgrid really makes sense. In terms of regular customer applications and residential, or small communities, maybe. But I don't think the economics payback.

MARK S. HEGEDUS: Tanuj?

TANUJ DEORA: Yeah. Thanks. I think just to build a little bit on what Allen had mentioned. Really a microgrid through the application seem to be for somebody who's looking for some sort of premium service. So power quality. But I think resiliency is also another place where microgrids could be interesting.

There's different models for how a microgrid could be created. If you're bring power to some location for the first time, you might think about making a microgrid so you have that either power quality benefit or that increased resiliency. If the rest of the grid goes down, you can island yourself and keep going. Other folks are retrofitting, effectively, a microgrid by trying to do some islanding work.

But it really is right now a premium product. And I think most of the interest that we're seeing, in places like New York, is really driven by a resiliency benefit, where with

the bulk power system we have, we get a ton of efficiency, really, really effective cost, and we get increased reliability.

But some folks are saying the resiliency, if something does go wrong, then I want to be able to be in control of being able to restore my power. And if you're part of the bulk power system without a microgrid, you can't really do that.

MARK S. HEGEDUS: Just a real quick follow up. Explain for us what we mean by power quality and by resiliency. For those of you who go to NERC meetings and things like that probably understand what that means, but there's probably a lot of us here who don't.

TANUJ DEORA: Well, Allen you can take power quality. I'll take resiliency. Resiliency is basically being able to recover from an outage quickly. Reliability is not having an outage. And resiliency is being able to recover quickly when it does occur.

ALLEN MOSHER: That's a good short answer for it. In terms of power quality, a minor voltage blip for a server farm is not acceptable, because you could damage equipment or cause an outage. If that happens to Google at a server farm, they'll probably be backed up, but that's mission critical for them. So they're looking for very high power quality. You can do that by conditioning equipment on-site.

But again, if you had a wider grid area problem, they want to maintain that service. And so they can have on-site generations, for example, to back it up and bulk power, high EHV, or extra high voltage connection potential.

MARK S. HEGEDUS: Any other comments on microgrids? OK. I want to ask a question about demographics of residential solar power customers. What do we see? Who is adopting rooftop solar? Do we see differences in terms of socioeconomic groups, racial groups? Or urban verses rural? Any insight that you can offer on that from any of the panelists?

VIKRAM AGGARWAL: Sure. Actually we did some pretty detailed research. I don't have exact data in front of me, but I can actually provide that data. In terms of

demographics, in terms of age groups, the biggest age group that is shopping for solar is the 40 to 55. There's a pretty strong uptake among near retirees and retirees, because it helps them fix their energy costs. So there's definitely a lot of uptake there.

In terms of other demographics, ethnic backgrounds and another, we actually see pretty even if not an even distribution among different groups who are adopting solar. I would not say that one particular demographic group is overtaking the installation, but it's pretty widely spread out.

ELAINE ULRICH: Yeah. So we have a program called, Solar Energy Evolution and Diffusion Studies. And so we look at why people make the choices to go solar. Retirement is a big time period when folks start to think about considering it.

But in terms of attitudes and interest, as Vikram was saying, it's fairly universal. Different marketing messages are more effective for different demographic groups, but overall the interest tends to be very, very broad.

We've seen some early studies that indicated that the majority of residential systems were installed by households that had incomes between \$40,000 and \$80,000 a year. And we do know that there is a gap in that low income customers represent only 5% of solar installations. But nonetheless, the interest level is high across demographics.

MARK S. HEGEDUS: Tanuj?

TANUJ DEORA: Thanks. I would encourage us, again, to think more broadly about DER options across the board. So while there might be certain products or DER technologies that are attracted to certain demographics, there are a lot of different options, if you look at demand response efficiency. There are things that can be done—put in combination—that should be able to not only fit within any individual consumers pocketbook or may resonate with different consumer groups, but really can be coupled together. So if you can couple together energy efficiency, and demand response, and solar you could buy down the economics and make them more attractive.

Some utilities—I think the question is, there are probably some broad trends when we think about actual deployment. It's going to depend on service territory to service territory. And so some utilities are starting to actually look at and model propensity to adopt as part of their work. So not only understanding the distribution system grid from a physical perspective, but also the propensity to adopt. And the consumer engagement and how you influence a message to consumers together to put together a really comprehensive look at their service territory to try to do that. SMUD for example, the Sacramento Municipality Utility District, is doing lots of interesting work there.

VIKRAM AGGARWAL: Just to add to Tanuj's point. EnergySage is working with National Grid, where we are combining an energy efficiency program with solar program, and the consumers are being encouraged to take energy efficiency actions and being rewarded with better incentives for installing solar.

ELAINE ULRICH: Right. And again through the studies that we've seen, there is actually—for residential installations—there's a clustering effect. Because people can see the technology and it makes them ask the question, what does my neighborhood know that I don't? So we've been able to do advanced modeling—to do what's called, Agent Based Modeling Behavioral Economics—to show how those clusters spread. And that can help with distribution planning and also with program design, because you can get out ahead of and understand where—utilities can look at where the strengths and weaknesses of the grid might be along with the consumer behaviors, so that as they can work design their programs and either get ahead of those upgrades that need to be had or help encourage folks in different neighborhoods.

So I'm thinking in Texas, they've done some really innovative work on this. So for example, CPS, a public power organization, they actually are deploying solar on rooftops in low income households and then basically giving those folks a discount, like a \$0.2 or \$0.3 credit on their utility bill, for hosting that solar, because they weren't getting uptake on the residential program in a certain low income section of their grid.

MARK S. HEGEDUS: James?

JAMES CRITCHFIELD: Yeah. I'd add that the community solar space is one that is particularly focused. There's a lot of dialogue going on with respect to the low income. And DOE, and EPA, and HUD, and USDA have a national community solar partnership that is focused on community solar in particular, but also has a distinct focus on the low income element of that. And how traditionally low income communities don't, perhaps, own their buildings. They don't have taxable income levels that allow them to take advantage of a lot of the incentives and other things that are otherwise available to others in the market. And being able to leverage different models for deployment to effectively make it more accessible to these other communities is something that's actively being discussed.

MARK S. HEGEDUS: Allen, yes?

ALLEN MOSHER: We just had our national conference for APPA in Phoenix. The sessions on community solar in the breakout sessions were packed. The palpable interest among APPA members in pursuing that option. They really come actually in a couple different flavors.

One is the one we've talked more about, shared solar, where is the utility or a third party arranges for customers to buy in, and there are a variety of different approaches for doing shared ownership or control of the project. There's also the community scale project that's owned by the municipal utility. Both are good ways of getting solar into a community. And there's actually a lot of pride that the communities have to say that they're embracing new technologies and trying to green up their power supply portfolio.

So I expect to see a lot of that. And it has a major price advantage too. In addition to overcoming the problem that the vast majority of households, their roofs aren't suitable for rooftop solar, so let's find the best way to do it.

ELAINE ULRICH: Yeah. We have a recent NREL study that indicates that 49% of households can't host a solar array. And even the ones that can, the size that we're

looking at was 1 ½ kilowatts, which is very small. And so, yeah. The siting benefits, the economy of scale benefits, you can really start to do some interesting work when you look at those transactions, enabling those transactions. And really there's no reason—folks sort of act like you either have to have solar and be 100% and it's on your roof or you just have to take what's in the utility. As though folks can't have a transaction, where they choose 20% or 40%. Or they may be getting more or less power from a particular resource on a seasonal basis, depending on how it's generated.

So there's been this sort of false discussions, as though this is not transactable—much like, RECs even. And even in the REC marketplace, we've seen folks can potentially sell one set of RECs and buy another set of RECs at a different price and still have those green attributes. So really enabling those transactions helps to create that flexibility in the marketplace that's highly enabling for a number of players.

VIKRAM AGGARWAL: And just to add to that. I think community solar could be a really good product. We are hoping that the product actually that is being offered to the consumer is pro-consumer. Today at the early stages, we are finding that the economics are being kept by the community solar providers, and the contracts that they're offering the consumers are very complex, long term, not easy to understand and get out of. So as those products become more consumer centric, I think community solar could be a very net positive.

MARK S. HEGEDUS: Tanuj?

TANUJ DEORA: DOE is actually funding some work that SEPA's leading up with some other partners on what makes community solar attractive to consumers. In fact, we just received back the results of some market research of about 2,000 different consumers from four different regions in the country, looking at how they think about the minimum term. Do they want to pay up front? Do they want to pay over time? All those types of factors. That report will be coming out here pretty shortly.

But two other points I wanted to mention about community solar. First, not only does it have economy scale and signing benefits from a consumer perspective, it has

signing benefits from a utility perspective, or potentially could. In fact, Madison Gas And Electric—when they designed and applied to the Commission for approval of their community solar program—actually included that half the cost of the inverter should be borne not by the community solar participants, but by all customers as part of a system benefit, because of the Volt-VAR support and their after power support that the community solar project can create.

And distributed solar could do those same types of things. It's just a little more complicated to do 100 systems as opposed to doing one system from that perspective. So it's the first step to that. But the other point I wanted to make was there are consumer protection issues around community solar, which were alluded to. And one of which we actually wrote a member brief on this in February was are consumers actually buying renewable energy when they subscribe to community solar if the RECs are being sold. And there some lack of clarity there. I'm sure FTC is very familiar with some of those issues. But something to keep in mind that doesn't get away from some of those consumer protection issues.

ELAINE ULRICH: I'm just shaking my head, because a number of these folks are talking about stuff that we're funding. I'm like, I don't have to talk about everything thank you. [INAUDIBLE].

MARK S. HEGEDUS: So I just want to throw out one last question. And then we've talked about solar as this renewable and green resource, but how long do solar panels last and what you do with them when they're worn out? Are there any environmental issues associated with that?

ELAINE ULRICH: Sure. So the typical solar product has a warranty around 25 years. We certainly have seen products that have been out in the field longer than that. And in terms of what happens at the end of life. Right now, there's not a very strong supply chain in place for recycling and reuse.

But I'm going to go back in time to around the Recovery Act, when there was a program that was called Cash for Clunkers—I don't know if you guys remember this—to

take vehicles off the road that had some emissions related issues. And basically you saw that the automotive recycling industries found out very quickly to be able to accept all those vehicles. And solar has similar kinds of materials that are involved, aluminum, or steel, concrete, glass, silicone is inert, there are some recoverable metals. For a while solar panels had a lot of silver in them in the contacts. Although now, they've moved to less expensive kinds of contacts.

So I would imagine that folks who are in the automotive recycling space would probably pretty quickly pick up on and start to get in the supply chain—be able to get involved in that when there's sufficient volume.

MARK S. HEGEDUS: All right. We're out of time. But I want to thank our panelists. It's been a really interesting discussion. We'll be going to a break, so I'm sure any of them would be happy to have you come talk to them. The next session is going to start at 11:15. Join me in thanking our panelists.

[APPLAUSE]

[SHORT BREAK]

PANEL 2: NET METERING: PRICING SOLAR DG AT RETAIL

Panelists:

- **Severin Borenstein, E.T. Grether Professor of Business Administration and Public Policy, Haas School of Business, University of California, Berkeley**
- **Philip D. Moeller, Senior Vice President of Energy Delivery & Chief Customer Solutions Officer, Edison Electric Institute**
- **Karl R. Rábago, Executive Director, Pace Energy and Climate Center, Elisabeth Haub School of Law, Pace University**
- **Jon Wellinghoff, Chief Policy Officer, SolarCity**
- **Tim Woolf, Vice President, Synapse Energy Economics**

Moderators:

- **John C. Hilke, Economic Consultant to the Federal Trade Commission**
- **Derek W. Moore, Attorney Advisor, Office of Policy Planning, Federal Trade Commission**

DEREK MOORE: Good morning, and welcome to the second panel today entitled “Net Metering: Pricing Solar DG at Retail.” My name is Derek Moore and I'm an attorney in the Office of Policy Planning here at the FTC. To my immediate left is John Hilke, a former staff economist in the FTC's Bureau of Economics, who now consults for the Commission. John and I will be co-moderating this panel.

Our distinguished panelists will discuss a number of issues related to a single question: how much, if anything, should an electric utility have to pay for electricity a customer self-generates at his home or business? Our five panelists bring a wide range of knowledge and expertise to our workshop. And I'd like to introduce them in the order in which they'll be speaking.

Phil Moeller is the senior vice president of energy delivery and chief customer solutions officer at the Edison Electric Institute and is a former commissioner on the Federal Energy Regulatory Commission. To his left is Jon Wellinghoff, the chief policy officer at SolarCity and a former chairman of the FERC. To his left is Karl Rábago, the executive director of the Pace Energy and Climate Center at the Elisabeth Haub School of Law at Pace University. To his left is a familiar face, Severin Borenstein, who is the E. T. Grether Professor of Business Administration and Public Policy at the Haas School of

Business at UC Berkeley. Finally, to his left is Tim Woolf, the vice president of Synapse Energy Economics. Phil, the floor is yours.

PHILIP MOELLER: Well, thank you, Derek. Thank you for holding this workshop. We appreciate the FTC looking into these issues in kind of a factual—taking some of emotions out of it.

It's a very exciting time in the electricity industry right now. Customers have more options, and they want more options. It's partly because we have a smart grid now that if you contrast to say, 35 years ago, we didn't. And so in that sense, there is something new under the sun. It's a two-way system. We've got 65 million smart meters in. People not only can have information flowing both ways, but power can actually flow both ways now, which is mainly the reason we're here today.

On the other hand, there is something that isn't new. And that is essentially what the focus of this panel is, which is: how do you compensate generation that's attached or that connects to the grid? That issue has actually been around since PURPA was passed in 1978. So, to the extent we have a new system, but to the other extent, we have the same issues of how to compensate generation.

When we talk about solar—and some of this was mentioned by Dr. Ulrich today—we want to keep in mind that the issue of private rooftop solar—which is expanding, is great—but actually the universal scale, utility scale solar amounted to 60% of the installed solar capacity last year. So the electric companies are definitely promoting solar. Customers want it. And we want to make sure that there's more available.

And as noted, I think by Mr. Agarwal, there are now over a million rooftop private solar installations. That number is expected to go up. Those are interconnected by the electric companies, by the cooperatives and the municipalities. And so those interconnections are going on. And those interconnection times are down to a day or two in some of the higher of areas penetration. So that is a success story in terms of getting private solar onto the grid.

The key questions, though, are really how much are these facilities going to be paid when they send electricity back to the grid? And are these facilities paying their fair share of the grid cost to maintain and accelerate the smart grid—essentially the distribution system? And the reality is that the smart grid that we've talked about a little bit today—but it's actually the enabling technology that allows all this to happen. So the proper investment signals to, again, maintain and expand smart grid are absolutely essential.

And those decisions are made by state regulators, sometimes state legislators. And we're glad that you have a couple of members of NARUC who will be speaking after this panel to give their perspectives. Because that's where the decisions are made and will continue to be made for the foreseeable future. Part of this is related to an effort that NARUC is undertaking to re-look at state rate designs. And that's important, because we're in a historical changing point.

Typically the bill—most people know this—but the bill that you pay, if you take out the taxes and fees, consists of three elements. It was referenced this morning—the cost to generate the power, the cost to transmit the power, which is typically regulated by FERC, and then the cost of the actual distribution grid—the smart grid that delivers it to the neighborhood.

And traditionally, most of the costs in that third category—to maintain and expand what's now increasingly a smart grid—have been put onto the commodities side. That was referenced this morning by the professor as well. And that's pretty inelegant ratemaking in terms of cost causation. But it's sustainable in an environment when consumption is increasing and demand is increasing.

But one of the things that we haven't mentioned this morning is that actually, energy efficiency programs work. And they've been effective. And we're now in an era where demand is either flat or declining. And in that era, that exposes kind of the historical flaws of putting the distribution smart grid costs onto the commodities side.

And what happens is if you're talking about compensation at the full retail rate for net energy metering, that means essentially that we contend there's a subsidy involved where the private rooftop solar owners are not paying their fair share of the distribution costs. And in fact, they're having other people who don't have solar pay their share of the cost. And as the grid needs to expand because it's getting more dynamic, these investments need to increase.

Typically, the average American pays \$110 per month for electricity in terms of their final bill. That's a very generic average. But generally speaking, the percentage of that \$110 that actually is a cost to maintain the smart grid and expand it, is somewhere between \$45 and \$70—a huge portion of that bill that right now, if allocated to the full retail rate of net energy metering, again, has non-private solar rooftop people subsidizing those who own rooftop.

We think this is a manageable problem through rate design. Again, NARUC is putting a lot of effort into this. We look forward to that. And this will continue for the year.

The other point I'd like to point the FTC staff to is when you're talking about compensation, I would like you to consider the comments you put into the record during FERC's Order 745 process where you were very concerned as an agency about over-compensation of demand response resources. And finally, I just urge you as you look into this and you put your report together to get out there and take a look at things. There are some amazing things going on out there.

Actually seeing how a distribution system is operated, particularly say in Southern California or Hawaii where there are challenges—manageable challenges, but real challenges—in terms of dealing with the variable nature of this generation. And going back to the duck curve that Allen Mosher showed today, the need to keep the system in balance—and actually seeing that in action, I think you'll find fascinating. It will be helpful in your report.

I look forward to questions, and answers, and more panel discussion.

DEREK MOORE: Before we move on to the next panelist, I just want to give everyone an idea about how this panel will proceed. We are going to each of our five panelists give an opening presentation. And then John and I will moderate a discussion following that. And any of you in the audience who has questions, flag down one of the staff members in the aisles for a question card. And write a question down. It will be brought up to us, and we will try to incorporate those questions into our panel discussion.

With that, Jon—

JON WELLINGHOFF: Thank you, Derek. As Derek mentioned, I'm Jon Wellingshoff. I'm the chief policy officer of SolarCity. That's a 14,000-plus employee company that is primarily focused on delivering distributed energy resources to consumers in the US, primarily solar PV and storage. We serve customers in over 27 states and the District of Columbia, and we are the largest provider of distributed energy resources in the US.

I'd like to certainly thank Chairwoman Ramirez and the FTC staff for having this workshop. I think it's a very important thing to have. I think it's a very important subject and one, as a former regulator with the Federal Energy Regulatory Commission for seven years as a commissioner serving with Phil, I can understand the challenges relative to a changing dynamic in the utility industry and the changing consumers' choices and the consumers' desires to have choices with respect to distributed energy.

It's also good to be back at the FTC. That 40-year-ago workshop that Chairwoman Ramirez talked about on solar—I was here then. I was actually a staff member in the Energy and Product Information Division of the Bureau of Consumer Protection under Chairman Pertschuk. Chairman Pertschuk hired me out of the Senate Commerce Committee to come over and actually focus on solar. And I focused on solar at that time. So it's good to kind of be back home here.

So the first thing I'd like to talk about is in looking at compensation for solar, we believe that consumers fundamentally have the right to self-generate. In fact, I wrote a paper on this with Steve Weissman from Boalt Hall, environmental attorney there at the

University of California Berkeley, on that fundamental principle that we think is grounded in federal law, and PURPA, and state laws, and also in common law.

And the right includes the right to offset all internal consumption of electricity with self-generational on a one-to-one real-time basis. So we think that's a fundamental right from the standpoint of compensation that—you need to understand that people do have that right to offset all the usage that they have with that generation if they do want to self-generate on their facilities.

Consumers also though have a right, we believe, to interconnect to the grid in a nondiscriminatory basis like everybody else. And simply having self-generation is not sufficient justification for putting the consumer in a separate utility rate class or imposing discriminatory rates against them. We do agree though that solar consumers, like everybody else, should pay fees to be interconnected and take service from that grid. But we think that those fees should be commensurate with that level of service. And it should be similar to the fees that are paid by all other consumers.

We do believe the distributed energy resources provide net benefits to the grid. And this is probably one of the biggest areas of controversy, but net metering has served as a sort of simplified method and a consumer-friendly proxy method for determining what these net benefits are. We think though now that there are more sophisticated models and analytical methods that are available for state regulators and others to use to determine pricing for the net excess generation that consumers generate from their own solar systems.

So solar and other distributed energy resources we believe can reduce utility costs. And costs we believe can be reduced across all segments of utility operations if solar deployment is factored into utility planning. For example, California recently canceled 13 transmission projects that were scaled to be put in place by the California ISO, and saved \$192 million in doing so on the basis of determining that distributed solar and energy efficiency had now made those projects not needed anymore.

So ultimately, the California ISO determined that solar did save costs in the system—\$192 million. And ignoring these distribution benefits in utility planning will result in redundant investments for utilities and impose unnecessary costs on all consumers.

So we have questions with and I think would raise the concerns with the utility concerns about the issue of what they call “cost shifting.” We believe that the claim of cost shifting is not fact-based and has not been, in fact, determined with substantial evidence. In fact, there have been, in some jurisdictions, imposition of fees on solar consumers based upon this alleged cost shift without that substantial evidence. Wisconsin was one example. We Energies—there was a fee in place. And that was overturned on appeal by the courts. The courts said there that the PUC did not have enough evidence to impose a fee.

Another example is Nevada, my home state. The Commission there imposed a fee but admitted in their own decision that they did so based upon limited evidence, that they neither had the adequate evidence or time to look at all the factors regarding the benefits of solar but yet imposed the fee anyway with some really, very disastrous results ultimately.

So we believe comprehensive cost-benefit analyses should be performed to determine the net benefits of solar DG to customers and to the grid. And we think that there are defined benefits that we can look at. In fact, the Nevada Commission, in their subsequent order to the previous one the put a fee in place based upon a limited review of the benefits, enumerated 11 benefits that they believe now should be reviewed and have indicated they will be reviewing in future cases to look at the full benefits.

But going back to the Nevada case, the result of that case, of that incomplete decision of imposing excessive fees on solar customers, resulted in consumer applications for solar going from 1,500 per month in Nevada to 15. So it basically killed consumers' ability to choose solar in Nevada.

We do believe that rational compromises can be achieved on these issues of determining cost for solar. And one model that we believe should be looked at for the country is New York, where the solar industry and New York utilities spent four months negotiating the settlement position on solar pricing. There, we all agreed to a glide path with net metering being a proxy until 2020, and in the interim, a full and fair analysis will be conducted to determine the costs and benefits of solar to consumers and to the grid. So we believe that's a rational way to proceed on this issue of solar pricing.

Also we believe that people should look at the tenets of grid neutrality. And grid neutrality is a concept that I have developed with a number of others in an article in the *Public Utility Fortnightly*. We think there are five basic tenets which will in fact increase efficiency of the grid and increase consumers' empowerment to ultimately make choices on the grid.

The first tenet is to empower consumers while maintaining universal access to safe and reliable electricity at a reasonable cost. The second is to demarcate and protect the commons. And this is, in essence, establishing clear operational and jurisdictional boundaries for public and private interests, and also recognize adjacent jurisdiction between FERC and the states as was done in the case recently decided by the Supreme Court in *FERC v. EPSA*.

Align risks and rewards across the industry is the third principle, where we can allocate financial risks to those who are willing to assume them and safeguard public interest by containing risk at the same time. Create a transparent and open grid is the fourth principle—to promote open standards and data access throughout the grid and prevent any single party from abusing its influence as to grid investment and financial and operational decisions. And finally, the fifth: foster open access to the grid by allowing all parties who meet open, system-wide standards the opportunity to add value and improve grid efficiency.

So in conclusion, we believe that consumers have the right to self-generate and use that generation to offset their usage. The consumer should not be charged

discriminatory fees if they choose to have solar. The consumers with solar have a right to interconnect and use the grid like all others. And the consumers with solar should pay fees to be interconnected, similar to all others.

Consumers with solar should be compensated for their net excess generation at a rate that considers the benefits solar provides to the grid. And consumers deserve to have solar cost-benefit studies conducted in a fair and comprehensive manner in an evidentiary proceeding. They're also entitled to have distributed benefits fully considered and incorporated into utility planning.

And we also believe that consumers would benefit from a solar industry and utility industry compromise settlement on price to solar consumers, similar to the structure of the New York settlement. And finally, we do believe that consumers will benefit from a more efficient, and cost-effective, and open, transparent grid if the principles of grid neutrality are instituted. Thank you.

DEREK MOORE: Thank you, Jon. Karl, the floor is yours.

KARL RÁBAGO: If you guys will pass the slide clicker down—thank you. And my thanks too to all of you for attending and for the FTC for putting on this important discussion. Yesterday, I had the opportunity to be at a conference in Tampa. And there was somebody who made a comment that was sort of expressing some skepticism about whether the Federal Trade Commission should actually be looking at solar rates.

Notwithstanding my willingness to actually raise this issue anywhere I can, it seems entirely appropriate given the potential growth of distributed energy resource markets and the role of electric utilities in vital electric service, that we look at competitive options. So I'm excited to do this.

What I'm going to do is take you through just a few principles. I've got some slides for leave-behind purposes. I'll make a key point or two off of each of them.

And I guess the first one I have to start with, since I'm with the Federal Trade Commission—having spent 15 years serving on the board of the Center for Resource

Solutions—Todd Jones over there, great resource and good comments in the record as well. I am aware of the risk of making general claims and whether or not they have to be substantiated in order to adequately provide that those claims are not misleading in the marketplace. I am also aware that best practices—Larry Sherwood from IREC is there, and so is Sarah—another great source of best practices and guidance.

So when I say the “value of solar,” I should explain that we have lots of utility evidence about the cost of solar. You heard from the gentleman from APPA about the potential costs of solar. Solar people will tell you about the benefits of solar.

When Austin Energy first commissioned a study with clean power research, the goal was to put them both together, as Jon just described, to come up with the value of solar. And Austin Energy used that value analysis, a detailed cost-benefit analysis based on avoided costs kind of approaches, in order to find out what solar was worth.

I ultimately used it to design a tariff that we called the value of solar tariff. So that's what I'm talking about when I say that. That's my substantiation for the term.

I'm not going to go into detail on this, but a good place to start is where you should begin. And that is with basic principles about how rate design should work. These are the ones I used when I designed the value of solar tariff. They're just another version of the kind of thinking you put together when you do ratemaking in the utility business in general.

Note that fairness is all around this. It's got to go up. It's got to go down. And you don't assume that subsidies are going in any particular direction until you actually back it with analysis. More on that in a minute.

I will also note that since solar is part of a suite—last slide as well—solar is part of a suite of emerging distributed energy resources, although perhaps the standard bearer or the tip of the spear. It's important to remember that we have lots of policy things going in electricity rates and electricity markets. So we've got to lay those all out there to make sure that we don't do damage to our objectives as we're going forward.

So it's also important to remember that we're not writing on a blank slate here. While some people may have just discovered—and we only really adopted the value of solar tariff in Austin in 2011; it went into effect in 2011, '12—there's a lot of history on the idea of the relationship between non-utility generators and the utility pricing. You heard about from Severin, an appreciation that price does not equal cost does not equal value except, perhaps, in the dreams of theoretical economists.

We've been doing green power and pricing premium products. Ask your utility, what would it take to deliver to my house a kilowatt hour of solar or solar-equivalent electricity? And they will tell you, it's retail plus a premium. Not surprisingly, value of solar analysis shows that's about what it's worth.

And then we've documented a lot of these benefits that Jon just mentioned in writing in the past. And we've even started developing some of those skills—when we were looking at local integrated resource planning, we're now talking about that in things like the DSIPs, the Distribution System Implementation Plans, that we're developing in New York under REV. Our utilities will be giving us the first look at those very soon.

So far this debate has been characterized by a fair amount of heat but not much light. The gold standard for claiming that there's a cost is a cost of service study in the utility business. So when a utility asserts that there's a cost associated with a customer using electricity, that general claim needs to be substantiated. It must be important to recognize that while Phil mentioned that the average customer does this or the average customer does that, the failure to use electricity does not create a cost, OK. The failure to use electricity, especially the amount of electricity the average customer uses, does not create a cost, OK.

And what it does is perhaps create a revenue shortfall, especially against sunk costs that the utility may try to recover through mechanisms like a fixed-cost recovery or an access fee on solar. But it doesn't create a cost, OK. And that's a general principle

of buying service under tariffed rates. Utilities with monopoly market power are not allowed to impose rates on us for not using their product.

Anyway, so what we have to realize is that the costs that we're talking about ultimately trace back to perhaps poor forecasting, overbuilding, or immunity from competitive forces. And there are remedies for some of that. We explored some of those in the telecom industries in the early days.

As W. Edwards Deming said, "In God we trust. All others must bring data." That's what should back up the claims of these costs that establish these fair rates.

That said, there are real issues with traditional net metering. It bears a legacy. Utilities didn't like being told they had to buy power from somebody in 1978. They don't like being told it today.

There is no direct relationship between net metering as the compensation level and the value of solar. So we should back it up with some analysis. There is this accounting under-recovery. There are impacts between rate cases, as I just mentioned.

And if we have under-compensation under net metering, as it may well be—especially for excess energy or differential values for offset and excess energy—then you're really going to get sub-optimal investment levels in a technology whose price is rapidly falling. That's not good for society.

In other words, when you constrain the size of the solar system you buy on your house because the utility under-compensates you if you produce one extra kWh, then the highly fixed cost business of installing solar suffers an economic efficiency loss. If you shorten the true-up period, you will also have sub-optimal investments. And if you try to use things like tiered rates, especially rates that go on peak, you actually can create perverse behavior in the customer and the user of the electricity to actually increase their consumption so that they're offset level is higher.

So there are issues associated with it. The value of solar approach tried to address some of that by basically looking at what are the full range of costs that are

avoided, and what integration costs are incurred in order to see and enjoy the benefit of solar operating on the grid?

The key point I want to make here is the very first bullet. And this is an important legal and regulatory framework. We do make a distinction in this country, at the IRS, at the FERC, between customers who generate for use and customers who generate for sale. So the attempt that some, for example, in the utility industry make of trying to argue that the only fair compensation rate is the locational marginal price or the PURPA avoided cost is intentionally ignoring the additional range of benefits associated with energy that is made at or near the point of consumption.

We look at lot of these things. We're looking at again also in New York, where we're examining the same ideas under the LMP plus D cost structure. With some work, we can improve on that proposal that Jon's company and the utilities came forward with. But it's a really good start, because we're trying to do it with an analytical foundation.

And let's remember that from a societal perspective, we're just talking about the costs and benefits we believe belong in utility rates. There are still huge additional un-priced benefits that are out there that should inform policy and that we need to continue to analyze.

Here's one thing that RMI put together a few years ago to sort of give you an idea of where these cost categories are. It's also important to remember, we're asking costs and benefits to whom? When you do a value of solar study with the latest kind of thinking, you end up with this stacked chart. Maine found that there is \$0.33 of value in a utility system where electricity costs about \$0.13. So you've got to do the analysis to find out what it's worth.

Put it together in a tariff with one simple change. All you basically do is you charge for the full consumption based on cost of service study. And you compensate for full production based on the value of solar analysis.

It's basically like net metering. And this formula here—I'm going to keep going just a bit, because I want to make this point. Old mechanical disk meters only allowed us to come once a month and see the net forward progress of the meter. As a result, we could only read the net bill.

But that mathematically is the same as charging the customer 100% for gross consumption and crediting them 100% for gross production both at the retail rate. That's the reason why you're seeing a formula here. All we changed with the value of solar tariff is the rate of compensation for production.

I can never get those dollar signs to line up. I change them every time.

[LAUGHTER]

It looks pretty simple. Normal charges, credited value of solar gives you a net bill. And that produces a whole range of benefits that I can talk about later but I don't want to take more time.

The last point I want to make as I shut down here is that what we're doing in solar matters, because there's a whole host of additional distributed energy resources coming along and some that have already been around. If we're going to really accomplish utility transformation, which a lot of people think we're in the middle of, we need to get these techniques and these market systems right so that we can support things like storage, smart technologies, security, and savings from customer actions on demand response and efficiency in the distributed energy resource field.

Sorry about running over. I'll stop there. Thank you.

DEREK MOORE: Severin—

SEVERIN BORENSTEIN: Thanks. And thank you for inviting me to be on this panel. I felt that the framing presentation—I had to be fairly opinion-free. This won't be.

[LAUGHTER]

So until the last decade, retail rate setting was mostly about fairness and redistribution. There was relatively little price responsiveness and regulators were mostly figuring out who's ox got gored.

DG solar, storage, and now I think even more importantly, monitoring and price responsiveness have really changed that. So now there is the ability of customers to really respond. And that means that, when one price looks better than another, to arbitrage between them.

In one sense, that's great. If the prices are set right, then you get efficient arbitrage. You get people choosing the most cost-effective approach. But if prices are set wrong—and certainly, there's been no pressure up until the last decade to set them right—then you get inefficient arbitrage.

If you over-reward some activity or under-reward some activity, you're going to get people over or under-investing in those activities. I see Karl nodding as I say this. And we're in complete agreement up to that point, I'm sure.

[LAUGHTER]

The question is: what are we over and under-rewarding? And I think we're in complete agreement that the first order of business is to figure out what those true costs and benefits are.

There have been a lot of studies done. SolarCity has done one of them. There's also been a study out of MIT on the value of solar. There's also been—my colleague Duncan Callaway has done a very nice study using PG&E data on the impacts DG solar.

And I think most of the studies that aren't actually done by a party are finding out that on net, the DG solar is reducing the revenues to the utility by more than the value it's actually adding to the system. That is, it's being over-compensated.

You have to remember, half of the solar in the United States is in California. And half of that is in PG&E territory. So PG&E has one quarter of all the DG solar in the country.

PG&E's rate has increasing block pricing. Their top tier rate has been as high as \$0.48 a kilowatt hour and is now around \$0.36 a kilowatt hour. And I don't think anyone thinks that that's the—well, I take that back—most people do not think that is the right incentive for creating any sort of generation. It is true, DG solar has real value. It generates at-end use. It reduces line losses in some, it turns out very limited, cases. It reduces the need to upgrade transmission or distribution.

But it also has real costs. Unlike grid scale solar, DG solar is completely uncontrollable. So we are curtailing in California—because of the duck curve right now—we are curtailing intermittent resources. We are not curtailing rooftop solar, because you can't. Because of the way the inverters are being installed and I suspect some legal ramifications as well, you simply can't do it. Whereas we are curtailing grid scale, because the grid operator has to balance the system.

And so I think that we need to create a level playing field so that the arbitrage that's going on is actually fair. One of the issues that's getting brought out quite a bit in the process of having these discussions as we do the cost-benefit is that many of the advocates are saying, one of the benefits is—and I think we heard this earlier today already—price suppression. That is, that by putting in DG solar, we are lowering wholesale electricity prices.

Now the Federal Trade Commission lawyers and economists know that if you go into a merger and the parties come in and say, by merging, we will be able to squeeze sellers and get a lower price out of them—no, it's not going to actually lower their cost. And it's not going to lower the cost of actually doing business. We're just going to get them to give us a better price. That is a transfer of value. That is not a creation of value.

And this is one of the significant areas that many of the advocates now claim is value creation from DG solar. It's not value creation from DG solar. It's also not value creation from grid scale solar. I think it's simply a transfer. And we have to keep those separate from the very real benefits of solar, both grid and distributed, and the very real costs that they impose, which we're still working on.

Net metering is a holdover. I'm glad we seem to be all in agreement. There is really no connection between net metering and the value brought. You can have a customer who is shooting a lot of power into the grid, a customer who is taking a lot of power from the grid, and you could have one that's running a pretty balanced system. Net metering is rewarding one of them massively, and it's giving no value to the other one.

So one customer who is installing solar that is mostly used on-site is getting very little benefit from net metering. Another injecting a lot is getting a huge benefit. But they actually are imposing different costs on the system. So we need to set rates that actually reflect that.

I do have to point out that the CEO of SolarCity when Nevada came out with this decision was quoted by Bloomberg as saying, “no one in their right mind would choose to install solar without net metering.” I think I agree with that. But I think that that's telling us something. We need to understand the real costs of DG solar when we have to balance the system, as well as the real benefits that it brings to the system.

My view is: when we get to that appropriate compensation for DG solar, it is quite possible it will kill the DG solar industry or greatly reduce it. And I'm OK with that. Because the goal is not to have DG solar. The goal is to have an efficient, reliable electricity system with an appropriate environmental impact—that's not going to be zero, we all know that—but an appropriate and presumably much lower environmental impact.

If we can do that with DG solar—and right now, I don't think that's the cost-effective way to do it, but I'm open to changing my mind on that—I'm all for that. But what worries me is that now that we have gotten amazing progress in solar and wind technologies, in just the last few years, the goal seems to have shifted that it's no longer to reduce environmental impact. It's no longer to curb global warming. But it's to give people energy independence, and choice, and things that you just did not see mentioned five years ago.

So we're moving the goalpost to pursue a goal that wasn't the original goal. If DG solar is the right way to achieve the goals of reliable, efficient, and environmentally appropriate energy, I'm all for it. We may get there, there are going to be some exciting changes in building material solar and so forth in the next decade. And when we do, I want the compensation to be appropriate so that those things are appropriately incentivized.

But until we do, it worries me a great deal that we are setting up inefficient arbitrage when we set prices that don't reflect the true value that we're bringing to the grid. Thank you very much.

DEREK MOORE: Tim—

TIM WOOLF: OK, so great to see you all here today. Thanks very much. And I want to thank all my panelists for setting me up perfectly for what I'm about to say.

[LAUGHTER]

We've heard from this panel, and earlier, and you've probably heard it elsewhere, the need for better data. We need better data on cost-effectiveness. We don't want to over-compensate customers. We don't want to under-compensate customers. We need to have better impacts on utilities. We need to have better understanding of the impacts on society. We need to have better understanding of impacts on customers. And we just heard Severin say, we need to understand the real costs. I think we'd all agree.

And so what I'm going to talk about is a way to move in that direction and to hopefully get that. I think there's a whole lot more we can do to get better data, which will then allow us to balance the two goals of promoting DG but also protecting customers.

So I've been working on this issue in a lot of states. And two themes jump out at me—and pretty much everywhere I work. One is that many distributed generation policies are developed piecemeal. You'll have solar RECs designed over here, tax breaks

over there, rate design there, net metering here. And it's not clear how they all work together.

And secondly, few policy discussions are informed by quantitative analyses on all the key issues. And in my mind, the key issues boil down to three. There's the development of DG. How much are you going to get? There's the cost effectiveness. And then there's the cost shifting. And if you have a good handle on all those three, then you're able to take a look at the implications for all people concerned.

So I should say, we are preparing a report to address just this. The report is for the Consumers Union. It's funded by the Energy Foundation. And we're calling it "Show Me the Numbers" to place emphasis on the fact that we need better data.

So the first topic is the development of DG. And this is fairly simple and it's remarkable how infrequently, how rarely you see in these debates people forecasting, well, what's this policy likely to do to DG? There are relatively straightforward ways of doing this. You can come up with the payback period for a typical homeowner. You can look at customer adoption rates and payback periods and then penetration rates.

And then these are very useful not only to see how the policies will affect DG, but it will also lead into the next two analyses, the next one being cost effectiveness. And there's a lot that could be said here. I'm going to keep it brief. We've already heard from several panelists about how important it is to keep all the costs in mind, get the true value. And I would agree.

And I would also say, you hear a lot of people saying that DG will increase costs on the system in terms of the balancing of the resources and the need to interconnect. And I say, fine, if that's true, show us the numbers. Put those costs into the analysis so we can have a fair treatment of both the costs and the benefits.

The other thing I'll say is that the lost revenues are a really critical part of all this. And I totally agree with what Karl said a few minutes ago about how when a utility loses revenues from lower sales, it's not a new cost on the system. It's a sunk cost. And all economists know that sunk costs should not be used in evaluating cost-effectiveness for

future decisions. So the lost revenues, which are sometimes captured in the rate impact measure test, should never be considered in cost-effectiveness evaluations.

And, I think it's important to look at all the different perspectives. So I would argue that we want to have cost effectiveness from the utility perspective, from the total resource cost perspective, and from society's perspective. And each state can put different weight on the different perspectives, but you want to have all the information in front of you.

So I don't mean to downplay the lost revenues and the cost shifting, because that's one of the central issues here in this whole debate. And it's rare that I see this analyzed at all, let alone thoroughly.

And so one of the key points I'll reiterate, in case it wasn't clear, is that the cost shifting analysis must be kept separate cost effectiveness. They're both important, but they're separate. The cost shifting, you want to look at long-term estimates of rate impacts. That's how costs are shifted—it's through changes to rates, whether it is a rate case, or a lost revenue adjustment mechanism, or decoupling, that's how cost shifting occurs.

So you want to do a long-term analysis that shows how rates might go up or not. And it will tell you things like what percent impact might there be on rates or what dollars per customer per month might be. So you have context to understand what the real cost shifting is going to be.

The other key thing here—this is critical—is that everyone recognizes that when you put PV on your roof, you have less consumption. Your revenues to the utility goes down. And that looks like, wow, that customer is being subsidized by everybody else, because they're not paying their bill so much. It may even shrink to zero

But you have to keep in mind that the other effect is avoided costs, which will put downward pressure on rates. And the rate impact analysis, the cost shifting analysis, must look at both of those impacts to see the net effect.

So I have a little bit of a preview of how this framework might shape up or should shape up. And I'll start by saying that this is an illustrative example, which means that I made the numbers up.

[LAUGHTER]

And the whole purpose of doing this study is to do some case studies and put in some real numbers. But the numbers are useful. Now they may not be big enough for you to see. So I'll just cover them at a very high level.

On the rows here, you put the various policy options. Or you could call them the rate design options or the net metering options. And I've just chosen three to keep it simple.

And for columns, there are three categories. One is how much DG gets developed. The other is how cost effective they are. And the third is the rate impacts.

And the policy options, they're ranked here by most generous to less generous, the first one being the conventional net energy metering rate, which I think, in many cases—but not always—is typically fairly generous. The next one is, you reduce payment for the excess generation. And the third one is, you add increased customer charges.

And what happens is what you'd expect, but it helps to see the numbers. For the DG development, as your compensation becomes less generous, you'll see less development. But it helps to know just what that is, how much it is. You might have certain goals that you want to achieve. And this will tell you how close you are to getting those goals.

And then with cost effectiveness, again, I think you should present utility, TRC, and societal net benefits. And you can see here that as you reduce the payment for net metering for the DG and you reduce the penetration, then your benefits go down. That's a trade-off, but that's something that you might want to make.

And then the rate impacts is the third one where first of all, it's really useful to see what they are. You rarely see that done in a way that is as comprehensive as I'm

suggesting here—and also to see how they change with different policies. And maybe this policy will reduce rate impacts to some extent, but not too much. So it's a way to understand what you're working with.

So on the last slide here, I have just a quick snapshot of a slice of this where I look at several payback periods. I call this initial draft results, which in plain English means, we've prepared these for this presentation and they're rough and I need to double check them before they're final. But I think they're extremely useful to give a sense of where they're going. I don't think they'll change much.

I've chosen for states that are in the news on all these issues, four states that I've been involved in in one way or the other. And I look at different policies that have been proposed in those states recently. So we have Arizona, Hawaii, Massachusetts, and Nevada.

And the one column says, what's the payback period to a typical residential customer before this policy is put in place? In case of Arizona, I think they have standard net energy metering. Before the policy is put in place, the payback period is 14 years. After they institute mandatory demand charges, it goes to 26 years.

You don't have to be an economist to know what that's going to do to DG development. Now maybe that's an outcome you want. But you at least have to know that that's what the outcome is going to be.

In Hawaii—now we all know what Hawaii is. In terms of the density, it's got PV much more densely, much more aggressively than any other state. And they've been looking at ways to do this. And they have a different approach, which is they reduced the payment for excess generation. And they have a higher fixed charge. Now in that case, before the policy was put in place, the payback period was six years.

The other thing about this framework is you can see that every state is different. So you can't just come out and say, oh, I think that this particular policy should be applied everywhere. Because every state will have a different impact – we'll see different impacts.

So for Hawaii, the reason that the payback period is so short before the policy is that the rates are really high there right now, and so it's very economic. And that's why they have so much. But in this case, they changed the policy to make it a little bit easier on customers and to give more revenues to the utility. And the payback period is seven years. If you ask me, that's a pretty good trade-off for what they've done there.

Massachusetts—different story altogether. And there, there's even a shorter payback period. The reason there is Massachusetts has a very generous solar REC program where customers are paid I think on the order of \$200 a megawatt hour for every megawatt hour from their PV. And it's helped push the market, which was the original intention five or six years ago.

But well, as you can see, it's very generous. And now the market's booming in Massachusetts. And then you increase fixed charges there. It doesn't change things much, because they have this huge—what you'd call a subsidy—on the other side still sitting there keeping the payback period short.

And then finally, Nevada—we've heard about Nevada. Before the utilities proposal, payback period was 11 years. Now with the proposal for increased fixed charges and reduced payment for excess, it's 21 years. And Jon Wellinghoff mentioned how that affected things. The applications dropped from 1,500 to 15.

So this analysis could have been done beforehand. And you could have predicted that that's what would happen. So I'm suggesting that this type of analysis be done during the policy discussions so that we have an informed debate and get just the right policies for every state.

Thanks. I look forward to your questions.

JOHN HILKE: Thanks very much to all our panelists. We're going to now open this for the panelists to comment on each other's presentations. And I got a verbal promise from everybody to not physically wrestle.

[LAUGHTER]

And in order to make this not take up the entire remaining period, I'd like to ask each panelist to restrict their comments to about two minutes. And we're actually going to go in the same order that people presented to begin with. So, Phil, you get the first shot.

PHILIP MOELLER: Well, thank you, John. I thought we had a nice, wide range of discussions, there. I think one of the areas that I wish had been emphasized a little bit more is ultimate impacts on customers. And, going back to the—since we're talking about solar generally—the universal utility-scale solar is less than half the cost of the private, rooftop solar. And so if society wants to promote a particular fuel type, which has its pros and cons, ultimate cost to the consumer should be a big part of the discussion. And part of that is economies of scale, and part of it is operational flexibility that was noted.

But it all goes back to, again—the smart grid is what enables this technology to survive. And I found that the discussion about sunk costs is not actually something that's necessarily recoverable, but it's real. And if we want to continue to see this grid, the smart grid of the future, develop and have more customer interaction—which I certainly hope we do—and more options, there are going to be more investments needed to update it. And so, in that sense, that discussion of the need to pay your fair share of grid costs, as the grid evolves, is important.

JON WELLINGHOFF: Thanks, Phil. Yeah, I agree. I think everybody should be paying the fair share of grid costs. And on this cost-benefit study, just as Severin's point in discussion, I haven't seen the studies that, Severin, you referred to, with respect to there being net costs. But I'll tell you, the net-benefit study that Solar City did was more than just Solar City doing the study.

It was also done by the NRDC. It was also peer-reviewed by Stanford and by Rocky Mountain Institute. So, you know, it was a very comprehensive study, done by one of our people who's a former PG&E grid engineer. In fact, he was head of the PG&E Smart Grid group. So I will stand by that study.

And that study, actually, for Nevada, using the 11 benefit items that the Nevada commission has already enumerated, and using the tool that Nevada has used in the past—which is a tool from a group called E3, a consulting firm—came out with \$7 million to \$14 million in net benefits annually from the current installed solar PV rooftop systems in Nevada.

KARL RÁBAGO: I'll make a couple of other, additional points. First of all, context matters. What's going on in the utility system and changing it right now is a failure of the old system. And that's the biggest game in the room. It is the exhaustion of the economies of the central station design. And if you want to find out more, just look at what our competitive utilities are saying in the Midwest about “organized market reform” and requests to be reregulated in the old style.

So solar is a harbinger, if you will, of some change that could be coming. But outside of California, Hawaii, a little bit maybe Arizona, the numbers are really, really small. And so remember—the second thing I would say is, the law of small numbers. Yes, residential installs have doubled in the last few years. But the numbers are very, very small. This is not what's driving what's going on the utility business, except perhaps in a positive way.

And then the last thing I'll say is, we have actually looked at this kind of transformation before. What we did with unbundling of rate elements in telecommunications in the 1990s, to ask ourselves what components of the traditional monopoly could be rendered up to competitive forces, is entirely appropriate. And that's where I take a little bit of difference from what Severin was saying, is we are making these changes because this is supposed to be the largest free-market, capitalistic society on the face of the earth. And we are supposed to always tend toward more competitive markets, where we can achieve some economic efficiencies. So I join on the good numbers, but we should always be looking for a more competitive option. And that's what distributed resources are increasingly offering us.

SEVERIN BORENSTEIN: So, if you do an analysis of a merger, such as they do at the FTC, the first thing you learn is you don't judge competitiveness by the number of firms in there or their market shares. You judge competitiveness by the ability to deliver the product at a reasonable cost. I am all for competitiveness, and competitiveness will come through a level playing field where the real costs and benefits are represented. If that leads to a decline in DG, I'm OK with that, because I actually don't think growing the DG market should be one of our public-policy goals.

Jon mentioned an E3 tool that was used to do some evaluation in Nevada. E3 actually did a whole study of cost-shifting in California and found—under the auspices not of a company that sells solar but of the California Public Utilities Commission—a very large cost shift, as a result of DG solar in California, which, just to remind you, is where half the solar is.

And I think this has a larger implications, as we go forward. There was this mention, in the previous session, of “community solar.” And “community solar” is one of those terms like the Bible that means what everybody thinks it means. But what goes with when many people say “community solar” is what's called “virtual net metering.” That is, you buy a little bit of this solar plant, and then you get to take it off at retail. And that's a great idea. Let's just virtual-net-meter all generation, and then we don't have to pay for the grid at all.

There's a real problem, obviously, when we start going down that road. And I think we need to recognize when concepts are actually cost-based and when they are the vestige of past subsidies that the main appeal is, they're a way of hiding the subsidy. I think that was the main appeal of net metering. We should be creating a level playing field where fossil-fuel generation really has to pay for its externalities. I'm all for that, but I think we have to recognize that these structures that we have now aren't creating that sort of feel that really allows the alternatives to appropriately grow.

TIM WOOLF: Two quick points—one just to clarify what I'm suggesting. I suggested every state develops its own policy goals for what it wants for DG

development. Some states might want much more. Some might want much less. But, once they do that, then they need the information to figure out how to get there.

And secondly I can't resist challenging Severin on his points about prices being based on short-run marginal costs. Because it's quite clear that long-run marginal costs are what affects utility-system cost. That's what's used when utilities do their resource planning. That's what Professor James Bonbright said should be in an efficient price signal. He's very clear that it should be based upon long-run marginal cost. And if a resource, whether it's DG or energy efficiency or anything else, can help avoid capacity ten years from now, then that should be factored into the price so the customer knows to curtail their load in order to save that money. And if you don't, then you're going to have overbuilding and costs unnecessarily high.

JOHN HILKE: Thank you all.

SEVERIN BORENSTEIN: I could respond to that.

JOHN HILKE: Go ahead.

TIM WOOLF: I had the advantage of being at the end of the row, so I could get that one in.

SEVERIN BORENSTEIN: Prices that don't reflect short-run marginal cost aren't going to reflect the dynamics of the market. There are hours in which the capacity is really stressed. And those are the hours where people should be paying appropriately high prices.

When you start smearing those long-run costs across all hours, you end up with inefficiently high prices off peak and inefficiently low prices on peak. And so the difference in terms of long run planning actually will get reflected, because you'll get high revenues on those peak periods where the system's truly stressed. And you will be able to recover long-run costs. Neither of these, by the way, is going to recover the long-run cost of the grid, which is truly a fixed cost that we need to figure out how to recover, apart from these energy costs. But maybe we should take that offline.

KARL RÁBAGO: That last bit was really important. Because DG operates after you've gone through all those other costs. And that's the point I tried to make—perhaps too quickly—was that equating the value of solar with the short-run, marginal-cost-heavy, locational-marginal price that shows up in a wholesale market or kludging it a little bit with a couple little additions is not the equivalent of capturing the long-run marginal costs.

DEREK MOORE: Tim?

TIM WOOLF: So I think it's really important in this discussion to keep in mind historic costs versus future costs. Historic costs are all fixed, basically. Future costs are both fixed and variable. In the short run, you have fixed costs and variable costs. In the long run—and, again, Bonbright was clear on this—in the long run, in this industry, all costs are variable.

When we do any kind of utility planning, we look over 20, 30 years, because that's how long the resources—the assets—last. And so I disagree with the concept that all distribution costs are fixed, because it's the future avoidable cost that should be used to set the price signals, because that then allows customers to make the right decisions to help avoid those costs.

DEREK MOORE: Severin?

SEVERIN BORENSTEIN: Actually, let's go to the Q&A.

DEREK MOORE: So this question is open to the panel. One of the original justifications for net metering at the retail rate is that it's very easy for consumers to understand. The rate that you pay for electricity that you're consuming is the same as the rate that you are being compensated for electricity that you generate at your home or at your business. And Karl articulated the value of solar approach, which delinks those two rates. And I'm wondering if anyone on the panel has a view about potential costs associated with the delinking those two rates, or if anyone can articulate the benefits of doing so. The point is to isolate the current linkage between generation and consumption for retail consumers.

KARL RÁBAGO: Well, one thing I'll just offer. One of the benefits that we were going after, when we did it at Austin Energy we found our new solar customers were using more energy in the period after they installed their solar systems. Maybe it's psychological—they thought their energy was free. Maybe they wanted to maximize the benefit when the sun was shining. They were shifting load to the peak.

So one of the benefits of actually using the two-part rate structure was that you decouple the compensation component for the solar production from the consumption component and reinstall an incentive for efficient behavior that also, for us as the utility, made us a little bit of a free rider. Because if the customer would receive the benefit of reducing their consumption, save on the consumption charge, and the benefit of producing kilowatt hours at that peak time—which we knew were then going to be exported, because they were compensated the value of solar rate—we the utility got lots of valuable electricity injected right at the most valuable part of the grid, and often at a net cost that was way below what we were facing in short-run markets.

So that was one big benefit. You reinstall an efficiency incentive that otherwise net metering can obscure.

PHILIP MOELLER: Well, I think, generally speaking, we're going to see more market segmentation both at the federal level that FERC regulates and also at state utility commissions. The various ancillary services that are provided are eventually going to be broken out, to some extent unbundled and valued. And, as we talk about the general discussion of distributed generation—its value to the smart grid, to consumers—I'd point you to Sue Tierney's study from March, from the Analysis Group, which I think it's safe to say you can conclude that it's so location-specific. The farther a distributed-energy resource is from the load center, the less value it has. If it's concentrated too much, it can impose significant costs on the system, because the system initially wasn't designed to be taking generated power two ways.

So the details really do matter, I guess, to Tim's point. The data will be very important. And diving into it will provide more answers as to the best way to go.

SEVERIN BORENSTEIN: I think the “net metering is easier to understand” argument is sort of taking the concept of flat rates that we've had for years—it's easy to understand—and spreading it to an even more distortionary usage. I think the reality is, electricity markets are really complicated. And electricity value is locational, and it is time-varying.

And I think if we're going to go down the road of saying, you become a generator who's integrated with the grid—as Jon says, they have a right to be a generator and they have a right to integrate with the grid—they don't have a right to also have all the complexity of doing that stripped away. I don't think there should be extra complexity needlessly added. But saying, “well, you should be protected from the reality of what you're actually bringing to the grid” is just not a compelling argument.

JOHN HILKE: So I want to follow up on a couple of the comments, here. And this is a little cheating, too, because this is sort of backroom conversation. But several of you have actually said that just talking about the value of solar as a general proposition is really not nearly as fruitful as talking about it in a sort of a local optimization fashion.

And I just wonder how much of the back-and-forth argument would be reduced if we were really sort of taking the New York PSC seriously and saying that you ought to look at each location and the time periods and basically use those locational and temporal pieces of information to value solar. And whether that would be a way around much of the argument.

KARL RÁBAGO: Well, I'll say, from a policy perspective, the answer to your question is, “what moves you toward that?” I think everybody agrees that locational granularity,—understanding of costs and price—is valuable in improving the accuracy of the service and the level and quality of investments that are made. So what gets you in that direction?

One approach would be sort of monopoly rents—sky-high fixed charges, uniform across massive customer classes. That doesn't move you toward understanding and quantifying locational benefits and sending price signals that customers can respond to.

I think a good argument for value-based pricing to set the compensation level is that, in fact, it will move you towards that more granular understanding. And it will inspire utilities to really start understanding costs far below the 30 KVA minimum grid level that often shows up in a rate case so they can start assigning costs and understanding their costs better. So I think it's good policy just to get you moving in that direction.

JON WELLINGHOFF: If I could, I think that the granularity is important. It's important from the perspective that—to the extent that we can, in fact, identify the values of these distributed systems at the granular level and, in fact, compensate and reward for those values, it's going to be important in the future. But we're looking at New York that's just starting the process. California is just starting the process, as well. It's going to be a long time before it's going to be able to rolled out across the country in any meaningful way, number 1.

Number 2, there's something to be said for simplicity, in some regard, although simplicity can be interjected for consumers in various ways. And that can be done with imposing layers of oversight by various entities, whether they be retail providers of energy who can provide more simplicity to consumers if they desire and they can choose a simpler plan, or other mechanisms that will ensure that these costs and benefits all can be appropriately valued. But the bottom line is, we need to make sure that whatever these distribute resources provide in value at whatever place, are appropriately valued and compensated.

TIM WOOLF: So I think all would agree that locational and temporal prices make more sense, for lots of reasons. And I agree, as well. We also have to recognize that consumers—getting back to the previous question—are limited in how much they can understand and respond to.

And the way that I see this is that customers who adopt photovoltaics or even other types of demand response, sometimes even energy efficiency, are among the more, well, engaged customers. I wouldn't say “educated” or “informed,” I'd say they're more engaged. And if they're more engaged, then they're more likely to be able to

respond to complex pricing structures. Whereas a lot of customers out there are just not, and they might not be for a long time.

And so that's why I generally avoid rate design for all customers that's complex and different from what we're used to. So I am very cautious about tiered customer charges or even demand charges, because customers don't get it. But if you've got a handful of customers, a growing number of customers, who are engaged and are informed and care about their bills, then you can use more complicated, locational, temporal pricing for that subset of customers. And then hopefully expand that subset over time, so that all customers, at some point, are engaged and are responding to the right prices.

JOHN HILKE: And so would you see a problem in basically allowing some customers to be on a more sophisticated metering system than others?

TIM WOOLF: No. There are issues, but in general, no.

SEVERIN BORENSTEIN: I would argue that that's exactly where we should be going, and we should have—people who really want simplicity should continue to have a right to flat electricity rates. I don't think with net metering, but there's going to be a premium associated with that. And that's just fine. Some people don't want to have to think about this.

I think that when we start talking about locational and time-varying pricing, issues come up that, I think, can be managed on the equity side but historically have not been well-managed. California has locational, marginal pricing on the supply side but has avoided it or rejected it on the demand side. And I think if we're going to start talking about this, it is going to require some pressure to start taking demand-side locational pricing seriously, which most utilities are not excited about doing.

I do want to make one other point that actually we should bring up, here, which is, when we talk about where the solar is and where these sorts of incentives have been, it is overwhelmingly—partially because it's two utilities—in the IOU sector. If you look at the public power sector, they have not been aggressive with this. I think it's partially

because public power agencies tend to be smaller and tend to immediately see the impact it's going to have on other ratepayers.

And so, in some sense, that's a market test. They are the public power agencies who are doing their cost-benefit analysis—supposedly don't have the profit incentive that the IOUs do (and I think they do). But they also are not jumping on, DG is going to save us a boatload of money.

PHILIP MOELLER: Well, I think when we talk about rates, generally speaking, customers haven't seen a lot of dynamic pricing at the retail level, at least residential. But they are seeing it in other parts of the economy, where they're getting used to that kind of dynamism. And I think they can adapt pretty quickly. It might not be for everybody. But it would certainly send better price signals, in terms of consumption.

Again, I'll get back to making sure that the proper cost to maintain and enhance the grid has to be talked about in a way that makes sense. Again, to develop this grid so that more of this can happen—more dynamic pricing, more options to consumers. It's a great potential.

But we'll go back to what Jon said about New York and California—two very different markets. The density is different in, say, the ConEd service territory then it would be in SoCal Edison. Very different. Dynamics are different.

The utility commissions are looking at this. But it's going to take them a while to digest the approach, and particularly when you get a locational element to retail pricing.

KARL RÁBAGO: Yeah, just a couple things, real quick. First of all, the demand-side market is very different than the generation market, in some ways. We've been paying customers for demand-side reductions at the full retail rate since the start, because when you just don't use, you don't pay. And then we fully socialize the utility side of the costs associated with implementing those, which really reduces the effective cost that customers see coming back in their rates.

Second of all, there's a lot of technology coming along at the distribution side that is probably way ahead of what we're even talking about, in terms of pricing distributed generation. You think about blockchain technology, to sort of record and ultimately transfer microreductions in consumption level. You think about cloud-based technologies through thermostat and controls. You think about the opportunity to turn your solar system into a dispatchable system by adding storage, as companies are doing, like Tesla.

Where all of that takes you should not be the scary world of thinking every individual customer has to make every individual one of these decisions, one by one. My third point is, we're mostly going to do this through a building kind of management technology system that is managed by an aggregator. So we'll have to understand our relationships with those kinds of service providers but not necessarily the finely detailed technological decisions about things like, you know, dropping my household voltage down a little bit as part of a comprehensive conservation voltage program. I just need to know that the time is right on the VCR. Oh, we don't have VCRs anymore, so I'm OK, then. On the microwave.

DEREK MOORE: I'd like to ask a question from the audience that relates to the discussion, a few moments ago, between different types of customers and their ability to respond to different pricing scenarios. The question is, how can low-income customers share in the benefits—clean energy, local investment, health—while also designing efficient markets? Is there a risk of benefits primarily skewing towards those with the most resources?

JON WELLINGHOFF: Sure, I'll try to take that one. I think there are multiple ways that low-income consumers can benefit from clean energy resources. There are a number of programs in a number of states, including California and others, that allow low-income consumers to take advantage of these types of programs. There's also, as I think was mentioned earlier, the issue of community solar, to the extent that people either don't own their home or don't have the availability of an adequate roof to actually put solar on. There are multiple states, Minnesota probably being the most

prominent one, that has a very extensive community solar program. So I think there are a number of ways for them to participate.

DEREK MOORE: Severin?

SEVERIN BORENSTEIN: I think we do low-income customers a real disservice when we focus on giving them solar power. I think that what we should focus on is moving the system to reduced emissions while maintaining cost-effectiveness. I think that there are very few low-income customers—actually, there are very few customers—who are hell-bent on having solar on their rooftops. As we heard this morning, the main driver is lowering your costs.

There were some early adopters who did it for the warm-glow reason, but most people want to lower their costs. And there are much more effective ways to lower the costs of low-income customers, particularly since they tend to live in much less energy-efficient homes. So improving the energy efficiency of their homes, through more efficient appliances—refrigerators, for instance, air conditioners, and so forth—is likely to be much more cost-effective than getting them their own solar power.

DEREK MOORE: Tim?

TIM WOOLF: Just to follow up, I was going to say, before Severin mentioned that, that distributed energy resources should be considered by utilities in a comprehensive way, like they do their supply-side resources, with some diversity. And if they find that some of them—for example, the solar—not enough reaches the low-income communities, then they should think of other distributed energy resources that might.

And, as Severin mentioned energy efficiency is one that every customer can benefit from, especially low-income. So literally as a part of the package of distributed energy resources, it might make sense if a customer doesn't have his or her own roof, if they can't install PV on their house, maybe they get additional efficiency measures than they would otherwise get, or at least there they're reached out to and try to be served, so that keep some balance—not just with just any one single resource, but across all of your resources.

SEVERIN BORENSTEIN: Can I add one thing? I think that we need to keep in mind that when we start talking about community solar and other options, because low-income tend to have small roofs or no roofs at all the systems are going to be way below efficient size. I think that's just the first step towards the most reasonable policy, which is, figure out the most cost-effective way to deploy this technology and go with that.

It probably isn't going to be rooftop. It now looks like it may not be the giant grid scale, either—the moderate grid-scale systems are coming down in cost and getting closer to the giant grid scale and may run into less transmission and siting problems. But whatever those are, moving low-income customers towards community or slightly larger-scale solar—actually, moving all customers towards that—is the step towards moving us towards an efficient deployment of the amazing technological progress we've heard about.

PHILIP MOELLER: Well, I didn't want to associate my remarks with Severin. I think we have community solar potential, universal scale solar, definitely more cost-effective at half the price, if that's what low-income people want. But a focus on energy-efficiency programs that work is probably the most cost-effective way to address it.

KARL RÁBAGO: Yeah. I was just going to say, whether or not you agree with Severin on the demand-response-induced price effect—moderating the wholesale prices as a result of solar—it is true, and an increasing number of very large consumers recognize that wind and solar have flat pricing, because they don't have the variable cost associated with fuel. That is a benefit that is inducing them to buy.

When we ran our green power program at Austin Energy, that's why 85% of our customers were large business customers, because they could lock in a component of their price for 10 years under a subscription to the program. That is a benefit that we can figure out how to transfer to customers. And it is one of the reasons why we don't necessarily want to socialize all of those benefits through just utility-scale solar.

So community solar, where you pass through the fixed-price benefit to low-income customers, can something really helpful, in terms of stabilizing their electricity

bills and therefore increasing energy affordability through predictability. So that is a reason to explore it.

JOHN HILKE: So this is sort of a follow-up to that. We ran across this particular perspective and would just like to get your reactions. So some people said, well, society's decided that decarbonization of the economy is really important, to avoid some extreme detrimental climate effects at some point. Customers with DG solar are making their contribution to decarbonization by paying for carbon-free generation for part of their load. It seems entirely fitting and proper that the rest of the people should help subsidize that process, since they're not taking any steps themselves.

PHILIP MOELLER: That's a pretty big assumption, that people aren't making steps themselves. So I think I disagree with the premise. But if there's going to be a price on carbon, we have to be careful, I think as Severin would say, about it being arbitrated between different markets. So the more uniformity there is it is really the key, because we want to make sure, again, that consumers are protected. And an approach like this, with externalities that society wants to impose, should be done as uniformly as possible.

JOHN HILKE: Other responses?

TIM WOOLF: So I don't quite agree with the premise that society has decided—unfortunately, our government hasn't—our federal government—quite yet. But each state has—or many states, I should say—have climate-change goals. And each state typically also makes decisions about the development of solar.

And so the way that I see is, each state should identify its own climate-change goals, some of which might be fairly aggressive, like reducing emissions by 80% by 2050, like some states. Others may be less so. Once you have those goals in place, then I agree with Severin—you look at what your options are. You put them out in terms of, what's it going to take to get to those goals? And you'll find, like, what's the lowest-cost way of getting there, and what's the most expensive way?

And I've done some of this. My company's done some of this. And it's true that rooftop PV is towards the high end of the spectrum. But it's also true that if you want to get to some of those goals, you have to do it, as well.

So, yes to all of the above. We need to look at, what's the most cost-effective way of getting there? And we need to recognize that, if a state has a goal of reducing climate change, then how are we going to get there?

JOHN HILKE: Severin?

SEVERIN BORENSTEIN: Yeah. I think that we—first of all, as we heard this morning, the primary driver of the people putting on rooftop solar is saving money. So they aren't making a contribution, they are getting subsidized. They are actually lowering their bills. The only payment—extra payment—is coming from the system to them, in that case. And so it's not sharing, it's purely subsidizing them.

Secondly, I'm all for subsidizing them at the appropriate level—the level that reflects the true benefits to the system. And we need to figure out what that is. My own belief, from the studies I've read, is that we can get to those goals more cost-effectively with larger-scale deployment of renewables—and nuclear, by the way. We should be keeping all carbon-free sources in the mix—and energy efficiency, of course.

JOHN HILKE: Jon?

JON WELLINGHOFF: I almost agreed with the last statement of Severin, there.

[LAUGHTER]

When we talked about, we need to look at the benefits and provide distributed-generation compensation for the level of benefits. I'm not suggesting that DG is getting the subsidy. I'm suggesting that, if we do a proper cost-benefit analysis, done in an open, evidentiary proceeding that's open and transparent and has parties participating fully, that we'll come to some answer. Or at least the regulators will determine some answer from the parties that participate in that proceeding.

And I think studies have shown not only the one that I talked about in Nevada, but there's also what Karl did in Austin. And the value there showed that the value was in excess of the retail rate. The study for the value of solar in Minnesota found the same thing. The study for the value of solar in Maine found the same thing. None of those studies were done by the solar industry. Those studies were done by independent entities. Determines that the benefit is higher than the cost. And I think when we do that there is no subsidy.

SEVERIN BORENSTEIN: And in California, where we have very high retail rates—at least the people who are putting in solar have very high retail rates that they're avoiding—we're getting the opposite conclusion. And that's another study that was done not by the solar industry. And I think that that is where half of all the solar is.

KARL RÁBAGO: Just to put a little fine point on it—if Severin's talking about the E3 study, it's important to remember that the E3 study on the California solar initiative attempted to quantify the total costs and total benefits and included the out-of-pocket costs of individual customers as part of the cost of the California solar initiative. Which you would not do—private investment costs are not used in rate calculations and under cost-effectiveness tests for setting utility rates. The utility rates should be indifferent to whether I choose to pay \$5 a watt, \$10 a watt, or \$1 a watt for my solar. It's a question of what the utility and other customers have to pay in order for me to get solar.

SEVERIN BORENSTEIN: And just to clarify on Karl's clarification—

[LAUGHTER]

—the conclusion of the study was that there was a very many million dollar cost shift to nonsolar households.

JOHN HILKE: This is a question from the audience and says, most of the discussions related to residential solar. How do the cost and benefits differ, if we're looking at the way solar's being treated for C&I customers?

KARL RÁBAGO: There's a really good little primer on solar-value methodologies published by Clean Power Research. They did one for Iowa and for Michigan, just laying it out without getting into the numbers—just, how do you go through it? They make an important point, that what we're really measuring is the value of generation—a kWh that appears in the distribution system. So if the C&I customer on the small end is a shop, a strip mall, a multifamily apartment complex, your local theater, it's being injected at the distribution level of the system.

If, as it moves up the scale and gets to primary- and transmission-level voltage, it starts looking like a wholesale generator of electricity. What we're really trying to determine is an indifference price. With value of solar, we're just trying to figure out, eh, you make it, I make it. At this number, I don't really care.

Under old PURPA law, we always did that at the power-plant bus bar, because the utility had to haul and distribute all that electricity. We're at the meter, for distributed generation, because that's the point at which we should measure indifference, because that's the point at which the energy is injected. So, for C&I customers, we're somewhere along the continuum, depending on where that customer takes energy.

PHILIP MOELLER: Bigger is cheaper.

[LAUGHTER]

KARL RÁBAGO: It worked for nuclear power really well.

DEREK MOORE: We will end on—we will end our solar-rate-design discussion with a nuclear-power point.

KARL RÁBAGO: I sat on a nuclear-power rate case. That was not fun. I don't want to do that big—

DEREK MOORE: But we are officially out of time. Before we thank our panelists, one programming note. We will have our state regulator keynote panel immediately following this one. But I just want to say thanks to all of you. I thought the discussion

was terrific and interesting. And no fists were drawn, which we're all very happy about.
So—give a round of applause.

[APPLAUSE]

STATE REGULATOR KEYNOTES

- **Ellen Nowak, Chairperson, Public Service Commission of Wisconsin**
- **Ann Rendahl, Commissioner, Washington Utilities and Transportation Commission**

Moderator:

- **John Seesel, Associate General Counsel for Energy, Office of the General Counsel, Federal Trade Commission**

JOHN SEESEL: Good afternoon, everyone. I'm John Seesel, and I work in the General Counsel's Office at the FTC. And I'm going to get off message for just a second to say that my daughter, who works for Major League Baseball, up in New York, very much appreciated Tanuj Deora's mention of several teams from her favorite sport.

First of all, I want to express thanks to Severin and to our first two panels for giving us precisely the kind of interesting and thought-provoking discussions that we expected from such an array of distinguished and experienced participants. Solar distributed generation raises a host of complex issues. And you have given us all much food for thought.

Speaking of food, we're going to take an hour's break for lunch at 1:15. But before we do that, we're really looking forward to the next segment of the workshop. We have two state utility regulators who have graciously offered to make keynote presentations about their states' experiences with distributed solar energy. We are honored and very fortunate to have with us the Honorable Ellen Nowak, the chairperson of the Wisconsin Public Service Commission, and the Honorable Ann Rendahl, a commissioner on the Washington State Utilities and Transportation Commission.

I won't take up our speakers' time by going into much detail, but you can see from their biographies that Chairperson Nowak and Commissioner Rendahl have had remarkably successful and varied careers in all aspects of utility regulation. They will discuss their states' on-the-ground experience with a number of the issues that our other panels are considering today.

I will turn the microphone over to Chairperson Nowak first. Her presentation relates somewhat more to the topics that we've covered this morning, with an emphasis on net metering and other pricing issues in Wisconsin. Then Commissioner Rendahl will address several aspects of Washington State's experience with regulation of distributed energy resources, including some of the competition and consumer protection issues that this afternoon's panels will probe.

Again, let me thank these two distinguished regulators for taking part in the FTC's solar workshop. Chairperson Nowak, you have the floor.

ELLEN NOWAK: Good afternoon.

Thank you for having me. And that was a very enlightening panel. And I have some prepared remarks, and I was scribbling a bunch of new prepared remarks, trying to respond maybe to some of the panel. But I'll see if I can work it in a little bit.

I'm going to talk today from my perspective as a state regulator and what I have seen in Wisconsin—what we've touched on. But I'm also going to put on my NARUC hat—the National Association of Regulatory Utility Commissioners—and talk a little bit more broadly to what some other states—and we've touched on that a little bit, too—but what NARUC as an organization is doing. I'm honored to serve on the executive committee, and I'm in a leadership role with that organization, as well. So I'm going to touch a little bit that NARUC work is very active with.

So, as we've been hearing all morning, the states are very active in this field. NARUC's members are, I believe, on the cutting edge of promoting distributed energy resources. Forty-three states and the District of Columbia have net-metering policies in place. Many state regulatory commissions are currently engaged in proceedings that aim to determine the value for these resources and how to appropriately compensate consumers for such generation without shifting costs to nonparticipating customers.

This exercise, as I can personally tell you, is not simple—and as we've just heard from our previous panelists, as well. As state regulators, we are obligated to represent all customers. So we have to think about the largest industrial customer that spends

tens of millions of dollars a year on electricity to the single senior on a fixed income. We have to be cognizant of every policy that we implement or decision we make is going to impact all of them.

We've had a very good discussion, so far, about one type of customer, so far, today. But I have to remind you all that, as regulators, we have to keep every single customer in mind as we make decisions. Our goal, of course, is to represent all fairly, treat all parties fairly, ensure safe, reliable, and affordable utility services. And, again, while not also jeopardizing the health of our utilities so that they can keep delivering that reliable and safe power.

Again, it's not an easy job, and it certainly rarely comes with accolades. All too often, particularly of late, it comes with the opposite. And I'll touch on that in just a few minutes.

I do want to emphasize that net metering is a state issue. States have exclusive jurisdiction to establish retail rates. That is not debatable.

What is being debated across the country is how to reasonably compensate distributed-energy providers, and that is where the debate should remain—again, in the states. A national or a one-size-fits-all approach to net metering would not solve anything and, I submit, is an unworkable plan and would upset the very structure of state regulatory commission practices that strive to keep rates affordable and electricity reliable.

As state commissioners, our decisions must be impartial and must be based on the evidentiary record. Each state's considerations for distributed generation are unique, and state commissions are the ones that are in the best position to determine the necessary components of compensation and what does compensate a reasonable methodology.

Last winter, Senators Reid and King introduced an amendment regarding on-site generating or net metering to the energy bill that was floating around in the Senate. This amendment would have set, as a default, the concept that customer-sited

generation should be compensated at the full retail rate for electricity service. NARUC voiced its opposition to this amendment, as it would interfere with the states' ability to set retail rates and would undermine the fundamental purpose of PURPA, which establishes that small generators should be compensated no more and no less than the energy and capacity benefit it provides to the system. Fortunately, that amendment did not pass.

NARUC strongly believes in the need to allow consumers options to generate their own electricity in competition with monopoly providers while being compensated fairly. A case in point—and someone mentioned this earlier—NARUC is in the process of authoring a distributed-energy resource compensation manual to assist our members in making determinations about what is fair and reasonable compensation. We're holding a town-hall meeting to discuss that draft on July 23 at NARUC's summer meetings in Nashville to get some feedback.

So, since this is a state issue, I'm going to now turn to my home state of Wisconsin and talk about a few things that we've done there. And Wisconsin has been referenced earlier this morning, in good or bad light, depending on your perspective. Now I don't make any claim that what we've done in Wisconsin is the best solution for any other state. It may or may not work. Again, I think these are very unique issues.

Wisconsin has a very heavy industry—manufacturing sector. And that requires a very robust baseload energy capability. And this, combined with limited and wind, solar resources, probably means that a solution that we've crafted in Wisconsin doesn't fit so well in Hawaii or Arizona. So, again, that's the problem with the one-size-fits-all solution.

So let me—there we are. Just quickly—again, this just will establish and underscore that states have the exclusive jurisdiction to set the retail rates. In net metering, if a customer is overcompensated for their generation, it makes the investment more economical, of course, for that particular customer, but there is a price that is paid by all of the other customers and the non-utility generating customers. So, as a regulator, of course, we have to try to strike that balance.

Oh, I went backwards. Here's a snapshot of some things that we've done in Wisconsin, in an effort to strike a fair compensation for net-metering customers. There are a couple things we looked at.

Well, first of all, we have about 19 megawatts of distributed generation statewide. And as we've talked and heard earlier today, it is not just growing nationwide. It's growing right here in Wisconsin—about 22% per year since 2008, we've seen that growth.

Some things that we've done in our rates, with respect to net metering, is we have looked at the retail versus the wholesale—what that compensation should be. Many of the customers previously receiving a wholesale—I'm sorry, a retail rate—for their excess generation—now they are receiving retail rates set at the average LMP. We've also limited the size that a customer can build. The purpose of that is to reduce the incentive to overbuild and produce excess energy that is not needed for that particular customer.

And we've also, for some of our utilities, modified the netting period. I think you've heard a little bit about that, earlier today. We have two of our investor-owned utilities that are on an annual netting period, meaning that there is a true-up only once a year. They get to carry over, from month to month, their hours of excess generation. Three of our large industrial utilities or municipal utilities now have to have monthly netting periods. And that's a recognition that energy is worth different amounts at different times of the year. And there's an argument that if you allow it to carry over throughout the whole year, you're not appropriately pricing the energy at that time.

This is just a chart that more neatly summarizes some of the changes we've made in Wisconsin that I've talked about. You could see, again, that the utilities are paying a wholesale rate to DG customers rather than a retail rate.

There was a couple comments made earlier—a lot of talk in the last panel about cross-subsidization. And that's certainly something that we are working with and trying to address in our rates. There also was a comment, I think by Mr. Rábago, that failure to

use energy is not a cost. But I would submit that there is a cost to the utility, to have its commodity available 24/7. So there is—that customer may not at that moment be using the system, as far as receiving energy. But if that customer is expecting if his distributed generation or her distributed generation is not going to produce at that very moment, and that will be able to draw upon the utility's services at that time, then there is a cost to the utility to have it available to all customers 24/7.

We have taken a look at the fixed charges. There was a bit of a discussion about fixed charges changing across the country. They do—we have found that they better align rates with costs—reduce cross-subsidization. It is a very controversial subject, and it has garnered a lot of interest among many stakeholders. But we have found that it does recognize the utility's fixed costs have traditionally been put in the variable bucket charge. And if a distributed-generation customer is not using the grid as much, they aren't contributing their proportionate share to those utilities' fixed costs.

A couple other things that utilities have done that have been spoken about earlier are looking at the value of solar, perhaps implementing time-of-use rates, unbundling rates for these types of customers, or implementing demand meters. It was noted we did have a decision that was implemented in Wisconsin—it was overturned by the circuit court—that would have employed demand meters for certain distributed-generation customers. That is something, I think, though, has survived—right now, at least—some other court challenges across the country. And I think for those customers that want to use the system in a different way that demand more information, I think a demand meter might be a useful way to provide them that information that they are seeking and provide a nice, two-way communication with the utility.

Someone also on the first panel, I think, mentioned that if you want to see a lot of interesting and innovative things that utilities are doing regarding rate design and addressing that metering, to take a look at the Sacramento Municipal Utility District. And they are certainly working on a lot of interesting things out there.

I'm not going to talk too much about community solar. It's been discussed many times, as well, this morning. But it's another thing that we do have experience in Wisconsin. I think we've approved three or four of them, so far, in the past year. And we are approving them on a pilot basis. Small programs, to begin with.

They're not all designed the same, which is kind of the whole concept of doing a pilot program in the first place. Some of these actually do recognize the transmission benefits and the avoided costs and also implicitly acknowledge the distribution benefits and the avoided costs. In the orders we approved, we also are requiring the utilities to report to us on the data needed to evaluate those transmission benefits and costs. I think we hear a lot about what those are, and we want to actually—OK, if you're going to go ahead and do this, we want some actual data in return for approving this. And the utilities have been willing to do that, as well.

An added benefit of solar—and I think former Commissioner Moeller mentioned this a couple times—it is much cheaper than the customer-owned. In Wisconsin, it's been shown to be 42% cheaper than customer-owned distributed generation. Having the utilities also own and operate these systems does ensure better maintenance and integration to the grid. They can control the siting, and so on, and so forth.

This is another area, though, where NARUC has been very active, in community solar. Last February, at our winter meeting in Washington, DC, I moderated a panel on community solar. And we didn't have enough time to talk about it, so we're going to have another panel at our summer meeting in Nashville, on community solar, as well.

There's a lot to talk about. Utilities are very interested. Customers are very interested in it, as well. And we're also very interested in how we can address it with the low-income customers, as well. There is typically a significant up-front cost for some of the customers to participate in that.

I'll wrap up here with just a few comments. Finally, I noted that the job we have doesn't come with many accolades. And that's fine. Most people don't know what a

public utility commissioner is. I think I finally taught my family, after five years, what I do for a living. But I won't test them on that.

[LAUGH]

But unfortunately, as of late, doing what we do has come—we've seen too many arrows come at us, particularly with respect to this very topic we're talking about today. Over the past several years, as distributed-energy generation grows, so too have the strategic efforts by different organizations and individuals to publicly criticize state utility commissioners. And unfortunately these efforts are specifically aimed at intimidating and threatening commissioners who disagree with them on policy positions of those individuals or groups speaking out.

Now, I certainly don't mind having a good, healthy debate on policy. And I think it's actually very necessary for all of us, in order to make decisions as we move forward. And I know, every day, that I make decisions that make people unhappy.

But is the personal attacks against commissioners—who, as I noted earlier, we must represent every customer that comes before us—that has really gotten a bit out of hand. Our decisions are based on the evidentiary record. We are public servants that strive to ensure outcomes are based and serve the public interest.

From my state of Wisconsin to Nevada, to Arizona, to Utah and Florida, just to name a few, we have seen the disruptions and distractions caused by these activities. These activities must stop, and NARUC will work to support its members to convey how state commissions do an effective job of serving the public interest, not the special interests.

So, as you have heard this morning—and I know that will be discussed this afternoon—the topic of distributed generation is one of great interest that invokes many passionate and complex questions. And I can assure you that the states are actively engaged and look forward to working with all stakeholders to ensure that fair, reasonable compensation is provided for these resources. Thank you for your time.

[APPLAUSE]

JOHN SEESEL: Thank you very much, Chair Nowak. And now we'll hear from Commissioner Rendahl.

ANN RENDAHL: Good afternoon. It's a pleasure to be here in the other Washington. I just need to make a caveat that I'm speaking for myself and not for my fellow commissioners or for the commission itself.

I also appreciate the opportunity to speak as a state regulator. And I'm going to focus on the important role that state regulators can play in consumer protection. This is an area also that the Federal Trade Commission can play a highly constructive role, particularly in identifying guidelines for certain business practices and disclosure of terms. But states should be the ones who are responsible for adopting consumer-protection requirements and engaging in dispute resolution and enforcement, if necessary.

It is the consumer-protection staff at state commissions and those consumer divisions who are associated with state commissions that can and do provide effective, one-on-one assistance for customers. And that's most effective at the state level and not at the federal level.

So, while Washington State is not a leading state for solar installations, in part due to our very low electricity rates—in fact, they are the lowest in the nation—Washington State does have a policy framework that supports solar deployment, although maybe not as aggressively as other states. So this slide shows where we stand. We are ranked 26th in the nation in installed solar capacity. But the year-over-year growth is similar to other states.

Washington State is a bit unique, as former Commissioner Moeller knows full well, being from Washington originally. It is a very strong public-power state. And so our commission, the Washington commission, regulates only three out of 63 utilities that operate in the state. There are only three investor-owned utilities—Puget Sound Energy, Avista, and PacifiCorp. But there are 60 public-power entities that we don't regulate,

and they serve more than half of the customers in the state. So, in that respect, Washington has a very different electricity framework.

This is just a scope—very quick overview of our net-metering provisions. It's very low. The cap is 0.5% of the utility's 1996 peak load. That's very small compared to other states.

There's also a 100-kW size limit, which is also low compared to other states. Several of the utilities in the state have reached this net-metering cap, but they've continued to provide net metering. So I'm going to move on to the production incentives.

Washington, to make up for its low rates and low size limits for net metering, has a pretty good tax incentive. It's a public-utility tax credit to participating utilities. The tax credit rate to customers varies from a base rate of \$0.15 per kilowatt hour, for a system that involves out-of-state manufactured materials, to a \$0.54-per-kilowatt rate if you use Washington-made panels and inverters. And if you're a community solar, you can double that rate. So, for a community solar, they can get \$1.08 per kilowatt hour, which is pretty good.

This is capped, though. The utilities don't have to pay more than half of their taxable power sales or \$100,000 per year. So some utilities are rapidly reaching that cap. And, under the statute, they're required to proportionally pay customers. And some customers are not very happy about having their production incentive reduced, when they expected to receive it for the full term. Some utilities, some of the public entities have actually placed a moratorium on their applications for the production incentives.

Actually, the program expires in 2020. There have been several legislative efforts to try to extend this program, addressing some of the other issues in terms of the incentives. One of the issues is that third-party owners of solar do not have the advantage of taking the incentives. They're not allowed to.

Well, customers who take third-party solar can net meter. The third-party solar companies are not allowed to take the incentives, so it has reduced the amount of third-party solar in Washington State.

Another of the issues in Washington State involving third-party solar is the question of whether the commission can regulate them as an electric utility. In a rule-making we put forward in 2011, we initiated it in 2011 to update our interconnection standards to try to address some of the soft costs that one of the speakers addressed earlier for DG interconnection.

A few of the parties asked us to address the question of whether third-party owners of net-metered systems are electrical companies, within the definition of our jurisdiction as public utilities. So we deferred this to a policy statement. The commission issued it in 2014. Policy statements, under our Administrative Procedure Act, are nonbinding orders in which the commission provides guidance on a particular issue. We've issued such statements on issues like decoupling.

So we reviewed the statutory jurisdiction of the commission over electrical companies, as well as distributed-generation provisions, and we looked at a number of reported cases around the country in court cases and complaints before the Better Business Bureau involving third-party solar, alleging various consumer complaints. Granted, this was in 2014. It's now 2016, and a lot has changed over time.

But some of the issues that were raised in these cases involved fraud and deceptive business practices, poor quality of installed systems based on what was promised, unfulfilled contract obligations, issues with the securitization of lease payments, limitation of legal remedies through arbitration, inadequate communication and disclosure of contract terms, and the impacts on the sale of a consumer's home. And so all of these issues have been raised in complaints.

So we made a few key findings in the policy statement. First, that, based on this analysis of the jurisdictional analysis that is common, not just in Washington but in other states, in looking at whether a company is a public service company, is the company for

hire? Are they holding themselves out to the public? Is it a monopoly service? Or is this company providing significant market share? And finally, whether consumers are in need of protection in this line of business.

So, in looking at those factors, we decided that it was very likely that third-party owners of net-metered systems are subject to the commission's jurisdiction as electrical companies. But the policy statement also identified, this is a very fact-specific analysis. Those jurisdictional analyses are very fact-specific, and it really depends on what each third-party owner company is doing in what they're providing.

And it didn't make sense for us to make such decisions one on one. It's very time-consuming, and it also creates a fair amount of regulatory uncertainty. And we also looked at the fact that we don't really want to regulate third-party companies, like we do traditional investor-owned utilities. We don't want to set their rates. I don't think they want us to set their rates, either.

So the real issue is the consumer protection and that there's a role for the state commissions in providing some consumer-protection regulation over this issue. We do that for the utilities already. We have significant staff who answer questions on billing and services and all kinds of things and provide a very good dispute-resolution process.

So, if you access these slides, there are a few key findings—and I'm not going to read them—that I won't go into. But, because I'm between you and lunch, I'm just going to—

[CHUCKLING]

—close up, here. You're not there yet.

[LAUGHTER]

We did request that the legislature clarify our authority over third-party solar. Our third-party owners of distributed generation, generally, related to consumer-protection issues, similar to oversight we currently have over competitive telecommunications companies. And I was happy that one of the speakers before

mentioned the analogy to the telecom competition. So, in that respect, the commission—the statute provides that we require the companies to register with the commission and publicly disclose their contracts—particularly if they're standard contracts. This wouldn't apply to the more negotiated contracts with large commercial or industrial customers. But really we're talking the residential, standard contracts. And that the commission should be required to receive and investigate consumer complaints, resolve disputes so that they don't escalate, and then initiate any administrative action if necessary.

It also provided that this would be shared jurisdiction with our attorney general's division, who does consumer protection. They do not have the staff that the commission has to do the one-on-one dispute resolution, but they do take on the larger lemon-law-type cases. So shared jurisdiction would allow us to most effectively assist the consumers.

We did say that's if the legislature didn't act we would pursue a rule-making. Well, we've been through two legislative session since we initiated this, and we haven't taken action yet, the legislature hasn't taken action yet, but it's still a pending issue.

So there have been some recent developments, I think, in this area. South Carolina has adopted a statutory framework for solar companies to register with the state PUC as a part of a broader bill promoting solar in the state. Commissions in other jurisdictions have approved utility-owned residential solar that directly compete. The Consumer Financial Protection Bureau, here in Washington, is looking more broadly at the use of predispute arbitration clauses in consumer contracts in an array of financial products and services. And the industry itself has taken steps to address the business practices that we identified in the policy statement and has adopted a voluntary code of conduct for its member companies and is developing standard disclosure requirements for the contracts.

And these are very promising developments, but we need to do more. And consumers generally—you have some very savvy customers who know exactly where to

look and research the heck out of what they're about to engage in. And then there are others who are—you know, somebody goes door to door, and somebody signs up, and they may sign up for something that's really not in their best interest.

So I concur with Chair Nowak that the issues related to cross-subsidization, retail rate design, and impacts to the reliability of the grid are highly complex issues where everything affects everything else and where states have the expertise and the authority. So this isn't the place for the FTC. But the FTC, as I said, does have a role in consumer protection and some of the competitive issues that we're going to talk about after lunch.

So we would like to partner with the FTC, as well as the industry, in trying to come up with a framework for consumer protection. There are a number of state and federal laws that are intended to protect consumers against deceptive business practices. But consumers don't always know their rights. So the industry will say, there are all these laws that protect consumers, but consumers don't know about them. And they don't have a place to go if it's just an industry-driven consumer-protection plan.

So we would request that the FTC not take action to preempt state authority but to work with states and the industry to identify and share best practices, develop some templates for consumer communications, and maybe exert concurrent jurisdiction, if possible. We really do believe that the state commissions and their associated consumer agencies do help consumers navigate these issues. And, because they work directly with the utilities and the consumers and they can work directly with the industry, as well, that they can provide the best service to consumers.

So, despite the contentious relationship that some state commissions and the industry currently have on net-metering issues, I don't think it has to be that way. And I think we need to work closely and work together. Because, really, this is about the customer experience. I think that's what the industry would say, and I think that's what the commissions would say. It's about the customer experience. And so this should be a shared goal, and we should work together on that. So, thank you.

[APPLAUSE]

JOHN SEESEL: I just want to thank Chair Nowak and Commissioner Rendahl again for excellent presentations. We've really enjoyed them. And it is time now for lunch.

For people in the audience, if you go out—and many of you may already know this—but if you go out those doors and then take a left, there's a cafeteria, a very good cafeteria, on the first floor of the building. And you'll find it if you just go out here and then take a left. For panelists and speakers, we're going to be assembling in the green room. And then we'll be back here at 2:15 for two afternoon panels on competition and consumer-protection issues in solar DG. Thank you.

[LUNCH BREAK]

PANEL 3: COMPETITIVE ISSUES IN A CHANGING INDUSTRY

Panelists:

- **Diana L. Moss, President, American Antitrust Institute**
- **Ari Peskoe, Senior Fellow in Electricity Law, Environmental Policy Initiative, Harvard Law School**
- **Nancy E. Pfund, Founder & Managing Partner, DBL Partners**
- **Richard Schmalensee, Howard W. Johnson Professor of Economics and Management, Emeritus, Massachusetts Institute of Technology**
- **Michael Wara, Associate Professor of Law and Justin M. Roach, Jr. Faculty Scholar, Stanford Law School**

Moderators:

- **Jade Alice Eaton, Advisor, Antitrust Division, US Department of Justice**
- **James F. Mongoven, Assistant Director, Office of Policy and Coordination, Bureau of Competition, Federal Trade Commission**

JAMES MONGOVEN: Well, we'll get started despite the fact that we're missing one panelist. But I'm sure he's on the way. OK. Good afternoon, and welcome to the afternoon, Competition Issues in a Changing Industry. First, a few administrative issues. This panel will run until 3:45. Then we'll have a 15-minute break. And we'll be followed by the fourth panel on consumer protection issues. My name is Jim Mongoven. I am the assistant director of the Office of Policy and Coordination at the Federal Trade Commission. My co-moderator is Jade Eaton, who's a staff attorney with the Transportation, Energy, and Agriculture section in the Antitrust Division at the Department of Justice. I'll briefly introduce each of our speakers. They will have approximately 10 minutes to give their opening remarks. Then Jade will give each of them an opportunity to react to the other speakers. And then we'll have a question and answer session, and time permitting, we'll take questions from the audience.

I'll just give a brief introduction. There is a fuller biography in the handout on the table outside. Our first speaker will be Ari Peskoe. He is the senior fellow in electricity law at the Harvard Environmental Policy Initiative, which is a nonpartisan organization that provides legal analysis on a range of energy and environmental issues. Next is Diana Moss, president of the American Antitrust Institute and an adjunct faculty member at the Department of Economics at the University of Colorado at Boulder. Following her

will be Richard Schmalensee, who is the Howard W. Johnson Professor of Management and Economics, Emeritus at MIT, and has served as the John C. Head III Dean of the MIT Sloan School of Management. As a side note, we heard several references this morning to a 1977 conference on solar issues at the FTC. Derek Moore went to the FTC library and found the report from that conference. Low and behold, on page 119, we find out that associate professor Richard Schmalensee was a speaker at that conference.

RICHARD SCHMALENSEE: Time flies.

JAMES MONGOVEN: So if we don't get it right this time, we'll invite you back in 2055 to finish it.

RICHARD SCHMALENSEE: I can't imagine what I said.

JAMES MONGOVEN: Our fourth speaker will be Michael Wara. He's an associate professor of law and the Justin M. Roche Junior Faculty Scholar at Stanford Law School. Also, a research fellow at The Program in Energy and Sustainable Development at Stanford's Freeman Spogli Institute for International Studies, a faculty fellow at the Steyer-Taylor Center for Energy Policy and Finance, and a center fellow at the Woods Institute for the Environment. Finally, we have Nancy Pfund who is founder and managing partner of DBL Partners, which provides financing in the solar space. She's also chair of the advisory council of the Bill Lane Center for the American West at Stanford University, a member of the advisory board of the Lawrence Berkeley National Laboratory and the UC Davis Center for Energy Efficiency, and is a trustee of the National Geographic Society. We'll start with Ari Peskoe.

ARI PESKOE: Good afternoon, and thank you to the FTC staff for inviting me to participate today. My remarks will focus on the role of state regulation in setting the terms and conditions for adoption by utility ratepayers of distributed solar. My thesis is that investor-owned utilities' century-old technology and business model for electricity distribution is being fundamentally challenged. Decentralized technologies and services owned and provided by ratepayers and third parties allow consumers to buy less power from their local monopoly utility and may effectively compete with the utility for capital

investments. State regulation plays a vital role in how investor-owned utilities have responded to this threat. Utilities can and indeed are using the regulatory system to maintain the status quo of a top-down utility system. However, to varying degrees, regulators and some states are taking steps to enable an innovative environment where decentralized third party providers of technologies and services can compete and flourish.

One note before I dig into this. While the focus today is on solar, as has been mentioned previously, it's really a combination of complementary technologies and services that really has the potential to disrupt the electricity system. Some of them face similar challenges in terms of a state regulation perspective that I'll talk about now.

State regulation is about protection. Utilities receive protection when states initially passed laws in the early 20th century that tasked public utility commissions with regulating electric companies. State regulation effectively insulated utilities from competitive market pressures and provided them with de facto monopolies over electricity distribution in a given geographic region. Ratepayers receive ongoing protection from state regulation. By law, utility rates must be approved by regulators and must be just and reasonable and not unduly discriminatory. Seventy years ago, the Supreme Court concluded that just and reasonable rates must balance consumer and utility investor interests. In practice, rates reimburse utilities for operating expenses and provide them with an opportunity to earn a return on prudent capital investments, while also preventing monopoly profits. The just and reasonable price approved by regulators is intended to mimic the price that a competitive commodity market would produce. The prohibition on undue discrimination prevents the utility from playing favorites among its ratepayers by charging different rates for the same service. Another formulation of this prohibition is that rates should adhere to the cost causation principle. Like just and reasonable, undue discrimination connects utility rates to utility costs.

There are essentially two steps to ratemaking. First, setting the revenue requirement. That is, the amount of money that utility can expect to earn from rates.

Two, establishing the rate design, which allocates that amount among different classes of ratepayers, and then sets volumetric fixed rates and other charges. This is a highly technical, contested process involving engineers, economists, and lawyers. Although parties often speak in neutral terms, emphasizing cost causation, economic efficiency, and sound engineering, choosing a rate structure involves a subjective balancing of interests.

State courts reviewing utility commission rate design decisions are deferential to the commission on both aspects of the rate. Many state courts have said on rate design that cost causation is a factor, but it is just a factor. As long as the commission bases its decision on the record, state courts are very unlikely to overturn a utilities rate decision. Effectively, regulators have the final say on rate design.

This regulatory model was created 100 years ago when it was clearly in the public interest to expand electricity and enable more per capita consumption. The basic ratemaking formula incentivized utilities to invest capital and to sell more kilowatt hours. Growth was the key ingredient that aligned the public interest with private profit. Today, volumetric sales have been flat in the US for nearly a decade, and this is unprecedented. Rooftop solar probably played a very small role in that, but the prospect for dramatic expansion, along with other complementary technologies, raises the possibility that utility sales may actually decline in the future.

To delay this decline and blunt the effects of flat sales on their revenues, utilities across the country have sought permission to change rate designs. Two widespread utility proposals, which we've already touched on today, are to increase fixed fees on all ratepayers and to reduce the net metering rate. Utilities typically rationalize these changes by appealing to the cost causation principle. They argue because they recover most costs through volumetric rates, and the costs of distribution are largely fixed, they must increase fixed fees to account for no volumetric growth. On net metering, there is a similar argument. Net metered consumers reduce their volume and are therefore, underpaying for the fixed costs of distribution. The result, according to utilities, is that

net metered ratepayers are being subsidized by other ratepayers. And we've heard about this cost shift.

These rationales and the underlying facts are hotly debated. I won't get into that debate now, but what I'd like to do is just highlight that cross subsidies, or cost shifts, between individual ratepayers are a feature and not a flaw of utility rates. There are numerous such cross subsidies, and utilities and regulators typically ignore them. Rather, they ignore the differences between individuals in the same class. Historically, when utilities offered incentives either to increase consumption, which they often did in the earlier days of regulation, or today to decrease consumption, regulators evaluated those incentives by looking at the overall benefit or cost to the utility system. So long as regulators could find that the utilities benefited, they typically allowed incentives that may have directly benefit only a handful of consumers as long as there were system-wide benefits.

I just wanted to briefly mention there was a lot of back and forth on the last panel about a California study that found that there was a cost shift that benefited net metered customers. It's worth pointing out that that same study also showed that prior to adopting solar, those customers we're actually paying 50% more than the cost to serve them. That is because these cross subsidies, or cost shifts, are just an inherent feature of how we've always done utility rates. To the extent regulators today think they must chase economically efficient pricing to the exclusion of other goals, there are places to start other than targeting ratepayers who buy less energy from their utility.

Apart from rate design and any specific policy such as interconnection procedures that could be used to stall the growth of solar, there are deeper features of the state regulatory system that the utilities at odds with distributed solar. Although rapid per capita growth in electricity consumption may no longer be in the public interest, one could still certainly make the case that we need a lot of capital investment in the electricity system. Today, ratepayers, independent power producers, and other parties, rather than the utility, could potentially provide those investments. But under the traditional ratemaking formula, utilities have an incentive to make those capital

investments. And utilities also have an incentive to rely on capital intensive solutions rather than operational solutions to maintain the grid.

The architecture and ownership of the grid are additional factors. Nearly all power today is still generated at thousands of large, central power stations and transmitted over hundreds of thousands of miles of high voltage power lines. Utilities, investor-owned utilities, own 2/3 of those power lines in the continental US. In 35 states, utilities that distribute power still own most of the generating capacity. If the electricity system becomes more decentralized, capital deployed by non-utility parties may effectively compete with these utility investments. Then there are also utility holding companies.

Take the case of Exelon, one of the largest generating companies in the country, which also distributes power in five states, as well as the District of Columbia. Last year, two utility commissioners in Maryland dissented from a state commission order that provided the company with permission to purchase two distribution utilities. This is what the dissent wrote. "Exelon's economic interests to shield it's generating fleet from emerging distributed energy technologies and other competitive threats are inherently misaligned with the interests of the customer of the distribution utilities it's purchasing."

A decentralized architecture is not just a major change to the physical electric grid. It raises the possibility that rather than paying a uniform rate, each rate payer could have their own unique economic profile. And rather than transacting with just a handful of large-scale entities, it raises the possibility utilities could be transacting with tens of thousands of entities on an hourly basis. This vision is a dramatic departure from the industry's 100-year-old model. This sort of transformation is very difficult, and incentives created by the regulatory system appear weighted towards maintaining the status quo, even if decentralized technologies can benefit ratepayers. Using regulation to insulate a monopoly from the effects of industry trends and technological development, such as by increasing fixed fees, seems unlikely to facilitate innovation. In fact, high fixed fees seem designed to maintain this status quo. The nature of regulation

of this industry means that innovation must be a shared endeavor among regulators, utilities, ratepayers, and third party providers.

I'll close by saying that regulators in some states are moving forward. Many states have been rejecting utility requests for high fixed fees. For example, a few states—New York has come up as the leading example—are taking a broader approach, and are looking at how they can change utility incentives generally in a way that doesn't put them at odds with distributed technologies and services. As regulators examine whether and how to open the distribution system, one tool at their disposal is the prohibition on undue discrimination. This prohibition is rooted in concerns about anti-competitive behavior.

The connection between discrimination and the economic self-interests of monopolists was a key factor, a key part of FERC's argument to advance competition in a wholesale generation in the 1990s. FERC concluded then that the incentive for utilities to engage in discriminatory practices is increasing significantly as competitive pressures grow in the industry. This was FERC in 1996. FERC was talking about the very same companies that today are facing competitive pressures on the distribution grid. Depending on the state law, regulators at the very least may be able to use this authority to ensure fair procedures that allow new market entrants to participate and are not biased in favor of incumbents.

JAMES MONGOVEN: Thank you, Ari. Diana?

DIANA MOSS: Well first, thanks to the FTC staff for organizing this very productive day. And thanks to Jim and to Jade for moderating. It's an honor and privilege to be here. I was asked to speak to the intersection between antitrust and regulation in promoting competition in this very emerging area of downstream, or retail-level distributed generation. I'm happy to do that.

I want to talk about three things. The, as yet, undiscovered role of antitrust in this domain. I'd like to speak about that for a couple of minutes. Then I want to try and frame some analytics around how we would define or look at markets in the event there

were some antitrust enforcement developments in this space. Then finally, I would like to talk a little bit about what antitrust remedies might be available and contrast those to what regulatory remedies are available for anticompetitive conduct were it to be found in some of these markets.

So first of all, the role of antitrust enforcement. We know the role of regulation. Regulators are very busy out there at the state level developing rate structures to deal with these very unusual little distributed generation customers with rooftop solar panels. It really is a state-by-state play at this point. But we don't know that much about how antitrust is developing. So the ultimate role for antitrust is really undetermined at this point. We're watching cases very carefully like the *SolarCity / Salt River Project* case. We will be reading carefully what the courts say about the role of antitrust in this domain. I would wager that the antitrust agencies, the DOJ and the FTC, will use a lot of prosecutorial discretion in deciding if and when to engage public enforcement resources in this debate. I think we can expect to see the full range of antitrust immunities claimed as a defense for the type of conduct that we're seeing at the utility level. I'm not opining on whether that conduct is good or bad or legal or illegal. But I do think we've already seen this and certainly in *SolarCity*, that the full range of immunities will be rolled out. State action, filed rate doctrine, all sorts of things.

I think it is instructive and useful to look to history for some lessons on how this will develop. My first jobs out of graduate school as a new PhD were to work on the QF cases from the PURPA days. I'm dating myself, unfortunately. But that's what I worked on. My first case was a case involving Thermo Electron and Rolls Royce filing a case against Florida Power & Light. They built a 17 megawatt co-generator down there in Dade County, and were summarily slapped with very, very discriminatory, allegedly discriminatory, standby and backup rates to sell power back to the grid. Those are very instructive cases to look at. It's perhaps old wine in a new bottle when we're talking about distributed generation. There, I think state action got a lot of traction because there was a state-level regulatory regime that deliberately displaced competition. That's a very, very different play now.

We've certainly seen antitrust step in when we had what were called deferral packs. This is the Rochester Gas and Electric / University of Rochester agreement that the university would not build a co-generator. So we have a little bit of history on that front from the PURPA days and from more recent antitrust activity. But this is really a fundamentally different play that we're in now. Very fundamentally different. We have states that have competition regimes, legislated regimes, that promote competition at the retail level. They don't displace competition. They promote competition.

We also have all this happening within the broader rubric of a national policy designed to promote energy efficiency. A really bad outcome would be for us to proceed state by state, where state action defenses get traction in some states and not in others. We'd have a very Balkanized system where antitrust applied here, but it didn't apply there. That would have very bad effects on innovation. It would have perverse results for driving innovators in distributed generation to some states where it was a friendlier environment and away from other states. Consumers would be overall deprived of new technology, of competition, and of benefits from that.

So how antitrust sort of fits into the bigger picture has yet to be determined. But my guess is there are complementary roles for antitrust and regulation in this space.

Let me go on quickly and talk a little bit about how we might look at markets for distributed generation PV in an antitrust framework. I think we have to consider some unique factors and attributes of what goes on down there. Obviously, we've got networks, distribution networks, now being used instead of one way, power injected, power taken off – it's being used in two ways. Power injected and taken off and power re-injected into the grid. We have equipment and services being bundled together. That raises potential for some mischief on the competition front, which we have not yet seen. We're also talking about an essential facility. I know that's a bad word, but I'm going to say essential facility. There is an essential facility doctrine that I think may be revitalized in the context of some of these competitive concerns.

If you look to the demand side, we see some unique demand attributes on the part of consumers, residential consumers, who are installing these rooftop solar arrays. I live in Boulder, Colorado. It is mania in Boulder to have rooftop solar on your home. I cannot because I have too many trees in my backyard. But I have friends who really value having rooftop solar for both intrinsic and extrinsic reasons. There is the feeling that you're green. You're supporting energy efficiency. You feel good because you have rooftop on your home, but you get to sell back and make some money that way. It also implies that perhaps this particular set of customers that install these technologies may value utility-provided services less. They may not value one stop shopping. Go to utility, they do all the procurement, they package it all together for you, you have a simple billing system. They may not value that as much as they would generating themselves.

So this all leads us to questions about market definition. How would we, as antitrust advocates and enforcers, define a market in which distributed generation of photovoltaics live in this market? Who's the competition? What's competing with rooftop solar? For the purposes of determining whether there has been anticompetitive conduct, for example, of the sort we see in *SolarCity*, that would really be the first stop. So I would say, and I'm just raising questions here, we probably want to think about relevant markets for green electricity since there are these very unique consumer attributes, demand attributes, and use of the grid. We might want to think about green electricity delivered at the retail level. We may want to think about these consumers as what we call targeted consumers. If you go to the merger guidelines, there is big section on market definition. Targeted consumers who can be price discriminated against because of these unique demand attributes.

These are differentiated product markets. If you want to generate electricity on your rooftop, you may well, if price were to go up high enough, switch over to the utility to buy rooftop solar with bundled service or utility. Or you might even be happy buying a green utility product that was generated higher up in the supply chain from a solar garden, for example. Or a central station Solar, or even a wind farm, or something like that. So the question is if the price were to go up to the consumer because of

anticompetitive conduct, who would they switch to? Who's in the market? Who's available to avoid the price increase?

So this is where the question of price comes in. I think it will be hotly debated as we've seen in earlier panels in terms of the net metering issues. But as far as antitrust is concerned, unpacking that hugely complex calculation of what's in the price, what are the components of price, what does the rate structure look like is something that antitrust probably should and needs to avoid.

Finally, just a word on remedies in the context of remediating the type of anticompetitive—alleged anticompetitive—conduct that is an issue in the *SolarCity* cases. There are things antitrust can do that regulation cannot, as we all know. As Ari just pointed out, regulators are loath to sort of undercut or indict their own regulatory regimes. FERC has as a regime in place for open access and RTOs to promote access at the wholesale level. State regulators are going to have exactly the same reaction at the retail level where they will not want to indict their existing access regimes. Antitrust has a lot of deterrence value when it comes to levying penalties, particularly in private cases where they are damages involved. So that's something to consider. The type of exclusionary conduct that we're talking about in *SolarCity* is probably a pretty standard case for antitrust. The question is what can antitrust do that will complement as opposed to interfering with or creating tensions with regulation? That's where the big questions lie.

Antitrust should not get involved in price regulation. That really is the domain of the regulators. Injunctive relief. Stop doing what you're doing in terms of excluding the *SolarCity*'s of the world with discriminatory rate structures. That might open up some options for reviewing what's going on at the state level. There might even be possibilities for structural relief. I would just pose the question to this group that we might want to start thinking about whether utility should be in the business of competing with competitive downstream rooftop photovoltaic suppliers. Or whether their job is better done higher up in the supply chain with more efficient, larger scale

generation. Certainly, the antitrust agencies should continue their competition advocacy work, workshops, technical conferences, and like. Thank you.

JAMES MONGOVEN: Dick?

RICHARD SCHMALENSEE: Thanks for having me back and giving me a chance to correct whatever it was I said in 1977. I'm sure was all correct, and I'll go on to something else. I find it useful in settings like this that are complex to start with simple examples and add layers of complexity.

So let me start with my own situation. I get billed by Eversource, which is a wire-only utility in the New England area. My bill has three components. It's a tiny, fixed charge, which I gather is being increased, but a pretty small, fixed charge. An energy charge, which reflects the cost of purchases in the wholesale market, and a distribution charge. The distribution charge is a pretty big deal. In 2014, the average wholesale price in Massachusetts was \$0.076 a kilowatt hour, and the residential retail price was \$0.174 a kilowatt hour. That's not uncharacteristic of gaps elsewhere in the country. Now, as we all know by now, that gap doesn't reflect a calculation of costs related to rooftop solar. It's basically the cost of Eversource's operation, most of which involves fixed cost, divided by kilowatt hours and added to my monthly bill.

I want to mention the MIT study that was referred to before lunch. It's a pretty straightforward study done by a bunch of engineers. They asked the question, compared to generation at the high voltage grid level, suppose you put PV distributed in the low voltage distribution system, what's the difference? In the low voltage it varies a lot by the configuration of the grid and the detailed incidence of where the solar hits. But the general pattern was really simple. You save online losses because you're putting power nearer to load. But the grid is not designed for reverse power flows. The grid is not designed to have power injected at the ends of feeders. You can handle those, but the cost of handling those overwhelms the reduction in line losses. That's engineering; that's not hard stuff.

So is there competition in the Eversource case? Eversource has decoupling, so its revenues aren't threatened by rooftop solar. Is there competition? Well, sure. Rooftop solar competes with other generation. And rooftop solar is more highly compensated than other generation. But there's no particular scope or incentive for Eversource to take anticompetitive action. In fact, rooftop solar doesn't compete with what Eversource provides, which is a connection to the high voltage, bulk power system. That's what it provides under decoupling. That's what it's paid for.

So there's a rough sense in which decoupling makes sense. But now let me go another step. Suppose Eversource has no generation, but doesn't have decoupling. OK. Then rooftop solar—I should've said one other thing—decoupling automatically shifts costs. You can say whether it's good, whether it's bad, but that's what it does. This is not theory. This is not highbrow economics. Fewer kilowatt hours sold, fixed cost, higher distribution charge per kilowatt hour. That's just—that's arithmetic folks, that's arithmetic. And if you don't have rooftop solar, you pay a higher distribution charge. Whether it's good or it's bad, it's arithmetic. Now suppose Eversource doesn't have decoupling. Well, it has every incentive to resist rooftop solar and to scream to the regulators and to complain. Not because it's being competed with, because remember I said it doesn't have generation. But because, under the regulatory regime I hypothesized, its revenues are being eroded, its ability to maintain the grid, its ability to make the grid smart are being affected. That's not a competition problem; that's a rate design problem.

Volumetric rates are, in a situation where you could have distributed generation, a terrible way to recover fixed costs. An easy way to see that is suppose I have a solar roof that permits me to sell power during the sunniest hours. Then I buy power the rest of the time. And suppose my net usage is zero. Well, in that case, under the rate design that's almost universal in this country, in fact almost universal worldwide, I don't pay for the grid. I'm not paying net any distribution charge. But I'm using the grid intensively. Pure volumetric can't be the way to go. Applying the same fixed charge to everybody can't be the way to go, because people differ in how much they use and when they use

it. We are going to need to do distribution cost recovery that reflects basically, the load profile. How much do you use, and when do you use it? We need a system that is perceived as fair, reflects cause causality, and can be explained to people. My engineering colleagues say, oh, I've got it. And they run off into reference network models. And I say, no, no, we don't play that game in this country. There has to be another way to do it. We don't know what that way is. I think that's a regulatory problem. I'm afraid it's not an antitrust problem.

I would say one other thing. There was a discussion this morning about grid neutrality. I would suggest an important principle of grid neutrality that I would propose is that what goes on behind the meter shouldn't matter. All that should matter is what the customer does when. Whether I use electricity because I have a solar roof, or because I've installed efficient appliances, or because I leave the lights off all night, shouldn't affect what I pay for electricity. Whether I have storage or don't have storage, what should matter is what demands I put on the system. It can't be current demands, because then you get back into the volumetric problem. But some appropriate demand. Figuring this out is that not something antitrust is likely to be good at.

Now let me add one more level of complexity. Let me suppose Eversource doesn't have decoupling, but has generation. Well, now you get into the potential for real competitive problems. Because Eversource has every incentive to resist competition with its generation fleet. The natural cure, of course, the cleanest cure is structural. They shouldn't have generation. They should be in the wires business. We should go where a number of other countries have gone, and do a structural separation. At the very least, pricing should be separate. But then you have the problem is there's a good economic course for protecting the wires part of the business in most parts of the country where competition in generation is the norm. There is no good case for protecting the generation part of the business. How you do that, and how you do rate design to do that, and what kind of proposals the company can make that are and aren't anticompetitive, is not simple. I believe that is a hard regulatory problem, not an easy antitrust problem when you've got generation and distribution together.

Let me come to the final problem. Suppose all of this happens. Eversource doesn't have decoupling. Eversource has generation. And it is in a part of the country that doesn't have organized wholesale markets, doesn't have generation competition. And now comes distributed generation. Well, the regulatory problem is hard because there's no easy way to separate distribution from generation. Because they haven't been separated either in an accounting sense, and certainly not generally in a structural sense. It's not clear to me antitrust is a good tool for that, to deal with that anticompetitive problem. It is clear there is potentially enormous incentive, and probably ability, to exclude.

It strikes me that antitrust is a relatively blunt instrument. Except, and I love to hear Diana talk about structural remedies because structural remedies are the cleanest in these situations. Antitrust shouldn't—I agree with her—be in the business of price regulation. But without structural remedies, is it anticompetitive to impose a fixed charge? Well, doesn't it depend on what the fixed charge is, and how that relates to other principles of ratemaking? And how is an antitrust court going to make that decision? So I would, being a believer in competitive markets, love to see structural change. Whether brought about by antitrust or other means. But I'm not convinced that antitrust has a huge role to play. Thank you.

JAMES MONGOVEN: Thank you, Dick. Michael?

MICHAEL WARA: Thanks for having me today. Unfortunately, my Stanford IT and the FTC's IT don't talk to each other in a way that allows me to print things. So I'm going to read from my, or work from my laptop today.

I want to start by saying that I think that competitive markets, as I think everyone on the panel so far has agreed, are in the national interest. This is especially true when technological innovation creates the prospect of competition where natural monopoly has previously existed. Rate regulation of industries that do not require it will always tend to produce sub-optimal outcomes, because of the information challenges of the undertaking. Competition in the power sector, as in other sectors, most notably

telecoms, will tend to create productivity gains, greater consumer choice, greater consumer value. Not necessarily lower consumer costs.

This workshop, this harps back something to that Ari said, is ostensibly about solar. But at the outset, I want to state clearly that the real issue for the electricity industry is not limited to a particular technology. The competition issue is not just about solar net metering, although it might seem like it right now. The real issue is customer side energy services, generally. Storage is the next big thing. Smart homes and businesses will follow. All that focus on solar and net metering risks missing the bigger and much more important question of what to do to avoid erecting barriers to, and perhaps even to enable, the dynamic innovation that's unfolding on the customer side of the meter. To be clear, the evolution is occurring at a much more rapid pace than the utility industry can likely be responsive to.

I think the most important aspect of this unfolding dynamic is probably the very different product cycles that occur in utility scale power generation, relative to distributed energy resources. DER product cycles are annual. They are like your iPhone. Utility scale product cycles, the product cycle for a GE gas turbine, are more like decadal. This has important implications for rates of innovation. It means that the competition situation today is unlikely to be representative of where things will be in a decade.

I also want to be clear that I believe very strongly that utilities deserve a fair shake. They've made, and continue to be required to make, investments predicated on a business model that assumes no competition, and focuses on cost minimization rather than value creation for their customer. Cost minimization is a very limiting box to be in when exposed to firms that are willing to take risk, because they can enjoy high returns if those risks turnout well. Regulated utilities provide a very valuable service to American consumers at relatively low cost, and are obligated to serve all comers, unlike their would be disruptors. These firms need to be given a fair deal and allowed to enjoy, in Warren Buffett's words, the good, but not great return on investment capital that they have enjoyed for the past century or so.

So how should competition agencies respond to this nascent competition we see in the power sector? I think in a number of different ways. The basic principle should be to strive to create a level playing field for energy services' provision to consumers. To resist attempts to create or raise barriers to entry. The goals will be effectuated by differentiating between rate structures and encouraging competition from those that allow for and reward it. The end goal should be creation of a national market for DERs that allows for full exploitation of the potential productivity gains created by these technological innovations.

Involvement of competition agencies implies, at least in the background, the potential for antitrust enforcement. Utilities object strenuously to the idea that any of their regulated businesses might be subject to the Sherman Act. And for much of their regulated businesses, they are absolutely correct. State action immunity doctrine, filed rate doctrine, protect state chartered and supervised monopolies from the application of the antitrust laws. And has done so since the 1930s. The court articulated doctrine states that even when anti-competitive conduct has been authorized, and this is by the state, and is actively supervised by the state, it's exempt from antitrust enforcement. Should the doctrine shield utilities when they take actions that erect barriers to entry to distributed energy resource providers? I think the answer is, at least in some cases, no, it shouldn't shield them.

The first issue is authorization. Many of the actions being taken by utilities across the country to change rate structures are focused solely on PV, on the subject of today. Should the utility be free from immunity when it modifies its rate structures to reduce competition from outside of its regulated service territory, from behind the meter? Absent specific statutory authorization, the answer may be no. But in many cases, the authorization will be more clear than this. Certainly in California it is. Where state authorizing legislation has been passed, conduct is authorized.

A separate question that matters for both separate PV net energy metering rates, and for retail electricity rates more generally, is whether utilities anti-competitive conduct is sufficiently supervised by the Public Service Commission that oversee and

approve rates. On the one hand, it might seem odd to suggest that PUC does not actively supervise retail rates. Most utilities would beg to differ. But the important question here is what is the content of supervision that occurs? Is it of utility cost recovery? Is it of bill impacts to ratepayers? Or is it of competitive impacts to other would be customer energy service providers? I at least would argue that, to some degree, the last piece is the most important criterion in assessing whether in fact supervision is active in the context of a structurally competitive, but indirectly rate regulated, market such as distributed energy resources. Truth is we don't really know how courts will respond to this question. They have been quite vague to date on the content of active supervision. What the history and evolution of antitrust does teach is that enforcement is highly fact and context specific. These are a new set of facts and a very different context.

Private enforcement of antitrust law in the energy resource context, as has been mentioned, is already being actively pursued by SolarCity in Arizona. There, the DER provider has survived a motion to dismiss based on state action immunity. The issue of state action is currently before the Ninth Circuit. DOJ antitrust has submitted an amicus brief in support of SolarCity's position. The decision is both in the trial court and the Ninth Circuit. Given that this jurisdiction covers the largest solar markets in the country, it will be crucial to determining whether anticompetitive business practices are permitted in the evolution of the US distributed energy resources market. I think this is true even though Salt River Project is a bit of an odd duck when it comes to the question of state action immunity doctrine. The court will send an important signal about how they are going to think about this question moving forward.

I believe the best way forward in the broader context of the numerous rate cases across countries is for utility commissions to take a much more active role in oversight of the competitive impacts and proposed changes to retail rates. By evaluating not just how retail rates will impact current ratepayers, but how rate structure changes, including but not limited to net energy metering, fixed charges, time and use rates, demand charges, will affect competition more generally. PUCs and their regulated

utilities can do much to avoid a highly disruptive private, or potentially public, antitrust challenge by taking such actions. DOJ antitrust involvement in the *SolarCity* SRP case is an important signal, I think, to utility commissions that this should be the rule moving forward. That competitive impacts need to be an additional and important factor in thinking about changes to rate structures. But antitrust regulators needn't stop there. Federal competition regulators can and should be taking a more active stance in their horizontal merger review of major utilities. Competition regulators should be asking for disclosure during merger review of current retail rate structures and the competitive impacts on distributed energy resources of the spread of one set of practices to the other territory. They should also be soliciting input from the merging utilities DER competitors.

Finally, they should also be actively seeking input on developing a set of per se anticompetitive practices for utilities to commit to avoid. In particular, I'd point to high fixed bills as has been mentioned as highly anticompetitive. I agree with the remarks earlier on the panel that context matters. What is high in one place may be low in another. But there are complexities here. However, high fixed charges eliminate consumer choice. They remove the ability of DER providers to create value by offering a partial alternative to grid services. Managing competition in context where rate regulation and structurally competitive markets intersect is hard work.

The issues are enormously complex. Particularly challenging is the issue of allocation of joint costs, as has been mentioned. But antitrust agencies should not shy away from this challenge. They should, instead, take heart in fact that the law governing what counts as acceptable rate recovery for utilities already recognizes this complexity. For 72 years, the law of the land has been that rate cases will not be overturned by courts so long as their impact is reasonable. Not because there are technical defects in their accounting methods.

Perfection is not required. For 48 years, the Supreme Court doctrine has held that so long as the commission's decision is within the zone of reasonableness, whatever exactly that means, it will not be disturbed. In other words, rough justice is

acceptable in the rate setting context, so long as the utility is maintained as an ongoing concern, earning a reasonable rate of return for its shareholders. Regulators should reassure themselves, therefore, that there is no question that utilities shouldn't be free to charge a rate that allows them a fair recovery on their invested capital. That is not what is at issue in these cases. The issue is how that rate is distributed across customers and the competitive impact of that structure on consumer energy services. In that context, there is no reason why antitrust agencies, in collaboration with both PUCs and regulated firms, should not play a more active role in ensuring that the competitive landscape is level for all participants. Insuring this will further not just the interest of DER providers, but of energy consumers, the regulated utilities themselves, which have an interest in not facing these kinds of disruptive changes that will come because of consumer demand, state governments that face political pressure from would be consumers of DER, and the nation as a whole, which has an interest in seeing technological innovation produce the kinds of productivity gains that we so desperately need in this country. Thank you.

JAMES MONGOVEN: Thank you, Michael. Nancy?

NANCY PFUND: Thanks to the FTC for bringing us here today. We've talked a lot about solar and the role of regulation. And I agree, we need to broaden the discussion. It's not just solar. It's a whole new way of interacting with your electricity life. Let's make sure we're not dinosaurs here. Some people have been talking about storage as though it's five, ten years away. It's around the corner. It's coming to a garage in your neighborhood very, very soon. And that changes everything. So it's important that we celebrate rather than obfuscate the role of innovation. And that's what I'm going to talk about here. But for innovation to work, we need regulations that really do level the playing field as so many people have said.

So just setting the stage. We've really lived with our grandfather's electricity system for the past 100 years. Not much has changed. Not a lot of innovation. Well, the good news is that now we're in an innovation cycle. We all know what innovation cycles are because we've lived through them in industries like phones, and music, and

computers. We all know how our lives have improved because of innovations there. The issue here is that since it's been so long since there's been an innovation cycle in electricity, and it's so early, a lot of people don't even realize that we're in one. So that's why we really need to elevate what's happening. Because we certainly don't want to miss the boat and lose ground in terms of a better future.

Over the past few years, our firm has been involved in funding companies like PowerLight, which was sold to SunPower, and Tesla, and SolarCity, and NEXTracker, which was just sold to Flextronics, a tracker company. And several more. We've seen iconic firms emerge creating customer choice, increasing the quality of life, reducing costs along the way. We've got electric vehicles, we've got residential storage, smart home services, appliances, thermostats, wind, and of course, more and more cost effective solar panels that are becoming very common in many regions of the country.

These new innovations would never have happened if we had relied on the incumbents. As Michael said, they're not designed to do that. If my investors see me investing, they want me to be compensated for the high risk I'm taking with a high return. That's not what utilities are set up to do. So we have to understand we're never going to innovate, we're never going to move to the future, if we hang onto a monopolistic, centralized utility model. PowerLight and NEXTracker, both home runs created over half a billion in market value and hundreds of jobs, that were started by the same guy, Dan Shugar, who was a PG&E engineer and just thought about trackers years and years ago. And then just said, you know what, I can never do this in PG&E, so I'm getting out and I'm going to start a company. That's the American dream. We wouldn't have these companies that are employing tens of thousands of people each if we didn't recognize the role of innovation.

It's important to understand that while companies like Tesla and SolarCity and Nest and such are great success stories, that getting the policy right is super important going forward. Because we have a whole new generation of companies that are coming down the pike, and we need to help them thrive just as we've seen the first generation thrive. And just on a cultural level, it's important to realize that in terms of who's

working at these companies, all your students—I'm a venture capitalist, but sometimes I feel I'm a recruiter, because while this panel is going on, I've probably gotten 15 resumes of people in your classes that want to work in this industry. It's aspirational. It pays well. It is changing the world.

We all have our millennial relatives, children or otherwise, and this is what they love. They don't want to do the same old, same old. We've got to work this out so that we have places for these folks to live. We talked about the importance of locational placement and granularity a few panels ago. We've already invested in a company that's doing just that. And guess who the engineers are in that company? They all worked at SoCal Ed or PG&E. This is where people want to go to work. This is really what the future holds. This is America's strength. So what we can't afford to do is to let our electricity sector fall behind do to an environment that doesn't reward innovation and competition. We need a level playing field.

A lot of folks have mentioned how we are not at a level playing field. We mentioned demand charges, a tax for and against net metering, the bait-and-switch, changing regulatory regimes midway. Lack of visibility is anathema to successful investing. We hate yanking policies midstream. This prohibition against third party ownership. My favorite example of the dysfunctionality of that is that the Sunshine State, Florida, with arguably some of the best solar characteristics in the country has a prohibition about third party ownership. I mean these are the kinds of real world obstacles that this young industry faces. And there is a cost.

We've talked about the SRP suit that SolarCity is involved in, which is going to—it's already changing the way we think about antitrust and other policies. But you know what? It's expensive. This suit for young company in a very young industry is not done without a cost. Same with all of the state-by-state regulation. Even the AT&T break-up, at least that was more on a national level and you didn't have to do it state by state. SolarCity, for example, has some 60 government affairs professionals. Very talented, very committed crew. Some of them are probably in this room. But that's a huge expense. I've been a venture capitalist for over 25 years. I used to be in life sciences,

which is where everyone thinks the heavy regulatory burden is and imposes risk on your investments because of that regulatory cost. Nothing compared to the rooftop solar industry. So we've got to understand that you can't have to have it both ways. You can't want innovation and progress and put such a cost structure on the business that they're compromised from the get go.

We also need to have much more visibility as to what the incumbents are spending their money on? There's a lot of opposition going on. We read all of these articles about spending for this campaign or that campaign. This is something that really is hard to come together when you don't have all the cards on the table.

And we've also heard about the various positions on net metering. There are many studies. I mean Brookings just came out with a compilation of studies that show that net metering is a benefit. You have one MIT study. Well Brookings has 11 studies. And NRDC has this. This is empirical data. This is something we can measure. Let's get rid of the polemics, and let's get people around the table figuring out what the way forward is. I do believe that the time for net metering—we didn't invent net metering, we being the solar industry. That was kind of a regulatory process. And maybe it won't last forever. I don't think anyone wants to hang onto it forever. But don't blame the solar industry for taking a regulation that was on the books and building successful businesses that reduce carbon footprint, create 200,000 quality jobs. This is something that has worked, and now needs to evolve as we go forward.

So what I'd like to present is sort of two visions of the future, and then I'll close with looking at really, what is a level playing field? What does that look like? We have two paths we can take. The first is that solar and clean tech and storage and DG companies continue to make a huge amount of progress and advance their business models as they have been doing. That the existing utilities realize there's need for collaboration. Because it's a very difficult road ahead if you're a utility trying to do this yourself. And we've mentioned—people said, oh, well utilities should sell solar. I think Georgia Power, I just read, has been at this for about a year and has sold like five systems. So no, it's not easy to do. It's not something you can just snap your fingers and

have this happen. We need to have that collaboration where we all figure out the path forward. And of course, there's a way for utilities to play a significant role here.

The alternative is that utilities continue to resist this and then we as a nation fall behind. And you're going to think I'm joking, but we have an investment in an East African solar and storage company that brings little solar, little storage to rooftops in Tanzania. Well, guess what? At the rate we're going, if we don't fix this, there's going to be more solar and storage in Tanzania than there is in Tallahassee. Is that really the world you want to live in? Do you want progress—do you want to seed progress to other parts of the world? Of course you don't. And there's no reason why we have to do.

So what does a level playing field look like? First of all, it's all about consumer choice. I'm not going to go into detail. But unless you've been living in a cave somewhere from the late 20th century until now, you need to realize that consumer choice is one of the most compelling, overarching investment themes of our age. It's every sector. It's every geography. It's happening everywhere. And it doesn't listen to regulatory pundits.

We also need procompetitive incentives. We've talked a lot about this. And whether that starts as net metering and evolves into something else, it really is something that we have to recognize that there are ways to create barriers and there are ways that incentivize the innovation that we all want. We also need to make sure that we don't shift the costs and risks of your business onto innocent third parties. So don't externalize that. Don't allow utilities to charge DG customers more to counter their drop in revenue caused by customer's decision to conserve energy or go solar or whatever. That just doesn't make any sense.

And finally, we need uniformity and transparency. We need transparency even in things as basic as contributing to the campaigns of your regulatory commissioners and things like that. Yes, it gets personal sometimes. I found that you have to have kind of a thick skin. No one asked me to do this. No one asked anyone to be a commissioner.

We've got to kind of do this and understand that there will be different points of view. But we do need transparency in who's backing whom. And put some limits on that, of course. Then we also need to make data much more freely accessible. I mean, imagine if Uber didn't have locational data on where you were and they had to look it up on the internet and record your address. Imagine all of the mistakes that would be turn a very positive app experience into a very inefficient one. Well that's kind of where we are in the utility, solar, storage industry. We need that access to data in order to innovate and bring the next generation of services and appliances to our world.

So just in closing, we're at a major junction here. The MGM Grand Casino in Las Vegas a month or so ago decided to exit their system and pay a big exit fee to leave the grid. Apple is setting up a company to sell renewable energy. Lot of brand power in Apple. We all love our utilities, but seriously, people are going to look at branding as part of their choice, their decision making in energy. It's not far away. The battles that are going on are going to get resolved. In most states, they're getting resolved favorably. And storage is going to take care of a lot of these issues about intermittency and be able to help us shape the load curve. So these are inevitable. This is an inevitable tide. It's something that's going to continue to happen with or without the support of the various stakeholders. So we really do have a choice now. We can allow new entrants to thrive and be competitive and work with the incumbents so that they continue to have sources of revenue and growth. But in the end, innovation always wins. Any other answer is not just anticompetitive, it's distinctly un-American. Thank you.

JAMES MONGOVEN: Thank you, Nancy. Jade?

JADE EATON: Well, I want to start out by just saying, because the amicus brief that was filed by the Department of Justice has been mentioned a number of times today that my participation on this panel, any grimaces I've had, any questions I choose to ask are my own and not the comments of the Department of Justice. And so with that, I'm going to ask each of the panelists in turn to take a little bit of time to respond to anything that they felt really needed a response by the other speakers. That'll give

everybody in the audience also a little bit of time to think about your questions and get them back up here. And with that, I will start with Ari.

ARI PESKOE: Thank you. I guess the only thing I wanted to respond to was something that Dick said about that if there's a wires-only utility and it has decoupling, then it's revenues are not threatened by DG solar, and everything should be OK. I think what I was trying to hit on was that there's 100-year-old technological and business model that's kind of at stake here. And that we used to think of sort of a one-way flow model verses now it's a two-way flow model. Actually, it's always been two ways. The power would flow down from the utility to the consumer and then the money would flow back up from the consumer to the utility. If we look at how DG solar can be sustainable, those flows are going to get more complicated. I think that's a nontrivial business change for these 100-year-old companies.

Then if you look at a decoupling mechanism, there's a lot of different ways to do it. But basically, if consumption is going to go down because some people have adopted DG, well then what the utility can do is either raise variable rates for everyone else, and you start to perhaps run into some political problems with that depending on exactly how much you have to raise the rates to make up for that difference, or you start imposing fixed fees, which is what we've seen in a lot of places. And that has the effect of being essentially not blocking, but certainly reducing the incentive to adopt DG. So I think all utilities in this industry that have been operating certain ways are in some sense threatened by DG. I think the answer of just maintaining the current system and just sort of twisting around the sort of variable and fixed fees is a short term solution, but doesn't really move the ball forward.

DIANA MOSS: I don't want to take issue with what anybody has said particularly. But I would like to just draw out a, I think, an emerging theme. I've heard this earlier in the day. And that is that the role of competition enforcement and policy is really not to pick winners and losers here. It's about promoting competition and innovation and consumer choice. It's about fair markets, fair competition. It's about market entry. With what is turning into a very complex overlay of public policy surrounding energy, energy

efficiency, which is now being patterned into the states through renewable portfolio standards and whatnot. So to hold all this together through competition enforcement, which includes antitrust and regulation, is not to pick winners and losers. It's to accomplish the objective with the best technologies that emerge in the process of doing that. So I just wanted to note that.

RICHARD SCHMALENSEE: Let me react briefly to Ari's point. I didn't mean to say everything was Nirvana with wires-only and decoupling. It's just as you've sort of removed some competition problems. The utility has no incentive, if its revenues aren't affected, to resist solar. There may be serious questions about how you do the decoupling. And I would say on top of that, there are serious questions how, in that environment, you provided an incentive for innovation. US utilities are smartening the grid, as was discussed this morning. But you talk to people who sell equipment internationally and ours are not innovative, American utilities. And maybe it's in the water, but maybe it's also in the regulatory environment. So I don't think wires-only decoupling is Nirvana. I think you still have hard problems. But it's certainly removed some competitive concerns.

Let me say a little bit about Nancy's response. I must say, I don't think anybody blames the solar industry for taking advantage of a net metering, but you shouldn't blame utilities for seeking to change it when it's to their disadvantage. Net metering does two things that are really hard to contest. First, it gives rooftop solar an advantage over utility level solar. Seven point whatever cents I had versus \$0.17 as payment for power. That's net metering. The second thing it does is if you want to pay the cost of the grid, you want to cover the fixed cost of the grid, then under net metering, more solar puts a hole in the recovery of those costs. Those costs either get shifted to shareholders or get shifted somehow to other ratepayers. That's arithmetic. That's not theory about net metering. The MIT study I talk about is an engineering study that had nothing to do with pricing. It had to do with the technical effects of putting distributed generation into a low voltage grid, as currently designed. They had to do with grid reinforcement costs

versus line losses. And if there are studies that reach the other conclusion, I would be stunned.

MICHAEL WARA: I actually want to agree and reinforce something that Dick said, and then disagree with him on another point. The thing I agree with is that I think that attention to cost causation and greater willingness to experiment and innovate in rate structures is going to be a really important part of the solution to all of these competition questions. And while he and I may read our power bills, I think most people do not. Most people if they tried to read their power bills, even when they have volumetric rates, would not understand them because they are incredibly complex, other than that one number that you pay. What most people care about is what that one number is. If we want to create more complex rate structures that then create incentives—problems—for Nancy's companies to come in and solve, I think there's nothing wrong with that as long as we understand how that one number is going to change.

The piece I want to disagree with is about the knowledge of and the current situation in the distribution grid. Most regulated utilities that I talked to, absent a few exceptions, I would single out—well, it's not a reg, it's a municipal, but SMUD is a good example of someone who knows a lot about their distribution system. Because they've invested heavily in smartening it up. Most utilities are not like that. Most utilities have a paper map on the wall with pins in it. Part of the issue is that the current system is old, outdated, has not been invested in, and so it has a hard time managing these new energy resources that are in the distribution system. And so, yeah, there are costs. Should those costs be allocated to the distributed energy resources? Or should it be the responsibility of the utilities and ratepayers to have an up to date grid that reflects even late 20th century technology rather than mid-20th century technology. I think those are important questions to be thinking about as we move forward in this conversation.

NANCY PFUND: I would just come back to the net metering. I'm not going to go into the details. But obviously you can validate it empirically. You can figure out what the costs are, what the benefits are. I've also invested heavily in utility solar. I'm not just

a rooftop solar person. I've done storage. I've done microgrids. And I'm pretty good at math. So I will tell you that it's apples and oranges completely comparing utility solar to rooftop solar. Because if you put a plant out in the desert somewhere and you've got years and years of battling the various interests that don't want you there, then you've got transmission development, you've got line losses. And you add all of that up, and depending on the location and the circumstances, there a lot of costs added on that you completely avoid when you have localized rooftop solar in a distribution system.

Plus, what you're not factoring in, which is the whole point really in terms of reducing our energy usage, is that through net metering, through incentives that allow you to sell back your power, you're able to rely less, especially as we develop storage. You're really going to be able to avoid certain distribution costs and transmission development cost. Because you're managing your load in a much more modern, proactive way. And so you're actually—there's a net benefit. And I think it was John Wellinghoff that cited the PG&E \$192 million recently saved. Not a cost, saved. That's quite a lot of money. Because of avoided costs of having to build a distribution and transmission due to the more prevalent use of solar and renewables. So we've got empirical evidence there that suggests that there's a lot of great savings to be had. My view—I mean obviously I'm an optimist or I wouldn't be in the job I'm in—but we have so much more technology to modernize and make this all better. Why would we ever want to put a barrier in place so that we have to have another 100 years of the same old electricity grid?

JADE EATON: Well, I want to ask a question to the whole panel. It's really been raised both by some audience questions and just by each other's comments. That is, if regulation is a better place for these pricing issues to be determined but the pricing is really affecting entry and innovation, is state regulation flexible enough to create regulations that can actually take into account competitive effects on non-jurisdictional entities? They have enough trouble thinking about competitive effects on the people they see every day. How do you think they can take on this task of looking at the impact

on technologies that are in their infancy? And anybody who wants the answer just put your name tag up like this to start.

[EVERYONE PUTS THEIR NAME TAGS UP]

[LAUGHTER]

Let's start at the other end and everybody gets a chance.

NANCY PFUND: Just briefly, I mean, we're seeing amazing regulatory interventions that are bringing us to the clean energy future. I means the 1.3 gigawatt mandate from Carla Petermann of the California Public Utilities Commission a few years ago. I invested in a company based on that rule that's doing extremely well and is creating jobs and bringing utilities and storage and renewables together to solve customer problems. The net metering is something that has allowed us to create, helped to create over 200,000 jobs. And has allowed us to derive all the benefits I just spoke about a few minutes ago in terms of strengthening the grid and load shifting. So there are plenty—New York, the recent agreement between the solar industry and the utilities that has been talked about many times today. There are plenty of examples and they're in big states, by the way. California, New York, these are where a lot of people live. And so there's plenty of regulation that's working. As usual, it's the kind of histrionics and the negative examples that occupy all the headlines.

MICHAEL WARA: I guess I would respond to that by saying that I don't think the regulators have any choice. They are subject to political constraints one way or another. And anywhere where we observe distributed energy resources starting to gain any kind of traction, the consumer political response means that the regulators need to be paying attention. You see this in California in spades obviously. But even in states where—one state that was mentioned, Georgia, is a useful example. Right? Georgia Power is responding to political pressure, trying to direct that to its five rate-based installations. Poor Georgia Power on this panel. They do many good things. But there is political pressure to allow consumer choice that's coming from all parts of the political spectrum. And that pressure is only going to grow as facts on the ground are

demonstrated about how these technologies give consumers more choice. So I don't think that the regulators have any choice but to address these questions.

RICHARD SCHMALENSEE: I think the regulators have to address these questions. I think the regulators are better positioned to address these questions really than anyone else. I can't imagine legislating on them. I can't imagine an antitrust court ruling except in very clear extreme cases. I mean huge fixed cost untied to customer specific expenses could well, it seems to me, be actionable. But they are well positioned institutionally. But they're also subject to political pressures of various kinds in various directions. Yeah, the consumer pressures are rising, but the utility is there every day. So it really varies from state to state sort of what that balance looks like. Capabilities vary enormously from state to state. But there isn't an obvious alternative institution. And I think in this case, as I said, I think the rate design question is really critical and really hard. And it's going to require some states doing some things, and our seeing how they work out. I think we're going to need some experiments. All of which will be challenged in court by one side or another. But we're going to need see some experiments worked out. And to see how they go. I can't see saying the FERC should just do this nationally. Because I don't think they know enough to do it nationally.

DIANA MOSS: Yeah, I would just add that I think regulators should do what they are good at doing, which is to regulate. To develop rate structures, to consider all of the sort of public interest factors that go into regulation. But if you're a devotee like I am of a two-pronged competition enforcement and policy approach, which consists of regulation and antitrust, I think antitrust plays a really critically important role in highlighting to regulators, pressuring regulators, raising issues to regulators, that perhaps the rate structures are not producing efficient and fair outcomes. That perhaps the rate structures are designed to foreclose competition downstream. And designed to be exclusionary. So if we talk about the tools of regulation and antitrust, obviously regulators have the institutional knowledge. They have the technical knowledge. But antitrust enforcers have the knowledge of competition, and how to promote competition, and how to fix potential competitive problems. So there are things that

antitrust can do that would pressure and shape how regulators are thinking about how they develop rate structures. And encouraging them to develop rate structures with an eye to promoting competition as opposed to promoting potentially exclusionary conduct. You can do that through injunctive relief. Stop doing what you're doing. Stop charging discriminatory rates. That will pressure regulators to think again. It can be done potentially through private cases and damages, which will inherently force a calculation of what would have been the rate but for the exclusionary or the anticompetitive conduct? That will force a reshaping and a rethinking about how rate structures are developed. Certainly, as I said earlier, all the advocacy activities that the agencies engage in are very helpful in this regard, as well.

ARI PESKOE: I think if this is just a matter of rate design in terms of reallocating utility costs between fixed, variable, and demand charges, then certainly regulators have the legal authority and the confidence to do that. But if we think that we need to have 50 state processes, or there might be 49. I think Nebraska might be all public power. But if we think this as a state by state and we need 50 reds like New York is doing right now, I think then you might have to look to state legislation. That's going to play a role in some states. The New York commission is a particularly powerful commission. They've done some big things like a renewable portfolio standard and industry restructuring in the '90s without any what legislation, which is very unusual. So other state utility regulators are more constrained by existing state law, and to the extent they want to really look at changing the utility incentives, they may need help from legislators.

JADE EATON: I'm going to just ask one last question that came from the audience in general which is that there's been some discussion this morning and then a little bit even this afternoon harkening back to the regulatory compact. You mentioned, Ari, that the original idea behind regulation is that it's one of protection. To protect the consumers from high prices, you protect the utilities from different risk. So I want to put out to all of you how much you think that protection from regulatory risk should continue to play a role in regulation? How much and how long do we protect utilities from the consequences of regulation? I just want to throw out the fact that when

wholesale competition was inaugurated and when retail competition was inaugurated, in each of those cases, there were often state regulatory proceedings that collected stranded costs so that the change in the competitive landscape was already built into rates. How long do we protect the monopolist from the loss of revenues in here? Or let me say the shareholders in monopolies from the consequences of competition?

ARI PESKOE: I'd like to just hit back on the concept that there's a regulatory compact. I did talk about protection, but there is no compact. This phrase is—so I would urge the government not to use that term—but this phrase usually takes on one of two meanings. Either the one person using the term is imagining that there's some legally binding contract between regulators and utilities. Certainly there is no legally binding contract. Public utility commission is based on state laws. State laws can change within the confines of the US Constitution. The other way that sometimes that term is meant is just sort of as a shorthand metaphor kind of describing the nature of the current regulatory system. But I think the compact metaphor is misleading historically because it actually—that sort of term comes from the 1980s, not the early 20th century when this regulatory system came into being.

But it also suggests that state regulators are somehow constrained. That somehow state regulation has to keep us in some sort of system that held in an earlier era when natural monopolies sort of pervaded this industry. But now we've approached a new era, as you brought up, the deregulation, a restructuring of wholesale generation that happened the 1990s. Certainly there was no compact that prohibited that. And actually when utilities went to public utility commissions and state courts, there are only a couple of cases where this was explicit in the decisions, but they tried to argue that there's some sort of compact that requires them to get every dollar that they demanded. Courts rejected that argument. So I don't think the metaphor has any legal force. It can be sort of a quick shorthand description, but I think we should be careful about how we toss that term around.

RICHARD SCHMALENSEE: I think that game is over in 2/3 of the country. Right? We have competition in generation, in ISOs, and RTOs. There is no presumption of any

sort that anybody who generates ought to be immune from competition. The wires are different. I'm a big believer in consumer choice. We can have consumer choice, but I don't have a choice of wires to connect to the high voltage grid. That is a natural monopoly. Generation isn't. It's not a matter of a compact. I want to make sure the people who have the wires have incentive to maintain them and modernize the system. In one third of the country, the game's not over, right? In one third of the country, we have vertically integrated utilities on the same business model they were running in 1900. How that gets changed, if it gets changed, and it should get changed in my view, is a whole other question. But in 2/3 of the country, that issue, at that most conceptual level, most fundamental level, is settled. There is competition in generation. No generator should be protected.

JADE EATON: Michael, you were first.

MICHAEL WARA: I'll just make a quick point. Well, on the way to the airport, there's an ad on the radio. You can get a free Android smartphone in California if you're a low-income person. And that is the new version of lifeline service for telephones in California. You get 500 megabytes a month, you get your data plan, you get your voice plan, you get your smartphone. I think that in order to undo the kinds of protections, quasi protections, whatever you want to call them, reduction in risk that utilities currently benefit from, we are also going to need to reimagine as a country how we provide essential energy services to our consumers? And that will probably have to be via federal legislation, as it was for telecoms.

DIANA MOSS: Yeah, I think the regulatory compact has undergone a gradual erosion and tightening and restriction of the compact and redefinition the compact. I mean wholesale competition and all the stranded cost recovery stuff on the electricity side, and on the gas side for that matter, was sort of the first salvo. Technological change is really stressing the regulatory compact. Smaller, modular technologies, more efficient technologies, those are all relieving a lot of the burdens of having to engage in cost recovery for very long lived generating equipment. So I think it's a gradual process.

A shortening of the time horizon. We see in strategic planning, horizons go down for utilities because of risk and technological change and regulatory changes.

But it is a gradual process. I would have to agree with Professor Schmalensee here that it really is—you can strip off all the generation technologies. Given the advent of technological change, at this point, we must have to do that. But it's the wires that really present sort of the essential facility problem. Everyone has to use the wires. So we may end up eventually at a place where we really should have started when we restructured the industry starting in the mid-1990s, which is to structurally unbundle and allow wires companies to really focus on the wires, and to regulate that. Then to promote more competition and better ways in other parts of the industry.

JADE EATON: I know we're running out of time, but I just want to

NANCY PFUND: I wanted to address this, too.

JADE EATON: OK. If I can throw this out, and you can address both of them. Because it's an add-on. What I was really thinking about here was the ways in which new technologies are competing for the distribution function. Things like storage, which unload the distribution system, reduce the guaranteed revenue that underlies a monopoly that you just divide volumetrically and then charge. So with that little twist on it, I hand it over to you.

NANCY PFUND: Thank you. Well, certainly storage has distribution and generation advantages, and is an example of what we need to move to based on your first question. It's pretty simple. If you don't get paid to do something, you're not going to do it. There are many utility regimes where you don't get paid for using the distributed assets, renewables, storage. You have to invest in transmission lines. You have to develop substations. You have to—your capital goes to very, very traditional kinds of allocations. So we just by simply allowing utilities to get paid for using the rooftop and distributed asset infrastructure to do their job better, to manage loads, to go bi-directional, to strengthen weak areas of the grid, et cetera, et cetera. That would make a huge difference. Allow them to be paid for, say, infrastructure as a service. And

then all of these great, innovative, entrepreneurial companies that are developing next gen services will have a partner.

But it's important to understand that that's not the only partner. We have to move from this idea that that we've had for a century that we have the utility plus a passive consumer. We have to move to we have utility plus an active consumer plus other industry stakeholders. That's why I keep harping on the data. Because I would guess that many of you think that while utilities know data, there are other groups that know it as well or better. I mean I think Google, Microsoft, Amazon, Apple are pretty good at data. They want into this. They want to help us develop better products and services, reduce costs, along with the new entrants and the utilities. In order for all that to work, there has to be less protection of that asset called utility data.

RICHARD SCHMALENSEE: Very quickly. I think storage is a terrific emerging technology. For it to really benefit the system well, we need to do the thing that we've talked about for years and years that smart meters enable, which is to move to real time pricing. I would also say that as long as you need the wires, you've got to pay for the wires. In particular, you need to modernize the wires to allow for two-way flow and all those other things. And finally, I think the answer to storage, I'll come back to a point I made earlier, what goes on behind the meter should be irrelevant to what you're charged. It's what you use and when you use it ought to matter. So if you've got storage, fabulous. If you don't, fabulous. But that shouldn't matter to what rates, what rate structure, you're in.

JAMES MONGOVEN: That will have to be the last word. Thank you to our panelists for an excellent discussion. We will take a 15-minute break and then we will have the last panel on consumer protection issues.

[SHORT BREAK]

PANEL 4: SHINING THE LIGHT ON CONSUMER PROTECTION ISSUES AND ROOFTOP SOLAR

Panelists:

- **Shannon Baker-Branstetter, Policy Counsel, Energy and Environment, Consumers Union**
- **Shennan Kavanagh, Deputy Chief, Consumer Protection Division, Office of the Attorney General of Massachusetts**
- **Thomas P. Kimbis, Interim President, Solar Energy Industries Association**
- **Robert M. Margolis, Senior Analyst & Group Manager, Strategic Energy Analysis Center, National Renewable Energy Laboratory, US Department of Energy**
- **Richard Sedano, Principal & US Programs Director, Regulatory Assistance Project**

Moderators:

- **Jonathan Hill, Attorney, Office of the General Counsel, Federal Trade Commission**
- **Hampton Newsom, Bureau of Consumer Protection, Federal Trade Commission**

HAMPTON NEWSOME: Let's go ahead and get our seats, and we'll get started here in a second. OK, good afternoon. I'm Hampton Newsome. I'm an attorney in FTC's Bureau of Consumer Protection. My co-moderator here is Jonathan Hill. He's an attorney in the General Counsel's office. And we know it's late, and we want to thank you for sticking around for the fourth quarter, here, and digging deep. It should be a really interesting panel. Lots of interesting issues here.

So now we're basically pivoting to consumer protection issues and the rooftop solar area, and a lot of these issues are significantly different from questions we've been talking about earlier today. Our focus is on the burgeoning solar market, and how individual residential consumers—what the kinds of purchasing decisions that they're faced with. And the questions we're looking at are, what kinds of decisions they're looking at. Do they understand what's being offered? Do they grasp the financial aspects of these transactions? Are they receiving accurate information from marketers?

And we're going to structure this like some of the other panels. Each panelist will give a short presentation and then we'll have a discussion of the issues. And during this

discussion, we'll go well beyond FTC's role in this area. So we'll be talking about industry education efforts and state involvement through the Attorney General's offices, and PUCs and other agencies, and that kind of thing. But before we do, I just wanted to give a little background about FTC's role in the consumer protection world, just to give some context.

Under the FTC Act, the commission has authority to address deceptive and unfair practices. The core issues involved with this authority are the FTC's work on deceptive advertising. And, in a nutshell, this means that marketers must tell the truth, have substantiation for all express and implied claims and, where appropriate, have competent, reliable evidence. It also means that if claims are made that have to be qualified or explained, those qualifications should be clear and prominent.

In the world of rooftop solar sales, this means that marketers should not misrepresent any aspect of their product, whether they're talking about material terms of a contract, including the payments, the warranties, the cost terms of the lease, the energy savings of the product, or the environmental benefits. There are also marketing rules that can apply, such as the Do Not Call rule, and rules related to financial disclosures. So the FTC has done some work already with solar issues. As some of you know, last year the staff issued a consumer guide called Solar Power for Your Home that introduces interested consumers to some basic questions and issues they should consider in exploring solar options. And as the chairwoman mentioned in her opening remarks this morning, this spring the Commission, in conjunction with the Department of Justice, filed a federal court action related to alleged illegal robocalls involving leads for solar installations.

But, in addition to this FTC work, there are many other entities involved. There are many other issues, and what we're doing today is to try to get a better understanding of what's happening, and so we look forward to hearing from our excellent panelists. We're looking at, what are the big challenges? What's being done right? What's being done wrong? And also, what improvements are needed to help

consumers in their purchasing decisions? So with that, I'm going to pass it along to Jonathan.

JONATHAN HILL: Thanks, Hampton, and thank you to all of our panelists today. We're very excited with the group we've got here, and I'd like to do a quick introduction. To my left we have Robert Margolis, who's a senior analyst and group manager for the Strategic Energy Analysis Center at The National Renewable Energy Lab. Next to Robert we've got Shannon Baker-Branstetter, who is policy council for energy and environment at Consumers Union. Next we have Tom Kimbis, who's the interim president at the Solar Energy Industry Association. Next we have Shennan Kavanagh, who's the deputy chief of the Consumer Protection Division in the Massachusetts Attorney General's Office. And, finally we have Rich Sedano, who's a principal and US programs director with the Regulatory Assistance Project.

As Hampton mentioned, our panel will be structured primarily as a discussion, but we would like to just go ahead—oh, sorry. As Hampton mentioned, our program will be structured primarily as a discussion, but we'd like to give each one of the panelists a couple of minutes to present some of the issues that they feel are most pressing in the consumer protection space. So, with that, we'd like to start with Robert.

ROBERT MARGOLIS: Sure, thank you very much, Jonathan. I'm an analyst. I think a lot about information, and data, and market transparency. I'm also a consumer. We're all consumers, right? So, I guess I have a question since we're all consumers. How many people in the room, please raise your hand, have received a quote for a solar system? Raise your hands.

OK, a little bit of a bias here, because we are obviously interested in solar. Does anybody know what was in that quote in terms of an assumption about the escalation rate for electricity, in terms of calculating the economic benefits? Anybody? Raise your hand. I've got one or two. OK, can you tell me what it was? Three percent? We've got a three percent. So, we have anybody that's any higher than three percent?

AUDIENCE: Six percent.

ROBERT MARGOLIS: Six percent. Do we have anybody that was lower than three percent? Do we get anybody—yell it out. Do you get a zero percent? We got anybody who got zero percent? Actually, I got a quote that had a zero percent escalation rate assumed for electricity. But, think about that. And so—wow, I don't think I've heard six percent, or seen that in numbers very often, but anywhere from zero to six percent in terms of the escalation rate assumed about the price of electricity.

So, if I'm trying to estimate what the payback for a system is, there are a whole bunch of assumptions. There are assumptions about the performance of the system, whether it's going to last. There are assumptions about whether net metering is going to persist, and there are assumptions about whether the price of electricity that I'm going to get paid under net metering, for example, is going to increase over the life of that system.

And, I asked it on the rate escalation for electricity because, in many ways, what we assume about future prices for electricity is probably the biggest risk area for consumers. When we do analysis for the payback on PV systems, we look at three areas of risk. The first is the technical risk. Does the equipment perform? And today, most equipment that's out there comes with 20 or 25 year warranty on the panels, and something like five, to 10, to 15 years on the inverters, and the equipment is pretty reliable. There may be some issues about installation. If systems aren't installed well they won't perform, so there are some questions about how do you manage the risk on the installation side. But, in general, if the system is installed reasonably well it's going to last.

So there's really minimal technical risk. There's also some risk on the annual performance due to whether the sun shines more or less on an annual basis, and there's a little bit of variability in that. So from year to year you might have a little bit more benefit or a little less benefit, but over the course of the life of a system it's pretty much going to be within a couple percent of what you predict when you run our performance models. So really, the biggest area for risk for consumers and investing in solar has to do with the regulatory rate structure issues. And, we've heard a lot of talk about, today—

actually, I'm sorry, I missed some of the sessions. But I know that the sessions I was here, at least, about rates and net metering, what's the right way to do that.

But, people are investing in these systems, and when they're being sold systems there's, in some sense, an implicit belief on the part of the consumers, I think, and an implicit sort of sales strategy on the part of people that are selling solar, that the existing regulatory structure—that rates that are there today are going to be there for the next 20, 25 years possibly—and that that's what their payback on their systems are estimated on. Again, in the interest of keeping this really short I picked one topic to focus on in my five minutes. I guess I pose it as, from a regulatory standpoint, what disclosures to customers should be required in the sales process, with respect to—what about rates? And, should you be required to go with a standard set of escalation assumptions, or at least clarity on it? Or, disclaimers about existing regulatory structure may not exist, or it may change, and that could change the economics and make some risk in the process.

I will mention the quotes that I got. I got quotes that had very different prices, and for one they quoted me a payback of about 15.8 years. I live in Virginia, so solar doesn't work very well here. To be honest, it's not a great economic investment, per se, if you're just looking at the pure economics of it. I got a quote for a similarly sized system that was about 30 percent higher in initial cost, but they had a three percent assumed escalation rate in electricity rates, and it came out that it had about the same payback. So again, it was weird that I got one quote that was much higher cost, but they presented it to me as if it would have a similar economic benefit.

So again, I think there's a lot of room for consumers to be confused about what the system sizes are, what their performances will be, and how to interpret the economics of the benefits versus costs. Thank you.

SHANNON BAKER-BRANSTETTER: So just to give you a little bit of background on Consumers Union, it's the advocacy division of Consumer Reports. And so Consumer Reports has done some coverage of the solar market, and we've also worked with IREC

and others to kind of help support solar checklists of things that consumers should think about when they are approaching possible solar purchases. And, generally, on the advocacy side we're supportive of cost effective solar for consumers. We think consumers should have choices in the electricity market and distributed generation solar should be one of them.

That being said, we do think that, at this point, solar does need better consumer protection. Consumers right now, for the most part, are getting electricity from regulated utility, and so it makes sense that in transitioning to another electricity product that they would expect consumer protection in that realm as well. I think this has probably been mentioned, but electricity really is an essential service, especially for seniors and people who may be home during the day. Electricity can be essential for medical services as well, so everyone agrees that reliability is important. But, then beyond that, affordability is important. Thousands of consumers every month get shut off from their electricity, and so affordability and reliability need to go hand in hand.

There are already pretty big problems in the home contractor market for home renovations, remodeling, and while we have no reason to believe that solar is worse than some of those companies and some of the unscrupulous practices that go on with home contractors, since this is a growing market we think this is a good opportunity to kind of get ahead of problems. And right now, most solar consumers tend to be a little savvier than non-solar customers, and so as the market continues to expand there is a risk for bigger problems and bigger manipulation or deceits.

So, the three biggest problems we think are facing consumers when they're approaching installation are, first the difficulty comparing offers. Robert mentioned the difference in assumptions can vary pretty wildly. And then both in terms of escalating costs, and even understanding the difference between a lease and a PPA can be difficult for consumers. Then the second thing is difficulty understanding the contracts and negotiating the contract itself. That's not unique to solar contracts, but since consumers are coming from a pretty low information point of view on solar, it's especially problematic in negotiating the contract.

Then the third thing, really, is dealing with bad actors, and those are things like fraud, misrepresentation, and then the robocalls, as Hampton mentioned. So we have a robocall advocacy campaign and we push for strong enforcement of the Do Not Call Registry, and we've heard from some of the robocall complaints that people complain when they already have solar and they're still getting these robocalls. So they can be pretty widespread and pretty egregious, and a lot of people, also, who don't even have a roof.

So let's see, some of the difficulties and challenges in addition to the assumptions and low consumer awareness. A lot of the company names sound the same, which can be a problem, I think, for reputation and for the big name companies to make sure that their reputation is being protected but, also, consumers may not know to look for the address to compare to major name companies if it sounds similar. So, one of the potential solutions we would like to see, and that FTC could be a real partner or leader on, is developing a consumer template that then states could require solar companies to present in their disclosures and as part of any contract.

I'm sure Tom will talk more about this, and SEIA does have lease and PPA disclosures, and we think that's a great start. It really does have a lot of the key information that people would need so that they can compare solar offers, and we think that there are a few more things that could be improved upon that but, also, states would need to actually pass it and enforce it for it to be effective, so the consumers really know what they're getting into. We can get into some of the details of what would be in that kind of disclosure, but something along the lines of a good faith estimate, and that way consumers could compare among offers, and then also would have an average basis to compare across a time period. So it's not just the next five years or the payback period but, really, what is the comparison to my utility costs over the next 20 years, and what's the average cost per kilowatt hour.

I think that that was all I wanted to say for now. Oh, I was going to say also, as well, that some states have tried to implement a template, and some states do have a voluntary template. So it would be expanding on a current idea, but we would hope to

see that so the consumers really can compare apples to apples and understand the disclosures in a very simple format. There are lots of disclosures that could fill up 20 pages, but there needs to be a balance between simplicity and thoroughness. Something along the two-page range that is comparable would be really useful.

THOMAS KIMBIS: Great, thanks, Shannon. So good afternoon, and thanks to FTC for allowing the solar industry to be here today, and happy solstice. I know you scheduled this exactly on the summer solstice, where you get the most sun on the longest day of the year. I think if you have one take away from me and what I have to say today, it's that the solar industry is firmly committed to consumer protection. The education of consumers and solar companies alike on the right way to do business is a top priority for SEIA, which is our national trade association. Education, standardization of forms and disclosures, such as Shannon spoke about, and collaboration with federal, state, and local authorities is the winning path to increase consumer understanding, maximize the transparency of the residential solar transaction, and also ensure that those who don't follow the rules suffer the consequences.

It's a really great, exciting time for solar. You heard some of the numbers on the earlier panels. There's innovation happening across solar research and development, manufacturing, ownership and financing models, which allow more Americans a competitive choice for electricity. At the same time, that rapid expansion can't come at the cost of uninformed consumers. That's why we're committed, even as our industry grows at nearly 100 percent this year, to consumers understanding solar even better now than when solar was a much smaller market. Residential solar, similar to other home improvement industries, relies heavily on word of mouth for success.

So studies from universities and national laboratories, such as Robert's, show that solar customers ask family, they ask friends and neighbors before choosing a company, and then they talk to those groups after going solar. So it's very important that that information that they're conveying is positive. It took 40 years to celebrate the one millionth solar panel in the United States, which we proudly did this year, and yet, it's only going to take 24 months to hit that second million. Customers who understand

what they're getting are more likely to have good experiences and be satisfied customers.

But on the other hand, solar companies who take shortcuts for a quick buck damage the consumer experience and solar's reputation, and no doubt, the customer's friends, families, and neighbors will hear about it. So that second million won't happen if the customer isn't treated right. So there's a strong business case for solar companies to take consumer protection seriously, in addition to the very core legal reasons. Consumer protection abuses by a few bad apples in our industry represent a threat, but, that said, our experiences to date show that the vast majority of consumer protection complaints or problems are not due to intentional acts. They're due to misunderstandings between the company and consumer, and that's what we're trying to work on very hard at SEIA in the development of our consumer protection committee that's developed a wide range of materials to help make sure consumers fully understand the solar transaction.

At the heart of our work is the SEIA Solar Business Code. Last year, we passed this voluntary code of conduct that all 1,000 SEIA member companies must abide by, the first time this has ever happened at the national level within the solar industry. That represents roughly 80 to 90 percent of residential transactions. This code—and it's right here, you can download it on the SEIA website if you want to take a look—is written in a way so that the industry knows the right way to do advertising, marketing, and contracting.

And, Robert, to your point, section 3.12 talks specifically about the acceptable way of calculating those escalations of electricity rates, and actually specifies the types of sources that can be used, whether it's DOE, EIA, state, previously published, and utility forecast, etc. But, it limits it in a certain way, so they can't just be, well, I'm a contractor and I've been in this business 10 years, so my projection is it's going to be a five percent escalation rate. We've seen that before, and we don't want to see it again. In addition, the Better Business Bureau is now using this guide across its own 114 chapters to help resolve complaints that they receive.

The core issue here is building a more informed consumer base that fully understands the solar proposition. We developed a residential guide as well as a powerful educational tool that provides tips on evaluating whether your home is right for solar in the first place, then information about the different ways you can go solar from a financial perspective, the tough questions to ask when evaluating among solar companies, and then how to ensure the best outcome once you've selected a solar firm. And, several states now have this guide posted for public information on their websites.

It's critical that consumers understand contract terms like payments, RECs, UCC filings, and can easily compare offers. The SEIA-adopted model lease and PPA contracts that were created by a US Department of Energy working group are clear, they use standardized language, and they allow companies the flexibility to innovate. Also key is making the paperwork simpler, which Shannon mentioned.

We firmly believe that consumers can benefit from clear disclosures. We've heard this over and over again—there's been some confusion between the company and the consumer. That clear disclosure is important. That's why we've released, even just yesterday, our lease and PPA disclosure forms, which summarize the key details so that consumers can understand and compare offers, and see the key terms of the agreement in a short three or four page form. You can think about it as a GFE, a good faith estimate, or sort of a HUD-1 in a home sale. Some of SEIA's largest residential solar companies have already committed to using these contracts and using these disclosures in all of their sales processes by the end of this year.

This work by SEIA and its companies is an ongoing effort. We haven't gotten it all right. It's a work in progress, so we welcome all the opinions of folks in this panel and in the audience. It's an ongoing effort to increase consumer understanding. There's more coming, including a community solar consumer protection guide, because there are slightly different issues there, some that are specific to certain states. Spanish editions will be coming out next month as well as a cash sale disclosure form later this summer. Our code of conduct is impactful but, alone, it's insufficient to ensure certain behavior. That's why it's so important to understand that the industry's productivity in this area is

only part of the answer. Our efforts only complement, they don't supplant the hard work of regulators such as the FTC, the FCC, the CFPB and state AG's to protect consumers and use governmental enforcement powers.

So one misconception that we see often in the press, and among certain lawmakers alike, is that we need more consumer protection laws that are specific to solar. This doesn't make sense, it just doesn't. We already have a full suite of federal, state, and local laws that protect consumers from all types of deceptive practices, regardless of the product or the service offered. For instance, regulators use the FTC Act and similar laws to take on false advertising or misleading claims, like savings claims. Contract laws and fraud laws have been on the books in states for over a century. More recent laws, such as the 40-year-old consumer leasing act, or Reg M, require leases to include key contract terms such as payment schedules, security filings, and warranties.

And, as for robocalls, I mean, who likes them? I hate them. Our industry hates them. We'd love to get rid of them. We're working with the FTC and the FCC – we meet with every quarter to figure out, how do we get rid of them? What can we do? It's not only solar, but the other issues that are pestered by this part of the industry. In fact, we're partnering with a brand new lead generation industry trade association that just recently formed here in Washington to help stop unwanted marketing calls, and we'll be doing so in collaboration with the FTC and FCC.

So, in conclusion, the solar industry is at the forefront of consumer protection for many reasons. We rely on consumers having great experiences. That means making sure they understand solar fully, they can compare offers, and they can see their problems resolved. Our customers have some of the most carefully considered and advanced protections in the country, and when they make a well-informed decision to go solar, we wind up with happy customers who are producing their own power, saving money, and helping to drive the nation toward a clean and affordable energy future. Thank you.

SHENNAN KAVANAGH: Tom, that was such a diplomatic and even-keeled presentation. I feel like I have to kind of change mine up a little bit to keep the spirit of the cooperative nature of the presentation.

THOMAS KIMBIS: Well, it is an opening statement after all, Counselor.

SHENNAN KAVANAGH: So the Consumer Protection Division at the Massachusetts Attorney General's Office is charged with the enforcement and conducting investigations of violations of chapter 93A, which is our very broad consumer protection statute modeled after the FTC Act. And I was asked to speak here today to talk a little bit about some of the consumer issues that we see firsthand coming through our office. That being said, we see things when they have already gone wrong, and my office does encourage the expansion of the solar industry in Massachusetts. And, in addition, we feel very strongly about educating consumers and helping to create transparency in the market, so everybody goes in with the clear view of the investment that they're making, which is a long term investment.

Unfortunately, that does not always happen, and the results can be devastating to consumers if they don't understand the commitment they're making when they invest in residential solar. We've talked a little bit today, or, actually, a lot today, specifically about understanding whether you're getting the cost savings associated with what was told to you at the point of sale and generally understanding the options you have with financing solar panels. So I'm not going to talk much more about those, because I think they've been well covered, and, instead, focus on a couple of issues that I think maybe are not necessarily ripe to fully understand, but may be coming down the pike and are things to consider.

Our office put out an advisory in March to bullet point a number of issues that consumers should keep their eyes open for and make sure they understand. And while the consumers, as the purchasers, should be doing their due diligence and educating themselves, it's incumbent upon the industry to make sure that that is possible. It's one

thing to get a number of disclosures. It's another thing to get clear information from the person who is actually selling you the product or service.

One issue that has raised concern in Massachusetts are the implications of UCC-1 filings at the Registry of Deeds, and whether or not those create a lien that would encumber the property of the solar panel purchaser such that that homeowner may have difficulties either selling the property or obtaining financing in the form of a home equity line of credit, or refinancing their mortgage. Also in March, the Registry of Deeds, one of the Registry of Deeds, Massachusetts, put out some statistics in the form of a consumer advisory, and the statistics showed that in 2013 151 UCC solar panel filings were recorded. In 2014 there were 683 UCC solar panel filings, and in 2015 there were 1,166.

And at this point in time I am unaware personally, but also from folks that I've spoke to, what the implications of these filings may mean for homeowners. If somebody is in a long term lease or financing, and have obligations on their solar panels, will they be able to easily assign those to a new purchaser, or will it be difficult for somebody to sell their home because a new purchaser doesn't want to take on the obligation of the lease or the solar panels? Is that something that consumers are aware of or told to think about when they're making a decision to invest in solar panels?

What if a consumer wishes to get a line of credit on their home or to refinance their mortgage? HUD guidelines provide that if there is an encumbrance on real property, the homeowner cannot convey that real property and, therefore, may not be eligible for FHA insured financing. An encumbrance includes if the new purchaser of the property has to undergo a credit approval before the seller can convey the real estate. So what do the contracts say when a consumer signs up for solar installation about whether a subsequent purchaser of the property would have to undergo a credit check in order to be able to take assumption of the liability under the lease or the purchase agreement?

There's been already activity, as has been spoken about before, generally, about misrepresentations and false advertising. We have seen complaints come through our office that involve alleged misuse of homeowners' signatures, where somebody sees a flyer that asks them to provide their name and to sign the card in order to get information about a particular solar company or solar panel option, and it turns out that that card is actually a binding contract and they've signed themselves up to receive the services. Other contracts may assign the tax credits or other incentives that are promised to the homeowner if they get solar panel to the company itself, so the homeowner actually never sees the benefits of those tax credits. Is that clearly disclosed to the consumer? And in my personal opinion—and I'm not speaking for my office—but I believe that any such provision would be unconscionable, especially if the homeowner is signing up in large part to get the incentives that are offered.

And then, what happens if a solar panel company closes? These are long term investments and, as Tom was saying, you know, there are many industry players that are in and doing this work correctly, but it's a new industry and a growing industry, and there may be people getting involved without really understanding how the industry works and how it's capitalized, and what happens when they go out of business. Homeowners may be left with projects that are either incomplete, or they may have put deposits in to have projects begun and the projects have never begun. What do homeowners do to get replacement services to finish those projects? What can homeowners do to get their money back if they paid it to a failing company? What do homeowners do if they have a warranty that was provided to them under the initial service provider, and that service provider can no longer perform under that warranty?

In conclusion, I do agree with Tom that, in light of the newness of the industry and some of the unanswered questions, it behooves both regulators and the industry to have meetings and talk about concerns so there are ways for the best players in the industry to address those before they come up. But, I don't think that it's only upon the consumer to make sure that the consumer is educating him or herself. It's also incumbent upon the industry to make sure that they're presenting this product and this

long term investment just like a mortgage, in a way that makes sense, given the damages that could occur in the long run to consumers.

RICHARD SEDANO: OK, well, thanks for the opportunity, staff, to help out on this, and I had three points I wanted to make. The first one has been covered pretty well, and that's on standardization for things like disclosures. And the only couple of things I wanted to add to that is how important it is for the confidence of customers. I've been involved in regulation for a long time and watched energy efficiency grow, and there are all these different barriers that programs have to accomplish with energy efficiency. And one of them is just getting the customers to appreciate that this stuff actually works.

Now, this can be multiple times the amount of dollar investment, although there are some energy efficiency projects that are \$10,000 for a house, so we get up into that scale. And so I think, in order to achieve the consumer confidence that's necessary to, for example, meet the objectives of the New York "Reforming the Energy Vision," in which they want customer resources to be the principal resource for supplying the grid over the next decades, or the California loading order, in order to meet a lot of social objectives, consumer confidence is very, very important. And, we should consider that with other big ticket items in homes, like heating systems for space and water, we leave the customer kind of out there, I think, in a lot of ways. When there's water on the floor or no heat in the winter, the customer is kind of out there. And so the potential for just letting the customer be out there is certainly, actually, the more likely outcome. It's actually very interesting that we're having this depth of conversation on this, and I guess I'm kind of hoping that maybe that will help splash back on some of the other big ticket energy items that customers can face.

The second thing I wanted to talk about was government operations. I worked in state government for a long time. I ran the agency that included both the consumer advocacy and the state energy office where I worked, and was deeply embedded in the public utility activities and worked with the Attorney General's Office on a lot of things. And as I was thinking about the invitation to come here, I realized the important synergies that all of the state agencies that have something to do with this really need

to have in order for this to go well. The PUC is involved with establishing rates, with creating a stable regulatory environment so that even though we need to disclose the potential for government policy changing, we would rather it didn't change. And so it's important for the PUC to establish some backdrop of stable regulation for everyone to work in.

The Attorney General has the consumer protection, and as we heard from Ann, from Washington state, earlier, there is an important reason for them to be coordinated, and I appreciated what she had to say and support it. The State Energy Office Ann didn't mention, and the State Energy Office is an important place to validate information. Customers—I talked about customer confidence. Having a trusted adviser, a place where a customer can go with an 800 number or to a website to get some sense of, what should I be hearing here in this conversation? What should I be looking for in these papers? Not just the sense that there are a lot papers and they're the same, which is useful—standardization is very useful—but to actually be able to go and get some of what you're hearing validated.

So the State Energy Office is a very important aspect to all of this. And returning to the Attorney General for a moment, during the period of time when we went to retail competition, or during the time when telecommunications was being deregulated, I recall that the National Association of Attorneys General were very helpful in picking out the critical things that states could do to assure that the transition that was underway was successful for consumers. And so guidelines that the National Association was able to produce I think were very helpful then, and I have the feeling that they'd be very helpful now. And in speaking with Tom in advance of this, he reminded me that there are licensing boards that govern the contractors and tradespeople involved in these things in states. And certainly, they should be part of the conversation to have a useful response from state government to this. I think from the FTC's perspective, I would just hope that they would be able to give support and comfort to good behavior at the states.

The last point I wanted to make has to do with the word prosumer. Earlier today, at various times, different speakers talked about production on site that was within the customer's usage, and at other times other people talked about the idea that customers should be able to be enabled to do whatever they want to do. I think where we're headed is the notion of a prosumer kind of blowing the doors off of a lot of people's conception of what customers are about, and that customers are going to want to do what they want to do. And if they want to produce three times, or four times, or 10 times their usage because they happen to have the capacity, both physically and financially to do that, I think it's going to be up to states who are interested in some of the priorities that I've talked about in New York and California to help them figure out how to do that. So the idea of getting rate design right—and usually when I'm asked to talk about PV I'm asked to talk about rate design, so I'm happy that's not the feature of this. But I think as we get into the notion of prosumer, part of it is just getting out of the sense that we've had for the first 30 years of PV development, where it's incidental to the grid. It's as almost inconsequential to the grid. You won't even notice it on the grid.

Well, that's not happening anymore. Now it's an important resource on the grid, and for those states and utilities that choose to use it that way we're going to have to adapt to new expectations of customers and new regulatory forms that's going to change that. One final facet about that is that we're increasingly not going to be talking just about solar. We're going to be talking about customer services integrated that includes solar, and storage, and demand response, and energy efficiency, and other building services that are going to be serving customers' needs. And those kinds of things that are going to challenge us further, but I think increasingly that's where technology and where customers are going to want us to go. Thanks.

JONATHAN HILL: Thank you, everyone. We'd like to first of all start—if anyone would like to respond to anything that they've heard so far, feel free. Yes, Tom?

THOMAS KIMBIS: You just, I think—a couple of comments back to Shennan, I think they're very apt comments about what's happening in the Commonwealth. I just want to address a few different points because I think they have been perhaps

misunderstood, especially in the media. One is having to do the UCC filings. There certainly have been a larger number of UCC filings increasing. The reason for that is because there's more solar systems going in.

What the UCC-1 filing does is, when you have a third party system, it provides a public notice that the solar company owns a certain part of personal property on the house. So that way, Mr. Smith can't just turn around and sell the house to somebody else and represent that the solar system on top of his house is his own. This provides a public notice that there's a third party that owns that system that's on top of the house, whether it's a power purchase agreement or a lease. So it's actually not an encumbrance at all on real property.

However, since solar is new—and a lot of the issues we deal with come down to solar is kind of new to many people and to many markets—it's not very well known by settlement attorneys or by realtors. So we actually have a member of our consumer protection committee who's going to be addressing the National Association of Realtors at their national conference in September. We're going to be speaking with the appraisers as well as a number of the different—there are several different title company associations—then, get kind of the word out about what the UCC-1 is.

So it only covers the solar equipment. It does not encumber the home. It does not create a lien. It actually says in the UCC-1, this does not create a lien. So again, I think this is something that has to do partly with education, and a lot of it is up to us as an industry to work with the states that are out there and to work with the various different other industries that I mentioned that involve residential real estate to ensure they understand what the UCC-1 is intended to do in this situation.

Second is just to Shennan's point about the new company. This is a tough one when you talk about warranties. I think it's not something that's explicitly—I don't have a great answer for this one. I don't think it's something that's exclusive to solar. If you're hiring a home contractor to put in your kitchen, as I did when I had a two-year-old and one on the way, and they wind up walking away halfway through the kitchen—that's

kind of my fault, it's kind of his fault, but I probably should have done a little more homework. It's hard when you have a newer industry like solar moving in to your area.

But again, this is why we really encourage in our consumer guide—and we actually require all of our members to give out the residential guide, where it says to contact the Better Business Bureau, contact the state for licensing requirements. Ask for references and make sure that that company has not only done a good job in, say, doing an addition on the back of house, but actually has done good solar jobs. And that's, I think, the best we can do at this point in terms of having the consumer get as educated as they can through checking references.

And lastly, under the misuse of cards and the signatures, can you throw those guys in jail? Because we can't, but that's fraud.

SHENNAN KAVANAGH: Yes.

THOMAS KIMBIS: That's pure fraud, and they all deserve to go to jail, including the ones who take the ITC away and bury it in three point font at the bottom of the contract. So I think were in complete agreement on that.

SHENNAN KAVANAGH: Can I respond very briefly? Right, and starting with the latter point of the misuse of signatures, yes, that's fraud. And again, I want to emphasize that we see things come through our office when they're egregious, usually, and when something has gone wrong. So I'm not to suggest that every company is out there fraudulently using folks' signature. It's more to just raise the issue that this is something we've heard about that's been floating around.

Going back to the UCC filings, yeah, I—the UCC serves that purpose—to show that there's an ownership interest in the fixture on the property. And I understand what you're saying, Tom, that it's not, at least your representation, the industry's intention to put a lien on the property. But doesn't the UCC filing operate kind of as a de facto encumbrance on the property? Because anybody that's going to purchase—be a subsequent purchaser of that property—has to want to take on the solar panels and whatever remains on the lease or the financing agreement as part of that purchase of

the property. And, doesn't it then make it more difficult, in a free market, for a consumer to sell their home when it has a solar panel on it than when it does not?

THOMAS KIMBIS: So that's a good question. So I think taking it out of the legal construct and getting more into, well, this home has a leased solar system on it, and you're trying to sell it, and I'm trying to buy it. Am I interested in it? Partly what we see is that it's sort of a self selection. That I might not be interested in your home because it has a solar panel, or I might be very interested in your home because it has a solar system on it. Just like if you're on the water or you're not on the water, or you're on a busy street or not a busy street.

But if it's a situation in which we actually, from talking to our consumer protection committee that represents such a high percentage, it's actually quite a rare instance—and rarer than I even thought—where you have a seller and a buyer who agree on everything except for the fact that there is this lease up there. What happens in those instances? Well, there are a couple of options, and sometimes they're included in the actual contract itself.

One is, you can simply have—the seller can just sort of buy out—there's a financial way to do it where the seller could buy out the lease, essentially. That could be paid by the seller or buyer. That's sort of just the market economics behind it. But we're seeing increasingly is that we want to make sure in that situation, rare as it is, that consumers are still happy about the transaction. So what we're seeing is a lot of the larger residential companies are actually giving you a couple options, including the ability to move the system to your new home for a relatively small fee. Some companies are charging as little as \$300 to \$500 to move the system within a certain radius. I don't know if it's 50 or 100 miles. It depends on the company.

But this is something where we need to kind of innovate as we come up against these issues that are kind of the exception rather than the rule, and find solutions. That's one of them, is this ability to kind of uproot the system and move it, because it will still function. That's what we've seen to date.

SHENNAN KAVANAGH: That's very interesting.

RICHARD SEDANO: So the one thing—first of all, Tom's opening remarks were very compelling. But what I will say is that the amount of money coming into the industry is significant, and the amount of financial engineering that is distinguishing some of the participants is significant. And when we saw it 20 years ago with telecommunications and long distance providers is that we started getting away from innovators and into market share growers, and the tactics became more boiler room type tactics.

And so I guess what I want to say is, it's not a consumer risk that would be disclosed. This is a risk to overseers, regulators, that the risk, I think—as there's more money coming into this, as we see 100% percent growth year over year—is that the kinds of people who are coming in to fill that increasing market are not necessarily going to be exactly the same people, or like the same people that have been part of the initial growth. They're going to be financial engineers who are looking to financial engineer, and are not going to be taking such pride in the installations. Now, perhaps they'll be driven out, perhaps they'll be discouraged by the requirements, but I guess I'm forecasting that we're going to have to be keeping up with an increasing trend of people who are not going to necessarily be focusing on Shennan's concerns right off the bat. They're going to be focused on returns right off the bat.

THOMAS KIMBIS: And hopefully, those are the types of companies I think we see in other industries that fail, and fail quickly, because they're not—

RICHARD SEDANO: But the thing that you don't want to see happen, I suspect, is what did happen in telecommunications, which are these entities needing to get certified by states. You're not really interested in that. And the reason states want to do that is so they can throw them out, so they can do something to them once they do misbehave. You'd like to have them, I think, execute and not have to go through that.

JONATHAN HILL: I think the conversation demonstrates that there is—these contracts in these sort of transactions are extremely complicated. Where are consumers

supposed to go to get this type of information? How do they compare the offers that they're seeing and the information? How do they educate themselves in the best decisions to make?

SHANNON BAKER-BRANSTETTER: Yeah, so I think there are great resources out there for finding out general information, and the kinds of things that people should think about. FTC, DOE's handouts, IRECs, as I mentioned. But I think to really get into the nuts and bolts of the solar offers and the contracts, I think that consumers are mainly relying on the solar companies themselves to answer questions about the contracts and to understand the different offers. And that's probably pretty problematic, because in addition to the outright fraudulent, or misrepresentation, or burying things in fine print—I think those are the more egregious things that we all agree on shouldn't happen. But we spoke earlier, in earlier sessions, about the value of solar and who gets it, the utility or the consumer, and what is the value proposition for solar customers, and what are the cost shifts to non-solar customers.

But there's also the same thing at play about the value of solar between the solar provider, solar installer, and customers. So things like tax credits, things like RECs, and then of course the differential between the utility rates and the average rate that you'd be getting from the solar installation by generating the electrons yourself. So those three things aren't really that transparent, for the most part. If you're buying a new kitchen there may be some things you don't really know. I don't really know how much time it takes to install something, so maybe the labor can be fudged a little bit. But people, I think, have a better sense of what the hardware that they're installing, and there aren't these other kind of abstracts incentives.

So that's, I think, why we really push for a disclosure that really list out these things in a uniform way, so that people really can compare them and know if they're missing out on a certain value. If they know that—because they may not know what a REC is, and so they may not even know that they're signing away that value. So that way, I think it kind of evens the playing field between the solar installer and the customer.

RICHARD SEDANO: Well, I mentioned the state energy offices and I think, let's steal from the models for energy efficiency that we have, where we can create case studies that people can see themselves in the experiences of others, and where some of the most important variables can be included in a story that people can see. When I ran an energy office, we were the place to go for the admittedly prehistoric solar industry that existed at that time, but we were able to send people to trusted providers of solar services. And maybe that's more complicated now, but I think that we should all be reaching out to NASEO, which I think is not here, to engage them on what their members can do.

HAMPTON NEWSOME: OK, we have about 20 minutes here so let's talk a little bit about deceptive claims out there, what people are seeing. This morning we talked a lot about energy savings claims. This idea that the solar seller is telling the customer that, well, your energy costs are going to be going up this percentage over the next 10, 15 years. And that seems to be—there's some concern about that. How common are those types of claims? How accurate are the ones that are being made out there? Is there a way to make that claim—to substantiate it? Are there sources to do that? What can you guys say about that issue?

THOMAS KIMBIS: Well, I think when we put together—just to start the discussion—when we put together the Solar Business Code, Hampton, we were kind of confronting that issue. I don't know how prevalent the issue is in terms of inaccuracies, but I think one of the things we wanted to get to with this business code was to define the ways in which you should be able to show that number that you're providing as a company, to the consumer, where it came from, and make sure that it's from some established source. So we actually list sources in here. I mentioned earlier, but in the Department of Energy. We have in here the State Utility Commission, the EIA, a retail utility or electricity generation source servicing the system location, rate case filings, historical utility price data, industry experts or other qualified consultants. In which case, you need to explain where it's coming from.

So I think one way to get a little bit more transparent with the consumer is to say that, if you are making a claim about savings you have to put down how you made that calculation, and you have to not only show where the underlying data comes from, but also using a minimum number of years of projections. So you can't just do it based on one year projections. It's got minimum number of years in here. So that's one thing to at least get the conversation started.

SHANNON BAKER-BRANSTETTER: And I think those are all possibly legitimate sources, but I still go back to the need for it to be more uniform and less wiggle room, because those assumptions and those data can still provide wildly different underlying numbers. So I think that having some format, almost like a table of – if utility rates go up two percent, you know, and then compare over the next five years, 10 years, 15 years, and then compare to your electric bill or your cost under your solar contract. So you're really comparing apples to apples.

How much would I be paying over the next 15 years under this scenario of electric rates? How much would I be paying for solar energy for the next 15 years under these assumptions? And have those assumptions the same across disclosures and, that way, you can really compare different solar offers. And it should be specific to your utility. Not generic for the state or the region, but for your utility.

HAMPTON NEWSOME: Are there any other common types of claims that are being made out there that warrant discussion that have come on anybody's radar that they're concerned about?

RICHARD SEDANO: One issue, Hampton, relates to shared renewables. I want to say community solar, except that term seems to have been hijacked by everybody else who wants it to mean whatever they want it to mean. So I'm just going to say shared renewables, generally, presents distinct issues for customers, because now they are trying to understand a financial transaction and how the utility is going to treat them. And I think at this point we have, for example, the Minnesota shared renewables program in which, in many cases, the renewables never actually make it to the

community because it gets taken up by large corporations looking for sustainable—accomplishing sustainable goals and take up all the capacity. So I think there is some general complaints about this reaching average individuals. The original virtual net metering was for average individuals and, increasingly, that's challenging for them.

ROBERT MARGOLIS: Sorry, so I would say that another area that there can be some confusion is around SRECs, and particularly if you sell your SRECs, can you claim that you have solar? Or what's the value of those SRECs? We see that, for example, here in DC where SRECs have a very high value. And I have a friend who got quotes here DC, one in which they sold the SRECs as part of the package and they got a price that was a third of what it would be if they wanted to keep the system with the SRECs. And the reality is maybe that would've been the better thing for them to do, to try to sell the SRECs on their own but, again, it's confusing.

So now she's going to get a system, sell the SRECs, can she say she has green energy or not in her home? So what the value is for them, how they're sort of presented to the consumer when you sell them, if you don't tell them, how can you actually sell them, those types of things. What value do they have, and how should they be incorporated sort of the sales process is an area of potential confusion.

HAMPTON NEWSOME: Is there—does anyone have any suggestions for—and this came up earlier, about how it's unlikely the average consumer understands what a REC is. Is there any talk of ways to clarify that to consumers? Is it relevant to all consumers in these transactions? Is it different if I'm putting solar on top of my house versus, say, I'm entering into a community solar arrangement? Does that make a difference in terms of what I need to know about RECs?

RICHARD SEDANO: Well, Hampton, one idea about that is this case study idea. If we produce some case studies of people who have either kept the RECs or sold the RECs and put some words around that to explain what that means, then you have a page or two page thing that you can give to a customer that puts it in context. Because it is a pretty abstract concept, and yet in my experience in social and entitlement programs,

people figure out a lot of very complicated thing very successfully if it means money or other objectives for them. So I think we can help them do that.

THOMAS KIMBIS: I would add, too, Hampton, we confronted this issue, too, as an industry, and in putting together our business code one thing we require all of our member companies to do is, we state that RECs are a material term in any contract. Now, not every state has a REC market, so it's not going to apply everywhere. But where it does apply, we make it clear that—and state, right in here—that many consumers are unfamiliar with SRECs, or RECs, and their characteristics. And so if you're in a state in which a REC market exists, the company must take steps to educate the consumer about the RECs, providing the consumer with a copy or link to the CRS publication, which is the best one we've found out there.

CRS is a nonprofit, and they work very diligently in the SREC market to explain how exactly SRECs work, and how they can't be double counted, et cetera. So rather than reinventing the wheel, we worked with them. So our companies have to provide a copy of that guide, and then if an agreement assigns the RECs to a company instead of to a consumer, which might happen in a contract, the company has to explain that the consumer no longer has the right to trade or sell the REC, and tells them a little bit about something that's very dear to your heart, Hampton, I know, which is the green guides, and that they can't talk about the fact that they're generating clean energy or green energy anymore, et cetera.

HAMPTON NEWSOME: OK, before—in a second we'll get into the role of state agencies, and also the efforts by industry on codes of conduct and that kind of thing. Before we do, does anybody have anything else on advertising claims and potential deceptive claims out there?

THOMAS KIMBIS: Just one more that we see quite often is “free.” It drives me nuts. We get a flyer in the mail, it will say free solar—a free solar system. That's a violation, in almost every instance, of our code, and we will go after those folks if they're SEIA members, to warn them and potentially take action against them. The only way in

which you can say that you're getting a free solar system is, essentially, if the person has won it, as in, like, a lottery, and you're just giving it away. But if you're giving them a free hardware—if you're giving them hardware that you're not charging them for, but they have to enter into a lease, or a PPA, or some other arrangement, that's not free. So that's something we found to be very common across the states, Massachusetts to California, and we've been trying to crack down on that one.

JONATHAN HILL: We know that when consumers run into issues with their solar contracts and their solar providers, they can go to state AG's or the FTC for enforcement of unfair and deceptive acts and practices, the laws that we've heard about, SEIA's consumer dispute resolution mechanism. My question is, what is the sort of appropriate balance for these types of remedies, and are these tools sufficient to address consumer issues in the solar industry, or is there something else that's needed?

SHENNAN KAVANAGH: I think, if I understand your question, it really depends on the nature of the issue. So if it's an extreme circumstance where a company has failed, it's very difficult, even with enforcement power or investigatory power, to make consumers whole in that circumstance. In Massachusetts, we do have a home improvement contractors fund that registered home improvement contractors—and that does include solar installation companies—have to put into when they register. And if a consumer gets a judgment against a company, and attempt to collect from that company, and the company is judgment-proof or defunct, then that consumer can make a claim up to \$10,000 to the guarantee fund as a backstop. Because it's very difficult—in those circumstances you have to look at issues of, if the business is defunct, of principal liability or piercing the corporate veil to be able to get money back for consumers if they've already paid out of pocket.

And, in addition, a lot of the consumers may have ongoing financial obligations to a third party finance company that may not have been part of the alleged unlawful conduct. So what happens when those obligations are still arising every month, but somebody only has two solar panels out of 20 installed in their home, and they're not getting the services? So those are very tricky situations on the worst case scenario end.

On the best case scenario end, coordinating with industry members and trying to take a preemptive approach to any problems that are of concern, that we hear come through our office, is the best approach, in order to hopefully prevent those problems from happening to begin with.

Understanding more about the industries and looking at bad players obviously helps educate our office in terms of knowing what types of issues to keep our eyes open for. And I think most state regulators have a division in their office that's the outward facing division that will take the consumer complaints coming in off the ground, and when there's kind of a one off situation, work with—in an advocacy, in an assistance role—work with that individual company to try to resolve those one off issues.

RICHARD SEDANO: Is your staffing enough to do what you have to do now?

SHENNAN KAVANAGH: Say again?

RICHARD SEDANO: Is your staffing enough to do what you're doing now? I mean, you're keeping up?

SHENNAN KAVANAGH: It's, you know—right, well, there are a lot of consumer protection issues that come through our office, so solar is just one of many. Certainly, I do have to say we have to pick and choose our enforcement actions based on the contact and level of harm. Our outward facing consumer assistance unit does an incredible job with working with individuals to try to get them resolutions, but it requires industry to also want to work towards a resolution. So that all depends, again—to answer John's question—on the nature of the issue itself and the player involved.

THOMAS KIMBIS: And I think, just to quickly follow up on that, I think I see the role of SEIA as not going after real hard criminals, but instead some of, maybe, the smaller issues. That maybe there's not enough bandwidth within the state. We've had some states who are just—not Massachusetts—we've had some states that are not as familiar, don't have as big of a market, refer complaints over to us for resolution.

I think the best thing that we can try to do as an industry is—the kind of prophylactic side—is through education. It's making sure that our companies understand what they should and shouldn't be doing. And to the extent we can partner, as we are, with the Better Business Bureau and the NAACP, getting the message out there to consumers about what they should do to prepare themselves to avoid getting into misunderstandings, so that we don't have as many disputes coming through the system. So that states that are going through battles over budget have to allocate precious FTEs—nobody wants to hire an extra FTE to deal just with solar. So instead, I think it's our role—I see our role as being mostly on the front end. And then to the extent we can help, if there's something to offload we can try to do that on the back end for smaller issues.

SHANNON BAKER-BRANSTETTER: Just one other thing. So I think that some of the gaps in consumer protection on solar probably are general consumer protection gaps. Lack of funding for AG's offices, or lack of just protections in general, either by statute or common law. And then, while I think it's admirable that SEIA is trying to self-police and trying to get their members to do a good job on the front end—that's really, I think, very important—in terms of consumer compensation for when something does go wrong there's not a mechanism for doing that. And also, a lot of states now have pretty tight limits on small claims court.

Some states it's only like \$2,000 or \$3,000 that can be recovered in small claims court, and some solar contracts also require consumers to go to mandatory binding arbitration. So there are—but again, that's not unique to solar, but there are limited recourses for consumers, and so state enforcement and strong consumer protection laws generally are just really important in this area. And FTC enforcement is just really important in this area because there's not much of a back stop otherwise.

HAMPTON NEWSOME: Well, we'll go ahead and wrap it up there, three minutes early. We also—we're going to stick up here while Pat Schultheiss comes and gives the closing remarks, but I want to thank—on behalf of Jonathon and myself I want to thank you guys. It was a very interesting panel, thanks.

[APPLAUSE]

CLOSING REMARKS

- **Patricia Schultheiss, Attorney Advisor, Office of Policy Planning, Federal Trade Commission**

PATRICIA SCHULTHEISS: Are these on? Yeah, I guess they are. Hi, thanks, Hampton. I'm Pat Schultheiss, and I am an attorney in the Office of Policy Planning. I just want—this is going to be quick. I want to thank you all for coming today. I'm not going to keep you long because I know you either have flights, or trains, or some way to get home, and I don't really have anything more of substance to add to what has been a full day of excellent presentations and discussion. But we do want to close by thanking those who made this workshop possible.

First, we want to thank our panelists and speakers. For those of you who don't know, as a government agency we cannot pay honoraria or travel expenses, for that matter, to speakers when we put together a program like this. So we are really appreciative of all the speakers who came here today and generously shared their time and expertise with all of us. And I want to thank you on behalf of the FTC and all the workshop team.

We'd also like to take the opportunity to acknowledge the enthusiasm, dedication, and hard work of all the FTC staff who helped to make this workshop a success. As some of you know, it takes a lot of people to put on a workshop like this and today's was no exception. Although we can't begin to thank everyone by name who has contributed to this effort, we'd like to recognize those who have provided significant support and help.

First, we'd like to thank Chairwoman Ramirez, who has been supportive of this project from the very beginning, and who actually arranged her schedule today so that she would be here to open the workshop this morning. We'd also like to give a special thanks Marina Lao the director of OPP, the Office of Policy Planning, who really had the original idea for a project on rooftop solar, which eventually led to the decision to organize this workshop. We all greatly appreciated her leadership, enthusiasm, and

active participation in all aspects of putting together this workshop. So, thank you, Marina.

The two attorneys who were the co-leaders of the workshop team also deserve special recognition – Derek Moore and John Seesel. Their hard work, substantive knowledge, and team leadership really brought this workshop from an idea to a reality. Additionally, we want to thank the core workshop team who helped organize the workshop: Ellen Connelly from the Office of Policy Planning, Mark Hegedus and Jonathan Hill from the Office of the General Counsel, Jim Mongoven and Brian Telpner from the Bureau of Competition, Hampton Newsome from the Bureau of Consumer Protection, Larry Schumann from the Bureau of Economics, John Hilke, who was a former FTC economist, who continues to share his expertise in electricity markets with us as an economic consultant, and Jade Eaton, who is an attorney for the DOJ's antitrust division.

We'd also like to thank Henry Su, the chairwoman's attorney adviser, who actually worked very closely with us on this workshop from the very beginning. And I guess I should mention that I was also a member of this team, and I'd like to thank the rest of the team for allowing me to be a part of it because I really didn't know that much about this industry. I'm relatively new to this industry, and they let me be a part of it and learn the industry as we went along. So thank you, guys.

We'd also like to thank the following senior managers for supporting this project, including providing key staff and helpful feedback during the planning stages: Debbie Fienstein, the director of the Bureau of Competition, Jessica Rich, the director of the Bureau of Consumer Protection, Ginger Jin, the director of the Bureau of Economics, and Dave Shonka, acting general counsel. I'd also like to personally give a shout out to Carole Reynolds, who is an attorney in BCP, who provided important feedback and guidance throughout the planning process on many of the consumer protection issues.

And then, critical, of course, to the success of any project is the work of the support staff, and I'm pleased that, as an agency, we have a very good practice of

thanking those who helped make the magic happen. Those who made significant contributions include: Chris Bryan and Waleed Abbasi from the Office of Policy Planning; Teresa, AKA "TJ," Peeler and Nathan Luskey from the Division of Consumer and Business Education, who designed the logo, the web page, the agenda, and all the other workshop materials you've seen; Fawn Bouchard and Crystal Peters from our events staff, who helped with everything; Brandon Miles, who worked on helping to set up the room; Michael Bumphus, who helped us with security; Bruce Jennings, James Murray, and Glen Savoy, who ensured early on that our technology needs were anticipated, and ensured that everything ran today as smoothly as possible; Frank Dorman and Peter Kaplan from the Office of Public Affairs; and Tara Koslov from the Office of Policy Planning and Richard Custard from the Office of Public Affairs, who did all of the tweeting for the workshop today.

And, finally, I want to thank the group of wonderful volunteers who helped with the various, onsite logistics today: Esther Lee, Oren Vitenson, Taylor Becker, Martin Sicilia, Taylor Nefussy and Vinayak Balasubramanian. And they were here all day. All of them helped us in various capacities throughout the day. And as someone whose last name is often mispronounced, I sincerely apologize if I just mispronounced somebody's name, which I suspect I did.

And, finally, I just want to remind you that the public comment period will remain open until August 22nd of this year, and we welcome your comments. And the webcast transcripts and speaker presentations will go up on the web event page soon, and the public comments will also be posted. Again, thank you all for attending and have safe travels home. Thank you.

[APPLAUSE]

[END OF WORKSHOP]