

Transcript of TAP Webinar, October 28, 2009, Feed-In Tariffs: Best Practices and Applications in the United States

Misty Conrad: Thank you so much and welcome everybody to the Technical Assistance Program, better known as TAP, a part of the webinar series and I'm Misty Conrad, the Technical Assistance Program manager here at NREL and my co-host, as always, Jimmy Jones, welcome. Jimmy how are you doing this afternoon?

Jimmy Jones: Well we're doing great here Misty but people might know we had this huge snowstorm in Denver so we're broadcasting from the U.S. Department of Energy (DOE) National Renewable Energy Laboratory (NREL) in Golden which is absolutely deserted and we're the only ones here. Misty, you didn't even make it in today did you?

Misty Conrad: No I didn't even make it in. So I am actually broadcasting from my kitchen table looking at a very, very big snowstorm outdoors and I know NREL closed earlier today so after we wrap this up I sure hope you guys get on home.

Jimmy Jones: We want to welcome everybody from around the country. We want to remind people that the presentation is posted online if you have trouble with the video and as you heard the operator announce this conference will be recorded. We will post the audio about next week after we get a transcription made. We'll post the transcript and the audio on the TAP webcast Web page, and you can see that at:

http://www.eere.energy.gov/tap_webinar.cfm.

A reminder to please enable pop-ups on your browser, if you're having trouble that often is the cause. This is a Microsoft product that we're using to give this webcast and a reminder of the phone number, if you'll write that down if you haven't connected yet. We're expecting many hundreds of people, maybe close to a thousand people on the line today which is more than NREL is subscribed for on this service. So if you have trouble getting in on the phone number please keep dialing and everything will work out. Misty are you still connected with us?

Misty Conrad: I'm still connected. I am mobile so if anything happens I'll call back in.

Jimmy Jones:

Alright. For our attendees, we want to urge people to ask questions. This is interactive, as much as we can with this many people on the line. We're going to call your attention to the Q&A icon at the top of your screen, a Q&A, and that's how you ask questions. Go ahead and send us questions. Send us comments. We go over these. Misty and I go over these in great detail. If you send us a comment or a question we will look at it and try our best to respond if we can. Those questions that we don't get to today we'll post on the TAP webcast blog and today's presenter Karlynn Cory has agreed to answer these questions for one week. So Q&A icon at the top of the screen and send us your questions.

A reminder we have some interesting upcoming TAP webcasts in November-December. In November it's *State of the States: Renewable Energy Policy*. Joyce McLaren, also an energy analyst here at the National Renewable Energy Laboratory or NREL, and in December Dustin Knudson and Jim Arwood, director of the Arizona Energy Office are going to give us an introduction to energy savings performance contracts. So as you did for this webcast you can register online at the TAP webcast webpage on the EERE website. Misty, you want to tell us a little bit about the TAP project?

Misty Conrad:

Sure and I just want to let everybody know to please remember that you know you're only as good as your computer and your bandwidth so if these slides move a little slower or they turn black for a minute and come back don't be alarmed it's probably just your server and also we will put the announcement at the very end of the webcast, again – excuse me, our webpage of where you can download the information on the next webcast. There are some really great new webcasts coming on in the future.

So let's get in and talk a little bit about the TAP program and I know that many of you that are on the coast probably have a little bit of exposure to this program but it is changing and it's growing and we've got some new things that are happening. In a nutshell the original TAP program has been around to provide state and local officials with quick access to technical and policy experts at three of our national laboratories, at LBNL and Oak Ridge as well as NREL. For the most part it's short-term assistance but some of these projects can go on for a little while. It's direct one-on-one assistance dealing with cost-cutting energy efficiency and renewable energy topics and it's a cooperative effort by the Department of Energy headquarters in the Weatherization and Intergovernmental Program. They're our sponsors and so we want to thank them for helping us do this program and sponsoring our

webinar today. There are many eligible TAP request areas that you will see on our website that you can come in and talk to us about or scope. Oftentimes what we see is folks who want to see how best TAP works for them. Sometimes it will be just a quick question on where to find a resource. Sometimes it'll be what are some of the best policy practices occurring around the states and also communities or task forces that are being brought up under mayors or the governors' offices will contact us to help get them started on where they need to move forward in looking at renewable and energy efficiency potentials.

So there's a list here. I'm not going to go through all of them but maybe give you a few examples. We deal a lot with energy portfolio standards for instance, whether you've got an RPS in your state or you're trying to get one instituted, or maybe you're looking at a new benchmarking or how to reach those goals. You can come to us for that assistance. Oftentimes folks will want to drill down a little deeper in wind resources for instance although we do know or hopefully you know that for most of the contiguous United States the renewable energy potential has been mapped but renewable energy potential is also site specific so if you're looking at specific places that you're looking at small wind or community wind for instance and you want to drill down a little bit deeper you can access to TAP program for that type of help. We look at helping with disaster relief, mitigation, and planning. We've done a lot of assistance in those areas with New Orleans and in Greensburg, and in most recently working in America Samoa. We hope folks are doing well there. They just recently had a terrible disaster with a tsunami. There are a lot of energy efficiency and renewable energy assessment and planning and that seems to be something we are getting a lot of requests for right now especially with the Recovery Act money that's been coming through DOE and WIP.

So, help with strategic planning or strategies, looking at renewable energy management plans, climate action plans, and the like and that kind of moves into sustainable community and building design. So there's a lot of opportunity here and if you don't see a particular request area that fits your needs, often it's just a phone call with me or one of the team to kind of scope out those needs. Of course what everybody is talking about is the Recovery Act. It's been going on for a little while now and everybody is still really inundated with contracts that are coming through and the money that's moving and so I want to talk a little bit about something relatively new that's on the TAP webpage that you'll find and that's our TAP assistance that provides states, communities, as well as tribal governments with technical assistance and this is in relation to your state energy

program, our funds or plans, as well as your Energy Efficiency and Conservation Block Grants or as better known at NREL quickly also as EECBG.

So I wanted to let you know that you can apply through the TAP program if you are looking for technical assistance on any of your plans whether it's SCEPA or EECBG and I'm going to give you some examples on what you might want to come to us for and I'm also going to tell you what not to come to us for because we have seen a lot of folks that are looking for program information such as bids, if you've got questions on your contracts, if you're looking for Davis-Bacon, anything to do with the Buy American issues, anything that relates to your actual contracts or program policies for Department of Energy or through these. You need to go talk to your project officer or the EECBG webpage make sure you ask your questions back through DOE. Those are questions we're not going to be able to answer for you. but if you're looking for specific technological, technology or policy based information or assistance then you can come to TAP, if you're looking for building your strategy, what type of strategic energy management plan for instance and specific technology whether it's drilling down with specific lighting issues, whether it's performance contracting for instance, whether the energy conservation measures which you're looking at, or detailed programs and policies, please access us and you'll be able to find, I'm not going to go through all these fourteen categories at EECBG but most of you all are very familiar with them by now, but how to apply, that's the most important, go to our website and you'll be seeing this pop up, again, at the very end of the presentation.

There are two different request forms, one for the energy program and one for the EECBG recipients. So save a copy to your computer and then send it. That's actually – I'm sorry Jimmy but that's actually the wrong email address. It was changed. But it is on our website correctly and it's actually ARRATECHNICALASISTANCE@NREL.GOV. There are a lot of resources for policy makers and analysts on there that you can access for renewable energy policies and programs. It's being updated constantly. It's really ways to access that and again if you've got any questions, comments, or concerns, if you've got some ideas for future webcasts, if there's some information that you're not seeing, capacity building within the state or your city or county that you would like some help on, please give us a call. I believe that concludes my finish although Jimmy I guess we can talk a little bit real quickly before we move on about the webcast blog.

Jimmy Jones:

Yes we're going to have that. It actually starts already. It started today, the TAP webcast blog. By the way Misty we have changed URLs as of this morning on the TAP webcast blog. We joined the EERE, the DOE office of energy efficiency and renewable energy has a new blog service and we have changed our blog to match that EERE service. So that URL is EEREBlog.energy.gov/TAP and of course you can link to that blog from the TAP webcast webpage on the EERE website. So we urge people, again, ask the questions. We'll have a question and answer session in the middle of this presentation upcoming. We'll have questions at the end of the presentation. Those questions we can't get to today we'll join people in that TAP webcast blog. Let's go on to the next slide. Okay we're about done here and Misty it sounds like the snowstorm, you were cutting out a little bit there. So speak into that microphone into your kitchen and people let us know if you continue to have problems with the audio. We've got a couple notes about an audio issue there. So send us notes if you have problems. We'll try to address them. Anyway, we have a very, very distinguished presenter and it's just my pleasure to present you Karlynn Cory, a senior energy analyst at the National Renewable Energy Laboratory or NREL here in Golden. Karlynn leads the analysis team at NREL for renewable energy financed projects and she has a number of presentations and she's back by acclaim from a year ago from another TAP webcast, an excellent one. So Karlynn take it away. I'm going to pull up your presentation here if that's okay.

Karlynn Cory:

Yeah, well Misty and Jimmy thank you very much. It's certainly a pleasure to be here today and I'm excited to chat with folks about a new topic of mine which I've become very interested in and have been analyzing for the past about eighteen months or two years, renewable energy feed-in tariffs and I'll be talking about lessons learned from the US and abroad. As Jimmy mentioned I will stop a couple times in the middle and then again at the end to answer your questions. So please make sure that you use that Q&A button up at the top in order to submit your questions.

So first a little overview of what I will be discussing today. First I'll talk about feed-in tariff policies, what it is, how it works. I'll talk briefly about a couple examples of how it's used in the United States. I'm not going to be comprehensive here because I think it's important to compare what's happening between the US and in Europe. So I'll get into that comparison. Then I'll move into some policy clarification. There are some questions and concerns with PURPA and policy interactions with renewable electricity standards or renewable portfolio standards as they're commonly

known in the states and then finally talk about some design and implementation challenges.

So let's launch into what is a feed-in tariff. A feed-in tariff is a renewable energy policy that typically offers a guarantee of three things: first, payments to project owners for the total kilowatt-hours of renewable electricity produced, second, guaranteed access to the grid, and third, stable long-term contracts and long-term contracts typically are on the order of 15-20 years. One thing I would like to point out is since the payments are for the total amount of kilowatt-hours generated feed-in tariffs are distinctly different from net metering. Net metering programs tend to focus on the excess generation, anything that's not used at a particular site whereas feed-in tariffs, the payment is for the total amount which is generated even if it's used onsite. There are many different names for feed-in tariffs including advanced renewable tariff, feed laws, and standard offer contracts.

There are really four main fundamental policy design options that a policymaker should consider and I would recommend considering them in the order laid out here. First is the price method and what do I mean by that, I mean how are you going to set your payments and what is it that you're trying to do with your payments. There are really two main ways this is done. One is by estimating the cost of a particular project and then adding on a targeted return on top of that. This is the way that Vermont and Hawaii are structuring their feed-in tariff and it does dominate in feed-in tariff design in Europe as well. You can also use a price methodology based on avoided cost, so what is the current mix of electricity generation and what is the avoided cost of electricity for that particular system. This is the market price reference system which is used in California. We'll get into some of the distinctions between these two a little bit later

In terms of payment structure there are different ways that you can actually design the payment to be paid out. There are fixed payments. This is where it's essentially a pre-established cents per kWh which is paid out to the projects or you can have a premium. The premium is typically a smaller cents per kWh which is on top of spot market prices or some sort of market price indicator. Fixed price payments are typically used in Europe and the premium prices can be done in two different ways. You can have a premium that's a constant and it just rides over the spot market or you can have a sliding one and I have some graphic depictions of those in the next slides.

The third fundamental FIT policy design option is differentiation. A lot of feed-in tariffs are being designed to try to target the estimated cost of developing a project plus that targeted rate of return and there's a recognition that each project will cost something different depending on the technology that's used, the project size, whether it's distributed generation on a residential level or a commercial and industrial level or something that's more utility scale, the actual physical location of the project, for example ground mounted PV has different costs than roof mounted PV compared to building integrated PV and because the different projects have different costs feed-in tariffs are sometimes designed to recognize the differences, and then sometimes by resource quality as well, recognizing that in the south of France where there's lots of sunshine you're going to have much higher output than in the north of France but wanting to also provide incentives to allow the north of France to put in PV as well.

The last are bonus payments and these bonus payments I'm starting to realize are really looking to target some smart grid principles. So in addition to covering the base cost of the project which is essentially what the price methodology does and the payment structure does you can also try to target those things which are beneficial to your electric system. So if there's generation that meets peak load, peak demand, you can provide a bonus payment. If it uses optimal use of the existing transmission system, bonus payments can encourage locations near these areas or if there are specific technologies. Some states have a particular industry which is starting whether it's fuel cells or PV or geothermal. So you might want to try to target those technologies which will help create jobs in states. There can be ownership structures, deployment in locations with high loads like urban centers, etc. So it is interesting to see the convergence of some of the smart grid principles and how they're translated into feed-in tariff design.

So now we'll look at the payment choice and these are the graphical depictions of the different options which are currently used. The first one is a fixed price FIT payment. Typically it's just a cents per kWh, which is set out over the life of the contract, whether that's 15, 20, even 25 years. It can include an escalator, maybe a 2% or 3% escalation rate. But the important thing is that it's predetermined at the beginning of the contract and everybody knows what the payment price is going to be. The utility knows what they're going to be paying and the investors and the developers know what revenues they will be receiving. An example of this is what is proposed in Vermont. There's also the premium FIT payment. So as you can see in Spain before 2007 they had a fixed or a constant premium

which rode above their spot market price and I will point out that most countries use the fixed price FIT payment that is shown in the first graph. Now there are a couple of refinements which are a little more detailed that are starting to be used. What Spain moved to after having just a constant price riding over the spot payment was a FIT payment with caps and floors. This is actually a sliding premium where you can see there's a minimum payment of about €70 per MWh which is paid if spot market prices along the bottom axis are low. However if those rise then in the middle the premium stays constant until those spot market prices rise and after a time if spot market prices are extremely high then the actual premium which is the dark blue goes to zero. You can see it disappear on the right side of the graph. Now the profit that's received on the far right side, that comes from spot market prices. So this is an interesting sliding premium. It's fairly complicated and if you need some more clarification please let me know.

The last structure is what we call the spot market gap model. So it's kind of a hybrid between the first two structures where there's a total payment guaranteed. So the investor and the developer know what revenues they're guaranteed to get. They're just not sure exactly where they're going to get them from. You can see the blue line which is the electricity price and it moves up and down over time as electricity prices are volatile. However as time goes by and electricity prices rise, to the extent they rise above that total payment guarantee, then the feed-in tariff payment goes to zero. So this is another variation of what we saw in the previous slide for Spain although it's a little simpler. So the shaded area of the left side of the chart, that's the feed-in tariff payment. Below that is what the facilities receive from the electricity market and to the extent that retail prices rise high enough the FIT payment goes to zero. So you know you will get at least that total payment guarantee, perhaps more if spot market prices go higher. This is something which is used in Switzerland and actually Germany is going to be moving to this system starting in 2010.

So in terms of policy application in the United States, here's a map which shows where feed-in tariffs are enacted. You can see that California has feed-in tariff legislation based on avoided cost. Both Vermont and Hawaii have enacted FIT legislation based on project cost. So they're trying to more closely target the estimated cost of different technologies and different sizes of projects. Three states have enacted utility based feed-in tariffs and then seven states including four municipalities have proposed feed-in tariff legislation, again, based on renewable project cost. We do receive some questions on this map about how come my state isn't included in terms of

having proposed legislation. We've decided to focus this map particularly on the FIT legislation which focuses on renewable energy project cost as opposed to avoided cost just to keep the map a little more simple and of course I'd be remiss if I didn't mention Gainesville, Florida, the Gainesville Regional Utilities approved the first US cost based feed-in tariff specifically for solar PV.

So let's see, I actually have two more slides and then I'll stop for some questions. The two slides get into some details of two of the feed-in tariffs. The first one is California. Just recently in the last week or two, AB 32 was passed and signed by the governor. This feed-in tariff includes commercial, industrial, and residential customers. Contract length can be 10, 15, or 20 years. The payment as I mentioned before was based on avoided cost and this is what the public utility commission refers to as their market price reference. Now it is adjusted by time of use factor and they provide a higher payment level for solar energy rates during their peak period, so from 8:00am to 6:00pm. There are some caps which are in place for this program. A statewide program cap of 750 MW and then a project size cap of 3 MW. That used to be 1.5 MW until as I mentioned just in the last couple weeks AB 32 was passed and you can see there's a wide variety of technologies which are eligible to participate in the feed-in tariff. One important thing to note is California has had wide success on their California Solar Initiative and that has been because of a program separate from this feed-in tariff. It's through their production based incentive and one thing to note is if you take the production based incentive you are not eligible for the feed-in tariff and vice versa. So it's kind of up to the people in the market to determine which of the two offerings will provide them with the best value, particularly for solar projects.

Next I'll mention the Vermont Energy Act. They have a number of additional sectors which can participate in their feed-in tariff, so not just commercial and industrial but also agricultural and owners of qualified SPEED resources. SPEED is a program in Vermont that is geared towards accelerating the deployment of renewable energy technologies. Their contract length is actually 25 years for solar and then 15-20 years for the other eligible technologies. The payment level, again, is based on estimates of the project cost plus a profit and here are the prices that have been proposed. They still need to be – they were approved in an interim order by the PUC but they still need to be finalized before the end of January. So landfill methane, 12 cents per kWh, agricultural methane, 16 cents per kWh, small wind less than 15 KW could receive 20 cents per kWh, and then larger wind greater than 15 KW as well as hydro or biomass, they all

have access to 12.5 cents per kWh, and then solar has 30 cents per kWh. So if you look at these different prices you can see two things, that there is differentiation recognizing that different technologies have different costs and for wind in particular they have a differentiation based on the size of the project. Smaller projects are not able to enjoy the economies of scale of larger projects and so this feed-in tariff takes that into account. There are some caps. The statewide program cap is 50 MW and project size cap is 2.2 MW and again there are a number of technologies which are eligible.

So I think I'd like to stop here and see if there are some questions that would be timely to answer.

Jimmy Jones: We have a number of questions already, more than several dozen in the queue here. So as I said we're going to try to answer all these we can in the next 5-10 minutes. We'll stop at the end of the presentation again and Karlynn those questions we can't get to today we'll sort through them this afternoon and start posting the answers on our blog hopefully by this evening or tomorrow morning. So be sure to check out that TAP webcast blog at EEREblogs.energy.gov/TAP. Alright we have a question from TC Jamel and I apologize if I mispronounce your name: just send me a scathing note or tell me the right pronunciation; just apologies in advance if we get your name pronunciation. TC Jamel, is there a hope for a national feed-in tariff for electricity?

Karlynn Cory: That's a great question. In fact, there was some legislation that had been proposed by Representative Inslee and I've talked to some of his staffers and they are hoping to reintroduce that bill this fall. I don't believe it has hit yet but they are doing some adjustments to it and expect that will be reintroduced. In terms of its passage, that's anybody's guess. Talk to somebody in DC I guess is my recommendation. But I think there's certainly some good interest at the national level.

Jimmy Jones: Okay we have a bunch of questions on the California feed-in tariff and I would say about a dozen people wrote in asking if you mean FB 32 or something like that?

Karlynn Cory: Oh perhaps I got that wrong.

Jimmy Jones: So we appreciate people responding and no slip of the finger goes unnoticed here with our audience. It was Laura Arnold, it sounds like she's from California, asked if the California feed-in tariff is based on avoided cost and I guess she's not from California now

that I read the question. She said in her state the avoided cost is about one-third the average cost of electricity or something like that, something to that effect. So is there a connection with avoided cost?

Karlynn Cory: Yes and it's a very good question. Avoided cost calculations are something that are done using different methodologies in every state and sometimes within the same state different utilities will use different methodologies. So to answer the question, yes, California is using an avoided cost based methodology and let's see, I didn't revisit it specifically but it can be based either on retail avoided cost or wholesale avoided cost. I believe in California it's done by wholesale but I'm probably going to get a slew of emails if I misspoke there. But that is how California has toned it whereas in Vermont and Hawaii as I mentioned they are focusing on feed-in tariffs that are cost based, so based on the estimated cost of developing a project.

Jimmy Jones: Okay very good, we have a question from John Warren. Are the proposed feed-in tariff policies shown on your map all financed by ratepayers through their utilities or does the finance mechanism vary?

Karlynn Cory: I believe – that's a great question. I don't have that detail in mind specifically. I would have to say that in the United States most of the feed-in tariffs are usually paid for by ratepayers. There are some instances in Europe where it's paid by taxpayers. So it comes out of the annual budget every year. But that has not been as common here since putting the payment into rates means it will more readily be available over the time horizon of the long-term contracts.

Jimmy Jones: Okay, Charles Benjamin asked the question: Are there examples of feed-in tariffs used to encourage energy efficiency?

Karlynn Cory: That's a great question. I am not aware of any specifically. I know that there are renewable portfolio standards which are designed to encourage energy efficiency and one example there is in Connecticut where they actually have a three tier renewable portfolio standard where energy efficiency is its own tier. So it doesn't actually compete against renewable projects but it does have a minimum level which needs to be met. I haven't seen any – I guess I can answer it this way. I haven't seen any instances of feed-in tariffs used to target energy efficiency. I will point out that in Spain they are moving and maybe have moved towards using

feed-in tariffs for all generation not just renewables which I found pretty interesting.

Jimmy Jones: Okay we have a couple more questions here and then we'll get back to your presentation. Jack wanted to know is natural gas ever considered a renewable energy technology specifically used on cogeneration. It sort of gets back to that energy efficiency question. Is that ever considered part of the technology mix for feed-in tariffs?

Karlynn Cory: Again, not for feed-in tariffs. I have seen natural gas used for alternative energy standards. So perhaps a state like, again, Connecticut wants to encourage fuel cells. They might allow for natural gas to be used to provide the fuel for those fuel cells in order to encourage development and employment of the fuel cell technology. But I certainly haven't seen anything where a – well, actually I think a natural gas cogeneration if it meets a minimum efficiency standard is eligible to meet the main RPS but again I haven't seen that for a feed-in tariff. That might be something – actually cogeneration specifically can be encouraged as a bonus payment. So it is sometimes there's a bonus payment for like biomass generation that has cogeneration but again I don't think it's necessarily targeting natural gas.

Jimmy Jones: Okay one more question from Steven, are there federal income tax implications to customers that receive payment from feed-in tariffs?

Karlynn Cory: Well that'll probably depend on the state. It's going to depend on how the state assumes whether the federal tax credits which I assume is part of what you're getting at can be used in conjunction with the feed-in tariff. I think for the most part the states are currently assuming the tax credits which are currently in place will be in place and that's part of the calculation that they're making in determining the payment levels. I don't know if that has specifically been looked at legally from a lawyer standpoint and I have to add the little caveat that I'm not a lawyer and I don't really want to be so it's probably good to talk to lawyers about that aspect. But as far as I know I think what would be wise if I was talking to a state policymaker and they were wondering this I think it's important to be very clear in establishing feed-in tariff policy what your assumption is. Are you able to take the tax credits or not?

So I think we'll keep moving on, yeah? So let's see, so moving into more of the detail about feed-in tariff policy design, my point of this next slide which

is slide eleven for those following at home is feed-in tariffs do have flexible design. So as you see, Germany has a set of policy design choices they've made. Spain does, the Netherlands you can add on all the states that are starting to have feed-in tariffs. But the important thing here is just because Germany has designed it including all of these and more which are not captured here, design choices, doesn't mean that a state or jurisdiction has to follow them specifically. What you actually can do is pick and choose the options, the design options, which seem to work best for your particular situation or for your particular jurisdiction from the feed-in tariffs that are currently out there. So that flexibility in design I think is pretty important to recognize.

There is a lot of literature since feed-in tariffs have been used in Europe for many years now. There are a number of thoughts from analysts on why the policy has been so successful and these European analysts attribute the success factor to the following seven elements. First, methodologically based on renewable project cost plus a return, this gets back to the targeted return and it's really the policymaker that establishes what they think is a reasonable return, what that targeted return should be. Then it's up to the marketplace to determine whether they can make a project work using those payment levels. Number two, the feed-in tariffs are more successful if they're in place over a long period of time to provide policy stability. This reduces uncertainty particularly to investors who are looking to invest in a particular location. So committing to having a policy in place for five or ten years certainly sends a stronger market signal than saying we're going to revisit the policy next year and we might shut it down or turn it off. Third, payments are differentiated by technology type, project size, and resource quality potentially. This again gets back to trying to target the actual estimated project cost for a wide range of technologies. Long-term contracts are seen as fairly key particularly for renewables as you have a longer and longer contract the levelized cost of energy decreases and looks to be therefore closer to current electricity rates. So that can certainly help and it also provides the investors certainty that they'll make the return that they're looking for in the life of the project.

Number five is you can include built-in decreased payments and these decreased payments can drive innovation and cost reduction over time and I have a graphic that depicts that I believe on the next slide. Number six are generally available to all end users and project investors. So we saw in California and Hawaii there was certainly a concentration on commercial and industrial users as well as agriculture and sometimes residential. Interestingly in Europe

they've opened it up and allowed state and local government agencies to take advantage, federal agencies to take advantage, nonprofit institutions to take advantage, and sometimes even the utility is allowed to be eligible and to take the feed-in tariff. Finally number seven, minimizing the use of program and project caps, however targeting their use for high cost or emerging technologies. There's been a lot of discussion about what happened in the Spanish PV market in 2008 and one of the things they didn't consider was if they set their feed-in tariff at an aggressive rate whether they would be wildly successful which is what happened. So the price tag was significantly higher than they could have ever dreamed of or ever anticipated. I think the lesson there is each jurisdiction needs to think about especially for technologies which are higher cost right now what is it that you're willing to pay, is there a budget limitation to what you're willing to pay and then you can put in a program or project size cap accordingly in order to make sure to minimize the potential impact.

The next slide, slide thirteen, talks about some of the key differences between US based systems and European based systems and I will say there are exceptions. So this is a fairly broad generalization. But first is the methodology used to set the payment level. Typically in the US for supporting renewable energy projects we tend to focus on the avoided generation cost typically. As I mentioned Vermont, Hawaii, they're trying to break the mold here as did Gainesville. However in the EU they tend to focus on the estimated renewable energy cost plus a reasonable rate of return. Number two is the ability to encourage diversity. In the US right now the feed-in tariff programs, it's great to see the Vermont one. Gainesville was just targeting solar PV for example. California has a wide range of technologies which are eligible but because the payments are based on the avoided cost of generation they're really only a couple technologies which have the economics that would be able to take advantage of those whereas in the EU they tend to differentiate the payment based on technology, size of project, number of installations, quality of resource, and other locational factors. In doing so they're trying to encourage diversity of all of those factors. Number three is the investor certainty provided. The EU typically guarantees these long-term 15–25 year contracts in order to meet their long-term goals. In the US we're starting to see longer time horizons both in the use of feed-in tariffs as well as for renewable portfolio standards. However shorter contracts are considered and there are also program and project caps which can take away from providing the certainty to investors. They don't know perhaps where their projects will be in the queue for example and whether they'll be able to get the payment level that's set out.

Number four is the breadth of eligible participants. I had mentioned this on the previous slide where in the US we tend to focus on commercial and industrial customers, sometimes residential. But in the EU they've really thought of this as a mechanism for encouraging everybody to participate in their electricity decision instead of just kind of receiving whatever power mix they get from their utility.

This is the graphic on slide fourteen of tariff regression and tariff regression is the incremental decrease that's predetermined of payment levels over time, over time or somebody is moving the slides for me so let me just get back to the slide that I was on, here we go, slide fourteen, so it can either be done on a time period level or on a capacity level. So the capacity level would be if we meet 100 or 500 MW then the payment level goes down. This would be similar to the California production based incentives where as those capacity levels were hit the payment level marched down on a pre-specified table. It can also be based on time periods and like in Germany every year they have the payment levels going down and they revisit those payment levels every four years.

So moving on to some fed-in tariff policy clarifications, I think it's important for folks particularly in the US to recognize that feed-in tariffs are not a foreign policy. I'd say the real genesis of the feed-in tariff was the California standard offer contract under PURPA. It was a standard offer contract. As long as you met the minimum eligibility requirements you were able to get that standard contract with the utility and because it was a standard contract you didn't necessarily have to hire lawyers to negotiate terms and conditions with the utilities which definitely has some advantages. But even though it was kind of rooted in PURPA I'll explain in a couple slides how it has evolved to be a policy which is quite different than PURPA and I'll point out some of the differences there. The other thing is that utilities also tend to get cost recover plus a profit for conventional generation. So some feed-in policy proponents have asked why should it be any different for renewables, sure their cost is higher but they have to meet their costs and they have to meet a rate of return as well.

So again, the next couple slides, I'll go through these next couple points. Feed-in tariffs are not the same as PURPA. They can be used to meet renewable electricity goals and really are a complimentary policy to renewable portfolio standards and feed-in tariffs can provide investor certainty even in times when we're having kind of a market slowdown as we're seeing today.

So PURPA was a FIT policy precursor but it is distinctly different. PURPA payments were anchored on erroneous projections of oil and assuming that oil was going to remain on the margin. But in reality actual electricity prices diverged greatly from these forecasts. Natural gas fired power plants were natural gas was allowed to be used in the electric power sector and it then became a marginal power resource and had lower fuel prices than the \$100-120 a barrel oil that was projected. PURPA payments as a result remained high and then continued to grow. In contrast feed-in tariffs are not usually tied to fossil fuel or electricity prices. They're mostly tied to the estimated project cost of renewable electricity. So there's a realization and recognition that the cost of developing a renewable project really doesn't have much to do with what's happening in the electricity market or in the fossil fuel market and again the payments tend to be levelized. So they might have a small fixed escalator of 2-3% but it's laid out in a fashion that doesn't rise incrementally as the PURPA payments had. This depiction at the bottom shows kind of on the left-hand side where the California standard offer contract number four was, think of it as the horse and buggy. As Europe took the standard offer contract idea and kind of transformed it and evolved it they looked at avoided cost FIT policies and undifferentiated FIT policies but what we really see today is kind of the Prius of feed-in tariffs where they're modern, they're fully differentiated by technology, by size of project, and they're most often based on project cost estimates.

So now I'll talk about feed-in tariffs and renewable portfolio standards. I really see that these are complimentary policies. Typically the RPS sets out what type of level and target you want to get to for having renewables and utilities will try to meet that in one of two ways in the US. They'll either own the power generation if they're allowed or they purchase power through competitive solicitation. These are called requests for proposals or RFPs. Now feed-in tariffs actually replace or compliment the RFP process. They don't replace the RPS policies. So you can still have those targets laid out by the RPS and you can see the feed-in tariff as a supply procurement mechanism, a way to meet those targets. This is what's really happened in Europe where they use the feed-in tariff to achieve their goals. There are options for how this can be implemented. They can be designed to target distributed generation only and then leave for RFPs left to target utility scale systems and here I would say distributed generation would be up to about 20 MW in size. So it might be behind the meter and some behind the meter systems are really big. If you look at the Nellis Air Force Base system it's 14 MW of PV and it's all behind the meter. It's not meeting – I think it's meeting about a quarter of the load of that air force base.

So up to 20 MW is feasible but it could also be a system that is just on the distribution system up to 20 MW that doesn't require additional transmission infrastructure. Feed-in tariffs can also be used for utility scale projects. So, if competitive solicitations for RPSs are only done once a year or once every so often feed-in tariffs can be used in between those competitive solicitations in order to try to get more projects going. They can also be used to replace utility RFPs and this is what has been used in Europe for utility scale winds projects and even some of the CHP plants are coming online using feed-in tariffs.

So how would they work in the financial crisis? One of the challenges we have in the US is that our incentives are based on tax credits and that can be a challenge because the tax appetite has decreased significantly. Well feed-in tariffs help facilitate project financing because they provide that guaranteed long-term contract. They help therefore attract capital and the ratepayer backing can be very attractive to debt lenders. FIT policies can stimulate new industries, create jobs if they're designed well and the details are always the devil of any policy and feed-in tariffs can provide the opportunity for low risk moderate returns on local energy investments. So what we had in the United States is now we had a very successful program where the Treasury grants and the loan guarantees have really helped. The whole Recovery Act has helped kick start the market. In Europe development continues because they had feed-in tariffs and the investors had the certainty they needed to move forward. So that's just an interesting contrast there.

There are some policy challenges. Obviously for a feed-in tariff, whoever is putting a system in still needs to secure upfront capital. The feed-in tariff does not directly offset the need to cover the upfront project cost. But the long-term contract can certainly increase investor confidence that they will be repaid. Setting the feed-in tariff level is challenging. If it's set too low then little new renewables will be developed. If it's set too high there can be concerns of overpayment or surplus profit to developers. There's a policy design challenge in terms of tracking technological improvements and reducing the cost accurately over time. This is a complex policy and usually with the many levels of differentiation it can seem a little overwhelming if you're not used to thinking about renewable policies in this way. Cost can be an issue particularly in thinking about emerging or higher cost technologies. It can lead to upward pressure on electricity cost and rates. However this where using some sort of program or project size caps can limit the support for technologies to give them something in order to help projects move forward but so that the policymakers are not

overwhelmed and as with any policy there's a concern that this will be a crutch and there'll be a reliance on it going forward.

So these are the key takeaways. I'm not going to read them to you. I think it would be more interesting to get some more questions at this point. But Europe really credits the feed-in tariff as an effective policy for both rapid deployment as well as cost efficient deployment and if they're designed well you can get the best of both worlds where you limit ratepayer cost and also provide investor certainty.

Oh I will mention a couple activities that we're doing right now because I think they may be of particular interest to this crowd. We have a set of subcontractors and analysts that we're working with in order to examine feed-in tariffs. We're coming out with a couple of Excel models that are going to be designed to help policymakers understand how to structure a feed-in tariff based on the inputs that you provide. We have a paper that will look at interconnection policy, best practices because interconnection is a pretty important aspect to feed-in tariffs and then finally we hope by the end of the year if not January to have a legal analysis. There are some questions surrounding whether states are able to set feed-in tariff rates above the wholesale avoided cost of generation because that tends to be considered PURPA's jurisdiction through either the Federal Power Act or PURPA and we have a draft analysis and I think the good news is there are probably – I saw a draft of it and the good news is there are some ways to address that under current law and the proposed language which is in the Waxman-Markey bill targeted to adjust PURPA to allow for states to set renewable rates would directly address any concerns here whatsoever. Finally, I and Claire Kreycik we're providing technical and policy assistance to some specific states that are participating in a NASEO and DOE Solar collaborative.

So we have a couple of reports. I'll leave those up there. Two of them have been published. One we're hoping to get out. Actually we decided to change the name of it. It's going to be *Policymaker's Guide to Feed-in Tariff Design*. So hopefully that will be helpful and we're hoping to get that out again by the end of the year or January. So Jimmy what questions are flooding in?

Jimmy Jones: Well we have a bunch of specific questions and then a couple of comments and maybe it'd be easier to start with the comments for **Niton**, and again I apologize in advance if we get the pronunciation slightly different for any of these names. You just have to bear with me. So Niton has a comment that the feed-in tariff equivalent for energy efficiency is called a standard offer program. For

example in New York State, and I think you touched on that, the standard offers were sort of the precursor for feed-in tariffs. Do you agree with that?

Karlynn Cory: I mean I agree that there's certainly a lot of great work which has been done at the state level, particularly in New York and California on energy efficiency and it probably – it could very well be an equivalent. I guess the question that I have is does it meet those fundamental three things in terms of guarantees. Does it guarantee a long-term payment? Does it guarantee full payment? I guess for energy efficiency it'd be for the energy saved and guaranteeing interconnection I guess isn't quite relevant. There may not be. I'd have to think further about whether you can really apply a feed-in tariff specifically to energy efficiency but there certainly are a lot of great things happening at states. I'd also add Massachusetts to that list too.

Jimmy Jones: Okay we have Bill Knock from the California Air Board Office of Climate Change has a comment that California's MPR –

Karlynn Cory: Market price reference.

Jimmy Jones: Alright so California's MPR, market price reference, is not marginal avoided cost per kilowatt-hour of a new natural gas facility including a small carbon adder. I wonder if I got that one wrong here. Anyway his comment is maybe it is the marginal avoided cost per kilowatt-hour of a natural gas facility including a small carbon adder.

Karlynn Cory: That's how I understand it, yeah. So it's therefore not based on the estimated cost of different projects using different technologies. It's just based on what is going to be avoided if this plant – what gets backed down, what gets avoided if this renewable plant is online from the conventional electricity system.

Jimmy Jones: It's really another avoided cost really.

Karlynn Cory: It is, it's an avoided cost, yeah, I mean he does point out though that it has a small carbon adder which is a good point. So it's not purely avoided cost. It has a small carbon adder but it comes down to it being value based as opposed to cost based.

Jimmy Jones: Okay, we have a bunch of specific questions for specific states and then here's one, here's a big picture question from someone who signed in as ACP. What are some of the long-term financial planning difficulties associated with feed-in tariffs and this person

is thinking about Germany, a lot of reports recently on Germany and the feed-in tariffs and difficulties.

Karlynn Cory:

Yeah, so I mean one of the challenges with how Germany has structured their feed-in tariff is as I mentioned they like to set a four year payment horizon. They payment levels decrease incrementally over time each year within those four years but the goal is for them to be set out over the four years and transparent. The idea there is it'll give developers enough time in order to develop their project. The challenge that Germany has seen in the last year is that because of the economic slowdown and because of the inventory and the oversupply of, for example, PV modules, prices have come down significantly and that was something that could not be anticipated in that four year time horizon. So Germany is actually looking at revising some of their payment levels to account for this what I would call disruptive market condition. It's something that really can't be anticipated and I'll be very interested to see if once things start to pick up again and supply and demand come back into balance whether we'll actually see a slight uptake in terms of the actual payment levels or the price of PV panels just because right now people are sitting on inventory and they're just trying to get rid of it. So I wonder if they're selling their panels closer to at cost rather than trying to have a profit which isn't exactly a great way to run a business.

Jimmy Jones:

Right, there are all these newspaper articles about the cheapest time ever to buy solar.

Karlynn Cory:

It really is, yeah.

Jimmy Jones:

Alright we have a couple questions on commercial scale projects. Gary asks are there feed-in tariffs for larger commercial scale projects greater than 10 MW and I assume he's just talking about the United States and not Europe.

Karlynn Cory:

Yeah I'd say right now in the United States we don't have that. However that is very common in Europe. So the Spanish CSP plants which can be 100-200 MW they are under a feed-in tariff. That's how their payment is done. Same thing for wind plants in France, Germany, Spain, etc., there is no limit to the project size. I think the bigger limitation they have is in terms of land availability. But there are some fairly big facilities going in France. I don't know the exact size but I know they have at least one of 100 MW and it's done through their feed-in tariff.

Jimmy Jones: Dan has a related question. He says Vermont's feed-in tariff has a cap of 2.2 MW and this seems to target small scale and distributed technologies. Is this the case in Europe? You seem to have just answered that question really.

Karlynn Cory: Yeah, I mean it's not. I think the challenge is that Vermont is a very small system. It's one of the smaller states and so having some sort of cap makes sense because if they had a 100 MW wind farm put in somewhere that could lead to some challenges in terms of integration, the integration of the wind and how they were able to balance it matching with the load. So they decided to try to temper that. Larger states, certainly some of the states in the west might be able to think about going larger than that but none really have. There are some proposals in California to go up to 20 MW. But none of them have been made into law at this point.

Jimmy Jones: Okay John asks for Vermont how is the price set and I think you covered this briefly in your presentation, right? Is it estimated cost plus profit?

Karlynn Cory: That, yeah, so the goal in Vermont as laid out in the legislation is to estimate the cost of the facilities plus profit and they defined what the profit adder is and I don't remember off the top of my head what it is but that's how they determined that table of prices that I had up on the slide. So yeah that's really the goal of what they're trying to do.

Jimmy Jones: Okay Ryan asks a similar question about the Vermont feed-in tariff. Are these rates set specifically to offset economies of scale for smaller projects? It seems like they really are targeting the smaller projects in Vermont.

Karlynn Cory: They're targeting the smaller projects and I think to answer that question I'd point to the wind one where they have a differentiation and a higher payment level for wind projects that are less than 15 kW. The larger projects about 15 kW get a lower payment price of 12.5 cents as opposed to the 20 cents for the smaller wind project. So there really is – they're trying to recognize the differences in economies of scale.

Jimmy Jones: Okay Michael –

Misty Conrad: Karlynn can I ask you a quick question as we start to wrap this up?

Karlynn Cory: Yes, Misty?

Misty Conrad: What do you see occurring in the future between renewable portfolio standards and feed-in tariffs for the states? Could this possible become part of RPSs or do you see them competing in the future?

Karlynn Cory: That's a great question Misty. I'd say personally I think that especially with the economic slowdown that we've experienced, there was a bit of a pause put on the development of projects until the Recovery Act is starting to kick in right now and yet we didn't see this same kind of slowdown in development to the same degree in Europe and so I think there's a lot of interest at the state level in terms of using the feed-in tariff as a way to efficiently move forward and keep project development moving forward even if the economy has another downturn. So I'd say really I think there's a convergence of the two policies. I think the RPSs can set the target level. They are starting to show some of the tendencies of feed-in tariffs where a lot of them have requirements now and they didn't a couple years ago for the utility to sign long-term contracts typically between 10-20 years. Some of the RPSs more recently have a solar set aside recognizing that solar technologies cost more than landfill gas and wind and biomass. So that just gets to some of the technology differentiation we see in feed-in tariffs. So I would expect going forward feed-in tariffs will be used as a supply procurement mechanism in order to meet RPSs. I guess the question I have is I think they're certainly well-suited for distributed generation and kind of that wholesale distributed generation of 1-20 MW because they're not really going to try to participate in a utility RFP process. They're kind of excluded and don't really have a mechanism for moving forward right now where a feed-in tariff can provide that mechanism.

Misty Conrad: Thank you.

Jimmy Jones: Well you now I think that's a great place to stop. We're at an hour and fifteen minutes and that is our advertised cutoff rate. We have dozens and dozens of unanswered questions so I just want to point out that we will start posting these probably tomorrow morning. We're in the middle of a snowstorm today. We have no coders left here on NREL but certainly by tomorrow hopefully they'll come back to work and we'll get some of these answered on the TAP webcast blog, EEREblogs.energy.gov/TAP and I want to thank all of the attendees. I want to thank Karlynn and of course the US Department of Energy's Weatherization Intergovernmental Program for sponsoring this activity. Hopefully we'll see you all back here on November 18. We have another great policy presentation, *State of the States: Renewable Energy Development*

and the Role of Policy, again one of the big policy topics here at NREL and your team I would say, right, very, very hot topic.

Karlynn Cory: Yeah and this is really done by Liz Doris' team in the state and local group and they've done a great job of really trying to look at the impact of the different policies and to do some statistical analysis here. So I'd highly recommend this webinar.

Jimmy Jones: Okay we have a bunch of questions on the posting of this presentation. We're sorry we don't have it posted today. I'm going to promise that for tomorrow on the TAP webcast webpage and that's listed online. You can sign up for upcoming webcasts, read more about feed-in tariffs, and link to all kind of background materials. So until next month, we want to thank you Misty, thank you Kalynn, and we'll see you all next time.