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Community Choice Aggregators and Community Solar

by Deanne Barrow, in Washington

New community choice aggregators may face delays in starting up in California.

Meanwhile, New York is moving to an innovative program that will help direct some community choice aggregator customers into community solar projects.

California

The California Public Utilities Commission is tightening the regulatory belt around community choice aggregators as it attempts to keep pace with the rapid growth of such entities.

Community choice aggregators, or CCAs, are county-level entities operating currently in eight counties that buy electricity at wholesale prices and supply it to county residents. Another 12 counties are expected to have CCAs operating by the end of this year. The California Public Utilities Commission estimates that as much as 85% of the electricity load in California will have shifted from investor-owned utilities to CCAs and other electricity suppliers by the mid-2020s.

California CCAs face new filing deadlines that could delay the start dates of some new CCAs by up to one year under Resolution E-4907, which the commission issued in February.

The CPUC acknowledged that the new requirements could have the effect of pushing back desired start dates, but said that the delay was only for a finite period / *continued page 2*

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UNCERTAINTY around what US import tariffs the Trump administration might impose is making it difficult to get fixed-price quotes for equipment that may be affected by tariffs.

Some vendors are insisting on clauses that give them the ability to pass through future tariffs.

The tariffs, plus rising interest rates, could upend a business model that some solar and wind developers have used to sign power contracts to supply electricity at prices that are currently unrealistic, but that should be manageable by the time electricity must start being delivered under the contract. Such developers have counted on equipment costs to keep falling. A reversal in costs could put some projects in distress.

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CCAs

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of time and necessary to ensure CCAs comply with the California resource adequacy requirements before they begin serving customers.

Resolution E-4907 requires CCAs to file an implementation plan and statement of intent with the CPUC describing, among other things, the program, its operations, rates and funding, no later than January 1 the year before the CCA wants to begin service. For example, if a CCA wants to begin service in 2020, then it must submit an implementation plan and statement of intent by the end of this year. Previously a CCA could file this information and begin service at any time it chose.

The new deadlines sync up a CCA's launch date with existing deadlines for submission of annual year-ahead resource-adequacy load forecasts.

All load-serving entities in California, which include CCAs, investor-owned utilities and direct-access providers, are subject to resource-adequacy obligations under section 380 of the Public Utilities Code. They must show state regulators that they have enough capacity commitments to be able to meet all of their customers' energy requirements plus a minimum reserve requirement.

New York is launching a program to direct some CCA customers into community solar projects.

The idea is to avoid a situation where a CCA starts service too late in the year to receive a resource-adequacy obligation allocation for the upcoming year. When this happens, the local investor-owned utility continues to procure capacity for the CCA's customers and recoups the cost through a fee called the power charge indifference adjustment or PCIA. Each utility and other supplier operating in the retail market is allocated a specific capacity requirement by the CPUC to cover peak loads plus planning reserves based on the supplier's best estimates of future customers and loads for the year ahead.

The CPUC's order applies to newly-formed CCAs and existing CCAs that wish to expand their territories to serve new load. An example of the latter is Marin Clean Energy, which is planning to expand its coverage beyond Marin County to include Contra Costa County.

The order is not retroactive. CCAs whose implementation plans pre-date the order are exempted from the new requirements. Among those exempted is the Clean Power Alliance of Southern California, California's newest and largest CCA that began serving Los Angeles County and about 24 cities in February.

New York

Community solar developers can now partner with CCAs in New York to provide services in a single, combined program.

This model, which is the first of its kind in the nation, has the advantage of leveraging the opt-out feature of CCAs to fill the subscriber base of a community solar project. If a CCA is formed, electricity customers must choose their suppliers. Anyone failing to choose an alternative supplier is automatically assigned in New York (and California) to the local CCA. The fact that community solar developers could pick up subscribers from residents who opt for CCAs could significantly reduce customer acquisition costs for community solar projects, which can be as high as 15% to 20% of the installed cost of the system.

CCAs have been gaining popularity in New York since they were first authorized by the New York Public Service Commission in 2016. Four CCAs currently exist within the state, two of which were formed just this year. According to a report released by the NYPSC in January, as many as 100 municipalities have expressed an interest in forming CCAs.

Community solar refers to small utility-scale solar arrays to which local residents can subscribe by buying a share of the electricity output or solar panels. All of the electricity ends up on

the utility grid. The utility gives bill credits that the subscribers use to offset their own utility bills. They still take their electricity as before from the local utility.

Community solar was first authorized in New York in 2015, but it has been slow to take off. In an effort to jump start the industry, the NYPSC increased the size limit for projects eligible to receive New York's version of net metering compensation from two megawatts to five megawatts in February so that developers can take advantage of economies of scale to improve project economics. Community solar relies on net metering to swap electricity for bill credits.

A proposal to integrate CCAs and community solar found its way before the NYPSC as part of a CCA implementation plan filed before the commission last September. The implementation plan was filed by Joule Assets, Inc. on behalf of seven municipalities in upstate New York, who sought the commission's approval to form what is now New York's fourth CCA. The NYPSC approved the proposal in mid-March. (A copy of the order can be accessed online through the NYPSC's electronic docket card for cases 14-M-0224 and 15-E-0082.)

The NYPSC received 14 comment letters. One supporter said that the integration of community solar with CCAs would help finance the development and expansion of new community arrays, thereby advancing New York's climate and clean energy goals. Another pointed to the potential of the new arrangement, in theory, to eliminate community solar customer acquisition costs and minimize the possibility that the project will not be fully subscribed. New York City commented that by offering CCA customers a mechanism through which they may receive community solar credits, the NYPSC would be encouraging consumers to take a more active role in their energy choices, thereby advancing a core objective of the state's "Reforming the Energy Vision" or REV strategy.

Leveraging Opt-Out

Joule's proposal is designed so that CCA customers can become community solar subscribers as part of their participation in the CCA program. Each municipality making up the CCA gets to choose whether to enroll its residents in the community solar program on an opt-out basis or an opt-up basis. "Opt-out" means automatic enrollment, whereas "opt-up" requires enrollment with affirmative consent. The NYPSC waived the requirement for explicit customer consent and replaced it with a requirement for municipal consent with an opt-out process.

Figure 1 shows what a community / *continued page 4*

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The solar industry is waiting to see whether tariffs might be imposed on inverters from China. Inverters remain off the latest list of Chinese products that the US might target, but President Trump threatened to up the ante after China said it would impose reciprocal tariffs on an equal volume of US products. A significant percentage of inverters used in US solar projects are imported from China.

Import tariffs are now in effect at the US border on solar cells and panels, steel and aluminum, and Trump is threatening tariffs on up to $150 billion a year in Chinese products that could be put into effect later this year.

The solar tariffs went into effect on February 7 and will remain in place for four years, starting at a 30% rate and then declining annually to 25%, 20% and 15% over the period. The US Court of International Trade declined on March 6 to order a temporary halt to tariffs on solar cell and panel imports from Canada. Four Canadian companies filed suit, arguing in part that Canadian products should be exempted under the North American Free Trade Agreement. The chief judge said he is not persuaded the plaintiffs are likely to succeed. The case is headed to trial.

The European Union, China, South Korea, Taiwan, Singapore, Vietnam, Malaysia and The Philippines are challenging the solar tariffs before the World Trade Organization. The WTO process is expected to take roughly 18 months to play out.

Fifty-two companies applied for exemptions from the solar tariffs for particular products by a March 16 deadline for such applications. Ironically, the applicants include SolarWorld Industries GmbH, the former German parent of SolarWorld Americas Inc., which has been pushing for tariffs in the US. The two companies are no longer affiliated after the German parent went bankrupt.

The US started collecting tariffs on imported steel at a 25% rate and imported aluminum at a 10% rate on March 23. / *continued page 5*

CCAs

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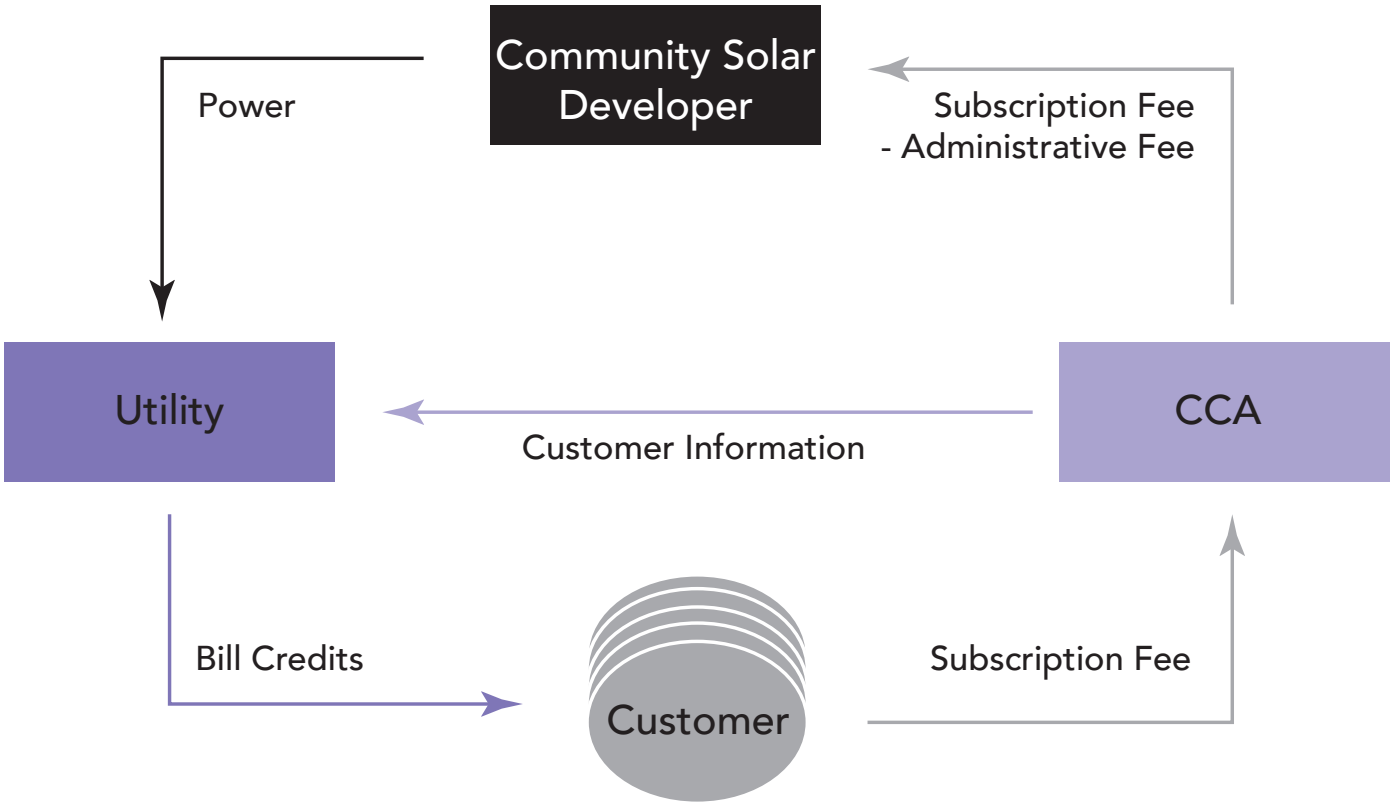
solar project integrated with a CCA might look like based on the NYPSC's order.

The CCA can either build, own and operate the community solar project itself or contract with a third-party developer that is registered with the state as a "DER [distributed energy resource] provider."

The CCA then aggregates customers and provides the utility with customer information. The utility tracks and distributes the credits from the community solar facility to the customer. The subscription fee for community solar will be a percentage of the community solar credits in any given month. The CCA bears the responsibility for managing and accounting for the community solar credits with the utility.

The NYPSC order includes a number of conditions dealing with customer protections. The most significant is that Joule must make quarterly filings with the commission demonstrating that it has made good on its promise of guaranteed customer savings. Joule promised that CCA customers who subscribe to community solar arrays will receive bill credits each quarter that exceed the community solar subscription fees the customers must pay. Joule also will not be permitted to initiate collection activity, impose cancellation fees or reallocate bill credits, except on a prospective basis, if a CCA member enrolled on an opt-out basis objects to paying the community solar subscription fee.

Figure 1: CCA and Community Solar Structure



Solar Tax Equity Update

A panel of four prominent tax equity investors discussed how the recent overhaul of the US tax code is affecting the solar tax equity market and also talked through a collection of current issues in deals at the annual Solar Energy Industries Association finance workshop in New York in March.

The panelists are Laura Hegedus, a managing director of Bank of New York Mellon, Joel Spenadel, an executive director at J.P.Morgan, Julian Torres, a director at RBC Capital Markets, and Darren Van't Hof, director of renewable energy investments for US Bank. The moderator is Keith Martin with Norton Rose Fulbright in Washington.

Effects of Tax Reform

MR. MARTIN: The lower corporate tax rate means that one of the two tax benefits for solar — depreciation — is worth less. Tax equity used to account for about 40% to 50% of the capital stack of the typical solar projects. What do you think the percentage will be going forward?

MR. VAN'T HOF: It is not uniform, but roughly 35%. The percentage depends on how much cash is distributed to the tax equity investor. We think there will be about a net 8% decrease in the amount of tax equity on an apples-to-apples basis.

MR. SPENADEL: We are seeing less than that, maybe a 3% to 5% decrease, and some of it may be that falling electricity prices are leaving less cash to distribute to the tax equity investor. The problem as the percentage drops is it raises both capital-account deficit and at-risk issues.

MR. MARTIN: We will come back to those issues. Next topic: BEAT, or the base erosion and anti-abuse tax. This new tax requires tax equity investors to do an annual calculation, and they may have to give back 20% of the investment tax credit to the government. Do you expect BEAT to cause tax equity investors not to take the full investment credit into account in pricing or is solar unlikely to be affected. BEAT is more likely to be a problem with wind deals where tax credits are claimed over 10 years.

MR. VAN'T HOF: BEAT is more of a problem for wind deals.

MR. MARTIN: Will tax equity investors take the risk that they will be subject to BEAT in the year a solar deal closes?

MR. VAN'T HOF: The transactions we have seen over the last three months suggest yes. */ continued page 6*

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However, the Trump administration temporarily suspended tariffs on imports from Canada, Mexico, the European Union, Australia, South Korea, Brazil and Argentina through May 1. Any extension will require the affected countries to persuade the Trump administration that they will take "satisfactory long-term alternative means to address the threatened impairment to US national security" caused by their steel and aluminum exports to the United States. South Korea has already agreed to an export quota in lieu of tariffs.

The countries given temporary reprieves accounted for 65% of US steel imports and 57% of aluminum imports in 2017.

The steel and aluminum tariffs are expected to affect the cost of transformers, wind towers, solar ground-mounted posts, tracker torque tubes and containers for housing batteries. Roughly 25% of steel pipe and tube purchased by US companies in 2016 were imports, according to the US Department of Commerce.

GTM Research estimated that broad steel and aluminum import tariffs would add 3% to 5% to the levelized cost of electricity from renewable energy projects. The Solar Energy Industries Association said the tariffs could add 2¢ a watt to solar installed costs.

China hit back on March 22 by releasing two lists of 128 US products against which it plans to retaliate in response to the steel and aluminum tariffs. It imposed a 15% duty on 120 of the products worth about $1 billion in US exports, and said it will levy a 25% tariff on the other eight valued at $2 billion after further evaluation of the US measures. The second list includes pork. China is the third largest export market for US pork producers.

The European Union published two lists of American products that it will target if the US ends up imposing tariffs on European steel and aluminum. The European Commission also opened an investigation on March 26 into whether the US tariff on steel will cause steel originally destined for the */ continued page 7*

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MR. MARTIN: Does anyone on the panel disagree?

MR. SPENADEL: No. We have not spent too much time on BEAT because our bank does not expect to be affected by it. We sometimes bring in other investors in our deals. They could be affected. I think it is still a moving target. It is hard to say where things will settle, but in general, it does not seem to be as big an issue as people feared.

MR. MARTIN: Are you speaking about your bank or about the market as a whole?

MR. SPENADEL: The market as a whole

The solar tax equity market should remain flat through most of 2018, but then pick up in anticipation of a busy 2019.

MS. HEGEDUS: I think people are still figuring it out. It is still early. There is more analysis to do. BEAT is an on-off switch. Either you are in it or you are not.

MR. MARTIN: Do you think tax equity investors will take the BEAT risk for tax credits taken in the year the deal closes?

MS. HEGEDUS: I think that has yet to be played out. The supply and demand of tax equity will play a role in where the market settles on this issue. We do not really know where yields are headed or what the relative bargaining positions of the parties will be.

MR. SPENADEL: The BEAT is a work in progress. Investors have to figure out whether they will be subject to the BEAT and whether they can do something about it. It is triggered by payments to foreign affiliates. There may be ways to restructure arrangements with affiliates to avoid becoming subject to the tax. This is a transition year because the BEAT rate is lower in 2018 than it will be in 2019 and future years. You will not really know for sure if you are in it until after you do your tax return, which comes well after the year in which the solar project goes into service. If a sponsor were to say to us, "Prove it," we would not be able to show him our tax return. I think if an investor expects to be subject to BEAT, then it should think long and hard about whether it makes sense to do the deal.

MR. MARTIN: Is it your impression, like Darren's, that BEAT really only affects a small number of tax equity investors?

MR. TORRES: I think that sounds right, but it is just scuttlebutt and rumor. Before we move off, I just want to say that SEIA did a great job scaling back this provision, as did others in this room, from the original proposal. I want to make sure that is acknowledged.

MR. MARTIN: Not only did SEIA do a great job, SEIA and AWEA did it in a very short period of time, and it was thanks to a lot of people in the solar and wind industries who turned up in Washington quickly to make the case. And ACORE helped to get the word out.

Let's turn to the depreciation bonus. Companies can now deduct the full cost of equipment they purchase immediately when the equipment is put in service. It does not matter whether the equipment is new or used.

Tax equity investors were never really keen on taking the earlier, 50% depreciation bonus, except in 2017 when they had an incentive to accelerate deductions into 2017 before the corporate tax rate was reduced. Do you think the tax equity market will return to form and not be interested in the depreciation bonus?

MR. VAN'T HOF: I think investors will not be interested in it. It forces the deficit restoration obligation to get too high and it tempts you to want to put debt at the project level in to avoid having to increase the DRO, which are both things that tax equity does not like.

MS. HEGEDUS: I think we have yet to see where the market will land. There has been a lot of competition among tax equity investors for deals in the last couple of years.

MR. MARTIN: That is an interesting point. In the debt market, the lenders have been trying to distinguish themselves by assigning value to a merchant tail, meaning two to three years of electricity revenue beyond the power contract term. This may be a way for a tax equity investor to distinguish itself.

Next question: The lower corporate tax rate should make the residual interest held by the tax equity investor after the flip more valuable. Are you seeing this play out already in sponsor call option prices?

MR. SPENADEL: That is a fact. It may play out in other ways by putting pressure on tax equity investors to reduce the target yield. The argument is that if the residual interest is worth more, then the investor's all-in return will be higher. It could also cause sponsors to ask for fixed-price call options rather than options at fair market value.

MR. MARTIN: Interesting connection. You are getting a larger share of the yield through the residual.

MR. VAN'T HOF: There is also some volatility around interest rates and what discount rate to use. We have also seen the fair market value calculation be a pre-tax number in some instances and after-tax in others. This could cause some sponsors to be more interested in a fixed flip date or to try to define the target yield calculation more precisely.

MR. MARTIN: I would have thought the fair market value call price would be an after-tax value. Does anybody use a pre-tax calculation for this purpose?

MR. VAN'T HOF: We do not, but we have seen it.

Market Size

MR. MARTIN: Next question: The renewable tax equity market last year was a $10 billion market, down $1 billion from the year before. What do you expect this year?

MR. SPENADEL: It should be a lot like last year. The composition of the market may change. We are not seeing a lot of utility-scale solar projects. The wind market may grow significantly this year not only because of new wind projects that face deadlines to be completed, but also because of repowerings and some secondary market sales that can occur in the wind market but not in solar.

MR. MARTIN: Roughly $6 billion of the $10 billion in renewable energy tax equity last year was wind. Solar was $4 billion. If you add repowerings, does that mean that the solar number will shrink in 2018?

MR. VAN'T HOF: We are forecasting solar to be pretty flat. Things should start to pick up late in 2018 and certainly in 2019 when all remaining solar projects must be under construction to qualify for the 30% investment tax credit.

MR. SPENADEL: This may depend also on how you track numbers. The $10 billion figure for last year is the volume of deals that were mandated last year rather than the volume that funded in 2017. I agree that we will start */ continued page 8*

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United States to be diverted to Europe and, therefore, whether it needs to impose its own tariffs to protect European steel producers.

The Commerce Department is entertaining requests for exemptions from the steel and aluminum tariffs. However, the process is a mess. Commerce requires a separate five-page form be filed by each importer for each individual product for which an exemption is sought. Thus, for example, if one importer wants exemptions for five products, it must file five separate applications. Trade associations are not allowed to apply for whole industries. An exemption granted to importer A on product X does not allow importer B to import the same product duty free. B would have to apply for its own exemption.

Commerce expects to receive 4,500 exemption requests for steel and 1,500 for aluminum. It hopes to respond within 90 days to requests, but that is after a period through May 18 while it collects and later considers comments about the process. Domestic steel and aluminum producers have 30 days after requests are posted on line to object.

As the *NewsWire* went to press, Trump and Chinese leaders were trading threats to impose and match tariffs on each other's products. The US threatened to impose tariffs, under section 301 of the Trade Act of 1974, on more than 1,300 Chinese products valued at $50 billion in annual exports, the US said, as punishment for Chinese theft of US intellectual property and Chinese policies that require US technology companies to turn over rights to their technology as a cost of admission to the Chinese market.

The list of Chinese products includes wind-powered generating sets, nuclear energy equipment, industrial robots, lithium primary cells and primary batteries, DC motors with outputs of less than 75 kilowatts that are used for mechanical power in electric cars, among other items. The US is collecting comments on the proposed list until */ continued page 9*

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to see a lot more activity toward the end of the year.

MR. TORRES: Greentech Media released a forecast in January that new solar installations will be down 7% in 2018 compared to what they would have been without the solar tariff. Combine that with the lower funding ratio for solar that we have just been discussing and you get a dollar value that is flat to down in 2018. Solar megawatts financed could be flat to up.

Another factor that has not been mentioned yet is that other tax credits for so-called orphan technologies were just extended. So other types of generators will be looking for tax equity.

MR. MARTIN: The orphan technologies are things like fuel cells, combined heat and power projects, small wind turbines, biomass and geothermal.

The lower corporate tax rate means corporations as a whole will pay less in taxes. Do you expect that to have any effect on volume of tax equity?

MR. VAN'T HOF: I'll take a stab. A lot of our syndication partners are corporates. Their tax rates have gone down, but the corporate alternative minimum tax also went away, so even though their rates may have gone from effective rates in the high 20% range down to a flat 21%, they are realizing that they can reduce the effective rate even further than that. We are seeing new entrants in the market. The tax credit did not get killed. The solar tariff case is over. And now people know what their tax liability is. Those are three things they did not know in November.

MR. MARTIN: So the tax equity pool might expand.

MR. VAN'T HOF: Yes.

MR. TORRES: One thing we see as a syndicator of tax credits is that many of the buyers are banks, and banks have fairly complex regulatory regimes with which they need to comply. Some such regimes are more friendly toward tax equity investments. Others are a bit more strict. Getting the approval to make the investments has kept some tax equity investors from realizing their full potential regardless of their capacity.

MR. MARTIN: Is the bank regulatory climate for tax equity changing?

MR. TORRES: The Trump administration talks about rolling back bank regulation, but we have not seen it do so in ways that affect the merchant banking authority or other regulatory authority on which banks rely to do tax equity.

MR. MARTIN: Is it becoming harder for banks to do tax equity?

MR. TORRES: It depends on who you are talking to at your regulator. What we are hearing is that the regulators have been slow to respond to some investors.

MR. MARTIN: Laura Hegedus, you are with a bank. Have you seen any change in the regulatory climate?

MS. HEGEDUS: I have not. Returning to the original question of tax capacity, a lot of the investors in this space either expect to continue to have significant tax capacity, the BEAT question aside, or they have been in this space, at some points in time, without regard to their tax capacity, so tax capacity is not the only driver.

MR. MARTIN: Is there competition within your banks for what tax capacity there is among low-income housing, renewables and other competing investments that was not there before tax reform?

MR. SPENADEL: We are invested in renewables, low-income housing, new markets tax credits and other related fields. Our marginal tax rate was just reduced by 40%. There is no guarantee that we will continue to have capacity in every future year. It is something that we have to evaluate over time. There will probably be some investors who run into capacity constraints. They may have to cut back. Hopefully the syndication market will continue to gather pace and we will get some new investors who are willing to invest from inception rather than just buy into existing or already negotiated deals.

MR. MARTIN: Most of you are out syndicating these deals. Word at the end of last year was

Tax equity is a 3%-to-8% smaller share of the capital stack of a typical solar project after tax reform.

that there were at least 10 significant institutions that are investing alongside more experienced investors like you. Does that sound like the right number?

MR. SPENADEL: That is probably right, and the number is increasing. There are some who will do smaller tickets, but the number who will invest $20 or $30 million at a time is probably now greater than 10.

MR. MARTIN: So the tax rate has gone down but the number of people who are willing to invest is increasing. We see about 35 active tax equity investors between wind and solar, but not all are in the market at any given time. Does that sound like the right number?

MR. TORRES: I think it is higher than that.

MR. MARTIN: What number would you use?

MR. TORRES: I would peg it closer to 50.

MR. MARTIN: That is 50 in addition to the 10+ investors who will invest on a syndicated basis?

MR. TORRES: There are opportunistic investors, but I think the number of investors who have been consistent players is about 30 to 35 in any given year. A significant percentage are just doing solar.

MR. MARTIN: With that many investors chasing deals, there should be downward pressure on yields.

MR. TORRES: It has been a bifurcated market. I think there are some institutions, represented by those sitting to my left, that invest solely in big-ticket deals.

MR. MARTIN: Let the record show that everyone on the panel is sitting to his left. [Laughter]

MR. TORRES: Then there are more opportunistic investors who are willing to do deals with smaller developers who are more start up in nature and who have to pay higher yields for their tax equity. Developers in the C&I solar sector are an example.

MR. MARTIN: The opportunistic investors are in sectors where there is not as much competition?

MR. TORRES: Correct.

Absorption Problems

MR. MARTIN: Falling electricity prices mean that there is less cash in deals, and this is also contributing to a reduction in tax equity as a percentage of the capital stack. How high have you seen deficit restoration obligations go to try to deal with the problem that the investors do not have enough capital account to absorb all the depreciation?

MR. VAN'T HOF: We have seen a couple that have gotten as high as 70%. That is probably a tipping */ continued page 10*

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May 22 and will take up to 180 days thereafter to decide against which of the products to act.

China wasted no time in retaliating. It promptly released a list of another 106 US products with the same $50 billion value as the US list and said tariffs would be imposed at the same rate as any US tariffs.

The list includes soybeans, putting US farmers deciding now what crops to plant this spring in a bind. Roughly a quarter of the US soybean crop is exported to China. The US agriculture secretary, Sonny Perdue, said the administration is looking at ways to insulate US farmers from harm.

President Trump quickly upped the ante by announcing that he would release a list of another $100 billion in Chinese products that would be subject to tariffs. The list had not been released by press time.

The Chinese commerce ministry responded in a statement: "The Chinese side will follow suit to the end, not hesitate to pay any price, resolutely counterattack and take new comprehensive measures in response." However, Chinese President Xi Jingping then gave a conciliatory speech in which he vowed to cut Chinese import duties on autos this year.

Chinese exports to the US were $506 billion, and US exports to China were $130 billion, in 2017.

The US government is also looking into limiting Chinese inbound investment. Such investments have already faced hurdles getting approval from CFIUS, a 16-agency committee that reviews foreign acquisitions of US companies for national security implications. Trump directed the US Treasury in a March 22 memo to propose actions that he can take to address concerns about investments "directed or facilitated by China" in industries or technologies "deemed important" to the United States.

The US commerce secretary, Wilbur Ross, told Fox News on March 27 that "There will be limitations on foreign */ continued page 11*

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point at that number.

MR. MARTIN: Another way to deal with the absorption problem is to move debt ahead of the tax equity in the capital stack. Are you seeing a move in that direction?

MR. TORRES: We are definitely seeing such a move in the right situation. It makes the leverage a bit more efficient, although the cost of the debt is the same in the current market whether it is front or back levered. The lender would have to agree to a fairly generous forbearance provision where it would forbear from foreclosing on the project after a non-payment default, unless the borrower is bankrupt.

MR. MARTIN: If the lender is getting its principal and interest paid, it cannot foreclose.

MR. TORRES: That's right. That protects the tax equity investor against recapture of the investment tax credit and an acceleration of minimum gain during the five-year ITC recapture period.

MR. MARTIN: One reason that we were not seeing front leverage for the last four years is there seemed to have been a collapse in the market consensus about the terms of any lender forbearance. The forbearance you need is the lender cannot foreclose if it is getting its debt paid, and you told me during the break that it must forbear for just five years. For the first five years, it is limited to pushing out the sponsor and taking over its role. After that, it can take the project.

MR. TORRES: That's right. During the forbearance period, the lender can squeeze out the sponsor and accelerate its ability to recover something. A front-levered lender is already at the top of the cash-flow waterfall. But what that does for the tax equity investor is it allows the investor to continue absorbing depreciation after it has run out of capital account.

MR. MARTIN: Another thing you told me during the break is you think a return to front leverage is more likely in the solar rooftop market than in single-asset solar deals. Why is that?

MR. TORRES: If you have 50 to 100 assets and 20 different offtakers with BBB+ ratings or better, the tax equity investor has more of a securitization pool than with a single utility offtake.

MR. MARTIN: So when you have risk diversification, you are more willing stand behind somebody else in line for payment. Does anyone else see a move toward front leverage?

MR. SPENADEL: We do not. One of the issues is if project-level term debt will run 15 years, we do not want to have to deal with the transaction for 15 years. The project will run net losses for tax purposes for the first three or four years. There are still another six, seven, eight or more years of debt repayment. We have effectively to repay the losses we claimed. Either the income gets accelerated or the depreciation is reversed. The losses have a time value, but it is not a big benefit and not one for which we would pay very much to be honest, especially the way we measure our deals from an accounting standpoint.

MR. MARTIN: When the sponsor buys you out after the flip, he is considered to pay not only the cash option price, but also to absorb your share of the debt and therefore you end up being taxed on the debt that shifts. Does anyone else see a return to front leverage?

MR. VAN'T HOF: We generally do not permit it, mostly for risk mitigation reasons, but we see people try to put debt at the project level. It is not that desirable. I agree with Joel.

MR. MARTIN: There are some tax equity investors who are looking to invest part of their money as tax equity and part as a lender either on a back-levered or front-levered basis. Are any of you looking at that and, if so, what issues does it raise?

MR. TORRES: Where we offer debt on tax equity transactions as a construction lender. We will bridge to the tax equity, and this works very well for large utility-scale projects that will have substantial tax equity and back-levered financing on a term basis. The tax equity group and the corporate lending and project finance groups at RBC will collaborate on a seamless package to finance both ends, but not be in the project at the same time. We are not really term lenders.

MS. HEGEDUS: We are not lenders either in this space, but we have contemplated construction finance. It is still at the early stages of contemplation, but that is probably the only place where we could do it.

MR. MARTIN: Another way to deal with the absorption problem would be to move to sale-leasebacks. Partnership flips are about 80% of the solar market today. Do you see a move to sale-leasebacks?

MR. VAN'T HOF: We don't do them. We see a lot of people asking for them. They can be very efficient. From the developer side, there are a lot of attractive qualities, but from an investor side, it is just not a structure we are able to do.

MS. HEGEDUS: The term is too long from our perspective, so we have not done them, and we don't expect to do them.

Other Current Issues

MR. MARTIN: One change in the new tax law is that you can now claim a 100% depreciation bonus on used equipment. Do you see any interest among sponsors in selling and leasing back their

used assets, perhaps after the ITC recapture period has run, to get more cash into the business?

MR. SPENADEL: I have not seen that. It is still early. It is not clear to me the economics make sense where the only tax benefit for the lessor is depreciation and no tax credit.

MR. TORRES: I have not seen it either, but it would be an interesting refinancing post-flip structure where there is a long-term PPA or some other form of long-duration contracted cash flow. It could be attractive as a way to take out tax equity and re-finance the asset.

MR. MARTIN: Next question. The market managed to function last year despite uncertainty about what the tax code would say. It did it because the deal papers provided for a one-time resizing of the investment, usually in 2018. Have you seen any problems arise as a consequence of these resizing provisions or are they working properly?

MR. VAN'T HOF: They are a little messy because the language got a little tighter closer to the end of the year. If you were closing in June or July, the people at the table did not have a collective sense that tax reform was likely to pass. The resizing language got better as the year wore on. In all cases, because of that, there is some subjectivity to the determination as to what gets adjusted and when. It becomes a negotiation, but we have gotten through it.

MR. MARTIN: "Messy" means that you may not have provided for an adjustment for everything that actually happened.

MR. VAN'T HOF: That's right. For example, if the adjustment is supposed to get the investor back to its original yield, how do you do it? Do you adjust the cash sharing ratio? Do you elect faster depreciation? Who decides?

MS. HEGEDUS: I agree. What was drafted earlier in the year just was not as useful as what people were able to draft once they had a full sense of what could possibly be on the table. There were some lessons learned along the way.

MR. MARTIN: Do you think the market will go back to where it was before by doing deals without resizing provisions now that tax reform is behind us?

MR. TORRES: There is a tendency to add to the deal papers rather than subtract from them. I suspect the change-in-tax-law provisions will stay in the documents.

MR. MARTIN: That's not unlike how the US tax code works. It gets longer and longer over time because of all the dead wood.

MR. TORRES: That's true. What we have found is that the heavily negotiated provisions still have */ continued page 12*

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investment." Ross suggested there will be "other actions" that go beyond a bill pending in Congress to give CFIUS authority to review a broader range of inbound foreign investments. (For more details on the CFIUS bill, see "CFIUS" in the December 2017 *NewsWire*.)

Among the options being considered are to block Chinese investments in specific sectors, like 5G wireless communications, or to require strict reciprocity on Chinese acquisitions, meaning that CFIUS would only approve deals in sectors in which US companies are allowed to invest in China. The administration is also reportedly looking into possible uses of a 1977 law called the International Emergency Economic Powers Act that lets the president block transactions and temporarily seize assets in response to an "unusual and extraordinary threat."

The mere threat of tariffs leads to price increases and changes in behavior before the tariffs are actually imposed. Solar panel prices increased dramatically after April 2017 when Suniva and SolarWorld petitioned the US government to impose tariffs, as US developers scrambled to find panels to get past US Customs before the tariffs could take effect. New solar development slowed as developers were uncertain at what price they would be able to offer electricity.

Aluminum prices increased last year also in anticipation of tariffs, but once the tariffs were imposed, prices fell, possibly because the level of import duty was less than the market expected.

The typical construction contract allows the contractor to pass through increased costs due to changes in tariffs, but this ability turns on what the contract says about change orders, changes in law and *force majeure*, according to Tim Walsh and Luke Maher with Norton Rose Fulbright in St. Louis.

The willingness of the Trump administration to protect US manufacturers may invite more requests from */ continued page 13*

Solar Tax Equity

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relevance even though the legislation has been signed into law. The agencies still have to interpret it. We think there is still relevancy there.

MR. MARTIN: Let the record show that Joel Spenadel is nodding yes.

MR. SPENADEL: There are two issues. I know next up is expected guidance on the start-of-construction rules for solar. We know they are coming. Other tax changes are already baked into our deals. We have a flip calculation that varies based on the actual tax rate if that were to change or other changes were to come about. There are historically certain risks that we as investors fully absorb.

MR. MARTIN: Next topic. The government is challenging a 12.3% developer fee paid in a wind farm. It was paid under a development services agreement. The case goes to trial July 23. Is this affecting your view of what developer fees can be put in basis?

MS. HEGEDUS: It sounds like someone started out with a good problem. In wind, you cannot contemplate a developer fee that high unless the PPA pricing is pretty rich because the valuation is a constraint for most investors.

MR. MARTIN: Next question. There is a sense in the market solar hedges will become available this year so that solar projects can be done on a merchant basis. The first project will probably be in ERCOT. Wind has been financeable on a merchant basis. The tax equity market has done merchant wind deals. Does that mean that solar should be financeable on the same basis?

MR. SPENADEL: Yes. It really depends on whether the economics of the hedge work. In a PPA, the buyer is paying for more than just power. Hedges are a way to protect against power price risk. If the economics work for the sponsor, then we will finance the project. The hedge has to be done right.

MR. MARTIN: How long does it have to be? Five years? Eight years? Ten, twelve?

MR. SPENADEL: For wind with the tax credits being claimed over 10 years, it had to be longer. It would probably need to be more than five years in a solar project. We will see how much longer.

MR. TORRES: The longer duration you can get with price certainty on your offtake in a solar deal, the more comfort you can take in the value of the project as a whole. Valuation is a more acute issue in the solar market than it is in the wind market because tax basis plays a larger role in the deal economics.

The other point is that we are seeing hedges in ERCOT. That will be a very interesting dynamic as solar generators drive generation during peak hours. You have wind generators that may not be as competitive during those hours. For many that have loaded up on ERCOT wind PTC deals, solar might be an attractive pivot.

MS. HEGEDUS: Also, solar hedging would not be starting at the same place that wind hedging started from an investor's perspective because we have learned a lot over the past 10 years about how hedges work. The market has also shifted toward sponsors retaining a lot of basis risk. Investors are pushing back. That will be the starting point for the solar hedging market.

MR. MARTIN: So investors will focus on the amount of basis risk that sponsors are taking. The risk may be too great. That bleeds into the next question. Corporate PPAs are more common. Most of them seem to be virtual PPAs, which means they are financially settled rather than requiring physical delivery of electricity. Do such deals raise any special issues for you beyond the basis risk that Laura just mentioned?

MR. VAN'T HOF: I don't think so. The credit counterparty may be a corporation that our banks have already underwritten. So in some cases, the underwriting can be the same or even a little easier than for a utility.

MR. SPENADEL: You do have to watch the credit though because, if the counterparty wants to use a special-purpose subsidiary for which you may not be able to get financials, then the focus shifts to what kind of guarantee you can get from the entity.

The lower corporate tax rate means that tax equity residual interests are worth more.

Community Solar

MR. MARTIN: Let's talk briefly about community solar. Those projects seem to be getting financed in Minnesota and Massachusetts and perhaps other states. The subscribers are not locked into their subscription agreements. They can usually walk away. How comfortable are you with that feature?

MR. VAN'T HOF: The ones we finance have subscribers who are locked in. We do a fair amount of this type of project. Only a small percentage of subscribers in our deals might have a walk-away right. Most are pretty decent offtakers.

It is interesting that corporate community solar has not gotten more traction. I think there is a misunderstanding among the investor and lending communities around how such deals work. In our view, they are bankable, and they are good credits. They look like small utility-scale transactions.

MR. TORRES: I agree. We have done two funds in Minnesota and, by and large, they were with municipal offtakers. They have pretty tight termination provisions that are protective to tax equity.

MR. MARTIN: How fully subscribed does the project have to be before you will close, and do you care about the mix between residential, on the one hand, and commercial and municipal, on the other?

MR. TORRES: We have only financed 100%-subscribed portfolios.

MR. SPENADEL: Same here.

MR. MARTIN: And the mix? Do you allow residential, what percentage?

MR. VAN'T HOF: We will allow as much as 20% residential, in some cases. It depends on what the other 80% share looks like.

MR. MARTIN: The C&I solar rooftop market is still not getting the traction people expected. Is it just the fact that the customer agreements have so many varied terms so that due diligence is expensive or is it something else?

MR. VAN'T HOF: We spent a lot of time last year in our deal execution on C&I portfolios. I would say that the something else is probably more significant in terms of getting these deals done and finding portfolios that work for investors. That is the real estate diligence and the sponsor strength.

At this point, I think people have gotten efficient at dealing with PPAs. We have seen a number of portfolios that have semi-standard terms. So you maybe have three different types of PPA base forms with a few deviations in terms with individual customers.

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domestic industry for protection. Energy Fuels and Ur-Energy petitioned the Commerce Department on January 16 to require nuclear power plant operators to buy at least 25% of their uranium from US suppliers. Roughly 5% of uranium comes currently from US sources. The government has yet to act on the request. Any "Buy America" requirement could hobble nuclear power plants that various states are trying to keep open with zero emissions credits. Domestic wind tower manufacturers are asking to extend existing anti-dumping duties on Chinese and Vietnamese wind towers for another five years.

Meanwhile, the US, Canada and Mexico have been engaged in challenging negotiations to rewrite the NAFTA treaty. Any repudiation of the treaty by the US president could complicate US wind and other renewable energy projects on agricultural land. Many states have laws that restrict foreign ownership of such land. However, Canadian and Mexican companies generally escape the restrictions under a NAFTA requirement that the US not discriminate against such companies in favor of US developers.

SALES OF PARTNERSHIP INTERESTS and "excess" cash distributions by US partnerships to foreign persons require US tax withholding after the latest overhaul of the US tax code.

Withholding at a 10% rate on the "amount realized" by the foreign person is required on sales of partnership interests and excess cash distributions on or after January 1 this year.

The idea is to help the IRS collect US tax on foreign sellers who may be hard to track down or audit later.

There is a presumption that every partner is a foreign person unless he certifies to the contrary. Thus, even in purely US deals, it is important to get certificates.

The person buying the partnership interest must withhold part of the purchase price. Failure to do so obligates */ continued page 15*

Solar Tax Equity

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MR. SPENADEL: We have found the same thing.

MR. MARTIN: Next question. Inverted leases raise less capital than the other two structures: sale-leasebacks and partnership flips. They were popular during the Treasury cash grant era, particularly for tax equity investors who did not have tax capacity. But they remain popular in some segments of the market. What accounts for their continued popularity?

MR. VAN'T HOF: We do a fair number of them. The sponsors generally drive the choice of structure. On the investor side, we have other investors who actually prefer the structure. Sponsors who choose it prefer to keep the depreciation. As an investor, we like the fact that we can call it before the end of the full lease term, and our pricing and advance rates are lower than for other structures.

MR. MARTIN: Next question. Are you aware of any IRS audit issues in the market?

MR. VAN'T HOF: There were challenges under the Treasury cash grant program, but we have not seen the IRS disallow investment tax credits on solar deals.

MR. MARTIN: No challenges to the tax bases claimed? No challenges to the structures? Nothing?

MR. VAN'T HOF: Correct. It is interesting to note that the premiums for tax insurance on these transactions have been falling. That may be a sign of a perception that the risks are small.

MR. MARTIN: Let's work in a few audience questions.

MR. BARRETT: Jason Barrett from GAF. There was a comment earlier about the C&I market struggling to get traction. We have put close to a billion dollars to work in that market. Our sense is that market is working fine. It may just be a matter of finding the right investor.

MR. SHORE: Bill Shore from Hanwha. For those of you who will do hedge deals, are you requiring that the sponsor use your bank as the hedge provider or will you do a tax equity deal when someone else is the hedge provider.

MR. VAN'T HOF: Frankly, it is easier if another institution provides the hedge because then we are just underwriting another counterparty. But be careful how the hedge is structured. We are less keen on hedges that start to look like senior debt. The identity of the hedge counterparty also matters.

MR. GOARMON: Bernardo Goarmon from EDP Renewables. Have any storage deals combined with solar come across your desks and if so, can you elaborate the amount of ancillary services you feel comfortable allowing the project to provide without jeopardizing any investment tax credit on the storage device?

MR. MARTIN: [Pause] I guess the answer the answer no. For anyone interested in this topic, search on Google for "Batteries and Tax Credits." A paper will come up that addresses this.

The Green Bank Value Proposition

by Ben Grayson, in New York

Green banks in six states are emerging as valuable and distinct financial partners for developers and lenders seeking to lower their costs of capital.

With their deep understanding of regulatory regimes in their own states, green banks provide due diligence and technical services such as sharing forward curves in utility service areas and advising on regulatory shifts.

They use unique investment criteria, allowing sponsors to make more efficient use of capital, allocating funds toward novel financial instruments and adding subordinated debt to projects in order to increase liquidity and tenors and lower interest rates.

Recognized issues in newer energy technologies, like residential solar, microgrids and energy storage, include a lack of precedent, standardization and scale. Green banks have worked with developers and financiers to solve these issues and accelerate bringing these technologies into the resource mix.

This article focuses on how two green banks — NY Green Bank and the Connecticut Green Bank — have used their positions within their respective states to bring clean energy to the grid.

Six US states have green banks currently: New York, Connecticut, California, Hawaii, Nevada and Rhode Island.

NY Green Bank was funded initially from repurposed allocations of ongoing surcharges collected from utility ratepayers. The funds were allocated to the bank by the Public Service Commission. The Connecticut Green Bank was similarly funded through ratepayer benefit charges. As they have grown, both green banks have begun moving away from relying on ratepayer charges for funding.

NY Green Bank is a division of the New York State Energy and Research Development Authority (NYSERDA) and one pillar of the state's $5 billion Clean Energy Fund (CEF).

In late 2017, the bank issued a request for proposals from firms interested in helping the bank evaluate strategies for raising at

least $1 billion in third-party capital to leverage the funding from utility ratepayers. Alfred Griffin, the bank president, announced in June 2017 that the bank generated positive net income a full year ahead of schedule by generating enough revenue to more than cover expenses.

Leveraging green banks with private capital reduces the burden on electricity ratepayers. To date, NY Green Bank's cumulative revenues exceed cumulative expenses. The Connecticut bank has been able to leverage more than six dollars of private investment for every one public dollar. To date, the Connecticut bank has approximately $130 million in non-cash invested assets, which include solar lease investments (residential and commercial), solar loan investments, commercial PACE, wind, hydro, anaerobic digesters and fuel cells.

Value Creation

Several avenues are being explored to mitigate the issues of precedent, standardization and scale.

For instance, Dynamic Energy Networks, a creation of the Carlyle Group, will deploy Carlyle capital to create microgrids, and then operate them in an energy-as-a-service model using long-term contracts. The goal is to eliminate upfront capital requirements and engage in enterprise-wide contracts using Carlyle's large balance sheet.

Green banks can serve as useful partners in ways different from private equity.

NY Green Bank's investment criteria are built specifically around transforming financial markets and focusing on areas lacking liquidity. This means engaging with the private sector to explore novel financing structures where the scale and standardization issues are recognized. NY Green Bank has contributed to several credit facilities in order to create larger-term securitizations for residential solar. Griffin said there is no reason why NY Green Bank cannot use its lessons learned from securitizing residential solar to securitize revenue streams from microgrids and commercial and industrial solar projects as a way to reduce capital costs.

The mandate of green banks is to attract private capital, transition away from ratepayer support and create thriving clean energy markets.

The Connecticut bank has worked at its mandate through a number of partnerships that helped move novel financial instruments into the mainstream.

For instance, in 2012, the Connecticut bank partnered with Sungage Financial to create the CT Solar */ continued page 16*

the partnership to withhold future cash distributions to the buyer, after the buyer becomes a partner, until the tax debt, including interest for late payment, has been paid.

A cash distribution is an "excess" distribution to the extent it exceeds the "outside basis" a partner has in its partnership interest. Partnerships use two metrics to track what each partner put into the partnership and is able to take out. One is called "outside basis." Once the outside basis reaches zero, then any further cash distributions to the partner are treated as "excess" distributions and must be reported as capital gain.

Withholding is required by section 1446(f) of the US tax code.

The IRS has suspended such withholding by master limited partnerships whose units are publicly traded, pending future guidance. It is harder to track sellers in such partnerships.

The agency said in a notice in early April that there will be no delay for other partnerships.

However, it said no withholding is required in five situations. The notice is Notice 2018-29.

Withholding is not required if the seller or partner receiving cash distributions certifies in writing that it is not a foreign person.

Withholding is not required if the seller certifies that it does not have a gain.

It is not required if the seller certifies that less than 25% of its total income from the partnership in each of the last three years was "effectively connected" with a US trade or business. This would be relevant in a US partnership with significant foreign assets.

Withholding is not required if the partnership certifies that less than 25% of the gain from a sale of all its assets would be effectively connected with a US trade or business.

The 25% thresholds are expected to be reduced eventually by the IRS when it issues formal regulations.

The "amount realized" */ continued page 17*

Green Banks

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Loan Pilot. This was the solar industry's first dedicated residential solar loan product that did not require any home equity or a lien on the home. The Connecticut bank provided a $300,000 loan loss reserve, $1 million of subordinated debt and a $5 million warehouse for this facility. The residential solar loan sector and the no-money-down model have grown significantly since.

Green banks in six US states could be valuable partners in efforts to reduce the cost of capital.

In 2014, the Connecticut bank partnered with Mosaic, a solar lender, to create the country's first crowdfunding platform to raise private capital that Mosaic lends to homeowners to help them buy rooftop solar systems. Both examples highlight the Connecticut bank's risk appetite and its willingness to experiment with novel financial mechanisms to harness more private capital for the clean energy sector, according to Brian Farnen, general counsel and chief legal officer of the Connecticut bank.

Where large commercial institutions may take a pass on individual projects because of high diligence costs, green banks can step in.

For example, some types of projects are done without fixed-price offtake contracts, which means it is hard to predict the revenue that will be generated. In traditional project finance, there are fixed contractual offtake prices over a 10- to 25-year period. To make financiers comfortable financing projects without fixed offtakes, forward curves are used to measure the value of transmission, congestion and supply. NY Green Bank has engaged third-party engineers to create forward curves for the energy value stack over a 20-year period, breaking down each utility and customer class in the state. These forward curves help banks determine how much to lend and how to set debt-service coverage ratios. The forward curves are made available to private financiers engaging with NY Green bank. They also help reduce diligence costs for lenders and investors interested in financing projects in the state.

New York is in the process of moving away from a traditional net metering program for community solar projects that supply their electricity to the local utility in exchange for bill credits that are then transferred to subscribers. In the future, the amount of bill credits will be tied to the value of the excess electricity to the grid, taking into account, among other things, the demands on, or benefits to, transmission infrastructure. New York calls this a "VDER" model. (The acronym stands for value of distributed energy.) Under traditional net metering, someone supplying excess electricity to the grid is paid a retail rate for his or her electricity. NY Green Bank is helping to facilitate financing for community solar projects under the new VDER model.

The bank also helps lenders and investors with technical support as they navigate the regulatory regime in New York. The goal is to bring more private capital into the clean energy sector in New York.

The commercial and industrial solar market remains fragmented. NY Green Bank recently put out an RFP (RFP 7: Construction & Back Leveraged-Financing for Ground Mounted Solar) aimed at C&I solar developers who plan to use third-party tax equity and seek back-levered debt for projects in New York. The RFP describes the due diligence, credit approach and basic set of documents necessary for financing. The bank hopes this will help the market move toward standardization in financing terms and documents. Standardization has the potential to reduce financing costs.

Beyond diligence and regulatory acumen, green banks can perform roles similar to insurance companies on large project financings where they take on risks that allow lenders to increase advance rates or improve debt-service coverage ratios.

Green banks are often willing to subordinate their debt to commercial lenders. This is useful when attempting to create scale. To entice local banks and credit unions to lend more in the residential energy sector at lower rates and longer terms, the Connecticut bank currently offers loan loss reserves to these

institutions without charging a fee.

Green banks can also help free up sponsor equity for other uses. For example, NY Green Bank provided support to Cypress Creek Renewables in a manner that increased a bridge loan to the company to finance 72 community solar installations. In New York, developers seeking interconnection are required to deposit 25% of the interconnection upgrade estimates followed by full payment 120 days later. NY Green Bank closed a bridge loan with Cypress Creek for up to $25 million in order to pay for interconnection. Alfred Griffin said these types of products create precedent and allow the private sector to become comfortable in offering similar products.

On the Horizon

Griffin said NY Green Bank is focused next on community solar, storage and energy savings performance arrangements. He expects to see loan products in the residential solar sector that take no security interest in the home.

Brian Farnen said the Connecticut bank is moving in the same direction and is also interested in facilitating the ability of mid-market companies to enter into corporate PPAs. The Connecticut bank is also exploring performance and energy savings products for use by low- and moderate-income customers.

Griffin says the ideal is not necessarily to have 50 individual green banks at the state level. He would prefer a focus on a national platform, complemented by a few players with regional focuses.

As the New York bank continues working to raise $1 billion in private capital, it is looking for opportunities to support transactions outside New York.

How Electric Vehicles Are Transforming the Power Sector

Adding an electric vehicle to a household doubles the electricity load. This creates both opportunities and challenges for utilities. Distribution lines may not be able to accommodate a large concentration of vehicles plugging into chargers at the same time. Utilities are focused on two concepts called V1G and V2G for managing load tied to electric vehicles. New business models are emerging, including leasing batteries to

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by someone selling a partnership interest includes the partner's share of debt at the partnership level and other debt to which the interest is subject directly, such as back-levered debt at the partner level. In some cases, the share of debt may exceed the cash received from the sale. Where that happens, no withholding is required beyond the cash sales proceeds for now, but this is likely to change when IRS regulations are issued.

CARBON TAXES are potentially in play in seven US states, but they are hard to enact.

Legislators in New York, Vermont, Maryland, Massachusetts, Hawaii, Rhode Island and Washington state have been trying to move carbon tax proposals through state legislatures.

A carbon tax proposal in Washington state failed narrowly to advance in the current legislative session that ended in March, despite strong support from the governor and the fact that both houses of the state legislature are under Democratic control.

Carbon tax advocates in Washington are now focused on putting a proposal to impose carbon taxes, called Initiative 1631, on the November ballot. They need 259,622 voter signatures by July 6 to do so.

Under the proposal, a tax would be imposed on fossil fuels sold or used in the state and electricity generated or imported into the state. The tax would be paid only by large emitters. It would start at $15 per metric ton of carbon content starting in 2020 and increase by $2 a year plus inflation. The tax rate would keep increasing until the state reaches its 2035 greenhouse reduction target and state emissions are on a trajectory that makes it likely a separate 2050 target will be reached no later than 2050.

Several sectors would be exempted from the tax. For example, the tax would not apply to fuel for agricultural use or to coal used in a large coal-fired power plant that is already scheduled to be shut down in 2025.

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Electric Vehicles

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vehicle owners as surveys have shown vehicle owners are less likely to allow other uses for batteries — for example, to provide frequency regulation services to the grid — that they own than that they lease.

A panel of experts talked about how the move to electric vehicles is affecting the power sector at an Infocast storage conference in San Francisco in early March. The panelists are Marc Fenigstein, chief product officer of electric motorcycle company Alta Motors, Matt Horton, CCO of electric bus company Proterra, Harmeet Singh, CTO of charging infrastructure company Greenlots, Russell Vare, manager of business development at Mercedes-Benz Energy Americas, and Abigail Tinker, vehicle-grid integration lead at Pacific Gas & Electric. The moderator is Deanne Barrow with Norton Rose Fulbright in Washington.

Electricity Demand

MS. BARROW: To kick off the discussion, let's talk about what the proliferation of electric vehicles will mean for electricity demand in this country. A lot of people in the room are in the business of selling electricity, but demand for power has been flat or declining in most parts of the country. Will electric vehicles change that and when?

MS. TINKER: From the utility perspective, Pacific Gas & Electric currently has the most electric vehicles of any utility. In terms of passenger cars, one in five electric vehicles sold in the United States is sold in our service territory. We had about 150,000 EVs registered as of the end of last year.

We hope within the next 10 to 12 years to see that number go up by 10 to 15 times. We are aiming for two million by 2030. Adoption has been strong and has outpaced our early expectations, but it is a heavy lift to get to two million.

The impact of that would be significant and is a reason why PG&E has made electric vehicles a central part of its strategy. We are making a big effort to promote EVs. They could account for as much as 5% to 10% of our total electric sales in 2030.

MR. SINGH: The most recent forecast by the California Energy Commission is that electric vehicles in California will consume between 4,500 to 6,500 gigawatt hours of electricity annually by 2030. They are a big opportunity.

MR. VARE: Mercedes-Benz global targets are 25% electric by 2025. Based on the couple of million cars we sold in 2017, that would mean about half a million electric vehicles sold a year globally. Mercedes-Benz is a part of Daimler. Daimler also has trucks, vans, buses — everything from smart cars up to freightliner trucks — that are all undergoing electrification, too. We think this will have significant impact on electricity demand when we look at our targets.

We are building a second battery plant in Germany, where Mercedes-Benz Energy is headquartered. Our Tuscaloosa plant is adding a battery factory and EV production line. We have plants in China, too. We have about $10 billion committed to R&D and production for electric vehicles, so it is a serious commitment. We are in about ninth place for passenger cars and are maybe the fourth or fifth largest global auto manufacturer when you add in all of our other vehicles. Other auto manufacturers are also moving in the same direction.

MR. HORTON: The little known fact that will probably be interesting for many of you is buses should be the first market in transportation that will go 100% battery electric. We think that's going to take place in North America within about 10 years in terms of all new sales.

The total cost of owning an electric heavy-duty transit bus is already lower today than any fossil fuel-powered alternative. When we look at the cost reduction in batteries, the increase in range, the reliability and the performance, just on the economics alone, electric buses are quickly becoming the only viable alternative in North American transit.

We are not talking about millions of vehicles a year. There are about 70,000 buses in the US today. Every one of those will be carrying about a half a megawatt hour of energy storage onboard, so a lot of battery capacity will be needed by the bus sector. It will outpace almost every other transportation mode for the rate of electrification.

MR. FENIGSTEIN: The lightweight vehicles on which we focus are a different animal. It is complicated to predict how vehicles at such a small scale will affect the grid, but I can talk in terms of the storage demand of that segment. These are vehicles that need between one to 10 kilowatt hours of storage.

I think you will see 50% of the sector go electric globally within the next 10 years. That would represent about 30 gigawatt hours of annual battery demand. At that scale and with the amount of diversity, using such vehicles as storage assets becomes a complex challenge.

Electric vehicles will prove something smaller than the micro-grid, sort of the mobile nano-grid. People will be able to start using these vehicles as a mobile power station.

MS. BARROW: Abigail Tinker, with all these electric vehicles on

the road, why does the utility need or want the vehicles to interface directly with the grid?

MS. TINKER: They will be interfacing with the grid when they plug in to charge. The question is whether there is something more they can do while connected to the grid during charging, either by timing the charging so that it is not creating issues or using higher cost electricity, or by discharging into the grid to help supply electricity.

It is a complicated challenge. The vehicles will be in motion. They are only useful to the grid when they are plugged into a charger. How many chargers are we going to have? What is the capacity of the chargers?

V1G v. V2G

MS. BARROW: We will come back to how to manage power consumption for the driver, but before we get there, let's dig deeper into the details of how vehicles will be interacting with the grid. There are two ways: V1G and V2G. Can someone explain what those are?

MR. VARE: V1G is just another word for smart charging. You are able to schedule the start and stop of charging. V2G is where you are discharging energy from the car and inputting it into the grid.

With V2G, there are three ways to pull energy off a vehicle. One way is to pull AC power off a bi-directional motor inverter. You make the power train inverter bi-directional and pull AC energy off.

A second way is to do the same thing with an on-board charger. You can make that bi-directional and pull AC energy off the car. A third way is to connect directly to the battery and pull DC energy off the car with an off-board inverter. With that method, you have to convert the energy from the battery to AC somehow. You can either do it on-board or off-board. Different technology is required for V1G and V2G. V1G is potentially a lot simpler than V2G.

MS. BARROW: So V2G is bi-directional charging, whereas V1G is just charging from the grid and not putting power back onto the grid from the vehicle.

MR. VARE: Yes, but it is charging intelligently from the grid. Maybe Greenlots can speak to the nuances.

MR. SINGH: Let me give an example of a use case. As the electric vehicle population grows, we are already seeing that the growth is happening in clusters. There will be areas of more dense EV population than others. When an electric vehicle is added to a household, it effectively / *continued page 20*

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Electric utilities would be receive an offsetting credit if they pursue clean energy investment plans.

An earlier ballot initiative to impose such a tax failed in 2016, but a broader coalition is backing the initiative this year. Many environmental groups opposed the 2016 ballot initiative over disagreements about how the money collected would be spent. The new proposal is 38 pages.

ARIZONA remains an active battleground for renewable energy advocates.

The state supreme court said in March that the state tax department cannot assess property taxes on solar rooftop systems that solar companies lease to residential and commercial customers. The court left open whether such taxes can be assessed by county assessors.

The Arizona Department of Revenue started notifying solar rooftop companies in April 2014 that it planned to send property tax assessments for the 2015 tax year.

SolarCity and Sunrun promptly asked the state tax court for a declaratory judgment that the state tax department is not authorized to make such assessments.

By law, the state can assess all property owned or leased by gas, water, electric, sewer and wastewater utilities, including "all property, owned or leased, or used by taxpayers in the following businesses . . . (4) [o]peration of an electric generation system." An electric generation system is a system that generates electricity "to be delivered to customers through a transmission or distribution system."

The supreme court said the solar rooftop systems in this case are not being used by the two solar companies to deliver electricity to customers. The customers use the systems themselves to generate electricity for their own use and, even though some of the electricity moves to the grid through net metering, the two solar companies have / *continued page 21*

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doubles that household load. It is equal almost to adding another home into the service territory.

Before you start seeing the effect of that on the larger grid, you will see it start to stress the local distribution system. An example of V1G is coordinated charging. Say you are in a block in a neighborhood. Every other home has an electric vehicle, and they all plug in during the evening. Through software-based controls, you can coordinate that charging and make sure that at an aggregate level, it does not exceed the threshold that the local distribution system can handle. No electricity moves from the electric vehicle onto the grid, but the rate of charging across multiple vehicles is controlled.

MS. TINKER: V1G is happening already. The most simple use case of V1G is an individual customer managing the time of his or her charging to reduce their electricity bill. The customer has a demand charge on the electricity bill and does not want his or her car to charge when the demand charge is in effect, or there are time-of-use rates, and the customers want to time charging to get the lowest rate. For example, PG&E's electric vehicle rate drops at 11 p.m. A customer will plug in the car when he gets home, but charging will be timed either through the car or through the charger so that it does not start until after 11 p.m.

If we have 100 vehicles all in one place that start charging right at 11 p.m., then that might cause issues. At this point, the main use case is for individual customers to manage their own energy costs by managing the timing of when they charge.

MS. BARROW: In addition to the customer proactively managing when it charges, do you actually, in any programs, pay customers to charge or not to charge at certain times?

MS. TINKER: We do that through demand-response programs that already exist. There are EV service providers or automakers that are aggregating EV charging to participate in those programs. Basically, the utility sends a signal to the aggregator and says from, for example, 2 to 4 p.m., we need you to drop 100 kilowatts of load. The service provider would figure out which chargers to shut off during that period and be compensated by the utility for that capacity.

MR. HORTON: The economics of V2G can be challenging. It depends a lot on the use case and the types of batteries used.

In our case, we have an industrial buyer, generally a municipal government. It looks at the level of its demand charges and decides how much it wants to reduce its electricity bill. Many of the transit agencies we work with are interested in what we call a battery service agreement. They buy vehicles without batteries and lease the batteries from a storage company.

When they do that, it removes any concern they might have of overusing the batteries. It is our responsibility to make sure there is enough energy storage capacity on the vehicle to drive the bus routes that they need. We figure out the rate of degradation and when to replace a battery for the customer.

In the utility scenario, we have looked at use cases where the economics from providing grid services are more attractive than the cost of battery degradation to the customer.

> Adding an electric vehicle to a household doubles the electricity load.

MR. VARE: Mercedes-Benz does not have any plans for V2G. We are focusing on smart charging for passenger cars. Use of vehicles for demand response works much better in fleet scenarios involving medium-to-heavy-duty trucks. It is easier to deal with warranty issues surrounding degradation with those types of customers than with a 100,000-mile warranty for a passenger vehicle.

The bigger issue is less with the warranty and more with value. The value today for V2G is demand-charge avoidance, but you can already do a lot of that through V1G. When you start talking about discharging energy into the grid, you need a new market. A lot of markets are wholesale markets and are hard to access.

At my previous company, we worked on a project with the Los Angeles Air Force Base. The telemetry and metering

requirements make it difficult and expensive to discharge power to the wholesale market.

MR. FENIGSTEIN: Moving into a leasing model takes the irrational ownership aspect out of the equation for customers. There is potential, but the leasing model relies on having a secondary market for used equipment.

Customer Responses

MS. BARROW: What is the irrational perspective of users?

MR. FENIGSTEIN: Ownership brings out all kinds of weird emotions in humans.

Here is a really simple analogy. Let's say you pick a Toyota Corolla, where you can have total confidence that the engine will last at least 200,000 miles. You are probably going to own it only for 40,000 or 50,000 miles. Yet if I were to offer to pay you almost any amount to use your car as a generator while it is sitting in your garage, you are probably going to say no if you own the vehicle. And the economics do not even come into play.

It is the idea that this thing — this asset that you own — is being depreciated by someone else while you are not using it. It is a pretty hard hump to get over. Once you lease the asset, that emotional aspect goes out the window. You see that in the way people use leased vehicles versus owned vehicles.

MS. BARROW: So V2G is going to be a tough sell to vehicle owners versus those who lease.

Let's talk more about value. Harmeet Singh, could you map out the value chain in V1G and V2G to give us a sense of what each stakeholder gets from it and what kinds of incentives could encourage customers to adopt V1G or V2G?

MR. SINGH: Starting with V1G, I will give you some examples of the systems that we have already deployed, what kinds of challenges they address and the value that they generate.

V1G can provide three different kinds of services.

One is infrastructure offset. You have local capacity constraints, but you do not want to invest that kind of capital to upgrade your infrastructure. Through V1G, you can deploy infrastructure that provides more capacity and manage it through software.

The second service is for the site itself by providing demand-charge mitigation. This is done through simple load shifting or peak shaving. It can also be paired with a stationary storage asset, such as a second-life battery, to provide a buffer to the local EV charging infrastructure.

The third service is a demand-response play. This involves aggregating the electric vehicle load

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no part in such transmissions.

The court said if any property taxes are to be paid, they must be assessed locally. County assessors in Arizona assess both "real property" and "business personal property," but some types of business personal property must be assigned a zero value.

The court said the rooftop solar panels are "business personal property" rather than "real property."

It refrained from addressing whether county assessors have authority to assess the rooftop systems and, if so, at what value at the urging of the two solar companies, since counties have not sought to date to tax them and were not parties to the litigation. The case has moved back to the state tax court, where it originated, to give the counties an opportunity to join if they want a decision on the county-level issues.

The Arizona Department of Revenue said in a statement on March 19 that it is "committed to following the direction of the state supreme court outlined in its ruling."

The case is *SolarCity Corporation v. Arizona Department of Revenue*. The supreme court released its decision on March 16. (For earlier coverage, see "Arizona Property Taxes and Rooftop Solar" in the June 2017 *NewsWire*.)

Meanwhile, a group called Clean Energy for a Healthy Arizona has petitioned the state to include on the November ballot a proposal to require Arizona utilities to supply at least 50% of their electricity from renewable energy by 2030. At least 10% would have to come from distributed sources like rooftop solar. The group needs 233,953 voter signatures by July 5.

The current renewable portfolio standard in Arizona is 15% renewable energy by 2025.

The governor, Doug Ducey (R), signed a bill on March 23 to limit the penalties that utilities face for falling short on their renewable portfolio targets to a maximum of $5,000 per day per offense. Rep. Vince Leach (R), who sponsored the bill in the state legislature, said the measure

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and presenting that as a flexible load to the utility and then being able to curtail that load based on utility needs. All of these use cases exist today.

When you go to V2G, it becomes more complicated. There are a lot of players involved. The battery manufacturer needs to provide the capability to use the battery energy while the battery is not in use to turn your wheels for transportation.

MS. BARROW: How much does that capability add to the cost?

MR. SINGH: I am not best suited to answer that question.

MR. FENIGSTEIN: I can answer it. For DC off-charge, nothing. It is done through control software. For AC off-charge, it is more than a dollar, so it is too expensive. We do not want the extra cost in our components.

MR. SINGH: Beyond that, there are other players in the value chain, such as the operators and the grid. Each one of the players in the value chain needs to have an incentive to participate, and participation must happen in a synchronized manner.

Now we get into issues regarding technology and standards. Every battery maker today may have its own proprietary technology. Standards are going to be key to enable interoperability so that the technology can scale.

MR. VARE: Can I add a comment about smart charging? There is a study that Idaho National Labs did in 2015, where they looked at EV drivers across the country and measured when they plug in. They all plug in when they get home at 5 or 6 p.m., except for San Francisco.

In San Francisco, everyone took the trouble to program the charge time on his or her car to 11 p.m. because there was a rate benefit. Unless there is a value like that to the EV driver, there is no real incentive to adjust the time. There must be time-of-use rates or demand response or other incentives.

MR. HORTON: One of the drivers of interest in V2G among municipalities is for emergency-response situations. People often ask, with regard to a bus, whether it can connect to a hospital, for example, and provide electricity back to the grid that way. As cities are looking at resiliency, this has been one area where V2G has demonstrated real value at the municipal level. It is not just the dollars and cents that may flow back from the utility.

MS. BARROW: I want to come back to the opportunities for municipal operators, but before we get there, how do you manage the power consumption for the user? If I am a vehicle owner and I need my vehicle for my daily commute, or even if I am a business and I need my vehicles to go on a daily run, why would I give up capacity in my battery to the grid?

MR. HORTON: Municipal users have regimented schedules and generally know exactly when they need to pull out in the morning. This provides more flexibility in terms of adjusting the timing of charging and discharge.

The challenge with transit buses is that they are generally parked and charging overnight, which is not the ideal time to be providing grid services. Having said that, there are other applications. Everybody talks about school buses as the ideal situation because they sit for a long time in the middle of the day and usually take the whole summer off.

There are also some heavy-duty applications that have a defined operating time frame. They do not have to run to the grocery store in the middle of the night. Every little sliver of this market is going to look at the pros and cons of V2G, and V1G, frankly, a little differently.

MS. TINKER: Heavy-duty and consistent-duty-cycle use cases will be the first to be good candidates for V2G. From the utility perspective, we look for vehicles that can provide capacity reliably, particularly if it is to alleviate a local distribution concern. A concept that is starting to get attention today is how can we avoid utility capital investment, such as a local distribution project, and instead manage load or distributed generation on the grid to solve that problem.

Lots of vehicles simultaneously plugging into chargers puts stress on distribution lines.

Utility Responses

MS. BARROW: Matt Horton, how does Proterra work with utilities and municipal operators in this space?

MR. HORTON: We engage with the utility early in the

process. Today, transit operators are generally convinced that battery electric buses can do all the work that they need. Where they have significant concerns still is about the infrastructure.

Here in California, there are probably more than a dozen cities that have made a 100% zero-emission commitment for their municipal fleets. The thing that they are worried about is making sure there are enough charging stations deployed in time to allow for 100 to 400 buses in a single location.

Bringing the utility to the table early to help design how to get that much power to a single location, and to start talking about rate design and time-of-use and demand-charge mitigation strategies is critical.

All of that is really important in fleet usage generally. In most of these markets, we have had pilot programs that are fairly easy to do because there is not yet a heavy electricity load. We are now moving as an industry into the phase where we have to have tight coordination with the utility.

Frankly, a lot of municipalities are expecting their relationships to be a little adversarial. They are not quite sure what to expect. It has been refreshing for many of them when the utility says, "We want that demand. That is good for us. We want to help enable this."

MR. FENIGSTEIN: For a sense of the scale of 300 hundred buses, do your buses start at 100 kilowatt-hour battery packs and go up from there?

MR. HORTON: Yes. The mainstay is going to be a 440 kilowatt-hour bus. That is what most of our customers are migrating toward.

MR. FENIGSTEIN: When you are talking about a fleet of a 100 buses, that is significant.

MS. BARROW: What is the charging capacity?

MR. HORTON: A bus will usually have a 125-kilowatt charging capacity. We think that is about the most the market really needs.

MS. BARROW: Let's talk about the adoption curve and why residential users are farther down and fleet owners farther up on the adoption curve. Abigail Tinker, PG&E has data from a survey it ran on its customers. What did it find?

MS. TINKER: PG&E just completed a pilot project involving a technology demonstration of a vehicle-to-home system. We had to modify a vehicle to be able to discharge to home because none of these is available on the market yet. The technology certainly is feasible.

What was most interesting was on the customer side. The customers are initially very interested in the concept of vehicle-to-home, with about 54% of those we */ continued page 24*

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is needed to protect Arizona utility customers from costly mandates.

BITCOIN MINING could use as much electricity in 2018 as all electric vehicles are expected to use in 2025, according to a report by Morgan Stanley.

Some US utilities in such places as New York and Washington state are increasing rates for bitcoin miners, defined as "high-density load customers," because of the stress put on distribution lines. The typical definition is a customer who uses at least 250 kilowatt hours of electricity per square foot in a year.

With so much demand, some electricity suppliers are taking notice.

A gas producer in Calgary "decided that it is better off using its gas to generate power to mine bitcoin than trying to sell the gas," according to Crae Garrett, head of the Norton Rose Fulbright energy practice in Canada. Iron Bridge Resources Inc. produces enough gas currently to power a 45-megawatt power plant. The company said it is getting next to nothing for the gas, so it hired experts in cryptocurrency mining and launched its own pilot-scale mining operation with plans to expand.

Atlantic Power decided against acting for now on a suggestion by one of its shareholders earlier this year to try to sell electricity from three uncontracted power plants to bitcoin miners.

Demand by bitcoin miners should decline in the long run. A new block of bitcoins is released every 10 minutes to the first person to solve a complicated series of equations. However, the number of bitcoins in each new block is reduced by half every four years, with the next reduction coming in 2020.

New start-up energy companies are appearing using platforms created on block-chain for such diverse purposes as to allow members access to sites where they can buy retail electricity */ continued page 25*

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surveyed showing interest, but that dropped below 10% as soon as the cost came into the picture. Overall there was high interest, but the cost far outweighs the perceived benefits.

MS. BARROW: Is it just the cost of the equipment? What is the associated cost?

MS. TINKER: It is the cost of the equipment and the installation. You have to install a secondary, critical-load panel that can isolate power from the utility so that the vehicle can discharge into the house. It is similar to the set up you would need for a backup diesel generator. We estimate the cost currently is $4,500. Based on the willingness-to-pay questions we asked the customers, their optimal price is somewhere between $800 and $1,000.

When asked about functionality, of those respondents that were interested, 30% wanted it for either resiliency or backup for a power outage. When we asked them if they would want it to discharge into the grid to earn incentives from utility programs, only 8% to 12% were interested in that. The asset, their car, being used for something other than their own transportation is a big hurdle to get over.

MR. SINGH: Greenlots and BMW did an electric vehicle pilot program in Germany. During the day, EVs can soak up the energy from the sun and during the evening hours, soak up wind energy. We used a fleet of up to 100 BMW EVs to charge and store the excess wind energy in the EV batteries.

MS. BARROW: How much capacity does 100 vehicles provide?

MR. FENIGSTEIN: If they are all Teslas, their top of the line model provides 100 kilowatt hours. So for 100 units, you are at 10,000 kilowatt hours of storage if they are all plugged in simultaneously.

MR. VARE: And all empty.

MR. FENIGSTEIN: Exactly.

MS. TINKER: In the BMW study, on average, the vehicles were providing 20% of their capacity.

It also matters what the charger rating is. For a Tesla, a level 2 charger goes up to 19 to 20 kilowatts, but for most EVs on the market, the charger rating is at the 7-kilowatt level. Therefore, 100 vehicles would be about 700 kilowatts.

After Market

MS. BARROW: Let's take this in a different direction and talk about second-life batteries. Are Alta, Mercedes, and Proterra batteries being repurposed at the end of their useful lives for stationary applications?

MR. VARE: I'll go first. We have done two pilots of large-scale utility programs. One is in Lunen, Germany using 1,000 smart EV batteries in a second-life project that is built at a recycling facility. It has a 13.5-megawatt capacity rating. It is bidding into the frequency regulation market, which is called the "primary reserve market."

We have another pilot employing a different concept of partially used batteries and spare-parts batteries. One thing with batteries is that they need to maintain a state of charge, so if you are keeping spare parts for years, you need to charge them. The project provides about 17 megawatts using some spare-parts batteries.

We have been working on the technology for putting second-life EV batteries into commercial systems. It is part of our mission at Mercedes-Benz Energy to understand how to tackle the problem of reusing batteries as we see vehicle volumes growing.

MS. BARROW: Russell Vare, what is the price of a second-life battery versus a new one?

MR. VARE: There is not really a market. The demonstration I mentioned was unique in that they took the batteries from an in-house car-sharing program that was finished. The price is less than a new battery, but more than the cost of recycling.

MR. HORTON: Proterra designs our batteries so that they are underneath the body of the vehicle. We have four large battery packs on a standard-sized vehicle. Because they are exposed to the environment, they have been weatherized. They have been designed to be able to stack on top of each other for a second-life use.

We designed the vehicle knowing that six to 10 years into a vehicle's life, it will still have a useful asset because of the energy density. The batteries are still going to have a lot of value to somebody. We wanted to make sure that they would be readily useable.

We do not have any batteries yet for secondary use because they are still in first-life use. Our first buses were delivered in 2010, so they are now about eight years old. At some point in the next couple years, we will start pulling those out and will be looking for a market.

Many of our customers want to hang on to the batteries for use in their own depots to lower demand charges. We are talking with utilities that are thinking about this. They would like to initially lease a battery to transit agencies and then own the battery at the end of its transit life so that they will have a ready supply of second-life batteries that can be deployed for demand response and other grid services.

MS. BARROW: So the utilities are leasing batteries to customers and taking them back at the end of the lease?

MR. HORTON: Yes. The arrangement is that Proterra sells a bus to a customer without the batteries in it. The utility purchases the batteries from us and then leases them or provides an energy service to the customer: both the electricity and the use of the battery. At the end of its useful life in transit, the utility still owns that battery and can use it however the utility wants.

MS. BARROW: In a grid-scale stationary setting?

MR. HORTON: Correct.

MR. FENIGSTEIN: We're at the other end of the spectrum where the scale of our packs for our current platforms is 6 kilowatt hours. Depleted to 80%, we are a little shy of 5 kilowatt-hours. At that scale, the battery is not actually that useful.

We certainly are refurbishing and recycling them internally for warranty purposes. It is more for environmental reasons and maybe a little bit of recovery of value for the business.

MS. BARROW: Harmeet Singh, can you tell us about the technical challenges involved in second-life programs?

MR. SINGH: We are developing a product that is a fast-charging hub: for example, up to four fast-charging stations paired with stationary storage. We are integrating second-life batteries.

When you are repurposing a battery from an electric vehicle for second life, electric vehicle battery packs have modules, and modules have cells, and not every module and not every cell degrades uniformly. There is an effort required to repurpose the right modules and the right cells into the second-life battery pack. There are costs associated with that.

Then there is the physical element of the form factor. If you want the battery packs to be more compact and more optimized for the given physical dimensions, the cost will be higher.

Beyond that, there is the issue of incentives. More incentives are available today for new batteries than for second-life batteries.

These sorts of issues are not unexpected from a technology perspective. I think integrating a second-life battery system is not that different from integrating a new energy storage system. It is a comparable effort.

MR. VARE: Those are some of the challenges on which we are working. I mentioned a project we have using second-life batteries from 1,000 electric vehicles. One of the things that made that project more easy to tackle is that the vehicle batteries were all the same model and model year, and all had the same use cycle and the same state of health and life. Integrating 1,000 of the same batteries that came from the same */ continued page 26*

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more cheaply than from the local utility, coordinate sharing of excess electricity from rooftop solar panels among neighbors, and handle billing for charging electric vehicles. (For more on the potential energy-related uses of blockchain, see "Blockchain and the Energy Sector" in this issue.)

Blockchain energy companies raise capital through "initial coin offerings." GTM Research reports that $300 million was raised by such companies since the third quarter 2017 through January 2018. It expects another 25 ICOs through June this year. It says ICOs account for 75% of the funding for blockchain energy companies currently, but more capital should come over time from utilities as they experiment with the technology.

Regulatory issues make such initial coin offerings more challenging in the United States than in capital markets outside the US. (For more details, see "Initial Coin Offerings" in this issue.)

INTERCONNECTING TO A DISTRIBUTION LINE did not trigger taxes to the utility, the IRS said.

Utilities require independent generators connecting to the grid to reimburse for the cost of the intertie and of any network upgrades to accommodate the additional electricity on the grid.

Utilities must report any such payments from an independent generator that is a customer of the utility as income. This makes interconnection more expensive for such generators, since the utility will collect a tax gross up as part of the interconnection payment.

However, the IRS has made clear in a series of notices since 1988 that interconnection payments from independent generators who are not customers do not have to be reported as income.

The IRS updates these notices periodically. The latest such update */ continued page 27*

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place is a lot easier.

Integrating different types of batteries with different types of state of health and different form factors are challenges to be overcome on the technical side.

Bloomberg New Energy Finance has some numbers on battery volume. It estimates that by 2025, there will be 95 gigawatt hours of used EV batteries and that 26 gigawatt hours of those will have some useful second-life applications. Therefore, when you look at the volume of EV batteries that are going to be coming off pretty early in the market, it will quickly dwarf stationary energy storage.

Tax Equity and Carbon Sequestration Credits

by Keith Martin, in Washington

Changes in a US tax credit for carbon sequestration should make the tax credit more attractive to the tax equity market.

However, the issue will be whether Congress gave a long enough runway for developers to respond to the new incentive and for the tax equity market to become comfortable with the risks in such transactions.

Sequestration projects must be under construction by the end of 2023 to qualify. Tax credits can be claimed for up to 12 years after a project is put in service on the carbon dioxide captured at an industrial facility or power plant and permanently buried, used as a tertiary injectant to recover oil and gas or put to some other commercial use in a manner that disposes of the CO2.

The US government has offered a tax credit to sequester carbon since late 2008. The credit is in section 45Q of the US tax code.

In the past, the tax credit was too small in amount to generate enough activity, and it could only be claimed on the first 75 million metric tons in total carbon dioxide sequestered nationwide. No more tax credits could be claimed by anyone after the year the IRS announced the 75-million figure was reached. This made it impossible to know, when undertaking a project, how much in tax credits a developer would receive.

Congress eliminated the 75-million-ton cap and increased the credit amount for new carbon capture equipment installed on or after February 9, 2018 as part of a rider to a temporary spending bill, called the "Bipartisan Budget Act," in early February that kept the federal government operating for another three weeks until a more permanent budget deal was worked out later that month.

Congress also made it easier to transfer the tax credits in cases where the person entitled to tax credits is unable to use them.

Carbon capture at older facilities that were in service before February 9, 2018 will continue to qualify for tax credits, but at the old rates and subject to the 75-million-ton cap.

A big coal-fired power plant that emits and captures five million tons of CO2 a year could generate more than $110 million a year in tax credits.

The credit is more likely to lead to transactions at smaller industrial facilities than power plants in the short run because of cost. Costly deals are more complicated and time consuming to put together.

What Qualifies?

The revamped tax credit for installing new capture equipment — like the old tax credit — rewards capturing carbon dioxide from any industrial source, including a power plant, and then either burying it in a secure geological storage or using it in one of a variety of ways.

The possible uses include injecting it into the ground to help with oil and gas recovery, causing algae or bacteria to absorb it, converting it into a chemical in which the CO2 is securely stored or finding another commercial use for it as CO2. The Internal Revenue Service has the final say about permitted commercial uses. The CO2 would have to be considered permanently disposed.

A credit can also be claimed as a reward for using direct air capture equipment to pull carbon dioxide from everyday air, but not from pockets where it has been "deliberately" released. An example of "deliberate" release is where CO2 is being released from a naturally occurring subsurface spring.

Secure geological storage means stored in places like deep underground saline formations, oil and gas reservoirs and unminable coal seams in a manner that does not allow the CO2 to seep into the atmosphere. The IRS is supposed to work out with the Environmental Protection Agency, Department of Energy and Department of Interior what makes for "secure" storage, but no formal guidelines have been published.

Both the CO2 capture and the disposal or use must be in the

United States or in a US possession like Puerto Rico or Guam.

The credit is an amount per metric ton of CO2 captured. The CO2 must be measured both at the point of capture and the point of burial or use.

For commercial uses as CO2 — in other words, the CO2 is not buried underground or used as an injectant at an oil or gas field — the measurement must take into account the lifecyle reduction in CO2 using the same approach the Environmental Protection Agency uses to track lifecycle greenhouse gas reductions. For example, when trying to assess how much greenhouse gas emissions have been reduced by switching to a biomass fuel, EPA looks at the full greenhouse gas emissions from growing, harvesting and transporting the plants that later become the fuel all the way through their use as fuel. Section 211(o)(1)(H) of the Clean Air Act says the "lifestyle greenhouse gas emissions" are the "aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) . . . related to the full fuel lifecycle, including all stages of fuel . . . production and distribution . . . ."

Amount

The amount of tax credit depends on when the carbon capture equipment was installed and what is done with the CO2.

The tax credit for CO2 captured using older capture equipment placed in service before February 9, 2018 is $22.48 per metric ton if the CO2 is stored securely underground and $11.24 for other uses. These are the 2017 figures. The amounts are adjusted each year for inflation.

For new capture equipment placed in service on or after February 9, 2018, the tax credit is higher. The IRS is supposed to set the credit amounts each year by doing a linear interpolation with the credit rising from $22.66 a metric ton in 2017 to $50 a ton in 2026 for CO2 stored securely underground and from $12.83 in 2017 to $35 a ton in 2026 for other uses. Starting in 2027, the amounts are adjusted for inflation.

The new capture equipment must be at a power plant, factory or other industrial facility that was under construction by the end of 2023. The capture equipment must also be under construction by then or be contemplated as part of the original planning or design for the power plant, factory or other industrial facility.

There may be situations where older capture equipment is upgraded on or after February 9, 2018. If that happens, then the amount of tax credit that can be claimed turns on how extensively the existing equipment was / *continued page 28*

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was Notice 2016-36 in June 2016. One of the issues the IRS addressed in the 2016 update is whether it matters whether the independent generator connects its project to a utility transmission line or a distribution line. Community solar projects are often connected to distribution lines.

The 2016 notice said it makes no difference. The notice said the interconnection payment is not income "even if the generator is interconnected with a distribution system, rather than the transmission system." Later, where the notice lists the boxes that must be checked to avoid income, one box is the intertie must be used for "transmitting electricity." (For more details on IRS policy in this area, see "IRS Updates Tax Treatment of Interconnection Payments" in the August 2016 *NewsWire*.)

The IRS does not issue private letter rulings about issues addressed in the interconnection notices as a labor-saving measure. It does not want to have to spend time repeating what it has already said in notices.

The utility to whom it issued the new ruling had already asked for a ruling on this issue before the latest notice was issued, so the IRS made an exception.

The generator in the ruling had a long-term power purchase agreement to sell its electricity to X, but had to move the electricity across two utility systems to reach X. Its project was connected to the distribution lines of one utility and to the distribution and transmission lines of the utility to whom the IRS issued the ruling. Presumably X took title to the electricity near the generator's power plant and was the customer of the two utilities for transmission.

The ruling confirmed that the intertie will be used for "transmitting electricity" within the meaning of the 2016 notice.

The ruling is Private Letter Ruling 201813016. The IRS released a redacted copy to the public on March 30. / *continued page 29*

CO2 Tax Credits

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improved. If the spending on improvements is at least four times the value of the equipment retained from the existing system, then the entire system is treated as brand new, and the owner will qualify for the higher, new credit amounts. Otherwise, the CO2 captured must be allocated between the old and new parts based on capture capacity, with the CO2 treated as captured first by the old equipment up to its capture capacity.

It must be clear that the CO2 captured would otherwise have been released into the atmosphere as part of the greenhouse gas emissions from the power plant or other industrial facility. Thus, a power plant cannot scale back other existing means it is using to cut emissions in order to get better economics by tapping into tax credits.

At least a minimum amount of CO2 must be captured to qualify for any tax credits in a year.

Carbon capture from power plants must be at least 500,000 metric tons a year, with one exception.

The carbon capture at power plants, factories and other industrial facilities that emit 500,000 or fewer metric tons a year can be as little as 25,000 metric tons if the CO2 captured will be put to some other use than being buried underground or used as a tertiary injectant to produce oil or gas.

Where direct capture equipment is used to pull CO2 from the air, then at least 100,000 metric tons must be captured in a year.

Tax credits on CO2 captured at new equipment can be claimed for 12 years after the new equipment originally went into service.

Tax credits on older equipment can be claimed only until the end of the year in which the IRS certifies that credits have been claimed on 75 million metric tons of captured CO2 nationwide since October 3, 2008. As of May 10, 2017, tax credits had been claimed on 52,831,877 metric tons.

Changes in a US tax credit for carbon sequestration should make the credit more attractive to the tax equity market.

Who Claims?

The tax credits for new capture equipment belong to the person who owns the equipment. Credits for use of older capture equipment belong to the person who uses the equipment regardless of ownership. In both cases, the person claiming the credit must either dispose of the captured CO2 by secure burial or use or contract with someone else to do it.

Often, the person entitled to the tax credits cannot use them. In such cases, the credits can be transferred to the company that disposes of the CO2 by burial or use by making an election on an IRS form.

Alternatively, it may be possible to get value for the credits in the tax equity market.

Any tax equity deal involving new equipment would have to take the form of a partnership flip transaction. That's because the entity claiming the tax credits must both own the capture equipment and dispose of the CO2 captured or contract with someone else to do it. Thus, as a practical matter, the same entity must both own and use the equipment.

There are several ways to put a partnership flip transaction in place. Two of the more common are the owner of the new equipment would sell an interest in a special-purpose "project company" that owns the capture equipment to a tax equity investor or else the tax equity investor would make a capital contribution to the project company for an interest in the project company, thereby converting the project company into a partnership. Thus, the sponsor and tax equity investor would own the capture equipment through a partnership.

The partnership would enter into a contract with the owner of the power plant or other industrial facility to capture CO2 for it. The partnership would also hire the sponsor or a third party to operate the capture equipment on its behalf. It would contract with one or more third parties to dispose of or buy the CO2.

The tax equity investor would size its investment by discounting the net benefits stream it expects as a part owner of the capture equipment using its target yield as the discount rate. Its net benefits stream would include its expected share of the tax credits, tax savings from any tax losses (including depreciation of the capture equipment) and cash the partnership is able to

earn by capturing CO2 for a power plant or other industrial facility and reselling the CO2 for a commercial use. The taxes the tax equity investor would have to pay on its share of partnership revenue would have to be backed out as a detriment.

The partnership would allocate up to 99% of the tax credits to the tax equity investor. Section 45Q credits must be shared by the partners in the same ratio they share in "bottom-line" losses. Thus, for example, if a partnership allocates one type of tax loss in a 50-50 ratio and allocates all remaining losses in a 99-1 ratio, then the section 45Q credits must be shared in a 99-1 ratio. Taking the simplest approach, the partnership would allocate the tax equity investor 99% of income and loss and tax credits until it reaches a target yield, after which the investor's interest in the partnership would flip down to 5%. The sponsor would have an option to buy the investor's 5% interest after the flip.

Each partner has a capital account that is a metric for tracking what the partner put into the partnership and is allowed to take out. The investor's capital account starts with his investment. It goes up as the investor reports taxable income from the partnership. It goes down as the investor reports losses or is distributed cash.

Once the capital account hits zero, any further loss would shift to the sponsor. This would drag tax credits to the sponsor. Therefore, the transaction should be structured to make sure this does not happen. One way may be to write off the full cost of the carbon capture equipment as depreciation in year 1. The cost of assets that a partnership puts in service through 2022 can be deducted entirely in year 1 as a "100% depreciation bonus." Another way is for the investor to promise to increase its investment if its capital account is still negative when the partnership liquidates. This is a called a "deficit restoration obligation" or DRO. Another way to for the partnership to borrow all or part of the cost of the carbon capture equipment as this turns the depreciation into a type of tax loss that the investor can continue being allocated even after it runs out of capital account.

Practical Issues

Small sponsors without track records and good financial metrics will have a hard time raising tax equity.

Most mainstream tax equity investors like deals that require investments of at least $40 to $50 million. They are less keen to do one-off deals than deals with a sponsor who will have a pipeline of projects.

New technologies are nearly impossible to finance. The market is only interested in proven technologies.

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PIPELINE companies that operate as master limited partnerships will no longer be able to pass through an income tax charge to customers as part of cost-of-service rates, the Federal Energy Regulatory Commission said on March 15.

FERC also began moving the same day to direct some pipelines and electric transmission companies to reduce rates after Congress reduced the corporate tax rate from 35% to 21%.

The commission said it is inappropriate for pipelines owned by master limited partnerships to pass through an income tax charge because such partnerships are not subject to income taxes.

Various airlines and oil refineries had sued to stop the practice. A US appeals court ordered FERC to take another look at it in July 2016. (For earlier coverage, see "Court Orders FERC to Revisit Pipeline Charges" in the August 2016 *NewsWire* and "Taxes in Transmission and Pipeline Tariffs" in the February 2017 *NewsWire*.)

A master limited partnership is a partnership whose units are publicly traded.

FERC said it will address whether other partnerships that do not trade as MLPs will be allowed to pass through income taxes as those issues arise in subsequent proceedings.

The Alerian MLP index, which tracks the prices at which MLP units are trading, has fallen by 7.2% since the FERC action.

The potential effects vary from one pipeline to the next, since not all pipeline rates are cost-of-service rates. Some are negotiated or market-based rates that would not be affected.

The FERC pipeline decision is in Opinion No. 511-C.

The decision could accelerate a trend of MLPs converting to corporations, selling existing pipelines affected by the change to corporations or taking MLPs private. (For a discussion about one corporate conversion, see "Master Limited Partnerships" in the August 2014 *NewsWire*.)

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CO2 Tax Credits

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There is also the issue of making investors confident in a new market about what amount of sequestered CO2 — and, by extension, tax credits — to project for purposes of sizing their investments. The investor may be willing to invest something up front and make ongoing additional investments as it sees each year how much CO2 was sequestered. However, the IRS generally prefers in such "pay-go" structures that the contingent amounts to be invested over time not be more than 25% of the total investment.

Another risk for investors is the credits are subject to recapture — without time limit unless the IRS adopts one — if the CO2 ends up in the atmosphere. Congress directed the IRS to come up with recapture rules. The issue is not on the current IRS priority guidance plan.

For older capture equipment put in service before February 9, 2018, two tax equity structures are possible in theory — partnership flips and inverted leases — but the 75-million-ton cap on total tax credits nationwide is a serious impediment.

In an inverted lease, the sponsor leases the capture equipment to a tax equity investor. The investor hires the sponsor or a third party to operate the equipment and dispose of the CO2. The investor claims the tax credits and deducts the rent paid to lease the capture equipment. The sponsor keeps the depreciation on the equipment and uses it to shelter the rent. At the end of the lease, the sponsor takes back the equipment.

Blockchain and the Energy Sector

by Kathryn Emmett, Sean Murphy and Andrew Hedges in London, and Gerd Stuhlmacher in Munich

Blockchain has become a buzzword, but leaving the hype aside, when applied to the energy sector, it has the potential to reduce business complexity and improve both profitability and customer experience.

Blockchain is basically an open ledger.

It has immediate application in energy asset management, energy trading and payment mechanisms. However, as understanding of blockchain increases, people are finding new applications.

In future, the use of blockchain, in combination with other emerging technologies such as smart contracts, intelligent sensors and the "internet of things," could change user engagement and potentially alter market structures.

The physical movement of energy remains at the heart of these transactions.

Therefore, it is necessary to consider how blockchain applications will interface both with physical energy infrastructure and with the regulatory framework governing the sector. These industry-specific considerations must also be overlaid with other, more ubiquitous regulatory requirements, such as rules relating to data privacy, corporate governance and fraud prevention. The result is a complex regulatory matrix that varies according to energy sub-sector and jurisdiction and that will inevitably need to adapt to accommodate the opportunities that blockchain presents.

Finally, the adoption of blockchain by the energy sector also needs to be carefully considered in the light of the energy demand required for it to function; it must be sustainable. The energy usage required will depend on whether a permissionless system is needed, which may not be the case in many energy applications. Designers of new platforms must be mindful of this.

The focus of this article is existing, emerging and future applications of blockchain in two key energy industry sub-sectors: energy trading and power.

The contents are adapted from the latest chapter in our "Unlocking the Blockchain series - Chapter 4: Digitizing the energy value chain." The full paper, as well as earlier chapters, can be found on the Norton Rose Fulbright website at http://www.nortonrosefulbright.com/knowledge/publications/163801/unlocking-the-blockchain

Key Attributes

Blockchain can act as a trusted platform for parties to record transactions and distribute information among themselves without having to share everything with a central entity. It also allows participants to transact using new technologies and data, such as internet-of-things devices, other sources of data from off the ledger (often known as oracles) and smart contracts.

Blockchain allows creation of synchronized electronic "ledgers" or records among transaction counterparties to create a single

and shared version of data, commonly known as a "single version of the truth." Thus, blockchain allows parties to avoid transacting on the basis of disparate and disconnected systems which can lead to reconciliation errors. Recordkeeping and record validation become a combined and automated activity. Transaction time scales can be reduced. Blockchain can shorten the settlement time to near real time.

It also has the potential to share costs among multiple parties and reduce them overall by streamlining numerous processes.

It may increase cybersecurity for the data recorded. For example, digital currency is not stored in a file. Instead, it is represented by transactions indicated on a cryptographic hash available for all platform users to see.

There is greater accountability. Transaction steps are recorded on the blockchain, and all participants have shared access and can spot any errors. There is an audit trail of all information and data.

Blockchain enables automation. Blockchain platforms can provide automated or partly automated products and services through use of "smart contracts." A smart contract is a computer program that encodes conditions and outcomes and can move currency or information across the ledger.

Applications

There are possible uses for blockchain in the energy sector.

It is expected to enhance the products and services offered. For example, Grid+ is operating a platform where, using a so-called smart agent, energy will be bought and sold in exchange for cryptocurrencies such as BOLT. Separately, exchange platforms, such as WePower or SunContract, are exploring the use of tokens in energy trading.

Blockchain will let market participants more easily verify material facts relevant to the energy products being traded, such as the ownership, location or provenance of the product. Removing "unknowns" from the trading process may increase trust between the parties as well as improve compliance checks.

Blockchain is expected to play a role in emissions trading and assist with renewable energy certification because it can be used together with intelligent sensors and smart meters to provide more accurate data. For example, IDEO Co Lab, with Nasdaq's and Filament's support, reportedly designed a prototype of a blockchain-connected solar panel that monitors its energy and autonomously creates the renewable energy certificates. Separately, Poseidon is understood to be developing a blockchain-enabled system that will allow / *continued page 32*

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Meanwhile, attorneys general from 16 states had asked FERC in January to require interstate pipelines and transmission companies to share tax savings from the corporate rate reduction with their customers by reducing rates.

On March 15, FERC asked 48 electric transmission companies to propose revisions to their rates to reflect the corporate tax reduction or show cause why they should not be required to do so. The utilities have 60 days. The 48 utilities involved have rates that assume a 35% corporate tax rate.

Most other utilities have formula rates that adjust as the corporate tax rate changes.

FERC also asked interstate gas pipelines to make a one-time filing to help it assess the effect of the corporate tax reduction on pipeline rates. The pipeline filings are expected in the late summer or early fall.

AMERICAN INDIANS are subject to US income taxes on gravel mined on the reservation, the US Tax Court said in March.

The decision put the Tax Court potentially at odds with a federal district court that heard the case last year.

Alice Perkins, a Seneca Indian, got permission from the tribe to mine gravel on a Seneca reservation in upstate New York. She owned a trucking company. The company had income from gravel sales in 2008, 2009 and 2010.

She argued that two treaties that the US government signed with the Seneca Indians in 1794 and 1842 bar the US from taxing income that a member of the tribe earns from gravel sales.

The Tax Court concluded that neither treaty spares her from having to pay income taxes on the gravel sales. The 1794 treaty promises that the government will not disturb "the free use and enjoyment" by the Senecas of their land. The 1842 treaty bars the government from taxing "real property" / *continued page 33*

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emissions allowance to be traded transparently, enabling greater regulatory compliance. Regulators might adopt a similar system for reporting renewable energy certificates used in fuel mix disclosure and renewable portfolio standards.

Big data are being used to inform increasingly precise and segmented trading decisions, including pricing and risk assessment.

The use of blockchain with other emerging technologies like smart contracts could alter market structures.

Blockchain may provide potential new data sources for analyzing big data in almost real time that can then be used to inform trading strategies and pricing decisions. Access to near real-time information might enable better monitoring of open positions, mark-to-market exposure and customer credit standing.

Blockchain could be used to store data on counterparties, subject to customer agreement. For example, once a counterparty is validated by another trusted market participant, the counterparty could be accepted by reference to its existing records in the ledger. This may ultimately require regulatory approval as a regulated entity does not typically discharge its regulatory know-your-customer obligations by relying on checks undertaken by another entity.

Blockchain may reduce the number of administrative processes involved in deal execution. With the use of smart contracts and systems of electronic payments, it may, for instance, be possible for blockchain to execute dispatch of commodities automatically once the trade is booked.

By reducing the involvement of intermediaries, blockchain will decrease the time and costs involved in executing transactions. For example, when ING and Société Générale concluded the first oil trade using a prototype blockchain platform, Easy Trading Connect, ING estimated that blockchain helped reduce its involvement in the transaction from three hours to 25 minutes, resulting in 30% cost savings per transaction.

Blockchain can also automate much of the regulatory reporting process. It lets trade data be posted directly to regulators' systems.

Altered Market Structures

The power value chain has been divided traditionally into generation, transmission and distribution, supply and consumption.

Blockchain and other innovations are likely fundamentally to blur the distinction among these roles, potentially altering market structures.

For example, blockchain has already changed the fundraising methods used by some energy start-ups. "Initial coin offerings," often described as the evolution of crowdfunding, have been particularly prominent. Power Ledger reportedly raised more than $24 million in an initial coin offering by selling POWR tokens using an Ethereum-based technology.

Such offerings also have the potential to raise funds for constructing power plants, as an alternative to traditional debt or equity capital, by allowing developers to sell tokens representing kWh units of future energy.

These tokenized rights to the power produced are sold at a discounted rate to the market price, much like a forward power purchase agreement. This approach was pioneered by WePower, a green energy trading platform and independent energy supplier. Customers holding tokens acquire rights to discounted electricity generation or can trade these rights.

Blockchain will also make small grids more commercially viable, allowing "prosumers" — that is a person who both produces and consumes a product such as electricity — to sell excess energy to other households. An example is the Brooklyn, New York micro-grid project designed by LO3 Energy that lets households trade excess solar power directly.

Blockchain can help manage over- or under-supply of energy at peak times. It can record and regulate metering systems,

networks, generation facilities and demand-side response. Reporting of positions to system operators by balancing market participants could be fully automated, and smart contracts could be used to execute efficient transactions needed to balance supply and demand.

For instance, in November 2016, TenneT announced that in Germany it was running the first European blockchain-controlled power stabilization scheme, in a partnership with battery supplier Sonnen, using IBM's blockchain software. To balance the system, instead of dispatching power plants, TenneT draws the required electricity from Sonnen's customer home storage systems. Blockchain can support this technical solution by tracking the movement of excess energy and helping to manage bottlenecks.

In areas with less developed electricity networks, blockchain and smart contracts can facilitate access to electricity by making it easier for micro-grids to function and by coordinating trading and operations among small generators, diesel back-up, battery storage units and smart appliances in order to provide security of supply.

Blockchain can make metering more accurate and facilitate switching among energy suppliers. For instance, Electron is working on a proof-of-concept platform populated with simulated data from 53 million metering points and 60 energy suppliers to represent the UK market. Scale-out tests have shown it capable of executing switches over 30 times faster than is possible currently.

It may also reduce the operational hurdles to collecting and analyzing corporate energy usage data across multiple facilities in different countries. This will help identify potential savings.

Blockchain can also create real-time payment systems. For example, in South Africa, Bankymoon has launched an application for pre-payment meter top-up using Bitcoin.

Legal and Regulatory Issues

The energy industry is highly regulated. Regulation will have to evolve to deal with the many uses of blockchain. Issues crop up in the following areas.

In the United States, although many entities still provide bundled services, federal regulations restrict the ability of internal business units engaged in energy delivery, on the one hand, and in production and supply, on the other hand, from sharing non-public, operational information. This is a matter of competition law.

A license is required to supply retail / *continued page 34*

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belonging to the tribe. The court said gravel is no longer "real property" after it has been removed from the ground.

American Indians have been considered US citizens since 1924. The tribes are still considered sovereign nations.

The US tax code says that "every individual" is taxed on "all income from whatever source derived" unless the income is specially excluded. Indians are subject to US income taxes like everyone else, the court said.

Treaties with Indian tribes are interpreted liberally by the US courts. Courts try to guess at what the tribe understood was the agreement when it signed the treaty.

Ms. Perkins had paid taxes on her gravel sales in 2010 and sued earlier in the federal district court in New York for a refund. The government moved to dismiss that case in 2017. The district court declined to do so, finding that she may be exempted from US income taxes under both treaties.

The district court said taxing gravel arguably interferes with "the free use and enjoyment" of the Seneca land as the phrase is used in the 1794 treaty, and the 1842 treaty protects Seneca Indian land from all taxes. It said there is no reason to believe the Senecas understood, when signing the treaty, that one rule applies to the dirt, gravel and foliage and another to the land itself.

The Tax Court said the district court's holding was limited to 2010 and not to 2008 and 2009, the two years at issue in the case before the Tax Court.

The Tax Court case is *Alice and Frederick Perkins v. Commissioner.* The case was called *Perkins v. US* in the district court. The district court issued its decision in August 2017.

SOME REFINED COAL transactions will remain audit targets after a new IRS field directive was made public in mid-March.

The US government offers tax credits of $6.909 a ton as an / *continued page 35*

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customers in many jurisdictions, which makes peer-to-peer supply difficult.

Gas and electricity must be physically delivered. Transmission and distribution network returns are generally regulated, permitting recovery of capital infrastructure costs from customers over the asset life via rate structures. Where customers choose to go "off-grid" and to use independent energy supply regimes such as micro-grids, the network owner faces a shrinking rate base, meaning higher costs per remaining connected customer.

Collaboration with regulators will be important for those developing blockchain platforms.

Another issue will be how legal relations between participants will be recorded and managed. One approach may be to put in place a participation agreement to be entered into on behalf of each participant. The participation agreement would act as a governance framework for the platform setting out, for example, the agreement as to access and administration of the platform, allocation of validation permissions, how regulatory compliance is assured and how liability is apportioned among participants.

Consumer protection will also loom large in transactions with the general public. The current energy regulatory framework is based on a clear delineation of roles within the system (for example, supplier, customer, transmission owner). However, in the medium to long term, this framework will have to be adjusted to accommodate changes to generation and consumption brought about by the convergence of distributed energy, energy storage, electric vehicles, smart appliances and distributed transaction models. The market will require a policy framework that is flexible enough to support innovation while providing consumer protection.

Where blockchain is used in a regulated activity, then it is possible that entities using it could require authorization to do so. Financial regulatory authorities are taking a close interest in blockchain and crypto-currencies; in particular there is likely to be increased scrutiny of the initial coin offering market.

Privacy-related issues must be also considered. The sharing of information passed through the blockchain will need to comply with local data-protection rules.

There are a number of intellectual property rights associated with blockchain. Blockchain has an "open source" core upon which a bespoke application may be built. It also contains data in the form of a database of "messages" or transactions. Businesses developing the technology will want to take steps to entrench value via the protection of intellectual property rights in it and to ensure that what they are developing does not infringe another's intellectual property rights. Similarly, businesses that license the technology will need to undertake due diligence to ensure that they have the rights they need and protection for their use if it infringes another's intellectual property rights.

Information can be included in a distributed ledger that is false, whether through mechanical error, human manipulation or through cyber intrusion. Due to the immutability of blockchain (as it stands at the moment), such errors can become locked into the chain. A methodology for error adjustment will have to be incorporated into the framework.

Energy Usage

Crypto-currencies, like bitcoin, require high levels of processing power for mining. The International Energy Agency estimated in 2017 that the electricity usage by bitcoin data miners may currently be on the order of 0.25% of global electricity use.

Blockchain uses a consensus protocol, agreed among the participants and provided for by the rules of the relevant distributed ledger to facilitate agreement on data among the relevant parties. The consensus protocol may take the form of a "proof-of-work" mechanism, a "proof-of-stake" mechanism, an administrator or a determined sub-group, depending on how a distributed ledger is designed and its proposed functionality.

Bitcoin and many other crypto-currencies use a proof-of-work consensus, which creates high electricity demand by requiring computing power to solve mathematical problems to prove the integrity of the information contained on the ledger.

By contrast, permissioned or closed systems, where transactions are taking place between parties with existing legal relationships, may adopt consensus protocols requiring lower energy usage.

The energy usage associated with blockchain is an important consideration to be factored into the design and implementation in any sector.

Anatomy of an ICO

by Andrew Lom, Rita Astoor and Rachael Browndorf, in New York

A growing number of companies are turning to initial coin offerings — called ICOs — as an innovative way to raise capital.

In a typical ICO, a company sells digital coins or tokens to participants for a purchase price that can be paid in such currencies as US dollars or euros or in a cryptocurrency, such as bitcoin or ether.

Once issued, the tokens exist on a blockchain maintained by a network of participants and computers. These tokens can serve a variety of functions depending on the company's business model. For example, tokens may grant access to services on a blockchain platform the company has set up — for example, to trade electricity — maintain governance rights over the platform, serve as their own tailored cryptocurrency for conducting transactions on the platform, or some or all of the above.

To function properly, most blockchain business platforms need a large number of widely-distributed token holders. In addition to raising money, an ICO can facilitate that wide distribution.

Whatever the design intent of a platform and token system, in many cases the tokens do not exist yet at the time of the ICO. Instead, the money raised is intended to fund development of the platform.

Delivery of the tokens to the ICO participants is expected at some future date, contingent on actual, successful development of the platform.

This payment with hopes of future development and delivery of tokens and other practical uncertainties and risks involved with blockchains and token systems leads to further uncertainty as to how tokens are treated for regulatory purposes.

While a lot of attention has been paid to whether tokens are securities under US federal and state securities laws, tokens can also look like, or be treated like, commodities, gift cards or other regulated assets. An analysis of what a token is then informs the offering and sale process for that token.

This analysis also has implications for how the token is used and exchanged by token holders and participants in secondary markets.

Token = Security?

When thinking about "securities," most people envision stocks, bonds, mutual funds, ETFs and similar investments.

The US Securities Act of 1933 does / *continued page 36*

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inducement to companies to turn raw coal into "refined coal" that is less polluting. Nitrogen oxide emissions must be at least 20% lower, and mercury or sulfur dioxide emissions must be at least 40% lower, than emissions from burning raw coal.

The equipment for making refined coal had to be in service by December 2011. Tax credits can be claimed for 10 years on the output from such equipment. Only refined coal sold to third parties qualifies for tax credits.

Several developers put refined coal equipment in service before the deadline with the aim of deploying the equipment at coal-fired utility power plants. Utilities must usually be paid to take the product. Thus, the refined coal operations lose money and would be uneconomic without the tax credits. The developers have too little tax capacity to use the tax credits. They enter into various forms of transactions to get value for them.

The transactions take several forms. The most common is for the developer to bring in the tax equity investor as a partner to own a refined coal facility through a partnership. In other tax equity deals, the refined coal facility is leased or sold outright to the tax equity investor. In all three cases, the developer remains the contract operator of the facility. It is also the managing partner in transactions structured as partnerships.

In March 2016, the IRS released a heavily redacted internal memo suggesting that it was moving to disallow tax credits in a partnership transaction on grounds that the tax equity investor retained too little risk of the refined coal business to be considered a real partner. (For more details, see "Refined Coal" in the April 2016 *NewsWire*.)

A different partnership transaction ended up in front of the IRS chief counsel in Washington for a good part of 2016. Tax credits in that deal were ultimately disallowed in a "technical advice memorandum," or memo issued by the IRS national / *continued page 37*

ICOs

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not include "tokens" or "coins" or virtual or crypto-currencies in its litany of regulated securities.

However, the litany finishes with the term "investment contract," which acts as a catch-all to cover any other asset that behaves and feels like a security. In the seminal case of SEC v. Howey, the US Supreme Court explained what it considers an investment contract using a four-part test.

Under the Howey test, an investment contract is (i) an investment of money (ii) in a common enterprise (iii) with an expectation of profits (iv) from the efforts of others. If an asset satisfies all four parts, then it is a security.

Determining whether an asset is an investment contract under Howey requires a factually intensive analysis, encompassing both the underlying characteristics of the asset, as well as the circumstances surrounding how it is generated, marketed and sold. When applied to tokens, the Howey analysis considers both the design and issuance of tokens, as well as how the token functions within its specific platform or blockchain. While each token is different, they all have certain similarities.

An "investment of money" is interpreted broadly to include cash, goods, services, sweat equity, promissory notes or anything else that could lead to a potential for economic loss to the purchaser. Along these lines, two US courts have determined that bitcoin is a form of "money," with one court holding that payment using bitcoin is an "investment of money" for the purposes of Howey.

A "common enterprise" arises when there are certain ties between the seller of the asset and its buyers, or among the buyers themselves. In an ICO context, the buyers typically rely on a core team of software developers to design the blockchain platform and create the initial block of tokens. Then, once the tokens are issued, holders are usually involved in the governance of the token system through certain consensus rights attached to the tokens and, in some cases, the core team of software developers maintains the power to upgrade and steward the use of the system. On an initial and ongoing basis, token holders are tied either to each other or the software team or both, thus creating a common enterprise.

An "expectation of profits" encompasses many different forms of financial benefit, such as additional tokens accumulated through participation in a system, or returns from the sale of tokens at appreciated values on an external trading platform. Some courts also extend this part of the Howey test to include a risk of loss.

One example is a golf club membership. Generally, golf club memberships are not refundable and cannot be transferred or sold at a profit, and thus are not considered securities. However, if a person buys a membership in a golf club that has not yet been built, and the proceeds are used for development of the golf course itself, then there is a risk that the golf course may never be finished or playable. Therefore, the potential loss of money invested and loss of opportunity to use the course makes that membership a security. This is particularly relevant for tokens, when the ICO proceeds are used to finance the development of the tokens in the first place, and then the tokens may not be available for use by participants for several months, if ever.

"Efforts of others" can include, for example, someone else building a factory, designing a product or selecting an investment portfolio. Again, because many ICOs involve tokens that have not yet been built, it is not hard to see that, at least at the initial stages, the success of the ICO depends on the efforts of the token's development team. Then, on an ongoing basis, even if individual token holders participate in governance or other aspects of the token system, success and potential profits come from the efforts of many people, not just token holders acting individually.

If a token is a security, then the US Securities and Exchange Commission or one or more state securities regulators will have jurisdiction to regulate the offer and sale of that token. In particular, as the SEC continues to remind token issuers, a security token must be registered under the Securities Act if its ICO is open to the public.

However, not all tokens fit all four parts of the Howey test. Moreover, a token to an unbuilt platform, or a contract to purchase such a token, may be a security during the ICO phase, but that same token may not be a security once built and fully functional in the hands of its end users.

If a token is not a security, then the question becomes whether it fits into any other category of regulated asset.

Token = Commodity?

A whole host of assets are bought and sold with fluctuating values that may lead to speculative profits or losses, but these assets are not always securities. Many of these assets, such as consumer goods and physical coins, are commodities.

Most tokens are intended to be used as consumer goods or in place of physical coins or other money. Examples include tokens that represent a physical asset or product, such as gold, tokens that can be used to purchase concert tickets in a trusted environment with no transaction or processing fees, and tokens that can be used for buying and selling media online.

These kinds of tokens generally look like commodities, and especially so after the blockchain platform has been built by the development team and tokens have been issued to ICO participants who can use them in a fully functional way to serve the intended purpose of the token design.

In 2015, the Commodity Futures Trading Commission determined that bitcoin and other virtual currencies are "properly defined as commodities" for the purposes of the US Commodity Exchange Act of 1936.

The CFTC's regulatory jurisdiction covers derivatives transactions on "all services, rights, and interests in which contracts for future delivery are presently or in the future dealt in."

While this includes commodity futures contracts, options on futures and swaps, it generally excludes spot (near immediate physical delivery) contracts and forward (deferred physical delivery) transactions. Nevertheless, the CFTC does have anti-fraud jurisdiction over commodity spot and forward markets.

Generally speaking, a futures contract is "an agreement to purchase or sell a commodity for delivery in the future (i) at a price that is determined at initiation of the contract, (ii) that obligates each party to the contract to fulfill the contract at the specified price, (iii) that is used to assume or shift price risk, and (iv) that may be satisfied by delivery or offset."

While tokens may be commodities in the consumer sense, they usually are not structured in a futures format, although it is possible to have a separate regulated futures contract on a token, as discussed below. Also, while many ICOs involve a price determined and paid at the outset for delivery later at no additional cost, that delivery usually cannot be satisfied by a cash or other offset.

Other Possible Labels

What else might a token be? Labels have consequences.

Some tokens are seen as a store of value that can be used within a specific blockchain platform or that can be exchanged across different systems. Bitcoin is one example of a general-purpose store of value that can be exchanged with relatively little difficulty into and out of fiat currencies like US dollars and euros.

If a token has a more limited purpose / *continued page 38*

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office to settle a dispute between a taxpayer and an IRS agent in the field. The technical advice memorandum was sent to the taxpayer in early February 2017.

The transaction addressed in the technical advice memorandum was aggressively structured. There were two tax equity investors in a single partnership with the developer. Each paid a small amount to the developer up front for an interest in the facility, but most of the investment was supposed to be in the form of ongoing capital contributions over time to the partnership so that it could pay royalties to the developer for use of the chemical formula for treating the raw coal. The royalties were tied to the amount of tax credits the investors were allocated. The IRS said the investors "invested only in tax benefits, and had no meaningful expectation of risks or rewards" from the underlying business. (For more details, see "Refined Coal Transaction Nixed" in the April 2017 *NewsWire*.)

The tax equity market for refined coal transactions largely froze while awaiting a decision in the audit case by the IRS chief counsel.

After the technical advice memorandum was released, concern spread among developers with existing deals that were structured largely as "pay-go" transactions where the amount invested was contingent on tax credits. A group representing such developers submitted a list of principles for evaluating refined coal transactions that it urged the chief counsel to issue as a "field directive" to IRS agents handling refined coal audits.

The IRS associate chief counsel who oversees refined coal credits finally sent a memo to the field on February 28. A copy was released to the public in mid-March as AM2018-002.

It did not do what the group hoped.

The memo describes an ideal "base case" that it says works where a developer and investor enter into a / *continued page 39*

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on a closed system, to the extent that money is used to buy the token and the token can only be used to buy goods or services on its particular closed system, then that token could be similar to a gift card. Nearly every state has at least some level of regulation applicable to gift cards.

Other tokens provide access to, and can serve as payment methods on, virtual worlds or game systems. To the extent that the value of these tokens depend on outcomes of events in the virtual world or game, the tokens may be viewed as a gambling device. Again, nearly every state has at least some level of regulation applicable to gambling.

Blockchain energy companies are raising 75% of their development capital through "initial coin offerings."

As new use cases for tokens are developed, those tokens may also fall into other regulated categories.

Regardless of whether tokens are securities or commodities or something else, any marketing and advertising of tokens or ICOs must still comply with US consumer protection laws.

The Federal Trade Commission is tasked with protecting consumers by preventing deceptive and unfair acts or practices. In a sales process, this includes any representation, omission or practice if it is likely to mislead consumers and affect their behavior or decisions about the product or service. Many states have similar consumer protection laws and agencies. These laws and agency jurisdiction cover not only the ICO process, but also continued use and exchange of tokens.

The FTC has received hundreds of complaints relating to bitcoin and other virtual currencies, most commonly involving consumer claims against online merchants that failed to deliver products on time, if at all. In FTC v. BF Labs, Inc., a federal court upheld the FTC's final order against Butterfly Labs, a company that the FTC argued had deceptively marketed bitcoin mining machines and unfairly kept consumers' up-front payments despite its failure to deliver the machines. According to the FTC, Butterfly Labs deceived consumers regarding the "availability, profitability, and newness of machines" it had designed to mine bitcoin.

In addition to ordering payment of a monetary fine, the final order prohibited the company from taking up-front payments for any product not available to be delivered to a purchaser within 30 days of payment, and required the company to provide consumers with "prompt refunds" for any damaged or defective product.

Along these lines, when a company is using an ICO to fund the development of its platform and token, the company must make it explicitly clear to ICO purchasers that the tokens will only be issued if the platform is eventually built, and that there is some risk that the platform will not actually be built.

Token Trading

The value of many tokens is based on their expected use and exchange.

After an ICO, the regulatory requirements, liabilities and usage risks of tokens can fall in various ways on the original ICO sponsors (the software team), the consumers who use the tokens, any investors in and re-sellers of tokens in trading markets, and any exchanges or platforms on which the tokens are used or traded.

If a token is a security, it cannot be offered or sold to the public, by the issuer or on the secondary market, except pursuant to a registration statement or exemption from registration. Any intermediary through which security tokens are traded must be a registered broker-dealer, regulated exchange or similar entity. In some cases, under Rule 144 of the Securities Act, an unregistered token may be able to be resold to the public after a minimum holding period and without registration, but broker-dealer and exchange regulations would still apply. Moreover, tokens that are not registered under the Securities Act may be subject to "blue sky" securities regulations in multiple states.

If a token will be registered, the issuer must file a registration statement using Form S-1, which is subject to SEC review, before

any tokens can be sold. The Form S-1 requires, among other things, a prospectus describing the issuer's business and the securities being offered, financial information about the issuer, and certain disclosures regarding executive officers and key employees. Because tokens do not represent equity or debt in a business, it is difficult to imagine how some of these topics can be addressed sufficiently in a token context.

There is currently no token that has been approved by the SEC for public sale.

If a token is not a security, then there may be more freedom to trade it, especially in the commodity spot context, but such trading is still subject to potential regulation or enforcement actions by the CFTC, the FTC, state regulators and other agencies. Then, if the token is traded in a futures or options format, like CME Group or CBOE futures on bitcoin, additional rules will apply under the Commodity Exchange Act.

However, the Financial Crimes Enforcement Network, or FinCEN, asserts its jurisdiction over any issuer or exchange that sells "convertible virtual currency, including in the form of ICO coins or tokens, in exchange for another type of value that substitutes for currency." Under the US Bank Secrecy Act of 1970, any such issuer or exchange is a money transmitter that must be registered with FinCEN and must comply with certain anti-money laundering and know-your-customer obligations.

Enter the SAFT

Assuming, as is the case in a typical ICO, that the money raised will be used to build the blockchain platform, it is very likely that the ICO is selling a security, at least until the tokens have been built.

In this context, rather than issue a token for an unbuilt platform as a security and then convert it into a, hopefully, non-security later, the instrument purchased in the ICO is typically a "Simple Agreement for Future Tokens," or SAFT.

A SAFT is a contract in which payment is made today for delivery of tokens at some future date.

This contract was modeled off of the "Simple Agreement for Future Equity," or SAFE, but has developed in its own direction and is not merely a SAFE for tokens. This contract does not have to be called a SAFT to be subject to the securities law and other considerations discussed below.

In form, the SAFT has many features in common with a stock purchase agreement or subscription agreement, including representations and warranties of the purchaser and disclaimers by the issuer.

Perhaps the most important feature */ continued page 40*

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joint venture to own the "technology" and multiple refined coal facilities.

It then analyzes a "common case" that it says has developed in the refined coal market where a partnership of a developer and an investor own a single facility and contract with a utility effectively to pay it to take refined coal at a loss to the partnership, with all the arrangements running just for the tax-credit period.

The memo encourages the IRS field to look closely at such deals.

It says the tax equity investor may not be a real partner, it may be a bare purchaser of tax credits, or the transaction may lack substance beyond a pure tax play.

The common thread in all three lines of attack, the IRS said, is the tax equity investor is too insulated from the risks of the underlying business and has no "substantial exposure to variability of economic returns."

The memo lists factors that it says suggest the investor faces an acceptable level of entrepreneurial risk and reward.

First, the investor must make a upfront investment of at least 20% of its "total capital investment" and more than 50% of its total investment should be fixed in amount and non-refundable. Its total investment for this purpose does not include ongoing capital contributions to cover operating costs, but does include royalty payments that are tied to the refined coal produced.

Second, the investor should be exposed under the various contracts to changes in circumstances. For example, the investor's return to should change in response to changes in operating costs. If the technology improves, the investor should be able to benefit from the changes. It helps if the utility contracts let the investor revisit the refined coal price if there is a change, for example in environmental regulations, that makes the product more valuable.

Third, the investor should take steps to try to minimize operating costs.

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is the risk that the platform and tokens may never be built, or may not function as originally intended.

Moreover, a typical SAFT does not obligate the seller to refund any part of the purchase price if, after appropriate efforts, the development team is not able to create the tokens.

A SAFT is generally understood to be a security under Howey because it is an investment of money alongside other investors in a blockchain project that is to be developed by a separate team of software engineers and that has a risk of loss and an expectation of gain. A SAFT may also be a forward contract on the tokens because it is a payment now for delivery later. However, a SAFT is unlikely to be a futures contract because it can be settled only by physical delivery of the tokens, not by a cash or other offset.

When tokens are delivered under a SAFT, the regulatory status of the tokens themselves must be assessed separately, along the lines discussed above.

In addition to the SAFT, the ICO documentation package includes a white paper and a disclosure document. Among other things, the white paper discusses in more technical terms how the platform will work and what the tokens will do. The disclosure document looks like a prospectus or private placement memorandum and includes risk factors and various other pieces of information that would not necessarily be in the white paper. A key risk factor is the future regulatory treatment of the tokens. While the hope of many ICOs is that the tokens will be relatively liquid commodities and not securities once issued (perhaps a year in the future), it is entirely possible that tokens could be unregistered securities subject to substantial restrictions on transfer.

The ICO Process

Because a SAFT is a security, it must be sold in the US pursuant to a registration with the SEC or pursuant to an exemption from registration.

As registration is for the time being impractical, for the same reasons that registration of tokens is impractical, a private offering under Regulation D of the Securities Act is used as the typical registration exemption for an ICO. The most relevant exemptions under Regulation D are Rule 506(b) and Rule 506(c), both of which relate in principal part to sales only to "accredited investors" and can be in unlimited dollar amounts.

Rule 506(b) requires a true private offering and prohibits any kind of general solicitation or advertising. The SEC has explicitly stated that the use of an "unrestricted, publicly available" website is a general solicitation if the website contains an offer of securities. Given the internet-based nature of ICOs and the need to have a widely distributed token base that may not be accessible through private channels, such a website is often unavoidable, making Rule 506(b) impractical for an ICO. However, if general solicitation and advertising can be avoided, the advantage of Rule 506(b) is that each purchaser can self-certify in the SAFT that the purchaser is an accredited investor, and the issuer can generally rely on such self-certifications.

Under Rule 506(c), any amount of public solicitation and advertising is allowed, which can be a very powerful tool in an ICO context, but the issuer must take reasonable steps to verify that all investors are accredited. Relying on a purchaser representation in the SAFT would not be sufficient. While verification had been seen as an onerous process, because certain third parties, such as a purchaser's accountant, are allowed to provide the verification, it is becoming more and more mainstream.

Whether a SAFT is sold under Rule 506(b) or Rule 506(c), the issuer must file a Form D with the SEC. The issuer must also

Regulatory issues make such offerings more challenging in the US than in other capital markets.

comply with certain "bad actor" disqualification rules under Regulation D.

If the ICO issuer is not in the US, then Regulation S of the Securities Act allows the issuer to conduct a public offering outside the US concurrently with an offering in the US under Regulation D.

The main requirement is that the offering activities outside the US are not directed back into the US and do not constitute general solicitation or advertising in the US. For the same reasons that a Rule 506(b) ICO may not be practical, an ICO that relies on Regulation S outside the US may not be practical unless the Regulation D offering in the US follows the requirements of Rule 506(c).

While many ICO issuers hope for a vibrant and public secondary market to develop for their tokens, because securities sold under Regulation D and Regulation S are restricted securities under Rule 144 of the Securities Act, the SAFT will often include contractual restrictions on transfer. This means that no secondary market is likely to develop until after the blockchain platform has been built and the tokens issued, and only if the tokens can be traded without violating the Securities Act, the Commodities Exchange Act or any other applicable regulations.

Crowdfunding

Apart from offering a SAFT under Rule 506(c) and Regulation S, it may be possible to conduct an ICO as a form of crowdfunding under Regulation Crowdfunding or Regulation A+ of the Securities Act. (For more on crowdfunding, see "Crowdfunding: Good Way to Raise Capital?" in the February 2015 *NewsWire*.)

While both of these regulations would allow more immediate trading of SAFTs and security tokens, they would also require disclosures and SEC filings that are not unlike what is required in a traditional registration statement. Thus, just as registering with the SEC using Form S-1 is not always practical in the token context, using either of these regulations is likely to raise several issues as well. ◎

The memo also lists bad factors.

One is that the tax benefits are guaranteed to the investor. The tax equity investor should not be able to get its investment back if the tax credits are disallowed.

The memo ends with an example of a partnership transaction that it concludes works.

In the example, the investor contributes 50% of its total investment up front and another 25% as a fixed amount within two years. The remaining 25% is contingent on meeting production and sales targets. The utility is paid to take the product. The contracts run for the tax credit period, which, in the example, is the full 10 years. In theory, the price can be reset if the parties agree to extend the deal. However, the partnership will liquidate after the tax credits run, and the assets will be distributed according to capital account balances. The technology is licensed from a third party rather than from the developer. Royalties are paid under the technology license that are a per-ton amount of refined coal produced.

There appear to be conflicting views within the IRS national office about these deals. Much of the memo has a tough tone. However, someone wanted to end on a positive note. The large upfront investment and payment of another 25% within two years (in a 10-year deal) appear to have been enough to swing to a positive conclusion.

PUTTING A CONSERVATION EASEMENT on a project site did not lead to a tax deduction.

A partnership bought 1,280 acres of land 15 miles east of Raleigh, North Carolina with the aim of zoning the area for a planned community of mixed residential and commercial property and a school, subdividing into lots, and then selling the lots to developers.

It negotiated a sale of 125 acres that were part of the tract to the county for use as a park.

A condition for the sale was the partnership

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The Engine That Drives Storage: Software

Software is the brain that makes a storage system work. It optimizes use of a battery that is supposed to serve multiple functions, weighing the potential revenue from competing uses against the potential wear on the battery. If it does not work, the battery performs sub-optimally or does not work at all. Bankers are starting to focus on the software as part of their diligence.

A group of software experts talked about warranties, bankability and other issues around software at an Infocast storage conference in San Francisco in early March. The panelists are Jennifer Worrall, CEO and co-founder of software company Iteros, Ryan Wartena, president and co-founder of software company Geli, Pedro Elizondo, manager of energy storage business development at NEXTracker, and Michael Atkinson, vice president of sales and business development at Doosan Gridtech. The moderator is Deanne Barrow with Norton Rose Fulbright in Washington.

Market Data

MS. BARROW: Let's begin by setting the scene. Jennifer Worrall, you have some figures on the current size of the market for energy storage software and how the market size is expected to explode in the near term.

MS. WORRALL: Based on research done by Navigant and our own analysis, between 7% and 8% of project costs today, and maybe 5% and 6% in years to come, will be the software costs that go with a storage project. That translates into a $2.9 billion market today for energy management software in general, growing to about $8 billion in upcoming years. The energy software component of storage looks like a $400 to 500 million market this year, growing to $3 billion in the next five or six years.

MS. BARROW: Does anyone have a different view?

MR. WARTENA: The other side of the equation is battery prices are falling. So guess what? Our software costs — the 7% to 8% of system cost — need to be falling as well. Software is a big market, but it is also a competitive one.

MR. ATKINSON: Utility-scale software is a growing market. More utilities are putting in storage that they own. They need more flexibility in how they can operate their systems. Storage software also starts blending into how they manage distributed energy resources on their systems as well, which takes the potential market for storage software from hundreds of millions to many hundreds of millions to possibly a $1 billion market, purely from a utility perspective.

MR. WARTENA: When smart grid was big, Cisco suggested that 10% of the smart grid was going to be software. I remember buying my first Gateway computer. It was a $3,000 computer, and I had to buy a $300 operating system for it. That was 10% of the cost.

To do what we need to do over the next 20 to 30 years is equivalent to about an $80 trillion investment if we want to see global electricity supply move to 100% renewables. If software is 10% of an $80 trillion investment over the next 20 or 30 years, that is still a really good business.

MS. BARROW: Not only is it a really good business, but also software is often called the secret sauce of successful storage projects. I have a feeling the sauce has a slightly different flavor for each of you. So let's go across the panel and hear why you think software is vital to the storage industry and what you perceive to be the problems that software is solving today.

MR. ATKINSON: Storage is the secret sauce. Without it, you have a lot of bricks, a bunch of lithium, now ions, and they do not really do anything.

Storage itself is the most flexible asset that the electrical industry has ever seen, and the ability to use it productively depends on the software being able to pull together lots of different inputs.

It is reading in weather data to do forecasting. It is reading in the deregulated markets data to do pricing. It is optimizing batteries from both a physics and an economics perspective. The operating case and use cases are getting more complicated.

You have to make sure you model the operating and use cases properly ahead of time with an eye to an optimal solution and then, after the fact, you must be able to track what actually happened. Are they within the parameters you set?

Software is managing all of the disparate pieces of the system and sending operating data to other software programs and into utility control rooms. It is everywhere within a storage system.

MR. WARTENA: Now that we have systems that pencil out financially, it is starting gates open.

The flavor of our Geli sauce is called Geli Rapid Energy. It covers the full life cycle of a process from the front-end design to helping with financials to make sure they are accurate, to automating contracts. It is a holistic system.

Bankers are starting to focus on software as part of their diligence when financing storage projects.

Our goal is to reduce the design, construction and development time. We are starting at the beginning. This is a hard industry. It only takes a couple weeks to build, but development time was 18 months.

MS. BARROW: Pedro Elizondo, how does NEXTracker fit in?

MR. ELIZONDO: We build hardware. We build containers for batteries, lithium ion mainly. In order to be able to comply with the performance warranties, we need data. Data allows us to take decisions relating to the infrastructure we provide for the batteries. Data allows us to optimize battery performance and do preventive maintenance on the most significant equipment for the battery life, which is the H-pack. Batteries are great, but no H-pack, no batteries. Data is needed to prevent issues, prolong battery life and comply with the battery performance warranties.

MS. WORRALL: In order to fit into this rapidly changing landscape, you must have a software layer. Otherwise, your equipment is just a pile of cells over there in a corner.

Software is necessary to connect to different devices and to be able to take in the different inputs. For example, what happens if a rate plan changes for a behind-the-meter customer? What if there is a new market program that will allow you to continue to work within your warranty specifications and is a better use case for that particular battery?

Software enables equipment manufacturers to focus on what they do best, while leaving the core competency to a software provider to understand policies and what is the best economic use case at any given time. It provides the data for engineers who need to be able to understand how their products are working. It makes adjustments in real time when outside parameters, like rates, change.

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had to place a conservation easement on the land so that it could not be used for any purpose other than as a park. The partnership did so by granting a conservation easement in favor of the Smokey Mountain National Land Trust and then transferring ownership of the land to the county.

The partnership took a charitable contribution deduction of $1,798,000 that it said was the value of the conservation easement.

The IRS disallowed the deduction, and the US Tax Court agreed. The court said a charitable contribution deduction cannot be claimed where the taxpayer expects a substantial benefit from the contribution. In this case, the partnership benefited because turning part of the land into a park helped enhance the value of the rest of the property as a planned community.

The court also said even if a deduction were allowed, the fair market value of the conservation easement was zero. It said the value is the difference between the land saddled with the easement and the value without any restriction on use. Since the highest and best use of the 125 acres was as a park in the midst of a planned community, the court said, there was no difference in value between the land with or without the restrictive easement.

The court released its decision in early April. The case is *Wendell Falls Development, LLC v. Commissioner.*

THE MASSACHUSETTS ATTORNEY GENERAL wants the state to bar third parties from supplying retail electricity to residential customers.

The recommendation was in reaction to a report by her office in late March that found such customers paid $176.8 million more for electricity during the period July 2015 through June 2017 than if they had remained with the local utility.

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Optimizing Usage

MS. BARROW: Let's delve into how software optimizes performance when there are different parameters and sometimes competing priorities for the use of a storage system. If you have a behind-the-meter system that is installed on a customer's site partly to reduce demand charges, and excess capacity is being sold to the utility, how does software optimize dispatch in that situation?

MS. WORRALL: We organize each of those use cases, whether it is demand charge, energy arbitrage or market participation, into small pieces that we call orchestrations. We then create a customizable value stack that prioritizes those particular use cases based on how we think the economics should look.

We have an intelligent engine that does a simulation at the front end of a project to assist with financials and help our equipment manufacturers decide which projects are worth pursuing. We use the same engine on a daily basis to determine the right way to operate that device. We are always looking for the most economic way to operate.

Some of it will be rule based. In a must-offer system, capacity must be released at particular times. If the software is handling demand-charge management versus energy arbitrage, it must weigh the economics of both. It must evaluate both, which one will make the customer money and also whether the amount of money is worth the wear and tear on the battery.

If you are stacking energy arbitrage on top of peak reduction, but you only have a little sliver of battery to use for energy arbitrage, then the software must evaluate whether the arbitrage is worth the wear on the battery.

MR. ATKINSON: We build operating modes in much the same way. From a utility standpoint, storage systems must be able to run either autonomously or be able in real time to be shifted to whatever rapidly-developing situation the utility is seeing.

This involves reading in load-flow data and prioritizing at all points between economics and physics. It is done to decide the most productive way to use the system as a whole, or the circuit that it is on, by working through the potential use cases.

The use cases are prioritized. VAR support and frequency regulation are priorities one and two. Voltage support and demand-charge management are further down the line. The software cycles through those cases, and the use can be changed in real time. The software looks at weather forecasting and what is happening with the solar on the system. It also looks at market pricing and what are the wholesale market prices or market signals in non-market areas. It adapts in real time to these variables.

MS. BARROW: Ryan Wartena, Geli backs up its ability to optimize with a performance guarantee on demand-charge management. Can you tell us more about that?

MR. WARTENA: It is an industry first. It is an analytical insurance around demand-charge management. We model out demand-charge management performance for a specific system at a specific site, and we provide a guaranty around that, and we put our software maintenance fees up as collateral.

There is shared upside because we know we are constantly improving our algorithms.

We are going through a bankability study right now with Wells Fargo and DNV GL on how demand-charge management affects battery degradation. How the battery degrades affects how much demand-charge management you can do.

We have an online design tool called Geli ESyst and, within five or 10 minutes, you could have a solar storage system designed. We give you a performance guarantee.

MS. BARROW: Do you guarantee a specific dollar amount of savings in demand-charge reductions?

MR. WARTENA: It is in kilowatts. Tariff risk and

The goal in storage is to stack as many revenue streams as possible.

load-change risk is often put on the customer. The contracts give us the right to recalculate if load or tariffs change. Everyone walks into this knowing that tariffs may change.

MR. ELIZONDO: Demand management is a good example of a software application. From the hardware perspective, the batteries are capable of injecting the necessary power to reduce the maximum demand, but the key question is the time when this is done. Maximum demand is being measured every 15 minutes.

The key issue is how to inject the power at a precise time to avoid the charge. That is the part that software adds to the hardware.

MR. WARTENA: It is a hard question. I tell my team once we get to X%, we are getting out of the energy storage game and we are going to the stock market.

Predicting valleys and peaks is forecasting load.

Putting solar into the mix adds another level of difficulty because solar drops in and out, so you have to forecast both solar and load. We have a model predictive control loop which we can stack. Each site can optimize itself, and they can work like gears with an upper-level optimizer also. Each is solving its own equations, each is modeling, each is optimizing, and we move between multiple optimization algorithms, from convex algorithms to random-forest approaches, to standard last-day approaches.

Going through that loop constantly is how we manage multiple value streams. That is how we focus on the value at that site, and we can also decouple value at the site versus value for the grid. We can co-optimize where the site and grid have different owners.

MS. BARROW: This is big data analytics and machine learning.

If a solar project is supposed to qualify for an SGIP payment or the investment tax credit, then you have to control the source of charging. I bet that adds another layer of complexity. Does software control all of that?

MR. WARTENA: Absolutely. When you have a good model predictive control loop, it can solve for multiple constraints. We weigh all the constraints by assigning dollar values. If you want something to happen, make it really valuable. That is how we do it.

Warranties

MR. ATKINSON: It is important to track usage both in real time and for history. In eight years, when suddenly an issue comes up with the batteries, or you have a / *continued page 46*

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Nearly 500,000 customers in Massachusetts buy electricity from third-party suppliers. Of that number, 37% have low incomes.

More than 700 complaints have been lodged against competitive suppliers with the attorney general in last three years. The report found that low-income customers paid $231 more a year on average for electricity than if they had remained with the local utility. In some cases, the amounts were as high as $541.

New York has a moratorium in place against energy service companies signing up subsidized low-income customers until the companies consent to state supervised audits.

BRIBERY INVESTIGATIONS were underway at year end 2017 in 82 countries, according to the latest "Global Enforcement Report 2017" released in March by TRACE International.

Brazil had 20 pending investigations into possible bribes paid to its own domestic officials. The next six countries with the most such investigations were India (14), China (12), Nigeria (12), Argentina (7) and Poland (7).

The United States has made it a crime since 1977 to offer anything of value to an official of a foreign government or international public organization in an effort to win or retain business. The Foreign Corrupt Practices Act applies not only to US companies, but also to foreign companies that issue securities in US capital markets. In the four decades since the Foreign Corrupt Practices Act was enacted, the top six countries where the US has found illegal bribes paid are China, Iraq, Brazil, Nigeria, India and Russia.

In terms of where companies are under investigation by US authorities as of the end of December for paying bribes, there were 27 pending investigations looking into possible bribes paid to Chinese officials, 13 in Brazil, 11 in India, 10 in Russia, seven in Mexico and six in Poland. Over the last 40 years, three other countries have also featured prominently on lists of where actual / *continued page 47*

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disagreement about whether there is enough battery life left to meet your performance guarantees through the full 10 years, you must be able to look back at how the battery was used. Did the usage fall within the parameters of the contract? Is the battery still under warranty, or did you do things that made it go out of warranty?

That kind of real-time tracking of data is critically important. We are putting together a live warranty tracker for a project on which we are working now. It allows the customer to model what it must do in the future. Ten years from now, when there are wildly different potential use cases and you want to do something different, they would take you out of warranty, and that worries you.

Only four or five of the 13 potential revenue streams identified by experts are being tapped currently.

We are looking at real-time warranty tracking. We are modeling how certain usage could affect the warranty. For example, if you are now going to use the battery in a certain manner, and you originally had a 10-year performance guaranty, we will have to reduce it to a 9 1/2-year performance guaranty if you use the battery in that manner.

The maintenance of the data and then the backwards analysis of that data is going to become more and more important as we move forward.

MR. WARTENA: There are two parts to this question. One is warranty tracking. You are tracking the warranty that came with the equipment.

What is actually happening on the battery is the delta. If you did the best optimization, then you have more capacity than the equipment manufacturer's warranty says you should have. Now you have some extra play room — basically a buffer on your warranty.

MR. ATKINSON: Yes and no. What we are talking about is either extending or reducing the length of the warranty in real time. We provide a warranty to the system for the owner, and we are taking it on ourselves to be able to predict whether that warranty is going to extend or be cut short. It is a little bit of a risk for us, but we have worked enough with the battery and inverter companies to understand what will happen.

MS. BARROW: So these are back-to-back warranties? A warranty from the equipment supplier to GridTech and then GridTech provides a warranty to the project?

MR. ATKINSON: Yes, we provide the overall performance guarantee to the customer.

MS. BARROW: And your warranty tracker tracks whether a warranty will be scaled back based on usage patterns?

MR. ATKINSON: Yes, because we wrapped the entire project. The customer does not care if the problem is the battery, the inverter or the software. He does not care because he has a wrapped performance guarantee from us that the system will be able to operate within certain parameters for a certain number of years.

We are working on implementing the first stages of this on a project now. We are giving people the flexibility to operate in more of a freewheeling environment as opposed to being locked in today to operating this many cycles, this depth of discharge and that's it. We are not there yet, but we are working on it.

Predictive Maintenance

MS. BARROW: Pedro, you mentioned the role of software in predictive and preventative maintenance. Can you explain how that works?

MR. ELIZONDO: Predictive maintenance is implementing maintenance routines before the equipment fails, which is by far more cost-effective than corrective maintenance.

Maintenance-free batteries are common, but there is no such

thing as inspection-free. You need to inspect the batteries. Things can happen. If you get data about duty cycles, meaning depth of discharge, state of charge, state of health and the charge rate, you can predict what maintenance will be required. You are able to say that after 1,000 cycles, a maintenance routine should be done.

Batteries are like circuit breakers. After 1,000 operations, they require maintenance. The key part is getting the data to know when maintenance must be done. This prolongs the life of the battery. Batteries are the most expensive asset in the energy storage system. Without batteries, nothing happens.

MR. WARTENA: Pedro, you did not mention the type of temperature control.

MR. ELIZONDO: You have to keep the temperature inside the container steady. We do that with software. We do not do it with a thermostat like in the home.

MS. BARROW: So temperature control is important. Ryan, you also said high state of charge is the new smoking.

MR. WARTENA: I think they say sitting is the new smoking, and high state of charge is the new sitting. We found that keeping a battery at a high state of charge is just as bad as having it hot. You are starting to see that in warranties. If you do it right, you could end up with 1% to 2% degradation a year. If you do not do it right and keep a high state of charge and you let the temperature drift a little bit, you can have 9% to 10% degradation a year.

MR. ELIZONDO: If you keep the temperature at 28 degrees Celsius, for example, you get certain warranty terms. If you design for 21 degrees Celsius, terms are better.

MR. ATKINSON: Not only is high state of charge bad for the battery, it is also bad for the business cases. If you stay at a high state of charge all the time, you are limiting what that battery can do. Batteries are not there just to discharge. Batteries are there to add flexibility to the system. They are there to charge when it is beneficial and to discharge when it is beneficial.

MS. WORRALL: I want to tie together this concept of preventative maintenance and planning for operations. Machine learning is important for forecasting load and solar production. But machine learning can really be a great guide in terms of predictive maintenance, too.

MR. WARTENA: This is a complicated thing. I remember the first time I walked up to an internet browser. I thought, "I see the internet, but I have no idea how this computer really works." We are building all of that now. The level of complexity is high.

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IN OTHER NEWS

enforcement measures have been taken by US authorities: Nigeria, Iraq and Indonesia.

US companies and foreign companies issuing securities in the US capital markets have an extra duty to be on the lookout for red flags suggesting potential bribes by their employees and outside contractors to government officials in such countries.

DATA POINTS. Bidders in the solicitation by the Public Service Co. of Colorado to buy 1,800 megawatts of electricity were allowed to refresh their bids in late February to reflect the new US tax laws and import tariffs on solar panels. The utility received more than 400 bids. Of the refreshed bids, 26% came in lower, 16% were higher, and the rest were unchanged. The median wind bid increased 6.6% to $19.30 a megawatt hour. The median solar bid increased 5.5% to $30.96. Standalone storage fell by almost 7% to $10.53 a KW-month. Wind plus storage fell slightly to $20.63 a megawatt hour. Solar plus storage increased 6.4% to $38.30 . . . . Lithium-ion battery prices have fallen by 80% in the last eight years, according to Bloomberg New Energy Finance . . . . Geisha Williams, CEO of PG&E Corporation, said at the CERAWeek conference in Houston in March that the California utility expects to have retained only 50% of the retail electricity customers in its service territory by 2020. Many customers are moving to county-level entities called community choice aggregators . . . . Solar accounted for 62.4% of renewable energy capacity additions worldwide in 2017, according to a new report by the UN Environment Program. In all, 157,000 megawatts of new renewable capacity was added in 2017. Solar was 98,000 megawatts . . . . Community solar now accounts for 20% of commercial and industrial solar installations in the United States, according to GTM Research. Minnesota and Massachusetts were more than */ continued page 49*

Storage Software

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manufacturers and battery manufacturers. They may buffer capacity. They may put a battery management system in that will limit the capacity by limiting the voltage range.

Cell makers like to sell cells. They like to sell all the kilowatt hours in them. A manufacturer may sell a 100 kilowatt-hour battery, but install 120 kilowatt-hours and eat that cost. This way the customer gets a 10-year battery with 100 kilowatt-hours and can use 100% of it. In reality, the manufacturer never wants someone to use 100% of the battery.

Oversizing

MS. BARROW: You are saying suppliers are oversizing their batteries.

MR. ATKINSON: No battery system is installed with the exact amount of nameplate capacity. We put in a project within the past year that is more than 50% oversized because of the end-of-life requirements and because of the heat and the environmental conditions.

However, from a warranty standpoint, the customer is not allowed to draw out more than nameplate capacity — more than was signed up for in the beginning. That ensures at the end of 20 years it can still draw nameplate capacity.

MR. ELIZONDO: One of the main reasons batteries are oversized is because of lack of data. There are no batteries with 25 years of operating history at this point. Better to oversize to be on the safe side.

MS. WORRALL: Which increases the cost of the project in general.

MR. ELIZONDO: There is always a reason why prices are going down.

MR. WARTENA: All the ones in our favor.

MR. ELIZONDO: When we talk about warranties, project life and performance, that is one thing. When we put that in a contract, then we are not friends.

MS. BARROW: Why is that?

MR. ELIZONDO: Because you have to comply with the contract terms.

MS. BARROW: And the penalty for not doing so is liquidated damages?

MR. ELIZONDO: Money. If something affects your pocket, then you think differently.

MR. WARTENA: Good fences make good neighbors. Good contracts make good friends. They have to be good contracts.

Where to Probe

MS. BARROW: They have to be good contracts, so you need good lawyers.

Let's move this in a different direction. Ryan, you mentioned bankability in a study you did with Wells Fargo. So, probing on bankability, what questions are you being asked by lenders and investors, and on what issues should they be focused?

MR. WARTENA: People are very concerned about whether the battery will work. It took a long time for investors in solar to believe that the sun will rise every day. That is kind of a universal fear. The sun is definitely rising. Whether the software will work is not like that. That is a much different risk factor. If the software does not operate, the system is a brick. That is the biggest concern.

It is really not about the volume of money. It is the predictability of the revenue stream. That is why half of our software development team is in analytics, working on this exact problem. It is hard to predict.

Lenders and investors are looking for predictability. They want a warranty. A performance guarantee will be necessary for the next two to five years until the rest of the industry gets comfortable that the software works.

Geli has an interesting approach on how we do battery modeling. A number of other universities and national labs, including Sandia, have battery models, too. So we are using all each other's battery models, which is kind of cool.

We are headed toward an algorithm war, but it will produce some really great algorithms that the whole industry can stand behind. Some banks have looked into degradation. We pair algorithms with models from universities and national labs to get a better handle on degradation. It is important to give financiers visibility into the algorithms.

There is something else that financiers like, but do not always request. In solar, you do monthly wrap ups on how your projects are performing. It gives financiers 12 data points a year on how their billions of dollars of investment are doing. In our case, we

can tell them every single moment how well the systems are performing. That is an entirely different level of data and visibility, and it allows people to aggregate and hedge in different ways. They like that.

MR. ATKINSON: Bankability also turns on whether the software company will be around in 10 to 20 years.

I am sure people are seeing required escrows. It is an advantage to be a company that looks stable. These are assets with long lifetimes. They have to be able to operate as promised at the back end. A 20-year performance guaranty is really worth nothing if the manufacturer is not around after three years. Bankability relies on a number of things, and one of them is clearly the perceived longevity of the firm.

MS. BARROW: So software companies are being asked to escrow source code. Jen Worrall, how do you license your software?

MS. WORRALL: We have a couple of different models.

Something that we get asked about by everyone is cybersecurity. That is a major risk that can affect the operation of a project. An external factor could completely interrupt the operation of a project, cause irreversible damage and result in lost profits to the customer.

MS. BARROW: Pedro Elizondo, any thoughts on bankability?

MR. ELIZONDO: Since we are talking about 20 years of project life, one of the problems is the lack of data. As suppliers move to more efficient racks that provide more energy, there is less data. For example, one of the suppliers in less than two years has moved from 100 kilowatt-hours per rack to almost 200 kilowatt-hours, double per rack. Data is going to be a really key part to model the new battery racks, but there is obviously no operating history. Advances can sometimes be less bankable for this reason, even though they are improvements in what existed before.

IN OTHER NEWS

80% of the community solar market in 2017 . . . .

— contributed by Keith Martin in Washington

Emerging Storage Business Models: Part II

Storage is coming down rapidly in cost, and developers are figuring out ways to tap new revenue streams. A group on the front lines of the storage business talked at an Infocast conference in San Francisco in late February about the evolving storage business models.

The panelists are Karen Butterfield, chief commercial officer of US storage company Stem, Raphael Declercq, vice president of portfolio strategy for EDF Renewable Energy, the North American arm of Electricité de France, Sam Jaffe, managing director of Cairn Energy Research Advisors, an energy storage consulting and research firm, and John Jung, CEO of Greensmith, the US storage arm of Finnish company Wärtsilä. The moderator is Keith Martin with Norton Rose Fulbright in Washington.

Utility-Scale Storage

MR. MARTIN: One thing new industries must do is find the right business model to get traction.

The solar rooftop industry took off when SolarCity and others pioneered a third-party ownership model where the solar company put solar panels on customer roofs for free. The customers signed 20-year contracts to buy electricity or lease the solar systems.

What business models are taking shape in the electricity storage business?

Let's start with utility-scale storage. There seem to be four main business models.

One is where a standalone battery is bid into an organized market, like PJM. The battery is offered each hour to provide frequency regulation services at whatever price is established by auction that hour. The battery owner receives a payment from the grid. If the auction price is $25 a megawatt hour and the battery owner bid 20 megawatts, the battery owner receives $25 times 20 from the grid for the ability to use the battery than hour.

Another utility-scale business model is a tolling agreement where the battery owner stores electricity for the local utility for a fee. The fee may be a variable hourly fee like an energy payment tied to how much actual use there is of the battery. It could be a fixed capacity payment that is like a reservation charge for the right to use the battery that hour. It could be a combination of the two. This is the business model used for the 110-megawatt battery that is part of the AES Southland project in southern California.

The third model is a buy-sell model where the battery owner buys electricity during off-peak periods when the electricity is cheap and sells it back to the grid during peak hours. This model focuses on time-based arbitrage. It most common use is in pilot-scale storage projects.

The fourth business model is where a large battery is added to a solar or wind project. It regulates the ramp rate at which electricity from the project is fed into the grid. It also puts the project in a position to earn additional revenue by providing ancillary services.

Are there other utility-scale business models that are not on this list?

MR. JUNG: The way you get value out of energy storage, solve problems and make money varies depending on not only who you are, but also where you are.

For example, we have an 80-megawatt hour system that is doing four things to make money for the customer, AltaGas. It is doing resource adequacy, which is a four-hour product, for California. It is also making money by providing frequency regulation services. It is making money in the day-ahead power market. It is also making money in the five-minute market. At some moments, the price in the five-minute market exceeds $1,000 a megawatt hour.

The key to succeeding at storage is to combine as many different applications as possible. Your ability to do that depends on where you are and who you are.

MR. MARTIN: This is what is called value stacking. Your point is that it is not possible to draw clear lines around four current business models in the utility-scale market? Each of the models has elements of value stacking?

MR. JUNG: No, you can. My main point is that business models mean different things in terms of how customers make money and how the storage company makes money.

For example, we had two 10-megawatt systems going in ERCOT recently. The way in which the business model monetizes systems in ERCOT is very different than in California, PJM, New York or other places.

MR. MARTIN: The question is whether there are other basic business models for utility-scale batteries than the four I described.

MR. DECLERCQ: Another model is to use a battery as a way to

avoid investment in transmission or distribution. This is something that we have done at the distribution level for smaller utilities in the northeast where we compare the cost of adding poles and lines to support additional load at the end of the line to putting a battery there instead.

Another comment is you could combine your third and fourth business models. Energy arbitrage with a standalone battery is not economical today; but adding storage to solar is starting to be economic at utility scale, especially if you are not only focused on your internal rate of return, but also on reducing your risk. A solar project with a battery is more likely to be in the money on any hedge.

Software optimizes battery usage by weighing potential revenue from competing uses against wear on the battery.

MR. JAFFE: Let me add to your list my pet favorite, which is the new First Solar-Arizona Public Service announcement. It is essentially a solar storage peaking plant.

MR. MARTIN: Describe how it works.

MR. JAFFE: It is a solar park plus energy storage that is used solely to provide peaking capabilities in the middle of the day. Traditionally, utilities spend 85% of their resources on the 15% higher part of the peak. That has always been the most challenging part of managing the grid. If you can address that challenge with solar plus storage rather than gas peakers, that is potentially a very significant development for the grid.

MR. MARTIN: Why do you need to add storage to solar to provide peaking capability during the middle of the day when solar is at maximum output?

MR. JAFFE: Cloudy days. If solar is offered as the solution to serving peak load, then you have to guarantee you can solve that problem every day and, even if you are in Arizona where there are two days a year with clouds, you have to have some sort of solution for those two days.

Distributed Storage

MR. MARTIN: Let's move to behind-the-meter models.

One business model is a storage company installs batteries, retains ownership and charges customers either a subscription fee or a percentage of the customer's energy savings. The storage company manages the battery to reduce the amount of electricity the customer draws from the grid. It uses software to predict how much the battery will be used and when there will be spare capacity. Karen Butterfield, what is a typical subscription fee under this model?

MS. BUTTERFIELD: It is calculated the same way a PPA price is calculated. It is cost based. We gravitate toward markets where the customer can reduce its utility bill by at least 200% of the fee charged.

This is just a rule of thumb that we use. We have found over the last year that many customers are willing to take less than that, especially in the public sector where customers are very interested in sustainability initiatives and in promoting storage.

MR. MARTIN: So you say to a potential customer, "We will put a battery on your premises. We will manage it with software to try to manage your use of energy so that you save money." You charge a subscription fee. It is a periodic fee, and you set it at a level that ensures the customer is getting at least twice the savings as the fee.

MS. BUTTERFIELD: That is a good description.

MR. MARTIN: What is a typical fee for a business? I think you are focused on putting storage on commercial properties.

MS. BUTTERFIELD: We install systems anywhere from 100 kilowatts to two megawatts in size, so the cost and the fee vary depending on the energy savings and the cost of the equipment.

The important part is we go to markets where we can convince the customer to think, "Why wouldn't I */ continued page 52*

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do this? There are savings for me." Then the real beauty of the model is that as new programs come along, we will go back to the same customer and say, "We can bid you into something called DRAM in California — demand response auction mechanism — or we can use the battery to bid into a demand-response program in Hawaii.

We have a system sitting there at the building that is generating savings for the customer. We go back to the customer and add another value stream. We might modify our service fee and increase their savings, or give them a cut of the additional revenue. As the regulatory world changes and more value streams become available, we can share the benefits with our customers.

MR. MARTIN: It is a little like cable television. You keep adding more channels.

MS. BUTTERFIELD: Yes, the sports package is extra. [Laughter]

MR. MARTIN: Sometimes you charge the customer not a monthly subscription fee, but a percentage of the savings. What percentage of savings would you typically charge?

Four main business models are being used in the utility-scale storage market.

MS. BUTTERFIELD: Sometimes that model is not as easy to finance and so if we do not have to go in that direction, we don't. We have some markets that are opening up where that seems to be the flavor of the day, and we are certainly going to participate in those markets.

MR. MARTIN: Let me ask you three more questions. How long are the contracts typically with the customers?

MS. BUTTERFIELD: Ten years.

MR. MARTIN: Does the customer have to buy out the back end of the contract if he or she cancels?

MS. BUTTERFIELD: Yes, like a solar rooftop power purchase agreement.

MR. MARTIN: Why are you focused solely on commercial and not also residential?

MS. BUTTERFIELD: Because of the rate structures and the software and equipment that you have to put at the site. Most residential customers do not face demand charges. But for commercial and public customers that do face them — they can be more than 50% of their bills — we offer automated savings using artificial intelligence. That captures data for the customer at one-second intervals, provides real-time metering, and uses five-minute-or-less dispatch response without their involvement. That is the primary reason today.

MR. MARTIN: Raphael Declercq, EDF owns groSolar, which is also in this business. Does its business model work the same way as Stem's?

MR. DECLERCQ: Partly. We have more flexibility on the financing side because we can do it on the balance sheet, at least for now. So we can do some shared savings where the customer gets something for nothing. The customer gets a share of the savings that the battery is going to generate. We compare the electricity bill as it is today to what it would have been if the battery had not been installed, and we give something between 15% to 40% of the savings to the customer.

You have to take into account some behavioral economics, too. If you agree to pay the customers something, then the customers may be willing to pay larger subscription fees. That helps with financing.

In some cases, we have moved to lease payments. They are a fixed amount each month.

MR. MARTIN: Are you finding customers prefer leasing the batteries?

MR. DECLERCQ: It depends on the customer.

MR. MARTIN: How long is the lease?

MR. DECLERCQ: Typically 10 years.

MR. MARTIN: Sam Jaffe, you wanted to mention something.

MR. JAFFE: It is important to understand we are talking about

two different business models. There is the business model being used with the customer. But then Stem or EDF or groSolar is not only providing a service to that customer, it is also making revenue from aggregating all the customer batteries to turn them into a virtual power plant that I assume is almost always tied back into some form of contract with the local utility or grid operator to sell it unused storage capacity.

Would either of your firms be able to do just a customer model without that aggregation or virtual power plant?

MR. MARTIN: Before you answer, let's stipulate that the second distributed business model is where you offer the spare capacity on the customer batteries to the local utility.

MS. BUTTERFIELD: In some markets, it is economically viable to work just with the customer. However, as a venture-backed company, our investors are interested in seeing us build the largest storage network possible as quickly as possible. They want the additional value streams offered by a virtual power plant.

In some cases, we start with the utility contract, but most of the time, we find places where the customer economics work well enough to build a fleet of batteries, and then we try to add that other revenue stream.

The AI software to manage everything is key. We call it Athena. We have data coming every second from the building load. We have a price coming from the market. We have hourly temperatures coming in from weather services. All of this data must be managed in real time.

Every single building, every single market, every single tariff has to be managed. Athena is able to find the optimization point where Stem can save more money for the customer when a utility says, "We will pay you for a demand-response rate." That is really the future.

The reason we are selling so much so fast right now is costs are coming down, customers are comfortable with the technology, and the customer-facing business model is simple.

MR. MARTIN: This is big data. It is artificial intelligence. It is a software business. You are managing these assets with the help of software to optimize their use. Are the software engineers or the salesmen at the top of the pecking order at a storage company?

MS. BUTTERFIELD: I run the sales organization, so . . . .

MR. MARTIN: It is the sales people. [Laughter]

MS. BUTTERFIELD: I am kidding, of course. We work together as a team. When something changes in the marketplace, we all change. We work with the product managers, the development team, and we say, "We know we told you we wanted to develop these algorithms for this market, but this is happening faster." We do a quarterly planning process.

The sales people have their ears to the ground. They get ahead of the technology people. Then you have tech debt, and they have to chip away at that tech debt. Then the sales people have to catch up. It is like a see-saw. The two roles are equally important.

MR. MARTIN: How does it work for the customer? The customer has a battery that is being used to manage its energy usage, but you are also offering the local utility the right to use the battery. Does the customer have first claim on the storage capacity?

MS. BUTTERFIELD: Not exactly. We have made a commitment to the customer to save it a certain amount each month on its utility bill. If we are also making this optimization decision about how to get more grid revenue, which the customer partakes in, or how to get more demand-charge savings, which the customer partakes in, or how to get more out of the demand-response program, which the customer partakes in, the customer should be fine with use of the battery in that manner.

MR. JUNG: Can I offer a contrasting picture? On the one hand, you have a kind of SolarCity no-money-down type of model. There are a lot of interesting aspects to that model, especially in so-called behind the meter-type applications where, for the most part, I think the use case has largely started with demand-charge management.

On the utility side or the grid-scale side, which is where we have dwelled, it was very simple. Big companies like NextEra or Duke or E.On or AEP want to put the storage system into rate base. If the customer is an independent power producer, then it wants to own and operate the assets like any other technology.

The difference — and I want to amplify the software aspect — is that while these utility-scale customers are buying a piece of equipment, the thing that is new to these very large power companies is they are now also getting a software license.

In some ways, the utility-scale model is a lot simpler because we do not have to own and operate. The big power companies can use their own balance sheets. When you can tell someone that the return on investment is not just the denominator in terms of waiting for prices to come down, but also the more value streams you are able to capture. It leads to a better outcome.

This software thing is pretty important. We are already on our sixth generation of software.

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When you talk about the multiple things that energy storage can do, you need software in order to be able to do them.

MR. MARTIN: This is as much a software business as a hardware business. Raphael Declercq, you were about to say something.

MR. DECLERCQ: Both the commercial efforts and the software development are expensive. This is something that an investor should look into because making these business models sustainable in the long term is not an easy thing.

MR. MARTIN: Part of your selling point is that you are offering software to manage the battery.

MS. BUTTERFIELD: Yes, but we call it customer acquisition costs. If you sell two things, you are better off than just selling one. If you can sell three things, you are better off still. You look at opportunities. One thing we did recently is we partnered with CPower on the demand-response side, and now we can take the sales organization and multiply the coverage. We can do demand response and storage at the same site of the customer. This helps to reduce your customer acquisition costs as a percentage of revenue.

Customer Acquisition Costs

MR. MARTIN: One of the challenges of the residential solar rooftop industry is the high customer acquisition cost. It is about 25% of an installed system. What is it for storage?

MS. BUTTERFIELD: It is nowhere near that, and it is nowhere near that for commercial solar either. But it is still substantial. When we were selling 30-kilowatt systems, our customer acquisition costs were off the charts. Now we are selling one- and two-megawatt systems to large universities and the customer acquisition costs are a smaller fraction of that, but still meaningful.

MR. JUNG: The economies of scale are really important. The 20-megawatt, 80-megawatt-hour system can be installed in about four months. It takes the same effort as to install a one-megawatt, four-megawatt-hour system. The bigger, the better.

If you take a look at the supply-chain cost or at the total cost of ownership of, let's say, solar which I think people understand a lot better than energy storage, it is kind of similar. Most contemporary studies show that the total cost of ownership at the residential level is two to three times higher than the utility level. Why? Because it is just a ratio of how many installations, how many points of failure you need to manage, and just the ability to buy 100 megawatts versus five kilowatts of solar panels and inverters. It is all that kind of supply chain stuff.

The cost of energy storage is falling because the cost of lithium ion has fallen by 50% in the last 18 months.

We buy a lot of batteries around the world. The cost is also falling because each successive installation of energy storage is getting faster.

The counterpoint is many energy storage companies have gone out of business. It is hard to tell which one will be the Uber or Google and which ones will fail.

MR. MARTIN: This is a typical pattern in any new industry.

MR. JUNG: We published a white paper called "Futureproofing Energy Storage" because the average tenure of most of these contemporary systems, although the warranties are 10+ years, is actually about three years. People do not know the eventual shape of the degradation curve and what will actually happen 10 years down the road.

Potential Revenue Streams

MR. MARTIN: That's a lot to chew over.

Let me wrap up the distributed business models. We have 10-year leases of batteries. We have a service model where the storage company charges a subscription fee or a percentage of savings. Within that model, companies are also offering the spare storage capacity to the local utility to earn more revenue.

Two other models are direct sales of batteries to homeowners, and then there are solar rooftop companies that are installing batteries in connection with rooftop systems and charging for their use.

All of you have talked about trying to add more revenue streams. The Rocky Mountain Institute says there are as many as 13 potential revenue streams. How many is the industry realizing on today and which ones?

MS. BUTTERFIELD: It is probably on the order of four or five.

MR. MARTIN: What are they?

MS. BUTTERFIELD: Demand-charge management. Solar plus storage, so that would be ramp rate. There are plenty of people doing ramp rate.

MR. JUNG: Frequency regulation service is probably there too, Karen?

MS. BUTTERFIELD: Behind the meter?

MR. JUNG: Yes.

MS. BUTTERFIELD: We are starting to see it in one or two markets.

MR. DECLERCQ: There are some demand-response programs, too. I don't know if they were included in demand-charge management.

MS. BUTTERFIELD: I think a non-wires alternative is one of the other items.

MR. JUNG: It depends whether you are behind or in front of the meter. On the grid-scale side, in Texas for instance, the energy storage systems are being fed in Roscoe entirely by wind, and they are addressing capacity. ERCOT looks at fast responding frequency as a separate product.

In California, the applications are multifaceted because a big system does four different things. To be clear, these use cases are not just expanding beyond the four or so that we mentioned, but the phenomenon of value stacking in multiple markets is also happening depending on what part of the world you are in.

We just delivered a German system that does multiple things. We just got awarded a system in Hungary that is dealing with frequency. That is its day job. It does other things on the side.

MR. MARTIN: Stop on the German system. It does multiple things. What are they?

MR. JUNG: Number one is it helps the grid manage frequency. Germany has periods when power suppliers have to pay the grid to take their electricity because Germany has a lot of solar. The storage system can do some peak shifting.

MR. JAFFE: And also capacity.

MR. JUNG: If you are a developer who has put a lot of solar in, the worst word you can hear is curtailment. You just spent $100 million on a system that you are only allowed to use 70% of the time. More markets are combining these use cases, which I think is a really positive thing.

MR. DECLERCQ: I am trying to think of other use cases still behind the meter. The contract we have with PG&E for 10 megawatts and 40 megawatt hours behind the meter serves PG&E with resource adequacy, and then we do peak shaving for the customer. So there are two revenue streams that are stacked.

The interesting thing about resource adequacy is that it is driven purely by the utility. It is an accounting matter. Sometimes the utility will do other things with the energy that we provide. If PG&E decides that it wants us to discharge at another time, for example, we may do so, but we don't know exactly what the utility is doing with that energy. So there may be other hidden revenue streams that are in the hands of the utility.

MR. JAFFE: There is now a UK capacity market specifically for storage. But also in response to the Rocky Mountain Institute comment, our taxonomy is a little bit different. We have over 25 different profit models for over 25 different applications of energy storage, and I can say that eight of them are now in the money in various places in the world. Two years ago, there was only one.

MR. MARTIN: Twenty-five different models. Do they go beyond what we have discussed here?

MR. JAFFE: Yes. Essentially they are segregated more finely than the way that the Rocky Mountain Institute is looking at this. How do you own a battery and make money off of it? Any way we can think of.

MR. JUNG: If you look at the ancillary services market, frequency regulation service — one type of ancillary service — is done differently around the world, so there could be five or six different revenue streams there. From a software standpoint, we have seven different applications out of the box, but the algorithms underneath those applications, like for frequency, vary from one location to the next. If you treat each of those as a different revenue stream, that is about 30 application streams.

MR. JAFFE: We cover batteries for cars, too. Cars are easy. You put a battery in a car, you sell the car, it goes. Stationary storage is so complex and sophisticated and that is a sense of what this market really is. A few years ago, we didn't know what energy storage was. Companies like these three are figuring it out as they go and starting to make profitable business models out of it.

MR. MARTIN: And testing different business models to see what sells in the market.

Arbitrage

MS. BUTTERFIELD: One topic we touched on is arbitrage. Many people think that that is the name of the game. You buy low, sell high. The spread is just not enough to make the model work, but the spread exists, and it is incremental. It is a value stream that we didn't even mention. There are more and more places where that spread is worth chasing.

MR. MARTIN: The spread between what and what?

MS. BUTTERFIELD: Between the charging price and the discharging price of the battery. So you could charge at 8¢ a kilowatt hour and discharge at 30¢ a kilowatt hour. You are saving that customer the difference between the two rates.

MR. MARTIN: Is that being done currently in California?

MS. BUTTERFIELD: Yes. It does not stand on its own yet because the spread is not substantial enough in any market, but adding it to an existing model and using the Athena software helps to capture it. All of a sudden the */ continued page 56*

Storage Business Models

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utility changes those rates and the spread changes. You have to be able to react to that. That is what the software does.

MR. MARTIN: Stem aggregated the capacity reserves on lots of batteries at florist shops, grocery stores, and so on in southern California and sold them to Southern California Edison. What percentage of the revenue is coming from capacity and what percentage from subscription payments or energy savings?

MS. BUTTERFIELD: I would not be able to share that information in this public forum.

MR. MARTIN: Audience, go ask her after the session.

MR. DECLERCQ: There is another part of the equation that is not really a revenue stream, but that really matters in California, and that is the SGIP. I don't think the economics work without SGIPs behind the meter.

The biggest unknown in storage is the rate of degradation.

MR. MARTIN: Explain the SGIP.

MR. DECLERCQ: It is the self-generator incentive program. It provides a subsidy spread over five years as an inducement to make sure a storage system actually works. It is a well-designed program as far as we are concerned.

MR. MARTIN: Do you have a revenue breakdown for how much is SGIP, how much is subscription payments, how much is capacity payments by utilities for the right to use the batteries?

MR. DECLERCQ: It depends on the particular case. What I can tell you is that SGIP is very important. In our experience, the installation does not work without it.

MR. MARTIN: 10%?

MR. DECLERCQ: It is more than that in the first five years. It is closer to 40% to 50%.

Potential Issues

MR. MARTIN: Sam Jaffe, wear a different hat. You are now a lender or maybe an equity investor. Where would you probe before investing in a storage project?

MR. JAFFE: Degradation. Former US defense secretary Donald Rumsfeld said there are things I know I don't know and things I don't know I don't know. In this sector, there is a lot of not knowing what we don't know. We do not know how long the batteries will last. There are five or six ways you can manage that risk, but right now essentially what is happening is people are relying on the largest Asian conglomerates that make the batteries. Part of that is for quality, part is for expertise, but mostly it is for balance sheet. These guys can back up their own warrantees.

MR. MARTIN: So people will probe on degradation, but won't find an answer.

MR. JAFFE: We will know in 10 years whether a battery lasts 10 years.

MR. MARTIN: That is not so comforting for a project that relies on a 10-year offtake contract. Raphael Declercq, where would you probe first as a lender or equity investor?

MR. DECLERCQ: I would look for a strong parental guarantee because, at this point, there are a lot of unknowns. I agree with Sam Jaffe. Our industry is still in its infancy. There are a lot of things, like rate of degradation, that we do not know. Degradation is the biggest risk.

I would look also at who is behind the project. It matters. This is like the early days of solar or wind.

MR. MARTIN: You want a big company like EDF?

MR. DECLERCQ: No, no. But seriously, the customer or lender who goes with a startup takes a high risk. Maybe they are aware of that and perhaps that is why there have not been many systems financed by third parties, except with very, very rich contracts. .

MR. MARTIN: Karen Butterfield?

MS. BUTTERFIELD: I would focus on the data. The important thing with batteries is how often you use them and how you use them, and when you charge them and discharge them. Our relationship with our financiers is premised on being able to provide them with data that shows what we are doing.

What happens when you want to change what you are doing? It has to work financially. So what if you burn the battery out in eight years if you have made 10 times the amount of money that you thought you were going to make? Just replace it after eight years.

MR. MARTIN: John Jung.

MR. JUNG: I think we are gathering more data about how these batteries operate in the field than even the OEMs are. So data is very valuable in and of itself, but I think also that nothing supplants experience. We have had a chance to integrate 16 different batteries since we started the company 10 years ago. We are all in the risk business in this room. That is how we make money. I like to say the serenity prayer, which is, "May I have the serenity to accept the things that I cannot change, the courage to change the things that I can, and the wisdom to know the difference between the two."

MR. MARTIN: This is not encouraging for investors. [Laughter]

MR. JUNG: It is, actually. I can say it given that we have delivered seven times returns to investors. We need to make sure that we manage technology risk.

MR. MARTIN: Sam Jaffe, each of the three has basically just made a sales pitch for his or her own company. You are an unbiased advisor. Is there anything else you would add if you were a lender or investor? Where would you probe?

MR. JAFFE: Another point that was touched on earlier is the changing landscape of how an application works. If you are doing demand-charge mitigation behind the meter in San Diego, for example, what happens when that problem is solved and demand charges contract dramatically? All of a sudden you have a great return-on-investment model that just disappeared. Anticipating that and trying to understand future dynamics of regulations and markets is important too.

Editor's note: "Part I" on this topic can be found in the April 2017 NewsWire.

Environmental Update

New data released by the US Environmental Protection Agency in February shows the power sector is three quarters of the way to meeting the greenhouse gas targets set in the Obama-era Clean Power Plan.

These data suggest that the goals established in the plan may be achieved more than a decade ahead of the 2030 deadline set in the Obama plan and just three years after that plan was issued.

The Clean Power Plan would have set limits on greenhouse gas emissions by existing power plants, but implementation was blocked by the US Supreme Court, and the plan never took effect. EPA moved formally to withdraw it in October 2017.

Nevertheless, greenhouse gas emissions by the US power sector are now 25% below 2005 levels.

The Obama EPA projected that full implementation of the Clean Power Plan would reduce power-sector emissions by 32% by 2030 from the same baseline.

Greenhouse gas emissions by the power sector are expected to continue to fall. The reason for these declines has much less to do with the blocked regulation than the fact that natural gas remains cheap, the cost of renewable energy continues to fall year on year, and there has been no significant spike in electricity demand.

The data appear to validate claims that market shifts toward lower carbon power would make Clean Power Plan compliance much easier and cheaper than anticipated.

EPA is now contemplating replacing the Obama-era Clean Power Plan with a different Trump plan.

The power sector and other major business groups have called for a replacement that will provide them with legal and regulatory certainty regarding greenhouse gas standards, in part because they realize that greenhouse gas regulation is inevitable. However, public comments received ahead of the February deadline for comments about EPA's withdrawal of the Obama plan show significant disagreement about what a replacement should look like, even among groups that have urged repeal and replace.

Migratory Birds

The US Department of the Interior has reversed a long-standing agency legal position that the Migratory Bird Treaty Act criminalizes the unintentional killing of migratory birds incidental to otherwise lawful activities like wind farms.

The MBTA prohibits the "taking" or killing of migratory birds and their eggs and nests, except when specifically authorized by the Department of Interior. The MBTA, which is a criminal statute, does not explicitly allow an unauthorized "take" and can be read to impose strict liability without regard to intent. In recent years, a split among courts interpreting the act has been developing over whether persons conducting activities that inadvertently cause the death of migratory birds can be subject to prosecution.

In late 2017, Interior issued a solicitor's opinion (number M-37050) withdrawing and replacing an earlier opinion that the MBTA imposes liability for the incidental taking of protected birds. The prior solicitor's opinion had interpreted the MBTA to prohibit "incidental takes" on grounds that "the MBTA's broad prohibition on taking and killing migratory birds by any means and in any manner includes incidental take and killing."

The new legal position means that the Trump administration will not pursue criminal prosecution of the unintended killing of birds by wind farms and other businesses in the course of their otherwise lawful activities.

The opinion concludes that "the MBTA's prohibition on pursuing, hunting, taking, capturing, killing, or attempting to do the same applies only . . . to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control."

It emphasizes the uncertainty that previous interpretations of the MBTA and the exercise of prosecutorial discretion created for wind farms and industry generally. "Interpreting the MBTA to apply to incidental or accidental actions hangs the sword of Damocles over a host of otherwise lawful and productive actions."

The opinion notes that the MBTA protects nearly every bird species in North America and specifically lists wind turbines, electrical lines, communications towers, buildings and vehicles as among the many "human-caused threats" to over 1,000 species of birds covered by the act.

It acknowledges its narrow interpretation of the act, suggesting that this is necessary to avoid what it considers the "constitutional doubt" related to a law that would criminalize such a broad range of otherwise lawful activity where no harm is intended.

The opinion may provide practical comfort with respect to federal prosecution, but such opinions are technically not binding on a court. The policy could change in a future administration.

Wetlands

EPA Administrator Scott Pruitt has withdrawn power from regional EPA offices to make final jurisdictional determinations under the Clean Water Act and centralized it at EPA headquarters in Washington.

The US power sector is already three quarters of the way to meeting greenhouse gas targets set in the Obama Clean Power Plan.

The Clean Water Act protects wetlands and "waters of the United States" and can limit development where such waters or wetlands are found.

Pruitt has specifically restricted regional authority to implement section 404 of the act, which governs dredge-and-fill permitting and broadly covers the filling of wetlands.

A leaked memo establishes a new process that will involve headquarters "early on" in decisions over the law's scope.

Also leaked was the amendment to the standing delegation of Clean Water Act authority from the administrator to regional heads. The memo said the change is required "to ensure consistency and certainty in how the EPA makes certain jurisdictional determinations."

While the final determinations will now be made in Washington, it is uncertain what roles headquarters and regional offices will each play leading up to the final determination stage. The memo directs staff to take all necessary steps to "adjust associated consultations, reviews and other practices in a manner consistent with the revised delegation" and "involve the Administrator's Office early on in the process of developing geographic determinations."

Previously, EPA regional offices used delegated authority to decide when particular water bodies are jurisdictional and to threaten to veto section 404 permits issued by the US Army Corps of Engineers that regional offices found too lenient to protect the environment. Often this power was used to demand changes in permits to mitigate impacts.

The memo formalizes what had already long been rumored to be going on unofficially. Staff at the EPA office of enforcement & compliance assurance were directed in early 2017 to compile a list of ongoing enforcement cases.

The memo appears to focus on agency decisions being made under the section 404 "dredge-and-fill" permit process and not to "NPDES" discharge permits issued under section 402.

The most common use of a section 404 permit is to fill in wetlands.

US Waters

Staff at EPA reportedly expect new guidelines redefining the scope of what qualifies as "waters of the United States" as early as this month.

The new guidelines are expected to narrow the existing definition significantly. They would replace an Obama-era definition adopted in 2015.

EPA suspended enforcement of the Obama-era rule until 2020. The delay in enforcement is being challenged in court.

Narrowing what qualifies as "waters of the United States" will allow more filling activity to avoid regulation.

Pending lawsuits on the legality of the Obama definition could become moot if that definition is formally replaced, but then the litigation will shift to challenges against the Trump definition.

Meanwhile, Pruitt is being battered in the press by almost daily revelations about perceived ethical / *continued page 60*

Environmental Update

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lapses. A number of the charges are the subject of inquiries by the Government Accountability Office and the EPA inspector general, and there are calls by a small number of Republican House members for his ouster.

— contributed by Andrew Skroback in Washington

CHADBOURNE MERGER

Chadbourne & Parke merged into Norton Rose Fulbright on June 30. The combined firm has 4,000 lawyers in 59 offices in 33 countries.

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