

D I A L O G U E

RENEWABLE ENERGY: CORPORATE OBSTACLES AND OPPORTUNITIES

SUMMARY

In the absence of a national mandate to intensify use of renewable energy, many corporations are increasing their own reliance on renewables. Numerous utilities are likewise transitioning toward wind, thermal, and solar power. But renewable energy continues to face challenges, including battery storage, grid expansion and incorporation of renewables into the grid, initial project costs, and regulatory barriers. How are utilities and energy-consuming companies increasing their renewables portfolios while navigating this terrain? On October 22, 2019, the Environmental Law Institute hosted its 2019 Annual Corporate Forum, which explored these questions and discussed the obstacles and opportunities for renewable energy. Below, we present a transcript of the discussion, which has been edited for style, clarity, and space considerations.

Scott Fulton is President of the Environmental Law Institute. **Sofia O'Connor** (moderator) is a Staff Attorney with the Environmental Law Institute.

Wayne Balta is Vice President of Corporate Environmental Affairs and Product Safety at IBM Corporation.

Janice Dean is Deputy Counsel at the New York State Energy Research and Development Authority.

Beth Deane is Chief Counsel for Project Development at First Solar.

Scott Fulton: Welcome to this year's Corporate Forum. We've been thinking about the build-out of renewable energy throughout the Environmental Law Institute's (ELI's) 50th anniversary year. Perhaps no issue speaks more directly to the future of environmental and energy policy than how to optimize renewable energy.

Early in the year, ELI produced a report entitled *Corporate Statements About the Use of Renewable Energy: What Does the "100% Renewable" Goal Really Mean?*¹ Among the questions raised by this report was whether renewable energy credits were, in fact, moving us toward the rapid build-out of renewable energy power sources that many believe to be necessary. Shortly thereafter, ELI published a book, spearheaded by Michael Gerrard of Columbia Law School and John Dernbach of Widener University Commonwealth Law School, with scores of other authors as contributors, entitled *Legal Pathways to Deep Decarbonization in the United States*.² It's a tremendous contribution of

thought about advancing to a lower-carbon future, with renewable energy factoring prominently in that review.

This question came into even sharper relief through a convening we did this past spring with George Washington University Law School at the Wingspread Conference Center in Racine, Wisconsin, entitled "Reimagining Environmental Law." At Wingspread, there was a heightened sense of urgency for progress on renewables buildup, with some of the participants describing our need to move forward quickly as an industrial-scale project for the country, akin to the build-out of weapons production and military support efforts around World War II. It was an interesting discussion, with folks who would ordinarily be seen as champions of environmental safeguards questioning out loud whether we can tolerate the roadblocks to renewables projects allowed by procedural statutes like the National Environmental Policy Act (NEPA)³ and the Endangered Species Act (ESA),⁴ as well as state counterpart laws that have served us so well up until now in advancing environmental quality.

So, we thought, as we often do at ELI, let's have a conversation about this. Here, we'll be talking about advances on renewables. There are so many power consumers who want to increase their reliance on renewables, and so many power producers who want to produce more energy through renewables. How are we doing? What are the obstacles and enablers in our progression? Are there legal and policy reforms needed to get us to where we're trying to go?

These are just some of the questions that our excellent panel will be working through. I'll now introduce our panel moderator, Sofia O'Connor. Sofia is a staff attorney

1. SOFIA YAZYKOVA ET AL., CORPORATE STATEMENTS ABOUT THE USE OF RENEWABLE ENERGY: WHAT DOES THE "100% RENEWABLE" GOAL REALLY MEAN? (ELI 2019), <https://www.eli.org/sites/default/files/eli-pubs/corporate-renewables.pdf>.

2. LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES (Michael B. Gerrard & John C. Dernbach eds., ELI Press 2019), available at <https://www.eli.org/eli-press-books/legal-pathways-deep-decarbonization-united-states>.

3. 42 U.S.C. §§4321-4370h, ELR STAT. NEPA §§2-209.

4. 16 U.S.C. §§1531-1544, ELR STAT. ESA §§2-18.

ney at ELI, part of our climate team, among other things. She's worked on many projects, including those related to climate change adaptation, marine spatial planning, and renewable energy. Recently, Sofia co-authored the report that I mentioned a moment ago, which examined corporate renewable goals and strategies for obtaining renewable energy. Sofia is one of the real stars on the ELI staff, and we're pleased to have her as our moderator here today.

Sofia O'Connor: I'll say a few words about the report. Earlier this year, ELI examined goals of a couple dozen companies. We looked at what they tried to do with regard to renewable energy and how they achieved that. We looked at strategies for each company, and then we compared the possible ways in which they try to procure renewable energy, what role renewable energy certificates (RECs) play, and what the potential impacts might be depending on the strategy the company utilizes.

What we found is that there are a variety of ways in which companies try to achieve their goals. Some primarily rely on unbundled RECs. Others try to generate renewable energy themselves or help create renewable energy projects that are close to their operations. Some companies specifically say they're no longer going to be using unbundled RECs; they will only be relying on bundled RECs. So there are all these different approaches.

One of the questions ELI started looking at is, what are the challenges that companies are facing when they're trying to utilize more renewable energy? For purposes of this panel, I hope we can address some of those questions, such as battery storage and incorporation of renewable energy into the grid. What are the technical and other barriers that exist, what are the regulatory barriers that currently exist, and how can they be overcome?

On our panel today we have Wayne Balta, who is vice president of corporate environmental affairs and product safety at IBM Corporation. He has global responsibility for environmental affairs, energy efficiency, and toxicology and chemical management, as well as product safety and related hardware compliance functions. Wayne has also played a leadership role with a variety of organizations, including ELI and the World Environment Center.

We also have Janice Dean, who is deputy counsel at the New York State Energy Research and Development Authority (NYSERDA), where she advises clean energy programs, including clean transportation, work force development, communities and local government, and energy storage. She's also counsel to the nuclear program, including the West Valley Nuclear Service Center, the nation's only privately operated spent fuel reprocessing facility, as it undergoes decommissioning. In that role, she guides legal compliance at the site with federal and state environmental laws, the U.S. Nuclear Regulatory Commission Part 50 operating license, and state licensing and permitting requirements.

We also have Beth Deane, who is chief counsel of project development at First Solar, Inc., a solar manufacturing, construction, and development company with more than 17 gigawatts of installed capacity globally. In that role,

she is involved in all aspects of solar project development, including real estate, permitting, interconnection, tax, and power procurement, as well as having the responsibility for project-related transactional, litigation, regulatory, and corporate matters.

Wayne Balta: Thank you for inviting me to participate. ELI is the foremost convener of mature, seasoned intellectual thought. So, when one is asked to participate in an ELI event, it's something you would say, I'm honored to be here. And I am. Sofia asked me to speak about IBM, what we try to do regarding renewable energy, and some of the challenges we face. I'll also mention a few characteristics about the company itself to create a context for my remarks.

IBM's 108 years old; it's an old company. It's fair to say that it is the oldest company in today's information technology (IT) industry. If you know anything about the IT industry, you know that change is constant. And every time there's a technological leap, it's essential for you to foresee it, adapt to it, and change your business quickly to capitalize upon it. IBM is a company that has, by necessity, transformed itself often. At present, in the earlier part of this decade, we and many others have been in the midst of yet another change toward cloud computing, such that today you would define IBM as a cloud and cognitive services company.

IBM is a business-to-business company. That means our clients are other businesses, typically large enterprises like the Fortune 50, 100, and 200. We are not a consumer-facing company. IBM does business in more than 170 countries around the world with about 350,000 employees. Again, the clients are some of the companies that do some of the most essential things throughout the world. Vis-à-vis the environment, IBM as a company, perhaps owing to its longevity, has aspired to perform as an environmental leader for close to 50 years, going back to the very early 1970s, not long after the U.S. Environmental Protection Agency (EPA) was put into place.

Over the years, we've had some successes, and I want to mention some relating to climate. Back in 1992, we were one of eight companies that helped EPA launch the ENERGY STAR program. Look at ENERGY STAR today. Look how many products it covers. You see it at Home Depot and Lowe's. You can get rated roofs and shingles. It's everywhere. But back in 1992, it was just the personal computer that was rated.

In 1995, under §1605(b) of the Energy Policy Act of 1992, the U.S. Department of Energy had a mandate to begin asking for companies to voluntarily disclose their greenhouse gas emissions.⁵ IBM was one of the first to do that; it was in 1995 that IBM began to voluntarily disclose its greenhouse gas emissions. In 2000, we helped the World Wildlife Fund with Johnson & Johnson to create Climate Savers. We also worked with the World Resources Institute to join the Green Power Market Development

5. 16 U.S.C. §1605(b).

Group, and we've been endeavoring to procure renewable energy at least since then.

In 2007, IBM published its first formal position on climate change. In 2015, we joined the Barack Obama Administration's American Business Act on Climate Pledge, which was intended to show corporate support in advance of the United Nations Conference of Parties meeting in Paris. And most recently, in 2017, we publicly expressed our support for the United States to remain a Party to the United Nations' Paris Climate Agreement.

Along the way, we've always tried to communicate with transparency. Transparency has been important to us. We have now published 29 corporate environmental reports in a row, uninterrupted. I don't know of a company that's done it longer than that. At present, we have three goals pertaining to climate change, one of which is renewables. First, we endeavor to conserve energy each year equal to 3% of our consumption. That's a rolling annual ongoing goal. Second, by 2025, we hope for 55% of the energy IBM consumes to come from renewable sources. And third, we hope to reduce carbon dioxide emissions attributable to IBM's consumption of energy by 40% by year-end 2025. Those are our current goals. Some of those are the second, third, or fourth time around.

With that as context, let me turn to renewable energy specifically. I mentioned IBM's current renewable energy goal. We consider it to be, for us, aggressive. Where do we stand today? As of year-end 2018, we're at 37.9%, so say 38%. That means today that 38% of the energy that's consumed by IBM credibly comes from a renewable source. Not bad. It's more than one-third of IBM's global electricity consumption. And if you look at the consumption of renewables across society at large, estimates range from 10% to 12% to 15%. So, I think corporations, hopefully IBM among them, are trying hard to help lead the way.

Importantly, when I cite a percentage—in this case at 38% today and endeavoring to become 55%—I'm referring to consumption, and consumption that I think we can credibly stand behind. That's another way of saying that, by choice, we do not rely on the purchase of unbundled RECs to assert that IBM uses, is powered by, or consumes renewable electricity. The reason we don't do that is simple: because we wouldn't be consuming the electrons that those certificates represent. We think that's the transparent way to communicate about it.

There are a lot of aspects of today's accounting for renewable energy that I think are very well-intended, but are pretty muddy, and I've just revealed one of them. Another one would be as follows: If you are an entity that has put, for example, solar panels on a property such that the electricity from those solar panels is coming into your facility and you're consuming it. If you don't own as an asset this financial instrument known as a "renewable energy certificate," today's accounting practices would say that you cannot say that you're using that renewable energy. I think that's awfully weird. While well-intended, it obfuscates the way in which people communicate about this. I think it falls short on transparency.

Wrapping up, there are a few challenges about IBM. Again, it's 108 years old; that means that the existing infrastructure wasn't just built in the past five years. Some of it goes back decades. So, we're working with buildings and facilities that have been constructed long ago in various places. I mentioned we're in many different countries—more than 1,300 locations for our business, more than 200 data centers in 45 different countries—yet we don't have hyperscale data centers. The megawatts demanded by our data centers are 10 times less than many others in the industry. They're not what you would call a large-scale hyperscale, but rather a larger number of smaller, decentralized data centers.

Many of our large sites in the United States are in regulated markets, specifically North Carolina and Colorado. That affects one's ability to procure renewable energy. Contract terms for us have always been long. Not long ago, the contract terms for a power purchase agreement (PPA) would be 15 to 20 years. If you're a business in the IT industry and you're committing to something for 15 to 20 years, you're almost doing arbitrage because our industry changes so much. It's hard to know where you'll need to be located in five years, let alone 15 to 20. Most of our leases are five-year leases. So, we're looking for short-term agreements, but the market isn't quite there yet.

Lastly, we, like others in the IT industry, operate with what are called colocation data centers. Basically that's leasing space from somebody who provides the building and procures the energy and you put in your servers and operate them. Our goals and objectives include our occupancy in these colocation spaces even though it's a landlord that controls the procurement of energy. Our challenge is to convince that landlord to bring renewables into that building that we're renting. In summary, we're involved in decentralized, smaller data centers and other short-term leases, not building new construction, not operating data centers at hyperscale, and endeavoring to be transparent.

Beth Deane: This is a topic that I'm very passionate about. I went to First Solar, the company I work with, because I think climate change is such an important issue, and I wanted to be part of something that was addressing it. I really think that ELI convening these kinds of discussions helps with moving things along because I think it's very easy to say we want to be green. It's now very cost effective to procure renewables, especially solar. So, it's sort of easy to do, but there are obstacles. These kinds of conversations help in terms of bringing minds together and finding solutions.

First Solar is a company that started almost in reaction to some of the early things that companies like IBM were doing. We came into existence in 1999, so we're young compared to IBM. We went public in 2006. We're a U.S. company and the largest U.S. solar panel manufacturer. In an industry dominated by companies from China, First Solar has been able to grow. We're right now at about 20 gigawatts, and we're also, we believe, the largest provider to corporates in the United States.

We also work internationally. We sell panels across the globe. We also do development, and development is what I can speak to. If you've got questions about that, like how to develop a project that will sell power to a corporate customer, that's what I do day in and day out. We do that at First Solar in the United States very intensively, but we also do it around the world in Asia and India, in Australia, and a little bit in Latin America.

We spend a lot of time thinking about what the possible concerns and obstacles are. That's something I'm going to speak to. But first I'll tell you a little more about our solar panels. We manufacture what's called thin film. It's a really simple technology. It's a piece of glass and you put a conductor material, which in our case is a heavy metal, and then you put another piece of glass on top and that makes energy. I'm a lawyer, so I'd like to make things done into that kind of simplicity. Because we have a very simple process—even simpler than most solar modules that are made from silicon as the conductor—we're the lowest-carbon module. We're the lowest water-use module. We're the lowest air pollutant module in terms of thinking through the whole chain and the whole cycle. We really take that seriously.

We're a product that addresses the full gamut—not just providing renewable energy, but trying to address the impacts of our manufacturing and waste and so on. The thin film, the heavy metal that conducts the electricity, is a byproduct of the mining industry. We try to be full cycle in reusing things. About 90% of our modules can be recycled, and we provide recycling facilities in various locations around the world.

One of the things that's happening industrywide is that solar is now the cheapest form of energy. I've been at First Solar for nine years. That was not true when I started. So, in the course of nine years, that has completely turned upside down in the energy world. As a result, it makes a lot of sense for corporates to think about how they can turn to renewables, not just because it's the right thing to do, but because it's the cheapest thing to do.

Also, the mix has been changing within renewables. I think Wood Mackenzie is predicting that the mix of solar to wind by 2021 will be about 85% solar to 15% wind. Even just three or four years ago, that was flipped. So, it's an industry that changes very rapidly just like technology. And it's interesting because solar is really an inverter-based technology, meaning it's all electronic. It can deliver to the grid and respond to the variability of load on the grid. The grid is the interconnection of all the transmission lines. It can respond to changes in people turning on computers or turning off their computers and all the variability that goes with that. It can do that very quickly in nanoseconds. As a result, it has a lot of inherent capabilities that traditional fossil fuel resources don't have. We're just starting to learn how to use some of those capabilities, and I'll speak to that a little bit more.

But in terms of how corporate renewable procurement happens, how corporate and industrial customers get their power, there are three different ways right now. One is kind of a direct purchase of power when there's an ability to

colocate right at the facility and sell power, sell the actual energy, which is what Wayne was talking about. That can be a direct contract between the project and the company.

Another way, when you can't locate right there where the factory is, for example, is to have a project somewhere else that delivers power into the grid. But then, how do you know those electrons get to the place and how do you deal with the regulatory structure to allow that sale of power, because there are all sorts of federal, state, and local rules around that? One of the ways that that can be facilitated in a regulated market is through the utility mix. In that case, the contract is between the project and the utility, and then the utility has a contract with the corporate off-taker. Often, the corporate customer pays a premium for that renewable energy and that's how that sort of contractual purchase can happen.

The last way is a virtual PPA. That's more of a financial hedge on that energy, where the energy is just being sold into an unregulated market. That only works where there is a regulated market. And then, the corporate entity is ensuring a price. If the price on the market of that energy is below, then the corporate pays that project the difference, and that ensures a revenue stream, which allows the project to get financed and built. The financing is a lot of why the terms are so long.

Or if the price is above, then that corporate entity actually gets the difference. That difference then allows the company to hedge their energy costs over the long term. That can be very attractive and is kind of a win-win, win-win. Not only do you get renewables, not only do you ensure additionality with the project getting built, not only do you have more green, and so on, but you also have an energy hedge so that you know what your energy cost is and can have more predictability around that as a company.

Those are the very basic ways that energy gets procured and projects get built. This applies particularly in the United States, but it applies internationally as well. One of the things that we find can be an obstacle is that if you're selling energy to a company that has another business as opposed to a utility whose business is energy, they do not want to take risks related to how energy markets work. They don't want to have to worry about a lot of congestion on the transmission line, which caused that project to be turned off because there are grid operators and they look at how the energy's being delivered and used by consumers. They're balancing that second by second, minute by minute. If there's an imbalance, then they have to curtail that project perhaps.

That's a loss of revenue for that project. If we go back to what I said earlier about the revenue stream, meaning to be really predictable in order to get that project financed, then you have a problem if that risk isn't somehow taken care of outside of the project. Companies don't want to take that risk. Developers of projects can't really take that risk from a financing standpoint. So then you have to come up with another solution. Solar comes on and then goes away because the sun goes down; nobody wants the risk of this imbalance caused by the variability of solar matched

with the variability of load. We really have to find technical solutions.

First Solar has actually taken this on. We hired people to work on this particular issue and to think about how we could level out that congestion. How can we make it so that grid operators don't have risks around these kinds of things and then don't need to curtail? It turns out that, because these facilities are electronic, you can do a lot more with a solar facility than you can with a spinning turbine in terms of responding and holding back energy. You can use the inverters, which are what transforms the energy current into something that can be sold. You can hold back energy right on the site and store it on-site even without batteries. If you operate it properly, you can have a lot of that up and down flattened out, which really helps the grid and helps manage that risk around congestion.

Then, if you add batteries to that, which is kind of a new thing, solar panels have become cheaper and cheaper, and now batteries are becoming cheaper and cheaper. If you combine how you operate to level out things, these are like plant controls and inverter controls. You combine that with a battery that you're charging at just the right time, and then you can start to have a solar product that operates just like any other resource where you have the power when you need it.

That is becoming very cost effective, which is very exciting. It encourages us to think more creatively about how to sell that energy. Should we be paying for energy or should we be paying for capacity? In other words, just being able to sit there and be ready, which is how we pay with fossil fuel resources like turbines that stand ready. If we change how we pay, then we get the right incentives. There are regulatory challenges around this. This is all very new, sort of understanding the capabilities, so we have to change our policies to incentivize this kind of operation, and then we have to change how we procure.

We're right on the cusp. I think if we can solve grid congestion, we can have much greater solar penetration. We've done some studies that show that not only do you bring down curtailment, but you bring down costs overall for the system if you operate solar plants this way. As I said, it's kind of a win-win-win.

Janice Dean: I want to talk about what New York does. To alleviate some of these barriers, I want to raise a couple of other challenges that we hear from clean energy-sector customers, businesses, and developers. NYSERDA is New York's energy policy arm. We work to implement clean energy policies, and we work to spur and accelerate clean energy markets. As Beth was saying, when you've explained things as a lawyer, on the ground level, what that means is we take funding sources like a small surcharge on New Yorkers' energy bills. It will say "systems benefit charge." It's a couple of cents. That rolls up into a meaningful amount of money that we then reinvest in clean energy development, helping drive down collective greenhouse gas emissions across the state.

At NYSERDA, what we do is put solicitations on the street. We build out programs that allow all kinds of sec-

tors to come in and take advantage of that collective source of money. To Beth's point, when you have folks who can't bear the risk themselves for a certain build-out or a certain type of technology, we help buy that risk down. We bring those costs down by the influx of a little bit of targeted money at those pain points where it's most effective in spurring market development.

I'm going to talk a little about solar and energy storage and a couple of other programs to give you a sense of what New York is doing. Since about 2013, New York has put climate mitigation and greenhouse gas reduction at the top of our policy agenda. It's been a very exciting time to be a New Yorker. I hope that will continue. I suspect it will. And we are seeing that NYSERDA, with its ability to morph rapidly and address these challenges, is really playing a critical role in helping these changes take effect quickly.

We do extensive voice-of-customer outreach and stakeholder outreach. So, we hear a lot from solar developers, multifamily property owners, the commercial sector, and industrial sector about why they're not building out. To Wayne's point, what are the reasons why we're not seeing more investment in a certain sector, and what can we do to help folks on the corporate side make different decisions about their energy mix?

Then, we employ a buyer feedback group. We test, measure, and adjust. If the market is responding the way that we thought it would, we'll bring those incentives down. If it's not responding, are we targeting them at the wrong sector? Is the risk still too high or are incentive levels not right? And then, we go back to the drawing board, retool, and put a program back on the street.

In addition to the obstacles we've talked about so far, we also see shortage of skilled workers in these fields, in sufficient building maintenance, and energy efficiency and weatherization of homes and businesses. I'll talk a bit about our work force development initiatives, high siting costs, permitting costs, permitting delays, and interconnection delays. We aim at not only the hard costs of these programs, but at trying to bring down the soft costs as well. I'll talk about what we do with municipal education, model building codes, model fire codes, and helping authorities have jurisdiction to smooth the transition. For the lawyers in the room, when your clients come to a municipality with a project that needs to be sited or needs a permit, if they're well-educated in what that means, you're going to get through much faster. That's our goal in New York communities.

On the work force development front, New York saw 7,200 new clean energy jobs in 2018, and we have about 159,000 clean energy jobs right now across the state, with an expectation that companies will have hired 12,000 more in 2019. What's most fascinating about these numbers is the clean energy sector is growing at a rate of more than twice that of traditional job growth across the state. So this is really where change is happening. We have 123,000 New Yorkers employed in energy-efficiency jobs. Again, these are the construction-type jobs—weatherization, insulation, bringing new energy-efficient appliances online.

One of our programs works with building managers, property managers across the state, where we set up training labs. So we're not burdening the day-to-day operations of the facility, we will contract with building lab space, mock up the building systems, and train them on more efficient building operations. This is things like when we shut down boilers for maintenance, adjusting air handling systems. It could be really basic changes that see a marked increase in efficiency. This program can bring greenhouse gases down 5% to 20% just through different building maintenance practices.

As an example, for the work force development program, our average incentive would be about \$260,000, which the property owner or the management company would match. An annual energy savings through our work force development program can average about \$725,000 per project. We do hope to train about 28,000 New Yorkers in energy-efficiency technologies, and that includes clean technology, cooling, and building operations and management in the future. I'll talk in a minute about New York's new nation-leading climate legislation, but we are looking at potentially 100,000 new jobs in the clean energy field as that statute takes effect and begins to roll out. A lot of work to be done in work force development is a key component. Although not one of the foremost challenges the panelists have noted today, it's certainly something that we hear from folks when they can't get the staff they need to move quickly. So, we're targeting money at that issue.

I talked a little bit about declining incentives. Again, in New York, we've employed those right now in the solar programs and in energy storage. That's providing incentives when the market needs them and then watching to see when the market has become self-sustaining. We can taper those incentives off. Beth noted that costs have come down quite a bit, and New York has definitely seen that. Since NY-Sun, which is the New York solar program, came online, we have seen an increase in solar deployment of 1,700%. That leveraged \$3.8 billion of private investment at the same time. We saw the price per watt come down 58% between 2011 and 2018.

Another note on the obstacle that we have heard about permitting and siting delays, we have sent the siting team out to every municipality that asks for a meeting within 48 hours. So, if you have questions where you live, you might be seeing moratoriums on solar development. We've seen that come up a couple of times throughout New York. That's an understandable reaction to some degree when communities say we're not well-versed in this; this is a new technology; we're not familiar with this; this is going to change our landscape. Certainly, with land-based wind, you might see the same thing. So, we have educational guides. We've had websites up. We do in-person meetings and trainings. Again, we provide our "little NEPA," the State Environmental Quality Review Act (SEQRA). We'll provide guidance on the SEQRA review. We approach all stages of development in these projects and where we can be the most effective from the state level.

We do the same with energy storage, and this is a very rapidly changing field. We are targeting solar-plus-storage

in New York and building out energy storage as a way of keeping, as Beth noted, the intermittency of some of these technologies. Energy storage can attempt to even out that playing field with more traditional baseload technologies. Building on the success of the NY-Sun program, New York's energy storage program aims to get 1,500 megawatts online by 2025 and 3,000 by 2030. We do have a fairly complex sort of reward system, and we are not a net metering jurisdiction anymore. We have a value-based system, which, fortunately as a lawyer, I don't have to get into, but it looks at where you're exporting it to, the location, the timing, and so on.

One of the primary obstacles that we hear with any new technology is that it's too expensive. Just straight across the board, it might not be something that's really workable for folks. What we are seeing in a very rapid period of time is that the approach that we're taking to bringing these costs down is really working. We're seeing storage costs coming down about 10% to 15% per year. We're hoping to accelerate that through the programs I was talking about.

At the same time that all of this is happening, like Wayne noted, his company is doing business in some regulated states. A lot of this has to do with where you are geographically and what that state's energy policy approach is. These are all changing very quickly. The map of states that are moving to 100% renewable or 100% clean energy is changing really quickly, and I think that will continue.

You're going to see states follow the lead of California, New York, and others and take the leap. It's a very open dialogue. There is a lot of room for collaboration, for new ideas, for players like Wayne's company to come in and say here's what we can do. Can we build on that? Can we collectively make this more accessible to others? Those partnerships are really what make this happen.

I want to talk about New York's new legislation, the Climate Leadership and Community Protection Act.⁶ In July, Gov. Andrew Cuomo signed the bill into law. It is the most aggressive climate policy ever enacted by a major economy. It codifies and expands on the governor's Green New Deal and mandates the state to reduce emissions 85% by 2050, with a 100% clean electricity by 2040, which is not that long from now. So, there's a lot to be done. It's an exciting time to be in New York in this space. As we like to say at NYSEDA, we built the plane, now we're flying it. We don't want to wait to have it all figured out before we put it into motion. We have the blueprint and we moved forward on a number of different fronts at one time to make these goals happen.

This statute is worthy of note, in particular not only for its ambitious goals, but also because it's very inclusive. There are working groups and a requirement to serve low-income communities. There have to be six public comment hearings, with 120 days for public comment. And there are particular opportunities for disadvantaged communities to participate. There is an environmental justice community representative on every climate justice working group that informs the Climate Action Council, which the law

6. S.B. 6599, 2019-2020 Leg. Sess. (Cal. 2019).

establishes and that will guide statewide policymaking. The state has to invest 35% of clean energy and energy-efficiency resources to benefit disadvantaged communities, and we'll aim to invest 40%.

We are aiming, with this law, to do this the right way and learn from past policies that have not been as inclusive as I think we all would like. It's going to be an interesting time to watch New York, and I think a great time to do business in the state.

Sofia O'Connor: I have a question for Beth first. Can you tell us, in your experience, is it easier in some states to help incorporate renewable energy, specifically solar, than in other states? And why do you think that is?

Beth Deane: Yes, it does vary quite a bit by state and region. There can be the obvious reasons because there's a renewable portfolio standard (RPS) program that encourages the development of projects. As a result, there's a big appetite for renewables. And from there, it's a lot of different factors. One factor is the type of market that applies, whether it's regulated—meaning it's a traditional utility model with vertical cohesiveness, where the consumer gets the bill from the utility and the utility owns all the resources and then delivers that power to consumers—or an unregulated market—like in California or Texas, for example, where the utilities own the lines and send the bills, but they procure their power from other power providers. There's a very active market for the sale of power. That's also how the transmission system can be operated. It can be its own market on top of the retail, wholesale, and then transmission market. So those market differences between regions really do make a difference.

I think there's political differences and appetites for renewables. But even in regions that historically weren't that interested politically in procuring renewables, that's really changing just because of the cost. So, as people learn more, for example in the Southeast, I think the appetite has really grown for renewables on the utility side.

I think the next factor is how do utilities work with corporate, with companies to really meet the needs of those companies? Some of the incentive programs that have been developed are based more on economic development. This is something Wayne and I have been talking about. And that's good for a state that wants to draw in new business and new jobs. They can use their renewable policy to help their economic development policy. But for a company like IBM that's been around a long time, those programs may not encourage the right kind of incentives, and so on. So, there's quite a lot of variability for all of those economic, political, and regulatory reasons.

Sofia O'Connor: Speaking of regulatory reasons, can any of the panelists summarize the regulatory barriers to having more renewable energy on the grid?

Janice Dean: I'm not on the ground level, but from up here, I would say we are seeing, as I mentioned, permitting challenges. We see it is a changing model. It is asking

utilities to play a different role. It's asking for information-sharing to be done in a different way. For example, one of the issues that New York is working on collaboratively with the utilities is data-sharing. Who has the rights to customer information? When you need to know where you can drive down costs and drive down greenhouse gas emissions, that requires a look across the spectrum at who's using the energy.

But that information has traditionally and rightfully been held as private. No one wants their name and energy usage out there with a utility account number and utility bill and all of that. But that information has to be shared by other parties to make these decisions more broadly. So, we've been addressing those issues with the utilities via data-sharing agreements, a unified set of terms, the baseline terms that everyone can agree with for getting this started.

Wayne Balta: From the point of view of a company, probably any company, not just us, we would bump into regulatory issues when we learn whether the state has a regulated utility or is not regulated, and whether or not there would be an RPS. The reason that would become relevant to a buyer is that those issues could affect the pricing and the term of the energy that's available to you. That doesn't mean it's good or bad; it just means it's something you would encounter in response to your questions.

So, you have to be able to navigate around that. In our case, in Boulder, Colorado, the local utility needs to retain the RECs, so IBM can't claim use of renewable energy under accounting protocols, even though we consume it.

Sofia O'Connor: To add to that, to understand an RPS, a utility has to comply with an RPS and thus has to keep the RECs. To build on Wayne's point, a company may need the RECs, but a utility also needs the RECs. So, there is a question of who gets to keep the RECs.

Do we have any questions from the audience?

Karen Florini: I'm the vice president for programs at Climate Central, which is a climate science research communications organization. Last week, we launched version 2 of our WeatherPower tool, which combines information on installed wind and solar capacity for every community in the country with yesterday's actual weather and forecasts for today and tomorrow. This was developed originally for meteorologists so they could go online or go on air and say things like, hey, here in the Quad Cities area yesterday, we produced enough power from renewables to power 48% of the homes in our community, or what have you. It also turns out that they're very fond of saying this was enough to charge 538 million cell phones.

We're starting to think about a version 3 of the tool, and I'm wondering whether it makes sense for us to think about incorporating—in addition to what we already have, which is at the state, county, media market, and congressional district levels—information on corporate sales and utilization of renewable energy?

Wayne Balta: I would see no reason not to want to share that kind of information. I think the more transparent we are with actual real-life data, the more success we'll collectively have in increasing the quantity of renewable energy that's actually consumed, which is what we all want. Your question makes me think about the fact that IBM owns the Weather Company and the ability that exists to now forecast at a square-kilometer level.

One would think technologically that the marriage of a hyper-accurate forecasting with diverse data, whether they be structured or unstructured, and to separate consumption from generation and matching it all up, would help move the needle forward on what's really possible.

Beth Deane: Yes, I think from a developer standpoint, that kind of information would be really interesting for us. But I think for companies, a lot of why they're doing what they're doing on the energy front is because they want to improve their image around being green. So, if there were a way to self-report what they were doing and get that information out, I could see why that might be attractive to a number of different companies.

Based on what we've been able to put together, companies collectively in 2018 bought about 8.5 gigawatts of power, one way or another. And that's the additional concept where they encouraged that much development of new projects because of the revenue streams this created. That's a lot of power. So, I would think you'd have a lot to report. It would be meaningful if you could develop that and get people to participate.

Frank Friedman: I've been involved recently in several solar projects in Massachusetts. I was intrigued by the comment made that now solar is at the lowest comparative cost. I'm curious as to what is the basis. In other words, how do you define "cost"? Does it include any form of government incentives? Cost, for example, as compared to, say, natural gas?

Beth Deane: I'm the lawyer, so I'm reporting out what I'm being told by our financial folks, but my understanding is that it's the lowest cost even without the incentives. It's the cheapest new form of energy out there basically. So, if you were going to build a solar plant versus another more traditional form, the solar would be cheaper with or without incentives.

Wayne Balta: You probably mean in terms of generating the energy. But the retail price at your front door may involve some other costs to get it from where it's generated to your consumption of it. As these sources of power become better integrated across grids, that should become more and more competitive, I would think.

Sofia O'Connor: We haven't talked much about integration into the grid. Would anyone like to provide more information on some of the caveats that exist with regard to why it might be complicated to integrate new projects and what should be done?

Beth Deane: Any project that's going to hook up to the grid has to apply and then be studied. Often, that takes several years as to the cost, and what upgrades might be needed in order to facilitate that project coming online. That's why a project can take two to three to four to five years to develop. One of the things is just having the right to hook up. The other thing is this idea of how people that own the right to sell that power, which might be a utility or a corporate customer, how they participate in the day-to-day market.

Different regions are more market-based than other regions in terms of the transmission piece. If you really wanted to incentivize a particular project to provide capacity so that you can turn it on and off and up and down, and operate it in a way that really tracks to that intermittency, you would need to be able to sell that capacity. And there are capacity markets and there are regulatory rules about what counts as capacity.

Right now, like in many markets, to be capacity, you have to be available 24 hours a day. But solar has a lot of ability to provide capacity within the daylight hours when there is all this variability. So you would have to change that rule, for example. But that's happening region-by-region, state-by-state. It's a very time-intensive kind of thing to really modernize the transmission aspect of this whole thing.

Jay Pendergrass: Do any of you think there's a need to have some fundamental revisions to our national energy regulatory system in order to promote this? Or is it working fine as it is? Beth started to talk about some of the complexities of things, and some of that's regional, but some of it's based on national rules. Any perspectives on that?

Wayne Balta: In general, businesses like simplification. That's not a shocking statement. Oftentimes, in the environmental arena or the energy arena, when one encounters different requirements state-by-state or country-by-country, it's just simply more complicated. There may be good reasons for that to be the case, but it becomes more complicated and more cumbersome. So the more simplicity, the better; the more uniformity, the better.

I think what all of us would ultimately want is for renewable energy to be able to be integrated onto the grid such that it comes to us in grid-supplied power more routinely and that that becomes the new norm. Strategically, the question then becomes, what policies would be needed to further encourage that or enable it? I think some technology will help. I think things like blockchain can help verify with trusted transparency an intermittent source being available and ready to come on or to go off. There are things that can technologically be done, but I think, policy-wise, anything that can cause that to be the case would be good, so that it isn't hard to procure renewable energy.

I don't meet anybody who says "I don't want to use renewable energy." Nobody says that. So, to the extent that it becomes less complicated, less cumbersome, that is what we want.

And another way to look at this is very encouraging: my company, other companies, a lot of entities are consuming over 33% of our power from renewable sources. That's pretty good so far. Not enough, but there's a lot of reasons for optimism. And if you think back, what would you guys have been doing in the 1990s? This? Maybe not. So, a lot of things have happened and I try to see the glass half full.

Beth Deane: I think there is a role to be played by the federal government in terms of looking, for example, at the grid and how to modernize it and what really makes sense from a policy standpoint. I think there is an opportunity there. If the Federal Energy Regulatory Commission doesn't provide that leadership, I think it will happen on the regional level.

It's already happening with different regions looking at these issues. I think the California Independent System Operator, the state's grid operator, has been forced to look at it first because they have the highest level of penetration of renewables right now because they were early adopters of an RPS. I think it will happen organically at a regional level or federally if there's leadership provided—to be determined.

Audience Member: This is a question for Beth. Could you elaborate on the waste management and recycling of solar panels at the end of their life cycle? Also, do you have a ratio on your solar panels sold for use behind the meter and in front of the meter?

Beth Deane: I can only speak to what First Solar does. Most of what a solar panel is, is glass. That glass is highly valuable, so recycling makes a lot of sense. We have a big manufacturing facility in Ohio. We will take back any of our modules from anyone who buys them from us and then recycle them. It's cost effective for the entity that owns them to do that, and it's cost effective for us to have that material back again.

We're a relatively young industry, so we haven't had volumes and volumes of panels come back. But there's always breakage in shipment. Things happen at a site and they have to get replaced. We're already doing that on a very routine basis. As I said, about 90% of the material is recyclable and we reuse that. I think other industries that are more silicon-based have a different way of doing it. And it's been a big issue. There are concerns in communities about that issue and making sure that we don't send all of the panels that are going to be done in the next 10, 20, or 30 years to a landfill.

That is still to be determined. Right now, it's very standard to have a 20- or 25-year warranty on a panel. But a lot of people believe panels will last a lot longer than that. Then again, the technology is always evolving. Even though they may still be perfectly good panels producing energy, there may be a panel that is a much higher efficiency. There'd be an economic reason to replace the original panel just because land costs are high. So, if you can get more energy out of that same amount of land, that might make sense. It could be that we'll never really know how long because

they just keep getting more efficient and get replaced in a shorter period of time. But it's still a very young industry.

Scott Bush: One of your topics was supposed to be barriers and I haven't heard any talk about barriers. I come from West Virginia, where you can have your solar power, but you can't sell it back to all the coal utilities there. If you're going to have reliability, it's going to cost more money. And if you're going to go up to 55%, there's going to be a potential reliability problem. If you're going to have a green energy program that one of the political parties wants to put up, you're going to have a tough problem with reliability and costs. Do you have any comments?

Wayne Balta: Barriers, largely for us, have been term, meaning duration of a contract, price, and accessibility. The goal for us is 55%. I did not say 100%, and I didn't say that on purpose. I would like nothing better than for my organization to be able to operate on 100% renewable energy. But at the same time, I know that's simply not realistic. And I think the more honest we are about that, the more we'll be able to get additional people constructively into the whole debate.

A data center has to run 24 hours a day, seven days a week, with 99.99% reliability. Quite frankly, anybody in that business, if they're honest with you, is going to have to tell you they need fossil fuel backup for today and for the foreseeable future. There's no reason not to be honest and candid about that. It's just the way it is. It doesn't mean we don't care. It doesn't mean we're not going to try to do more.

So, barriers include price, duration, and accessibility, and there is an acknowledgment that, for a while, some fossil fuel use is going to continue to be necessary, as provocative as that may be to this audience.

Beth Deane: Yes. And I think over time, batteries will start to fill that void, but that's a cost issue. And we're seeing utilities, for example, that are very interested in procuring colocated battery and solar plants. You don't need to have a battery that's the size of the plant. You can have a much, much smaller battery to address the period of time when energy load is the highest, which is when people get home at night. And if you right-size the battery and right-size the operation and the charging of that battery, it can be very cost effective, even today from a utility standpoint. From a data center standpoint, I think that's just another technological barrier challenge that we will be looking to solve over time. But it's in the future.

Wayne Balta: Yes, I know it is. And the technology that can get renewable sources that may produce intermittently or may be able to produce when a grid fundamentally goes down, the technology that can cause an integration to occur, will eventually dampen out the need for the fossil fuel backup.

Joe Cascio: I've been reading articles on pushback from communities, the "not in my backyard" (NIMBY) kind of

thing. They don't want the solar panels. They don't think they look good. And then there's the argument on arable land, valuable land that's taken up with solar panels. Obviously, that's an issue. I have no way of gauging how big an issue that is and whether that's going to be a real problem in spreading the use of panels and solar.

Janice Dean: I can tell you a bit about the New York side of things, that we find education goes a long way. Particularly in western New York, in very rural communities, these developers come in and are proposing something very new. There are a lot of concerns about what that will mean for community character, what that will mean for their economic base, for jobs.

So, what we have tried to do is address any questions about what it means for the type of land use. We are trying to get at that on a very regional retail level by coming into the community and having those meetings. A lot of that does fall on the developer and the project team as well to do a lot of stakeholder engagement and really get at what those questions are and how they can be addressed.

That said, we are seeing developers in New York focusing on brownfield sites. We're siting on our nuclear waste disposal site a community solar development to benefit the local communities around the site. There are always opportunities for creative use and not moving into greenfields where possible as well, but it's no different than any large development project. I think those factors are present, but I do think education and the more that we're seeing these projects come around the state and bring down energy costs, we're going to see that helping the dynamic as well.

Alexander Stapleton: I have a question about this conversation on regulated versus deregulated markets. I think it's a distinction we've heard about quite a bit on the panel. I know in our neighboring state of Virginia, there's an issue related to the 50-megawatt cap that they have on the PPA regulated market.

I'm wondering whether you think that the path forward in regulated markets that will hopefully expand renewable energy procurements by corporates is giving more lanes for those types of PPAs in regulated markets. Or is there more of a role for the government or PSEs to bring the regulated monopoly utilities in as constructive partners?

Beth Deane: I can say that based on our experience, a lot of times the corporates are the ones that drive the demand. They work really closely with utilities to develop the right policy. They work really closely with legislators to develop the right policies. So from my perspective, a lot of that is driven by corporate needs and interests. And developers follow that as opposed to developers being the ones that are saying, this is what we need.

That said, from sort of a legal structure standpoint, having the right policy does matter. If you really do want to develop more renewable energy, having people that are thinking about those issues and working with utilities, my experience is utilities are very open and they're learning a lot very quickly. The Dominions and Dukes of the South-

east are on the forefront of looking at policies and developing very proactive ways to solve what their needs are. And they work closely with corporates about what those needs should be.

Wayne Balta: We've been able to consume renewable energy in U.S. states that are both regulated and non-regulated. In New York, which has been deregulated, we worked with state hydro. We did a lot of hydro power there. On the other hand, I previously gave the example of Colorado, which is regulated, where we worked with Xcel Energy and NextEra Energy for solar.

I believe that there were fundamentally good reasons to have originally regulated the utilities in certain states. There must also have been good reasons for RPS to exist. The only thing I would say is that we should all keep in mind that times change. Over two, three, four years, things change. Technologies change. Economic practices change.

Although I can't provide a knowledgeable answer to a very good question, I can say that the best thing we can do is to remind ourselves to re-look at these things frequently and re-ask ourselves, is the basis upon which we decided to have regulated utilities or RPS still the best thing in 2019 or 2020 or 2021? We need to have the ability in society and the way we govern things to change if we collectively conclude that something worked for a while, but now it's better to do something different. A lot of times when regulations and practices get put in place, they tend to stick and become static.

Beth Deane: Yes. And I think RPS are a really good example of how that might be something that needs to be re-looked at because that's very much energy-focused, like maximizing the amount of energy produced. But if you want to really integrate power into the grid, maybe you don't want to have the absolute most energy from that plant every day, every hour. You want to have the flexibility to operate it to provide capacity rather than energy. And that's a different policy.

Charles Howland: I want to follow up on something that Janice said, and then go back for a comment. What she was talking about was what are called brightfields, renewable energy projects on environmentally impaired land. The reason I want to expand on that here is because of this audience, which might include corporations who are interested in increasing their renewable energy consumption. There's a real sweet spot there. Renewable energy projects on environmentally impaired land could be the highest and best use of the land. You often get rid of the NIMBY problem. And it's not just people who don't like solar or wind on political grounds. Plenty of states exclude such property from their property taxes.

So, as between losing Farmer Brown's farm to a solar farm as opposed to Walmart, as between those choices, maybe you're going to go for Walmart. Putting it on an environmentally impaired land sort of takes care of that problem. There are lots of corporations with existing legacy liabilities. They're behind the meter or in front. For both of

them, they already own the liability. So, the biggest impediment to renewable energy on environmentally impaired lands is much less of an issue and it's one that often the corporations, the owners, are well-versed in dealing with.

The closing question would be, any war stories, pro or con, a little more specifically from any of you on this issue of using environmentally impaired lands as sites for renewable energy projects?

Janice Dean: I don't have a war story, other than we did as the licensee of this nuclear waste disposal facility go through the lease with the town, and they went through the sublease. We've sort of seen that from the front-end. In that case, it was a win-win. That facility should break ground in the spring.

I should note that in NYSERDA's NY-Sun program, we do have an adder for brownfield sites. And we're seeing the build-out of solar on landfills in New York. I don't know of any downside. I'm not an expert. There might be some, but for all the reasons you just stated, it's a great idea.

Beth Deane: We, First Solar, don't have as much experience on brownfield sites, unfortunately, because we tend to do really large projects. Twenty megawatts is a really small project for us. Landfills are not that big, usually. It would be other developers, that aren't here on the stage, that could speak to that more, but it is something we're always looking for because of the sort of win-win aspect of it.

Wayne Balta: No war stories. All I can say is, as a private citizen, I like nothing better than seeing an environmentally impaired land or a brownfield be put back into a beautiful beneficial use. And if that should be for solar panels or windmills or for creating biomasses, so be it.

Scott Fulton: Thank you all for coming to the 2019 Corporate Forum. A special thanks to our fantastic panel for investing their time and energy, and for sharing their thoughts with us.