SMART ENERGY DECISIONS

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Insights from the 2019 Innovation Summit



March 11-13, 2019 / The Houstonian Hotel, Houston, TX

Collaboration energizes the SED Innovation Summit

he consistent growth of Smart Energy Decisions' Innovation Summit clearly reinforces the need for an event that helps advance best practices in energy efficiency and renewable energy sourcing by our community of large electric power users from commercial, industrial, institutional and cities/maniple entities. To address their unique needs, the Innovation Summit offered 12 general sessions featuring 16 energy management executives sharing their experience, 54 boardroom case studies, and over 400 one-on-one meetings between customers and suppliers to explore opportunities, all wrapped in a package of high-quality networking in an intimate environment.

This *Insights* report, part of our continuing series, offers excerpts from each general session to give you a taste of the thought-provoking content, as well as the spirit of collaboration in evidence throughout the event.

We're extremely grateful for the ongoing support of the SED Advisory Board and the growing ranks of supplier sponsors who form a central element of the content at the Forum. We hope you'll join the community at our **2020 Innovation Summit** as we return to the Houstonian in Houston from March 9–11, 2020. You can request an invitation to participate at the event website by clicking <u>here</u>.

If you do business in the 11-county greater Philadelphia region (including Northern Delaware, Eastern Pennsylvania and South Jersey) check out our newest event, Accelerate Philly, December 9–10 at the Logan Hotel in Philadelphia. This landmark event will bring together large power users, renewable energy developers, suppliers and government from the area to advance best practices in renewable energy sourcing and energy efficiency. Click <u>here</u> for more information.

Cordially,

John Failla Founder & editorial director john@smartenergydecisions.com



Editorial director's letter

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Snapshots from the 2019 Innovation Summit





Keynote: Collaboration enables Merck to take a huge, sustainable leap forward

MERCK



Christopher Broome, associate director, Energy Center of Excellence, Merck



Michael Waslin, senior engineer, Environmental Sustainability Center of Excellence, Merck



Doug Yunaska, associate director, global energy, Merck



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Keynote: Collaboration enables Merck to take a huge, sustainable leap forward

WASLIN: Four years ago you wouldn't have seen all three of us on stage together. We're a big company and we can be very siloed at times. Part of our presentation today is about how we broke down those silos.

We've had many sets of sustainability goals, but we never really had a formal strategy. About six years ago the Environmental Sustainability Center of Excellence, my group, was established and we were challenged: we have 17 environmental sustainability goals—boil those down to three and make sure that they make sense and align with the business. So, we got to work. We did some benchmarking and created our current environmental sustainability strategy. There are ongoing updates—our strategy is flexible—but at its heart, our 3-pronged strategy is sound.

The first prong is looking at Efficient Operations. That's mostly what you think of as traditional sustainability goals—energy reductions, water reductions, waste reductions—which are the areas that we control internally. The second prong is Design for Environment. That's not doing things the same way that we've always done them, but trying to think, what do we want our company to look like 20 years from now? The final prong is the Value Chain, which, for a pharmaceutical company, is complex and vast. When you look at the impact that Merck causes—or any pharmaceutical company causes—the largest impacts and, therefore, opportunity is in that value chain.

In setting this strategy, we also created our latest environmental sustainability goals. Some of the goals are specific to our industry around packaging and the supply chain. Others are more familiar around reducing water. We're trying to reduce waste. I'm proud to say that we've used science-based methodologies to create our GHG emissions target of a 40% reduction by 2025 versus a 2015 baseline. We also, for the first time, have a renewable energy goal. So how did we, a conservative company with silos, get there? About four years ago, we got together as a group—my group, Chris and his group from energy demand, Doug and his group from energy procurement—and started to talk about the value of energy to us. For me, as a sustainability guy, it was GHG emissions. For Chris, it was the costs and reliability of supply. For Doug, it was the budget certainty and diversifying our supply. We had this a-ha moment together and we said, okay, we're never going to speak just about energy or just GHG emissions. It's going to be about the value of energy to Merck.

We took that revelation to senior leadership and they got on board with it because something connected with them when we spoke. That's how we started to build trust and that's how we got to these pretty aggressive goals. We never would've gotten there if it wasn't for this collaborative effort.

The final piece was that we needed an example. The energy program was our example of a sustainability measure that was working.

BROOME: I work on the facilities side. At the beginning, it was all about trying to get the costs lower. Now we are mainly trying to reduce GHG emissions. My group is focused on reducing the demand side. I'm the corporate energy manager. At every site, there's a designated energy manager called a GENIUS, which stands for Global Energy Network for Improvement in Usage and Supply.

We work with these site energy managers to make sure that the individual cares about his energy use because it's not really his full-time job. He's got a ton of other stuff to do but we want him to focus on energy reduction at the site level. We have an energy strategy pyramid that we talk about to the sites. The first rung of the pyramid is all about energy savings through reliability. The reason why we chose reliability is that it



Keynote: Collaboration enables Merck to take a huge, sustainable leap forward

gives you a two-for-one: you fix something that's broken and change something that's causing energy waste.

Next, we have energy savings through operations. How is the equipment running? Is it running when it shouldn't be? I always say in operations that the greenest and cheapest kilowatt-hour is the one that's not being used. If you need to run it, then you will run it as efficiently as possible. Some examples are chilled water optimizations, lighting controls, anything to reduce the demand to make it as efficient as possible.

Next up the pyramid is energy saving through design. If something needs to be upgraded, we make sure that it's upgraded to be as energy efficient as possible. If it's not broken, don't try to fix it. Replace things at the end of their useful life. We want to influence them to not only look at the first cost, but also the life-cycle cost of an asset.

Another rung up the pyramid is energy savings through renewables. My colleague, Doug, works in procurement on the sourcing side so he's going to walk through how we look at energy sourcing. **YUNASKA:** Our energy supply risk management program has established CPO and Treasury engagement as we manage our portfolio. We leveraged that visibility to involve leadership early in the process so that there was an opportunity to have an informed conversation, understand risk tolerance, and gain insights into strategic priorities. For contracts such as VPPAs, we represent the business requirement as a sustainability play rather than a financial opportunity.

We have a diversified approach to achieving our goals through a mix of onsite direct investments, above site contract models across a variety of different markets/technologies, assessment of real estate opportunities, and updating business processes to drive performance.

If you're an energy buyer considering how to get engaged in the renewable energy markets, you don't know what you don't know, so you have to talk to the experts. Also, don't be afraid to have informed conversations with senior executives to get their feedback on risk tolerance. For contracts such as VPPAs, we represent the business requirement as a sustainability play rather than a financial opportunity.



"We had this a-ha moment together and we said, okay, we're never going to speak just about energy or just GHG emissions. It's going to be about the value of energy to Merck." —**Michael Waslin**, senior engineer, environmental sustainability, Merck

Panel: Approaches to employee engagement in energy management



Wolfgang Bauer, university distinguished professor, associate vice president for administration, Michigan State University



David Reid, global energy and productivity leader, Celanese Corp.



David Templeman, vice president, environmental health and safety, CBS Corp.



Ali Ahmed, principal, Green Strategies (moderator)



Panel: Approaches to employee engagement in energy management

AHMED: This panel is going to talk about how to engage employees—what these three very different companies are doing, how they arrived at that location, what's their why and how their stories hopefully can be applied when you go back home.

REID: At Celanese, we have about 7,600 people worldwide. We've had a strong energy program in place for over 20 years, mostly focused on the technical side—how to reduce energy, how to be more efficient, how to drive our costs down. In the last couple years, we realized as a team that we weren't going to be able to achieve our goals and be sustainable for a long period of time without getting many, many more people involved in our energy program.

About two years ago we had an energy summit where we brought a group of our energy leaders from the different sites together to talk about energy. Just like a manufacturing company, we looked at the technical side of energy reduction. We had a session where we asked, how are we going to achieve these goals? What do we need to do? We came to the realization that we weren't going to be able to hit our goals without getting a lot more people involved in the program —otherwise, the program's going to drift or it's going to die on the vine or when people leave or move to different roles. There's going to be a loss of momentum.

AHMED: David, what at CBS is the motivating factor?

TEMPLEMAN: We had some investors who put pressure on us to do better in terms of energy reporting. But what's driven us is that we recognize that there are trillions of dollars in investment money out there that we were probably not going to have access to if we didn't do a better job in the area of sustainability. This includes the whole GRI (Global Reporting Initiative) framework of not just energy but all aspects of sustainability.

AHMED: Wolfgang, how do students affect the decision-making at Michigan State?

BAUER: Michigan State University is one of the top 100 Universities in the world. We are in the top 3 of all U.S. universities as far as federal support from the National Science Foundation and the Department of Energy is concerned so we need to lead on important societal issues. Our students demand that of us, as do our alumni. And we think there is pretty much no issue that's more important than global warming, so it's a perfect area to attack for a university to show that green energy is not just the right thing to do, but also the fiscally prudent thing to do. Our students push this and I like to work with them. One example is Beyond Coal. It's a national movement that tries to get universities out of coal. I have cooperated with them as much as I could behind the scenes. Three years ago we actually completely went out of coal, saved something like 500 million pounds of CO₂ emissions per year in our own microgrid in the process, and saved \$7 million in energy costs each year. So, you can help people, the planet, and prosperity at the same time and that's what we're trying to show basically with everything that we do.

AHMED: What about challenges?

TEMPLEMAN: CBS, as you know, is a news and entertainment company and it's divided into business units that have some relationship to one another but are separate, distinct operations. People naturally are in their own swim lanes, so we have been siloed and we haven't really been communicating. We never had a mechanism or any sort of infrastructure that allowed us to engage the various divisions collectively to accomplish anything.

What we did was first and foremost was to assemble a group of leadership just below the C-suite and present to them the benefits of



Panel: Approaches to employee engagement in energy management

having a sustainability program. We didn't advocate, we just said, here are the things that you could accomplish. Here are the ramifications for the corporation if you choose to do it or if you choose not to do it. By the time we left the meeting, everybody was pretty much in favor, quite frankly, because the numbers don't lie. They were looking at it from a financial perspective. Then they had to sell it to the C-suite. It worked because this leadership group is representative across the corporation.

We've done a number of other things to drive that sort of collective thinking. We now have an Executive Sustainability Council. We have a data integrity working group charged with making sure that the data reported is accurate, auditable, and verifiable from a sustainability viewpoint. Last year, we created an energy management working group, composed of the technical types—engineering and facility functions—across multiple business units. The thought was to use the brain trusts from all these different groups to arrive at solutions that apply across the entire company. It would be easier and more effective to execute because it wouldn't be coming from the ivory tower, you know, corporate types like me. It seems to be working.

AHMED: David's talked about going up and coming back down again approach. How has Celenese organized their employee engagement structure?

REID: We are, I think, bottom-up. A couple of years ago we started a sub-team of our Global Energy Council. We call it the Communications and Engagement Team. Some of them volunteered, some were volunteered. So now we've got this small team in place that really helps push our initiatives, and it's very much bottom-up. We come up with different ideas, the different sites implement different programs, and we share that across the sites. Hopefully people take these moves into account and do them for their own site. We've seen a groundswell of ideas coming from this group, a small team of people driving the program within the company.

BAUER: We also have a monetary incentive in place. It's called the Spartan Treasure Hunt and it's shamelessly copied from GE, who have shamelessly copied part of this from Toyota. We go building by building for an entire weekend. We invite all of our facilities experts in HVAC and heating and electricity and so on, but also the building occupants, so there's faculty, staff and student participation in these events. All we really do is feed them and collect their ideas. They form teams that think about how we use energy in this building and how we can do it better. Any idea that has an ROI of fewer than seven years, I will fund. When the initial expense is paid off, the profit from that innovation is then shared 50/50 between my office and the unit of the building. You know, budgets are tough and if you get half a million added to your budget just from this, that's a big win for everybody.



"We came to the realization that we weren't going to be able to hit our goals without getting a lot more people involved in the program. Otherwise, the program's going to drift or it's going to die on the vine or when people leave or move to different roles. There's going to be a loss of momentum."

-David Reid, global energy and productivity leader, Celanese Corp.

Executive interview: Trends in renewable energy procurement



Lynda Clemmons, vice president, Sustainable Solutions, NRG Energy



John Failla, founder and editorial director, Smart Energy Decisions



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Executive interview: Trends in renewable energy procurement

FAILLA: What do you see as the key trends that are currently shaping the renewable energy markets?

CLEMMONS: More than ever, customers face—and often expect multiple options when deciding how to source their energy. The push to decarbonize our economy has brought about a change in the marketplace that gives customers the opportunity to ask broader questions that perhaps weren't important before. And the world of customization has resulted in a customer base that is used to getting the services they want, delivered when and how they want it.

Let's say I'm a major private corporation based out of New York, and I have offices all over the world. I am now asking questions like: 'What are the benefits of buying renewable energy? Is it reliable?' 'I want to focus on the health of my buildings, how does energy relate to the health of my employees?' These are the conversations taking place every day across corporate operations, in ways that they never have before. No longer is the focus just price or whether the lights will turn on when I flip the switch.

Another reason for expanding the conversation stems from the decline in renewable energy prices. New technologies are developing at a rapid pace and, despite the threat of tariffs on solar panels, we've seen an incredible amount of renewables developed and installed. In Texas alone, the market has roughly 24 GWs of renewables – 18 GWs of wind out of West Texas that's flowing through 3,600 miles of transmission lines built, pretty much exclusively, to take renewable resources from the West Texas generation area to the load areas in the Eastern part of the state.

Now, what is taking place in Texas is a little different than other parts of the U.S. due to the healthy competitive electricity market. Access to that market gives people not only a choice, but also lower prices. Texas is one of the only places where most of the renewable energy is not compliancedriven. The state met its RPS for 2025 in 2009, so compliance has not been an issue for a very long time. Texas has strong solar and wind resources, as well as the ingenuity, the customers and the population to support that type of growth.

FAILLA: One data point we shared at the outset of the meeting was that corporate commitments to emission reductions are increasingly important as a driver. What type of influence do you see emissions commitment having on the marketplace?

CLEMMONS: SASB [Sustainability Accounting Standards Board] and TCFD [Climate Related Financial Disclosure] are ways to report and examine environmental commitments and climate-related risk to the investor community. While they sound like alphabet soup, both are playing an influential role. In my opinion, the adoption of SASB has been a little slower compared to TCFD for a couple of reasons.

SASB [Sustainability Accounting Standards Board] is playing a role, but SASB has been a little slower to be adopted than the TCFD—Taskforce for Climate Related Financial Disclosure—which has had a really very quick adoption as a framework for people to understand. When you look at SASB or other sustainability measures, they're talking about what the company does to the environment and how to measure what your impact is on the environment. TCFD turns it around and asks, what happens to your company when the environment changes? What happens when climate changes impact your business going forward? All the major rating agencies have said that they're taking climate into account as they look at corporate debt profiles and investors are getting in on understanding TCFD. And it's not a single frame-work. It's more about scenario planning.

For instance, a company might put forward four different scenarios about what might happen in the world, whether it's a world of 100% renewables, a world where renewables stop being developed for whatever reason, a world of total command and control, or it's a world where it's a total free-for-all and everybody's about doing the greenest thing possible.



Executive interview: Trends in renewable energy procurement

With each of those scenarios in mind, then, the company evaluates their exposure to different possibilities such as a carbon tax, or market reregulation, or rising sea levels. Companies are calculating these impacts right now and they are unique for every company. They are also becoming one of the main drivers of what companies are doing to reduce their greenhouse gas profiles and to reduce their ultimate risk exposure to the changing environment.

FAILLA: ERCOT's a fascinating marketplace and there's so much going on there. Talk a little bit further about how you see ERCOT evolving.

CLEMMONS: In ERCOT, the biggest news over the last couple of weeks is concerns about reserve margin. We heard concerns about it last summer, and we are hearing the same this year. Reserve margin is basically how much generation capacity we have available to meet load on those very high demand days. In the summertime, when it is very hot in ERCOT, we have a huge air conditioning load. And on a hot day in July, or August, or even September—because summer keeps going and going in Texas—there's a chance that you're going to have some sort of an event.

Last year, we had lower-than-recommended reserve margins. Ideal reserve margins are recommended to be roughly 13%, almost 14%, of the total generating capacity, so you want that cushion at 14%. Last year, the state looked around and said, we think we're only going to have 9.5% of reserve margin. We also had a grid load high of over 73,000 MWs, which is a tremendous draw.

Thankfully, when we had a load event in July, the state, and the grid, handled it very well. We didn't have any brownouts. We didn't even have any emergency alerts. We didn't ask people to cut back or turn off appliances. A lot of that was because the market anticipated this event and responded.

One of the reasons for ERCOT's decreased reserve margins is that so many coal plants have been retired. Since mid-2017, ERCOT has approved the retirement of more than 4,500 MWs of coal-fired generation and we are seeing numerous projects cancelled or delayed. Overall, there is also a significant amount of change happening in this market as we're building up renewables, storage and more modern, efficient generation.

This summer we are again expecting a reserve margin below the recommended levels and that has an impact on pricing. For companies looking to buy power for the summer, and haven't locked in yet, could face a potentially problematic situation, because the markets are expecting that there will be shortages. And, even though the market physically is learning how to deal with these shortages, there's still the potential for price spikes. In ERCOT, prices can spike up to \$9,000 a megawatt-hour before it's capped at that level. But, when reserve margins drop down below a certain percentage, prices can go up higher and higher because of an adder that's built into the marketplace. This adder is to incent those who have more expensive generation to come online and provide power to offset the growing load.



"What we've got in Texas is a little different than other parts of the U.S. due to the healthy competitive electricity market. Access to that market gives people not only a choice, but also lower prices."

-Lynda Clemmons, vice president, Sustainable Solutions, NRG Energy

Keynote: The evolution of sustainable operations at Bloomberg



Michael Barry, head of sustainable business operations, Bloomberg



Keynote: The evolution of sustainable operations at Bloomberg

B loomberg is a privately held company with its headquarters located in New York City. Founded by Mike Bloomberg in 1981 the company now has over 19,000 employees in 177 locations, with 4.9 million square feet of leased offices, and data centers in 72 countries.

Innovative design is a key feature of our offices. We host a lot of clients and customers in our offices and it is important for us that our offices reflect our culture through their design. Our offices are the biggest contributor to our carbon emissions. Energy consumption at our facilities contributes to 55% of our annual emissions. Our data centers make up a little bit less than 50% of overall emissions.

In New York City, we have three offices, totaling about 1.7 million square feet. These, combined with our London and Princeton operations, represent about 30% of our emissions from our offices. Many of our 177 locations around the world are smaller news bureaus with only one, two or three reporters. These smaller offices combined make up about 20% of our emissions. However, Bloomberg still considers projects in those smaller locations—as long as they make sense and they have a good payback.

We are fundamentally a data company, hence, not surprisingly; we use many different metrics. One important measure for us is energy use per employee. This is significant to us because the company has grown a lot since the introduction of its sustainable operations program in 2007. At that time, Bloomberg had a little over 9,000 employees. Today we have over 19,000 employees. Since 2007 we have been able to reduce energy use by 34% on a per-employee basis. That equates to about 8,000 kilowatt hours per employee. If you annualize in 2018, that amounts to savings of 157,000 megawatt hours—about \$19 million.

A key focus of Bloomberg's sustainability program is not just on reducing carbon emissions but also on proving the business case for sustainability. With data being at the heart of everything we do as a company, the Sustainable Business & Finance team had to show the value of projects from the beginning. To make business sense, the team worked hard not only to quantify carbon saved, but also the dollars saved.

Proving the value of sustainability efforts can have a positive impact both internally as well as externally. We started to publicly report on our sustainability activities in 2009. We have been very transparent about how we have achieved reductions and savings to inspire and help other companies take steps towards more sustainable business operations. After all, we initially also relied on others' corporate reports and talking to other people. There is a lot of collaboration in the sustainability space. By sharing our knowledge, we hope to help others prove their business case internally.

The majority of our savings come from two categories: demand reduction and infrastructure investment. Simply put demand reduction means turning things off. We were able to implement some very quick savings wins when we started our program in 2007. One was switching off the lights in our offices at nighttime, where previously—and embarrassingly—they had been on 24 hours a day. We also used to have screen savers that were on all the time. Eliminating those and conserving energy was the first step in our journey.

As a next step we began investing in energy efficiency through infrastructure investments, mainly lighting retrofits. We conducted countless lighting retrofit projects around the world. Additionally, we worked on HVAC improvements, instituting things such as free cooling on our data centers. Our data centers had free cooling, however, it was not properly commissioned. We spent a lot of money to set that up and running, eventually, though, the payback was very good. These projects account for the majority of the \$116 million that we have saved to date.

Another important element of our sustainable business operations are third-party certifications like LEED and BREEM. These certifications help to bring transparency to the market. To date, 39 Bloomberg offices with



Keynote: The evolution of sustainable operations at Bloomberg

75% of our employees are third-party certified, covering about 3 million square feet. Given the small to medium size of the majority of our offices 36 of the 39 projects are certified with LEED for commercial interiors, which has enabled us to bring the program around the world. Bloomberg has at least two LEED projects on each of the six continents. Initially complying with LEED requirements was challenging as some of the consultants and contractors were not familiar with the certification. However, as LEED has gained more significance globally over the years it has become easier to implement and find people who are educated on it.

731 Lexington Avenue is our flagship headquarters in New York City. Despite a significant amount of growth both in terms of employees and square footage, we have been able to implement many reductions from 2007 onwards. Since then, our employee base grew by 50% to 6,000 employees and our square footage grew by 28%. Nine additional floors were added, 300,000 square feet for a total of 900,000 square feet in the building. However, our electricity consumption on an absolute basis has decreased by 15%. Again, this is due to turning things off and working with our landlord. Our headquarters had a very low chilled water setpoint that was in our lease and we increased that. We have also seen a lot of efficiencies in the base building in HVAC, which gets passed along to us as 100% pass-through. If you consider per employee and per square foot, the savings really increase. It is a testament to a lot of the work that we have done. Importantly, we changed our company culture to make sure energy savings for the building are part of our day-to-day operations. (





"We have been very transparent about how we have achieved reductions and savings to inspire and help other companies take steps towards more sustainable business operations. There is a lot of collaboration in the sustainability space."

-Michael Barry, head of sustainable business operations, Bloomberg



Keynote: Lockheed Martin 2025: The future of energy management



Devan Tracy, senior energy engineer, Lockheed Martin



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Keynote: Lockheed Martin 2025: The future of energy management

in going to tell you about Lockheed Martin's data and energy analytics journey, which we're really just beginning, and how we got to this point. To give you a sense of what we're working with, most of our buildings could apply for Social Security today. We've been tracking energy consumption for the last ten years or so and our strategy is constantly evolving. Early on, energy was still an afterthought and it was put on the back burner. Often, our energy efficiency and renewable energy projects had to compete with emergency capital improvement projects such as the leaky roof and end-of-life equipment.

If we fast-forward to the present, our energy strategy fits into the resource management focus of our overall corporate sustainability priorities. Our corporate sustainability office is uniquely defined: it's part of Ethics, Corporate Sustainability, ESH, and Risk—a four-pronged business function that reports directly to the CEO, which happens to be a great way to receive feedback

Today, instead of competing for capital dollars, we have a gated capital budget that our treasurer sets aside every year specifically to fund energy projects. If the internal rate of return meets its threshold and our annual saving exceeds the annual depreciation, we rarely hear no for an answer. Since we instituted the fund, we've seen \$34 million in energy savings in our facilities.

You may ask, how do we most efficiently spend these funds?

Taking a deeper look at our energy strategy, we begin with efficiency and the mantra that the cheapest energy is the energy that you don't use. Next is peak shaving, whether with demand response or with energy storage. Lockheed Martin has a commercial line of business specifically focused on advanced energy technologies, including lithium-ion batteries and flow batteries, so often we're the guinea pigs internally. The other components of our strategy are renewable energy and smart purchasing. My question for you is, then, what are the common threads in our energy strategy? One commonality is that loads of data are produced, and this is where the Industrial Internet of Things comes into play. I did notice on the attendee survey that John Failla presented yesterday that only ~8% of this audience had earmarked data analytics and energy data as the main driver for their 2019 activities. I would suspect that this focus changes dramatically over the next couple of years.

Hypothetically, with all this data, if we could spend half as much time analyzing and sifting through it, then we could spend twice as much time actually doing something with it, and that's where we want to be. Using preventative maintenance and fault detection and diagnostics software platforms to overlay existing building management systems, we can give buildings a brain and a voice and answer questions such as:

- Is our equipment functioning as designed?
- Are we realizing the full ECM savings?
- Are we simultaneously heating and cooling a space?
- Is this damper or valve stuck?
- What is the root cause of this hot/cold call?
- Is this filter already dirty?
- Are our alarms correctly prioritized?

This is an exciting time—we have the opportunity as an industry to make big leaps using data analytics, artificial intelligence, and machine learning—and most of that data already exists!

The last part of our strategy that I don't want to forget is the people. Today, we have facilities engineers across our major sites who volunteer for stretch assignments and participate in a Go Green Team. We meet monthly to report on ideas and share lessons learned. We check in on the progress of our gated capital fund.

Keynote: Lockheed Martin 2025: The future of energy management

We also have our Tiger Team, which is an initiative that our corporate team spearheaded. The team conducts frequent energy audits for our major buildings. In the early stages of this program, there was a lot of resistance. There was a perception that this was a way for corporate to identify all the things that were going wrong. But eventually, the Tiger Teams were embraced as their work led to the adoption of great ideas and funding assistance. Now we can't schedule enough Tiger Team visits!

One more thing I wanted to share is this playbook that we developed. If you closed your eyes and woke up tomorrow in the ideal-state building, how would you know? There are a hundred-plus items on this checklist and each column represents one of our major sites. It's a concise approach, especially for executive leadership, to illustrate where the gaps are, which sites are doing well in which areas, and to help prioritize funding.

A critical part of our playbook is to ensure that each campus has a deep understanding of their load profiles. How many of us can confidently say that we know on a semi real-time basis the percentage of energy that's used for process cooling versus comfort cooling versus the energy in our CNC machines?

Gone are the days of blaming high utility bills on weather and production unless there is proof in the data. Now that we have better access to the data, we have the ability to normalize and obtain more sub-meter granularity. And maybe it's not even from a piece of hardware on each machine. We can conduct virtual metering and calculate the estimated energy demand profile for each piece of equipment.

With that being said, what does the future hold? Lockheed Martin, like many other companies these days, is in the middle of a digital transformation that's changing the way we work and making us a more efficient and productive company. As we optimize our manufacturing operations with all this technology of the fourth industrial revolution, energy is such a natural part of that process, which creates a perfect opportunity for change. Facilities was not part of that original conversation. It wasn't part of the scope until we talked about our story. We had to make ourselves known and break the stigma to show that Facilities is not just about ensuring the lights turn on when you want them to, but rather operating as efficiently as possible, and adopting technology as it is available. Now that our role is better understood, it is clear that Facilities is core to our digital transformation strategy. Before, the concept was simply, our facilities are working fine, leave them alone. But our response is, we're remodeling the house anyway, so let's just do it. ()



"Hypothetically, with all this data, if we could spend half as much time analyzing and sifting through it, then we could spend twice as much time actually doing something with it, and that's where we want to be." —Devan Tracy, senior energy engineer, Lockheed Martin



Panel: Strategies for managing risk in energy operations



Jay Dietrich, distinguished engineer, energy and climate stewardship, IBM



Richard Malmstrom, senior energy manager, Dana-Farber Cancer Institute



Mary "Lynn" Ready, AVP facilities ops. dev., The Ohio State University (retired)



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Ken Cowan, vice president, solutions sales and marketing, ENGIE North America (moderator)



Panel: Strategies for managing risk in energy operations

COWAN: Lynn, talk about some trends in energy management that you've seen, from a higher-ed perspective, and how they played a role in some of the decisions that you made back during your time at Ohio State.

READEY: One of the trends we've seen, and it isn't true of all campuses, is a lot of growth and development, and figuring how to support that growth and development through energy management. We also have a tremendous emphasis on our sustainability initiatives and setting sustainability goals and trying to meet all of those goals by focusing on reduction in energy utilization. And third, frankly, is a need for investment in the academic mission of the university. Those are the trends you've seen front and center in the last dozen years or so.

COWAN: From a stakeholder perspective, have you seen more engagement from students or faculty?

READEY: I've never met anybody who's against sustainability on our campus. This notion of sustainability, the students are really the emotional leaders of that. They're seeing themselves as the forefront of the next generation. Among staff and faculty there's been interest, but converting that passion into savings, into advancements, into true sustainable initiatives has been the challenge for us.

COWAN: Rick, what about the healthcare perspective? You're seeing people who are actually connecting the dots and tying sustainability or greenhouse gas reduction to healthcare. Does that play into your decision-making?

MALMSTROM: Absolutely. It is a new, evolving trend, but there are a lot of leading healthcare institutions—city-wide private healthcare, education folks, green ribbon commissions—who are finally saying, here we are trying to cure people of various diseases and health maladies and yet

behind that, we're polluting the air. That has really been foundationshaking, which is a good thing because now, all of a sudden, sustainability has become a co-conspirator, if you will, to reduce energy costs, whereas in the past the trend was, gee, energy is costing more and more; we should look at it from a cost-savings perspective. Now you have two drivers and that's a good thing and that's really making things move faster.

COWAN: Jay, at IBM, in terms of data centers and technology, things are moving quickly. How has that impacted current trends?

DIETRICH: One area is that as the technology cycle gets shorter and you're seeing a lot more changes in energy use and infrastructure, data centers are becoming more energy-intensive. We're seeing an increasing need to be more flexible in operations. Now we're depending more on colocation providers on shorter cycle times because you can basically turn a data center in four years. Then that becomes an issue of how to integrate energy efficiency into those discussions. We've always had a really strong program. It's been tied to our operations with our teams, and now we've got to learn to work with teams from other organizations. That requires a partnership and getting into automation, so there's increased reliability demand. We're looking at tools that allow us to monitor operations, assess the performance of those operations against rules and give us early notice if things are headed down the wrong road or if there are actions we can take in IT operations to consolidate and reduce the amount of infrastructure we need to do the work. There are a lot of really neat tools out there that can do a lot of things that we wouldn't be able to do otherwise.

COWAN: That leads me to managing the risk side of it. What are you doing to help mitigate risk? What tools do you use to do that?



Panel: Strategies for managing risk in energy operations

DIETRICH: A big focus with the addition of renewables is reliable supply. We can't have a data center go down. Renewables actually can destabilize depending on what the capacity loads are in a given area. We're looking at what can we do to physically integrate our renewable purchases into our supply. How do you demonstrate what has to happen to make intermittent renewables a part of your reliable supply on a regular basis? Because when you're all done, that's really what's got to happen to change the game. Within that is managing the risk on renewables from the standpoint of pricing and terms. We've got much shorter terms. We're spinning our facilities faster so we can't get into long-term contracts. We're looking for providers that help us balance that risk in terms of requirements.

COWAN: Lynn, from a university perspective, risk, resiliency and redundancy are critical.

READEY: Absolutely. As a research institution, we are supporting our researchers on campus. We're also co-located with our medical center and have five hospitals on the Columbus campus. Historically for us, energy management has been, number one, about reliability, and, number two, about budget. That's exactly how we move forward in terms of our energy management and our energy purchasing. The twist now is that the energy markets are so different and have changed so dramatically. It's no longer

just buying your electricity from your state-regulated electric provider. It's a very, very different world. We have to manage that risk as well, the risk of a changing marketplace and the changing technology in the marketplace.

COWAN: Rick, obviously resiliency is also key for healthcare and the hospital. What are some techniques and tools that you are using at Dana-Farber?

MALMSTROM: In a healthcare institution reliability is everything. Sure, we have enough emergency generators to keep everybody safe and keep all medical operations okay, but without a steady supply, we're basically out of business. I think every institution, whether it be medical, academic or a private company if you don't have your full capabilities, you're in big trouble. But Lynn mentioned something else: budget stability. I remember the time about 8 or 10 years when I told the CFO our being on budget was dependent on whether there were any gunboats in the Persian Gulf and that just made his head explode. Budget stability is important but so are our goals, so we're walking slowly into the renewable arena. We are an urban medical center. I think if we covered every single roof we have with solar panels, we would offset about 0.01% of our electrical loads. In our neighborhood it's not feasible so we are looking at a virtual PPA. We're just beginning that process so we can attack our sustainability goals and yet keep it financially stable and predictable.



"In a healthcare institution reliability is everything. Sure, we have enough emergency generators to keep everybody safe and keep all medical operations okay, but without a steady supply, we're basically out of business." —**Richard Malmstrom**, senior energy manager, Dana-Farber Cancer Institute



Keynote: Driving energy efficiency at UVA



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Jesse Warren, sustainability program manager, buildings & operations, University of Virginia





Keynote: Driving energy efficiency at UVA

e view our sustainability vision through three lenses: engage, steward and discover. Engagement is about how we bring sustainability into our daily lives. It's something our students, our undergraduates, our researchers, our faculty, and staff are still learning about. Stewardship is how we manage our environmental resources, how we manage our environmental impact, and how we reduce that environmental impact. Discovery is our core mission—how do we take on the teaching and research aspects of sustainability? One conversation that we often have at the University asks, is it better to put money into a particular facility upgrade or is it better to put money into something that would drive coursework and research to then give us better sustainability solutions in the future?

We entered into a sustainability plan in 2016 that gave us a five-year horizon. We wanted to see a number of short-term actions completed in that time as well as some long-term goals that weren't going to be completed until 2025 or 2035. The biggest one is to reduce our carbon emissions by 25% against our 2010 levels by 2025.

We've taken on similar goals around energy and water, but the one that I wanted to point out is nitrogen. We've been studying reactive nitrogen at the University of Virginia for a number of years and we've now got a method by which to quantify the nitrogen emissions associated with our food production as well as our energy footprint, and that's one of the numbers that we're looking to manage over time.

Our carbon goal is not a per-square-foot number or a per-capita number. It says we have to reduce our footprint by 25% and offset all new growth from 2009 forward. When we set that goal we were at 15 million square feet. We've since added about 2.3 million square feet on top of that, and we've got another 7 million square feet coming. That's where we start to realize just how big the University and the campus really is. We've got 25,000 students. We've got 1,700 acres. What drives a lot of this growth is our medical center and our School of Medicine, which consumes half of our energy. Right now we've got 600 hospital beds, and that number will increase by 40%. We're doing 900,000 outpatient visits a year now the last time I looked for that stat, it was 600,000. So the growth in the healthcare side of our business is really exponential right now, but we're still able to get to our GHG goals. Taking that absolute goal into account, we've been able to reduce all of that by 18.9%. Next year we're going to hit that goal of 25%.

I want to talk about one of the programs that we use to get to those goals, Delta Force. I'm an energy engineer and I work with a team of four other energy engineers to implement this program. In short, we're investing in existing buildings on our grounds and we're reducing their energy consumption. When we reduce that energy consumption we're capturing 125% of the savings to repay our investment. Once we've repaid 125% of that savings, the control falls off and the savings goes back to the building customer. In essence, they have done very little to initiate the program other than let us in the door. We go through, we retro-commission their systems, we identify a timeframe for savings, we all agree on that up front, and then we go into a project where we're looking to implement as many energy conservation measures as we can under the three to seven-year window.

Sometimes we get lucky, and Clark Hall was one of our biggest successes. I say that because we did an amazing job, but we also started out with a building that needed work. This building was from the 1930s, the original law school at the University of Virginia. When you walk in there's a beautiful mural room full of naked philosophers. It doesn't really fit in the current environmental science building, but that's what it's become. After the mural room, you go into the Brown Engineering and Science library as well as the School of Environmental Science. We added on a wet lab and a library in 2008 so we have a combination of every conceivable type of equipment in this building, about 180,000 square feet in all.



Keynote: Driving energy efficiency at UVA

The way we used our Delta Force program to fund this project is that we found out there was going to be an improvement to the building control system on part of the building—not all of it, but only the half that was added in 2008. We said, let's partner with them. We'll change out all the controls in the building, upgrade everything to pneumatic. We'll put another \$1.25 million into it and then together we'll have a \$2 million budget by which to upgrade this building. With my model, I get back the first 125% of \$1.25 million because that was what we put in, so we take back the first \$1.56 million.

Here's our overall program's success to date: starting in 2008, we've

invested about \$16.3 million in energy efficiency projects on grounds and we've shown about \$36.8 million in metered energy savings as a result.

That brings me back to how we seeded this program. In 2008 we had a building that was performing very poorly from our perspective. We have a strong energy and utilities group, and that group found \$400,000 to go into this building, retro-commission it, and replace chilled water valves. We ended up saving \$800,000 a year in energy so our \$400,000 got a 6-month payback on it. The university said, okay, you keep your \$400,000, and we've been able to roll that into energy savings. We've been taking on short payback, quick return projects ever since. (



"One conversation that we often have at the University asks, is it better to put money into a particular facility upgrade or is it better to put money into something that would drive coursework and research to then give us better sustainability solutions in the future?"

-Jesse Warren, sustainability program manager, buildings & operations, University of Virginia





December 9–10, 2019 • Logan Hotel, Philadelphia, PA https://acceleratephilly2019.smartenergydecisions.com/



Keynote: Decentralized energy management strategies at McDonald's





Emma Cox, sustainability manager, McDonald's Corporation



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f you ever talked to somebody who works at McDonald's, you may have heard of the concept we call our three-legged stool. This is made up of our franchisees, our suppliers, and our employees—our triple bottom line. The concept is that a stool can't stand if one of the legs is uneven. All of these contributors and stakeholders have to participate equally.

I joined McDonald's two years ago, a really great time to join. The company had just reviewed our 2014 sustainability strategy, which is our original one, and reworked it into something called Scale For Good. Why did we rework it? Our customers needed to feel good in the moment about our food, our company, and our effect on the world. We took a look at our sustainability strategy and really wanted to capture that sentiment in what we were doing. We did this for our customers.

The concept around Scale for Good is actually Sustainability Scale for Good. At McDonald's, we'd typically been thought of along the lines of "big is bad," but that's no longer the case. We have more of an opportunity to do good with our existing footprint. We see that as an opportunity and so we've identified key pillars on which to focus and with each pillar we've made a public commitment or goal. We have a commitment to families, including issues like kids' nutrition. Beef sustainability is another big one, along with packaging and recycling. Climate action is the one that I'll be touching on more today and is most relevant to this group. There is also youth opportunity, which is providing employment opportunities for youth at our restaurants.

Steve Easterbrook, our CEO, has stated that we are publicly committed to these goals. On a global scale, the company has agreed through the Science Based Target Initiative to reduce our overall greenhouse gas emissions by 36% by 2030. When you think about our scale and our size and you think about the three legs of the stool, that's a big commitment. My task is to look at the U.S., our largest market at over 40%. We have 14,000 restaurants here and 1,800 operators. Those are a lot of voices with decentralized decision-making. In the U.S., 95% of our restaurants are franchised so we don't have visibility over that data. Each individual operator controls their consumption and their spend.

McDonald's has a good reputation in a lot of cases but we are also open to more scrutiny. NGOs are constantly watching what we're doing. Also, we are constantly being approached with new solutions by solutions providers. Again, we have many voices weighing in and—remember the three-legged stool concept—we need to make sure that all of them are satisfied with whatever we've decided to put forward.

Yes, our scale and volume can do a lot of good, but it can also slow down progress. When we launch any initiatives it can take a lot of time to push them forward. I think we're all familiar with the fact that our regulatory landscape is very fragmented, so navigating that with all our restaurants and operators is very difficult. There are varying levels of interest and levels of expertise. When we're talking to a particular operator, for example, they may have interest in energy efficiency or renewable energy. On the other hand, there are those who may not participate in those initiatives.

At McDonald's, we're always changing in terms of corporate versus operator relationship and dynamic. Our relationship as corporate is not to be a dictator. We don't tell the operators, this is the program and you're doing it. Our job is to do the due diligence, make the recommendation and business case, and then it's their decision to make (with the exception of "key to business" issues).

In the area of renewable energy, we're not afraid to admit we were late to the game. In the spring of 2017 the company started exploring renewable energy options and I was hired shortly thereafter. We hired Customer First Renewables as our renewable energy strategy and implementation



Keynote: Decentralized energy management strategies at McDonald's

advisor. They helped us build a strategy over a number of months. During that time period, we were getting our hands on the data, interviewing stakeholders, and building our strategy.

Then our Science Based Target goal was announced, a 36% reduction goal. By the way, with the U.S. being the largest market, we have a slightly higher percentage goal, so we're working at around 40+% reduction in the U.S.

In May of 2018, we launched our first-ever renewable energy program, a local, community solar program. We had 100% adoption but, again, it was very local. A small number of operators participated and it was only available to that small group—not a scalable option.

When we first started looking at renewable energy opportunities, we looked at three solutions: PPAs, community solar, and retail. Right now, we're focusing most of our time and energy on PPAs.

The evolution of our energy efficiency experience at McDonald's is a longer journey. I'm sure a lot of you remember the 1970's energy crisis. That was the initial awakening around energy efficiency. In response to this, McDonald's implemented some initiatives. They started daily meter reading and restaurant air balance controls. At the Hamburger University, we introduced operational training. In the 1980s and 1990s, we introduced system design to incorporate energy efficiency into the design of our restaurants.

Skipping ahead to 2004, Steve DePalo was hired as an energy manager at McDonald's. Having that function centrally located bolstered support at a corporate level. In 2008 we hired Burton Energy Group as an outsource energy consultant for data and energy management as well as gas supply contracts and they're still our supplier today. In 2010 we launched system-wide programs, LED being one of those, that has had neutral buy-in.

Today we have a program that is fairly turnkey and customizable, called ECO2—Energy Cost Optimization for Operators. The idea behind this is that operators really don't have time to dedicate to energy efficiency. They don't have the subject matter expertise in-house. Therefore, they can look to ECO2 or Burton to help manage this program.

We launched a pilot during our Worldwide Convention last year and have gone through further iterations based on feedback from our operators. They told us that it needs to be more customized and that there need to be various levels that operators can buy into—basic level and then add-ons, if necessary. Other feedback said they weren't interested in spending any capital, so they wanted funding opportunities. We've also partnered with utilities to help subsidize some of the cost of this program.



"Our customers needed to feel good in the moment about our food, our company, and our effect on the world. We took a look at our sustainability strategy and really wanted to capture that sentiment in what we were doing. We did this for our customers." —Emma Cox, sustainability manager, McDonald's Corporation





Panel: Energy portfolio financial management



Brad Christensen, managing director of risk management products, Calpine **Energy Solutions**



Denis George, senior leader, enterprise sourcing, The Kroger Co.



director of maintenance, energy, and engineering, Harris Teeter, LLC

Michal Shepard,

John Failla, founder and editorial director, **Smart Energy** Decisions (moderator)



Panel: Energy portfolio financial management

FAILLA: Several years have passed since the first wave of renewable energy, virtual PPAs have been signed, and there's an increasing array of options for sourcing energy, so the whole topic of managing financial risk in your energy portfolio is more important than ever. This panel session is going to do a deep dive on that topic. Denis and Michal, let's start with an explanation of the way that Harris Teeter and Kroger are aligned and work together.

GEORGE: Harris Teeter is a wholly-owned subsidiary of Kroger, but has independent operations. While Michal and I collaborate, ultimately he is making recommendations to his management and I'm making similar recommendations to the other 23 store divisions throughout Kroger in our 3,000 stores regarding utilities and things of that nature.

SHEPARD: As you can tell by my title, I wear a bunch of hats in my organization, so it's hard to manage all the pieces. I feel like a man juggling chainsaws on most days. Having Denis and the staff at Kroger has helped me significantly on the management side of our business.

FAILLA: Between the two of you are over 75 years of energy experience. What have been the biggest changes in how you manage your energy spend during your careers?

GEORGE: It's been a journey, to be sure, for the last 20 years and it's not over yet by any stretch of the imagination. We're talking a lot more these days about risk management. Price is still important, but it's just one component of risk management. We've finally put ourselves in the position where we are managing the portfolio on a nationwide basis, not just looking at individual utility systems. If you have one plant in one place, that's your focus, but when you have, in our case, almost 2.6 billion KW hours of deregulated portfolio in more markets than I can name right now, it makes a lot more sense to look at it in that way. To do that, of course, you need the right help and you need a lot of data. You need a lot of different kinds of service offerings. Our supplier and the market are, in many respects, beginning to produce that and make that valuable to us. The real innovation is all the ways we can now buy energy whereas even 10 years ago they weren't available.

SHEPARD: Ten years ago, we did transactional contracts. You sent out an RFP, people gave you prices, you signed the contract. With the advent of renewables and demand-side management, we don't want to go back 10 years and do those same transactions. We have to bring the conversation to strategy and risk management. As an energy buyer, that is where we're at today. We don't want to digress. We want to take the new options and filter them back into our existing portfolio.

FAILLA: Brad, what's your perspective on how your customers are viewing their energy spend?

CHRISTENSEN: There has been a realization by our customers—and consumers in general—that energy is not just an expense line item like durable goods or things of that nature. It's really a portfolio of financial exposures that has to be managed the same way as any other financial exposure in your company, be it interest rates or currencies or other raw materials that have to be thought about in terms of their impact to the bottom line. Energy is that same type of animal. The transformation that we've started to see is that it's being thought about in terms of its financial variability, in terms of its outcome in cost, and the returns that we can see by managing this in a smarter way.



FAILLA: Michal, you must get calls all the time from people who have a new idea, either renewable-related or demand-response related. How do you evaluate these accelerating number of opportunities?

SHEPARD: First, take all the junk science that everybody would love to peddle and toss them aside. You have to look at each opportunity and ask, is this a long-term thing or a short-term thing? Look at the backgrounds of those companies. You have to deduce what is real and what's not. Look for the experts in the industry and find allies within your company. Then you have to find out what's important to your stakeholders.

GEORGE: Absolutely right. We have an energy committee that guides what we do. It's a great collection of finance, accounting, manufacturing, logistics, grocery store, risk management. One of the reasons why we talk about risk management so much is that it helps align our strategies. We manage all those things Brad mentioned—interest rates and taxes—and we manage over 300 commodities manufacturing side, so our company understands risk. They're willing to take a risk when they understand the risk. When you talk about PJM capacity auction rules and California resource adequacy, they start looking sideways. But if you talk about risk management, it's something they understand. What's the risk? How do we measure it in this business? And we connect. When you start connecting with management, you get better direction. It helps drive not only what you can do in terms of some non-traditional alternatives, which we do time and again, but also drives term length. There was a long time that we were very conservative and they wouldn't let us go for more than a year at a time. Now we're driving three, four, five years and beyond because now we've got a plan and they understand the risk associated with that. It's opened up great opportunities to help us turn around and help drive the expense for the organization.

SHEPARD: It's important to engage the financial, risk management, and operations people in your organization. You have to be transparent to those people. If not, you get zero buy-in and you get zero leverage. When you get to a point and say, this is where we really need to go, if you have their trust, they will say let's go.



"We're talking a lot more these days about risk management. Price is still important, but it's just one component of risk management." —Denis George, senior leader, enterprise sourcing, The Kroger Co.



Executive interview: Unlocking the value of connected buildings

Will Coleman,

previous CEO,

Lucid



founder and editorial

director, Smart Energy

John Failla,

Decisions

Executive interview: Unlocking the value of connected buildings

FAILLA: We're going to have a detailed conversation on the future of connected buildings and how they can help everyone operate more efficiently. Will, what's your concept around connected buildings— where are they today and where are they headed?

COLEMAN: The way to think about what's going on with connected buildings is we're effectively applying modern data analytics software technologies to an asset that has been largely disconnected for decades, despite the fact that there are a lot of digital systems inside of those buildings. The evolution, first and foremost, is about connecting and getting access to those systems. Ultimately, it's about getting to smart buildings that can learn from how those systems are behaving and react to different cues inside of those buildings. This evolution has been a long time in the making. We spent about \$1.2 trillion on buildings every year in the United States, which is 15% of GDP, an absolutely massive amount and that's not even including the businesses that rely on these buildings. The businesses that are housed inside these buildings are dramatically impacted by these buildings and yet we don't connect those dots as much as we should. On the flip side, look at other industries. One example: when I first got involved with Lucid in 2015, there were 3,500 companies attacking online ad optimization, which had a value of \$100 million. In the buildings industry, you've got \$1.2 trillion being spent plus all the impacts on the businesses inside of these buildings and you have only about 100 software companies going after it.

We're at the front edge of this evolution. I would say that the first step is connectivity. It's about talking to these systems, figuring out how to get into them and then how to take what they're saying—all the data—and make sense of it. As all of you who deal with energy data know, it's not easy because that data is often patchy, it's often inaccessible, and it's definitely not normalized. The starting point is getting a holistic view and starting with the optimization of energy and then moving into a smart building world where you're connecting the dots between all these systems. Then you'll see the opportunity to start making connections between the core issues that we're trying to attack around energy and some of the impacts on the businesses that are inside these buildings.

FAILLA: Capturing and understanding energy data is really core to process. Let's talk through a couple of specific use cases from different industry sectors. Tell us how this plays out in various market sectors.

COLEMAN: It's been interesting because, as I mentioned, this is an evolution where we're taking something that doesn't have a lot of value. It's a cost center in most people's minds. People are trying to manage an area like cost savings and we're trying, through connected buildings, to convert it into a strategic asset. You've seen these technologies applied to other industries, like the automotive industry. I still drive around in a '99 Subaru where you have to plug something into it when you go into the service station to get about three pieces of information about whether or not that car functions correctly. If you have a Tesla, they're monitoring you 24/7. I would argue that industry has gone through this type of transformation and, in large part, it happened the minute we stepped into the cars with phones. That's when we created connected vehicles. We're seeing that same evolution with buildings. Think about how many connected points exist. How many different sensor points are in this room now? Every single one of you has 72 different sensors in your phone, at least, and that's a pretty interesting batch of data.

Within buildings today, we're focused on that starting point of energy and resources. I think everybody in this room feels that same pain. The way we go in has often been with customers who say, I have to at least



Executive interview: Unlocking the value of connected buildings

start with getting visibility on cost savings. Often these customers start with trying to aggregate all their utility bills. Their systems are spread around, whether it's their ERP system or their billing system. In some cases, even the most sophisticated customers don't have visibility into what they're spending or whether they paid the bill until the lights turn off. We start by getting hold of basic data and then using tools like our mobile app to go out in the field and start collecting specific data points to get a more composite view of their building portfolios.

Look at universities, like Stanford, who measure everything. They're looking at 700-plus buildings across the campus. They're looking at their own buildings which are owner-occupied, and leased spaces like residential halls to get a grip on not just what their individual systems are doing, but also at work orders and what it actually costs to maintain these systems. When they're making capital decisions, they're trying to understand issues like total cost of ownership across all of those different systems, and you can't tell that just from how much energy something's consuming and you can't even tell it just from your work order stream. You've got to put these pieces together so you can look across all your systems and say, maybe it does make sense, for example, to replace all our HVAC systems or whatever it might be. Stanford also does things like measuring the number of meals served and energy per meal served. They're trying to optimize pretty much everything across the campus. Stanford's a pretty techie, wonky, Silicon Valley campus, but they're very focused on how to squeeze out costs.

FAILLA: The applications, particularly in retail, are pretty dramatic. If you're in a commercial building that is multi-tenant, what are the challenges in accessing the data so that you can manage them more effectively?

COLEMAN: A lot of our customers have a mix of owner-occupied buildings and leased spaces. They have very different challenges although both of them have to work with facility teams or IT teams that often are very risk-averse. Inside of a multi-tenant space, the hardest part is if you're a subtenant within that space, you're often working with a core facility engineer who is responsible for that building's systems. You might also have a third party in there, like a Siemen's. Then there's the security challenge. Sometimes these zones overlap. You need to have a reason for taking action as a tenant and you need to start small. Start by focusing on the data you can access.



"The evolution, first and foremost, is about connecting and getting access to those systems. Ultimately, it's about getting to smart buildings that can learn from how those systems are behaving and react to different cues inside of those buildings." **—Will Coleman,** previous CEO, Lucid



Executive Interview: Breaking the mold—A new business model for power reliability

SOLUTION

Allan Schurr,

Rock, LLC

chief commercial

officer. Enchanted



TEAM

Shaping

STRATE GY 🔍



John Failla.

Decisions

founder and editorial

director, Smart Energy

Executive Interview: Breaking the mold—A new business model for power reliability

FAILLA: Why do you think people are now focusing more on resiliency? What role do you think resiliency will play in the deployment of DERs going forward?

SCHURR: I think that safe, reliable, affordable energy has always been the mandate of the industry and safe, reliable, affordable, clean energy was a big conversation piece a few years back. A lot of that conversation was that it was not compatible—you can't have affordable AND clean—though we know better now. But I think we skipped over reliability. It's never been something people weren't caring about but there were limited options as to what they could do about it. Today, continuous power requirements are increasing, supply chains are tighter, and customer expectations have never been as high. We simply can't have that kind of disruption to business, so reliability is back on the table. The grid can only be as good as it can be. We still have aging equipment and countless miles of overhead construction that will cause outages. We have them all the time—we had some here in Houston this morning because there was a wind event that came through with thunderstorms.

FAILLA: In one of our recent conversations we talked about the degree to which customers are calculating the cost associated with outages on their business. In doing some research on plans for deploying distributed energy, we asked if companies had calculated the cost of power outages to your business and were shocked to see that less than half have done so. What's your view on associated costs and what are companies doing—or what should they be doing—to get their arms around this issue?

SCHURR: I think that there is a lack of knowledge inside most enterprises around what happens when the power goes out. Sometimes it's the local folks who have to address the problem, so it doesn't get addressed holistically. In our experience, most organizations don't have a good handle on the direct and indirect costs. Direct costs could be product

loss, diminished quality, or impacts to contract deliverables and sometimes penalties that they incur. Unplanned emissions might cause them to be, again, penalized. There might be customer inconvenience and even defection.

When we talk to customers, we go through a process of asking about a variety of things that could go wrong. Often it's someone else's job that is impacted and they have to go get an answer. The ones that are really interested in determining the cost are always surprised by how much it is. We have some industrial customers that have multi-million dollar costs when there's a single outage that lasts more than 30 minutes. We have customers for whom it's a few hundred thousand dollars, as an example, for a healthcare organization that has to cancel procedures. They weren't always thinking about these issues before, but they are very open to trying to find out about these facts so they can make a business case for doing something about it.

FAILLA: In talking to customers about deploying distributed energy resources, the financing piece is often an obstacle because there could be heavy capital expense to deploy these technologies. We're increasingly seeing companies coming out with as-a-service model to try to help accelerate deployment of these technologies. Your model is based on as-a-service so tell us what that looks like and how it works.

SCHURR: In its simplest form, as-a-service really is just outsourcing. In energy, it happens to be applied to very capital-intensive assets and usually is coupled with services that are wrapped around those assets. Basically, it's outsourcing to a company that is willing to take the capital risk, take the technology risk, and has specialty expertise in operating those assets. I think the ENGIE example with The Ohio State University is a big, bold move across a huge portfolio of assets, but a solar PPA is a similar as-a-service option.



Executive Interview: Breaking the mold—A new business model for power reliability

What we provide is backup power as a service to our customers. They get first call on the asset when there's a power outage. When the grid goes down, they'll have backup in 8 to 10 seconds. They don't own the asset; they simply get that backup power service. We're like a second utility feeder. What's novel about our approach is a fundamental breakthrough in the economics model. Most backup generators run one or two or even zero hours a year in backup mode and then they'll have a short test cycle. That asset really is not doing anything all year long so it's a balance sheet hit without any offsetting income. Our model takes that asset and uses every opportunity we get to make revenue from it. Since we're a connected grid parallel, the customer never sees that physically happening. We will run in the Texas market maybe 500 hours a year. Usually an average of once a week there's an event of some kind, sometimes for an extended period of hours so we're testing that asset all the time. In fact, it creates higher reliability than the diesel generator that sits there because these systems like to run. Some might think you wear out an engine if you run it but, if you know engines, you actually wear them in. They are more reliable when they run. If you don't believe that, park your car for six months and then try to start it up. Often it won't run, and diesel is especially difficult because the fuel can have some moisture or bacteria contaminants in it. We have a higher reliability outcome and we provide service levels to our customers. We provide them a unique economic opportunity that is

subsidized by various market revenues and we have the expertise to do it without them having to worry about it. Ultimately, that's what people want with backup systems—"I just need power when I need it."

FAILLA: What's your sense for where the as-a-service model is headed? Are there particular categories where it will be more likely to be adopted quickly?

SCHURR: Thinking about as-a-service applied to energy, in a way we are both laggards and we've always been doing it. Utility power is energy as-a-service if you think about it. All the assets are owned by somebody else, they're all maintained by somebody else, and you pay a variable fee. Landlords renting an office building is office space-as-a-service. We're simply applying as-a-service to new categories, including DER categories that otherwise might be more challenging in terms of both financial adoption and operations. There is also some specialty expertise needed, as an example, to be able to maximize the value of storage. There are literally an infinite number of ways to manage storage—every instant you can decide to charge or discharge and that's extremely complicated—so that's a case where specialty expertise is needed. DERs are also particularly well suited because the capital commitment can be rather high and because they can generate revenue, if properly managed.



"I think that there is a lack of knowledge inside most enterprises around what happens when the power goes out. Sometimes it's the local folks who have to address the problem, so it doesn't get addressed holistically." —Allan Shurr, chief commercial officer, Enchanted Rock, LLC



Panel: Innovative approaches to pursuing sustainability goals





Sam Castor, EVP of policy, deputy general counsel, Switch



Ramé Hemstreet, vice president of operations & chief sustainable resources officer, Kaiser Permanente



Erin Craig, vice president, energy and climate practice, 3Degrees



CRAIG: Energy efficiency is crucially important to meeting carbon goals and the aggressive energy goals that address climate change. Sam, when other data center operators talk about energy efficiency they're often talking about just the outer envelope of the building system. Switch has had, since its very inception, a more integrated approach.

CASTOR: Almost all of our customers have calculated, at least from an Internet operation standpoint, how much it costs if they go down. Therefore, what we sell is never losing power, never losing connectivity, never losing uptime. We've been doing that since the early 2000's and our CEO has put his brain to envisioning the future of what the Internet means and what the Internet of absolutely everything will need in order to be able to continue to scale up. He has over 600 patent pending claims on how we power, cool, connect, and protect the Internet. Here's a fun trivia question: what percentage of the world had Internet back in, let's say, the year 2000? It was 1.28%. If you had a dial-up modem back in 2000 you were part of that elite few that had access to the Internet. In the year 2015, it was up to 51%. If you start to recognize how far we've come and how much further we have to go, you realize the infrastructure that powers the Internet-that mission-critical environment-is central to everything everyone does. There's no such thing as a technology company anymore if you are engaged in business, you are a technology company. The Internet is the supporting infrastructure for modern-day commerce so we're in the business of making sure that not only does the power never go out and the connectivity never goes away, but we also do it in a way where we can deliver up to a megawatt of power to a 20 cabinet environment using these patented designs, and we can do it very, very efficiently.

CRAIG: Ramé, most of Kaiser Permanente's load is in California and it's distributed amongst your offices and your hospitals. Tell us how you've looked at your load in designing your renewable energy supply around it?

HEMSTREET: Let me put this in the context of our environmental stewardship goals. In 2012 we first set out to reduce our carbon footprint and then a couple of years ago we made a commitment to be carbon neutral by next year, which we will be. That's one aspect. The more important aspect, frankly, is that the biggest issue in healthcare is affordability. We had to achieve those environmental stewardship goals in a way that didn't increase cost to our members. Kaiser Permanente is a not-for-profit, so we're not beholden to shareholders but we are beholden to the members who we try to keep healthy and, when they need it, to provide great healthcare. We looked at this from a couple of perspectives, both the distributed or local perspective and a more statewide perspective on the supply side. We have a lower hurdle rate for energy efficiency projects, which was the foundational element. We looked site-by-site at where we could do distributed generation. Our first choice being solar, we wanted a PPA for solar that beat the cost of purchasing that power from the utility. We're now up to about 35 MW of onsite solar power and we think we'll double that again over the next couple of years. Having done that, we still are only about 10% of our way to our goal to be carbon neutral. That's why we needed to look at utility-scale company-wide, state-wide options.

CRAIG: I'd like to ask each of you to talk about what's next on your agenda.

HEMSTREET: We'd like to meet our goal through additionality, as I mentioned earlier. Outside of California that can be a little more



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challenging so part of what's next is figuring out how to achieve that goal for Scope 2 emissions through additionality in all of our markets. We're currently tackling the Scope 1 aspect through carbon offsets so in the short run we're going to have to purchase existing carbon offsets. What's next for us is, one, looking at thermal renewables to try to directly impact our Scope 1 emissions. Two, since for the foreseeable future we're going to have to purchase carbon offsets, we're looking for opportunities where we can actually participate in the creation of those offsets—the creation of those projects—to be able to claim real additionality for ourselves.

CASTOR: When a data center turns on, it's almost like a toaster, just a nice, flat 90% load factor. One idea that we've been playing with over the last few years is, how do we leverage that stability from a grid planning standpoint in a way that benefits not only our data center customers but everybody else in the surrounding area? That's where we came up with the vision of Gigawatt Nevada. If we can take advantage of Nevada's solar window, which is one of the best in the United States, and we can also couple that with the stability of almost 100 MW of data center facility, we think we can balance our load with that of our customers and do it in a way where it's almost like a tech cooperative—let's collectively come together in a way that we benefit each other, and do it in a way where the ownership interest and the user interest is aligned.





"If you start to recognize how far we've come and how much further we have to go, you realize the infrastructure that powers the Internet—that mission-critical environment—is central to everything everyone does."

-Sam Castor, EVP of policy, deputy general counsel, Switch





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