

Blake Dressel:

Hello everyone. Welcome to the March edition of the Better Buildings Webinar series. In this series we profile the best practices of Better Building's challenge and alliance partners and other organizations working to improve energy efficiency in buildings. Next slide.

I'm your moderator, Blake Dressel. I'm a technology policy fellow in the U.S. Department of Energy's office of the Building Technologies office. I work closely with national labs, building owners, and academics to improve the adoption of energy efficiency in commercial buildings. Next, I'll introduce our panelists. Next slide.

John Gilbert is the COO of the Rudin Management Company. He has been involved in every major project the company has developed over the last 24 years. He is acknowledged nationally as an industry thought leader in the integration of technology in the built environment. As a co-inventor of the Nantum Building Operating System and executive chairman of Prescriptive Data, his vision is to future proof real estate by giving all buildings a brain.

Our second panelist, Robert Azrin, is the vice president of research at Breckinridge Capital Advisors. In his role, Robert performs municipal credit analysis. Robert has been with the firm since 2017 and has over 13 years of experience in the investment industry. Prior to Breckinridge, he was a credit analyst for the Moody's Investor Service covering local governments. Before Moody's, he was a financial analyst for the legislative committee with the Commonwealth of Massachusetts.

Our third panelist, Nancy Wallace, is a professor of finance and real estate and holds the Lisle and Roslyn Payne Chair in Real Estate and Capital Markets at the hospital of business at Berkeley. She is the chair of the real estate group, co-chair of the Fisher Center for Real Estate and Urban Economics, and directs the real estate and financial markets laboratory. Professor Wallace has held a variety of positions at the American Real Estate and Urban Economics Association, their Journal of Computational Finance, the U.S. Department of Treasury, and the Model Validation Council for the Federal Reserve System.

Thank you all for being with us today. I want to remind our audience that we will hold questions near the end of the hour. Please send your question through the chat box on your Webinar screen towards the bottom right throughout the session today, and we will try to get to as many of them as we can. Next slide, please.

I'd like to kick us off with a brief introduction on the research projects that the Department of Energy has been working on. And so, in 2018 the U.S. Department of Energy partnered with Lawrence Berkeley National Lab and the Real Estate Research Institute to develop research around the financial value of high-performing, energy-efficient buildings in efforts to generate greater insights that influence commercial real estate practitioners and drive further investment in energy efficiency technologies. You'll see here five research reports that quantified results on energy conservation measures, policy implementation, and energy audits in efforts to highlight opportunities where energy efficiency investments add value to commercial real estate portfolios. Next slide please.

Yeah, so these reports along with summaries of key findings are posted on our Better Buildings Solution Center. You can access more details there. You'll get the entire report along with some key findings that demonstrate the quantitative measures that we found. You'll also find more information on our mortgages work and appraisals through the Better Building Solution Team. Next slide, please.

So with that, John Gilbert will tell us more about the work that's happening at the Rudin Management Company. John, are you ready to share your slide?

John Gilbert: Happy to, yes. Thank you very much.

Blake Dressel: Thank you. Thanks.

John Gilbert: So, good afternoon, everyone. This is John Gilbert, Chief Operating Officer for the Rudin family here in New York. And what I hope to do today is to show you what a brain for a building looks like and to illustrate how we bring value through not only the collection of data, the aggregation of data, but also the correlation of data across different sets of data.

What you're looking at right now, everything I'm gonna be showing you is in real time. These are not PowerPoint slides. We can literally see in real time on the aggregate in terms of what's going on in the Rudin portfolio today. Currently at 3:09, I've got almost 21,000 people in our 10 million square feet of office. We're burning just under 20 megawatts of power. We've consumed – we're consuming 52 M pounds of steam, and we've already consumed almost 190,000 gallons of water.

The key piece here, obviously, is as we organize this data and aggregate it, how do we use it? How do we create value? And what we've been able to do in the Rudin portfolio with regard to the energy that we control, we've cut our carbon by 44 percent, we've cut our steam by 48 percent, and our electrical consumption by 41 percent. And I'm gonna show you now how we do that.

So what you're looking at is Nantum. Nantum is a building operating system. It is the first brain for buildings that has been created. And what we're focused on, really, is creating a place for all data that a building generates to live. What we, when we created this and started creating this back in 2009, what we wanted – we didn't want to have happen was to die the death of multiple dashboards. So as you can see, and as I go through this, we're gonna look at a bunch of different data sets. They all live in Nantum.

People say, "Well, what is a Nantum?" Nantum is derived from an ancient Algonquin word that means prayer or blessing. And we like to say that this – that Nantum – is a blessing, because it did answer our prayers as property owners when we were trying to take external data feeds and mix them with our internal data.

So, as you can see, Nantum talks to us. There are ten operational drifts. Approximately three minutes ago an anomaly detection was found. That will be sent via text or E-mail to an operator to go ultimately check that out and to fix that. We're gonna dive in to 345 Park. I should go back and see that this is our entire portfolio. So regardless of the size of your portfolio, you can actually organize your data, standardize your data, and ultimately bring it all together into a single place.

As you can see here, we've got startup, we've got ramp down, we've got ramp up, and final ramp down. This is Nantum, again, speaking to us. And Nantum is also telling us what the optimal time to start our engines tomorrow will be.

This, I'm jumping into electric demand. As you can see, the dotted line is our predictive curve. We're a brand-new month, so this horizontal red line that you're seeing is literally our peak demand later in the month, obviously, or at the end of last month. We don't want to cross that line, because that creates a new peak demand metric that we're gonna have to pay higher rates for electricity. The blue line is actually the real time of what's going on. As you

can see, it's been a good day here for 345 Park, because we're well below the predictive curve.

Now what does this actually mean relative to other days? We can jump into our savings calculator. We can literally see how this relates. The orange graph is actually a real graph from our benchmark year. And as you can see, the green graph with a divot in the middle of the day, we've redrawn this curve. And this divot represents the correlation between two data sets that never talked to each other before, occupancy and fan speed. And this divot is the resulting savings in terms of modulating fan speed as we correlate that against occupancy and people going to lunch.

What you'll also see is back in the day we would start our engines roughly 4:00 in the morning. Because Nantum is able to measure the thermal inertia of the building, we start our engines much later. And this morning we actually started them somewhat around 6:20. So all of this savings, and as you can see over here, we're almost at 29 percent in terms of kWh savings off benchmark. And we are at 29 percent in terms of dollar savings. All really, really important points. And this is how you create value ultimately by using your data, organizing it properly, and ultimately correlating it in ways that can make you more efficient.

The other piece that – actually I'm gonna go into our greenhouse gas. So this is very important. For those of you in New York, you know all about Local Law 97. If you're not calling in from New York, Local Law 97 is an attempt by the city council and by the mayor to ultimately reduce our carbon footprint. In order to measure this and manage this, what we've created is in actually a real time greenhouse gas calculator, or a carbon ledger, if you will.

The red line represents where we – if we're above the red line in 2024, we face enormous fines. The green is actually real time where we are. And the blue line represents where we need to be in 2030 or we face additional fines. And as you can see as you look at that, we're doing pretty well compared to 2024. I got work to do by 2030 in order to get that carbon down below.

This shows it in graph form. You can see that we've completed January and February. We've put a lot of money in the bank, if you will, in terms of the delta between actual, green, and 2024, orange. February was just barely. And hopefully in March we can do a lot better. And the summer you can see we're actually predicting the gray, we're predicting where we think our consumption is going to be based upon a bunch of different factors.

In terms of other data sets that we're looking at, you name it, we've got it. This is our cooling towers. We're actually measuring in real time the pH of the water in our cooling towers. This obviously relates to legionnaire's disease, any type of microbes that want to grow. From an HVAC standpoint, you can see that we've got CO₂, we've got chilled water temps. You name it, again, we're measuring it and managing it.

Occupancy, which I think is the – is really important. We can look at our last seven days of occupancy. This takes a little while. We can see that every day is different. Here we had Saturday and Sunday. This was last Friday. And we're looking at Monday and Tuesday. As we can see, we peaked Monday at roughly 4500 people here in a single building at 345 Park. But again, we look at this. We understand that every day is different from an occupancy standpoint. And if we're not correlating our comfort delivery to meet our occupancy, then we're wasting energy, either by having it too hot or too cold.

Power quality, our power quality meters, obviously, are very, very important. Temperature: we look at all sorts of temperature. That's our report card, obviously. The good news is, is not only is Nantum saving us five-and-a-half million dollars a year across our office portfolio, but it's also decreasing our hot and cold calls by anywhere between 75 and 80 percent. So, as we've rolled Nantum out into other portfolios, non-Rudin portfolios, we've seen amazing savings, but also an enhancement in comfort.

I can go on, but I think I'm bumping up against my time here. Blake, unless you want me to keep going.

Blake Dressel: Yeah, I think that was really insightful, John. Thank you for that.

John Gilbert: My pleasure.

Blake Dressel: Now we'll – yeah, thank you. We'll transition over to Robert now, who will tell us about his work with ESG integration.

Robert Azrin: Good afternoon. Again, my name is Rob Azrin. I am with Breckinridge Capital Advisors, here to talk about how environmental, social, and governance, also known as ESG, considerations are incorporated into municipal fixed income investing.

Before I go into this, I want to very briefly tell you about Breckinridge. As indicated on the next slide, we are a fixed income investment manager headquartered in Boston. Been around for about 25 years, have about 40 billion of assets under management. We work through a network of financial advisors and investment consultants, and we have a wide variety of end clients from high net worth individuals to large institutions investing in separately managed accounts. A large portion of our assets under management are invested in municipal bonds, and we stick to the investment grade rated realm of the market.

So I'm on the municipal credit research team. And my primary responsibility is to evaluate the credit quality of bonds issued by states, cities, towns, municipal water sewer systems, school districts, and other governmental entities. I provide internal credit ratings to the portfolio managers and traders at my firm, who use these assessments when making investment decisions. Next slide, please.

So, as an investment grade municipal bond manager, we do all of the type of fundamental research and due diligence you would expect, which includes reviewing budgets, income statements, balance sheets, looking at debt and pension levels, and health of the local economy. Also, we believe that key environmental, social, and governance factors, again known as ESG, can impact a municipality's long-term financial performance, their health, and their overall credit quality.

And since 2011 we have been integrating these ESG principles into our fundamental analysis and decision-making process. We're really kind of looking for things that may not be obvious from financial statements. As this slide indicates, Breckinridge believes the comprehensive assessment of risk includes ESG factors.

And before we go further into the discussion of specific ESG factors in the muni market, I did want to note that sustainable investing incorporating ESG is a growing part of the muni market. And there are many flavors, methods, and approaches. This could be a whole separate Webinar.

But I did just want to point out, though, that within sustainable investing, ESG-G integration is distinct from values aligned strategy, also known as socially responsible investing, or SRI, which emphasizes screening out companies or sectors that conflict with investors' missions or beliefs. It is also different from thematic strategies that target investment opportunities based on

impact objectives, such as concerns about climate change or global health.

Today I just want to give a quick overview of Breckinridge's approach with respect to ESG integration into fundamental analysis from the perspective of a manager who has been thinking about this, talking about this investment method for a long time. And I will also spend some time discussing how we specifically incorporate environmental and climate change issues into our ESG analysis.

So while our analysis begins with fundamental bottom of research, we believe that systematically analyzing ESG data provides a broader, more comprehensive, and forward-looking assessment of potential long-term risks that may not be reflected in the market. We also believe that the market may at times underprice these certain idiosyncratic risks such as those posed by material ESG issues.

So, we have nine sector-specific sustainability frameworks that look at these ESG factors. We have them for cities, for utilities, school districts, hospitals, and a couple of other sectors. The frameworks were developed internally but influenced by thought leaders in the fields such as the social progress imperative. We believe that bond issue are scoring highly in our proprietary sector specific ESG frameworks are better prepared to meet future challenges, whether it be from climate change, lack of affordable housing, water scarcity, and they're just gonna be more resilient communities in the long run. Next slide, please.

So, you know, we do believe that ESG analysis especially makes a lot of sense in the high-grade fixed income sector with investment grade fixed incomes bonds, as opposed to, say, equities or high yield. There is a intense focus on risk mitigation and capital preservation. And investment time horizons in the high-grade fixed income sector are often long-term, often holding bonds to maturity, maybe 10-15 years out. Next slide, please.

So, I've been talking about ESG. What exactly do I mean by ESG? So, ESG factors will vary depending on the sector. Many of the factors here are self-explanatory. But I do want to highlight a few environmental factors. On the environmental side, of course, climate change is included. We're thinking about things like how will a particular city be impacted by climate change, is the city thinking about transitioning to a low carbon economy, what are the

risks, challenges, and opportunities, you know, and what industries or sectors will be impacted?

So we are routinely looking at specific quantitative data pertaining to a number of climate environmental risks as well for any given city, county, or water system. We review projections for sea level rise of a coastal city. This will be a growing challenge in my home city, Boston, and in other coastal cities around the U.S.

We also gauge vulnerability to droughts. Exposure to extreme heat is another concern. Increased frequency in severity of hot days can impact a city's infrastructure, energy demand, grid reliability, worker productivity, and public health. And this will be an increasing problem, particularly in the Midwest and Southeast.

Also, increasing prevalence of extreme rainfall and inland flooding is another risk we check for. These events can damage city and residential property and infrastructure and disrupt economic activity as well.

So, as investors, questions we also ask are, are cities aware of these risks? Has the city or town undertaken a vulnerability assessment which quantifies the potential economic property value or financial losses to the cities for the relevant climate risk if nothing is done? Has the city begun proposing solutions to adapt or mitigate the impacts of climate change? Do they have a climate action plan? Does the capital planning process integrate adaptation planning? Have they identified potential funding sources, whether it be bonds, grants, general fund moneys, or new revenue streams? Is the city considering climate resiliency in the city development approval process and in its land use and zoning policies?

Lastly, is the city engaging all relevant stakeholders in their climate change planning? We believe that those cities that are inclusive in their planning will be more successful in getting the climate adaptation and mitigation plans implemented. This means bringing businesses, nonprofits, and residents to the table, including those from vulnerable and underrepresented populations.

Under social factors, our city/county framework seeks to emphasize the combination of material metrics that are related to the concepts of inclusivity and equality. The hypothesis here, used to create this framework, was that inclusive communities will attract and retain diverse and talented residents that will enhance the social structures and community cohesion and also attract businesses as well. We believe the combination of social

dynamism and economic health should create long-term stability and resiliency, which will then drive economic as well as social progress.

And then regarding the G or Governance, we look for transparency and quality of reporting. Our frameworks recognize those cities that post timely financial statements, that have robust long-term capital and operating planning, and that have policies and practices in place that support long term fiscal health. Next slide, please.

So, here is an overview of three of our most common sector-specific frameworks and just a few of the selected ESG factors we look at. On the city/county side we already talked about some of the factors related to climate preparedness and inclusion, which relates to the income inequality factor there. Housing affordability is becoming a more pressing issue in many cities. This metric that we use measures whether a typical family could qualify for a mortgage loan on a typical home. And housing affordability is important because a lack of affordable housing supply can constrain economic growth and cause out migration, which can impact the city or town's finances.

On the school district side, I just want to highlight one metric here. We look at test scores adjusted for a parent's economic status. What we're trying to do is we're aiming to identify and reward school districts in which students tend to outperform peers with comparable family socioeconomic status within other schools. Strong performance on this metric indicates a commitment to excellence by the school district regardless of resources available and reflects employment of competent teachers, administrators, and other staff. Our municipal credit research finds that having a strong management team is not only good for student education and teacher retention, but also for bond holders who can rely on these management teams to navigate periods of fiscal stress.

Lastly here, just on the water side, we look at rate design. Does the rate structure encourage conservation? Has management been increasing rates at a manageable pace? Are water/sewer charges affordable? So that's just kind of a little bit of a flavor of a few of our frameworks. Let's go on to slide seven – or, I'm sorry, the next slide.

So, this is, you know, this kind of illustrates our approach at Breckinridge with respect to ESG integration. The frameworks are a mix of quantitative and qualitative factors. As indicated earlier, our city framework includes quantitative data on a number of

environmental risks, and we combine this with a qualitative assessment of a city's environmental and climate change plans and initiatives.

So the outcome of our ESG analysis is a sustainability rating on a one to four scale. Once an analyst determines the sustainability rating or score for an issue, they incorporate the rating into the overall credit rating for the issuer. We use a scale similar to the rating agencies triple A to triple B minus for investment grade. So, in general, analysts can downgrade the overall credit rating if ESG risks are considered elevated or even raise the internal rating to reflect lowest ESG risks. Next slide, please.

So, just kind of in closing, I just want to highlight our engagement initiatives. We believe there's value in talking to municipalities regarding their ESG or sustainability issues, including climate change. We do engage with a small subset of the issuers bonds we own, but we believe it's important for a few reasons. One, by talking to issuers directly, it really helps us to be informed about ESG issues and trends. It also lets municipal issuers know that these issues are important to investors. This will hopefully spur on action and increase disclosure on whatever the relevant ESG issue is.

In 2008 – 2018, actually – I spent time talking to Florida cities and learning about their sustainability strategies including how they are thinking about climate change. Many of these cities are grappling with how to approach sea level rise and other environmental challenges. In hearing how a city sets up its organizational structure to focus on sustainability and discussing their community outreach strategy and listening to how the sustainability and resilience officers sell these projects to their finance reps is very enlightening.

So, I suspect engagement will continue to be helpful in understanding ESG issues in the future as well. That's the end of my presentation, and I look forward to any questions later on.

Blake Dressel:

Great, thank you. Thanks, Robert. Yeah, a quick reminder, if you send in any questions you have in the Webinar chat box, and we'll be doing a Q and A session at the end of Nancy's presentation here. Nancy will be talking on default risk in commercial mortgages. So take it from here.

Nancy Wallace:

Thank you very much. This is Nancy Wallace. May I have the next slide, please?

So, I've been working with the Lawrence Berkeley National Labs on various projects related to the commercial mortgage market. As you know, the market size is just shy of three trillion dollars. And the goal of this work has been to try to connect the dots between energy efficiency inside the buildings and the cost of capital that the buildings might face if they go into the, either the direct link to the mortgage market, or put together a capital stack on private equity. May I have the next slide, please?

Thank you. So the focus of our work has been on energy use, both the volume of use, and basically connecting what we saw with John Gilbert's presentation, important efforts within buildings to reduce energy consumption, and trying to have good metrics to report that to lenders and to get credit for that for your mortgage decisions. So we focused on four aspects, but the use of energy, the price of energy, the volatility of use, and also the energy price volatility.

And why we're focusing on these four factors is that current practice is to focus on net operating income. And net operating income does not fully account for these four channels. So, you heard John talk about hitting the capacity constraints on their electricity consumption, and that type of risk is typically not accounted for in NOI until it's too late, and the electricity bills have been trebled for hitting capacity.

So, usually underwriting is done on historical averages if it's available. And often the lenders do not have historical energy use data. So, the key question of this work has been how much do these factors move the needle for NOI and for default risk, which is what the lenders are trying to apprise. May I have the next slide, please?

Thank you. So, as I said, we're looking or trying to understand the link between energy and mortgage default. We have completed several phases of this work. I'm gonna report three of them. The first was looking at to understand what fraction of overall cost of operating a building was represented in energy and once we had measures of energy use. So we focused on two types of energy use. We looked at source EUI, which EUI. And then we also scaled source EUI by the net operating income per square foot of buildings.

And we also developed a measure of what we called the electricity price gap, which is the difference between the pro forma electricity

use – the expected, in other words, electricity use – and what the building actually realized over the life of the loan that we’re observing. And again, for both of these, the higher the source EUI, the more likely the default. That was our expectation. And the higher the likelihood of default is also associated with higher electricity price gaps. And our first analysis was looking at mortgage data to try to establish these associations. May I have the next slide?

So, that’s the first thing we looked at, is office thesis primarily in the East Coast ISOs. So we’re looking at office and some mixed-use office with retail on the ground floor. And what we find here, just briefly, is scaled source EUI is very positive. So what we’re predicting here is the probability of default. Scaled source EUI is a very important indicator of higher levels of default, as is the electricity price gap for office properties. May I have the next slide, please?

And for the multifamily properties – these are mortgages on multifamily buildings – we find the same relationship that scaled source EUI is very positively associated with elevated levels of default, as is a higher electricity price gap. So, both of them are highly associated with default, suggesting that lenders should think seriously about measuring this as part of the underwriting process. May I have the next slide?

So, we have been partnering with lenders in a pilot project to work closely with lenders who are actually underwriting loans. So as you see here, we have five – four lenders – five lenders that are now involved with us and using our models and simulations with very detailed information on buildings that they have been willing to let us re-underwrite using our evaluation technology. We then work with these lenders to demonstrate the impact of both energy use and price on specific loans that they have actually underwritten. And from this we develop recommendations and then work with our pilot partners to think about either re-underwriting the loan, or more importantly, think about evaluating their entire book of business for the energy channels that may be a hidden source of risk that they haven’t accounted for.

So, as I say here, our approach has been with a specific loan. So you can almost think of these as a set of case studies using our methodology on a randomly selected sample of loans and then applying it to specific loans provided by our pilot bank partners. And we estimate the source EUI. We use simulations here developed at the Lawrence Berkeley National Labs. We compute

the electricity price gap, and then using our models we compute the default risk impact due to whatever the levels, the model levels, of source EUI and electricity price gap for specific buildings. May I have the next slide?

So this is an example of five specific buildings. Each of them had a commercial mortgage written on them. And our exercise was to take our forecasting models of default and a very deep dive into the engineering features of each of these buildings to get good measures of their source EUI. And from that we developed what the relative default risk would be. And this is relative to the TREPP average default rate of about an eight percent. So about eight percent of our – of the mortgage data that TREPP holds, which is the securitized mortgage data – experience default.

So, what we found for these buildings is that source EUI percent variations can be quite substantial. And these are modeled, so it's basically a measure of how well the building can be calibrated to shocks to demand, very much the graphs that John was showing you, how responsive these actual buildings are. Then, given that responsiveness and what a given shock would do to their source EUI under, say, a poorly managed response to an anomaly similar to what John was showing you of how well the commissioning on the building's engineering elements, like HVAC or other elements within the building, how responsive they are to shocks.

And what we find is that there's quite a lot of heterogeneity across these buildings. Of course, they're in different wholesale electricity markets. One's in Denver. The other four are in Northern California. That's what's shown to you at the bottom. But we find that there's quite a lot of sensitivity to default, other than the multifamily building in San Francisco and also the Denver hotel is extremely efficient.

So, again, there's quite a lot of variation depending on the level of commissioning in the engineering systems in these buildings. And these are model based. And from that relative to the default, the eight percent default that we find in the TREPP data, we see that the default variations are between plus or minus 30 percent, roughly speaking. And for a lender this is material, obviously, because these loans are held in their balance sheet. And having this kind of sensitivity to default is of concern. And therefore, thinking about this at the moment of originating a loan is highly likely to be very important to them financially.

And that's the next step of our project. So, we've now moved on beyond the case studies. And if my have – if I could have the next slide, I can show you these results.

Okay, so now we've done the statistical analyses on large samples of loans. We've done case studies working with pilot mortgage originators. And we're now looking at how we would think about pricing this risk. In other words, if a lender was underwriting a specific loan with a specific borrower, and the borrower gave them statistics on their important features like source EUI and energy price gap historically, how would the lender respond in terms of setting the mortgage interest rate, the level of the mortgage interest rate, and also, or alternatively, setting the points up front on a commercial mortgage.

So, the focus of this last phase of the work that we're working on right now, or we just completed, our question is with increased default risks, how should the lenders actually price these mortgages? And/or alternatively, if you have really attractive and very low, say, source EUI, or you always are at your pro forma electricity average use, what kinds of discounts could you expect your lender to offer you in terms of the interest rate or on the points up front?

So, that's what our effort has been. How much are these pricing features of loans respond to energy risk? And then secondarily, are there differences in the responsiveness of mortgages written on office buildings as opposed to mortgages written on multifamily mortgages? May I have the next slide?

So, this is a complicated set of simulations. That's what we do here at Cal. We build mortgage pricing and bond market pricing valuation tools. That's – we have a master's in financial engineering program here at Cal. And that's what we work on. Very focused on the bond market and actuarial pricing in the bond market to risks, in this case such as energy risk.

And what we find from the simulation, and this is from a sample of both office loans and also multifamily loans, where we've measured their source EUI and then we forecast it over their horizon, investment horizon, what shocks to scaled source EUI would be, what the effect would be on default. Or/and similarly measuring, given those default sensitivities, how should a lender who is underwriting those loans change the contract rate that they offer on a loan? Obviously, this would be done ex anti, so this is all set up in expectation how should a lender think about the relative

sensitivity of mortgages on office properties and multifamily if they know something about the scale source EUI and its volatility.

And what we find is that points are quite sensitive, so about seven basis points. That may seem like a low number, but when you look at the potential scaled source EUI shocks that we saw in the – four slides ago – where you can see four, five, six percent changes in the actual levels of source EUI, this is material in terms of the numbers of points that would be charged up front. And we find systematically that office loans are more sensitive, and therefore, should be charged more points than multifamily loans.

Of course, the other way to price is through higher coupons or symmetrically. If the scaled source EUI levels are very low and the vols are very attenuated, you should be able to negotiate coupon advantages on the loans. We find the coupon sensitivity is about two basis points. Again, given the volatility in the EUI, these could lead to substantial coupon differentials in the loans. And we find multifamily loans, again, much less sensitive than the office loans.

So, where we are now is, we're scaling up this project to a very large sample across the country and hoping to find and establish actuarial tables by region for these both point sensitivity and coupon sensitivity for specific underwriting. Thank you. So that's the last slide.

Blake Dressel:

Thank you. Thank you, Nancy. Thank you, Nancy.

Nancy Wallace:

Oh, I want – if I could just one last point, go back once. So, since there are a lot of you on this call, we had to think about what we could ask of you. And for the lenders in the room, I think that what we've learned here with our pilots and with these studies is that it really is valuable to ask the owners to provide information on energy cost ranges. Often this information is not asked for. And we think we've come up with measures where, even from the energy – from the utility bills – we can devise very useful underwriting metrics that could be used both for commercial and multifamily lending.

And for the owners, we highly recommend that you ask lenders to account for your energy efficiency, certainly if you have buildings that are metered, as well as the buildings that we just saw at the beginning of this Webinar. Then you should absolutely get pricing advantages in your mortgage products for the ability to manage your energy levels within a very tight range. And so, again, both for owners and lenders, we think this set of studies really

establishes the importance of having good energy metrics that are brought to the table in underwriting. Thank you. That's it.

Blake Dressel: Thank you, Nancy. So that wraps up our panelists. Before we dive into the questions that we have from the audience, I'd like to highlight some additional resources on our Better Building solutions page Websites. Here we have 2500 public available solutions as they relate to energy efficiency. You can explore by topic, by solution type, by the type of program that we have, or through our partner pages directly. You'll also find our market solutions page that contains information focused on energy efficiency technologies as it relates to commercial real estate investment practitioners. Can go to the next slide, please, and we'll open up the – our question and answer segment. Next slide, please.

So, I will start with John. We have a lot of questions here, and we definitely will not be able to get to all of them. But with the next ten minutes or so we'll try to hash some out. So John, if you are still there, if you can hear me – can you hear me? Are you there?

John Gilbert: I'm here.

Blake Dressel: Cool. So, this first question, your analysis includes a baseline which provides monetary benefits. Do you set that baseline with external benchmarking or subjective historical factors? And how do you decide to change that baseline year to year?

John Gilbert: Yeah, in two – the Bloomberg administration created the benchmarking law. So we are all fixed on a benchmark year of 2005.

Blake Dressel: Okay, and that's just, you just pull that data into the platform every year, or do you have an understanding how that works?

John Gilbert: Yeah. The beauty of Nantum that it loads dynamically. So all of this data is stored, and then we use that, the historical data. Ultimately our algorithms work through that data and ultimately help us make predictions and then prescriptions for how we should be running our buildings.

Blake Dressel: Okay. So one that I was particularly interested in is this platform, Nantum, it is very powerful, and you can get a lot of predictive analytics from it. What is the workload burden, and how is it integrated into your day-to-day or into your organizational management?

John Gilbert: Well, for me it's the first thing I see every morning. It's the last thing I see every night. And I'll look at it during the day. From our operating engineer standpoint, they can look at it all day long. The beauty of the platform is it's mobile, so they don't have to sit in the engine room and look at this data. The data can be pushed to them wherever they are via their cell phone or iPad.

Blake Dressel: Okay. Yeah, so let's do another question here. And it's what was the – answer this however you see fits for the audience – but what was the installation hardware/software/labor cost per square foot for the Nantum application, and what is the cost or what is the revenue structure here in terms of subscription associated with the application?

John Gilbert: Yeah, we've, obviously, we've spent millions of dollars developing this. In terms of the subscription cost, it's ten cents a square foot. And on average for the install cost there's not a lot of hardware here. It's basically a gateway. Nantum acts as middleware. We sit on top of the BMS and then grab data from all other sources as well, so whether it's metered data or whether it's additional sensors that we put in. The install cost is really the occupancy sensors and ultimately cracking open that BMS and matching up the data points. And that averages roughly anywhere from \$25,000 to \$30,000 per building, depending upon the size of the building.

Blake Dressel: Mm-hmm. Okay. Thank you for that.

John Gilbert: I think there was another question in there in terms of is Nantum available. Yeah, we're out there. We've got the largest bank in the world, largest REIT in the world, largest asset manager in the world, all as our customer base.

Blake Dressel: All right. Thank you. So Robert, some questions here. Have you analyzed in a quantitative measure whether there is a relationship between ESG and financial performance? Is your work focused on that, or what is your understanding of that?

Robert Azrin: Yeah, sure. You know, it needs – and maybe if we have some kind of financial performance, I'm sorry, investment performance – of those companies that are, say, strong ESG performers, so we have kind of regular accounts and sustainable accounts, we actually haven't seen a meaningful difference in performance. But in the muni bond space, yields are very compressed and kind of market technical are driving a lot of the performance. So, it's really hard to

kind of tease out the benefit in pricing you're getting from strong kind of ESG – or issues with strong ESG profiles.

Blake Dressel: Okay. Do you have any examples of situations where mitigation of a risk led to some type of a stronger value statement for completing a deal? So, if there's, you know, maybe like building [crosstalk] –

Robert Azrin: Yeah. I mean, you know, one thing they'll do is, you know, Miami, City of Miami, issued forever bonds. That helped to address their sea level rise problems. Also we've seen various cities and towns, coastal cities and towns across the U.S., issuing bonds, whether it be for sea level, for sea walls, or stormwater projects, or to address various kind of other environmental risks.

Blake Dressel: Mm-hmm. All righty. Let's see. I'll move down to questions that were pointed towards Nancy. So, this question is in regards to we focused on energy cost, but how does this relate to natural gas, and can this be analogous to natural gas or would it throw off the model?

Nancy Wallace: Yeah, so many of the questions that I'm getting are about measurement. And the answer is we believe it would be. The problem right now is the availability of data for specific buildings having to do with measurement of energy over time. And natural gas is more difficult. It's not recorded as much. But our hope is we're also using metering data, and we find very similar patterns. So the answer is yes, and we hope to get better measurement to carry on and differentiate between both electricity and natural gas.

Blake Dressel: Okay. It looks like how is the research proving that the energy correlation is in regards to default? It looks like, it just says how did you ensure that energy was causation drive with default rather than like a correlated factor?

Nancy Wallace: This is an excellent question. And it has, again, to do with the availability of data. Our hunch is that the – it's almost a sufficient statistic, high source EUI, for poorly commissioned buildings or poor maintenance on the energy usage segment of the heavy equipment in buildings. So, obviously it's correlated if you have poor management systems in terms of your energy usage. It may be that that's really what's correlated with default, rather than specifically your actual level of consumption of either electricity or natural gas.

And that's why as we improve these data sets and get better energy metrics, we can start differentiating those channels. As things stand

right now, this is the first study that got real energy metrics associated with specific loans that are now securitized and that we can track. And we just don't have good enough data to finely tune the actual channel.

Blake Dressel: Mm-hmm. I think the last question for you, Nancy, is it seems like this energy risk score can be really important for lenders.

Nancy Wallace: Yes.

Blake Dressel: So how do you plan on reaching out to these different stakeholders, and what does that planning look like?

Nancy Wallace: Yeah, so the planning is to expand our reach. We're now focusing on multifamily, the Fanny May multifamily book, which is across the United States. Now that we can actually price mortgages, we can connect these channels to the actual contract structure, and therefore, what the discount rate should be offered for a specific energy efficiency improvement. We hope that we can build actuarial tables. I mean, actually provide data that lenders could use by region to actually look – like a lookup table for specific classes of building and mortgage products.

Blake Dressel: Mm-hmm. All right, thank you, Nancy. That's gonna wrap up our question and answer session. If we could go to the next slide, I'd like to share our Better Buildings Webinar Series. We have taken on the most pressing topics facing energy professionals with new experts leading the conversation each month. The topics are listed here. And when we send out the slides later this week, you'll be able to either register for the upcoming Webinars or our on-demand archive Webinars from our program's history. So I hope you check those out. Next slide, please.

So in April we have our two-part Webinar series on Finance and Resilience Initiative. Part one will talk about building the business case for resilience, and part two will talk about actions needed to improve resilience and disclosure performance. It's a lot of details there. It pieces out into two parts. I hope you check that out. Next slide, please.

And then our 2020 Better Buildings Summit, it's June 8-10 in Arlington, Virginia, right across the river from Washington, D.C. And here you have the opportunity to take part in interactive sessions, networking with peers, ask an expert, building tours. It's really our face-to-face interaction of these Webinar series, so a lot of the same dynamics, same partners, stakeholders involved there.

You can find more details and registration on the Better Buildings Solutions Center. And next slide.

And with that, I'd like to thank our panelists, John, Robert, Nancy. Appreciate all of your insights today. Feel free to contact our presenters directly with additional questions. I know we were running to the end of our time here. If you'd like to learn more about the resources discussed today, please check out our Website or feel free to contact me at the E-mail below. For general inquiries, you'll see to the left those green icons will direct you to the respective contact, whether that's the social media Better Buildings solutions center.

And with that, that's the end of our Webinar for today. So I appreciate all of you taking the time to listen in, and please reach out with any questions. Thank you. Bye.