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NET ZERO  
ENERGY  
BUILDING  
EAST COAST  
TASK FORCE  
MEETING #1

SKANSKA

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# What is Agrion?

AGRION is the global business network for energy, cleantech and corporate sustainability. With offices in New York, San Francisco, Paris and Beijing, and an international community of more than 200,000 industry professionals, AGRION provides a platform for members to connect, exchange ideas and identify business opportunities on a global scale. Each office hosts weekly onsite and online conferences to facilitate face-to-face networking and online collaboration with industry leaders. Our global network enables AGRION members to determine critical business drivers, explore innovation and realize sustainable growth in a world challenged by resource constraints, climate change and evolving political landscapes.

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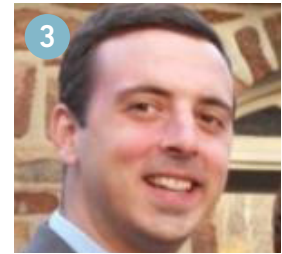
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# PRESENTERS

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The Beautiful Earth Group,  
President and CEO



**2 MAX JOEL**  
Solar1  
Director,  
Community Solar Initiative



**3 MICHAEL ROVITO**  
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**4 BETH HEIDER**  
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## SUMMARY

On May 2nd, AGRION convened 4 experts to discuss a framework for net zero energy building. Mike Rovito, Senior Consultant at ERS, Beth Heider, Senior Vice President of Green Markets at Skanska, and former Chair of USGBC, Lex Heslin, CEO of the Beautiful Earth Group, Max Joel, Director, Community Solar Initiative at Solar1 presented at this session, moderated by AECOM's Rob Rothblatt, Director, Architectural Design Practice.

Lex Heslin began by giving an overview of sustainable building standards: LOHAS (Lifestyles of Health and Sustainability), Passivhaus, LEED, Living Buildings, and Net Zero, and the Beautiful Earth Group's corporate net zero objectives. He credited LOHAS, and Living Buildings with being more forward looking, as they incorporate measures of tenant behaviours and lifestyle. Passivhaus is the strictest, more performance based, and focused on insulating, heat, air, and energy exchangers. This presents a downside he mentioned, as it can be economically unviable to achieve this certification. LEED was less scientific, and empirical, and is more

concerned with source materials. Net Zero places on emphasis, on the balance of energy. The downside is, "you could build a mansion out in the desert in California and put a big solar field in your backyard and run the air conditioning all day long with the windows open and still achieve Net Zero." He said he looks forward to incorporating water use, and waste disposal to the definition of net zero. He emphasized that the group needed to a definition that could fit the marketplace: "I think what works is some kind of system that can be changed along the way as technology changes, and it also meets market rates, and it has to be flexible to accommodate that."

The Beautiful Earth Group, has the goal of constructing the first net zero commercial office building in Manhattan, and hopes to push forward a global initiative focused on net zero energy building in major cities.

Beth Heider, presented on Skanska's Powerhouse building in Norway, for which they partnered with Entra Eindem, ZERO, and Hydro. The Powerhouse project is a refurbishment project, which highlighted that "you don't have to rely on new, always, to do things that are Net Zero, or do things that are exemplary from a construc-

tion or energy performance standpoint.” It aims to be net positive, but is currently net zero as built. For this project, given the cold climate in Norway, and that they were aiming to achieve Net Zero, they focused heavily on insulating the container. Heider made note however, that “when you get to Net Zero and you are super-insulating buildings, you must pay attention to what you put in the container, or you could be creating a perfect gas chamber. You need to pay attention to how chemicals and materials that you put inside buildings perform in a space that has lower air exchanges to avoid that.” The architects also took into consideration heavily, the embodied energy, which Beth noted, impacted their decision to do without ocean and wind energy.

Apart from these design and engineering feats, the Powerhouse project was also a testament to internal corporate bravery : “The Powerhouse project required a tremendous amount of bravery, both externally and internally. Skanska actually had to do a lot of cultivation internal to our group to move this project forward. We are not a bunch of troglodytes, Skanska is deeply committed to sustainability, yet, even with this commitment, we are pushing the edge. We are attempting to do something that hasn’t been done before, and so we are getting out of our comfort zone.”

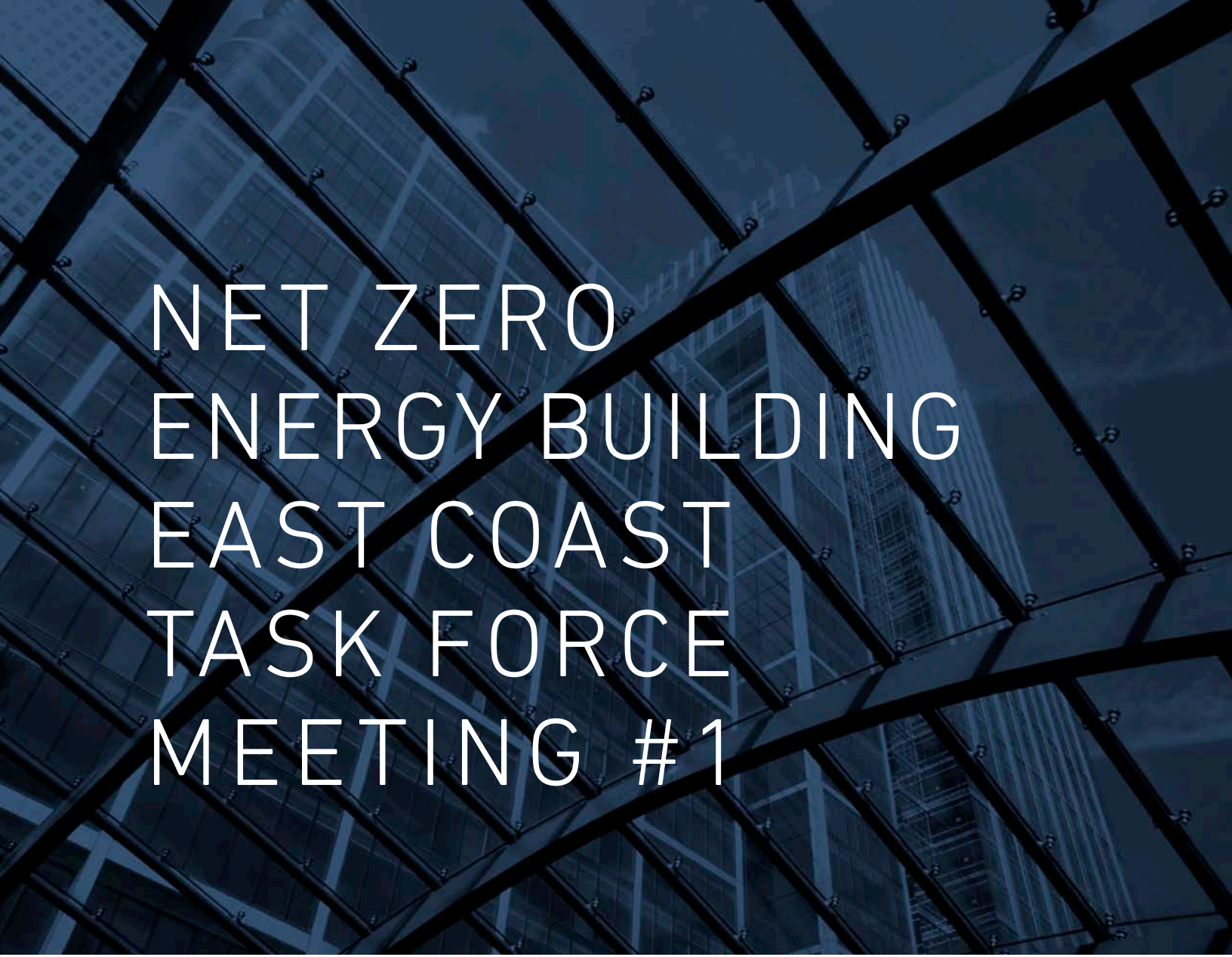
She went on to highlight another project, The Bertschi School, located in Seattle, and completed in 2011. “The Living Building Challenge has over a 100 projects now in the works. This is the fourth one in the world that has achieved its certification, and that is based on performance.”

You can view the Powerhouse video here:  
<http://powerhouse.no/en/movies/>

Michael Rovito, shared the results of a market and technical assessment done in collaboration with NY-SERDA on Net Zero and deep energy savings in commercial buildings, collectively called High Performance Buildings. His presentation focused on the cost-effectiveness of net zero. Building on a concept put forth by Paul Torcellini of NREL, he presented a graph measuring lowest-cost and highest-efficiency frontier for buildings and said that “Net Zero buildings and high performance buildings really live in this lower right-hand corner. It’s Better Design. It’s not necessarily more expensive, but it’s more efficient. It’s not that they are dipping into this well because it’s cheaper; they are dipping into this well because they have to, to achieve the level of performance necessary to become Net Zero.”

He brought up an evaluative framework that expands on Mr. Torcellini’s framework and which uses 3 variables: cost, energy performance, and non-energy performance, with the non-energy dimension, encompassing aesthetics, functionality, and comfort. Referencing a New Buildings Institute study which showed that nationally, there is a 0-18% premium on building net zero, Mr. Rovito, highlighted the fact that 8 out of 10 most frequently appearing features of NZE buildings, are load reducing ones which often have net negative costs in new construction. An example is building a courtyard, at no incremental cost, which allows better lighting, thermal fluxes, and ventilation. Mr. Rovito showcased the Alberici Headquarters retrofit project in Overland, Missouri, where they implemented similar cost effective design upgrades, such as a sawtooth design, to optimize the orientation of the building for better sun exposure. “[Some] have negative cost, like getting rid of the glass curtain wall, or they have an investment cost upfront that can be then ameliorated by reducing the size of mechanical equipment.” Moving forward, he said it was important to build transparency about the tradeoffs in non-energy performance of net zero energy buildings to combat skepticism about its low cost premium.

Max Joel presented on the plans for Solar 2, a net-zero education center on Stuyvesant Cove, which will be LEED platinum, and meet Passivhaus standards. He wanted to discuss the experiential aspects of Net Zero, and show how the building philosophy behind Solar 2 could be a reflection of “Solar One and New York’s broader goals for sustainability”. Experiencing the devastation of Hurricane Sandy helped to shape their conception of the building. Solar 2 wants it to be adaptive, and resilient, so as to potentially be a community post-disaster refuge shelter. As it is on the waterfront, it will need to be raised by 7.5 feet; it will have a90 kW solar array. “We already do solar powered concerts, movies, dance performances at the site, we are going to keep doing that, really invite people inside a Net Zero building and show them what it means for themselves and for the city.”



# NET ZERO ENERGY BUILDING EAST COAST TASK FORCE MEETING #1

**Rob Rothblatt:** What we are going to do today, we have four panelists who are going to tell you about projects that they are doing. We are really going to be investigating, I think, the nascent business, which is Net Zero. This is still very much in its formation. What is it? We are going to talk about energy, water, carbon. We are going to talk about large scale and smaller scale things, buildings, energy generation, etcetera.

What I thought we would do is, every one of our panelists will spend about eight to ten minutes. They are going to give you a quick bio. They are going to tell you the salient things that they are working on these days that are right up at the edge. There's no point in going too much back into history. They are really in it knee deep, so we will jump in with them.

And then that will take about half of our 90-minute time, and then the other half we will do questions. So what I might do is try to elicit a couple of things out of them on topics that their colleagues have brought up and then you guys jump in after that.

My 10-second bio is that, I am actually a design architect, so I actually don't belong with these esteemed people who are working to make the world better. I am at AECOM, where it's an enormous Fortune 500 firm. I am part of a sort of boutique practice which is trying to grow architectural design work in New York.

My previous world, I came from a firm called Skidmore, Owings & Merrill. My only thing that I can say is institutional work, which is a big challenge actually for Net Zero, especially my latest project, which our cousins

Tishman are building, which is the PSAC, the 911 call center for the City of New York, which responds to the terrorist bombings.

It had a really interesting sustainability problem, because people are locked in there taking your calls at midnight; people having fire or etcetera, and no stress relief possible, and no real way to go outside a bombproof building in the middle of the night.

One of the things that we have worked on there with a wonderful group from Rensselaer Polytechnic, it's not Net Zero, but it's an idea about how experientially we can think about sustainability, is the AMPS Wall, the Phytoremediation Wall, that was on the cover of 'ARCHITECT Magazine', which Professor Jason Vollen is working on with us, and is now going to go into the building, and it puts air through the root zone of plants, to clean the air 200 times better than putting it through the leaves of plants.

And I am happy to say that DDC and Commissioner David Burney have funded this, and it's happening in PSAC. And that's my only major contribution, I believe, but I have always wanted to do a Net Zero, and I haven't, so I am going to learn as much today, I think, as everybody.

I have an order. So do your little presentation, give them a quick bio, and then I know that you have got things that are dear to your heart that you want to share with everybody here on the panel.

So Lex, we are going to start with you. Lex is from the Beautiful Earth Group. Lex, take it away.

Lex Heslin: Okay. Thank you so much Rob! I am glad to be here as part of this working group, because the message that I want to leave you with today is that we need a lot of work in this area, and one thing that we have learned is that one size really does not fit all for these buildings.

Let me give you a little background on who we are and

how we are involved in this. I think we are one of the few principals on the panel, and that means that we are spending our own money to achieve Net Zero and get other people involved in it, and money of course is a big consideration for all of these projects.

Beautiful Earth Group is a sustainable energy developer. We are a utility-scale developer. Sustainable energy for us means solar, wind, and hydro. Our niche in the market is the 20 megawatt PV project. 20 megawatts of PV is a couple of 100 acres. It's about \$70, \$80 million plant. 20 megawatts in utility-scale, as far as like big projects is concerned, is actually like the smallest of the big projects basically.

You hear a lot about the triple digit projects that people like, for solar and NRG and others are building out West, we

are the smallest end of that scale. And we do that because we want to be near the load centers, and we want to also be able to develop sites in a green way, which means not taking down virgin land and doing a cradle to grave analysis of the whole site, so that we can make it a really green project, because we feel that there's no reason to make green energy if it's not a green project.

How did we come here today? Well, we are doing a couple of things. We are mostly out in the southwest. We are also involved in Japan. Japan has a great new Feed-in Tariff; it's about \$0.35, \$0.38 a kilowatt hour for a 20-year PPA. In California we are getting about 7, 7.5 cents a kilowatt hour.

There's a lot of reason for us to be there. In Japan we are called the mega solar developer, which is kind of a joke, because mega solar in Japan means two megawatts and above. And we love that, to be called a mega solar developer, because we are always the smallest guys on the block out here. They don't have a lot of land there, but they do have a great Feed-in Tariff and it's a real gold rush going on over there right now. That's a little bit about what we are doing as our main business.

How do we intersect with Net Zero buildings? When we founded the company it was really important for us to develop a strategy, where we would not only build green

“The Powerhouse project required a tremendous amount of bravery, both externally and internally.”

— Beth Heider

energy, but we would sell that energy downstream to users who would appreciate that energy, and also use it in green applications.

Our initial goals were to sell to EV drivers, for example, and also into things like Net Zero homes, so you get a real double benefit of not only having the Net Zero design and construction, but using green energy to run that home or building.

We try to walk the walk as much as possible. We own a few sites here in New York. Our goal is to build the first Net Zero commercial office building in Manhattan, and also to build a Net Zero building in Japan for our operation there.

In Japan, we are working on a really unique project, which is a very old red brick structure in the City of Fukushima. It's a historic structure that we are going to renovate, and it will be both Net Zero and LOHAS compliant.

I will just jump into the various, kind of, regimes surrounding Net Zero and these types of construction. I am sure we will hear a lot more about it from the other panelists. But when we looked at building our own buildings, we looked at Net Zero, which you all know, and also Passivhaus, which is very popular in Germany and Sweden and Northern Europe. Also, just typical LEED kind of stuff. Also, the Living Buildings Initiative and LOHAS.

And LOHAS is kind of the most important movement in Japan. LOHAS is Lifestyles of Health and Sustainability. Of the group that I just mentioned, LOHAS and Living Buildings really takes a very different approach than the former three. It's much more organic and it's much more about changing your lifestyle to kind of fit the building and work around it, and live in a more energy efficient way.

Of all of the programs, Passivhaus right now is probably the most scientific; LEED is great, it really stimulated this whole drive towards green buildings, but there is

very much of a focus on materials, and it's not as scientific. Let's just say it's not based on performance as much as something like Passivhaus is.

So Passivhaus is all about insulating. Basically what they say is, you have got a box, you need to build a box with as few holes in it as possible. And what they want to do is, in Passivhaus they use very – they have a lot of strategies for insulating that box and keeping it closed and using heat exchangers for the air and energy exchangers. It's a really pretty successful regime.

The idea is that, if you insulate your box well enough, like a thermos bottle, you won't have to use very much energy to keep it going. So I like that concept. It's also very, very measurable.

“I think at the end of the day that what we need to focus on in the working group is coming up with a definition of what works in the marketplace.”

— Lex Heslin

Let me introduce some of the challenges that we face when we looked at adopting any of these things. Net Zero, for example, that's how we started out, and we are really behind the Net Zero movement, because it focuses people on energy and on clean energy, and it's a pretty easy concept to grasp and to kind of achieve. We even

have a program where we are encouraging cities to go Net Zero around the world.

We are working with Lancaster, California, and you may have read two weeks ago in 'The Times' that the City of Lancaster just passed a law that all new buildings; residential, commercial, everything, have to have solar installed in order to get a permit. So that's the first city in the country that's done that, and we are very proud of them, and we have been involved with them in getting that going.

I just got back from there yesterday. It's a little scrappy town 70 miles North of Los Angeles, and just yesterday they cut the ribbon with BYD. BYD is going to build the first electric bus manufacturing facility out in Lancaster.

**Beth Heider:** Do you know that was in 'USA TODAY'



today?

Lex Heslin: Was it? Okay. I didn't know that.

**Beth Heider:** I wanted 'The New York Times', but I knew there was a reason that they gave me 'USA TODAY'.

**Lex Heslin:** Well, okay. It's for real. I was there. It's a very interesting company. I think it's pretty historic, because it's actually the first Chinese auto manufacturer to invest in the U.S. Where are they going? Lancaster. Why are they going to Lancaster? Because their Mayor is devoted to going Net Zero. He has passed the law, you have got to have solar, but he is also working with people like KB Home to build Net Zero homes out there.

And the kind of homes they build are like tract homes, and they just build them over and over again. But it works. It's a systemic approach.

Anyway, couple of the positives and negatives that I will finish up on Net Zero. You could build a mansion out in the desert in California and put a big solar field in your backyard and run the air conditioning all day long with the windows open and still achieve Net Zero.

That's not our idea of sustainability, and Net Zero theoretically would allow you to do that.

Passivhaus, like some of the other standards, it's very, very strict about what you need to do to achieve the certification. As a former economist what I can tell you is that, as you implement all these programs, it gets very, very costly, and at the extreme, as you get towards certification, the marginal revenues don't really justify the marginal cost. You have got to spend a ton extra.

You know what, at the end of the day, none of this stuff is going to work if we can't build it at market rate, so that people will actually build it. So that's one of the problems with Passivhaus, and it's so strict about what you need to do to achieve that certification, and people get so caught up in achieving the certification, they forget about what they are doing, which is trying to build a green building.

As an example, to achieve Passivhaus, you could actually just pop a panel or two on the roof, which is on the energy generation side, and the result would be the same, rather than going that extra distance and putting in an extra four inches of insulation on the exterior of the building or something. You could achieve it very easily and cost efficiently with a couple of solar panels, but they won't let you do

that, so that's one of the failures of the program.

LOHAS, which is really popular in Japan right now, is really great and it's more of an organic approach. It's the same thing; it has got to be Net Zero; all the energy has to be generated on the side. It's based on water. It's based on inputs and outputs, and lifestyle as well, and geothermal, shallow geothermal heating. It's really a great thing, but it's not scalable. You have to be very wealthy and have your own plot of land to build this thing on.

Living Buildings is another good one. I like the approach because it incorporates all these different types of sustainability into it, but I think at the end of the day that what we need to focus on in the working group is coming up with a definition of what works in the marketplace.

I think what works is some kind of system that can be changed along the way as technology changes, and it also meets market rates, and it has to be flexible to accommodate that.

These are some of the challenges that we are facing when we are looking at building our own buildings. There are a lot of things around the world, a lot of different programs going on around the world right now to encourage this in different directions.

I think the main movement is trying to bring in not just energy, but things like water use and waste disposal and so forth, and it's becoming much more lifestyle and behavioral oriented. I think that that is kind of the way it should be. It's about a change in thinking, but at the end of the day it has still got to be at a price that we can build it. So we don't want to forget that when we start any of these projects. Thanks!

**Rob Rothblatt:** Thanks Lex! I think that's a great overall introduction too, so we won't have to come back on all of that. It's clear that we are going to be talking about things that are in New York versus things that are in other places. I think Beth who is next, SVP from Skanska, is going to talk about some things that maybe go the other way in terms of hemispheres, right? Beth, your turn.

Beth Heider: We are going to sort of bracket New York, because I love New York. I love to come up, whenever Daniel calls me and says, there's something to do, I love to come up to New York. But we are going to be talking about some things that are happening in Norway and some things that are happening in the U.S.

The project that we have behind us is Powerhouse. First of all, I want to also recognize that Katrine Johansen is here with us from our Norway Office. She is here on a stretch assignment this summer. If I say anything wrong, Katrine, you just speak right up.

The Powerhouse in Norway, and we have a little video that we are going to show in just a minute. There you go.

**Beth Heider:** Okay. A couple of lessons from this. First of all, full disclosure, I am also an architect so I like happy little graphics and things.

Also, I encourage you guys for inspiration, this is available online, you can go back and see it, but what I would like to add to what – you have learned a little bit about sort of the story of Powerhouse is some of the stuff behind the scenes, if you will, that are really, really important to remember if you pursue more ambitious projects like this, and then I will just make a few brief comments about another project, the Bertschi School.

The Powerhouse project required a tremendous amount of bravery, both externally and internally. So Skanska actually had to do a lot of cultivation internal to our group to move this project forward. We are a very sustainable company. We are not a troglodyte construction company, but even with that, we are pushing the edge. We are attempting to do something that hasn't been done before, and so we are getting out of our comfort zone.

In order to do that it required corporate bravery, but leadership at the top who said, we will take that mountain. We will do this. And it required a collaboration of a different source. So you noticed that all of the players were recognized. They were engaged from the very beginning.

This project, by the way, we don't have the performance information on it yet, because it's still in construction, so what we are looking at here is Zero Net as it has been modeled.

Another important thing about this project is that it's a refurbishment project. You don't have to rely on new, always, to do things that are Net Zero, or do things that are exemplary from a construction or energy performance standpoint.

I think another important lesson from this building, and this is a theme that we have heard a lot today, is that if you are building Net Zero, if you are really focused on energy, you can't just be focused on the equipment,

you have to eat your conservation vegetables before you get your photovoltaic cookies. Didn't your mother tell you that?

As you saw with Powerhouse, the building is extremely well insulated. There's a great deal of focus on the container. You are going to use that?

Lex Heslin: I love it. That's great. I am taking notes.

**Beth Heider:** There's a real need to collaborate between the design partners on the project as well. And back in the day, in the late '70s, when I graduated from architecture school, first of all, it was BC, right, it was before CAD, so we were throwing hand-drawn drawings over to the engineers and they would have to figure it out. Today it takes everybody playing around the same table.

Another lesson from this is that, we are looking at Norway here, right? Norway is not a temperate zone, it's really cold in the winter, but Jörger, who was the corporate visionary within Skanska out of our Norway office said that he was really surprised at the power of the sun, even in Norway. That if you orient the building properly or if you orient the equipment properly, even in climates that you wouldn't think, it's not in the middle of the desert, even in climates that you would think wouldn't be able to take advantage of the sun, there's a great deal of opportunity there.

This particular project looked a great deal at embodied energy and that helped change their decision making. In fact, they have looked at ocean and wind solutions, but they just simply couldn't get enough power out of it when they started looking at the embodied carbon.

I think this is another lesson, and I need to come up with a pithy way of expressing this one too, but as we get closer to Net Zero energy in terms of consumption, you begin to take a look at the embodied energy more, because now all of a sudden that becomes part of the equation and the common currency for embodied energy is carbon, and so that may be a big part of the next thing.

Next slide, I just have one image of the Bertschi School, although we also have a video for that. You can go online and take a look at this. This is a Living Building Challenge Project in Seattle; very small, 1,400 square feet. There are homes in Washington that are like 10 times that size, so it's a small vision. Lots of stories with this one, including the focus on collaboration.

The Living Building Challenge has over a 100 projects now in the process. This is the fourth one in the world that has achieved its certification, and that is based on performance. An important lesson here is that it was built in 2011. Its first performance period was complete in 2012, and they weren't certified on the Energy Petal, the metric within the Living Building Challenge. LEED talks about points. Living Building Challenge talks about petals. It was the Energy Petal that they weren't able to achieve, so they ended up adding additional PV panels to close the gap.

The hardest thing that we did on this project was not the energy piece; energy is much easier to quantify, there are lots of solutions in the marketplace that would allow us to get there, it was the material piece that was really difficult.

While LEED does – you know that I am the former Chair of USGBC, so you go whack LEED all you want.

**Lex Heslin:** No, I am a supporter.

**Beth Heider:** But the thing about LEED and the Living Building Challenge around materials, and this is where I will end, and we can talk more when we get into the conversation part of this, is that when you get to Net Zero and you are really super insulating buildings, if you don't pay attention to what you put in the container, you are creating a perfect gas chamber.

What you want to make sure that you are doing is paying attention to how chemicals and materials that you put inside of buildings perform in a space that has lower air exchanges to make that you avoid that.

**Mike Rovito:** Great!

**Lex Heslin:** Great!

**Rob Rothblatt:** All right! Mike Rovito is next from ERS. So go ahead Mike.

**Mike Rovito:** Thanks Rob! I have got a few slides prepared, so while they are coming up I will just say, I am Mike Rovito, I work with ERS. We have recently completed some research with NYSERDA. We collaborated with them on a market and technical assessment of Net Zero and Deep Energy Savings, which we collectively call high performance buildings.

We are focusing on nonresidential and almost entirely on the energy efficiency side, for the reason of the field full of solar panels with Net Zero, you can get away with a lot of stuff. So really we are looking at high performance energy

performance on the consumption side.

I could speak for hours on this, so we only have a few minutes, so I am going to focus on one little nugget, it's a framework that we find useful for thinking about these concepts. It's very simple. It's a three-dimensional framework, three variables; cost, energy performance, and non-energy performance. I think it illuminates, it's a good lens through which to look at Net Zero and so on, because it illuminates a lot of the core features of the concept and may help us bring Net Zero from the bleeding edge to the mainstream.

One of the first things you run into when you are researching Net Zero in the high performance buildings, it's kind of counterintuitive, you find that they don't actually cost – they don't have to cost all that much more, and this is kind of an interesting finding.

So when we looked at high performance buildings in New York, we found that they were roughly in line with average building cost, I think RSMean, it's a little bit inflated, so perhaps it's implying a small premium, but that's in line with national statistics and national research, and New Buildings Institute has done both modeled and empirical studies showing no to small premiums, 0-18% depending on what you are looking at.

I think that raises a couple of questions. First of all, how is this possible? Is this really true? So I think there's some natural skepticism that needs to be



brought to that. And then second of all, if it is true, why isn't everybody doing it?

One of the first things that you need to look at and think about is this graph that really helps to illuminate how this is possible. And this is actually – I am adapting this from Paul Torcellini of the National Renewable Energy Labs. It's really simple. The first two dimensions of the framework, and I will just talk about the right-hand side because we don't have much time.

So cost is going up and down; so higher cost is going up, and better efficiency to the right. If we look at the upper right quadrant there, that's better stuff, Better Component. This is really where energy engineering takes place today. It's where the regulatory environment is. It assumes that every piece of equipment you put in there, that's better, must cost more. You have to have an incremental cost.

But the reality is that Net Zero buildings and high performance buildings really live in this lower right-hand corner. It's Better Design. It's not necessarily more expensive, but it's more efficient.

I think a really classic example here is getting rid of the glass curtain wall. Glass is expensive. It's more expensive than opaque wall, and it's less efficient. You get much greater thermal flux.

And so I think that's just one example, and there are a lot of measures in here in this quadrant that Net Zero buildings rely on, not just from the cost perspective, but from the efficiency perspective. It's not that they are dipping into this well because it's cheaper; they are dipping into this well because they have to, to achieve the level of performance necessary to become Net Zero. And really the sort of dotted line, that is just a sketch, is sort of the path, it's like the best – the best building you can get for the cheapest.

So the first measures you get actually have a negative incremental cost. And only later, after you have reduced loads with design features, that cost nothing or have negative cost, do you then add on the better stuff; the LED lights, the high performance boiler and so on.

Just to ground this in an example and I am using a retrofit example. We can talk about this in retrofits and image renovation and new construction, but just a retrofit example, I love because you have an actual baseline to look at. It's less abstract.

The Alberici Headquarters in Overland, Missouri, a really fantastic building, only 34 kBtu per square foot per year. It was a major renovation of an existing manufacturing plant, or I guess it was abandoned at the time.

So it had two big problems from that perspective of designing a Net Zero building. One was the orientation. Orientation is really critical, as already been mentioned today, because of how the sun comes in, you want to get a lot of daylight, but you don't want to overdo it with the thermal fluxes, so you want it oriented a certain way. This building was not oriented properly.

They couldn't move it because it's a major renovation, you can't just turn the building. So what did they do? They added this little sawtooth pattern at the bottom, which I think is just a fantastic creative design solution to effectively reorient that facade so that it's proper for day lighting and for thermal fluxes.

Another problem they had was, it was too wide. You kind of want a narrow floor plan or footprint for Net Zero to facilitate both day lighting and natural ventilation. You don't want all these internal loads and you don't want all these dark spaces.

Well, this was a big building, so what did they do? They just ripped the roof off in the middle and created a courtyard space running straight through the middle of the building, which enabled them to take advantage of day lighting and natural ventilation.

Now, obviously this is a renovation, so they had to pay for that but if you are building a building from scratch, it's a freebie. Design the building in this shape and in this orientation and you can achieve these things at essentially no incremental cost.

Interestingly enough, the National Renewable Energy Labs building in Colorado, their research support facility, which is the largest, I believe, commercial office building in the world Net Zero, has roughly the shape of two pieces connected by one in the middle.

And to take this up from one specific example to a more general aggregate, what we saw when we looked at Net Zero buildings and high performance buildings in New York in terms of the features was a huge reliance on the sort of load reducing design features.

If you look at the ones on the left here, so this is sort of at frequency of appearance, so the ones on the left are showing up in a lot of buildings. Eight out of the top

ten most frequently appearing features are load reducing features that either have no cost or freebie like on the previous slide. They have negative cost, like getting rid of the glass curtain wall, or they have an investment cost upfront that can be then ameliorated by reducing the size of mechanical equipment.

So you reduce the load upfront by investing in something like, for instance, occupancy sensors and then that reduces a load. You have less waste heat from the lighting; you can shrink your cooling systems and thus spend less on that.

We now have some evidence; we can say pretty confidently that Net Zero buildings can be built at roughly the same cost if things are done in a certain way. And we kind of have the recipes, these load reducing design features. What's going on? Why isn't everybody doing this? Why isn't this the mainstream practice?

Well, that's where the framework comes in. So the third dimension of the framework, which we haven't talked about yet, and I think that's really telling is Non-Energy Performance. So it's a three-dimensional framework, and I think it's difficult – I mean, it's hard for us as energy engineers to believe this, but buildings are built for reasons other than consuming as little energy as possible. People are doing things in the building and it's important that they operate in a certain way.

So high performance buildings with all those load reducing design features, as it happens those features, they require at least a perceived compromise in the Non Energy Performance dimension or an actual sort of experimentation, sort of first step, I am the one taking the risk and doing this new thing, that type of approach. So it requires that.

And just to give a few examples of how there is a perceived compromise or an actual compromise or risk in the Non-Energy Performance dimension as a result of these features, if you look at the three subcategories that I have here.

So Aesthetics; we have talked about the glass curtain wall. It saves you money and it saves you energy to get rid of it, but people like it because they think it looks good, it sells spaces, it leases space, and that's why people are doing it. You have to give that up. I think Net Zero buildings look attractive in their own right in a different way, it's interesting, but glass curtain wall is something that people use to sell.

Second, from a Functionality perspective; perimeter enclosed offices are kind of a norm in a lot of class A office space. But you don't have to but in many cases it's really helpful to get rid of them, to have an open floor plan to facilitate day lighting and natural ventilation. So reimagining the interior space comes at the expense of a traditional office organization. And third, when it comes to Comfort, this is – I don't want to make it sound like these buildings are uncomfortable, but I mean there are certain expectations that come with the modern commercial office space. This room is freezing right now. Net Zero buildings can't really do that, or a lot of times this is something that they will give up.

So there's a great example from Cape Cod. There's a research facility out there, has this awesome automated windows. The breeze comes in, it's pretty comfortable, but if the breeze stops, it might get a little bit warm.

So that's sort of the end of the presentation. I will conclude by saying that this doesn't mean we can't build these buildings in a comfortable, aesthetically pleasing functional way; it's just that we need to think a little bit more about the decisions we are making. And I think this kind of explains a lot – this framework, this idea of thinking about all the aspects of the building helps explain a lot of the aspects of Net Zero buildings.


And if we are going to move those buildings from the edge to the mainstream, we need to have a more honest discussion about these things, otherwise people are going to become skeptical, how is it going to cost nothing more to build a building that's twice as good? So this is the tradeoff, these are the things we need to think about and talk about.

**Rob Rothblatt:** All right, Mike, thank you! I sense the sort of Yankee, North Andover philosophy hiding behind some of it, which is terrific! If you are from Orlando, it might be a little different.

Max, your turn. I know you want to talk about – from Solar One, and I am also hearing these rumors you are going to talk about Solar Two also. So off you go.

**Max Joel:** So here we go. Thank you everybody! And thank you, this has been the best leading panel for a conversation about a Net Zero building case study ever. I don't have to go into the technical stuff at all.

My name is Max Joel. I work for Solar One, which is a nonprofit green energy arts and education organization. I do a couple of different things there. A lot of it focused around our outreach and education

A construction site at sunset. The sky is a mix of orange and blue. In the foreground, there's a complex network of dark steel beams. A large red crane arm extends from the top right towards the center. A worker is visible on a scissor lift in the lower right. The overall scene is industrial and dramatic.

“Eight out of the top ten most frequently appearing features are load reducing features that either have no or negative cost.”

— *Michael Rovito*

efforts around solar power and energy efficiency. A lot of that is done through our work with NYSERDA. We are NYSERDA's outreach contractor for New York City. Today I am going to be talking about Solar Two, which is our planned, in design Net Zero energy building. Say by way of a little more background about myself. This is my second LEED Platinum public environmental education center in a park in New York City project. I previously worked for the Queens Botanical Gardens. I may be the only person who can say that.

So just a quick introduction to the project, as I said, I am not going to talk a ton about the technical elements, because that's been covered so well. This building, the envelope will meet Passivhaus standards, it will be LEED Platinum. We are hoping to meet the Living Building Challenge, though as I will discuss, our scope is sort of changing and we may be losing a lot of the water components.

So what I am really going to be talking about is the aspect of Net Zero building that Rob touched on, the sort of the experiential element and how a building like this reflects the mission and program of an organization like Solar One and New York's broader goals for sustainability.

**Max Joel:** So history of the project; really since the organization was founded in 2004 we have been working on this project. The organization's education center is based on the East River, at 23rd Street. We manage Stuyvesant Cove Park, along the water right there. And currently we have the small Solar One Education Center. If you have ever been on that bike path or jogged there, it's like a little shaft with PV on the roof. That's Solar One; it will be replaced by Solar Two.

A big focus of this presentation is going to be how we are sort of adapting to sort of the post-Sandy reality, which was always the reality of course; Sandy just sort of rubbed our face in it. During Hurricane Sandy we got about ten feet of water on our site. Solar One was swamped. Our stage and everything outside was blown away. Our park was inundated. So one, that was a big destruction for the organization, but in a way it also brought us back to our roots.

Even after the flood our PV system was still functional. It's not grid-tied; our battery packs were way up in the loft. So we were able to turn the power on the next day and it quickly became sort of a community gathering and charging station.

We had tons of volunteers walk over and help us clear out the park and get the building back functioning

again. Once we were back on our feet, we took that same concept on the road and brought 10 mobile solar arrays out to areas of the city that were still without power; Staten Island, the Rockaways, in New Jersey and Long Island a bit as well.

So that experience, both of what happened at the site and how we were able to use renewable energy to provide real community value in a time of need is really shaping how we are rethinking, or slightly rethinking the Solar Two project.

We are going to have to make some design changes as a result of being in a V zone and being right on the water. So I have some renderings I can show you of the original design. We are going to have to raise the building 7.5 feet. The first floor is going to have to become breakaway walls, wave resistant construction.

And all this isn't cheap, we are finding there's an interesting set of Sophie's choices we are making right now. The approaches that kind of keep the design the most intact are the most expensive from construction point of view, basically because we are putting another 7.5 feet of steel in the building. And the choices that are sort of the cheapest from a construction point of view, one, cost a lot – forces us to cut out a lot of our scope and are actually more expensive from a design perspective, but we have been paying our wonderful architecture and engineering team..

So that's sort of the story of the building in a nutshell. I think we are in a very interesting position, because we are doing Net Zero, not just in the age of adaptation and resilience, but we really need to adapt and we need this building to be resilient. And not just because we want it to be functional, but given this location, we are talking about the city and making plans for it to be something of a post-disaster refuge shelter space, because we can keep it going. It doesn't just mean hurricanes that we are always planning for the last disaster, but there are a lot of other scenarios where this could become a useful building. So that's where we are now.

Again, the technology, Passivhaus, power ventilation, 90Kw, PV array, the usual hyper efficient – there you go. So let's roll through them real, real fast.

So right on the river, you can see the line there in the center. That's the Solar One building. Another view. Like two and change array.

So this is the point where our product manager texted out these photos and we just texted back, get out. This

is at like 7:00 a.m. the day of the storm.

This is afterwards. There were stairs and other big air conditioning units blown off. But as I said, we had the array and the lights running. People are starting to trickle in.

Our charging center, people are really happy, as you can see. A great group of volunteers. We had like hundreds of people come down.

Here's one of our mobile solar arrays out in Staten Island. A map showing where we put them.

So this is the more refined graphic of where we put them. So these are just – some of these resiliency issues we are thinking about, a lot of people doing work around this on the city; CUNY has a library of resources on this.

I ran through all this. A couple of renderings; this is going to change. I mean, we have the PV array elevated above a rooftop terrace. If we are raising the building 7.5 feet, that's either going to be a lot of steel or that's going to have to collapse.

Just another view. A lot of these design elements are going to change. This is sort of – I like this slide, it shows sort of again the experiential problematic element of the building. We already do solar powered concerts, movies, dance performances at the site, we are going to keep doing that, really invite people inside a Net Zero building and show them what it means for themselves and for the city.

We can just run through these floor plans, you can just keep going.

Again, these are – we are making decisions about how to change all this. Our sort of interior plan will pretty much stay the same, but some of that exterior stuff will have to change. As I mentioned, we are facing a lot of choices right now.

That's the fastest I have ever run through those slides.

**Rob Rothblatt:** A couple of things or a couple of themes that have come out, and I thought I would fire off one or two quick questions to the panel and then you guys jump in too after that.

Clearly, even though file this under the category of, well, you have got to crawl before you can walk and walk before you can run. Clearly, learning how to do a Net Zero building on a small, little, perhaps subur-

ban building, something that sits on a site, something that's got decent sun, or is an isolated little building, to a certain extent, is almost there.

Okay, not everybody can do it, but all of you have done it and there's other people coming up behind you, whether it's one of these categories, as Lex mentioned, which one it is; is it BREEAM or is it LEED or is it Living Building, or is it Passivhaus, etcetera, we are getting there.

But a couple of other larger questions, I am going to make it larger and then they can come back and make it smaller. There's no question when you look at the satellite photographs of NASA, of the earth, the United States lit up at night, the creeping suburbia and the urbanism of New York is not typical, right? This country is spread out all over the place and uses a vast amount of energy.

And no matter how much we take suburban homes, like the McMansions in San Fernando Valley and put a solar panel on top, yards of blacktop and car necessity in the back, and you can't take a bus because it's too long and it's too far, that kind of thing is never going to actually get us there for suburban and large urban areas.

So I guess, Mike, I want to ask the question is, are we trying to atone for our sins here? Are we trying to get Net Zero because eventually we want to make a difference to the total use of energy in this country? Is that our goal? Do we want to be able to help cities as a whole, not just Lancaster, but can we do it in New York City, can we do it in this building? Can we do it in the dense areas of Queens that I live in, near your Botanical Garden? Can we do it in these kinds of places so that we really make an actual difference beyond the isolated and wonderful little prototype projects that we are all doing as a start? Thoughts, panel?

**Beth Heider:** Well, cavemen made wheels before they put floorings. So yeah, I do think that it's a process, and I think that we are actually at the evolutionary base when it comes to Zero Net energy buildings, where we have gone from the point where we are just building science demonstration centers. The Bertschi School was a science addition to trying to figure out how to scale that up into other venues. And I think solar too is a perfect example, that's sort of the next step up.

Skanska worked on a project that was actually a developer driven project that was looking for first city and then state bond funding in Portland,



Oregon, so that's again a relatively mature market called the Oregon Sustainability Center. That was a 130,000 square foot office building that was being built in Downtown – it was a new built being built on a brownfield site in Downtown Portland. And we were getting to the point with the development of that project where it was near market rate rent. But it was being developed right in the trough of the depression. I don't even call it the recession. And they just could not get the support for it. So I think we are at a precipice now where we just need a couple of those projects to push us over the edge.

And I also think that those projects will be really important to make the case on the behavioral side, which is something that that you were talking about. You don't have to be uncomfortable to be in these buildings, but you do have to think a little bit differently about how you use energy.

**Rob Rothblatt:** Like the new PUD building in San Francisco that's just been widely published with a wind turbine tower inside?

**Beth Heider:** Right, right.

**Rob Rothblatt:** It's fabulous, right?

**Lex Heslin:** Fabulous!

**Mike Rovito:** Well, I will add to that. I think as you get vertical, you run into issues with the concept of Net Zero as it is strictly defined. I mean, just from the fundamentals of solar irradiance and the fact that if you have a building that's one story, you have X amount of square feet of solar array and you have X amount of square feet of energy use. If it's stories, it's two X, we can support about one X and three X and so on.

And we did some research, and there's papers on this as well, some of the ones that says, wait, once you get about three stories, it's effectively impossible to have Net Zero with rooftop solar alone, so you have to get a little creative. And I think most of the Net Zero buildings today that are truly Net Zero, either are short, or they use parking lot solar, or they have some other arrangement whereby they are connected to a solar panel out somewhere a little off, or they have something else going on with biomass or something – more creative solution. So that's one issue is that if you are talking about –

**Beth Heider:** It goes outside the drip line of the building too, which is hard for us, because we are used to developing within our lot, and there's a whole cascade of zoning. of ownership of – yeah.

**Mike Rovito:** Yeah. And I really think that for Net Zero – I mean, Net Zero is great, because it gives us something that we can put our arms around. But because of



the issues with the solar, you have a field full of solar and a really terrible building. If we are just focused too much on making sure the supply meets the demand, we are missing the point.

I think the important part of Net Zero is getting the building to consume a lot less energy, because we can't really meet today's building energy needs completely with renewables, we are going to have to really take that down a lot. And a bunch of buildings have shown that we can take it from an average of a 100 for a commercial office building to something like 30, or even 20. And we have seen that repeatedly, so that's really important.

Then you figure out the renewable thing, that's fine. If you want to buy some RECs, some Renewable Energy Credits, I have got no problem with that, I will call it Net Zero, that's fine by me. So it's really kind of a definition issue of whether we can really do Net Zero as it is defined, or do we need to change the definition a little bit.

**Lex Heslin:** So I think the definition is changing, and needs to be changed a lot. Just to answer your question, every one of these projects makes a change, every one of them. We have got PV panels in California that have been producing electricity since early 1970s. They are very little efficiencies, but you build it, you put it up, it just keeps working. So that's something that can't be trivialized, so every one of them we need to do and push for.

However, can Net Zero change the world? Well, in some ways it can, and I love what Beth was saying earlier about how some people in her organization really took some chances, and you need some real strong leadership to get behind making a change and the world and in society. And that's what this kind of thing takes.

We are advancing a program to encourage cities to go Net Zero, because one of the problems that can be easily solved with Net Zero is just measuring energy. In the City of New York, people don't really know how much energy they use and how that energy is priced, and some very basic information like that.

And so I think the first – the good thing about Net Zero is it's something that can be measured. And the first thing we need to do is say, how much energy do we use around the world? And how much do all these buildings added up with all these homes use? And then, where is that energy coming from? And so that's something good that Net Zero can do, but it's going to take really strong leadership. We think that leadership can come from like strong Mayors; like a Bloomberg, or the Mayor

of Lancaster, California. And that's what we are looking for, is people that are leaders who can make that kind of change.

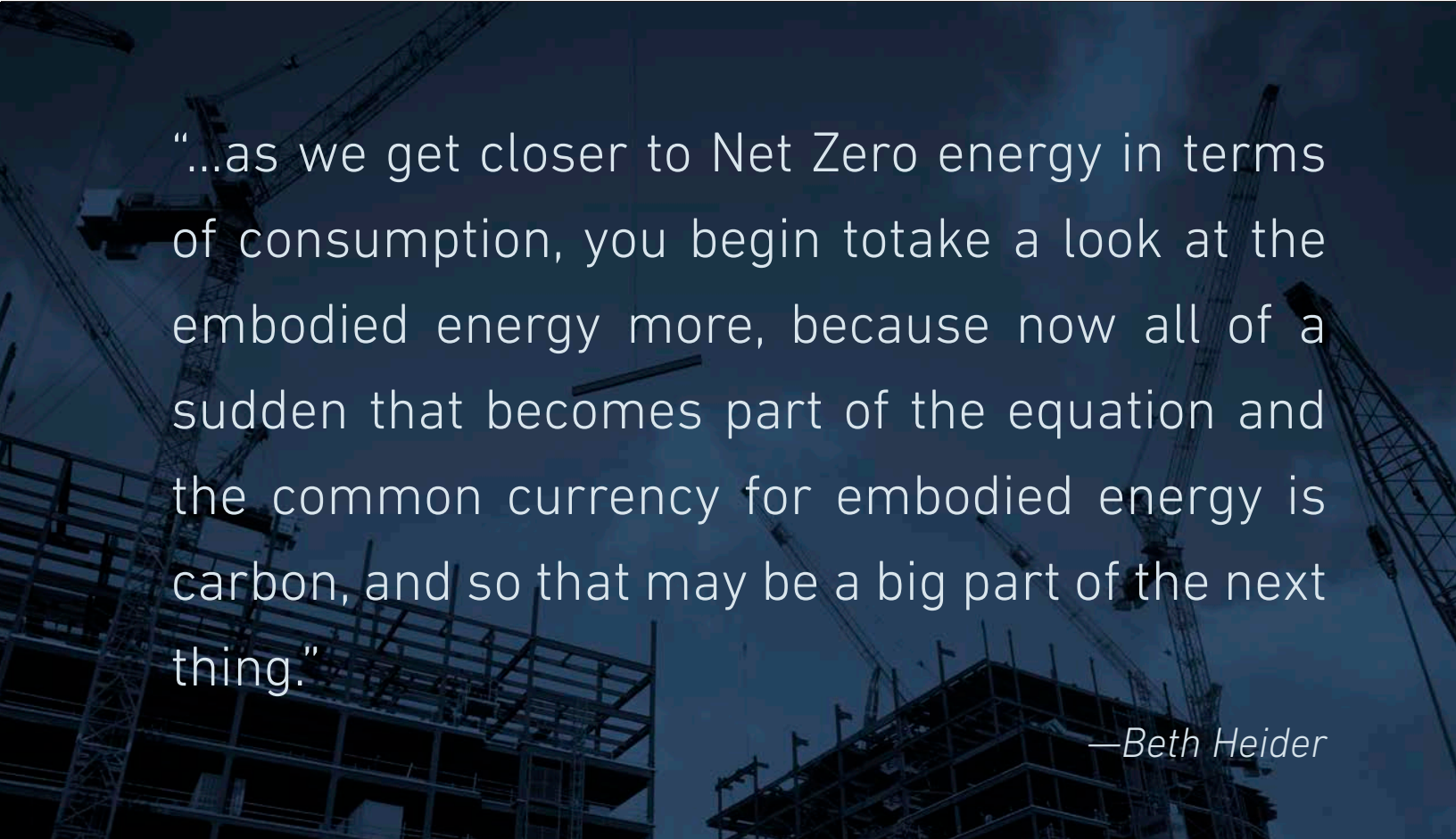
**Rob Rothblatt:** An analogous thing here of course in New York is Fit City, with the idea that – encouraging people to use stairs and not to use elevators and not to use too much energy that way and not to have transportation that's close and people walking, and not using things like that.

But I guess continuing then that question and that dialogue, is there a role for the big cities, like New York and Boston and Chicago to be leaders in this, even though the higher buildings and the bigger buildings and the denser buildings are tougher to deal with and we have aging infrastructures? All of you have done some things that involve older cities, maybe you are on the edges of them sometimes or in the parks or whatever, but is there a real role for places like these big cities to lead in this way?

**Mike Rovito:** Well, I will say, old buildings are actually pretty good buildings when it comes from an energy perspective. Reason being that prior to roughly 1960, the advent of the HVAC system, buildings needed to rely on day lighting and natural ventilation for a significant part of how they operated. And the layouts of the buildings promote day lighting and natural ventilation. And so renovation of that type of building can actually lead to a much lower EUI than a renovation of a building built in 1968, when we were very excited about the fact that we had mechanical systems that could put the building in nice 70 degrees, permanently, hermetically sealed, full glass curtain wall, energy cost were really low. So it's not – the old infrastructure here isn't necessarily – it's not a huge liability in the sense that it's worst than newer buildings, because there are some newer buildings that are worst than older buildings.

On the other hand, we are stuck with the buildings we have. It's great that we can do Net Zero and new construction. We have the methodologies and we can do it at a reasonable cost, and we sort of know the tradeoffs and all of that. But very tiny percentage of buildings are new, right?

So we have to figure out – that's one key challenge is kind to figuring out how do we do this on a retrofit basis and what is the actual technical potential of the building stock that we have and sort of prioritizing. Well, these ones we can get renovated; these ones are close enough, let's just change a



“...as we get closer to Net Zero energy in terms of consumption, you begin to take a look at the embodied energy more, because now all of a sudden that becomes part of the equation and the common currency for embodied energy is carbon, and so that may be a big part of the next thing.”

—Beth Heider

few things out; and these ones, well, let's knock them down and build something new, that's a permanent solution.

**Max Joel:** I would just answer your question, emphatically yes. I think we have to be looking at it and really starting with big cities; for a lot of reasons. One of them is, again, to Beth's point about the building's drip line, like we need to be looking outside of that drip line. You can look at embodied energy as a building as part of what you are looking with Net Zero, and there's where old buildings are great. But even beyond that, transportation, distribution, there are a lot of other pieces of the energy puzzle.

So getting back to that scenario, let's say we don't have a mansion with the windows open in the desert in a field of solar panels, let's say it's a very tight little box with PV on the roof and it's kind of the ideal Net Zero building. But if someone is driving an hour each way to work each day, is that a Net Zero building?

And we could – the energy use and transportation of the staff that works in this building is probably way lower than any suburban office market. And that's really significant. So I think New York and other big cities can be a leader beyond some of those infrastructure advantages we have. There's also - there is a civic culture and people do like to work together on these issues here, so I think it has to start here.

**Lex Heslin:** And I think you can't underestimate the power of what humans can do to change if they need to. You go to a meeting in Tokyo two years ago, after the Fukushima explosion, they had 52 nuclear plants, they shut down 50 of them. You go to a meeting in Tokyo, everyone has short sleeves, no more suits and ties. You are up in the top floor, it's 6 o'clock, it's hot. Maybe they have windows open, maybe they don't. You walk down hallways to go to the restroom, black. Maybe the lights come on or maybe not. Is it a little uncomfortable? Yeah, but you know what, the meetings go on. Everybody changed. And what happened was energy consumption in Tokyo went down to 28%. This is a city of almost 19 million people. It's huge. So we can't underestimate the behavioral component of this.

**Rob Rothblatt:** I think that's huge. Of course speaking to architects, we are just true believers from the beginning, right? And I think we have that hidden agenda, we like the idea that things are going to be open, and all that stuff. Of course, I can't convince my stepdaughter to raise the blinds during the day and she sleeps with the light on all night, and there's not much I can do to change that culture. Totally resistive in our household. I think it's time to open up to the audience, you might have questions for individual folks.

**Male Speaker:** My question is, in looking at Net Zero,

“...one key challenge is figuring out how do we do this on a retrofit basis and what is the actual technical potential of the building stock that we have and sort of prioritizing. Well, these ones we can get renovated; these ones are close enough, let’s just change a few things out; and these ones, well, let’s knock them down and build something new, that’s a permanent solution.”

— *Michael Rovito*

and if you had to set a benchmark goal, what percentage is alternative energy and what percentage is materials, technology, and behavior? I mean, for a first city or even a retrofit. If you are looking at a building or you are looking to generate 50% less electricity and have to support the building through – if you don’t understand my question –

**Beth Heider:** All buildings are different, all users are different, so it depends. But generally, there is at least a trifecta that you need to look at and balance. It’s how you build the container of the building and all the equipment that’s associated with it. It’s user behavior and it’s how the building is maintained and operated.

If you drive your Prius like a Maserati, you are not going to get great gas mileage, and the same is true with buildings. And it astonishes me how there is this general and pervasive disconnect with what individuals do, what building – I mean, and certainly USGBC was under fire and continues to be under fire about the whole performance piece. And there are changes, I am glad to report, that are upcoming, that are actually looking at a very dynamic plaque that shows real-time what your building is working on. So stay tuned, Greenbuild, we are hoping to announce

that, but it really is beginning to change the argument from just what you build to how the building operates. And the building operation then will be dependent on what the population of the building is doing, and also what the operation and maintenance guys are doing.

And I also think that there was some discussion earlier about attributes that as designers we think about a lot, which is how the space is organized and how it is maintained. I can remember – I was about ready to give a presentation at Harvard on our space at the Empire State Building, which we built out to LEED Platinum.

And with the caveat – again, this took a lot of corporate bravery and a lot of arm twisting that we built the space, this is just one floor at the Empire State Building out to LEED Platinum at no additional cost, right? So the key differential at no additional cost was over the life of the lease. And once we got that it was like, yes, this is possible. So we built the space out to Platinum, and after five years we got to the point where there was no – where the improvements had paid for themselves. But getting back to the presentation at Harvard, I called the guys up because I wanted to get really current data.

We had been in the building at this point about two years and we were on track. And the report came back, oh my God, Beth, the numbers are getting worse. I don't know what we are doing.;

And I am like, well, think about it, we have almost twice as many people in our offices in the Empire State Building because everybody; Katrine and Adam from Norway and from the UK, they want to come hang out with us in the New York office. We have a lot of people hoteling. The spaces are densifying, and so the plug loads are going up. All of these dynamics need to be taken into consideration.

So it also has to do with the densification and changes and behavior, not just temperature, but how we use the space and how we report that out.

**Rob Rothblatt:** Life cycle costs, always a tricky concept, right? I mean, very real, but hard to convince people philosophically that they should either invest in things that have life cycle cost or how you really quantify them or what counts. It's tough. Those kind of metrics, always tough. But indispensable I think, right? Wouldn't you say? To the Net Zero world the idea of life cycle cost goes along hand-in-hand with building systems integration is indispensable in a way.

**Beth Heider:** We did a – and I don't want to take up too much airtime here, but we did a study with the Living Building Challenge folks. The year after that study came out, it was clear to them that people were going to say, this is just stupid expensive, right, to your comments earlier.

And so what we did is we did a theoretical study based on projects that had actually been built at about LEED Gold, and we looked at working with a bunch of really smart people, like NBI and SERA Architects, and we had a developer on the team to take those legal projects that had been built and take their program and give it a spa makeover to a Living Building Project.

And then we looked at what the payback would be on the projects and what we found, and this is one of the ways that New York City can lead and cities like Boston can lead, where energy costs are really high.

If you look at buildings that are real energy hogs, like hospitals and those buildings that are located in high tariff areas like Boston and New York, then even though the cost to do the change from a LEED goal to a Living Hospital was 37% incremental initial cost, the return on that investment was about 7-11 years. And

the ROI, Dana, who was here this morning from JLL will tell you, her folks would not necessarily be interested in that. But if you are an institutional owner that's going to own that building in perpetuity, you are going to be real interested in returns like that, and that's where I think sometimes the perfect is the enemy of the good. What studies like that I think tell us is that, so don't get to Net Zero. Oh, what a shame, you got to 90%, you know? And that study by the way is out there on ILBI's site. Rob Rothblatt That's sort of like, if it's worth doing, it's worth doing badly, or worth doing halfway. Anyone else?

**Male Speaker:** Beth, I am hoping you will continue to monopolize the floor for a moment, because what you had said earlier and what you just said to me kind of are two sides of the same coin. And as you were talking about the bond issue that had been considered for the Net Zero project, and then you are talking about how it is that you access the longer term capital that's necessary to actually do a Net Zero project. I am curious what your thoughts – general thoughts are on the evolution of the bond finance market for Net Zero projects and portfolios?

**Beth Heider:** Well, I am not a bond person. I am not on the financial side. But I am glad that you brought that up, because we are seeing, John and I – where is John?

Max Joel: He is talking outside.

**Beth Heider:** He is talking outside. I will have to cuff him later. We are actually working on a project that we now have an NDA on. It's looking at bringing financing to play, to harvest future savings, to make capital improvements today.

And PACE financing is beginning to sort of reemerge. It had been squashed down by primary lenders for a long period of time. Even though, I will be the first to admit that the financial world is not my area of expertise, it is so powerful and so important that work goes on in that area to begin to fuel this. And I look at all of the cash money that is sitting on the sideline, and I am looking at energy performance and the incredible potential for harvesting future savings by making improvements today. And I am looking at our market where we need jobs, and I am thinking, why aren't we doing this? So the fact that there seems to be movement there I think is incredibly encouraging.

**Female Speaker:** Can I just add something to that, because my background is in financial services at an unknown rating agency that I won't mention. I ran it,

so that's why I don't want to say which one it was. But when I talk to bankers now, because now I am working for a not-for-profit to find a way to accelerate the funding in the debt markets, equity markets, the amount that is needed, especially with retrofitting or anything else, and retrofitting in the United States, a lot of the buildings, I mean you talk about an impact on climate change, it's a huge impact on climate change.

But one of the things – first of all, bankers have been very nervous since the credit crunch. I mean, they have been very, very nervous. However, the good news is, if it is an asset class that they really understand, and there's a project, they will securitize it.

There was an article recently, it came out of the UK from somebody from Standards & Poor's that talk about that a lot of the financing for these projects now are coming from shadow banking. Well, in the U.S. shadow banking is a bad word. If you say securitization, it still leaves a bad taste in people's mouth. So try to call it something different.

But what I have been hearing lately from bankers is that they are gearing up for this. They see it as a huge opportunity. It's a 30-year business model with a lot of money to be made, and whether you are a banker that believes in lowering carbon emissions or you still want to make money.

So if you bring them the right kind of project, with the right kind investment grade and yields that investors are going to want, I think it's moving towards the market to be broken open, but there has to be that first big bond issue, whether you want to call it a green security or you want to call it – whatever you want to call it, do it in a CMBS deal, a commercial mortgage-backed security deal. Fanny and Freddie have been wrapping deals like that, that are actually green securities. There's been a lot of pension funds that have been doing it. It is being done by tax equity, as we heard in the last webinar. I just go to these events for a living.

But I think people are waiting for the first project, the economics of the project, and it doesn't have to be all green, it doesn't have to be all Net Zero; it just has to show the value that you get by having a building and the way the bond market looks at it is the amount of cash flow and the predictability of that cash flow going over a period of time.

And so who I work for has been trying to get all these silos together and there are plenty of them to sit down,

and they also need common standards to look at it. And standards are not homogenous across the board, there are standards everywhere. I mean, for one thing or another and I really do think you have to show the added value to the bankers and to the analysts in order for them to give any particular credit for it.

But I think it's coming, I really do. There's just too much money sitting on the side, and obviously one of the big issues, both here and now in Europe, is that banks haven't been lending. They don't want to lend.

**Rob Rothblatt:** Panel, thank you so much, it was wonderful! Thank you everybody for letting me moderate, and Pamela is going to take it.

# ABOUT US

## About AGRION

AGRION hosts more than 400 events per year across our office locations in New York, San Francisco, Paris and Beijing that include webinars to intimate roundtable discussions to large multi-day international conventions. Membership allows companies complimentary access to all events, recordings and reports, and gives them the opportunity to collaborate on a tailored program to promote new technologies, projects and partnerships. AGRION currently has close to 200 member companies spanning a wide spectrum of industries and sectors. Through weekly events held online and on-site, AGRION reaches over 200,000 professionals globally.

To find out more about membership, please contact [qurban.walia@agrion.org](mailto:qurban.walia@agrion.org)

## Our Communities

Corporate Sustainability

Solar Energy

Green Buildings

Smart Grid

Wind Energy

Smart Cities

Energy Storage

Electric Vehicles

## Weekly Programs

AGRION organizes local and global meetings that span business and technological innovations, market challenges and competition, and policy and financing issues in the energy and sustainability spaces. All meetings are filmed and members have the option to attend meetings on-site (locally) or online. Detailed meeting reports and videos are available following our events.

(To view future and past AGRION meetings, [see here.](#))

## Networking and Industry Collaboration

AGRION performs targeted outreach for member companies, ensuring that our unique networking platform will result in high-level industry connections and concrete business leads.

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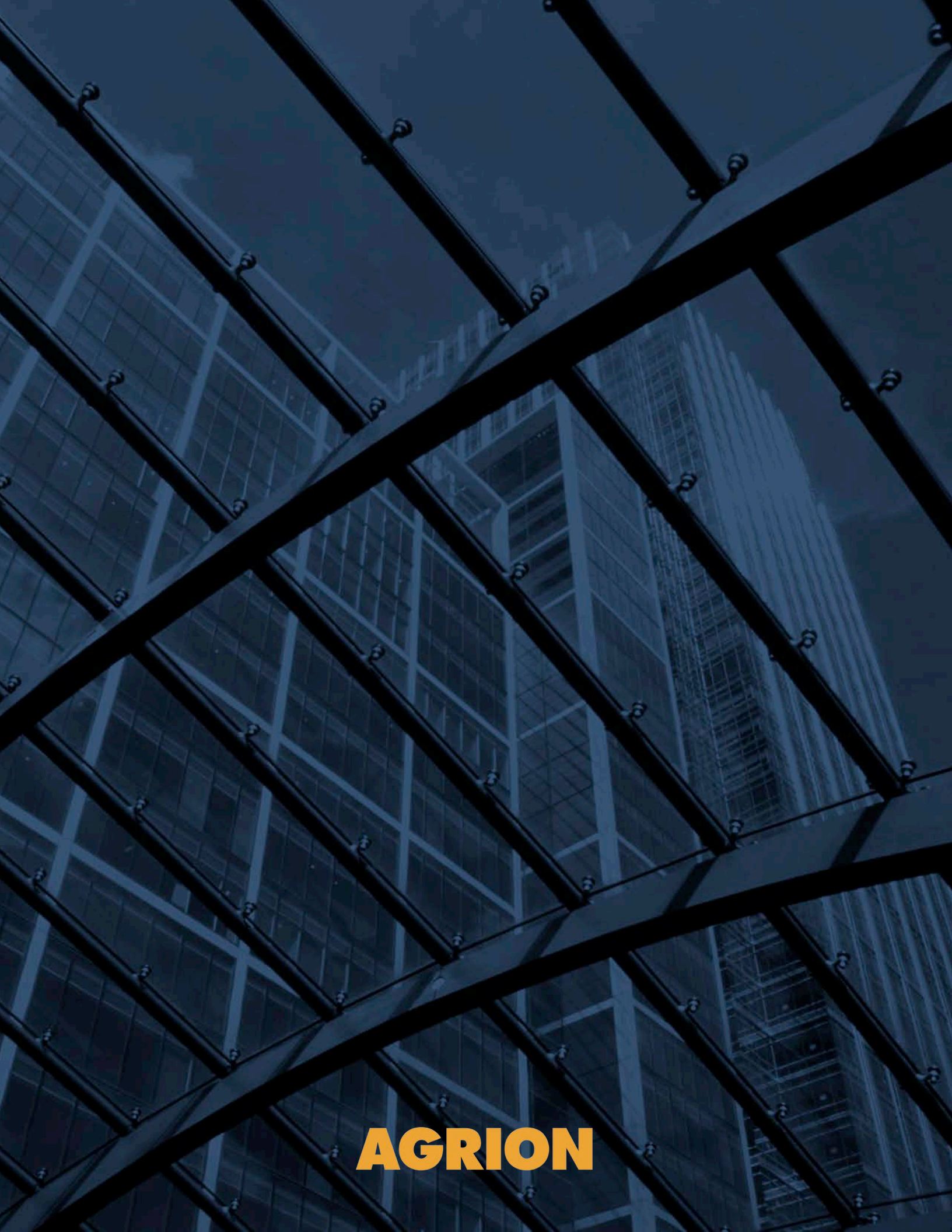
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