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BUILDING A 100 PERCENT CLEAN ECONOMY:

SOLUTIONS FOR THE U.S. BUILDING SECTOR

FRIDAY, SEPTEMBER 20, 2019

House of Representatives,

Subcommittee on Energy,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 9:02 a.m., in Room 2123, Rayburn House Office Building, Hon. Bobby L. Rush [chairman of the subcommittee] presiding.

Present: Representatives Rush, Peters, McNerney, Tonko, Loebsack, Butterfield, Welch, Schrader, Kennedy, Veasey, Kuster, Kelly, Barragan, O'Halleran, Blunt Rochester, Pallone (ex officio), Upton, Latta, Rodgers, McKinley, Griffith, Johnson, Bucshon, Flores, Walberg, Duncan, and Walden (ex officio).

Staff Present: Jeff Carroll, Staff Director; Jean Fruci, Energy and Environment

Policy Advisor; Catherine Giljohann, FERC Detailee; Waverly Gordon, Deputy Chief Counsel; Tiffany Guarascio, Deputy Staff Director; Omar Guzman-Toro, Policy Analyst; Zach Kahan, Outreach and Member Service Coordinator; Rick Kessler, Senior Advisor and Staff Director, Energy and Environment; Brendan Larkin, Policy Coordinator; Dustin Maghamfar, Air and Climate Counsel; John Marshall, Policy Coordinator; Elysa Montfort, Press Secretary; Joe Orlando, Staff Assistant; Alivia Roberts, Press Assistant; Tim Robinson, Chief Counsel; Rebecca Tomilchik, Staff Assistant; Tuley Wright, Energy and Environment Policy Advisor; Peter Kielty, Minority General Counsel; Mary Martin, Minority Chief Counsel, Energy & Environment & Climate Change; Brandon Mooney, Minority Deputy Chief Counsel, Energy; Brannon Rains, Minority Legislative Clerk; and Peter Spencer, Minority Senior Professional Staff Member, Environment & Climate Change.

Mr. Rush. The Subcommittee on Energy will now come to order.

The chair now recognizes himself for 5 minutes for the purposes of an opening statement.

I want to thank you all for joining us this morning for this important hearing entitled Building a 100 Percent Clean Energy Economy: Solutions for the U.S. Building Sector.

This hearing is part of a series that we will be holding in this subcommittee and in other subcommittees to highlight areas where we can achieve significant emissions reductions in order to achieve a 100 percent clean energy economy by 2050 as Chairman Tonko and I proposed back in July.

As we know, the building sector is responsible for an estimated 40 percent of energy consumed and greenhouse gas emissions that are produced nationwide. In the same time, there are numerous opportunities for reducing these emissions through technology advances, efficiency sufficient standards, and innovative programs such as Energy Star, Smart Metering, and others that are on the drawing boards.

Additionally, there are tremendous employment opportunities for putting Americans to work in my district and in every district in our Nation. These are good-paying, quality retrofitting jobs that can not be exported. In fact, earlier this week, E4TheFuture released its 2019 energy efficiency jobs in America report which show that the energy efficiency sector added more jobs than any other energy sector for the second straight year. The study noted that there are over 2.3 million Americans currently

employed in energy efficiency sector including more than 89,000 jobs in the State of Illinois and over 5,000 jobs in my district on the South Side of Chicago.

While it is important for Congress to provide resources and establish policies to guide actions in these areas of energy efficiency, as my bill, H.R. 1315, the Blue to Green Collar Job bill does. It is also critical that the Federal Government sets the example through its action. You can't lead where you don't go.

There are literally thousands of federally owned office buildings, courthouses, post offices, and the likes that must be retrofitted in order to save millions, if not billions, of dollars annually in energy savings. My staff is working on legislation that would ensure that the Federal Energy Management Program, or FEMP, must ensure that minority business owners and entrepreneurs are able to participate in this multibillion dollar, tax-funded program.

It is way past the time for the Department of Energy to work within these contracts so that these good old boys networks are not the only entities receiving these lucrative government-backed contracts.

Tackling this issue are making our homes, our schools, and our business more energy efficient, will save money, put people back to work, and expand the American middle class. It will help us to address the severe issue of climate change also.

So I welcome each of these distinguished panelists to today's hearing. I look forward to engaging them on the best ways to an achieve each of these objectives.

It is now my distinct honor, privilege to welcome my friend and my colleague from the great Midwestern State of Michigan, the ranking member, Fred Upton, for his

opening statement.

[The prepared statement of Mr. Rush follows:]

******** COMMITTEE INSERT ********

Mr. Upton. Well, thank you, Mr. Chairman. We are close friends for sure. But I also want to thank our witnesses for appearing before us today.

But before we begin, I just want to call our attention to a legislative matter that does require the full committee's attention.

As you know the Pipeline Safety Act is about to expire in another week and a half, and we should remind everyone that this is a reauthorization bill that we have consistently passed with unanimous consent under Republican majorities. I am troubled that we are not yet at a point where we can say that we have a bipartisan agreement to move forward to full committee. We owe it to our constituents to do better. So I would hope that we could work together on this bill in the short couple days ahead.

Turning to the subject at hand, I want to use today's hearing to focus on real-world solutions to improve the performance and environmental sustainability of our homes and our commercial buildings. Thanks to innovation and technological advancements, we are making great strides to reduce energy consumption and enhance building performance, but we still have room for improvement.

So as we consider clean energy solutions for the building sector at the Federal level, we have to recognize that these high performance, or green technologies, are often more expensive to design, build, and maintain. And as policymakers, we need to take this into account, especially as we are confronted with declining rates of home ownership, increasing rental prices and high vacancy rates in any many Americans.

I believe that cleaner solutions for the building sector must meet three core objectives. They have to be affordable, cost-effective, and they must be driven by consumer demand rather than government mandates. Housing affordability is my number one concern. It has been reported that housing affordability is near a 10-year low, and public polling confirms 80 percent of Americans think housing affordability is, in fact, in a crisis.

With a large and growing share of American households having difficulty finding housing that they can afford, this committee should be focused on ways to make housing less expensive rather than piling on more rags and driving up the cost.

I am also concerned about the cost effectiveness of some of the proposals such as those with net zero or carbon free mandates. We need to be honest about the performance tradeoffs, the higher up-front cost, and number of years it will take to pay back the difference. We have to look at the life cycle of the products and the building itself before jumping to a "one size fits all" regulation that does, in fact, pick technology winners and losers.

Finally, I just believe that clean building solutions must be consumer driven in order to be successful. Consumers know what they want, they know what they don't like. And they question about government telling them what they can and cannot have. Americans demand high performance, cost effectiveness, and, most importantly, plenty of options to choose what works best for them. Experience has shown that consumers are turned off by expensive mandates, but they are more open to properly placed incentives.

And as you think about clean solutions for the building sector, I would challenge everyone to think about clean building solutions that really do add value to their homes.

With that, I look forward to the hearing. I also want to have a special welcome to Arn McIntyre, who has traveled from, yes, the great State of Michigan to be with us today. He has got a great perspective. He is a custom home builder, a leader in energy efficiency and environmentally friendly design, State of Michigan building inspector, and he provides research and consulting business in the building sector as a whole.

And with that, Mr. Chairman, I yield back.

[The prepared statement of Mr. Upton follows:]

******** COMMITTEE INSERT ********

Mr. Rush. The gentleman yields back. The chair now recognizes the esteemed chairman of the full committee, my friend from the great State of New Jersey, Mr. Pallone, for 5 minutes for the purposes of an opening statement.

The Chairman. Thank you, Chairman Rush.

Today's hearing is the committee's second this week and third in a series of ongoing hearings as we work to achieve 100 percent clean economy by 2050.

On Wednesday, the Environment and Climate Change Subcommittee examined the challenges in the industrial sector, and today this subcommittee will review the U.S. building sector. We will discuss policies to reduce pollution and save money by making our buildings more efficient.

Residential and commercial buildings are responsible for nearly 40 percent of U.S. carbon pollution, more than any other sector. And this is not only attributable to electricity consumption but also to the use of fossil fuels and furnaces, hot water heaters, and other building equipment and appliances. Roughly half of building floor space in U.S. is heated by fossil fueled fired systems.

In developing a 100 percent clean economy by 2050 is not going to be easy, but it is absolutely necessary. And there are policies and solutions in the building sector that can help us reach that goal. Reducing pollution from buildings is tied to the power sector in how we produce electricity. Buildings account for 70 percent of U.S. electricity consumption, and that means making them 100 percent clean, requires transitioning the power sector to clean, no carbon resources, like renewables and nuclear power.

And perhaps the quickest and easiest way to reduce building emissions is by improving building efficiency. Existing energy efficiency measures have shown the ability dramatically reduced building energy use and the associated operating cost for heating, cooling, and lighting. Yet there is much more we can do accelerate and broaden the adoption of these technologies: Adhering to strong building energy codes, updating Federal minimum energy efficiency standards for building equipment and appliances, and bolstering Federal support for programs to weatherize homes can all make a huge impact.

Unfortunately, President Trump is stifling this effort to both save money and reduce carbon pollution. His administration has refused to finalized or update efficiency standards for more than a dozen consumer products. At the same time, he is rolling back efficiency standards for light bulbs, allowing inefficient products to stay on the market for years. And this wastes energy and costs consumers more money.

And as we explore ways to reduce carbon pollution from the building sector, we have to improve the energy performance of existing buildings that will likely still be in use in 2050.

So the upfront costs of retrofitting remain a barrier we must address. This committee has already taken -- already acted by passing a bill authored by Chairman Tonko and Rush to increase funding for DOE's weatherization assistance program. We passed legislation by Representative Kelly to provide funds for public building efficiency upgrades, and we passed Representative's Stanton and Veasey's bill to reauthorize the energy efficiency and conservation block grant program. And these are all going to help,

but we still need to do a lot more to meet the 2050 goal.

There are several interesting ideas that I look forward to exploring today, including performance standards for existing buildings, innovative smart building controls, use of net zero building materials and designs, and electrification of heating and cooling systems.

States have often been leaders on this issue. My home State of New Jersey has a draft energy master plan that calls for the electrifying the building sector by 2050 and reducing the reliance on natural gas for heating homes and buildings. And other States are making similar progress. But the Federal Government must also lead efforts to decarbonize commercial and residential buildings across the country. Making existing buildings more energy efficient can create jobs in every community around the country. Over 2 million Americans work in energy efficiency, and it is the fastest growing energy sector in the whole country.

So the widespread need for this work also creates opportunities to invest in worker training and address local unemployment in vulnerable communities. Increasing Federal investment in energy efficiency will spur job growth in community development that will impact every State and district. And reducing building emissions will help us address the climate crisis, obviously. It will also lower energy bills and make the buildings we live and work in more comfortable, safer, and healthier.

So I look forward to the testimony from our panel of witnesses today as we look to find solutions that will work for all of us.

And with that, Mr. Chairman, unless somebody else wants -- there is not much

time back.

I yield back.

[The prepared statement of The Chairman follows:]

******** COMMITTEE INSERT ********

Mr. Rush. The chair yields back.

Members, want to take just a moment for personal privilege before we entertain our -- and listen to our witnesses.

Some 15 years ago, I hired a young man on my staff who has been very involved to me such a remarkable and effective, brilliant young man. And a few days ago he informed me that he would be leaving my staff to go to the private sector.

And I must note, and this was a few weeks after he got married. So he married a wise woman. She made him leave in order to go make some more money. But notwithstanding that, I just really wish -- this man has meant so much to me, and to each and every one of you, I hope. And on his last -- this is his last hearing before, in this subcommittee. Would you please join me in giving John Marshall a big round of applause as --

I would now like to welcome our witnesses for today's hearing. Mr. Carl Elefante is the 2018 AIA president, and that is the American Institute of Architects. He is here. Welcome, Mr. Elefante.

Mr. Steven Nadel is the executive director of the American Council for Energy Efficiency Economy. Welcome, Mr. Nadel.

Dr. Curtis Zimmerman is the manager of Government Liaison, rather, for BASF Corporation. Welcome, Mr. Zimmerman.

And now I would also take at a moment to especially welcome to this hearing and acknowledge someone from my home district in Chicago, Mr. Timothy Keane, who is the

international vice president at large for the International Association of Heat and Frost Insulators and Allied Workers. Welcome, Mr. Keane, my friend.

Mr. Arn McIntyre, who is the president of McIntyre Builders, Inc., on behalf of the National Association of Home Builders.

And lastly Ms. Elizabeth Beardsley, who is the senior policy counsel for the U.S. Green Building Council.

I want to thank you all for joining us here today. And we look forward to your testimony.

Before we begin, a part of our ritual is that there is a lighting system before you. And the light will initially be green at the start of your opening statement. The light will turn yellow when you have 1 minute remaining. Please begin to wrap up your testimony at that point. The light will turn red when your time is expired, and then a siren will go off if you don't adhere to that time.

Mr. Elefante, you are recognized for 5 minutes.

STATEMENTS OF CARL ELEFANTE, FAIA, 2018 AIA PRESIDENT, AMERICAN INSTITUTE OF ARCHITECTS; ELIZABETH BEARDSLEY, SENIOR POLICY COUNSEL, U.S. GREEN BUILDING COUNSEL; STEVEN NADEL, EXECUTIVE DIRECTOR, AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY; TIMOTHY KEANE, INTERNATIONAL VICE PRESIDENT AT LARGE, INTERNATIONAL ASSOCIATION OF HEAT AND FROST INSULATORS AND ALLIED WORKERS; DR. CURTIS J. ZIMMERMANN, PH.D., MANAGER, GOVERNMENT LIAISON BASF CORPORATION; AND ARN MCINTYRE, PRESIDENT, MCINTYRE BUILDERS INC., ON BEHALF OF NATIONAL ASSOCIATION OF HOME BUILDERS

STATEMENT OF CARL ELEFANTE

Mr. Elefante. Thank you, Mr. Chairman.

Good morning, Chairman Rush, Ranking Member Upton, and members of the subcommittee. My name is Carl Elefante, as you already know. I am the immediate past president of the American Institute of Architects, known as AIA.

Thank you for this opportunity to share what AIA and its more than 94,000 members are doing to make the Nation's buildings more energy efficient. For more than 160 years, the AIA's mission has remained constant: To advance our Nation's quality of life and to protect the public's health, safety, and welfare. AIA's founders helped lead the fight for the then-novel concept of fire codes. Today it is unimaginable that any building would be constructed without following them.

Right now we are at a similar inflection point when it comes to the built world:

Specifically the necessary role of buildings to fight climate disruption. Buildings account for 75 percent of the electricity used in the United States and 28 percent of methane use.

Overall, buildings represent 39 percent of the Nation's primary energy use and greenhouse gas emissions. To reduce the impact of buildings on our environment and to make our communities healthy, secure, and resilient, AIA supports your goal of net zero emissions for the buildings by 2050.

To achieve your goal, we are focused on four imperatives. First, net zero carbon building design; second, net zero carbon renovation and retrofit; third, net zero carbon construction and materials; and fourth renewable energy use in buildings.

Success of these initiatives will require a holistic integrated approach and long-term commitment to incorporate these strategies into the design, construction, operation, and maintenance of the Nation's buildings. Ultimately in the decades ahead, we want them to be as fundamental to the construction of buildings as fire and life safety codes are today.

Why? Because the threat posed by climate disruptions to our homes, cities, Nation, and planet require that we fundamentally reexamine how we develop and adapt the built world.

To cite one example and one that receives too little attention today, it is important to rapidly accelerate the retrofitting of existing buildings. It is estimated that in order to meet 2050 emissions targets, among other actions, 75 percent of the existing commercial and institutional building stock, 54 million square feet -- billion square feet -- excuse me -- needs to be renovated or retrofitted that is, on average, nearly 2

billion square feet per year.

For context, that is about four times current rates which, by the way, are at an all-time high. That is a prime example that highlights the magnitude of the challenge. But as architects, facing big challenges is our day job.

We know that appropriate standards of design and construction can be utilized to combat climate disruption. We also know that partnership with business, civic, and elected leaders is the surest path to success.

The Nation's architects, engineers, developers, building product manufacturers, and others have the technical expertise needed to contribute to the fight of climate disruption. However, we can do more in partnership with you and your colleagues at the Federal, State, and local levels who share your vision and our passion to transform the built environment.

Together we can make a different. Together we can assure that buildings help achieve dramatic reductions in energy use and greenhouse gas emissions to fight climate disruption.

AIA looks forward to working with you, this subcommittee, and Congress to make our Nation's buildings part of the solution to climate disruption through the power of design.

Again, thank you to the subcommittee for this opportunity. I look forward to your questions and our discussion this morning.

[The prepared statement of Mr. Elefante follows:]

******** INSERT 1-1 ********

Mr. Rush. The chair recognizes Mr. Steven Nadel 5 minutes.

STATEMENT OF STEVEN NADEL

Mr. Nadel. Okay. Thank you, Mr. Chairman, ranking member, other members of the committee. I appreciate the opportunity to testify here today.

My organization, the American Council for an Energy Efficient Economy, otherwise known as ACEEE, was founded in 1980 by researchers at universities and National Laboratories. We produce more than 30 reports and other research products each year on energy saving technologies, programs, and policies.

Earlier this week, ACEEE released a major report entitled Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in half by 2050. This report shows how energy efficiency can make a large contribution toward reaching long-term climate goals while also saving consumers and businesses money, providing jobs, improving comfort, and reducing the health impacts associated with indoor air pollution.

Specifically, our analysis included 11 different efficiency opportunities which five address the building sector. Improved appliances and equipment, zero energy new buildings, smart buildings, building retrofits, and electrifying existing buildings.

Overall, we estimate that the 11 opportunities can reduce 2050 U.S. energy use by about 50 percent, cut it in half, and also reduce carbon dioxide emissions, in this case by

57 percent, in total reducing greenhouse gases by about 50 percent once we include the non CO2 greenhouse gases.

The building sector accounts for nearly 40 percent of U.S. energy use in emissions. We found from our five buildings measures that 2050 building sector energy use could be reduced by a little over 50 percent. No single measure dominates the savings. The overall savings require the combined effect of many different measures as shown in Figure 1 in my written testimony. And we are going to try to show it on the screen, but I guess that didn't work. So we will -- very good. Thanks.

In addition, we conducted a policy analysis looking at policies to implement each of the efficiency opportunities we analyzed. Our policy analysis found a path for achieving about 90 percent of the efficiency opportunity we identified. A little bit more than 90 percent for commercial buildings; a little bit less for homes because of the difficulty convincing people to retrofit their homes. The allocation of savings by policy is shown in Figure 2 of my written testimony, which I believe -- yes, thank you very much, which shows up there.

Let me talk now a little bit more about some of the policies starting with new construction. As the law of whole states, when you are in a hole, the first to do is stop digging. In order to address climate change, one of the first priorities is to stop building inefficient homes and buildings and instead build them as efficiently as possible.

While substantial progress has been made, multiple organizations are well targeting adoption of codes by 2030 that will move towards zero energy or zero carbon new homes and buildings when the energy use is summed over the course of an entire

year.

Such buildings typically combine high levels of energy efficiency, reduce loads about 70 percent below typical new buildings with on-site renewable energy systems to provide the remaining energy. And whether it is not sufficient on-site renewable energy, off site renewable energy can be used.

In order to encourage movement towards these types of buildings, we recommend a variety of steps. First, adopt H.R. 3962 introduced by Representatives McKinley and Welch. This includes provisions promoting regular updates of building codes as well as a variety of other provisions. It will not require zero energy codes but it set up a process that will further study code improvements.

Two, we recommend going beyond McKinley-Welch provisions. And for DOE to assist cities and States in adopting improved codes as well as conducting additional research.

Third, we recommend providing tax incentives for zero energy homes and buildings with the incentives eventually phasing out as market share becomes substantial.

And fourth, we recommend requiring that new Federal buildings as of a future date be zero energy buildings. In this way, the Federal Government can be a leader.

While these things may cost a little bit more, citations I provided in my full written testimony show how they are highly cost effective in terms of the energy savings we will pay back the higher cost in just a few years.

The second area we recommend is doing more on appliances and equipment, building on the appliance and equipment standards program and also tax incentives to

encourage the best equipment. In the interest of time, I won't go into details there, because I wanted to get to improvements to existing buildings, which are very important. Many of the buildings that will be standing in 2050 have already been built, and we need to make them much more efficient.

Some of the things we should do is have the Federal Government again lead by example. When buildings go through major renovations, do deep energy retrofits. Likewise, Department of Energy can do more to work with cities and States on energy use benchmarking and retrofit programs. And we also recommend expanding retrofit programs including the weatherization assistance program for low and moderate income families as well as adoption of the Homes Act that Representatives McKinley and Welch have introduced.

In my written testimony I provide a few examples of crosscutting policies as well. And I am happy to answer questions about those as well. But since my time is up, I, therefore, look forward to your questions.

Thank you.

[The prepared statement of Mr. Nadel follows:]

******** INSERT 1-2 ********

Mr. Rush. I want to thank you, Mr. Nadel.

The chair now recognizes Dr. Zimmerman. You are recognized for 5 minutes.

STATEMENT OF CURTIS ZIMMERMAN, PHD, J.D.

Mr. Zimmerman. Good morning, Chairman Rush, Ranking Member Upton, and members of the committee. I am Curtis Zimmerman, manager and government liaison of BASF Corporation. We truly appreciate the opportunity to --

Mr. Rush. Will you please speak more directly into the microphone.

Mr. Zimmerman. I am sorry?

Mr. Rush. Would you please speak more directly into the microphone.

Mr. Zimmerman. BASF Corporation is headquartered in Florham Park, New Jersey. We operate over 100 sites in 30 States and including several represented by members of this subcommittee. And BASF employs 20,000 people in North America. We are the largest chemical company globally providing a wide range of chemistry solutions for all sectors of the economy. At BASF, we create chemistry for a sustainable solution including a number of solutions for the built environment.

I provided detailed examples of our chemistry innovations used in sustainable construction in my written statement, so I'll highlight just a few today as BASF products and materials contribute to the efficiency and sustainability for the built environmental across the U.S., including our own buildings.

First, BASF corporate headquarter's building is one of the largest sustainable buildings in the State of New Jersey. Opened in May 2012, the 325,000 square foot building features a number of BASF products and chemistries that lower its energy consumption prolong its service life. Designed to achieve lead platinum standard in featuring high-efficiency HVAC, lighting, glass, and office equipment, our building uses much less energy than a conventionally designed building.

In addition to a number of water saving features and the use of recycled materials, it has a 30 percent improvement in indoor air quality, and more than half of the energy used for building is supplied by renewable sources.

Many of our facilities have also undergone major roofing upgrades utilizing our spray polyurethane foam technology. The seamless and monolithic application of the spray foam can be applied directly over an existing roof. This not only improves the efficiency and during of roof but also lowers labor and maintenance costs.

Additionally, our facility in Huntsville, Alabama, has twice been awarded the air pollution control achievement award by the city. In 2017, the site performed an LED lighting upgrade that saved 1 million kilowatt hours. And in 2018, it achieved platinum level 0 waste validation from UL. Currently the only manufacturing facility in the southeast to do so.

More importantly, however, is the sustainability solutions that our products provide for for customers. For example, our HP+ Wall system embodies a new way to build homes. This innovative wall works as a system and features two types of insulating foam, spray polyurethane foam and graphite enhanced polystyrene foam called

NEOPOR. In addition to its superior insulating performance, the design capacity of the wall is up to 130 percent greater than the design capacity of a standard wall making HP Plus Wall stronger than those on typical houses. Because of its structural performance, this wall system can reduce the amount of lumber needed by up to 25 percent.

This innovation delivers efficiency and resilience so that our customers, who are builders, can better serve their customers, the home buyer.

This brings me to my last point, and that is innovation and technology deployment into the built environment. Embracing new ways to design, build, and construct homes, buildings, and infrastructure will further deliver efficiencies and sustainability across this important sector.

By 2050, the world is expected to hold 9 billion people who will not only need food and clean water but will also need shelter. How do we construct the buildings of the future that meet the demands and growing population while conserving our limited resources? What is the role of government in the process?

As an energy intensive company, BASF strives to be as energy efficient as possible. BASF has made efforts to play a leadership role by incorporating efficiency and sustainability into our own buildings as well as providing those same solutions for our customers.

The Federal Government, as the largest landlord in the U.S., has an opportunity to do the same. Government can utilize tools like energy savings performance contracts and undertake deep efficiency upgrades in its own building stock.

For example, BASF has already supplied a hundred million square feet of installed

roofing formulations across many Federal agencies, including NASA, Navy DOE, and DOD. We appreciate these collaborations and hope that the government buildings are not unnecessarily wasting money on energy costs as that can detract from important mission-specific activities.

Thank you for the opportunity to testify about the solutions BASF is providing for the built environment. There is always more to do, and we look forward to working with you as you consider ways to further promote efficiency and sustainability across the important sector.

I look forward answering any questions. Thank you for your time.

[The prepared statement of Mr. Zimmerman follows:]

******** INSERT 1-3 ********

Mr. Rush. I want to thank you, Dr. Zimmerman.

The chair now recognizes Mr. Keane for 5 minutes for the purposes of an opening statement.

STATEMENT OF TIM KEANE

Mr. Keane. Good morning. My name is Tim Keane, and I am the international vice president at large for the International Association of Heat and Frost Insulators and Allied workers. And I greatly appreciate the opportunity to appear before the Energy Subcommittee today.

Since 1903, when our union was created, our members have always been known by many names: Pipe covers, asbestos workers, and now insulators. But we are and have always been the original clean energy workers.

While the value of mechanical insulation has been known for many years, it is often overlooked. I thank you, Mr. Chairman, for today's hearing and for this opportunity to share with you and your colleagues the importance of mechanical insulation.

To summarize my testimony, mechanical insulation is a proven energy efficient technology that promotes our national energy, economic, and environmental goals. Increased utilization of mechanical insulation saves energy for commercial buildings and industrial facilities that makes our Nation more energy independent. The energy savings

of mechanical insulation also help our economy as our manufacturing sector comes more competitive in the global economy.

As a result of reduced fossil fuel energy consumption, mechanical insulation also reduces carbon emissions. As the House Energy and Commerce Committee and other congressional committees work to develop clean energy legislation, the insulators encourage your support for the following principles that insulator's union general president, McCourt, shared with the congressional leadership last December.

The reality of climate change demands that we take immediate action to reduce carbon emissions. Another important reality is that our Nation will continue to require considerable fossil energy to ensure reliable base load power for today and tomorrow.

Our union does not discourage ambitious goals for a 100 percent clean energy economy, but our focus must be on what can be achieved now. The insulators also encourage your support for energy efficiency investments that have consistently enjoyed strong bipartisan support.

Clean energy incentives should include both technologies like mechanical insulation that are already available for increased utilization and investments in research and development to promote new clean energy technologies.

It is also imperative that clean energy legislation contain bipartisan building trades labor standards, Davis-Bacon prevailing wages, use of project labor agreements to ensure that clean energy jobs are good jobs.

These labor standards recognize that clean energy infrastructure should be built by the best trained and most productive and safest construction workers. The insulators

support many specific legislative proposals to increase the use of mechanical insulation that you can see in my written statement.

Energy efficiency is often considered the fifth fuel behind coal, oil and natural gas, nuclear and renewable energy, or for this committee, energy efficiency should be considered the first fuel. Because the cheapest and cleanest energy is energy that is conserved.

As I conclude my testimony, I have focused on what the insulators are doing to achieve a clean economy. But I also want to recognize the important energy efficiency work that other building trades unions perform. It is unfortunate that some characterize building trades jobs as dirty or temporary jobs.

The truth is that building trades unions and our contractors invest 1.3 billion per year in our apprenticeship programs that produce the best trained, safest and most productive craft workers for long-term careers.

As Chairman Rush knows, one of the best apprenticeship programs in the Nation is my home, Local 17, that is located in Chairman Rush's district.

Thank you, Mr. Chairman. And I am looking forced to continuing this important conversation as we work to build a clean economy. Thank you.

[The prepared statement of Mr. Keane follows:]

******** INSERT 1-4 ********

Mr. Rush. The chair thanks Mr. Keane.

And now the chair recognize Mr. McIntyre who is recognized for 5 minutes for the purposes of an opening statement.

STATEMENT OF ARN MCINTYRE

Mr. McIntyre. Thank you, Chairman Rush, Ranking Member Upton, members of the subcommittee.

I am pleased to appear before you today on behalf of the National Association of Home Builders. I would like to share our views regarding energy use within residential buildings and solutions that encourage energy efficiency that are market-driven and voluntary without jeopardizing housing affordability.

My name is Arn McIntyre. I am a green builder from Grand Rapids, Michigan. My company has focused on designing and constructing high-performance homes for 25 years. Most notably, my company built the first independently certified green home in the State of Michigan in 2002. I also served as one of the founding members of the committee that developed the first national green building standard in 2008, the NGBS.

As long-time leaders in the drive to make new and existing homes more efficient, one of the biggest challenges continues to be balance and efficiency with housing affordability. As energy efficiency standards become more stringent, home prices increase for new home buyers. In fact, NHB estimates that if the median new U.S. home

price goes up a thousand dollars, more than 127,000 households would be priced out of the market or out of housing nationwide.

First and foremost, Congress must factor in housing affordability when looking at solutions for a 100 percent clean economy. According to a 2018 study, the Environmental Information Administration, the residential sector uses approximately 16 percent of the energy consumed in the United States. That is residential sector. Because new homes account for a small share of a total housing inventory, they use only a small share of the annual consumption.

In contrast, there are 130 million homes built prior to 2010 that are much less energy efficient than today's new homes. Therefore, in addition to housing affordability, any efforts to address the energy consumption of homes must prioritize the inefficiencies of existing homes over the higher performing new homes.

I would also caution the committee against proposing Federal mandates as a solution to building a 100 percent clean economy. Mandating energy building codes are requiring builders to reach net zero or near zero energy emissions, and usage is extremely difficult, costly, and is not consumer driven.

Many have suggested that mandates are an answer to improving residential energy efficiency in reducing greenhouse gas emissions. These are highly problematic and have unintended consequences.

As a Michigan State licensed building inspector and home energy rater, I am involved in the code process. To simply mandate compliance with more stringent energy codes makes little sense. Since the codes are developed at a national level,

many of the energy efficiency provisions are based on national construction and cost savings which are of limited use on a local level.

Further, because new construction is already highly efficient requiring compliance with with more stringent energy codes yields minimal overall benefits yet can impose significant costs to new home contribution.

Finally, any Federal intrusion into the building codes adoption process could have catastrophic impact on each State's ability to implement codes that best fit their needs. Instead of focusing on mandates to reach its clean economy goals, Congress should support and facilitate voluntary above-code programs. Unlike mandates, these are driven by the market and recognized by consumers and result in veritable reductions in greenhouse gas emissions.

Programs such as the ICC 700, the National Green Building Standard, Lead, Energy Star, and DOE's Better Building program, all have proven track records for reducing energy usage and meeting other sustainability and high-performance goals. Multiple options of flexibility allow us as builders to choose the energy efficiency option that meets our individual needs for the market.

In conclusion, I strongly urge Congress to promote voluntary market-driven and viable green building intuitives in lieu of mandates to meet energy efficiency goals. These types of programs reduce lower total ownership costs through utility savings as well as provide the flexibility of builders need to construct homes that are cost-effective, affordable, and meet consumer demand.

Thank you for the opportunity to testify here before you today. I strongly

recommend that Congress seriously consider and address the housing affordability when exploring solutions for a 100 percent clean economy.

Thank you.

[The prepared statement of Mr. McIntyre follows:]

******** INSERT 1-5 ********

Mr. Rush. Well, thank you, Mr. McIntyre.

The chair now recognizes Ms. Beardsley for 5 minutes for the purposes of an opening statement.

STATEMENT OF ELIZABETH R. BEARDSLEY, P.E.

Ms. Beardsley. Thank you, chairman. Thanks to the leadership and members of the subcommittee. I am honored to join you today on behalf of the U.S. Green Building Council, a nonprofit organization. We are best known for our leadership in energy and environmental design, lead green building system.

Through lead and other initiatives, we drive sustainable and high-performing buildings that improve the quality of life for all. We thank the subcommittee for this attention to progress on buildings in support of the 100 by 50 goal.

While climate risks are ever more apparent and urgent, the good news is, that we can do this. The solution set is robust and growing to meet the challenge. This is certainly true in the building sector where we have much of the technology and can start now.

Deep efficiency is possible and being achieved every day in places like Texas where a recent story reported on a family power bill being cut in half after they rebuilt to modern code post Harvey.

We can deploy these cost-effective commonsense solutions and reduce emissions

along the way while creating jobs. The recent energy efficiency jobs in America report finds this to be -- this sector to be one of the Nation's biggest employers, as noted by the chairman.

In fact, building technologies are getting so good, available, and low cost that net zero is no longer merely an aspiration but increasingly a reality. For example, this year we recognized the Entergy office in Little Rock as the first lead zero certified building in the U.S. and others are in the pipeline. In the new buildings institute, net zero database shows more than 600 buildings that are verified or emerging as net zero energy.

Net zero buildings are on the rise because these high-performing buildings are cost-effective over their life cycle. When you build or retrofit a building to utilize smart technology, modern efficient heating and cool, highly insulated envelops, and add on-site renewable energy, the results are highly cost-effective, resilient, and comfortable building.

Study after study shows that high-performing buildings are valued in the commercial market with price and rent premiums, improvement in net operating income, and (inaudible) times.

Just this week, a new report from U.S. GBC Massachusetts showed that net zero buildings can be built with little to no additional cost, meaning pay back times were as short as a year. And they found that existing office buildings retrofitted to net energy with renewables can produce a return on their investment in 5 to 6 years.

Now, as for single-family homes, the Rocky Mountain Institute studied the incremental cost of building net zero homes in four U.S. locations. RMI found the cost

to build a zero energy ready home to be between 0.9 percent to 2.5 percent over a comparable code home and concluded the cost increase is modest, far less than consumers, builders, and policymakers realize while predicting costs will continue declining over time.

To put in perspective the benefits, the Discovery School across the river in Arlington is in that net zero energy school. With the money saved from utility bills, the school has funded two additional full-time teachers this year. And in the Federal space, the NREL campus in Colorado features a net zero building built at cost within the regional construction cost average.

With these positive trends, we see many options for bipartisan progress on a suite of approaches. Not every building needs to be net zero, but we can aim to give everyone the opportunity to benefit from modern building methods on new buildings and retrofits to optimize energy efficiency.

Even while cost-effective improvements -- even when cost-effective, improvements. Even when cost-effective, improvements face other real and perceived barriers that are hindering progress.

Policy has a critical role in accelerating implementation, and a suite of approaches can best speed the rate of adoption while enabling continued American innovation.

Our statement includes a wide range of measures for consideration. To highlight a few, first, we should reestablish and expand Federal agency targets for annual improvements and energy efficiency, renewable energy, and other key metrics, and make needed changes to unlock the use of contracting mechanisms that leverage private funds

for public efficiency and renewable projects.

Second, Federal agencies have a number of existing programs providing funds to State and local governments used for construction. These programs should ensure that Federally funded buildings are highly efficient and resilient, protecting Federal investment, and aligning outcomes with goals. Additional programs could help feed States and cities in improving public buildings.

Third, we see many positive improvements in the private sector. Financial incentives can help bring attention to these potential savings, including to small business which may lack technical capacity. Different financial models and ensuring efficiency is properly valued can also break down barriers. Transitioning our building sector to be high performing and resource efficient is financially beneficial and is taking place now throughout country.

The building sector could represent significant progress towards the 100 by 50 goal. To accelerate this transformation, an integrated set of strategies are called for.

I look forward to discussing more in the questions. Thank you.

[The prepared statement of Ms. Beardsley follows:]

******** INSERT 1-6 ********

Mr. Rush. I want to thank all the witnesses. We have now concluded opening statements, and we will now move to member questions. Each member will have 5 minutes to ask questions of our witnesses, and I will start by recognizing myself for 5 minutes.

Mr. Keane, I want to thank you for your willingness here this morning, and I appreciate your willingness to work with my office to hold an energy efficiency job readiness fair early next year in my district. My office will followup with you to confirm the logistics. We are eager to work with Local 17 chapter of the insulators to provide you with hardworking, qualified candidates to help swell the ranks of your union.

My office, Mr. Keane, received information regarding some of the programs that you conduct in my district, including the Same for all Community Development Program, the South Suburban Highway to Construction Career Program, and the Chicago Women in Trades Program.

Can you briefly summarize what each of these programs do and how an interested candidate may enlist in each of these programs and the impact of each of these programs on energy efficiency?

Mr. Keane. Thank you for the question, Mr. Chairman.

When we go to these different -- these different sectors when we are doing our reach out, okay, it is an umbrella. We try to hit as many places as we can to make sure that we reach out to all communities.

With the Women Build Nations, that is a big movement for our ladies in the trades

to express how being a tradeswoman is. As far as the reachouts to the different communities and the different groups with Mrs. Ford, we want the communities to know that we are there, that we are there for their people that we offer not just jobs.

We offer careers. And we want to really, really bring it home with our people all across the board, especially in Illinois, in -- Chairman Rush, in your district. We want to reach out to the people. We want them to learn as they earn with an apprenticeship.

And the big thing is, after their 5-year apprenticeship, they were paid to learn for 5 years. And now they are going into the job market with not just a job, Mr. Chairman, but a career.

Mr. Rush. I want to thank you very much.

Mr. Elefante, my offices will be partnering with the National Laboratories, coupled with NSN and the Illinois Institute of Technology, another organization in one of the poorest neighbors in my city in the Englewood community to develop affordable energy efficient housing that can be used as a national model.

I would like to followup with your organization, the AIA, to work with these housing developments that will consist of some of the most innovative energy efficiency designs possible. We would like to work with you if I can followup with you and get your organization to work with us. Would that be something that you would be interested in?

Mr. Elefante. Absolutely, Mr. Chairman. Thank you for the question.

Housing design has always, of course, been a really important part of what we do. If you look at the statistics of the building stock, housing is, you know, an enormous part

of it, 325 billion square feet of building in the United States of America.

About 2 billion square feet of that is single-family residential. The remaining 130-plus billion square feet is somewhat equally divided between multifamily housing, commercial, and institutional buildings. So each one of them is an enormous sector.

Our work with affordable housing has shown that housing affordability and energy efficiency are not oxymorons that don't go together. But actually both can be achieved together. So we would be happy to work with you to really demonstrate that affordability and energy efficiency support each other.

The last thing I will say on it is to just simply say that one of the things that I can say from my own work in the State of Michigan, for example, is that you end up with an affordable housing unit that then has very low utility bills, in the nature of something like 20 percent. And that is a gift that keeps on giving.

Mr. Rush. The chair is out of time.

The chair now recognizes Mr. Upton for 5 minutes for the purposes of questioning.

Mr. Upton. Thank you, Mr. Chairman, I know that we are going to be pressed for time because of the votes that are going to occur shortly, so let me just yield the first part of my time Mr. Griffith from Virginia for --

Mr. Griffith. Thank you very much. I appreciate you yielding.

As many of you may have seen yesterday, led by some Cornell Lab ornithology scientists, a report came out that the breeding population of birds in the U.S. and Canada has dropped nearly 30 percent since 1970.

The good news is is as we are making buildings more efficient, and particularly when we are dealing with glass, we can make bird-safe buildings as well. Nearly a billion birds, estimates range from anywhere from 100 million, 640 million to a billion birds a year collide with buildings and die.

Accordingly, I would ask -- instead of going through all the testimony, I would ask that we have unanimous consent to submit reports on how we can have both energy efficient and bird-safe buildings. And I would mention that the American Bird Conservancy has shouted out yesterday that one of the ways to solve the problem is a bill that Mr. Quigley and I have introduced. And Mr. Welch and I are currently working on an amendment to his energy bill that would incorporate some of this language.

Mr. Rush. Hearing no objections, so ordered.

[The information follows:]

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Mr. Griffith. And I yield back.

Mr. Upton. Thank you, my friend.

Mr. McIntyre, State and local governments do, as we know, play a very key role in the codes adoption process. And I believe that it ought to stay that way because State and local governments have a better hand on how nationally developed codes are going to work in practice, particularly as you look at north, south, east, and west.

Why is it so important to tailor codes to local conditions, local market forces, and in demands versus a one size fits all.

RPTR WARREN

EDTR ZAMORA

[9:59 a.m.]

Mr. Upton. Versus a one-size-fits-all.

Mr. McIntyre. First and foremost, our code process now is a consensus code process, and it is a vigorous consensus-driven. It is input from industry, input from code officials, input from builders, input from associations. So it is driven by consensus. Then that drafts the overall code or the national code that then can go to the States, that the States can adopt to their choosing. They can modify it for local conditions. They can adjust it for local conditions. They can adopt it statewide, as in the case of Michigan with modifications for the State of Michigan, which are important to meet the needs of the consumer and the market in our State. States also have the choice, if they want, to add to that code, if they choose, as other States have.

So having that flexibility as builders, the market, markets are not the same across the country. They are not the same within a State. Having the ability to adopt the code -- and this is the code officials in the industry that are -- consensus that are doing this at the State level, is very critical to have that flexibility to deliver the product that the consumer is demanding. That is the key. The consumer, if we want this to scale, the key is developing a product, a house is a product, developing a product that the consumer wants in the area that the consumer wants it, and deliver that product to them cost effectively, and it will go to scale. Having the ability to adopt local codes or adjust to local codes is important for that reason.

Mr. Upton. So as we all think about energy conservation, how valuable would it -- or is it done very much now where a new buyer sitting down with a builder to actually see an audit as to what the energy efficiency will be for that home, whether it be glass, heating and cooling, water, electrical use, based on the size of the --

Mr. McIntyre. Yeah, you are referring to an energy audit?

Mr. Upton. Right.

Mr. McIntyre. Part of the value that we need, that the consumer needs to realize, they have to see and realize what they are going to get.

Mr. Upton. But is that done now?

Mr. McIntyre. It is starting to be done. We do it. The folks that are building high-performance homes are doing it. We are doing it voluntarily. We have a history of the houses we built. We have built hundreds of houses that are high-forming homes. Low HERS, ENERGY STAR, Energy Value Housing houses, we have a record of what it costs to build them, what it costs to -- how they perform and to live in. And we can start showing that to consumers, and then we can model, through software, what the performance of their projected home is and give them that, I will say, comfort level of how their house is going to perform.

When a consumer comes through the door, 10 years ago -- don't ask me why that is going of.

Mr. Upton. Hopefully it is your wife.

Mr. McIntyre. Shut off.

Geez.

Mr. Upton. It is a robocall, but we are going to stop those. We passed a bill to get that done.

Mr. McIntyre. When a consumer comes through the door, 10 years ago, they weren't looking for energy efficiency. Today, when they come through our door, they are looking for it, because they know we have the ability to deliver that value. And that is what they ask for. So we show them that. We show them some history, and then we're on our way to going down that road with them.

Mr. Upton. My time is expired.

I yield back.

Mr. Rush. The chair now recognizes Mr. Pallone, the chairman of the full committee, for 5 minutes for the purposes of an opening statement -- questions.

The Chairman. Thank you, Chairman Rush.

Our witnesses today have testified that more than half of the residential and commercial buildings that will be standing in 2050 have already been built. And as we look for ways to achieve net-zero emissions by that year, we will have to find effective ways to eliminate emissions from these existing buildings. I am actually glad they will still be standing. I like old buildings. I don't want to knock them down.

But my first question will be for either Mr. Nadel or Ms. Beardsley or Mr. Elefante. We know that efficiency can go a long way in decarbonizing existing buildings, but we need to do more than just maximize efficiency. So just talk to us about some policy levers we can pull today to reduce or eliminate emissions from buildings beyond just improving the energy efficiency.

And I will start with Mr. Nadel, if we could.

Mr. Nadel. Yes, there are a variety of policies that can be pursued, and in particular, let me pick up on something that Mr. Upton was asking about. Do we provide information to home buyers on the energy efficiency of homes before they buy it? For example, the city of Portland, Oregon, requires that when you put a home on the market, you provide a 1 to 10 rating. It is called the Home Energy Score. It is information that the homeowner can consider as they buy the home and particularly since so many homeowners improve their homes right after buying it. It can be a powerful incentive. So that would be one thing.

We do endorse the HOMES Act that Representatives McKinley and Welch have introduced. How do we encourage people to make those improvements? Likewise, improving increasing the Weatherization Assistance Program, particularly for low-moderate income families, as well as in tax incentives. But let me --

The Chairman. Well, Mr. Beardsley, I guess -- or Ms. Beardsley. I am sorry.

Ms. Beardsley. Thank you, Chairman.

It is a great question because we talk a lot about energy efficiency, and that is the core, but actually there is a lot of other pieces to a high-performing green building that can contribute to reducing emissions and reducing their energy use.

So if you think about water, so if we are connected to a public water system, that takes energy to withdraw that water, to treat it, to pump it to your house or your building. So if you are conserving water in your building, that is also reducing energy of the system at large. Similarly, if you are using a landscape that is lower-water using or

you are using rain barrels or cisterns or other methods that are less needing, potable water, that also reduces that energy.

And then on the material side, there is lots of choices and innovation. This is a great area for the U.S. economy to move ahead in different material options. And even with green building, there is an intent to try to reduce construction waste. So buildings are planned and built in such a way that there is reduced waste and it is often reused in other ways or recycled for other products down the road, rather than going to a landfill or incinerator, and these all contribute to reducing emissions.

Thank you.

The Chairman. All right. Thank you.

Mr. Elefante?

Mr. Elefante. Thank you. I would just like to build on both of those comments. First, to the benchmarking, the value of data in this. And I would just remind everybody the importance of the U.S. Energy Information Agency's database. Everything that we do from any kind of a policy or program point of view, we have to go back and really look at the data, understand what the impact is. The importance of the work of that agency I just wanted to underscore. We really need that data to understand what our practices need to be.

And then just related to what Ms. Beardsley just said about these other factors, I would just sort of put it out there to be thinking about the associated benefits of energy efficiency, and I particularly point to health benefits. We went to a global energy efficiency conference last year, and really that was the nature of that conversation.

And I would just kind of remind everybody that thinking about these associated benefits to the kind of central goals here are actually the kind of win-win that really helps drive the market and really helps articulate the value of these energy-efficient goals that we are seeking.

The Chairman. All right. Thank you.

Thank you, Mr. Chairman.

Mr. Rush. The chair now recognizes Mr. Latta for questioning.

Mr. Latta. Well, thank you, Mr. Chairman. And thanks to our witnesses for appearing before us today.

Through this hearing today, it is my desire that we will continue to focus on improving energy efficiency, which should be a bipartisan issue. One of the most successful programs for promoting energy efficiency and benefit customers, manufacturers, and the environment is the ENERGY STAR program. The ENERGY STAR program is a voluntary program run by the Environmental Protection Agency and the Department of Energy. It allows manufacturers to obtain ENERGY STAR labeling for products. Its specific energy savings guidelines are met, benefiting consumers that are looking to purchase high-efficiency energy products.

I believe that one way we can improve the energy efficiency in the building sector is to strengthen this important program. That is why I introduced the bipartisan H.R. 2104, the Energy Star Program Integrity Act, along with my good friend, the gentleman from Vermont. This bill fixes a gap in the Federal law by prohibiting the pursuit of private litigation against manufacturers who comply with corrective compliance

measures that were approved by the EPA. This will ensure the ENERGY STAR program will operate as intended by maintaining robust, voluntary participation by the manufacturers.

If I could start my questioning with you, Dr. Zimmerman, and also, I do have a BASF plant in my district in Whitehouse, Ohio, and which I have visited on many occasions. And it is my understanding that BASF Corporation has sought out the ENERGY STAR label for many of its products. Would you go into some detail about these products and how they help create more energy-efficient homes and buildings?

Mr. Zimmermann. Thank you for the question, Mr. Congressman. BASF has a variety of products right now that do enhance energy efficiency, such as spray polyurethane foam, which is a very good example of that. These products bring not only reduced energy utilization, but they also provide resilience as well through water barrier protection and also barrier wrap protection. These are very good products.

Other products we have like our Green Sense Concrete, these are not just product names; it is more of a philosophy around developing cement formulations that can really utilize local ingredients that reduce the carbon footprint so they are used in place. A great example of that is Portland cement can be replaced with recyclable material, locally found material, again, leading to a reduced carbon footprint in the application of those materials.

A variety of other products, again, from an ENERGY STAR perspective, you know, greatly reduce the energy of manufacturing, the carbon footprint, the greenhouse gas emissions during both manufacturing and use as well.

Mr. Latta. So it is very important for your company to participate in the ENERGY STAR program?

Mr. Zimmermann. It is very important, and also, we utilize our own products in our own facilities to ensure that they are running energy efficient.

Mr. Latta. Do you think there is a merit in strengthening the voluntary programs like ENERGY STAR so that more companies can continue to innovate with energy-efficient products?

Mr. Zimmermann. Companies like BASF will continue to innovate products for more energy efficiency because we have incentive to do that. We certainly don't want to waste energy, because it costs money. I think strengthening the program that allows for more voluntary adoption would be very good for manufacturers.

Mr. Latta. Thank you.

Mr. McIntyre, let me turn my questions, if I may. In your testimony, you specifically cite the ENERGY STAR program is a successful program with a proven track record in reducing energy usage in part due to its voluntary nature. Would you explain to us why this program is so popular in the homebuilding industry?

Mr. McIntyre. Well, the ENERGY STAR program is one of several, and it is -- I will say it is somewhat the pinnacle of a high-performance home. That can be argued to a degree, but the point is, when a consumer comes through your door, they are -- for the most part, they want a performing home. They don't know what that means necessarily. You have got to explain that to them to a degree. And you have a HERS-rated home. You have an ENERGY STAR home. You have green homes that you

can do.

We spend the time to go through and explain to them what the difference in performance is and how you get there, the system's approach, how you address the envelope, how you address the air sealant, how you address mechanical systems. Then we give them the option. We tell them we HERS rate every home. HERS rating is an energy rating. It is a miles-per-gallon sticker for your home. We tell them we rate every home. Here is where our homes generally score. That starts to give them the feel that, okay, the confidence. We show them some of the energy simulations, if they want to get to that level of detail. And then we offer to certify the home for ENERGY STAR, and we also offer green building programs if they want.

And about 25 to maybe 30 percent of our customers will want to go for the ENERGY STAR certification. Right now, we are a small homebuilder. We used to be a lot bigger, but we scaled back at the recession and kind of like it that way now, but -- right now, we have one ENERGY STAR home in certification, two of them in process. That is probably the max we would have at any one time being built, but we leave it up to the consumer to make that choice.

Mr. Rush. Mr. McIntyre, will you bring your comments to a close?

Mr. Latta. Thank you very much to the witness.

And, Mr. Chairman, my time is expired. And I yield back.

Mr. Rush. I want to thank the gentleman.

I want to remind members that between 10:15 and 10:30, there are votes expected on the floor.

So, with that, I want to recognize now Mr. McNerney for 5 minutes for questioning.

Mr. McNerney. I thank the chairman. I thank the witnesses this morning. Very interesting testimony.

So let's take a hypothetical 50-year-old home somewhere on the coast of California, maybe 2,000 square foot. What is the payback time for retrofitting that for energy efficiency?

Ms. Beardsley, if you would like to take that.

Ms. Beardsley. Thank you for the question. It really depends on, you know, what the fuel rates are, what fuel they are currently using, what the options are in that. But generally, the paybacks, as we have seen in some of these studies, can be very small. You know, it could be a couple of years to maybe 7 to 10 years, but I can answer in detail on the record.

Mr. McNerney. Mr. McIntyre, it looks like you want to say something.

Mr. McIntyre. No, I just wondered if that was a general question.

I concur to a degree of what Ms. Beardsley just said. It depends on what you are doing to it, the types of retrofits you are doing and how far you are going with it. But what is important, that is a key piece to the value that we talked about. As consumers start to see that return, whether it is in their energy bills or whether it is in their gas bills or electric bills, they start to see that return, that value, then they start incurring more -- they will pay more. They will do more as they see that value.

And it is a key to get them to understand that. Once you get the market to start

understanding that, they know there is true payback there, then the market will take over and start driving it, which it is starting to do.

Mr. McNerney. So, Mr. Nadel, could you give me some idea of how much regional variation there would be in that answer? You know, is there a huge difference between, say, Michigan and California in terms of payback?

Mr. Nadel. There definitely will be regional variation. Paybacks tend to be quicker in colder climates like Michigan. California is a very diverse State, where you are talking the Sierras or you are talking, you know, the desert, but it will vary. On the other hand, in California, they use a lot less -- they use a lot less energy to begin with.

Mr. McNerney. Thank you.

Again, Mr. Nadel, can time-shifting of energy requirements for homes be realistic, say, to sync better with renewable energy?

Mr. Nadel. Definitely there are opportunities to shift the time that energy is used, particularly, you know, if you add a little thermal mass to the home or include a modest amount of storage. California, as I am sure you well know, is moving to time-of-use rates, and we expect a lot more of that happening in California.

Mr. McNerney. Well, one of the frequently cited concerns with regard to electrification is the operating costs. Is there a way to restructure utility billing to sort of levelize that problem?

Mr. Nadel. I mean, I think the general trend is to have time-of-use rates so that the rate varies, depending on the cost to produce. But then as you are designing the retrofits, as you are doing electrification, you need to add a little bit of storage and think

about it; how can you do more of your heating and cooling during those off-peak times and glide through the times when the period is high? And, yes, that can be done.

Mr. McNerney. All right. In the interest of time, I am going to yield back early, Mr. Chairman.

Mr. Rush. The chair thanks the gentleman.

The chair now recognizes Mrs. McMorris Rodgers for 5 minutes.

Mrs. Rodgers. Thank you, Mr. Chairman.

As many of you know, I am proud of how eastern Washington has been leading the country in clean energy solutions such as clean, renewable, reliable, affordable hydropower. As we discuss ways to increase building efficiency, I also wanted to highlight a way that we are leading, and that is cross-laminated timber. CLT is strong, sustainable, and a renewable low-carbon building material, and it has the potential to significantly increase the energy efficiency of buildings.

There are two CLT manufacturers in the United States and they are both right now in eastern Washington. Vaagen Timbers in Colville and Katerra in Spokane Valley. In Spokane, Avista Utilities is working to develop an eco district center in our community that will be -- that will include one of the most sustainable buildings in the country using cross-laminated timber. And later on today, Katerra is unveiling its new state-of-the-art factory, which will produce the highest volume of CLT in North America.

These eastern Washington companies are on the cutting edge of building a more efficient and sustainable future. I am excited about what the potential of new and innovative building materials and processes such as CLT have: economic growth for

rural communities, a cleaner environment, stronger buildings, and better forest management.

So it really is -- it is a rural job solution. It is a timber solution, but it is also better forest management solution, but it also is part of the carbon solution.

Mr. Elefante, do you agree that the properties of CLT mainly in strength, flexibility, sustainability, and ability to sequester carbon make it an ideal material to build more energy-efficient midlevel buildings?

Mr. Elefante. So I think that the most important thing about CLTs is they indicate what an innovative future would look like where we consider carbon sequestration as one of the factors. I talked about the four things that we in the building sector understand that we must do. One of them is essentially embodied carbon which, you know, the CLT technology is a terrific example of not just looking for products that are more energy efficient, but actually have this additional benefit of actually sequestering carbon in the actual material itself. There is a lot of innovation happening in that area. I would say that at this point, the CLT technology is kind of the poster child of just how many layers of benefit can come from looking at that sort of innovation.

Mrs. Rodgers. Thank you.

I wanted to move on to another important issue in eastern Washington, and that is housing affordability. Like many areas in the country, we are experiencing a serious crisis in affordable housing. We have consistently heard about the desire to mandate net-zero buildings across the country. I have concerns about how this is going to impact housing costs and how it might only add to the current affordability crisis that we are in.

It is going to be difficult for me to support any legislation that would make it more difficult to find affordable housing as a result of additional government mandates.

Mr. McIntyre, given your experience building green homes, how much more would it cost to go to net zero?

Mr. McIntyre. Well, one of the key items with net zero, the first thing to get to net zero is you got to optimize the envelope. You got to reduce your load. That is done a number of ways. It is done by the shape of the structure, the configuration of the structure. It doesn't matter how you build it or what you build it out of; it is just a simple shape. And then it is the materials you build it out of to reduce the load. But I think it is a pretty fair statement to say that to get to net zero, it is going to require renewables or something to that effect, and that is where the additional cost really comes in at this point.

To get to an optimized home from, I will say, a standard-built home, you are talking a few thousand dollars, $5,000 to $15,000, in that range. It could be as high as 20. When you go to net zero, now we are looking at renewables of some sort.

I personally just put in a 12-kilowatt system on our farm, and I did that work all myself, and I did it because it makes sense now because we have net metering. There is tax incentives. And the cost of solars come down because it is scaled much more than it was 15, 20 years ago.

So now that they are more affordable, it makes sense to do, but they were still $18,000 for me and I installed all of it. Actually, it was more like $20,000, and I installed it all. That system quoted to me was about 40,000.

So the difference in cost really starts coming in the PV. That is where getting to scale, getting that consumer recognition, which is solar -- we are starting to see we have net metering in Michigan -- and now we are seeing solar panels pop up, small panels all over in yards and homesteads around Michigan.

Mrs. Rodgers. Thank you.

Mr. Rush. The chair now recognizes Mr. Loebsack for 5 minutes.

Mr. Loebsack. Thank you, Chairman Rush, Ranking Member Upton. And thank you to the witnesses for being here today as well. It has been a great discussion. I personally want to thank my friend, Mr. Tonko, for letting me go ahead of him.

Thank you so much, Paul.

When it comes to tackling the climate crisis, we must be committed to finding solutions that reduce emissions now and that grow our economy and create new jobs in our communities, and I think any investments in infrastructure across the country must drive down the costs. For Iowans, where I am from, particularly those in the rural communities, promote the production and expansion of renewable energy sources and create jobs.

I want to shift the focus a little bit to schools, if I could. Today, we are specifically looking at ways to reduce emissions and improve energy efficiency in the U.S. building sector, but I recently introduced legislation to help achieve this goal in our Nation's school buildings. This is the Renew America's Schools Act. This bill, which has been included in the LIFT America infrastructure proposal, would award $100 million over the course of 5 years to help schools modernize and make critical energy-efficient

upgrades to their facilities. And to add to that, the legislation also sets aside a percentage of funding to be used for educational programming for students around the efficiency upgrades so they know what this all means for them and for future generations. And they can take that home to their parents as well, by the way. I think that is a part of this that is really important.

This is a win-win for workers, students, and parents that will help create jobs, reduce emissions, and produce long-term cost savings for our schools due to increased energy efficiency, all while providing our students with topnotch learning environments and educating them about the importance of clean and efficient energy technologies.

We know that the environment in which our students learn and educators teach can have an immense impact on the quality of education our children receive. My wife was a second grade teacher for over 30 years. So she is very aware of that. And, unfortunately, many of our Nation's schools are in a really sad state of disrepair, as I think everyone here knows.

First, I would like to go to Ms. Beardsley for a couple of questions. In your testimony, you highlighted some of the advances being made both in new and existing school facilities. First question: Can you elaborate on what you think are the most effective upgrades that existing schools can make to their facilities in order to significantly reduce emissions and improve their efficiency in the short term?

Ms. Beardsley. Thank you, and I really appreciate your sponsoring the schools bill. That is really important.

With existing schools, it is much like other existing buildings. So the basics are

improving the envelope and upgrading the HVAC systems, the lighting. But, you know, with schools, as you alluded to, with students, there is so much research. Our Center for Green Schools has collected much of this. We have done a State of Our Schools report a few years ago, showing the State of the Nation's schools and the need for this reinvestment in school infrastructure.

We know that students learn best when the indoor environmental quality is very high, so CO2 levels and oxygen, and also when there is daylight and there is connection with nature. So schools are a really special environment, and they are really important to not just the students, but the whole community. So there is really a lot that can be done there to increase efficiency, use it as a living laboratory, and really help that connect with the community's schools.

Mr. Loebsack. Thank you. You have kind of answered the second question, but you might want to add a little bit to that. What are some of the most significant co-benefits that you expect to see when schools make improvements to their facilities outside of reduced emission and lower energy costs?

Ms. Beardsley. Right. So we would see, with the indoor improved air quality, there would be improved conditions for student learning. You may have better wellness, so reduced sick days, and that includes the teachers as well, the staff. And really, like having that benefit of increased connection with nature and daylight, which has been proven to support learning.

Mr. Loebsack. Thank you.

I do love going to brand-new schools that incorporate a lot of the technologies we

are talking about today, but I really would like to see more of the older schools be able to do exactly the same things and be upgraded.

Mr. Chairman, in schools throughout the country, buildings often lack proper heating, ventilation, and air-conditioning systems. Energy costs for K-12 schools total approximately $8 billion annually nationwide, but according to the EPA, $2 billion of those dollars can be saved by improving energy efficiency. This cost is equivalent to about 40 million new textbooks or hiring an additional 50,000 teachers at current salaries. We need to think about the opportunity costs there.

So, thank you very much, Mr. Chair and Mr. Upton, for having this hearing, and thanks to the witnesses. And in particular, I want to thank my colleague, Mr. Tonko, for letting me go before him.

Mr. Rush. The chair thanks the gentleman.

The chair now recognizes my friend from West Virginia, Mr. McKinley, for 5 minutes.

Mr. McKinley. Thank you, Mr. Chairman.

Look, as a professional engineer, I have probably spent 50 years, nearly 50 years in the construction sector specifying a lot of low energy -- low use -- low-energy use and high-efficiency building. In fact, my company, about 15, 20 years ago, we were some of the first designing LEED-certified buildings in this country, and certainly in West Virginia. And we have tried to do this, working with my fellow colleague from Vermont, we have been able to try to get some accomplishments in energy efficiency.

And I appreciate, Mr. Nadel, you are underscoring two of our bills that we are

working on, and I think that we can advance those. But I guess I don't want it to be a "but" on there, but there is a concern. And, Elizabeth, you were the first -- you have mentioned it now for the first time was indoor air quality.

And I have been troubled as an engineer that we tend to ignore that, the impact that indoor air quality is going to have an effect on it, because it is really going to stress our ability to get energy efficient -- or, excuse me -- energy reductions costs. Because we know that typically a classroom today, it may be, at best, it has one air turnover an hour, maybe at best, but under ASHRAE standards, it wants us to go to anywhere from 4 to 20 air changes an hour.

So we know we are going to be putting a lot more energy into our buildings as a result of that to achieve good indoor air quality so Little Johnny sitting there next to someone sneezing or having some dis -- whatever, in the carbon dioxide buildup in that classroom is going to affect his or her health. So I know we are going to have some impact on that.

So I am a little curious about how we might be able to explain to people their energy demands are going to go up because they are currently not meeting good air quality in our classrooms. So I am curious to see how we might be able -- so that with full disclosure that people understand their energy costs actually might go up, but their air quality is going to improve and Little Johnny and his sister are going to be healthier when they get out of that classroom.

Can you work with me a little bit on how we might be able to get the public be more aware that we are going to challenge energy for a while?

Ms. Beardsley. Yeah. Thanks, Representative. And I do have to mention that I am a frequent visitor to the beautiful Canaan Valley of winter.

Yeah, so with schools, again, as with other buildings, what we promote is a whole building approach, and that is really where you can get the most benefit and the most potential cost savings. Even if you improve your air quality with increased mechanical air changes in that example, if you are looking at the whole building and you are upgrading your lighting, say you are going from old incandescent up to LED, you are adding more daylighting with better insulated windows, you are upgrading your HVAC. If you really look at it as a whole systems approach, that is where you can save money even at the same time as you are increasing.

Mr. McKinley. You could I guess, but when you say it can be offset with this air, I think it is important for people to understand we are going to -- if we do the proper air changes, we are going to increase at least that component of it. I agree with you on lighting and other elements to it. But I think we need a full disclosure to make sure people are aware some component might actually increase, but the rest of it we can offset. It is an educational process we have to do with it.

So, Mr. Nadel, in the timeframe that unfortunately we got, one of the most controversial parts we are getting pushback on our legislation has to do with the introduction of the building energy codes. From your perception, what is wrong with the 10-year payback requirement?

Mr. Nadel. I think a 10-year payback is okay, if you have the adequate financing. So, therefore, your loan payments, the extra loan payments are less than the energy

savings. In that case, you get immediate positive cash flow. And with mortgage rates today, typically that will be the case.

Mr. McKinley. So would you suggest we should stay the course on this or should we give more flexibility to go beyond 10 years? What do you think we should do?

Mr. Nadel. I think staying the course is good but, yes, maybe some flexibility. Interest rates go up and down. You know, ultimately it should be, if you are going to recommend anything rather than an arbitrary period, talk about immediate positive cash flow and finance with the mortgage act, the then-current mortgage rates, because that is going to be the key.

Mr. McKinley. Thank you, Mr. Nadel.

And just for all of you, I just hope we have more discussion, Mr. Chairman, about indoor air quality, because we think we know. That is an area that we need to pay a lot more attention to.

Thank you. And I yield back my time.

Mr. Rush. The gentleman yields back.

I want to remind members that the votes have started, and it is the intention of the chair to recognize two more members, Mr. Tonko and Mr. Griffith. And if either one of them want to yield some of their time, then I would certainly be willing to grant that.

But the chair now recognizes Mr. Tonko for questions.

Mr. Tonko. Thank you, Mr. Chair. And thank you to our witnesses.

Earlier this week, the Environment Subcommittee held a hearing on industrial emissions. I would like to try to explore how these sectors are interconnected, which

demonstrates that comprehensive action is necessary to decarbonize our economy.

In many cases, industrial products are difficult to decarbonize, and this includes building and construction materials like cement and steel. Unlike operational emissions, embodied carbon emissions in buildings are locked in place from day one. They cannot be reduced through retrofits or new energy-efficient technologies.

So, Mr. Elefante, do you have any thoughts on the challenges with embodied carbon?

Mr. Elefante. We don't have nearly enough time. This is clearly, I would say, the challenge of 2019, to kind of get our arms around what is an emerging challenge. There is actually a lot of work. We have a summit coming up next week on this to get building product manufacturers, contractors, and architects and engineers together to essentially lay out the problem. That is how early we are in this.

But I would also just point to actually some really exciting work that is being done across many sectors -- the CLTs were mentioned earlier -- to really address this. And I would just kind of add one thought to this, which is that we have to be thinking about embodied carbon as something looking forward. You know, what is the carbon that we are going to spend from this time forward rather than the carbon that we spent looking backwards?

And when you do that, it sort of changes the lens on embodied carbon, and the importance of material product manufacturer and construction techniques as investments into energy savings, then becomes the kind of formula. How much carbon are you spending to create that efficiency? How long does it take you to capture that

efficiency back? A 2050 timeframe is probably long enough for us to be talking about a formula that works.

Mr. Tonko. Thank you. And how can we encourage lower carbon materials are a greater material efficiency for new construction?

Mr. Elefante. There is a lot of ways, but I will point to the one that I think is actually most important, and that is the analogy of the Federal Government and it as a procurer of green building services and green building products. I think that the marketplace transformation that we witnessed was actually begun in the nineties by the Federal Government adopting new standards. And I would just underscore the importance of the Federal purse as a procurer to help transform the marketplace.

Mr. Tonko. Thank you.

And, Ms. Beardsley, what do you think about this whole phenomenon? Does LEED, the LEED incentivize these types of cleaner materials and greater material of efficiency?

Ms. Beardsley. Yeah, thank you. This is a great topic and one that is getting a lot more attention. We have been working on it and many of our members for quite a few years, and LEED does incentivize by looking at the -- there is credits and points available if you reduce the whole impact of the building, and that includes accounting for key materials.

And we now have the first LEED-certified steel plant, Big River Steel in Arkansas, for example. So that type of facility can look at its own operations and employ energy efficiency to reduce the embodied carbon in its products.

I think there is a few things you can do. You first give industry the tools to use technology to do energy efficiency in the manufacturing plants. Second, R&D to develop new technologies, and that is kind of where the CLT came out of and there is some really cool work at MIT right now on cement. And then, third, encouraging building design and construction teams to evaluate embodied carbon as they are making choices on materials. And the Federal Government as a procurement body, the Buy Clean California Act, there are a number of examples where this is starting to take place.

Mr. Tonko. Thank you. Thank you very much.

We know the impact of buildings on overall emissions, but I would like to focus specifically on direct emissions. Onsite fossil fuel combustion in commercial and residential buildings accounts for some 12 percent of our Nation's greenhouse gas emissions.

Mr. Nadel, what opportunities and challenges do you see for electrification through products like heat pumps?

Mr. Nadel. Okay. Yes, heat pumps are dramatically improving. There is a whole new set of cold climate heat pumps. It can work better in places like your district. Still, most of the available systems are ductless systems, but most homes have ducts. I think we need more work on ducted cold climate heat pumps to better adapt to existing homes. And I think the Department of Energy and EPRI are doing a little bit, but much more can and should be done to help refine these systems for existing homes and the ducts they have.

Mr. Tonko. Thank you very much.

Mr. Chair, I yield back.

Mr. Rush. The chair now recognizes Mr. Griffith for 5 minutes.

Mr. Griffith. Thank you, Mr. Chairman.

The ranking member earlier yielded to me so that I could talk about bird-safe buildings and how we can do that fairly efficiently while we are making the buildings energy efficient. So I will return the favor for my friend from Michigan to another friend from Michigan, Mr. Walberg,

And I yield to Mr. Walberg.

Mr. Walberg. I thank the gentleman.

And I appreciate the fact that we have a gentleman from Michigan here today who has extensive experience in what we are talking about, including some -- a demonstration home in my district. Worked with the Emory school district, not far from my house, that shows what can be done, but has a reality about it of what it costs.

I represent many areas in my 7th District that are extremely rural, and many of the net-zero technologies we mentioned here today aren't exactly cheap or accessible in Adrian, Michigan, and the surrounding areas. While I am for efficiency, and 19 years ago my wife and I renovated and restored completely our 1837 vintage farmhouse, and at that time, what we did in air-conditioning, heating, electrical systems, water systems, everything about that place was up-to-date. That is 19 years ago. And so since then, we have been attempting little by little to continue updating to standards, but it takes time and it is expensive.

So in your testimony, Mr. McIntyre, you mention that net-zero building is

extremely difficult, costly, and impractical in many parts of the Nation. Could you elaborate further? Do you have examples why this would be the case in States like Michigan?

Mr. McIntyre. Well, a lot of what drives that is the complexity of understanding. When you build a net-zero home or you build a high-performance home -- I won't necessarily go to net zero -- you build a high-performance home, you need to look at the system of the home. You need to look at -- build the house as a system and understand the whole system. So the complexity comes in understanding that.

The unintended consequences are when we don't understand that and we put the wrong parts together, we put them together the wrong way in the wrong climate, and we end up with issues. We end up with air quality issues. We end up with moisture issues, so on and so forth.

So that is a lot of what drives the difficulties is getting the consumer and the industry further along. They have come a long ways in the last 10, 15 years, further along in understanding, on an education level, understanding the complexity of the modern home and a high-performance home so we don't end up with those serious, unintended consequences.

Mr. Walberg. Okay. Thank you.

Mr. Zimmerman, how does customer demand influence the type of products you sell?

Mr. Zimmermann. Certainly, customers are demanding more and more resilient and sustainable products. They may specify that they want to be able to prove that they

have a reduced carbon footprint, and we certainly take that into our product design.

Mr. Walberg. Do they know the specifics that they are looking for or are they expecting somebody to tell them?

Mr. Zimmermann. I think it goes both ways, but certainly we are market driven. The market instructs us in terms of what is important to them for that particular building sector.

Mr. Walberg. Hence, it would be incumbent upon us in government to make sure that we understand the market as well, understand what is out there.

Mr. Zimmermann. I think there is a lot of technologies out there we can take advantage of, and the more we can understand what the needs are in the marketplace, the better we can service the marketplace.

Mr. Walberg. Okay. Thank you.

I appreciate the courtesy. And I yield back.

Mr. Griffith. I will take that last minute 20 real quick.

Dr. Zimmerman, if you could, does your company have a film that they can add to a window or energy-efficiency film that also is something that the birds can see?

Mr. Zimmermann. I am not aware of anything at this point in time, but I would prefer to get back to you on that.

Mr. Griffith. If you would, because I know the products are out there. Whether your company makes it or not, there are products out there. And if you put it in when you are building the building, the cost is nonexistent or minimal. If you wait till later, of course, obviously it is much more expensive. But with the report coming out yesterday

that we have lost up to 30 percent of the birds in North America since 1970, it is something that is high time we take a look at, particularly when the cost is low.

Mr. Zimmermann. I do know we just recently discussed with Terraforma One a unique concrete structure for Monarch butterflies, including a habitat for them. Perhaps we have something for birds as well. I am not aware.

Mr. Griffith. And there is lots of other things you can do, and some of the material I submitted for the record has, you know -- and some people wouldn't like this but some do -- decorative mesh that you put around the building that lets the light come in, but it makes it a barrier that birds can see so they don't think they are flying into open space and crash into a building and die. When The Guardian publication earlier this year put out an estimate as high as a billion dollars, so it is -- I mean a billion birds, it is a concern.

Mr. Zimmermann. I am happy to look into that.

Mr. Griffith. I yield back.

Mr. Rush. The chair now recognizes Ms. Kuster for 1 minute.

Ms. Kuster. Thank you, Mr. Chair.

Our votes have been called, but I want to commend the chair and all of you for being here. This is a win-win-win scenario and a very bipartisan hearing, and we can save the planet, save money, create jobs, and, it turns out, save the birds.

I am going to just dive right in. I am a proud cosponsor of my friend, Congressman Welch's, bill on improving energy efficiency. And my question is about the most cost-effective energy efficiency technologies that can be deployed. And, in

particular, I am from a rural district. Is there anything in particular about these technologies for rural communities and homeowners that you would recommend?

Anybody can take it, and our time is short.

Mr. Nadel. I will start. Smart building controls can often be some of the most cost-effective opportunities, particularly in commercial buildings, but also there is some in residential. But the other residential stuff vary very much from home to home or building to building. That also brings into rural areas the need sometimes for rural broadband, which is a whole big issue but something that ultimately we need to address if we are going get all the benefits to all of the U.S. and not just the urban areas.

Ms. Kuster. And definitely, we are working on that as well. By that, you mean smart technology so that homeowners and business owners can control their energy efficiency and their use?

Mr. Nadel. Often it means having sensors that help identify when something is out of kilter and either automatically adjusting or at least letting people know so that they don't just go for years and years unaware of the problem.

Ms. Kuster. Any other quick ideas? Quickly.

Ms. Beardsley. First of all, weatherization, so definitely getting better insulation in these buildings. And then, secondly, making sure that there is availability of high-efficiency products and that the workforce is trained so that naturally as HVAC breaks down and needs to be replaced, it is replaced with high efficiency.

Ms. Kuster. Great. Very helpful. I should have mentioned cold and rural. So, thank you.

Mr. McIntyre, sure.

Mr. McIntyre. If I can just make a quick comment on that. The quick analogy, in my perspective, is address the envelope first, address the load of the building first, what the building needs, and then address the efficiencies of what goes into it.

If we put high-efficiency systems into a building that we don't address the building, I have a simple analogy for that that I tell customers regularly and I put in my presentations: That is wasting energy more efficiently.

Ms. Kuster. Thank you. Having grown up in a very drafty colonial, I can relate. Thank you very much. Thanks for your time.

And thank you, Mr. Chair.

Mr. Rush. The chair now requests unanimous consent to enter into the record five documents.

And, without objection, so ordered.

[The information follows:]

******** COMMITTEE INSERT ********

Mr. Rush. That concludes the witnesses' questions, and I would like to thank all of our witnesses for their participation in today's hearing.

I must remind members that pursuant to committee rules they have 10 business days to submit additional questions for the record to be answered by the witnesses who have appeared. I ask each witness to respond promptly to any such questions that you may receive.

And at this time, the subcommittee stands adjourned.

[Whereupon, at 10:45 a.m., the subcommittee was adjourned.]