

# EFFICIENCY AND RESILIENCY IN FEDERAL BUILDING DESIGN AND CONSTRUCTION

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(116–20)

HEARING  
BEFORE THE  
SUBCOMMITTEE ON  
ECONOMIC DEVELOPMENT, PUBLIC BUILDINGS, AND  
EMERGENCY MANAGEMENT  
OF THE  
COMMITTEE ON  
TRANSPORTATION AND  
INFRASTRUCTURE  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED SIXTEENTH CONGRESS

FIRST SESSION

JUNE 11, 2019

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Committee on Transportation and Infrastructure  
U.S. House of Representatives  
Washington, DC 20515

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Ranking Member

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JUNE 6, 2019

**SUMMARY OF SUBJECT MATTER**

TO: Members, Subcommittee on Economic Development, Public Buildings, and Emergency Management  
FROM: Staff, Subcommittee on Economic Development, Public Buildings, and Emergency Management  
RE: Hearing on “Efficiency and Resiliency in Federal Building Design and Construction”

**PURPOSE**

The Subcommittee on Economic Development, Public Buildings, and Emergency Management will meet on Tuesday, June 11, 2019, at 10:00 a.m. in 2167 Rayburn House Office Building to hold a hearing titled, “Efficiency and Resiliency in Federal Building Design and Construction.” At the hearing, Members will receive testimony from the General Services Administration’s (GSA) Office of Federal High-Performance Buildings and representatives of organizations with equities in the green building space.

**BACKGROUND**

GSA manages an extensive real estate portfolio on behalf of the Federal Government. The agency owns and leases over 376.9 million square feet of space in approximately 9,600 buildings throughout the country.<sup>1</sup> Construction and operation of such a large portfolio of buildings requires a significant amount of energy consumption. Federal buildings, generally, consume approximately \$6.5 billion in utilities each year.<sup>2</sup> As a result, GSA’s property management practices and agency compliance with statutory energy efficiency requirements have a direct impact on the environment.

GSA’s Office of Federal High-Performance Buildings within the Office of Government-wide Policy was established in 2007 to develop guidance and best practices in the planning, design, and operation of Federal buildings. GSA utilizes legislative targets and third-party certification programs such as LEED, ENERGY STAR, and Green Globes to meet its energy efficiency and sustainability goals.

*GSA’S OFFICE OF FEDERAL HIGH-PERFORMANCE BUILDINGS*

Section 436 of the Energy Independence and Security Act of 2007 (EISA, P.L. 110–140) established the Office of Federal High-Performance Buildings within GSA to develop guidance and best practices in the planning, design, and operation of Federal buildings. Subsection (h) requires GSA to evaluate high-performance building certification systems and submit the findings to the Secretary of Energy who, in consultation with the Department of Defense and GSA, identifies the system(s) to be implemented across the Federal Government. GSA completed its most recent 5-year review in March 2019. The review consisted of an initial market analysis screening of building-related certification systems, followed by a formal review of the systems that pass the initial market analysis screening. The findings report includes an analysis of the alignment of five building certification systems (LEED, Green Globes, Living Building Challenge, BOMA BEST, and BREEAM) with Fed-

<sup>1</sup>“Inventory of Owned and Leased Properties.” *GSA.gov*. (Accessed May 29, 2019).

<sup>2</sup>Ewing, Mark. “GSA Building Energy Strategy.” 2014. Available at [https://www.energy.gov/sites/prod/files/2014/05/f15/fupwg\\_may2014\\_gsa\\_update.pdf](https://www.energy.gov/sites/prod/files/2014/05/f15/fupwg_may2014_gsa_update.pdf).

eral high-performance building requirements.<sup>3</sup> In 2012, two certification systems were identified as meeting federal criteria—LEED and Green Globes.<sup>4</sup> The March 2019 review will inform DOE’s determination of what systems are recommended over the next 5 years.

Section 494 of EISA created the Green Building Advisory Committee. The committee is composed of Federal and private stakeholders who provide policy advice to the Office of Federal High-Performance Buildings. In October 2017, the Green Building Advisory Committee submitted a number of recommendations to the Office of Federal High-Performance Buildings, enumerating recommendations on maximizing the sustainability and efficiency in Federal buildings. The Advisory Committee recommended the use of long-term, clean energy power purchasing agreements to lock in stable energy costs and save money.<sup>5</sup> In a separate letter from 2017, the Advisory Committee proposed recommendations to double the annual rate of high-performance retrofitting of Federal buildings.<sup>6</sup> These recommendations provided a narrower focus for methods to increase building efficiency and provided clarity in choosing the most cost-effective methods to do so.

The Subcommittee on Economic Development, Public Buildings, and Emergency Management is responsible for overseeing GSA’s role in ensuring the statutory standards promoting sustainability are continually updated and implemented in the construction and operation of federal buildings. It has been almost a decade since the Subcommittee conducted oversight activities related to energy efficiency and resilience in federal buildings.

#### RELATED STATUTES AND LEGISLATION

Improving the efficiency of federal buildings and reducing costs has generally been a bipartisan concern across both Democratic and Republican administrations. The laws below detail the evolution of building efficiency requirements.

The Energy Policy Act of 1992 (PL 102–486) directed the Secretary of Energy to establish federal building energy standards to require energy efficiency measures that were “technologically feasible and economically justified.”<sup>7</sup>

The Energy Policy Act of 2005 (PL 109–58) required the development of energy and water conservation programs for congressional buildings; required a 20 percent reduction in energy consumption for existing Federal buildings by 2015; set an energy consumption target of 30 percent below 2005 standards for new Federal buildings; required the application of sustainable design principles to the siting, design, and construction of new and replacement buildings; established Energy Star as a joint program of the Department of Energy (DOE) and the Environmental Protection Agency (EPA) and required agencies to purchase products that have either an Energy Star label or are designated as energy-efficient by the DOE.

The Energy Independence and Security Act of 2007 (EISA, P.L. 110–140) established energy use intensity (EUI) targets to reduce agency energy usage by 30 percent by 2015; required federal agencies to designate an energy manager to reduce facility energy use; required GSA’s Office of Federal High-Performance Green Buildings to report every five years on certification systems that are comprehensive and environmentally-sound in the certification of green buildings. Specifically, in identifying certification systems, the Secretary of DOE should take into account a number of criteria including the ability of the applicable certification organization to collect and reflect public comment and the ability of the standard to be developed and revised through a consensus-based process. The Office of Federal High-Performance Buildings published three reports in 2006, 2012, and 2019.

The Energy Efficiency Improvement Act (PL 114–11) directs GSA to develop model leasing provisions to encourage the implementation of energy and water efficiency measures by tenants in commercial buildings. GSA may also use such provisions for leases involving Federal agencies.

<sup>3</sup>General Services Administration “High-Performance Building Certification System Review.” Available at <https://www.gsa.gov/about-us/organization/office-of-governmentwide-policy/office-of-federal-highperformance-buildings/policy/highperformance-building-certification-system-review>.

<sup>4</sup>While both LEED and Green Globes were recommended certification systems, GSA recognizes both for its leased space but only LEED for its owned space. GSA’s Facilities Standards (P100) establishes design standards and criteria for new owned buildings, repairs, renovations, modernizations and alterations for GSA buildings. The P100 requires all new construction projects and substantial renovations to achieve, at a minimum, a Gold rating through LEED.

<sup>5</sup>Advisory Committee PPA Advice Letter, October 24, 2017. Available at <https://www.gsa.gov/cdnstatic/Adv%20Comm%20PPA%20Advice%20Letter%202012-15-17.pdf>.

<sup>6</sup>Advisory Committee HPBA Advice Letter, October 24, 2017. Available at <https://www.gsa.gov/cdnstatic/Adv%20Comm%20HPBA%20Advice%20Ltr%202012-15-17.pdf>.

<sup>7</sup>Quoting (in part) P.L. 102–486.

The act also amended EISA to add provisions to improve energy efficiency in tenant spaces. These include a DOE study to determine the feasibility of improving energy efficiency in commercial buildings through the implementation of energy-efficiency measures in discrete spaces within those buildings; directing DOE's Energy Information Administration to collect additional occupant energy-use information as part of its Commercial Buildings Energy Consumption Surveys; and directing EPA to develop a Tenant Star recognition label as a part of the Energy Star program.

#### *EXECUTIVE ORDERS*

On March 19, 2015, President Obama signed Executive Order (EO) 13693 revoking EOs 13423 and 13514.<sup>8</sup> EO 13693 set specific targets for Federal agencies to achieve by FY 2025. Targets included requiring each agency to reduce building energy intensity by 2.5 percent annually relative to FY 2015, reducing potable water consumption by 36 percent relative to FY 2007, producing at minimum 25 percent of total building electric and thermal energy from clean sources, and ensuring that all new buildings with more than 5,000 gross square feet of floorspace are designed to achieve net-zero energy, and, if possible, net-zero water or waste by FY 2030. Executive Order 13693 also called for the inclusion of climate-resilient design elements in federal buildings and directed the Chair of the Council on Environmental Quality (CEQ) to issue a revised set of "Guiding Principles."

On May 17, 2018, President Trump signed EO 13834, which revoked the specific reduction targets of EO 13693 and replaced them with the requirement that agencies meet goals established in statute. The EO provides broad direction to "achieve and maintain annual reductions in building energy use and implement efficiency measures that reduce costs" and

"ensure that new construction and major renovations conform to applicable building energy efficiency requirements and sustainable design principles; consider building efficiency when renewing or entering into leases; implement space utilization and optimization practices; and annually assess and report on building conformance to sustainability metrics."<sup>9</sup>

The Implementing Instructions for EO 13834 do not set new reduction targets beyond those already in statute. They re-establish EISA's 30 percent EUI reduction requirements and extend indefinitely the deadline for agencies to achieve those targets.

#### CONCLUSION

The hearing will focus on the progress made on improving the efficiency of federal buildings and reducing costs and GSA's role in meeting the efficiency goals for public buildings government-wide.

#### WITNESS LIST

##### *Panel I*

- Mr. Kevin Kampschroer, Director, Office of Federal High-Performance Green Buildings, U.S. General Services Administration

##### *Panel II*

- Dr. Kevin Van Den Wymelenberg, Director, Energy Studies in Buildings Laboratory, University of Oregon
- Ms. Elizabeth Beardsley, Senior Policy Counsel, U.S. Green Building Council
- Mr. Mark Russell, Green Globes Assessor, Green Building Initiative

<sup>8</sup>EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," signed by President George W. Bush, January 24, 2007; EO 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," Signed by President Barack Obama, October 5, 2009.

<sup>9</sup>*Quoting (in part)* "Executive Order Regarding Efficient Federal Operations." Available at <https://www.whitehouse.gov/presidential-actions/executive-order-regarding-efficient-federal-operations>.



## EFFICIENCY AND RESILIENCY IN FEDERAL BUILDING DESIGN AND CONSTRUCTION

TUESDAY, JUNE 11, 2019

HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON ECONOMIC DEVELOPMENT, PUBLIC  
BUILDINGS, AND EMERGENCY MANAGEMENT,  
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,  
*Washington, DC.*

The subcommittee met, pursuant to notice, at 10:06 a.m. in room 2167, Rayburn House Office Building, Hon. Dina Titus (Chairwoman of the subcommittee) presiding.

Ms. TITUS. The subcommittee will come to order. I want to thank all of our witnesses for joining us today, as we examine what I think is a very important topic: the state of energy efficiency and resiliency, and the design, construction, and operation of our Federal buildings.

It is appropriate we are having this hearing, because this is High-Performance Building Week. So what could be better than looking for high performance in our Government buildings?

The GSA owns and leases over 376.9 million square feet of space, and approximately 9,600 buildings throughout the country. Having such a large real estate portfolio results in an enormous amount of energy consumption. The Federal Government spends over \$7 billion every year on utilities. And accordingly, we are the Nation's largest energy consumer.

We know our natural resources aren't infinite, so it is imperative that the Government lead by example to achieve efficiency in construction and operation practices in buildings. Government action often sets the standard for best practices and innovation in the private sector, as well. And successful and cost-neutral changes can have reverberating effects across the entire construction industry.

Recent extreme weather events and natural disasters have demonstrated the importance of incorporating elements of resilience into our public buildings. With the increasing threat of climate change, it is now more important than ever that the Federal Government take preventive steps to curb its carbon footprint and ensure the long-term sustainability of our buildings.

It has been some time since this subcommittee heard testimony regarding the greening of our public buildings. In fact, it was nearly a decade ago that the very first witness testified in front of this subcommittee on life-cycle cost benefits and improved health of occupants in green buildings. So I look forward to hearing from our witnesses what progress has been made, and where we continue to lag behind, and what we can do to address that.

Third-party certification systems, such as LEED, Energy Star, and Green Globes, are used to assess how well green building principles are incorporated into a building's design and operation. So it is important that this subcommittee get a clearer picture of how those systems are perceived today, and how they are being utilized by Federal agencies. So thank you all for being here.

In 2015, President Obama issued an Executive order providing specific annual guidelines to significantly decrease energy consumption in our public buildings, to promote renewable energy use, and to incorporate resilient design elements into public building construction. That Executive order, unfortunately, was rescinded under the Trump administration. And then, instead, the current administration issued Executive Order 13854, which states broad goals to achieve efficiency and resiliency. They aren't very meaningful standards, and what does exist dates back to 2007. We know a lot has changed since then.

I look to our witnesses and hope that they can discuss what impact this new Executive order is having or will have on achieving our resiliency and efficiency goals. My colleagues and I are anxious to hear about progress from the witnesses, but we also want to understand how the existing state of regulation may be insufficient.

This morning's hearing is an opportunity to examine what has and has not been effective, and ensure that our Government's sustainability efforts are rising to the significant challenges we face. This is a chance to look at the past accomplishments, the present situation, and our future goals. We have gone, over time, from a focus on green buildings to trying to also create healthy buildings, and to the future need for smart and secure buildings. So we realize that, as we try to achieve those goals and move across that path, we can be both responsible stewards of our environment and of taxpayer dollars. Those are not mutually exclusive goals.

So thank you for being here, and I look forward to hearing from you.

[Ms. Titus's prepared statement follows:]

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**Prepared Statement of Hon. Dina Titus, a Representative in Congress from the State of Nevada, and Chair, Subcommittee on Economic Development, Public Buildings, and Emergency Management**

I want to thank our witnesses for joining us today as we examine the state of energy efficiency and resiliency in the design, construction, and operation of Federal buildings.

The General Services Administration owns and leases over 376.9 million square feet of space in approximately 9,600 buildings throughout the country.

Such a large real estate portfolio results in an enormous amount of energy consumption.

Spending over \$7 billion each year on utilities, the Federal Government is the nation's largest energy consumer.

Our natural resources are not infinite, and it is imperative that the government lead by example to achieve efficiency in construction and operation practices for buildings.

Government action often sets the standard for best practices and innovation in the private sector, and successful and cost-neutral changes can have reverberating effects across the construction industry.

Recent extreme weather events and natural disasters have demonstrated the importance of incorporating elements of resilience into our public buildings.

With the increasing threat of climate change, it is now more important than ever that the Federal Government take preventive steps to curb its carbon footprint and ensure the long-term sustainability of its buildings.

It has been some time since this Subcommittee heard testimony regarding the “greening” of public buildings.

In fact, it was nearly a decade ago, that our first witness testified in front of this Subcommittee on life-cycle cost benefits and improved health of occupants in green buildings.

I look forward to hearing what progress has been made and where we continue to lag behind.

Third-party certification systems, such as LEED, ENERGY STAR, and Green Globes, are used to assess how well green building principles are incorporated into a building’s design and operation.

It is important that this Subcommittee get a clearer picture of how those systems are perceived today and how they are being utilized by Federal agencies.

In 2015, President Obama issued an executive order providing specific, annual guidelines to significantly decrease energy consumption in public buildings, promote renewable energy use, and incorporate resilient design elements into public building construction.

That executive order was rescinded under the Trump Administration and in its stead, the current administration issued executive order 13854, which states broad goals to achieve efficiency and resiliency yet fails to create meaningful standards when compared to the order issued by President Obama.

I hope our witnesses can discuss what impacts this new executive order will have in achieving our resiliency and efficiency goals.

My colleagues and I are eager to hear about progress from the witnesses, but we also want to understand how the existing state of regulations may be insufficient.

This morning’s hearing is an opportunity to examine what has and has not been effective and ensure that our government’s sustainability efforts are rising to the significant challenges we face.

We can be both responsible stewards of our environment and of taxpayer dollars—these are not mutually-exclusive goals.

Ms. TITUS. And I would now recognize Mr. Meadows, our ranking member, for his opening statement.

Mr. MEADOWS. Thank you, Madam Chair. I certainly appreciate your leadership on so many vital areas in a city where division is the headline of the day. I can tell you that your willingness to engage and take a leadership role should be applauded, and I applaud you.

Certainly reducing costs and increasing efficiency in our Federal real estate portfolio is a bipartisan issue, and this subcommittee has worked and will continue to work to ensure that the Federal space is not only right-sized, but used efficiently, consolidated, and, if not, is sold if needed.

For example, just last week my colleague, the fine gentleman, Mr. Pence, and I introduced some legislation to look at reform that will actually provide an additional tool to GSA in terms of replacing expiring leases with good deals for the American taxpayer, and to expand the opportunities to consolidate and reduce space, and I would like to thank the gentleman for his leadership on that particular area.

These are not controversial issues, and yet many times the effective solutions seem to elude us in terms of reducing costs. When we look at efficiency, we are looking at not only the efficiency of the leased space, but the energy and water consumption. It is also important that we apply those processes and those solutions in other ways to reduce costs.

But there are challenges that we must address. For example, nearly 50 percent of GSA’s owned building inventory is more than 50 years old. More than 50 percent of GSA’s space is now in leased

facilities, and there is limited funding for new construction. And if we are serious about building efficiency, then we must look at new ways of approaching the financing of Federal facilities.

Federal agencies already can take advantage of performance contracting, which provides a way to finance improvements by leveraging private dollars. However, these presume a building is already built or that there is funding for construction. And if we are serious about efficiency, then we should look at doing more in the public-private partnership side of things, as they are commonly called.

Now, when we look at public-private partnerships, oftentimes those are looked at with a jaundiced eye from both sides of the aisle. But if we are looking at design-build—and you are talking to someone who is in the real estate business—if we are truly looking at design-build, there are real opportunities if we provide the flexibility of the Federal Government to allow these buildings to be constructed, ensure that they are efficient, and maintained throughout the life of the building.

Ultimately, our goal in building efficiency is really looking at the effectiveness and reducing costs. We must ensure solutions are, in fact, effective, and that we aren't "greening" to just "green." Now I will say, having been in the private sector, and having built commercial buildings, new construction generally is the best way to find—whether it is through the LEED program or others—is the best way to make sure that we are energy efficient. And yet, with our aging portfolio, we continue at times to pay higher water, and higher electric costs, higher maintenance costs. And, indeed, it would be cheaper to have a new facility.

And yet we sometimes don't look at the overall return on investment. Those solutions are something that would ultimately reduce the cost to the taxpayer. So to achieve this effectiveness and return on investment, there needs to be some flexibility and competition in those solutions. New space solutions are different than those for historic space. Office space is different than warehouse space or testing facilities.

And we must ensure that there are standards that are flexible to allow the agency to have choices in those certifications as we meet those needs. GSA has a unique role in this regard. GSA provides recommendations governmentwide, but also has the responsibility of improving efficiency in its own facilities. I can also say this, that the hodgepodge way that we do our Federal portfolio drives me crazy. I could never figure out whether it is GSA's responsibility, or the agency's responsibility, or somebody else's responsibility. And so, for me, you are going to find a very willing bipartisan support, even if it goes against perhaps some of the long-held principles that I might have. If we can find a way to be efficient, and consolidate, and make sure that we lower our costs, I am all in.

So I look forward to hearing from the witness, and I yield back.  
[Mr. Meadows's prepared statement follows:]

**Prepared Statement of Hon. Mark Meadows, a Representative in Congress from the State of North Carolina, and Ranking Member, Subcommittee on Economic Development, Public Buildings, and Emergency Management**

Reducing costs and increasing efficiency in federal real estate has been a bipartisan issue. This subcommittee has worked and continues to work to ensure federal space is right-sized, used efficiently, consolidated, and sold if not needed.

For example, just last week my colleague, Mr. Pence, and I introduced reform legislation that will provide GSA with the tools needed to replace expiring leases with good deals for the taxpayer and expand opportunities to consolidate and reduce space.

These are not controversial issues—these are effective solutions that we know will reduce costs.

As we examine efficiency issues, including energy and water usage, it is important we apply those same principles in this context to ensure such solutions are effective and will reduce costs.

But there are challenges we must address. For example, nearly 50 percent of GSA's owned building inventory is more than 50 years old. More than 50 percent of GSA's space is now in leased facilities and there is limited funding for new construction.

If we are serious about building in efficiency, we must look to new ways of approaching the financing of federal facilities. Federal agencies already can take advantage of performance contracting, which provides a way to finance improvements by leveraging private dollars. However, these presume a building is already built or that there is funding for construction. If we are serious about efficiency, we should be doing more with public-private partnerships, or P3s.

For example, P3s such as Design-Build-Finance-Manage-Operate, would allow for new efficient buildings to be constructed and ensure efficiency is maintained throughout the life of the building.

Ultimately, our goals in building efficiency are effectiveness and reducing costs. We must ensure solutions are, in fact, effective—that we aren't "greening" to just "green."

We also must ensure a return on investment. Solutions should reduce costs for the taxpayer.

To achieve effectiveness and return on investment, there must be some flexibility and competition in the solutions. New space solutions are different than those for historic space. Office space is different than warehouse space or a testing facility. We must ensure standards are flexible and that agencies have choices in the certifications they use to meet their needs.

GSA has a unique role in this regard. GSA provides recommendations government-wide but also has the responsibility of improving efficiency in its own facilities.

Ms. TITUS. Thank you very much. Sounds like we are on the same path, so I appreciate that.

I would now like to recognize Mr. DeFazio, who is the chairman of the Transportation and Infrastructure Committee, for his opening statement.

Mr. DEFazio. Thanks, Madam Chair. As you mentioned, it has been 10 years since this subcommittee held a hearing on energy efficiency in Federal buildings, and it is long past time that we exert some oversight, look at progress that has been made, and look at new objectives.

I would also echo some of the concerns of the gentleman who just spoke in terms of making more sense out of the Federal Government's portfolio and looking toward where we can make some upfront investments, whether it is through a P3 or other ways, that ultimately, over the term of the occupancy, whether it is a lease option or an actual outright purchase, when we are going to have net savings over time. So I think there is a lot of room for bipartisan consensus here.

I was disappointed that this administration did rescind the order of President Obama's administration to have energy, water and net zero buildings by 2030. But GSA has actually had a couple of successes with some historic buildings. And if you can move a historic building in that direction without an inordinate investment, then I think we should be looking more and more at those, and at all new acquisitions.

I actually last week was at Oregon State University. We are hearing from the University of Oregon today—no offense to the U of O—but I was there and we were talking about earthquake resilience and retrofitting. And they have developed a new system that they can retrofit our massive VA hospital in Portland to make it not only survive an earthquake, but the people inside—but to be functional afterwards. And making those sorts of investments in resilience and energy efficiency, I think, are very, very prudent.

And we are also going to hear from Professor Kevin Van Den Wymelenberg, a professor of architecture at the University of Oregon, and he will talk both about green buildings and energy efficiency. He is also going to talk about resilience and something that is really just receiving attention, which is health, the health of the buildings that we work in, and how they impact our productivity and our long-term health. And I think it is something that really has been overlooked over time, and it is something that needs more attention.

So I look forward to the testimony, and I thank you for holding the hearing.

[Mr. DeFazio's prepared statement follows:]

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**Prepared Statement of Hon. Peter A. DeFazio, a Representative in Congress from the State of Oregon, and Chair, Committee on Transportation and Infrastructure**

It's been ten years since this subcommittee held a hearing on energy efficiency in federal buildings and in those ten years much has changed.

The General Services Administration now owns and leases over 376.9 million square feet of space in approximately 9,600 buildings throughout the nation.

The operation of federal buildings now consumes approximately \$6.5 billion in utilities annually.

Energy savings contracts are being utilized by the GSA.

The United States committed to—and then abandoned—the Paris Climate Accords.

President Obama ordered the Federal Government to achieve energy, water, and waste net-zero buildings by 2030—and President Trump rescinded that directive.

GSA stood up its Office of High Performance Buildings.

There are now more building codes and more certified buildings.

Old buildings in GSA's portfolio have been renovated to achieve net-zero energy consumption.

And forward thinkers are asking how buildings can improve human health.

I've heard that the Federal Government sets the standard for the private sector because buildings owners want to build buildings that GSA will lease.

And I hope that is true—but I'm sure that the Federal Government can do even better. Federal buildings can be more energy efficient, more resilient to the effects of climate change, and become healthier places in which to work. That is why we are holding today's hearing.

I want to thank the witnesses for being here, and particularly Mr. Kevin Van Den Wymelenberg, a professor of architecture at the University of Oregon. I look forward to hearing testimony on the current state of federal green building efforts and where we can improve.

Ms. TITUS. Thank you, Mr. Chairman. Mr. Graves is not here.

All right. Well, at this time I want to welcome our witnesses. On our first panel, Mr. Kevin Kampschroer, who is the director of the Office of Federal High-Performance Buildings at the U.S. General Services Administration.

Thank you for being here today. I look forward to hearing what you have to say.

Without objection, our witness' full statement will be included in the record.

Since your written testimony will be made part of the record, the subcommittee requests that you limit your oral testimony to 5 minutes.

I welcome Mr. Kampschroer, and please proceed.

**TESTIMONY OF KEVIN KAMPSCHROER, DIRECTOR, OFFICE OF FEDERAL HIGH-PERFORMANCE BUILDINGS, OFFICE OF GOVERNMENTWIDE POLICY, AND CHIEF SUSTAINABILITY OFFICER, U.S. GENERAL SERVICES ADMINISTRATION**

Mr. KAMPSCHROER. Good morning, Chairwoman Titus, and thank you, Ranking Member Meadows and members of the subcommittee. My name is Kevin Kampschroer, and I am the U.S. General Services Administration's Director for the Office of Federal High-Performance Buildings, and GSA's Chief Sustainability Officer. I appreciate being invited here today to testify about our work on efficiency and resilience in Federal building design, construction, and operation.

GSA's mission is to deliver value and savings in real estate acquisition, technology, and other mission support services across the Government. GSA manages over 371 million square feet of space, housing 1.1 million Federal employees from 65 Federal agencies. Congress created the Office of Federal High-Performance Buildings in the Energy Independence and Security Act of 2007 to enable and enhance Federal leadership in sustainable real property portfolio policy, management, and operations. Our office develops best practices, guidance, and tools for governmentwide use to advance building innovations in planning, design, and operations that reduce cost and enhance human health and performance.

High-performance Federal buildings provide value for the taxpayer through life-cycle cost benefits and positive effects on human health and performance. In a recent study comparing 100 GSA high-performance buildings to 100 GSA legacy-stock buildings, the high-performance buildings used 23 percent less energy; 28 percent less water; 23 percent less money for building operations; and have 9 percent less waste; and still maintain 2 percent overall higher tenant satisfaction. Energy and water savings are even greater when compared to industry benchmarks: 43 percent lower for energy; and 35 percent for water. By striving for annual improvement in energy and water efficiency, GSA has avoided over \$600 million in energy and water costs over the past decade.

GSA shares information, provides guidance, and assists the agency in improving building performance through the Federal Management Regulations, and through tools such as the Sustainable Facilities Tool and Green Procurement Compilation, and by working with our Federal partners and the private sector. Among these are the Interagency Sustainability Working Group which GSA cochairs;

the Chief Sustainability Officers Council; ASHRAE; NAESCO; and the American Institute of Architects, among others.

GSA also tests new technologies in conjunction with the Department of Defense, the Department of Energy, and their national laboratories.

Technologies that GSA has recently recommended for broader deployment include next generation chillers, alternative water treatment technologies for cooling towers, LED upgrades for lighting, and low-e window retrofits.

Over the past 5 years, GSA has deployed these and other advanced technologies in over 200 Federal buildings, resulting in annual savings of over \$7 million a year. One of the key areas of interagency collaboration is our review of high-performance building certification systems. EISA requires our office to complete a review of certification systems every 5 years and to provide our findings and recommendations to the Secretary of Energy. The Secretary then issues a rule to encourage a comprehensive and environmentally sound approach to the certification of high-performance buildings within the Federal sector.

We evaluate the alignment of certification systems based on a list of criteria found in the 2014 DOE certification system rule, EISA, the Energy Policy Act of 2005, and the Guiding Principles for Sustainable Federal Buildings. We are now completing our third review, and plan to submit our recommendation to the Secretary later this year.

Another area of interagency collaboration, one that affects the Federal Government more broadly, is planning for resilience. GSA works with other key agencies, such as the Department of Homeland Security, FEMA, and the U.S. Army Corps of Engineers to better understand infrastructure risk, and methods for enhancing resilience, and to safeguard Federal investments.

GSA incorporates resilience by integrating the latest building codes and methodologies into existing processes and standards, and applying them in its capital investment leasing program. Each capital project is screened for multiple factors, including the weather extremes, expected long-term changes during the asset life, and the presence of core mission functions.

High-performance buildings need to be operated as efficiently as possible, and Congress has recognized that there is a shortage of skilled building professionals needed to keep buildings operating at peak efficiency. GSA has fulfilled the requirements of the Federal Buildings Personnel Training Act of 2010 to consult with professional societies, industry associations, and apprenticeship training providers, and to identify, develop, and annually update core competencies. These are for building operations and maintenance, energy management, safety, and design functions. GSA has created an online tool that agencies can use to establish a training baseline and identify training needs.

Thank you for the opportunity to testify today. Putting all of these tools together will help the Federal Government to make strides in designing, operating, and maintaining high-performance Federal buildings.

And to support further investment in GSA's portfolio of buildings I would ask that this committee support the President's fiscal year

2020 budget to fully fund GSA's repair and alteration request. This \$1.6 billion funding level will allow GSA to address a portion of the \$1.4 billion repair backlog, which will further improve the energy efficiency and performance of our buildings.

I am pleased to be here today, and I am happy to answer any questions you may have.

[Mr. Kampschroer's prepared statement follows:]

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**Prepared Statement of Kevin Kampschroer, Director, Office of Federal High-Performance Buildings, Office of Governmentwide Policy, and Chief Sustainability Officer, U.S. General Services Administration**

Good morning, Chairwoman Titus, Ranking Member Meadows, and members of the Subcommittee. My name is Kevin Kampschroer and I am the Director of the Office of Federal High-Performance Buildings (OFHPB) within the Office of Government-wide Policy (OGP) and the Chief Sustainability Officer for the U.S. General Services Administration. Thank you for inviting me today to discuss our work on efficiency and resiliency in Federal building design, construction, and operation.

GSA's mission is to deliver value and savings in real estate, acquisition, technology, and other mission-support services across government. GSA leads the way in maximizing the effectiveness of every tax dollar by supporting more than \$55 billion in annual procurement spending, while managing approximately 370 million square feet of space in over 8,700 owned and leased properties across the country. GSA also owns and maintains a fleet of over 214,000 vehicles used by over 75 other Federal agencies.

GSA's approach to sustainability focuses on our major mission areas of real estate, procurement, and fleet, and our core role as service provider to other agencies. Our mission is to provide Federal agencies with the workspaces, services, products, and vehicles they need to accomplish their missions today. Our commitment to sustainability is to carry out this mission cost-effectively, while advancing the economic, civic, and environmental well-being of the United States.

To support investment in GSA's portfolio of more than 1,600 buildings, I would ask this Committee to advocate for the President's FY20 budget request. Fully funding GSA's major and minor repair and alteration programs will allow GSA to address a portion of the \$1.4 billion repair backlog while also improving the energy efficiency and performance of GSA's buildings.

Congress created my office within GSA to enable and enhance Federal leadership in sustainable real property portfolio policy, management and operations. Authorized in December 2007 under Section 436 of the Energy Independence and Security Act (EISA), OFHPB develops best practices, guidance and tools for government-wide use to advance building innovations in planning, design, and operations to reduce costs, and enhance human health and performance. OFHPB partners with GSA's Public Buildings Service and other Federal agencies to pilot and implement the high-performance building practices. In this effort, OFHPB has played a major role in the advent of Energy Savings Performance Contracts (ESPCs) across Government.

**BENEFITS**

High-performance Federal buildings provide value for the taxpayer and for the public through both life-cycle cost benefits and positive effects on human health and performance. Compared to average buildings, high-performance buildings use less energy, water, and material resources; have better indoor environmental quality; reduce air and water pollution, and produce less waste; use environmentally preferable products; have integrated systems; use local transportation to reduce adverse impacts on the local community; and improve conditions for the health and productivity of the buildings' occupants.

EISA section 401(13) states that a high-performance green building must not just perform well mechanically, but perform to improve the health and enhance the performance of the occupants. The Environmental Protection Agency (EPA) has found that indoor air can contain volatile organic compounds, such as those found in paints and cleaning products, at concentrations indoors that are 2-5 times, and sometimes as much as 100 times, higher than outdoor air. Poor indoor air quality associated with such pollutants as mold, tobacco smoke, and radon can also increase

respiratory diseases and the risk of cancer<sup>1</sup>. Lighting quality, including levels of daylighting and views, have significant impacts on employee performance and satisfaction.

GSA has conducted 3 studies in the past 10 years on improvements to its high-performance buildings, and each study has found that high-performance buildings save energy, save water, cost less to operate, produce less waste, and have more satisfied occupants compared with typical buildings. In short, they deliver cost savings and tenant satisfaction. The latest study, conducted in 2018, *The Impact of High-Performance Buildings*<sup>2</sup> compared 100 GSA high-performance buildings to 100 GSA legacy stock buildings looking at actual performance data in five key metrics from three full years of operation. Compared to legacy stock buildings, GSA's high-performance buildings have 23 percent lower energy use, 28 percent lower water use, 23 percent lower building operating expenses, 9% less waste landfilled and a 2 percent higher overall tenant satisfaction. Energy and water savings are even greater when compared to industry average benchmarks—43 percent for energy and 35 percent for water.

By striving for annual improvement in energy and water efficiency targets (as required by EISA and related laws), GSA estimates that by the end of fiscal year 2019, GSA controlled buildings will have saved or avoided hundreds of millions of dollars in energy and water expenses for taxpayers relative to 2009 spending levels. These efforts have benefitted Federal agencies and taxpayers by lowering utility bills.

#### INTER-AGENCY WORK AND COORDINATION

GSA has a long history working with our Federal partners, the Department of Energy (DOE) National Laboratories, and the private sector on these issues. Consistent with its EISA charter, OFHPB has dedicated resources and expertise to a variety of interagency high-performance buildings initiatives. OFHPB coordinates much of this agenda through existing Federal interagency bodies—such as the Interagency Sustainability Working Group, which GSA co-chairs with DOE. We work with the DOE Federal Energy Management Program and the Buildings Technology Office on ESPCs, on providing training for Federal facility managers, and on evaluating new and emerging building technologies. In addition, GSA participated in the creation of the DOE's Commercial Real Estate Energy Alliance<sup>3</sup>.

GSA uses several means to share information, provide guidance, and aid other agencies in improving building performance. GSA's Office of Government-wide Policy issues the Federal Management Regulations<sup>4</sup> and provides agencies with access to guidance and best practices through tools like the Sustainable Facilities Tool, Green Procurement Compilation, and GSA Bulletins. GSA invests in next-generation building technologies based on their actual performance, and recommends such technologies for broad deployment only after they have demonstrated good financial payback, cybersecurity and claimed performance factors via actual installation and operation in the real world of our portfolio of buildings. GSA tests new technologies in conjunction with the Department of Defense, the DOE and the DOE National Laboratories. The results of these tests are available for all agencies to use in evaluating building investments, and the results include information on both financial performance and operational performance results. Technologies that GSA has recently recommended for broader deployment in Federal facilities include next generation (such as magnetic levitation) chillers, alternative water treatment technologies for cooling towers, low-e window retrofits and LED upgrades. Over the past five years, GSA has deployed these and other advanced technologies in over 200 GSA-owned Federal buildings, resulting in annual savings of \$7 million.

#### HIGH-PERFORMANCE BUILDING CERTIFICATION SYSTEM REVIEW

One of the key areas of inter-agency consultation is in the review of High-performance Building Certification Systems. Sections 433(a) and 436(h) of EISA require

<sup>1</sup> US Environmental Protection Agency, Indoor Environments Division, <http://www.epa.gov/iaq/voc.html>

<sup>2</sup> US General Services Administration. Impact of High-Performance Buildings [https://www.gsa.gov/cdnstatic/GSA%20Impact%20of%20HPB%20Paper%20June%202018\\_508-2%20\(1\).pdf](https://www.gsa.gov/cdnstatic/GSA%20Impact%20of%20HPB%20Paper%20June%202018_508-2%20(1).pdf)

<sup>3</sup> <https://betterbuildingsinitiative.energy.gov/alliance/sector/commercial-real-estate>

<sup>4</sup> The Federal Management Regulation applies to Federal agencies, including GSA's Public Buildings Service, operating under, or subject to, the authorities of the Administrator of General Services. These policies cover the acquisition, management, utilization, and disposal of real property by Federal agencies that initiate and have decision-making authority over actions for real property services.

OFHPB to complete a review of high-performance building certification systems every five years and provide its findings to the Secretary of Energy. The Secretary then identifies a certification system most likely to encourage a comprehensive and environmentally sound approach to the certification of high-performance buildings within the Federal sector based on a review of GSA's findings.

The purpose of GSA's review is to provide an objective, independent evaluation of the alignment of certification systems with Federal high-performance building requirements for new construction and existing buildings. GSA evaluates certification systems available in the market based on a list of effectiveness, development, and conformance criteria found in the 2014 DOE certification system rule<sup>5</sup>, EISA and the Guiding Principles for Sustainable Federal Buildings.

GSA is now completing its third review of certification systems and plans to deliver the results of its latest review to the Secretary of Energy later this year. Previous reviews have found that while each building certification system offers a unique framework and approach to achieving building certification, they all support aspects of building design, construction, operation and maintenance that lead to high-performing buildings.

GSA's previous review in 2014<sup>6</sup> found that both the LEED and Green Globes systems were most aligned with Federal criteria. GSA recommended that agencies use the system that best meets their mission.

#### RESILIENCY

GSA's Public Buildings Service (PBS) incorporates resiliency by integrating the latest building codes (such as seismic or wildfire) and resilience methodologies into its existing processes and standards, such as PBS' Capital Investment and Leasing Program and the Facilities Standards for PBS. GSA also collects lessons learned from building performance in recent extreme weather incidents. Within this context, each capital project is screened for multiple factors including: 1) the observed extremes and expected long term changes during the asset service life; 2) if the asset houses a core mission or mission dependent function that is currently or is expected to be vulnerable to extreme weather or long term changes; and 3) if the asset is designated as culturally or historically significant. From this analysis, GSA engages contracted, licensed design professionals to include risk management throughout the design and delivery of the building project. These activities are undertaken by GSA to safeguard Federal investments and ensure reliable delivery of mission and operations in changing conditions. The National Institute of Building Sciences has found that mitigation saves \$11 for every \$1 invested<sup>7</sup>.

The American Society of Civil Engineers, the American Institute of Architects, the American Society of Landscape Architects, ASHRAE and others are each advancing the concept of resiliency, and GSA is aware of the standards development, resilience training, and ethical commitments of these professional societies. GSA is also engaged with multiple entities that are developing standardized metrics for resilience. Progress and leadership by Federal agencies such as the Federal Emergency Management Agency (FEMA), the U.S. Army Corps of Engineers (USACE), Federal Highway Administration (FHWA) and the National Aeronautics and Space Administration (NASA) serve as useful resilience and risk management resources to GSA. Collectively, there is a demand for American design innovation for a more resilient and secure Nation.

This is an issue that affects the Federal Government broadly, and it is through inter-agency cooperation and knowledge sharing that agencies are progressing. GSA participates with other key agencies such as Department of Homeland Security-Cybersecurity and Infrastructure Security Agency (CISA), FEMA and the USACE to better understand infrastructure risk and methods for enhancing resiliency. This also extends to energy system resilience, which focuses on preparing for and adapting to changing conditions and withstanding and recovering rapidly from disruptions, which includes deliberate attacks, accidents, or naturally occurring threats or incidents. GSA is engaged in the MitFLG (Mitigation Federal Leadership Group) and has supported the development of the National Mitigation Investment Strategy

<sup>5</sup> US Department of Energy. Green Building Certification Systems Requirement for New Federal Buildings and Major Renovations of Federal Buildings Final Rule [https://www.ecfr.gov/cgi-bin/text-idx?SID=18013effcf886527d31170b774b0771&mc=true&node=se10.3.433\\_1300&rgn=div8](https://www.ecfr.gov/cgi-bin/text-idx?SID=18013effcf886527d31170b774b0771&mc=true&node=se10.3.433_1300&rgn=div8) <https://www.energy.gov/eere/femp/downloads/green-building-certification-systems-requirement-new-federal-buildings-and-major>

<sup>6</sup> <https://www.gsa.gov/gbcertificationreview>

<sup>7</sup> National Institute of Building Sciences. Natural Hazard Mitigation Saves Study <https://www.nibs.org/page/mitigationsaves>

(NMIS) and multiple other strategic resilience initiatives. GSA is also engaged in CISA's Resilient Infrastructure Planning and Development Working Group.

#### FEDERAL BUILDINGS PERSONNEL TRAINING ACT OF 2010

Congress has recognized that a crucial component of building performance, especially complex modern buildings, is the people who operate them. Both public and private sector building operators have recognized that in the U.S., there is a shortage of skilled building professionals needed to keep buildings operating at peak efficiency.

The Federal Buildings Personnel Act of 2010 (FBPTA) requires GSA, in consultation with representatives of professional societies, industry associations, and apprenticeship training providers, "to identify, develop and annually update core competencies for Federal personnel performing building operations and maintenance, energy management, safety and design functions."

The FBPTA leverages existing private industry and Federal Government training to develop Federal facilities professionals with the knowledge, skills and abilities needed to efficiently and responsibly operate, maintain and manage hundreds of millions of square feet of taxpayer-funded buildings and related facilities throughout the world. A highly developed facilities workforce reduces the cost of operating and maintaining buildings.

GSA annually updates the FBPTA Competency Model to ensure it contains the specific skills needed by building professionals to be effective in their respective roles. GSA created an online tool, Accelerate FM (AFM), to advance the outcome of the use of the FBPTA Competency Model for use government-wide and to eliminate the duplication of effort by other agencies. Agencies and their building professionals use this tool to identify specific responsibilities at different levels of expertise, establish a training baseline, identify gaps in training, and align existing industry and government training to fill identified training gaps while at the same time providing clear justification for investment in that training.

GSA created an exam within AFM called the Federal Skills Assessment Test (FEDSAT), which is used to jumpstart individual participation in facilities workforce development by leveraging existing facilities training and related content to educate individuals on the most high impact skills and knowledge that will yield the most immediate results in actual facility performance.

GSA continues to pursue engagement with Federal agencies, training providers and private industry to maintain the FBPTA competency model and identify new relevant training resources. For example the latest FBPTA Competency Model update contains 19 newly identified cyber security related competency performance areas deemed to be critically important in the emerging landscape of web enabled facility systems. Recently, the Department of Defense approached GSA about using this tool to help identify cyber-security skills gaps, and training requirements, to support implementation of Executive Order 13870, *America's Cybersecurity Workforce*.

#### CONCLUSION

Putting all of these tools together, and ensuring we use the best evidence available to make decisions, will allow the Federal Government to make strides in designing, operating, and maintaining high performance Federal buildings. GSA is proud to be part of that effort.

Thank you again for this opportunity to come before you and we look forward to working with this Subcommittee to further improve the efficiency, effectiveness, and resiliency of Federal buildings. I am available to address any questions you may have.

Mr. KAMPSCHROER. And I don't have any time to return. Sorry.  
[Laughter.]

Ms. TITUS. That is all right. Most people say, "I give back my time" when they don't have any time, anyway. So that is all right. But thank you very much.

We are going to move on now to Member questions. Each Member will be recognized for 5 minutes, and I would like to start by recognizing myself.

Mr. Kampschroer, you have been at this a long time. And as you laid out some of those statistics, when you began—you have accom-

plished quite a lot. You have championed sustainability, and I want to thank you for that.

A couple of things that you mentioned, though, I would like to talk about a little more in detail, because they kind of fit with FEMA and what we have been discussing in that subcommittee.

When you assess the damage that has been done by flooding or tornadoes or hurricanes, and then you determine what changes we need to make to rebuild, can you tell us a little more about that process, and how you are working towards making us more resilient? Because we have found in the past we just keep making the same mistake over and over again, and you keep building right back where it is going to be flooded or destroyed. And that just didn't make good sense.

Mr. KAMPSCHROER. Thank you. Yes, we have changed in the last several years our processes for the initial selection of capital projects to require a comprehensive look at the site, the longevity, the expected life of the asset, and what is likely to happen at that particular site. And, of course, that is very geographically specific.

In addition, we are looking at making sure that all of the architects and engineering firms that are working on our projects have the proper credentials to be able to make good evaluations for how to design buildings that would last for the service life. And that includes looking at strengthening the enclosure, ensuring that the services can continue to operate, examining with the intended tenant of the building, how we will react to a disaster, whether there are retreat options, what other backup facilities there will—and including looking at supply chain effects.

We worked with one agency where we discovered that they could do everything in a storm, relocate elsewhere and operate, except for one little problem. They didn't have the bandwidth on their contract for electrical service, for Wi-Fi services. So looking at a comprehensive view of what we might do in different circumstances is the key.

And in the case of rebuilding, obviously, after a disaster our first goal is to get the Government up and running, but then to look at the existing facilities and apply exactly the same criteria to them as we rebuild, moving forward.

Ms. TITUS. Well, I know we had \$92 million for damages after Hurricane Florence, and that is just for Federal buildings. So we want to be sure that money is put to good use.

Mr. KAMPSCHROER. Yes. And, in fact, we are looking in that particular case to—the most expensive thing that we experience is flooding. And this is the flooding result. So we are looking at making different decisions about how to protect the existing structures, despite their presence in low-lying areas, so that we can either shed the water or make sure that it gets in and out more carefully—moving, for example, electrical connections up higher, so that they are not in the basement, and solutions like that.

Ms. TITUS. Thank you. Another question I have is we often talk about what we do to the building itself, how to make it sustainable or energy efficient. But some of it has to do with locating the building. In many places around the country outside of Washington the location of a Federal building has to do with the development in that area.

So how do we go about locating a building where it is close to transportation, or helps a neighborhood, or is close to the workforce? And once you decide the general area, how do you locate the building so that it is able to take advantage of the sunlight, for example?

Mr. KAMPSCHROER. That is, obviously, a very local decision across the country. We look at the presence of transportation. We look at how people get to and from the building. That is part of our common evaluation in places with no local transportation. We look at the road services, and the other ways that people can get to the building, and how they can commute. That is part of the decision.

We also look at how it is that we can—in building a new building we have very strong day-lighting requirements within the building. And in renovating old buildings we are able to do that. In the chairman's district, the Edith Green-Wendell Wyatt Building, when the facade was replaced, we were able to have the building be day-lit all day long in the entire occupied part of the building, including some areas of the basement that had historically been cut off from light.

I will stop there.

Ms. TITUS. So those are considerations that you could make—

Mr. KAMPSCHROER. Yes, ma'am.

Ms. TITUS [continuing]. With every building, both in new buildings and in renovated buildings. Thank you.

I would recognize the ranking member.

Mr. MEADOWS. Thank you, Madam Chair. Mr. Kampschroer, can you help me understand, I guess, the role of the Green Building Advisory Committee? I guess in that criteria it talks about a process of adding non-Federal members for participation. And I guess I am unclear on exactly how those non-Federal members are added to that advisory board.

Mr. KAMPSCHROER. Thank you, sir. The Green Building Advisory Committee's non-Federal members are specified in the Energy Independence and Security Act of 2007, mostly by category. So we have members who represent rating systems, we have members who represent the construction industry, architectural industry, engineering expertise, transportation expertise on there. In fact, our chair of the committee is from the New York MTA.

We go through a process of, every 4 years, of reappointing people. We put out a Federal Register notice. We explain what the expertise we are looking for is. We ask for resumes. We evaluate those, and then submit a recommendation to the Administrator of General Services, who makes the final selection. And then—

Mr. MEADOWS. So I guess what I am saying is what is that criteria? Because you talked about reappointment. So does everybody just get reappointed, or how do you break into this club?

And I see one of your staff shaking their head no. So I guess the answer is no.

Mr. KAMPSCHROER. Actually—

Mr. MEADOWS. She should never play poker, by the way, but go ahead.

[Laughter.]

Mr. MEADOWS. Oh, you are not staff. Oh, you are just shaking your head no? All right, go ahead.

Mr. KAMPSCHROER. So people have rotated off the committee. The last time there were four new members that joined the committee. And so people leave, and new people come on.

The criteria we have, we look for expertise in the things that the Green Building Advisory Committee is charged with doing—

Mr. MEADOWS. No, I get that. But who is the evaluator of that expertise, I guess, is what I am saying.

Mr. KAMPSCHROER. Oh, the staff of the GSA making recommendations to the Administrator.

Mr. MEADOWS. All right. And so if I were a non-Federal member, what is the best chances of me actually getting on that advisory committee? I mean I put forth a resume, and what—I mean, in the matrix, how do you get appointed to that? I mean what is the top priority for getting included in that group?

Mr. KAMPSCHROER. Expertise on the work of the committee.

Mr. MEADOWS. Having built buildings that are indeed—

Mr. KAMPSCHROER. Yes, if they are representing the construction industry, experience in building buildings. And—

Mr. MEADOWS. I guess what I am looking for is if you can get to this committee how do we make sure that we have a diversity of opinions as we do that, because some things, like boards, are self-perpetuating. And then what they do is they end up patting each other on the back, and you get no new ideas coming. And there has been groundbreaking ideas, in terms of how we make sure that we are more efficient.

So can you get to this committee, in the next 60 days or so, a plan on how—and maybe you already are doing that, but how you would best make sure that we don't self-perpetuate—

Mr. KAMPSCHROER. I would be happy to do so, and I apologize for not explaining it well enough in the short time—

Mr. MEADOWS. No, you are very kind. And actually, we are not in a confrontational kind of situation here, I just want to make sure that I understand it.

So, in terms of updating the P100 facilities, why—it is my understanding there is only one certification system that is there. Why would that be? Why has that not been updated? Am I correct in that?

Mr. KAMPSCHROER. That is correct. The P100 is used by GSA as its standard for Federal buildings. In our recommendations that we made 5 years ago on high-performance building rating systems, we recommended that for each portfolio an agency select one and use that one, rather than have multiple systems. It is an efficiency measure, more than anything else.

And in GSA's case the Public Building Service determined that the lead was the one that was most familiar to GSA employees who had to enforce it, and to the construction industry who were bidding on our projects.

Mr. MEADOWS. And so—and I get that, as being most familiar. But I—you know, it wasn't too long ago that BlackBerries were most familiar to everybody, and I don't know that you can find one on Capitol Hill now.

And so I guess what I am saying is, as we look at that, again, I am looking for a diversity of opinions and the ability to make

sure we are efficient and effective. When will the P100 be updated next?

Mr. KAMPSCHROER. It is on a—it has moved, actually, from a periodic updating to a continuous updating cycle now, so it gets updated frequently. So there is no particular brandnew P100 version 12, so it gets updated almost every month with—

Mr. MEADOWS. So it could change tomorrow.

Mr. KAMPSCHROER. It could. It probably will.

Mr. MEADOWS. All right. I yield back. Thank you.

Ms. TITUS. Thank you. I would now like to recognize Ms. Davids for 5 minutes.

Ms. DAVIDS. Thank you, Chairwoman, Ranking Member, and to Mr. Kampschroer for being here today. I appreciate your testimony, and I applaud the GSA for its leadership in developing new building code standards for Federal buildings.

And I am particularly intrigued by the information you provided around resilient building. As the chairwoman noted already, with increases in large weather events and climate change being an indisputably real and daunting challenge for our time, there is no action too small to help mitigate the effects of climate change. And we need to use every tool at our disposal, and I think this committee can make it easier for agencies like yours to play a significant role in that mitigation.

So I am from the Kansas Third Congressional District, which encompasses all of Johnson County, Wyandotte County. And I think a lot of times people think of coastal cities when they think about climate change, but the Weather Channel ranked our region, the Kansas City area, as the fifth in the top 25 list of U.S. cities to be most impacted by climate change. We are certainly an important area for purposes of our Nation's infrastructure and transportation. Our metro area is going to see 20 more days above 90 degrees, which is—you know, it will be more than the rural counterparts, and we have a lot of drought concerns coming up. And then, with heavy rains that are occurring, our region has a lot of flooding issues, as well.

I guess I want to hear a bit about the process for information gathering prior to or during the design phase, like prior to the building, but during the design phase. What is the process for factors that you take into account there?

Mr. KAMPSCHROER. So before we even get to design phase, when we are selecting projects and developing the prospectus, and developing the contract, we work very closely with FEMA, in particular; the Army Corps of Engineers, with their experience; NASA; and other agencies, mostly in the Department of Homeland Security. That is where we get the most up-to-date standards, and that is where we get the most up-to-date information about forecasts for long-term events.

So we look at—and it is very geographically specific, so we look at what—where we are in the country, what we are likely to have to deal with, and we look for the long term, because most new buildings that GSA built, we assume, are going to be functional for 100 years. So we are looking out 100 years using the science assessments of what is going to happen in that area.

And, as you mentioned it is very geographic-specific. We worry about flooding, because that is the most expensive to recuperate from. But we have actually worked with people in the Midwest, our clients, who are operating computer centers that won't operate without water. And in extended periods of drought how do you deal with that? How do you do that?

So we look at different options for cooling, different options for designing backup systems for data centers and that. And we do all of that before the building starts. Then we put those things into the specifications, and they become a part of the selection criteria for the teams that we hire that actually do the design and construction of facilities.

Ms. DAVIDS. Thank you. And one of the things—I think part of the reason that I am so interested in this is because when—under the benefits section of your testimony I was very excited to see the 23-percent lower building operating expenses that you noted. I mean, of course, I am excited about the 23-percent lower energy, and the lower water usage, and that sort of thing.

But I guess how do you marry up the potential cost savings with the—all that work that you put in with the other agencies? How do you marry those things up when you are looking for—when you are looking at the design and the building function?

And then also, can you tell me, are you—do you use a design-build construction risk manager—what kind of—

Mr. KAMPSCHROER. If I could start with that one, because it is one of the things that we have learned, is the efficacy of design-build or design-built like—we also use something called design-build bridging, both of which are very effective.

We did some studies of particularly effective buildings to look at what made those projects so successful. And the answer was integrated design, making sure that everybody was at the table, making sure that when the architects and engineers were thinking about buildings we had the building manager, who was going to operate the building, in the room contributing to that, as well as the people who are building it. The diversity of ideas in teams that are developed with integrated design principles is the most important factor in success there.

And to get back to your savings question, we assume that we can get savings because we know we can do that, so we just keep watching for it as we go through the building, through energy models and the like. I mentioned the Edith Green-Wendell Wyatt Building. They did over 30 energy models during the course of design, just to make sure that the building would operate as well as it does today.

Ms. DAVIDS. Thank you.

Ms. TITUS. Thank you. I will now recognize Mr. Pence for 5 minutes.

Mr. PENCE. Thank you, Chairwoman Titus and Ranking Member Meadows. And nice to meet you, Mr. Kampschroer. Thank you for being here today.

The Energy Efficiency Improvement Act of 2015 directed GSA to develop model leasing provisions related to energy and water efficiency measured in leased space. GSA space is now more than 50 percent leased. While we have been working to reduce those costs

through consolidation and positioning—GSA did negotiate better deals, as Congressman Meadows mentioned—we have seen the costs of lease space increase. How does GSA ensure the taxpayer realizes the savings in the rental rates of leased space from efficiency requirements?

Mr. KAMPSCHROER. Well, to your first point, we actually did publish the model lease provisions, and we had them vetted with a number of different private-sector entities, and we used those provisions in our own leases.

And, in fact, we based, in many cases, the model lease provisions on what GSA had been developing over the years.

Leasing is a competitive process, and it is, like all real estate, a combination of location, functionality, size, and future benefit to the occupants of the building.

I think that I would defer further questions on how that competitive process goes. It doesn't happen to be my particular area of expertise, if I may.

Mr. PENCE. OK, thank you. I yield my time.

Mr. MEADOWS. Will the gentleman yield?

Mr. PENCE. I will so yield.

Mr. MEADOWS. Yes, so let me follow up on one particular—because you mentioned one area that really is a pet peeve of mine. When we look at leasing overall, the residual value of a building, GSA doesn't really get to figure that in. So if you are actually leasing a building and being able to purchase that building at the end of that contract, there are constraints on that. Is that correct?

Mr. KAMPSCHROER. That is correct.

Mr. MEADOWS. How can you compare to the private sector, then?

I guess the question for me is—because in the private sector, what we would do, if we go out and lease something, we would actually have a lease. And if it was a lease purchase, we would have a residual value. Sometimes that is \$1, sometimes that is market value at the time.

How do you compare to the private sector when, indeed, you can't even enter into a contract that is the same as the private sector?

Mr. KAMPSCHROER. We have done a number of studies that compare the Federal construction to private-sector construction by taking into account those differences.

Obviously, we don't pay—

Mr. MEADOWS. Well, in terms of cost, I get that, because you have those parameters. But in terms of lease costs, you are comparing apples to oranges. Wouldn't it be better if we were able to find an apple-to-apple comparison to allow residual values to—that if we are leasing a building, and we can purchase it for \$1—let's put it in car terms, in automobile terms. You can have a lease on a car with a zero residual, or you can have a lease on a car that has a \$10,000 residual. And yet the lease payments will be very different on those two automobiles.

And so how do you compare the two? And I guess that is what happens in the private versus Federal. Would it not be helpful if you were given greater flexibility in that, to be able to make sure that we are efficient for the American taxpayer?

Mr. KAMPSCHROER. [No response.]

Mr. MEADOWS. It is not a trick question.

Mr. KAMPSCHROER. I know it is not a trick question. It is also a question that is not—I am not quite current in all of the flexibility that the Government does have. So I would actually prefer to—

Mr. MEADOWS. I yield back, and I thank the chairwoman's courtesy.

Ms. TITUS. We appreciate that, Mr. Kampschroer. We are here to talk about energy efficiency. The topic of leasing versus building and all that GSA does is—well, could be a whole other hearing. Maybe we can bring the Director in to address some of those questions. So we will get back to energy efficiency, and resilience, and that sort of thing.

So I now recognize Ms. Holmes Norton.

Ms. NORTON. Thank you very much, Madam Chair, a very important hearing.

But I would simply like to go on record before asking my questions to thank you, Madam Chair, for joining me in sending a letter last month to the Financial Services Appropriations Subcommittee to request that they restrict GSA's ability to use funds to assist in the implementation of USDA's plan to relocate two agencies, the Economic Research Service and the National Institute of Food and Agriculture, out of the Washington, DC, area. I very much appreciate your help in this respect. It is an attempt to use GSA's leasing authority without having moved through the standard GSA procurement process.

The other committees and Members, including the entire House and Senate Capital Region delegation, have noted this problem. And, Madam Chair, I would ask that you consider a hearing in our subcommittee on GSA's role in facilitating USDA's relocation proposal. It is an attempt to get around this subcommittee, as well as the standard procedures. I would appreciate very much your considering that, Madam—

Ms. TITUS. Thank you for bringing that to our attention again.

Ms. NORTON. I have a question on the implementation of President Trump's Executive Order 13834. I am trying to figure out where it stands now, in relation to a prior Executive order.

The Executive order says it does want to increase efficiency and eliminate unnecessary use of resources, protect the environment. So all of the upfront language is what you might expect. But it does not set specific energy, water, or greenhouse gas reduction targets, and it repeals the Obama-era Executive order, which specifically required such targets. Its target was to reduce building energy intensity by 2.5 percent, annually.

Now, I can understand perhaps this administration disagrees with that, but it has got a new Executive order. And so I must ask you if you believe that the Trump Executive order actually repeals specific performance targets. And if it does, how will you know that there has been any reduction in energy consumption?

Mr. KAMPSCHROER. Thank you, Congresswoman. The Executive order whose implementing instructions were just issued a couple of weeks ago requires the same degree of reporting on all of those factors. And also—

Ms. NORTON. Well, the degree of reporting—so what do the agencies report?

Mr. KAMPSCHROER. Well, we are reporting on energy intensity, water intensity over time. Greenhouse gases are still reported, and they still appear on the OMB score card of agencies.

What has changed is the flexibility with which individual agencies have to set targets for reduction. What is required is a reduction.

Ms. NORTON. And how will you know if there is a reduction? And why do you think there do not need to be targets, sir? What are they aiming for? If they reduce it a tiny bit, that is OK with GSA? If they reduce it a great deal, what do they get for that? What was the point?

And erasing specific targets, perhaps you have another target. Perhaps you think the 2.5 percent is too great. Why then not have at least your own administration target?

Mr. KAMPSCHROER. Well, every agency sets an internal target and reports that in an annual plan, which is reviewed by the Council on Environmental Quality—

Ms. NORTON. So the Executive order does instruct them to, agency by agency, set targets and report them to GSA?

Mr. KAMPSCHROER. To report them to the Office of Management and Budget, and the Council on Environmental Quality.

Ms. NORTON. Madam Chair, I would ask that any targets set, which are not clear in the Executive order, by the way, be also reported to this subcommittee. I yield back.

Ms. TITUS. Thank you. If you could help us with that, we would appreciate it, Mr. Kampschroer.

I now recognize Mrs. Miller for 5 minutes.

Mrs. MILLER. Thank you, Chairwoman Titus and Ranking Member Meadows. And thank you for being here today.

In your testimony you mentioned that the GSA's investment in next generation building technology is based on actual performance, financial payback, and real-world demonstration. The GSA will then recommend deployment only after these technologies have demonstrated positive results. What technological resources has GSA recommended for deployment in the Federal facilities?

Mr. KAMPSCHROER. I mentioned new efficiency chillers. We did a series of studies of magnetic levitation chillers. They have much lower friction. We found them to be almost universally an improvement. We have recommended those, we have recommended several different kinds of LED lighting systems over the years.

We have just—if I can get a plug to Congressman Meadows's earlier question—the Green Building Advisory Committee has recommended to us to take a look at, in particular, what we think is a very exciting new technology, which is the integration of buildings with grid-integrated buildings, and we are working closely with the Department of Energy to do a pilot project on that. I think it is very exciting, it is sort of the next generation there.

We have looked at high-efficiency boilers.

And then I think the other three areas which we have done—we think are very worthy of investment are water and sewer savings get a very high payback; control systems, because the changes in control systems have made—and the presence of advanced meters have made—the analysis of what goes on buildings much more effective than it was a decade ago—

Mrs. MILLER. And even things like newer windows?

Mr. KAMPSCHROER. Windows are the most difficult energy improvement to make cost-effective in a reasonable time. But yes, it includes new windows, low-e glass panes.

We have looked at—and, in fact, the building I work in has a roof that has electrochromic glass. It is one of the first installations on the east coast with electrochromic glass, because it was actually the cheapest way to cool the space much cheaper than sort of physical canvas coverings, and shades, and so on.

Mrs. MILLER. OK, so what is the timeline for the testing of the technology following the installation of these operations?

Mr. KAMPSCHROER. We usually test—and if I could back up a second—we look at the Department of Energy for ideas, and sort of the laboratory testing of buildings, and then ourselves and the Department of Defense test them in actual buildings. We work with the National Laboratories to do, usually, a yearlong test of equipment in situ, so we get the experience on all four seasons.

Mrs. MILLER. OK, thank you. And can you speak to GSA's goals for the upcoming year on continuing to implement analysis-based evaluations that you have been talking about?

Mr. KAMPSCHROER. Yes. I mentioned our focus this year is on selecting one, two, perhaps even three pilots on grid-integrated buildings. We are looking at a combination of finding the right building, plus a cooperative utility, because you can't do this without a utility, and plus rates that are conducive to make this change.

So grid-integrated buildings make the most sense where you have significant swings in time-of-day pricing—you know, cheap energy in the middle of the night, and expensive energy in the afternoon—where you can make those adjustments to the grid operator, and conceivably reduce the overall cost of the grid, and increase the reliability of the grid, which actually gets the utility interested in the project.

Mrs. MILLER. Thank you. And would you please humor me and tell me the name of those windows again, and how they operate?

Ms. EVANS. Electrochromic glass windows operate by reacting to the amount of sunlight that hits them, and then changing color automatically. They require a little trickle of electricity. And in our installation we have a couple of translucent solar panels that provide that trickle of electricity on the same roof.

Mrs. MILLER. OK, thank you. I yield back my time.

Ms. TITUS. Thank you. Don't you also work with the Department of Energy sometimes to put solar panels over covered parking buildings?

Mr. KAMPSCHROER. We have done that. And, in fact, in an energy project that we did under the ESPC authority right in New Carrollton, we found that the most cost-effective way to install the solar component was to cover the parking, which has sort of the very nice side effect of making the cars of the people who work in the building much cooler at the end of the day, and it also supplies over 20 percent of the electricity of that building.

I might add that that is a wonderful case study of Energy Savings Performance Contract. We achieved over 62 percent actual energy savings. It has been in operation for 4 years, and it continues to outperform the predictions.

Ms. TITUS. Thank you. Now I recognize Mrs. Fletcher for 5 minutes.

Mrs. FLETCHER. Thank you, Chairwoman Titus. And thank you, Ranking Member Meadows, for holding this important hearing today. Thank you, Mr. Kampschroer, for taking the time to testify.

Management of Federal buildings throughout the country is no easy undertaking, and I want to talk just a little bit about some of the goals and objectives that have been set. The Energy Independence and Security Act of 2007 established the Office of Federal High-Performance Buildings to develop best practices, guidance, and tools for governmentwide use to reduce cost, enhance human health and performance, and minimize environmental impacts, as you know.

GSA has driven improvements to the efficiency of Federal buildings through this office, which has been a large success story. Energy efficiency at Federal buildings is vastly improved from where we were a decade ago. I do, however, worry that some aspects of the Energy Independence and Security Act of 2007 have not spurred the desired outcome that was envisioned when the law was enacted.

Section 433 of the Energy Independence and Security Act calls for the elimination of all fossil fuel-generated energy from Federal buildings by 2030. With the growth that we have seen domestically in natural gas over the last decade, I am not sure this provision has the desired environmental effect that was intended. Natural gas plants replacing coal-fired plants in the power sector have been the greatest factor in reducing carbon emissions to levels we haven't seen, the lowest levels in the last 20 years.

But we now have a statute saying that by 2030 there will be no natural gas used in Federal buildings. This is counterintuitive to addressing carbon emissions. And so I want to ask you a couple questions that go to that issue.

Number one, can you tell me what percentage of Federal buildings currently rely on fossil fuel-generated energy?

Mr. KAMPSCHROER. In GSA's inventory it is virtually all of them.

Mrs. FLETCHER. And, as I think you know, the 2007 Act sets targets for fossil fuels at 80 percent of all Federal buildings being fossil fuel free by 2020. Is this target a realistic one that you expect to meet?

Mr. KAMPSCHROER. As we build new buildings we are taking that target into effect in the buildings that we bring into the inventory, and we are currently achieving the targets that are set in statute.

Mrs. FLETCHER. Well, that applies to new buildings. But for existing inventory—I think you just told me virtually all of the buildings rely on fossil fuels. So do you think that a policy focused on energy efficiency and reduction of carbon emissions at Federal buildings, rather than the elimination of all fossil fuels, but instead having a fuel-source-neutral effort to reduce our overall carbon footprint, would be a better way to foster the environmental mandate?

Mr. KAMPSCHROER. In my personal opinion, if the goals are very clear, having greater flexibility in the means of achieving them is usually the better way to achieve those goals.

Mrs. FLETCHER. And just to be clear, we are talking about a goal—all the buildings right now rely to some extent on fossil fuels to power them. And we are talking about a reduction by 2020, but—80 percent. That target is not achievable.

Mr. KAMPSCHROER. I am sorry, I didn't hear that.

Mrs. FLETCHER. Would you agree with me that the target of reducing fossil fuels 80 percent is not achievable by 2020?

Mr. KAMPSCHROER. I would agree with you that it is a very difficult goal.

Mrs. FLETCHER. And would you agree with me that it makes sense to revisit the goals and—instead of reducing all carbon—instead of reducing fossil fuels, instead focusing on carbon emissions and reducing emissions?

Mr. KAMPSCHROER. I am sure that we would be very happy to provide an opinion to this committee on proposed legislation that would talk about the practicality of achieving the legislation that was drafted.

Mrs. FLETCHER. I think that would be very helpful. I think one of the things that we should strive to do on our committee is set achievable targets. And from your testimony today, I don't think the goal for 2020 or for 2030 seem like they are in sight.

So I thank you for your testimony this morning. I look forward to getting additional information from you. And I see that my time is running out, so with that I will yield back.

Ms. TITUS. Thank you. I now recognize Mr. Palmer.

Mr. PALMER. Thank you, Madam Chair.

Mr. Kampschroer, I want to go in a little bit different direction. There was a report that came out that said—it has been a few years ago—that there were 77,000 empty or underutilized Federal buildings. I know that we are, on the energy side, spending some amount of money to maintain those buildings.

Doesn't it make sense—wouldn't it make more sense for us to sell those buildings, get them out of the Federal inventory, and get them off the books in terms of what we are expending?

Mr. KAMPSCHROER. I am not sure I completely understand the question, but I would agree with the premise that buildings that are underutilized can save the most amount by being renovated so that they can be more intensively used.

In GSA's headquarters, for example, we increased the number of people in the building after the modernization of the building by over 40 percent. And we are avoiding \$32 million a year in avoided lease costs by reducing the amount of leasing, moving people into the building.

It is also interesting that we studied two buildings, the one I work in here in Washington, DC, and a building in Denver, Colorado, that have that kind of density. And when you increase the density by 40 percent, the electrical consumption of the building only goes up by 4 percent. So it is also an energy efficiency component there.

And it is certainly true that the square foot of space that you don't use at all has the greatest savings, compared to one that is more efficient.

Mr. PALMER. Right. Well, Mr. Meadows made this point about buildings that are over 50 years old.

Here is an article from National Public Radio about empty buildings, and there is one in particular. Now, this is from 2014, so I don't know what has happened with this building, but it is a 132-year-old building that is just 6 blocks from the White House that is sitting empty.

And the point I am trying to make is that, if you have got property that is underutilized, you are still paying to keep it heated and cooled. It might make more sense to sell those buildings, let somebody else bear the cost of doing the modernization of the building, reduce the energy footprint, rather than the Federal Government doing that.

Then you have got this report from the GAO from March of last year on space utilization. I just think that has got to be part of the discussion when we are talking about reducing our overall energy costs, is better utilization of the properties that we have, and maybe disposal of the properties that we don't need. And I think that needs to be part of the conversation.

Mr. KAMPSCHROER. I think that is an important thing, sir. And it is also something that GSA is supporting governmentwide in the past several years. If I recall—I may have this statistic a little bit off—we have reduced the overall Federal inventory by over 3 million square feet, \$3 billion.

And there is a very active program to reduce the total footprint of the Government, and I would be happy to provide you some more information about that program.

Mr. PALMER. Well, there is some—a little bit of frustration involved here, because the GAO placed the handling of Federal buildings on its high-risk list, and it has been on there since 2003. And I think, now that we have got this major focus on energy, and going to renewables, and being more efficient, that now would be a good time to start implementing some of the suggestions that the GAO has made.

Obviously, there is some major complications with selling Federal property that I think we need to work through. But when you are talking about buildings, particularly older buildings, as Mr. Meadows brought up, and he has been a developer, I worked for two international engineering companies—I think it would be in our best interests if we took a holistic view of this, and start looking at property that is underutilized or unoccupied, and make some decisions there that would help us reduce our energy footprint.

With that, Madam Chair, I will yield back.

Ms. TITUS. Thank you very much, Mr. Palmer.

I would also remind this committee that during the last session of Congress, when it was chaired by Mr. Barletta, he was very concerned about this, and we were working towards this, and had several hearings on how to reduce that footprint and move away from some of the old buildings, sell some instead of renting, building. So we can get some of that information from previous hearings to the committee, and see where we want to go from there. Because I think some progress has been made as a result of those hearings, and we will see what might be next.

Thank you. We are done with this? Thank you very much for being with us, it has been very enlightening. We appreciate your

expertise and your commitment to this. Thank you for spending time this morning.

Mr. KAMPSCHROER. Thank you, Madam Chair.

Ms. TITUS. I will now ask the second panel to come forward.

[Pause.]

Ms. TITUS. Well, thank you very much for being here, and welcome. Our next panel of distinguished guests includes Dr. Kevin Van Den Wymelenberg, henceforth known as Dr. Van Den Wy, who is the director of Energy Studies in Buildings Laboratory at the University of Oregon; Ms. Elizabeth Beardsley, who is the senior policy counsel, U.S. Green Building Council; and Mr. Mark Russell, the Green Globes Assessor from the Green Building Initiative.

We thank you for being here today. We look forward to hearing your testimony.

Without objection, our witnesses' full statements will be included in the record. As with Mr. Kampschroer, since your written testimony has been made part of the record, we would request that you limit your oral testimony to just 5 minutes.

So we will proceed with Ms. Beardsley.

**TESTIMONY OF ELIZABETH R. BEARDSLEY, P.E., SENIOR POLICY COUNSEL, U.S. GREEN BUILDING COUNCIL; KEVIN VAN DEN WYMELLENBERG, DIRECTOR, ENERGY STUDIES IN BUILDINGS LABORATORY, UNIVERSITY OF OREGON; AND MARK RUSSELL, PH.D., P.E., GGA, LEED AP, BREAAAM IA, GREEN GLOBES ASSESSOR, GREEN BUILDING INITIATIVE**

Ms. BEARDSLEY. Thank you, Chairwoman Titus, Ranking Member Meadows, and members of the subcommittee. I am greatly honored to join you today on behalf of the U.S. Green Building Council.

USGBC is a nonprofit organization dedicated to transforming the way buildings and communities are designed, built, and operated, enabling an environmentally and socially responsible, healthy, and prosperous world. We are best known for our successful Leadership in Energy and Environmental Design—LEED—green building rating system. Through LEED initiatives such as education and events, we drive sustainable and high-performing buildings that improve the quality of life for all.

Federal progress in building efficiency and sustainability over the past decade has been significant. We offer these highlights of our recommendations for strengthening and expanding upon this progress.

First, Federal agency targets for key metrics such as energy and water, intensity, renewable energy, and efficiency investments such as performance contracting, have been important and successful levers, and could be brought forward to ensure all agencies continue to benefit from efficiency.

Federal energy efficiency performance standards are another area where updating could increase savings. Ensuring adequate continued funding for the GSA Office of Federal High-Performance Buildings and for the Federal Energy Management Program, FEMP, within the Department of Energy, is also critical for progress. Additional advances in Federal building sustainability and cost savings could be made through enhancing resiliency activities, updating key contracting provisions, and improving energy

efficient leasing implementation, as well as reestablishing Federal flood plain guidelines.

To provide additional context on who we are and our partnership with the Federal Government, USGBC has more than 9,000 diverse business organizational and Government members. More than 200,000 individuals around the globe hold LEED credentials, including Government professionals and veterans, for whom this is available through the GI bill.

Since its establishment, LEED has become the most successful voluntary, consensus-based, high-performing green building program in the country, with more than 64,000 commercial and institutional LEED-certified projects in the U.S. alone.

The private sector has embraced LEED in recognition of its strong business case. Green buildings can save money on a life-cycle basis, as energy and water savings pay back quickly and add value. Numerous econometric studies have found evidence of the economic benefits of LEED and Energy Star, including improvement in net operating income, and value premiums for rent and sales.

Businesses also understand that their biggest investment is in the human resources that work in those buildings. High-performing green buildings have been shown to support improved employee productivity, as compared with conventional buildings, by providing spaces that are comfortable, with air quality that promotes health, focus, and cognitive function.

In the Federal sector the GSA is the leader in implementing energy and water efficiency across its large Federal buildings portfolio to provide high-performing spaces, saving money, and supporting Federal employees. Through construction and leasing policies, performance contracting, and other public-private partnership models, and use of third-party certification, GSA saved many millions of dollars, as you have just heard directly from GSA.

LEED is among the private-sector tools GSA and Federal agencies use to meet their goals for public facilities. Across more than 20 agencies and departments, the Federal Government has certified over 5,000 LEED projects, representing nearly 290 million gross square feet. GSA has repeatedly found LEED to align well with Federal goals, as part of its statutory review of green building systems.

LEED also supports Federal resilience, as found with a recent study from UT San Antonio, for example. We have been increasing our focus and tools for resilience, as well, with pilot resilience credits in LEED, and a new resilience-focused rating system known as RELi. The GAO has also affirmed Federal agency benefits from green building systems. GAO reported third-party certification helps agencies ensure compliance with their requirements by holding contractors and agency project teams accountable. And GAO had no recommendations from this review.

Federal agencies' use of high-performing buildings can also spill over, spurring innovative building science and technology, and has enabled a thriving industry with an export market now valued at almost \$40 billion.

Thank you for the opportunity to provide these remarks, and I look forward to answering your questions.

[Ms. Beardsley's prepared statement follows:]

**Prepared Statement of Elizabeth R. Beardsley, P.E., Senior Policy Counsel,  
U.S. Green Building Council**

Chairman Titus, Ranking Member Meadows, and Subcommittee Members,  
I am greatly honored to join you today on behalf of the U.S. Green Building Council (USGBC). USGBC, best known for the Leadership in Energy and Environmental Design (LEED) green building rating system, has been engaged with the Federal agencies, including the U.S. General Services Administration (GSA), throughout our history. We are pleased to share this morning our observations on the significant progress that has been made in Federal high performing buildings over the past decade. We appreciate the opportunity to look forward as well, and comment on ways that the GSA and Federal agencies can have even greater impact, saving money and resources, while providing high performing spaces to support productivity and wellness of federal employees.

In sum, GSA is a leader in implementing energy and water efficiency across the Federal buildings portfolio it manages. Through construction and leasing policies, deployment of performance contracting and other public private partnership models, and use of third party certification, GSA has saved many millions of dollars. GSA has reported, for example, that sustainable building standards helped GSA avoid more than \$250 million in energy and water costs from 2008 to 2014.<sup>1</sup>

The significant progress that has been made also serves as a guide to opportunities for further improvement including energy, water, and cost savings. Federal agency goals for key metrics such as energy use, water consumption, renewable energy, and efficiency investment such as performance contracting, have been an important touchstone and could be brought forward to ensure all agencies are engaged in and benefit from efficiency. Federal energy efficiency performance standards are another area where updating could help increase federal savings. Areas for strengthening and expanding Federal building sustainability and cost savings include enhancing resiliency activities; updating key contracting provisions; and improving energy efficient leasing implementation. Ensuring adequate continued funding for the GSA Office of Federal High-Performance Buildings, and for the Federal Energy Management Program (FEMP) within the Department of Energy, is also critical to continue making progress in providing high-performing, cost-saving buildings.

USGBC

USGBC is a nonprofit organization dedicated to transforming the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous world. We are best known for our successful Leadership in Energy & Environmental Design (LEED) green building certification system. In addition to LEED, we leverage our education, credentials, events, communications, and policy advocacy activities to drive sustainable and high performing buildings, campuses, and communities that improve the quality of life for all. Through these programs, we support building owners, operators, and tenants from the private and public sectors in meeting their goals for spaces that save energy and water, support occupant health and productivity, reduce impacts on the climate, and incorporate resilience.

USGBC has more than 9,000 business, organizational, and government members. Our business membership includes the full range of the building sector, including builders of all sizes, product manufacturers, professional firms, and real estate owners and firms, as well as health care, major retail corporations, hospitality, financial services and insurance companies. More than 200,000 individuals around the globe have LEED credentials including LEED AP and Green Associate.

LEED

Since its establishment in 2000, LEED has become the most successful voluntary, consensus-based private market-driven high-performing green building program in the country, with more than 64,000 commercial and institutional projects that have achieved LEED certification and another 49,000 projects underway. In addition, there are more than 394,000 residential units currently certified and many more

<sup>1</sup> GSA, 2015 Strategic Sustainability Performance Plan [https://app\_gsa.gov\_prod\_rdcgwaajp/wr.s3.amazonaws.com/GSA\_FY\_2015\_SSPP\_Final.docx].

registered.<sup>2</sup> LEED has bolstered the U.S. construction sector and created new industries that have converged into a multibillion dollar domestic high-performing building industry.

LEED gives building owners and operators the tools they need to have a measurable effect on their buildings' performance, with a whole building, life cycle approach driving achievement of sustained savings. LEED works by establishing prerequisites and optional credits in key categories including integrative process, location and transportation, sustainable sites, water, energy, materials and resources, and Indoor environmental quality, as well as rewarding innovative strategies and attention to priority regional issues. Achieving LEED certification requires satisfying all prerequisites and earning a minimum number of credits. The levels of certification reflect the number of points earned: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points), and Platinum (80+ points).

To reflect building industry best practices, LEED is updated following processes that ensure the highest levels of openness, inclusion and transparency. LEED committees are populated by a diverse group of technical and market experts who donate their time and expertise to advance the system.

The most recent full update to LEED is known as LEED v4. Adopted after countless hours of volunteer time, consideration of public review comments, and a rigorous consensus process, LEED v4 offers a performance-based approach to measurable results and ongoing operations. During LEED v4 development, USGBC conducted six public comment periods and responded to more than 22,000 public comments. The final draft of LEED v4 was approved by 86% of the consensus body members.

LEED v4 builds on the progress of previous versions, raising the bar for minimum performance and adding new optional credits in every category. LEED v4 was designed to address the unique needs and challenges of a variety of different building and space types. It currently includes 21 different market sector adaptations. Projects such as warehouses and distribution centers, data centers, laboratories, hotels and motels, existing retail, existing schools, existing multifamily, and mid-rise residential buildings are specifically addressed within LEED. The LEED rating system addresses new construction and major renovation, and existing buildings. Because optimizing operations on an ongoing basis is critical to achieve savings and benefits, projects are encouraged to recertify periodically; USGBC has invested in systems to support and streamline recertification.

LEED seeks to engage building projects with industry best practices and deliver superior outcomes for the built environment. LEED's flexible, credit-based structure allows project teams to pursue a tailored benefit package that best suits the project's location, climate zone, building type, budget, and market positioning; while minimum prerequisites across all categories assure threshold performance. Third-party review and verification offer accountability and transparency for performance outcomes.

Complementing LEED, we recently introduced LEED Zero certifications, which recognize buildings that have achieved net zero carbon, net zero energy, net zero water, or net zero waste. LEED Zero is a performance-based certification indicating the achievement of net zero in operations over a 12-month period.

#### BUSINESS CASE

LEED has transformed how the building industry and the public consider sustainability in real estate. The private sector has embraced LEED in recognition of the strong business case for green building. It has been demonstrated through many studies that green buildings can save money on a life cycle basis, as energy and water savings pay back quickly and add value. Beyond these direct utility savings, studies have documented a number of financial benefits for businesses, and supported the proposition that LEED-certified buildings with lower operating costs and better indoor environmental quality are more attractive to many corporate, public and individual buyers.

Businesses understand that their biggest investment is in the human resources that work in those buildings. By providing spaces that are comfortable, high air quality that allows focus and high cognitive function, and features such as daylight and ample ventilation, employees are poised to be more productive and healthier than those working in conventional buildings. High quality, health-supporting buildings help attract talent as well; since we spend about 90 percent of our time indoors, people naturally want to feel confident interior spaces are good for them. These con-

<sup>2</sup>USGBC data, as of May 2019. The commercial and institutional category includes all non-residential building types and some mixed use and high rise residential.

siderations can translate into increased sales and rent prices and improved lease-up rates for green buildings.

For example, in one Department of Energy (DOE) funded study, a researcher from the Wharton School reviewed over 50 studies examining the impact of energy efficiency and green labeling on building valuation and completed a “metastudy” of the literature.<sup>3</sup> The report provides evidence of substantial price and rent premiums that are associated with sustainable buildings in the commercial sector. The team reviewed studies that investigate the impact of certifications such as LEED and ENERGY STAR using state of the art methodologies, based on econometrics, combined with current real estate industry data to identify the relationships between green building practices and value. On average, these econometric studies establish value premiums of 6% for rents and 15% for prices for buildings with LEED and Energy Star labels. The research found evidence of multiple economic benefits of LEED and ENERGY STAR, such as improvement in net operating income (NOI) by both (1) reducing energy costs (which represent 25% of the operating expenses) and (2) increasing rents by reducing vacancy and by increasing a tenant’s willingness to pay higher rents due to a higher worker productivity and a desire for “green” space and the reputational advantages; and a decrease in the Cap Rate, indicative of lower risk.

Another study of some 26,000 office buildings, found that certified office buildings, on average, continue to have higher rental, occupancy and pricing levels.<sup>4</sup>

#### RESILIENCE

High-performing, efficient sustainable buildings are the first step towards resiliency, since they require less energy and water to maintain operations, and reduce stress on local grids and water infrastructure.

LEED projects are rewarded for incorporating such resiliency-supporting features as the use of durable materials, careful site selection, rainwater collection, demand response, grid islanding, maximal energy efficiency, on-site renewable energy generation, and more. These approaches can help not only LEED buildings become more resilient, but also their surrounding communities.

A 2018 study by the University of Texas at San Antonio focused on how LEED v4: New Construction specifically addresses building resilience.<sup>5</sup> The study, presented at the National Institute for Building Sciences (NIBS) Building Innovation Conference, identified 14 types of natural disasters relevant to the built environment, and then analyzed how LEED v4 credit requirements enhance building resilience against these adversities. The study concluded that LEED v4 credits and prerequisites provide a multitude of opportunities to enhance resilience. Specifically, the study found that 64.8% of all credits contribute to increased resilience against flooding, and 63% of credits enhance resilience to hurricanes or typhoons.

Examples of LEED certified projects that have demonstrated exceptional resilience qualities include an interior office space in San Juan, Puerto Rico that survived and thrived in the aftermath of a hurricane; an apartment building designed to rehabilitate and support formerly homeless veterans; and a large corporate headquarters building designed to withstand hurricane-strength winds.

To further support project teams in enhancing resilience, USGBC now offers a resilience-focused rating system, RELi, as well as several resilient design pilot credits in the LEED system. The RELi rating system, originally developed by the Institute for Market Transformation to Sustainability, aligns with LEED, while expanding the focus on proven strategies and methods. For example, RELi requires assessment and planning for acute hazards, preparedness to mitigate against them, and designing and constructing for passive survivability.

USGBC partnered with the Institute to synthesize LEED resilient design pilot credits with RELi’s Hazard Mitigation and Adaptation credits, thereby strengthening the alignment and compatibility of LEED and RELi for projects. The LEED resilient design pilot credits are currently available to all new construction projects.

<sup>3</sup>Susan Wachter, *Valuing Energy Efficient Buildings* (2013), supported by the Consortium for Building Energy Innovation (CBEI) sponsored by the U.S. Department of Energy, <http://cbei.psu.edu/wp-content/uploads/2016/07/Valuing-Energy-Efficient-Buildings.pdf>

<sup>4</sup>Nils Kok and Rogier Holtermans, of the University of Southern California. “On the Value of Environmental Certification in the Commercial Real Estate Market (date) <https://lusk.usc.edu/research/working-papers/value-environmental-certification-commercial-real-estate-market>.

<sup>5</sup>Sandeep Langar, Ph. D., and Suchismita Bhattacharjee, Ph. D., *Focus of resilience within Building Rating Systems (BRS) LEED 4.0 Review* [<https://portal.nibs.org/files/wl?id=672ajV0PmTXtR8SqPwPP2DYyh97RcXK>], presented at Building Innovation 2018 (January 9, 2018).

The credits include *Assessment and Planning for Resilience; Design for Enhanced Resilience*; and *Passive Survivability and Back-up Power During Disruptions*.

Building resiliently—and building back “better”—deliver significant financial benefits, as well as protecting life and property. A 2019 study by the National Institute of Building Sciences (NIBS) found that each \$1 spent on mitigation activities saves \$11 in response and recovery costs.<sup>6</sup> By incorporating resilient strategies, especially via LEED certification, projects are more sustainable, durable, healthier, and better for the overall community.

#### FEDERAL AGENCIES AND HIGH-PERFORMING BUILDINGS

Through its buildings and construction investments, the Federal government can protect and expand the American workforce and also catalyze future competitiveness and growth of domestic enterprises.

Federal agencies use green building certification to meet their energy and sustainability goals for public facilities. GSA was an early adopter of LEED and has helped shape the system as its versions evolved over the past 15 years. Notably, GSA has contributed through demonstrating LEED in practice, developing experience in building technologies, and direct involvement in the development of the rating system through technical committees and pursuit of LEED Interpretations. This involvement has contributed to LEED being a green building certification system that is flexible enough to meet the unique challenges of the diverse federal portfolio, and robust enough to help Federal agencies meet increasingly stringent performance metrics.

In addition to GSA, nine Federal departments and agencies and five national laboratories have participated on committees and as subject matter experts. Federal agencies have also helped, on numerous occasions, shape the system. For example, National Institute for Occupational Safety and Health (NIOSH) worked with USGBC to propose its Prevention through Design standard for use in LEED; this is now a pilot credit.

Under section 436 of the Energy Independence and Security Act of 2007,<sup>7</sup> the U.S. General Services Administration (GSA) is tasked with evaluating green building certification systems every five years in order to identify a system and certification level “most likely to encourage a comprehensive and environmentally sound approach to certification of green buildings” in the federal government. GSA’s Office of High-Performance Green Buildings recommends to the Secretary of Energy the green building certification system to be used in the federal government, and has recommended LEED since 2006. GSA has repeatedly found LEED to align well with federal requirements.<sup>8</sup> GSA has its third five-year review underway. For this review, GSA applied a new methodology, including collecting information from green building system owners through a survey and providing an independent, third-party review by the Rocky Mountain Institute. LEED has consistently received superior scores across all three reviews. The recently released Findings Report concludes that LEED is even more aligned with federal requirements.<sup>9</sup>

Across more than 20 agencies and departments, the federal government has certified over 5,000 LEED projects, driving tremendous taxpayer savings while also creating jobs and reducing environmental impacts. As of May 2019, the total number of LEED certified federal projects is 5,319 representing 289 Million GSF, with additional registrations of more than 4,000 projects representing 462 Million GSF. The Department of Defense is a leader in high performing building certifications (3,810), along with GSA (225), Department of Health and Human Services (132), Interior (98), Energy (84), State (65), and NASA (50).

A notable example is the U.S. Department of the Treasury’s iconic headquarters, which earned LEED Gold in 2011. The building, which made significant building operation improvements to slash energy and water consumption, saves taxpayers \$3.5 million per year. Another is the Wayne Aspinall Federal Building in Grand Junction, Colorado, which earned LEED Platinum certification in 2013. The building was modernized to operate as net-zero energy, while maintaining its status on the National Register of Historic Places—the first such building to do so. Incorporation of

<sup>6</sup>National Institute of Building Science, *Natural Hazard Mitigation Saves: 2018 Interim Report* [<https://www.nibs.org/page/mitigationsaves>].

<sup>7</sup>Energy Independence and Security Act of 2007 (EISA), Pub. L. No. 110-140, tit. IV subtit. C, §§ 433(a), 436, codified at 42 U.S.C. § 6834(a)(3)(D)(iv), 42 U.S.C. § 17092.

<sup>8</sup>See GSA, *High Performance Building Certification System Review* [<https://www.gsa.gov/about-us/organization/office-of-governmentwide-policy/office-of-federal-highperformance-buildings/policy/highperformance-building-certification-system-review>].

<sup>9</sup>See GSA, *High-Performance Building Certification System Review Findings Report (2019)* [[https://www.gsa.gov/cdnstatic/HPBCS\\_Findings%20Report%20March2019.pdf](https://www.gsa.gov/cdnstatic/HPBCS_Findings%20Report%20March2019.pdf)].

rooftop photovoltaic panels along with a thermally enhanced building envelope and advanced metering and controls helped the Aspinall Federal Building achieve net-zero status.<sup>10</sup>

#### FEDERAL PROGRESS

The federal government is one of the nation's largest energy consumers, spending approximately \$6 billion in FY 2017 to provide energy to more than 300,000 buildings.<sup>11</sup> Over the past decade, driven by agency leadership, congressional and executive direction, GSA and other Federal agencies have made strides in saving energy, water, and money, while providing high quality spaces with indoor air quality that promotes wellness and productivity.

The GSA uses high-performing building standards as part of its tools and strategies to help achieve energy and water savings goals. GSA reported in 2015 that it had reduced its EUI by over 30 percent since 2003, resulting in \$83.6 million in avoided utility costs in 2015. With water, GSA reported reducing its water use intensity (gallons per square foot) by nearly 30 percent from 2007-2015, avoiding over 2.78 billion gallons of water use since 2007 through efficiency and saving \$10.6 million in FY 2015.<sup>12</sup>

For a 2018 report, GSA examined 200 buildings over a three year period and found that, compared to legacy buildings, GSA's high performing buildings show 23% less building operating expenses, 23% less energy use, 28% less water use, and a 9% decrease in waste.<sup>13</sup> And, according to the Office of Management and Budget (OMB), as a result of historic investments in energy efficiency since 2009, the government will consume 20 percent less energy in buildings than it would have, saving taxpayers billions of dollars.

High performing, green building certification systems—particularly LEED—have helped agencies achieve these savings. GSA's use of third-party standards, including LEED, fulfills the National Technology Transfer and Advancement Act (NTTAA) of 1996, which calls for the federal government to use nongovernmental standards where appropriate, rather than waste government resources to create duplicative standards. GSA's ad-hoc Discussion Group found in 2013 that “[P]roperly aligned with government requirements, use of these systems saves government resources by eliminating the cost to Government of developing its own standards while furthering the policy of reliance on the private sector to supply Government needs for goods and services.”

In addition to GSA's leadership by example and its recommendations for third-party high-performing building certification systems, government-wide efficiency is also significant aided by FEMP, a DOE office that provides key efficiency guidance and services to federal agencies. FEMP also works with agencies and with the Office of Management and Budget, and the Council on Environmental Quality, on reporting related to energy, water, and other aspects of sustainability.

Through these efforts, the Office of Federal Sustainability of CEQ reports that in Fiscal Year 2017, the Federal government reduced energy in Federal buildings by 2% since FY2016 and reduced potable water consumption by 3.8% since FY2016. In addition, Federal agencies reported leveraging \$1.145 billion in private sector investments (performance contracts) to drive energy and water savings in Federal facilities; using renewable energy to power more than 10% of facility energy needs; and increasing renewable electricity produced on Federal land by 16% since FY2016.

The Office collects and reports additional critical data, including government Scope 1 and 2 greenhouse gas (GHG) emissions, which indicate over 25 percent reduction since 2008. Investment in federal efficiency is also tracked; these data reflect American Recovery and Reinvestment Act of 2009 (ARRA), which includes the single largest investment in energy efficiency in history. GSA, for example, received over \$5 billion to invest in high-performing buildings. These data also help show the leverage of private sector funding through performance contracts, which continues to increase.

<sup>10</sup> See GSA project information page [<https://www.gsa.gov/about-us/regions/welcome-to-the-rocky-mountain-region-8/buildings-and-facilities/colorado/wayne-n-aspinall-federal-building-and-us-courthouse>].

<sup>11</sup> Data drawn from the DOE, Comprehensive Annual Energy Data and Sustainability Performance database [<https://ctsedweb.ee.doe.gov/Annual/Report/HistoricalFederalEnergyConsumptionDataByAgencyAndEnergyTypeFY1975ToPresent.aspx>].

<sup>12</sup> GSA, FY 2016 Strategic Sustainability Performance Plan [[https://www.gsa.gov/cdnstatic/GSA\\_FY\\_2016\\_SSPP\\_Final\\_Cleared\\_508.pdf](https://www.gsa.gov/cdnstatic/GSA_FY_2016_SSPP_Final_Cleared_508.pdf)].

<sup>13</sup> U.S. General Services Administration, “The Impact of High Performing Buildings” [[https://www.gsa.gov/cdnstatic/GSA%20Impact%20of%20HPB%20Paper%20June%202018\\_508-2%20\(1\).pdf](https://www.gsa.gov/cdnstatic/GSA%20Impact%20of%20HPB%20Paper%20June%202018_508-2%20(1).pdf)] (2018).

GAO has also affirmed Federal agency benefits from green building systems. As part of the Government Accountability Office's (GAO) portfolio of work on the performance and accountability of federal agencies with respect to sustainability, GAO evaluated the implementation of key green building requirements as directed by federal laws, executive orders and other policies.<sup>14</sup> The report examined the use of third-party certification, including the LEED green building rating system, in helping meet these standards.

GAO surveyed five agencies including the GSA, Department of Energy (DOE) and the Environmental Protection Agency (EPA), each of which have green building expertise and responsibilities related to federal guidelines for buildings, and the Veterans Administration (VA), Air Force and U.S. Army, as building owners and users. GAO did not make any recommendations to improve performance or evaluation or use of green building rating systems by the federal agencies.

All five agencies use LEED in their current policies related to new construction and major renovations. Additionally, officials from all five select agencies (DOE, EPA, GSA, VA, Air Force, and Army) reported to GAO that third-party certification helps ensure compliance with key building requirements by holding contractors and agency project teams accountable for incorporating the requirements. GAO reported agency comments on how LEED is used to support federal efforts, including reducing costs, promoting accountability, and providing a framework for projects. According to GSA officials, as reported to GAO, third-party certification accounts for an average of just .012 percent of total project costs.

#### BROAD BENEFITS

Beyond the direct financial benefits, high-performing buildings support a productive federal workforce. For example, a series of recent academic studies quantified higher cognitive function scores, fewer sick building symptoms and higher sleep quality scores associated with green, energy efficient buildings; and higher cognitive function with improved indoor air quality, associated with properly managed energy efficient buildings.<sup>15</sup> Specifically, the studies found improved indoor environmental quality doubled cognitive function test scores. Scores averaged 101% higher in green buildings with enhanced ventilation compared to conventional buildings. Finally, the studies estimated \$6,500 in annual improved productivity in green buildings with enhanced ventilation.

Federal agencies' use of high performing buildings may also have a positive spillover effect, in encouraging the spread of innovative building science and technology. A Harvard Business School study found that public investment in LEED-certified government buildings stimulates private investment, supply and market uptake of greener building practice.<sup>16</sup> The research finds that green public building commitments produce a near doubling effect in private investment across the building sector and up and down the supply chain of products, professionals and services.

#### EXPORTS

Global markets see growth for high performing, energy efficient buildings and the products and services that support their development and operation. Goods and services touching on clean energy, energy efficiency, resilience and increasingly, buildings and infrastructure related IT and data, are a growing area of the U.S. economy. These sectors provide an already impressive number of jobs for U.S. citizens including many high quality manufacturing and construction jobs. According to the IEA, the global market for energy efficiency in buildings grew by 9% from 2014 to 2015 to \$388 billion.<sup>17</sup> A 2016 study found that global green building continues to double every three years.<sup>18</sup>

Private and public sector support for energy efficiency and sustainability within the U.S. has enabled a thriving industry, in turn creating a huge export market for U.S. made building products and services. The U.S. Department of Commerce projected a \$39 billion export market for the building sector in 2018, with focus on sus-

<sup>14</sup>Federal Green Building—Federal Efforts and Third-Party Certification Help Agencies Implement Key Requirements, but Challenges Remain, GAO-15-667, July 2015, Page 17.

<sup>15</sup>See Harvard T.H. Chan School of Public Health, "The impact of green buildings on cognitive function." [<https://green.harvard.edu/tools-resources/research-highlight/impact-green-buildings-cognitive-function>]

<sup>16</sup>T. Simcoe and M. Toffel, Public Procurement and the Private Supply of Green Buildings, National Bureau of Economic Research, Working Paper 18385 (2012).

<sup>17</sup>International Energy Agency (IEA), Energy Efficiency Market Report 2016.

<sup>18</sup>Dodge Data & Analytics, SmartMarket Report: World Green Building Trends 2016: Developing Markets Accelerate Global Green Growth (2016).

tainable, energy efficient goods and services.<sup>19</sup> Commerce identifies the global demand for sustainable construction as a major driver for the demand for US products and services; with China number 3 in importing American building products.

This strong export market for products such as wood products, windows and doors, insulation, HVAC, plumbing and glass all increase good jobs here in the U.S. As Commerce observes, with increased global interest in smart, resilient, and efficient buildings, “U.S. building products are competitive . . . U.S. manufacturers have much to offer global markets that recognize increasing building performance.”<sup>20</sup>

#### FEDERAL DRIVERS

As a starting point, energy efficiency in federal buildings is established in law. Since the energy crisis of the late 1970s, Congress has repeatedly sought to ensure federal buildings achieve energy efficiency. Notably, the Energy Independence and Security Act of 2007 (EISA) requires federal agencies to reduce energy use in federal buildings by specified levels each year, culminating in a 30 percent reduction by 2015. More recently, in 2012, Congress added requirements regarding building metering and transparency, to help hold agencies accountable for their progress in energy management.

EISA also established GSA’s Office of Federal High-Performance Green Buildings, and required it to identify the certification system that is “most likely to encourage a comprehensive and environmentally sound approach to the certification of green buildings,” as noted above; In consultation with GSA and the Department of Defense, the Department of Energy (DOE) was then required to identify a system and level for use by agencies. The DOE rule asserts “the Federal government has a statutory obligation to lead by example,” and pushes agencies to do better. The DOE rule formalizes a policy of flexibility for federal agencies in how they meet requirements for energy and water efficient buildings.

Federal guidelines known as the Guiding Principles established by Federal agencies in 2006 and incorporated into executive orders in 2007 and 2009 and later codified by Congress, and updated in 2016, sets out to achieve gains in five key areas of sustainability: employ integrated design principles, optimize energy performance, protect and conserve water, enhance indoor environmental quality, and reduce the environmental impact of materials.<sup>21</sup>

#### AREAS FOR INCREASED IMPACT

Federal progress over the last decade has been significant, in term of increasing energy and water efficiency in buildings, providing indoor environments that support wellness and productivity, and achieving sustainability. Ensuring adequate continued funding for the GSA Office of High Performing Green Buildings is key to continued progress, as well as authorization of and funding for FEMP, which plays a critical role along with GSA in supporting government-wide energy and water efficiency and sustainability, for buildings and government operations. FEMP is a hub for best practices and provides services to help agencies implement improvements, including procurement through energy savings performance contracts, utility energy service contracts, and distributed energy.

We see opportunities to strengthen and expand Federal building sustainability and cost savings. For example, Federal agency goals for key metrics such as energy use, water consumption, renewable energy, and efficiency investment such as performance contracting, should be continued to ensure all agencies are engaged in and benefit from efficiency. Federal energy efficiency performance standards are another area where updating could help increase federal savings. For leases, there is opportunity to strengthen the applicability of efficiency and green lease provisions, and to further ensure cost-effective efficiency measure requirements are implemented.

To enhance resilience activities in particular, existing federal facilities, campuses, and land, can further utilize green infrastructure and stormwater management to reduce strain on local waterways, storm drains, and wastewater systems, building off of what is required under EISA 2007 for new development. Goals for applying these strategies could also be helpful.

<sup>19</sup>U.S. Department of Commerce, International Trade Administration, 2016 Top Markets Report: Building Products and Sustainable Construction, A Market Assessment Tool for U.S. Exporters (2016).

<sup>20</sup>Id.

<sup>21</sup> See *Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings* [<https://www.energy.gov/eere/femp/guiding-principles-sustainable-federal-buildings>].

Also related to resilience, as well as energy independence, Federal agencies can be encouraged to attain net zero operations at key facilities, to showcase American innovation as well as serve as hubs and operations centers. Pilot testing of new resilience tools and systems may also be beneficial, particular in conjunction with critical facilities such as military bases and hospitals; as would be a resiliency fund. In this regards, we encourage a broad view of resiliency to include health. We are also supportive of the reinstatement of a Federal flood risk management standard, to protect Federal investment.

Several contracting provisions could also be updated to reflect current conditions and opportunities. Federal agency achievement related to renewable energy could be increased with extension of allowable timeframes for power purchase agreements. Agency use of Utility Energy Service Contracts provisions could also benefit from an extension in permissible contract length, while their use of Energy Savings Performance Contracts could be increased with specific directives and clarifications.

With respect to Federal planning, we support continuation of agency Sustainability Plans, along with tracking and reporting, and are pleased to see that the recently issued Implementing Instructions for Executive Order 13834 include these critical requirements. The agency scorecards are also important and highlight some specific areas for further attention. These could potentially be expanded to incorporate resilience metrics.

In the context of infrastructure, we support inclusion of public buildings, including Federal buildings, as part of a package. In particular, funding could drive increased efficiency and resiliency in retrofitting or replacing aging facilities.

Thank you for the opportunity to provide information to the Subcommittee on this important topic.

Mr. VAN DEN WYMELENBERG. Good morning. I want to thank Chairman DeFazio, Chairwoman Titus, Ranking Member Meadows, and all the members of the committee for this opportunity.

As was mentioned, I direct the Energy Studies in Buildings Lab. But additionally, I direct the Biology and the Built Environment Center, and an institute called the Institute for Health and the Built Environment. Together, we are a group of designers and scientists from multiple institutions that partner with groups in industry in a program called Build Health. And together our goal is to look for the synergies between energy efficiency and healthy indoor environments.

Today I want to emphasize that a vision of resiliency that encompasses human health indoors and unleashes the power of integrated design is the key to unlocking deeper energy savings, while also promoting health indoors.

Why does resilience in buildings matter? Americans spend over 90 percent of our lives in buildings. After decades of increasing life-spans, now we see declines. We are spending more on health care than other industrialized countries, yet our quality of life and our life expectancy is decreasing.

Evidence is mounting that indoor environments impact human health outcomes. You may have heard of sick building syndrome, and thought we fixed that a couple of decades ago. But maybe more recently you have experienced headaches from background noise from traffic or a building fan whirring. And the WHO has connected those kind of impacts to cardiovascular and metabolic health implications. Or maybe you have had a child or a grandchild come home from daycare with a rapidly transmissible virus that wreaked havoc in your home. Or maybe you got sick, or a loved one got sick when they went to the hospital, the very place they were meant to go get healthy. So indeed, indoor environments impact human health.

So how are we doing on energy efficiency? Certainly we have made tremendous progress in efficiency: lighting and HVAC technologies, secondary glazing systems, smart windows, smart building infrastructure software. Many of these innovations are funded by the Department of Energy, implemented through GSA, and then supported with public utility investments.

Recently we worked with a group called the Northwest Energy Efficiency Alliance and Seattle City Light to pilot the first power purchase agreement for energy efficiency. It is typically used for rooftop solar. These efforts, though incredibly important, have only slowed the growth of energy consumption in the United States.

I will argue that we need more leverage. We spend \$1 on energy, and for every dollar we spend on energy we spend \$100 on employees. We need to focus on people. We need to focus on improving the health and wellness of people in buildings. And we need to make sure that we pull increased energy efficiency along for the ride.

So what is a resilient building? You might think of a resilient building as passive survivability, this idea that, under a power outage, that people can have access to light and air and still occupy a building safely. But we need a grander vision that I will call passive thriveability. This idea is that resilient buildings can improve the health of occupants, regenerate the health of the planet, produce more energy than is consumed, and support a healthy bottom line for the businesses that operate within them.

It is a grand vision, but the good news is we have two or three decades of lessons that can be learned from our efforts in energy efficiency market transformation that can be brought to bear. We have learned that we need ingenuity and innovation. We need incentives and investments. We need policy and education to sustain that innovation. This can be complex, or really quite simple.

When we put people next to an operable window they get an access to views of nature, they get abundant daylight, they get access to fresh air when they think they need it. And these have all been associated with increased health outcomes, circadian entrainment, supporting healthy sleep-wake cycles, accelerated stress recovery, and reduced exposure to indoor toxicants. This elegant strategy also can save tremendous amounts of energy. This is passive thriveability.

I encourage the committee to consider the following recommendations. I suggest we need to capitalize on the investments that we have made over decades in energy efficiency; document the persisting energy savings; establish reinvestment mechanisms; and research the associated non-energy benefits of health and comfort, such that we can drive these investment mechanisms for deeper energy and improved—deeper energy savings and improved health.

At the University of Oregon we call this approach, this program, BTUs 4 BTUs, or Building Tune-Ups for BTUs—reduced energy savings. We are developing metrics for non-energy benefits, developing institutional performance verification strategies, and reinvestment plans. We are expanding this with a campuswide building resilience initiative.

In closing, I would like to suggest that Federal buildings have a well-established tradition of serving as agents of change in our built environment. And the lessons that we have learned in the last

decades in energy efficiency can be applied to our new vision for resiliency.

Thank you.

[Mr. Van Den Wymelenberg's prepared statement follows:]

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**Prepared Statement of Kevin Van Den Wymelenberg, Director, Energy Studies in Buildings Laboratory, University of Oregon**

Good morning Chairwoman Titus, Ranking Member Meadows, and Committee Members. I want extend my gratitude to Chairwoman Titus, the Ranking Member, and all members of the committee for the opportunity to submit testimony about energy efficiency and resilience in federal building design and construction. I also want to thank you for your service to our country and your leadership through the impactful work of this subcommittee.

I am Kevin Van Den Wymelenberg, a professor of architecture at the University of Oregon. I direct the Energy Studies in Buildings Laboratory, a laboratory that for the past four decades has focused on passive heating and cooling, passive ventilation and daylighting in buildings. I co-direct the Biology and the Built Environment Center, a center focused on understanding indoor microbial ecology, the microbiome, and the architectural and human factors that influence it. I also lead the Institute for Health in the Built Environment, a cross-disciplinary institute comprising designers and scientists at the University of Oregon and many other collaborating universities, along with an industry partnership program called *Build Health* that seeks to research and design strategies that synthesize energy efficiency and human health.

Today, I will describe how the habitat in which Americans spend the majority of their time is changing and how this is connected with energy resource consumption, human health and well-being, and overall economic productivity. I will describe a vision for improving our built environment and the role of resilient design to achieve energy efficiency and improved human health outcomes. I will illustrate how our efforts to transform energy efficiency markets have taught us important lessons about how to achieve our goals for resilience of individuals, buildings, communities and our country. Finally, I will open a window to illuminate how to initiate and sustain progress toward our goal of resilient buildings and communities.

Over the course of the last 5–7 generations, Americans have transformed how and where we spend our time. We have moved indoors, become an indoor species. We have yet to fully understand the implications of this transformation. Over the same period, we have increased life-expectancy, from below 50 years of age in 1900 to nearly 79 years of age in 2010. But in the last few years, according to the Centers for Disease Control and Prevention, Americans are experiencing annual declines in life expectancy, in part due to factors related to mental health. Furthermore, we are falling behind our peers in Spain, Australia, and Canada, by as much as four years, despite the fact that we spend thousands of dollars more per person each year on healthcare than these countries (per OECD data). Evidence is mounting that highlights a connection between indoor environmental quality and human health outcomes. We have seen steep increases in inflammatory diseases including asthma, especially in families living in low-income housing. We have observed increases in healthcare-associated infection so severe that insurance companies are sometimes not reimbursing these costs and patients are beginning to make health care choices with infection risk in mind. Similarly, we have experienced increased absenteeism in K–12 schools due to the prevalence of rapidly transmissible viruses which appear increasingly resistant to antimicrobial compounds. In Oregon, as in other states, we have recently witnessed more severe wild fires whose smoke has forced my campus to shut off access to outside air in buildings for days at a time.

In the last 100 years we have dramatically increased energy production and consumption. In recent decades we have made concerted efforts to reduce energy consumption. Over my 20-year career in architectural research, I have witnessed tremendous innovations for energy efficiency by manufacturers of lighting and HVAC equipment, industry service providers of smart building infrastructure software, by public utilities through public benefit charges and incentive programs, by research funded through the US Department of Energy's Building Technology Office, and through standards within the US Government, such as building energy performance targets in federally owned or occupied buildings. These efforts, though incredibly important and substantial, have only *curbed* US total growth in energy consumption, *not* significantly reversed the trend.

I argue that we need a more leveraged suite of tools, a more comprehensive cost/benefit analysis than relying on energy efficiency alone. There is a principle of 3, 30, 300, in workplace facility management that proportionally represents business expenditures, such that if an organization annually spends \$3 per square foot on utilities, and \$30 per square foot on building infrastructure, then that same square foot will cost \$300 for employees annually, scaled by geographic and market location. Today, we are not only talking about federal spending on utilities and buildings, we are also talking about better leveraging spending to support federal employees such that they can more readily achieve the missions expected of them by taxpayers, policy makers, and meet their own high professional standards.

When we get past looking solely at building efficiency and open the discussion to resilience in federal buildings, we increase the scope of our potential impact to the lives of all federal employees. Resilience encompasses several aspects of building design, construction and operation. We can think of resilience as “passive survivability”, or the ability for people to survive in a building during a disaster or power outage. Do building occupants have access to light and air? Survivability is critical during an extreme event, but for a more comprehensive understanding of resilience on a day to day basis, we really need a vision of “passive thrive-ability”, or environments that improve human productivity and health outcomes while using less energy and approaching net-zero energy performance. We can also think of resilience as supporting the triple bottom line of people, planet, and profit. Resilient buildings improve the health of the people who occupy them, regenerate the health of the planet through their design, construction and operation, and produce a healthy bottom line for the organizations that use them to support governance and commerce.

Conceived in this manner, creating resilient buildings and communities is essential to the prosperity of our country, and indeed represents a grand challenge! The good news is that there are some important lessons to glean from decades of investment into market transformation for energy efficient buildings. First, we have learned it takes ingenuity and innovation. Academics have to generate new ideas, businesses need to create new technologies, and professionals need to innovate new best practices. Second, we need incentives and investment to ignite this innovation. We have seen the beneficial impacts of utility public benefit funded investments, such as that of the Northwest Energy Efficiency Alliance to support integrated design and energy efficiency market transformation, philanthropic and foundation support, such as that of the Alfred P. Sloan Foundation for fundamental research on indoor microbial ecology and indoor chemistry, and federal research funding such as that of the EPA and DOE. We have seen how mission-driven non-profits promote reach standards that focus the public's attention and provide guidelines for how to achieve these goals, how government organizations such as the General Services Administration can mobilize the private sector by establishing building performance thresholds, and finally how universities and industry can partner, through programs like *Build Health* at the University of Oregon, to sustain this progress by collaboratively exercising their business models.

Many of these lessons are transferrable to our quest to create resilient buildings and communities. We can leverage the power of design to take advantage of synergies in both human health and building energy goals. For example, we can provide people with an operable window, replete with access to a view of nature, filling rooms with abundant daylight, and direct access to fresh air. We can create spaces that achieve high performance thresholds for thermal, visual, and acoustical well-being while providing high air quality. These attributes have been shown to support positive human health outcomes through circadian entrainment, attention restoration, accelerated stress recovery, improved cognition, increased indoor microbial diversity, and reduction of low dose exposures to toxins. When implemented properly, these same strategies can dramatically reduce energy consumption. This is “passive thrive-ability”; this is building resilience.

In order to take advantage of the longer lever arm of our investment in people, there are critical knowledge gaps and barriers in practice to overcome. First, we need a clear vision that defines a healthy building and recognizes that energy efficiency alone is not a sufficient goal. Second, we need resources to ignite innovations that aim to improve human health indoors, document the impact of associated health outcomes, and monetize these for use in lifecycle cost-benefit studies. Third, we need to promote policies, reach standards, and educational programs that sustain continuous improvement and scale up implementation in a collaborative manner, inclusive of government, education, and private industry sectors. It is especially important that care be taken to support equity through these efforts so as to avoid some of the documented pitfalls of socio-economic class disparities that currently exist in our built environment.

I believe that the GSA is already on the pathway to efficient and healthy public buildings, indeed resilient buildings, and that their efforts to date should be lauded and further supported. Federal leadership has made a positive impact on energy efficiency market transformation and holds similar potential for healthy and resilient buildings. These efforts have taught us many important lessons that can accelerate our progress in this new quest. However, we need to be willing to transform our thinking and shift away from what has been a more singular focus on energy efficiency in public buildings and toward the inclusion of the health of federal employees, veterans, security and maintenance staff, guests and others that inhabit our public buildings. Only by harnessing the longer lever arm associated with the resources we invest in people will we achieve our far more ambitious goal of building resilience and support optimal human health and productivity. I encourage the committee to consider the following three recommendations to promote efficient and resilient public buildings that foster thriving occupant communities.

First, we should capitalize on the investments we have made in efficiency to date by documenting the persistent energy savings from strategies implemented and the associated non-energy benefits in domains such as thermal, visual, and acoustical well-being and improved air quality. This will facilitate efforts to establish mechanisms to reinvest these savings to drive deeper efficiency and even more positive human health outcomes. To accomplish this, we need further research to determine measurable and verifiable metrics for monetizing the associated non-energy benefits, case studies to test these approaches, some additional convening to facilitate the peer-review process and consensus building. The results of this work would have far-reaching impacts beyond GSA, including expanding public utility incentive programs and efforts of energy efficiency market transformation organizations.

Second, we should pilot these reinvestment mechanisms to implement deeper energy efficiency and human health strategies in existing federal and state public buildings. For example, the University of Oregon is in the second year of piloting ongoing building commissioning, a strategy whereby energy savings are achieved through improved building management tools and practices. We are developing metrics to document improved human comfort, productivity, and health outcomes, and developing institutional performance verification and reinvestment strategies. We are documenting the energy savings from ongoing commissioning and reinvesting a portion of these funds to support more ambitious goals for energy and health in existing buildings. We are concurrently developing a cross-disciplinary Resilience Initiative that aims to have teaching, research, and industry engagement components and will benefit from and support the ongoing building commissioning program. The reinvestment strategy creates a self-sustaining pool of resources to promulgate the initiative. The GSA has conducted building commissioning and has additional insights to share. We propose a program I call *BTUs 4 BTUs*, Building Tune-Ups for BTUs (energy), that expands our current work in ongoing commissioning and campus resiliency, and we would relish the opportunity to collaborate with GSA to pilot the program and potentially extend the model through collaboration with other universities and public sector organizations.

Third, the current and emerging investment streams need to be paired with targeted incentives, establishment of federal policies, and research grants that build upon lessons learned from energy efficiency market transformation to fill knowledge gaps and barriers in practices in order to achieve goals of healthy and resilient buildings. These steps can unlock increased energy savings and human productivity improvements while reducing the cost of operating infrastructure.

Public buildings have a well-established tradition of serving as pace-makers and agents of change for our built environment. By building upon these successes and striving for a more holistic vision of resilient buildings we can accelerate the implementation of energy efficiency, innovate best practices, increase productivity, support well-being, and ultimately reverse the disconcerting downward trend in life expectancy and rising cost of healthcare for Americans.

A grand challenge is upon us. Realizing the promise of resilient buildings will improve the health outcomes of the people inside, regenerate the health of the planet, and produce a healthy bottom line for the organizations that use them. Thank you for your time and attention.

Ms. TITUS. Dr. Russell?

Mr. RUSSELL. Thank you, Chair Titus, Ranking Member Meadows, and the committee for this chance to share some information about GBI and Green Globes' experiences working with the Federal Government on sustainability projects.

I am Mark Russell, a professional engineer with a background in Government construction building rating systems. As a Green Globes Assessor, I have completed 44 Federal Green Globes and Guiding Principles Compliance projects, and have 22 additional Federal projects in progress. I am appearing here on behalf of the Green Building Initiative.

GBI is a 501(c)(3) company which owns and operates the Green Globes sustainable building certification system. Green Globes offers four levels of certification, using a 1,000-point system. Points are weighted across the criteria to drive users toward best practices in areas such as energy, water, and materials. Green Globes' process also requires third-party assessment by a Green Globes Assessor. Assessors like me conduct oversight of each project, and conduct a final onsite assessment at completion to ensure the building has earned its certification level.

Green Globes also offers a not-applicable feature that allows projects to identify criteria that do not apply to the buildings. N/As are approved by assessors, and allow unique projects, like many undertaken by the Federal Government, to complete Green Globes certification without being penalized for lack of compliance with criteria that do not apply to them. For example, a museum that cannot allow windows and day-lighting in most of its space due to the need to preserve artifacts is not penalized for failure to have adequate energy-efficient windows.

GBI also offers a program called Guiding Principles Compliance, designed specifically for use by the Federal Government. In 2015 GBI introduced a DoD-specific GPC version that combines the DoD unified facilities criteria and the Interagency Sustainability Working Group's guiding principles into one program. These programs help departments and agencies to confirm compliance with Federal guiding principles requirements for sustainability.

The GSA, in 2013, and again in a 2009 review, recommended Green Globes for use by the Federal Government. GBI has long supported the idea that the Federal Government should encourage competition in the marketplace, as it relates to federally approved certification systems. As a significant marketplace customer, the Federal Government should have choices among certification systems to identify those that best meet the needs of the many unique projects the Government undertakes. Encouraging certification systems to compete helps the Government ensure it is getting what it needs on projects, attaining a good cost benefit for taxpayers on certification, and encouraging systems to continue to evolve to meet future needs.

Since 2014 over 600 Federal projects have been certified under Green Globes, and 104 Federal projects are in progress. In all, over 750 Federal building certifications have been done through GBI. We have worked with a broad scope of Federal buildings, including projects such as courthouses, data centers, laboratories, and VA hospitals. As an assessor I have encountered many interesting Federal projects that use creative methods for energy savings, such as a VA facility in Oregon that uses an ice plant to create an ice reservoir that is then used during the day to cool the facilities.

We continue to see Federal project teams make great progress in improving their buildings. Repeat clients often demonstrate signifi-

cant enhancement in subsequent buildings, and the use of the certification program helps organize and guide Federal teams. Building performance improvement helps to provide long-term savings to taxpayers as a result of energy and water savings, and increased workforce productivity, and followup with Federal teams to indicate that they see positive impacts to the operational costs resulting from the stabilizing measures incorporated into the buildings.

Government teams also have an increasing interest in understanding how occupant health, wellness, and effectiveness is influenced by their buildings, supporting a desire to provide buildings that are pleasant to work in, and lead to more efficient and productive work environments. This interest has helped to encourage the evolution of certification systems, which are now looking more closely at indoor environment criteria.

Building resilience continues to be an important concept, but one that still needs further discussion and definition. This is a great challenge ahead in determining how to establish which Federal buildings need to be resilient, and to which disasters or challenges. As part of the Guiding Principles Compliance Certification, we require the project team to identify potential impacts as part of the design process, and Green Globes' new update includes building risk assessment that attempts to identify resilience priorities.

In conclusion, improving the performance of Federal buildings stands to have ultimate benefit for operational costs, Government workers' productivity, and also taxpayers, who benefit from the cost savings generated by a more nimble, energy-efficient, and sustainable Federal portfolio.

The Green Building Initiative has greatly enjoyed its ongoing collaboration with the Federal Government on hundreds of projects, and we look forward to assisting the Federal teams as we improve Federal buildings and spaces to address better performance, sustainability, resilience, and savings for American taxpayers.

Thank you for this opportunity to provide our thoughts.

[Mr. Russell's prepared statement follows:]

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**Prepared Statement of Mark Russell, Ph.D., P.E., GGA, LEED AP, BREAA  
IA, Green Globes Assessor, Green Building Initiative**

Thank you Chair Titus, Ranking Member Meadows, and members of the committee for this opportunity to share some information and thoughts on the Green Building Initiative (GBI), our certification system Green Globes, and our work supporting the federal government's efforts toward advancements in green building.

My name is Mark Russell and I am a professional engineer based in Gainesville, Florida, with a PhD in Building Construction. My PhD dissertation focused on enhancing building rating systems. I am also a credentialed Green Globes Assessor (GGA) who has completed 44 federal building projects under the Green Globes and Guiding Principles Compliance programs. I have 22 additional federal projects currently in progress. I am appearing here today on behalf of The Green Building Initiative (GBI).

This statement will discuss the Green Building Initiative: our green building certification systems Green Globes and Guiding Principles Compliance; GBI's role working with the federal government on green building and sustainability; and the trends we see in this space.

THE GREEN BUILDING INITIATIVE: GREEN GLOBES AND GUIDING PRINCIPLES  
COMPLIANCE PROGRAMS

First, I would like to provide some background on GBI for those on the Subcommittee who are not familiar with our role. GBI is a 501(c)(3) non-profit organiza-

tion that brought the Green Globes certification system into the U.S. in 2004, having been adapted to the U.S. market from its original Canadian version. In 2005, GBI was approved as the first ANSI consensus-based Standards Developer for commercial green building certification systems in the U.S. GBI then undertook a multi-year process to bring together an ANSI Consensus Body and develop its American National Standard, ANSI/GBI 01–2010: Green Building Assessment Protocol for Commercial Buildings. Green Globes was further revised in 2013 to make several improvements, including adding many of the federal government’s Guiding Principles requirements into the system, and transitioning the entire system into a comprehensive online software program that provides clients with a user-friendly system that promotes a team-based approach to achieving goals. GBI has received ANSI approval of the revision to its 2010 American National Standard, now titled, ANSI/GBI 01–2019: Green Globes Assessment Protocol for Commercial Buildings, and it will be published in mid-June, 2019. In fact, today in Chicago, GBI is conducting its Board of Directors meeting to review ANSI’s final approval of ANSI/GBI 01–2019: Green Globes Assessment Protocol for Commercial Buildings, and to vote to approve and officially publish the updated consensus standard. This represents the culmination of a four-year cycle in the ANSI consensus update process that consisted of 38 full Consensus Body meetings, a total of more than 230 open meetings including subcommittee meetings, and 3 open public comment periods. Going forward, the updated Standard will be maintained using ANSI’s Continuous Maintenance process.

Green Globes offers four levels of certification. One Green Globes is the first level and requires at least 35% of Green Globes criteria to be met; whereas Four Green Globes is the highest level and requires 85% of criteria to be met. Green Globes uses a 1000-point system, where the point allocations are strategically weighted across the criteria to drive users towards best practices, rather than static prerequisites. The criteria cover a number of categories including energy, water, project management, site, water, materials & resources, emissions, and indoor environment.

Additionally, Green Globes’ process requires third-party assessment by an experienced Green Globes Assessor (GGA or assessor).

Under GBI’s requirements, GGAs must be a licensed engineer or architect, have an educational background in engineering, architecture, or sustainability, 10+ years of prior building experience, evidence of significant work on at least three sustainable projects, and must also complete GBI’s Green Globes Assessor training program and pass a series of exams. Assessors are involved with each project from the earliest possible point. Although the first official review of the project often occurs at the completion of the construction documents, assessors can be called upon by the design team during the design phase to provide recommendations to improve the building performance. Once the building has been completed, the assessor travels to the building location and performs an onsite assessment prior to submitting the final report on eligibility for certification. During the site visit, the GGA meets with the project team, reviews final documentation, and tours the building in a typically 6–8 hour timeframe to verify implementation of claimed credits. The GBI performs a review of all reports to ensure consistency and appropriate credit validation prior to issuing the official building certification. Once the certification is completed, the client receives a detailed copy of their final assessment report, which identifies the criteria that were met to achieve their level of certification, and provides recommendations for additional actions that can be taken in the future to improve the building further.

Green Globes’ combination of weighted criteria and direct oversight by third-party assessors makes across-the-board prerequisites unnecessary in our system and accommodates each building’s unique features and sustainability goals. In addition, the Green Globes system includes a Not Applicable (N/A) feature that allows project teams to identify criteria that do not apply to their projects. The assessor verifies the validity of each N/A claim through a document review or site visit—meaning project teams cannot claim N/A for a criterion simply because they don’t want to comply with it. Weighted criteria, actively engaged expert GGAs, an onsite assessment, and the ability to identify N/As mean that Green Globes can be used to certify unique buildings in both the private and public sectors. For example, a recycling facility in the Rocky Mountains at an elevation of 10,000+ feet is not penalized for a lack of energy efficient air-conditioning systems because the climate requires no air-conditioning. Likewise, a Department of Defense building that—for mission purposes—has no windows is not penalized under Green Globes for omitting energy efficient windows from its design.

In 2012 GBI first introduced to the federal market our Guiding Principles Compliance (GPC) program, which was designed specifically to help federal departments and agencies to efficiently and confidently confirm their compliance with the re-

quirements of federal guiding principles for sustainability. The 2013 update of Green Globes also included the incorporation of federal guiding principles requirements as established by the Interagency Sustainability Working Group (ISWG) as a subcommittee of the Steering Committee established by Executive Order (E.O.) 13423. The ISWG initiated development of the *High Performance and Sustainable Buildings Guidance (Guiding Principles)* to meet the EO goals. Additionally, in 2015, GBI worked closely with the Department of Defense to develop a program called Department of Defense Guiding Principles Compliance for New Construction & Modernization (DoD GPC NC,) which specifically combines the federal guiding principles requirements and those of the DoD's Unified Facilities Criteria (UFC 1-200-02) to provide the military branches with a program that allows them to verify compliance with the complex overlay of both federal and military-specific requirements. Not long after launch, the DoD GPC NC program was updated to reflect changes made in the 2016 Guiding Principles update.

Federal projects choose either to certify under Green Globes, Guiding Principles Compliance, or in some cases, dual-certify under both systems. The GPC programs are prescriptive in nature, covering the requirements of the Guiding Principles, whereas Green Globes is performance-based. Many federal teams choose to dual-certify their buildings under GPC *and* Green Globes because it provides guidance on additional opportunities for sustainable design in a building. As of May, 2019, 193 federal projects have certified under both programs.

#### FEDERAL RECOGNITION AND FEDERAL PROJECTS

In 2013, Green Globes was recognized by the GSA in its statutorily required High-Performance Building Certification System (HPBCS) Review as a certification program that could be used by the federal government to certify federal buildings alongside of USGBC's LEED program. The GSA recently released its initial analysis of the 2019 HPBCS Review, again recommending Green Globes as a system for use by the federal government.

GBI has long supported the idea that the federal government should encourage competition in the marketplace as it relates to federally approved certification systems. The federal government, as a significant customer in the marketplace, should be able to make choices among certification systems to identify those that best meet the needs of the many unique projects that the government undertakes. Additionally, encouraging certification systems to compete for the government's business not only puts the government into a better position to ensure it is getting what it needs for its projects, and attaining a good cost-benefit for taxpayers on the building certifications, it also encourages certification systems to continue to evolve and compete in order to meet government needs.

Since federal recognition of Green Globes was confirmed by the Department of Energy in 2014 and Guiding Principles Compliance was introduced in 2012, over 600 federal projects have been undertaken by nine federal departments and agencies including those such as DHHS, DHS, DOD, DOE, State Department, GSA, NASA, Department of Veterans Affairs, and USDA. Today, GBI has 104 additional federal building projects in process, for a total of over 750 federal building reviews completed or in progress since 2014.

The scope of federal buildings certified through Green Globes and GPC is broad. We have worked with projects ranging from offices and courthouses to data centers, laboratories, VA hospitals, specialized military facilities such as military working dog facilities in Guantanamo Bay, Engine Test facilities, Utility Distribution Centers, Submarine support centers, Barracks, Operational Readiness facilities, Training buildings, and Parachute maintenance facilities. Many federal project teams have appreciated GBI's approach to certification—noting that the ability to move their unique buildings and facilities through the GBI process using a team-based and user-friendly online system—and assessors who are actively involved and available to the teams throughout the project—has helped the departments and agencies to achieve their goals.

Some of the more interesting projects I have encountered in my time as a GGA include the renovation of a USDA Forest Service facility in Northern Wisconsin that was designed to reduce impact on the environment and educate the visitors on the sustainable principles; a VA facility in Oregon that uses an ice generation plant to create an ice reservoir that is then used during the day to cool the facilities; and a Navy Exchange car care center that is designed to capture exhausts and recycle vehicle waste products.

## TRENDS IN FEDERAL SUSTAINABILITY EFFORTS

Throughout our work with the federal government and GSA in the area of sustainability, we have noticed several significant trends. As a Green Globes Assessor, I see directly that repeat clients often demonstrate significant improvements in subsequent buildings with energy savings, water conservation, and material selection. The use of the certification program helps to organize and guide federal teams while educating them about the vast possibilities for improving their buildings. Once they have gone through the process, it informs their teams in the next project and often leads to an even greater desire to pursue more sustainability, efficiency, and long-term cost savings. Additionally, I find that in going through the certification process with federal teams that they are increasingly focused on ensuring that information is shared among other facilities in a campus environment and a synergy of techniques such as improved air handling systems and base wide monitoring systems are being installed. The involvement of a base energy manager or a sustainability coordinator enhances the program and further encourages higher levels of building ratings. Much of the data that is accumulated during the evaluation process can be used for tracking building performance and improving the life cycle efficiency of the facility. By effectively capturing the applicable information in the bases monitoring program they can continue to ensure that the building will perform at the optimum level and facilitate future maintenance operations.

Importantly, the use of GSA tools such as SFTOOL.GOV has assisted project managers in selecting appropriate materials and tracking procurement activities. DOE tools such as PVWATTS.NREL.GOV are providing a quick reference to assist with the decision making process. The federal government has invested in creating important tools that help the federal teams make good decisions about building construction and renovations. As an assessor, I often help to educate the project team on the available resources to improve the efficiency of the building and document their decisions.

More broadly, we see that government teams including GSA are increasingly interested in the health and wellness factors that are influenced by the buildings owned and used by the federal government. These factors, while in many cases are still being defined, are increasingly important to federal teams for the impact they have not only on the health and safety of federal workers, but also on creating workplaces that lend themselves to increased productivity of the federal workforce and increased longevity of the workers' tenure with the departments and agencies. This increasing interest in the nexus between buildings and their impact on the health and wellness of the workers within them has encouraged the evolution of certification systems in the private sector to do more to assess these areas. While Green Globes has always assessed key indoor environment factors such as ventilation systems, views, daylighting, air quality, thermal comfort, and noise attenuation, Green Globes' new ANSI update now includes criteria such as passive strategies for natural light, access to outdoors, and a Health Risk-Assessment, which assesses items that could impact the general health and welfare of humans (including residents, workers, and visitors). There is also a section on the Environmental Management System which reviews policies and practices that support the health of humans, especially those in occupied buildings during the construction process, which is often the case in federal projects.

Additionally, among federal teams we have seen an increased focus on attempting to identify the cost-effectiveness and taxpayer benefits of improving the performance of federal buildings. The recent implementing instructions that accompanied *Executive Order 13834, Efficient Federal Operations*, specifically emphasize these concepts as well. Another of GBI's third-party assessors, Jane Rohde of JSR Associates, Inc., who is also a member of GSA's Green Building Advisory Committee, conducted an analysis in 2017 of federal projects certified under Green Globes entitled "Efficiency, Effectiveness and Accountability for Federal High Performance Buildings: Green Globes Certification and Guiding Principles Compliance Assessment Program Cost-Benefits." In the analysis, she noted that a federal high efficiency building's energy and water savings, relative to an average sample of similar federal buildings, demonstrated a return on investment (ROI) of more than 200 percent over the life of the building. In her study of the topic she interviewed many federal agency energy managers with one noting, "[Since the Green Globes certification] back in 2009, we've probably increased our services by 40 percent, and our energy use has stayed flat. We probably have added 1,000 employees in that time."

According to the *National Institutes of Buildings Science's Whole Building Design Guide (WBDG)* [<https://www.wbdg.org/resources/life-cycle-cost-analysis-lcca>], the average life cycle costs of a building over a 30 year period are 2% for design and construction, 6% for operations & maintenance (O&M), and 92% for personnel. If we

assume, for purposes of example, an extremely modest construction cost of \$10 million, this would mean that the operations & maintenance costs of that building would be \$30 million over its lifetime, or roughly \$1 million per year. The WBDG also notes that approximately 50% of the O&M costs annually are in energy, meaning that our imaginary building spends approximately \$500,000 per year on energy costs.

Federal buildings typically design their sustainability projects to achieve around 30% energy savings—in fact, the federal Guiding Principles direct projects to achieve a minimum of 30% energy savings. For purposes of the example, we will assume that the total cost of all sustainability measures (planning, equipment, materials, technology, etc.) cost about 10% of the building cost, or \$1 million. Due to the energy savings built into the sustainability upgrades, the building has decreased its energy use by 30%, meaning it is saving \$150,000 per year in energy versus its previous energy costs. The \$1 million cost of implementing the sustainable features saves \$150,000 per year, and therefore the costs are recouped in 6.7 years. After that point, the initial investment is paid off and the building's energy cost savings are fully benefitting the bottom line. This very basic explanation doesn't take into account the indoor environmental factors that improve the health, well-being, and retention of employees, which is of course more difficult to quantify. But even without considering all of the other benefits that come from sustainability, the imaginary building is saving approximately \$3.45 million alone in energy costs during its 30-year lifetime. These types of savings, multiplied across the vast federal portfolio, are a significant benefit of sustainable design and improvements.

In our opinion, the focus of federal project teams on enhancing the performance and sustainability of the federal building stock provides benefits to taxpayers by improving energy efficiency, lowering water usage, and utilizing advanced technologies and construction practices to lower costs associated with the federal government's building stock. We believe that the efforts of the federal government to continue to pursue efficiency and sustainability should continue to be encouraged.

Another trend we see in both the federal and private sector sustainability fields is a push toward incorporating and better understanding the concept of "resilience." The next step to enhancing the concept of sustainability, the focus on determining the resilience of buildings—how well buildings can withstand an emergency situation and recover from it. GBI's ANSI update has added new criteria related to resilience, including a Building Risk Assessment. The assessment is designed to analyze continued building occupancy resulting from extreme natural events, anticipated changes to regional and local environment, and human activity for the expected service life of the building. The assessment identifies hazards and evaluates the probability and expected severity of occurrence of those events. These hazards include, but are not limited to, weather, flooding, seismic and volcanic events, drought, wildfire, soil stability, and terrorism.

However, in conversations with both federal agencies and private sector groups, we find that there is some disagreement about what constitutes true resilience, how to properly define its scope, and how to determine which buildings need to be resilient in the face of potential future disasters. In the private sector there is seemingly still a challenge related to finding entities that are qualified to determine that a building can be certified as "resilient." Because again, the question often becomes "resilient to what and for how long?" For example, many entities and experts who might attempt such resilience certifications are finding that their general liability insurance companies are unwilling to insure those declarations made by experts, fearing liability later if buildings are irrevocably damaged after having been certified as "resilient" by an expert they insure. This type of private sector uncertainty creates some challenges for developing a comprehensive and uniform definition of resilience, and a plan to achieve it. However, we believe that the ongoing work of the federal government in this area will be important to informing the private sector about the role of emerging resilience technologies, practices, and concepts. In every US community, the federal government operates facilities and offices that are important to the community and often key to helping a community respond to and address the aftermath of an emergency. Improving the sustainability and resilience of the federal portfolio will have long-term benefits once we can answer the question, from which types of potential challenges do specific federal buildings need to be resilient?

Importantly, while most people—when they think about the performance of federal buildings—think about buildings that are owned by the federal government, one of the areas of biggest challenge that we see is that of the leased portfolio of the federal footprint. Today, more than 50% of the GSA's footprint is in leased, or built-to-lease, buildings and facilities. The federal government as a whole is the largest commercial tenant in the United States, occupying approximately 2.8 billion

square feet of leased space, and its influence is great. While big cities like DC, New York, Chicago, and San Francisco, and states like Nevada, have prioritized policies that promote sustainability and enhanced building performance, many small- and medium-sized areas of the country and many private sector owners have not—whether due to a lack of information, a lack of incentive, or a lack of funds to undertake such improvements. Yet in many ways the government does not get to choose where to locate its offices and buildings—the federal government must be available everywhere. The lack of sustainably-designed buildings offering space for lease impacts the ability of GSA to find and secure space that helps the government meet its sustainability and energy savings goals.

There are some market changes occurring in a few areas where we see private sector building owners and developers incorporating sustainability and energy saving measures in an effort to entice the federal government to lease space in their buildings. However, market adoption in small and medium cities is slow to evolve and presents an interesting opportunity for the federal government, as a customer in the marketplace, and entities like GBI to find ways to encourage the adoption of sustainability measures. As a 501(c)(3), GBI's mission includes attempting to broaden the base of buildings in the U.S. that pursues sustainability and to explain to building owners and developers the benefits that result from both the better performance of a building and the lessening of its impact on the local community.

#### CONCLUSION

The federal government's leadership and influence in the area of green building and sustainability continues to be significant. The continued prioritization of improving the performance of federal buildings stands to ultimately benefit not only government workers and their productivity, but also taxpayers who will benefit from the cost savings generated by a more nimble, energy-efficient, and sustainable federal portfolio. The Green Building Initiative has greatly enjoyed its ongoing collaboration with the federal government on hundreds of projects, and we look forward to assisting the federal project teams as they strive to build and redevelop federal buildings and spaces to address better performance, sustainability, resilience, and savings for American taxpayers.

Thank you for this opportunity to provide our thoughts.

Ms. TITUS. Well, thank you very much. I am encouraged to hear all of you with a positive commitment to doing even more, but also with the recognition that a lot has been done. And so that is encouraging.

We will now have questions. I will recognize each of the Members for 5 minutes of questions, and begin by recognizing myself.

We know a good bit about how to make buildings greener and more energy efficient, less so about how to make them healthy, and even less about how to make them smart, when we talk about the development of artificial intelligence and internal security.

You are a very forward-thinking architect, Mr. Van Den Wy, will you please give us some specifics about how to make buildings more healthy? I know I am frustrated by the Russell Building, because I can't open my windows. I just want to open that window for some reason. Would you just talk about that a little more?

Mr. VAN DEN WYMELENBERG. Sure. Well, and I think in its simplicity, opening a window and having access to fresh air is a great starting point for making healthy buildings. We have seen buildings that are ventilated through the facade, through windows, have indoor microbial communities that look more like the outdoors and look less like our own skin and gut microbiomes, which inherently means there are likely to be fewer pathogens in these environments that are directly ventilated.

It is always a balancing act with energy, because if you leave a window open in the middle of winter, then you have those penalties, too. So this begs for that smart building, that automated building that can also have a strategy to close those windows when

it knows nobody is there, and it knows the best energy decision would be to close it.

So we are working on a project that we call Fuzzy Wrenches, which is—the fuzzy part is the fuzzy logic and machine learning ideas that we see through computational science. The wrenches part is people who own and operate and run buildings. And we are doing that as a microcosm on our campus. And the BTUs 4 BTUs project is an example. So we are trying to empower the folks who operate buildings with some of the capabilities that some of our scientists and our data science initiative have with fuzzy logic and machine learning.

Ms. TITUS. When you talk about healthy buildings, you are talking about mental health, as well as physical health, aren't you?

Mr. VAN DEN WYMELENBERG. Yes, definitely. In fact, you know, we look at some of the declines in life expectancy, and the root is often mental health concerns. And so access to views of nature have been shown to provide what we call microrestorative experiences. Researchers at Michigan several decades ago brought that idea to our lexicon.

One of the challenges with healthy buildings, and why I think, as Ranking Member Meadows described previously as this being elusive in some ways, is that we don't have great metrics for defining what is a healthy building. In energy we have got energy use indices. For healthy buildings we are starving for that sort of basic unit of, like, environmental and mental health. And perhaps the closest thing we have is occupancy rates. But that is an imperfect metric, as well. So that is where I referenced the need to develop some metrics of these non-energy benefits.

Ms. TITUS. Thank you. I would ask the two of you who represent different kinds of certification if you would address the types of buildings or projects that you are involved in.

So we know that you are kind of working in tandem, as opposed to competitively, and in conflict. Because I understand you do different kinds of projects and different kinds of buildings, that some are more appropriate for LEED, some may be more appropriate for what you do, Dr. Russell. Is that accurate?

Ms. BEARDSLEY. Thank you, Chairwoman. There are—I can speak to LEED, and let Mr. Russell speak to Green Globes, but LEED has many adaptations. I believe we are over 20 adaptations for different building types, so a wide range from—you know, certainly we started with office buildings, but now we have customized rating systems for things like data centers that can be large energy users, things like museums have been certified under LEED, certainly green schools are a major element that we have used, as well as residential of all sizes. So we have been really adapting and getting market feedback, and over the last 5 or 6 years creating those specialized systems to meet a full range of building types.

Mr. RUSSELL. We typically do, actually, very similar-type buildings. It is just the way we address them is probably a little bit different, in that for Green Globes the main way we deal with the different types of facilities, such as warehouses, data centers, VA hospitals, and things like that, we use a lot of our not-applicable-type criteria. So the main Green Globes criteria covers all the important aspects.

And then, working with the assessor, we determine—for example, if a certain aspect would not be applicable to a warehouse, we use N/A so that those features do not impact the overall score rating, and the building still gets the sustainable criteria that it has actually earned. And so—

Ms. TITUS. Thank you. The ranking member.

Mr. MEADOWS. Thank you, Madam Chair. Is it Beardsley?

Is that correct, Ms. Beardsley? Let me come to you. When you are doing the LEED certification, is there a different criteria for a building, the same building in Florida, as there is in Michigan?

Ms. BEARDSLEY. Thank you. Yes, that is correct, Ranking Member.

Mr. MEADOWS. So there is a different criteria?

Ms. BEARDSLEY. I am sorry. The criteria are the same, and the idea is that—

Mr. MEADOWS. Why would they be the same?

Ms. BEARDSLEY. So the idea is that, when you see a LEED certification, you know that it stands for the same performance.

Mr. MEADOWS. But since this is—you know, you guys are the experts. I just build the buildings.

Let me tell you the problem with that. And it gets to the fundamental question of why we need more flexibility in terms of the way that we actually quantify that. Actually, when we look at—you are solving, in terms of energy efficiency, for two different things: either heating load, HVAC, or lighting load. All right?

And so that is why you have windows. And yet, when you look at a building in Michigan versus a building in Florida, you will have two very different criteria that you should be solving for. And yet we have a—one LEED standard that actually will make you build a less-energy-efficient building in one of those two environments. Would you agree with that?

Ms. BEARDSLEY. Thank you for restating the question, Ranking Member. So the criteria are the same in the sense that, across the categories of LEED, we have prerequisites. Those apply to all buildings. Those are very baseline, so that you know—

Mr. MEADOWS. And they are a point system. I get that. All right.

Ms. BEARDSLEY. Right, right. So then, within the point system, project teams choose the points and the credits that are most applicable to their buildings. So we do have buildings that use natural ventilation and don't necessarily have mechanical systems if the climate is suited to that. We have other systems that might use day-lighting, and others might use a much smaller—

Mr. MEADOWS. No, I get that. I guess what I am saying is there is a lack of flexibility when it comes to those standards.

And in my opinion, having built buildings in different geographical locations, which, by its very definition of the way it is structured right now, makes you build a less energy efficient—because, for example, if you are looking to lessen your lighting load in Florida, you will create a higher building envelope with more windows in doing that, which makes it less energy efficient, because your HVAC load goes way up. And so you end up spending more on energy than you would, just because you have a very naturally lit environment.

And I guess my encouragement to you would be to look at recommendations that we could either do legislatively, or provide greater flexibility. So the example that Dr. Russell was putting, in terms of a museum or an art gallery, is applicable, but it is also applicable when you are not talking about necessarily use.

You can say a commercial building for the same exact use—Federal building in Florida should be designed differently than a Federal building in Michigan. Wouldn't you agree with that?

Ms. BEARDSLEY. And they are, and this is where the integrative design that Mr. Kampschroer spoke about comes into play, as well as—

Mr. MEADOWS. So you think LEED has enough flexibility to allow it to do that?

Ms. BEARDSLEY. We are—

Mr. MEADOWS. Because I would challenge you on that. That is—you are talking to someone who has actually done it.

And so you are saying LEED gives you enough flexibility, enough point system to give you that flexibility? Because I think a Federal footprint will be almost exactly the same because what they will do is not take in the geographical differences.

Ms. BEARDSLEY. Sir, I believe that the LEED system does provide flexibility. We have worked hard to increase flexibility in the system. And through the energy model, integrative design, those kind of trade-offs and balancing can be made between whether to get more energy—

Mr. MEADOWS. And those are based on scientific modeling?

Ms. BEARDSLEY. Yes, through feedback we have—

Mr. MEADOWS. I will let you revisit that.

Dr. Russell, do you agree with all of her analysis there?

Mr. RUSSELL. Not completely. For example, Green Globes—what we reference always is the ASHRAE 90.1 for energy performance. And ASHRAE 90.1 actually is climate-dependent. It sits there and says that each climate district has their own specific criteria.

And so, when we evaluate a building, we are looking at that specific criteria and how that building complies, relative to what the standard is for that location. And so you get a more sustainable building for that location.

There are certain criteria, for example, in which we encourage more day-lighting, and certain regions where we don't, because we recognize, because of the solar heat gain coefficient that you get out of that, you don't need to have those type of factors. And so we certainly try to build in that regional—

Mr. MEADOWS. All right. And I am out of time. And so, with our architect and his—is it Oregon?

So I am going to ask all of you if you will give three recommendations on how we can take the current rating system and make it more flexible, and more efficient, as it relates to those—and perhaps look at both LEED and other opportunities on rating commercial buildings. And if you will get that back to the chairman, I would appreciate it.

I yield back.

Ms. TITUS. Thank you. We will look forward to receiving that.

I now recognize Ms. Davids for 5 minutes.

I guess Ms. Davids has left us. So we will now go to Ms. Mucarsel-Powell.

Ms. MUCARSEL-POWELL. Yes, thank you, and thank you for coming here this morning.

I represent the southern-most part of Florida, the southern-most district, and I believe one of the most beautiful areas, the Florida Keys and parts of Miami-Dade County. And we are definitely ground zero for climate change. And so this hearing—if we can't make advances on ensuring that we have these regulations for our Federal buildings, then we won't be able to expect the same investments in commercial and private facilities, as well.

So I wanted to ask you, Ms. Beardsley. Last year the National Defense Authorization Act required the Department of Defense to assess the flood risk of its facilities, and to mitigate those risks. But other non-DoD facilities are not included in this requirement. And I am concerned about the resiliency of essential Federal buildings after hurricanes, specifically, and floods, buildings that house very important services for my constituents and constituents all over the United States.

Do you think that we need to establish a Federal flood risk management standard for all Federal buildings and infrastructure?

Ms. BEARDSLEY. Thank you, Congresswoman. Yes, we would agree that such a standard would be helpful to ensure that there is baseline protection of Federal investment, as well as life and property across the board.

Ms. MUCARSEL-POWELL. And so, since Mr. Meadows was bringing that up, that different buildings should have different requirements, can you expand a little bit on that? I would like for you to comment on the questions that he was asking.

Ms. BEARDSLEY. So, as I mentioned, the LEED system does have flexibility, and needs to account for what the conditions are facing that building, the climate zone.

And I will note we also do reference the ASHRAE 90.1 system, which is an energy model, and energy requirements are based on the climate.

With respect to the flood plain, this is where, you know, consideration of changing conditions is important, where existing maps may not reflect the conditions that the building will face over its lifetime of 60, 80, 100 years.

Ms. MUCARSEL-POWELL. Do you think—and I know that you attended the Paris climate meetings, and the talks—do you think that there are any specific policies from other countries that you would suggest we consider here in the United States, that we should implement, especially as it pertains to Government infrastructure, buildings, facilities?

Ms. BEARDSLEY. Yes, thank you. That is a great question. The Paris climate conference was really quite exciting, and a remarkable moment in time. And what we have seen since then is a movement from these high-level commitments towards more action by the countries who are a party to the agreement.

Some of the key areas that we are seeing action on relating to buildings include commitments to net zero energy buildings, and also interest in net zero carbon buildings. For example, the EU has a directive requiring all new public buildings to be nearly zero en-

ergy buildings, and all new buildings, including private, by 2030. Japan has some analogous requirements, as well. And some countries are also providing financial incentives to move towards zero energy buildings.

Ms. MUCARSEL-POWELL. So it is possible. We can do this.

Ms. BEARDSLEY. We would agree, yes.

Ms. MUCARSEL-POWELL. Thank you. Sorry. I realize I have an extra minute. I wanted to ask a quick question of Mr. Russell.

What has been your experience working with the GSA? And what have been the chief obstacles that the GSA or other agencies have faced in pursuing Green Globes certification?

Mr. RUSSELL. I have really enjoyed working with the GSA. I use a number of the GSA resources, such as the SFTool website, to provide education to our various clients, the various project teams, on really good sources of where you can find good materials, what are good methods, different techniques they can do to help make the projects more sustainable. And so we really haven't had much of a problem in working with GSA.

As far as obstacles, the biggest thing is probably more familiarity of working with Green Globes, and recognizing that we are a viable option out there, and to recognize, you know, that it is a great resource to consider. So—

Ms. MUCARSEL-POWELL. Thank you, Mr. Russell. I yield back my time.

Ms. TITUS. Thank you.

Mr. Pence?

Mr. PENCE. Thank you, Chairwoman Titus. Thank you, panelists, for all being here today.

As I mentioned in the first panel, it is my understanding that nearly half of the Federal buildings managed by GSA are over 50 years old. If we are serious about improving the efficiency of Federal buildings and reducing costs, we need to find solutions for new efficient buildings, given limited funding.

In 2016 Congress passed the Federal Asset Sale and Transfer Act. FASTA identifies opportunities for the Federal Government to sell underutilized property, generating capital by getting rid of some of these old, inefficient buildings. We should also be looking at public-private partnerships, or P3s. Not only do P3s shift liability to the private sector, but utilizing P3s would ensure efficiency is built in and maintained, long-term.

Dr. Russell, with limited dollars available for new construction and major renovations, and the overwhelming amount of old buildings in our inventory underutilized, do you believe P3s could help energy efficiency savings?

Mr. RUSSELL. Mr. Pence, yes, definitely. P3 has a lot of potential for assisting with that. I have over 12 years' actual construction experience, and one of the things I learned pretty fast from the construction standpoint is the person who is designing or building the facility—I don't have that much incentive to actually continue to make it more sustainable, to push above and beyond what has been required. It is that maintenance side where you really start to recognize the savings.

And so, by combining that maintenance side along with the person who is actually building it, you can actually get a building that

really does save energy over a long period of time. And so by encouraging those types of design-build-maintain or build-operate-transfer—there are a number of terminologies that will come out of the P3—it becomes very beneficial for those type of things, because now you are getting a contractor who is dedicated. They recognize that they need to save the operating money if they are going to make money in the long term on that project.

And so I think it is a fantastic resource. A number of other countries have looked into it. But the problem with it is that run into some unique financial conditions. There has been a lot of research over the last 5 years into difficulties in using P3, and how do you establish the correct parameters for monitoring it so that the contractors can work to the highest benefit, and yet it doesn't waste a lot of Government funding.

And so I think, with the proper parameters, I think P3 is a good way to proceed.

Mr. PENCE. So, on an efficiency point of view, do you think we should look at P3s with our older buildings that we are releasing, like we just did recently? Would we save money, operationally, and be more energy efficient?

Mr. RUSSELL. You can if the contract is set up properly. If the contractor recognizes that they are going to see the cost savings, that they are going to make more profit, essentially, by making it more sustainable based upon the way you establish the financial model, based on the operating costs, you can encourage the contractor to do that.

And if you don't set it up properly, no, you are not going to see that much of a change. And so it really requires some more detailed analysis of what is the proper contract language that is going to attract contractors who are good at making it more sustainable, and recognize the investment.

Mr. PENCE. And you are referring to existing buildings that we could turn? OK.

Mr. RUSSELL. Yes, you could definitely do that to existing buildings, also.

Mr. PENCE. OK, thank you.

Ms. Beardsley, you wrote in your closing statement paragraph that funding could drive increased efficiency and resiliency in retrofitting or replacing aging facilities. Are there other solutions, other than P3s, to address our lack of capital funding to make buildings more efficient?

Ms. BEARDSLEY. Thank you, Congressman. There are a number of different public-private partnership models that can be used to advance resiliency and save money. So there is performance contracting, there is also utility energy savings contracting, and other P3 models.

I think GSA uses a number of different models in its contracting, ranging from design-build with option to buy, design—different kinds of lease, build to lease, build to suit, and other models. So really, all of these different contracts can be used with a resiliency lens and an efficiency lens to save money and to set up a modern Federal portfolio for the future.

Mr. PENCE. OK. Thank you, everyone. I yield my time.

Ms. TITUS. Thank you. I now recognize Ms. Holmes Norton.

Ms. NORTON. Thank you very much, Madam Chair. I am particularly interested in the inventory of the Federal Government, because the most valuable inventory is in my own district, the Nation's Capital.

I have just spoken with our ranking member. He and I share an interest in selling buildings that simply cannot be made usable. I should indicate, however, that we don't want to do a lot of leasing, or any more leasing than we have to. So we value old buildings to the extent that we can make them usable.

Now, the Federal Government does have a number of old buildings because—and especially those here in the Nation's Capital. I am not talking about those that are no longer usable and should be sold. But what are the most important steps that should be taken first in making old buildings usable?

What I am really speaking to is how these must be the least energy-efficient buildings here. And so one of the things the Federal Government is going to look at is not only is it worth renovating it, but making it energy efficient—or it certainly should be looking at it before deciding whether to sell it, or whether to renovate it, which might help us also, because we don't want to do any more leasing than possible.

Actually, Mr. Russell, or any of you who have a view on that I would be interested in.

Mr. VAN DEN WYMELENBERG. Thank you, Congresswoman. I will answer very briefly and defer my time.

What I think is most important about existing buildings is—especially older existing buildings—is the investments have already been made, in many regards, and especially if they are over 50 years old. They probably have good bones, as we say, and they probably have reasonable access to natural light and ventilation through the facade. The trick will then be to create these hybrid new buildings that are not, you know, completely leaky at the facade, and have thin exterior skins.

So the first piece I would recommend—

Ms. NORTON. Well, those would be buildings—I mean they are probably more solidly built—

Mr. VAN DEN WYMELENBERG. That is right.

Ms. NORTON [continuing]. Than any buildings we are building today.

Mr. VAN DEN WYMELENBERG. Right. So it is likely looking at the envelope, looking at windows, in particular; reducing loads; and then looking at ways to downsize the existing systems when we replace mechanical heating and cooling. Thank you.

Ms. NORTON. Did you have any view, Mr. Russell?

Mr. RUSSELL. There has been a number of research papers and articles provided to go through exactly that process. I did some research projects, one of those at the University of New Mexico several years ago, in which we were analyzing various older buildings, and what is the most cost-effective way to make those differences.

And fortunately, agent groups like NAHB—National Association of Home Builders—AGC, they have come out with, actually, guidelines that help the average building owner with that process.

And so, as Dr. Van Den Wymelenberg had mentioned, you start with the building shell, and then you proceed on through the basic

systems—simple things you can do to your house, even. You know, make sure all your doors are properly sealed, your windows are properly sealed. Get rid of all those thermal bridges and enclose your facility as much as possible, keep it weather tight. And then just upgrade the performance of your individual components within that—

Ms. NORTON. Do you find that the Federal Government understands what you just said, in terms of its older buildings? You know, those are pretty simple things.

Mr. RUSSELL. Yes, exactly. And then the nice thing is they are simple things. The basic things that cause the biggest change are actually the most economical.

And so the key is you start by going through the basic elements before you get in the more complex—

Ms. NORTON. Are you finding that the Federal Government is doing what you are doing, those basic things? Especially with these older buildings?

Mr. RUSSELL. I think if they have the funding, if they have the—you know, it depends upon the agencies themselves, if they see the commitment to that. I have seen some DoD projects, definitely. They are trying to make that happen.

Ms. NORTON. I would just like to find out at the next hearing if the—if we are doing these simple things, first.

Mr. RUSSELL. Yes, yes.

Ms. NORTON. It seems to me we could be saving the Federal Government a lot of money.

Ms. BEARDSLEY. That definitely—

Ms. NORTON. I do have a question on—I am trying to find out about continuity. And I know there is some discrepancy between the parties on climate change. But I don't think there is any discrepancy on saving money.

And therefore, I want to ask about the difference between—and I asked an earlier question on the Executive order from this President and what was previously in existence, because if an administration says one thing, and the next administration undoes it, then I think we are all headed to hell when it comes to climate change.

So there were guidelines set forth by the Council on Environmental Quality's implementing instructions. That is really important, implementing instructions. They implement President Trump's Executive order. Are they different from the guidelines which existed from the Energy Independence and Security Act?

I am trying to find out are they a substantial-enough departure from those old standards to create a meaningful change in the energy footprint of Federal buildings?

Yes, ma'am.

Ms. BEARDSLEY. Delegate Norton, thank you for the question.

Ms. TITUS. You are going to have to be brief.

Ms. BEARDSLEY. Yes. So, essentially, Congress has been involved in these Federal targets for a number of years. But the statutory guidelines have expired now. And with the new Executive order, and the implementing instructions, it does leave a lot of discretion with the agencies, so it will remain to be seen how the agencies implement that, and as they set each annual target, as you heard from Mr. Kampschroer.

Ms. NORTON. Thank you very much. It is all in implementing a statute, Madam Chair. Thank you.

Ms. TITUS. Thank you. Maybe we can get some reports from some of the different agencies of how they are implementing it.

I now go to Mr. Palmer.

Mr. PALMER. Thank you, Madam Chair. I want to go back to questions raised by Mr. Pence about the age of buildings and what we do about those.

I do think modern engineering standards, construction standards, are high-quality. You know, I appreciate the architectural designs of the older buildings, but in terms of resiliency I think what we are building now is, in many respects, superior to what we had. Think about the older buildings and the problem that the Federal Government has is underutilization, which I think—or no utilization at all increases our cost. And I addressed that with our first panel.

Mr. Russell, when you are talking about utilization, you are really talking about reducing the square footage per person. And do you want to talk a little bit about how that impacts the operating cost of a facility, if you are packing more people into a smaller space?

Mr. RUSSELL. So by reducing the square foot per person, there can be multiple different effects of that. And so, from a straight energy standpoint, if you can reduce the square footage, then naturally you are going to reduce your operating cost. But at the same time, if I increase the number of people in a space, I am going to increase my CO<sub>2</sub> levels. As the people are exhaling, you are going to make it a little bit more difficult as far as—you know, we tend to like to have a little bit more space for ourselves.

And so, from the well-being standpoint, I tend to think it is not going to be as comparable. And so there is kind of a good and bad to it. It is not a definitive answer. So—

Mr. PALMER. That is my point. You are juxtaposing health against energy savings, other savings, lowering our costs. I think there was one study for a building out in Denver that showed that reducing the square footage per employee to about 165 square feet would save a little over \$2 million, but it creates other problems, not just exhaling CO<sub>2</sub>, but there are other things that might be—and what is being exhaled.

We have also got issues here with our Federal buildings, where we have rodents that—you know, you talk about some of the—

[Aside:] You have what? She has got a pet mouse, is that right? It is a pet now.

[Continuing:] But we have got some of those issues. And when we talk about asthma rates and things like that, the CDC and others admit they don't really know what causes that, asthma, but they do know things that create problems, particularly in low-income housing, but also in buildings like the ones that we occupy, where you have got mice, and other issues. That has to, I think, be part of—when we are talking about consolidating or better utilizing these buildings, because you can mitigate some of those problems by going into a renovated facility, and maybe disposing of the older facilities. And by that I mean selling or leasing.

Do you want to—any of you?

Mr. VAN DEN WYMELENBERG. So I will address it briefly, thank you. I think, when you look at utilization, I would recommend starting with leased facilities, and prioritizing owned facilities, and getting out of leased facilities whenever possible.

I also think that we could benefit through an optimization of leased facilities by thinking about which buildings are supporting greatest human health. And right now we have a lack of information. Mr. Kampschroer gave a great list of metrics around performance improvements in Federal facilities.

And when it came to health I think what we have done often is we relied on satisfaction as our metric for health. And it is a good start, but it is not sufficient. We need to build a more robust suite of metrics for documenting health, and I think that can serve as a lens for this optimization. Thank you.

Mr. PALMER. I want to address something Ms. Holmes Norton brought up about some of these older buildings in Washington. There is also a value, architecturally and historically, in that. And it may make sense that in making a determination what to do with the building, rather than have a 132-year-old building 6 blocks from the White House boarded up, it might make sense to sell that to someone else who will make better use of it, and preserve that building.

Madam Chair, I would like to introduce into the record a GAO report on space utilization, if we could do that.

But I just think, when we look at this, it is a broader issue, not just reducing our energy consumption costs, but also making a decision about how we best use our properties and reduce the need to lease.

With that I yield back.

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**“Federal Buildings: Agencies Focus on Space Utilization as They Reduce Office and Warehouse Space,” U.S. Government Accountability Office, GAO-18-304, March 2018, Submitted for the Record by Hon. Palmer**

This report is retained in committee files and is available at the GAO website at <https://www.gao.gov/assets/700/690536.pdf>.

Ms. TITUS. Thank you. Ms. Fletcher?

Mrs. FLETCHER. Thank you very much, Chairwoman. And I do think this is an interesting discussion, and I appreciate the comments from my colleagues about how we are prioritizing, and what the issues are that we are considering. And, obviously, efficiency is important, but I am interested in this conversation about the metrics that we value.

And coming from Houston, a city that is fairly new, I personally walk around Washington and wonder at the incredible architectural value of these buildings that we work in, and that we get to come to work in these buildings every day. And I think there is a value that we place on the facilities in Washington, and around the country with some of the older facilities. So certainly I am more interested in the metrics that we can look at besides age, and also the improvements that we can make.

And so I was interested in the conversation about what are the things that we can do to make our buildings more energy efficient when we recognize that there is a value. Certainly I don't think

anyone is suggesting that we wouldn't keep the buildings that we are currently in, but the discussion about looking at the envelope, looking at the windows, or doing some simple things like sealing at the exterior of the building.

I think what would be helpful to us is a sense of what are the other metrics we can look at as a shorthand for—and the leased—the idea of whether we are in leased buildings and getting out of those makes sense to me. But as we are evaluating these assets, knowing where we can make improvements, I think, would be a useful factor.

And one thing I want to ask, specifically. One of you mentioned the cost of an effort in improving and replacing the existing systems, the mechanical heating and cooling systems. So recently there was this survey that was supposed to come out, a study in September that came out in May from the National Institute of Standards and Technology on the economic and environmental benefits of gas versus electricity in homes. And I would be interested in kind of your thoughts and feedback on increasing the use of natural gas in some of these buildings versus electric, if that is one of the things, when we are talking about replacing existing systems, where you see room for improvement.

Ms. BEARDSLEY. Thank you, Congresswoman. And I have to note that Texas is the—one of the top States for LEED in 2018, number 5. Very good.

So I do want to point out that LEED has a system for existing buildings to provide a way to approach these buildings, which can be more challenging to bring up to highly performing energy and water efficiency, indoor air quality. And GSA does have experience with that system.

For example, here in DC there is the Treasury Building, an iconic historic structure that achieved LEED Gold in 2011, and has been reported at saving about \$3.5 million a year in utility costs. So that is a good success story.

You know, we favor and encourage a whole-building approach that looks at all of the systems, the envelope, in combination with the needs. What are the user's needs for the building? And make sure that those are aligned, and then create a structured plan to implement the improvements that are needed. That may include gas, it may include electric. It is really site-specific. It may also depend on resiliency goals, and the grid, and the vulnerabilities of that location. So these are all considerations for dealing with existing buildings and improving them over time.

Mrs. FLETCHER. Thank you.

Mr. VAN DEN WYMELENBERG. I would like to offer one answer to two parts of your question each.

So, in terms of what other metrics we might be considering, one that I think would be a great start is looking at how a building is occupiable when there is no power. How much of the floor area is day-lighted and has access to outside air? So many of our buildings, if there is no power, we have to leave them. And this is tragic.

The other is a technology. You asked about what technologies, in particular, for existing buildings. And I will offer one that continues to bear fruit, which is lighting.

There are some new innovations with what is called luminaire-level lighting control that I think can start to stitch together some of our conversations today, one around—it can help reduce energy consumption substantially by having a distributed sensor network of occupancy and daylight harvesting sensors on each light fixture. It is a retrofit technology. And you can start to understand your space utilization, because each sensor triggers when a person walks by, and it knows how occupied or unoccupied certain spaces would be. And it might help with the space prioritization. Thank you.

Mrs. FLETCHER. Thank you.

Mr. RUSSELL. If I can offer, you know, Green Globes also does an existing building program. But one of the things that we do that works really well, relative to your question, is with the Guiding Principles Compliance. It actually requires, when you are doing evaluations, to do what is called life-cycle assessment, and determine does it make sense. Just because you may have a certain efficiency HVAC system, and there is a newer efficiency one that comes out, it doesn't mean you need to immediately replace that. You need to look at the overall cost of it, and determine what is going to make the best sense for the operational cost, overall, long-term efficiency of that.

And so, when doing that analysis to determine the best thing, we always recommend to our clients do that analysis. What is the life-span, what is the operating cost that is going to come out of that, and what is your new, upfront cost to determine what is the best way to proceed.

Mrs. FLETCHER. Thank you very much.

I see I have gone over, so I will yield back. Thank you, Madam Chairwoman.

Ms. TITUS. Thank you. I appreciate you doing the shout-out to Texas, Ms. Beardsley, but you might have mentioned how great Nevada is, and all of the wonderful projects in Las Vegas, including in the private sector with MGM. OK, just put that on the record.

[Laughter.]

Ms. TITUS. All right. Well, thank you very much. It has been very interesting.

You—oh, you are back. All right, I am sorry.

OK, we will now—before I get to that, we will now hear from Mrs. Miller.

Mrs. MILLER. OK, good. Thank you. One thing that I have not heard anyone mention—which, to me, is real basic common sense, and costs anywhere from \$5 to \$100—is providing a green plant, you know, a tree or, you know, a schefflera, you know, any number of things that use carbon dioxide. That is very basic in helping keep a healthy office. But I will get on to a little more important questions.

Mr. Van Den Wymelenberg, can you further explain the mission of the Build Health program, and the role of resilient design and energy efficiency?

Mr. VAN DEN WYMELENBERG. Sure, thank you. Well, first, about trees I agree. There is a measurable clean air delivery rate associated with trees indoors. It is marginal. It is not gigantic. But every little bit helps. And I think—

Mrs. MILLER. Emotionally, as well.

Mr. VAN DEN WYMELENBERG. Yes, and emotionally, and from a biophilic standpoint, I couldn't agree more.

Mrs. MILLER. Yes, yes.

Mr. VAN DEN WYMELENBERG. The Build Health program is founded on the premise that academics don't know everything. Did you hear that?

Mrs. MILLER. I did.

Mr. VAN DEN WYMELENBERG. Academics don't know everything, and that we really—

Mr. MEADOWS. Could you repeat that again?

[Laughter.]

Mr. VAN DEN WYMELENBERG. And that industry is really essential. We believe, by working with industry, we will ask smarter questions, and that the work that we do, together with industry-guided research, will be more easily taken up and implemented into practice. And that is the founding principle for Build Health. Thank you.

Mrs. MILLER. Well, how could you educate other universities on the benefit of working with industries to create programs?

Mr. VAN DEN WYMELENBERG. Well, that is a wonderful question. Thank you.

So first of all, within Build Health we do have seven or so other universities that partner with us: so University of Arizona, Arizona State University, Oregon State University, Harvard School of Public Health, Northwestern University, and others—Oregon Health and Science University. So, in a way, we are doing that by stitching together the expertise that can be brought to bear about improving building health.

But I think, more broadly, one of the ideas is to take the BTUs 4 BTUs program and replicate it across other universities, similar to the program that is offered by the U.S. Department of Energy and their industrial assessment centers.

Mrs. MILLER. OK. In your testimony you recommend a more comprehensive cost-benefit analysis than relying on energy efficiency alone. What are the negatives of relying solely on energy efficiency?

Mr. VAN DEN WYMELENBERG. Thank you. So the negatives, I think, are slower progress. The positives of opening the aperture of leveraging that \$100 that we spent on employees, compared to the \$1 that we spend on energy, is that if we can link those financial streams we can create greater good for both health and energy and buildings.

Mrs. MILLER. All right. And what are some of the ways in which Congress can help eliminate barriers in practice, and to help to develop a cost-benefit analysis plan?

Mr. VAN DEN WYMELENBERG. Yes. Through the leadership that we have seen from GSA and the high-performance buildings program, I would love the opportunity to help explore those non-energy benefits, the health and the comfort, so that a few years from now, when Mr. Kampschroer comes here, there is another set of metrics in that delivery about health outcomes.

Mrs. MILLER. OK. Thank you. I yield back my time.

Ms. TITUS. Well, thank you again very much. We think it has been a very worthwhile hearing. We appreciate you all being here and sharing these ideas with us. We have some things now to kind

of get our arms around, and work toward. So you will probably be hearing from us again. As we do that we will need your help.

I will ask unanimous consent that the record of today's hearing remain open until such time as our witnesses have provided any answers or any information that may be submitted to them in writing, and unanimous consent that the record remain open for 15 days for any additional comments and information submitted by Members or witnesses to be included in the record of today's hearing.

Without objection, so ordered.

If no other Members have anything to add—are we good? Then the committee stands adjourned.

[Whereupon, at 12:10 p.m., the subcommittee was adjourned.]



## SUBMISSIONS FOR THE RECORD

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**Prepared Statement of Hon. Sam Graves, a Representative in Congress from the State of Missouri, and Ranking Member, Committee on Transportation and Infrastructure**

Thank you, Chairwoman Titus.

Ensuring federal buildings are efficient and resilient can help the taxpayer realize savings.

While we have saved billions of dollars in federal real estate costs through consolidations and shrinking our space footprint, even more can be saved with added efficiency.

However, like many things, government can get in its own way.

That is why it is critical to keep our focus on what works and what will ultimately reduce costs to the taxpayer.

When we pushed agencies to reduce their space footprint, a lot of savings were realized early on.

But, we also saw agencies begin to reduce space—just for the sake of reducing space—even when the reduced space cost more.

Similarly, as we work towards improving building efficiency, we cannot lose sight of the ultimate goals.

We must ensure measures used by agencies make sense, actually work, will lower costs, and best allow agencies to meet their missions.

I look forward to hearing from our witnesses today on these issues and yield back.



## APPENDIX

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QUESTIONS FROM HON. DINA TITUS FOR KEVIN KAMPSCHROER, DIRECTOR, OFFICE OF FEDERAL HIGH-PERFORMANCE BUILDINGS, OFFICE OF GOVERNMENTWIDE POLICY, AND CHIEF SUSTAINABILITY OFFICER, U.S. GENERAL SERVICES ADMINISTRATION

*Question 1.* Please provide a status report on the extent to which GSA has explored, or has implemented, subsurface utility engineering (SUE) on its design and construction projects. The Federal Highway Administration (FHWA) made a review of utilities on highway projects in 2018. The review team found that most state departments of transportation (DOT) do not adequately investigate underground utilities, resulting in utility conflicts either being misidentified or not identified at all during the preconstruction phase. The lack of adequately investigating underground utilities results in contractors unexpectedly encountering utilities during construction. This situation often causes delay, which increases project costs and imposes health and safety risks. One reason why utility conflicts are unknown and thus increase project risk is that very few DOTs systematically use SUE and American Society of Civil Engineers (ASCE) standard 38-02 (Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data) as a common best practice. Among those states that are regularly using SUE are continuing to find returns on investment as high as 22 to 1 in some cases for each dollar spent for SUE. Is GSA taking advantage of the benefits of SUE services on its projects?

*ANSWER.* GSA implements some of the principles of subsurface utility engineering (SUE) on design and construction projects. GSA's Public Buildings Service's Facilities Standards for the Public Buildings Service (P-100), found here—[https://www.gsa.gov/cdnstatic/2018%20P100%20Final%205-7-19\\_0.pdf](https://www.gsa.gov/cdnstatic/2018%20P100%20Final%205-7-19_0.pdf)—requirements include project site survey and documentation requirements. Projects primarily utilize SUE quality levels B, C, and D with limited use of quality level A. GSA does not currently implement ASCE standard 38-02 to classify the quality of existing subsurface utility data.

GSA uses a NEPA-based project feasibility and design review process for all major construction projects. This process reviews the current and historical information available, assesses changes required for access roads, in-project roadway construction, and assesses hazards that we may encounter when connecting to public roadways and utilities located within public roadways.

*Question 2.* According to Executive Order 13834 and your testimony, agencies have two energy goals: (1) an overarching goal to exceed a 30% energy use intensity (EUI) reduction compared to that in fiscal year (FY) 2003; and (2) an internally-set goal to achieve an incremental reduction from the previous year. These performance measures are reported to the Office of Management and Budget (OMB) and the Council on Environmental Quality (CEQ) annually and reported on the OMB Scorecard for Efficient Federal Operations/Management.<sup>1</sup> In a General Services Administration (GSA) and Rocky Mountain Institute report of August 2015, *Deep Energy Retrofits Using Energy Saving Performance Contracts: Success Stories (Success Stories)*,<sup>2</sup> GSA outlines six best practices to achieve deeper levels of energy savings. First among those is: "Set Aggressive Long-Term Goals." Would you agree that setting aggressive long-term goals remains a key best practice to achieve significant energy and cost savings? What affect does the absence of specific goals have on annual planning?

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<sup>1</sup>*Federal Register*. Executive Order on Efficient Federal Operations (13834). 83 Fed. Reg. 23,771. May 22, 2018. Available at: <https://www.govinfo.gov/content/pkg/FR-2018-05-22/pdf/2018-11101.pdf>

<sup>2</sup>Rocky Mountain Institute (RMI) and General Services Administration (GSA). *Deep Energy Retrofits Using Energy Savings Performance Contracts: Success Stories*. August 2015. Available at: [https://www.gsa.gov/cdnstatic/Deep\\_Energy\\_Retrofits\\_Using\\_ESPC\\_508\\_small.pdf](https://www.gsa.gov/cdnstatic/Deep_Energy_Retrofits_Using_ESPC_508_small.pdf)

*ANSWER.* GSA's planning processes for energy savings are generally focused on individual buildings that comprise its portfolio. Thus, the effect of the absence of specific long-term goals is unknown and would be difficult to determine. Meeting energy targets at the portfolio level has been the result of aggregating the results of numerous people and organizations who manage individual buildings. We should note that in the short-term, weather conditions can have a significant year over year effect. For example, performance in fiscal year (FY) 2018 as compared to FY2017 was strongly affected by weather conditions being much more difficult in FY2018. Further, since these energy conservation measures are life cycle cost effective, GSA continues to pursue them regardless of the goal-setting process.

*Question 3.* The *Success Stories* report suggests a key consideration is to "establish long-term goals and build a roadmap toward those goals." Which planning process would result in attaining significant energy and cost savings: By building a roadmap toward their achievement? Or by planning annual agency goals in June, four months prior to the start of the fiscal year to which they would apply? How can agencies such as GSA effectively plan for energy, water, and cost reductions without goals that stretch across multiple fiscal years, particularly with an uncertain annual appropriations process? Please detail GSA's planning process for implementation of energy conservation measures within its portfolio of public buildings during FY 2020.

*ANSWER.* GSA has already achieved significant energy, water, and cost savings through a multi-year, multi-faceted strategy. Standard GSA Federal office buildings—on average—currently use about 51,800 BTU per GSF (British thermal units of energy per gross square foot).<sup>1</sup> The typical commercial office building uses approximately 67,700 BTU per GSF.<sup>2</sup> This data suggests that GSA buildings use about 23 percent less energy than the commercial average. The average GSA Federal office building has reduced energy by over 15 percent relative to fiscal year 2009 usage levels.

GSA has a long track record of improving water usage. GSA's current water usage in standard Federal office buildings is about 9.5 gallons per GSF and has reduced 35 percent from 2007. The typical office building uses approximately 15 gallons per GSF.<sup>3</sup> These figures suggest that GSA buildings are significantly more water efficient than their commercial counterparts. Since 2007, GSA has saved or avoided using nearly 5 billion gallons of potable water, relative to 2007 usage levels.

As a result of reduced energy and water consumption, utility costs for GSA buildings are generally lower than industry benchmarks, on a cost per square foot basis. On average, standard GSA Federal office buildings spend about \$1.53 per GSF on utilities. According to the Building Owners and Managers Association (BOMA), typical commercial office buildings spend about \$1.92 per GSF<sup>4</sup> on utilities.<sup>5</sup>

This cost difference is due to more efficient buildings, and GSA's competitive procurement of utilities in markets that allow for such competition. For example, the average commercial price of electricity in Washington, D.C. was 11.97 cents per kilowatt hour in 2018.<sup>6</sup> GSA buildings in Washington, D.C. paid 10.24 cents per kilowatt hour in 2018.

GSA uses both short- and long-term goals, which help clarify expectations and accommodate for short-term fluctuations in energy usage correlated to changes in weather.

GSA's capital planning process, and the resulting 5 year capital investment plan, promote the improvement of energy efficiency, because of the emphasis on efficiency

<sup>1</sup>"Standard" is defined as buildings that do not have significant laboratory space, data center space, or other energy intensive functions such as border protection and national security operations. Also, buildings that do not have significant vacancy, are being disposed of by the Government, or have other circumstances that would distort energy usage significantly.

<sup>2</sup>Energy Information Administration, CBECs data [<https://www.eia.gov/consumption/commercial/>]; values through 2018 are estimated based on the trend observed from the CBEC's 2003 to 2012 data.

<sup>3</sup>Energy Information Administration, CBEC's water data [<https://www.eia.gov/consumption/commercial/reports/2012/water/>]

<sup>4</sup>BOMA figures are typically reported in rentable square foot, as opposed to gross square foot. This figure is adjusted by assuming commercial office space has 90 rentable square feet for every 100 gross square feet.

<sup>5</sup>BOMA International Benchmarking Report [<https://www.boma.org/BOMA/Research-Resources/3-BOMA-Spaces/Newsroom/PR91818.aspx>]

<sup>6</sup>Energy Information Administration, Electricity Data Browser [<https://www.eia.gov/electricity/data/browser/#/topic/7?agg=0,1&geo=g&endsec=vg&linechart=---ELEC.PRICE.US-COM.AELEC.PRICE.US-IND.A&columnchart=ELEC.PRICE.US-ALL.AELEC.PRICE.US-RES.AELEC.PRICE.US-COM.AELEC.PRICE.US-IND.A&map=ELEC.PRICE.US-COM.A&freq=A&start=2001&end=2018&ctype=map&ltype=pin&rtype=s>]

within the engineering and architectural industries. The resulting industry changes and improvements help GSA reduce energy usage through capital investment and equipment replacement cycles. For example, a standard efficiency chiller installed by GSA today is far more efficient than a standard efficiency chiller installed 20 years ago, resulting in improved energy efficiency.

In addition, GSA's successful footprint reduction and increased building utilization efforts have resulted in significant reductions in total energy usage and cost. For example, GSA reduced existing leases by approximately 3 million rentable square feet over the last two years. GSA accomplished this by replacing existing leases with smaller leases and by cancelling existing leases and relocating federal agencies to existing federal space. As a result, GSA is no longer paying to heat and cool 3 million rentable square feet of space that it previously occupied. These efforts represent one of the most significant opportunities for GSA to further decrease its total energy use.

*Question 4.* You testified that high performance buildings (HPBs) at GSA achieve reduced energy use by 23%, water use by 28%, building operating expenses by 23%, reduced waste landfilled by 9%, and increased overall tenant satisfaction of 2%. And you point out that GSA HPBs are even greater when compared to the industry average benchmarks (43% for energy, 23% for water). Given the improved performance and reduced energy, water, and cost wasted, does GSA plan to make every building in its portfolio a high-performance building? If not, why so?

*ANSWER.* Pursuant to section 432 of the Energy Independence and Security Act of 2007 (EISA) GSA is working to build the capability to analyze covered facilities every four years, identify energy conservation measures, and implement cost effective measures. Many buildings receive the High-Performance Building (HPB) distinction because they have already achieved certain thresholds of performance. In other words, by definition, a building designated HPB has already made significant progress in improving efficiency, or it is operating in top percentiles of the performance metrics. Often, getting the HPB distinction requires that program and property managers add documentation discussing existing property management and programmatic activities. GSA emphasizes the importance of each individual program within the process; the HPB designation becomes an added benefit. Ultimately, GSA's mission is to make all of its properties as efficient as possible while working within the following constraints:

- Fiduciary responsibilities to taxpayers, and adhering to basic life-cycle-cost analysis principles;
- Balancing the other critical investment needs of the property; and
- Ensuring safe, comfortable and stable working conditions for tenants (particularly around infrastructure and buildings systems that support critical Federal operations).

*Question 5.* How many GSA-owned buildings utilize intelligent efficiency technologies? What are your plans to expand the use of intelligent efficiency in GSA owned and leased buildings? Are there challenges specifically with older buildings in deploying digital or intelligent efficiency technologies?

*ANSWER.* "Intelligent efficiency technologies" is an umbrella term that can include several different types of technology and systems. For example, smart metering, lighting controls, continuous commissioning, building automation systems could all be described as intelligent efficiency technologies. Even within these system types and technologies, there is a spectrum of "intelligence". For example, a building automation system might have an "optimum start-stop" program, which attempts to optimize energy usage by learning how long it takes a building's temperature to reach the desired point.

This wide range of system types and differing levels of "intelligence" within each technology make it difficult to precisely quantify the number of GSA buildings included in this category. Over 400 GSA buildings have smart meters. Essentially all buildings have automated systems for controlling mechanical systems, but the control sophistication varies. About 90 GSA buildings use continuous commissioning technologies.

Retrofitting any system into an existing building, regardless of age, is more challenging than designing a new system in a new building or full-modernization. In addition, highly sophisticated systems are more costly and come with their own distinct challenges—particularly around cybersecurity and information-technology. Cost-benefit analysis heavily influences the decision between investing in a "standard" versus "intelligent" system. Within the lighting space, GSA research has found that new light bulbs are so efficient that "the added savings from [intelligent] con-

trols did not cover the added expense of the controls themselves.”<sup>7</sup> Ultimately, the decision is made within the context of long-term asset management priorities that weigh other critical needs of the buildings unrelated to energy, water or utility costs. For example, a dollar spent on an intelligent lighting control system means a dollar that *cannot be spent* on repairing cracks in concrete.

*Question 6.* In your testimony in December of 2018 in front of the House Committee on Energy and Commerce, you point to research from the Oak Ridge National Laboratory that indicates energy savings performance contracts save the government money in both the short term and the long term, on average 1.96 times what the government initially expected to save. Do you think that mandating the use of these contracts should be codified in legislation, or do you think there is sufficient variability in the regional needs of buildings that they should also be able to use utility energy service contracts and power purchase agreements?

*ANSWER.* GSA believes the Federal Government needs flexibility in determining which financing mechanism to use when performing facility upgrades to improve energy efficiency. Energy Savings Performance Contracts (ESPCs), Utility Energy Savings Contracts (UESCs) and Power Purchase Agreements (PPAs) are tools Federal agencies can use to finance energy conservation retrofits based on regional partnership opportunities. Limiting public private partnership tools to just ESPCs could decrease the number of opportunities and possible partnerships and would be counter-productive.

GSA encourages the use of third party financing to get the maximum possible improvement to each building as long as it can be amortized over the potential term of these contracts. GSA combines energy conservation measures (ECMs), so that measures with a short payback offset those with a longer payback in order to fully optimize the 25-year potential authority.

*Question 7.* How does GSA ensure that in buildings it leases, rather than owns, building owners are capitalizing on the most efficient technologies available, saving taxpayers money on the energy bill for government leased buildings?

*ANSWER.* Section 435 of the Energy Independence and Security Act (EISA) of 2007 (42 U.S.C. 17091) mandates that no Federal agency enter into a lease contract after December 19, 2010, in a building that has not earned the Energy Star label, unless the space requirement complies with specific exceptions provided in statute. As provided in EISA, offerors are not required to comply with the Energy Star Label requirements if the offered buildings meet one of the following statutory exceptions:

- No space is available in a building with an Energy Star label in the delineated area that meets the functional requirements of an agency, including location needs;
- The agency will remain in a building they currently occupy;
- The lease will be in a building of historical, architectural, or cultural significance verified by listing eligibility for listing on the National Register of Historic Places; or
- The lease is for 10,000 rentable square feet or less.

Currently, if a building will not have an Energy Star label in accordance with one of the statutory exceptions identified in the previous paragraph, the building owner must renovate the space for all energy efficiency and conservation improvements that would be cost-effective over the firm term of the lease, including, but not limited to improvements in lighting, windows, and heating, ventilation and air conditioning systems.

Offerors are required to address in their written offer to the Government whether or not any cost-effective energy efficiency and conservation improvements can be made, and to itemize the upgrades to be done. If no improvements can be made, the Offeror must demonstrate in writing to the Government why no energy efficiency and conservation improvements can be made, using the Building Upgrade Manual [<https://www.energystar.gov/buildings/tools-and-resources/building-upgrade-manual>] and Building Upgrade Value Calculator [<https://www.energystar.gov/buildings/tools-and-resources/building-upgrade-value-calculator>], which are two Energy Star Online Tools.

In addition, as 95 percent of GSA’s leased portfolio is fully serviced leases, GSA lessors are incentivized, without Energy Star lease provisions, to implement energy efficient and conservation measures in order to minimize the cost of utilities and reduce lease expenses.

<sup>7</sup> [https://www.gsa.gov/cdnstatic/GPG\\_037-Findings-Advanced-Lighting-Controls-and-LED.pdf](https://www.gsa.gov/cdnstatic/GPG_037-Findings-Advanced-Lighting-Controls-and-LED.pdf)

QUESTIONS FROM HON. MARK MEADOWS FOR KEVIN KAMPSCHROER, DIRECTOR, OFFICE OF FEDERAL HIGH-PERFORMANCE BUILDINGS, OFFICE OF GOVERNMENTWIDE POLICY, AND CHIEF SUSTAINABILITY OFFICER, U.S. GENERAL SERVICES ADMINISTRATION

*Question 8.* In March 2019, GSA issued “High-Performance Building Certification System Review Findings Report.” Page 15 of the report states, “Per section 9002 of the Farm Security and Rural Investment Act (FSRIA), for U.S. Department of Agriculture (USDA)-designated products, use products with the highest content level per USDA’s biobased content recommendations.” Page 21 of the report indicates that only the Living Building Challenge (LBC) has a prerequisite related to biobased content, and that it aligns with prescriptive federal building requirements. However, LBC has their own criteria for biobased content that goes beyond USDA program requirements and would exclude wood from my state and many other parts of the U.S. Why would GSA consider the biobased criterion met when it clearly discriminates against U.S. products that meet the USDA Biobased Program?

*ANSWER.* Section 436(h) of the Energy Independence and Security Act of 2007 (EISA) requires GSA to evaluate high-performance building certification systems and provide the findings to the Secretary of Energy who, in consultation with the Department of Defense and GSA, formally identifies the system(s) to be used across the Federal Government. GSA’s role is to determine how certification systems align with Federal requirements for high-performance buildings and provide the facts to the Department of Energy for their consideration in completing their statutory requirement. GSA does not make any judgements or issue any opinions on any of the certification systems.

In its review, GSA evaluated certification systems to determine their alignment with Federal requirements for high-performance buildings. Many of these requirements are contained in the Guiding Principles for Sustainable Federal Buildings, which were issued by the Council on Environmental Quality (CEQ) on February 26, 2016. One such Guiding Principle, Material Content and Performance, says that Federal buildings should procure products that meet several requirements, where applicable, including section 9002 of the Farm Security and Rural Investment Act, which establishes the U.S. Department of Agriculture’s (USDA) BioPreferred program.

The BioPreferred program publishes a catalogue of biobased products that are eligible for preferred Federal purchasing, and to identify products whose biobased content has been independently laboratory tested and third-party certified. The BioPreferred program includes wood products certified by several wood certification bodies including the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC).

In its review of certification systems, GSA determined that the Living Building Challenge fully aligned with bio-based products as it contains a requirement that all wood must be certified to the Forest Stewardship Council 100% labeling standards or from the harvest of on-site timber. While the other certification systems address biobased criterion in various ways, these credits are optional and are not required for certification. The Living Building Challenge received a green check for bio-based products because it will meet the Federal requirement and the other systems received a yellow exclamation point because the bio-based credits are optional.

*Question 9.* What is the process and criteria for the selection of the nonfederal members of the Green Building Advisory Committee? How often does the membership change? Please provide the Committee with a plan on how GSA ensures and will ensure a diversity of opinions are included on the Advisory Committee. Please provide the Committee with written documentation that governs the selection process, criteria, terms, and role.

*ANSWER.* Pursuant to section 494 of the Energy Independence and Security Act of 2007 (EISA), GSA’s Office of Federal High-Performance Buildings created the Green Building Advisory Committee (GBAC). The GBAC operates under the provisions of the Federal Advisory Committee Act and provides independent policy advice and recommendations to advance Federal building innovations in planning, design, and operations to reduce costs, enable agency missions, enhance human health and performance, and minimize environmental impacts from the built environment.

EISA §494 governs the selection process, criteria, terms, and roles of each of the GBAC members. EISA requires at least 10 federal representatives from executive agencies. The GBAC is currently made up of 8 federal agencies with 2 slots vacant and 14 non-federal members. The current chair is a non-federal member.

GBAC members serve staggered 4 year terms. EISA limits the non-Federal membership of the Committee to no more than 15 individuals. The law specifies the categories of expertise that need to be represented on the GBAC:

- State and local governmental green building programs;
- Independent green building associations or councils;
- Building experts, including architects, material suppliers, and construction contractors;
- Security advisors focusing on national security needs, natural disasters, and other dire emergency situations;
- Public transportation industry experts; and
- Environmental health experts, including those with experience in children's health.

When soliciting non-Federal members, GSA publishes a notice in the Federal Register. The notice contains minimum criteria for membership including:

- At least 5 years of high-performance green building experience, which may include a combination of project-based, research and policy experience;
- Academic degrees, certifications and/or training demonstrating green building and related sustainability and real estate expertise;
- Knowledge of Federal sustainability and energy laws and programs;
- Proven ability to work effectively in a collaborative, multi-disciplinary environment and add value to the work of a committee; and
- Qualifications appropriate to specific statutory requirements.

The notice requests that interested parties send GSA a resume or CV, and a letter expressing their interest and qualifications, including for which statutory category or categories they are applying. Current committee members are invited to reapply, following identical requirements and process. GSA groups applications according to EISA categories and reviews. The committee's Designated Federal Officer (DFO) identifies the most qualified candidates based on the criteria above and discusses with the Director of the Office of Federal High-Performance Buildings. Section 5(b)(2) of the Federal Advisory Committee Act (FACA) requires "... the membership of the advisory committee to be fairly balanced in terms of the points of view represented and the functions to be performed by the advisory committee." The mix of qualified GBAC candidates is reviewed to ensure that it meets various tests of balance, including on sector, perspective, geography and gender. The Office also ensures balance in membership rotation to ensure that no business, government, or sector is over-represented.

GSA solicited non-Federal members in 2014, 2016, and 2018, and will continue to do so as members' terms expire.

QUESTIONS FROM HON. MARK MEADOWS FOR ELIZABETH R. BEARDSLEY, P.E., SENIOR POLICY COUNSEL, U.S. GREEN BUILDING COUNCIL

*Question 1.* Certification systems should provide flexibility to ensure buildings are built in the most efficient way given the geographic location. An office building in Florida, for example, should not be built in the same way as one in Michigan to ensure maximum efficiency. Please provide the Committee with three recommendations on how certification systems should be more flexible given factors such as location.

*ANSWER.* Ranking Member Meadows correctly observes that geographic location can be a factor in determining optimum ways to construct buildings. We agree that considering not only the general geography such as climate zone, but also the site specific conditions are critical to designing, constructing, and operating high performing, efficient buildings.

Moreover, our Leadership in Energy and Environmental Design (LEED) certification system provides a high degree of flexibility to project teams in selecting the key outcomes—credits—appropriate for their project, while ensuring minimum performance of all LEED certified building through core prerequisites. LEED provides a range of credits for projects to choose from; and most credits provide several pathways for projects to achieve the credit. Thus, projects can choose the credits and the pathways that best fit their needs and conditions. In addition, LEED has an array of pilot credits to allow flexibility—and anyone from a member organization can propose new pilot credits for consideration.<sup>1</sup>

Below, I provide several recommendations for how certification systems can provide flexibility in regards to locational factors and conditions.

REFLECT LOCAL CLIMATIC CONDITIONS

A core way that certification systems should provide flexibility is through mechanisms for building designs and construction methods to reflect location-specific cli-

<sup>1</sup>See <https://www.usgbc.org/articles/leed-link-propose-pilot-credit>.

matic conditions. With the LEED system, this is accomplished by incorporating energy modeling into the design and certification process. LEED credits for new construction award points for building energy efficiency by comparing the modelled energy use for the building design with a “baseline” building.<sup>2</sup>

Building engineers develop energy models which include various inputs based on the project’s geographical location. LEED references the model code ASHRAE 90.1. This code incorporates geographical information such as location and weather, as well as building site characteristics such as orientation of building facades and materials. This process is described by the Pacific Northwest National Laboratory.<sup>3</sup> For example, local weather data in the model include such data as temperature and humidity for the site in which the proposed design is to be located.<sup>4</sup> These models reflect not only local weather, but local energy costs as well, to enable cost-effectiveness comparisons.

LEED points for energy efficiency are performance-based for the specific location. By comparing a building design to the baseline, both based on the local conditions, every project can show it is exceeding a code building. So, the model results for a high-performing building design in Michigan are compared to the model results for a baseline building in Michigan, to determine the points; whereas a the model results for a high-performing building design in Florida are compared to the model results for a baseline building in Florida, to determine the points. Building projects can earn up to 18 points in LEED for optimizing energy efficiency in this way, reflecting local geography.

We note the use of energy models to compare a building design with a baseline code building is the same way that Federal statute articulates the requirement for Federal buildings to be better than model code.<sup>5</sup>

#### PRIORITIZE LOCAL MATERIALS

Another key way that certification systems can provide flexibility and reflect local construction methods is to incentivize use of local building materials and products. This provides “triple bottom line” benefits by enhancing local economic opportunity; reducing transportation and associated environmental impacts and costs; and encouraging buildings that consider local context.

LEED both supports and incentivizes building projects to use local materials and products. Specifically, for three credits, when local materials or products—sourced within 100 miles of the project site—they are valued at 200% of their cost in credit calculations.<sup>6</sup> This extra value incentivizes project teams to use local materials and products, supporting local economies while reducing environmental impacts.

#### REGIONAL PRIORITIES

Certification systems can also reflect local conditions by emphasizing particular performance outcomes that are most critical to a location. LEED rewards projects that incorporate regional priorities with extra points. Projects can earn up to four of the six regional priority points by achieving the priority credits for the project location. These credits have been identified by the USGBC regional councils and chapters as having additional regional importance for the project’s region.<sup>7</sup>

For example, in North Carolina, regional priority credits include renewable energy, energy efficiency, daylight, rainwater management, outdoor water efficiency, and heat island effect. In contrast, the regional priority credits in Montana are renewable energy, energy efficiency, high priority sites, surrounding density and diverse uses, site development habitat protection, and indoor water efficiency.

#### USER INPUT

Another important way for certification systems to be more flexible and reflect local conditions and geography is to consider input and feedback from users. USGBC has instituted key mechanisms to proactively seek such input from users of the LEED program. For example, we have issued a Beta version, LEED v4.1, which is

<sup>2</sup>See LEED new construction v4 credit: optimize energy performance [<https://www.usgbc.org/node/2614273?return=/credits/new-construction/v4/energy-%26amp%3B-atmosphere>].

<sup>3</sup>See PNNL, ANSI/ASHRAE/IES Standard 90.1-2010 Performance Rating Method Reference Manual (May 2016), page 2.8, Figure 3, flow chart.

<sup>4</sup>See *id.* at page 1.2.

<sup>5</sup>See 42 U.S.C. § 6834(a)(3)(A)(i)(I).

<sup>6</sup>See v4 credits [<https://www.usgbc.org/credits/new-construction/v4/material-%26-resources?keys=local>] and v4.1 credits [<https://www.usgbc.org/credits/new-construction/v4.1/material-%26-resources>].

<sup>7</sup>A database of Regional Priority credits and their geographic applicability is available on the USGBC website, [www.usgbc.org/rpc](http://www.usgbc.org/rpc).

open for use and feedback through the end of the year. And, for the second time in two years, we have recently opened a call for suggestions.<sup>8</sup>

Understanding user experience with the certification system, including any feedback relating to the application of particular credits in different locations, is important to improve the effectiveness of the system long-term.

QUESTIONS FROM HON. MARK MEADOWS FOR KEVIN VAN DEN WYMELENBERG,  
DIRECTOR, ENERGY STUDIES IN BUILDINGS LABORATORY, UNIVERSITY OF OREGON

*Question 1.* In your testimony you highlighted the importance of building in health and wellness in buildings. Yet, the reality is—we do not know how many people *actually* work in a given building each day. GSA cannot tell in any given building how the space is actually being used. We know generally how many workers may be *assigned* to a building. How do we accurately plan for and design spaces if we do not have data on how buildings are actually being used? Would this data be helpful?

*ANSWER.* We agree that there is often little data about how real buildings are used by occupants. In fact, we have conducted original research to utilize sensors within buildings to try to better understand space utilization rates and human activities. Without adequate data, we are often forced to make theoretical assumptions based on market trends, anecdotal history or limited observation. We can model and simulate building energy usage; although, our simulations are only as good as our base assumptions (see IEA-EBC Annex 66 for improved assumptions) and as the culture of work constantly evolves, any assumptions we make can become quickly outmoded. One way that building product manufacturers have responded to this conundrum is through the development and deployment of mesh sensor networks in buildings, such as those integrated into light fixtures (Luminaire Level Lighting Control, or LLLC) at a high spatial density and able to discern patterns of spatial occupant density. This approach can be implemented when retrofitting a building's light fixtures. Another way to understand and design for actual versus assumed building usage is through the deployment of deidentified occupant wearable sensors and low-cost Bluetooth beaconing stations. These wearable sensors also have the added advantage of being able to collect a range of environmental data, such as light, relative humidity, temperature, or even air quality information. This type of original data would be very helpful in space planning existing or future infrastructure from fundamental aspects such as space utilization, to more advanced applications such as designing healthier buildings. For example, the LLLC sensors or the wearable sensors could provide information about air quality and access to natural light at a floor plan resolved scale, and illustrate how many people within a workforce are gaining access to high quality light and air and how many may be being exposed to toxicants or deprived of daylight.

*Question 2.* Certification systems should provide flexibility to ensure buildings are built in the most efficient way given the geographic location. An office building in Florida, for example, should not be built in the same way as one in Michigan to ensure maximum efficiency. Please provide the Committee with three recommendations on how certification systems should be more flexible given factors such as location.

*ANSWER.* One of the first concepts that we teach architecture students is the importance of site and designing in response to place, this is what we call *climate response design*. Good architecture responds to the local site through an understanding of vernacular forms, space patterns, material choices, and construction assemblies that have evolved with a keen awareness of local climate dynamics, culture, economics and building traditions, to be very efficient and effective. For example, in Oregon, we have a regionalist vernacular of heavy timber and broad roofs using local materials with forms that acknowledge our rainy climate, yet this may not be appropriate in the Southwest where wood is scarce, and the desert exerts high daily temperature swings on buildings. Given this, three ways in which certification systems might respond to geographic location include: (1) incentivize human health indoors at three scales—individual, community and planet—using a human health outcomes based approach (2) incentivize energy performance targets rather than prescriptive design pathways to meet targets, and (3) incentivize holistic approaches, such as calculations of embodied energy or carbon with life cycle analysis approaches. We believe each of these approaches will support an appropriately regionally responsive and flexible model for certification systems.

<sup>8</sup> See "Submit your ideas on the future of LEED." [<https://www.usgbc.org/articles/submit-your-ideas-future-lead>]

QUESTIONS FROM HON. MARK MEADOWS FOR MARK RUSSELL, PH.D., P.E., GGA,  
LEED AP, BREAAAM IA, GREEN GLOBES ASSESSOR, GREEN BUILDING INITIATIVE

*Question 1.* Certification systems should provide flexibility to ensure buildings are built in the most efficient way given the geographic location. An office building in Florida, for example, should not be built in the same way as one in Michigan to ensure maximum efficiency. Please provide the Committee with three recommendations on how certification systems should be more flexible given factors such as location.

*ANSWER.* As we mentioned during our testimony, GBI's Board of Directors met on June 11, 2019 in Chicago to hear the report from ANSI on its final approval of the updated Green Globes standard, and to vote to officially publish the standard. Thus, your question about improvements to flexibility was very well-timed because we have been thinking a lot about this topic as we conducted our consensus process to update the Green Globes standard, *ANSI 01/19: Green Globes Green Building Certification Standard*. GBI's mission continues to be to promote a practical, science-based approach to green building, with the goal of improving the performance, cost- and energy-savings of each building we work with, while recognizing every building's goals, priorities, and unique needs.

We believe that Green Globes presents a robust, logical, challenging—yet fair—green building certification regimen that appropriately acknowledges that in a nation as large as the United States, with 8 different climate zones, differing private- and public-sector building priorities, different marketplace needs, and an abundance of differing building purposes, the certification system has an obligation to work with projects of all types to meet their needs and help them attain their goals. If our collective goal is to build better, more sustainable and cost-efficient buildings, we must recognize that every building cannot be treated with a one-size-fits-all mentality.

Green Globes historically, and in its updated 2019 standard, addresses the issue of flexibility in several key ways:

1. The Green Globes and Guiding Principles rating systems are all based on industry standard documents such as ASHRAE 90.1, ASHRAE 189.1, and UFC 1-200-02. When evaluating buildings, the assessor ensures that the correct climate zone has been identified and that all energy modeling and criteria are based on that region. As an example, in ASHRAE 90.1, Table 5.5 Building Envelope Requirements, there is a different chart of criteria for each of the 8 Climate Zones. Thus a building in Miami, Florida—Climate Zone 1 may require a roof insulation of R-15 and a similar building in Fairbanks, Alaska—Climate Zone 8 may require a roof insulation of R-20. Additionally, the differences in building functionality and construction methods are also addressed in the same tables. The assessors are guided through this process by specific questions within the scorecard that call out climate zone and functionality differences. As one example, the criteria for skylights establishes that the requirement is not applicable for buildings in climate zones 7 and 8.
2. Green Globes does not mandate a static set of pre-requisites across all buildings. Instead, we use a system of weighted criteria to drive users toward best practices, while managing a process that allows buildings to identify the criteria that best meet their project, geographic, and sustainability needs. We frequently find in the marketplace that many building owners and developers are frustrated with prerequisites because static, mandatory prerequisites don't consider the needs of a specific building. Projects often feel that they must spend a lot of time, money, and resources “point chasing”—funding technologies, construction concepts and other development items—simply to meet mandated requirements that don't actually address that building's performance or goals.

As Green Globes was first being developed in its consensus process, participants highlighted the problems created by point chasing as a key factor in creating additional unnecessary costs, roadblocks to completing certification, and frustration with the process of developing sustainably built buildings. Because of those concerns, Green Globes chose to forego mandatory across-the-board prerequisites in favor of the weighted criteria system. As a result of that decision, Green Globes can be cleanly implemented by any building type, regardless of location, regardless of the building's purpose, and regardless of the building's unique or specific needs. This has also meant that Green Globes does not need to create additional modules targeted to one type of building or another, i.e. specific to hospitals, or retail, or military buildings. Every type of building can pursue Green Globes certification through our basic Green Globes for New Construction, Green Globes for Existing Buildings, or Green Globes for Sustainable Interiors programs.

3. Green Globes also chose to create an assessment system that uses the in-depth expertise of third-party Green Globes Assessors (GGA) to work in a team-based approach to completing projects. Our assessors must be licensed architects or engineers, must have a minimum of 10 years of specific experience in the field, and must have an educational background in architecture, engineering, or sustainability in order to qualify and train to sit for the exams to become a GGA. Assessors provide oversight over a project, providing expertise as needed and serving as a resource, in addition to acting as the assessor who determines whether the project has successfully and faithfully achieved the required criteria for recognition. Importantly, this process of using an assessor who is actively involved in reviewing the project enhances flexibility. Assessors bring to these projects significant expertise and provide support to projects by explaining our Green Globes criteria and providing insight into how projects with a similar building purpose in a similar location were able to achieve their desired performance. Often, GGAs provide innovative solutions and ideas to address challenges that occur during the construction process based on their prior experience.

To further enhance our assessor network, GBI has established a quarterly roundtable forum and annual meeting in which the assessors can share ideas, raise questions, and disseminate new information regarding building evaluations. This network is assisted by the GBI staff to provide a resource for assessors to provide timely consistent responses when unusual situations arise.

4. Green Globes offers a “Non-applicable (N/A)” feature that combines our expert assessors and our weighted-point criteria to create logical, project-based flexibility. Within the certification system, criteria can be declared “N/A” if they represent items in the system that do not apply to the building in question. A project team can identify N/A criteria, and the Green Globes Assessor confirms the N/A. For example, a DoD building that, for purposes of mission, does not have windows could receive an N/A for criteria related to energy-efficient windows. Projects may not have an N/A on criteria simply because they don’t want to meet a criterium’s requirements. This is an important distinction because approved N/A criteria are subtracted from the total possible score for a building. The value of approved N/A criteria is subtracted from the total possible points that can be earned by the building, allowing a building to still work to achieve the certification level it wants to, while not being penalized for criteria that should never have applied to the project.

We appreciate this opportunity to provide additional thoughts on the importance of flexibility in building certification systems. We strongly believe that recognizing the individual needs, challenges, and goals of each project is key to achieving the best possible performance and savings in each building that pursues certification. We would be happy to answer any further questions about Green Globes and our continued work with federal building projects.