

# Building Our New Energy Future

BY SHEILA J. HAYTER, P.E., ASHRAE PRESIDENT, FELLOW ASHRAE

I'm here today to take us on a journey to the future. In particular, the future of energy. And to discover the hugely important role buildings will play in our new energy future.

But before we begin, I'd like to tell you about my own journey to how I got to be here today.

Looking to the future is not new for me. I'm actually a person with a life-long habit of looking to the future. It all started in the 1970s.

Common images of my childhood in the 1970s were of pollution, the energy crisis, and the environment—the topics these images represent received intense global attention. And they really caught my attention, too.

Naturally, I started to think about energy. Where our energy comes from. How we use energy. The impacts of using energy. And the environment.

Sheila J. Hayter, P.E.,  
ASHRAE President 2018–2019





During this time, my dad, Dick Hayter, set the example for energy awareness in many ways including by adjusting the thermostat in our house every evening, every morning, every time we left the house. That thermostat was my dad's domain.

Dad was also actively involved in ASHRAE. So, all of our summer vacations were spent where ASHRAE Annual meetings were held. As many of you know, he later served as ASHRAE President from 1995 to 1996. He firmly established my belief that ASHRAE provides a community for advancing technical knowledge and influencing positive change in how we use our valuable energy resources.

My Mom, Barb Hayter, was also a key influencer. In the 1970s, she was an active member of a national public policy advocacy organization within our community. As a child, I helped stuff what seemed like thousands of envelopes containing information about environmental and social issues. I am proud to say my mom and her friends from those days are still building community awareness and advocating for changes about important issues today.

Now, being the daughter of these remarkable people, I probably had only two choices. One, was to rebel and reject their teachings completely. The other, of course, was to weave their teachings into the very fabric of who I am. Now, you decide which option I chose.

I pursued my education in mechanical engineering. I joined ASHRAE, naturally. And I have continued the fine tradition of bringing my own family to ASHRAE meetings, often times with my parents.

And, as a person with a life-long habit of always looking to the future, I went to work at the U.S. Department of Energy's National Renewable Energy Laboratory, or NREL, where I have worked for 26 years. NREL is a

research institution that focuses entirely on advancing energy efficiency and renewable energy technologies.

Being deeply involved with ASHRAE and working at NREL has given me a unique perspective. My work at NREL has me looking constantly to the future—working in the buildings industry to find opportunities to deploy cutting-edge research and make our new energy future a reality. ASHRAE keeps me firmly planted in the now. For my entire career, I have been a bridge between these two worlds. Between my ASHRAE colleagues, on the one hand, who work with realities in our profession every day. And, on the other hand, my NREL colleagues, who work every day to dream up a better future for all of us.

Ok, you might say. We see the connection between buildings and energy—mechanical engineer, ASHRAE, NREL—that all makes sense. But what about the environment? Well, hopefully each of us has a bridge that connects us to our environment as well.

My bridge? Skiing. Preferably with my family. Believe it or not, I am a certified ski instructor. My work, both at NREL and ASHRAE connect me to buildings and energy. Skiing connects me to the outdoors. And, altogether, they remind me every day of the critical role the our industry plays in preserving our environment.

So, I'd like you to think of me as a bridge. From our energy present to our energy future. A bridge that connects buildings, energy and the environment. And, today, I want to talk to you about an exciting new energy future that we're all going to share and how ASHRAE can lead in building a bridge to that new energy future.

To build this bridge between our Society and that new energy future, here's what we need to do:

First, we become aware.

Then, we get engaged.



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Hayter has previously served on the Board of Directors as treasurer, two terms as vice president, and director-at-large. She is the recipient of ASHRAE's Distinguished Service Award, Exceptional Service Award and an ASHRAE Technology Award.

Hayter earned a master's degree in mechanical engineering from the University of Colorado and a bachelor's degree in mechanical engineering from Kansas State University. Her roots in ASHRAE run deep. Her father, Richard Hayter, served as the ASHRAE president from 1995 - 1996.

And we start now!

Let's begin with becoming aware.

What does our new energy future look like? And what do buildings have to do with it?

Fortunately for you, we've already published this primer, "Building Our New Energy Future."

A PDF of the document is available from my Presidential page on the ASHRAE website at [www.ashrae.org/about/leadership/ashrae-president](http://www.ashrae.org/about/leadership/ashrae-president).

This document was developed in collaboration with the American Institute of Architects (AIA), the National Institute of Building Sciences (NIBS) and NREL. It looks at the future of the electricity sector and the role of buildings in that future. This document is designed to help you, your colleagues and your clients understand some of the topics I'll touch on today, and to give us a common language and a baseline of understanding.

Before describing what else ASHRAE is doing and is going to do to help you become aware, let me describe what this future will be.

Let's start with the electricity sector today.

Electricity powers modern life—our work, our homes, our schools, our health-care facilities.

And buildings are the electricity sector's number one customer. In fact, buildings consume two-thirds to three-quarters of all electricity that is generated.

The electricity sector—the grid—is an engineering marvel. But, the model for the electrical grid is about 100 years old—that's 1918, not 2018.

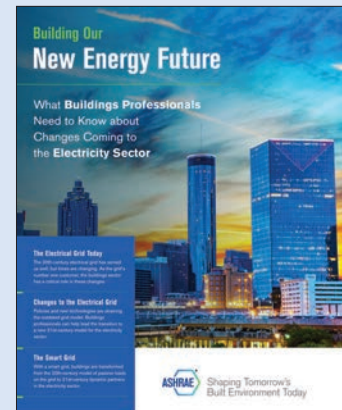
Generally, this is how it works:

- Most electricity comes from burning fossil fuels, mostly coal or natural gas.
- Power plants generate electricity in large quantities at only about 30% to 40% efficiency.
- Power plants are usually located very far from loads, so electricity travels great distances over transmission lines, introducing more inefficiencies in the system.
- Electricity is delivered to the end customers, which for the most part are buildings.
- The whole system is designed for one-way flow of electricity—from power plant to loads.

## Our New Energy Future

A rapid evolution is underway in the electricity sector that will also have a significant impact on the buildings sector. The result of this evolution is our new energy future, which is not far away. As a critical organization for buildings professionals, ASHRAE and its members must take an active role in the ongoing changes that will create this new energy future.

To that end, ASHRAE has published a report "Building Our New Energy Future," which is available at [www.ashrae.org/about/leadership/ashrae-president](http://www.ashrae.org/about/leadership/ashrae-president).



The current grid also influences what we do in buildings.

- Electricity is a big expense, so we design and operate buildings to minimize that expense.
- We tend to think of a building as a box connected to the grid by a feed from the electricity provider.
- We drop equipment into the box and put it all together to make the building work to meet client expectations.

I'm happy to say, we are really good at the box. And, given the way the current grid works, the box is the right way to go. But we need a 21<sup>st</sup>-century grid and 21<sup>st</sup>-century buildings, and ASHRAE is prepared to provide you with the continuing education, tools and resources to meet those needs.

Actually, the truth is that things are already changing and putting the 20<sup>th</sup>-century model under stress.

So what will a 21<sup>st</sup>-century grid look like?

- Technologies will change and we will see distributed energy resources, like solar and wind systems, that are integrated with improved and less-expensive battery storage and microgrids.
- Electricity flow will be bi-directional, not just one way.
- Individual building owners and third-party providers will own generation. Your building-owner client might decide to get into the electricity business.
- The grid will work with the "Internet of Things."

These are devices in buildings that communicate via the internet and have an impact on electricity loads.

- To handle all this, buildings and the grid will have to get smarter. We will transition to a future of smart buildings that play a dynamic role on a smart grid. And, we're going to have to do that without compromising the health and wellness of the built environment.

If the electricity sector is going to transition to a smart grid, and people like us—ASHRAE members—are going to be among the smart grid's most important customers, we better learn more about it.

The primer will help you get started. In addition to that, we're also in the process of developing an Application Guide on Smart Grid to put relevant information at your fingertips. The guide will include practical information for building owners and design professionals about designing and operating buildings, whether new construction or renovations, in ways that are smart grid friendly. So, look for an ASHRAE Smart Grid Application Guide this year.

In addition to the primer and application guide, we're also expanding the Distinguished Lecturer program for the 2018–2019 Society year. We'll provide speakers with high-quality content about smart buildings and smart grid, the connectivity of buildings through microgrids and the smart grid, and ensuring practices continue to focus on wellness in the built environment. Through the Distinguished Lecturer program we'll connect subject matter experts with chapter members throughout the year.

Earlier I said we have to do three things: become aware, get engaged, start now. All that I just said, that was about the getting aware part. It's a big job.

To increase your awareness about our new energy future, here's what I want you to do:

- Read the primer, "Building Our New Energy Future;"
- Attend DL lectures on these topics;
- Attend conferences and meetings on distributed energy resources, smart grid and buildings-to-grid, such as the anticipated series of ASHRAE educational webinars offered on related subjects;
- Get these topics on your radar now; and
- When it's available, read the Application Guide on Smart Grid.

Awareness is a great first step. But, we in the building profession have to do more. If we are to bridge our

Society to a new energy future, we have to get engaged. We are the buildings experts. We have the most knowledge about, as our mission states, to "serve humanity and promote a sustainable world." Buildings professionals have to be involved, and ASHRAE must become a leader.

All these changes will have an impact on the future of building design, construction, commissioning, maintenance and operation. Your building-owner clients may shift from being just building owners to also being providers of electricity and other energy services.

There are and will continue to be many other businesses and entire industry sectors out there that recognize the opportunities in the energy changes now underway and that are expected to expand in the near future. Think about it. We have big players in the technology sector making their way into home automation and controls—heating and cooling, lighting and electronics. We have big players in the technology sector making headway with energy storage and solar PV. The utility sector has been working on issues related to distributed energy resources (solar, wind, battery storage, microgrids) and smart grid for several years. Data will be the golden key in our new energy future. Any company with an interest in "our" data is already thinking about this energy future.

These industries see opportunities in how energy is generated, distributed and stored, and they are starting to mobilize to take advantage of these changes for their own benefit. If buildings professionals aren't part of the research, development and policy changes; the conferences, meetings and conversations, we will see other industries setting things up for their own benefit. And, what they decide and do may or may not benefit the buildings industry. It may or may not benefit our clients. And, it may or may not benefit building occupants.

Who would you rather have establishing smart grid or smart building standards about thermal comfort, indoor air quality and occupant wellness within the built environment? A tech company or those of us in this room? Who would you rather have establishing communications protocols and standards that affect building systems operations? Utility companies or those of us in this room? Of course, it should be us! We have nearly

125 years of experience doing this. We are the buildings experts!

If we don't become aware and get engaged, the essential, critically important role we play in the buildings industry right now, could change dramatically.

So, how do we get engaged and build a bridge to our energy future? During my Presidential year, we're going to create new networks and establish new partnerships to expand the Society's opportunities for engaging across the many industry sectors that also have a stake in our new energy future.

In addition to promoting awareness with the primer, the DL lectures and the Application Guide on Smart Grid, ASHRAE will actively engage in the smart grid community. Buildings are the number one consumer of electricity. So, as leaders in the buildings industry, we want to ensure ASHRAE asserts its expertise and maintains its relevance. ASHRAE will take a leadership role in defining the relationship between buildings and the smart grid. We will identify, and approach existing organizations or groups of organizations focused on smart grid with which we can engage and bring our critically valuable expertise to the table.

Buildings systems will likely communicate about energy use through the internet and be able to exchange information with an electricity provider or other buildings. Building systems will also likely receive data via the internet and use that data to inform system operation and performance. All that communication is a good thing as long as it can be done while ensuring the safety, security and privacy of the building occupants and their information.

That's why ASHRAE will engage in the cybersecurity community. It is important that the buildings industry addresses building-specific cybersecurity issues. We know there are some key players in this space. During this year, we will develop more effective collaboration among ASHRAE committees working in or having an interest in cybersecurity. And we'll develop a mechanism for ASHRAE to engage with and collaborate with other organizations that have strength in this area. We will also create webinars on buildings-specific cybersecurity issues to ensure our members are well-informed on the topic.

As we consider all the changes coming to both the electricity and buildings sectors—the challenges and the

opportunities—we must not lose sight of the fact that buildings are built for people. Buildings serve people, not the electrical grid. The best building design, construction and operation will achieve two important goals. First, they will ensure occupant safety, wellness and comfort. And, second, they will become a dynamic partner in a new electricity sector. The building that was designed yesterday will have to evolve to meet the design requirements of tomorrow. The building professionals who know how to create and operate grid-responsive buildings and also excel in delivering IEQ are the practitioners that building owners need today and in the future.

So, as we prepare our Society for a leadership role in a new energy future, ASHRAE will actively engage in the rapidly growing wellness community. The increased connectivity of the future brings more opportunities than just those in energy. Human wellness and wellbeing within the built environment is an area of significant opportunity, and ASHRAE members are well positioned to be at the forefront of this growing trend. We will expand ASHRAE's leadership role in IEQ to support the growing interest in wellness and wellbeing in buildings. We formed a multidisciplinary task group, "ASHRAE Health and Wellness in the Built Environment." We will work with other organizations to link the built environment to human wellness and happiness.

These are specific initiatives associated with my Presidential year. We welcome and encourage your involvement.

Here's how you can get engaged and bring your essential buildings professional expertise into all the discussions about our new energy future.

Get involved in ASHRAE's ongoing conversations:

- We formed a new Technical Committee on Resiliency and Security;
- ASHRAE has a smart grid standard and there may be new activities as a result of this conversation that you could get involved in;
- Start talking to your clients. Help them become aware. Help them take action for the future;
- Keep an ear to the ground and look for opportunities for demonstration projects that are testing new technologies, business models and relationships;
- Get to know your electricity providers and get to know the IT staff in your buildings—these are going to be



important relationships for the future;

Look for and get involved in local, state and/or regional activities:

- What is your public utility commission or other local or regional organizations doing regarding regulations and policy changes that affect the electricity and buildings sectors?
- What is your local utility provider doing to prepare for more distributed energy resources and the smart grid?
- You can inform these discussions with considerable expertise.
- Remember, ASHRAE has a strong Government Affairs Committee that can also use your expertise!

I've talked about how you can become aware of the issues, technologies, opportunities and challenges of our new energy future. I've talked about how to get engaged. Finally, I want to underscore the importance of starting now.

The new energy future will challenge current notions of building design, construction, commissioning, maintenance and operation. If you start now to develop the solutions to these challenges, you'll be ahead of the curve, and your competition.

To get ASHRAE started now, we're going to do two things.

First, we're going to partner with APPA to work with universities interested in using their campus as living labs. ASHRAE will provide research and technology resources to work with the universities to identify programs that do two things. First, to support the university's goals and, second, to expand our knowledge of our new energy future. ASHRAE will partner in the implementation and monitoring of these programs.

The partnership will also include the utilities that serve the university campuses so new technologies can be explored. Working with a living lab is important, because it allows ASHRAE members the opportunity to work on microgrid scenarios, making you all the more familiar with how microgrids are integrated with the classic grid and the role buildings must play to ensure the success of these scenarios. The more we understand the interconnection of buildings with other systems, the better equipped we are to lead the charge in the new energy future.

Additionally, we will encourage local chapter leaders to use Chapter Opportunity Funds to create

grass-roots programs, specific to the needs of the local community, in regard to changes to energy systems and the connectivity of buildings. We encourage any chapter program to reflect similar breadth and scope to a concept of a living laboratory within a community of buildings. This could include, for example, working with a local utility and neighborhood to provide community solar or other community shared, grid-connected renewable-energy, distributed generation, while improving wellness and resiliency in the buildings (residential or commercial) in the community.

Students can start now by participating in the Setty Family Foundation: 2019 Applied Engineering Challenge (AEC) to design a self-sustaining community for the 5,000 residents of the island of Vieques, Puerto Rico, that includes on-site power generation, water and sewer treatment, and agriculture to make the community self-sustaining.

That's how the society is starting now. As a member, you can start now by incorporating smart grid knowledge into the design of your projects.

Our new energy future is not far away.

ASHRAE knows it is essential to take a leadership role in this change. If we don't, someone else will. Please, take advantage of the work and research ASHRAE is doing and make sure you are contributing to it. Start in your day-to-day life. Become aware and build your own knowledge. Become engaged. Be a leader. We want everyone in this society one step ahead, and we're here to help you do that.

I've shared with you how I am a bridge. I've shared how ASHRAE is a bridge. I've shared the tools you need to be a bridge in your community. Now, *together* let's build the bridge to our new energy future. Thank you.

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