

# EFFICIENCY

THE OFFICIAL MEMBER MAGAZINE OF THE  
**ASSOCIATION OF ENERGY ENGINEERS**

**Technical Articles**  
**Member Stories**  
**Events Run Up**  
**Chapter News**

**Plus+**

## **HOW ENERGY PROJECTS GET DONE**

Jerry Zolkowski and Amy Glapinski explain the factors behind getting a green light for your project



## **HOPE FOR A ZERO CARBON WORLD**

Samer Adnan Zawaydeh reviews some global events related to energy and the environment



## **A PASSION FOR PEOPLE AND EVENTS**

A personal story about our founder by Lauren Lake, AEE's Director of Events



<< COVER IMAGE STORY

# EFFICIENCY

## Published By

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THE OFFICIAL MEMBER MAGAZINE OF AEE

# Welcome

From Bill Kent, Executive Director,  
Association of Energy Engineers

It is a great pleasure to welcome you to the inaugural issue of "Efficiency," the official magazine of the Association of Energy Engineers (AEE). In 1977, my predecessor, and founder of AEE, Al Thumann, had a vision for this organization. He built that vision by building a community. It was only with the direct help of the new members and certified industry experts that allowed AEE to grow into a global voice for energy professionals. This magazine is an extension of that vision that aims to celebrate our community and our need for technical information. We hope you will embrace it, share it and contribute to it, for we wish this to be a magazine for AEE members by AEE members.

As Executive Director, I have been fortunate to travel to many countries where we have chapters. I have met members from all walks of life and heard their stories. Last year, before the pandemic, I traveled through Africa and the Middle East. It was there I met Mr. Selwyn Govender, C.E.M. (Pictured Above). He provided a tour and overview of the energy efficiency projects implemented at the Supreme Spring plant in Nigel, South Africa.

Traditionally, financial aspects were the primary driver of energy efficiency projects. More regularly, I see energy efficiency as a mainstream means for driving economic growth, creating jobs, developing healthier buildings, and fighting climate change. Energy and efficiency are now much more than individual pieces of equipment; they are an



[Connect with Bill Kent](#)



integral part of the sustainable communities in which we live. Selwyn's is just one of many stories propelling AEE forward - every member has a story. Included in this edition, we recognize members that have been with us for 20+ years. Are you still on your 20-year or more membership journey with us? What is your story?

Our growth and success depend on our ability to overcome the challenges that face us. To that extent, a large portion of these pages will be technical in nature, such as the articles provided by Stephen A. Roosa, Jerry Zolkowski, and Amy Glapinski - All AEE Members. We will also bring you pertinent articles that will inform you of changes in the industry or help you be more successful in business, such as the benchmarking information offered by ENERGY STAR.

Inside this magazine, you will also hear from various AEE staff members and gain a glimpse of the inner workings of AEE and what motivates us. Over the past 18 months,

we have all dearly missed connecting with our members face to face. We cherish the time we get with you at our in-person events. This month, Lauren Lake, AEE's Director of Events, shares a heartfelt and timely story of "Our Founder; His Passion for People and Events."

I often say "We are local, we are global, we are AEE," because I believe it is true. As an AEE member or certified professional, we are honored you are part of the AEE family, grateful for your continued support,

and cherish the continuation of memories made together to change the world. For those of you on the fringes, you too can get involved and participate. I invite you to share your expertise and best practices with our community. Take the first step by submitting an article, nominating a colleague for an award, or attending an event. I would love to read your story in the next edition or even better, hear it from you directly at our next in-person event.

# Member Q&A



**John Nott**  
*Principal Energy Engineer  
Griffith Engineering*

John has been an AEE Member for 11 years and holds both CEM and CMVP certifications. He has attended numerous AEE World Conferences and presented at AEE East, AEE World, and a Monthly Membership Webinar. John is active in the Atlanta Chapter and enjoys the informative presentations and connecting with industry leaders and businesses. We met with John to talk about being an AEE member and how his CMVP Certification helps him with projects and his career.

## **What was your introduction to AEE?**

When I started getting into energy engineering, it was part of our company's policy to become a CEM. Our company's founder thought it was a required certification for people doing energy consulting as a baseline knowledge and understanding that people doing the work have those core principles.

## **What is your favorite part about being an AEE Member?**

It is involved in the local chapter by attending events and connecting with other industry professionals in the Atlanta area. It's really useful to see some of the projects people are doing.

## **How long have you had your CMVP Certification?**

I have had my CMVP Certification since 2017.

## **What was the deciding factor in becoming a CMVP?**

At Griffith Engineering, we work with all kinds of ESCO's and Utilities, and M&V was an aspect that we were less qualified to support at the time. We had been doing a little bit of M&V work and felt like we needed to get certified to be fully in line with industry standards and practices involved with that.

## **How has becoming a CMVP helped you in your career and your company?**

Since we offer full-service engineering for performance contracting and act as a flex resource for a lot of large ESCO's and Utilities, with that in mind, we wanted to round out our offerings for that. We get about 10-20 projects a year; we are doing annual M&V now that we weren't doing before. It's been a shift in the industry where companies are more willing to outsource M&V to a third-party consultant. Even



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when we're not actually doing the M&V for our clients, understanding what needs to be done and the processes involved in that can help us provide some synergy with what they are doing. Our efforts may be more involved in energy modeling or calculating savings for a particular energy conservation effort. Still, we can take measurements that may have been for us before but now, with witnessing and doing the documentation required for M&V so our client can take those measurements and use them later on. It also helps mold our approach to certain calculations and energy engineering tasks, knowing that things will be done later. I think it's given us a better product for our customers and makes us more valuable to them and has given us additional revenue streams.

### Why should someone become a CMVP?

If you're involved in measurement and verification either through performance contracting or a rebate program with utility, I think the M&V process can be a little non-intuitive. I think it's very important for the industry to stick to standards like the IPMVP and consistency across the board. I found the CMVP Certification helpful to frame the mental approach you take to M&V to create a solid plan and process. I think the industry strongly encourages people to get this certification if they are involved in measurement and verification. I believe this is the only M&V certification out there that is widely known and respected.

**SEE JOHN'S VIDEO>>**



# #ExploreTheEfficiency



Whether it's hiking, biking, or scuba diving, AEE encourages you to explore and enjoy the world our members are making more sustainable and efficient. Share your expeditions with us using our newest hashtag, **#ExploreTheEfficiency**.

*From the heights of Lebanon to Niagara Falls, right down to the South Pole, wherever you go, enjoy the world we are making better together.*



# Trending State and Local Energy Benchmarking Policies

# 15%

**of the US commercial building floor space, eleven billion square feet, is now covered by an energy benchmarking and disclosure policy.**

With the building sector consuming 40% of total US energy consumption and representing up to 80% of a city's greenhouse gas emissions, state and local governments have targeted more efficient built environments critical to their environmental and economic improvement goals. Local and state-level ordinances are an established and growing strategy for governments to understand the amount of energy commercial buildings consume, show their greenhouse gas footprints, and develop strategies to mitigate resulting emissions.

More and more frequently, these laws designate that a certified professional participates in a portion of the compliance process, representing a business opportunity for AEE members. With that in mind, you may want to know what these requirements are, what markets are they in, how these initiatives

are evolving, and how you can help your customers comply. As you begin supporting compliance, you can use the results to engage customers in discussions about energy and water efficiency improvement projects to improve their publicly disclosed scores.

The ongoing story of state and local benchmarking ordinances dates back over a decade. In 2005, Washington State legislation required all state buildings benchmark using EPA ENERGY STAR's Portfolio Manager. Shortly after, in 2007, California followed suit and went beyond state-owned and managed properties to include larger private sector buildings in its legislation. The trend has continued, with more local governments passing their

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*“the building sector consumes 40% of total US energy consumption and represents up to 80% of a city's greenhouse gas emissions”*

---

variations of ordinances that require owners to benchmark in Portfolio Manager and share the results with the city for compliance and public disclosure. Since Washington and California's initial efforts, the list of state and local governments with benchmarking ordinances has grown to nearly 40, including those shown in the graphic below.



An interactive version of this map can be found at [www.energystar.gov/policiesandprograms](http://www.energystar.gov/policiesandprograms).

A number of these ordinances, including those in Atlanta, New York City, San Francisco, and Seattle, require buildings to take the next step in identifying energy performance improvements via energy audits and retro-commissioning (often with an exemption available for properties that have earned ENERGY STAR certification). Upon completion of the assessment, laws may require owners to pay for upgrades in cases where buildings are under performing or otherwise show potential for a strong return on investment. The increase in the scope of benchmarking laws also encompasses water tracking, with 24 local governments, DC, and New Jersey now requiring that water data be submitted to Portfolio Manager. These additional requirements create significant business opportunities for AEE members to help owners assess, optimize, and/or upgrade buildings to meet compliance. More specifically, opportunities exist for CEAs and CEMs in some jurisdictions where the ordinance requires that a certified professional sign off on energy audits, complete data quality

verifications, or support other aspects of compliance.

Boulder, CO and Montgomery County, MD are examples of these jurisdictions. Boulder lists CEMs and CEAs as qualified professionals to complete periodic energy assessments and retro-commissioning requirements. Montgomery County requires that building owners have their performance data verified by a professional before submission. CEMs and CEAs are listed as professionals identified as acceptable verifiers by the County.

Another trend for jurisdictions that want to raise the bar is a focus on GHG or energy building performance standards. Building performance standards require that buildings owners implement building improvements until they meet certain performance thresholds. Currently Washington state, DC, NYC, and St. Louis have these types of requirements in place, and it is worth noting that quite a few other state and local governments are considering similar performance standards.

Certainly, the increase in scope of the laws is a trend but perhaps the biggest trend is toward the laws increasing in building coverage and the overall number of laws being passed. Several jurisdictions have updated their laws to incorporate more buildings typically by lowering the square footage threshold or adding a new property type (often multifamily). Then there is the trend for smaller cities to pass laws. Initially large cities led the way and smaller cities have taken note of the success with more and more proposing and passing their own laws. A few examples include Reno, NV, Evanston, IL, and Columbus, OH.

With varying scopes and approaches, benchmarking ordinances are a significant trend, and one that AEE members should be aware of. If a benchmarking ordinance is not impacting a customer of yours now, it is likely not too long before your customers will be asking about compliance.

For more information on ENERGY STAR, go to [www.energystar.gov](http://www.energystar.gov)



AEE's headquarters in Atlanta, GA was Energy Star Certified in 2017.



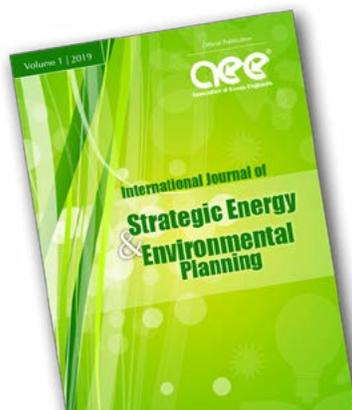
# illuminating Light Quality

By Stephen A. Roosa, Ph.D., CEM, CSDP, REP, BEP

*Continuous improvements in lighting technologies are occurring at a dizzying pace. Lamp manufacturers have strived for move light, better quality, higher efficiencies and a wider range of colors. Many energy-efficiency projects for buildings include energy conservation measures that involve strategically replacing lamps or light fixtures. In such cases, energy managers often propose more resilient lighting solutions, replacing outdated lighting systems with new technologies to reduce costs. While there is a drive to capture the potential savings, it is important that changes to lighting systems do not sacrifice light quality. When a lighting system replacement is properly engineered, new technologies can be employed that provide both energy savings and improve light quality.*

*How do we ensure that we are providing quality light for our building's occupants? This article addresses this important issue. Human physiological responses to light and the primary measures of light quality are considered. It further demystifies the various measures of light quality and explores their applications. These measures include color temperature, color rendering index and visual comfort probability. It also provides suggestions on how light quality can be improved and details the characteristics of quality lighting.*

Read the Expanded Article in the **International Journal of Strategic Energy & Environmental Planning**



## PSYCHOLOGICAL RESPONSES TO LIGHT

The human eye has evolved by exposure to natural daylight. When artificial lighting is provided, lighting designers are concerned with both the quantity and qualities of the light produced. While levels of illumination are important, so is light quality.

The human eye is capable of adjusting its vision to widely-variable light conditions. The amount of light (light level) that is needed depends on the task. These variable requirements pose a strong argument for natural lighting or artificial lighting that approximates the qualities of daylight; however, such light often produces glare when used indoors on sunny and cloudless days. The human eye responds to the portion of the visible light spectrum roughly between 400 nm (violet) to 700 nm (dark red). While sunlight can be seen and felt (due to heat), ultraviolet (UV) light cannot.

Light quality influences human behaviors, attitudes and performance. People have surprising physiological responses to light quality and color. Studies have indicated that ultraviolet rays in sunlight make people feel good, releasing beta-endorphins. However, exposure to high levels of UV light (10 nm to 400 nm) can be harmful to humans and is used to sanitize for viruses. Lamps that emit higher levels of blue light produce serotonin, which makes people more focused, keeping them more awake and alert [1]. It also serves as a natural mood stabilizer and aids with sleeping and digesting. Lamps that emit no or lesser levels of blue light waves allow for our brains to naturally produce melatonin, causing us to feel relaxed and drowsy [2]. Excessive amounts of melatonin, especially during waking hours, may also create moodiness and irritability.

(Article continues on page10)



# Virtual in Turkey

AEE Instructors, Tim Janos and Louis Lagrange taught a Virtual Certified Energy Manager (CEM) course for Turkish engineers hosted by the AEE Turkey Chapter and the Turkish Society of HVAC and Sanitary Engineers.

The CEM program was first presented in Turkey 4 years ago as part of the scope of the "Promoting Energy Efficiency in Buildings Project". The program was implemented by the Directorate General of Renewable Energy of Ministry of Energy & Natural Resources of Turkey and the United Nations Development Programme (UNDP). This recent program continues to build local capacity and certify local engineers in energy management and energy auditing, while also creating a sustainable pathway to AEE's certification programs through developing local trainers.

# Industrial Energy



The first two internationally presented Certified Industrial Energy Professional (CIEP) programs were held virtually in November and December 2020 in Saudi Arabia, instructed by Albert Williams with remote proctored certification exams.

**Albert Williams is** CEM, CEA, CIEP, CMVP, CRM, REP, and BEP Certified, and a UNIDO International Energy Expert

"Industrial sector consumes more than 45% of total primary energy in Saudi Arabia, most of this percentage goes to the industries of steel, petrochemical and cement with 70% of the total consumption in this sector while the rest of the energy is consumed by other industries such as paper, glass, ceramic, etc. For this reason, an initiative was launched to provide the Association of Energy Engineer's Certified Industrial Energy Professional (CIEP) program, which will significantly contribute to the knowledge of local human resources working in the field of industrial energy efficiency."

Saudi Energy Efficiency Center (SEEC), AEE's Training Partner in Saudi Arabia



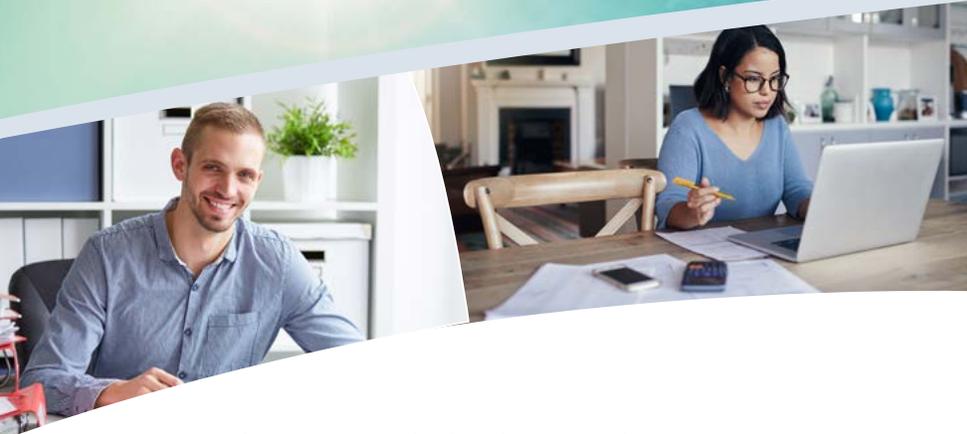
المركز السعودي لكفاءة الطاقة  
Saudi Energy Efficiency Center

"I would recommend to my colleagues"

"I am a chemist, but most of my experience is process engineering in cement industry - very valuable"

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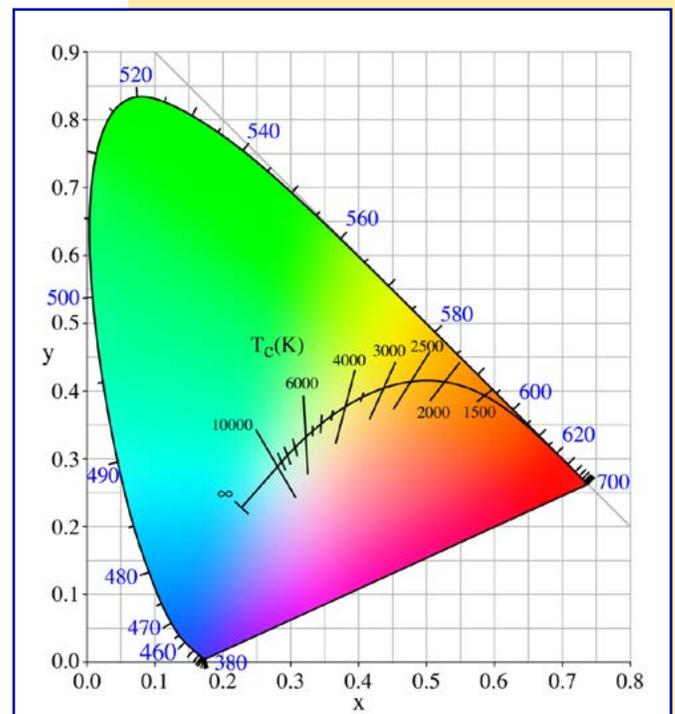
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## DEMYSTIFYING MEASURES OF LIGHT QUALITY

Lighting system design focuses on the need to provide the appropriate quantity and quality of light for a given task. Good quality light does not produce glare, is not too dim nor overly bright, provides uniform illumination and has appropriate qualities for the task. Providing quality illumination is complicated since human vision varies widely. For example, elderly people often require higher light levels for tasks such as reading. In places where some natural lighting is available, the amount and quality of artificial light required may vary. How is light quality measured? There are a number of ways to measure light quality. Common measures of light quality include the color temperature, the color rendering (rendition) index, and the visual comfort probability.



The CIE 1931 x,y chromaticity space, also showing the chromaticities of black-body light sources of various temperatures (Planckian locus), and lines of constant correlated color temperature.

## Color Temperature

The correlated color temperature (CCT) is a measure of the color of a light source relative to a black body at a particular color temperature. It is expressed using the Kelvin (K) scale [2]. This classification scale was first invented by Lord Kelvin in 1848 in Belfast, Ireland. The lower the color temperature number, the warmer or more yellow the light. The higher the color temperature, the colder or the bluer the light. Daylighting has a color temperature of about 4500°K. Incandescent lamps have a lower color temperature and a red-yellowish tone or a color similar to that of glowing fire [2]. Soft white lamps (2700°K to 3000°K) provide a yellowish light and offer a smoother, more relaxing feel. Cool white lamps (4100°K) emit a whiter light mimicking daylight and are often used for kitchens, work areas and outdoor lighting.

Lamps rated between 5000°K and 6000°K emit a slightly bluish white light resembling noon on a cloudless day [2]. Lamps above 6000°K tend to have a stronger bluish cast [2]. To add perspective, the color temperature of sunlight typically ranges from 5000°K to 5400°K. This color temperature range reproduces the effect of direct sunshine, considered to be a preferred color for most outdoor activities as it is native to human eyesight. However, sunlight varies widely based on atmospheric conditions, the angle of the sun and weather. The CCT of a uniform to moderately overcast sky ranges from 6500°K to 8000°K.

## Color Rendering Index

While both are measures of light quality, the correlated color temperature should not be confused with the color rendering (or rendition) index (CRI). The CRI is a quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source [3]. Light with higher CRIs makes it easier for humans to distinguish colors.

The CRI is determined by the spectrum of the light source and values normally range from a low of 0 to a high of 100. However, some low-pressure sodium (LPS) lamps actually have negative CRI values [3]. Higher CRI values equate to sharper, crisper and more natural colors [2]. Sources of light with a CRI less than 45 provide poor color rendition while light sources with CRIs greater than 75 provide excellent color rendition. A CRI of 100 is identical to standardized daylight. For merchandizing applications, higher CRIs (>90) are important to highlight products, enabling them to be visually characterized by potential purchasers. For specific tasks (e.g., color printing, art restoration, food preparation, and in emergency or operating rooms) providing light with a high CRI is important to allow occupants to distinguish colors without risking errors in judgment.

## Visual Comfort Probability

The visual comfort probability (VCP) is a subjective rating assigned to a light fixture that indicates the percentage of people who are comfortable with the glare being produced at a scene (specific location) by the light source [4]. Glare is the effect of sufficiently high differences in brightness within the visual field to cause annoyance, discomfort or loss of visual performance [4]. The VCP rating scale (also from 0 to 100) is applied only to indoor light fixtures and is designed to indicate how well the fixtures are accepted by the occupants. It is usually provided in a luminaire's (entire fixture with lamps) photometric test report.

A VCP rating of 75 indicates that 75% of the occupants in the scene's area with the poorest conditions would not be bothered by direct glare. Most specifications for office areas mandate a VCP rating ranging from 70 to 80. To minimize glare, lighting designers use indirect lighting, obscure bare lamps from the occupant's field of view, relocate existing light fixtures, or replace them with ones that have a higher VCP [4].

## What Light Quality Is Best?

Energy engineers understand that luminaire and lamp selection must be carefully considered to deliver quality lighting. Lighting systems must be designed to provide both the correct amount of light and the appropriate quality of light for a given task while not creating glare. This goal is not easily accomplished and there is often no optimum solution that meets all requirements. Light quality can be complicated by a number of variable conditions. For example, the introduction of natural light in an occupied space can cause variable light quality and levels. Various tasks can be performed in a common space, creating the need to vary light quantity or quality. While this might seem easier to resolve in new construction, lighting systems in new buildings are often over-designed to compensate for losses of illumination that will occur during the operating lifecycle of the lighting system used. Since lighting technologies are rapidly evolving, lighting designers have a wide-range of new options to consider. For existing buildings, retrofit solutions can successfully improve light quality while reducing energy and maintenance costs.

What light quality is considered to be perfect? This is a difficult question that lighting engineers grapple with daily. This is because the best light quality for an occupied space varies based on the design parameters. There is actually not a perfect light quality for all people and all tasks. Typically, areas with higher quality artificial lighting have a correlated color temperature in the range of 2800°K to 4100°K, a color rendering index of 75 or higher, and a visual comfort probability greater than 70.

## IMPROVING LIGHT QUALITY

Lighting system designers have many simple ways to improve light quality in occupied spaces. For residential applications, a focal point is selected for the light fixture placement. Otherwise, the human eye naturally tends to gravitate to visual clarity without focusing on a specific location. Balanced lighting is achieved by adding layers of light with a minimum of three sources in every space [5]. During daylight hours, windows and skylights can be used as a natural source of light. In smaller spaces, lamp wattage and fixture size can be reduced to better match the smaller illuminated areas [5]. Other ways include changing fixture placement, scaling, using light control applications, spot lighting for tasks, and varying fixture height when possible [5]. Mechanical approaches to reducing glare include changing surfaces to lower their reflectance, adding parabolic louvers or diffusing media, and installing blinds or shades to better control the transmittance angle of direct sunlight penetrating the occupied space.

In this era of the world-wide Covid-19 pandemic, home offices and home schooling are becoming the norm. Improving light quality in such spaces can be challenging. Many were rarely designed for such purposes and lighting conditions in these spaces vary widely. To confound this issue, existing ambient lighting is usually not functional lighting for home offices or educational purposes meaning supplementary light sources must be added [6]. It is important to avoid glare. Ways to manage this include having natural light available and providing ways to diffuse the ambient light entering the occupied space, especially at task. Effective solutions require keeping the light sources indirect with respect to the tasks, illuminating the entire space without creating undue glare or contrast, and avoiding the creation stark shadows [6].

Offices offer another set of priorities. The U.S. General Services Administration (GSA), one of the country's largest office providers, understands that every type of

work environment requires a certain amount of light to improve workers performance. Office lighting standards for a typical workstation requires 500 lumens/m<sup>2</sup> [7]. The GSA suggests that fluorescent ceiling fixtures offer the best office lighting. The layout of the lighting should provide an even amount of illumination across the entire office space [7]. It should also mitigate the effects of shadows from cubicle walls or partitions, and be adjusted to minimize these and other problem areas [7]. In open-plan office areas, the most direct light must be provided in the workstation itself, while allowing dimmer light in areas such as corridors and walkways [7]. It is important to provide individual task lighting that allows workers to adjust workstations to their personal needs and preferences [7]. For areas with computer workstations, computers should not be placed against a contrasting light source, such as nearby windows, or directly beneath the line of sight [7].

## CONCLUSIONS

Humans have interesting physiological responses to light and light quality. It is important that when changes to lighting systems are proposed, the quality and quantity of light provided is maintained or improved. There are many strategies for improving light quality. Appropriate light quality can be accomplished by matching the lighting system design to appropriate measures of color temperature, color rendering and visual comfort. It was stated that the common measures of light quality used for artificial lighting include the correlated color temperature, the color rendering index, and the visual comfort probability.

The need for quality lighting systems supports continuous innovation in the lighting industry. Lighting technologies are continuously evolving, with newer and improved lamps and fixtures becoming available. The focus has been to incrementally improve light quality, lower lamp and luminaire costs while significantly reducing energy use and maintenance costs.

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# Our Founder

## His Passion for People and Events

*A personal story from Lauren Lake, AEE's Director of Events.*

More than four decades ago, a spirited and innovative engineer from New York had a vision. He saw a need to bring professionals in the energy efficiency industry together. He left his corporate job and moved his family to Atlanta, and with no financial backers or grants, he started the Association of Energy Engineers (AEE).

Today, Al Thumann's mission is still thriving, with over 18,000 members in more than 100 countries—a truly global organization.

Al always said, "AEE is a family," and he backed that up with action. I'm sure it's no coincidence that when Al founded AEE in 1977, he immediately built a flagship event. The first World Energy Engineering Congress® was in Atlanta, GA, at the Royal Coach Inn in 1978, and thus began more than 43 years of conference and expo events at AEE.

Al was very focused on fostering education at events for attendees, so he always emphasized finding the best speakers for these events. But when someone recently asked me about what events meant to Al, I think about something else he

would say, "events bring the AEE family together." Building relationships that feel like family, the ones that change our lives, must start somewhere. They allow us to connect over a common interest and make the global community seem more local and personal. Al loved people and enjoyed bringing everyone together to network and make friends.

---

### "AEE is a family,"

---

Since we haven't met in person in more than a year, I've been reflecting on what makes networking at industry events so significant.

We can recreate the educational content in a virtual environment and deliver timely and relevant updates from experts in the field. What we cannot replace virtually is the value of face-to-face interactions.

Here are some reasons I think networking is so powerful and a cornerstone of why Al loved events so much:

Al Thumann, Founder AEE - 1978



- 1 Helping Others** — Attendees enjoy helping others with connections, career goals, and technical information; it feels good to help others. And the more you help others, more help comes your way. You'll find the advice from your connections can guide you from what a potential client might like to tips on interviewing at a certain company. The more people you know and help the more likely you are all to say "been there, done that, how can I help you succeed?"

**2 Being More Visible & Get Promoted** — Whether you are looking for a job or looking to stand out at your current position, networking helps you stay visible. Be the person that everyone knows and the one who can introduce others. Many studies have shown that having a great network makes you more visible and valuable to your boss, which may be rewarded with promotions and salary increases.

**3 New Opportunities & Opened Doors** — When you are more visible, there are more opportunities for conversations that lead to career growth, promotions, new jobs, or just meeting that important person who changes your career path for the better.



First WEEC Event - 1978



Keynote Speaker - Andrew Young, Atlanta Mayor - 1983



Chapter President Workshop - 1992



International Delegation - 1998



Recognition Awards - 2000

## 4 Expressing Opinions and Sharing Fresh Ideas

— Your family and friends are probably not your go-to for sharing your ideas about the industry and trends or your thoughts on a new project at work. Fellow attendees will welcome this and can give you valuable advice and share insights.

Continuing education and research can help you stay up to date on the ever-changing energy field, but speakers and other attendees have a wealth of knowledge you can grasp through a simple conversation.

## 5 Self-Esteem Lift

— People need to connect to people. And even if you are an introvert like me, you'll benefit from sharing your advice and opinions, and knowledge with others. You have a lot to offer!

## 6 It's the Best Resource

— Sometimes you can't search online for that answer. You need one-on-one opinions from professionals in your field.

## 7 Influencers

— The more extensive your professional network, the more likely you'll know and have access to the right influencer at the right time, whether it's to help you excel in your current job or someone who will put a good word in for a new job. OR, you can be that influencer for someone else.

# WORLD

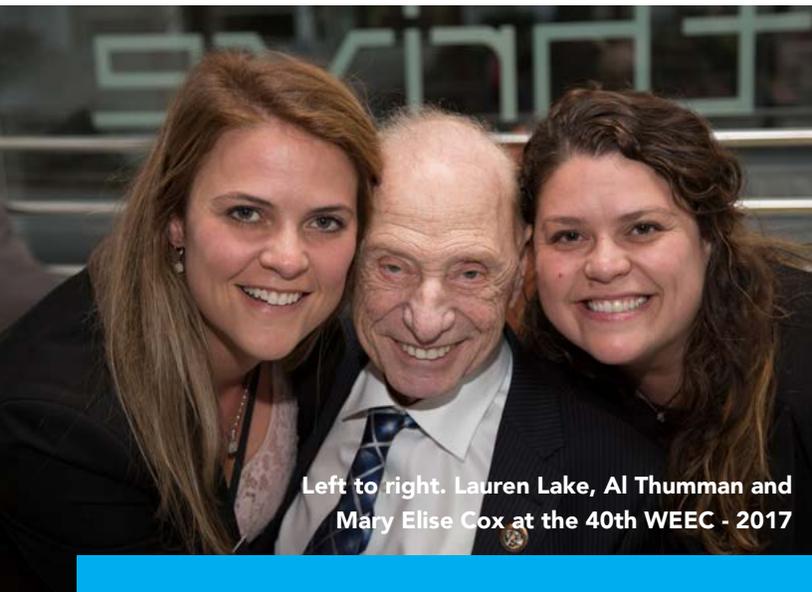
**Oct. 20-22, 2021**  
**New Orleans, LA**

In-Person + Virtual

When you can brush up on your technical knowledge AND gain lifelong friends and a sense of belonging, you've found why industry events can be so valuable. That's why we build these events for you as a member benefit and pack them with so many networking opportunities.

I bet Al realized that he would cherish relationships and experiences most when he looked back over his life. He believed in continuing education and being together, and he loved his AEE family. Events allowed him to be with all of you from around the world. If you knew Al, you know he was one-of-a-kind, had a heart of gold, and his energy was contagious. His passion for life and people will always be an inspiration.

I'm grateful Al trusted me with his vision for events 17 years ago, and I'll continue to do my best to keep our conferences fun and rewarding. After all, it's the connections we make and the relationships we build that help shape who we become and have the power to change our lives.



Left to right. Lauren Lake, Al Thumman and Mary Elise Cox at the 40th WEEC - 2017

If you have a story of how an AEE event changed your life, please email me at [lauren@aeecenter.org](mailto:lauren@aeecenter.org). Every story I hear motivates me to make events better for our members, and I love what I do because it furthers Al's vision.



[aeworld.org](http://aeworld.org)

# Earth's Energy Engineers

**Our members and certified professionals put their energy into slowing climate change.**

Why? Because energy efficiency reduces carbon emissions, which offsets climate change. We think that's energy well spent.

[earthenergyengineers.com](http://earthenergyengineers.com)



A VIRTUAL EVENT  
[earthenergyengineers.com](http://earthenergyengineers.com)

CLIMATE ACTION  
**CONNECT**

JUNE 23  
**2021**

Connecting Energy Engineering & Energy Efficiency for a Sustainable Energy Future



# Behind the Campaign

In early 2020, the AEE Board of Directors requested an initiative to promote the great work you [AEE members] do to people outside of the industry. We engaged with an external agency to get creative, and in November 2020, we launched the Earth's Energy Engineers campaign.

The concept was simple and accurate. No matter where our members are or what they are doing, they are thinking about how they can be more energy efficient. Whether they know it or not, they are making significant impacts to offset the effects of climate change.

The digital advertising campaign ran for three months, and we also posted to our social

accounts. The ads gained a lot of positive feedback for their creativity and humor. They over performed against industry benchmarks, generated over 2.6 million impressions, and sent over 53 thousand people to the earthsenergyengineers.com website to learn more about what you do and the impact you make.

We are continuing the campaign with a one-day virtual event - Climate Action Connect. Mark it in your calendars to attend, and it's free to AEE Members. Also, keep an eye out as we continue the campaign; maybe you have a story to tell? Did you see the ads online? Let us know your favorite at: [marketing@aeecenter.org](mailto:marketing@aeecenter.org).

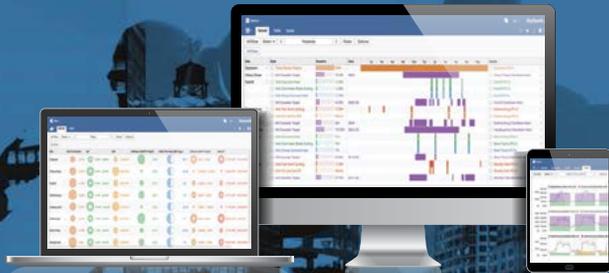


**Our members slow  
climate change by  
removing gas from  
the atmosphere.**



# The Leading Data Analytics Solution for Energy Analysis, MBCx and M&V

SkySpark® Analytics automatically analyzes data from building automation, metering systems and other smart devices to identify issues, faults and opportunities for savings. Learn why SkySpark has been deployed to over 1 Billion square feet of facilities around the world for energy management, optimization, monitoring-based commissioning and fault detection.

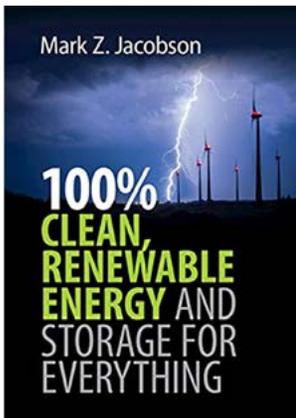


**Find What Matters™ to Improve Equipment Performance and Reduce Operational Costs.**

**SkyFoundry**

**Project Haystack**  
Founding Member

[www.skyfoundry.com](http://www.skyfoundry.com)

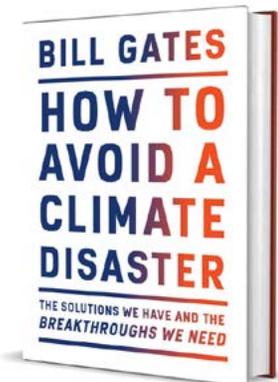


## Recommended Reads

### **100% Clean, Renewable Energy and Storage for Everything**

Prof. Mark Z. Jacobson

Focusing on solutions and how to solve the significant problems, eliminate pollution, stabilize temperature, and eliminate the insecurities to unequal distribution of fossil fuels. Electrification, storage, demand response, and how to supply the global energy demand using clean, renewable energy systems are outlined in the book.



### **How to Avoid a Climate Disaster**

Bill Gates

Bill covers how the world needs many breakthroughs to transform to clean energy businesses, live healthy lives while emitting zero GHG. Avoiding a climate disaster is the greatest challenge for all humans. The power of group work, scalable inventions, trust, cooperation, accepting failure, helping others, and picking up where they left off to find better solutions is paramount to human survival.



# Empowering Growth in Africa

AEE's Ghana Chapter, the Association of Energy Professionals Ghana (AEPG), recently created an Editorial Committee and a CWEEEL group. The committee will communicate and help educate on energy-related matters specific to Ghana and the African Continent at large. The CWEEEL group will help promote women and their roles in this normally male-dominated industry. AEPG hope both initiatives will help bring a renewed focus on energy, the environment, sustainable development, and climate change in the region.



The Members of the Editorial Board of AEPG include Ing. Bismarck Otoo, Nurideen Abdulai, Jonas Henry, Dominic Obeng, Sharon Flora Frimpong, Marina Agortimevor, and Kafui Dei.

## Current AEE Chapters

*(Country | Chapter Name | Date Established)*

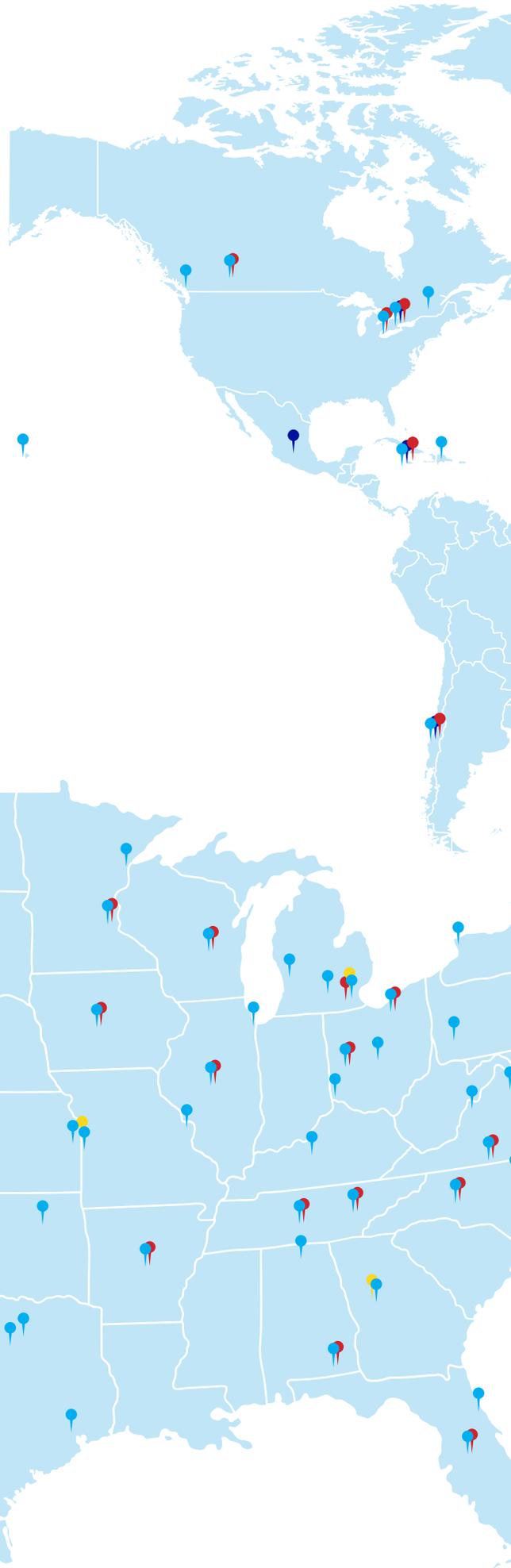
- Algeria | Algeria Chpt. | 2021
- Bangladesh | Bangladesh Chpt. | 2011
- Brazil | AEE CEFET-MG Stdnt. Chpt. | 2020
- Brazil | Brazil Chpt. | 2016
- Bulgaria | Plovdiv Chpt. | 1995
- Canada | Alberta Chpt. | 2015
- Canada | East Canada Chpt. | 2017
- Canada | Greater Toronto Area Chpt. | 1999
- Canada | Hamilton Chpt. | 2015
- Canada | Metro Vancouver Chpt. | 2019
- Canada | Southwestern Ontario Chpt. | 2016
- Canada | Univ. of Windsor Stdnt. Chpt. | 2019
- Chile | Capitulo Chileno Chpt. | 2014
- China | Central China Chpt. | 2019
- China | China Chpt. | 2014
- China | Hong Kong Chpt. | 1980
- Cyprus | Cyprus Chpt. | 2005
- Dominican Republic | Dominican Rep. Chpt. | 2015
- France | France Chpt. | 2015
- Georgia | Georgia Chpt. | 1999
- Ghana | Ghana Chpt. | 2020
- Hungary | Hungary Chpt. | 1993
- Hungary | Hungary Stdnt. Chpt. | 2006
- India | Amity Univ. Stdnt. Chpt. | 2015
- India | Delhi Chpt. | 2012
- India | Kolkata Chpt. | 1996
- India | Kolkata Stdnt. Chpt. | 2019
- India | Vellore Institute of Tech. Stdnt. Chpt. | 2015
- India | Western India Chpt. | 2015
- Ireland | Ireland Chpt. | 2007
- Jamaica | Jamaica Chpt. | 2009
- Jordan | Al al-Bayt Univ. Stdnt. Chpt. | 2020
- Jordan | Al Balqa Applied Univ. Stdnt. Chpt. | 2018
- Jordan | Al Hussein Tech. Univ. Stdnt. Chpt. | 2019
- Jordan | German Jordanian Univ. Stdnt. Chpt. | 2016
- Jordan | Hashemite Univ. Stdnt. Chpt. | 2020
- Jordan | Jordan Univ. of Science & Tech. Stdnt. Chpt. | 2015
- Jordan | Middle East Univ. Stdnt. Chpt. | 2020
- Jordan | Princess Sumaya Univ. of Tech. Stdnt. Chpt. | 2015
- Jordan | Tafila Tech. Univ. Stdnt. Chpt. | 2020
- Jordan | Univ. of Jordan Stdnt. Chpt. | 2016
- Kazakhstan | Kazakhstan Chpt. | 2014
- Kenya | Eastern Africa Chpt. | 2014
- Kuwait | Kuwait Chpt. | 2004
- Lebanon | Lebanese American Univ. Stdnt. Chpt. | 2020
- Lebanon | Lebanon Chpt. | 1999
- Lebanon | ULFGII Stdnt. Chpt. | 2018
- Lebanon | ULFS3- PNRJ Stdnt. Chpt. | 2018
- Lebanon | Univ. of Balamand Stdnt. Univ. Stdnt. Chpt. | 2018
- Malaysia | Malaysia Chpt. | 2014
- Mexico | Nuevo Leon Chpt. | 2008

*(Chapter list continues on page 26)*

# We Are Local, We Are Global

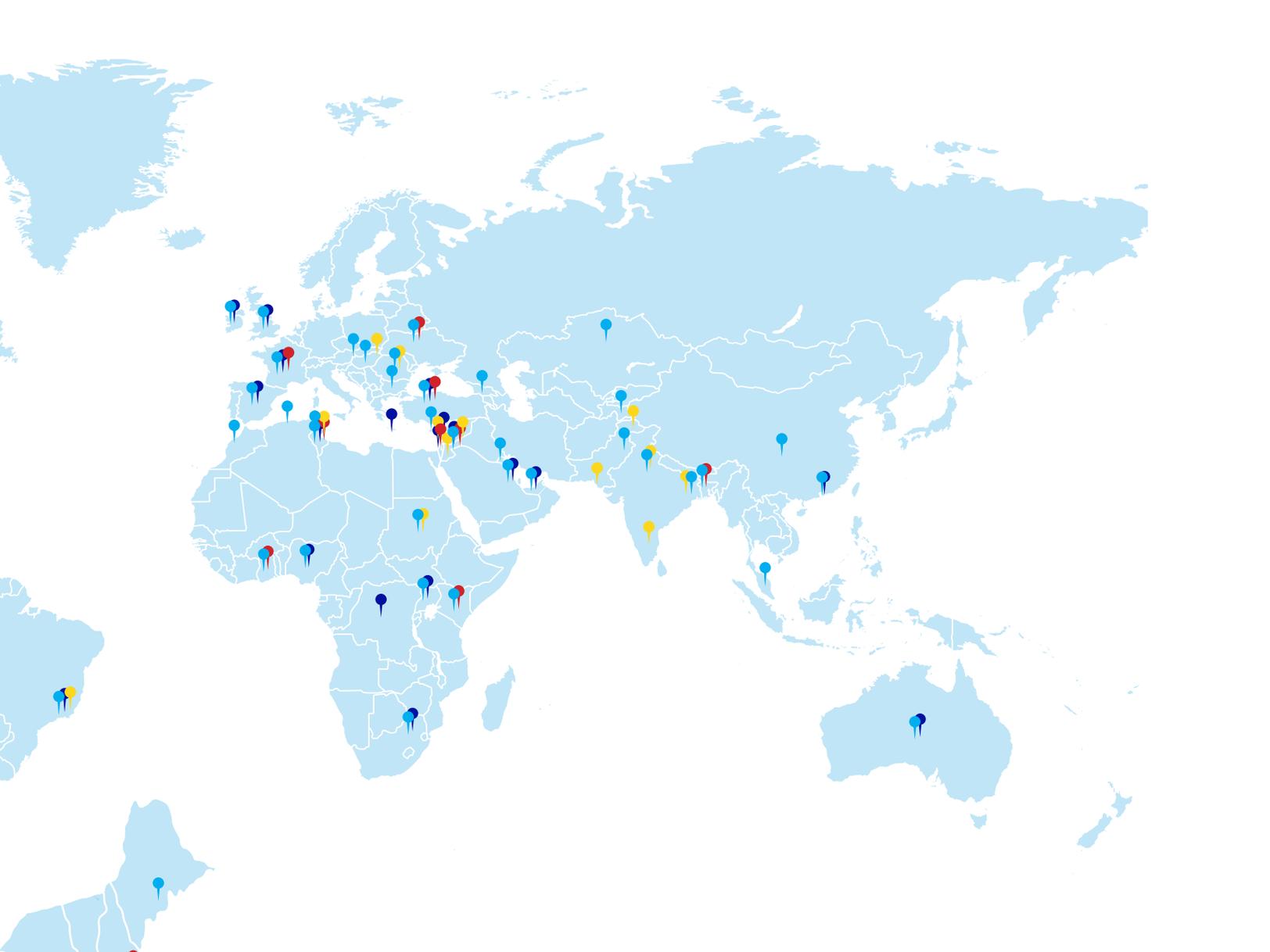
Chapters promote AEE's goals and programs on the local level while establishing themselves in their various communities as the "go-to" organization for all energy related matters.

-  AEE Chapter
-  AEE Student Chapter
-  CWEEL Representation
-  Training Partner



**CONTACT YOUR  
CHAPTER>>**





# AEE Employee *Spotlight*



**Mel Claus**, AEE's  
Membership Director  
and her dog Onyx.

Mel is one of the most recent additions to our team. She is our Membership Director and is responsible for overall management of AEE membership, enhancing member benefits and membership growth. Mel holds a Bachelors Degree in Strategic Communications from West Virginia University, USA. Mel likes to go to the lake on the weekends with her dog Onyx. She can be reached by email at [mel@aecenter.org](mailto:mel@aecenter.org), or phone at (770) 447-5083, ext. 238.

**Connect with Mel**



# Global, Recognized, Accredited.



Certified Energy Auditor



Certified Energy Manager



Certified Building Commissioning Professional



Business Energy Professional



Carbon Auditing Professional



Certified Demand Side Manager



Certified Energy Procurement Professional



Certified GeoExchange Designer



Certified Industrial Energy Professional



Certified Lighting Efficiency Professional



Certified Measurement & Verification Professional



Certified Sustainable Development Professional



Certified Water Efficiency Professional



Distributed Generation Certified Professional



Energy Efficiency Practitioner



Green Building Engineer



Performance Contracting & Funding Professional



Renewable Energy Professional



What Makes You **Stand Out?**

# Contribute *To Your Magazine*

For Members, By Members



## **Write a Technical Article**

Do you have a technical article, research paper, success story, or news that you think would be of interest to AEE Members?

—Email [marketing@aeecenter.org](mailto:marketing@aeecenter.org) with the details.



## **Tell us about Your Chapter**

Tell us about your stories. Maybe your chapter or its members has been instrumental in an energy efficiency project or defining policy that impacts your local communities.

—Email [marketing@aeecenter.org](mailto:marketing@aeecenter.org) with the details.



## **Share Your Stories and Photos**

Do you have something unique to share? The easiest way is to post to your social accounts while adding a relevant tag, such as @AEE, #exploretheefficiency #AEEworld. Or you can email them to [marketing@aeecenter.org](mailto:marketing@aeecenter.org) with a short story.



## **Advertise in Efficiency**

As a non-profit organization, advertising helps offset production costs and enables us to do more for our members. Email inquires to [marketing@aeecenter.org](mailto:marketing@aeecenter.org). Only products and services relevant to our members will be considered for placement. Space is limited.

***Next Edition - Fall 2021***





Thanks, You are in our thoughts and prayers with Love, Your AEE Family

555 meters #BurjKhalifa

# Current AEE Chapters

(Country | Chapter Name | Date Established)

Morocco | Morocco Chpt. | 2021  
Nepal | Nepal Chpt. | 2019  
Nigeria | Nigeria Chpt. | 2007  
Pakistan | Dawood Univ. of Engineering & Tech. Stdnt. Chpt. | 2018  
Pakistan | Pakistan Chpt. | 2018  
Pakistan | Univ. of Engineering & Tech., Peshawar Stdnt. Chpt. | 2018  
Palestine | An-Najah Stdnt. Chpt. | 2016  
Palestine | Palestine Chpt. | 2015  
Palestine | Palestine Polytechnic Univ. Stdnt. Chpt. | 2019  
Palestine | Palestine Technical Univ. Stdnt. Chpt. | 2018  
Romania | Cluj-Napoca Chpt. | 1994  
Saudi Arabia | Saudi Chpt. | 2012  
Slovakia | Slovak Univ. of Tech. in Bratislava Stdnt. Chpt. | 2019  
Slovakia | Slovakia Chpt. | 1999  
South Africa | Southern Africa Chpt. | 2003  
Spain | Spain Chpt. | 2012  
Sudan | Omdurman Islamic Univ. Stdnt. Chpt. | 2021  
Sudan | Univ. of Khartoum Stdnt. Chpt. | 2021  
Tajikistan | Tajikistan Chpt. | 2017  
Tunisia | National School of Engineers of Monastir Stdnt. Chpt. | 2019  
Tunisia | Tunisia Chpt. | 2016  
Turkey | Turkey Chpt. | 2001  
Uganda | Uganda Chpt. | 2018  
Ukraine | Central Ukraine Chpt. | 1997  
United Arab Emirates | UAE Chpt. | 2005  
United Kingdom | UKAEE | 2012  
USA | Arizona Chpt. | 1980  
USA | Arkansas Chpt. | 1999  
USA | Atlanta Chpt. | 1980  
USA | Austin/San Antonio Chpt. | 1992  
USA | Baltimore Chpt. | 1998  
USA | Central Alabama | 2012  
USA | Central Illinois Chpt. | 2014  
USA | Central Pennsylvania Chpt. | 2006  
USA | Chicago-Illiana Chpt. | 1990  
USA | Columbia River Chpt. | 2008  
USA | Connecticut Chpt. | 1984  
USA | Cooper Union Stdnt. Chpt. | 2016  
USA | Danville Chpt. | 2013  
USA | East Michigan Chpt. | 1998  
USA | East Tennessee Chpt. | 2011  
USA | George Mason Univ. Stdnt. Chpt. | 2018  
USA | George Washington Univ. Stdnt. Chpt. | 2018  
USA | Greater Philadelphia Chpt. | 2005  
USA | Hawaii Chpt. | 1998  
USA | Huntsville Chpt. | 2010  
USA | Iowa Chpt. | 2001  
USA | Kansas City Chpt. | 1981  
USA | Kennesaw State Univ. Stdnt. Chpt. | 2016  
USA | Kentucky Chpt. | 2012  
USA | Lehigh Valley Chpt. | 2012  
USA | Long Island Chpt. | 1990  
USA | Long Island NYIT Stdnt. Chpt. | 2017  
USA | Maine Chpt. | 2015  
USA | Middle Tennessee Chpt. | 1994  
USA | National Capital Chpt. | 1981  
USA | Nevada Chpt. | 2012  
USA | New England Chpt. | 1981  
USA | New Jersey Chpt. | 1980  
USA | New Mexico Chpt. | 1988  
USA | New York Capital Region Chpt. | 2003  
USA | New York City Chpt. | 1983  
USA | NorCal Chpt. | 2009  
USA | North Carolina Chpt. | 2010  
USA | North Texas Chpt. | 1984  
USA | Northern Ohio Chpt. | 1986  
USA | Ohio Capital City Chpt. | 2009  
USA | Oklahoma Chpt. | 1993  
USA | Oregon Institute of Tech. Stdnt. Chpt. | 2013  
USA | Oregon State Univ. Cascades Stdnt. Chpt. | 2014  
USA | Pacific Northwest Chpt. | 1980  
USA | Piedmont Chpt. | 2013  
USA | Rock Mountain Chpt. | 1998  
USA | San Diego Chpt. | 1981  
USA | San Joaquin Valley Chpt. | 1985  
USA | San Luis Obispo Chpt. | 2008  
USA | Silicon Valley Chpt. | 1984  
USA | Southeastern Virginia Chpt. | 2009  
USA | Southern California Chpt. | 1980  
USA | Southwest Ohio Chpt. | 1980  
USA | Southwest Virginia Chpt. | 1994  
USA | St. Louis Chpt. | 2008  
USA | Sunshine Chpt. | 2004  
USA | Tampa Bay Chpt. | 1999  
USA | Texas Lone Star Chpt. | 2014  
USA | Twin Cities Chpt. | 1985  
USA | University of Maryland Stdnt. Chpt. | 2008  
USA | Univ. of North Texas Stdnt. Chpt. | 2012  
USA | Utah Chpt. | 2008  
USA | Voyager Chpt. | 2008  
USA | West Central Ohio Chpt. | 1996  
USA | West Michigan Chpt. | 1988  
USA | Western New York Chpt. | 2009  
USA | Western Pennsylvania Chpt. | 1985  
USA | Wisconsin Chpt. | 2007

## The Power of Mentorship

A mentoring pair from the Council on Women in Energy & Environmental Leadership (CWEEL), Kjrsten and Cissy, have coauthored an Energy Management article for the International Journal of Strategic Energy and Environmental Planning (IJSEEP). "Kjrsten encouraged me to discuss a granular energy data methodology I developed...She also provided constructive feedback to enhance the discussion. I'm grateful to have her as my mentor," said Cissy.

The duo has been working to empower and professionally

develop Cissy's skills and strengths in energy engineering since May of 2019. One of Cissy's professional development goals was to publish an article in a recognized journal, and Kjrsten helped to provide recommendations and resources to support her goals.

Kjrsten is a licensed environmental professional engineer and Certified Energy Manager (CEM). Cissy works as an energy consultant, specializing in analytics related to clients' energy portfolio.



For over 14-years, CWEEL has been committed to supporting career development for professional women and advancing gender equality in a historically male-dominated industry. Visit [cweel.org](http://cweel.org) to get involved or learn more about CWEEL's mentoring program.

## Chapter Liaisons in the US and Canada.

Many of our chapters have specific liaisons to develop and support the goals of CWEEL. Contact your liaison to get more involved. Don't See Your Chapter Listed? Visit the website to volunteer.

### USA

Alabama, Central | Nagea Littleton  
Arkansas | Nicole Davis  
Baltimore, MD | Nandini Mouli  
California, San Diego | Celia Hoag  
California, Southern | Amrit Peck  
California, Bay Area | Nicolette Sowa  
California, San Joaquin Valley | Diana Medina  
Colorado | Emily Beck  
Columbia River, OR | Elin Shepard  
Greater Philadelphia, PA | Ami Amegan  
Danville, VA | Heather Wheeler  
Illinois, Central | Angela Holloway

Iowa | Kjrsten Bobb  
Michigan, Southeastern | Shelley Sullivan  
National Capital, DC | Christina DiBerardino  
New England | Andrea Moshier, CEM  
New Mexico | Tara Trafton  
New York, NY | Mazhengmin Bai  
Capital Region, NY | Tricia Cioni  
Orlando, FL | Melissa Boutwell  
Ohio, Northeast | Laura Sherman  
Ohio, Southwest | Maryanne E. McGowan  
Piedmont, NC | Jennifer Todd  
Tennessee, Middle | Leslie Marshall

Tennessee, Nashville | Kathryn Traxler  
Twin Cities, MN | Michelle Gage  
Utah | Leah Milcarek  
Wisconsin | Kathy Leifer

### Canada

Alberta | Kelsey Chegus  
Southwestern Ontario | Mark Lambert  
Southern Ontario | Suzanne Madder

## *Growing CWEEL Groups in AEE Chapters*

CWEEL has seen tremendous growth across our international chapter network in recent months through the development of CWEEL Groups. These groups, made up of local AEE members, help extend the reach of CWEEL's message as a forum to promote women in the energy industry.

One example of this is the Chilean Chapter (Est. 2017) and the associated CWEEL Group. More than 700 people between 2017-2020 have benefited from the strong representation of women in chapter leadership roles.

"Our purpose of working as founders of the CWEEL Chile Group was to open a space for meeting and empowering women who have chosen the world of energy...we are proud to have laid the foundations for this purpose," said Maria Veronica Tapia, former Director.

*"a space for meeting and empowering women who have chosen the world of energy"*



The group has been awarded national and international acknowledgments while reducing gender gaps within the energy sector. "It was very gratifying to collaborate with this group of women... we responded to them with training, visibility, and communication of our capacities," said Yahaira Fiallos, former Director. As the women depart their leadership roles, they open these leadership seats to new leaders who wish to drive further success for women in energy. "We have decided to leave and open spaces to new leaders who wish to see the CWEEL Group in Chile with greater success based on the contribution and virtuosity generated by gender parity in work groups, associations, and for course in the energy sector," said Romina Cid, former President (2017-2020).

## *Join Us*

### *Clean Energy & Career Opportunities Series*

#### *A Four-Part CWEEL Career Advancement Webinar Series*

This series will examine emerging initiatives and trends in technology, policy, etc., including the Biden Administration, e.g. *American Jobs Plan*, *American Rescue Plan*, and other efforts to help guide people in their prospective career moves and opportunities in the future.

May 5th *Save The Dates*  
May 19th *Register Online*  
June 2nd  
June 16th



### *International CWEEL Groups*

- Bangladesh*
- Chile*
- France*
- Ghana*
- Jamaica*
- Jordan*
- Kenya (East Africa)*
- Palestine*
- Tunisia*
- Turkey*
- Ukraine*

*Don't See Your Chapter Listed? Visit the website to Setup a CWEEL Group*  
[cweel.org](http://cweel.org)

# How Industrial Projects Get Done

By Jerry Zolkowski, PE, CEM  
and Amy Glapinski

While energy consumption and efficiency are a concern for most companies, it is not a top issue. In fact, energy efficiency may not even be on the radar. It is trumped by more pressing problems such as meeting customer demands, workforce capacity, quality, and reliability.

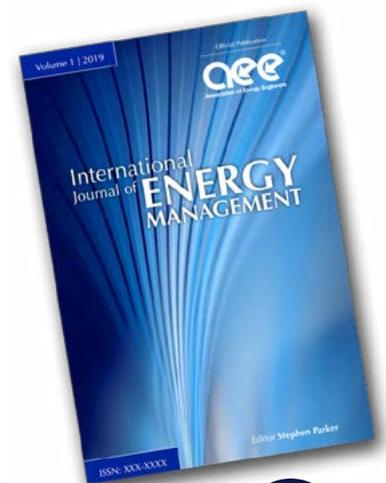
Because these concerns affect the very core operation of a business, saving energy is a lower priority. This is compounded by the fact that energy spent at most sites is a minor cost (less than 3%). It takes money and effort to execute energy projects that may not be as important as other issues. Because of the money and effort it takes to execute energy efficiency projects, these projects have a lower priority.

Yet many companies are actively implementing energy efficiency improvements. The reasons vary and include the following:

- **Some projects, such as lighting, have a good payback based only on the energy savings.**
- **Antiquated equipment eventually gets replaced, and new efficiencies are included.**
- **Expansions bring new capacity that may offer far better efficiency.**
- **Market demands for greener products.**
- **Some ways efficiency projects are implemented in this business environment**
- **An energy review for capital expenditures.**
- **Selling projects that also contribute to business goals such as higher reliability, lower maintenance, or greener products.**
- **An active identification process for new projects.**

Manufacturers exist to make a product, not save energy. Using less energy contributes to the company goals of staying profitable, but not as much as other improvements. For energy use to reduce in this environment, energy projects must coexist and support other business goals.

This article was originally published in the **International Journal of Energy Management (Vol 2. Issue 2)**



## CONSUMERS ENERGY IEM PROGRAM

Consumers Energy runs an Industrial Energy Management (IEM) program as part of the larger efficiency incentive program. The goal of IEM is for sites to continually seek energy savings and use the incentive program. Companies start by forming an energy team and receiving some energy management training and Level 1 assessment (about a half day on site total). The Level 1 assessment is only an identification of prospective energy saving measures. Sites that register for the ENERGY STAR® Challenge for Industry or commit to ISO 50001 receive a Level 2 audit that quantifies some of the measures. There is no fee for these services.

The goal for any audit is to identify as many opportunities as possible and show a large percentage reduction in energy expenditure. While that is a noble quest, a limited amount of “free” resources constrains the IEM audits focus on projects that have a higher probability of getting done. Ferreting out which projects the site might be willing to conquer during the audit process requires learning their motivations and limitations.

### WHY PROJECTS **DO NOT** GET DONE

First, a look at why great projects do not get done. Every auditor and energy manager has the experience of identifying an energy saving opportunity with a great payback that appeared to be a no-brainer to proceed but did not. There is always a reason why this happens, and some of them include the following:

**Not My Job** The person receiving the recommendation might want it done, but the task of executing it falls elsewhere – and it is not a priority for the other party. For example, a maintenance manager could show a good return for a new variable-frequency drive (VFD) air compressor, but the project must be done by engineering, and it is not a priority for engineering.

**It Is Not Important Enough** An energy saving project with a good return is always a great idea, but when it is not as important as other priorities, it does not receive time or financial resources. Other priorities can include just keeping the place running, expansions, and bringing new products to market.

**Risk** Anytime something changes, there is a chance it will not work as planned. There are different aspects to risk. One is risk that the new equipment may not work as planned, but a larger concern is that the change upsets something more valuable. It is possible that new lighting or controls do not illuminate as intended, but if that shortfall disrupts production then it becomes costly.

Another aspect to risk is “outside the box” changes for upgrades that exceed the

implementer’s comfort level. Directing the cooling air from an air-cooled air compressor into a space that needs to be heated is widely accepted, but adding a heat exchanger to the oil circuit to warm water modifies the OEM (original equipment manufacturer) equipment, which many will not consider.

**Insufficient Resources** Sometimes it is money or competition for money. There may not be enough to go around, or money just goes to better projects.

More often it is staff time or expertise. Companies have processes for allocating funds and selecting projects. Somebody must get vendor proposals and assemble the business case. When that responsibility falls on someone who is not available, the project does not get done.

Expertise can be another hurdle. When our efficiency program discusses frequency drives for pumps or fans, facilities that have staff capable of installing and programming them perceive it as something they can readily install. Sites that must hire a contractor have the burden of getting a proposal, funding, scheduling, and communicating their needs to the contractor. That can be enough to discourage some folks from acting.

## WHY PROJECTS **DO** GET DONE

For all the reasons things do not get done, a great many projects move forward. Some of the reasons successful organizations implement improvements are discussed below.

**Money** Many projects have strong returns, and the company acts to implement cost saving measures. This is how most vendors try to sell projects, and it is an important factor. Despite the frustration of great projects that do not move forward, most companies operate with the logic that cost reduction is important. Money is also at the root of the next reasons. Some companies seek out incentives to help overcome financial barriers.

**Continuous Improvement** When we discuss energy management principals with sites, one question we always ask is "Do you have a continuous improvement program?" This seems to be a strong indicator of the company's interest and ultimate success in getting energy savings. When these programs are in place, all employees are seeking cost reductions, and the only cost many can influence is energy use. When an energy saving idea goes into the continuous improvement program, it is assigned to someone that becomes responsible for it, and its progress is tracked. Everyone has a job responsibility to participate in the process, and it is part of the culture. Energy reduction becomes another way to improve.

Continuous improvement has been around awhile, and that is the basis for ISO standards including ISO 50001, the energy standard.

Companies that are already part of such programs find it easy to include energy aspects, but are loathe to take on the burden of an additional system, such as ISO 50001, unless it is required by their customers or supply chain.

**Green Aspects** The environmental impacts of a project can give more weight to an energy saving proposal. For most companies, their largest environmental impact is the air emissions created from their energy consumption.

Reducing the environmental footprint is something that can be used in marketing. Consumer products and markets where lower environmental impact has value to the customer can use energy savings as a positive product attribute.

Aside from consumer products, some industrial customers are asking their suppliers to implement energy saving measures. Some automotive companies actively seek savings and ask their suppliers to do so as well.

And a final benefit of being green is for the employees. In a period of low unemployment, a company can distinguish itself and look more attractive to folks that want to be associated with a responsible employer.

## GET MORE TRACTION

**Piggyback on Other Projects** Take advantage of production equipment upgrades such as adding an optional meter, taking efficiency upgrades, or including special controls. Upgrading new equipment when it is purchased is less expensive than trying to retrofit it after installation. Due to all the reasons projects do not get done, a retrofit may never happen.

If an expansion needs more central plant services (compressed air, chilled water, steam, etc.), use that chance to upgrade to VFD compressors, VFD pumps, high efficiency chillers, etc. Sometimes the central services can be upgraded, and the existing equipment can be used for backup.

**Reliability** Everything breaks down eventually. While the notion that a \$100,000 compressor might be down for several hours or days can be taken in stride, it becomes critical when that breakdown disrupts product deliveries and stops hundreds of employees and machines from working, which might be worth thousands of dollars per hour.

Companies deliver products and services. If they are motivated to acquire new equipment because of issues such as repair cost and downtime, a new piece of equipment can be acquired that will also provide energy savings. Often the old equipment is retained as backup.

# New Options for Professional Development

Energy efficiency is now at the forefront of conversations related to worldwide sustainable development, electrification, energy equity, and climate action. It is incredible how the pace at which changes occur in our (energy management) sector. AEE's Training Department is continually looking for ways to help support our members with the knowledge and skills needed to further their efforts in improving energy efficiency, including how we support existing certification programs. After all, just because you obtained a certification does not mean you should stop learning.

## TRANSPORT

To help support the lifelong learning of our members, we are pleased to announce new Certificate Programs. Each certificate program will focus on one specific technical or industry area in depth. Our first Certificate Program focuses on **Transport Energy Management and Efficiency**, which will be available to virtual participants early summer of 2021. Participants that undertake the online sessions and complete an assessment to demonstrate comprehension and proficiency gain a Certificate of Completion. Certificate programs do not require renewals.



## LEADERSHIP



We also want to provide our members with personal development support throughout their careers. Our first program in this area is **Lead Your Life and Energy Career** and aims to help energy professionals become more effective leaders. Participants will have the opportunity to set personal and professional goals, plus learn how to focus on what really matters. This course should be open for registration by the fall of 2021.



**Teresa Piazza**  
AEE Director of Training

**Keep a look out for more information on these programs in the coming months.**

**Being Green** Meeting a target payback is often the first hurdle, but after that other aspects influence which projects move forward. Marketing may be able to leverage the company's efforts to reduce their environmental footprint.

**Money** Quite often the return on an energy projects compliments other cost saving projects, and it gets done. When incentives can be leveraged, the likelihood the project gets implemented increases.

Aside from just the monetary aspect, energy projects are usually lower risk. For example, lower wattage lights will consume less energy, but investing to introduce a new product carries the risk that sales will not reach a sufficient level to provide the expected return.

**Better Performance** "Everybody loves the new lights." Lighting with superior color or illumination is one example of how modernization can bring better performance and efficiency.

Another example would be how an efficient VFD air compressor can deliver more consistent air pressure to the plant. And another example is how modernized building controls might reduce temperature and humidity variations thereby increasing comfort and productivity.

## TAPPING INTO PROJECT MOTIVATORS

First and foremost, discover what is motivating the person or company. Focus on what fits with their goals, even if it is not the project with the best financial return. These motivators include the following:

- "I have to do an energy project every year." When it is part of the job, they will try to find a project that will meet their job expectation. The more control they have over the project, the more they will favor it. A facilities manager might have a budget under his control where he can install some VFDs on pumps and fans, but might have to go through capital approvals for a new piece of equipment and thus favor doing the VFDs.
- Reliability/downtime. Even when central plant equipment is not causing production downtime, high service requirements such as getting technicians to the site or getting rental equipment are headaches. Reducing this stress can motivate folks to do the work it takes to assemble a capital project for approval.
- Money. Sometimes it really is all about the money. The better the return, the better the project looks.
- Operating problems/system not delivering. When unable to meet the mission (e.g., compressed air

(Article continues on page 34)

## Online Training Programs

### Get Certified, Upskill or Earn CEUs

- Accelerated Certified Energy Manager (CEM®)
- Certified Business Energy Professional (BEP™)
- Certified Demand Side Management Professional (CDSM™)
- Certified Renewable Energy Professional (REP™)
- Developing an Energy Management Master Plan
- Electrical Engineering for Non-electrical Engineers
- Energy Auditing Fundamentals: Essential Strategies and Techniques for Optimal Results
- Energy Conservation in Industrial and Commercial Environments
- Energy Efficiency Practitioner (EEP™)
- Finance, Accounting and Engineering Economics for Energy Professionals
- Life Cycle Costing for Energy Professionals
- Microgrid Fundamentals
- Project Management for Energy Engineers and Energy Managers
- Renewable Energy Hot Topics

[education.aeecenter.org/online](http://education.aeecenter.org/online)



<< FIND A  
PROGRAM

pressure, space temperatures, cooling water temperatures or flows) all the time, the plant will want to find a fix to the problem along with getting an energy savings.

- Sustainability. If marketing aspects happen to carry any weight at the organization, they will favor projects that can be leveraged to promote sustain-ability. It may be difficult to communicate many of the central plant services upgrades to consumers, but others such as lighting and instant water heaters are quite easy to understand.

While these are all great motivators to leverage when deciding which projects to pursue, the key is to find out what matters to the site or the person that is responsible for getting the project done. Ask them where their priorities lie, what is causing them problems, and what projects they want to do to meet goals beyond saving energy. Adding energy savings to one of those projects increases the likelihood it will get done.

Tapping into multiple drivers makes it easier for the

project owner to get approval. For example, at one company the initial driver to do energy projects came from the plant engineers or maintenance managers. It was part of their job to execute a continuous improvement project (expectations), and energy was the only controllable expense they had. The projects were cost justified (money) and got done. Later, marketing leveraged the projects to demonstrate how the company was reducing their environmental footprint (marketing).

## CONCLUSIONS

There are always reasons why great projects do not get done. These center around the project not being as important as other activities or projects to the person responsible for implementing the project. While it appears the failure to seize upon great energy and cost saving opportunities flies in the face of logic, the person responsible has higher priorities.

The key to advancing energy projects in such an environment is to discover what those other priorities are, and then find a way to save energy while meeting the more pressing needs.

### AUTHOR BIOGRAPHIES

#### **Jerry Zolkowski, PE CEM,**

is senior engineer at DNV GL (part of the Det Norske Veritas® group). He works on the consumers energy business energy efficiency programs in Michigan with a focus on making industrial plants more efficient. Prior to DNV GL, he worked at Dow Corning, supporting global manufacturing energy efficiency efforts, and Shaw Industries, evaluating energy conservation opportunities. He also worked at the State of Georgia's industrial extension service at Georgia Tech. That work included energy conservation, environmental compliance, and plant and design engineering. Jerry has BS in Mechanical Engineering from the University of Rochester and an MBA from Columbus State College. He may be contacted at Gerard.Zolkowski@dnvgl.com.



#### **Amy Glapinski** is the

commercial and industrial specialty and multifamily senior programs manager for Consumers Energy. Amy has been implementing and managing commercial energy efficiency programs for 8 years with Consumers Energy. She has been intimately involved with the development and implementation of over 20 different pilot and specialty programs serving a wide variety of market segments in Michigan, including agriculture, industrial, education, income qualified multifamily and government municipalities. Ms. Glapinski has a bachelor's degree in architecture from Ball State University. She may be contacted at Amy.Glapinski@cmsenergy.com.



# Event News

## A Look Ahead - 2021 Keynote Speakers



Bear Grylls has become known worldwide as one of the most recognized faces of survival and outdoor adventure. He has traveled across the globe to many natural and extreme environments. You may recognize him from Discovery Channel's Emmy Award-nominated *Man vs. Wild* TV series, which became one of the most-watched shows on the planet, reaching an estimated 1.2 billion viewers. His global hit TV show *Running Wild with Bear Grylls* has allowed him to take some of the world's best-known stars on incredible adventures, including President Obama, Julia Roberts, Roger Federer, Will Ferrell, Zac Efron, Channing Tatum, and Kate Winslet, to name but a few.

Bear will share his unique experiences with attendees of AEE World 2021 during the opening session and explain how courage, kindness, and a never-give-up attitude are all you need to succeed.



Robert Swan will be the keynote speaker that closes the AEE World Energy Conference & Expo. During the 2019 AEE World Energy Conference and Expo, Robert gave a compelling keynote speech before embarking on the Last 300 Expedition. Over the past three decades, Robert has worked to preserve the Antarctic, championed sustainable development, and has undertaken a wide range of global and local environmental missions.

Attendees of AEE World 2019 found him to be genuinely inspiring. The ideals he expressed in his presentation and his personal goals align with AEE's core mission of fostering sustainable energy for our planet. We anticipate Robert to challenge, entertain and motivate attendees again in 2021, when he provides an update on his journey to the South Pole in January 2020.

## A Word to Our Event Supporters

The Association of Energy Engineers would like to thank our sponsors, supporters and exhibitors for making all AEE events possible. It is due to these partnerships, and the contributions made, that allow us to deliver exceptional events that focus on education and networking. We thank you for your support in the past 18 months as we adjusted to virtual events, and we are looking forward to meeting everyone in person again at AEE World 2021, and at our in-person events in 2022.



**Diane McCullum**  
AEE Exhibit Sales Director

# Winner AEE World 2021

AEE held a competition during the AEE World 2020 Virtual Conference. The winner received an expense paid trip to New Orleans, LA, to attend the AEE World 2021 conference in person. Anthony Scaparra, CEM, is our lucky winner!

Anthony is a graduate of Texas A&M University and currently works for Aramark Engineering and Asset Solutions. On behalf of Aramark, he is one of the Energy Managers at the Lewisville Independent School District (LISD). He supports the energy program, which consists of achieving energy savings from 100+ schools and administrative facilities totaling over 10 million square feet. He has worked on energy engineering studies, lighting project development, HVAC scheduling, and system analysis using direct digital control systems, utility bill reviews, energy-use baseline analysis and has performed energy savings calculations.

If you see Anthony at AEE World 2021, please congratulate him.



**Anthony Scaparra**  
Energy Manager  
Aramark



## AEE Europe Postponed

We know there is nothing like attending events in-person to do business, learn new technical content, forge partnerships, and network. We were excited to launch the debut AEE Europe event in October 2020. But, due to the pandemic it was re-scheduled for this year. Again, we are saddened to announce, the postponement of the event until 2022. Look out for upcoming announcements of dates and locations for all AEE Events in 2022.

**Energy Events**  
**Mark Your**  
**Calendars**



**New Orleans, LA**  
Conference Oct. 20 – 22, 2021  
Expo: Oct. 20 & 21  
[aee.world.org](http://aee.world.org)



**Spring 2022**  
Dates and Location to  
be Announced  
[east.aeecenter.org](http://east.aeecenter.org)



**Summer 2022**  
Dates and Location to  
be Announced  
[west.aeecenter.org](http://west.aeecenter.org)



**Dublin, Ireland**  
2022 Dates to be Announced  
[europe.aeecenter.org](http://europe.aeecenter.org)



# BOOKS



Now available at [aeecenter.org/books](http://aeecenter.org/books)

River Publishers is now the official publisher for the AEE book catalog, which includes over 100 books that focus on energy management, energy efficiency, engineering, renewables, clean energy and sustainability. They offer full publishing services with global distribution to all AEE members. **AEE Members can also apply their member benefit discount to any book purchased from the AEE catalog.**



## New Releases



### Data Driven Energy Centered Maintenance

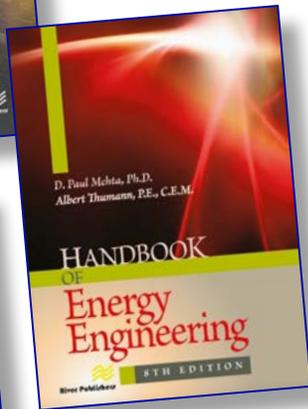
By Fadi Alshakhshir and Marvin T. Howell

ISBN: 2370000874948

e-ISBN: 9788770223560

**Price: \$154.5 after 15% Discount \$131.33**

Available: April 2021



### Handbook of Energy Engineering

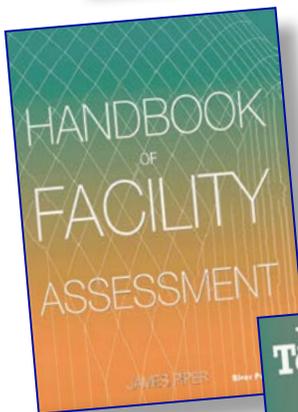
8th Edition By D. Paul Mehta & Albert Thumann

ISBN: 2370000874931

e-ISBN: 9788770223447

**Price: \$160 after 15% Discount \$136.00**

Available: April 2021



### Handbook of Facility Assessment

By James E. Piper

ISBN: 2370010911947

**Price: \$175 after 15% Discount \$148.75**

Available: January 2021



### New Technologies for Energy Efficiency

By Michael Frank Hordeski

ISBN: 2370010911312

**Price: \$119.95 after 15% Discount \$101.96**

Available: January 2021

SEARCH BOOKS >>



# Celebrating Member Dedication

## Have you been with AEE for over two decades?

In this first edition of AEE's Efficiency Magazine, we would have liked to celebrate all AEE members. But there is not enough space to list over 18,000 professionals in more than 100 different countries. So, we opted to draw the line at 20+ years. We wondered what it takes to be part of something for over two decades and what you gain in return — member dedication, commitment, value, knowledge, experience, and the list goes on.

There was no such thing as an “Energy Manager” when the association was founded in 1977. This list of individuals has helped define what it means to save energy and increase energy efficiency. By doing so, they have changed individuals' lives, corporations' success, and nations striving for energy efficiency and sustainable solutions. Are you or one of your colleagues or friends on this list? Reach out to them, congratulate them, and ask about their achievements and what it means to be a recognized Energy Manager.

# 20+

### AEE Fellows

Fotouh Al-Raqom | Kuwait | 22 Years  
Paul Allen | USA | 37 Years  
John Avina | USA | 21 Years  
George (Buster) Barksdale | USA | 21 Years  
Barry Benator | USA | 43 Years  
Alfonso Cabrera | USA | 26 Years  
Bruce Colburn | USA | 30 Years  
Graham Croman | USA | 22 Years  
Jeff Deem | USA | 23 Years  
David Eberly | USA | 31 Years  
Denis Enberg | USA | 40 Years  
William Fleming | USA | 43 Years  
Fredric Goldner | USA | 34 Years  
Stephen Hamstra | USA | 21 Years  
Warren Heffington | USA | 29 Years

Rusty Hodapp | USA | 33 Years  
Timothy Janos | USA | 39 Years  
Arun Jhaveri | USA | 22 Years  
Kenneth Kogut | USA | 42 Years  
Andrew Kozak | USA | 24 Years  
Michael Langton | USA | 39 Years  
Richard Lubinski | USA | 25 Years  
John Masiello | USA | 22 Years  
Thomas McGeachen | USA | 42 Years  
John McGowan | USA | 37 Years  
Prem Mehrotra | USA | 35 Years  
John Mench | USA | 26 Years  
Jeffrey Myrdek | USA | 26 Years  
Steven Parker | USA | 30 Years  
Graham Parker | USA | 29 Years

Michael Parker | USA | 26 Years  
Douglas Pearson | USA | 26 Years  
Stephen Roosa | USA | 26 Years  
Peter Rumsey | USA | 31 Years  
Mark Sankey | USA | 27 Years  
Boggarm Setty | USA | 22 Years  
William Stein | USA | 26 Years  
Wayne Turner | USA | 41 Years  
Keith Willis | USA | 33 Years  
David Wolcott | USA | 40 Years  
Eric Woodroof | USA | 27 Years  
James Yokota | USA | 23 Years

### Life Members

Kasey Abbott | USA | 29 Years  
John Ackerman | USA | 24 Years  
Wajdi Aghnatiou | USA | 23 Years  
William Aird | USA | 31 Years  
John Aiton | USA | 36 Years  
William Alexander | USA | 29 Years  
Benjamin Alkhas | USA | 24 Years  
Peter Allen | USA | 27 Years  
G. Mark Allen | USA | 27 Years  
Jim Allen | USA | 23 Years  
Robert Allender | Hong Kong | 29 Years  
James Anderson | USA | 34 Years  
Thomas Arms | USA | 22 Years  
Lindsay Audin | USA | 32 Years  
Bruce Ayres | USA | 36 Years  
Neal Bach | Canada | 24 Years  
Carolyn Banks | USA | 22 Years  
Douglas Barnard | USA | 21 Years  
John Basic | USA | 26 Years  
Maneck Bharucha | USA | 41 Years  
Robert Biddiscombe | USA | 23 Years  
J. Scott Biggers | USA | 22 Years

Jeffrey Blaevoet | USA | 33 Years  
Elliot Boardman | USA | 25 Years  
John Boderocco | USA | 38 Years  
Frederick Bova | USA | 32 Years  
Steven Boyce | USA | 23 Years  
Todd Boyer | Canada | 31 Years  
Louis Braquet | USA | 35 Years  
David Brender | USA | 25 Years  
Thomas Broderick | USA | 41 Years  
David Brown | USA | 40 Years  
Eddie Bullington | USA | 23 Years  
Sally Burt | USA | 35 Years  
Anthony Burton | USA | 32 Years  
Khaled Bushnaq | United Arab Emirates | 29 Years  
Robert Caldwell | USA | 36 Years  
Edward Carney | USA | 27 Years  
Millard Carr | USA | 24 Years  
Mike Case | USA | 24 Years  
William Castle | USA | 23 Years  
Nicholas Cavagnaro | USA | 23 Years  
William Chambers | USA | 32 Years

Richard Sou-Tung Chan | Hong Kong | 40 Years  
Elisia Chapnerkar | USA | 21 Years  
Jon Chestnut | USA | 20 Years  
Ronald Chin | Hong Kong | 28 Years  
Salvatore Ciampo | USA | 37 Years  
John Cilia | USA | 22 Years  
James Clark | USA | 25 Years  
Richard Claytor | USA | 25 Years  
Thomas Colvin | USA | 27 Years  
Matthew Conkling | USA | 21 Years  
Gregg Cox | USA | 24 Years  
Brian Crafts | USA | 23 Years  
Buckner Creel | USA | 22 Years  
John Dain | USA | 27 Years  
Steven Day | USA | 20 Years  
Mauro De Maio | USA | 28 Years  
Howard Dickinson | USA | 23 Years  
Jesse Dillard | USA | 25 Years  
Alberto Dolojan | USA | 21 Years  
Michael Downey | USA | 36 Years  
Alan Dufur | USA | 22 Years

# Member Spotlight



Since joining AEE in 2000, I could not have wished for a better professional family. While I reside in another continent,

I have never felt away from AEE's support, guidance and encouragement. The personal direction, training, and professional development have helped me succeed in my own country, Kuwait, and neighboring countries. With AEE's support, I have managed to get certified, trained, and win awards, not just from AEE but also from other prestigious organizations. I have made the most of the opportunities because of the skills I learned from AEE. I wanted to give back, so with AEE's support, I also helped establish and run Kuwait's local AEE chapter.

Even though AEE provided me with the technical knowledge and expertise in energy efficiency and energy management, which empowered me to lead national projects, AEE never forgot to treat me as a friend or family member. I often receive personal greeting cards, congratulation notes, and emails whenever I have a birthday or achieved a milestone, such as a promotion. To me, it was enough to know that they know me as a person, not just a name on a membership list.

**Fotouh Al-Ragom | AEE Fellow | 22 Years**  
Energy Efficiency Technologies Program Manager  
Energy and Building Research Center  
Kuwait Institute for Scientific Research

Michael Duncan | USA | 27 Years  
James Eaton | USA | 23 Years  
Charles Effinger | USA | 25 Years  
William Efir | USA | 42 Years  
John Eggink | USA | 22 Years  
Walter Elyon | USA | 20 Years  
Erik Emblem | USA | 22 Years  
David Emery | USA | 23 Years  
Robert Emrich | USA | 21 Years  
Bernard Erickson | USA | 29 Years  
John Fanning | USA | 26 Years  
Yadi Farhadi | USA | 21 Years  
Raymond Fischer | USA | 43 Years  
Jim Fischer | USA | 30 Years  
Luis Felipe Flores Torres | Mexico | 21 Years  
Michael Foraker | USA | 21 Years  
George Frank | USA | 24 Years  
Anthony Frattali | USA | 23 Years  
John Fung | Hong Kong | 40 Years  
Guy Gadola | USA | 20 Years  
Donald Galamaga | USA | 21 Years  
Rebecca Garland | USA | 30 Years  
Douglas Garrett | USA | 24 Years  
Joseph Glorioso | USA | 40 Years  
John Glover | USA | 20 Years  
Patrick Goggin | USA | 25 Years  
Roger Goode | USA | 21 Years  
Paul Goodman | USA | 42 Years  
Glenn Goodwin | USA | 31 Years  
Terry Grabau | USA | 26 Years  
Steve Greenberg | USA | 21 Years  
Hans Greene | USA | 21 Years  
Teresa Greis | USA | 36 Years  
Luis Grunauer | USA | 23 Years  
Armando Guerra | USA | 25 Years  
Manuel Guzman | USA | 22 Years  
Richard Hankins | USA | 41 Years  
Anthony Hardy | USA | 24 Years  
Teri Harper-Dufur | USA | 20 Years  
Terence Harrigan | USA | 24 Years  
Earl Hartmen | USA | 42 Years  
James Haven | USA | 22 Years  
Jon Haviland | USA | 42 Years  
James Hedin | USA | 27 Years  
Mohamed Helal | Egypt | 24 Years  
Larry Helpert | USA | 35 Years  
Larry Henson | USA | 22 Years  
Jeff Hightower | USA | 31 Years  
Patrick Hilleary | USA | 29 Years  
Paul Hoemann | USA | 37 Years  
Victor Hoffman | USA | 22 Years  
Mark Hollo | USA | 30 Years  
George Hon-Cheung Hung | Hong Kong | 40 Years  
Keith Hood | USA | 38 Years  
Len Horewitz | USA | 22 Years  
William Hudson | USA | 25 Years  
Sam C. M. Hui | China | 28 Years  
Benjamin Hunter | USA | 22 Years  
Edward Jackson | USA | 21 Years  
Syed Jafri | USA | 24 Years  
Glenn Johnson | USA | 25 Years  
Dan Johnson | USA | 22 Years  
John Jolly | USA | 21 Years  
Art Jorgensen | USA | 23 Years  
Lawrence Kaminsky | USA | 30 Years  
William Kean | USA | 40 Years  
Amitabh Kedia | India | 24 Years  
Richard Kelly | USA | 26 Years  
John Kinkela | USA | 43 Years

Thomas Kiser | USA | 32 Years  
Harry Kociencki | USA | 26 Years  
Russell Koehler | USA | 21 Years  
Donald Koenig | USA | 25 Years  
Mark Koski | USA | 22 Years  
Paul Kotowicz | USA | 38 Years  
Alan Krupski | USA | 24 Years  
Douglas Lancashire | USA | 26 Years  
Dennis Landsberg | USA | 22 Years  
Terry Lang | USA | 26 Years  
Regina Larrabee | USA | 21 Years  
James Larson | USA | 22 Years  
John Lavin | USA | 24 Years  
Qadri Lawal | USA | 31 Years  
Philip Le Grand | USA | 23 Years  
Lester Lieberman | USA | 42 Years  
Evans Lizardos | USA | 43 Years  
Armando Llamas Terres | Mexico | 21 Years  
Susan Lotz | USA | 28 Years  
Morris Lovett | USA | 22 Years  
Alfred Lutz | USA | 24 Years  
Aandy Ly | USA | 21 Years  
Matthew Lyczak | USA | 23 Years  
Mark MacBride | USA | 22 Years  
Marshal Maggard | USA | 22 Years  
John Magliano | USA | 21 Years  
Mike Magyary | USA | 29 Years  
Steven Maliszewski | USA | 24 Years  
Jose' Marrero | USA | 22 Years  
Paul Martin | USA | 28 Years  
James Matheson | USA | 39 Years  
Charles Maxwell | USA | 34 Years  
Malcom Maze | USA | 37 Years  
Peter McCone | USA | 28 Years  
John McEwan | USA | 35 Years  
Russ McIntosh | USA | 27 Years  
Paul Meierdierck | USA | 35 Years  
Edward Mergens | USA | 25 Years  
Kirk Michael | USA | 22 Years  
Richard Miller | USA | 42 Years  
Michael Miller | USA | 24 Years  
John Wesley Miller | USA | 21 Years  
Kenneth Mitchell | USA | 26 Years  
Thomas Moore | USA | 21 Years  
Robert Morey | USA | 21 Years  
John Morrill | USA | 31 Years  
Samuel Morris | USA | 24 Years  
Harvey Morris | USA | 23 Years  
Martin Mozzo | USA | 43 Years  
William Mutscheller | USA | 33 Years  
Donald Naiser | USA | 24 Years  
Armando Nava | Mexico | 28 Years  
James Nelson | USA | 24 Years  
James Newman | USA | 27 Years  
James Noe | USA | 21 Years  
Albert Nunez | USA | 21 Years  
Nariman Nusserwanji | USA | 27 Years  
Teri Orr | USA | 23 Years  
Deanne Ottaviano | USA | 27 Years  
Angelo Padro | USA | 25 Years  
Gary Painter | USA | 24 Years  
James Parker | USA | 21 Years  
Michael Pasky | USA | 26 Years  
Leonard Pattison | USA | 21 Years  
Thomas Peterson | USA | 31 Years  
Arnold Peterson | USA | 26 Years  
Jon Pietruszkiewicz | USA | 36 Years  
George Pudlo | USA | 42 Years  
Mark Purinton | USA | 42 Years  
Albert Putnam | USA | 23 Years

Chen Qigao | China | 30 Years  
Michael Quimbey | USA | 39 Years  
T.V. Ramachandra | India | 23 Years  
John Ramsden | USA | 28 Years  
Gary Ramus | USA | 21 Years  
Stephen Rawski | USA | 31 Years  
Raborn Reader | USA | 23 Years  
James Redden | USA | 30 Years  
Carmine Rende | USA | 22 Years  
Kenneth Riead | USA | 27 Years  
Howard Rivers | USA | 26 Years  
Nancy Rorabaugh | USA | 20 Years  
Lenny Rose | USA | 23 Years  
Dany Safi | Canada | 25 Years  
Jerry Sautler | USA | 20 Years  
Joseph Savala | USA | 27 Years  
John Saxton | USA | 33 Years  
Stephen Schaffner | USA | 23 Years  
Steven Schlegel | USA | 28 Years  
Robert Schubert | USA | 23 Years  
C Chet Schuelein | USA | 23 Years  
Ken Schwartz | USA | 26 Years  
Erick Seelinger | USA | 26 Years  
William Seldon | USA | 26 Years  
Yan Shen | USA | 24 Years

Jitendra Singh | USA | 41 Years  
Irwin Smiley | USA | 41 Years  
Robert Smith | USA | 28 Years  
Gary Smith | USA | 23 Years  
Scott Spiewak | USA | 35 Years  
Michael Spishock | USA | 33 Years  
Teerachai Srisirikul | USA | 23 Years  
Zachary Stern | USA | 22 Years  
Asmus Stoyke | Canada | 36 Years  
Samuel Sugarman | USA | 27 Years  
Hollis Sumrall | USA | 22 Years  
Paul Super | USA | 22 Years  
James Sura | USA | 27 Years  
Dennis Svalstad | USA | 24 Years  
Kar Tam | Hong Kong | 32 Years  
Wai Tang | Hong Kong | 25 Years  
James Taylor | USA | 22 Years  
Terry Taylor | USA | 22 Years  
Frances Tegnazian | USA | 20 Years  
Sabaratnam Thamilseran | USA | 22 Years  
John Theisen | USA | 21 Years  
Steven Thompson | USA | 21 Years  
Michael Torchio | USA | 40 Years  
Matthew Traum | USA | 21 Years  
Darrell Trimble | USA | 20 Years

Matt Urquhart | USA | 24 Years  
Denis Vazquez-Gascot | USA | 23 Years  
Frantz Vincent | USA | 24 Years  
Charlotte Wagner | USA | 27 Years  
William Wahl | USA | 26 Years  
Bruce Walker | USA | 20 Years  
James West | USA | 33 Years  
G. Peter Westerhoff | USA | 23 Years  
Garth White | Canada | 22 Years  
Anna Williams | USA | 38 Years  
Roy Williams | USA | 28 Years  
Daniel Williams | USA | 22 Years  
Darryl Winer | USA | 24 Years  
David Wolfe | USA | 23 Years  
Everett Wolverton | USA | 27 Years  
Carol Woodyard | USA | 28 Years  
J. Mark Young | USA | 21 Years  
Zhang Yunming | China | 33 Years  
Joseph Zahora | USA | 23 Years  
Yunming Zhang | China | 32 Years  
D Malone Zimmerman | USA | 20 Years  
Cory Zittlow | USA | 23 Years  
Salah Zoma | USA | 22 Years

## Members

Jamal Aboueljoud | USA | 26 Years  
Yousef Abouzelof | USA | 32 Years  
Joseph Acquaviva | USA | 20 Years  
Mark Adams | USA | 21 Years  
Carolyn Adkins | USA | 29 Years  
Robert Adkins | USA | 28 Years  
Jairam Agaram | USA | 35 Years  
Mohammad Al-Homoud | Saudi Arabia | 24 Years  
Richard Alaimo | USA | 41 Years  
W. John Albrecht | USA | 26 Years  
Michael Albright | USA | 25 Years  
Kenneth Allen | USA | 27 Years  
R. Scott Allen | USA | 21 Years  
Randy Altergott | USA | 26 Years  
Angel Alvarez | USA | 23 Years  
Robert Amundsen | USA | 34 Years  
Edmund Anderson | USA | 28 Years  
Kristofer Anderson | USA | 24 Years  
Martin C.T. Anderson | USA | 24 Years  
Lawrence Anderson | USA | 21 Years  
Clifford Andrews | USA | 20 Years  
Wilfredo Arce | USA | 25 Years  
Steven Armour | USA | 21 Years  
Andrew Arnold | USA | 35 Years  
Eric Arnold | USA | 20 Years  
David Ashwood | USA | 24 Years  
C. Douglas Auburg | USA | 39 Years  
Daniel Bacik | USA | 25 Years  
Kevin Baer | USA | 25 Years  
William Bagnell | USA | 26 Years  
Bruce Bailey | USA | 22 Years  
Jeff Baker | USA | 35 Years  
Edward Baker | USA | 26 Years  
Jeannie Baker | USA | 24 Years  
Matthew Baker | USA | 20 Years  
Srinath Balachandran | USA | 20 Years  
David Baldwin | USA | 36 Years  
Paul Banks | USA | 35 Years  
Anil Bansal | USA | 30 Years  
Michael Barancewicz | USA | 25 Years  
Timothy Barnish | USA | 20 Years  
Anthony Barone | USA | 24 Years

M. Renee Barr | USA | 23 Years  
Michael Bartlett | USA | 20 Years  
Michael Barton | USA | 21 Years  
Jonathan Baty | USA | 27 Years  
Stephen Beck | USA | 23 Years  
Gerard Beddington | USA | 36 Years  
Andrew Beggs | USA | 27 Years  
Daniel Begin | USA | 21 Years  
Mark Begle | USA | 22 Years  
Eugene Bell | USA | 25 Years  
William Bellamy | USA | 22 Years  
James Benoit | USA | 28 Years  
Michael Bergeron | USA | 24 Years  
Timothy Bernadowski | USA | 28 Years  
Michael Berning | USA | 24 Years  
Robert Berninger | USA | 22 Years  
Kevin Betz | USA | 28 Years  
Ajay Bhargava | USA | 23 Years  
Larry Bironas | USA | 43 Years  
Margaret Bishop | USA | 33 Years  
Stacy Black | USA | 20 Years  
Peter Bloch | USA | 24 Years  
Mark Boraski | USA | 21 Years  
Martin Borenstein | USA | 33 Years  
Vicente Bortone | USA | 27 Years  
Robert Botelho | USA | 31 Years  
Francis Boucher | USA | 21 Years  
Keith Boulton | Canada | 23 Years  
Martin Bowen | USA | 23 Years  
John Bowles | USA | 25 Years  
Marijn Braadbaart | USA | 20 Years  
Marko Bradica | USA | 24 Years  
Todd Bradley | USA | 23 Years  
Tim Brancheau | USA | 20 Years  
Thomas Brannen | USA | 25 Years  
Bruce Bremer | USA | 36 Years  
Duane Bronson | USA | 20 Years  
Benjamin Brooks | USA | 25 Years  
Bruce Brooks | USA | 25 Years  
Philip Brown | USA | 38 Years  
Bruce Brown | USA | 30 Years  
John Brown | USA | 26 Years  
Jeffrey Brown | USA | 26 Years

Michael Brown | USA | 24 Years  
Scott Brown | USA | 20 Years  
Bobby Browning | USA | 20 Years  
Beth Brummitt | USA | 30 Years  
Richard Buchanan | USA | 23 Years  
Patrick Buchanan | USA | 23 Years  
John Burgan | USA | 23 Years  
Diane Burger | Canada | 23 Years  
Nelson Burgess | USA | 20 Years  
Eric Burgis | USA | 24 Years  
Brian Burke | USA | 22 Years  
Sandra Burton | USA | 20 Years  
Rae Butler | USA | 23 Years  
Ricardo Cabanit | USA | 29 Years  
James Call | USA | 23 Years  
Thomas Callahan | USA | 36 Years  
Michael Calogero | USA | 37 Years  
Norman Campbell | USA | 24 Years  
R Card | USA | 35 Years  
Curtis Carl | USA | 30 Years  
Malcolm Carley | USA | 25 Years  
Scott Carlson | USA | 21 Years  
James Carlson | USA | 20 Years  
David Carpenter | USA | 41 Years  
Mark Casell | USA | 20 Years  
Salvatore Castro | USA | 30 Years  
Rafael Castro | USA | 23 Years  
Rolly Catapia | Canada | 26 Years  
Robert Catell | USA | 42 Years  
Lloyd Cavey | USA | 20 Years  
Vladimir Ceaus | Canada | 21 Years  
Richard Chalker | USA | 23 Years  
Guy Chamberlain | USA | 41 Years  
Maurice Chaput | USA | 23 Years  
Wayne Chase | USA | 27 Years  
James Chemplanikal | USA | 22 Years  
Peter Chiaravalle | USA | 22 Years  
Dan Clark | USA | 26 Years  
Marco Clerx | USA | 29 Years  
Robert Clifton | USA | 24 Years  
John Coath | USA | 22 Years  
Keith Cockerham | USA | 26 Years  
Christopher Collins | USA | 22 Years

Daniel Collins | USA | 21 Years  
John Connell | USA | 28 Years  
Neil Connelly | USA | 22 Years  
Jeffrey Conner | USA | 28 Years  
Ward Connors | USA | 25 Years  
Paul Consoli | USA | 22 Years  
Michael Conway | USA | 30 Years  
David Cooper | USA | 28 Years  
Charles Copeland | USA | 21 Years  
Thomas Coughlin | USA | 24 Years  
Thomas Cowing | USA | 23 Years  
William (Ed) Cox | USA | 35 Years  
Douglas Cox | USA | 25 Years  
Michael Coyne | USA | 26 Years  
Gary Crabtree | USA | 25 Years  
John Crawford | USA | 22 Years  
Joseph Cristino | USA | 35 Years  
Alan Croll | USA | 27 Years  
John Cross | USA | 24 Years  
Richard Crowson | USA | 36 Years  
Steven Croxton | USA | 26 Years  
Gerald Culbert | USA | 43 Years  
Jeffrey Czarniecki | USA | 26 Years  
Michael Daigneault | USA | 21 Years  
Michael Dalton | USA | 26 Years  
John Daniel | USA | 29 Years  
Annette Dann | USA | 22 Years  
Nancy Davies-Flickinger | USA | 23 Years  
Richard Davis | USA | 32 Years  
Craig Davis | USA | 22 Years  
Stephen Davis | USA | 21 Years  
Vicki Davis | USA | 20 Years  
William Dean | USA | 23 Years  
Michael DeBoer | USA | 37 Years  
Steven DeBusk | USA | 26 Years  
Kenneth Decker | USA | 25 Years  
Bruce Deetken | USA | 21 Years  
Ramon Delgadillo | USA | 21 Years  
Antonio Delgado | USA | 20 Years  
Agostino Dell'Oso | USA | 20 Years  
David Dellinger | USA | 22 Years  
Russ Dent | USA | 24 Years  
McLellan Deremer | USA | 23 Years  
Harry Devine II | USA | 23 Years  
Jeffrey DeVore | USA | 30 Years  
Mitchell Dexter | USA | 22 Years  
Thomas Dey | USA | 23 Years  
Joseph Dezamits | USA | 22 Years  
Robert Di Giandomenico | USA | 28 Years  
Keith Dias | USA | 24 Years  
R. Mark Dickson | USA | 20 Years  
William Diffley | USA | 21 Years  
Stephen DiGiacomo | USA | 38 Years  
Saadeddine Dimachkieh | USA | 23 Years  
Karen DiMeglio | USA | 25 Years  
Gregory DiNome | USA | 22 Years  
Mark DiPetrillo | USA | 28 Years  
Douglas Dixon | USA | 28 Years  
Paul Dobry | USA | 37 Years  
Daniel Donnelly | USA | 31 Years  
Russell Donnici | USA | 31 Years  
Judy Dorsey | USA | 21 Years  
Douglas Dougherty | USA | 24 Years  
Richard Doughty | USA | 24 Years  
Pharis Douglas | USA | 40 Years  
Gary Downes | USA | 22 Years  
Jonathan Driskill | USA | 23 Years  
Lance Duellman | USA | 22 Years  
Paul Duerre | USA | 26 Years  
John Duffy | USA | 20 Years  
Daniel Duncan | USA | 27 Years

William Dunnivant | USA | 26 Years  
David Dusenbury | USA | 26 Years  
Michael Eby | USA | 23 Years  
Michael Eckhardt | USA | 26 Years  
John Eckmann | USA | 28 Years  
Robert Ehrhardt | USA | 22 Years  
Tom Eldred | USA | 20 Years  
Michael Elliott | USA | 26 Years  
Richard Ellison | USA | 20 Years  
Joseph Elovich | USA | 25 Years  
Mark Enochs | USA | 22 Years  
Eric Erickson | USA | 30 Years  
Eric Erickson | USA | 22 Years  
Paul Erickson | USA | 21 Years  
Jeffrey Euclide | USA | 20 Years  
Garyne Evans | USA | 22 Years  
John Everts | USA | 23 Years  
David Evers | USA | 27 Years  
Jeffrey Fahey | USA | 24 Years  
Peter Fairbanks | USA | 30 Years  
Joe Fangman | USA | 30 Years  
Rodney Fanning | USA | 23 Years  
Louis Farquhar | USA | 26 Years  
Boyce Farrar | USA | 37 Years  
Roger Farrer | USA | 21 Years  
Robert Fegan | USA | 20 Years  
Vincent Ferguson | USA | 27 Years  
Ernesto Fernandez | USA | 26 Years  
David Ferrante | USA | 27 Years  
Nicholas Finia | USA | 21 Years  
Dennis Flynn | USA | 37 Years  
Kevin Folsom | USA | 21 Years  
Richard Ford | USA | 20 Years  
Dale Foster | USA | 21 Years  
Allen Foust | USA | 21 Years  
Jon Fox | USA | 23 Years  
Mark Franke | USA | 30 Years  
Jesse Frederick | USA | 31 Years  
Steven Frederickson | USA | 33 Years  
Joel Freeman | USA | 26 Years  
Harvey Freville | USA | 23 Years  
Steve Frohling | USA | 25 Years  
John Frugard | USA | 21 Years  
Mark Frye | USA | 23 Years  
Kenneth Fulk | USA | 32 Years  
Steven Funk | USA | 22 Years  
Peter Funk | USA | 21 Years  
James Gabler | USA | 24 Years  
Richard Gabrielson | USA | 24 Years  
Francis Gaffney | USA | 25 Years  
Richard Galipeau | USA | 24 Years  
Paul Garcia | USA | 24 Years  
Peter Garforth | USA | 25 Years  
Paul Garrison | USA | 23 Years  
Michelle Gerace | USA | 23 Years  
Suresh Ghadia | USA | 26 Years  
Abdul Ghalayini | USA | 29 Years  
Kevin Gilleran | USA | 25 Years  
Jayson Gilliam | USA | 28 Years  
Paul Gillis | USA | 25 Years  
Ronald Gillooly | USA | 30 Years  
Leroy Givler | USA | 33 Years  
James Glasspool | Canada | 27 Years  
Jeffrey Glick | USA | 26 Years  
Brian Glynn | USA | 21 Years  
David Goemaere | USA | 30 Years  
Steven Goldberg | USA | 25 Years  
Edwin Goodwin | USA | 42 Years  
Joseph Gorecki | USA | 28 Years  
C. Andre Gouin | USA | 21 Years  
Dakers Gowans | USA | 24 Years

Paul Graves | USA | 36 Years  
Scott Greenbaum | USA | 21 Years  
Walter Greenwood | USA | 36 Years  
Bruce Grenier | USA | 25 Years  
Manmohan Grewal | USA | 26 Years  
Mark Grichen | USA | 22 Years  
Steven Gridley | USA | 28 Years  
Craig Griffin | USA | 26 Years  
David Grimason | USA | 26 Years  
Paul Grisafi | USA | 24 Years  
Thomas Gross | USA | 20 Years  
Joseph Guagno | USA | 21 Years  
Sonny Ha | USA | 23 Years  
Michael Hahn | USA | 26 Years  
Stanley Hahn | USA | 25 Years  
Benjamin Haight | USA | 25 Years  
Randolph Haines | USA | 24 Years  
Matthew Haley | USA | 22 Years  
Joseph Hall | USA | 23 Years  
Dan Hall | USA | 22 Years  
Christopher Halpin | USA | 22 Years  
Kerry Hamamura | USA | 22 Years  
Mark Hamann | USA | 21 Years  
Kirk Hamilton | USA | 26 Years  
Chris Hamon | USA | 29 Years  
Michael Hanson | USA | 33 Years  
John Hardesty | USA | 23 Years  
Timothy Harper | USA | 25 Years  
David Harrell | USA | 23 Years  
Joseph Harrell | USA | 22 Years  
Greg Harrell | USA | 21 Years  
John Harris | USA | 22 Years  
Michael Hart | USA | 32 Years  
James Harvey | USA | 35 Years  
Fred Hauber | USA | 20 Years  
Shaun Hayes | USA | 23 Years  
Philip Hayet | USA | 24 Years  
Vivekanand Hegde | USA | 21 Years  
Steven Heinz | USA | 21 Years  
R. Scott Helm | USA | 28 Years  
Marcus Hendrickson | USA | 23 Years  
Ron Henry | USA | 29 Years  
Donald Herrmann | USA | 26 Years  
John Hester | USA | 22 Years  
Mark Hillman | USA | 22 Years  
Brian Hines | USA | 33 Years  
Adam Hinge | USA | 24 Years  
Gregory Hochstetler | USA | 22 Years  
David Hoelke | USA | 20 Years  
Garret Hoffman | USA | 26 Years  
James Hoffman | USA | 22 Years  
Martin Holich | USA | 23 Years  
Thomas Honeycheck | USA | 35 Years  
David Hopper | USA | 26 Years  
Harrison Horning | USA | 26 Years  
Valerie Houchin | USA | 20 Years  
Houssin Hourieh | USA | 31 Years  
Scott Houtz | USA | 32 Years  
Philip Howard | USA | 20 Years  
Thomas Howe | USA | 20 Years  
Peter Hoyle | USA | 24 Years  
George Hubbell | USA | 20 Years  
Ferdinand Hudencial | USA | 25 Years  
Scott Hulst | USA | 25 Years  
William Hunt | USA | 29 Years  
Scotty Hutto | USA | 25 Years  
John Hyfantis | USA | 43 Years  
Pat Impollonia | USA | 21 Years  
Nevena Iordanova | USA | 24 Years  
Ronald Ishii | USA | 32 Years  
Gary Israel | USA | 21 Years

Venkateswaran Iyer | USA | 26 Years  
Pamela Janney | USA | 28 Years  
Joseph Jansz | Canada | 21 Years  
Gilbert Jaramillo | USA | 26 Years  
M. Todd Jarvis | USA | 28 Years  
Robert Jeffries | USA | 28 Years  
Robert Jennings | USA | 20 Years  
Harold Jepsen | USA | 31 Years  
John Jirka | USA | 23 Years  
Robert Joba | USA | 24 Years  
Frank Johnson | USA | 43 Years  
Marcus Johnson | USA | 37 Years  
Leelan Johnson | USA | 22 Years  
Thomas Johnston | USA | 30 Years  
Tim Jones | USA | 26 Years  
Ricy Jones | USA | 21 Years  
David Jurgens | USA | 24 Years  
John Kamman | USA | 22 Years  
Merrill Kaney | USA | 28 Years  
Dimitris Kapsis | USA | 22 Years  
Mark Kauffman | USA | 23 Years  
John Keefe | USA | 28 Years  
Leif Keelty | USA | 27 Years  
Ron Keenan | USA | 23 Years  
Mark Keiser | USA | 25 Years  
James Kelsey | USA | 23 Years  
Robert Kenney | USA | 26 Years  
Gerald Kettler | USA | 28 Years  
Marion Keyes | USA | 38 Years  
Darshan Khalsa | USA | 21 Years  
Saleem Khan | USA | 27 Years  
Patrick King | USA | 20 Years  
Michael Klaassen | USA | 30 Years  
Robert Knowles | USA | 28 Years  
Paul Knowles | USA | 20 Years  
James Kobbe | USA | 27 Years  
Premdat Kokilepersaud | USA | 22 Years  
Diamond Kongoletos | USA | 33 Years  
William Kosik | USA | 24 Years  
Farouk Kothdiwala | Canada | 21 Years  
Brian Kowalski | USA | 23 Years  
Kevin Kramer | USA | 24 Years  
Fritz Kreiss | USA | 26 Years  
Milton Kruk | USA | 24 Years  
Gregory Kurpiel | USA | 27 Years  
Gary Kuzma | USA | 35 Years  
David Kwaske | USA | 33 Years  
Edward Lagoy | USA | 29 Years  
Peter Laiho | USA | 22 Years  
Michael Lam | Canada | 22 Years  
Frank Lamphere | USA | 24 Years  
David Landman | USA | 29 Years  
Charles Lane | USA | 23 Years  
MaryAnne Lauderdale | USA | 20 Years  
MaryAnne Lauderdale | USA | 20 Years  
Robert Lawson | USA | 21 Years  
James Letsinger | USA | 27 Years  
Glen Lewis | USA | 22 Years  
Philip Ling | Canada | 21 Years  
Andrew Lippert | USA | 24 Years  
Larry Lisenbee | USA | 32 Years  
Eric List | USA | 24 Years  
Douglas Litwiller | USA | 23 Years  
Edward Locke | USA | 28 Years  
Scott Locke | USA | 23 Years  
Robert Loprete | USA | 23 Years  
Gregory Lowe | USA | 29 Years  
Donald Lowe | USA | 22 Years  
Bradley Lowe | USA | 21 Years  
Kenneth Lucci | USA | 29 Years  
Holger Lukas | USA | 34 Years

Russell Luke | USA | 42 Years  
Lee Lundberg | USA | 23 Years  
Catherine Luthin | USA | 23 Years  
Dan MacDougall | Canada | 24 Years  
Mark Macpherson | USA | 29 Years  
Jesse Maestas | USA | 21 Years  
Edward Mahler | USA | 24 Years  
John Mahnken | USA | 23 Years  
Dan Mailath | USA | 29 Years  
W. Wallace Majors | USA | 33 Years  
Shahdad Makarechi | USA | 20 Years  
Neil Maldeis | USA | 27 Years  
Michael Malley | USA | 21 Years  
Colin Manahan | USA | 25 Years  
Sean Mancuso | USA | 23 Years  
Gary Marciniak | USA | 22 Years  
Russell Marcus | USA | 21 Years  
Lyle Mardis | USA | 25 Years  
Blas Marin | USA | 31 Years  
Ronald Markus | USA | 33 Years  
Jay Martin | USA | 21 Years  
Ruben Marty | Chile | 21 Years  
William Marzano | USA | 26 Years  
Thomas Massey | USA | 21 Years  
Geraldine Massey | USA | 21 Years  
Thomas Matonti | USA | 27 Years  
Michael May | USA | 31 Years  
Jeffrey May | USA | 21 Years  
Joe Maynard | USA | 21 Years  
Gary McAvoy | USA | 28 Years  
Paul McConvey | USA | 26 Years  
Wesley McDaniel | USA | 24 Years  
William McElrath | USA | 26 Years  
Edward McGlynn | USA | 25 Years  
Hollis McKee | USA | 23 Years  
Scott McKee | USA | 21 Years  
Jim McMann | USA | 28 Years  
Dave McMillan | USA | 25 Years  
Patrick McNamara | USA | 25 Years  
Jack Meador | USA | 27 Years  
Charles Mehanna | USA | 23 Years  
David Meisegeier | USA | 25 Years  
Alex Melathe | USA | 20 Years  
James Melton | USA | 21 Years  
Mark Melvin | USA | 24 Years  
Timothy Mense | USA | 25 Years  
Ronald Mesaros | USA | 26 Years  
Joseph Milam | USA | 23 Years  
Brian Miller | USA | 29 Years  
David Miller | USA | 24 Years  
Daniel Miller | USA | 23 Years  
Gary Miller | USA | 22 Years  
Richard Minetto | USA | 21 Years  
Joseph Mitchell | USA | 23 Years  
Ronald Mixer | USA | 29 Years  
Charles Mize | USA | 22 Years  
Michael Mizinski | USA | 21 Years  
Lori Moen | USA | 21 Years  
James Moncrief | USA | 22 Years  
Carlos Montanez | USA | 23 Years  
Robert Montgomery | USA | 26 Years  
William Moore | USA | 23 Years  
Robert Moran | USA | 27 Years  
Todd Morgan | USA | 28 Years  
Charles Morgan | USA | 26 Years  
John Morgan | USA | 21 Years  
Dan Mori | USA | 20 Years  
John Morris | USA | 36 Years  
Linda Morrison | USA | 23 Years  
Rodney Morrow | USA | 26 Years  
Daniel Moses | USA | 23 Years

Stephen Mueller | USA | 25 Years  
Bruce Mueller | USA | 20 Years  
Rene Mulero | USA | 22 Years  
Matthew Mullen | USA | 22 Years  
Paul Mullican | USA | 22 Years  
Michael Mullins | USA | 24 Years  
James Mulloy | USA | 29 Years  
Don Munroe | USA | 22 Years  
Renet Murad | USA | 23 Years  
Christopher Murphy | USA | 27 Years  
Gregory Murphy | USA | 21 Years  
Robert Musgrave | USA | 21 Years  
David Muzzy | USA | 31 Years  
J. Michael Myrick | USA | 20 Years  
Earl Naab | USA | 41 Years  
Santanu Nath | USA | 22 Years  
Ronnie Neal | USA | 30 Years  
Brahmaiah Neelagaru | USA | 20 Years  
Ron Neet | USA | 31 Years  
Dwight Neibling | USA | 22 Years  
David Neiburg | USA | 22 Years  
Timothy Neil | USA | 23 Years  
Raymond Nelson | Canada | 26 Years  
Donald Newell | USA | 21 Years  
Ken Newman | USA | 22 Years  
Frank Nicosia | USA | 24 Years  
Steven Nixon | USA | 25 Years  
Joseph Nowaczyk | USA | 27 Years  
Richard Nowak | USA | 43 Years  
Martin Nuetzel | USA | 39 Years  
Dennis O'Malley | USA | 22 Years  
R. James Oaks | USA | 25 Years  
Jason Oelke | USA | 22 Years  
Eric Oliver | USA | 23 Years  
David Ortega | USA | 21 Years  
Mark Orton | USA | 28 Years  
Matthew Ossi | USA | 26 Years  
Larry Oswald | USA | 26 Years  
David Owens | USA | 21 Years  
Terry Pahl | USA | 21 Years  
Michael Paik | USA | 36 Years  
Richard Panzeri | USA | 23 Years  
Ajit Patel | USA | 27 Years  
J. Vicente Pedraza | USA | 24 Years  
Kenneth Peet | USA | 39 Years  
Michael Persinger | USA | 21 Years  
Martin Petchul | USA | 24 Years  
Wayne Peterson | USA | 23 Years  
John Petze | USA | 34 Years  
Francis Peverly | USA | 29 Years  
James Phillips | USA | 36 Years  
William Pickett | USA | 20 Years  
Joseph Pietrzak | USA | 20 Years  
Michael Politi | USA | 27 Years  
Ronald Poole | USA | 34 Years  
Tom Poole | USA | 25 Years  
Judith Porter | USA | 27 Years  
Ronald Powell | USA | 22 Years  
Kevin Power | USA | 29 Years  
Joseph Price | USA | 21 Years  
Wilson Prichett | USA | 34 Years  
Jack Prince | USA | 23 Years  
Timothy Pugh | USA | 23 Years  
Mike Pumroy | USA | 21 Years  
John Puskar | USA | 35 Years  
Robert Quick | USA | 30 Years  
Paul Raabe | USA | 37 Years  
Manoj Raathor | USA | 27 Years  
William Randel | USA | 21 Years  
Linda Razor | USA | 25 Years  
Rajasekara Reddy | USA | 38 Years

Mark Redmond | USA | 27 Years  
 Gary Reed | USA | 21 Years  
 Stuart Reeve | USA | 25 Years  
 Helen Reeve | Canada | 24 Years  
 John Reid | USA | 25 Years  
 Paul Reid | USA | 20 Years  
 Kannan Rengarajan | USA | 20 Years  
 David Reynolds | USA | 28 Years  
 Kenneth Rheault | USA | 32 Years  
 John Rice | USA | 31 Years  
 Joe Rice | USA | 21 Years  
 Robert Richards | USA | 26 Years  
 Frank Richards | USA | 25 Years  
 Jason Richards | USA | 24 Years  
 Clifford Richardson | USA | 23 Years  
 James Richmond | USA | 20 Years  
 Thomas Richtsmeier | USA | 35 Years  
 Richard Ricks | USA | 22 Years  
 James Ridge | USA | 27 Years  
 Thomas Rinner | USA | 24 Years  
 Robert Risley | USA | 28 Years  
 Geoffrey Robbins | USA | 25 Years  
 Ryan Roberts | USA | 24 Years  
 Thomas Roberts | USA | 22 Years  
 Richard Rogan | USA | 23 Years  
 James Rogers | USA | 41 Years  
 Michael Rogers | USA | 25 Years  
 Lezli Root | USA | 21 Years  
 Wayne Rosa | USA | 25 Years  
 Julio Rovi | USA | 21 Years  
 Greg Ruess | USA | 22 Years  
 Eric Ruffel | USA | 21 Years  
 Mark Russell | USA | 22 Years  
 Hemmat Safwat | Greece | 33 Years  
 Stephen Sain | USA | 31 Years  
 Brad Salamone | USA | 23 Years  
 Carl Salas | USA | 40 Years  
 Siegfried Sanders | USA | 31 Years  
 Joseph Sarlo | USA | 22 Years  
 Mark Sawitsky | USA | 22 Years  
 Mel Scheeler | USA | 37 Years  
 Thomas Schmidt | USA | 21 Years  
 William Schmidt | USA | 21 Years  
 Randy Schrecengost | USA | 33 Years  
 Steve Schultz | USA | 25 Years  
 Carl Schultz | USA | 21 Years  
 Lawrence Schuster | USA | 33 Years  
 Daniel Schwab | USA | 26 Years  
 Robert Scott | USA | 22 Years  
 Rory Seagert | USA | 23 Years  
 Allen Sehart | USA | 23 Years  
 Glenn Seigler | USA | 26 Years  
 Edward Sekmistrz | USA | 23 Years  
 Aurel Selezeanu | USA | 24 Years  
 Edward Senter | USA | 32 Years  
 Paul Seward | USA | 34 Years  
 Phil Sewell | USA | 24 Years  
 William Sgro | USA | 22 Years  
 Daniel Shabo | USA | 27 Years  
 Chandra Shah | USA | 21 Years  
 Leonard Shapiro | USA | 29 Years  
 Michal Shepard | USA | 21 Years  
 William Shepherd | USA | 21 Years  
 Lawrence Sherman | USA | 24 Years  
 Tatyana Shine | USA | 20 Years  
 Adam Shirvinski | USA | 20 Years  
 Kenneth Shively | USA | 21 Years  
 Kenneth Sidebottom | USA | 26 Years  
 Scott Silver | USA | 37 Years  
 Jeff Simerl | USA | 27 Years  
 Kirk Simoneaux | USA | 24 Years  
 Mitch Simpler | USA | 29 Years  
 Joseph Sinclair | USA | 34 Years  
 Richard Skall | USA | 39 Years  
 Richard Skinner | USA | 21 Years  
 Mark Slabaugh | USA | 29 Years  
 Dave Smarsh | USA | 23 Years  
 Clyde Smith | USA | 35 Years  
 Richard Smith | USA | 32 Years  
 Richard Smith | USA | 31 Years  
 Thad Smith | USA | 28 Years  
 Todd Smith | USA | 24 Years  
 David Smith | USA | 24 Years  
 Phillip Smith | USA | 23 Years  
 Steven Smith | USA | 20 Years  
 Alexander Sokiranski | USA | 38 Years  
 Joseph Solomon | USA | 29 Years  
 John Songer | USA | 20 Years  
 John Sosoka | USA | 32 Years  
 Alfredo Sotolongo | USA | 41 Years  
 Gene Spires | USA | 25 Years  
 Barney Spratt | USA | 39 Years  
 Jeffrey Springer | USA | 30 Years  
 Marc St-Jean | Canada | 21 Years  
 Larry Stalica | USA | 23 Years  
 Kathleen Stanley | USA | 23 Years  
 James Stapleton | USA | 23 Years  
 Edwin Staunch | USA | 29 Years  
 Michael Stears | USA | 24 Years  
 John Sternitzke | USA | 23 Years  
 Lisa Stickler | USA | 22 Years  
 Norman Stickney | USA | 24 Years  
 Michael Stockard | USA | 29 Years  
 Kenneth Stone | USA | 22 Years  
 Steve Stookey | USA | 29 Years  
 James Strack | USA | 32 Years  
 Gary Strickland | USA | 34 Years  
 Robert Striff | USA | 20 Years  
 Jeffrey Stringfield | USA | 24 Years  
 Richard Stroh | USA | 23 Years  
 Keith Struble | USA | 26 Years  
 Robert Stryjewski | USA | 25 Years  
 Glenn Stubblefield | USA | 23 Years  
 Mark Stuebe | USA | 23 Years  
 Andrew Susemichel | USA | 42 Years  
 Cash Sutton | USA | 32 Years  
 Charles Sutton | USA | 23 Years  
 Donald Swick | USA | 27 Years  
 Lawrence Swisher | USA | 23 Years  
 Dean Switzer | USA | 21 Years  
 Leslie Taniyama | USA | 24 Years  
 Anthony Tartaglia | USA | 28 Years  
 Thomas Tate | USA | 26 Years  
 Robert Taylor | USA | 25 Years  
 Ralph Taylor | USA | 22 Years  
 Richard Teschner | USA | 31 Years  
 Harris Thanopoulos | USA | 23 Years  
 Daniel Thayer | USA | 27 Years  
 Ralph Thompson | USA | 23 Years  
 John Thomson | USA | 40 Years  
 Gary Throckmorton | USA | 25 Years  
 Robert Tidona | USA | 25 Years  
 R. Dean Tillison | USA | 39 Years  
 William Tinsley | USA | 22 Years  
 Stephen Tissiere | USA | 20 Years  
 Thomas To | USA | 25 Years  
 S. Thomas Tobias | USA | 39 Years  
 Greg Tomaro | USA | 23 Years  
 Robert Torre | USA | 25 Years  
 John Townsend | USA | 25 Years  
 Theodore Traum | USA | 37 Years  
 Dean Trigg | USA | 25 Years  
 Douglas Tripp | Canada | 22 Years  
 Guerino Trovato | USA | 21 Years  
 Michael Trzesniowski | USA | 26 Years  
 Michael Trzesniowski | USA | 26 Years  
 Mark Tschirhart | USA | 21 Years  
 Robert Tugwell | USA | 32 Years  
 Vincent Tummarello | USA | 21 Years  
 Garland Turner | USA | 24 Years  
 Roger Turner | USA | 23 Years  
 William Turpish | USA | 36 Years  
 Emily Tuzson | USA | 22 Years  
 Timothy Unruh | USA | 25 Years  
 Frank Vadino | USA | 38 Years  
 Dann Vail | USA | 21 Years  
 Richard Vaillencourt | USA | 20 Years  
 James Valgean | USA | 36 Years  
 Keith Valiquette | USA | 22 Years  
 Matthew VanDeCreek | USA | 23 Years  
 Andrew VanderMeer | USA | 20 Years  
 Paul VanDuynes | USA | 29 Years  
 Thomas Varghese | USA | 25 Years  
 Kevin Venturini | USA | 25 Years  
 Sonny Vera Cruz | USA | 23 Years  
 Frank Verbeke | USA | 21 Years  
 Michael Vernon | USA | 34 Years  
 T. Nejat Veziroglu | USA | 27 Years  
 Leonardo Vidal | USA | 21 Years  
 Dennis Villanueva | USA | 21 Years  
 Nelson Vital | USA | 41 Years  
 Ralph Vivo | USA | 23 Years  
 Lawrence Vogt | USA | 42 Years  
 Jeffrey Wachob | USA | 23 Years  
 Richard Wall | USA | 26 Years  
 James Waltz | USA | 43 Years  
 Steven Ward | USA | 20 Years  
 Craig Warner | USA | 20 Years  
 Gregory Warren | USA | 28 Years  
 Randall Warren | USA | 26 Years  
 Glenn Watkins | USA | 23 Years  
 Jerry Watson | USA | 25 Years  
 Thomas Weber | USA | 20 Years  
 David Weiss | USA | 25 Years  
 Brian Weldy | USA | 25 Years  
 Stephen Wells | USA | 20 Years  
 Robert Werner | USA | 36 Years  
 Bradley Wheaton | USA | 29 Years  
 Frank White | USA | 24 Years  
 Boyd White | USA | 23 Years  
 Kendall White | USA | 23 Years  
 Randall Whorton | USA | 25 Years  
 Donna Wicks | USA | 23 Years  
 Stan Wiens | USA | 21 Years  
 Robert Wilken | USA | 26 Years  
 Verle Williams | USA | 36 Years  
 Michael Wilson | USA | 23 Years  
 Frank Windle | USA | 20 Years  
 Lori Winyard | USA | 23 Years  
 William Wojcik | USA | 21 Years  
 Samuel Wolfe | USA | 21 Years  
 Peter S.Y. Wong | Canada | 21 Years  
 Daniel Woolford | USA | 24 Years  
 David Wrightsman | USA | 27 Years  
 Fred Wurst | USA | 26 Years  
 Albert Yasbick | USA | 28 Years  
 Paul Young | USA | 26 Years  
 Jimmy Young | USA | 21 Years  
 Khaled Yousef | USA | 25 Years  
 Sherif Youssef | USA | 20 Years  
 Eugene Yparrea | USA | 37 Years  
 William Zavanelli | USA | 20 Years  
 Mark Zoeteman | USA | 21 Years

# Hope for a Zero Carbon World

Global events related to energy and the environment.

By Samer Adnan Zawaydeh, AEE Past President

Over the past 16 months the pandemic has overshadowed many great accomplishments. I want to take this opportunity to highlight opportunities and reasons for hope, especially those that impact our organization and our work as energy engineers. And it is our organization I'd like to be optimistic about first.



The Association of Energy Engineers is taking the leadership position in disseminating knowledge, training, and certification in the energy sector. It educates energy engineers, managers, and fresh graduates about the latest science and technological advancements in energy efficiency, energy management, renewable energy solutions, and the environment to ensure efficient use of resources, reduce operational cost, and work towards carbon neutrality. AEE's flexibility, planning, and implementation, supported by dedicated professionals worldwide, ensured the smooth transition to online platforms and enabled thousands of engineers to continue building their capacities despite COVID-19 disruptions.

We live in a time of rapidly changing conditions as we move towards Net Zero Carbon's targets by 2050/2060. Global unity in purpose empowers the passion of hopeful young energy engineers. Collaboration in science and technology, local development of resources, and designing processes using clean energy will ensure pollution control, better efficiency, and less waste. No nation can do it alone. It will be the engineers of tomorrow that will eventually lead this change. They will see a bright future by driving local economies, creating jobs, and ensuring sustainable growth.

# NASA Mars Perseverance Robotic Rover



The rover accomplished giant steps for humankind in space exploration in February 2021. While the world is currently suffering from the pandemic, climate change, and the impacts of extreme weather conditions, NASA successfully landed the sixth spacecraft on Mars. I find it amazing that we can land a robot on a planet 126 million miles away from the earth using radio signals traveling at the speed of light for 11 minutes to communicate back and forth. Astonishingly, this was the third mission to reach Mars this month! Misbar Al Amal (Hope spaceship) from the United Arab Emirates and Tianwen-1 from China, reached Mars orbit on February 9, 2021.

# V236-15.0 MW™ Turbine



Vestas® announced earlier this year the new offshore wind platform with a 15MW turbine, 115.5m blade, and a swept area of 43,000 m<sup>2</sup>. This amazing engineering technology will empower the renewable energy sector and allow coastal cities to move more rapidly to clean energy generation. Subsequently, the offshore wind sector will have a larger share of the global energy mix.

# Social Cost of Carbon (SCC)

SCC will be the most critical number in the future. Simply put, it is the "Polluter Pays" principle. It is an estimate of the economic climate damages associated with the increase in one ton of CO<sub>2</sub>. In a working paper published in Feb 2021, "The Social Cost of Carbon, Risk, Distribution, Market Failures: An Alternative Approach" by Nobel Laureate Joseph Stiglitz and Lord Nicholas Stern, the price would reach between 50-100 USD/ton CO<sub>2</sub> by 2030. Also, the report shows how many companies are setting out to achieve carbon neutrality.

# Solar PV 182mm x 210mm Silicon Wafer



The SolarPV sector is pushed forward as the major manufacturers shift to larger size wafers. This size increase is just one of the many recent advancements that will provide consumers with higher efficiency PV modules at lower prices. In seven years, the space required for PV has halved, and the price has reduced by two-thirds. It is now more likely that end-users can rely on Solar to cover their annual energy needs.

# Pollution

Industrial nations worldwide (EU, Japan, South Korea, and China) took up the challenge targeting transition into Net Zero carbon by 2050 -2060. This is an unprecedented commitment towards environmental protection to stop air, water, and soil pollution. Achieving these objectives requires mobilizing the economy and institutionalizing policies and regulations to enforce clean energy and reduce the GHG across the supply chains.



# Impact of Extreme Weather

In February this year, a record cold snap across the USA broke over 2,000 records. Temperatures plummeted to about 40-50 degrees Fahrenheit below average, and over 70% of the country was covered in snow. Texas suffered the most with multiple failures in power generation across the state. Outages affected millions of households, leading to billions of dollars in losses, and numerous lives were lost. Freezing of pipes and pumps caused conventional power to fail. Solar PV didn't work without the Sun, and Wind energy didn't work because the blades froze.

# Planning for Extreme Weather

What happened in Texas is a clear lesson for the need to prepare for more extreme weather scenarios across all countries in the world. Investing in infrastructure, preparation, policymaking, and human resources building to deal with extreme weather conditions will save lives and reduce economic impact.



Large-scale planning, up to the national level, is becoming increasingly important. It is forecast severe weather will increase during this decade. Therefore securing enough time to complete contingency plans will save lives and reduce economic impact. And as energy engineers, we can learn to use weather forecasting to synchronize adequate supply with demand.

# Weather Forecasting

# Hope for a **Zero Carbon** World

## Sustainable Aviation Fuels (SAF)

Airline commits to 100% Sustainable Aviation Fuels (SAF) by 2030: SAF is a clean substitute for fossil jet fuels produced from sustainable resources such as waste oils from a biological origin, agricultural residues, or a non-fossil source. The announcement was made in January 2021 by Boeing Co. to ensure that all of its commercial aircraft will be capable and certified to operate entirely with SAF by 2030.

## Walking

People must be encouraged to walk every day to complete their errands and share electric vehicles if they need to use transportation. Basic, daily exercise will have a positive impact on health, the economy, and the environment. It will make them healthier, reduce obesity and illness, reduce fossil fuel, reduce pollution, reduce car accidents, reduce money spend on fuel, reduce infrastructure development to accommodate more cars on the roads. And to drive people to walk more, urban city design must change.



## Urban City Design

Modern urban areas have allowed us to allocated and manage resources more efficiently, reduce infrastructure and provide services to large populations. However, the services and transportation sectors grew organically and were not studied carefully. Urban planners now realize they must design living and working environments within a 2 km radius to shift populations from predominantly using vehicles for commuting and daily needs to a pedestrian lifestyle. In turn, this shift would create a massive number of jobs in small, local communities.



COVER STORY

**THE LIVING BUILDING CHALLENGE**

KENDED A BUILDING | ATLANTA, GA

Right in the heart of Atlanta, a building lives to defy energy experts' expectations by becoming the most efficient building in the Southeast and solve the Living Building Challenge. The *Kendeda Building for Innovative Sustainable Design* is located on Georgia Tech's campus as a multi-disciplinary building that gives back more to the environment than it takes.

According to Georgia Tech's website, "To be certified under the Living Building Challenge, projects must meet the following ambitious performance requirements – Petals – over a minimum of 12 months of continuous occupancy and operations: place, water, energy, materials, health & happiness, and beauty." This building was thought to be impossible in the humid south and other environmental challenges but has proved to be net positive over the past year.

The Living Building Challenge is a certification program to create sustainable and regenerative buildings that use the resources created only by the facility. Living Buildings not only produce more energy than they use, but they also treat and collect all water on site. The Kendeda Building has met the standards and is currently waiting for the Living Building Challenge Certificate.



**Take an  
Inside Look**



Issue 1, 2021

**EFFICIENCY**



**Association of Energy Engineers**

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