



Back to the Future

Our Industry in 2030

Presenter: Timothy G. Wentz, PE, HBDP | Fellow/ Presidential Member ASHRAE

Distinguished Lecturer (DL) Program

This ASHRAE Distinguished Lecturer is brought to you by the ASHRAE Society Chapter Technology Transfer Committee (CTTC).

- Please silence your phones.
- DL Evaluation Forms are very important. Please complete at the end of the presentation and return to CTTC Chair/Program Chair.
- Lecturer presentations and/or opinions do not necessarily reflect the policies or position of ASHRAE or the chapter.
- More information on the DL Program available at: [ashrae.org/distinguishedlecturers](https://www.ashrae.org/distinguishedlecturers)



LEADERSHIP WANTED!

Become a future leader in ASHRAE – Write the next chapter in your career!

ASHRAE members who are active at their chapter and society becomes leaders and bring information and technology back to their job.

You are needed for:

- Society Technical Committees
- Society Standard Committees
- Young Engineers in ASHRAE
- Chapter Membership Promotion
- Chapter Research Promotion
- Chapter Student Activities
- Chapter Technology Transfer

Find your place in ASHRAE and volunteer

[ashrae.org/volunteer](https://www.ashrae.org/volunteer)



I wonder.....

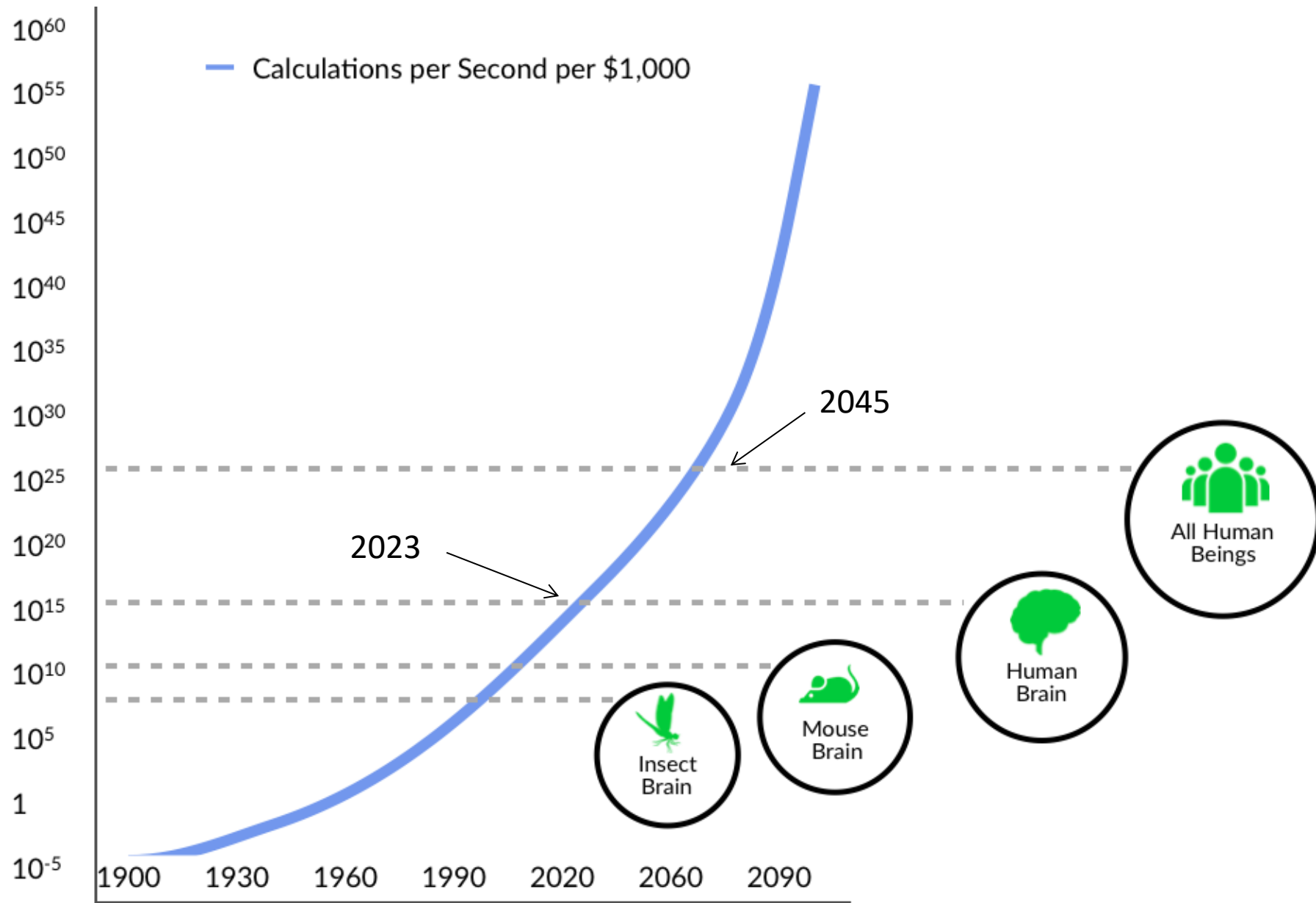
- What does our future look like?



Our Shared Future

- Big data
- Robotics
- Internet of Things (IoT)
- Virtual Reality/Augmented Reality
- Artificial Intelligence (AI)
- Resiliency
- Cyber Security
- Virtual Design & Construction





Source: Roy Kurzweil, GSV Asset Management

I wonder.....

- Where this new technology will lead us

"Success in creating effective AI could be the biggest event in the history of our civilization, or the worst".

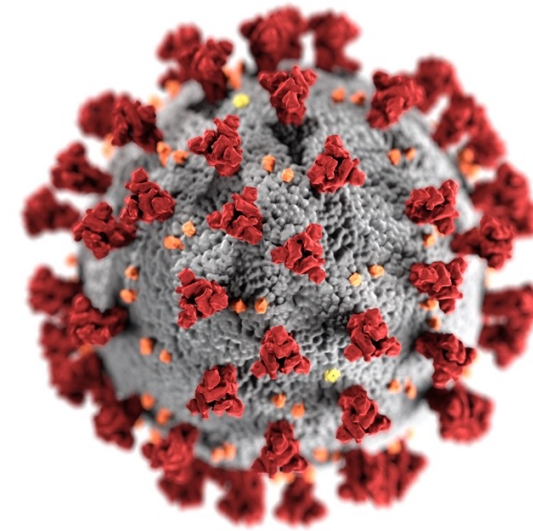
Stephen Hawking
Web Summit, Lisbon, Portugal
November, 2017



Our Shared Future

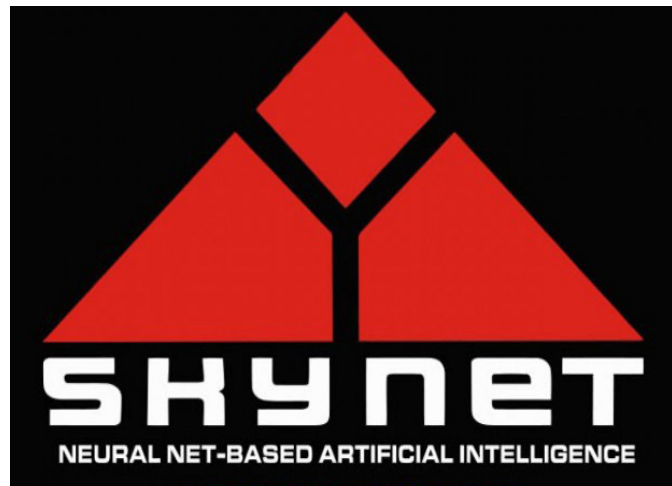
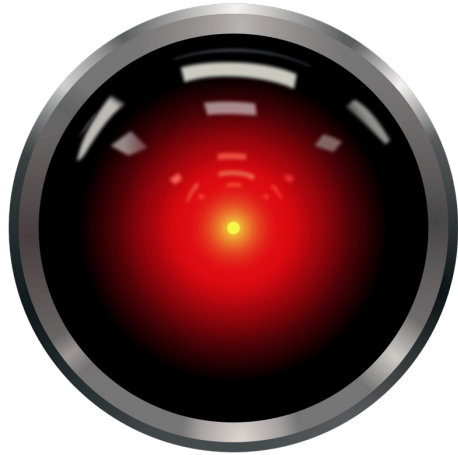


Blue Dot



Moderna's mRNA vaccine using computational biology

Our Shared Future



The Pentagon has adopted new ethical principles that call for *“people to exercise appropriate levels of judgement and care”* when deploying AI systems on the battlefield.

Feb. 25, 2020



I wonder.....

- How engineers will harness these resources to benefit humanity
- What will our industry look like in 2030?



Photo by [jaikishan patel](#) on [Unsplash](#)



Our Shared Future

- Engineering and construction is a people-based business



Photo by [Magnet.me](#) on [Unsplash](#)



Our Shared Future

- J. P. Kotter & J. L. Heskett, *'Corporate Culture and Performance'*, research sponsored by Harvard Business School

Businesses that focus obsessively on meeting the needs of clients:

- Revenues increase 4 times faster
- Job creation is 7 times faster
- Owner equity grows 12 times faster
- Profit performance is 750 percent higher



Our Shared Future

- How do we focus obsessively on people?
 - Beneficial intelligence, not undirected intelligence



Our Shared Future

- Align decision making with human core values
 - “Do no harm”
 - Either intentionally or unintentionally
 - Autonomy – Freedom in personal decision making
 - Justice - Fair treatment of others
 - Fiduciary – Put the best interest of others ahead of your own



I wonder.....

- What our future looks like

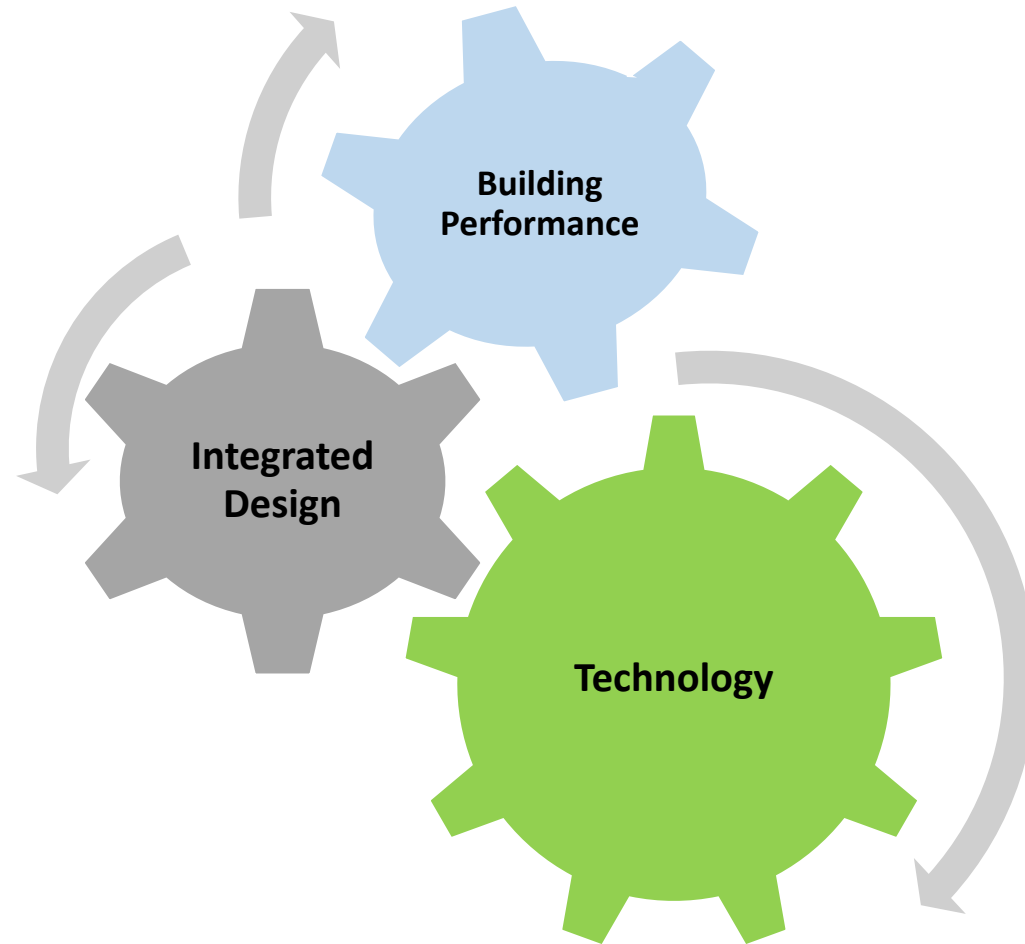


Our Shared Future

- A new renaissance of engineering and technology



Changing Technology



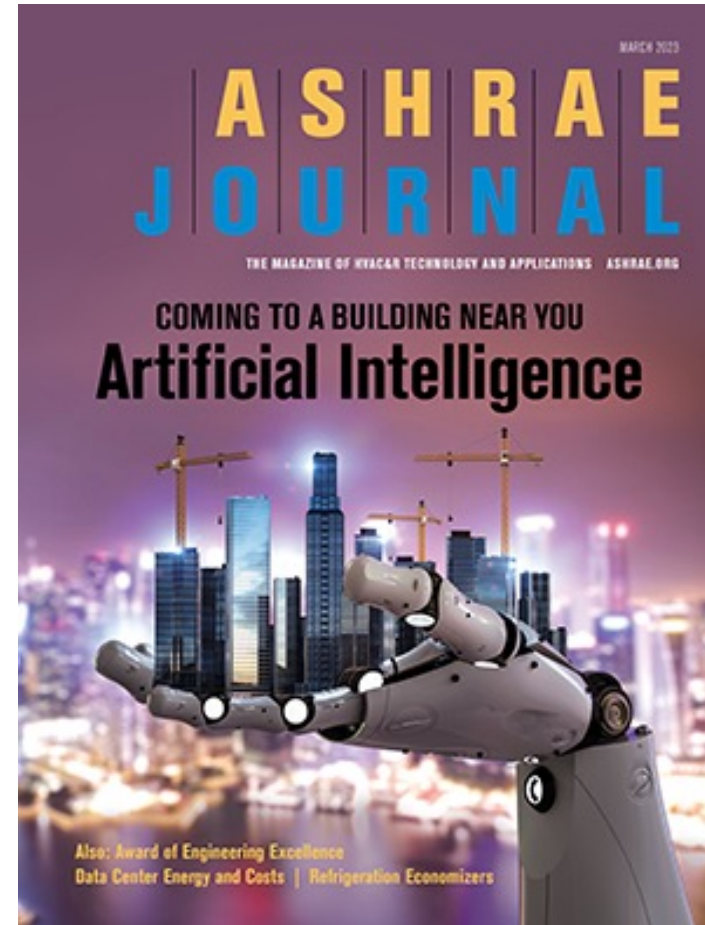
Changing Technology

- Virtual Design and Construction
 - Offsite construction
 - Connected data platform
 - Lean integrated project delivery
 - Data analytics
 - Generative design
 - Design for Manufacturing and Assembly (DfMA)
 - Digital twins



Changing Technology

- Artificially intelligent buildings (autonomous) will be:
 - Self-designing
 - Self-redesigning
 - Self-diagnosing
 - Self-reporting
 - Self-healing
 - Self-commissioned

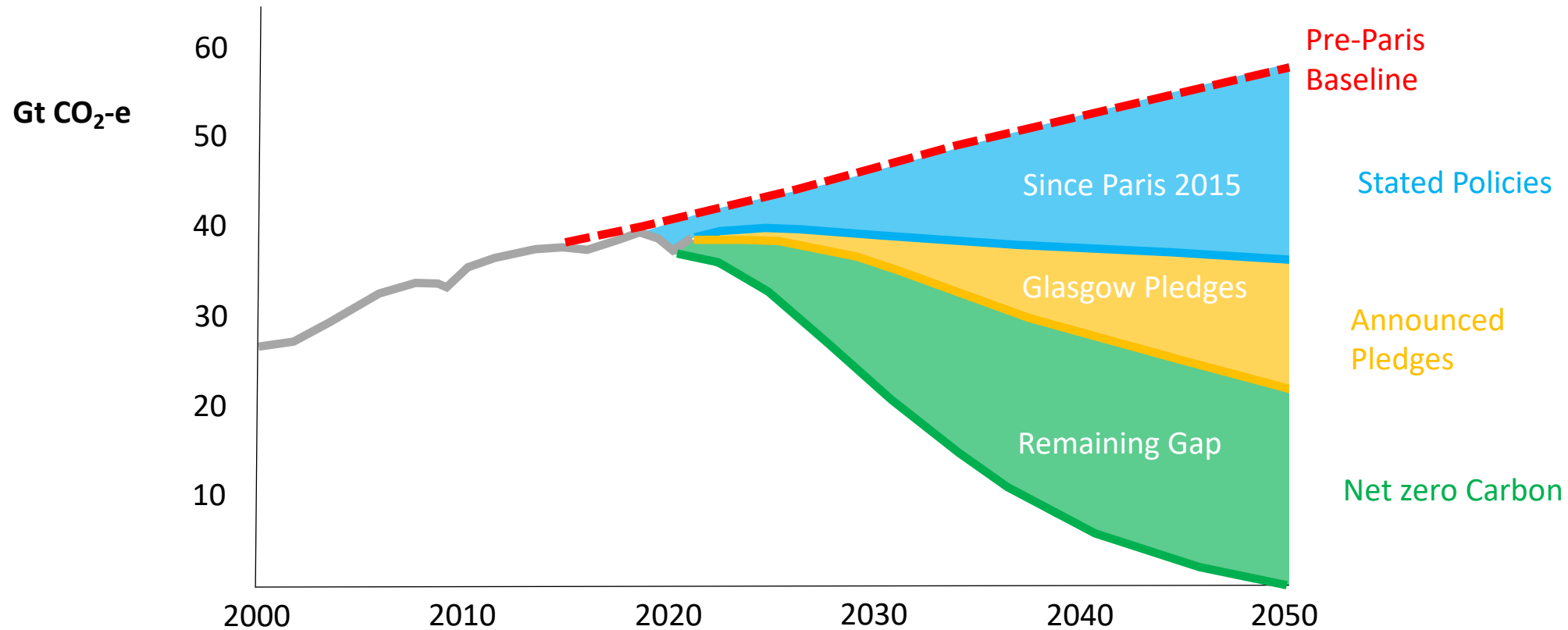


Our Shared Future

- Paris Accord specifies a unified approach to climate change by setting a goal to limit the increase in global temperature to 2°C (1.5°C in the future)
- 196 nations agree to stabilize “greenhouse gas concentrations”



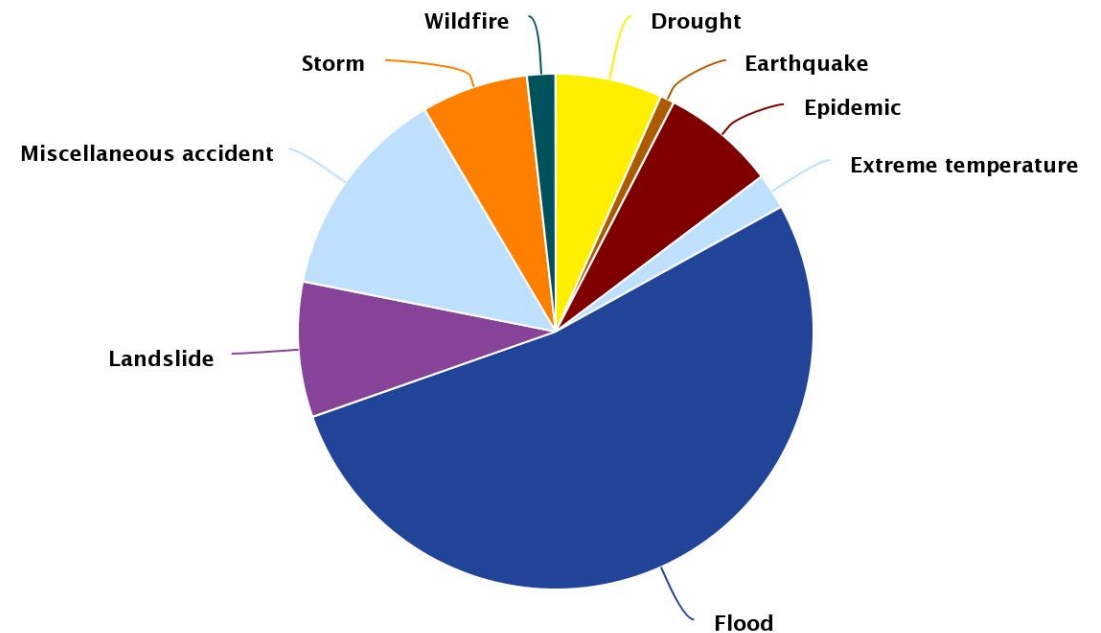
Our Shared Future



Our Shared Future

- Increased probability of extreme events
 - Flooding
 - Drought
 - Landslides
 - Sea level rise – Amazon Delta
- Worldwide, rainforests consume 2.4 billion metric tons of CO₂ – The Amazon absorbs 25% of that total

Average Annual Natural Hazard Occurrence for 1980–2020



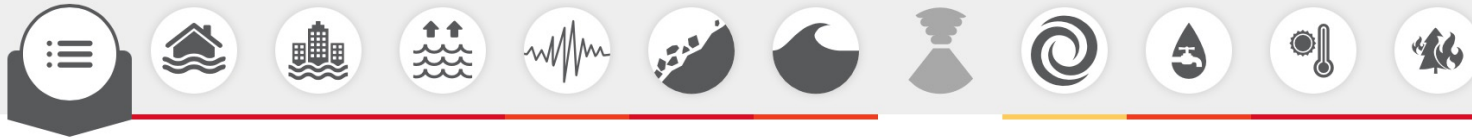
Average hazard occurrence for Brazil,
World Bank at

<https://climateknowledgeportal.worldbank.org/country/brazil/vulnerability>



Climate Change Vulnerability

Brazil



River flood	High
Urban flood	High
Coastal flood	High
Landslide	High
Extreme heat	High
Wildfire	High
Earthquake	Medium

HAZARD LEVEL



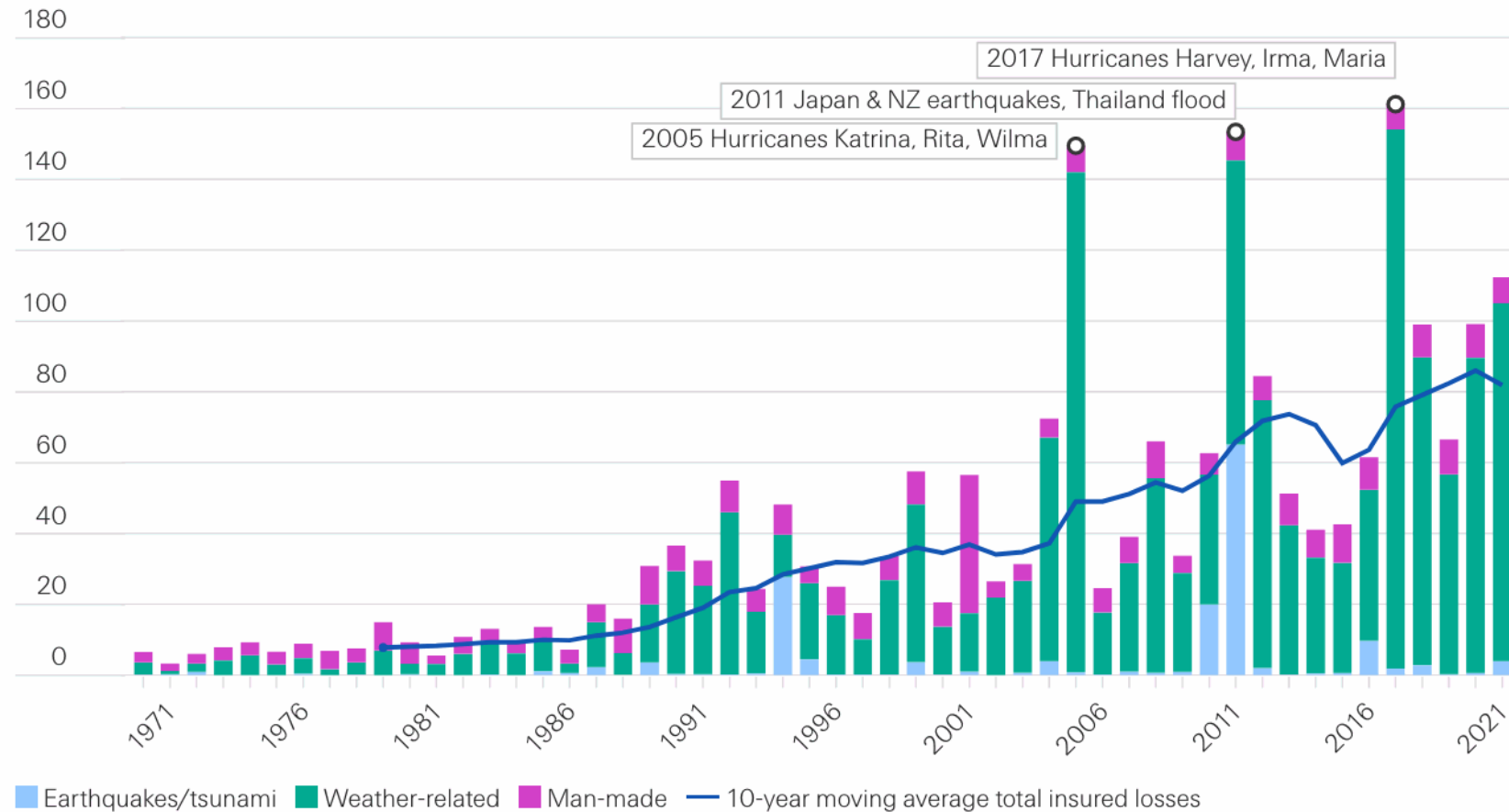
<https://thinkhazard.org/en/report/37-brazil>

Our Shared Future

Insured losses since 1970

USD billion (in 2021 prices)

Rollover/touch chart for details



Source: Swiss Re Institute



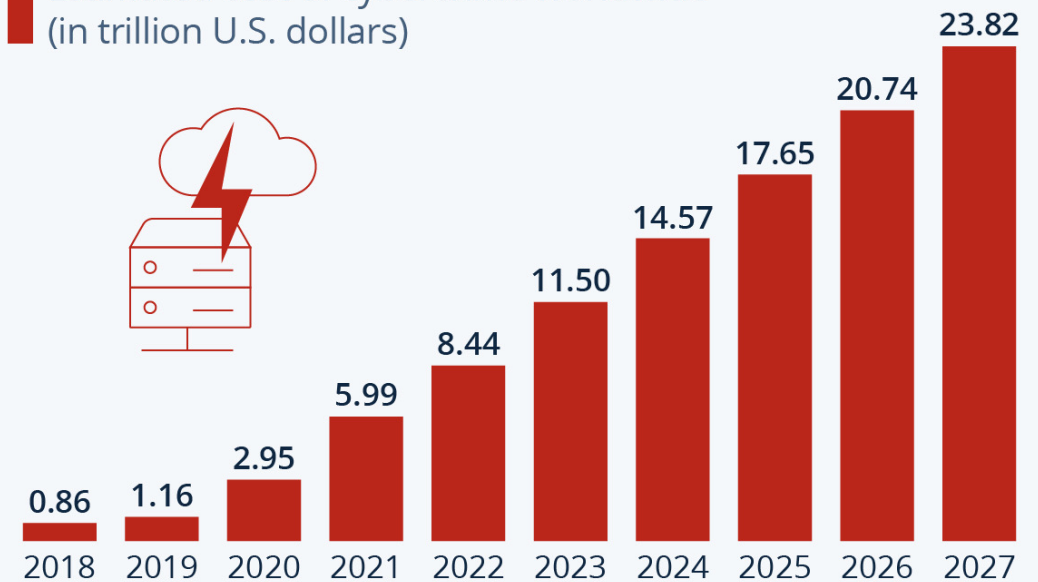
Our Shared Future

- Cyber attacks are increasing exponentially
- Roughly 60% of all small to mid-sized corporations are unable to survive a massive Cyberattack²

²Management Methods Manual
Mechanical Contractors Association of America

Cybercrime Expected To Skyrocket in the Coming Years

Estimated cost of cybercrime worldwide
(in trillion U.S. dollars)



As of November 2022. Data shown is using current exchange rates.

Sources: Statista Technology Market Outlook,
National Cyber Security Organizations, FBI, IMF



Our Shared Future

- The merging of sustainability, resiliency, security, design and construction strategies into a single perspective



The Importance of Our Work

- If we are to get back on track in addressing our common problems, we will need to focus on:
 - Building decarbonization
 - Climate change mitigation
 - Energy efficiency
 - Indoor Environmental Quality (IEQ)
 - Energy security
 - Food security
- What does that mean for a career in our industry?



Photo by [Usman Yousaf](#) on [Unsplash](#)

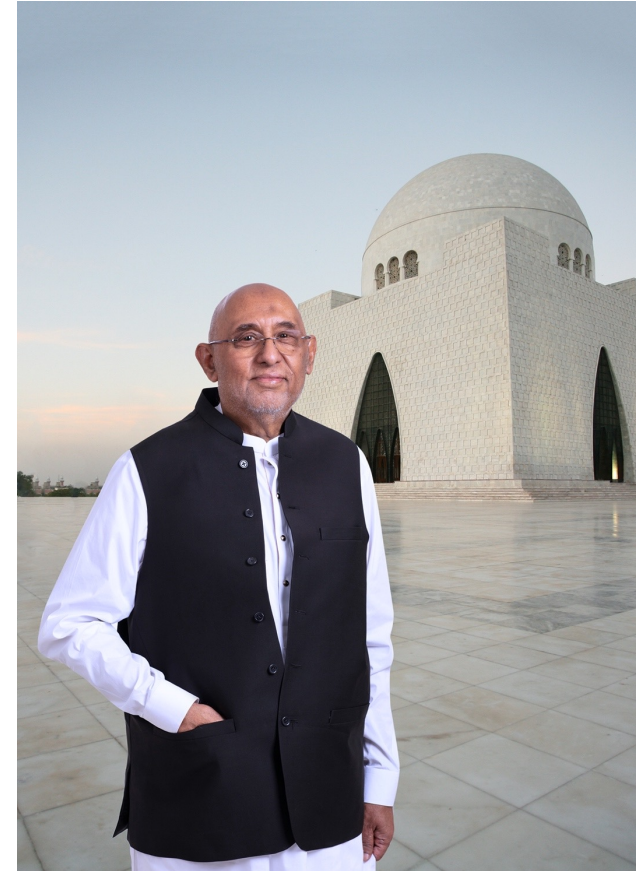
Our Shared Future

- What is ASHRAE doing to prepare you for this new future?



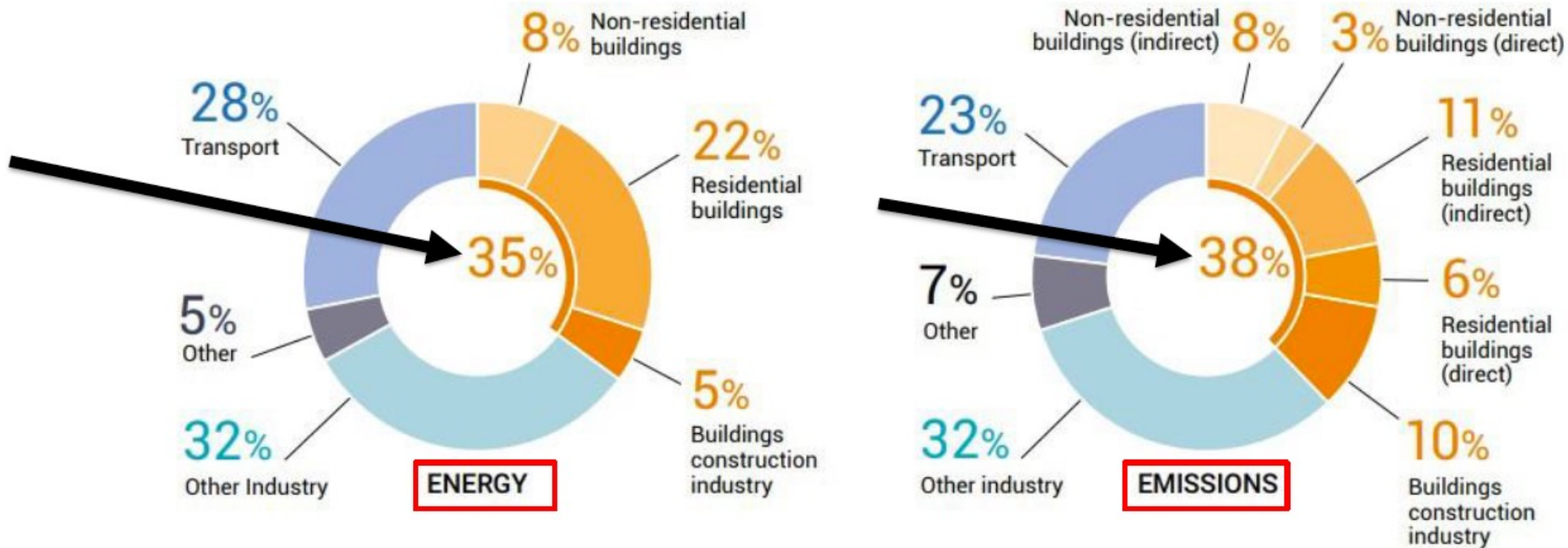
ASHRAE Response - Decarbonization

- Task Force on Decarbonization formed by immediate past President Schwedler
- Reformatted and continued by President Mehboob
 - Better align ASHRAE with the global focus on decarbonization
 - Decarbonization is a much broader issue
 - Energy efficiency is still important



ASHRAE Response - Decarbonization

Global share of buildings and construction final energy and emissions, 2019



Notes: Buildings construction industry is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat.

Sources: (IEA 2020d; IEA 2020b). All rights reserved. Adapted from "IEA World Energy Statistics and Balances" and "Energy Technology Perspectives".

ASHRAE Response - Decarbonization

- The reduction or elimination of greenhouse gas emissions using the standard metric of Carbon Dioxide
- Three pillars
 - Energy efficiency
 - Switching to cleaner energy sources
 - Shifting to electricity produced with low-carbon energy sources
- Direct Building CO₂ emissions need to be cut in half by 2030 to achieve net zero carbon building stock by 2050



ASHRAE Response

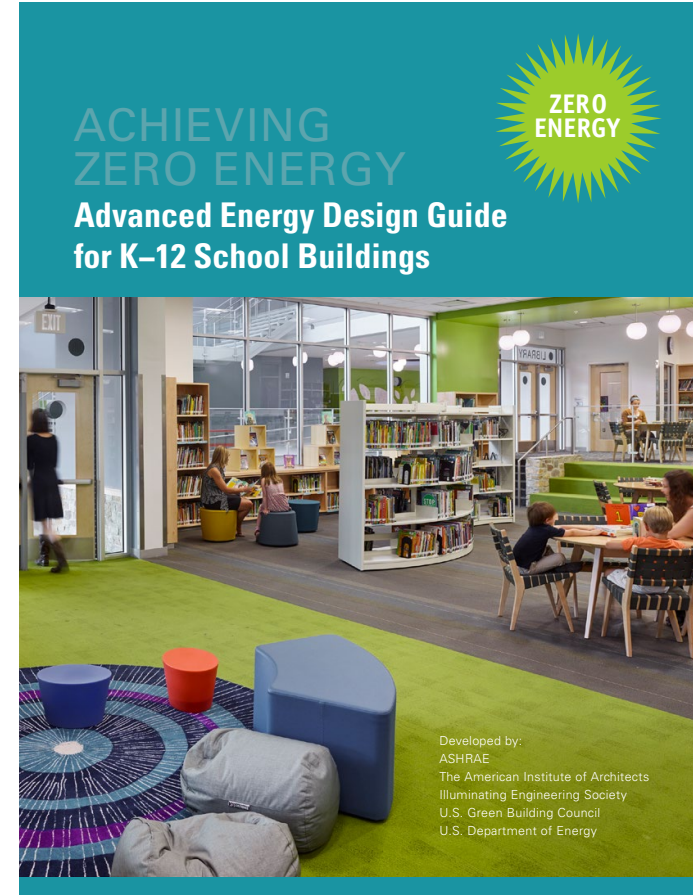
- Continued Move towards Net Zero Energy Buildings
 - Lower environmental impacts
 - Lower operating and maintenance costs
 - Better resilience to power outages and extraordinary events
 - Improved energy security
 - Must not ignore IEQ!



ASHRAE Response

- Net Zero AEDG
 - K-12 School Buildings (2018)
 - Small to Medium Office Buildings (2019)
 - Multi-family Buildings (2022)

Free Downloads!



ASHRAE Response

- Estimated 10 to 20% energy savings by focusing on human behavior



Chien-fei Chen, Beyond Technology: Improving Occupants' Energy Efficiency Behaviors through Social Psychological Analysis, 2016 ASHRAE Winter Conference



Human Behavior

- Create a “herd” – people are wired to follow the herd
 - Social proofing or modeling



Photo by [Melissa Walker Horn](#) on [Unsplash](#)

Social Proofing – “We determine what is correct by finding out what other people think is correct” - Cialdini.



Influence: The Psychology of Persuasion, Robert Cialdini, Harper Business, 1984



Human Behavior

- How is ASHRAE generating a 'behavioral herd'?

The Outlier



The herd

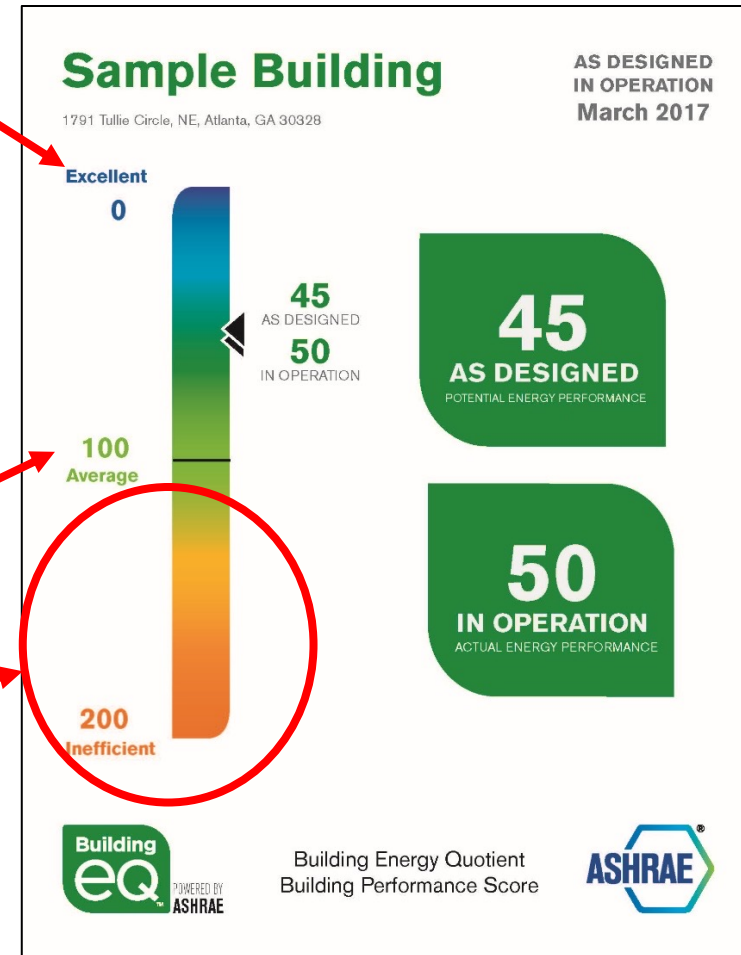
ASHRAE Response

- Completely new approach
 - New online portal
 - New rating system
 - "Herding" trigger

Early Adopters

The Herd

The Outliers



- Addresses the "energy gap"

ASHRAE Response

- To be a leader you must be fast and nimble



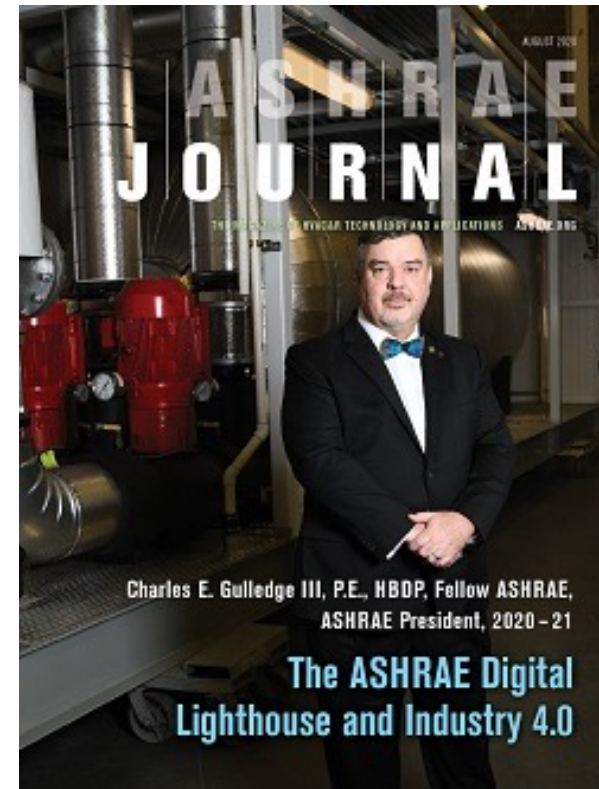
ASHRAE Response



Two states of being

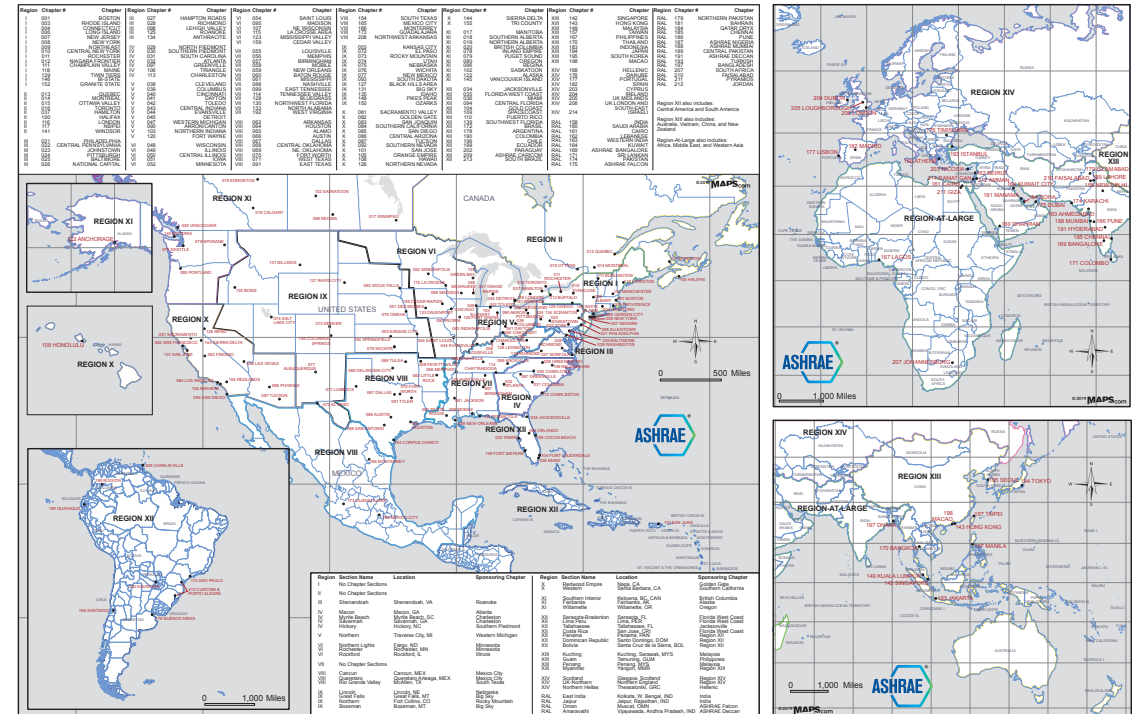
ASHRAE Response – Fast and Nimble

- Streamlining - Overcome the “speed of ASHRAE” obstacle
 - Eliminate silos and speed up decision making
 - Forge connections
 - Lean and agile collaboration
 - Push decision making lower down in the organization
 - Be market focused



ASHRAE Response – Fast and Nimble

- Recommend more emphasis on Councils and Regions
- Push decision making to the lowest possible level in Society



ASHRAE Response – Energy Security

- Prioritize energy efficiency for immediate emission reduction and boost access to affordable energy
- Secure integration of wind, solar and nuclear in the power system
- Rapidly scale up public investment in renewables to future-proof existing energy infrastructures
- Promote a **people-centred and inclusive approach** to ensure energy access, poverty reduction and greater diversification of producer economies



ASHRAE Response - Food Security

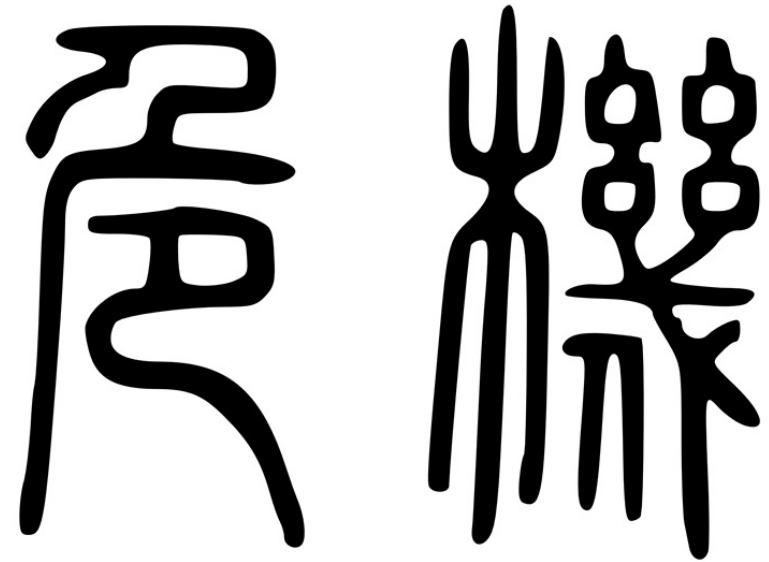
- IIR estimates that 778 million tons of food worldwide is preserved by refrigeration
- Theoretically, 1,661 million tons should have benefited from refrigeration
- 13 % of the food produced in the world is lost because of a lack of refrigeration (estimated >475 million tons)
- Potential of 475 million tons of food saved by refrigeration
- This could feed 950 million inhabitants per year
- Closely tied to climate change



Photo by [Anh Nguyen](#) on [Unsplash](#)

What Can You Do?

- Embrace change
- Join ASHRAE!
- Volunteer! Become a leader in the process of change
- Connect with ASHRAE members and resources to expand your vision
- Focus on opportunities



What Can You Do - Be Optimistic



Obrigado por ter participado

Em conclusão, reconhecemos a importância crítica da indústria de HVAC&R e expressamos nossos sinceros agradecimentos por sua contribuição para o nosso bem-estar. Seus esforços são essenciais para manter espaços internos saudáveis e confortáveis e melhorar nossa qualidade de vida geral.

Written and translated by AI



Thank You For Attending

In conclusion, we recognize the critical importance of the HVAC&R industry and express our sincere thanks for their contribution to our wellbeing. Their efforts are essential to maintaining healthy, comfortable indoor spaces and improving our overall quality of life.

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Questions

