Back to the Future
Our Industry in 2030

Presenter: Timothy G. Wentz, PE, HBDP | Fellow/ Presidential Member ASHRAE
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
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
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
Calculations per Second per $1,000

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
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?
Our Shared Future

• Engineering and construction is a people-based business
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

- Integrated Design
- Building Performance
- 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

- **Pre-Paris Baseline**
- **Stated Policies**
- **Announced Pledges**
- **Glasgow Pledges**
- **Remaining Gap**
- **Net zero Carbon**

Since Paris 2015

Credit: https://carbontracker.org
Our Shared Future

- Increased probably of extreme events
  - Flooding
  - Drought
  - Landslides
  - Sea level rise – Amazon Delta
- Worldwide, rainforests consume 2.4 billion metric tons of CO$_2$ – The Amazon absorbs 25% of that total

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 Cyberattack\(^2\)

\(^2\)Management Methods Manual
Mechanical Contractors Association of America
• 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?
Our Shared Future

• What is ASHRAE doing to prepare you for this new future?
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”.
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!
• 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

Human Behavior

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

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

Human Behavior

• How is ASHRAE generating a ‘behavioral herd’?
ASHRAE Response

• Completely new approach
  ▪ New online portal
  ▪ New rating system
  ▪ ”Herding” trigger

• Addresses the “energy gap”
ASHRAE Response

• To be a leader you must be fast and nimble
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
• 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
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
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.
Questions