



**whitney** **E2**



# Upgrade Your Chiller Plant for the Future

June 17, 2021

*Improving Society Through the Built Environment*

# ESD Overview

A global company, ESD is a leader in Improving Society Through the Built Environment. We create solutions that produce economic, environmental and experiential benefits for our clients, many of whom are the biggest names in the worlds of business, technology — and beyond. We embrace technological change and are in the forefront of developing Intelligent Buildings. We emphasize innovation, adaptability and sustainability when providing mechanical, electrical, plumbing, fire protection, life safety and technology engineering.

Innovation Since **1967**

Firm Size **300**

Repeat Business **80% +**

2020 Charitable Initiatives **38**

MBE **NMSDC**

## Geographic Coverage



## Markets & Services



**High Performance Buildings**



**Workplace**



**Mission Critical Facilities**

Engineering ♦ Automation ♦ Technology ♦ Energy+Eco ♦ Commissioning



# Presenters



Andrew Lehrer – ESD

- Practice Leader – High Performance Buildings
- With ESD since June 2002
- Market Focus: Life Sciences, High Rise, Asset RePx
- PE in IL + CA, LEED AP
- ACE Mentor Program Executive Board

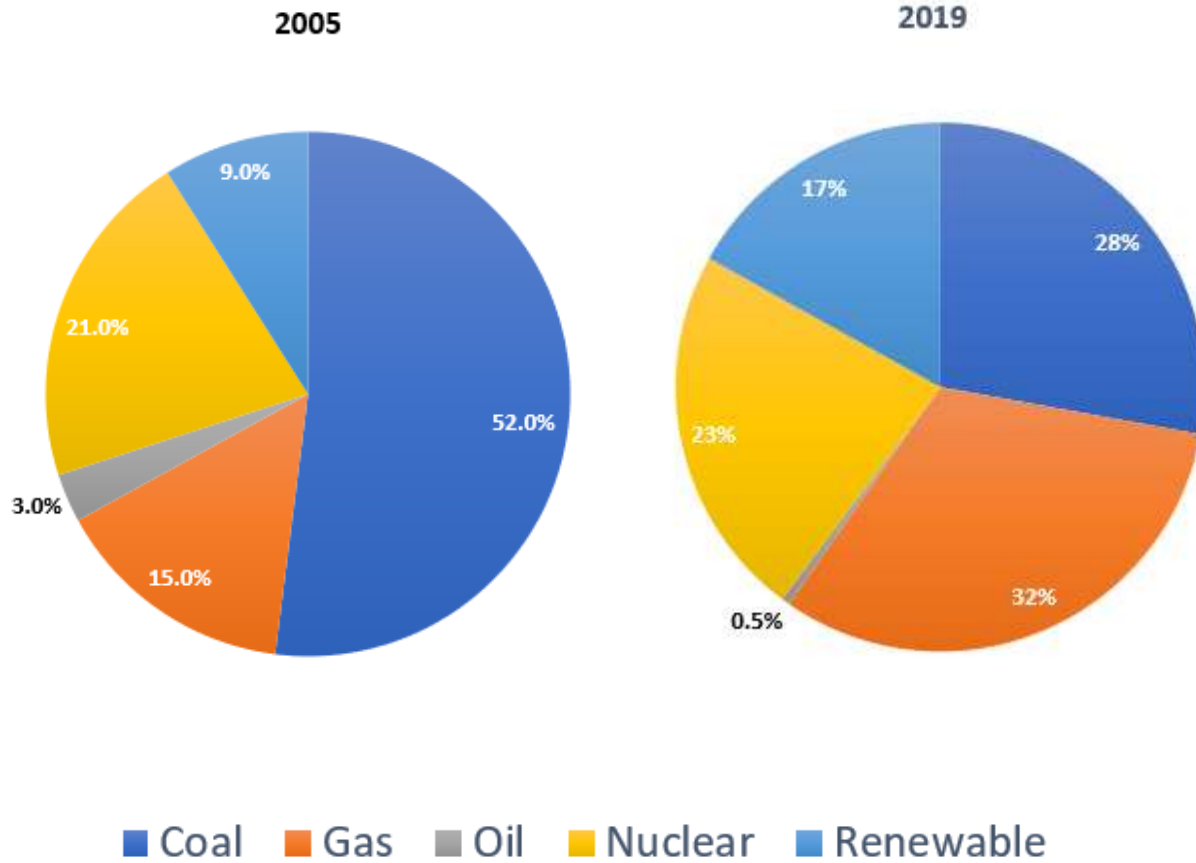


David Doniger - NRDC

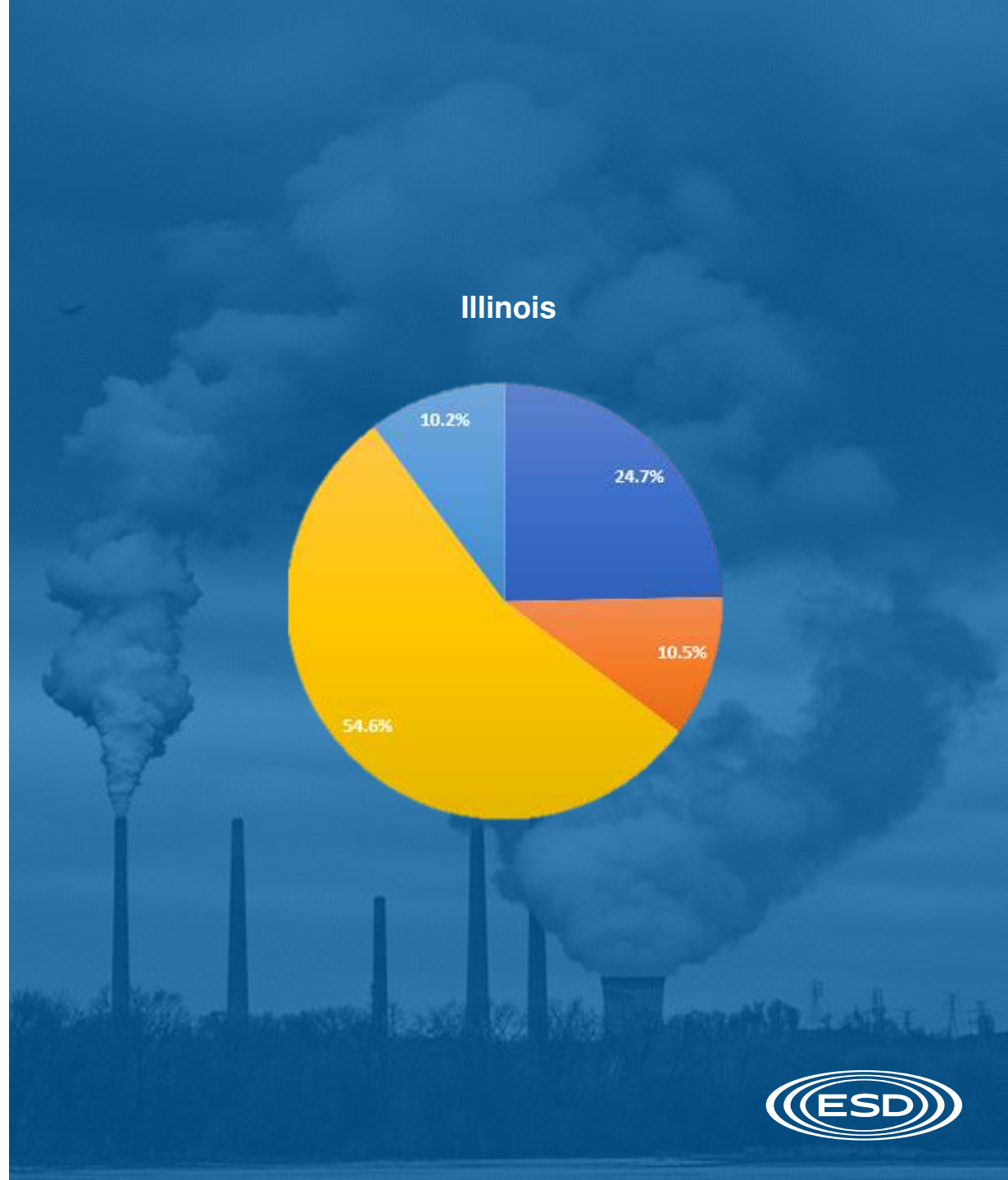
- Sr Strategic Director – Climate & Clean Energy Program
- With NRDC since June 1978
- White House Council on Environmental Quality
- US EPA
- Helped Formulate Montreal Protocol + Clean Air Act



# De-Carbonizing the Grid

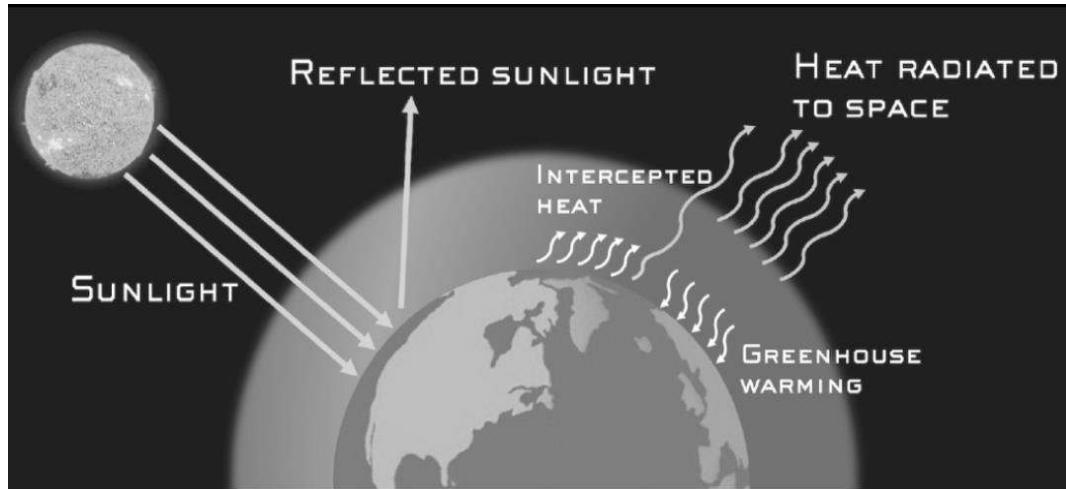


(Sources: US Energy Information Administration)



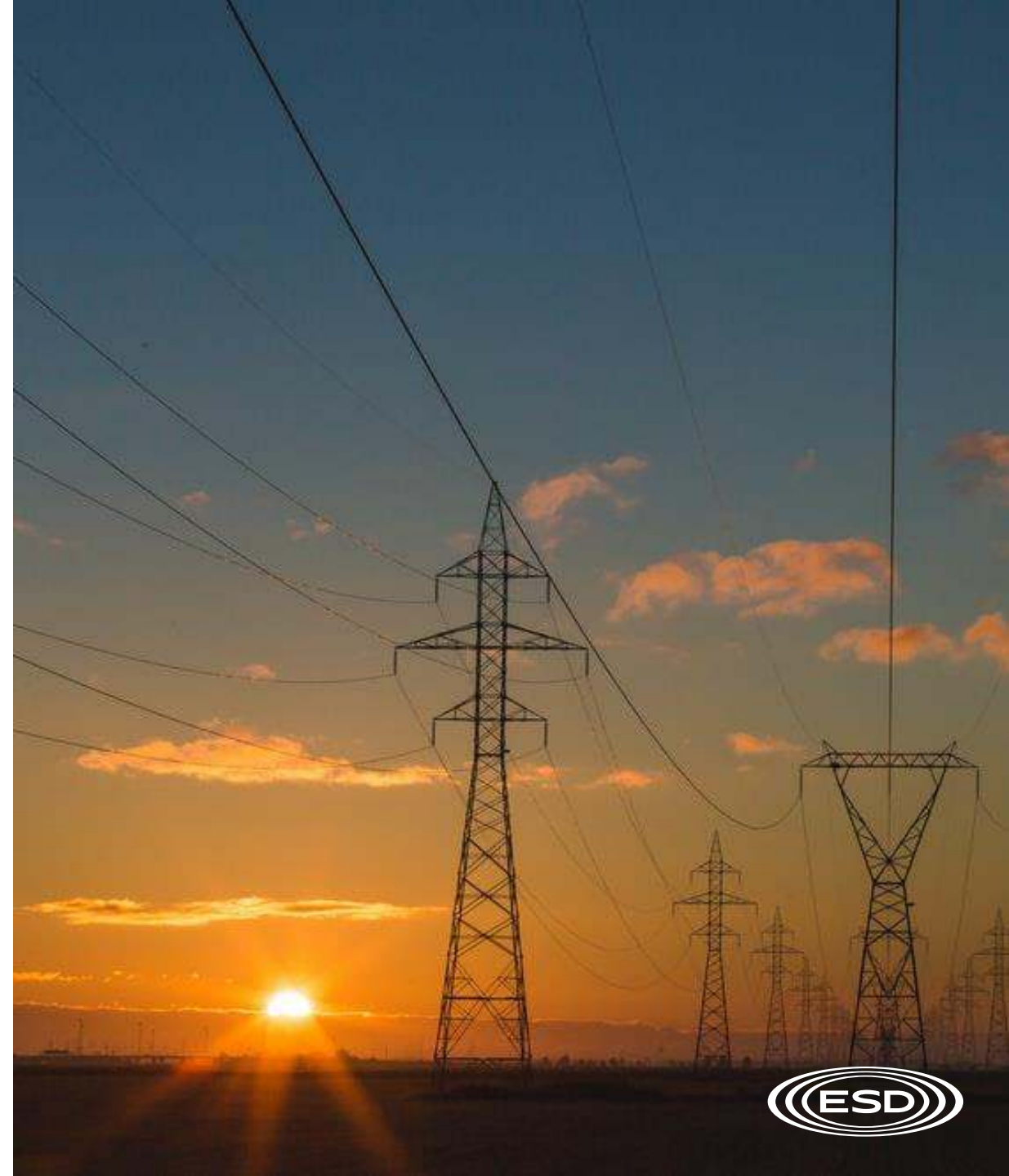
# The *Other* Critical Opportunity

- Address Other Sources of Emissions



- **Buildings...**
  - Consume 60% electricity & 50% of natural gas
  - Are responsible for 30% of US CO<sub>2</sub> emissions
  - Waste up to 30% of their energy due to inefficiencies
- **Refrigeration → Energy + Refrigerant**

(Other Sources: EIA, US DOE, Koonin 2021)



# Project Drawdown

- [www.drawdown.org](http://www.drawdown.org)
- *Drawdown – The Most Comprehensive Plan Ever Proposed to Reverse Global Warming (2017)*
  - Paul Hawken
  - Katharine K. Wilkinson
- **“The future point in time when levels of greenhouse gases in the atmosphere stop climbing and start to steadily decline.”**
- **Independent review and assessment of proposed Climate Solutions**
- **Framework**
  - Reduce Sources
  - Support Sinks
  - Improve Society
- **Replacing/Reducing High GWP Refrigeration is the #1 Ranked Solution for Addressing Climate Change**



# ODP vs GWP

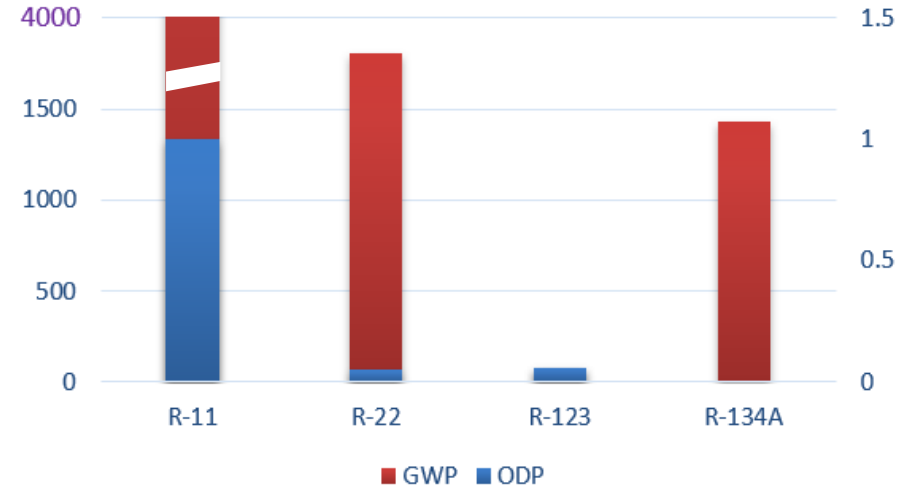
- **ODP:** The degradation to the ozone layer due to chlorine gas relative to R-11.
- **GWP:** Compares the insulating effect over 100 years relative to CO<sub>2</sub>.
- Chemical Composition
  - CFC: R-11 & R-12
  - HCFC: R-22, R-123
  - HFC: R-134A, R-410A
  - HFO: R-513/4A (A1/B1), R-1233zd (A1)

(Source: EPA, ASHRAE 34)

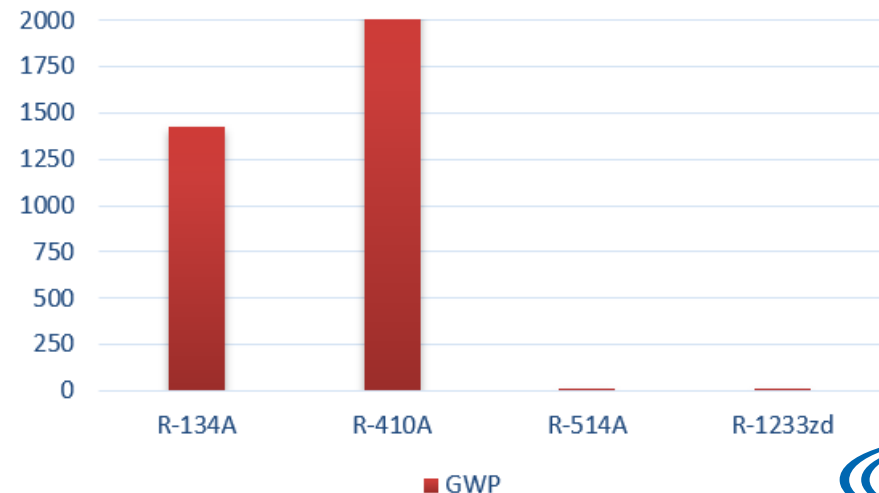


**CFC → HCFC → HFC → HFO**

## Legacy Refrigerant ODP & GWP



## Refrigerant GWP



# American Innovation & Manufacturing (AIM) Act

- Phases down HFCs on Kigali schedule – 85% reduction over 15 years.
- Authorizes EPA, on petition from NGOs or industry, to ban end-uses where there are climate friendlier alternatives.
- Authorizes EPA to set leak detection and prevention rules, to require reclaim, reuse, and destruction.
- Authorizes EPA, on petition, to accelerate the phase-down schedule.
- Aggressive regulatory implementation underway already.





# AIM Act Built On State-Level HFC Progress

- Initial EPA regs, issued in 2015 and 2016, started the phase-down by banning uses where there are safer substitutes.
- But these rules were blocked by a court decision.
- So, while working on the AIM Act to fix the court decision, NRDC also worked at the state level to adopt the same product bans under state law.
- 15 states acted HFCs: California, Colorado, Connecticut, Delaware, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont, Virginia, Washington.

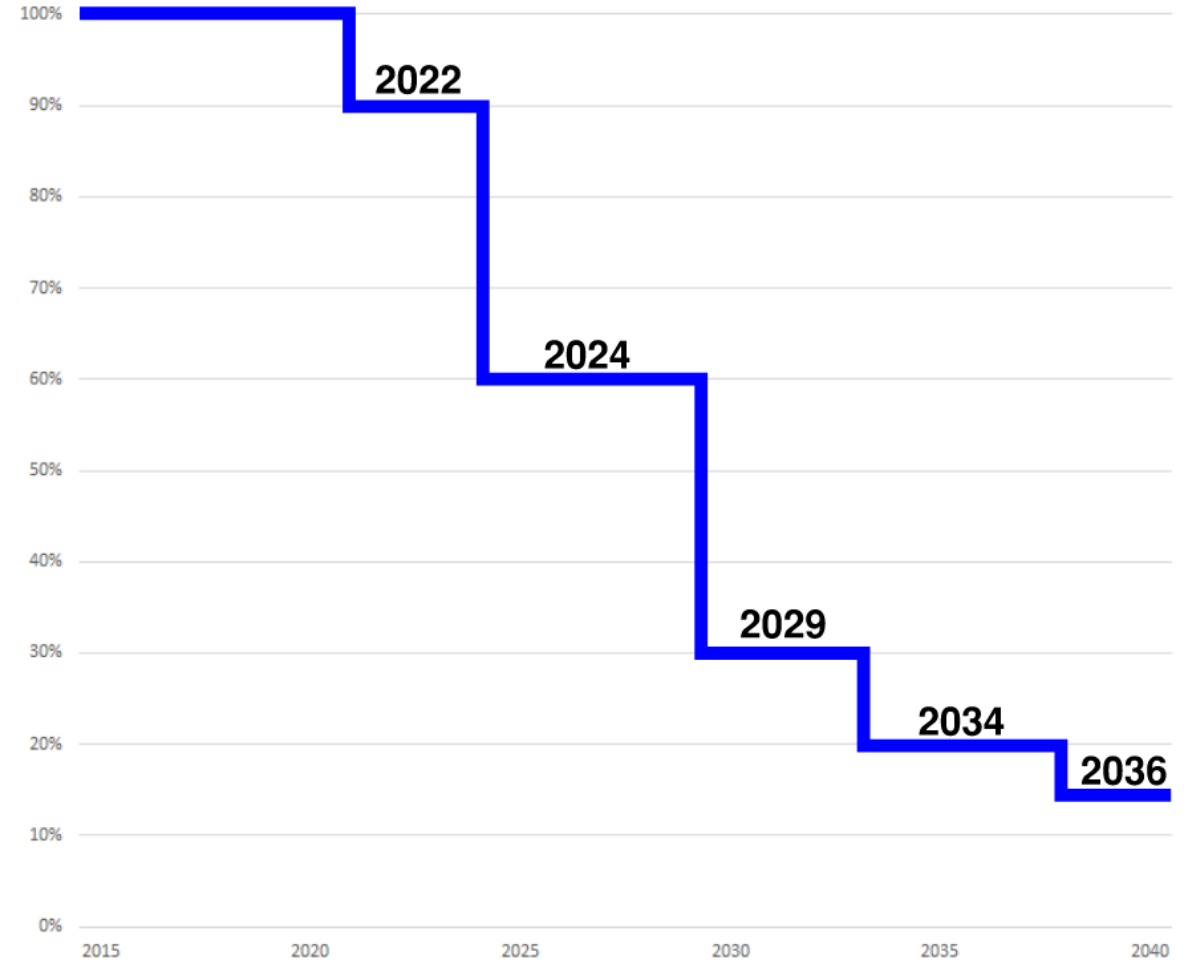


# HFC Phasedown

- **Implementation**

- EPA Can Regulate ODP + GWP
- The EPA has 270 days to determine next steps & regulations by industry.
- Must include “allocations” for each HFC.
- Limits must steadily decline.
- 15 Year HFC Phase-**down** may accelerate to accommodate technologies & markets.

## AIM Act HFC Phase-Down



# CME Center

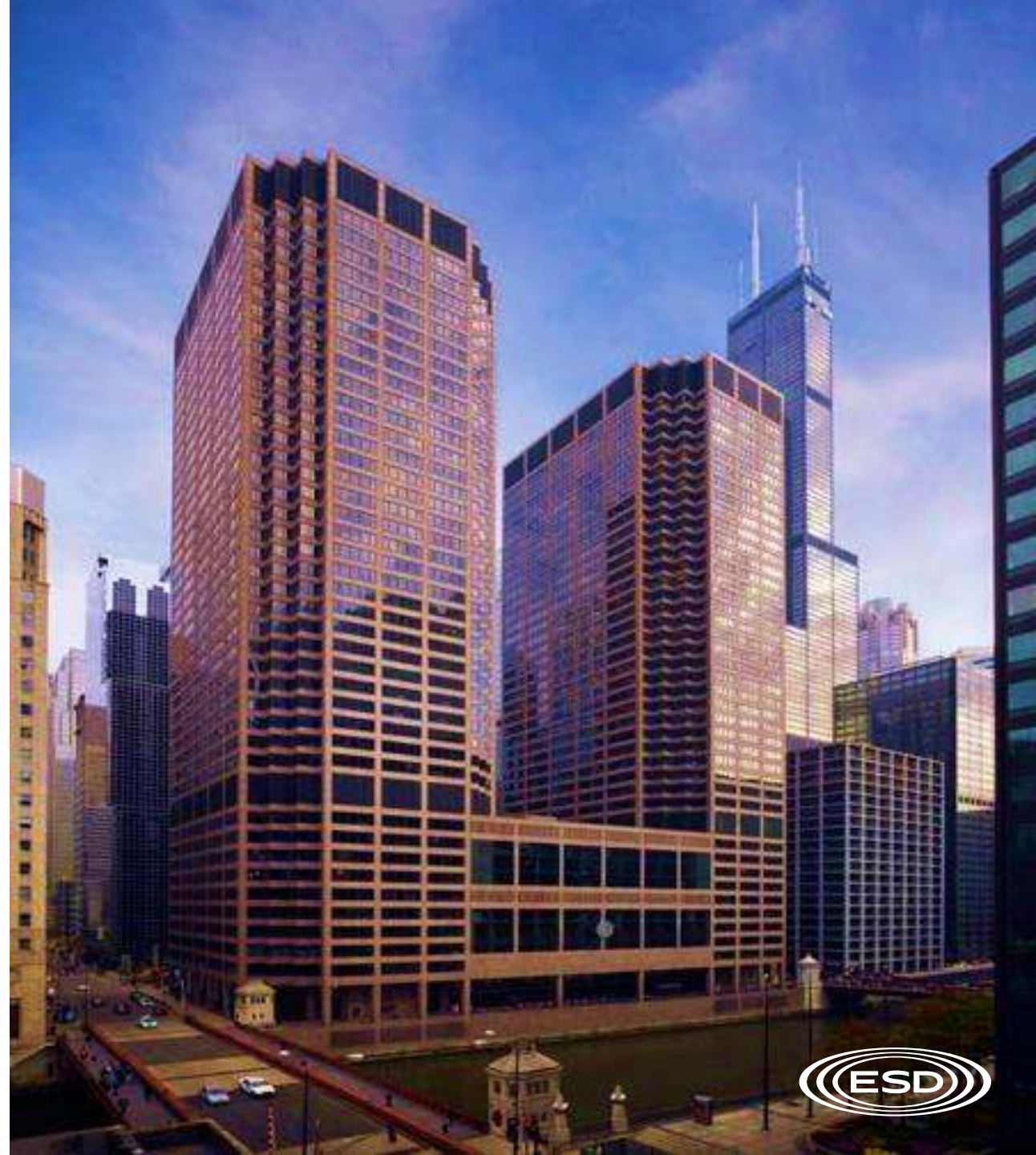
- **Asset Features**

- Two 40-Story Towers with Common 10-story Podium
- 2.3 million SF
- Completed 1983 – 1987
- Major redevelopment began 2018
- LEED Gold
- Home to Chicago Mercantile Exchange

- **Project Team Sustainability Commitments**

“As global leaders in the real estate industry, we at Tishman Speyer realize that a strong focus on sustainability is critical to the success of our firm and the future of our planet.” — Tishman Speyer

“Our overall sustainability objective is to deliver projects that consume less energy and water and produce less waste, increase air quality, and provide transparency into a project’s actual performance and occupant experience.” — ESD



# CME Center Impact

- **Existing Chiller Plants**
  - One per tower: 3,100T and 4,100T Refrigeration
  - Began upgrading Chillers in 2019
  - Replacing R-11 with R-514A
  - By end of 2021 will have 3100T replaced
  - Remaining Machines to be replaced 2025
- **Project Projected Impact**
  - 7,200T Refrigeration replaced R-11 to R-514A
  - ***Total R-11 removed: 4.9 metric tons***
  - Total R-514A added: 4.2 metric tons
  
  - → 19,600 metric tons CO<sub>2</sub> (R-11 Base)
  - → 8.4 metric tons CO<sub>2</sub> (R-514A Replacement)
  
  - **GWP Reduction = 19,592 tons CO<sub>2</sub> (99.96%)**  
→ **4,200 Cars Removed from Road for a Year**  
(Offsets ~50% of Building Occupants)



# Incentives

- **Utility Incentives**
  - Improved Chiller Efficiency
  - Variable Speed Drives
  - Custom Incentives
- **CARES QIP**
  - Interior Renovations to Existing Buildings
  - Full Tax Deduction
  - Full Depreciation in Year 1
  - Retroactive to 2018
  - Excludes
    - Building Enlargement
    - Vertical Transportation
    - Building Structure
    - Equipment Located on Building Exterior



# CME Center Incentives

- **\$2 Million Total Cost**
  - (2) New Chillers
  - New Controls & Valves
  - Power Modifications
- **ComEd Incentives**
  - 2020 Program: ~\$120,000 anticipated
  - 2021 Program:
    - Increased Incentive for First Chiller
    - 30% bonus if complete by July
    - **~\$900k Anticipated**



# Downtown Chicago Case Study

- **Existing Assets Considered**
  - ~100 Properties totalling 40+ million sf
  - Mix of Industries/Uses
  - 300k+ sf
  - Originally Constructed 1980-1995
- **Projected Impact**
  - ~120,000T Refrigeration Installed
  - **Total R-11 removed: 80 metric tons**
  - Total R-514A added: 67 metric tons
  
  - → 316k metric tons CO<sub>2</sub> (R-11 Base)
  - → 135 metric tons CO<sub>2</sub> (R-514A Replacement)
  
  - **Total GWP Reduction = 315,800 tons CO<sub>2</sub> (99.96%)**  
→ **68,650 Cars Removed from the Road for a Year**





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# Thank you

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