Energy Career and Leadership Webinar Series – Spring 2024

From Raising Cows to Removing Carbon: A Personal Sustainability Journey

TIEEP
TEXAS INDUSTRIAL ENERGY EFFICIENCY PROGRAM

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From Raising Cows to Removing Carbon: A Personal Sustainability Journey

Alan Rossiter

Executive Director, External Relations & Educational Program Development

UH Energy, University of Houston

From Raising Cows to Removing Carbon: A Personal Sustainability Journey

Confirmed Presenters

Rey Banatao, Ph.D. Director / Project Lead, X (formerly Google X)

Presentation Topic: Fall in Love with the Problem - Lessons in Moonshot Taking, Climate and Entrepreneurship

Don Victory. Founder and Chair of Energy Mentors; previously Upstream Chief Process Engineer at ExxonMobil

Presentation Topic: Defeating Career Anxiety

Dates: **Fridays February 9 - March 29, 2024 (excluding March 8 & 15)**
Time: **10am - 11am**
Location: **Webinar Series**

Sharon Nolen. Eastman Fellow; leader of Eastman's Global Natural Resource Management program.

Presentation Topic: From Raising Cows to Removing Carbon: A Personal Sustainability Journey

Jane Stricker. SVP and Executive Director, Houston Energy Transition Initiative (HETI), The Greater Houston Partnership.

Presentation Topic: Navigating a Successful Career in a Changing Energy Industry

Sindhu Balan. Investment principal, Chevron Technology Ventures (CTV).

Presentation Topic: Many Routes to a Career Destination

Additional Presenters to be announced soon.

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Notes for Certificate Candidates

Open to students enrolled students at institutions of higher education. Registration must include institution & student ID.

1. Use your unique, personal Zoom link for the webinars.
2. Activate course in Canvas.
3. Participate in at least 4 webinars in real time.
4. Limited waivers available to use recordings. Must be requested in advance.
5. Complete each test by 11:59 pm the Thursday after the webinar. Passing grade: 80%

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Critical Issues in Energy 2023-24 Symposium Series

THE GULF COAST HYDROGEN ECOSYSTEM: OPPORTUNITIES & SOLUTIONS

Wednesday, April 17, 2024
9:00AM - 5:00PM
UH Student Center South - Theater Room
Reception and Dinner to Follow

USE QR CODE TO REGISTER

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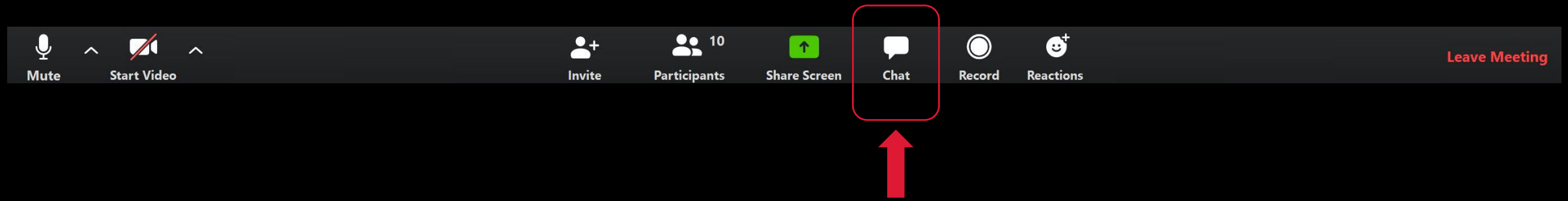
From Raising Cows to Removing Carbon: A Personal Sustainability Journey

Please stay muted with video off.
Submit your questions for our guest speaker during the live Q&A using the chat function in Zoom



Today's Moderator

Uchenna B. Ubeh

Vice-Chair | UH Energy Coalition

TEX-E Fellow

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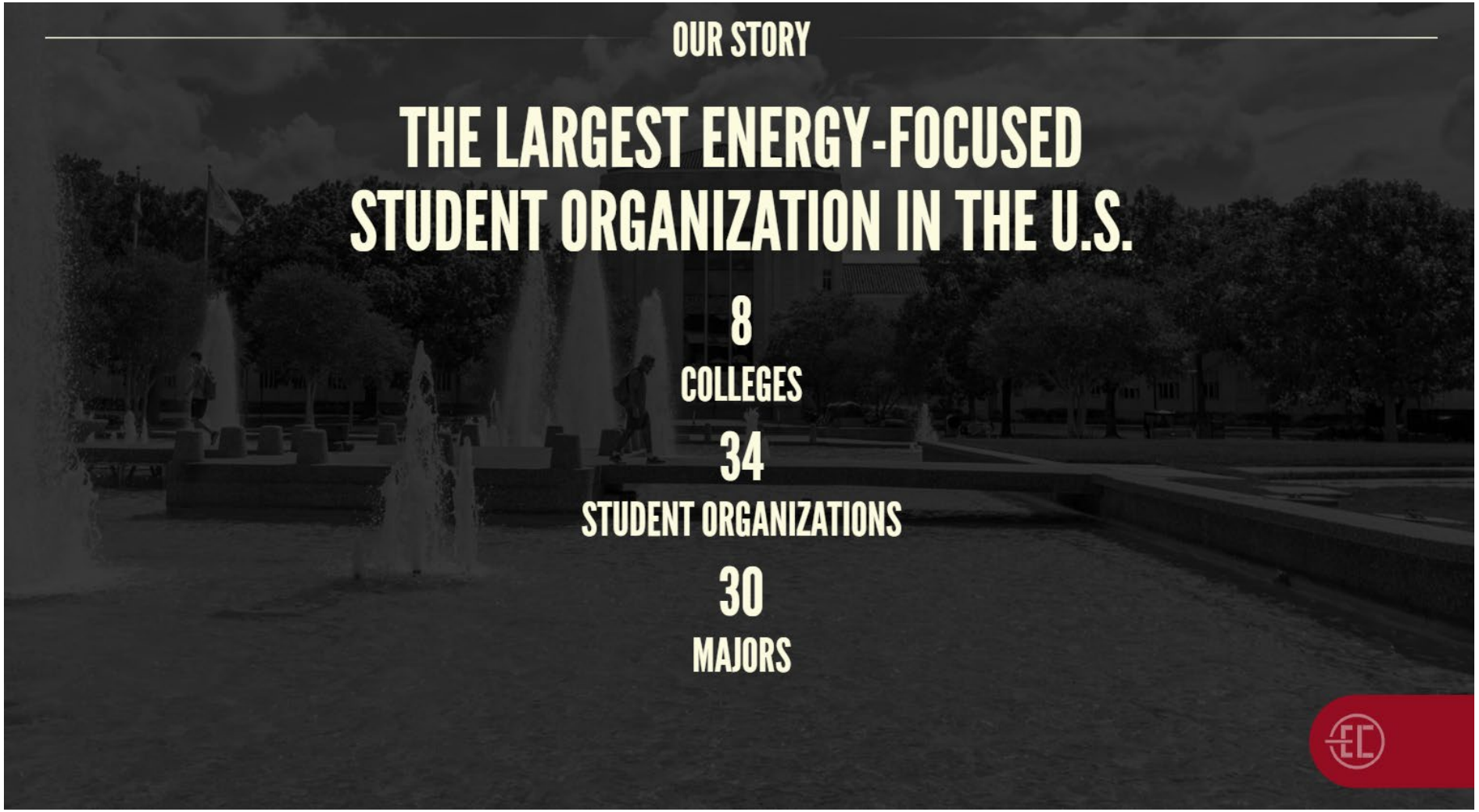

Upcoming Events

- Networking Event with Energy Professionals
- Career Readiness Sessions
- Crawfish Boil
- Hydrogen Symposium
- Banquet

From Raising Cows to Removing Carbon: A Personal Sustainability Journey

Sharon Nolen
Eastman Fellow
Leader, Global Natural Resource Management Program
Eastman Chemical Company

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From Raising Cows to Removing Carbon: A Personal Sustainability Journey

EASTMAN

A legacy of innovation and growth

A legacy that began more than 100 years ago

"Throughout our history, Eastman men and women have focused their sense of purpose, innovative spirit and drive for excellence to enhance the quality of life in a material way."

- Mark Costa, Board Chair and CEO

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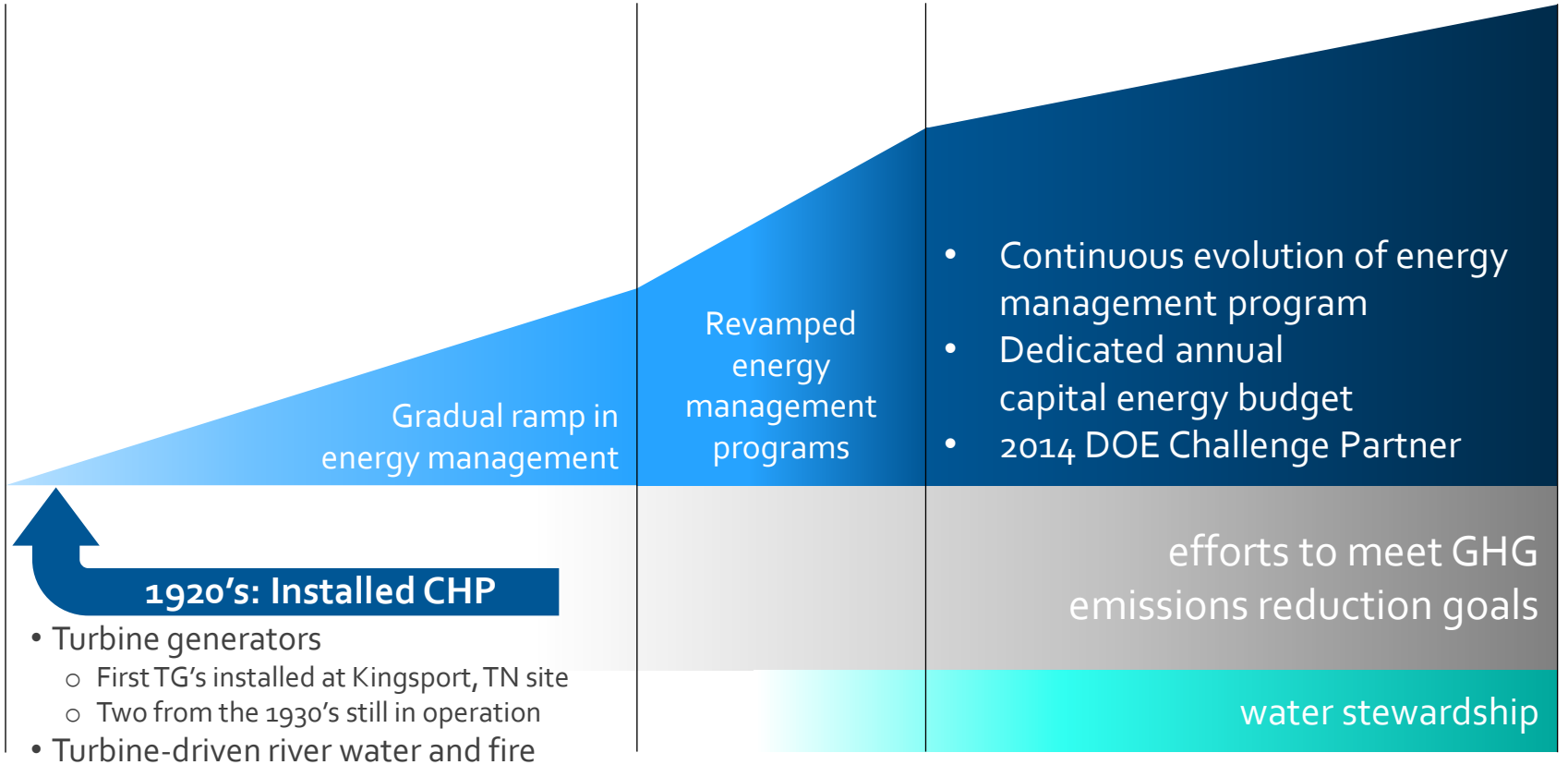
History of energy efficiency at Eastman

1920
Eastman founded

2008-2010
Joined ENERGY STAR® and DOE partner programs

2020's
Energy management program is integral to Eastman's sustainability initiatives



1920's: Installed CHP

- Turbine generators
  - First TG's installed at Kingsport, TN site
  - Two from the 1930's still in operation
- Turbine-driven river water and fire water pumps installed in mid-1920's

Eastman's Sustainability Council now provides broader oversight for several related initiatives

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Lessons Learned

- Help your neighbor
- Live within your means
- Be true to your values
- Plan for the future

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Help Your Neighbor

- The drive to improve energy efficiency led Eastman to join two external programs that have industrial focus groups
- These programs offer many benefits and resources to help companies reduce energy use
- Both government programs have partnerships which include our suppliers and customers
- We benefit and contribute to these relationships
  - GM showed us water conservation projects
  - We shared energy management program with others

ENERGY STAR AWARD 2019
PARTNER OF THE YEAR
Sustained Excellence

Better Plants CHALLENGE
U.S. DEPARTMENT OF ENERGY

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Live within your means: use less!

➢When Eastman reset their energy program in 2010:

- No capital energy budget existed
- Ideas to improve efficiency existed in manufacturing, but those ideas were competing against everything else

➢How did we get approval for a capital budget?

- Collected energy efficiency projects with good returns that had not received funding
- Presented a portfolio of these projects, ranked by internal rate of return (IRR) to the Executive Steering Committee

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Be true to your values

- **Components of Eastman's award-winning energy program existed in previous efforts**
  - Full time energy manager
  - Capital budget
- **The priority of the energy effort shifted with energy costs**
- **Maintaining a consistent program**
  - External commitments
  - Sustainability reporting

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Plan for the future

- Energy management system
- Capital energy budget became part of the base budget
- Standardized measures
- Tools to better monitor and optimize energy use
- Carbon price implementation
- Training and awareness activities
- Structured programs to maintain the gains

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Mitigating climate change

Eastman will:

- Reduce our absolute GHG Scope 1 and 2 emissions by one-third by 2030 to **achieve carbon neutrality by 2050**
- Increase renewable energy use at Eastman so **100% of our purchased electricity in North America and Europe will be renewable by 2030**
- **Comprehensively understand our downstream Scope 3 footprint** and develop a strategy that addresses it
- Innovate to provide products that **enable energy savings and greenhouse gas reduction** down our value chains and at the consumer level

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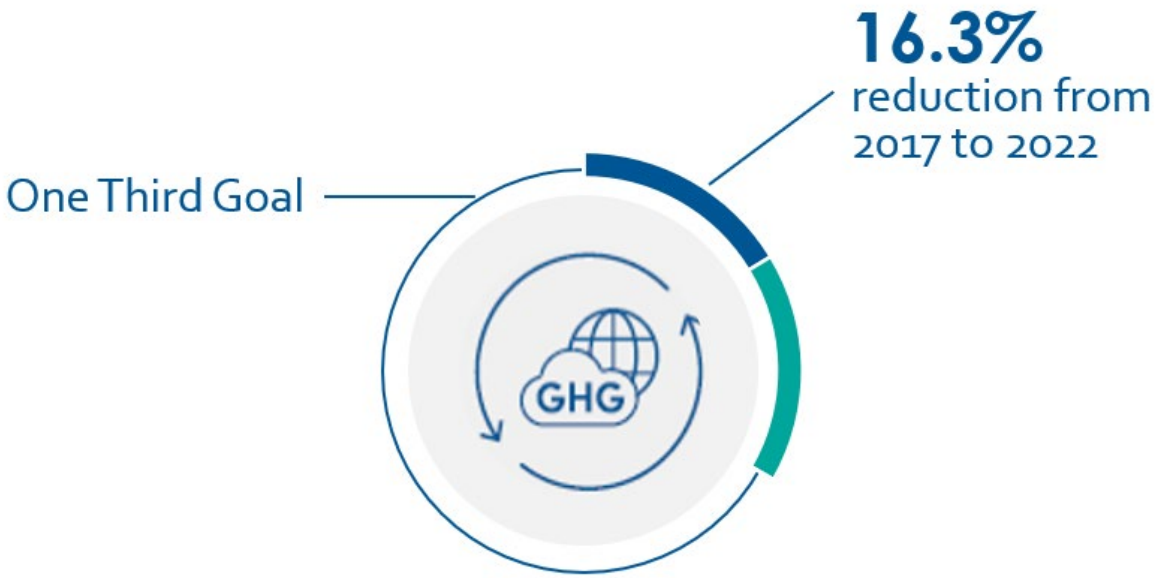
Progress on 2030 goals



One-third

reduction in absolute Scope 1 and 2 emissions by 2030 compared to 2017 baseline

100%

of North America and Europe purchased electricity will be renewable by 2030

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Our path toward carbon neutrality

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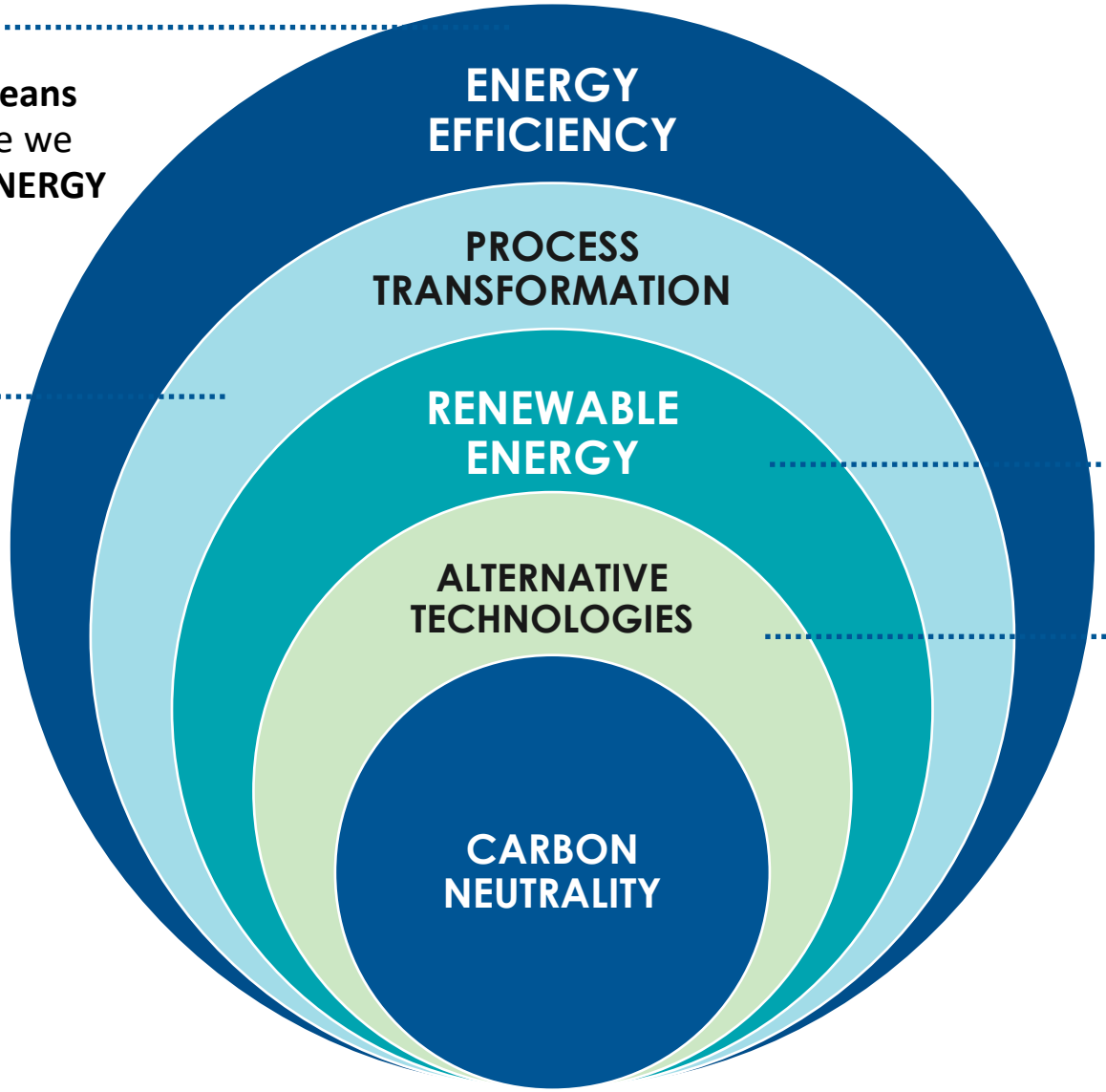
ENERGY EFFICIENCY

Eastman's climate progress today **leans heavily** on energy efficiency, where we have received multiple **DOE and ENERGY STAR® awards**.

PROCESS TRANSFORMATION

Our **molecular recycling technologies** produce new materials at a substantially reduced carbon footprint.

We will continue to identify and pursue additional enhancements to our manufacturing processes.



RENEWABLE ENERGY

By 2030, 100% of our purchased electricity in North America and Europe will be renewable.

ALTERNATIVE TECHNOLOGIES

We are exploring alternative energy technologies that have the **potential to accelerate** our progress toward decarbonization, such as:

- Clean hydrogen
- Carbon capture utilization & storage (CCUS)
- Other emerging innovations.

Energy efficiency is a top priority for experts in decarbonization, ensuring an efficient and credible transition to carbon neutral.

Industry experts put Energy Efficiency first

International Energy Agency:

It provides some of the **quickest and most cost-effective CO_2 mitigation** options while lowering energy bills and strengthening energy security.[1]

European Commission:

Energy Efficiency is the **first principle** to meet climate objectives.[2]

McKinsey:

EE is an **extremely attractive upfront investment** that pays for itself[3]

Department of Energy:

EE offers the **greatest opportunities for near-term decarbonization** solutions. In many cases, it **does not require major changes to industrial processes** and can bring immediate reductions in emissions.[4]

International Energy Agency:

Single **largest measure to avoid energy demand** in the Net Zero Emissions by 2050 Scenario and should be **front-loaded**[1]

Eastman Case Studies further validate EE impact

Category	Annual Savings ($M)	CO_2 Reduction (kMT)	Investment ($/mt CO_2)
Dashboards	0.8	12	No capital cost
Distillation Columns	0.6	10	0.23
Column Packing	0.4	5	45
Thermo-compressors	0.19	22	50

[1] Energy Efficiency
[2] Energy Efficiency First
[3] Energy Efficiency: A compelling global resource
[4] Industrial Decarbonization Roadmap

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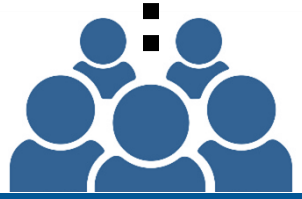
Eastman's structure to address decarbonization

Sustainability Council



led by a full-time program manager

Sustainable Infrastructure Steering Team

- **Energy Efficiency**
- **Process Transformation**
- **Breakthrough Technologies**
- **Renewable Energy**

Sustainable Infrastructure Program is a Top Corporate Program and has Corporate Strategy support in developing and executing our strategy

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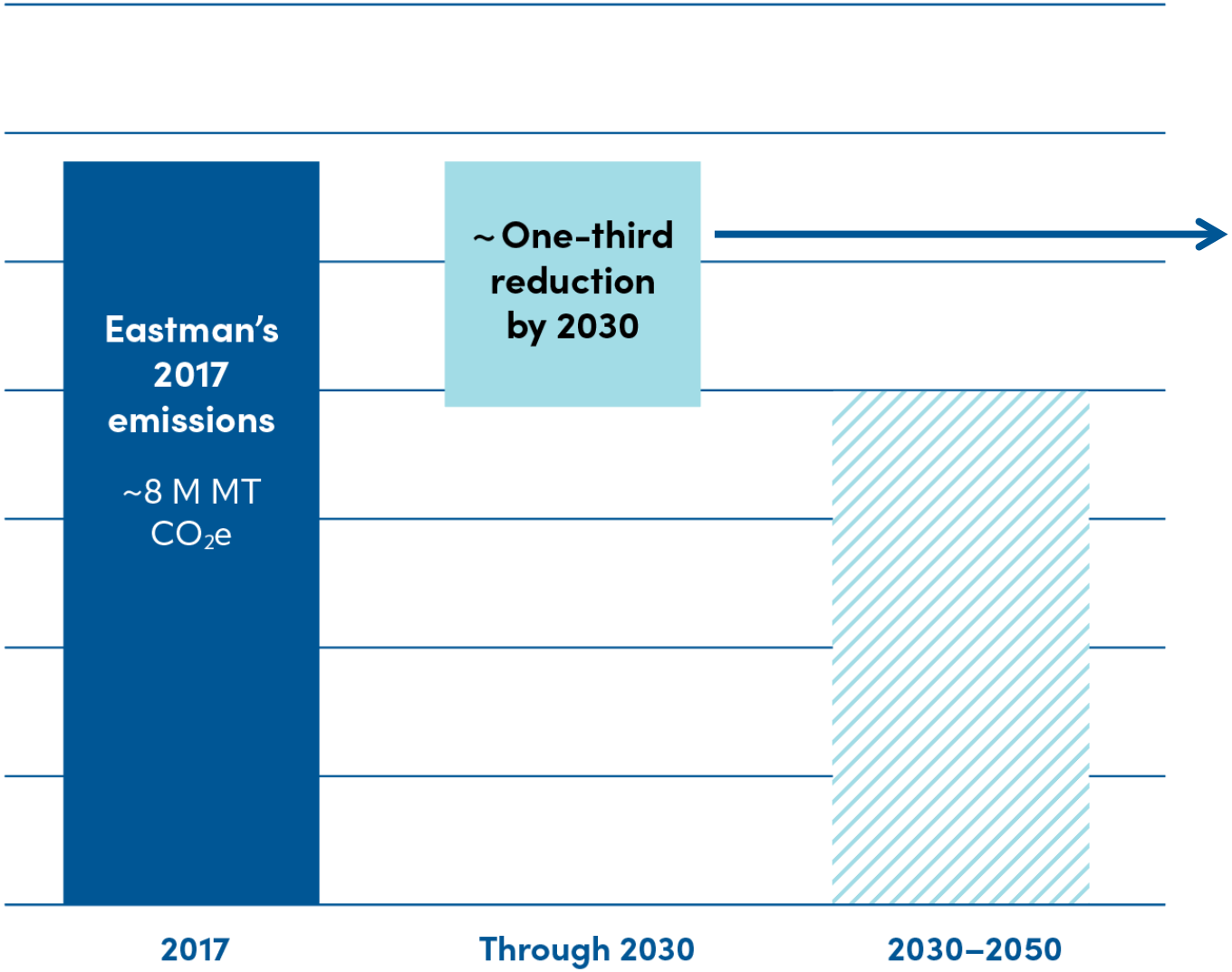
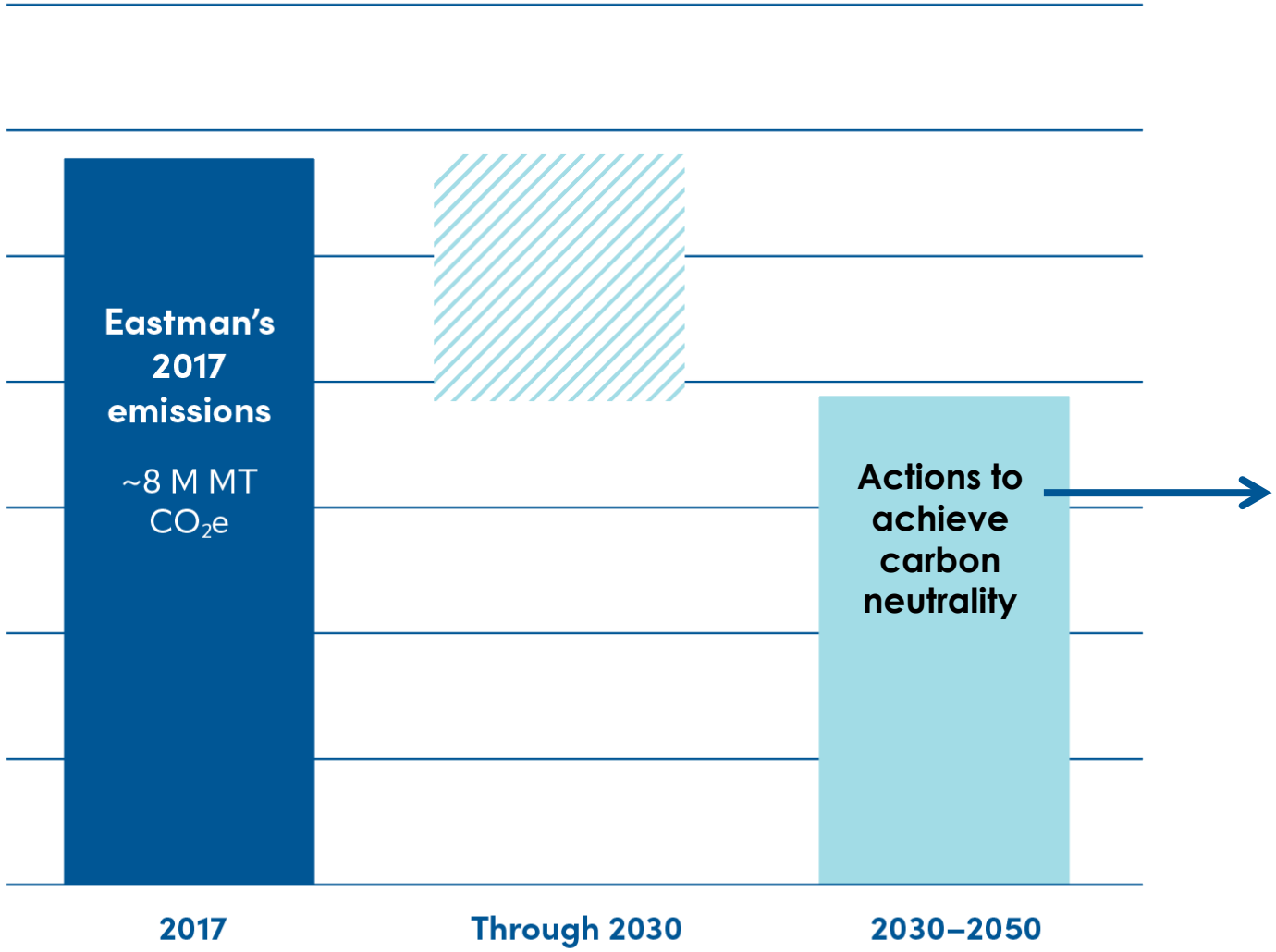
Clear action plans for carbon footprint reduction by 2030



Reduce One-Third of Scope 1 and 2 Carbon Emissions

- Convert steam boilers
- Optimize combined heat and power via advanced modeling
- Relentless energy efficiency
- Renewable energy
- Targeted process transformations

Driving initiatives now to achieve 2050 carbon neutrality



2030-2050

Portfolio of options:

- Advanced waste heat recovery
- Add clean hydrogen to feedstock and energy mix
- Electrification for suitable process heat loads
- Carbon capture and use
- Small modular nuclear
- Additional molecular recycling investments

Challenges and Headwinds to GHG Reduction Progress

Significant capital spend to maintain safe and reliable operations and meet GHG targets

Current technology readiness for lower-carbon options will not meet 2030 targets

Scope of projects require **3 or more years for implementation**

Complicating factors

Regulatory mandate timelines are unknown

High thermal loads fostered existing use of CHP but decarbonization may force shift towards electrification

Reliability decline due to age of assets

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The role played by energy efficiency

Decarbonization challenges scale with energy demands

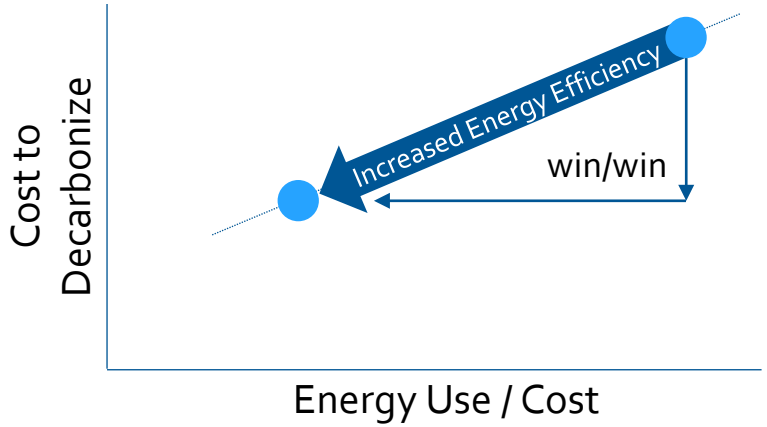
- Higher energy demands typically lead to more expensive equipment
- Some larger-scale solutions may require infrastructure or fuel sources that aren't available yet
- Commercialization of large, industrial decarbonization equipment may lag smaller (more common) sizes
- Regulatory requirements may be partially tied to solution size
- Life of existing assets may be extended at lower capacity utilization

Optimizing energy efficiency of existing assets is a critical first step

Lowering overall energy demand can lead to flexibility in the decarbonization solutions and strategy

Energy efficiency is the industry best-practice, first tier solution for addressing energy and emission targets

Energy efficiency is typically the lowest-cost decarbonization option



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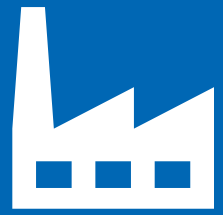
Example energy efficiency projects

Analytics / Dashboards

- Real-time supply optimization (additional sites)
- Real-time demand-side analytics

Utilities Systems

- Boiler efficiency improvements
- Rotating equipment efficiency
- Thermo-compressors



Distribution

- Steam trap improvement
- Insulation repair
- Leak repair

Manufacturing

- Distillation design and packing
- Heat integration
- Variable Frequency Drives

Reduces cost to meet short-term and long-term decarbonization goals

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Energy Cost Optimization (ECO) Model

Purchased Energy

>$100M/year
>40 trillion Btu/year

- Coal
- Natural Gas
- Electricity

Reduce cost of fuel mix

Energy Conversion

Steam	•17 boilers •Mix of sizes, fuel types, and auxiliaries
Electricity Generation	•19 turbine generators •Designed to support specific loads
Compressed Air	•>20 air compressors •Mix of sizes & drive types
Refrigeration	•>30 refrigeration machines •Mix of sizes & drive types
River Water	•>30 river water pumps •Mix of sizes
HTM Heaters	•Various sizes & efficiencies

Manufacturing

Products

Process Energy Losses

Energy Conversion Losses

Reduce energy losses

Goal: Reduce the cost of energy by picking the best path for each btu

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Eastman's Roadmap to Decarbonization

Competencies & Priorities

Innovation and investment to solve the triple challenge

Commitment and governance to decarbonize Eastman operations

Demonstrated energy efficiency focus

Enabling Progress on Goals

External Partnerships

Decarbonization roadmap with optionality to meet demands

Products & solutions to enable decarbonization beyond Eastman

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Questions?

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