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Converting Waste Into Resources

LA DWP Los Angeles Department of Water & Power

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

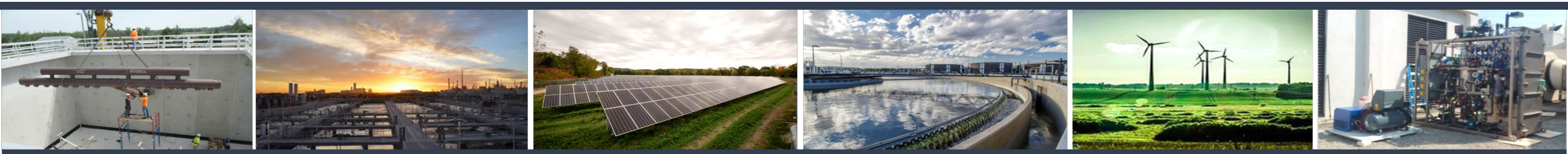
Geosyntec consultants

OCSAN ORANGE COUNTY SANITATION DISTRICT

DSWA DELAWARE SOLID WASTE AUTHORITY

dc water is life®

We will begin our presentation in a few minutes…



Thank you SCS Engineers

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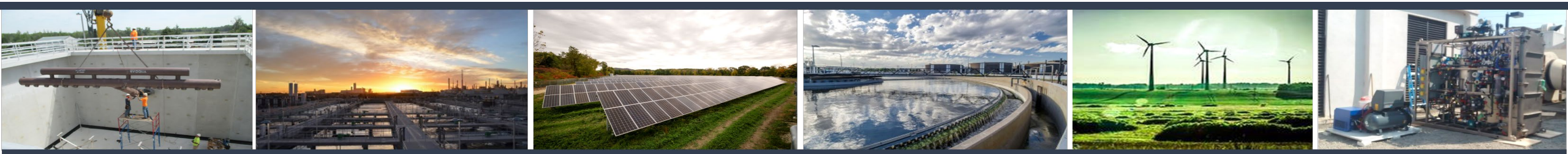
SCS ENGINEERS

SCS Engineers is an environmental consulting and contracting firm serving public and private clients across the nation and around the world. We employ nearly 1,200 engineers, environmental professionals, and construction specialists to work on solutions for pollution, energy consumption and emissions reductions, land remediation, water/wastewater treatment, and waste management. We strive to help our clients maintain the quality of our soil, water, and air, and to use resources more efficiently and less destructively as they deliver their products and services. In 2022, SCS was ranked the number one solid waste consulting firm in the country by Engineering News Record.

Our core capabilities are in solid and hazardous waste management, renewable energy, remediation, carbon capture, measurement and verification, sustainability, all of which are backed by environmental compliance experts. We work to prevent, mitigate and remediate environmental events, and use our environmental regulatory systems knowledge to help shorten project timelines and stay on budget. SCS is 100% employee-owned, which shapes our culture of serving client and our colleagues. For more information: www.scsengineers.com



Leadership and Excellence in Environmental Engineering and Science

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

Part 1

PLASTICS: HERO OR VILLAIN WHEN WE MANAGE THEIR AFTERLIFE?

Chaz Miller
AAEES

January 11, 2023

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HERO?

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

OR VILLAIN?

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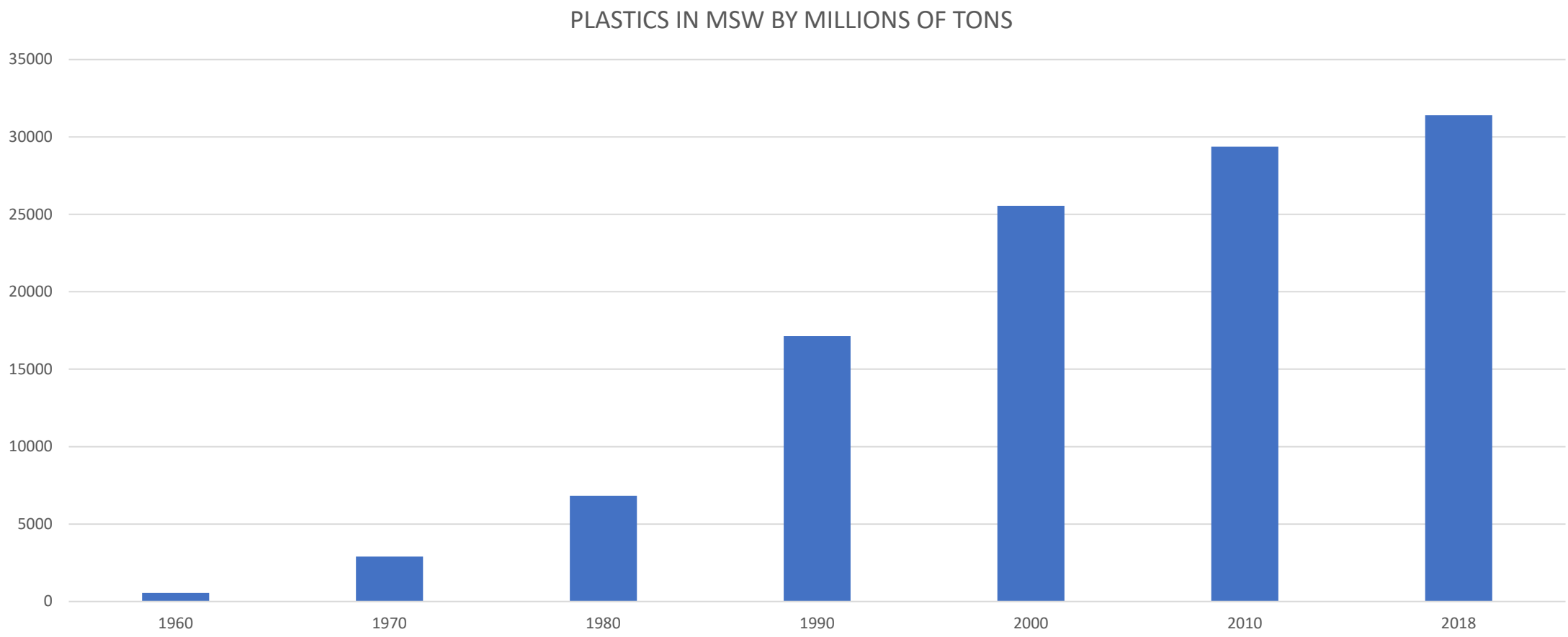
WHAT I'LL BE COVERING

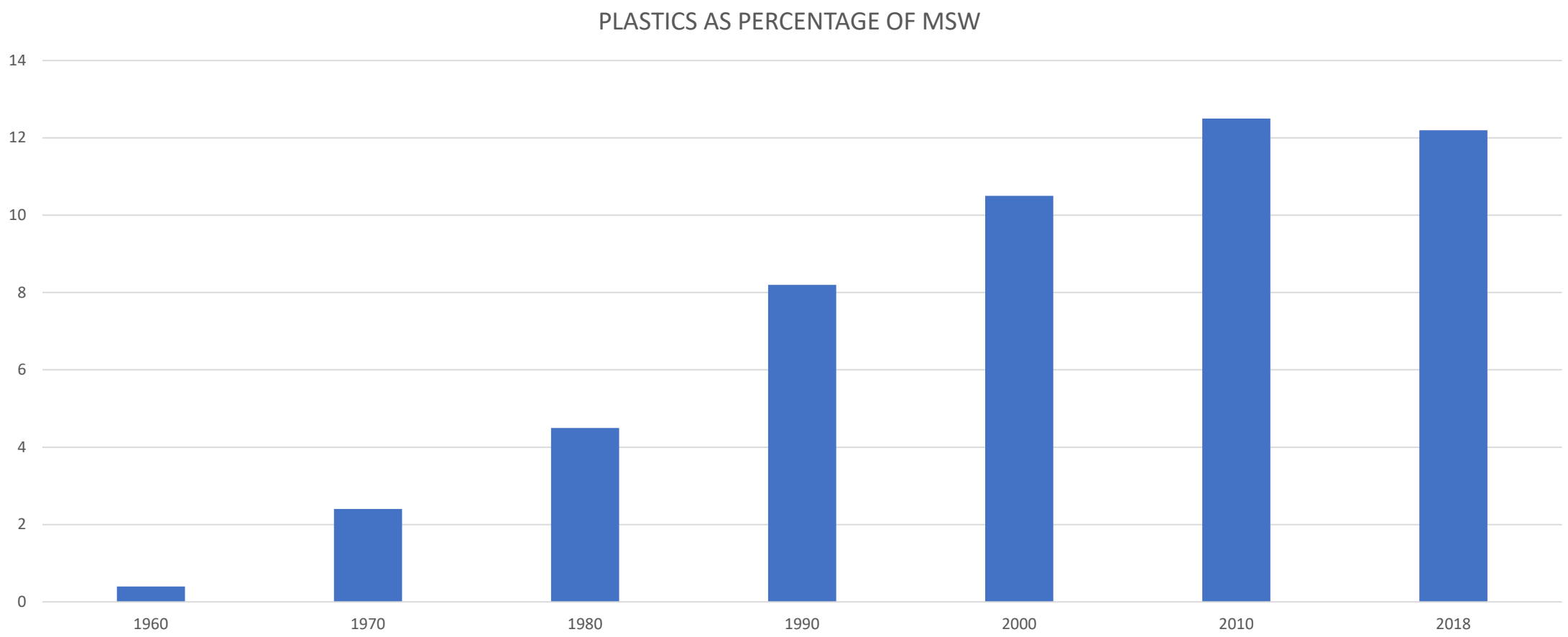
HOW MUCH PLASTIC

2018 EPA DATA



PLASTIC AS A PERCENTAGE OF MSW

2018 EPA DATA



EPA MSW PRODUCT CATEGORIES

2018 EPA DATA

Food & yard waste: 98.5 million tons = 33.75%

Containers & packaging: 82.2 million tons = 28.15%

Durables: 57.1 million tons = 19.5%

Non-durables: 50.4 million tons = 17.3%

Miscellaneous inorganic wastes: 4.1 million tons = 1.4%

PLASTICS BY MSW PRODUCT CATEGORIES

2018 EPA DATA

Containers & packaging: 14.5 million tons - 41%

Durables: 13.7 million tons - 38%

Nondurables: 7.5 million tons - 21%

PLASTICS IN MSW BY RESIN

2018 EPA DATA

LDPE/LLDPE: 8.6 million tons - 24%

PP: 8.2 million tons - 23%

HDPE: 6.3 million tons - 18%

PET: 5.3 million tons - 15%

PS: 2.3 million tons -- 6%

PVC: 0.840 million tons - 2%

Other resins: 4.2 million tons - 12%

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WHERE IS “AWAY” FOR PLASTICS?

WHERE IS “AWAY” FOR PLASTICS?

2018 EPA DATA

Recycle: 3,090 million tons - 8.7%

Energy Recovery: 5,650 million tons - 16.3%

Land disposal: 26,970 million tons - 75.6%

PLASTIC RECYCLING BY EPA PRODUCT CATEGORY

2018 EPA DATA

BY EPA PRODUCTS CATEGORY:

Durables: 0.93 million tons - 6.8%

Non-durables: 0.18 million tons - 2.4%

Containers & Packaging: 1.98 million tons - 13.6%

PLASTIC RECYCLING BY RESIN

2018 EPA DATA

BY RESIN TYPE:

PET: 0.98 million tons - 25.4%

HDPE: 0.56 million tons - 14.8%

LDPE/LLDPE: 0.37 million tons - 9.9%

PP: 0.05 million tons - 2.7%

MOST RECYCLED PLASTIC PRODUCTS

2018 EPA DATA

PET bottles: 0.91 million tons - 29.1%

Natural HDPE bottles: 0.22 million tons - 29.3%

Colored HDPE bottles: 0.29 million tons - 18.1%

LDPE/LLDPE bags, sacks & wraps: 0.37 million tons - 13.3%

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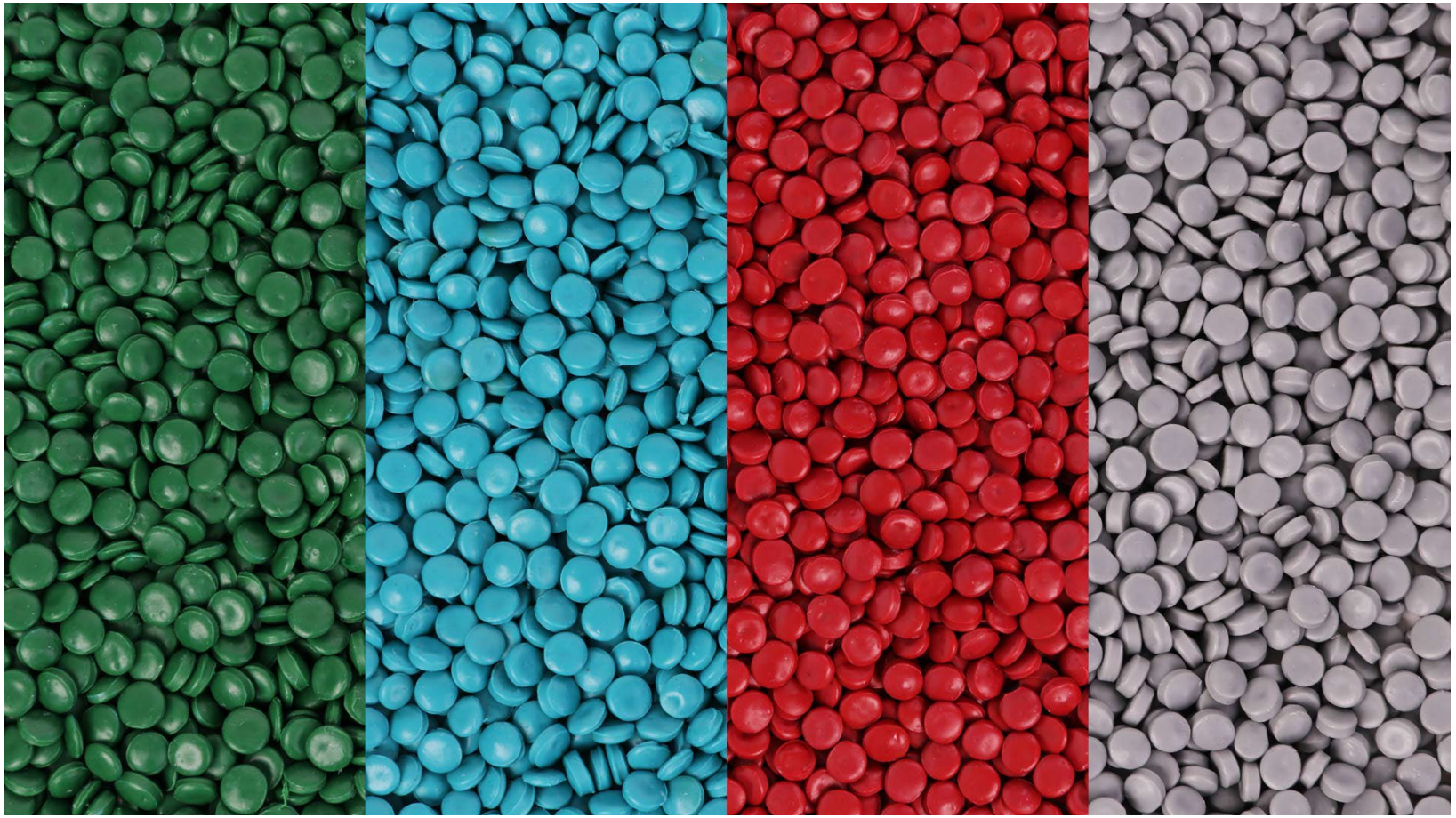
RECYCLED PLASTIC RESIN



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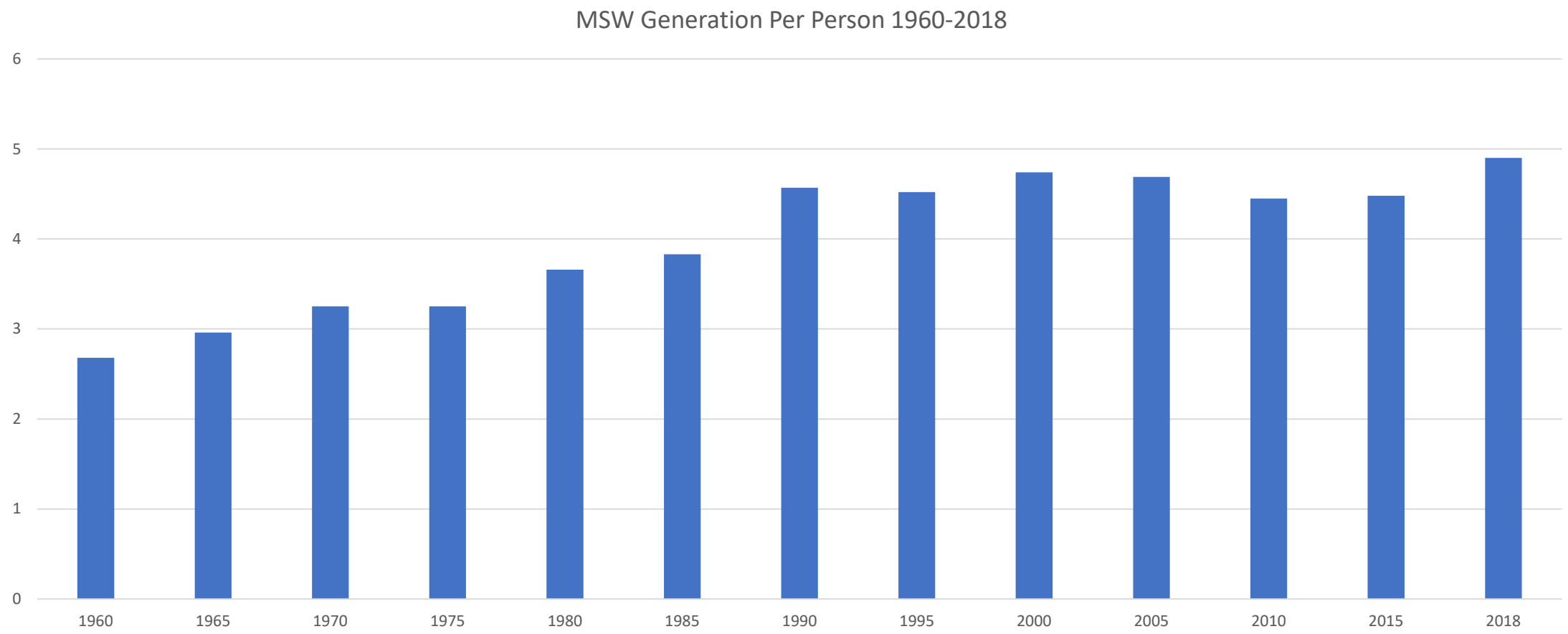
PLASTICS & WASTE REDUCTION



PACKAGING LCAS

LIGHTWEIGHT RULES

Consume less energy

Less fossil fuel in transportation

Produce less CO2 emissions

Lower water use

Higher product to package ratio

Generate less MSW even if unrecyclable

WHAT DOES ALL THIS DATA MEAN?

Our use of plastic products has skyrocketed over the years

Plastics are a significant part of the waste stream

Plastics are found in every type of manufactured products

Plastics have slowed down waste generation

Plastic products are more diverse in composition, colors used, etc., than products made from other materials

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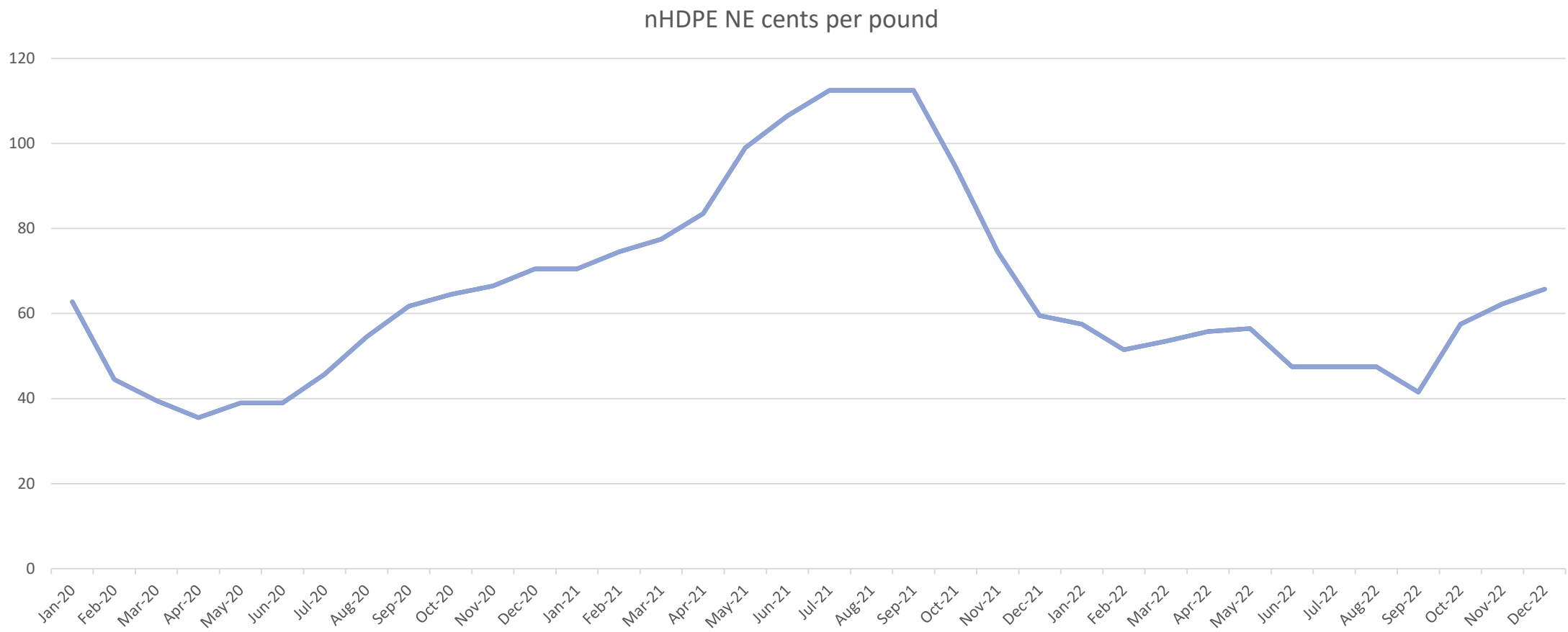
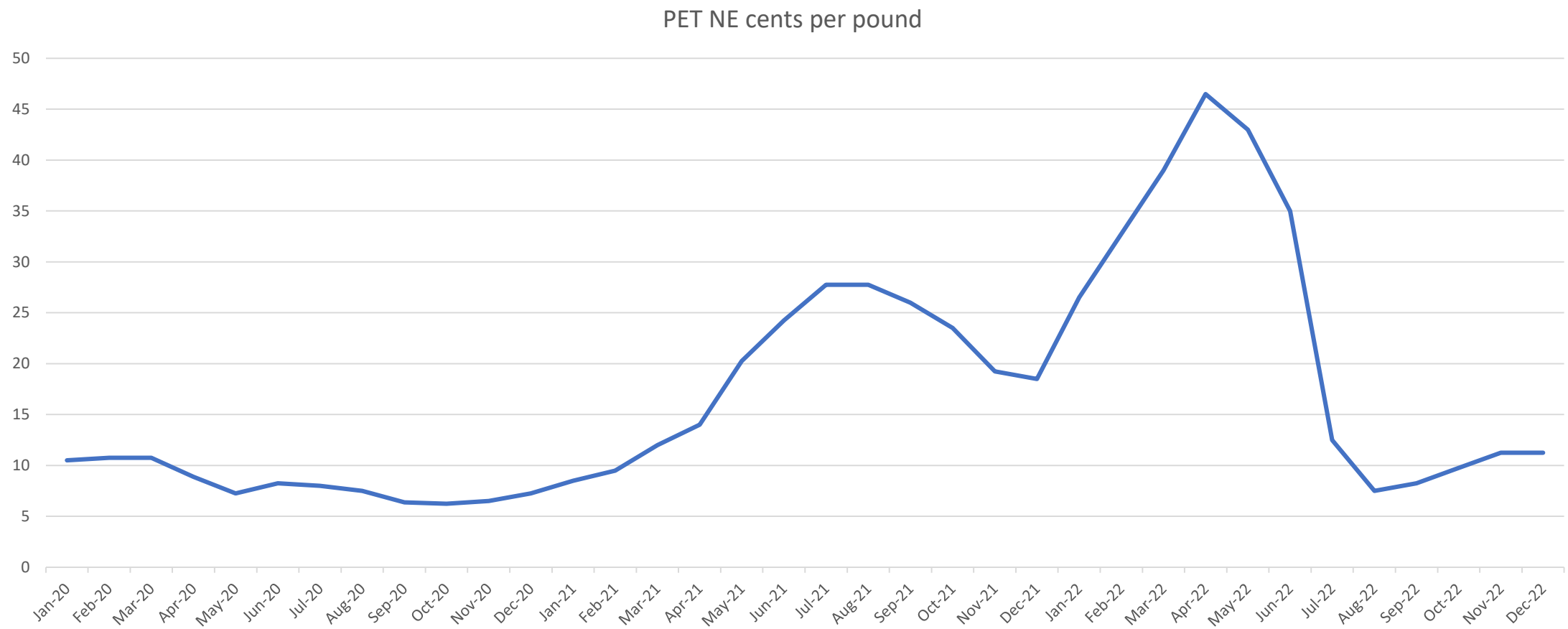
RAW MATERIALS LOOKING FOR BUYERS

nHDPE NORTHEAST
JAN 2020 – DEC 2022



PET NORTHEAST
JAN 2020 – DEC 2022



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EXPORTS

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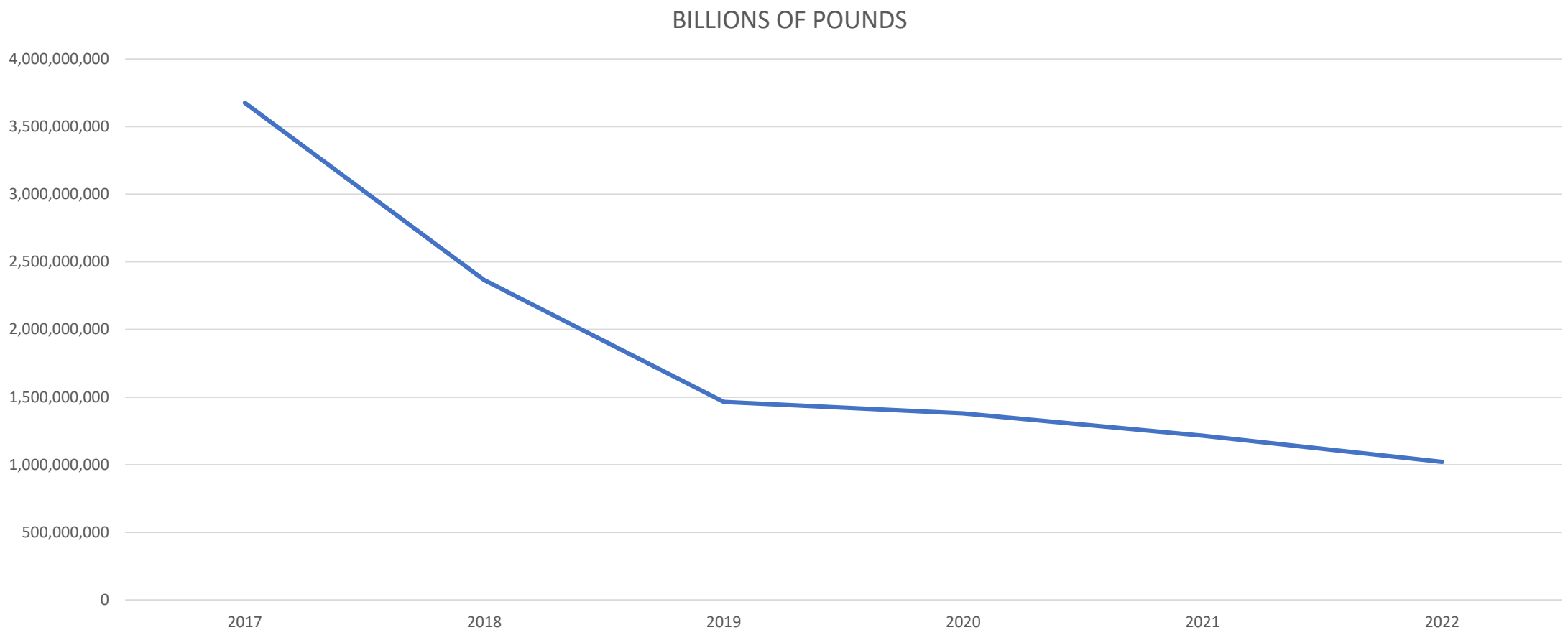
RECYCLED PLASTIC EXPORTS



EXPORT MARKETS MYTHS

MYTH: the U.S. dumps its trash on other countries

- FACT: Virtually all US garbage stays in the states
- FACT: Paper and metal recyclables have been exported for decades without controversy
- FACT: US PET & HDPE exports declining since 2010 as domestic markets increased
- FACT: some unscrupulous recyclers do salt bales with non-recyclables but that is uncommon.

RECYCLING MARKET TRENDS

Recycled plastic demand is high based on “commitments” to use recycled content

Recycled plastic supply is incapable of meeting those commitments.

Those commitments can be constrained by overall raw material costs.

Economic trends important:

- Is the economy growing or contracting
- Do end markets need more or less raw materials
- Infrastructure Act should be good for some recycled plastics

Competition with virgin resin which is usually less expensive

Recycling resin prices are affected by Brent and Henry Hub

BARRIERS TO PLASTIC RECYCLING

Lightweight

Wide range of products

Wide range of resins

Wide range of colors

Resin composition changes due to new chemistry & technology

Harder to recycle than paper or metals

Fluctuating markets

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HOW DO WE FIX PLASTIC RECYCLING

POLICIES TO INCREASE RECYCLING: DEMAND SIDE

Recycled content either as part of EPR or standalone

- Few states with laws, fewer in effect

Government procurement requirements

POLICIES TO INCREASE RECYCLING: SUPPLY SIDE

Mandatory recycling

Bottle container deposits

- Ten states
- Highest aluminum, glass & PET recycling rates

EPR

- “Internalize” waste management costs
- Packaging laws common in Europe
- Four states passed laws, none implemented until 2025

MECHANICAL OR NON-MECHANICAL ("CHEMICAL", ETC.) PROCESSING

"Mechanical" processing at the more than 375 "MRFs" in the U.S.

- Uses a variety of technologies to separate out different plastics for end markets

"Chemical" or "advanced" or "molecular" processing has potential to process a wider array of plastic products and resins

- Less than ten facilities are operating in the U.S.

Non-mechanical recycling needs to make the transition from papers and press releases into commercially-sized operating facilities

Is creating fuel "recycling"?

Facility siting often contentious

Industry promoting legislation to classify as "manufacturing" and exempt from waste regs

- 21 states have adopted

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MANAGING PLASTICS

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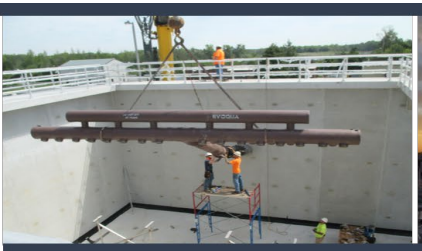
Part 2

PLASTICS: HERO OR VILLAIN WHEN WE MANAGE THEIR AFTERLIFE?

Bob Gardner, PE, BCEE
Senior Vice President
SCS Engineers
757-466-3361

January 11, 2023

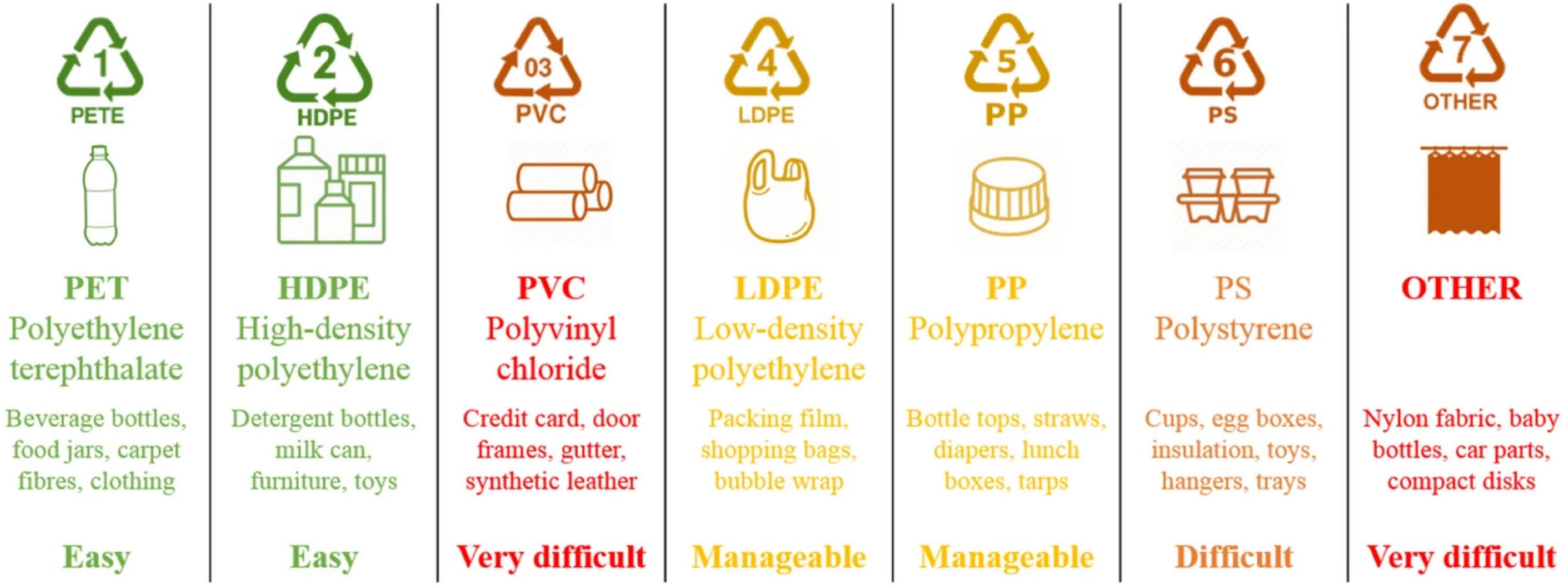





The Many Faces of Plastic

- Polyethylene terephthalate (PET #1 and #2)
- High Density Polyethylene (HDPE)
- Polyethylene (PE)
- Polypropylene (PP)
- Polystyrene (PS)
- Polyvinyl chloride (PVC)

The Many Forms of Plastic

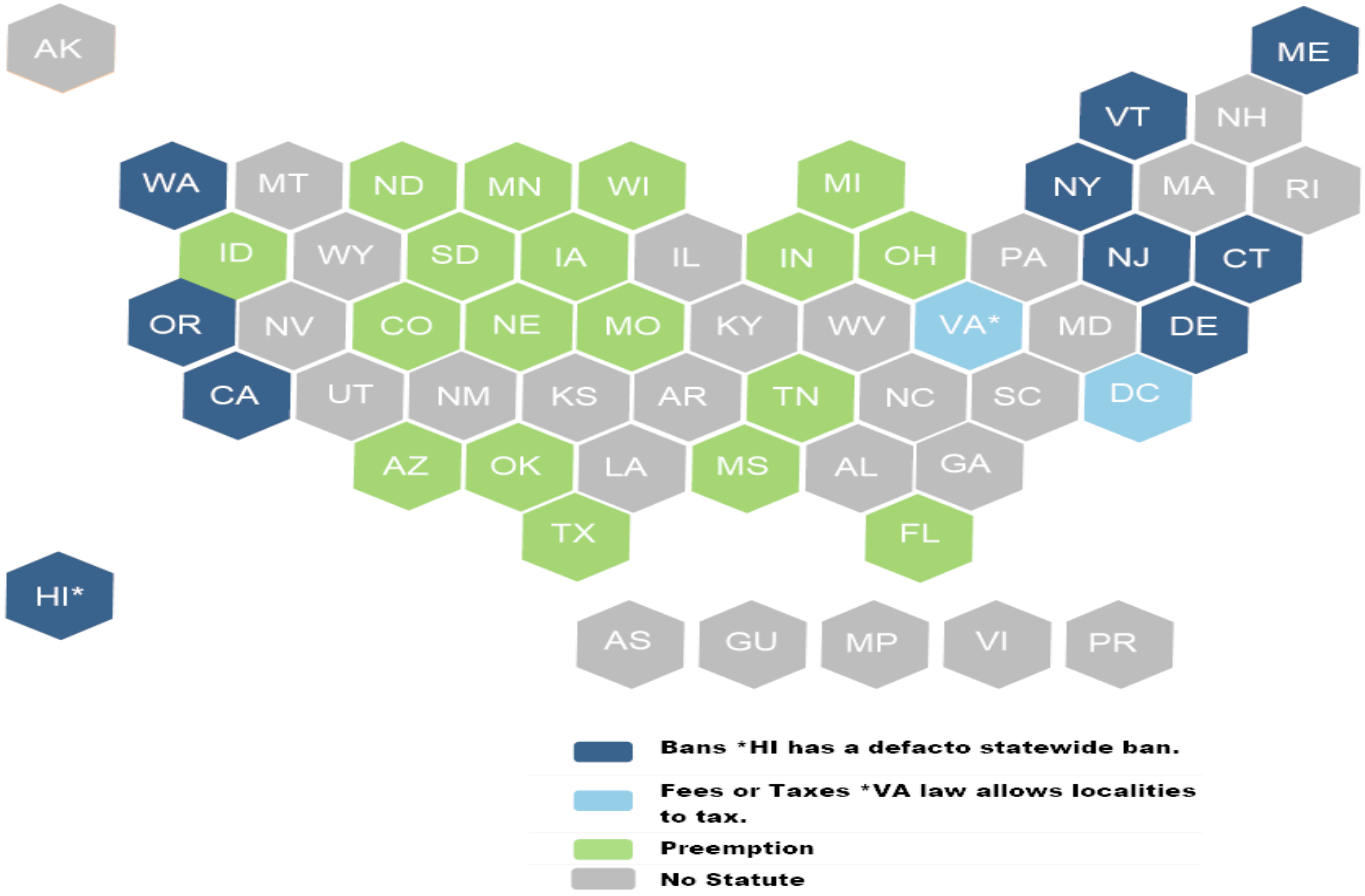


Source: Zaman, A., Newman, P. Plastics: are they part of the zero-waste agenda or the toxic-waste agenda?. *Sustain Earth* **4,** 4 (2021). https://doi.org/10.1186/s42055-021-00043-8

The Many Views of Plastic

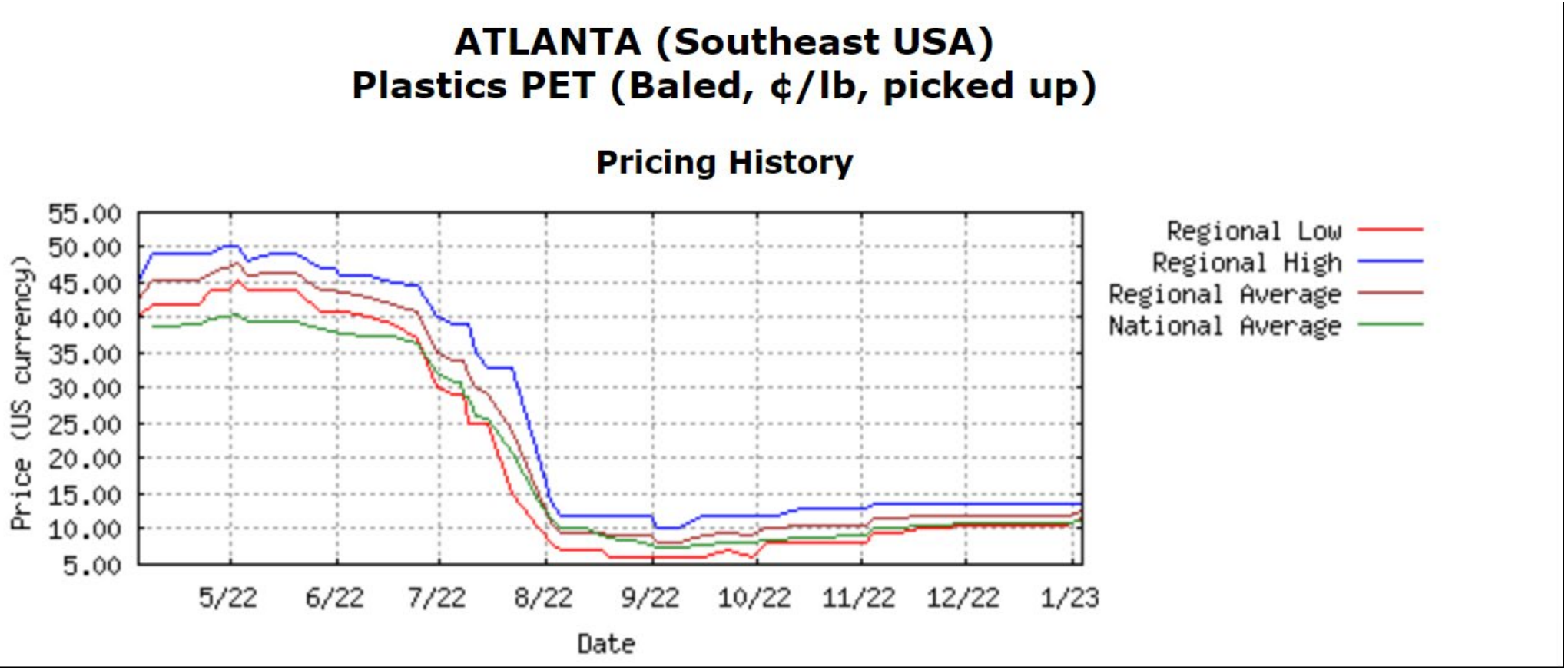
- It can and should be recycled/reused.
- It is too expensive to be recycled.
- It is environmental irresponsible to chemically recycle plastic.
- Plastics should be banned/limited or extended producer responsibility required.

Plastic Bans, Fees, Taxes

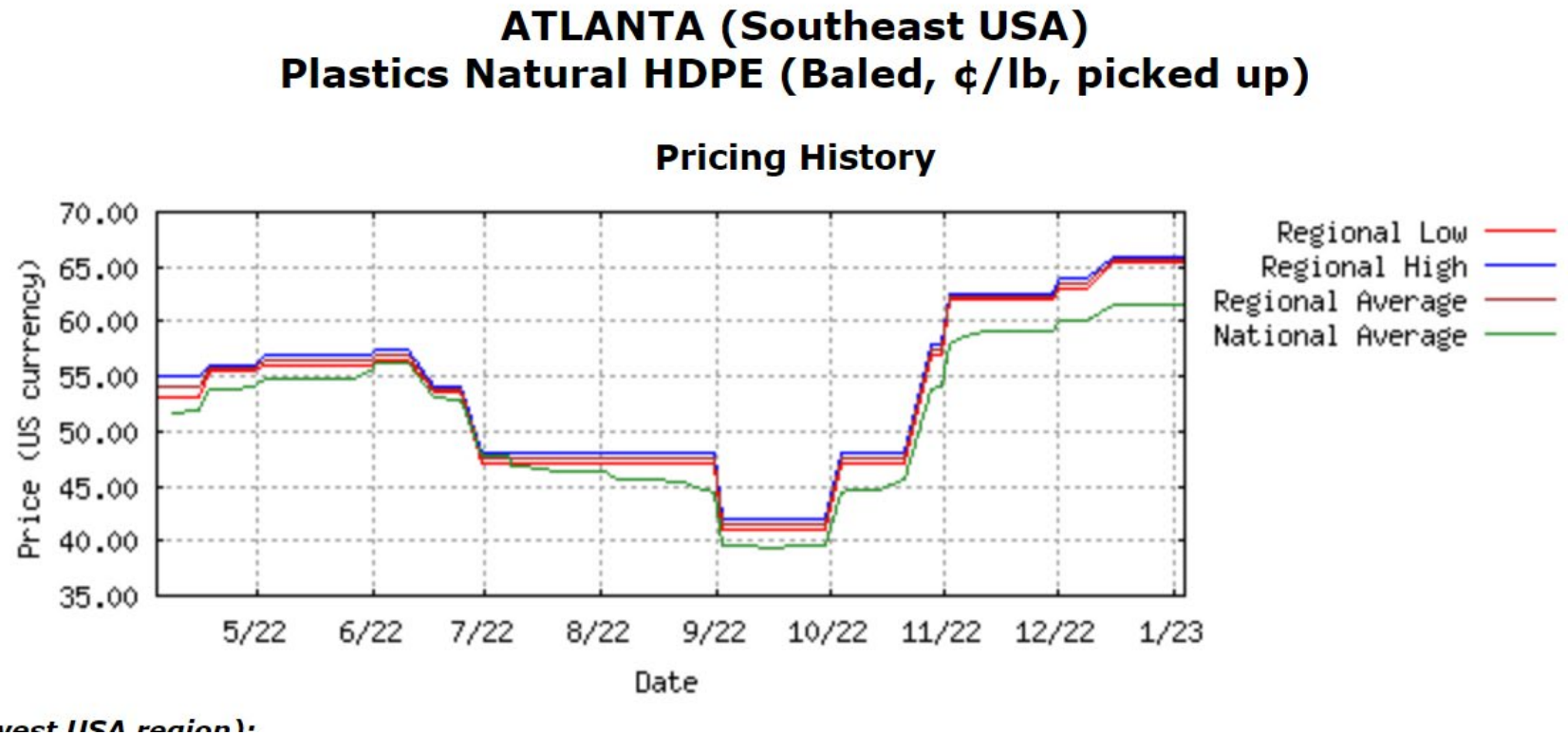


Source: https://www.ncsl.org/research/environment-and-natural-resources/plastic-bag-legislation.aspx>

Plastics Recycling Market – Highly Variable

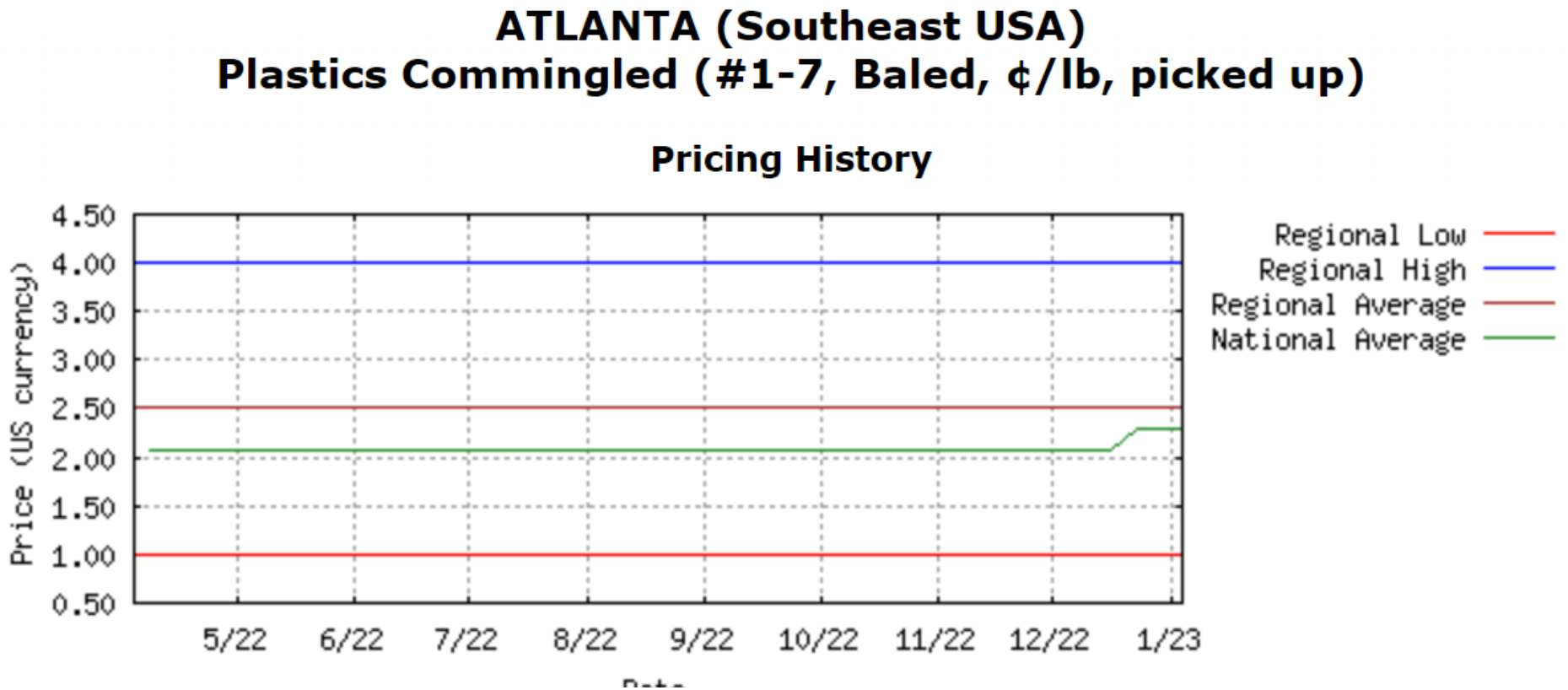


Plastics Recycling Market – Highly Variable



thwest USA region):

Plastics Recycling Market – Highly Variable



The Holy Grail of Plastics Recycling

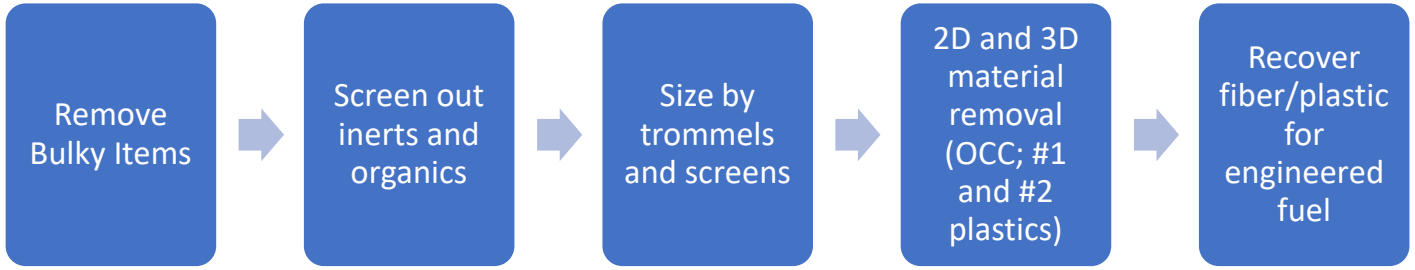
- End game: Quicker and more precise recovery of plastics by material composition, color, clarity, opacity, and form factor.
- Approaches
  - Mechanical separation
  - Optical sorting combined with artificial intelligence

Technologies

- Most the major equipment manufacturers employ various processes to segregate by size and material type:
  - Size segregation (trommels and screening)
  - Manual separation (both negative and positive sorting)
  - Shredding (various points in the process)
  - 2D-3D sorting
  - Optical sorting (plastics and fibers)
  - Robotics (positive and negative sorts, e.g., removal of PVC for pyrolysis)
  - Pneumatic separation (combined with optical)

General Process and Goals

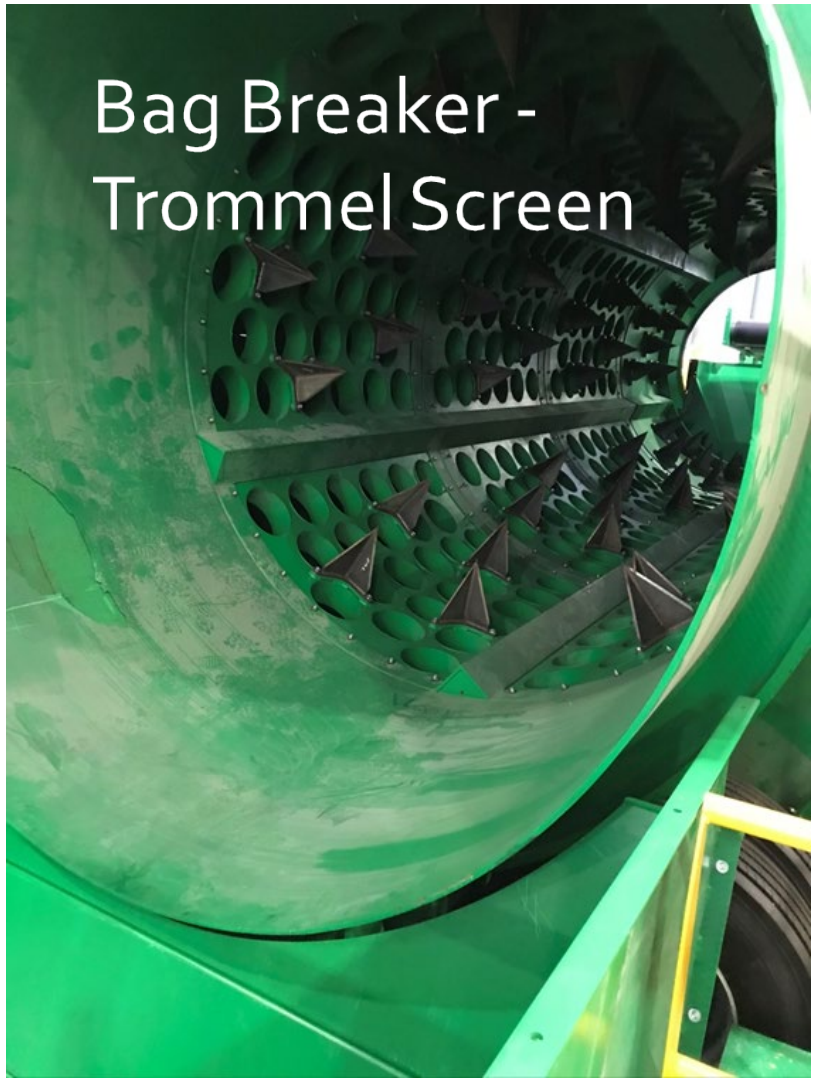
- Engineered Fuels
- Typical MRF recovery sequence:



- General goal: 94% to 96% efficiency for capture of targeted materials, with 92% purity of targeted capture material


Climate Controlled Sorting Stations

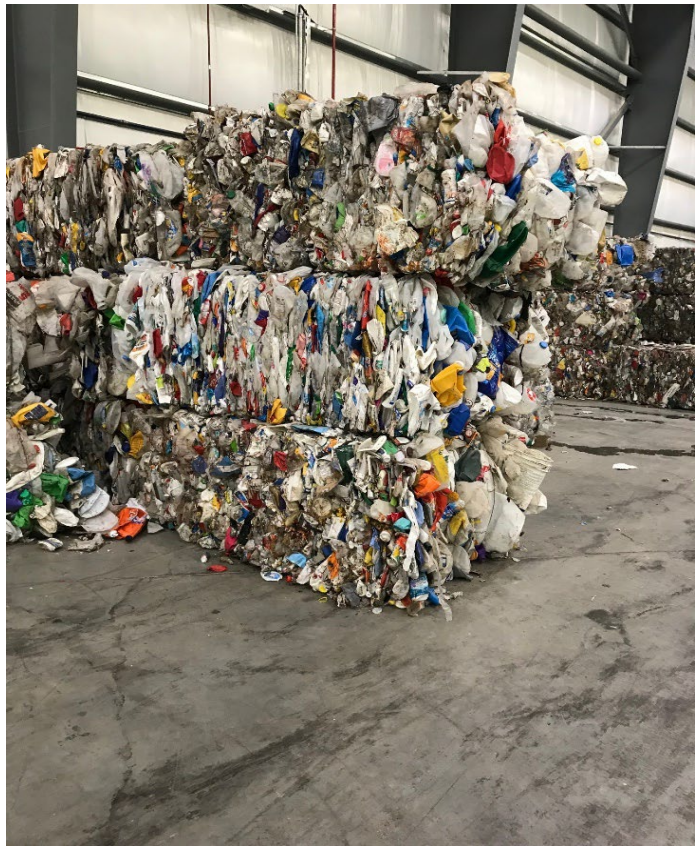

C101
CP Group Front-End MRF


Bag Breaker -
Trommel Screen

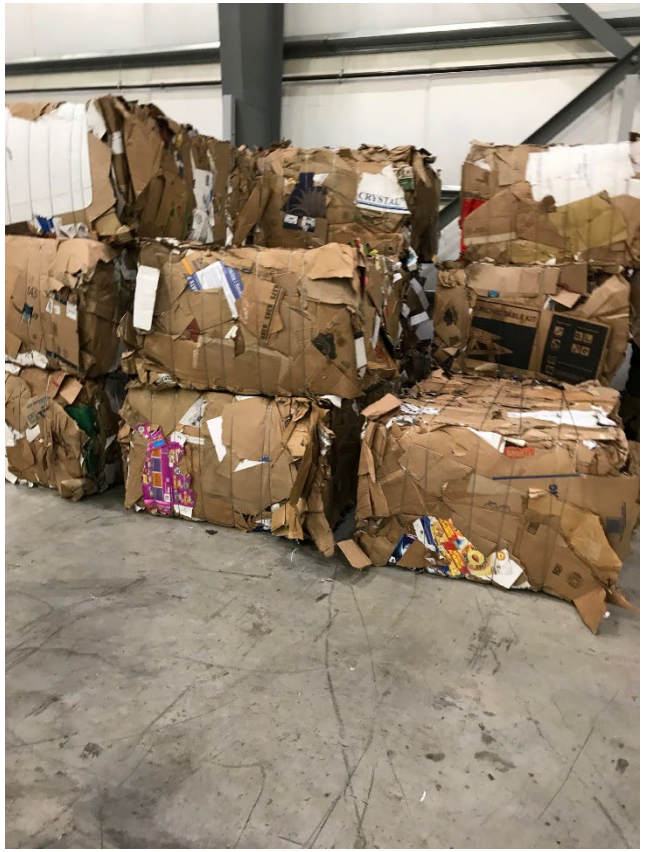

Disc Screen

Plastics Optical Sorter

Products



Plastics Bale



OCC Bale

Products

Engineered Fuel - Plastics

Cellulose/Pulp
Engineered Fuel or Pulp Feedstock

What are processors doing?

- The challenge: Falling blended commodity values in 2022.
  - Q4 2021: $132/ton (WM)
  - Q3 2022: $94/ton (WM)
  - Expected Q4: $50/ton (WM)
- Move away from commodity price-driven returns and into fixed processing fee
  - Covers processing costs more reliably
  - Provides more consistent revenue streams to weather ups and downs of the market
- Employing more technology, artificial intelligence and robots

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