“Love It” or “Leave It”:
What is the Real Story on Glass?

THINK GREEN®

SWANA - Illinois Chapter

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WASTE MANAGEMENT

WM Recycling Services

88%

Increase in amount of recyclables managed since 2007

15M

Tons of recyclables extracted from the waste stream

100

Materials recovery facilities owned/operated by Waste Management (12/2015)

WM has invested over $1 billion in its recycling infrastructure

Glass recycling overview

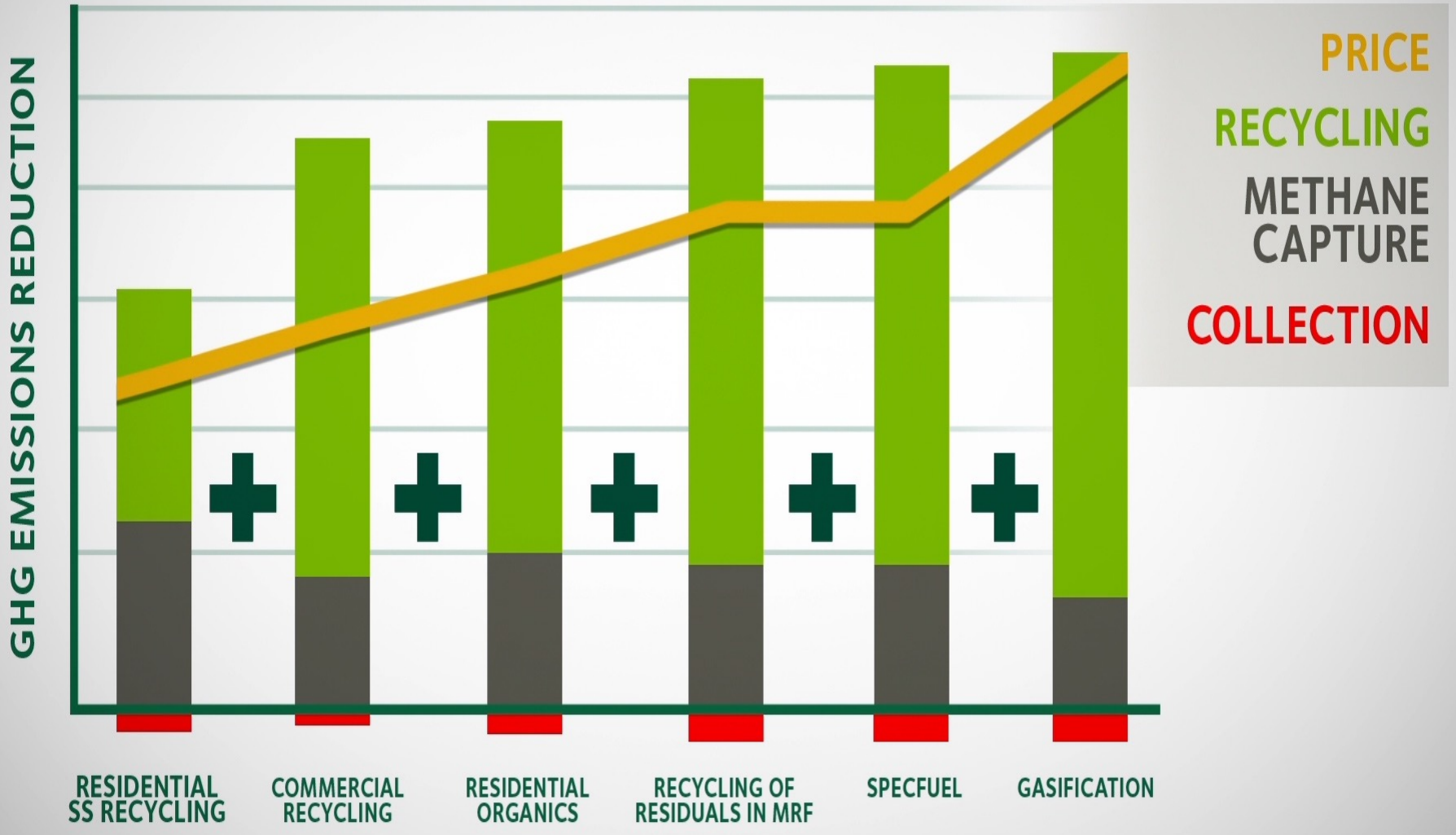
- **Glass makes up 4.5% of the overall waste stream and 13.1% of material recycled (US EPA 2013).** Glass plays in important role in achieving recycling goals.
- **Glass makes up 18% of the MRF stream.** As material has become lighter, glass makes up a higher percentage of the MRF stream.
- **Glass beneficiation.** Glass flows from MRFs to beneficiation plants for sorting, crushing and cleaning before delivery to the bottle manufacturers. These are not located everywhere.
- **The inelasticity of glass supply impacts markets.** Constant supply from curbside collection combined with uneven demand creates imbalanced markets across the U.S.
- **Glass ingredients are plentiful and cheap.** Its primary ingredient is sand.

Industry efforts to create system-wide solutions

- **Recognizing the need for solution, a new "Glass Industry Coalition" recently formed to help find solutions for glass recycling**
- **This coalition includes:**
  - Recycling collectors
  - MRFs
  - Glass beneficiators
  - Glass bottle manufacturers
  - Brands (the beer and alcohol industry who use 75% of all recycled cullet in the U.S.)

Companies across the supply chain are working to develop sustainable solutions for glass recycling

RECYCLING DRIVES SIGNIFICANT REDUCTION OF GHG



WASTE MANAGEMENT

"BEST IN CLASS" PAPER RECYCLING DRIVES GREATEST GHG REDUCTION

GHG BENEFITS

GLASS

PLASTICS

METAL

PAPER

RECYCLING

WM
WASTE MANAGEMENT

GHG REDUCTION (in $MTCO_2e$ per ton of material)

Glass market flow

- Over 50% to beneficiation (bottles and fiberglass).
- Other 50% to construction aggregate, and landfill road bed and cover
- End users of glass (75% are beer/alcohol brands) will not pay more for bottles with recycled glass. This puts the burden on generators (cities/residents) to cover the cost of recycling glass.

No one is willing to pay more for glass.
More cost invested does not lead to more revenue for glass.

Collection - most expensive component

Curbside collection

- ✓ Collection costs make up over 60% of the integrated cost of MSW/recycling programs.
- ✓ Collection costs for glass (curbside) collection are $100-150/ton.

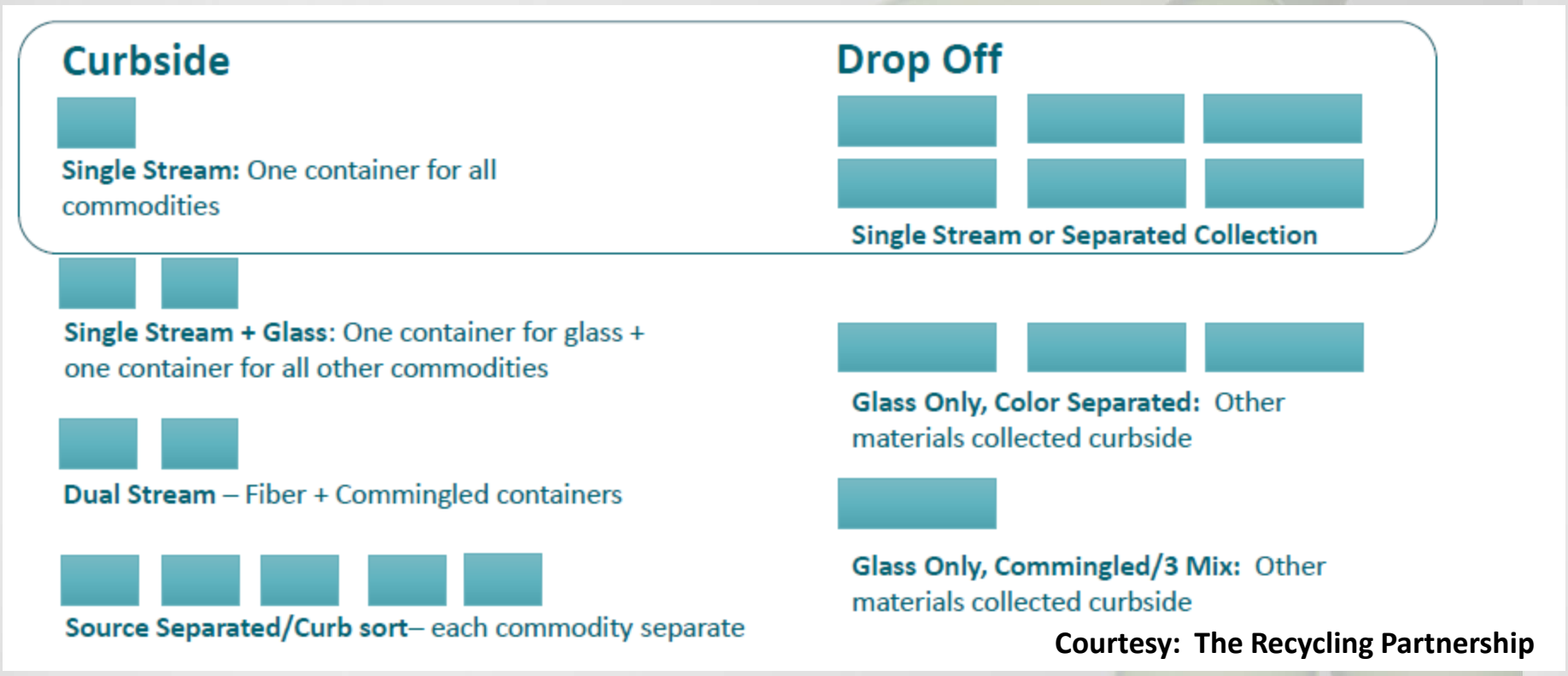
What costs goes into collection

- ✓ Trucks, equipment
- ✓ Employees
- ✓ Insurance, Workers Comp
- ✓ Fuel
- ✓ Maintenance
- ✓ Possible tip fee

Other costs/expenses

- ✓ Glass is abrasive and hard on equipment, including truck beds and recycling belts.
- ✓ It contaminates other recyclables, reducing the value of higher quality commodities.

What types of collection systems are available?



More volume/lower quality

Less volume/higher quality

1. Separate curbside collection of glass

Portland, OR

- **Glass is collected in separate containers and separate trucks in Oregon.** This increases the cost of recycling collection but minimizes glass recycling challenges due to contamination.

- **Oregon has a container deposit system for some types of bottles**. They also have been heavily influenced by PNW paper markets to keep glass out of single stream programs.

2. Subscription Collection

Salt Lake City, UT

Momentum Recycling offers residents in Salt Lake City a subscription program for separate glass collection. For an additional $7/month, residents can set out a 35 gallon cart provided by Momentum Recycling. Momentum processes and markets the glass for recycling.

Separate drop-off locations are also provided for no additional fee.

3. Drop site collection

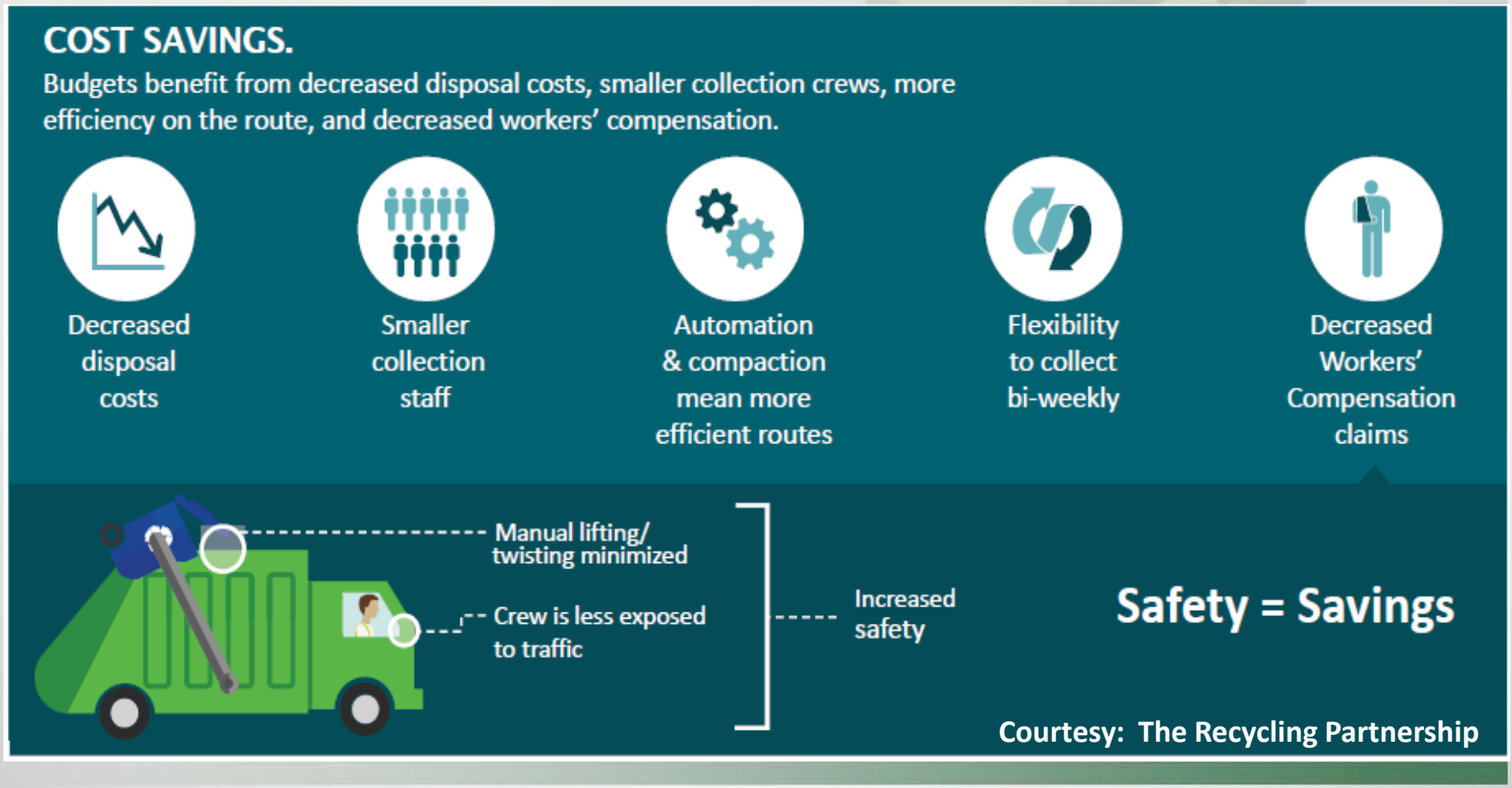
Kansas City

- Ripple Glass opened its processing plant in Kansas City in 2009.
- Glass is collected at 100 drop off sites in the Kansas City area.

- Momentum expects to recycling ~37,000 tons/year of glass in Kansas City, for a 20% recycling rate (up from 5%).
- Glass hitting their facility has a 98% recovery rate (as opposed to 40% for single-stream & 90% for Dual-Stream)

4. Single Stream Collection

- **Convenient** = More participation, more tons collected
- **Cost effective** = Over 60% of recycling cost is collection. Single stream is least expensive
- **Safe** = safer for drivers

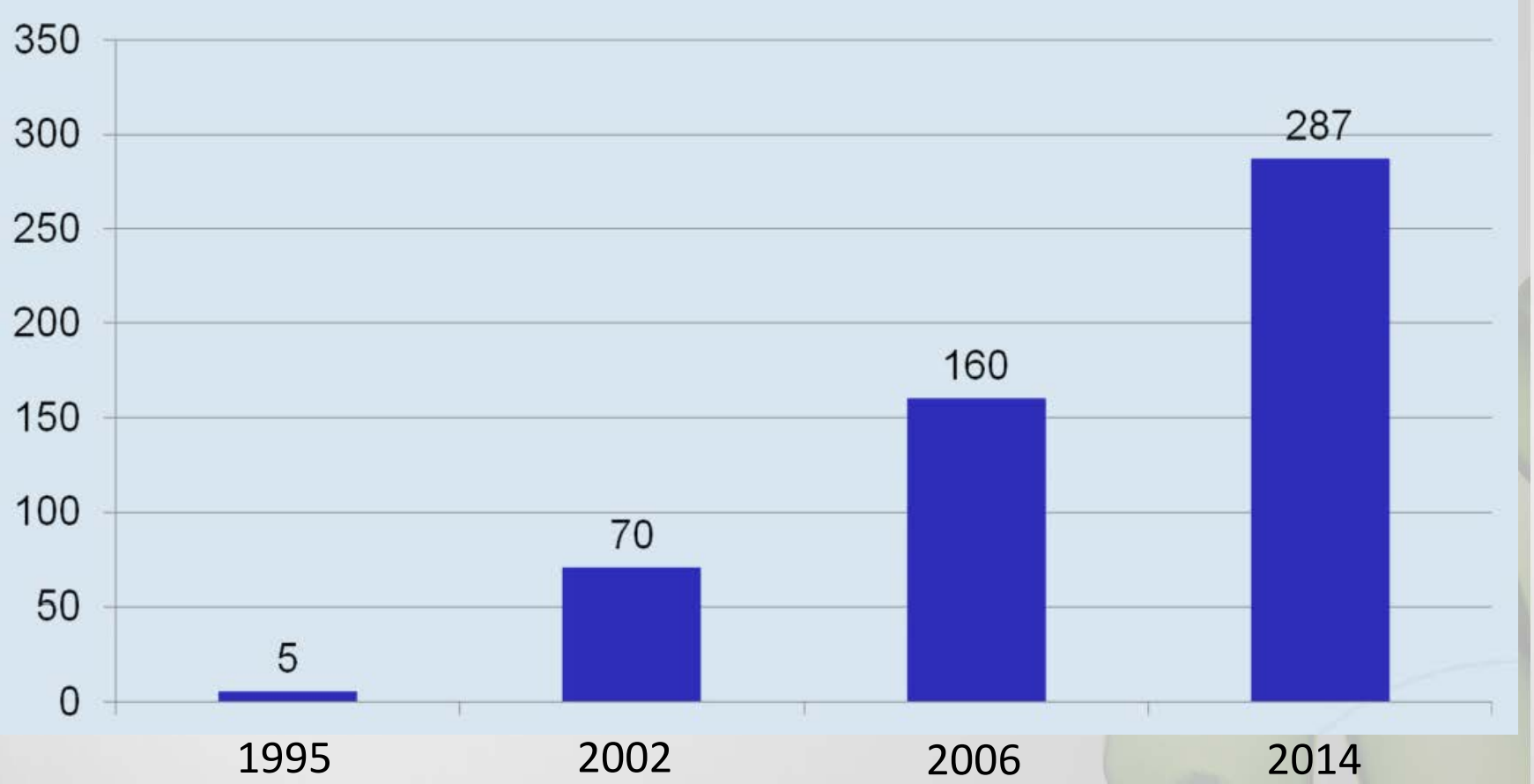


Single Stream Benefits

- **Minneapolis, MN** – Saved $250,000 in workers' compensation claims within the first year of single stream recycling collection
- **Olathe, KS** – Residential garbage tonnage decreased 8,000 tons after the first year of single stream cart-based collection.

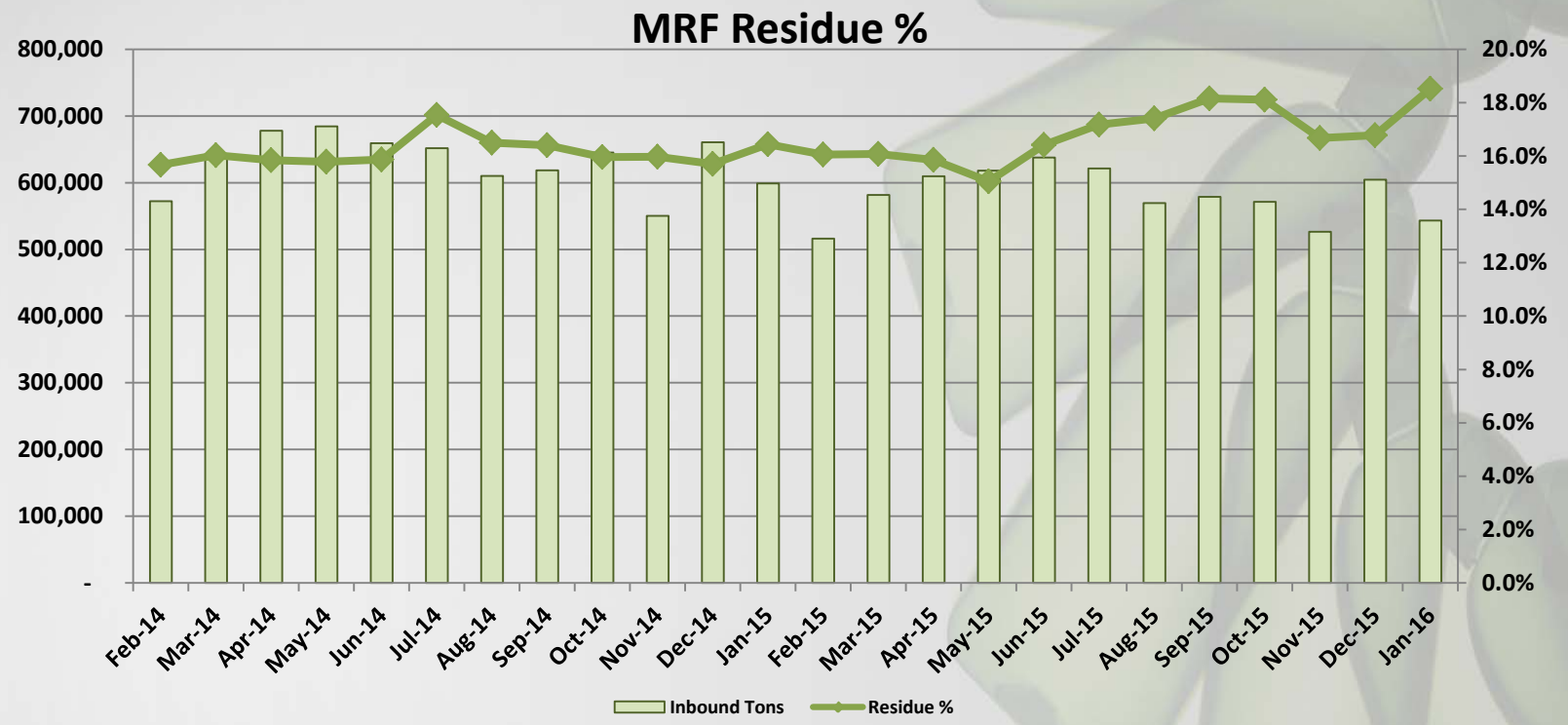
- **Orange County, NC** – Saved $200,000 annually through adoption of single stream recycling
- **Scarborough, ME -** $1.5 M in savings in garbage disposal since implementing single stream recycling 9 years ago.

Collection & processing go hand-in-hand Growth in Single Stream collection and



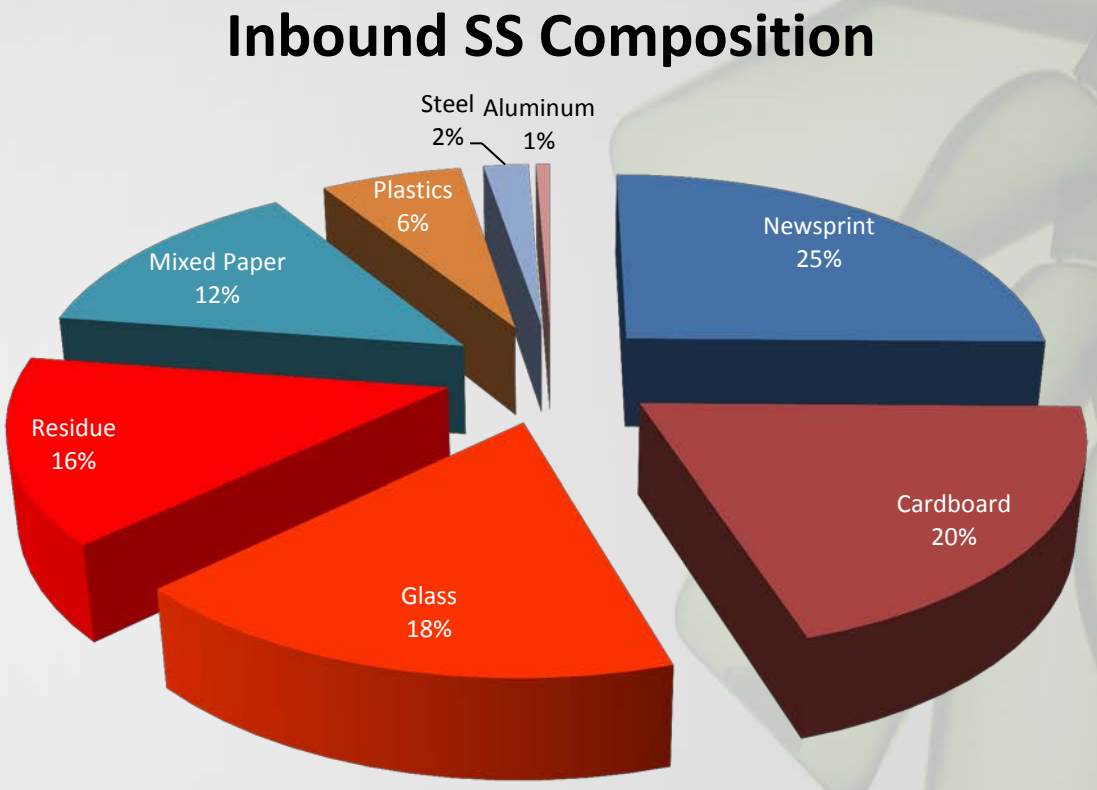
Source: Governmental Advisory Associates, Inc. Database of Materials Processing Facilities in the United States. Westport CT., 2015.

Single stream = increased contamination



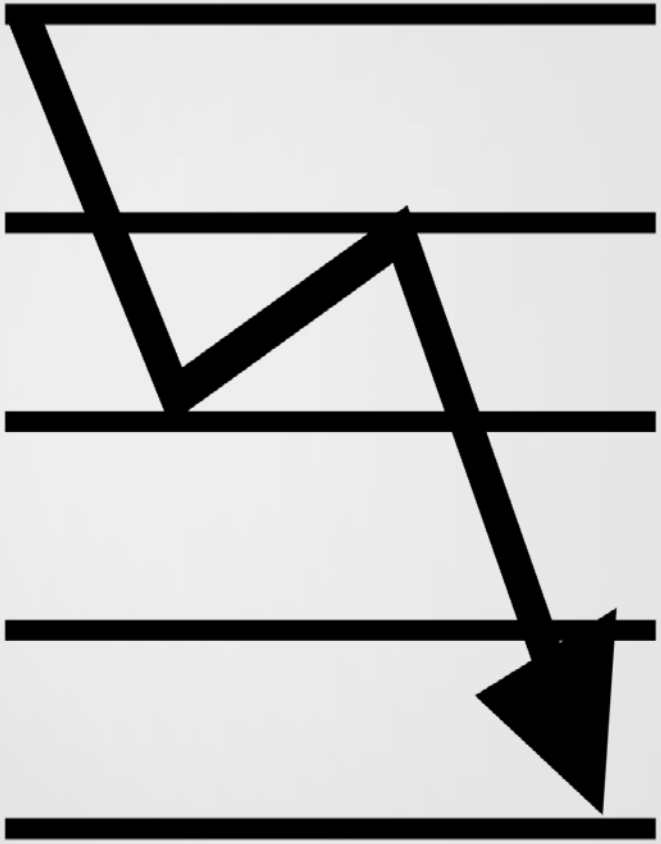
- Contamination of loads is an ***average*** of 16-19% of inbound tons and is increasing. Contaminated inbound increases outbound contamination.
- Contamination can be up to 50% of incoming loads
- Contamination cost an average of over $100 per ton
- Processing costs continue to increase as inbound contamination increases, material is “light weighted” and markets demand reduced contamination. This drives up cost to customers.

SS Inbound Materials – Stream is changing



- Fiber represents 60% of the inbound stream
- Residue is 16-19% of the inbound stream
- Glass makes up 18% of the material processed at our MRFs.
- **Over 30% Inbound material has negative value - Glass/Residue**

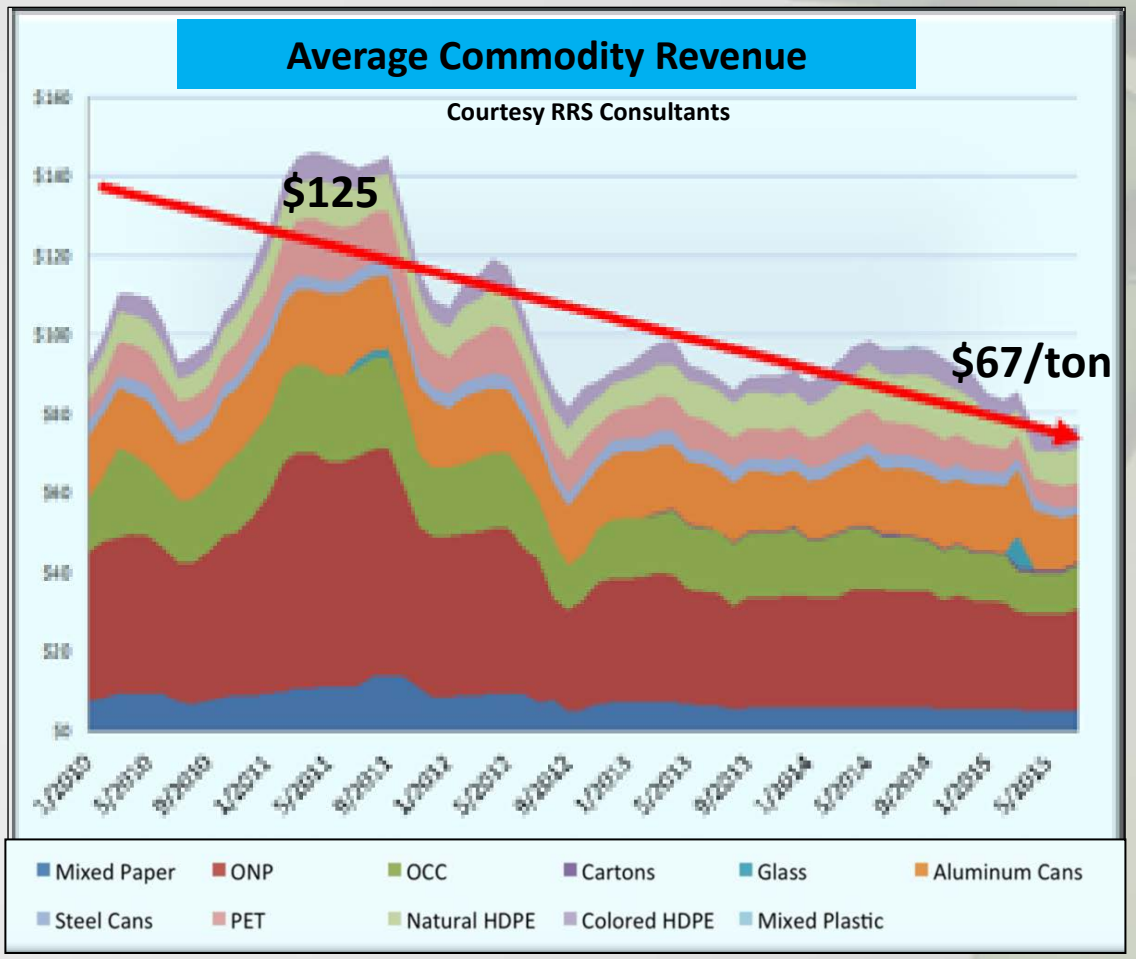
Challenging economics



A 4 plus year decline in commodity prices is driven by global market conditions - with no end in sight.

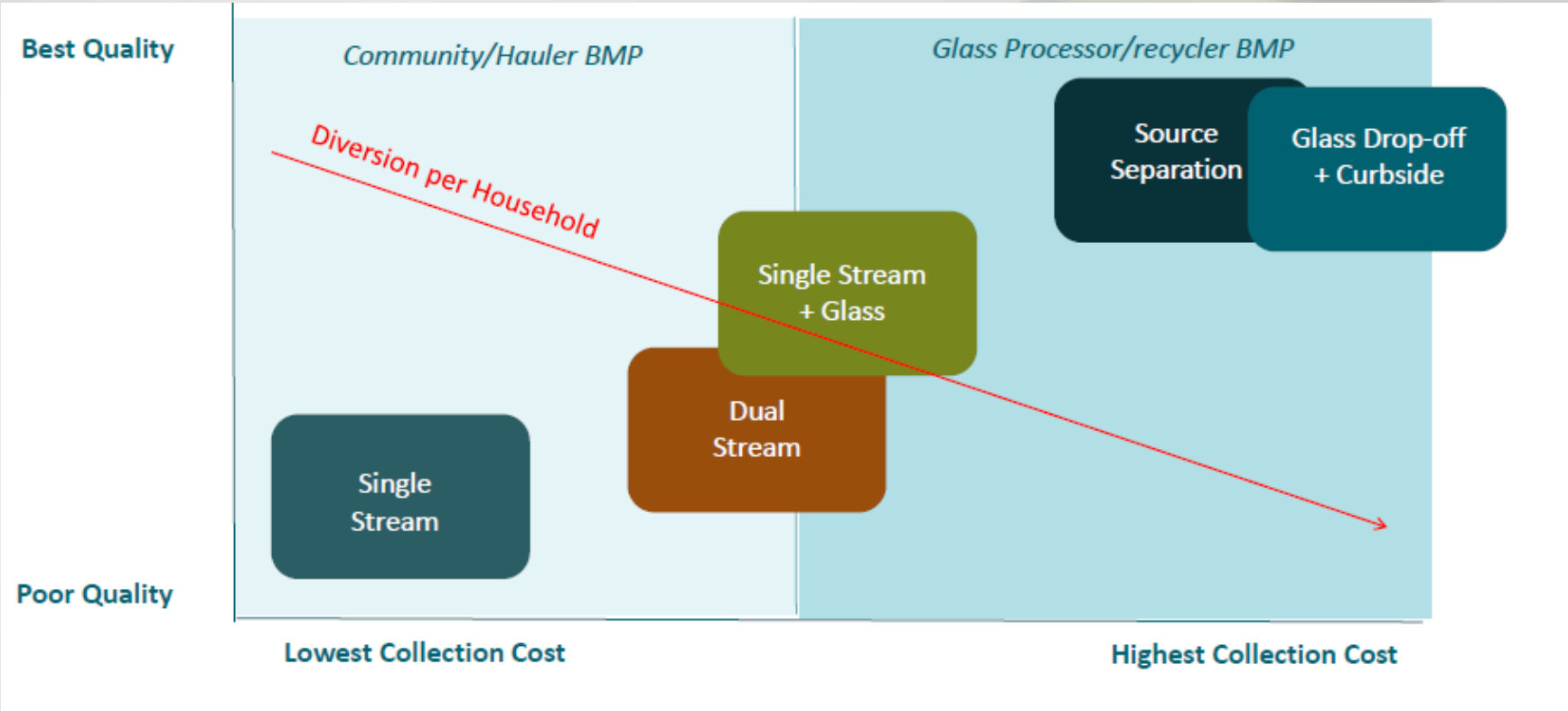
- Chinese economy
- Strong U.S. dollar
- Low oil prices

MRF Commodity Revenue Trends



- High commodity prices covered recycling challenges for many years
- Prolonged low prices have exposed inefficiencies and flaws in our historic residential recycling business model.

Solutions will vary by community



Single stream collection requires singles stream MRFs.

There are tradeoffs between the cost savings associated with single stream collection and the more expensive, sophisticated equipment needed to process this material.

Summary

- **There is no single solution for persistent glass recycling challenges**.
  - ✓ Changes are necessary at each point along the supply chain.
  - ✓ Even though there may technically be sufficient demand for acceptably processed cullet by the glass bottle and fiberglass manufacturing industry, supply and demand of specific colors do not always balance by geography.
- **Municipal contracts are beginning to reflect the cost of recycling glass**. With low commodity pricing for all materials, each must stand on its own. The high cost of recycling glass has been elevated through these efforts.
- **As the cost of recycling glass increases, communities are moving towards alternative collection methods for glass.** These decisions are made for the health of their overall recycling programs.