Carbon Emissions Reduction Priorities from Materials Management Strategies

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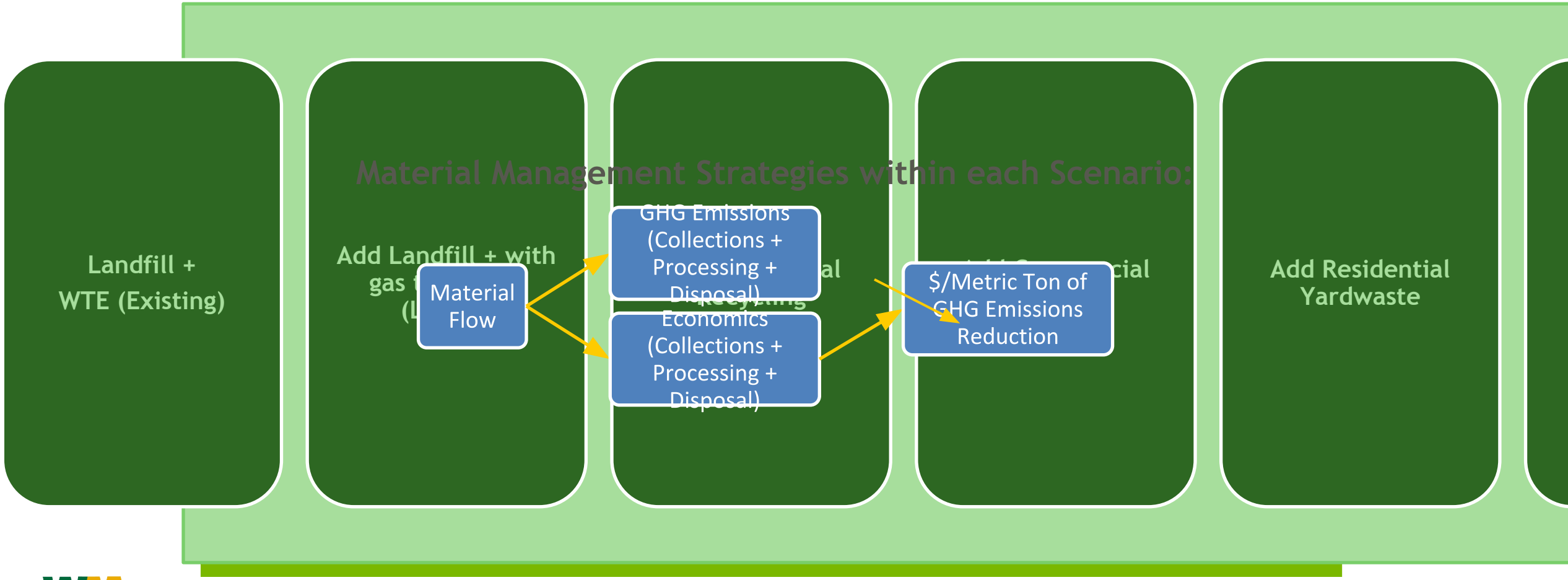
Project Overview

Scenarios



Assumptions within each Scenario

- US EPA 2014 Facts & Figures (254 million tons generated)
- Used 69 state & local waste char. studies to split by generator & material type
- Best practice recovery rates

- US EPA WARM Model
- GHG emissions reductions as proxy for Environmental Performance (availability + common understanding -> best single metric)

- System-wide economics
- National average disposal cost
- WM collection & processing cost
- 10-year average commodity values
- Excludes incentives (Bottle Bill, RIN, REC, LCFS, etc.)

WM
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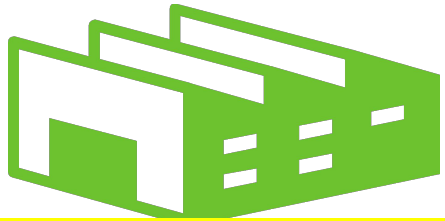
Scenarios



Landfill performance

- **Base case: National Avg. LF** 72% of MSW tons to landfills with LFGTE, 13% flare and 15% to LF with no LFG capture
- **Best Case Landfill scenario:** 100% of MSW to landfills with LFGTE. 75% gas capture.

Source Separated Collections

- **RSS (Residential SS):** Best practice residential single stream recycling of paper, cans and bottles
- **CSS (Commercial SS):** Best practice commercial SS recycling of paper, cans and bottles
- **YW:** Best practice YW composting
- **FW:** Best Practice composting / AD of Foodwaste.

Post Collection Processing

- **RMRF (Residual MRF):** Process all residual tons after recycling
- **Gasification:** All suitable post-recycling residuals material to gasification

Landfill + WTE (Existing) → Add Landfill + with gas to energy (LFGTE) → Add Residential Recycling → Add Commercial Recycling → Add Residential Yardwaste → Add Foodwaste → Add post recycing residual recycling → Add Gasification

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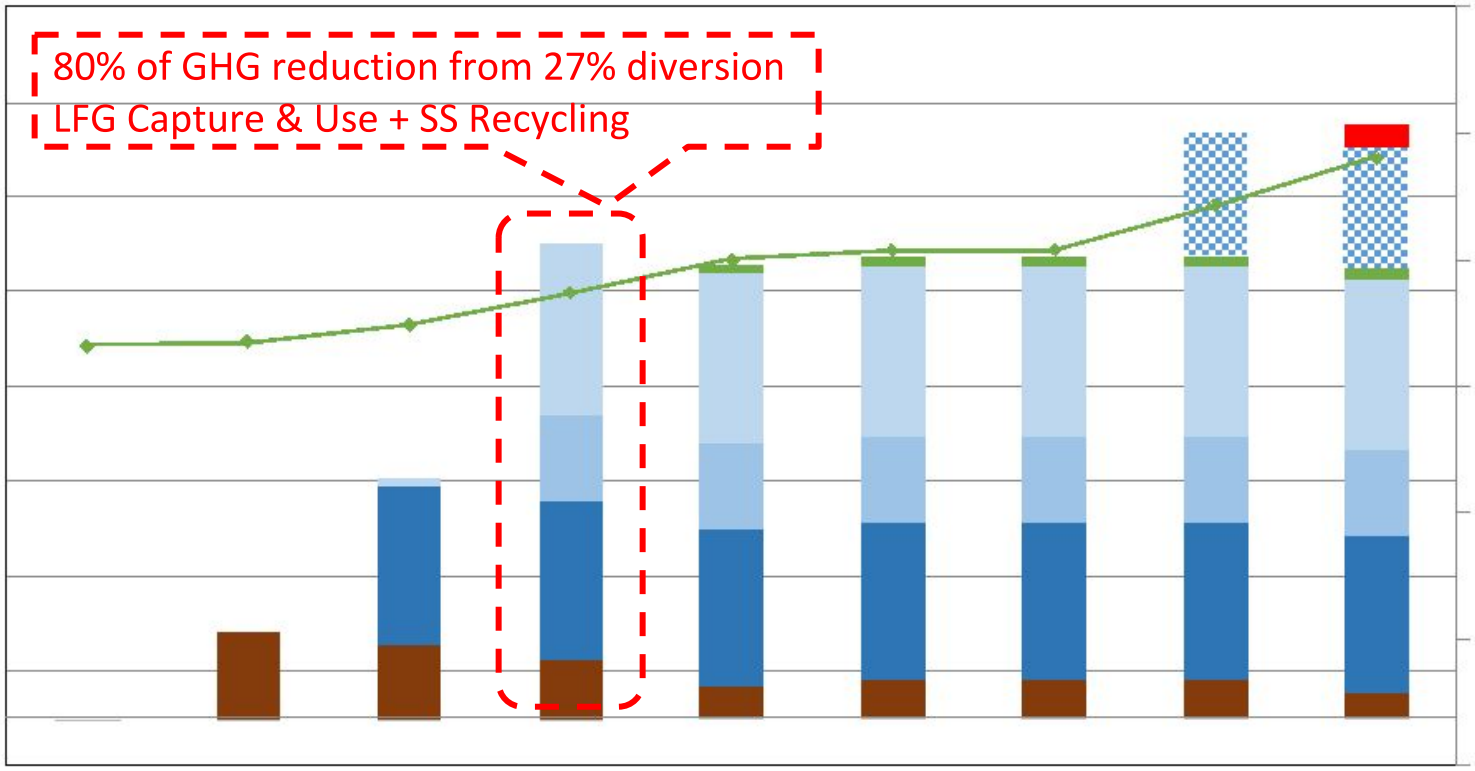
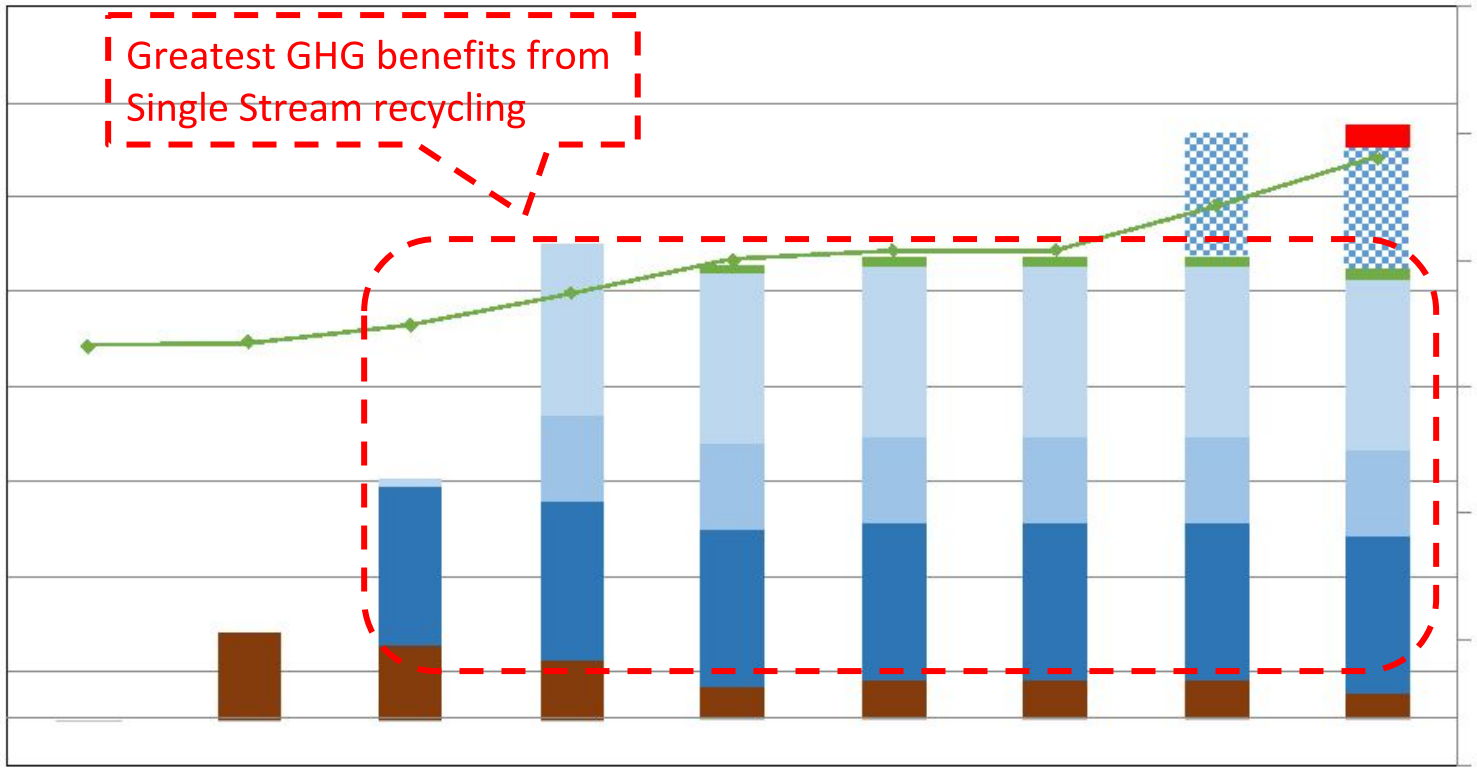
Spectrum: 80% of Emission Reductions from 27% Recycling



- Scenarios build upon each other
- 80% GHG benefit from aggressive LFG capture & use + recycling 27% of MSW
- More processing = high incremental cost for low incremental GHG reduction

Spectrum: Impact of Recycling



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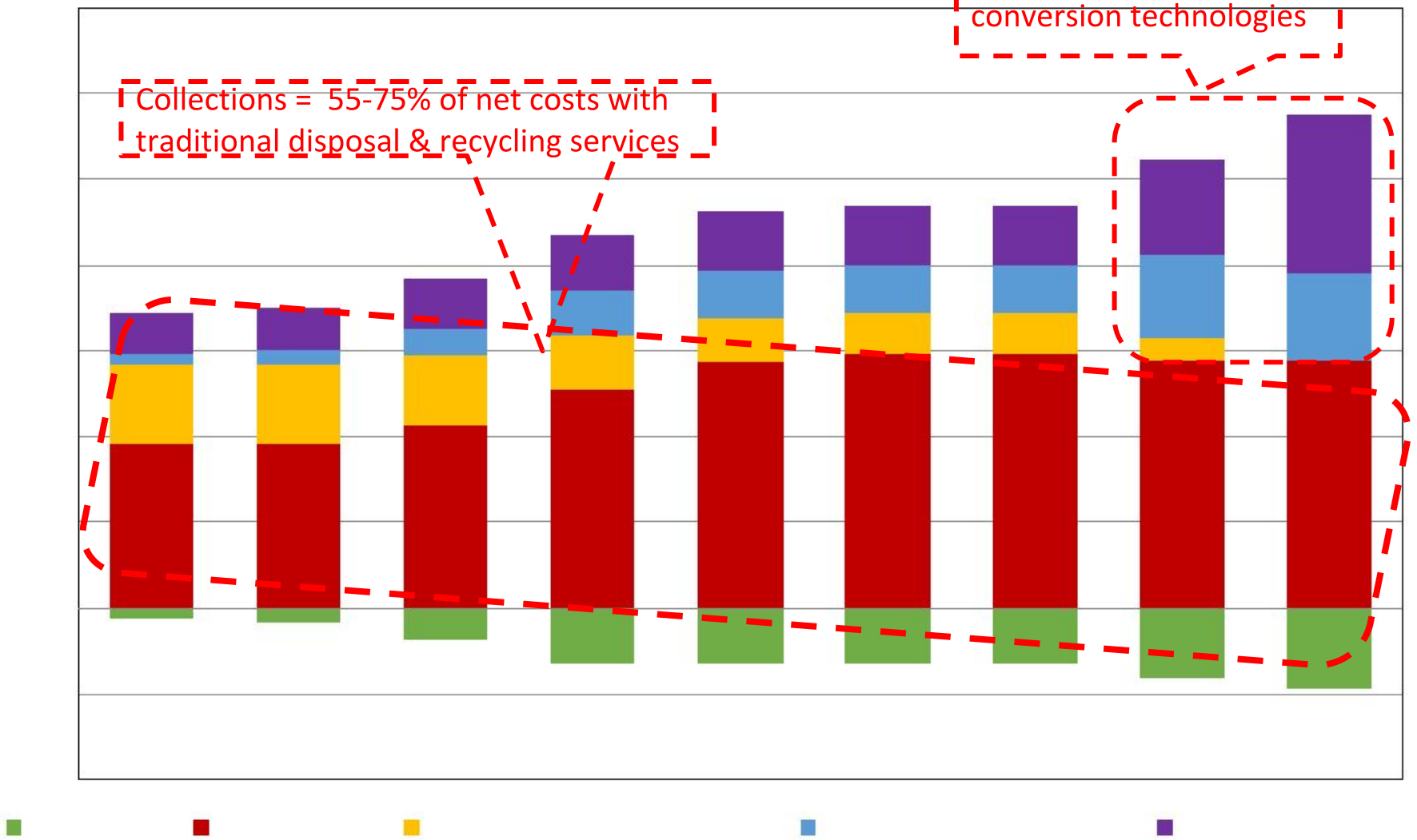
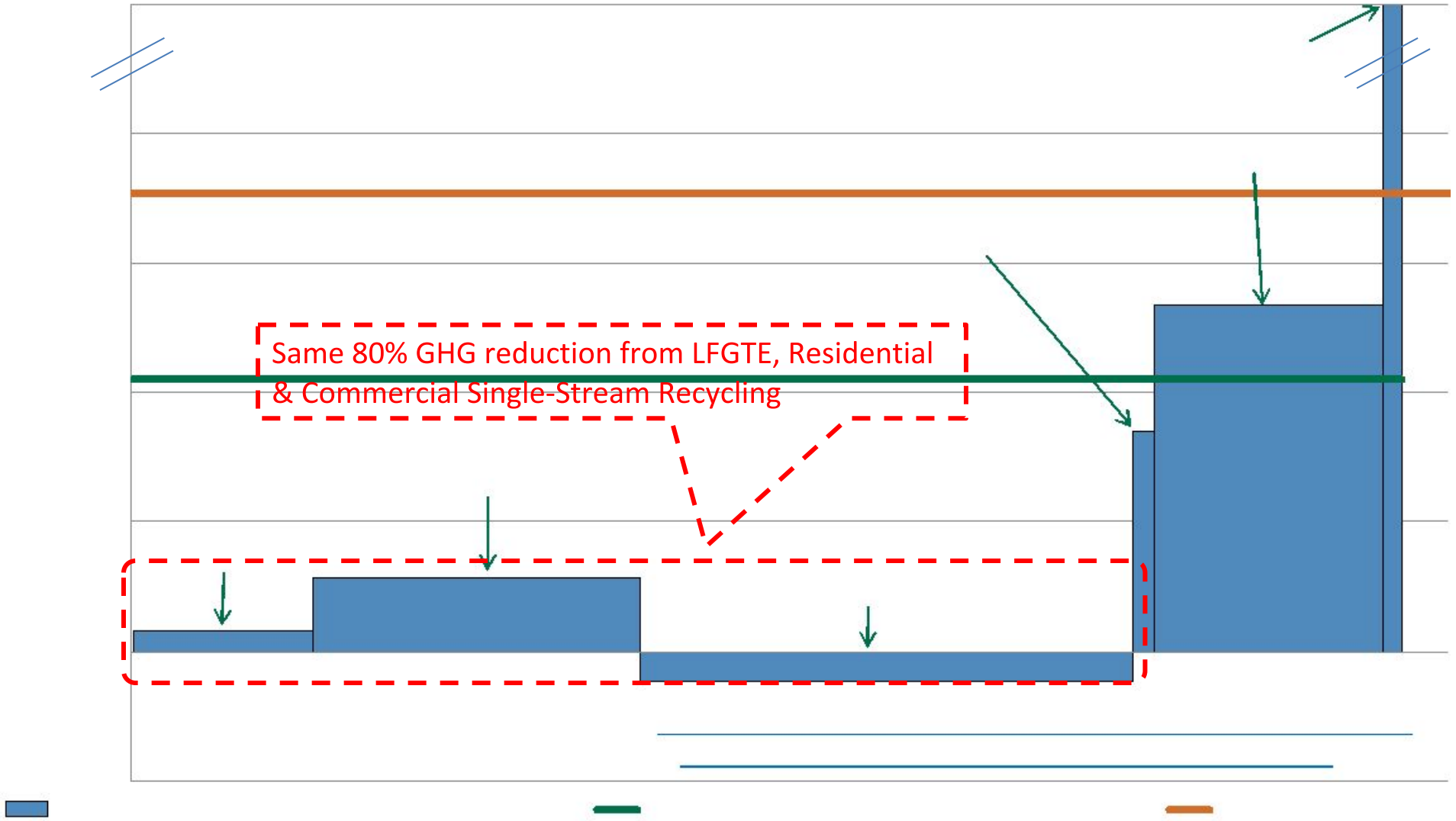
Price Breakdown by Category



- Collections is 55-75% of integrated costs until post processing options
- Infrastructure cost of new technologies is very high
- Commodity revenue is based on 10-year average blended value

GHG Cost Abatement Curve for the Environmental Services Industry



- Costs plus environmental benefits create a single metric = $/ton of GHG
- Width of bars is GHG reduction, height is cost of GHG reduction
- Also includes LCFS & EPA social cost of carbon as proxies

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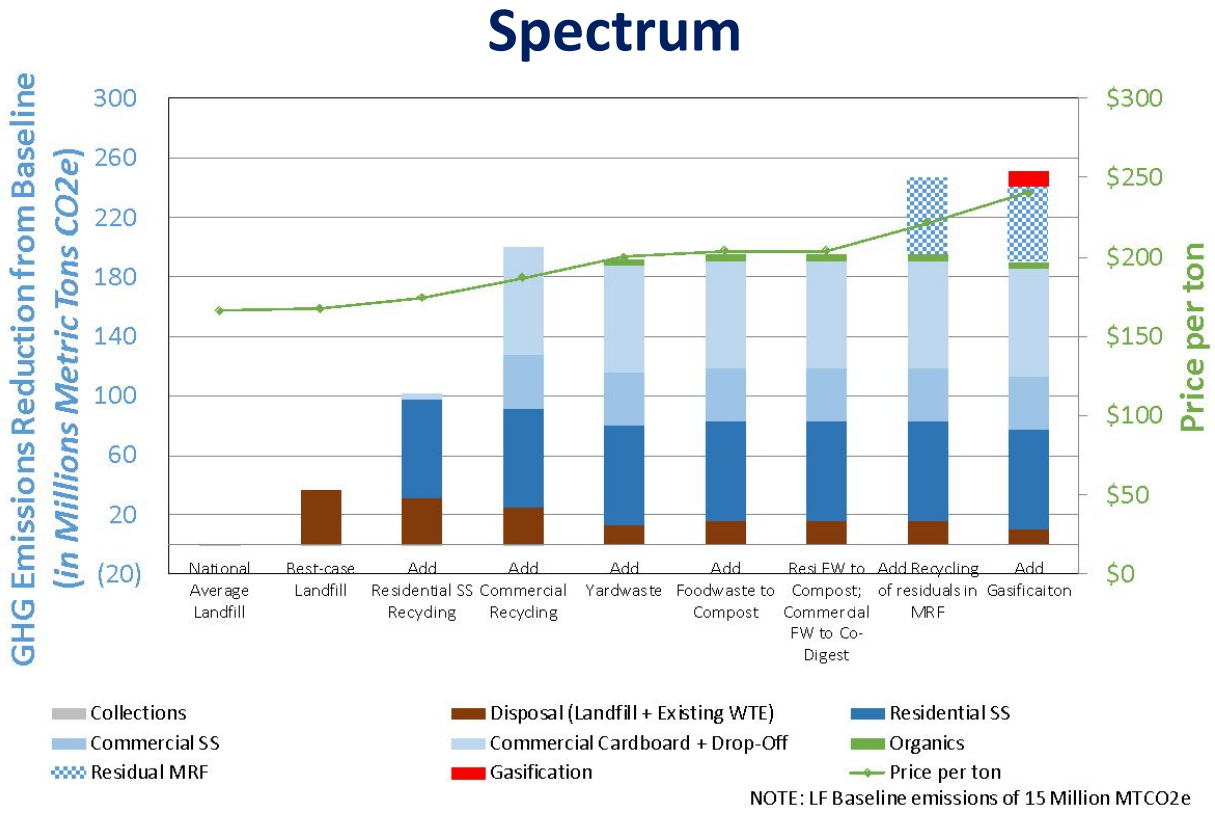
Summary

- Spectrum prioritizes programs and their impacts based on environmental benefit and cost.
- Reduction Rules! Reducing the use of virgin materials will always provide the best environmental impact.
- Recycling the right things really well reduces emissions by 80%
- Prioritizing efforts can help to focus limited resources



- Communities make investments in programs according to local policies. Spectrum can be used as guidance for cities and businesses in their incremental program development.