U.S. EPA Solid Waste Greenhouse Gas Inventory: Summary of Stakeholder Input

January 12, 2017

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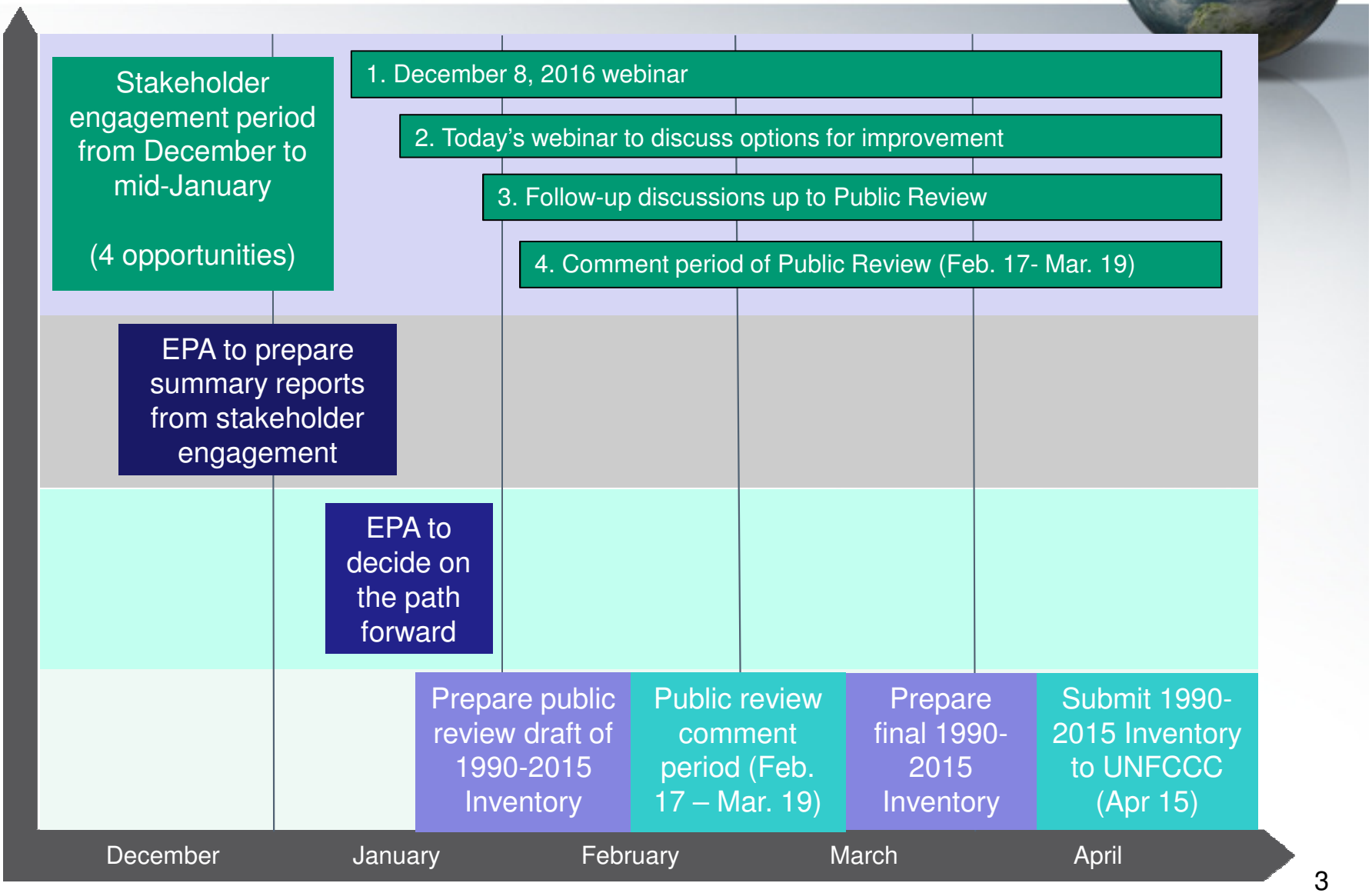
Agenda

- Recap of the December 8th webinar
- Specific areas for stakeholder input
- Suggestions and studies received
- Preliminary suggestions for consideration
- Q&A

Schedule of Events



Recap of the Dec 8th Webinar

- Discussed how the EPA accounts for landfill methane emissions (GHGRP and the Solid Waste Inventory)
- Reviewed in detail the data sources, activity data and emission factors for the Solid Waste Inventory
- Reviewed last year's Inventory, the differences between public review draft and final, and why methodology changes are needed.

Input requested

We asked for your input on the following:

1. Use of the GHGRP annual waste disposal data in methane generation equation
2. Use of the methane generation equation with respect to the DOC value
3. Proper way to account for annual waste disposal data for facilities not reporting to the GHGRP

Input includes, but is not limited to, data on:

- Quantities of waste types disposed at individual or groups of landfills
- How the waste composition has changed over time
- Tipping receipts documenting the fraction of inerts
- Statistics on the changing waste composition

Context

- Presentation by those who provided input
- We may engage in follow-up conversations with individual stakeholders between now and the public review comment period (Feb. 17 – Mar. 19)
- As stated previously, this is not intended to serve as a formal consensus-based process
- Ultimately, the methodological improvements made will be EPA's decision

Summary of Stakeholder Input Received

- Recommendations from Industry
- Summary of Study by Environmental Research and Education Foundation

Updating the U.G. GHG Inventory For Landfills

- Waste Management
- Republic Services
- SCS Engineers
- National Waste and Recycling Association
- Solid Waste Association of North America

Short-Term Implementation

Use GHGRP Subpart HH Emissions

- Subpart HH emissions calculations are more detailed and up-to-date than US GHG Inventory methodology
  - Reflects more representative emissions than 2006 IPCC methods
  - GHGRP is evolving to reflect new science (e.g., methane oxidation, influence of cover type)
- Reported emissions under GHGRP are subject to third-party validation to ensure accuracy
  - Validation done both automatically and by post-reporting review and questions from EPA
- Data submitted under GHGRP are "certified" by a designated representative
- Use of GHGRP data reduces burden on EPA/Contractor staff
  - Recognizes significant industry investment (time-money) to produce compliant and valid data on emissions

Use Subpart HH Emissions

- GHGRP represents Tier 3 level data under IPCC framework
  - Uses site-specific data
  - Employs complex calculations and systematic methodologies
  - Provides more rigorous and credible emission estimates
- Incorporate Methane Recovery Data (HH-4)
  - 88% of landfills reporting under GHGRP employ gas collection and control systems
  - GHGRP requires certified and validated annual methane flow rates and gas composition data

Use Subpart HH Emissions

- Reflects Site-Specific Oxidation Factors
  - GHGRP updated in 2013 to include new oxidation factors based on methane flux field data
  - More scientifically sound than IPCC default value
- Use HH-6/HH-8 for GCCS Sites to Quantify Emissions
  - Use results as-reported under HH-6 or HH-8 by sites
  - Both HH-6/HH-8 require site-specific data
  - Resulting reported emissions are certified and validated
- Use HH-5 for Non-GCCS sites to Quantify Emissions
  - Use as-reported by sites
- Use Annual Waste Disposal Data Reported under Subpart HH

Non-Reporting Sites?

- EPA has stated that GHGRP sites represent 85-95% of landfill emissions
- 10% correction factor is appropriate
  - This is consistent with national tonnage data showing only 7% of total U.S. annual waste is disposed in non-reporting sites

Accounting for 1990-2009

- Back-Cast using 2010-2015 GHGRP data
  - Include 10% adjustment for non-reporting sites

EREF

Environmental Research & Education Foundation

Lighting a path to sustainable waste management practices

Summary of EREF Efforts Related to U.S. EPA's Emissions Inventory

History & Mission

EREF
Environmental Research & Education Foundation
Lighting a path to sustainable waste management practices

- **Mission:** To fund and direct scientific research & educational initiatives for sustainable waste management practices to benefit solid waste field and the communities it serves.
- 501(c)3 charity began in 1992
- Non-lobbying organization
- Not a membership organization

EREF Programs

Environmental Research & Education Foundation
Lighting a path to sustainable waste management practices

1) **Data & Policy Analysis** *(Internal Research)*

2) **Education**

3) **Scholarships**

4) **Research Grants**

EREF Efforts Related to EPA Emissions Inventory

Environmental Research & Education Foundation

Lighting a path to sustainable waste management practices

1) MSW Management in the U.S.

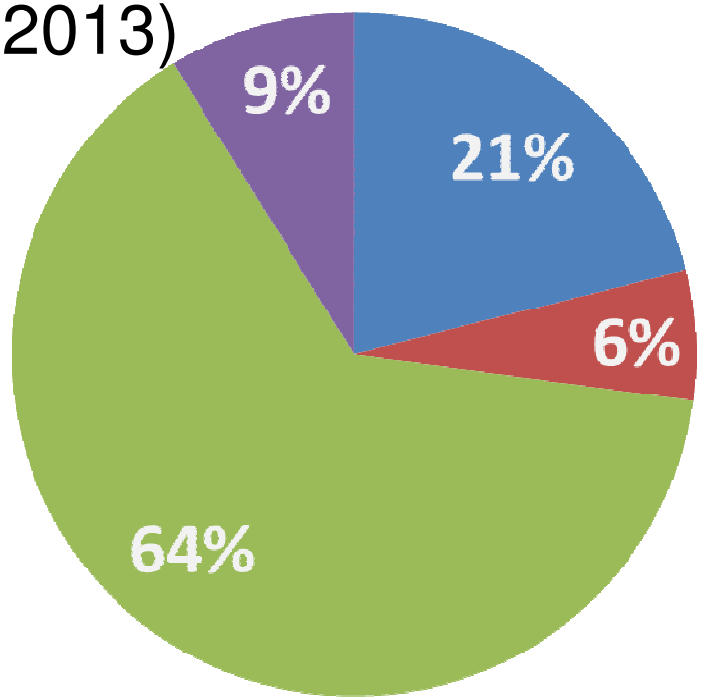
2) Estimating DOC in MSW Landfills

3) Beneficial Use of Landfill Gas

MSW Management in the U.S.

MSW Managed in the U.S.
Tonnages

- Methodology used a facility-based, bottom up approach
- 347 million tons MSW managed (2013)
  - 6.8 lbs/person-day
- Majority is landfilled
- Collectively, about 27% is recycled or composted



MSW Organics Tonnage

- **Total MSW Managed = 347 million tons**
- **Organic fraction = 48.8%**

Facility Type	Million Tons MSW Organics Managed	%
Landfills	133.6	79.0
Composting	21.3	12.6
Waste-to-Energy	11.0	6.5
Mulching	2.5	1.5
Anaerobic Digestion	0.8	0.5
Tons MSW Organics Managed	**169.2**	**100**

- Mulching tonnage based EPA estimates
- Re-use/On-site management tonnage is unknown

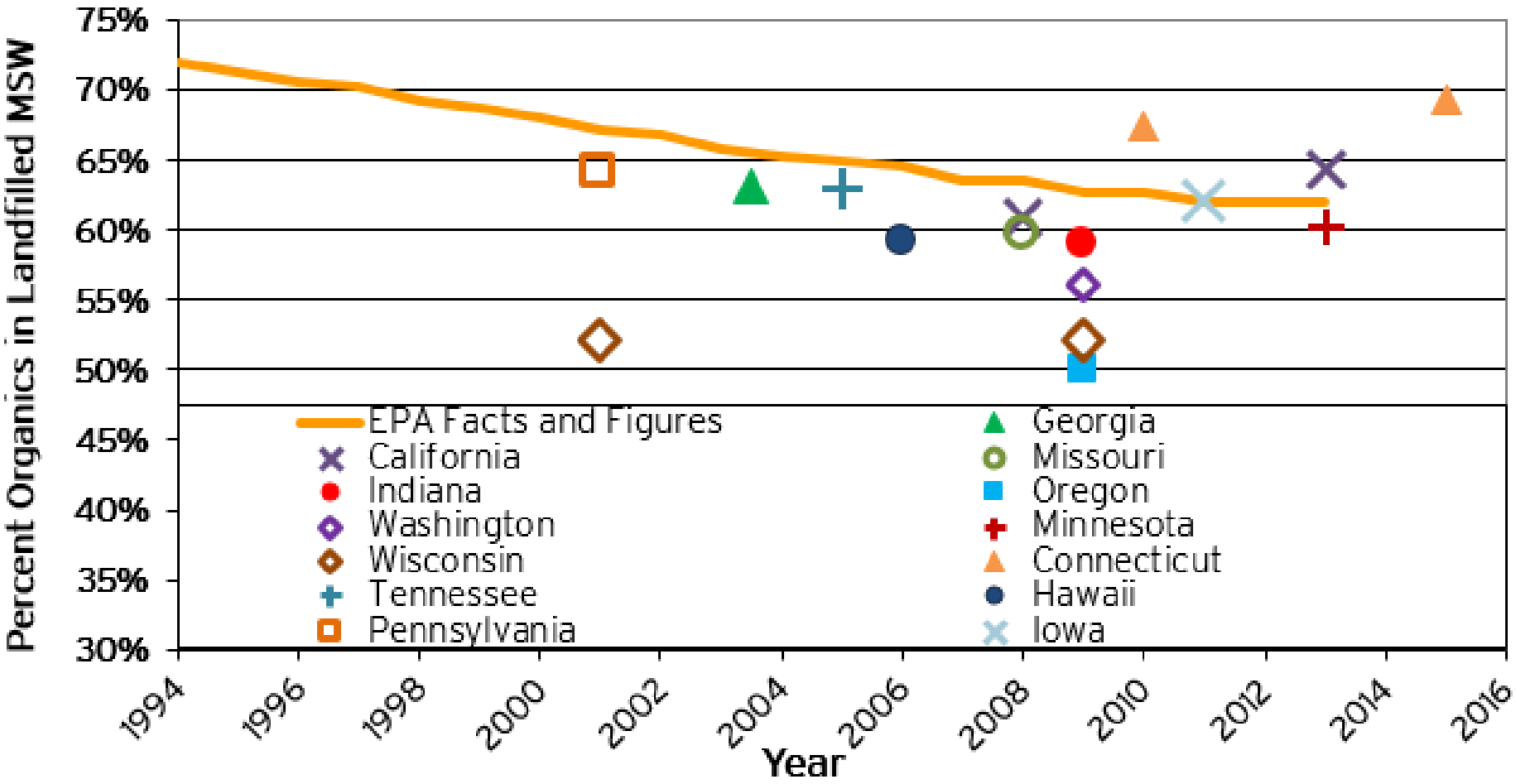
MSW Entering MSW Landfills

- The amount of MSW that entered landfills in 2010 and 2013 was recently assessed by EREF using a facility-based approach.

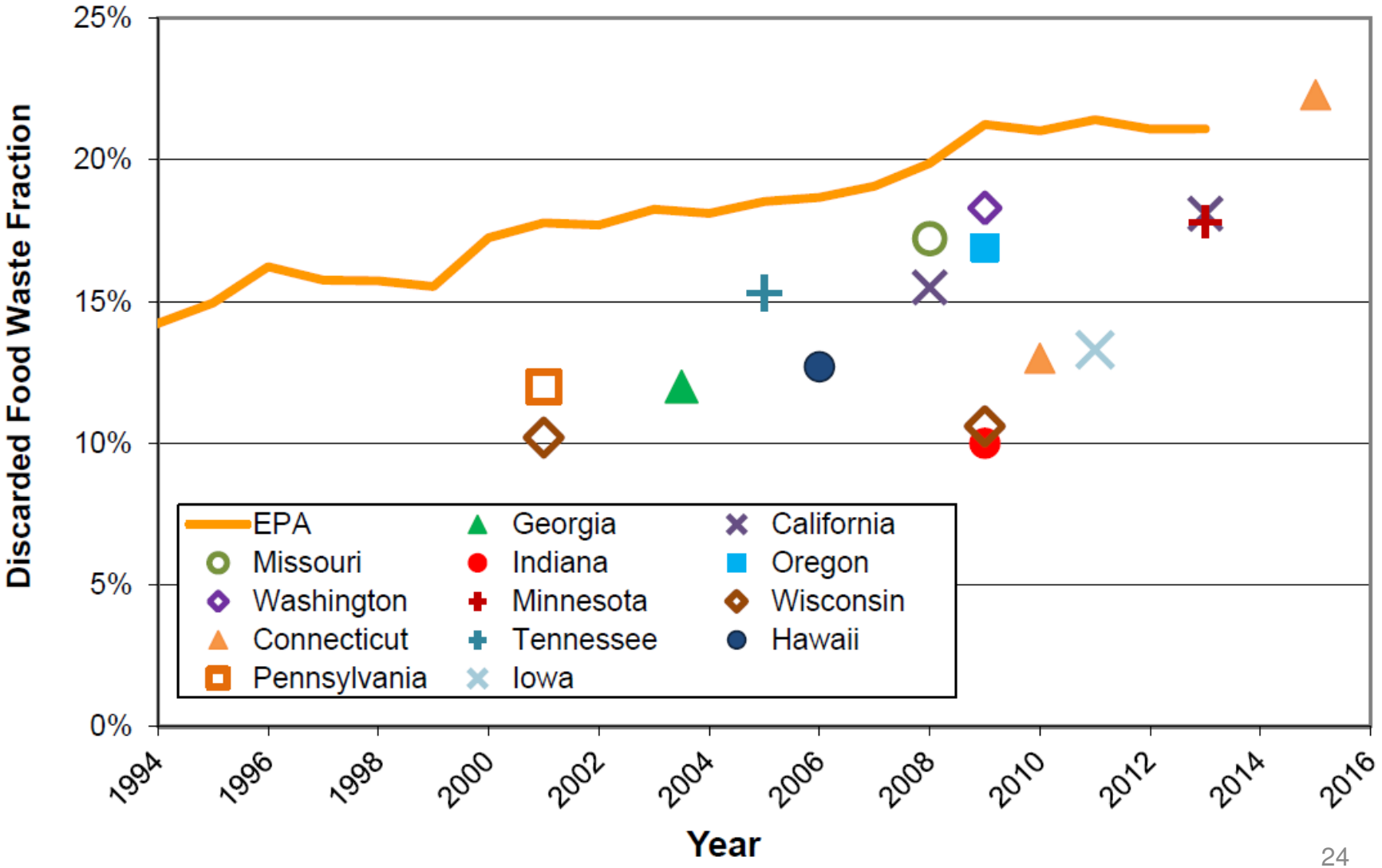
- Results, based on EPA definition of MSW:
  - 2013 landfilled MSW: 222.0 million tons
  - 2010 landfilled MSW: 224.4 million tons

- Regional and state breakdown of MSW landfilling is provided in *MSW Management in the U.S.: 2010 and 2013* pp. 12, 29-33.

Organics in Landfilled MSW



Food Waste in Landfilled MSW



Waste Entering MSW Landfills

- MSW (both degradable and inert) from residential, commercial, and institutional sources.

- 45 states allow for non-MSW Subtitle D wastes to be deposited in MSWLFs, but what they are vary:
  - construction and demolition (C&D) waste (41 states),
  - industrial waste (32 states),
  - municipal sludge/biosolids (28 states), and
  - ash (21 states).

- Thus, 2 scenarios for materials entering MSW landfills:
  1. MSW only entering LF
  2. MSW and Non-MSW materials entering LF

Non-MSW Entering MSWLFs

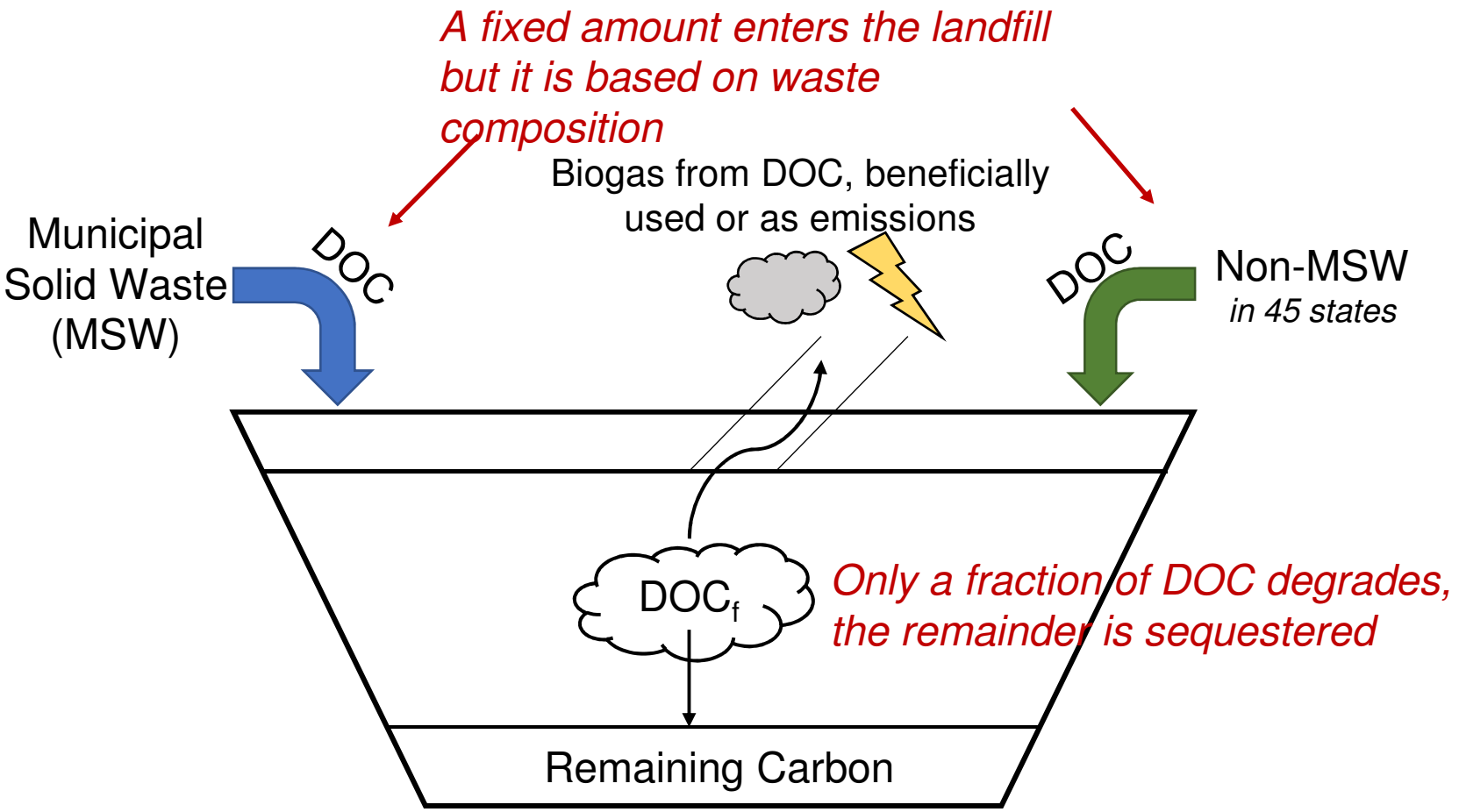
- Analysis used data from 14 states with 2013 data. These states represent:
  - 35% of open MSWLFs
  - 37% of landfilled MSW tonnage

- Total waste deposited in these landfills was:
  - 2/3 MSW
  - 1/3 Non-MSW

Detailed results for all 14 states are shown in *Estimating DOC in MSW Landfills and the Impact of Non-MSW* Appendix D.

Estimating DOC in MSW Landfills

Degradable Organics Carbon and the Impact on Emissions Estimates



Estimating DOC in MSWLFs

- DOC values were calculated for the waste streams entering MSW landfills using available data

- Sample-and-sort data:
  - MSW-only waste stream
  - C&D waste stream
  - Industrial waste stream

- State reporting data:
  - Bulk waste stream (all Subtitle D wastes entering MSWLFs)

Resulting DOC Estimates

Waste Type	State Sample-Sort Data		U.S. EPA
	Average	Range	Guideline Value
DOC bulk waste	0.161	0.118 - 0.180	0.20
DOC MSW	0.184	0.142 - 0.209	0.31
DOC C&D	0.136	0.103- 0.180	0.08
DOC Industrial	0.167	-	-

Beneficial Use of Landfill Gas

EREF Study and Comparison to GHG Reporting/LMOP

- Number of landfills identified for this study = 1,577

  (only Subtitle D LFs actively accepting waste were included)

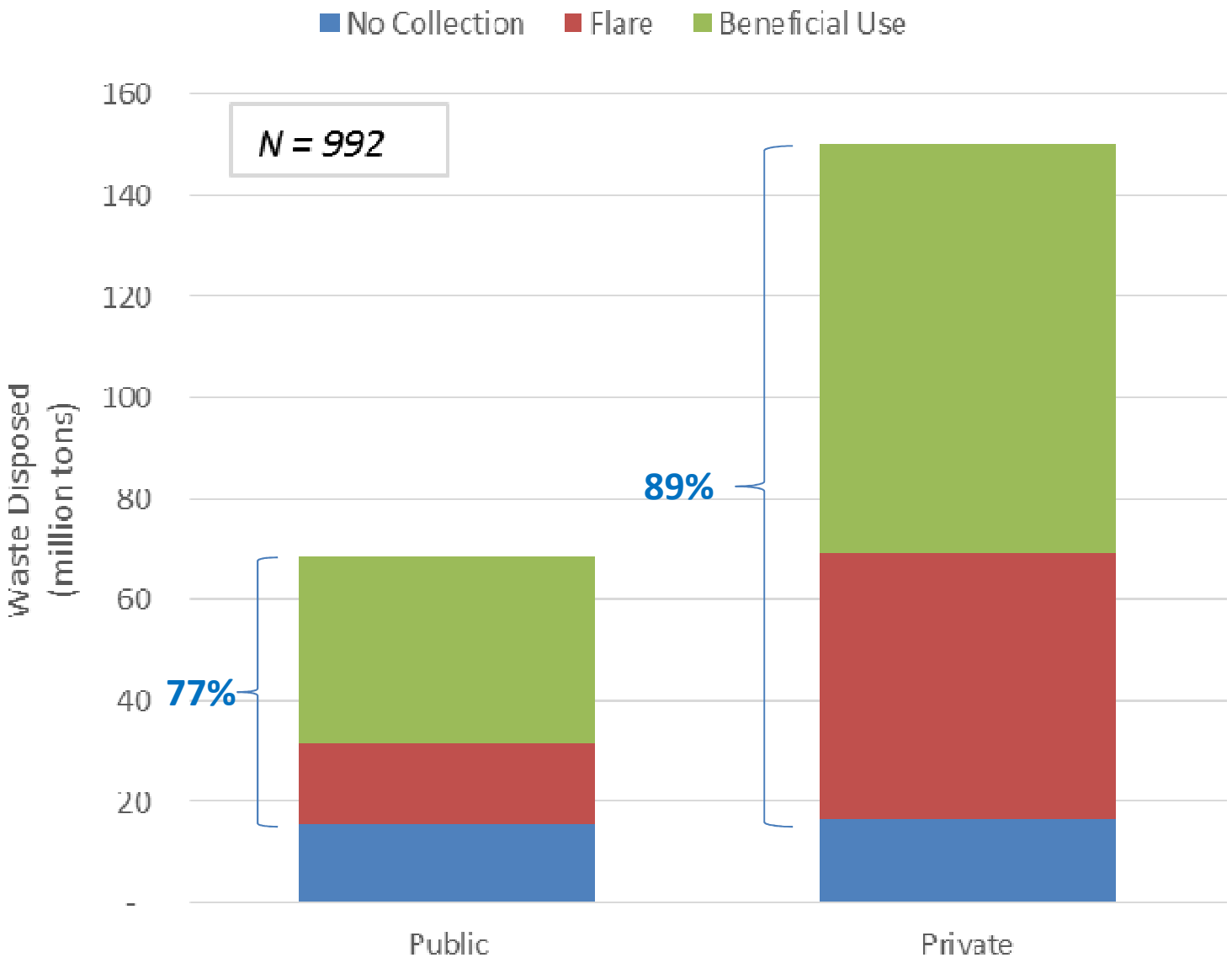
- Landfills that provided beneficial LFG usage data = 70.4 %

Number of Facilities: Comparison to GHG Reporting & LMOP

	2010			2013		
Facility Type	**EREF**	**GHG**	**LMOP**	**EREF**	**GHG**	**LMOP**
Open, receiving waste	1,577	1,141	1,282	1,546	1,133	1,241
Closed	-	122	1,112	-	130	1,155
Total	**1,577**	**1,263**	**2,394**	**1,546**	**1,263**	**2,396**

LFG Management

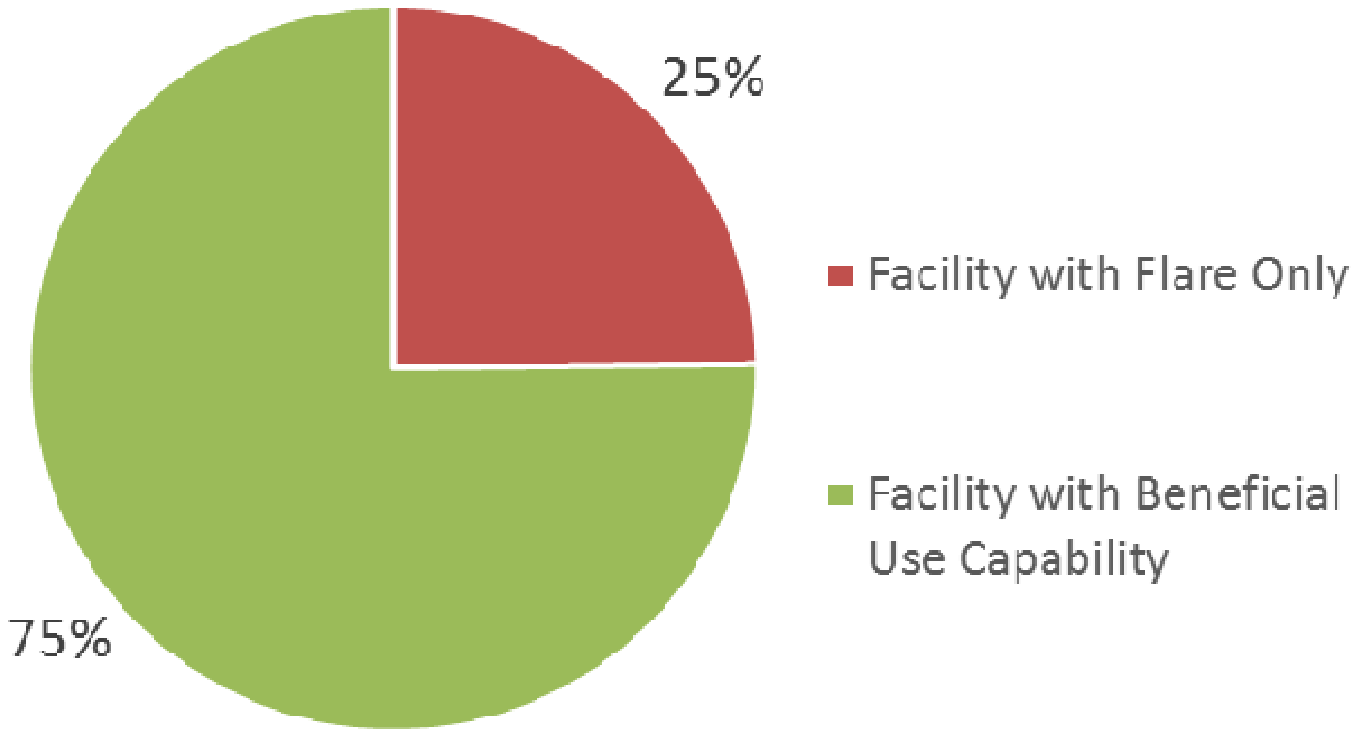
(based on tonnage)



Roughly ~80 million more tons goes to private vs public LFs

LFG Management

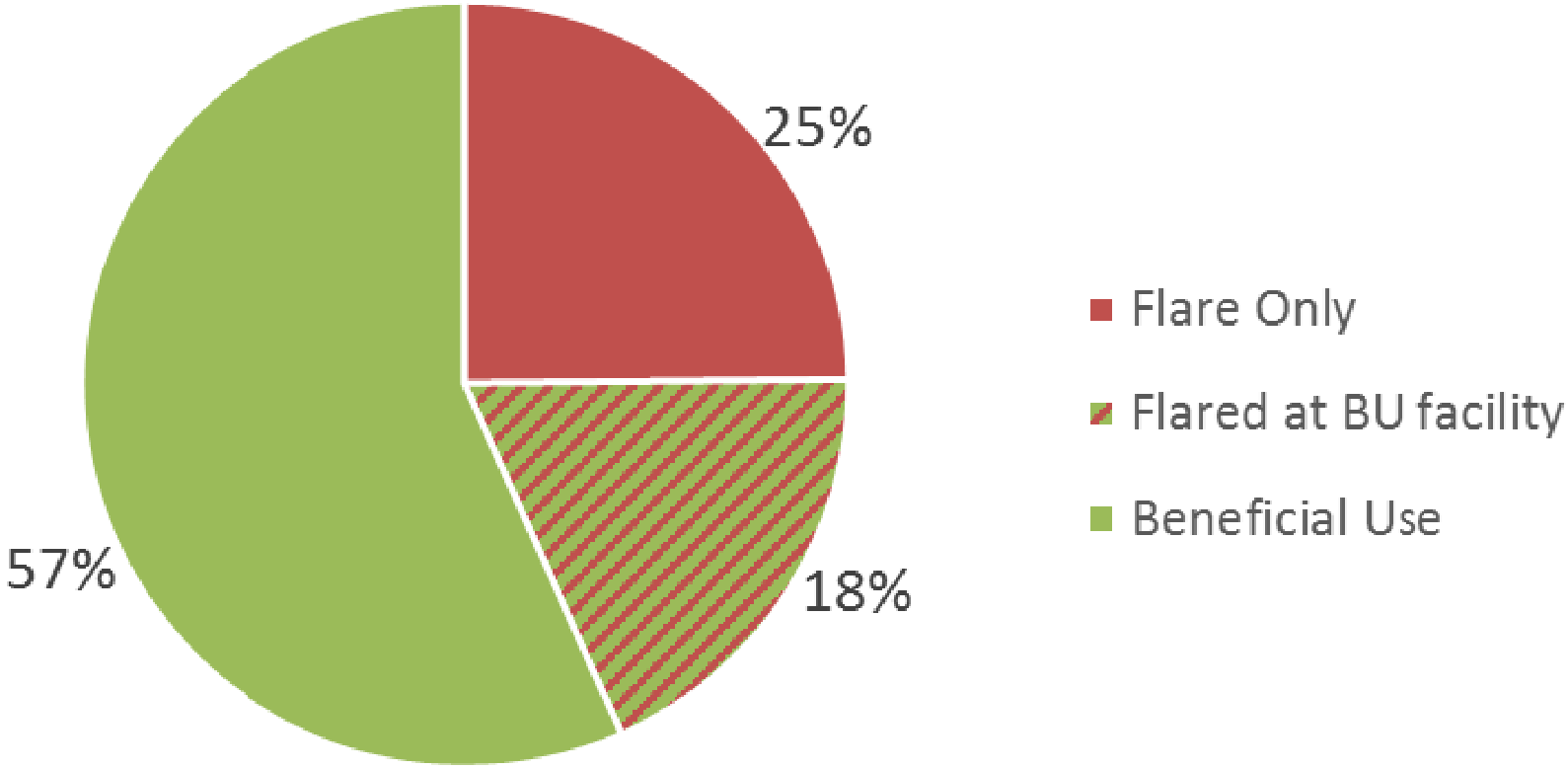
(based on gas collected)



- Majority of LFG collected occurs at facilities with beneficial use
- Does not account for gas flared at beneficial use facility

LFG Management

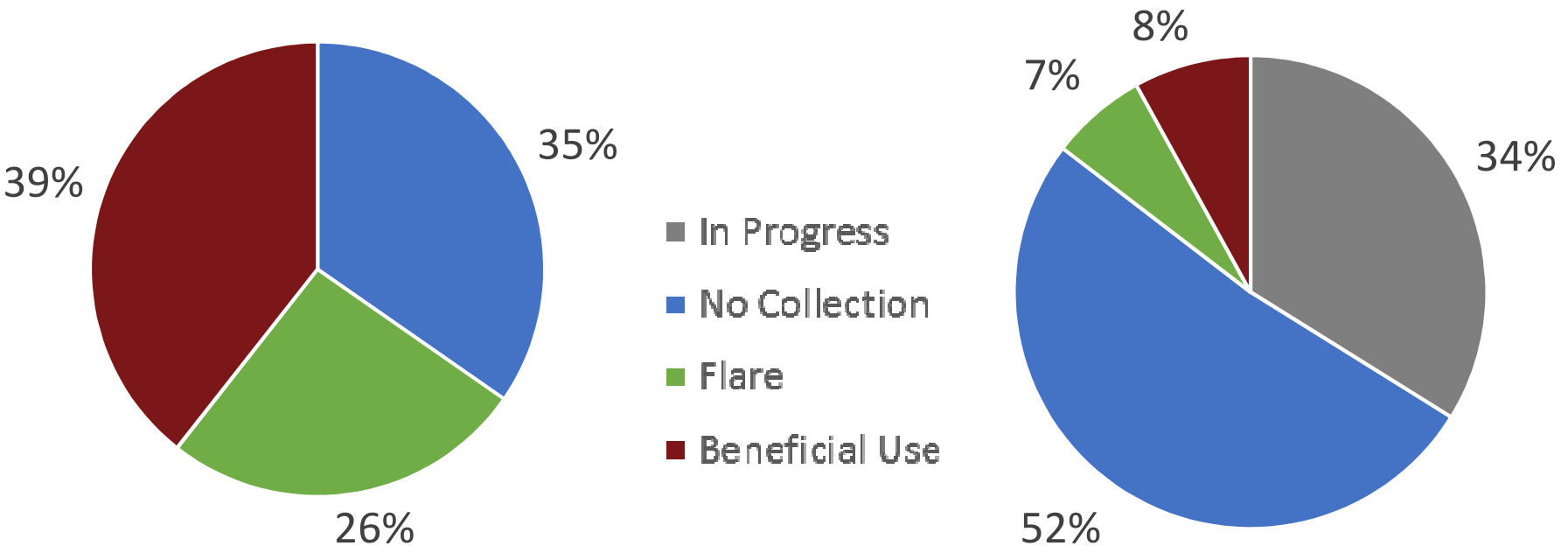
(based on gas collected)



- 18% is flared at BU facility as a result of downtime, excess generation, supply/demand imbalance, etc.

LFG Management- Reporting Coverage

(based on number of facilities)



GHGRP Open Landfills *n=848*

Non-Reporting Open Landfills *n=623*

- Landfills not covered in the GHGRP framework and reporting requirements are less likely to have gas capture and control
- Data collection ongoing to assess coverage of GHG database

Future Work:
Impact of Organics Diversion on LFG

Case Study in LFG Trends:

Aggressive (Altamont) vs. Typical (Scholl Canyon)

Altamont Landfill

Scholl Canyon Landfill

Comparison of Policies

San Francisco – Aggressive Policy (Altamont Landfill)

2001:

- Must meet 75% diversion by 2010 to send waste to Alameda County's Altamont Landfill.
- 3 bin system to collect organics

2009:

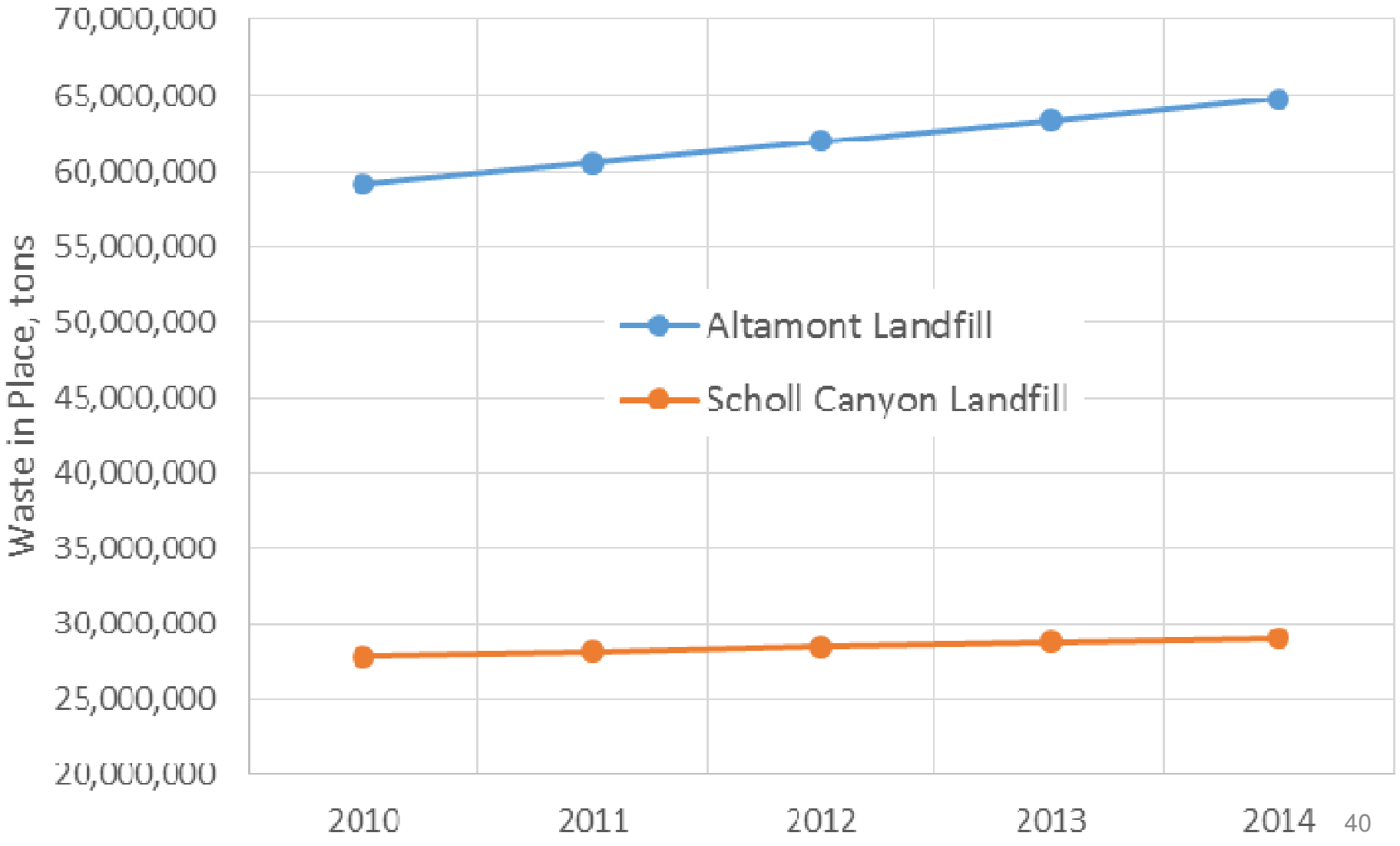
- San Francisco Mandatory Recycling and Composting Ordinance
- All residents must divert organics

CA State – Typical Policy (Scholl Canyon Landfill)

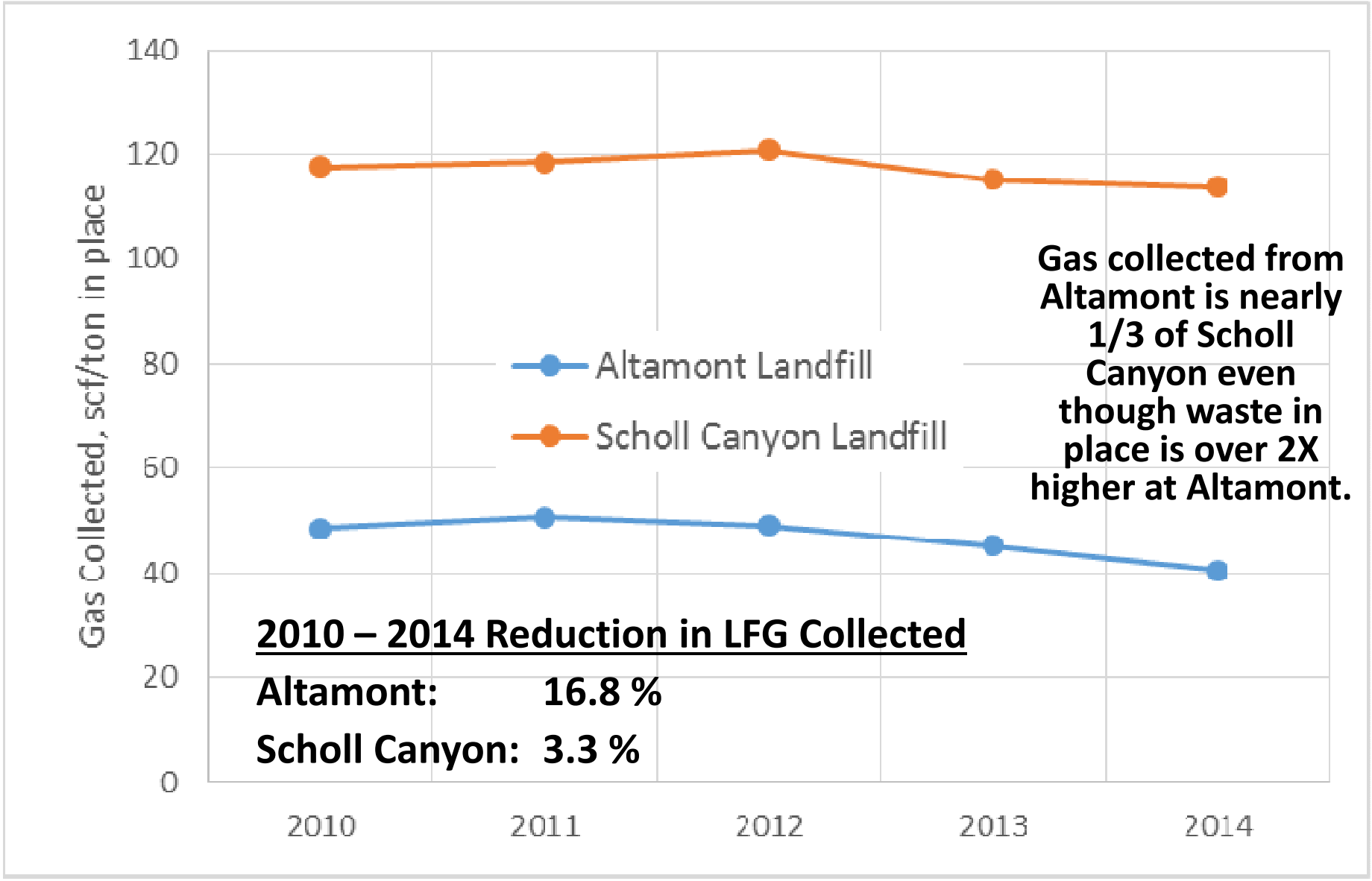
2012: AB 341- 75% recycling and composting rate by 2020

2014: AB 1826- Mandatory commercial organics recycling, beginning 2016

Altamont/Scholl Canyon
Waste in Place



Altamont/Scholl Canyon
Collected LFG per Ton



Preliminary Thoughts on Methodological Improvements for Consideration

Context

- Did not receive much input on . . .
  - Non-reporting landfills
  - Data for years prior to implementation of the GHGRP (pre-2010)
- Following options are concepts and touch upon pros/cons, but are not complete

Option 1: Use current method

- Use State of Garbage and EREF (2016) data on MSW generation and apply a disposal factor to estimate nationwide MSW landfilled
- Use GHGRP methane recovery data and supplement with other 3 databases
- Could modify the Inventory bulk MSW DOC value (through waste characterization studies, updated Lo)

Advantages	Disadvantages
Minimal changes required	Unsure when updated MSW generation data will be available
Allows for facility-specific CH4 recovery values to be used	Does not reduce uncertainty
	Unable to use facility-specific OX

Option 2: Use CH_4 Generation from GHGRP

- Use subpart HH reported methane generation values
- Augment with waste disposal amount for landfills that do not report using a modified Inventory DOC value (waste characterization studies, Lo)
- What method to use for pre-2010?
- Use GHGRP methane recovery data and supplement with other 3 databases
- Use default methane oxidation value of 10% for all landfills

Advantages	Disadvantages
HH data are facility-specific, EPA-verified, higher quality	Unable to use facility-specific OX
	Different method for non-reporting facilities and years pre-2010

Option 3: Use net CH_4 emissions from GHGRP

- Use directly-reported CH_4 emissions by facility from Subpart HH of the GHGRP for years 2010+ for reporting facilities
- What method to use for pre-2010?
- How to consider the ~300 non-reporting landfills?
  - 2010: 1,572 (EREF) - 1,235 (HH) = 337
  - 2013: 1,540 (EREF) – 1,237 (HH) = 303

Advantages	Disadvantages
HH data are facility-specific, EPA-verified, higher quality	Different method for non-reporting facilities and years pre-2010
For HH facilities, using facility-specific waste disposal data, OX, CE, R	Fluctuating dataset; some GHGRP facilities will off-ramp; technical modifications may impact cross-year net emissions

Q&A; Discussion

More Information

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