

TRASH AS TREASURE

Managing Waste as a Resource

DISTRIBUTED ENERGY MANAGEMENT

Jimmy Jia, CEO
February 1 2017



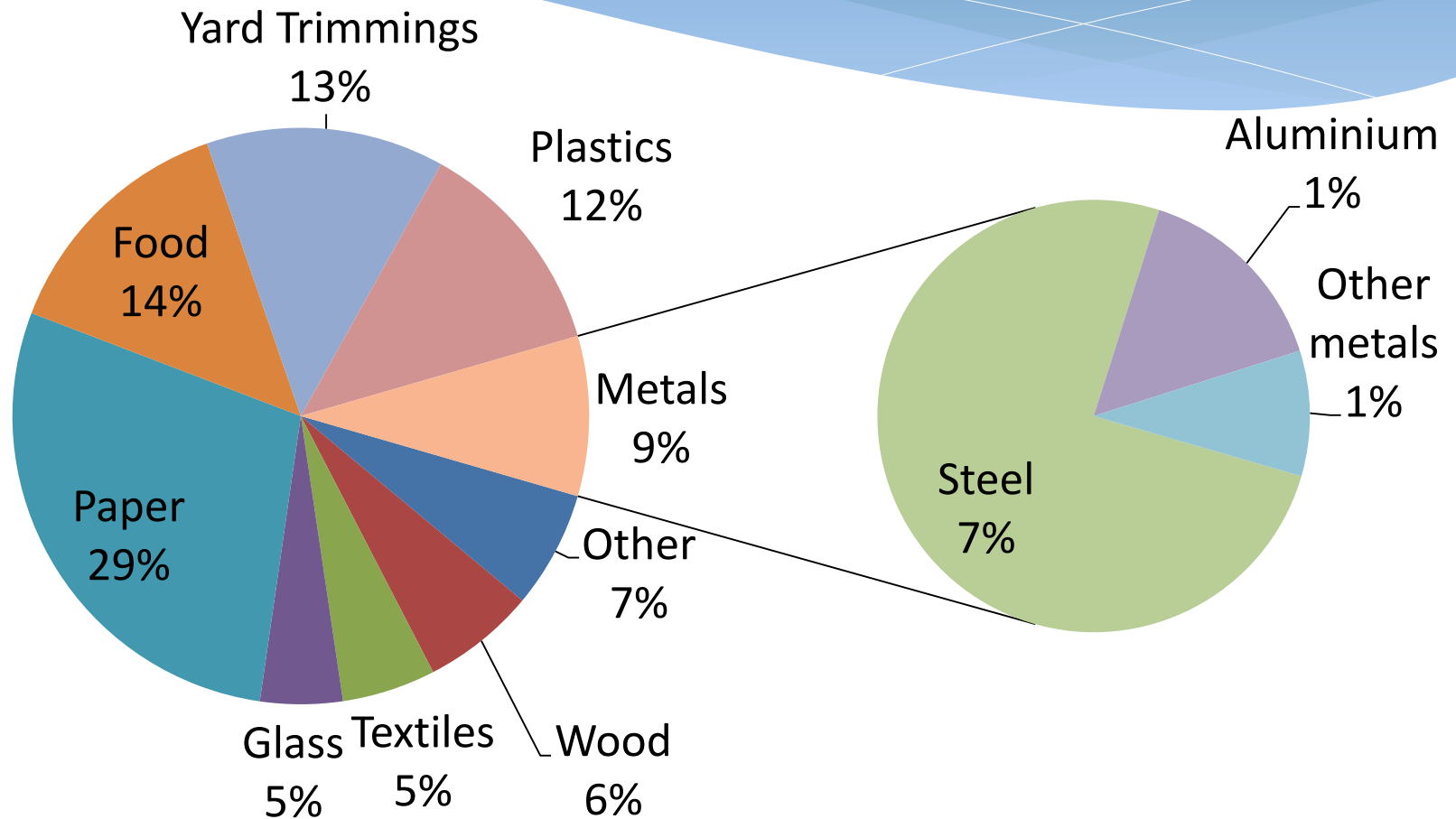
King County

Which view is waste?



95% of everything we buy is thrown away at some point

Composition of Waste in the USA



Compost / Fermentation

Diagram of Composting

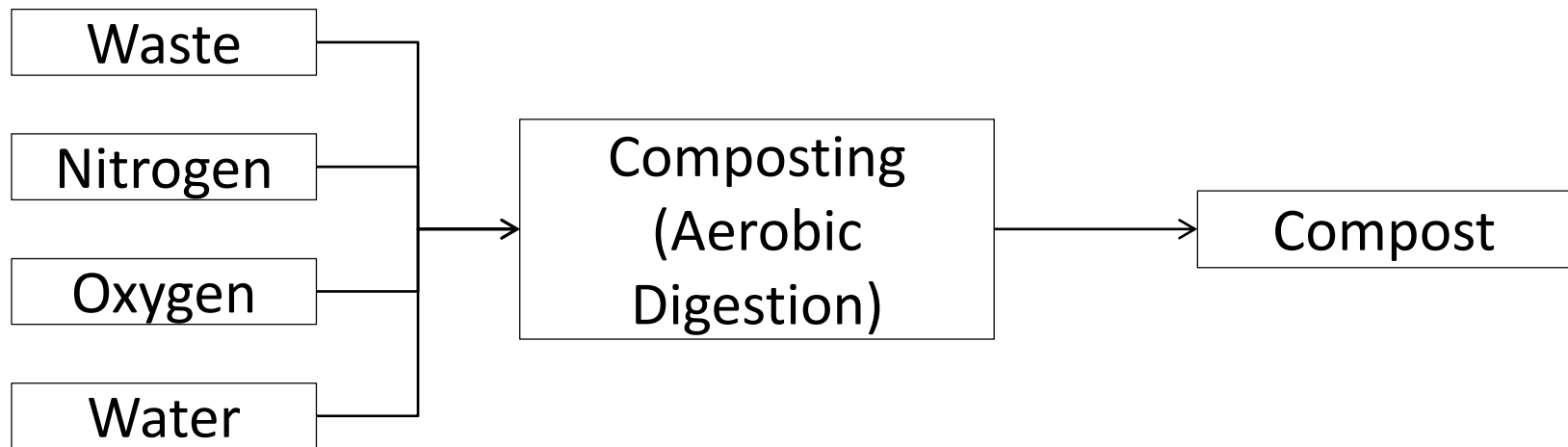
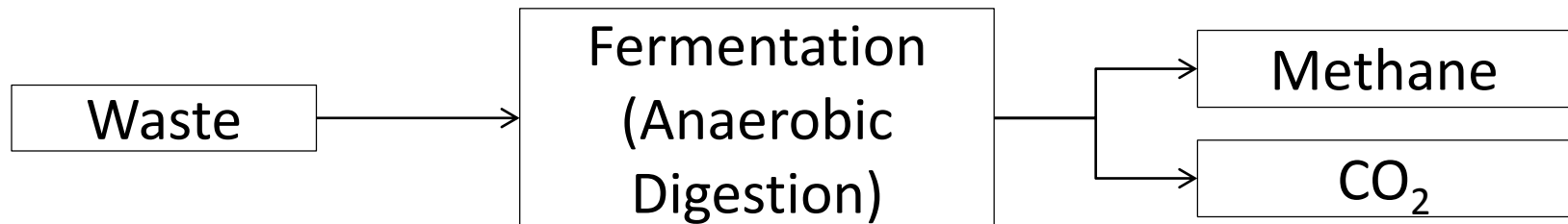


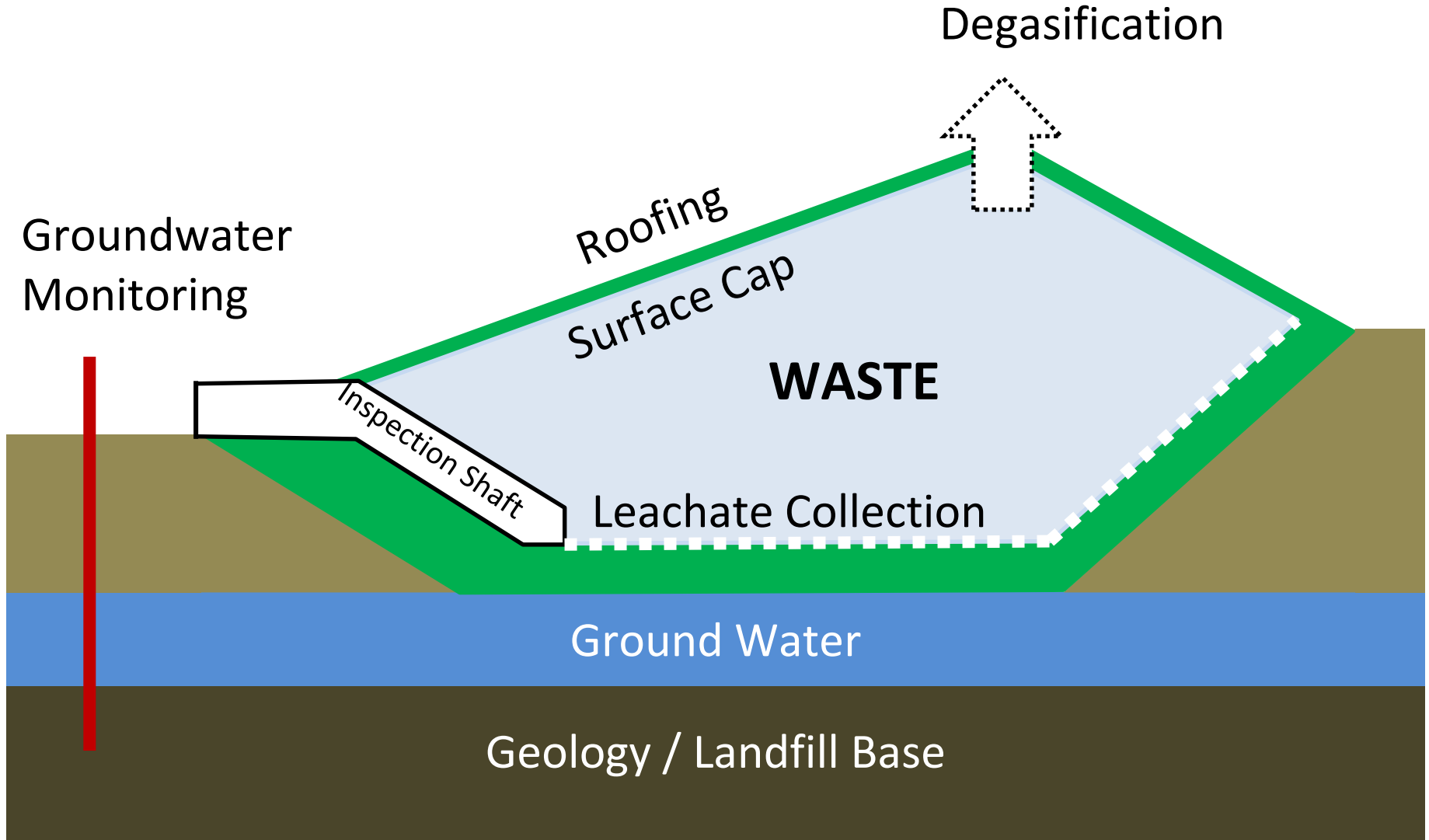
Diagram of Fermentation



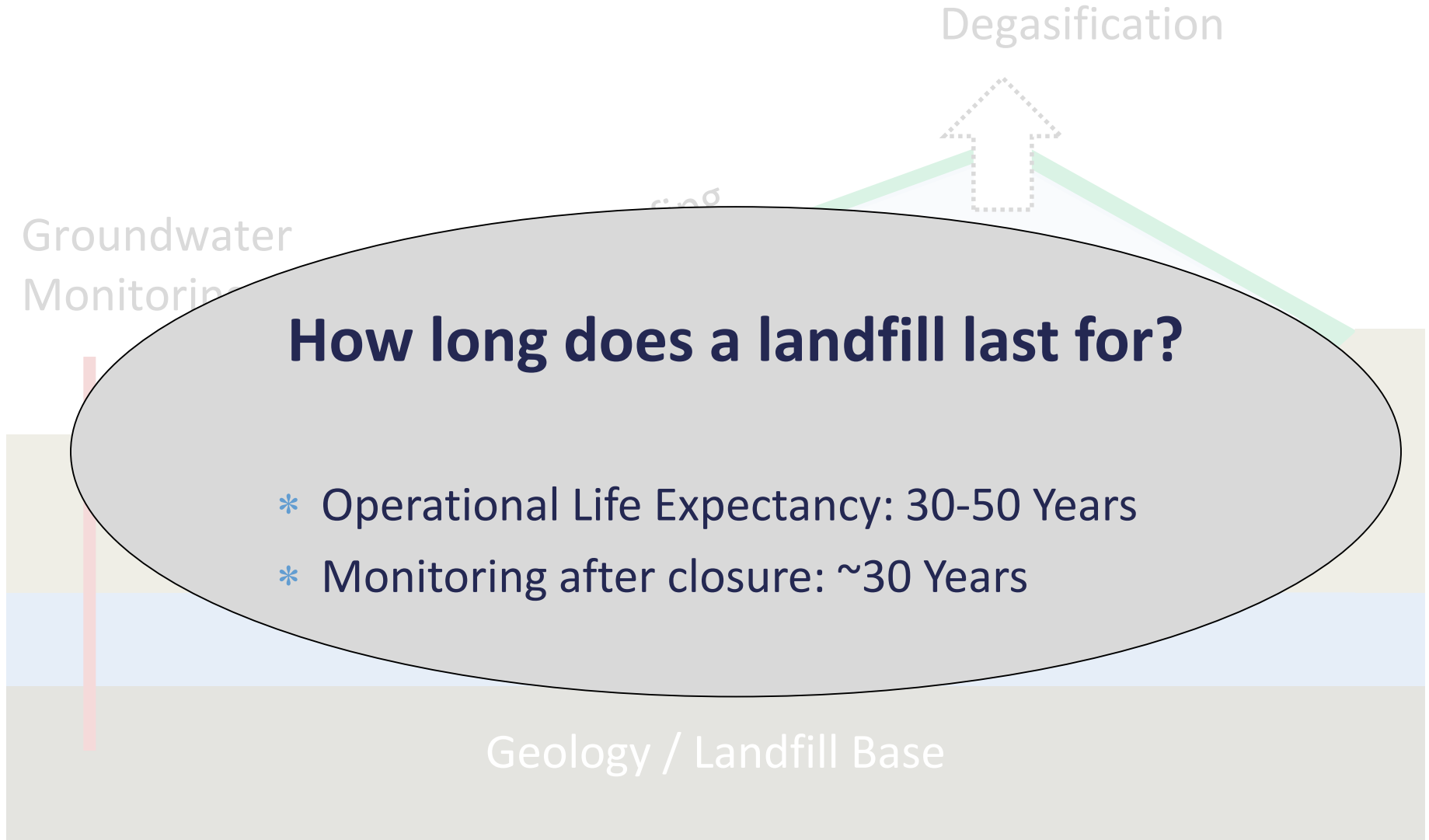
Recycling

| Reduction of: | Aluminum | Steel | Glass | Paper | Plastics |
|----------------------------------|----------|-------|-------|-------|----------|
| Energy Use | 95% | 60% | 20% | 50% | 60% |
| Air Pollution | 95% | 85% | 20% | 74% | - |
| Water Pollution | 97% | 76% | - | 35% | - |
| Water Use | - | 49% | 50% | 58% | - |
| Recyclable Number of times | Many | Many | Many | 5-7 | 1-2 |

What is a landfill?



What is a landfill?



Middens



World » Trash or treasure? Sifting through ancient rubbish for archaeological gold

Live TV

U.S. Edition +



menu

Trash or treasure? Sifting through ancient rubbish for archaeological gold

By Laura Allsop, CNN

Updated 6:24 AM ET, Tue October 4, 2011



Ancient trash dumps, or middens, such as this one at Harappa in Pakistan, are rich hunting grounds for archaeologists.

Top stories



Jose Baez to defend Aaron Hernandez

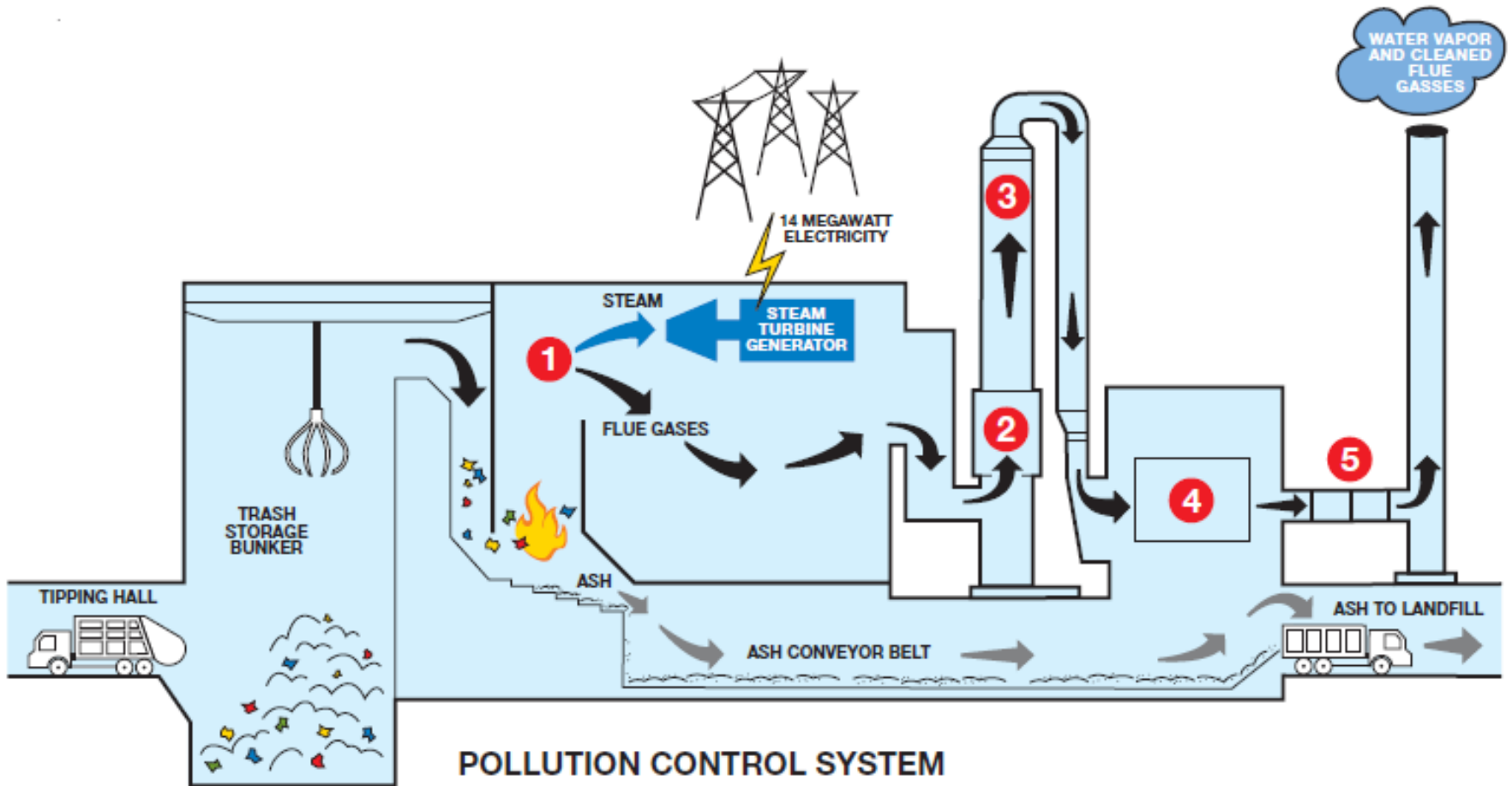


Family burns woman alive for eloping

DATADOG
Start monitoring your whole stack

Oldest ~140,000 years old (mid Paleolithic era)

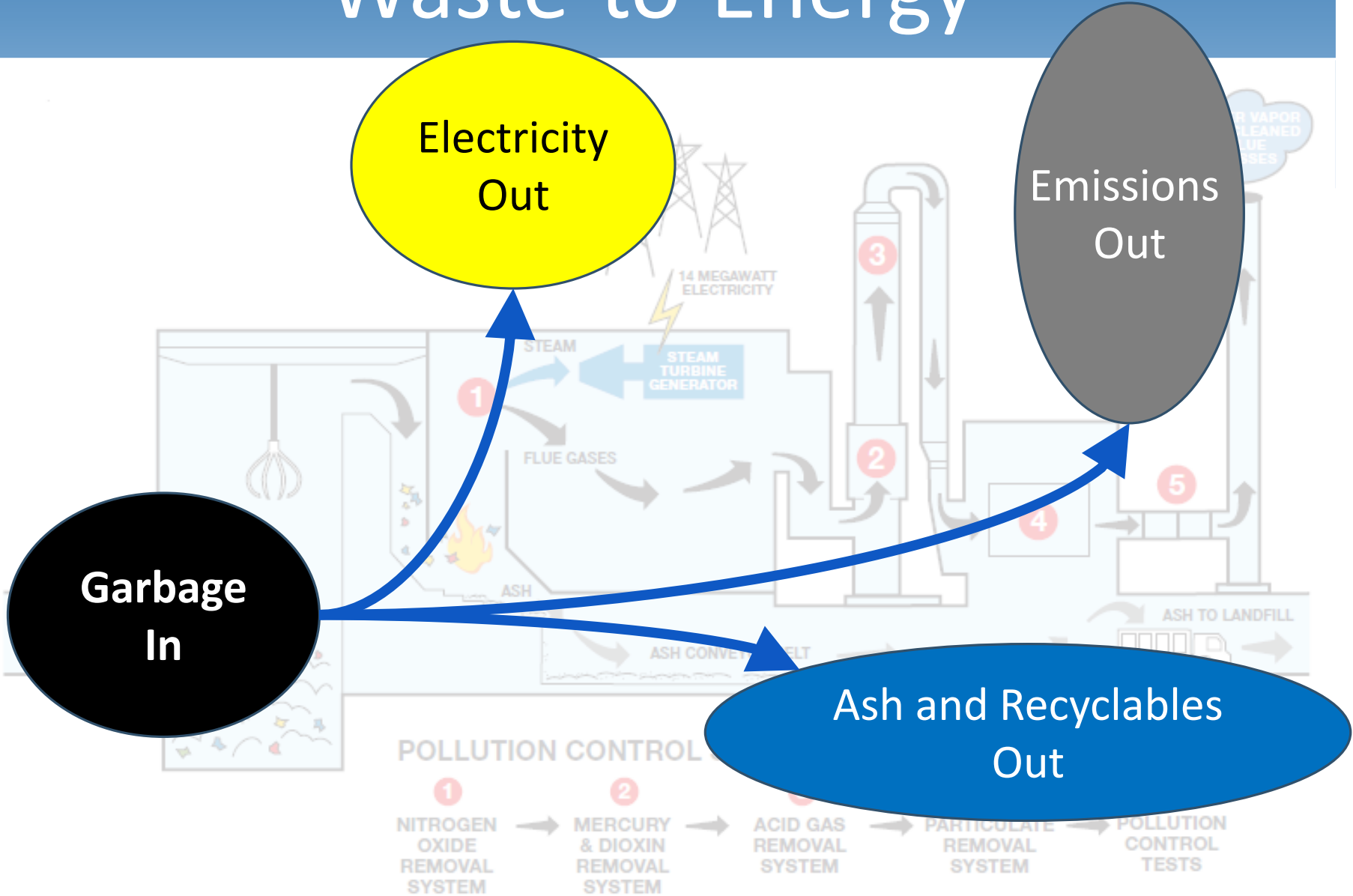
Waste-to-Energy



POLLUTION CONTROL SYSTEM

- 1** NITROGEN OXIDE REMOVAL SYSTEM
- 2** MERCURY & DIOXIN REMOVAL SYSTEM
- 3** ACID GAS REMOVAL SYSTEM
- 4** PARTICULATE REMOVAL SYSTEM
- 5** POLLUTION CONTROL TESTS

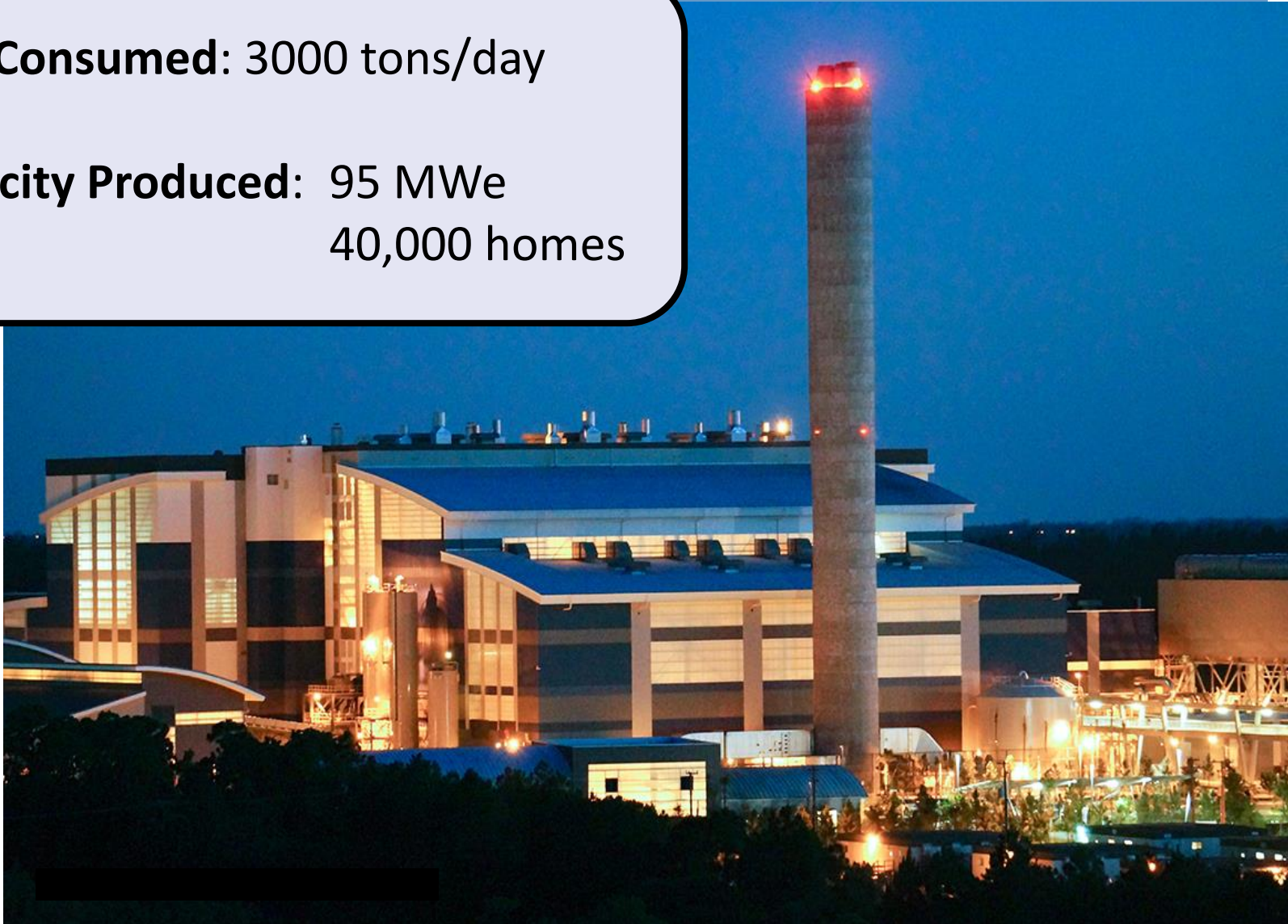
Waste-to-Energy



2015 Project in the USA

MSW Consumed: 3000 tons/day

Electricity Produced: 95 MWe
40,000 homes



USA Project Permit vs. Actual Emissions

| Pollutant | Emissions Permit | Actual Emissions Test** |
|-----------------------|------------------|-------------------------|
| NOx | <50 PPM | < 35 PPM |
| Carbon Monoxide | <100 PPM | < 30 PPM |
| SOx | <24 PPM | < 21 PPM |
| Unburned Hydrocarbons | < 7 PPM | < 3 PPM |
| Particulate Matter | 12 MG/DSCM | < 3 MG/DSCM |

* All Data Shown For Typical Concentration (Parts Per Million Volume) Except Where Noted

** Actual emission test conducted during compliance test three 4 hr. test per unit – 9 total test with range showing high and low measurement under stable full load testing



King County

USA Project Permit vs. Actual Emissions

| Pollutant | Emissions Permit | Actual Emissions Test** | |
|-----------------------|------------------|-------------------------|-------------------|
| NOx | <50 PPM | < 35 PPM | Less than 40 cars |
| Carbon Monoxide | <100 PPM | < 30 PPM | |
| SOx | <24 PPM | < 21 PPM | Less than 3 cars |
| Unburned Hydrocarbons | < 7 PPM | < 3 PPM | |
| Particulate Matter | 12 MG/DSCM | < 3 MG/DSCM | |

* All Data Shown For Typical Concentration (Parts Per Million Volume) Except Where Noted

** Actual emission test conducted during compliance test three 4 hr. test per unit – 9 total test with range showing high and low measurement under stable full load testing

Pasco County Ash Reuse - First in Florida to Receive FDEP Authorization for Beneficial Reuse



- FDEP approved beneficial reuse in December 2014 for three applications**
1. Bottom ash as road base
 2. Bottom ash as aggregate in asphalt
 3. Bottom ash as aggregate in concrete



High Tech Magnets for Optimized Recovery of Ferrous and Non-ferrous Metals

High Strength Drum Magnet for Ferrous Metals



Samples of Non-ferrous Metals Recovered by Eddy Current Separator

Aluminum, brass, bronze, copper... even gold and silver!



Dense aluminum "nuggets"

Outcomes

| | 1990's | 2010 |
|-----------------|-------------|-------------|
| MSW Generation | 50.9 M Tons | 49.2 M Tons |
| Composting | 13 % | 17 % |
| Recycling | 26 % | 46 % |
| Waste-to-Energy | 18 % | 37 % |
| Landfill | 43 % | 0.4 % |
| MSW Generation | 208 M Tons | 250 M Tons |
| Composting | 2 % | 8.1 % |
| Recycling | 14 % | 26 % |
| Waste-to-Energy | 14 % | 12 % |
| Landfill | 70 % | 54 % |

Germany:

Disposal

Cost:

\$294: 4 Person Household

USA - King County:

Disposal

Cost:

\$300: 4 Person Household

43 % → 0.4 %

70 % → 54 %

German Priorities

Prevention
Strategies

PRIORITIES

Avoidance

Reduction at
source

Product re-use

Minimization
Strategies

Quality
improvements

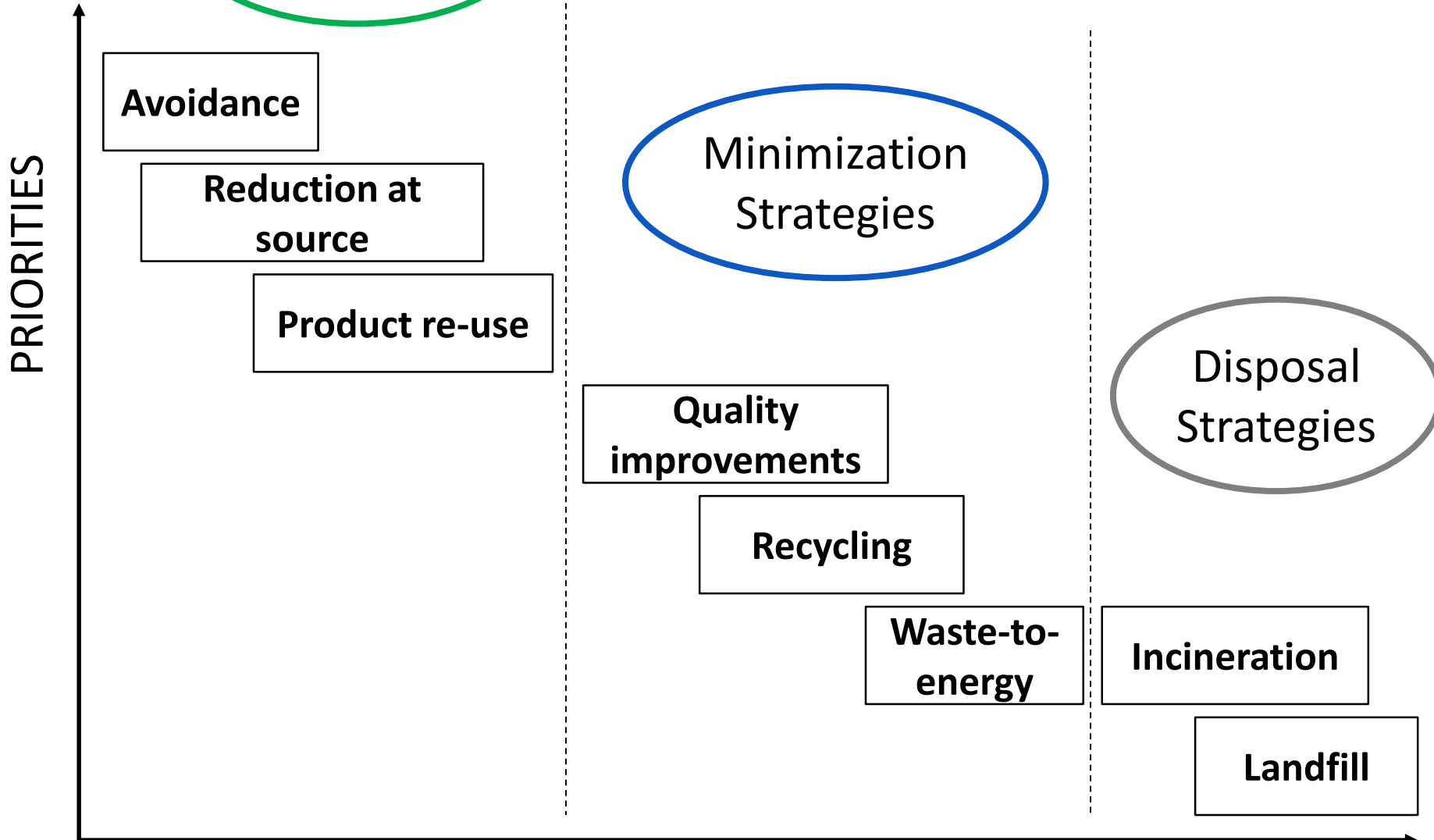
Recycling

Waste-to-
energy

Disposal
Strategies

Incineration

Landfill



Economic:

Germany:

- * Created 200,000 jobs to manage waste
- * Generates €75 Billion contribution to GDP

USA Equivalent:

- * “Bury” \$250-375 Billion in economic value in landfills every year (GDP Opportunity cost)

Economic:

Germany:

- * Created 200,000 jobs to manage waste
- * Generates €75 Billion contribution to GDP

King County Equivalent:

- * 4,000 jobs
- * \$1 – 1.5 Billion in GDP opportunity cost

German Priorities

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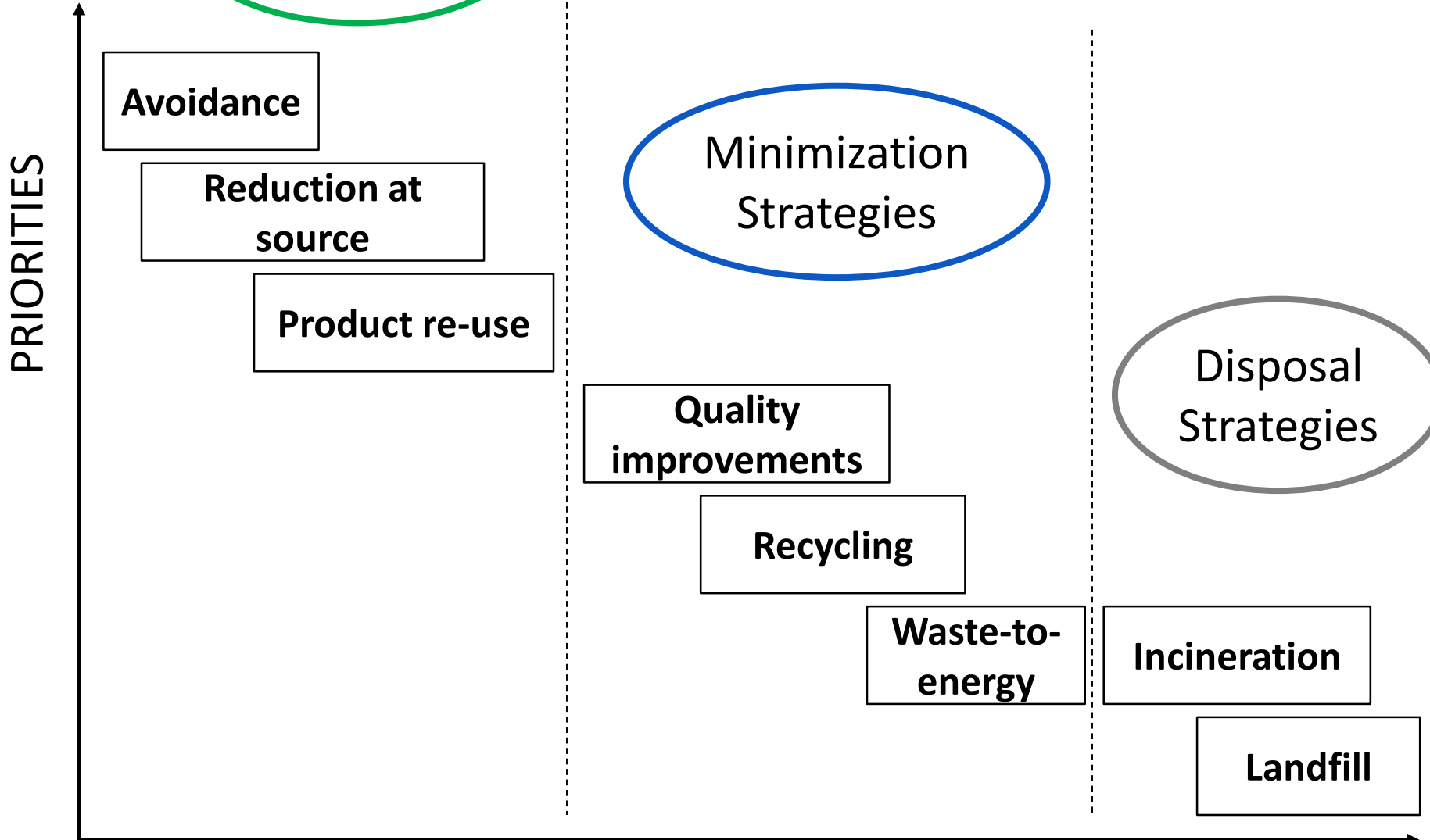
Waste-to-
energy

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PRIORITIES



Carbon Prioritization

Prevention
Strategies

Land Use Planning

Passive Housing

Energy Efficiency

Thermal Management

Non-Carbon Power

Co-Generation

Fossil Fuels

Sequestration

Minimization
Strategies

Management
Strategies

Thank you

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