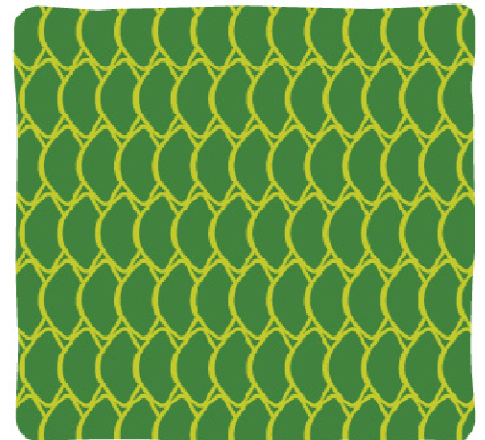


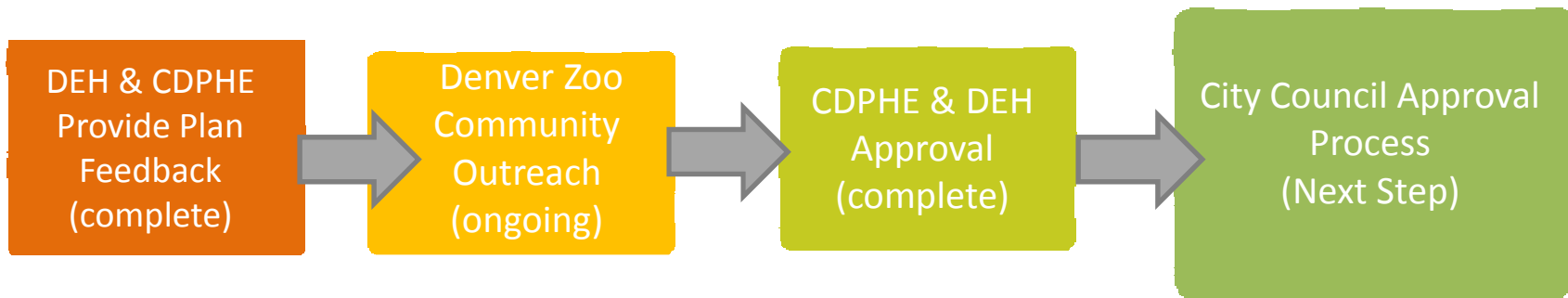
# Denver Zoo

## Waste to Energy System



# Denver Zoo Waste to Energy System

## Certificate of Designation Process



### Other permits

- Colorado Department of Public Health and Environment- Air Quality Operating Permits
- City and County of Denver Building Permits
- Potential for future wastewater permit

# Denver Zoo Waste to Energy System

## Historical Background



- Toyota Elephant Passage – A Vision for Renewable Energy
- 10 Years Research & Development in collaboration with City and County of Denver, NREL, CDPHE, Colorado School of Mines & University of Colorado



# Denver Zoo Waste to Energy System

## Historical Background



- Phase I



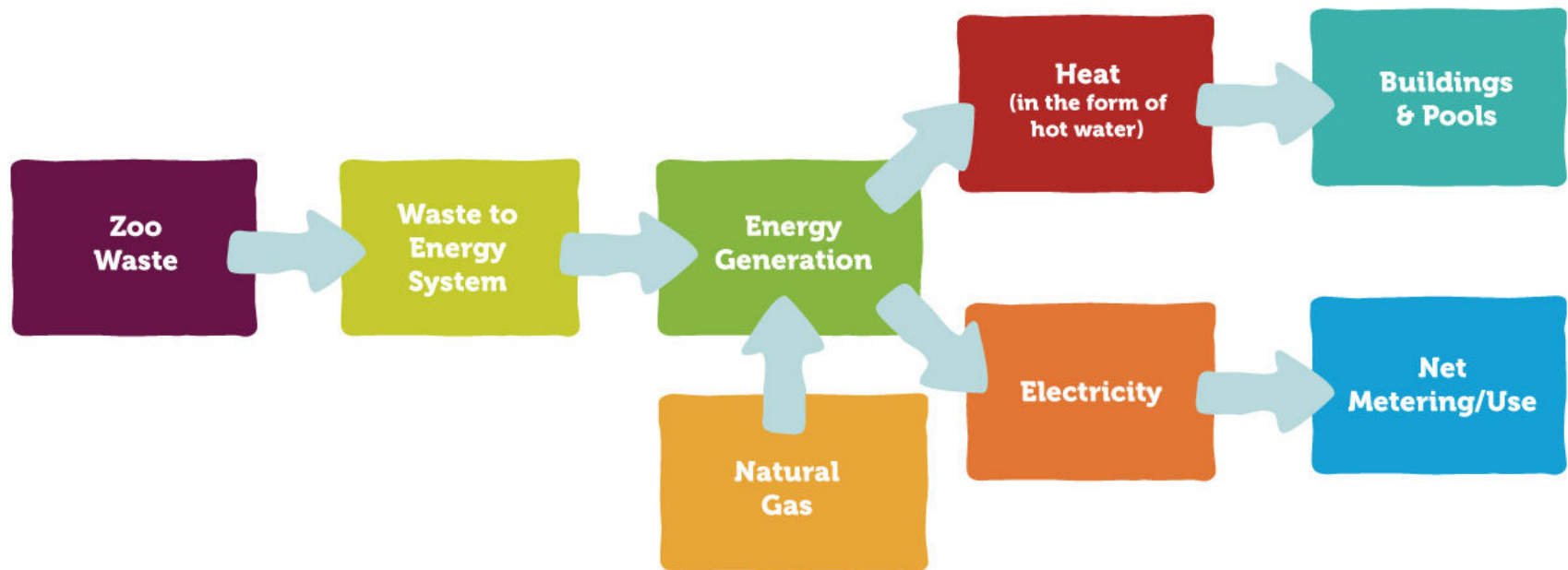
# Denver Zoo Waste to Energy System

## Historical Background



# Denver Zoo Waste to Energy System

## Process



# Denver Zoo Waste to Energy System



## Benefits



**Trash + Poop = POWER**

- Utilizing Gasification Technology
- Clean Energy
- Will produce 20% of zoo energy needs
- Will eliminate 90% zoo waste from landfill = 1.5 million pounds
- Will save \$150,000 annually
- Helps us reach our goal to become Zero Waste by 2025

# Denver Zoo Waste to Energy System



## By-Products



- Ash is the single largest bi-product. It is being tested for use in commercial composting or as an ingredient in concrete.
- Minimal air emissions will be consistently monitored to ensure standards are met.





# Denver Zoo Waste to Energy System

## The Most Important Thing...



- Biomass gasification involves the thermo chemical conversion (high temperature, low oxygen process) of biomass, or in the zoo's case, zoo waste, into a combustible gas, called synthetic gas or syngas.
- Syngas contains hydrogen, carbon monoxide, methane, and other inert gases. This gas provides a fuel source to power a generator to produce electrical energy and heat.
- Gasification is safe and has been used for more than 100 years. Our process will meet stringent emission standards.

# Denver Zoo Waste to Energy System

## CCOD 2020 Sustainability Goals



### Materials

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Reduce landfill waste  
by 20%

### Energy

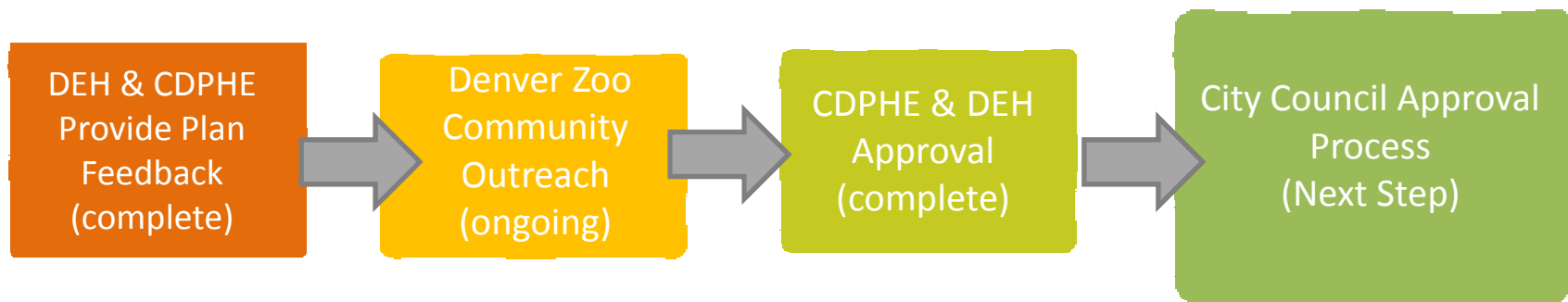
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Hold total energy usage  
below 2012 levels, with 50%  
coming from renewables

# Denver Zoo Waste to Energy System

## Certificate of Designation Process



# Denver Zoo Waste to Energy System

## Engineering, Design and Operations Plan



- A very specific document addressing both City & State regulatory requirements...
- Operational criteria and expectations that must be met by the designated operator...Denver Zoo
- Potential impacts (noise, odor, safety) are clearly outlined in the EDOP to establish metrics, responsibility, and communication protocols.

# Denver Zoo Waste to Energy System



## Review Process



CDPHE & DEH  
Approval  
(complete)

### State

- Regulate waste disposal (under 6 CCR-1007-2)
- Provide technical review of EDOP meet regulations for Siting of Solid Waste Incineration Facilities (6 CCR-1007-2, part 1, Section 11)
- Support process for local government review as part of Certificate of Designation

### CCoD

- Revised municipal code (see section below)
- State recommendation for approval of EDOP (Appendix F of application)
- DEH recommendation for approval (Appendix F of application)
- A passed ordinance by City Council equals the issuance of the Certificate of Designation

# Denver Zoo Waste to Energy System

## Outreach



Denver Zoo  
Community Outreach  
(ongoing)

- Local/National Public messaging since 2009
- Formal Outreach Process
  - City Council and Mayor (Aug-Oct 2013)
  - Presented to Inter-Neighborhood Cooperation
  - Hosted Stakeholder Meetings invited RNO Leadership
  - Hosted 3 Open houses (Sept-Oct 2013)
    - RNOs
    - City Officials
    - Public
  - Presented to DPRAB (Oct-Nov)
  - DPRAB Public Hearing and recommendation for approval (Nov)
- Operations /Being a Good Neighbor

# Denver Zoo Waste to Energy System



Thank you



## Any questions?

