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COLLABORATE. **CONNECT**. COMPLETE.

High Strength Waste Project
Muscatine Water ~~Pollution Control Plant~~ & Resource Recovery Facility

Midwest Food Recovery Summit 2017

Jon Koch, City of Muscatine

September 6-8, 2017

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Muscatine

Area

Resource

Recovery for

Vehicles &

Energy

MARRVE puts Muscatine on the path to sustainability

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Natural Gas for Vehicles


CLEAN
CNG
BI-FUEL
6500
miles
range


Think Green,
Think Clean.
We run on clean burning natural gas.


ups

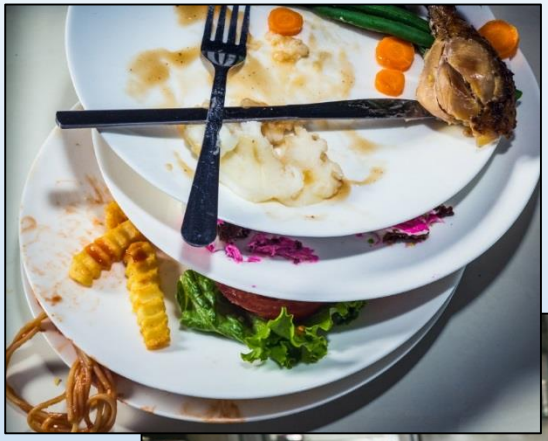

CNG
Compressed Natural Gas
This truck is powered by
Clean Burning
Natural Gas
DRIVE
NATURAL
Cleaner, Quieter, Smarter
CAUTION
PAPILLION
SANITATION
402-346-7800


EMERGENCY 911
PORTLAND POLICE


THIS EAST PIKELAND
POLICE VEHICLE
OPERATES ON C.N.G.


810
18251-T


Built for you.
Backed by GM.




ORGANIC MATERIAL
ORGANIC MATERIAL


recycle
food waste

Organics Recovery Is Possible!

- 40% of food produced is not eaten
- 20% of landfill waste is organic and can be recycled
- Resource recovery is needed for landfill sustainability
- Revenue, natural fertilizer and clean renewable energy from waste is the end product

Idea Formulation

Local Organic Wastes + Anaerobic Digestion= RENEWABLE FUEL FOR VEHICLES

FOG Program + Spare Unused Tanks + Lightly Loaded Digesters + Continuously flaring unused Digester Gas = OPPORTUNITY

Current Digesters-2010

- ~900,000 gallon capacity
- Floating covers
- Draft tube mixing
- Parallel or series operation

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Old Digesters-Retrofit from A Basins

- 4 square digesters
- 1.5 million gallon capacity
- Fixed top, middle mixing
- Bad gas capture
- Aeration basin retro-fit in the 80’s

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Muscatine Biogas Current Use

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Waste to Fuel Benefits

- Landfill diversion (up to 20%) saving expensive landfill space
- Lower air emissions with clean CNG fuel
- Provides a needed service to the community/industry (good for industry and the environment)
- Long term potential for recouping capital and developing a sustainable revenue source for wastewater

Waste Types (Feedstocks)

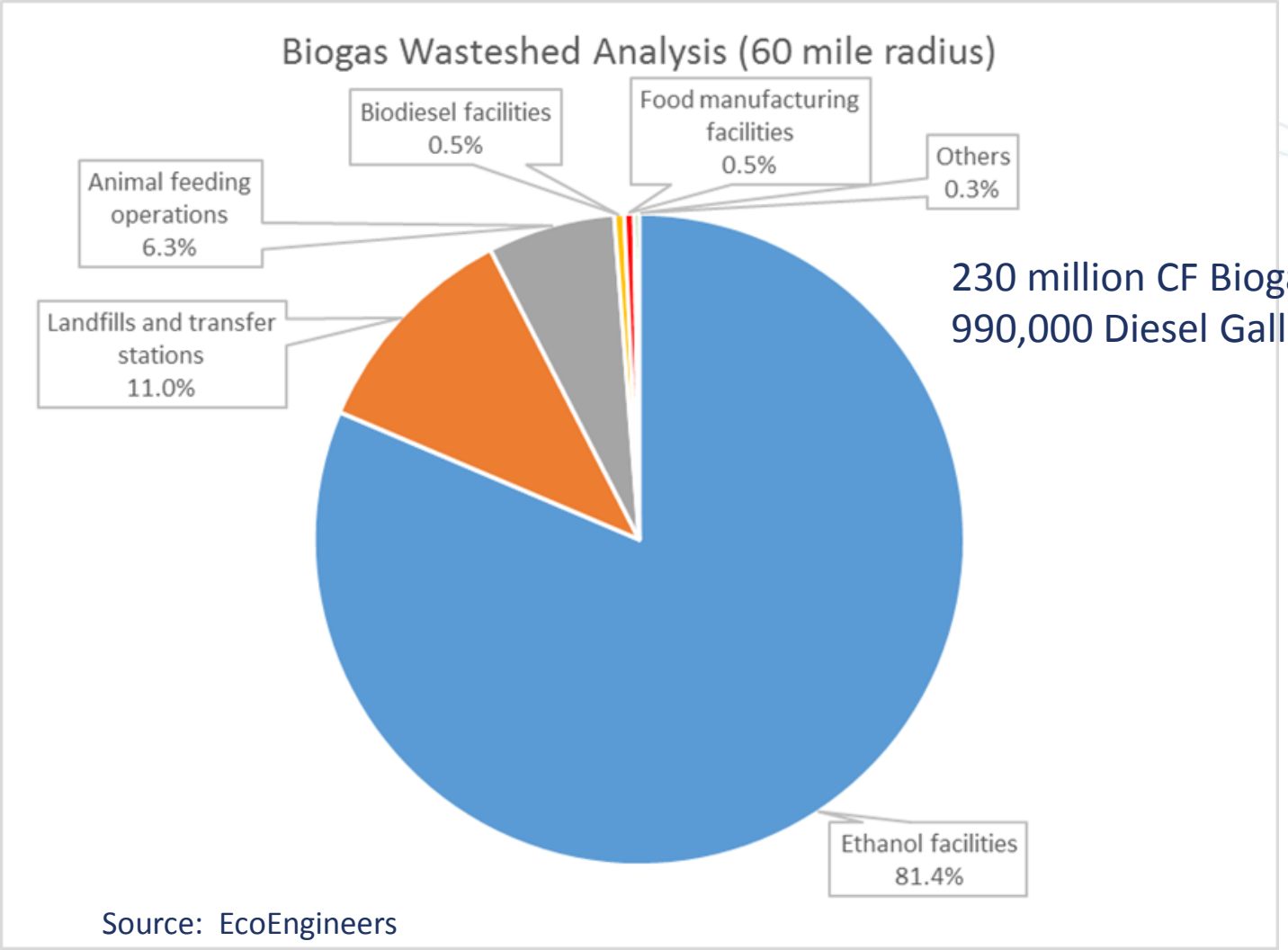
FOG = Fats, Oils, Greases – Restaurants

Liquid Organic Waste = high strength waste – liquid wastes with high organic content – often from food processors

Solid Organic Waste

- packaged materials – ex. bottled ketchup
- past prime vegetables from grocer
- cafeteria waste from schools

Local Potential



230 million CF Biogas/day
990,000 Diesel Gallons/Day

Source: EcoEngineers

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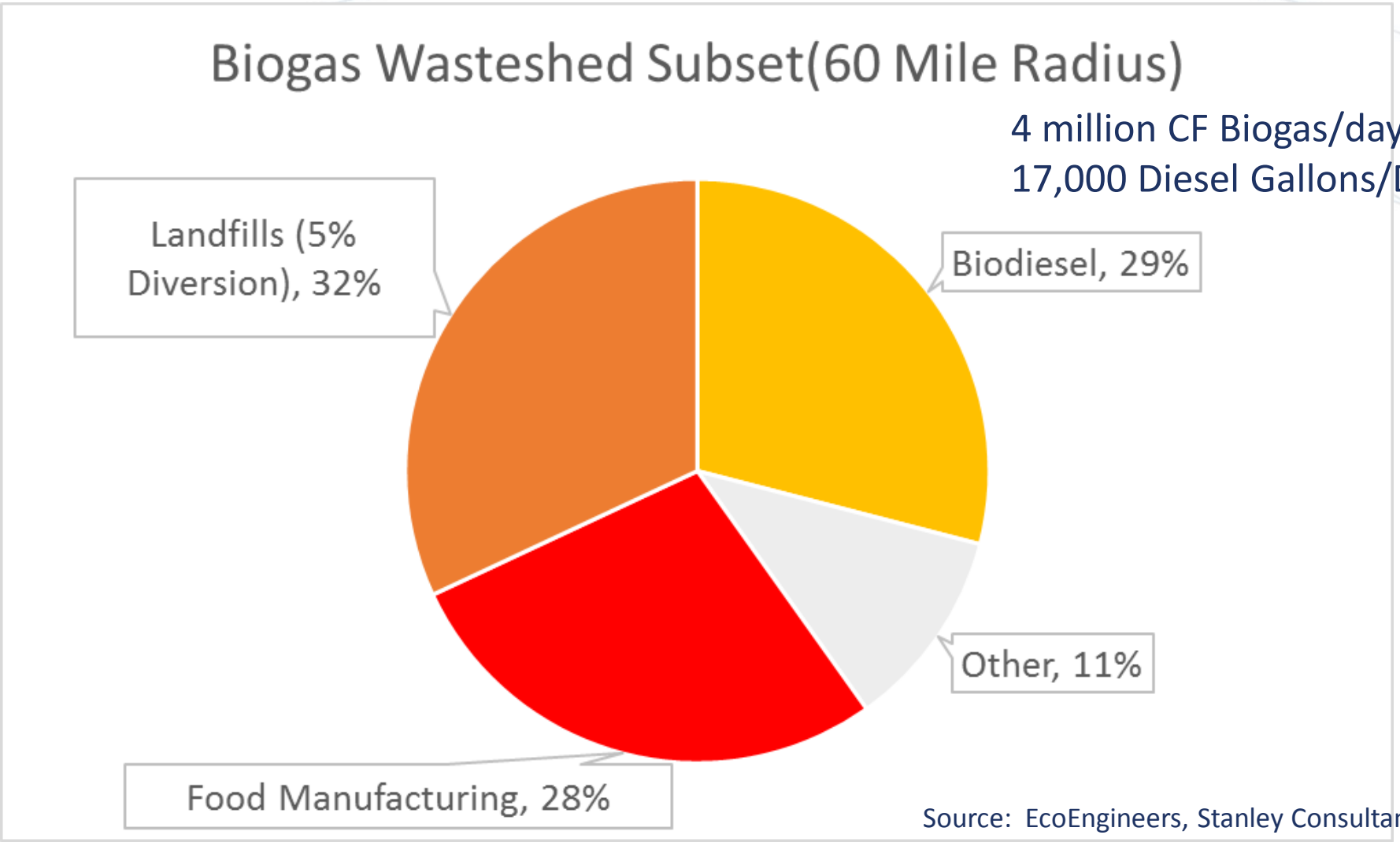
Local Potential

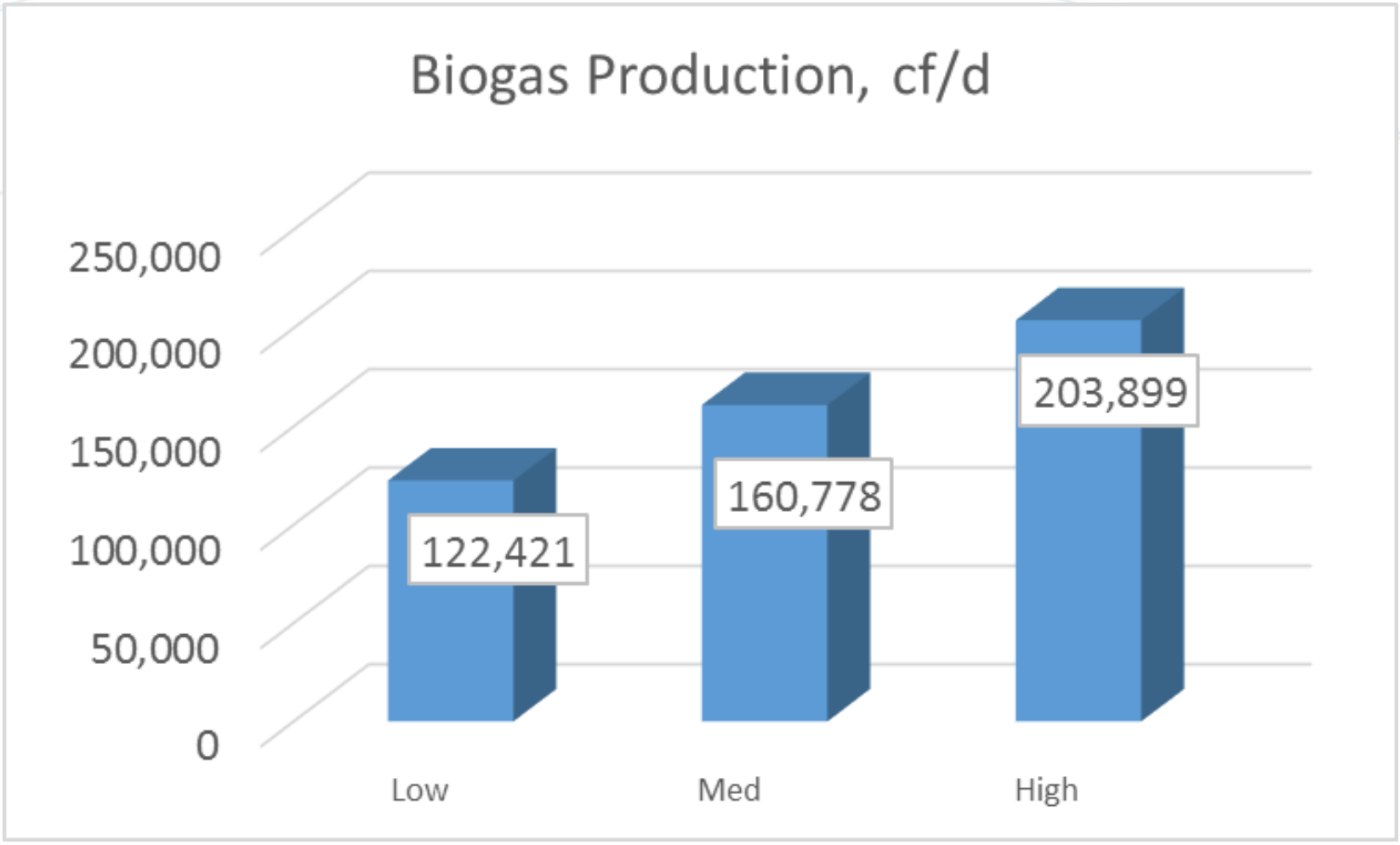


Source: EcoEngineers, Stanley Consultants

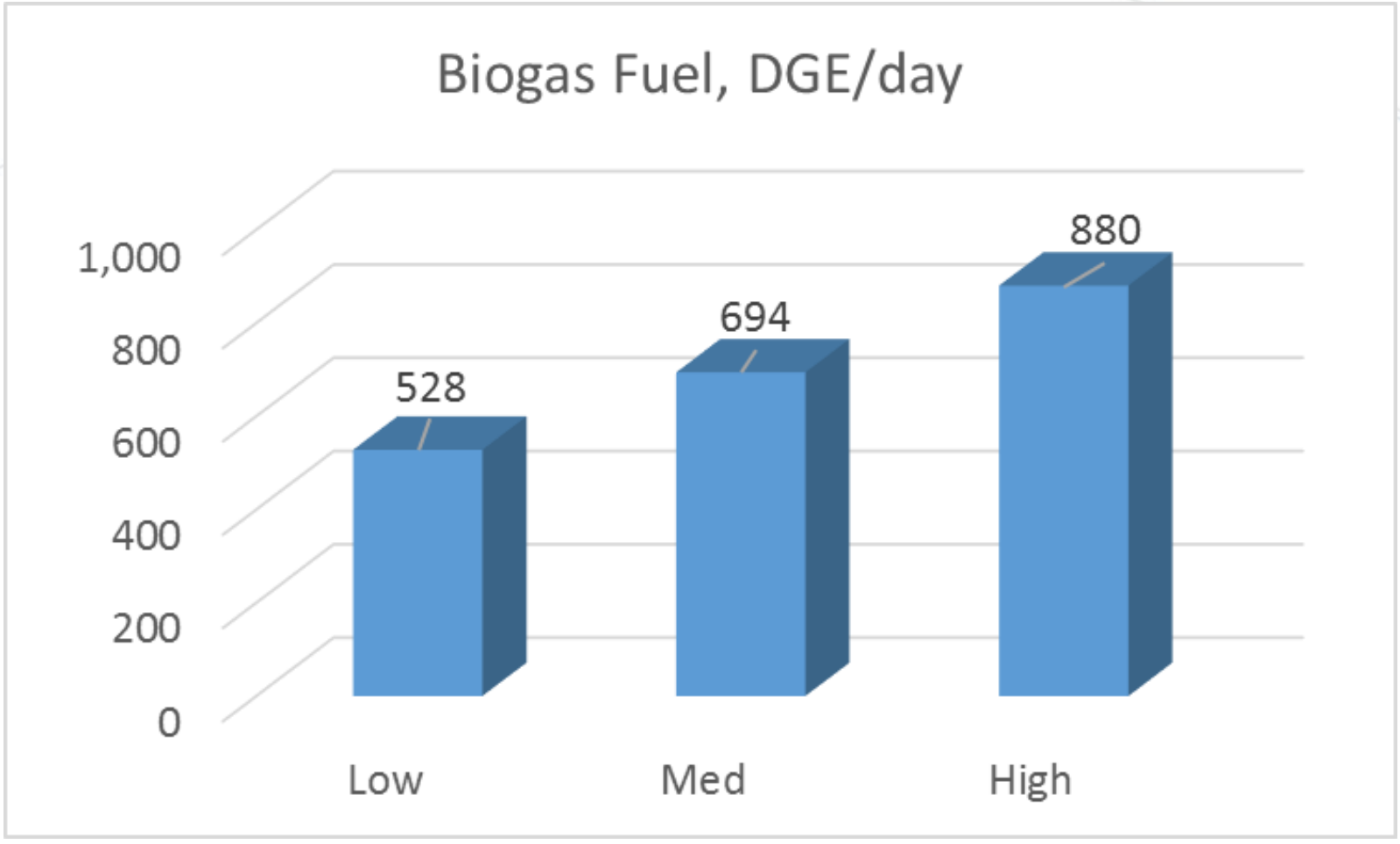
Local Potential

- FOG Haulers
- Local Industries such as Kraft-Heinz
- Local Businesses such as Hy-Vee
- Schools
- Restaurants
- Regional Industry Agreements: Nestle-Purina
- Possible Fuel Purchase Partner (Ruan)

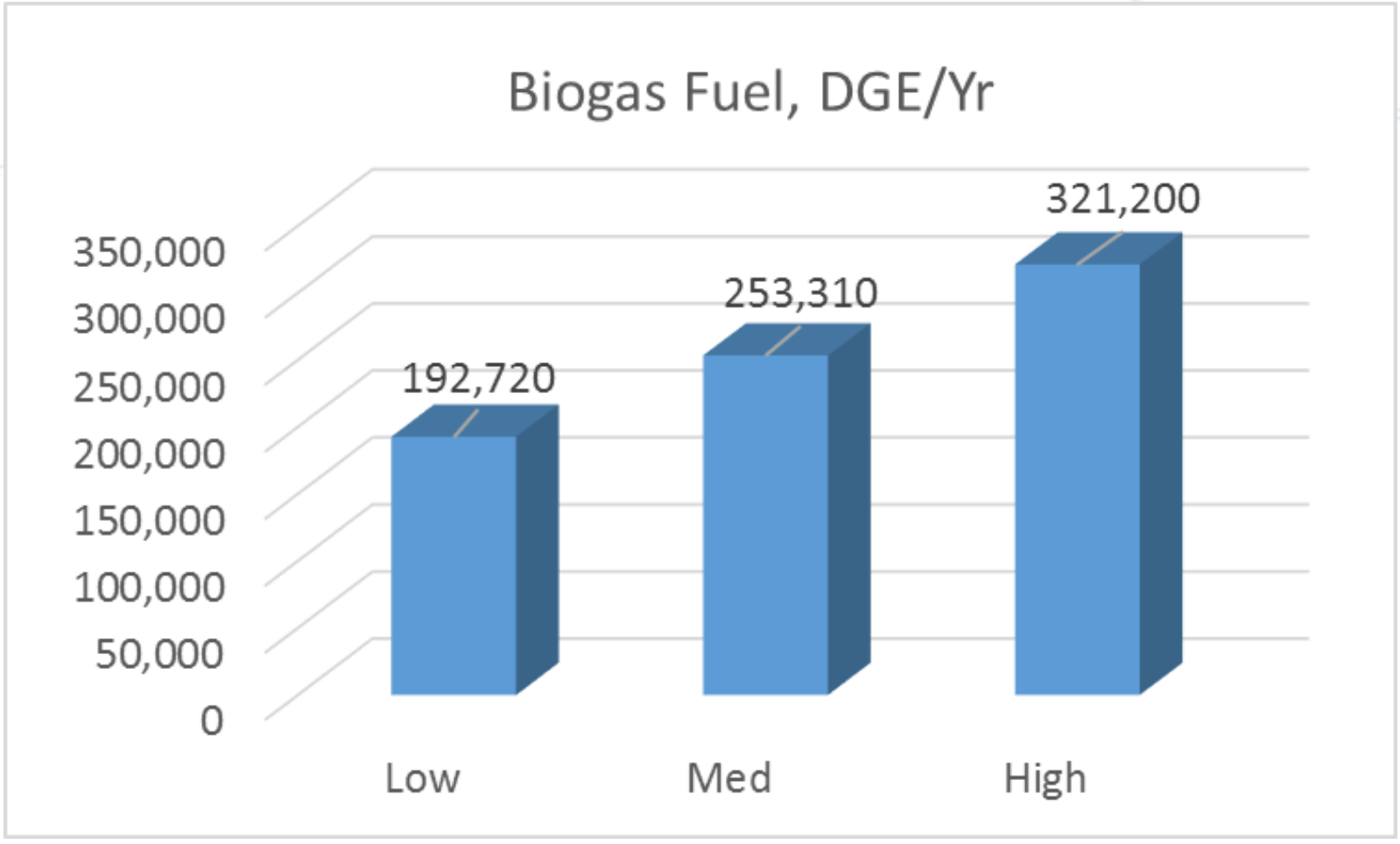
Biogas Production



Biogas Fuel in Diesel Gallons



Biogas Fuel in Diesel Gallons



The Overall Long-Term Project

Receiving Facility – Phase 1

Feeding Facility – Phase 1

Abandoned Digester Recommission-Phase 1-2?

Biogas Treatment Facilities-Phase 2

Biogas Usage Facilities-Phase 2

The Project-Phase 1

Receiving Facility

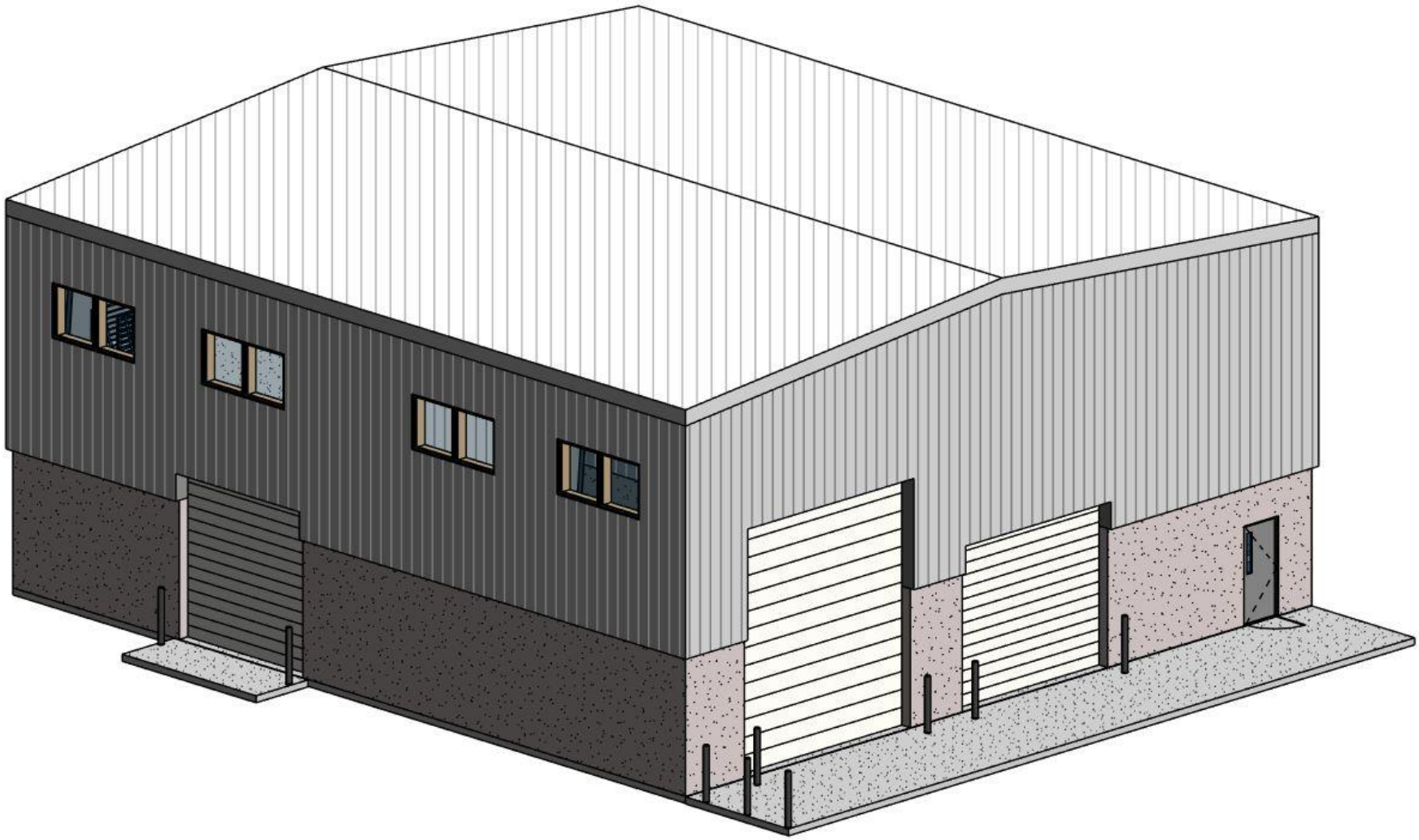
Receive & Preliminary Treatment:

FOG – remove rocks, cutlery, debris

Organic Liquid Waste - remove debris, retain organics

Organic Solid Waste – depackage and slurry, recover package materials

The Project – Receiving Building



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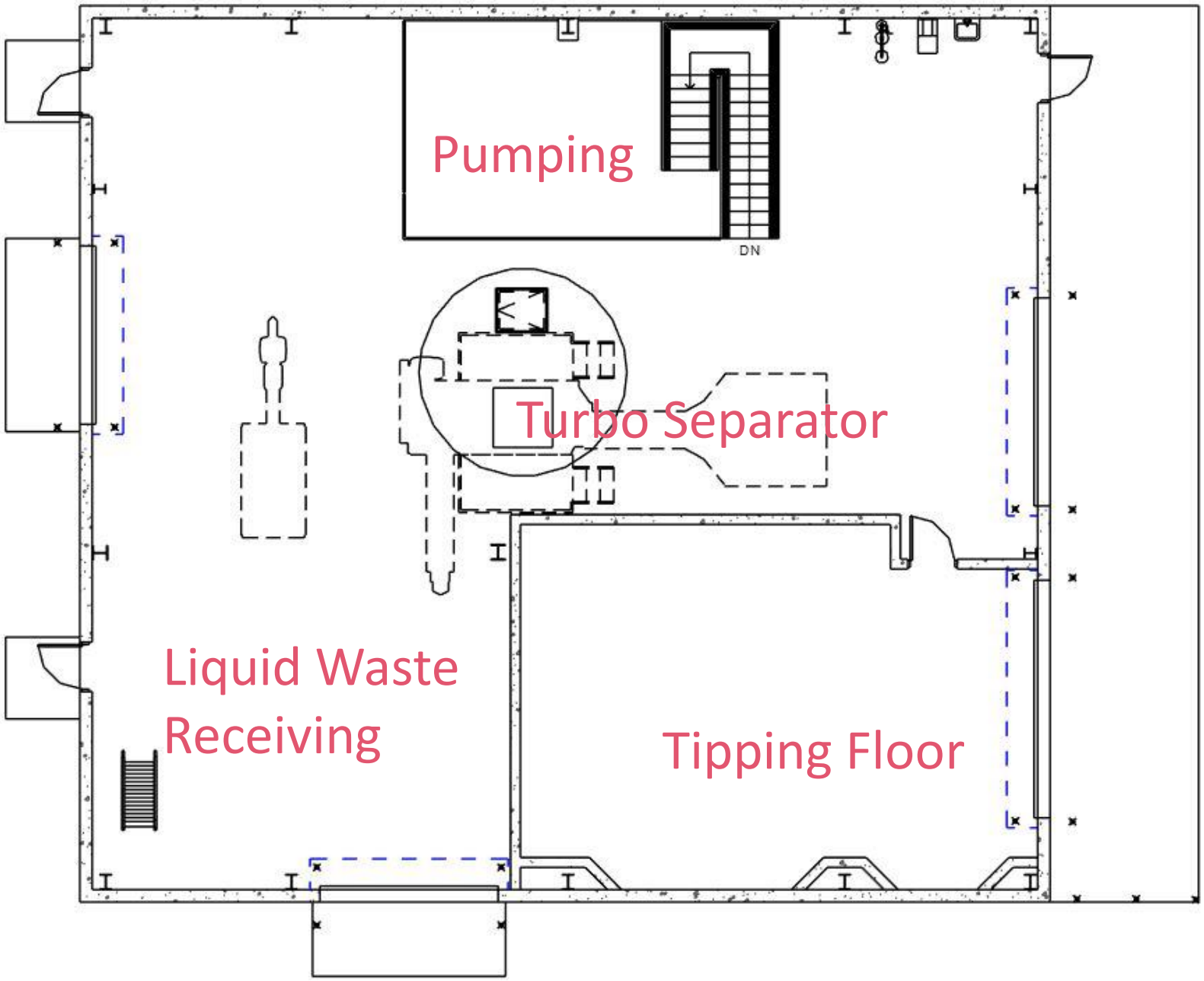
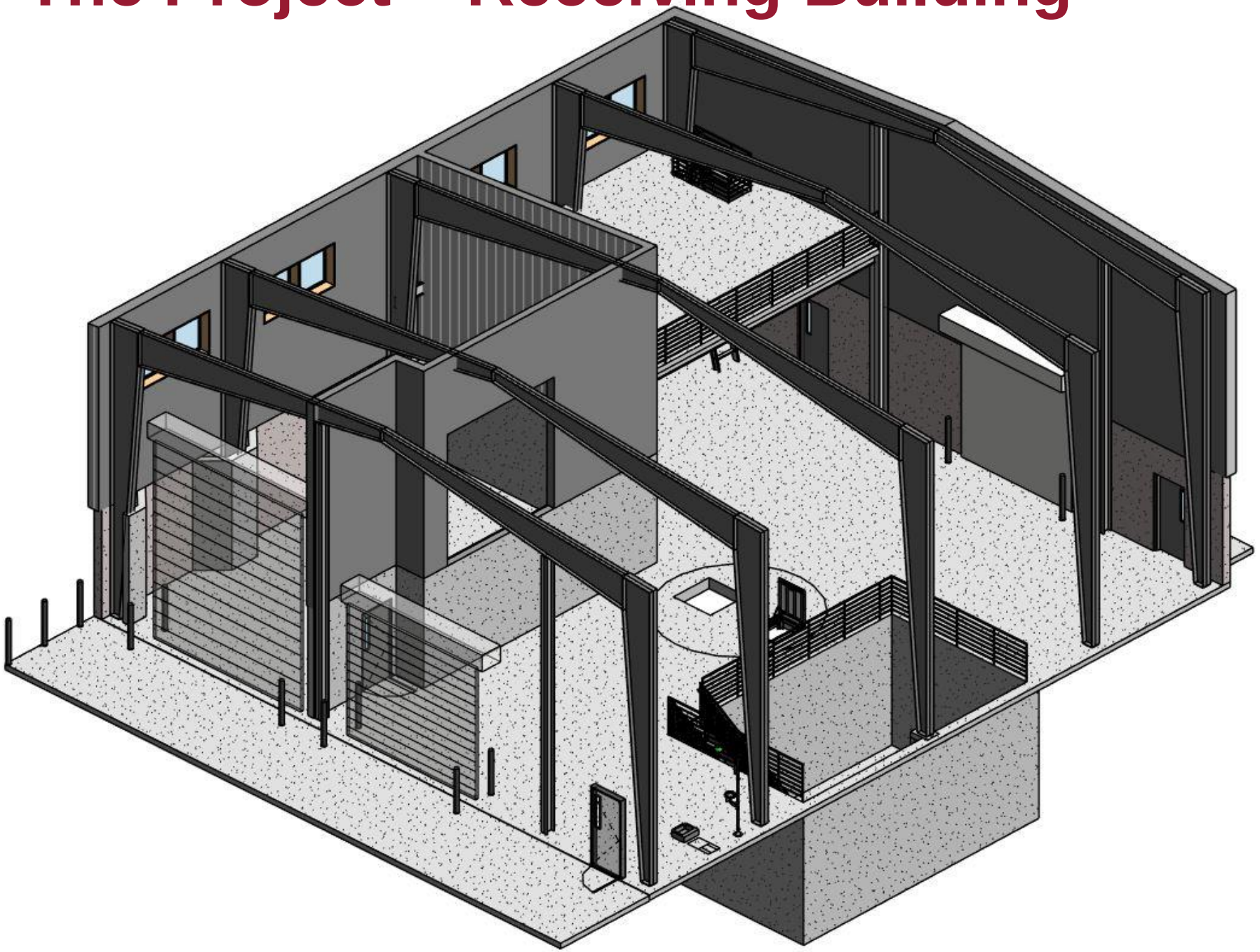
The Project – Receiving Building



The Project – Receiving Building



Depackaging Machine Proposed

T 42 Turbo Separator
Scott Equipment Co.

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Estimated Project Cost

- Phase 1 Receiving/Feed Facilities
  - $2.8 to $3.3 million
  - Includes Organic Solid Waste Separation and Odor Control ~$0.5 million
- Phase 2 Gas Treatment and BioCNG Vehicle Fueling Facility
  - $2.5 to $3 million
  - Fill rates, configuration, and CNG storage capacity alter cost

Potential Revenues

- Potential Revenue Sources
  - Waste tipping fees
  - Fuel Value
  - Renewable Energy Credits
    - Petroleum Producer $ paid to obtain offsetting renewable energy credits
    - Federal credits + for transportation related credits states such as CA, OR
    - Can be substantial revenue stream that can offset the capital investment

Risks

- Lower organic waste volumes
- Lower fuel usage/sales
- Lower tipping fee rates
- Lower RIN values or program phase out-secure to 2022
- Higher operating costs

Timeline

Phase 1

- Design Completion — September 2017
- Phase Permitting/Bidding — October 2017
- Construction — November 2017-April 2018
- Commissioning/Start Up — May 2018

Phase 2

- Design — 2017
- Construction — 2018

Some Waste to Fuel Basics

1 gallon of digested food waste produces 20 cubic feet (CF) of digester gas

1 gallon of digested FOG produces 2 CF of digester gas (due to water)

1000 CF of digester gas = 0.6 mmbtu

In terms of vehicle fuel

1000 CF of digester gas = 4 gallons of diesel fuel or 5 gallons of gasoline

= 150 miles car or 20 miles semi-truck

Some Waste to Fuel Basics

1 Ton (~200 gallons) of food waste yields ~17 gallons of diesel