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Monetizing Waste With Biogas Production

MN Renewable Energy Roundtable

Morris, MN

November 3, 2015



WHAT WE DO:

1. Program Management for Renewable Fuels Industry
 - Navigate the complexity of energy regulations
 - Gain access to carbon and fuel markets
 - Clients range from Fortune 500 companies to small startups

2. Develop RNG projects that are a model for energy recovery & reuse
 - Targeting municipal, industrial, agricultural, and institutional settings
 - Our regulatory expertise allows us to monetize energy credits and profitably market RNG into the best markets.
 - Comprehensive project development process is a one-stop shop for project feasibility analysis, engineering, equipment sourcing, financing and operations.

The Team



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1. The RNG Opportunity

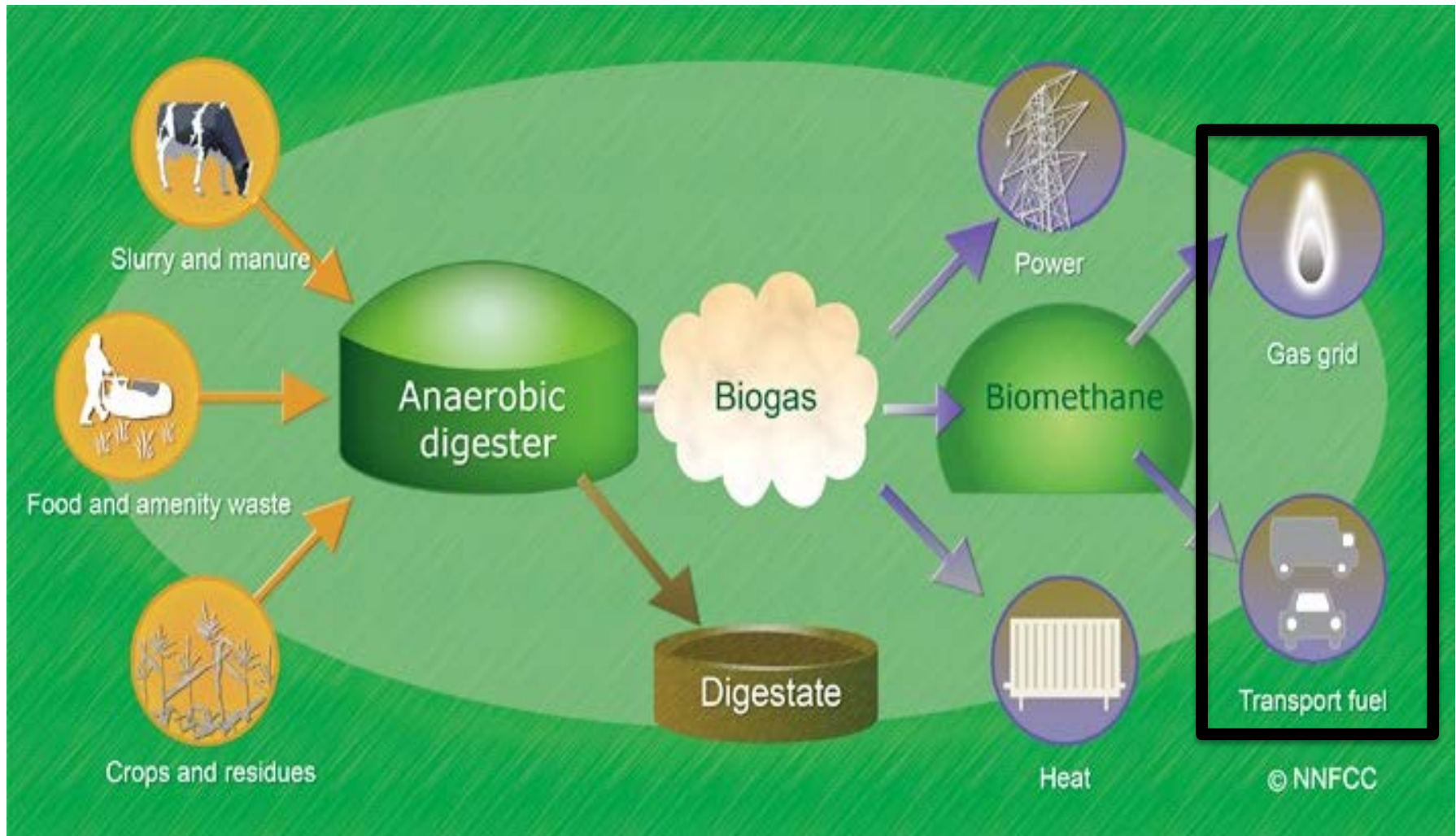
2. Case Study

3. Looking Forward

Methane From Biogas = RNG



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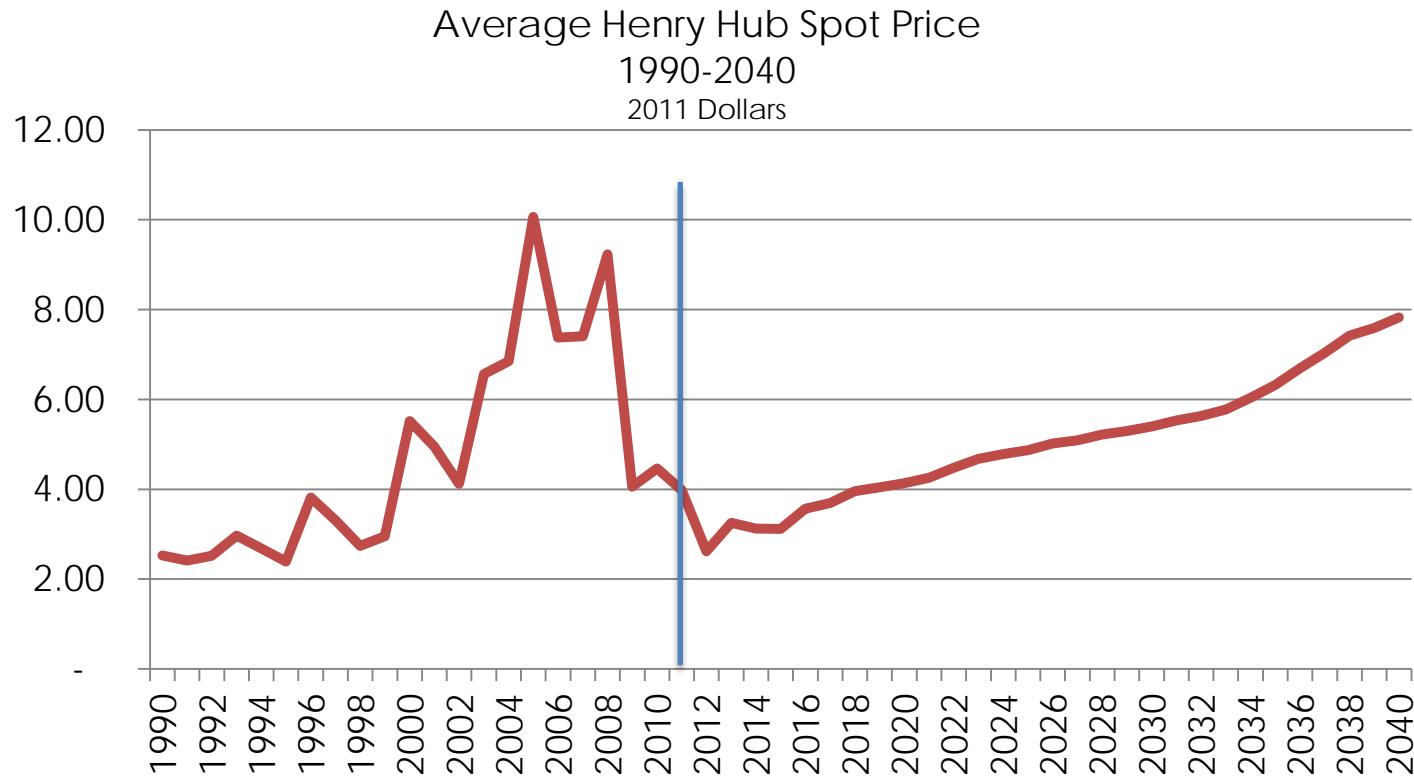


Underlying Commodity is Pipeline Quality Natural Gas



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Natural Gas Demand Increasing As The US Moves Away From Coal Fired Power



Expanding Carbon Markets Make RNG Projects Viable

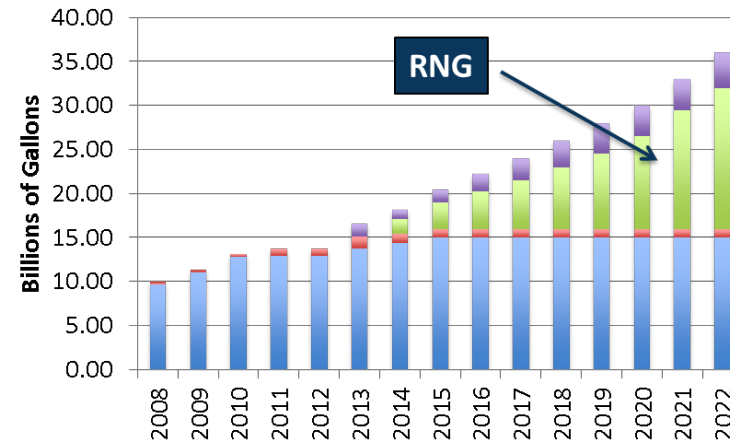


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One MMBTU of Pipeline Quality Biogas Produced in the Midwest and Used for Transportation in California

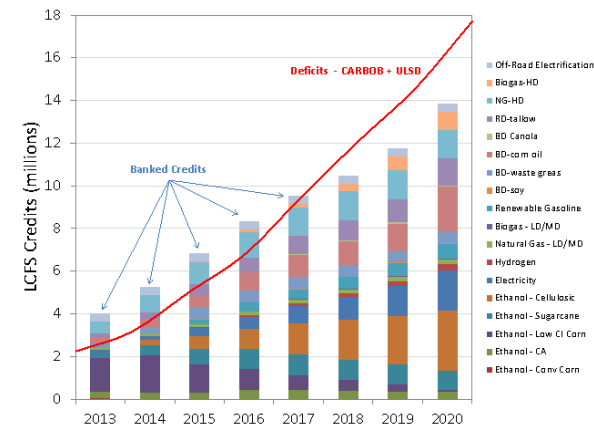
Value of Gas	\$3.00	26%
Value of RINs	\$4.70	40%
Value of LCFS Credits	\$4.04	34%
Total	\$11.74	100%

RFS



CAP & TRADE

LCFS



Successful Biofuel Projects Must Optimize Green Credits



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Majority Of Value Is Derived From The Volatile RIN Market



A Leader In Carbon Credit Realization



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Audits of
OVER 150
BIOFUEL PLANTS
in **18 COUNTRIES**



OVER
1 BILLION
GALLONS OF BIOFUEL CAPACITY
UNDER MANAGEMENT



OVER **50** PRODUCERS
have enrolled in
RIN COMPLIANCE PROGRAM

WHY ECOENGINEERS?



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ONE OF THE FIRST
USEPA RECOGNIZED
RIN Quality Assurance Programs

Assisted
REGISTRATION
& PREPARATION
for over **30 LCFS**
PATHWAY PROJECTS



TRANSACTIONED OVER
1.7 BILLION
RINS IN 2014

4.7 MILLION RINS 
PROCESSED **EACH DAY**
on our automated platform

We Manage The Complexity Of The Entire Supply Chain



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Manage Financial Risk

Debt liability

Equity risk

Manage Contract Fulfilment

Upgraded gas

Credit sales

Ensure Revenue Optimization

Maximize revenues through active management of sales

Develop New Markets

Monitor market opportunities and develop new ones to sustain and increase revenues

Manage Regulatory Matters

Manage regulatory volatility; preserve and develop policy supports

Manage Operational Costs

Manage all the operational costs, quality control, transport and sales.

RNG Recovery And Reuse At Industrial Waste Water Facility



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Kansas Waste Water Facility Dedicated To Beef Processing

- Awarded to EcoEngineers in 2014
- 20 year agreement
- Revenue share/profit share
- Ownership of gas purifiers upgrading raw biogas to pipeline quality methane
- 9,230 DGE/day of low carbon fuel
- 54,000 MT/Year CO2 reduction
- \$8.5 million capex @ 43% ROI



Current Project Pipeline



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- **13 sites in project pipeline**
 - Industry with high strength wastes incur significant disposal costs (surcharges and hauling fees). Expansion is restrained by cost of wastewater treatment
 - Iowa nutrient reduction plan is causing further stress on disposal options
 - Wastewater treatment infrastructure is a cost center for municipalities.
 - Private wastewater treatment (AD) can be a win-win solution and an economic development tool
 - Other targets include Institutions with sustainability goals, county landfills being consolidated, etc.
 - Using environmental credits to accelerate payback period
- **Pilot level studies launched at four locations**
 - Simulation of commercial scale operations
 - Short list of vendors
 - Developed supplier network in Iowa/Midwest
- **Negotiating contracts at one location**
 - Anticipated groundbreaking in winter 2015-2016



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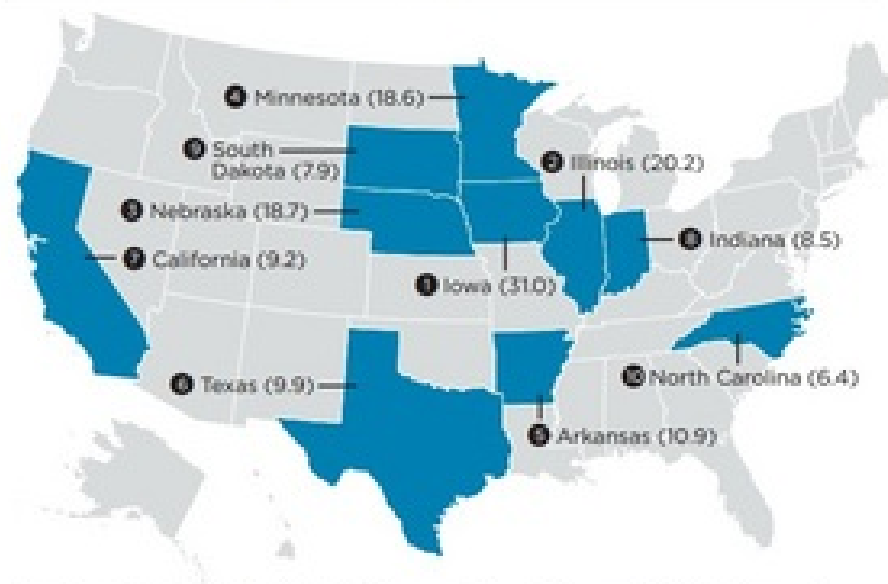
Abundant Biomass in The Midwest



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- US will have 680 million tons of biomass annually by 2030
 - 155 million tons of crop residues
 - 60 million tons of manure
- 10 states to produce two-thirds of that volume - Iowa, Illinois, Nebraska, Minnesota, Arkansas, Texas, California, Indiana, South Dakota and North Carolina
- Iowa will lead the nation in expected crop residue production – about 31 million tons

FIGURE 1. Top 10 States as Sources of Crop Residues and Manure for Bioenergy, 2030 (Million Metric Tons)



About two-thirds of total projected U.S. crop residues and manure in 2030 will come from just 10 U.S. states.

Note: Figures expressed in million metric tons of dry biomass weight.

SOURCE: ADAPTED FROM UCS 2010.

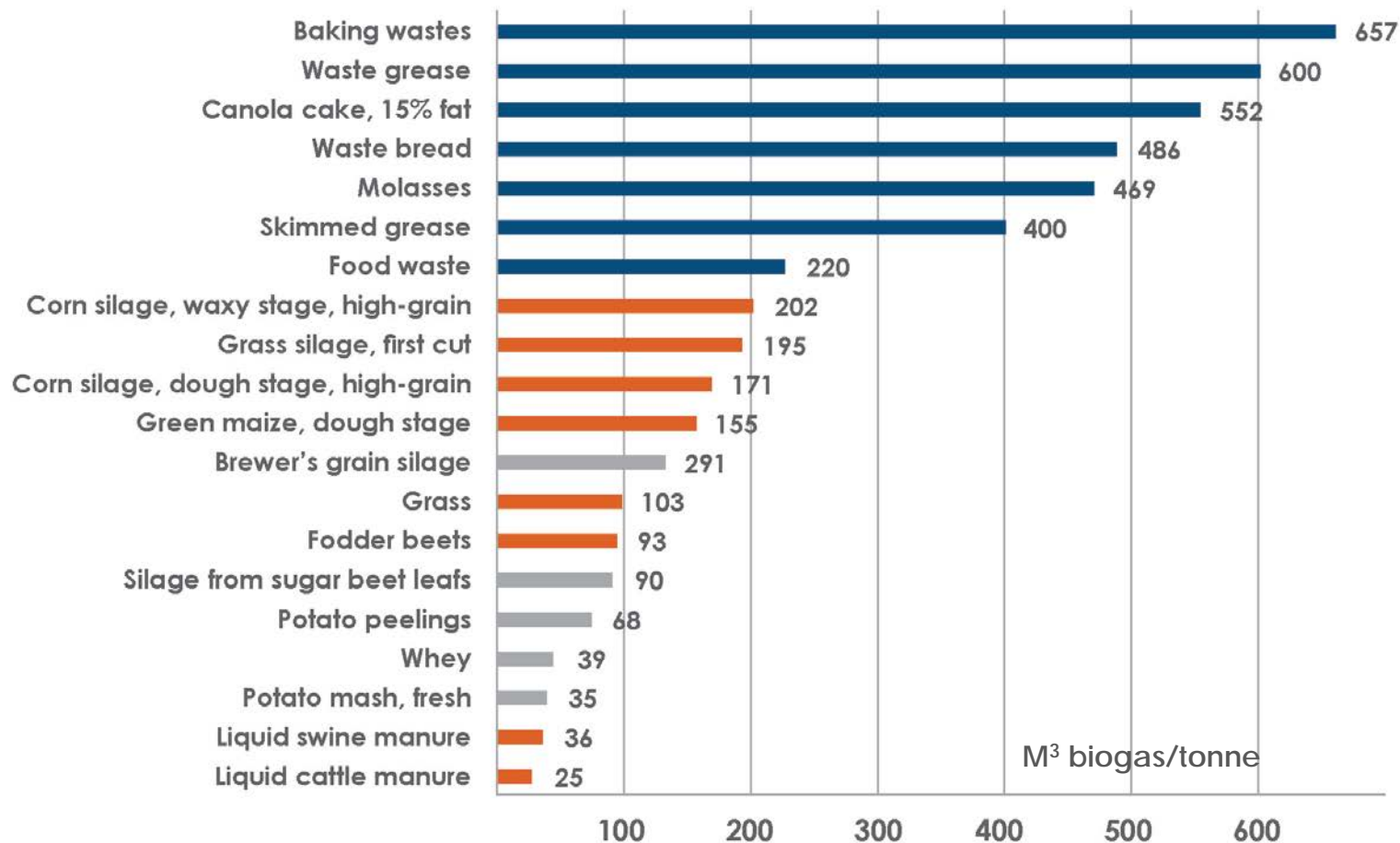
Source: Union of Concerned Scientists Fact Sheet

Energy Recovery And Reuse Through Community Digestion



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POTENTIAL YIELD CAN BE MAXIMIZED BY MIXING FEEDSTOCK.



Case Study: Iowa



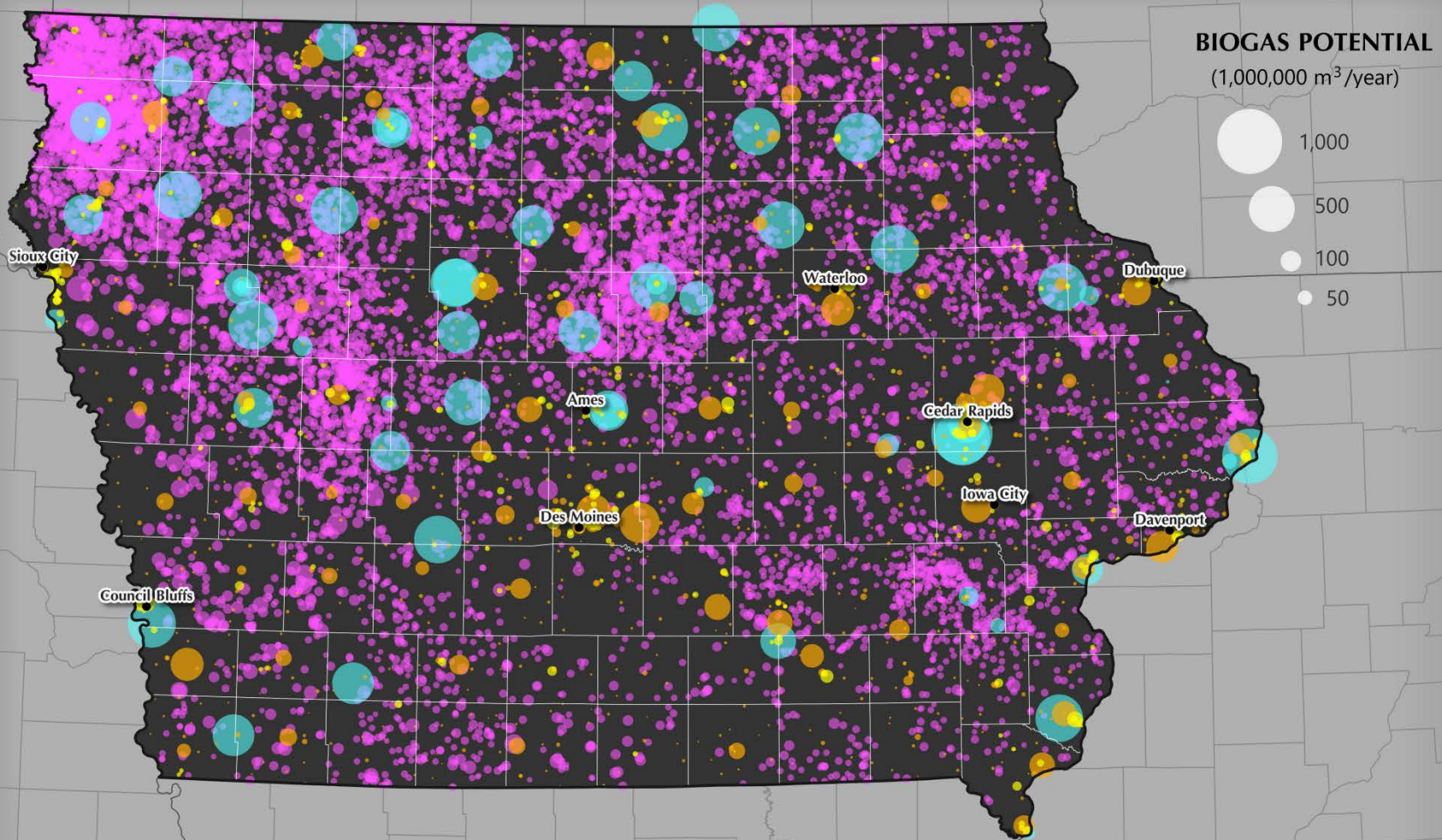
Animal feeding operations

Cities, group quarters & landfills

Food & paper manufacturers

Biofuel plants

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Case Study: Dubuque, IA



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Iowa Biogas Assessment Model

Summary

Biomass Source	Number of Facilities	Estimated Biogas Potential (cubic meters/year)
Agricultural residue	n/a	964,587,564
Animal feeding operations	439	111,724,722
Biodiesel facilities	2	8,071,086
Census places	90	1,235,071
Ethanol facilities	1	286,817,797
Food manufacturing facilities	15	1,108,548
Group quarter populations	2	38,981
Landfills and transfer stations	5	58,829,555
Paper manufacturing facilities	4	167,141
Total Estimated Biogas Potential:		1,432,580,464

Case Study: Dubuque, IA

Animal Feeding Operations



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	FACILITY NAME	CITY	OPERATION TYPE I	OPERATION TYPE II	TOTAL BIOGAS POTENTIAL (CU. M/YR)	FACILITY DISTANCE (MILES)
1	Beswick Feedlot	Greeley	Beef Cattle	Confined/Open	2,659,904	35
2	C.j. Farms	Lamont	Beef Cattle	Confined/Open	2,108,352	49
3	Johnson Valley Beef Inc	Andover	Beef Cattle	Confined/Open	1,748,064	42
4	Blanchard Family Dairy	Charlotte	Dairy Cattle	Confinement	1,556,800	40
5	Reuter Dairy Inc.	Peosta	Dairy Cattle	Confined/Open	1,354,860	11
6	Ed Hosch and Sons Inc. - Sec. 11	Cascade	Beef Cattle	Confined/Open	1,307,712	24
7	Don Stickle and Sons Farms Inc.	Anamosa	Beef Cattle	Open Feedlot	1,300,595	42
8	Naeve Livestock Farms	Andover	Beef Cattle	Open Feedlot	1,067,520	43
9	Johnson Family Farms Inc.	Maquoketa	Beef Cattle	Open Feedlot	1,067,520	33
10	Cwt Feedyards	Monticello	Beef Cattle	Open Feedlot	996,352	36
11	Blue Hyll Dairy	Clinton	Dairy Cattle	Confinement	991,014	45
12	Charles White Feedlot	Earlville	Beef Cattle	Open Feedlot	889,600	30
13	Loes Feeding Yards	Cascade	Beef Cattle	Open Feedlot	889,600	20
14	R and J Reiter	Cascade	Beef Cattle	Open Feedlot	888,710	17
15	Eastern Iowa Cattle	Strawberry Point	Beef Cattle	Confined/Open	888,710	46
16	Reiter Feedlot	Bernard	Beef Cattle	Confinement	880,704	19
17	Dairy Venture Llc	Central City	Dairy Cattle	Confinement	809,536	48
18	Kelchen Lloyd	Edgewood	Beef Cattle	Open Feedlot	800,640	37
19	Hosch Farms Co - Sec 14 and 23	Cascade	Beef Cattle	Open Feedlot	800,640	25
20	Chuck Shada Farm and Feedlot	Anamosa	Beef Cattle	Open Feedlot	800,640	46

Case Study: Dubuque, IA Food Production



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	COMPANY NAME	CITY	INDUSTRY GROUP DESCRIPTION	BIOGAS POTENTIAL (CUBIC METERS/YEAR)	FACILITY DISTANCE (MILES)
1	Edgewood Feed Mill Inc.	Edgewood	Prepared Feed and Feed Ingredients for Animals and Fowls Except Dogs and Cats	14,047	36
2	Silveredge Co-Op	Edgewood	Prepared Feed and Feed Ingredients for Animals and Fowls Except Dogs and Cats	15,451	36
3	Trappistine Creamy Caramels	Dubuque	Candy and Other Confectionery Products	17,558	8
4	Betty Jane HomeMade Candies Inc.	Dubuque	Candy and Other Confectionery Products	19,665	1
5	Edgewood Locker	Edgewood	Meat Packing Plants	25,863	38
6	Lime Rock Springs Co.	Dubuque	Groceries and Related Products Not Elsewhere Classified	26,993	2
7	Innovative Ag Services Co.	Monticello	Prepared Feed and Feed Ingredients for Animals and Fowls Except Dogs and Cats	28,093	32
8	Three Rivers FS Co.	Earlville	Prepared Feed and Feed Ingredients for Animals and Fowls Except Dogs and Cats	31,605	30
9	7g Distributing Co.	Dubuque	Beer and Ale	34,414	3
10	Nu-World Amaranth Inc.	Dyersville	Food Preparations Not Elsewhere Classified	35,117	23
11	Myers-Cox Co.	Peosta	Tobacco and Tobacco Products	44,925	9
12	FOOD WASTE SOLUTIONS LLC	Anamosa	Prepared Feed and Feed Ingredients for Animals and Fowls Except Dogs and Cats	59,698	43
13	Progressive Processing LLC	Dubuque	Meat Packing Plants	71,124	4
14	Prairie Farms Dairy Inc.	Dubuque	Fluid Milk	163,363	2
15	Bimbo Bakeries USA Inc.	Dubuque	Bread and Other Bakery Products Except Cookies and Crackers	520,632	2

Potential Value From RNG Production in Dubuque, IA



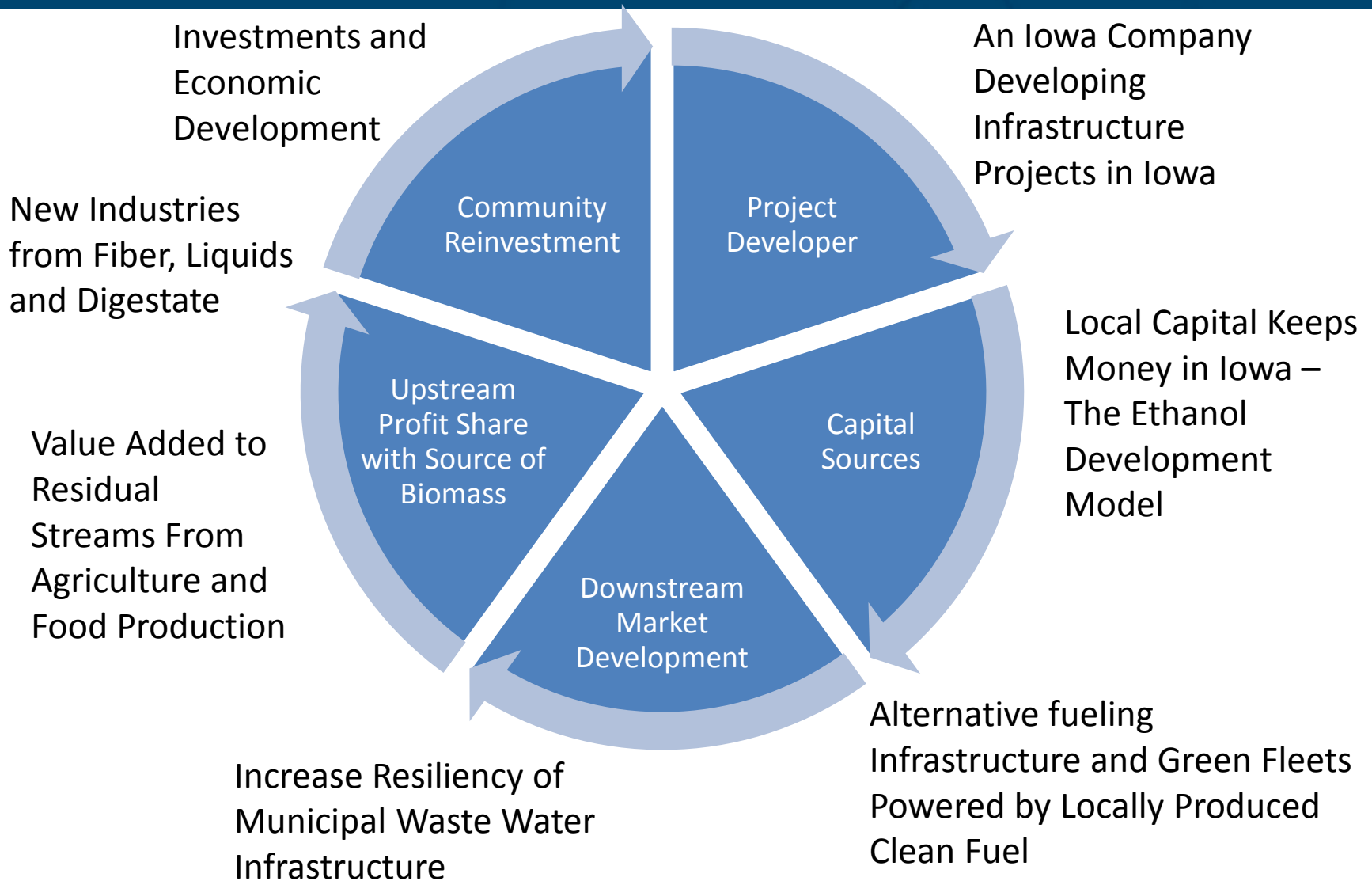
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Total Potential RNG Yield:	1,432,580,464	m³ / year
Utilization Assumption:	1.0%	
Available Yield:	14,325,805	m³ / year
	=	515,815 mmbtu / yr
	=	1,413 mmbtu / day
Total Value of Nat Gas plus Env. Aspects:	\$ 12	\$ (NG+Credits)/mmbtu
	=	\$ 16,958 / day
	=	\$ 6,104,988 / year

Circulating the Profits in the Local Economy



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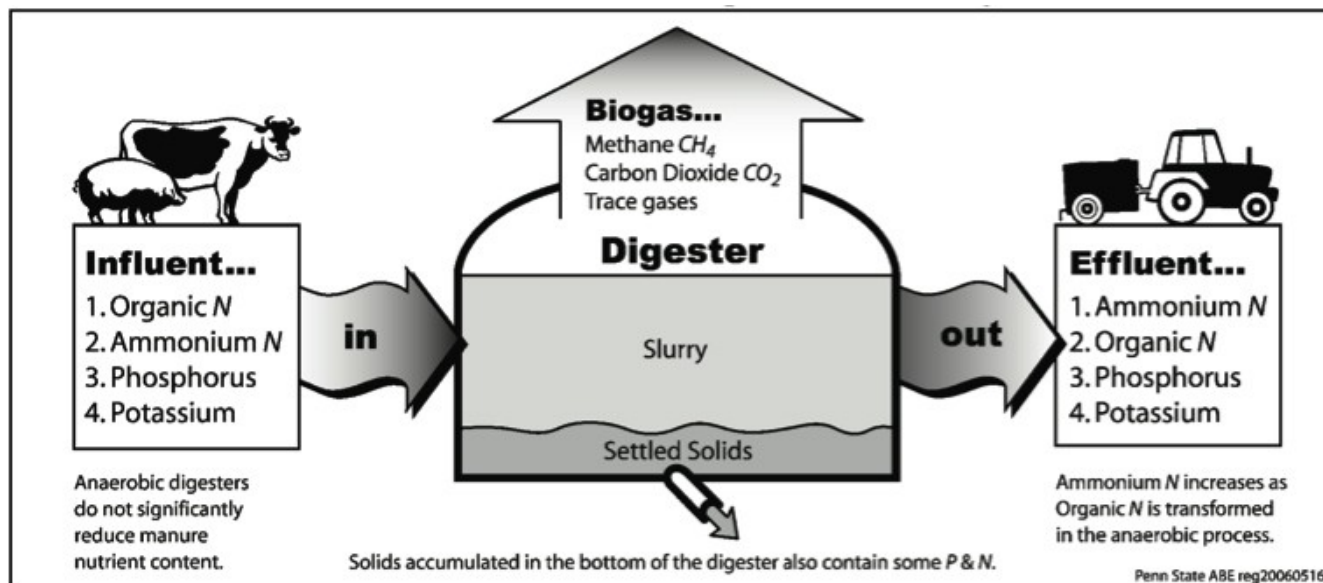


RNG Production Has Many Collateral Benefits



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- AD can create market for energy crops
 - Potentially mitigating nutrients runoff
 - Adding value to existing agricultural assets
- Effluent from manure digestion is rich in nutrients
 - AD provides opportunity to manage N and P Levels in fertilizer product
 - Fertilizer product from digestion has significantly lower pathogen levels relative to manure
- Digestion is a recommended practice for odor control



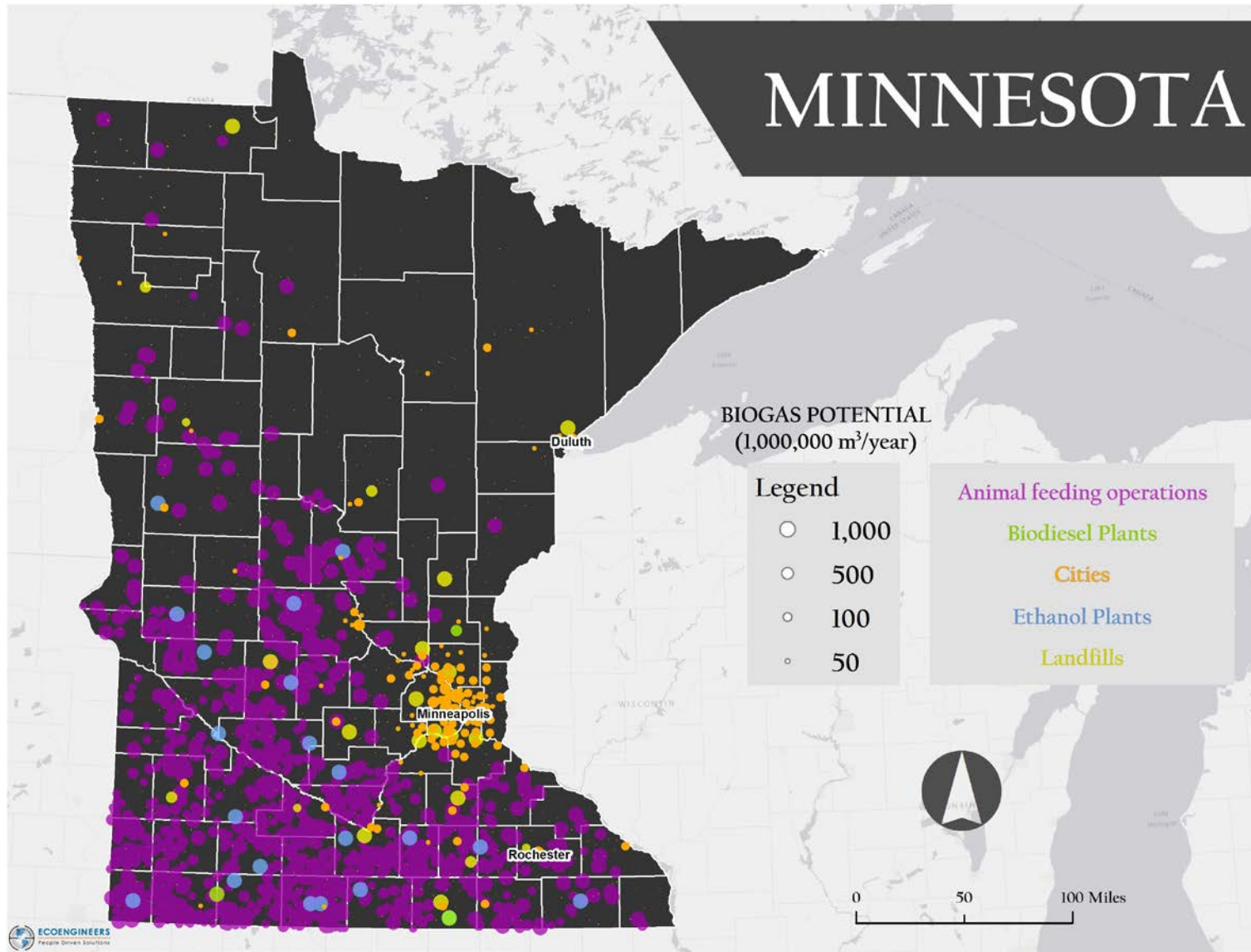


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We Have Started MN Biomass Mapping Project – ECD Jan 2016



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A Detailed 6-Step Process To Evaluate Project Feasibility



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PHASE I

1

IDENTIFY

- Location
- Stakeholders
- Biomass Availability
- Objectives

2

ANALYZE

- Biogas Yield
- Infrastructure / Logistics / End Use
- Economic Feasibility
- Investor ROI

3

DEMONSTRATE

- Business Case
- Community Impact
- Investment Opportunity

4

REFINE

- Engineering Study
- Final Installation Cost
- Financing Options
- Contracts

5

IMPLEMENT

- Final Design
- Permitting, Construction & Installation
- Project Commissioning

6

MANAGE

- Maximize Yield
- Maintain Compliance
- Gas Marketing
- Marketing Environmental Aspects

PHASE II

The Future of Fueling



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