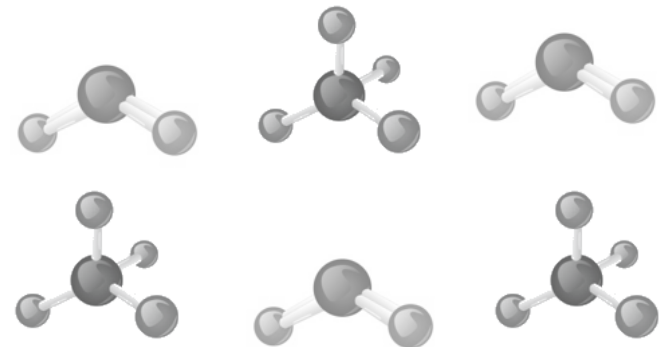
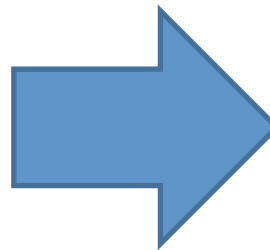




# Switch Grass to Biogas Evaluation

Presented By: Chris Ferguson



# Switch Grass to Biogas: Overview and Objectives

## Overview

- Evaluating the Integration into the Ontario On-Farm Biogas Model
- Corn Silage vs Switch Grass
- Currently running switch grass bales in Millbrook
- Planning to establish 10 Acre test plot on marginal acres



## Objectives

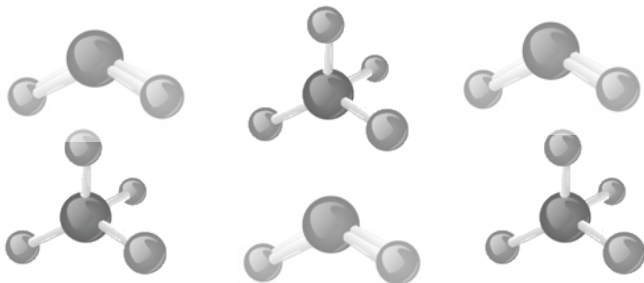
1. Added feedstock security
2. Use of unproductive marginal Farm lands
3. Bedding use and added Biogas Potential



# Current Work

## On-Farm Scale Digester Performance Evaluation

- Handling - Feeding
- Agitation/Pumping
- Digester Stratification
- Dry Matter/ VS Content  
(45% DM and 82% VS of DM)
- Biogas Production
- Corn Silage vs Switch Grass
- Required Hydraulic Retention Time for Switch Grass



# Current Results

- Bales were fed to continuous flow system at a rate of 1 per day starting Feb 1, 2015
- 42 Bales Went through Dry Feeder OK
- Agitation was doubled to combat stratification



- Ensiled Bales : 45% DM
- Volatile Solid Content : 82% VS
- Projected Biogas Amount : 580 m<sup>3</sup> per DM Tonne or 3100 kWh/DM tonne
- Hydraulic Retention Time : Greater than 60 days

# Future Work

## Marginal Farm Land Performance

- Establish 10 acres of Switch Grass
- Utilize Marginal Acres
- Harvesting
- Storage
- Feeding
- Agitation/ Pumping
- Biogas Production
- Digestate Land Application



# Context: 100 kWe Biogas Plant

- Produces approx. 800,000 kWh per year
- 10 acres of marginal land switch grass could produce 50 tonnes of Dry Matter (DM)
- 3100 kWh per tonne x 50 tonnes = 155000 kWh
- CHP efficiency 37% = 57350 kWh electrical
- This is equivalent to 7.1 % of needed feedstock
- Could also offset bedding costs (straw less biogas potential)





# Corn Silage vs. Switch Grass



## Corn Silage

**Yield per Acre:** 7 DM Tonnes

**Biogas Potential:** 680 m<sup>3</sup>/DM Tonne

**Energy / Acre:** 25,228 kWh

**Electrical Energy / Acre:** 9,334 kWh

**Input Costs:** High

**Land Required:** Good

## Switch Grass

**Yield per Acre:** 5 DM Tonnes

**Biogas Potential:** 580 m<sup>3</sup>/DM Tonne

**Energy per Acre:** 15,370 kWh

**Electrical Energy / Acre:** 5,687 kWh

**Input Costs:** Low

**Land Required:** Marginal



The data displayed above is for orientation purposes only



# Switch Grass: 100 kWe Digester Model

**Hydraulic Retention Time:** 120 days

**Digester Volume:** 1100 m<sup>3</sup>

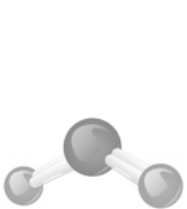
**Agitator:** 2 Paddle Giant Style Agitation

**Feed System:** Solid Feeder a Must

**Manure Source:** +2000 m<sup>3</sup>/year



**Switch Grass Acres:** 115 acres (assumes 5 DM tonne per acre yield)



The data displayed above is for orientation purposes only





## Questions ???



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