




# BioEnergy Opportunities for Eastern Ontario

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Ontario East Municipal Conference



Thursday September 13, 2007  
John DiPaolo – Senior Manager



## Bioenergy Opportunities in Eastern Ontario

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### Overview

- §ELORIN - Who We Are and What We Do
- §Bioenergy - The Basics
- §ELORIN Bioenergy Initiatives
- §The Eastern Ontario Opportunity

# Bioenergy Opportunities in Eastern Ontario

## ELORIN – Who We Are and What we do

§ELORIN – Eastern Lake Ontario Regional Innovation Network

§One of 12 Regional Innovation Networks (RINs) across Ontario

§ELORIN is set up as a not-for-profit organization

§ELORIN is supported in part by the Ontario Ministry of Research and Innovation



# Bioenergy Opportunities in Eastern Ontario

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## ELORIN Board of Directors

<b>Industry</b>	John Baker (Chair) - Stonhedge BioResources David Berg - DuPont Canada Graeme McRae - Bioniche Life Sciences Geoff Salter - Aztech Associates Inc. George Scott - Scott Group of Companies Tim Smith - Octane Orthobiologics Inc.
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# Bioenergy Opportunities in Eastern Ontario

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## ELORIN Mission Statement

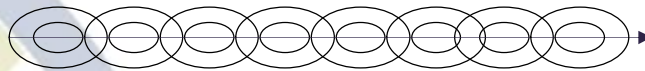
§ELORIN brings biobusiness opportunities to life by helping assemble the vital links of the value chains that take ideas into the marketplace

# Bioenergy Opportunities in Eastern Ontario

## Value Chain

**Innovation**

**Market**



Bringing people together

Identifying funding & training opportunities

Technology Transfer

Regional Resources

Provincial Resources

National Resources

# Bioenergy Opportunities in Eastern Ontario

## Bioenergy - The Basics

### Definition:

The process of converting biomass into energy using various forms of conversion technologies (combustion, gasification, pyrolysis, anaerobic digestion).

### Why biomass:

- § Enhance the rural economy
- § Decrease greenhouse gas emissions
- § Potential for an economically cheaper fuel for energy
- § Work towards becoming partially energy self-sufficient locally

## Bioenergy Opportunities in Eastern Ontario

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### Biomass Conversion Technologies

- Combustion - Most proven technology, efficiency not maximized
- Gasification - Less mature technology, better efficiency
- Pyrolysis - Pilot size technology, provides a "bio oil"
- Anaerobic Digestion - Waste diversion, regulatory issues still exist

## Bioenergy Opportunities in Eastern Ontario

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### ELORIN Bioenergy Initiatives

#### §Eastern Ontario Bioenergy Feasibility Studies

1. Thermal Conversion Technologies & Related Feedstocks
2. Anaerobic Digestion & Related Feedstocks

#### §Hastings/Prince Edward County Biomass For Energy

For copies of all 3 reports - [www.elorin.ca](http://www.elorin.ca)



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### The Eastern Ontario Opportunity

- §The Standard Offer Program (SOP)
- §Available land for conversion to energy crops
- §Transportation
- §Build on momentum
- §Leverage local champions



## Thank You

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# BioEnergy Opportunities in Eastern Ontario: Anaerobic Digestion

Presented to the Ontario East 2007 Conference

**George Brook**  
Senior Associate – Goodfellow Agricola

September 13th , 2007

## Agenda:

1. Overview of this presentation
2. A primer on anaerobic digestion
3. Pursuing anaerobic digestion opportunities in Eastern Ontario
4. Recommendations

## Overview of this presentation

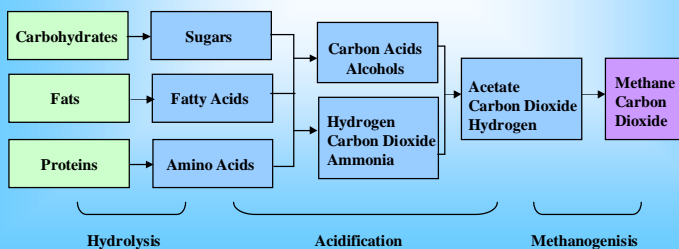
This presentation:

- adopts a regional economic development perspective
- provides a deeper look at one particular bioenergy platform of relevance to Eastern Ontario – anaerobic digestion
- outlines a methodology for analyzing bioenergy opportunities that is applicable to the full range of bio-based production platforms

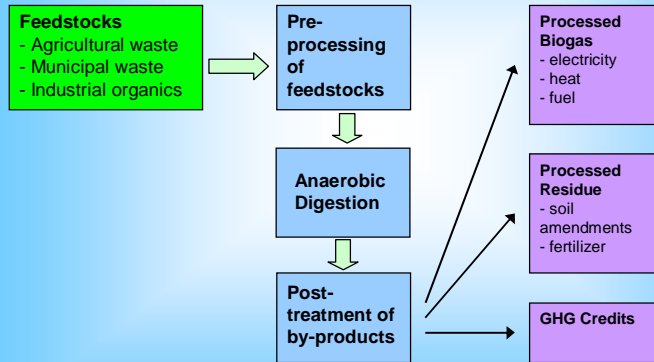
**Underlying theme: successful bio-based economic development requires a practical, systematic, and honest approach in order to identify the smaller subset of promising opportunities for a particular region from within the much broader world of emerging “possibilities”.**

## AD Primer- the basics

- Anaerobic digestion is a natural biological process involving the microbiological conversion of organic matter into methane in the absence of oxygen
- AD can be considered a mature technology (dating to at 1859)
- An efficient AD will convert source feedstocks into two streams – a nutrient rich digestate, and methane-rich biogas
- The science of AD is complex, involving the symbiotic action of three distinct groups of bacteria



## AD Primer- a generic system



## AD Primer- a generic system



## AD Primer- product outputs

### Biogas:

- is a renewable and CO<sub>2</sub> neutral fuel that consists of approximately 65% methane (CH<sub>4</sub>) and 35% carbon dioxide (CO<sub>2</sub>), as well as minor quantities (less than 1% of total gas volume) of other gases
- suitable for conversion to electricity, or CHP, or purification into natural gas

### Digestate:

- a stabilized slurry, retaining the nutritive value of the source feedstock
- suitable for use as a soil amendment, fertilizer, substitute for peat

### Biogas composition

Methane 55-75%  
Carbon dioxide 25-45%  
Nitrogen 0-0.3%  
Hydrogen 1-5%  
Hydrogen sulphide 0-3%  
Oxygen 0.1-0.5%

## AD Primer- potential feedstocks

### Agricultural materials:

- manure
- crop residue
- energy crops

### Municipal waste:

- organic fraction of municipal solid waste
- municipal solid waste / septage
- yard wastes

### Industrial Organics

- primarily from the food and beverage processing industries



## AD Primer- business models

### 1. On-Farm Digesters

Using only their own manure for feedstock

Using their own manure supplemented by industrial organics

### 2. Centralized Digesters

Collecting feedstocks from a number of sources to process in a centralized location

### 3. Municipal Sewage Treatment Digesters

Using municipal biosolids as a primary feedstock

### 4. Waste Water Treatment Systems

Use by producers of industrial organics as waste treatment systems

## AD Primer- primary design options

### 1) Temperature – thermophilic (50-55°C) or mesophilic (33-35°C)

### 2) Batch versus continuous flow (with hybrids - plug-flow)

### 3) One stage versus multi-stage

Other design considerations:

- Solids Content
- Capacity
- Orientation of the reactor
- Mixing mechanism

## AD in Eastern Ontario - Drivers

- § Volatile energy prices that have climbed dramatically over the last three years.
- § Regulatory changes (the Standard Offer Program) that have both guaranteed a (questionably) attractive price for electricity delivered from small-scale renewable power projects, and allowed for these projects to connect to the grid.
- § The introduction of environmental regulations restricting how some feedstocks such as septage, biosolids, manure, specified risk materials, and various industrial organics can be disposed off
- § Technological innovations across the broad range of anaerobic digestion platforms
- § Continuing and significant pain points in the agriculture sector, coupled with ongoing challenges in rural communities
- § An increasing body of real-world examples of anaerobic digester models (although not as of yet in Canada)
- § Relevant funding / support programs – provincial and federal

## AD in Eastern Ontario - Barriers

### Regulatory:

- The Standard Offer Program does not provide a rate structure sufficient to make most AD projects a viable proposition
- Projects participating in the SOP must sell 100% of the power being produced
- Costs of connection to the grid can be substantial
- Questions around the requirement to assign related products to the Ontario Power Authority
- Using industrial organics in an on-farm setting has not been approved in Ontario

## AD in Eastern Ontario - Barriers

### Operational:

- Anaerobic digestion is a complex process, requiring skilled management. The potential for reactor failure is ever-present.
- There a host of process parameters which must be maintained in tight tolerances.
- Storage issues related to the seasonality of feedstocks.
- Lack of established base, such as found in Europe

An anaerobic digester must be regarded as a living organism. You must “love her like a cow”.

## AD in Eastern Ontario - Barriers

### Market Entry issues:

There are numerous market entry issues that would need to be directly addressed around:

- the sale of electricity?
- the sale of thermal energy?
- the sale of spent digestate?
- sale of emission credits?

## AD in Eastern Ontario - Opportunities

- There are areas with significant concentrations of agricultural feedstocks within Eastern Ontario.
- There are some major producers of industrial organics.
- There are increased regulations being applied to several potential AD feedstocks, increasing the value to solution providers.
- There is a significant amount of regulated organic material passing down the 401 on its way from Southern Ontario to Quebec.
- The new Ontario Biogas Systems Financial Assistance Program

## Recommendations

### Getting Started:

1. Identify the biogas project drivers.
2. Begin with a project champion.
3. Identify the project scale.
4. Identify the relevant interests active in your region.
5. Form an advisory committee or working group.
6. Begin to develop the biogas project.

## Recommendations

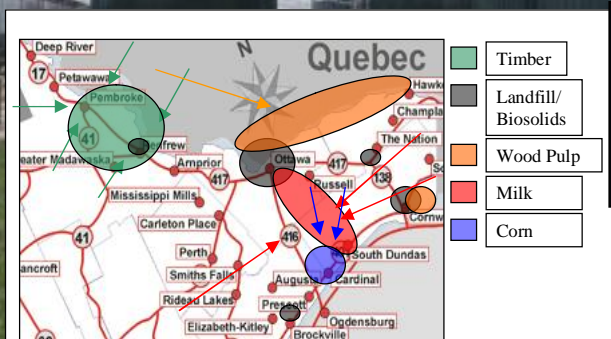
A methodology for identifying bioenergy opportunities in your region:

A	Resource mapping
B	Business model analysis
C	Market analysis
D	Stakeholder identification / engagement

## Recommendations

The currency of the bio-economy is biomass.

An assessment of a region's biomass resources is an essential early step in any bioproducts-based commercial initiative.



When assessing biomass, think in terms of sheds and amalgamation points

**Thank you.**

**The elorin Bioenergy Feasibility Study:  
Anaerobic Digestion for Bioenergy Production**  
is available from the resource section at:

[www.elorin.ca](http://www.elorin.ca)

**Contact me:**

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## Renewable & Clean Electricity Generation Options for Municipalities

### *Grid Connection Processes & Options for Revenue Generation*

09/13/07

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### **Introduction**

- Utilities Kingston
  - Operating authority / Services Company for City of Kingston owned utility assets
    - Kingston Electricity Distribution Limited (KEDL)
    - Gas Distribution
    - Fibre Optic Networks
    - Water & Sewer\*
- Myself
  - Background in Renewable Energy Development
  - Monitors Energy Regulation & Policy
  - Manages Generation Connections for KEDL

\* Also under contract to operate the Township of Sydenham's sewer & water system

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## Introduction



- Distributed Generation Definitions
  - Regulatory
    - Electricity Generation either not connected to the grid or connected at voltages of <50kV
  - Practical
    - Electricity generated close to the location of energy use.

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## Why Distributed Generation?



- D.G. technologies are typically Green or Clean
- Keeps \$ within local economies
- Reduces need for large centralized infrastructure
- Extend life of existing electricity system assets
- Local Production for Local Consumption
- Opportunity for individuals & communities to make sustainable energy choices

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## Why Distributed Generation?



- Revenue Generating alternative to retail green energy purchases
- Visible, tangible investment in the environment
- Control energy costs (shave peaks)
- Provincial & Federal support

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## Choosing the right D.G. options



- Conservation First!
  - Best economic & environmental ROI
- Answer the following:
  - What is your budget
  - What are the primary and secondary motivations
    - Backup power? Environmental? Economic? PR?
  - Electricity generation technology that makes sense?
  - Stand-alone or at an energy consuming facility?
  - Load Profile & Connection details of energy consuming facility.

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## Choosing the right D.G. options



- Grid Connection & Financial Settlement
  - Not connected - Backup or Batteries
  - Load Displacement
    - Generation cannot exceed load
  - Net Metered
    - Generate credits if power delivered to the grid
  - Retail Generation
    - Paid for each kWh generated
    - Wholesale market participants
    - Standard Offer Program for Renewable Energy
    - Clean Energy Standard Offer Program

Call your local distribution company for their requirements!

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## The Connection Process



- Read Your LDC's information package
  - Ex. KEDL's Guide for Distributed Generators
  - Hydro One has information available
- Select technology & connection type
- Fill out & submit connection application
  - 15 days until initial consultation
- 2 Different paths depending on size & complexity
  - Micro or small information exchange & connection agreement within 30 days
  - Medium, large, or complex connections proceed through a "Connection Impact Assessment" (CIA)

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## The Connection Process



- CIA's done at generator's cost
  - Includes detailed engineering analysis
  - Produces connection requirements, connection cost agreement, connection agreement.
  - Once CIA is done, generator gets a spot in a connection queue
  - Regulated timelines challenged by high volumes of connection requests
- Generator's responsibility to install equipment as set out and get ESA inspection

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***Get Connected. . .  
with those who want  
to help!***



### SWITCH - The Alternative Energy Cluster

- Access to subject matter experts
- Networking
- Peer review & third party advice
- Find the missing pieces of your puzzle...
- Looking to expand its network throughout the Kingston region



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## *Questions?*



- KEDL's Guide for Distributed Generators
  - [www.utilitieskingston.com/electric/generation](http://www.utilitieskingston.com/electric/generation)
- SWITCH - access to alternative energy experts
  - [www.switchkingston.ca](http://www.switchkingston.ca)
- Feel free to contact me with questions...

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