



# Food Byproducts for Energy

What's out there, who has it and where is it going now?

April 3, 2008

# Overview

*This presentation looks at food by-product, co-product and residual streams that are potential energy inputs for bio-digestion, pyrolysis and plasma technologies*

- 1. Study parameters, limitations and goals**
- 2. By-products, co-products and residues**
- 3. Location of materials**
- 4. Wet and dry streams**
- 5. Current dispositions**
- 6. Implications for the food industry – where can we go?**
  - Natural gas offsets**
  - Steam loads**
  - Carbon neutral strategies**

# Goals, Study Parameters and Limitations

## *Management begins with measurement*

- Data collection based on food industry residues and ICI plate scraps destined for waste
  - Green energy crops, manure, yard wastes and MSW excluded
- Benchmark data based on
  - Engineering expertise on residue volumes and characteristics
  - Census data
  - Associations, waste haulers and industry survey
  - Food Processing Handbook coefficients and previous studies from Ontario, New York, Washington and California
- Data set limitations
  - Industry response was limited
  - Recovery and residue data is proprietary
  - Waste management is proprietary
  - MOE CoA data is not currently tracked

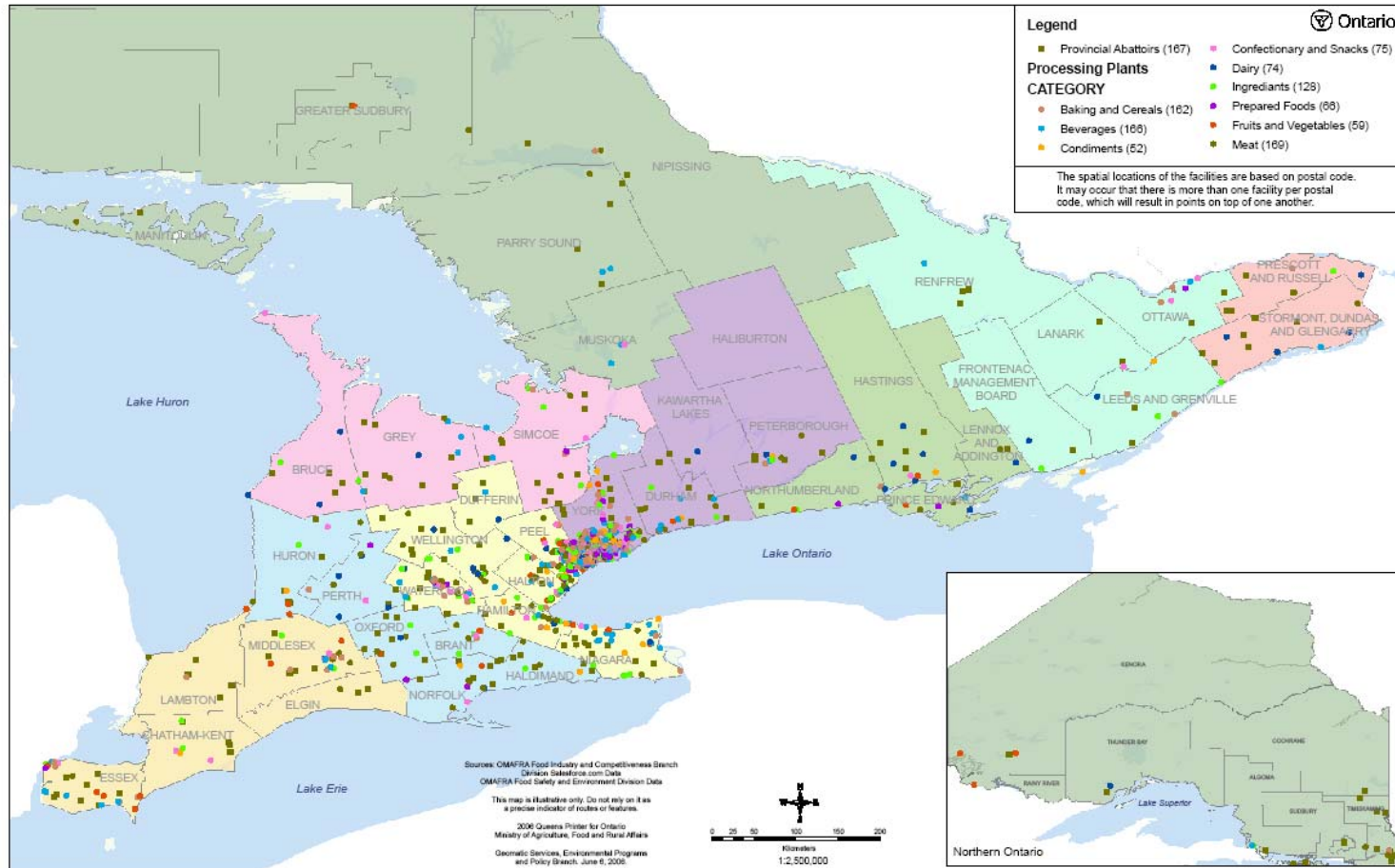
# By-products, Co-products and Residues

*Ontario's regulatory definition of waste affects biogas inputs*

There are four significant streams expressed in wet and dry volumes:  
 10,000,000 m<sup>3</sup> and 1,850,000t to 4,150,00t of potential biogas inputs

	Wet Volume	Dry Volume
– Primary Processing		
• Meat (beef, pork, chicken, fish)	3,125,00 m <sup>3</sup>	846,000t
• Rendering	68,000 m <sup>3</sup>	161,000t
• Dairy and eggs	2,066,000 m <sup>3</sup>	24,000t
• Grains (soy, corn and canola)	2,347,000 m <sup>3</sup>	1,650t
• Fruit and vegetable processing	2,450,000 m <sup>3</sup>	227,000t
– Secondary Processing		
• Bakery		2,900t (BOD)
• Cereals		481,000t
– Beverages (fermentation and juice production)		5,000t
– MSW (California coefficient 0.73t/yr/person) suitable for biogas (7,074,000 tonnes)		
• Food waste component		1,200,000 - 2,500,000t

# Ontario's Food Processing Plants



# Location of materials

*Ontario's food industry is clustered*

- 3500 food processors (approximate numbers):
  - 500 bakeries, 120 wineries, 60 breweries
  - 100 vegetable plants, 100 dairies
  - 500 free standing meat processors
- More than 2000 food retail outlets
- Over 8000 restaurants and 14,000 other commissaries, institutional kitchens and cafeterias
- Processing clusters in:
  - SW Ontario (vegetables, fish)
  - Grand River Valley (meats, dairy, milling, bakery)
  - GTA (confections, meats, dairy, bakery)
  - Niagara (wines, Carbohydrate Alley)
  - Quinte-Peterborough (beverages, confections, cereals)

# Wet and Dry Streams

*The residual output of food plants is characterized by a wet or dry nature.*

- Wet streams include DAF, wastewater and highly liquid solids
  - Dairy washwater, distillers' grains, whey, corn squeezings, brown grease, yellow grease, blood
- Dry streams are equally varied
  - Paunch manure, meat trimmings, 2-day bread/bakery returns
  - Vegetable peels, culls
  - Fish and meat offals
  - Table scraps

## Current Disposition

- Geomatrix estimates 40% to 60% of material may be “available”
  - Many streams already used as pet food, animal feed
  - Wet streams tipping feed \$6.60 to \$20/m<sup>3</sup>
  - Dry stream tipping fee \$20 to \$120 per tonne
- Vegetable waste – landspread
- Distillers’ Grains – landspread, animal feed
- Milling by-product (bran) – animal feed
- Meat packing wastes – pet food
- Restaurant/retail wastes – MSW
- Wastewater solids – wastewater treatment

# Implications for the Food Industry

Manufacturers are in a variable cost crisis ( exchange, energy costs, waste management costs and transportation). Biogas production offers a marketable benefit in an energy and waste management strategy

Food processors in Ontario used \$250M in electricity and \$250M in natural gas (Stats Can, 2001)

- On-site use for wet materials, restaurant materials require more organization
  - 311 to 467 GW-hours/year of energy
  - 1.1 to 1.7 GJ/year of natural gas equivalence

Potential for \$150,000,000 NG replacement (high estimate)

- Converted to energy through co-gen could offset:
  - \$200M to \$300M of energy costs
  - \$36M to \$200M waste management costs
  - Combine with energy efficiency to achieve carbon neutral processing status for plants and perhaps supply chain



# Thank You

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