

# Carbon Sequestration Opportunities with Biofuel Feedstock Production Practices

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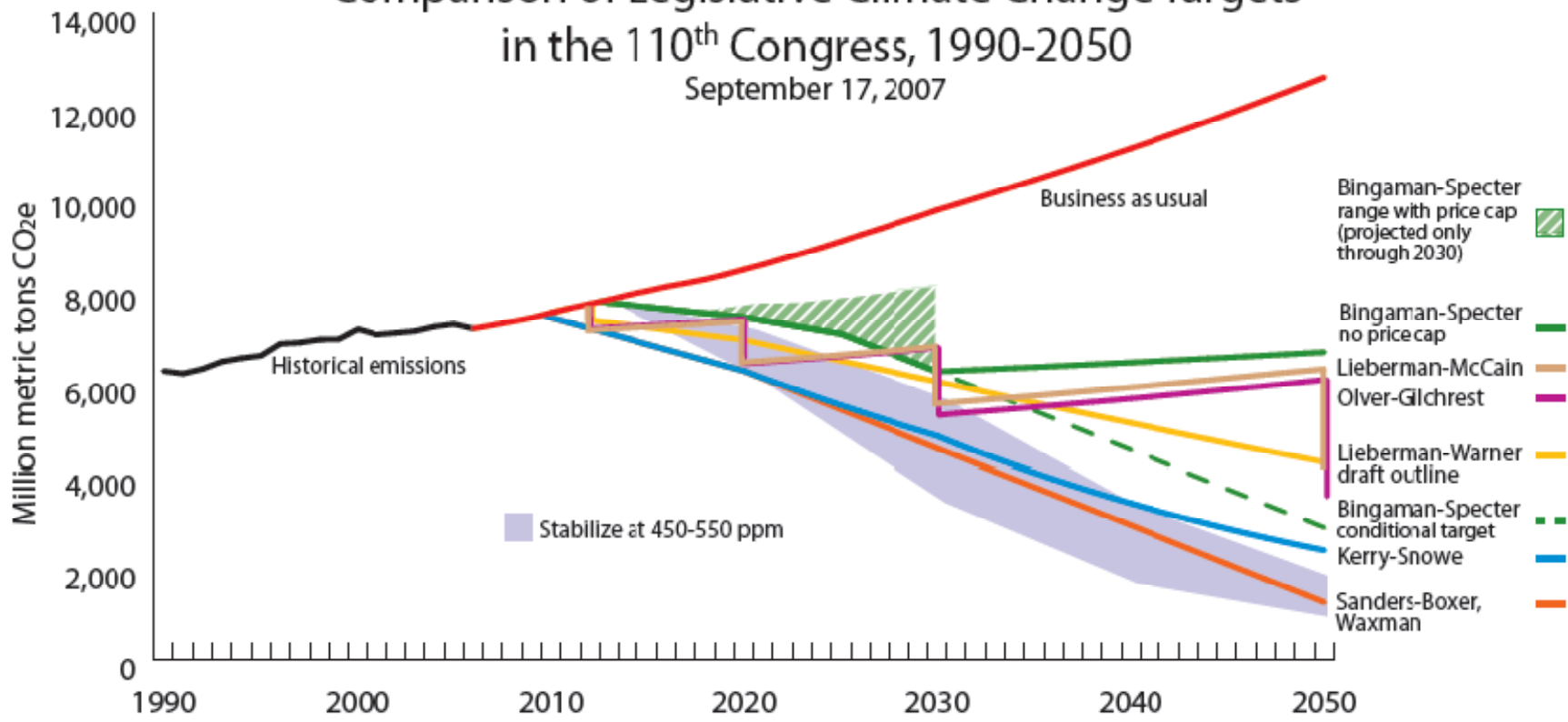
- Entity for carbon credit aggregation owned by Iowa Farm Bureau Federation
- First licensed aggregator on the Chicago Climate Exchange (2003)
- Aggregation Specialists – Build a nation-wide network of contract facilitators in every state.
- “Country Elevator of Carbon Credits”

# Global Warming Legislation

- The 110th U.S. Congress
  - no less than seven proposals
  - Use of market-based, cap-and-trade mechanisms.
- Specified emission caps
  - Different formulas, such as a return to 2000 levels (McCain-Lieberman) or 1.5% reductions per year (Kerry-Snowe).
  - Different time frames; some run only through 2020, while others run through 2050, usually with reductions that increase in later years.
- Bush administration policy--an [emissions intensity target](#)

# Comparison of Legislative Climate Change Targets in the 110<sup>th</sup> Congress, 1990-2050

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For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>. WRI does not endorse any of these bills. This analysis is for comparative purposes only. Data post-2030 may be derived from extrapolation of EIA projections.

# Creating Carbon Credits

-- Equivalent to one metric ton CO<sub>2</sub> --

- Emission Reductions
  - CO<sub>2</sub> emissions at point of use
  - Methane emissions at source
  - NO<sub>x</sub> emissions at soil interface
- Carbon Sequestration
  - In the soil
  - In trees & wood products

# Carbon Sequestration

Carbon sequestration can be defined as the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere.



# Emission Reductions

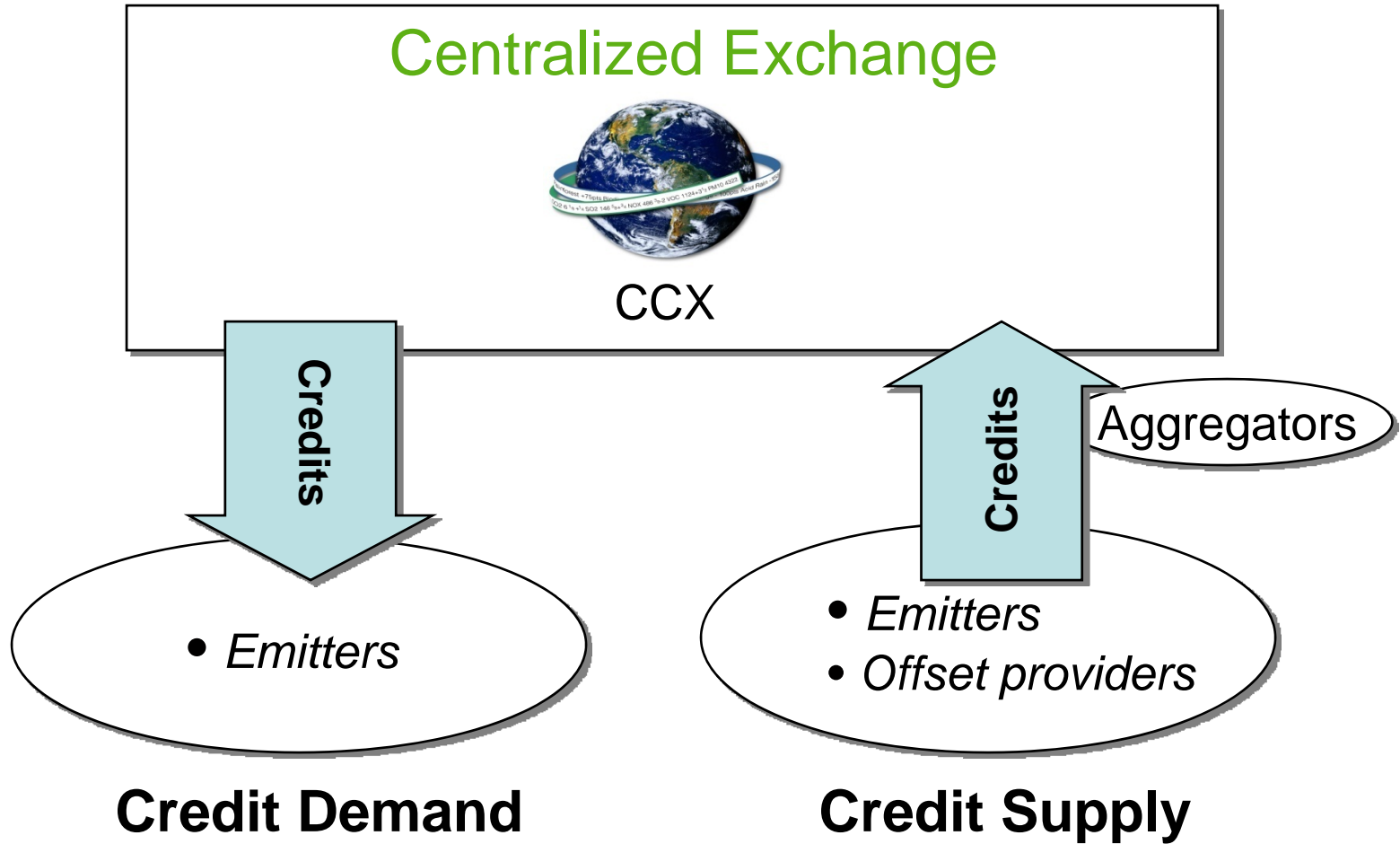
Emission reductions are defined as a net decrease in carbon-equivalent emissions that would otherwise be emitted to the atmosphere.



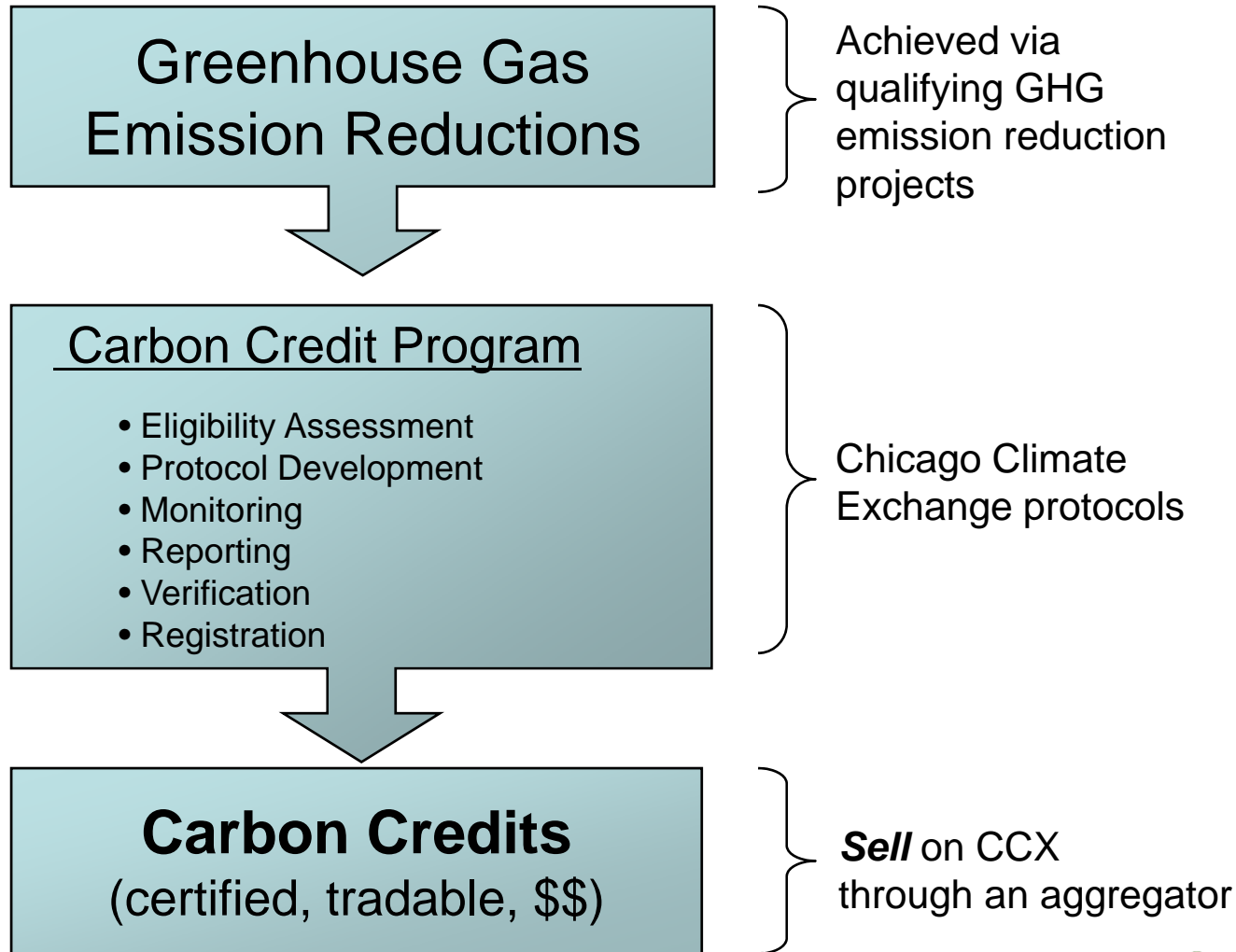
# Types of Markets Available

- Voluntary Markets
  - Chicago Climate Exchange
  - Voluntary Carbon Standard
  - OTC
- Regulated Markets
  - RGGI
  - WCI
  - CDM/JI

# The Carbon Credit Market



# Carbon Credit Program



# CCX Exchange Offsets (XO's)

CCX has two pre-defined XO protocols for sequestration

## 1. XSO – Exchange Soil Offset

- Continuous No-till/Strip-till
- New grass plantings after January 1, 1999.
- Rangeland improvement

## 2. XFO – Exchange Forestry Offset

- Afforestation after Jan. 1, 1990
- Managed Forestry
- Long-lived wood products

# CCX Exchange Offsets (XO's)

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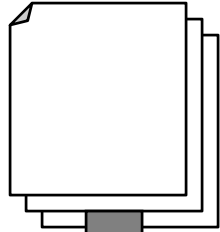
## 1. Industrial fuel switching

- Co-firing or substitution in boiler/burners
- Biogas for energy

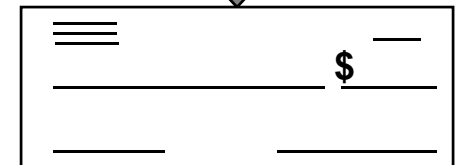
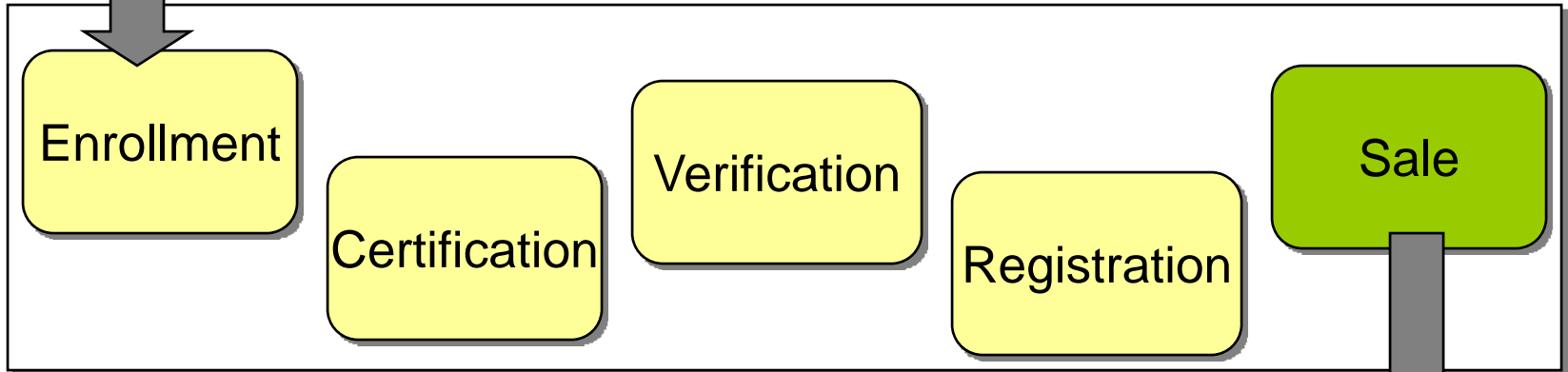
## 2. XMO – Exchange Methane Offset

- Ag Methane destruction
- Landfill Methane destruction

# The Carbon Credit Market Process

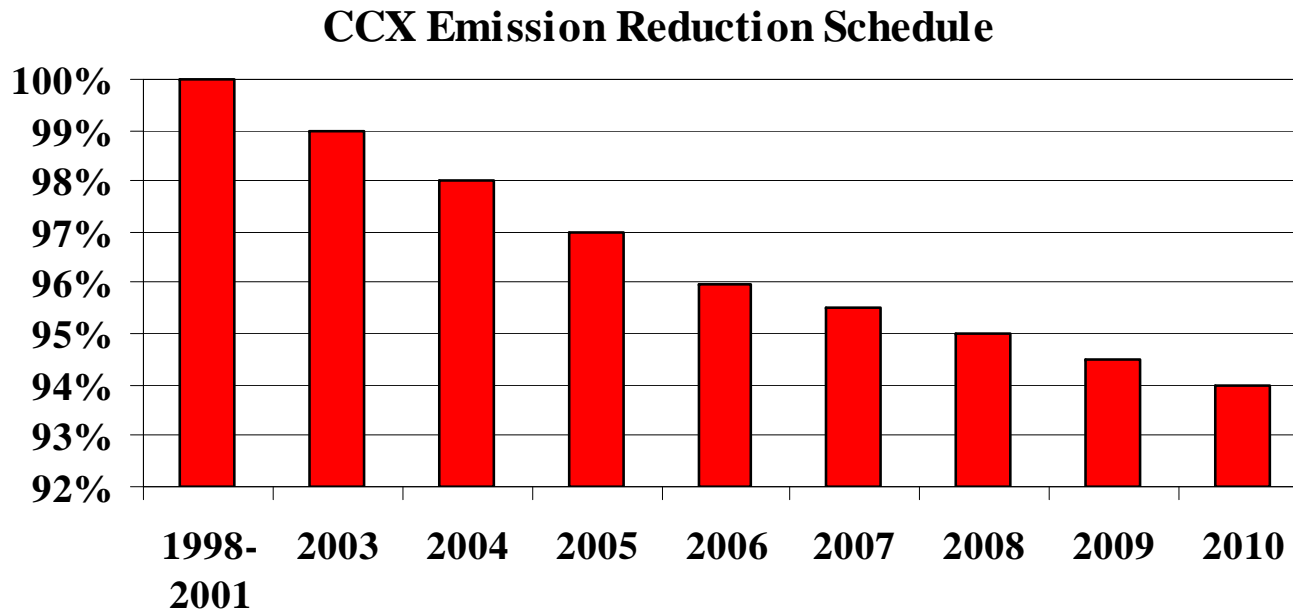


- Eligible project
- Carbon Credit Contract
- Worksheets
- Supporting documents



# CCX Reduction Timetable

- 2003-2006: Reduce emissions to 1%, 2%, 3%, 4% below 1998-2001 baseline
- 2006 – 2010: Reduce emissions to 6% below 98-01 baseline



# Meeting CCX Reductions

- Allowances (x% less than baseline)
- Own reductions
- Industry credits from excess reductions
- Offsets (no more than 50% of reduction requirement)

- Soil Offsets
  - No-till
  - New Grass
  - Rangeland
- Forestry
  - New Plantings
  - Enhanced Working Forest
- Ag Methane
- Industrial Fuel Switching
- Biofuels
- Landfill Methane

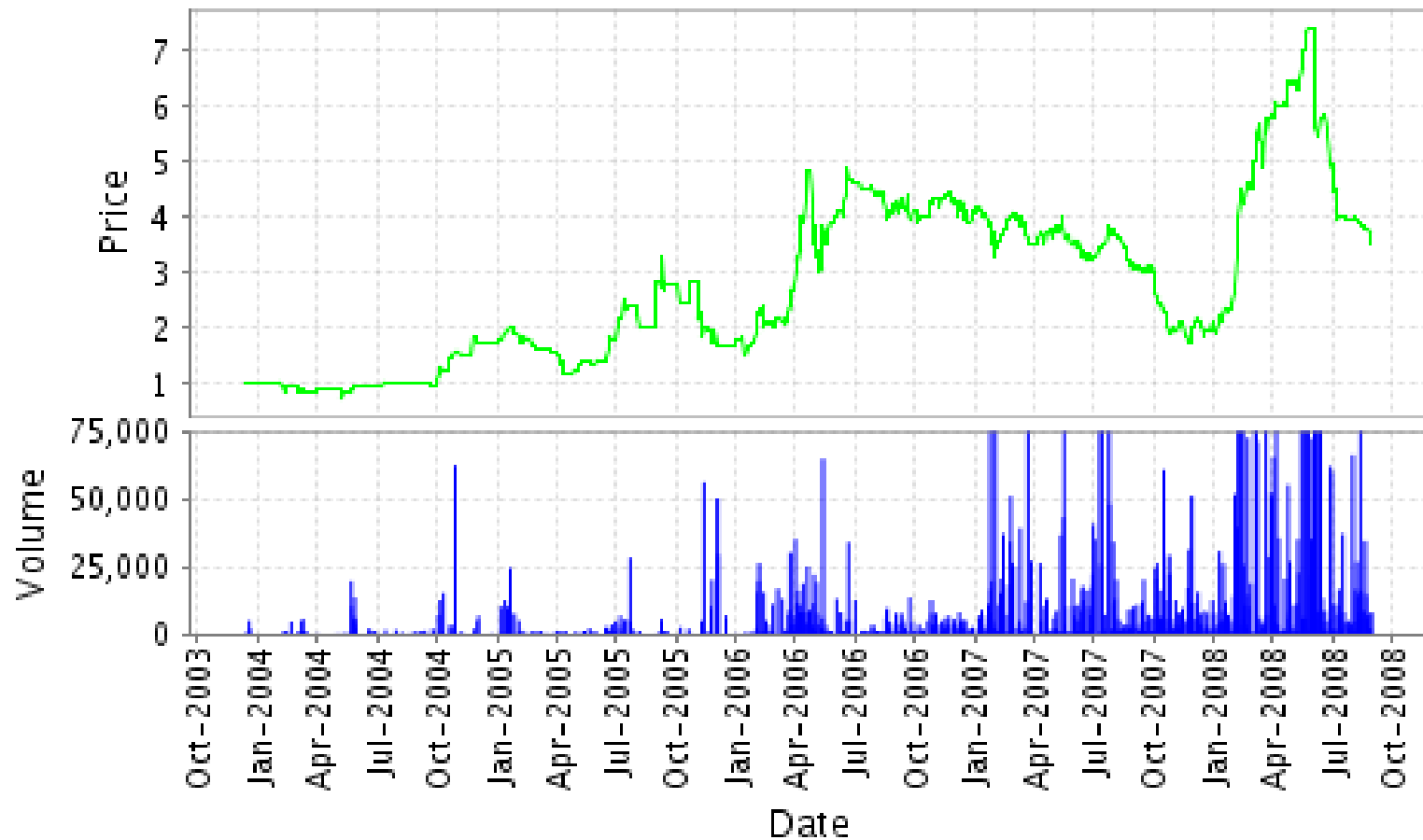
# Progress to date

- Protocols developed & implemented
  - No-till
  - Grasslands
  - Rangeland management
  - Afforestation
  - Managed forests
  - Ag Methane from Livestock facilities
  - Biomass substitution
  - Land-fill Methane
- Producers Enrolled; projects verified; credits traded; producers paid

# Carbon Offset Prices

thru Aug 2008

## CCX Carbon Financial Instrument (CFI) Contracts Daily Report



## Economics of Land-use Credits (Iowa)

| Credit Type      | Credit Rate per acre | Est Value per acre |
|------------------|----------------------|--------------------|
| No-till          | 0.6                  | \$2 - \$4          |
| New Grass        | 1.0                  | \$3 - \$7          |
| Afforestation    | 0.8 – 3.0            | \$3 - \$20         |
| Managed forest   | 0.5 – 2.5            | \$2 - \$17         |
| Switchgrass/coal | 4.0 – 12.0           | \$14 - \$80        |

## Baseline Methane Credit Rates - Iowa

| Liquid Slurry/Pit Storage (Metric Tons CO <sub>2</sub> e per head per year) |              |               |                 |                  |                       |                      |                    |                |
|---|--------------|---------------|-----------------|------------------|-----------------------|----------------------|--------------------|----------------|
| Dairy Cow   | Dairy Heifer | Feedlot Steer | Feedlot Heifers | Market Swine <60 | Market Swine 60 – 120 | Market Swine 120-180 | Market Swine > 180 | Breeding Swine |
| 1.56  | 0.70         | 0.70          | 0.68            | 0.09             | 0.13                  | 0.22                 | 0.30               | 0.31           |
| Anaerobic Lagoon (Metric Tons CO <sub>2</sub> e per head per year)          |              |               |                 |                  |                       |                      |                    |                |
| 4.42  | 1.97         | 1.98          | 1.92            | 0.24             | 0.38                  | 0.63                 | 0.84               | 0.88           |

\* 18.25 carbon credits per metric ton of Methane captured and destroyed.

| Annual revenue potential |              |                  |       |            |
|--------------------------|--------------|------------------|-------|------------|
| Farm type & size         | Storage type | Credits per year | Price | CC Revenue |
| 1,000 cow Dairy          | Lagoon       | 4,500            | \$4   | \$18,000   |
| 2,400 hd hog finisher    | Pit          | 520              | \$4   | \$2,080    |
| 1,000 sow F-F            | Lagoon       | 13,500           | \$4   | \$54,000   |

# Renewable Energy Credits

## Who is eligible?

- Generators of electricity (and thermal energy) from renewable sources (hydro, wind, solar, biomass)
- Placed into service after January 1, 1999
- CCX membership requirement for eligible large emitters
- Facilities that have not already committed or sold rights to project emission reductions to any other entity

## Annual revenue potential

- Carbon credit potential = 0.4 credits per MWh (or thermal equiv.)
- Typical project size = 1 MW (8,760 MWh), ~3,500 credits/year
- Est. value of carbon credits = \$4+ / credit
- Total credit value = \$14,000+ per year
- Considerably higher potential in the event of a market upswing

# Renewable Natural Gas Economics

- 10,000 cu ft RNG per year per cow
- 4.5 carbon credits per cow per year
  - RNG @ \$7.00 = \$70 per cow
  - Carbon Credits @ \$4 = \$18 per cow
- Supports capital outlays of \$900 to \$1,200 per cow to build digester.

# Current Carbon Credit Opportunities in Renewable Liquid Biofuels

- End-user emission reduction
  - Ethanol & biodiesel (CCX)
- Bio-fuel production efficiency projects

# Future Carbon Credit Opportunities in Renewable Liquid Biofuels

- New Feedstocks
  - Algae-based fuels
  - Cellulosic fuels
- Carbon capture & sequestration at production

## Other questions

- Impact of low-carbon fuel standards
- Scope of life-cycle analysis

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**Thank You**

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