Carbon Sequestration

Opportunities for Methane Digesters in the Carbon Markets

Waste-to-Energy Workshop
Richmond, Indiana
May 31, 2007

Delta P2E2 Center

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about Delta

Mission: Improve Environmental Quality and Promote Community Economic Development in the Great Lakes Region.

Programs:

- Pollution Prevention and Resource Conservation
  Policy development, technical assistance, green design, implementation financing
- Brownfield Redevelopment
  Financing, land assembly, site control, remediation, community development capacity
- Sustainability Programs
  Improve sustainability footprint, address environmental performance, and social and economic impacts
- Community Development
  Create community benefits through business development, planning, training, and project consulting

presentation overview

- Overview
- Roles and Responsibilities
- Anaerobic Digester Eligibility
- Contracting
- Verification
- Trading
- Payments

overview

- **Farmers/landowners earn greenhouse gas emissions credits** when they use conservation tillage, plant grasses and trees, or capture methane with manure digesters.
- **Conservation practices** store carbon in the soil and plants. Manure digesters produce energy and prevent methane from being released to the atmosphere.
- **Credits are aggregated** from many landowners and sold through the Chicago Climate Exchange (CCX®).

about the Chicago Climate Exchange

- Voluntary, legally binding.
- Cap and trade. Members reduce emissions and/or buy credits
- Members include: Ford Motor Company, City of Chicago, Waste Management.
- Reduce GHG emissions 4% between 2003 and 2005 and an additional 2% between 2006 and 2010. Members joining after 2005 agree to reduce GHG emissions by 6% between 2006 and 2010.
- Since its inception in 2003, 19,160,680 metric tons of CO2 reduced - 8% overall reduction.

CCX offset program

- Conservation tillage is credited 0.6 metric tons CO_2 per acre per year.
- Grass plantings implemented after January 1, 1999 are credited at 1.0 metric tons CO_2 per acre per year.
- Methane projects implemented after January 1, 1999 with necessary biogas flow monitoring equipment credited at 18.25 metric tons CO_2 per ton of methane per year.
- Forestation: January 1,1990. Projects include afforestation and reforestation. Tree plantings can be credited up to 7.7 metric tons of CO_2/acre/year. Credits will vary depending on the region, tree species, and years since planted and average between 2-4 tons/acre/year. Working forest protocols are under development.

methane program eligibility

- Project owners may directly register with CCX® if the project yields more than 10,000 metric tons of CO2 per year.
- Methane projects implemented after January 1, 1999 with necessary biogas flow or electric output monitoring equipment:
  - 18.25 metric tons CO2 per ton of methane per year.
- No minimum contract for methane offsets (XMOs).

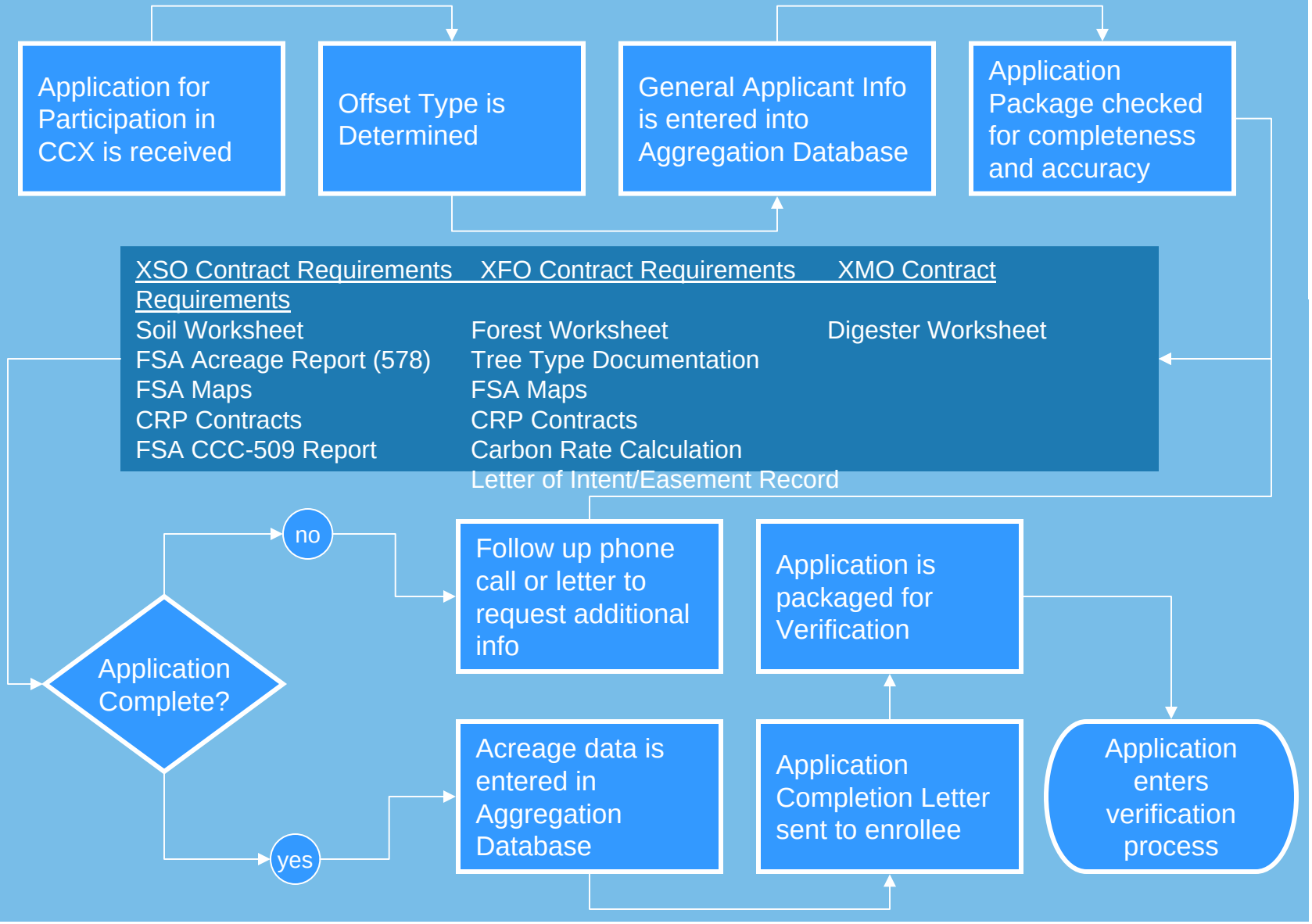
methane offset program eligibility

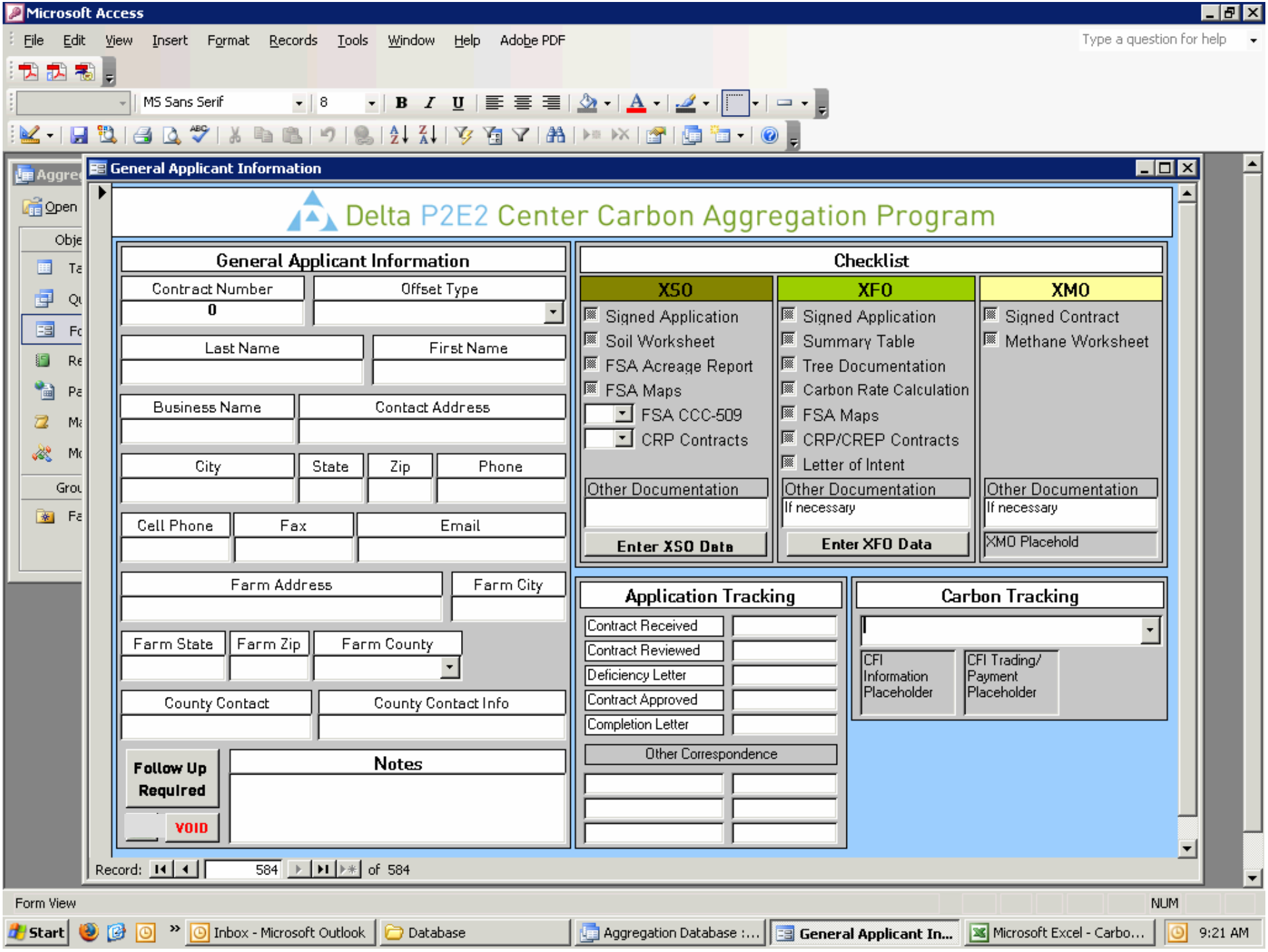
- Standards of practice found in the U.S. EPA National Resource Conservation Service for Anaerobic Digesters.
- Demonstrate clear ownership rights of the project owner to the greenhouse gas emissions registered with CCX®.
- Demonstrate eligibility of the site to earn XMOs.
- Keep and maintain records of methane content and total gas flows or total electricity generated from the project.

contracting

- Contract is between the Delta P2E2 Center (CCX approved aggregator) and the project owner.
- Contracts stipulate the program requirements and give the Delta Institute the rights to trade the carbon offset credits.
- There are no minimum contract periods for Methane Offset projects, but recommend through 2010.

aggregation process
application processing




Microsoft Access
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General Applicant Information
Delta P2E2 Center Carbon Aggregation Program
General Applicant Information
Contract Number
0
Offset Type
Last Name
First Name
Business Name
Contact Address
City
State
Zip
Phone
Cell Phone
Fax
Email
Farm Address
Farm City
Farm State
Farm Zip
Farm County
County Contact
County Contact Info
Follow Up Required
VOID
Notes
Checklist
XSO
Signed Application
Soil Worksheet
FSA Acreage Report
FSA Maps
FSA CCC-509
CRP Contracts
Other Documentation
Enter XSO Data
XFO
Signed Application
Summary Table
Tree Documentation
Carbon Rate Calculation
FSA Maps
CRP/CREP Contracts
Letter of Intent
Other Documentation
If necessary
Enter XFO Data
XMO
Signed Contract
Methane Worksheet
Other Documentation
If necessary
XMO Placehold
Application Tracking
Contract Received
Contract Reviewed
Deficiency Letter
Contract Approved
Completion Letter
Other Correspondence
Carbon Tracking
CFI Information Placeholder
CFI Trading/ Payment Placeholder
Record: 584 of 584
Form View
NUM
Start
Inbox - Microsoft Outlook
Database
Aggregation Database :...
General Applicant In...
Microsoft Excel - Carbo...
9:21 AM

verification

- The third party verifier will visit each project location to verify that the proper equipment is installed.
- Carbon offsets can be traded after the verification report is received and accepted.
- Verification can occur any time of the year and usually occurs more than once per year.
- The first year verification includes a site visit. Subsequent verifications may not require a site visit unless there has been equipment changes.

trading

- As an aggregator, the Delta Institute can trade carbon offset credits on the CCX® platform.
- Carbon offsets can only be traded once verification has occurred and has been accepted by CCX®.
- Trades are conducted in blocks of 100 metric ton units.
- On May 29, 2007, carbon was trading between $3.50 and $3.60 per metric ton according to the vintage year.

payments

- Once carbon offsets are traded, the funds from the trade will be placed by CCX in an account maintained by the Delta P2E2 Center.
- CCX trading fees will be deducted from the proceeds from the trade on a per metric ton CO_2 basis. $0.20/metric ton of CO_2 traded.
- An aggregation fee of 8% will also be deducted from the gross proceeds.
- The Delta P2E2 Center will provide payments to the project owners based on metric tons of carbon traded.

methane digester example

An anaerobic digester combusts 20,000,000 cubic feet (approximately 1,000 head dairy) of biogas per year (60% methane, 40% CO2 mix). Equivalent to approximately 4,130 metric tons of CO2.

Value of carbon offsets = 4,130 x $3.50	***$14,455***
CCX Trading Fee = 4,130 x $0.20	*$826*
Aggregator Fee = $16,520 x 8%	*$1,156*
Verification (Year 1)- Approximate	*$3,000*
Verification (Year 2)- Approximate	*$1,500*
TOTAL Fees (Year 1)	***$4,982***
Payment to Project Owner (Year 1)	$9,473
Payment to Project Owner (Year 2)	$10,973

methane digester carbon paybacks

Farm Type	Herd Size	Manure Waste Generated (gpd)	Electric Generation (kW/yr)	Estimated Biogas Generation (cf/yr)	Estimated Methane Produced (metric tons/year)	Potential Carbon (metric tons/year)	Potential First Year Revenue from Sale of Carbon Credits ($)
Dairy	1100	30,000	1,600,000	21,900,000	199	3,631	**$9,854**
Dairy	725	35,000	876,051	25,550,000	232	4,236	**$11,996**
Dairy	840	22,000	1,095,000	18,834,000	171	3,123	**$8,054**
Dairy	3750	115,000	NA	83,950,000	763	13,919	**$46,274**
Dairy	1400	38,000	1,500,000	17,383,333	158	2,882	**$7,203**
Dairy	1000	20,000	NA	14,600,000	133	2,421	**$5,569**
Dairy	2400	50,000	NA	43,800,000	398	7,262	**$22,708**
Dairy	700	17,000	NA	12,410,000	113	2,058	**$4,284**
Swine	2300	NA	NA	7,884,000	72	1,307	**$1,627**

Price of carbon based on recent market value of $4.00 per metric ton

Carbon generated is methane produced multiplied by 18.25 tons CO_2 per ton of methane

= Estimate based on gpd of manure

Methane generation ranges from 82 to 102 CF/Cow/Day

Electrical generation range from 1071 Kwh/Cow/yr

Methane generation ranges from 2 to 4 CF/gallon of manure

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