Generating Carbon Credits from Livestock Projects

*Perspectives of a Project Developer*

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Vice President – Carbon Services
Camco’s Role in Livestock Projects

Our Carbon business develops carbon credits.

- Feasibility Analysis
- Registration
- Operations Optimization
- Documentation
- Monitoring
- Verification
- Commercialization & Structuring

Our Investment business develops all aspects of the project.

- Sourcing & Acquisition
- Financing
- Development & Operation
- Project Delivery

Developing Livestock Projects Under the CAR
## Camco AD Carbon Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Project Status</th>
<th>Size (head)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Meadow Farms</td>
<td>Registered in 2010</td>
<td>~2,900</td>
</tr>
<tr>
<td>Bridgewater Dairy</td>
<td>Registered in 2010</td>
<td>~3,000</td>
</tr>
<tr>
<td>Willow Point Dairy</td>
<td>Registered in 2010</td>
<td>~3,200</td>
</tr>
<tr>
<td>Central Sands Dairy</td>
<td>Registered in 2010</td>
<td>~4,200</td>
</tr>
<tr>
<td>Riverview Dairy</td>
<td>Registered in 2010</td>
<td>~8,000</td>
</tr>
<tr>
<td>West River Dairy</td>
<td>Registered in 2010</td>
<td>~7,000</td>
</tr>
<tr>
<td>District 45 Dairy</td>
<td>Listed</td>
<td>~7,000</td>
</tr>
<tr>
<td>Fair Oaks Cyclus</td>
<td>Listed</td>
<td>~3,000</td>
</tr>
<tr>
<td>Fair Oaks GHD</td>
<td>Listed</td>
<td>~9,000</td>
</tr>
<tr>
<td>Double A Dairy</td>
<td>Pending listing</td>
<td>~10,000</td>
</tr>
</tbody>
</table>
Manure Management - Project Basics

Business as usual – Baseline:
- Manure is managed in large, open lagoons
- Lagoons generate large quantities of methane
- Waste water from lagoons spread on farm during summer
- Lagoons tend to be cleaned out once a year

Project:
- Manure passed through an anaerobic digester
- Conditions optimized for methane generation
- Methane captured and used productively
- Waste from digester fed to lagoon – significantly lower methane generation potential

Benefits:
- Manure is resource rather than waste stream
- Reduced odor
- Productive use of gas (power, gas)
Calculating Emissions Reductions

- Livestock AD projects have substantial GHG reduction benefits
- Recognize reductions by documenting activities and monitoring real-time.

Maximize carbon credits by optimizing monitoring systems.
Developing Livestock Projects Under the CAR

CAR Protocol – Theory to Practice

Livestock Projects:
- Small-scale
- Many moving parts
- Very sensitive to monitoring and verification costs

CAR Livestock Protocol:
- Four iterations – now v 3.0
- Builds on many other existing protocols to determine baseline and project emissions
- Provides certainty on eligibility
- Requires high-level of monitoring
Developing Livestock Projects Under the CAR

Keeping Track of all Activities

- Enteric Fermentation
  - Manure Production
    - Manure Collection & Transport
      - Manure Treatment & Storage
        - Anaerobic Digester
          - Effluent Pond
            - Use (fertilizer, bedding, etc.)
            - Flare
              - Electric Generation
                - Gas Refinement
                  - Boiler
                  - Pipeline
                    - Transmission onto grid
                      - Off-site energy generation
                        - Use of energy
                          - Project Boundary
## Livestock Protocol – the good, the bad and the future

<table>
<thead>
<tr>
<th>Promotes Development of Digester Projects</th>
<th>Areas for Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock Tool</td>
<td>20% Model Uncertainty Factor</td>
</tr>
<tr>
<td>Eligibility Criteria – Performance Test</td>
<td>Conservative Defaults</td>
</tr>
<tr>
<td>Provision for Data Substitution</td>
<td>Variances – No Project is Perfect</td>
</tr>
<tr>
<td>Accessibility of Reserve</td>
<td>More Defaults</td>
</tr>
<tr>
<td>Monitoring Checklist</td>
<td></td>
</tr>
</tbody>
</table>

## Future Developments?

- Aggregation of similar projects would lower transaction costs
- Accounting for Emissions Reductions from other waste sources added to digesters
Projects: Central Sands Dairy

- Constructed in 2008 (digester completed in 2009).
- Registered under version 2.1 Livestock Protocol (currently undergoing 2nd verification)
- Farm covers about 5,000 acres
- ~4,000 head of dairy cattle
Central Sands Dairy: AD System Setup

GHD Digester – Mixed Plug Flow, 100F, 16 day RT

Runs a boiler, which heats the digester

Runs a 720kW genset

Runs an open flare
Central Sands Dairy: Monitoring

**Equipment**

- **Fuel Use**
  - Accounting
  - Software

- **Biogas Flow & Destruction**
  - Meters
  - Thermocouples
  - PLC, HMI

- **Herd Population**
  - Software
  - Physical Count
Central Sands Dairy: Monitoring

Flow measured by Sage meters

Data saved/transmitted by Gen-Tech systems

Data analyzed, credits estimated, verification prepared

3rd party verified, credits issued, credits sold
Projects: Double A Dairy

- Currently under construction – operational early 2012
- >10,000 head of dairy cattle
- >400,000 gallons manure per day
- 4.5MW power generation
Charles Purshouse, Vice President – Carbon Services

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