AG biogas in the bio-economy

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By Jonathan Cocker, Partner at BLG, and Brent Lyon at Scovan Engineering

Traditional on-farm biogas projects have been modest in both scale and returns, often driven by a combination of localized concerns over manure management, nutrient recovery and energy generation for either on-farm usage or for limited electricity sale under specialized rate programs such as Ontario's feed-in-tariff.

But the push for decarbonisation, with expansive regulatory and voluntary purchase programs mandating lower carbon energy, is remaking many industry sectors –including biogas and its role within Canada's bio-economy.

On-farm renewable natural gas prioritized

With this climate change impetus, both the federal and many provincial governments are now promoting agricultural-based biogas projects as part of a broader bio-economy initiative to develop existing and readily available resources with a lower carbon footprint. For instance, the federal government's Agricultural Clean Technology (ACT) Program provides grants to on-farm biogas developers as part of its goal:

> *to create an enabling environment for the development and adoption of clean technology that will help drive the changes required to achieve a low-carbon economy and promote sustainable growth in Canada's agriculture and agri-food sector.*

With similar offerings from the provinces, including long-term RNG purchase contracts, growth in this sector for the coming years is assured.

Regenerative farming supported through biogas revenue

Adopting low carbon technologies on-farm, such as anaerobic digestion facilities, also has the parallel benefit of creating the monetary incentives for farmers to adopt regenerative farming techniques in place of single commodity planting, with its long-term depletion of soil nutrients. Crop rotations, including clover and other nutrient

replenishing crops, becomes more viable for farms where the costs can be recaptured through biogas sales.

Further, crops and other agricultural biomass material such as manure and off-spec crops, can be diverted from waste (and methane emissions) to use in biogas processes. As anaerobic digestion feedstocks are flexible, biogas production can serve to correct imbalances between biomass material generation and its on-farm deployment, while returning nutrient-rich digestate to the soil.

Sustainable agriculture needs energy transition

The development and deployment of agricultural feedstocks for biogas generation also assists the commercial food sector in achieving their environmental goals. For instance, many large agri-food companies have responded to consumer demands for sustainability by making Certified Sustainable Beef commitments.

The beneficial attributes of on-farm biogas projects, including their emissions profile, aid in cattle producers obtaining CRSB-certifications for their herds, thereby producing a product that is more marketable and of higher value.

Low carbon fuel markets reward methane emissions reductions from AG Waste

The premiums available for very low carbon fuels in compliance and voluntary markets also favour agricultural feedstocks. U.S. clean fuel regimes, such as California's Low Carbon Fuel Standard, has valued dairy manure-fed anaerobic digestion as warranting carbon intensity scores as low as minus 500, exponentially more valuable than biogas from non-AG inputs.

This valorization of on-farm biogas has allowed developers to take advantage of both the security of long-term voluntary purchase programs, such as those offered by FortisBC and Energir, as well the near-term market premiums available from private off-takers and under compliance regimes such as the BC LCFS and the coming federal Clean Fuel Standard. The business of on-farm biogas has never been better.

Federal offset credits may be next opportunity

Finally, there may also be a federal offset opportunity for AG biogas facilities under the Output-Based Pricing System. Numerous offset credit protocols are planned for the agricultural sector, including:

- Enhanced Soil Organic Carbon
- Reduced Nitrogen Oxide Emissions from Agriculture Fertilizer and
- Livestock Manure Management

With an express emphasis on regenerative farming, the crediting opportunities for biogas and digestate appear to be within reach under the OBPS.

The regenerative nature of on-farm biogas projects results in numerous environmental benefits throughout its resource cycle, rather than just at a single point. Global decarbonisation has resulted in pathways for these beneficial activities to be validated and monetized, significantly enhancing the economic viability of AG biogas projects.

The coming boom in agricultural biogas projects needs to be understood not simply as the production of a valuable fuel, but rather the simultaneous optimization of an energy cycle, carbon cycle, and nutrient cycle, delivering benefits and revenue in the bio-economy.

By

Jonathan Cocker

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BLG Offices

Calgary
Centennial Place, East Tower
520 3rd Avenue S.W.
Calgary, AB, Canada
T2P 0R3

T 403.232.9500
F 403.266.1395

Ottawa
World Exchange Plaza
100 Queen Street
Ottawa, ON, Canada
K1P 1J9

T 613.237.5160
F 613.230.8842

Vancouver
1200 Waterfront Centre
200 Burrard Street
Vancouver, BC, Canada
V7X 1T2

T 604.687.5744
F 604.687.1415

Montréal
1000 De La Gauchetière Street West
Suite 900
Montréal, QC, Canada
H3B 5H4

T 514.954.2555
F 514.879.9015

Toronto
Bay Adelaide Centre, East Tower
22 Adelaide Street West
Toronto, ON, Canada
M5H 4E3

T 416.367.6000
F 416.367.6749

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