

Carbon Calculation Basics

Corn Ethanol 365-Day Rolling Average Lifecycle GHG Emissions

Averaging Time Period Ending:	7/29/2019
Upstream GHGs	51.1 kgCO ₂ e/mmBtu
Process GHGs	5.4 kgCO ₂ e/mmBtu
Downstream GHGs	2.1 kgCO ₂ e/mmBtu
Lifecycle GHGs*	58.5 kgCO ₂ e/mmBtu
Percent GHG Reduction	40.5% % reduction compared to petroleum baseline

* Lifecycle GHGs may not be the sum of upstream, process and downstream GHGs if the averaging time period includes any periods of missing data

Grain Sorghum Ethanol 365-Day Rolling Average Lifecycle GHG Emissions

Averaging Time Period Ending:	7/29/2019
Upstream GHGs	46.8 kgCO ₂ e/mmBtu
Process GHGs	5.4 kgCO ₂ e/mmBtu
Downstream GHGs	2.1 kgCO ₂ e/mmBtu
Lifecycle GHGs*	54.2 kgCO ₂ e/mmBtu
Percent GHG Reduction	44.8% % reduction compared to petroleum baseline

* Lifecycle GHGs may not be the sum of upstream, process and downstream GHGs if the averaging time period includes any periods of missing data

- What factors go into calculating the carbon intensity?
 - Feedstock transportation
 - Co-Product Generation
 - Fuel Transportation
 - Energy Usage
 - Yield
- Biggest bang for your buck will come from targeting:
 - Energy Usage
 - Yield

Things To Consider

What about your
plant makes it unique?

Considerations that
make a technology more
or less feasible/desirable?

- Carbon Market availability
 - LCFS/California
 - RFS2
 - Advanced RINs
 - Cellulosic RINs
 - Emerging Markets
 - Pacific Northwest
 - Canada
 - Midwest LCFS
- Feedstock availability/alternatives
 - E.g., Milo
- Energy markets/energy alternatives and related accessibility
 - Nebraska Public Power
 - Gas line accessibility
 - Utility provider problems

Piecing it together

Goals for carbon reductions might not be a one technology answer

- CHP:
 - 6-10 points
 - Steam and electricity efficiency improvements
- Whitefox:
 - 0.9 – 2.0 plus points
 - Potential plant efficiency gains
- Bioleap:
 - 4-8 points
 - 4,500-8,500 btu/gal improvements
- Other yield and energy improvements

Value in bolt on technologies

- Diversity of products
- Higher value products
- Better yield – ethanol, corn oil
- Energy reductions
- Reliable energy
- Reliable technology, improved safety

What is best for your plant?

- With so many technologies, how do you decide?
 - Feasibility Studies
 - How does the technology work at your plant, and/or with other technologies.
 - Energy Audits
 - Where are the areas of most improvement, where are the weaknesses
 - Meeting with Regulators
 - Understand what regulators are seeing, how technologies are implemented and regulatory ramifications



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