

EPA's Proposed Regulation of Biofuels An Update



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Transportation Research Board Annual
Meeting

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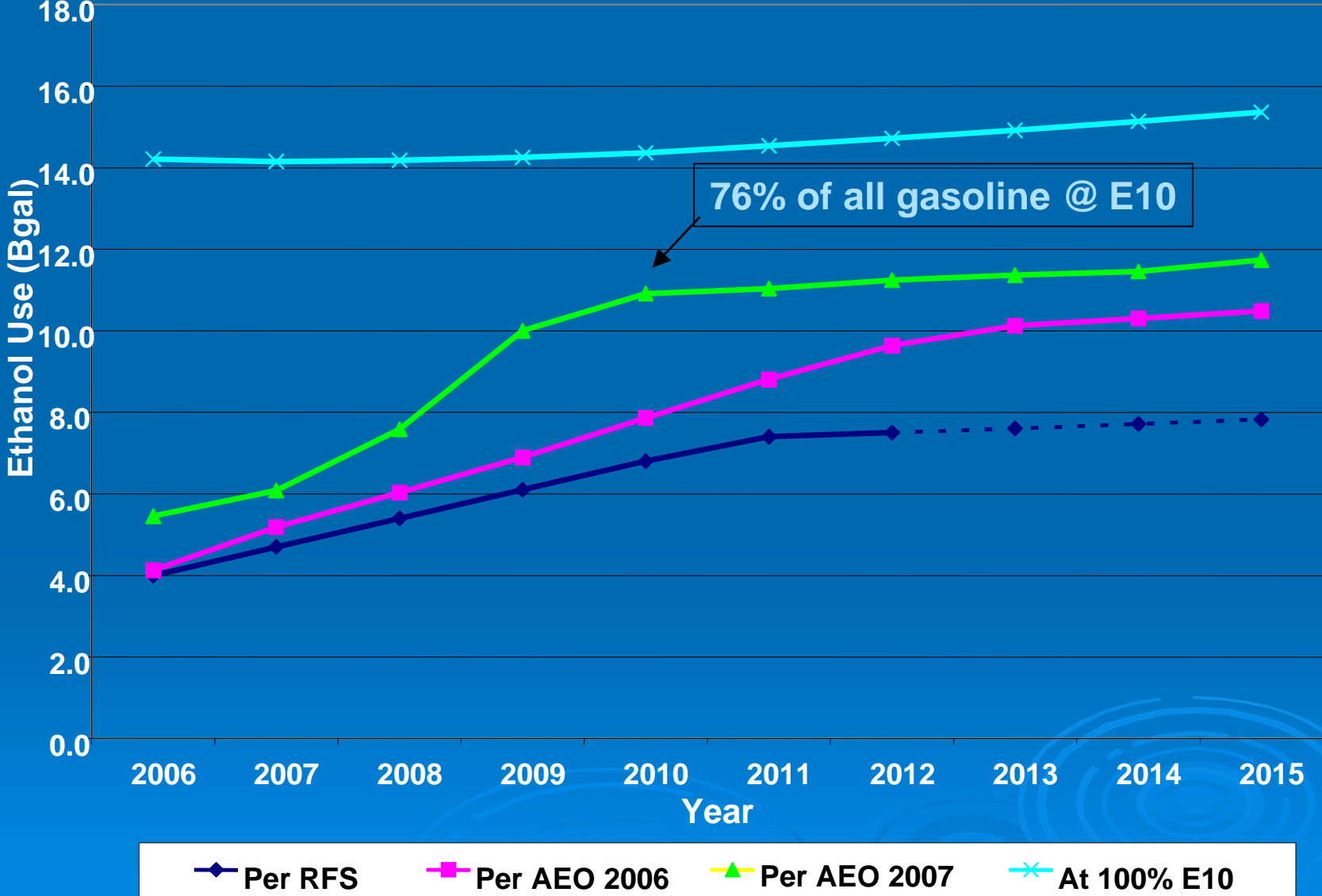
Recent Events

- January 2007 State of the Union Address—20-in-10 goal
- March 2007 Administration proposes Alternative Fuel Standard legislation
- April 2007 Supreme Court Decision
- May 2007 RFS Published (7.5 billion gallons of renewable fuels by 2012)
- May 2007 President's Announcement and Executive Order (35 billion gallons renewable and alternative fuel)
- December 2007 Energy Independence and Security Act (H.R. 6) was passed by Congress and signed by President Bush on December 19, including a 36 billion gallon renewable fuel mandate

Renewable Fuel Use in US Today

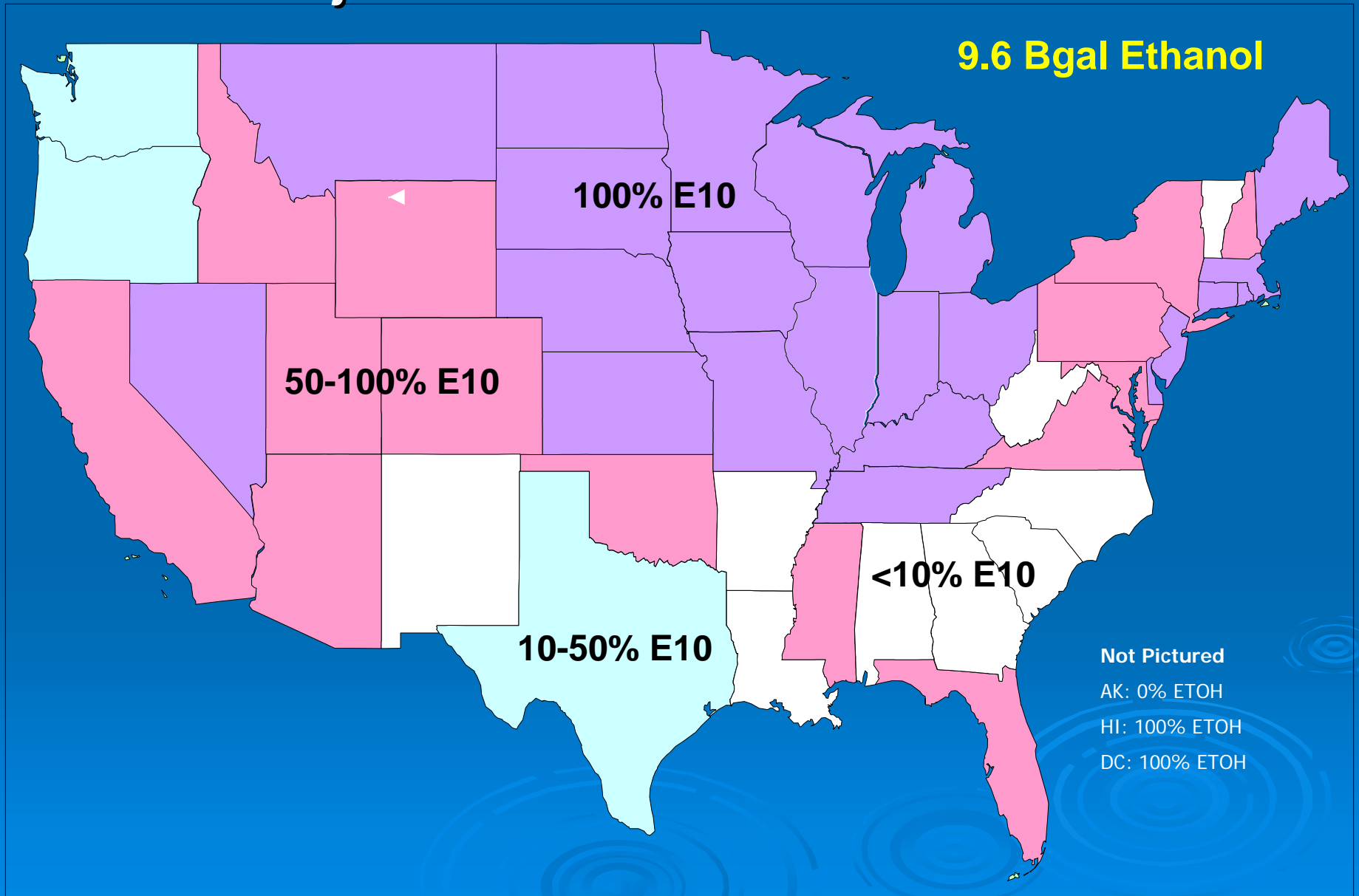


Ethanol is the most popular biofuel in the U.S.



Projected ethanol use in 2009

9.6 Bgal Ethanol



Importance of Lifecycle Assessment



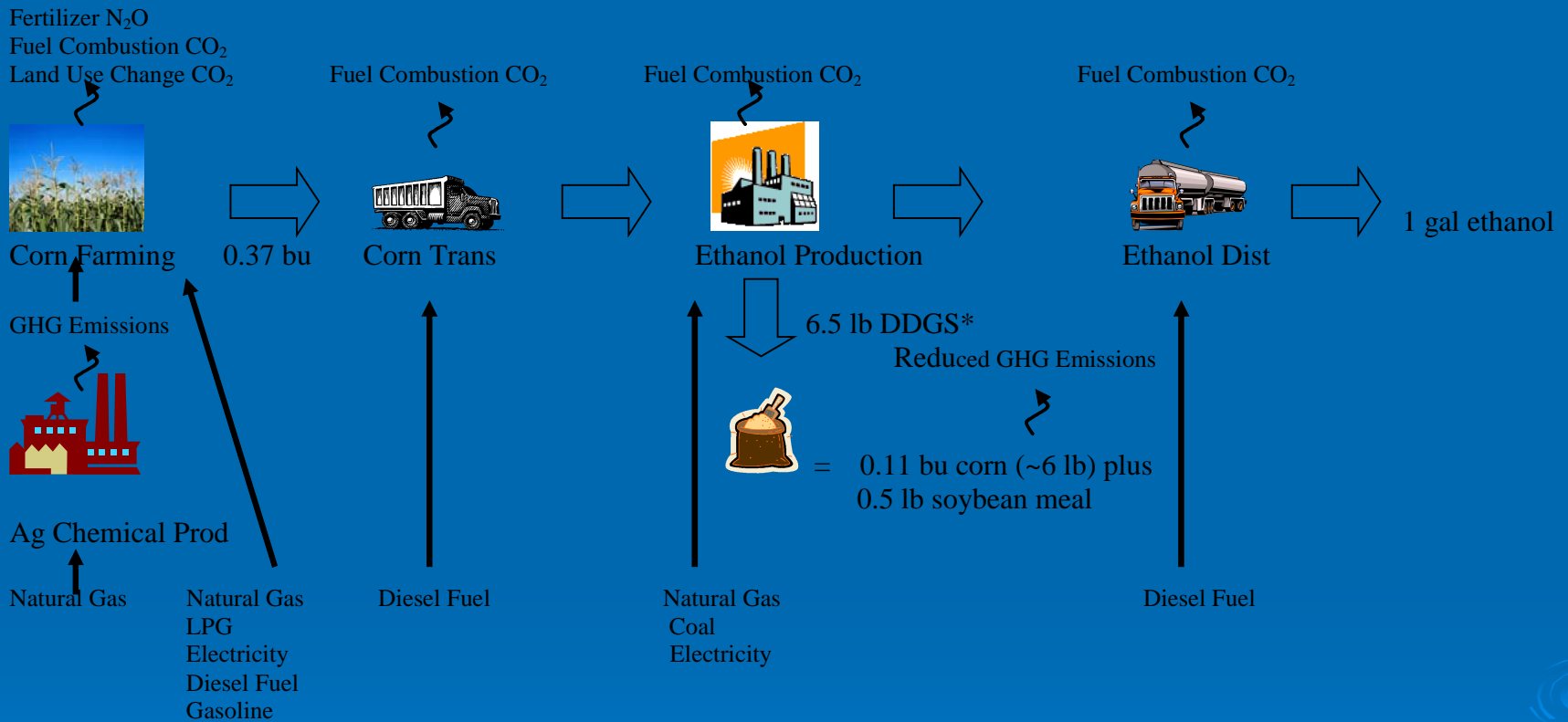
Energy Independence and Security Act Requires Lifecycle Assessment

- Lifecycle assessment required to determine which fuels meet mandated GHG performance thresholds
 - 20% reduction for new facility renewable fuel
 - 50% reduction for biomass-based diesel
 - 50% reduction for advanced biofuels
 - 60% reduction for cellulosic biofuel
- Lifecycle assessment must include impacts on land use

Fuel Life Cycle GHG Assessment

- Also called fuel cycle or well-to-wheel analysis, compilation of the GHG impacts of a fuel throughout its life cycle
 - Production / extraction of feedstock
 - Feedstock transportation
 - Fuel production
 - Fuel distribution
 - Tailpipe emissions
- Can be used to compare one or more fuels performing the same function (e.g., miles driven)

Corn Ethanol Example

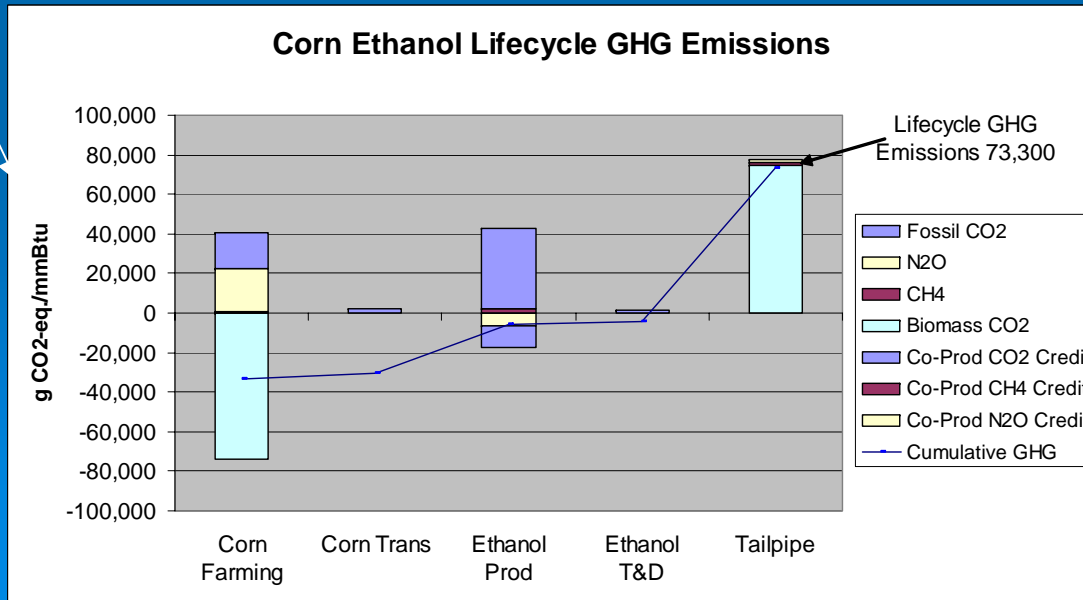
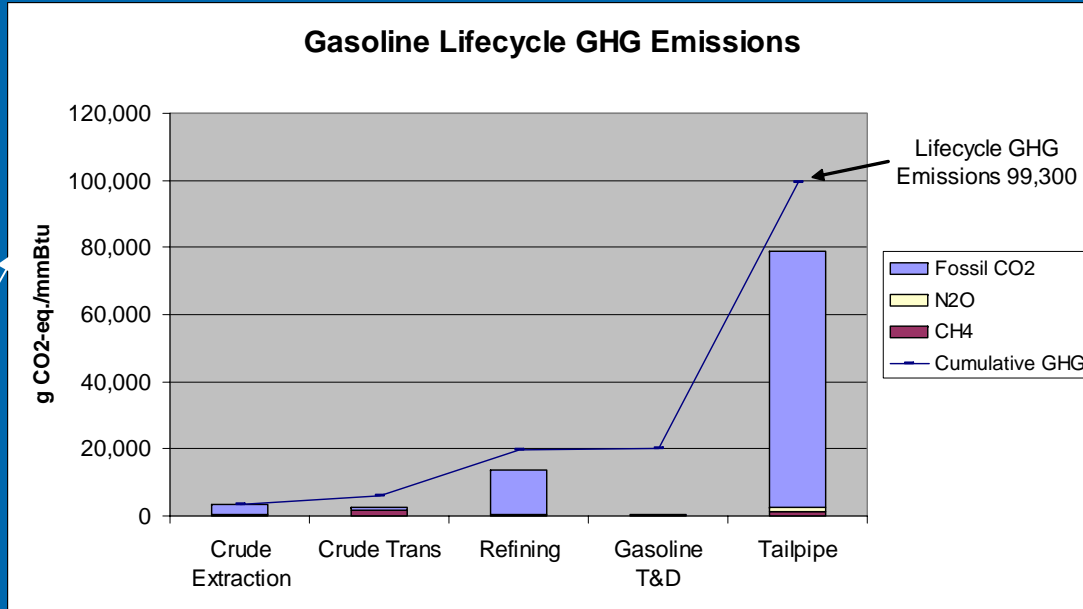


* Displacement allocation used, so for entire system new corn production = 0.26 bu and results in 0.4 less soybean meal produced
 DDGS = Distiller Dried Grains, substitute animal feed

Can compare to producing an equivalent amount of petroleum gasoline

Example: Gasoline vs. Corn Ethanol Lifecycle Comparison From RFS 1

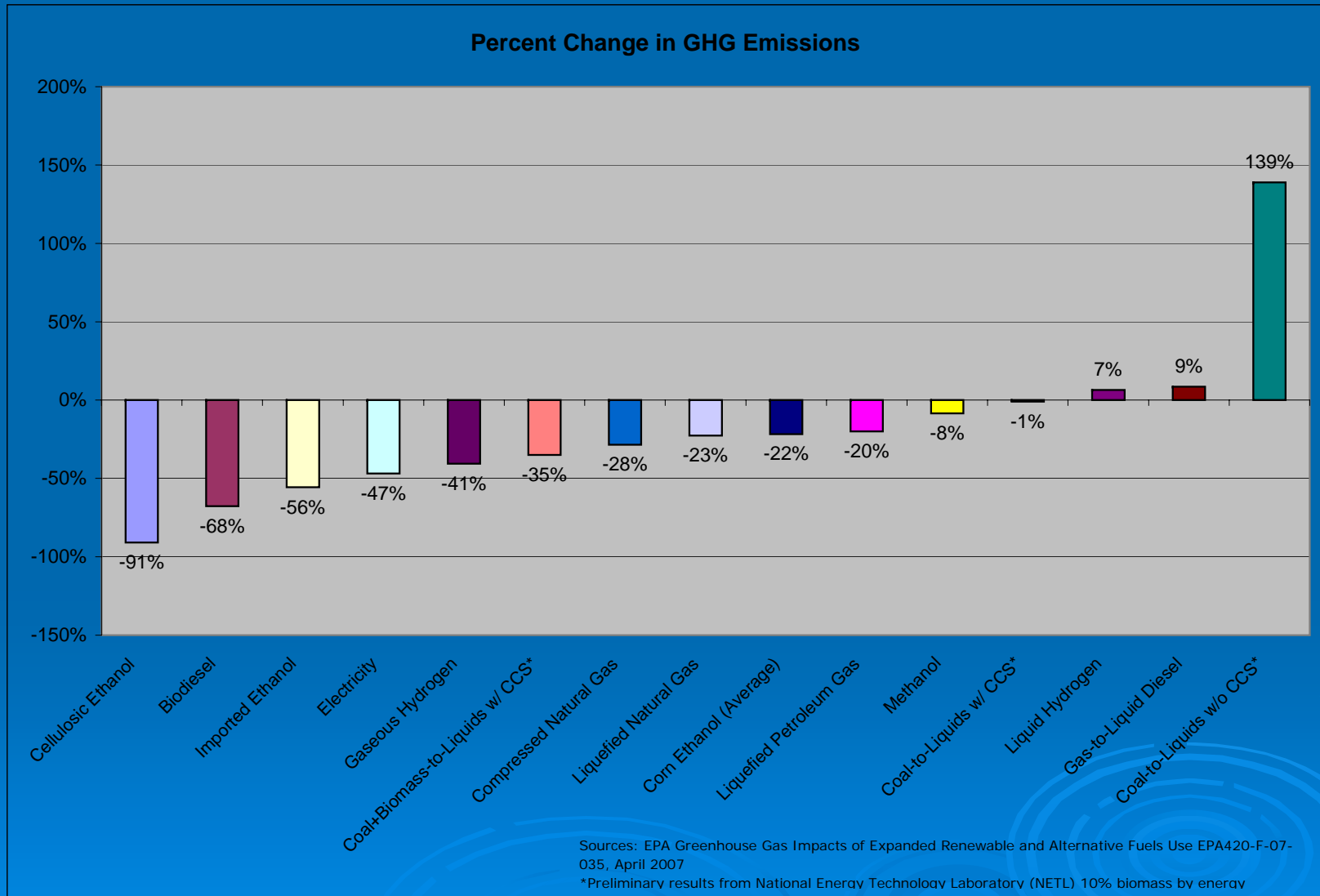
Comparing energy equivalent amounts of fuel



26% reduction in GHG emissions

Assumptions: 7.5 Bgal scenario used in the Renewable Fuel Standard Rulemaking, corn ethanol dry milling using natural gas

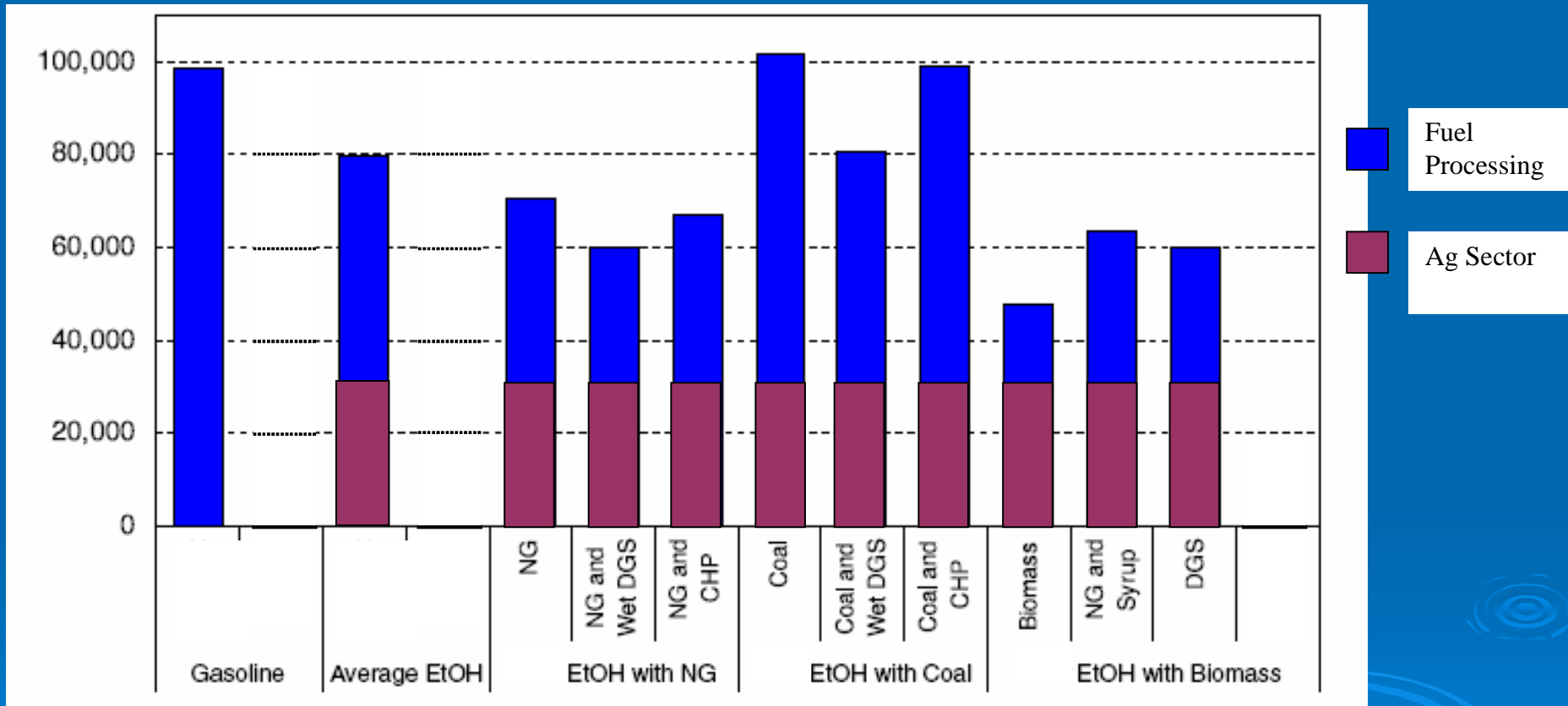
Important Method to Distinguish Between Fuels



Values were developed as part of the Renewable Fuels Standard analysis and are in the process of being updated. Values as well as types of fuels considered are subject to change.

Fuel Production Variation

- Range of results for different corn ethanol pathways

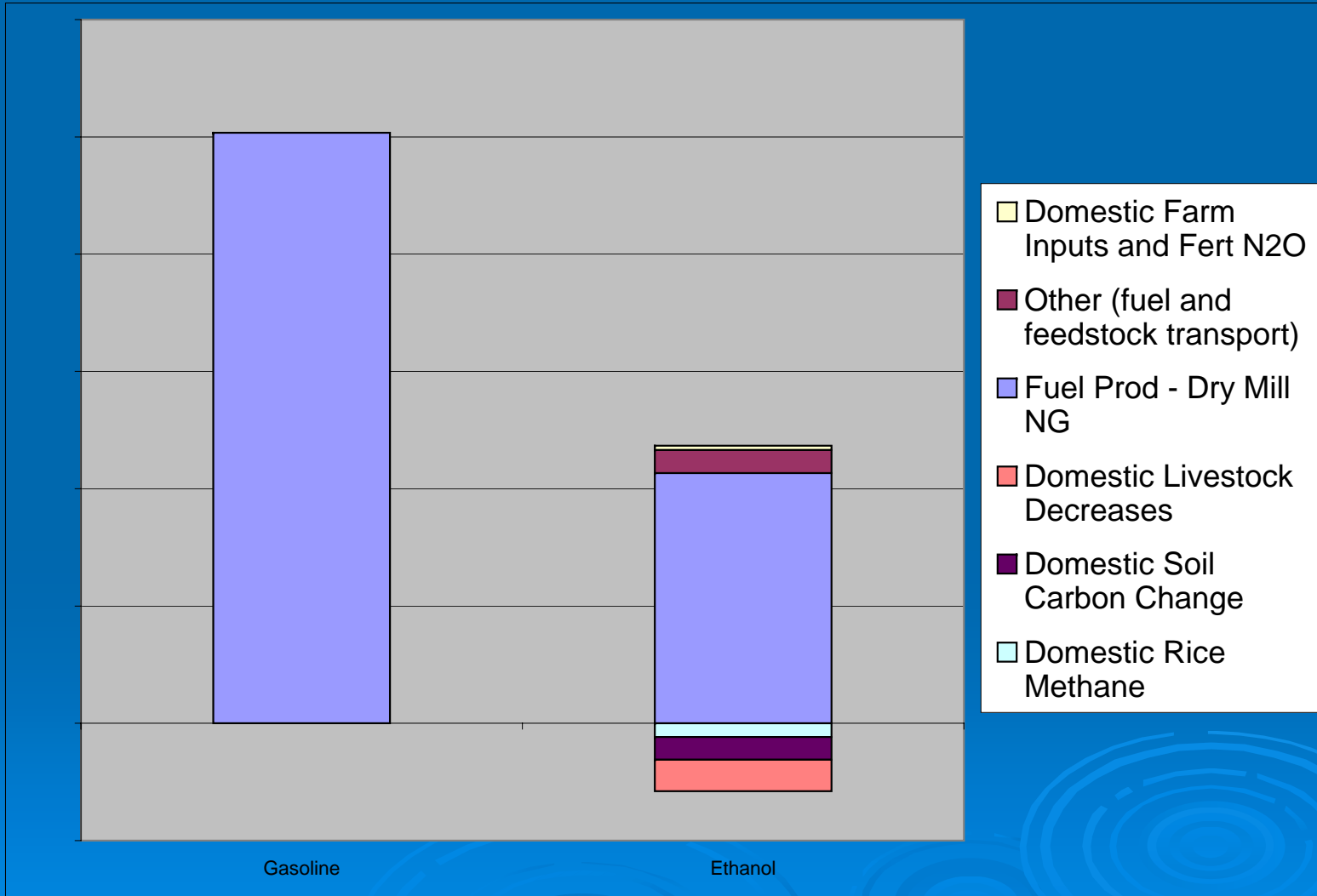


Source: Life-Cycle Energy and Greenhouse Gas Emission Impacts of Different Corn Ethanol Plant Types, Michael Wang, May Wu and Hong Huo, Environmental Research Letters, May 2007

Example Lifecycle Analysis

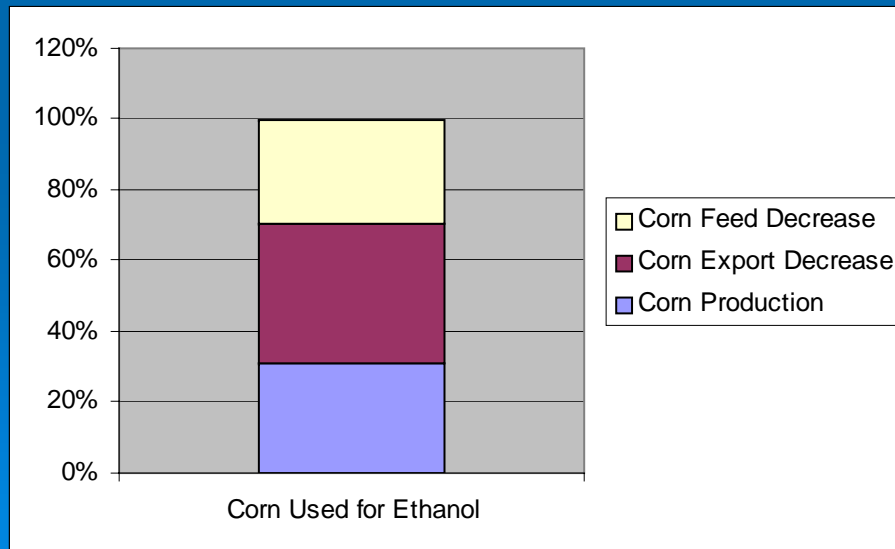
- RFS analysis assessed first order impacts
 - GHG impacts of corn and soybean acres in US
- New analysis more complete assessment of domestic impacts and added international
 - Corn and soybeans plus other crops
 - Land use changes
 - International impact of decreased US exports
 - Increased crop production in other countries adds GHG
 - Land use impacts critical

Domestic Emissions Only

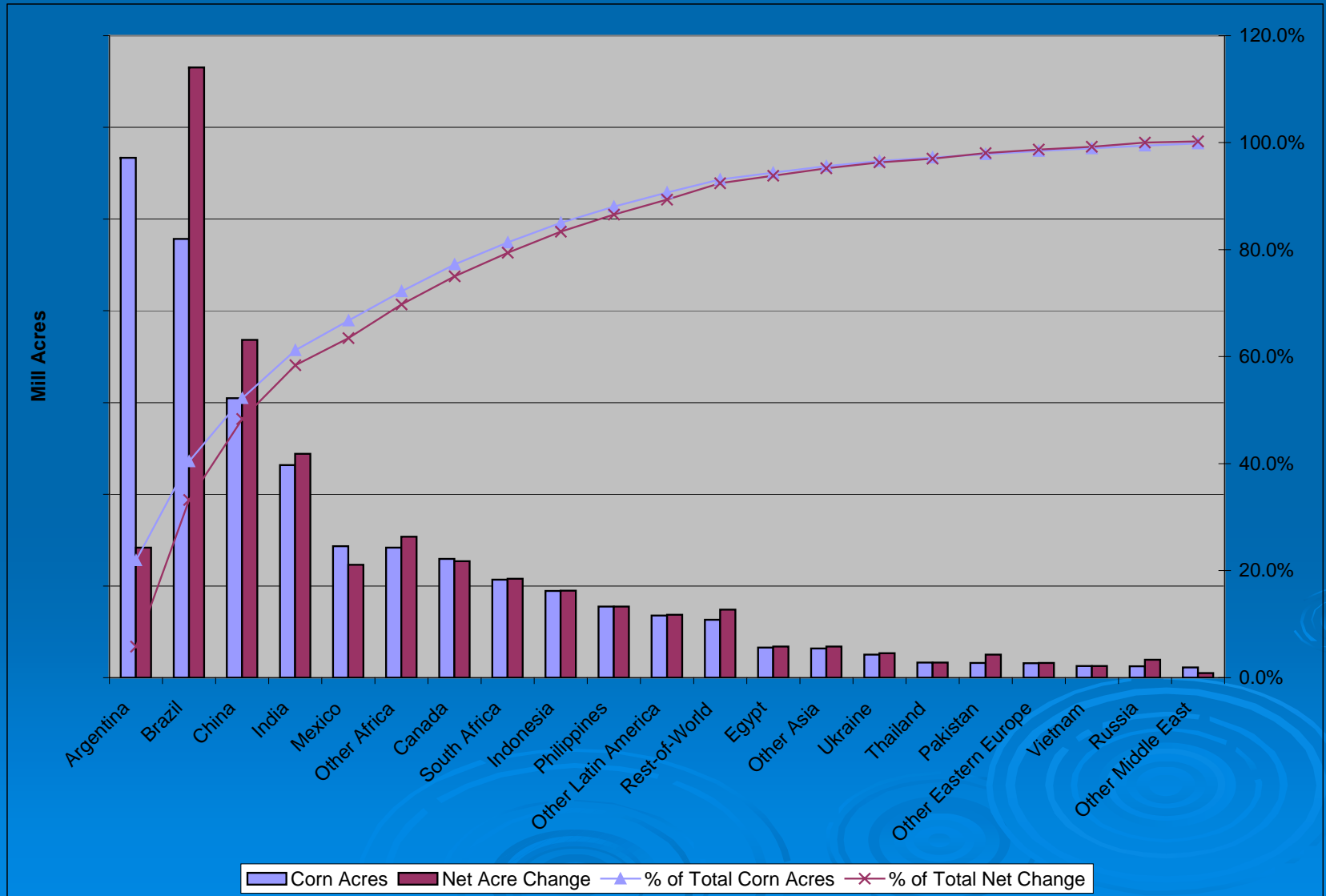


Modeled Export Changes

- Domestic impacts are only half of story
- Need to include international impacts due to changes in exports
- International impacts are dependent on domestic modeling of export changes

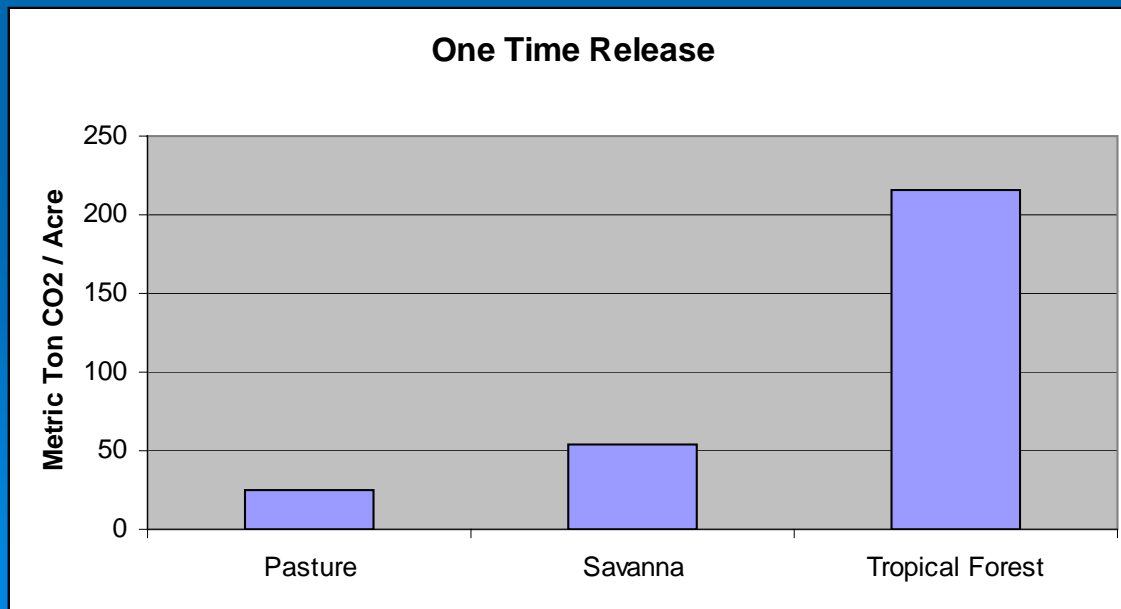


International Land Use Change

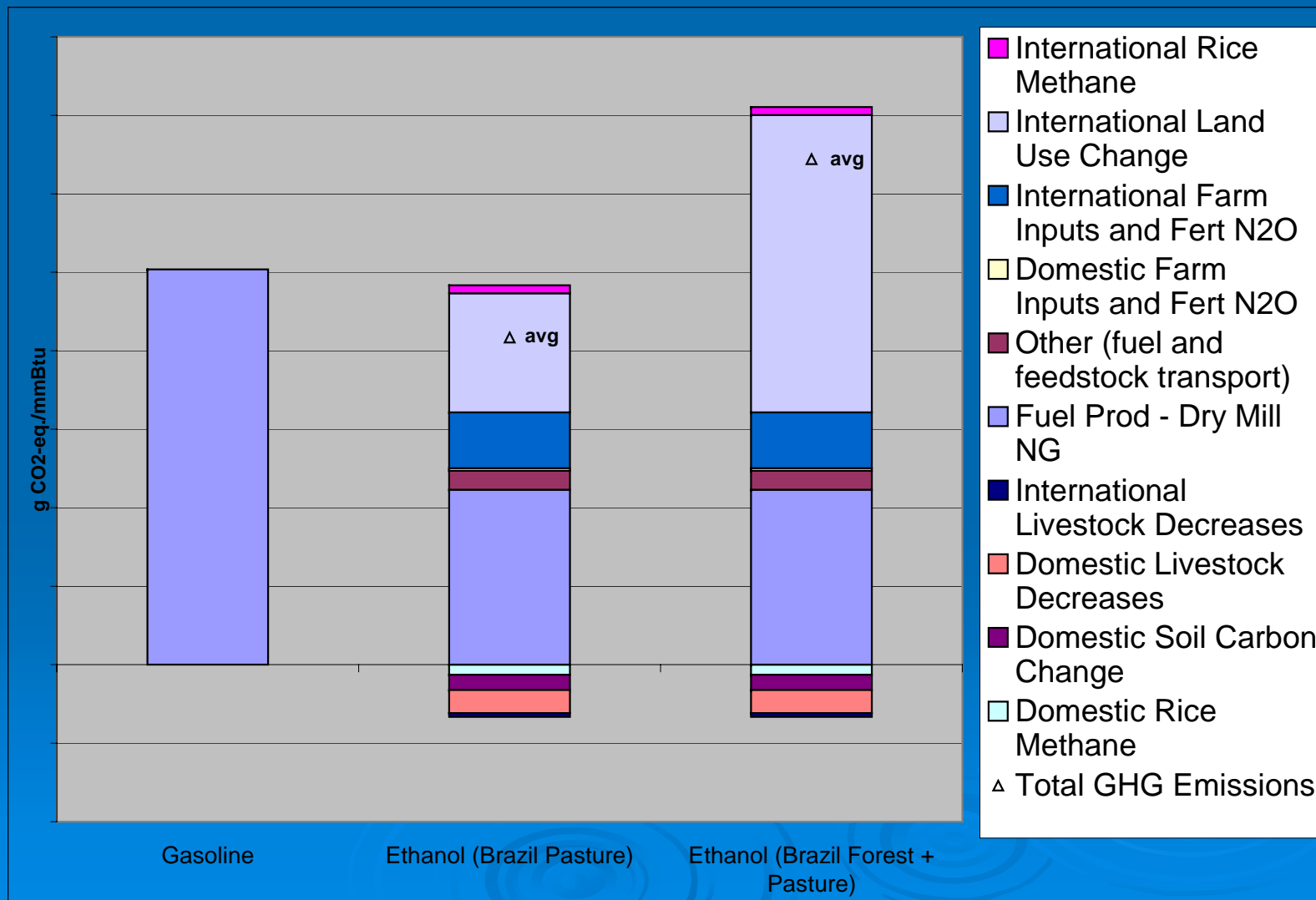


Land Use Change Assumptions

- Need to consider carbon per acre for different land types
- What type of land is converted in different countries, for example:
 - Argentina (Savanna)
 - Brazil Case 1 (Pasture)
 - Brazil Case 2 (Savanna)
 - Brazil Case 3 (Pasture + Tropical Forest)



Impact of Land Use Change Assumptions (Dry Mill Natural Gas Dry and Pelletized DDGS)



Impact of Ethanol Plant Energy Use (Pasture Land Use Change in Brazil)

