

# **Low Carbon Fuel Standard Life Cycle Analysis (LCA) Working Group 1 Meeting**

**January 17, 2008**

**California Environmental Protection Agency**

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## **Air Resources Board**

# Agenda

- Introductions
- GREET Training Update
- Presentation of values for Co-products
- Status of Land Use Change Issues
- Presentation by UC Berkeley
- Presentation by Univ. of Nebraska, Lincoln
- Other Stakeholder Presentations
- Presentation of various Fuel Pathways
- Sustainability Issues
- Other items to be discussed

# GREET Training

- GREET Training for stakeholders on February 14, 2008 at the California Energy Commission
- Agenda has been posted online
- Expect comments by stakeholders latest by January 31, 2008

# Co-product Credit Methodology

# Preliminary Staff Recommendation for Co-product Credits\* (in gCO<sub>2e</sub>/MJ)

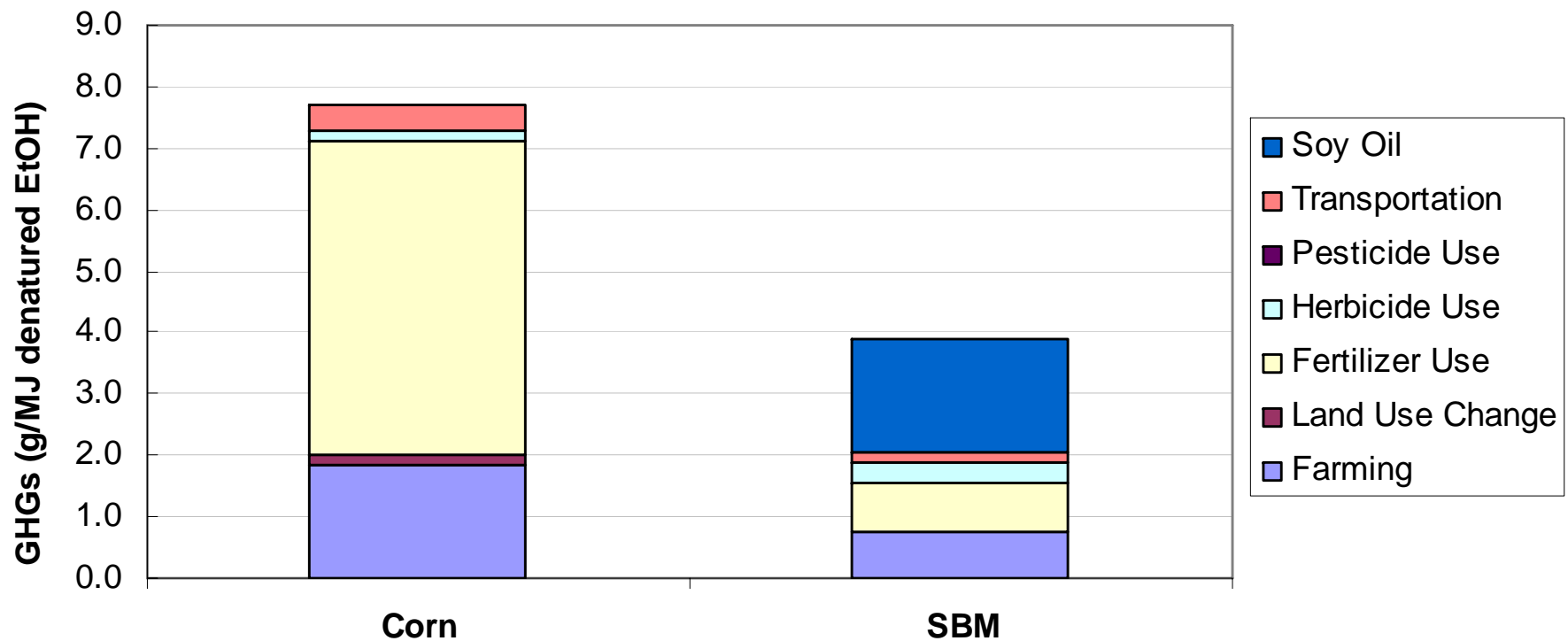
	Corn Ethanol (U. S.) Dry mill	Corn Ethanol (U. S.) Wet Mill	Stover to Ethanol (U. S.)	Soy Biodiesel (U. S.)
Animal Feed	9.5	17.7		28.3
Electricity			3.0	
Glycerin				5.0

\*values and methodology from GREET, Analysis by Life Cycle Associates. Electricity credit based on 1 kWh/gal ethanol, 792 g/kWh for US Average electricity in Midwest, For plants in CA, GHG impact of marginal generation is 400 g/kWh.

# Co-product Credit Methodology for DDGS from Dry Milling Process

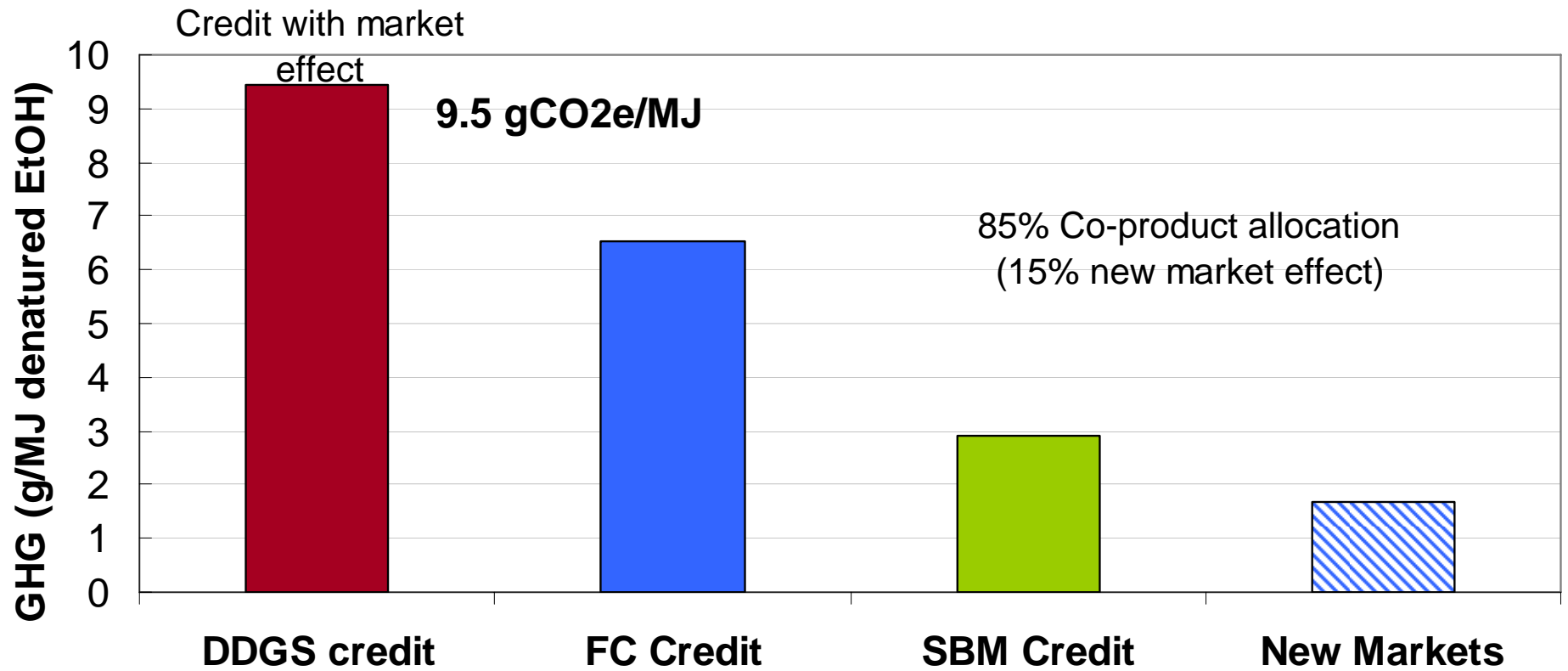
- DDGs is a co-product from dry milling ethanol process
- Replaces Feed Corn (FC) and Soy Bean Meal (SBM)
- Calculate LC emissions for FC and SBM
- Credit DDGS for equivalent emissions from FC and SBM

# Life Cycle Emissions for Feed Corn (FC) and Soy Bean Meal (SBM)



Analysis by Life Cycle Associates, GHG Impact does not include effect of DDGS on feed markets.

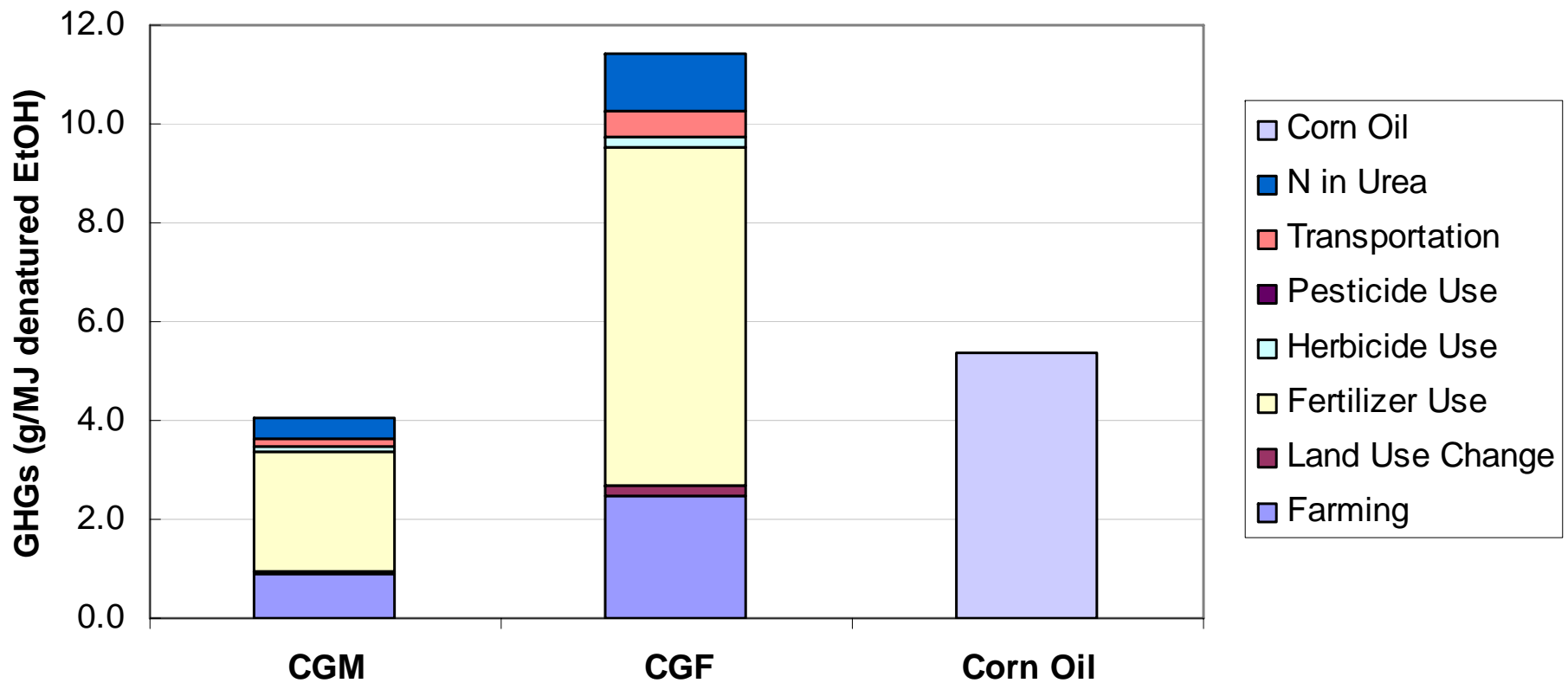
# Overall Co-product Credit for DDGS from Dry Mill Corn Ethanol



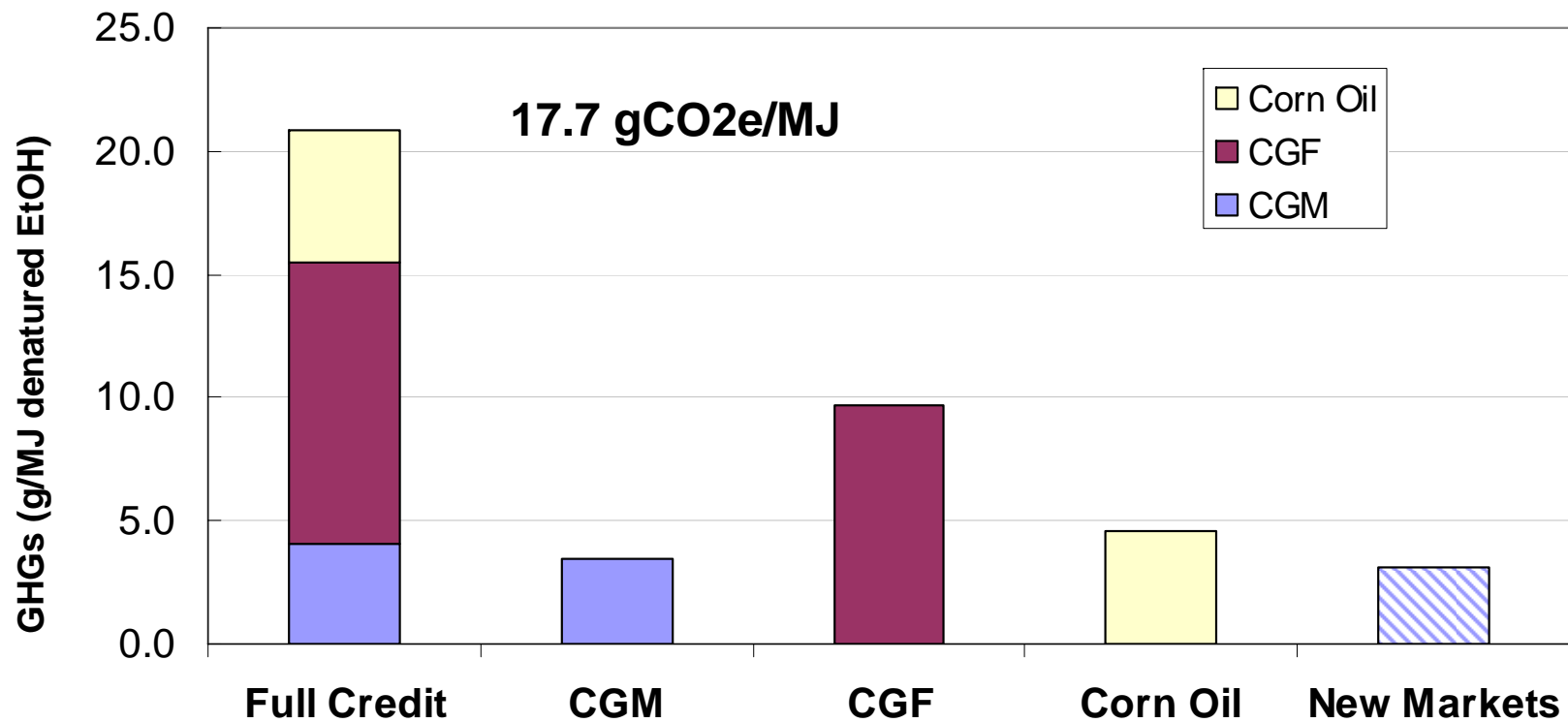


# Co-product Credit Methodology for Wet Milling Process

# Life Cycle Emissions for Corn Gluten Meal (CGM), Corn Gluten Feed (CGF) and Corn Oil

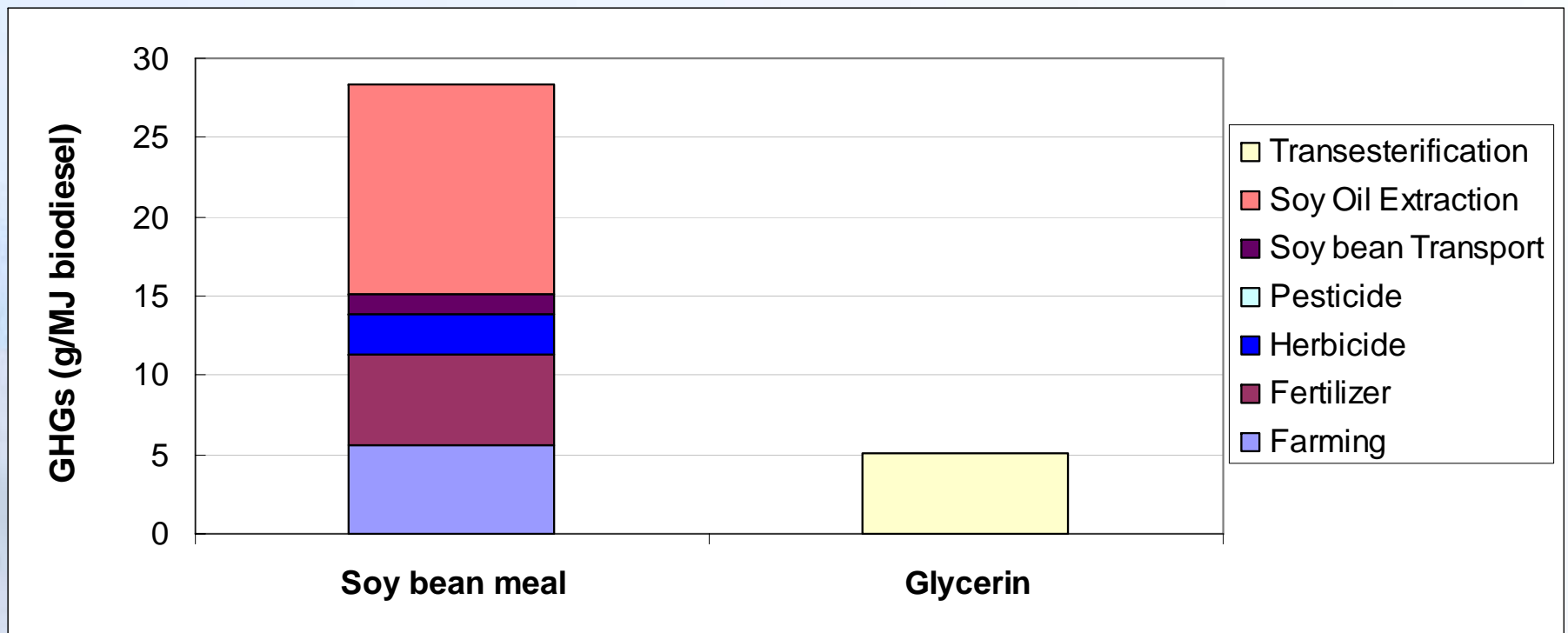


# Overall Co-product Credit for Wet Mill Corn Ethanol

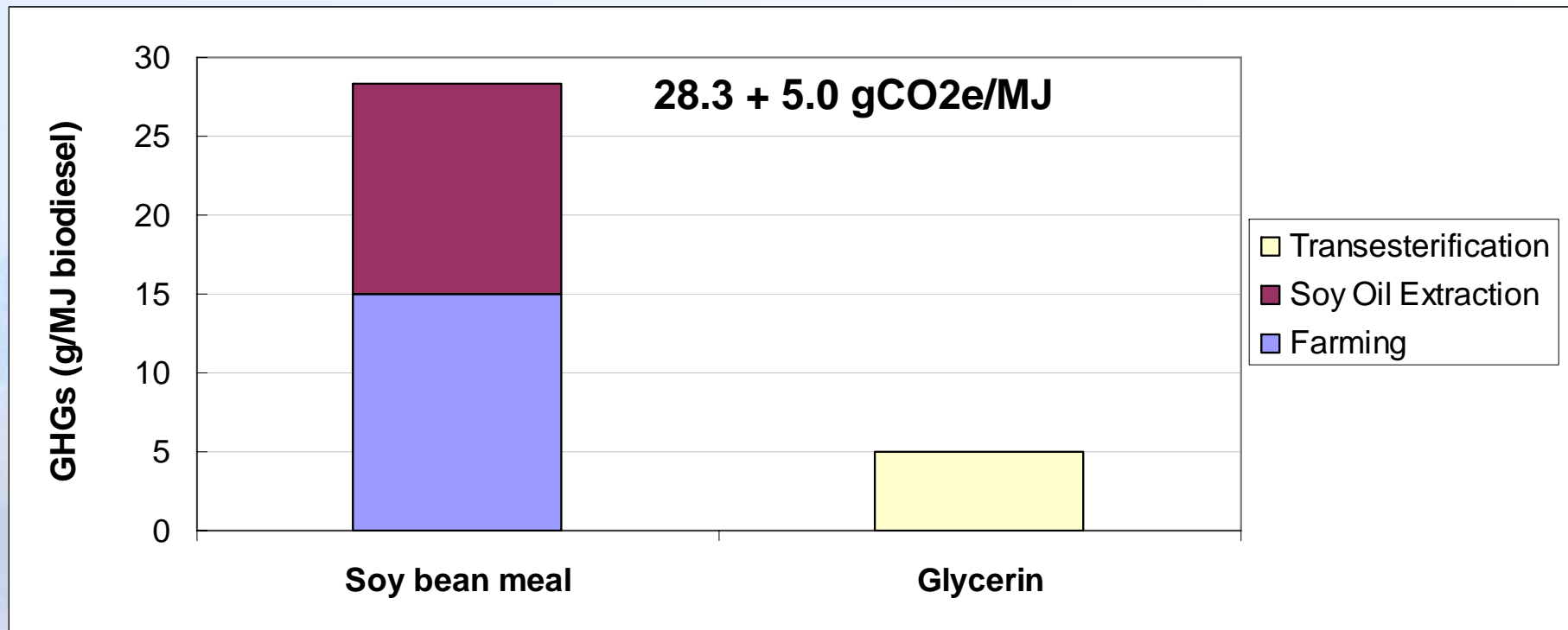


# Co-product Credit Methodology for Soy Biodiesel Process

# Life Cycle Emissions for Soy Bean Meal and Glycerin



# Overall Co-product Credit for Soy Biodiesel



# Electricity Co-product

- Obtain the resource mix for electricity for the region or nation
- Calculate the LC emissions from the resource mix
- Credit the fuel pathway for an equivalent emissions reduction

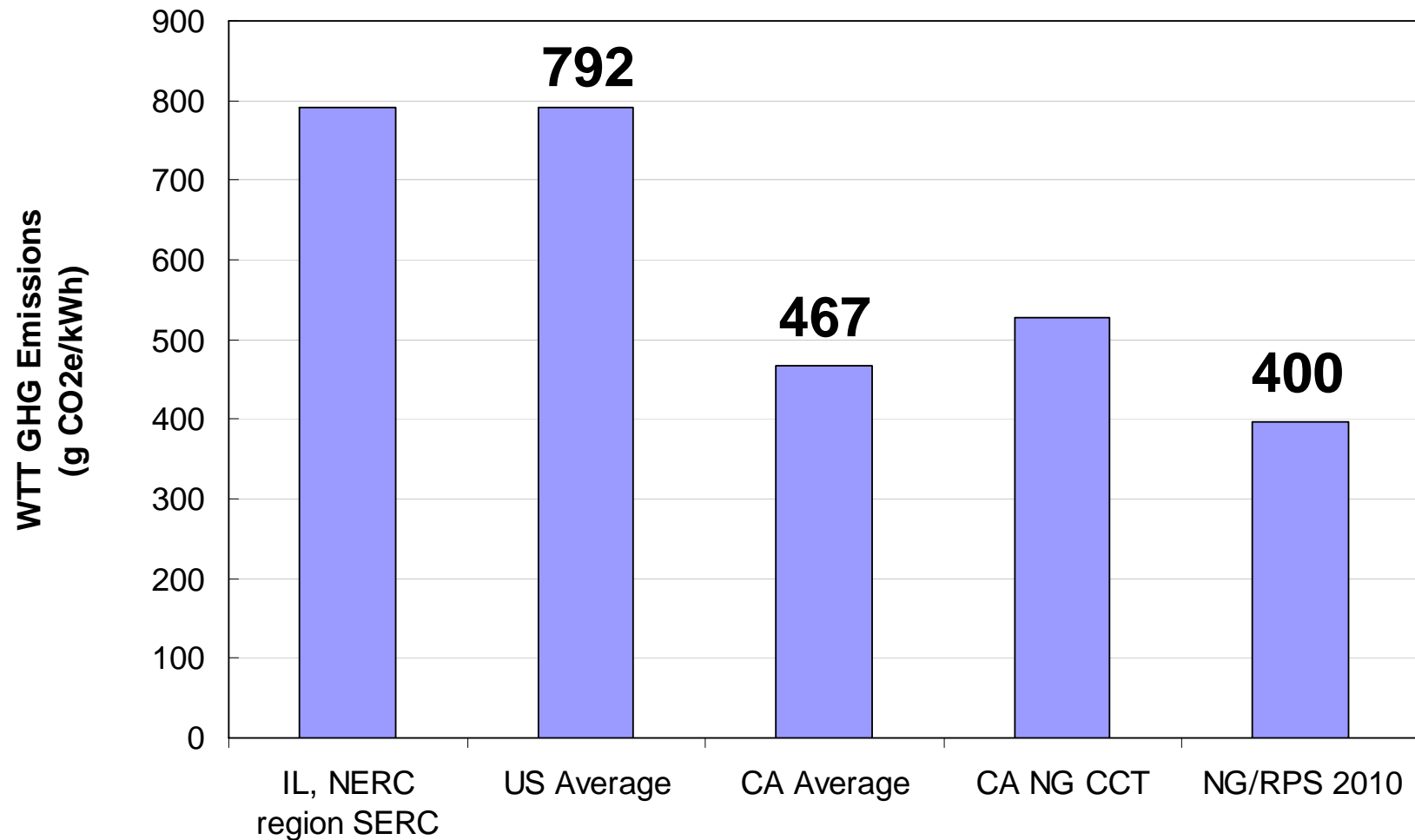
# Electricity Generation Resource Mix

	IL (NERC region) SERC	U. S. Ave.	CA Ave.	CA NG CCT	NG/RPS 2010
<b>Residual Oil</b>	1.77 %	2.70 %			
<b>NG</b>	10.01 %	18.90 %	41.50 %	78.70 %	78.70 %
<b>Coal</b>	57.30 %	50.70 %	15.70 %		
<b>Nuclear</b>	25.17 %	18.70 %	12.90 %		
<b>Biomass</b>	1.91 %	1.30 %	2.10 %		
<b>Other</b>	3.83 %	7.70 %	27.80 %	21.30 %	21.30 %

[2006 Net System Power Report, Energy Commission Publication # CEC-300-2007-007. \(Acrobat PDF, 8 pages, 48 kilobytes, date on line April 12, 2007\)](#)



# Co-product Credit for Electricity (as function of generation mix)



# Preliminary Staff Recommendation for Co-product Credits\* (in gCO<sub>2e</sub>/MJ)

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# Land Use Change

- Several efforts undertaken by ARB to include land use change issues in LCA
  - Contracts with UCB and UCD to provide technical assistance on addressing this issue
  - CEC working on contracts to initiate efforts on estimating impacts of land use change
  - Co-ordinate with DOE/USEPA/USDA and Argonne National Laboratory (Michael Wang) on their efforts to assess land use change impacts

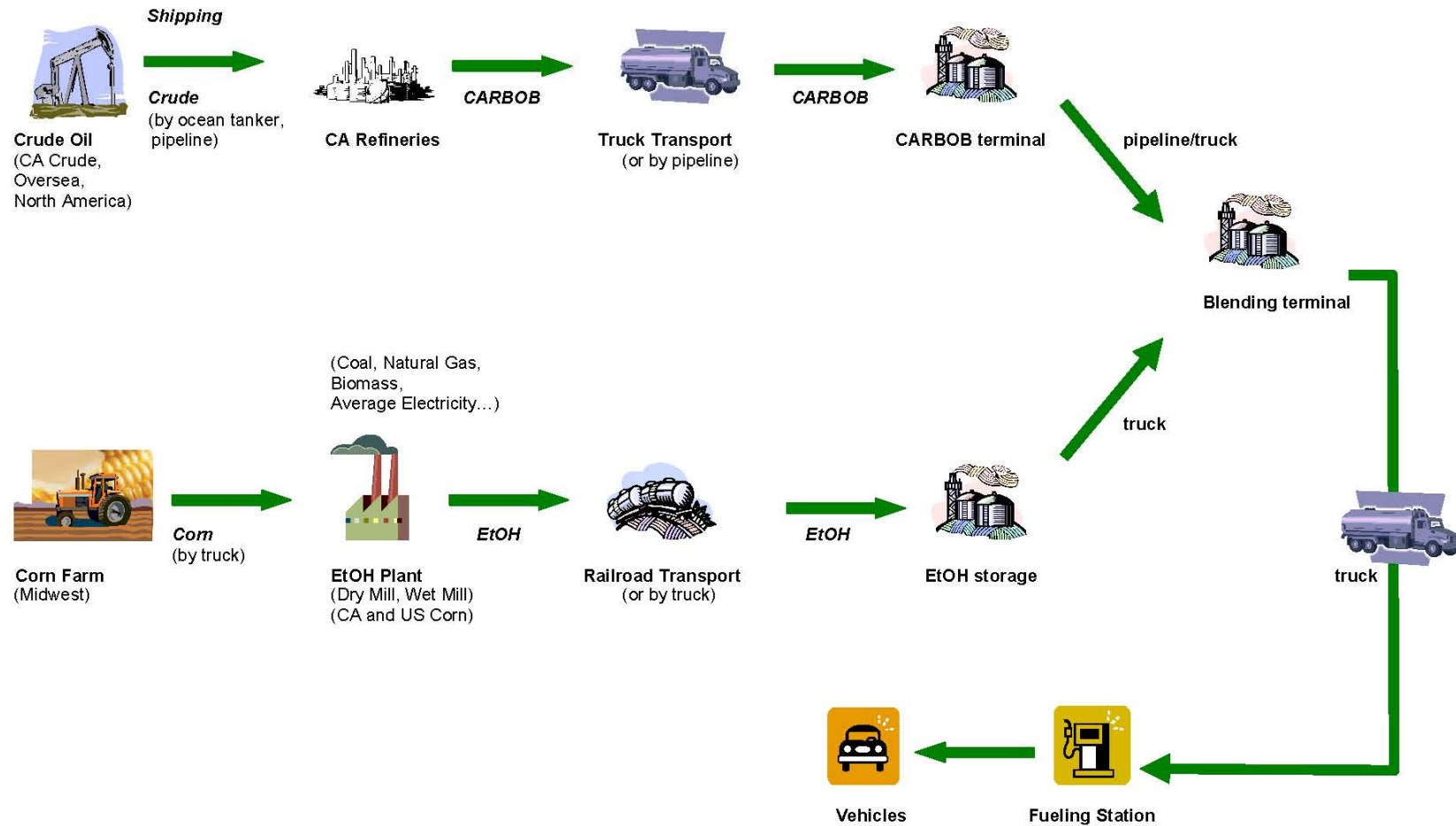
# Stakeholder Presentations

- Presentation by UC Berkeley
- Presentation by University of Nebraska, Lincoln, NE.
- Other Presentations?

# Potential Fuel Pathways

- Potential Feedstock-Fuel Pathways (~65) to be considered in the LCFS is posted online
- Additional pathways will be considered

# Example CaRFG Pathway



# Sustainability Issues

Land Erosion

Eutrophication

Biodiversity

Health impacts from agrochemicals use

Water Use

Water Pollution

Displacement of Indigenous People

Environmental Justice

Labor Law Violations



# Existing Regulatory Frameworks

<b>United Kingdom</b> RTFO (2008-2011)	<b>Germany</b> (Proposed by Meo-Consulting)
<ul style="list-style-type: none"><li>• Focuses on utilizing existing standards (eg. SAN/RA, RSPO EurepGAP, ACCS, LEAF)</li><li>• Acceptable standards must satisfy: Sustainability indicators and audit requirements</li><li>• Sustainable criteria do not apply to co-products until they have greater than 10% of economic value at farm-gate (re-evaluate in future)</li></ul>	<ul style="list-style-type: none"><li>• Certification-based scheme will allow the use of existing standards</li><li>• Covers all biomass (independent of the final use)</li><li>• Certification will focus on the most pressing issues such as biodiversity and carbon storage</li><li>• Prohibits: Conversion of high-carbon storing land and conversion of high-biodiversity land</li><li>• Sustainability certificates will be traded in a book and claim system</li></ul>



## Sustainability (future work)

- Sustainability needs to be addressed as we move into the future
- We intend to look at acceptable practices on sustainability

# Next Meeting

- Next Meeting Date: to be provided in the future

## For More Information

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<http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>

**Open for Discussion**