



Life Cycle Assessment in Support of the Commercialization of Cellulosic Ethanol

BIO World Congress, Washington DC

June 30, 2010

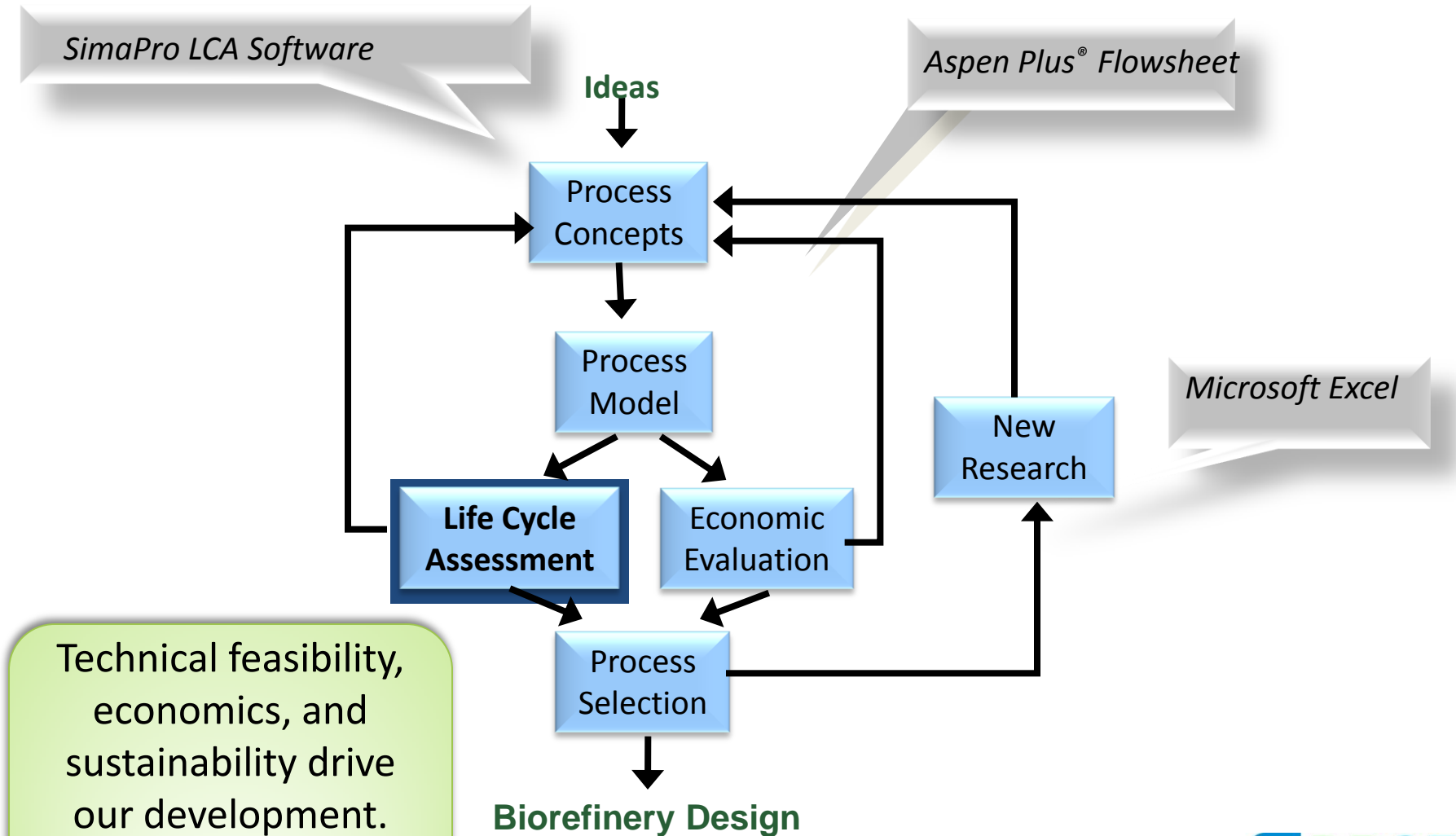
Robin Jenkins, DuPont



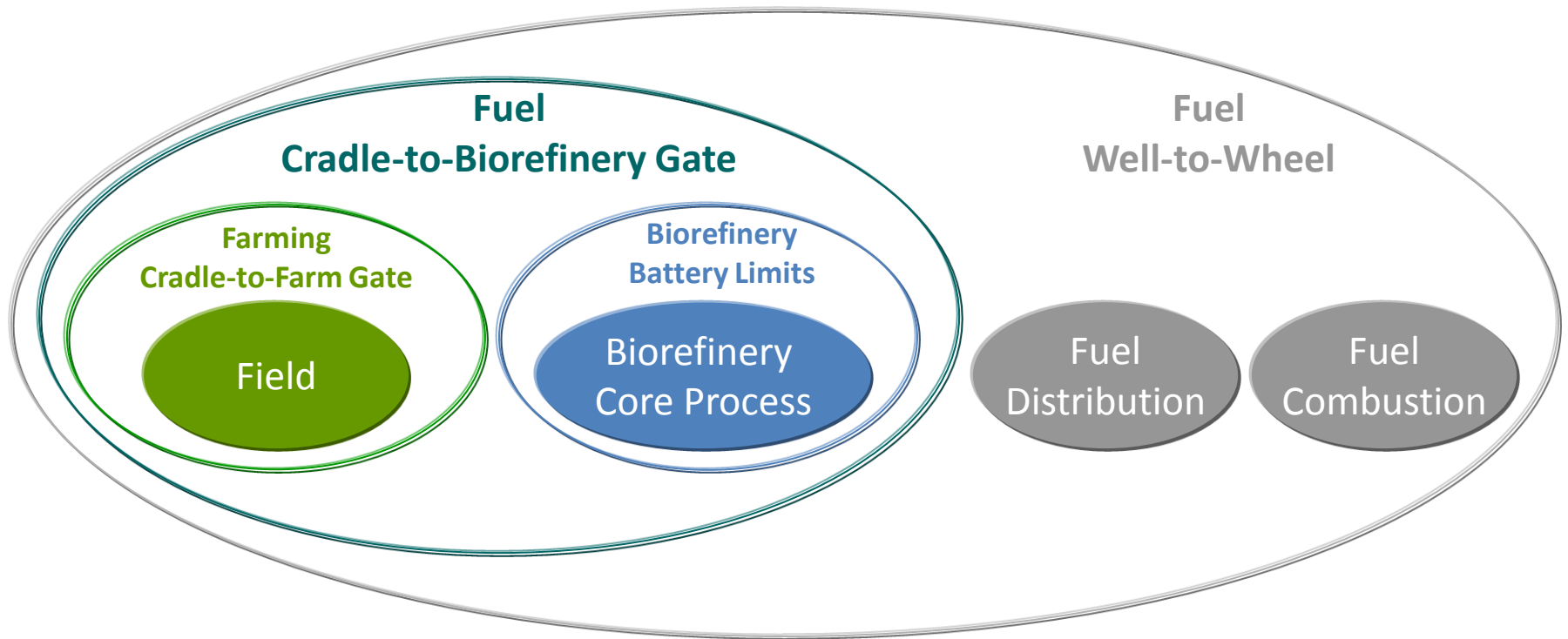
DDCE Sustainability Vision

- ▶ Deliver comprehensive cellulosic ethanol solutions with competitive social, economic, and environmental benefits
 - ▶ Integrate sustainability into all business practices and decisions:
 - process design
 - site selection
 - feedstock supply
 - co-product management
 - ▶ Assess environmental well-to-wheel impacts early and often, to understand consequences of business and technology choices
 - ▶ Engage stakeholders in dialogue on sustainability
-

Process Development Methodology



Biofuel Life Cycle Assessment



LCA should be complemented with assessments of local or regional environmental issues and evaluations of socio-economic impacts, including safety.

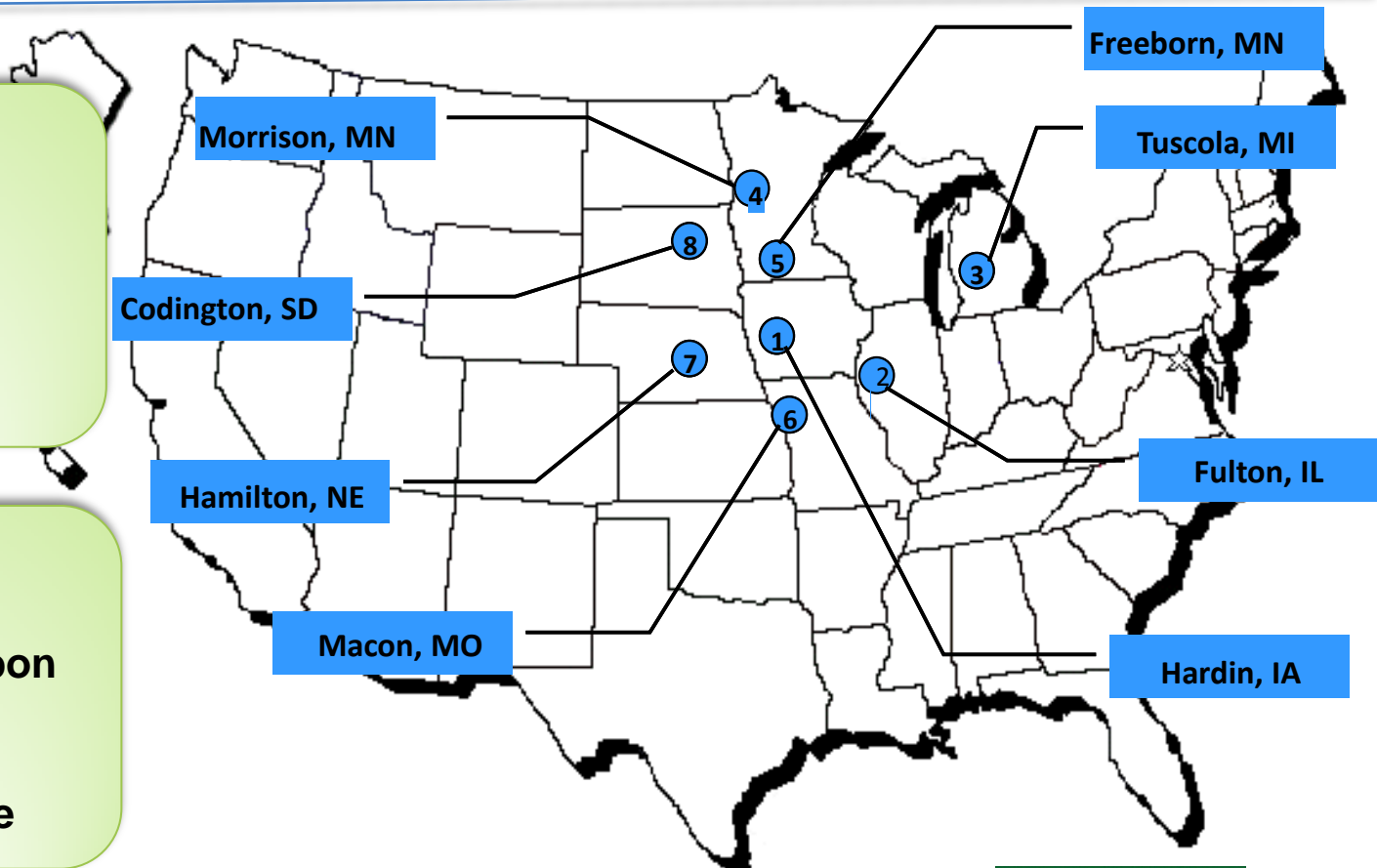
Corn Farming LCA with MSU: Locations across Corn Belt

Variables:

- Location
- Stover Removal Rate
- Farming Practice (Tillage and Winter Cover Crop)

Outputs:

- GHG
- Soil Organic Carbon
- Eutrophication
- Air Acidification
- Fossil Energy Use

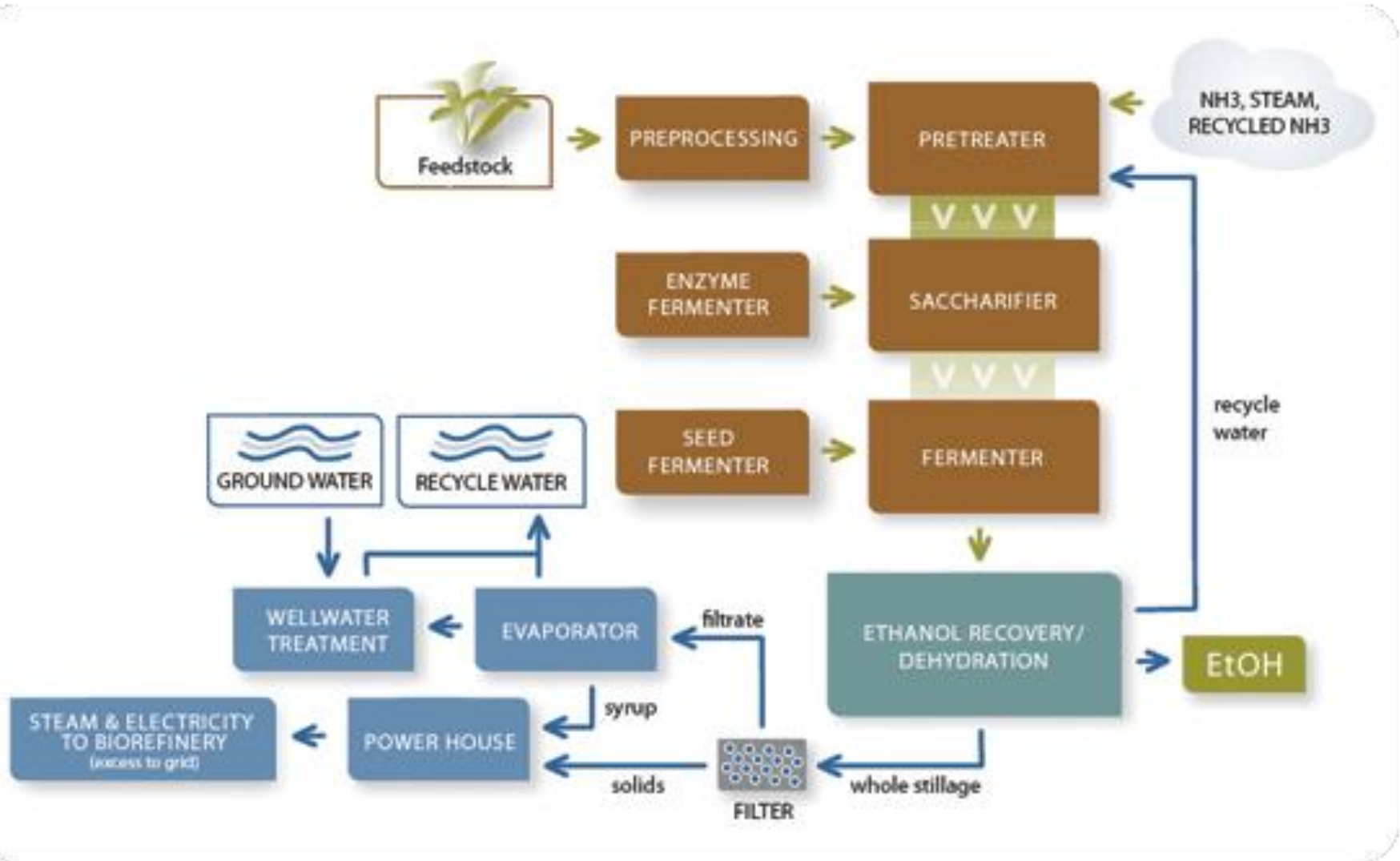


MICHIGAN STATE
UNIVERSITY

see Kim, Dale, and Jenkins (2009):

"Life cycle assessment of corn grain and corn stover in the United States", In J LCA, on-line @<http://www.springerlink.com/content/c220515747622673/fulltext.pdf>

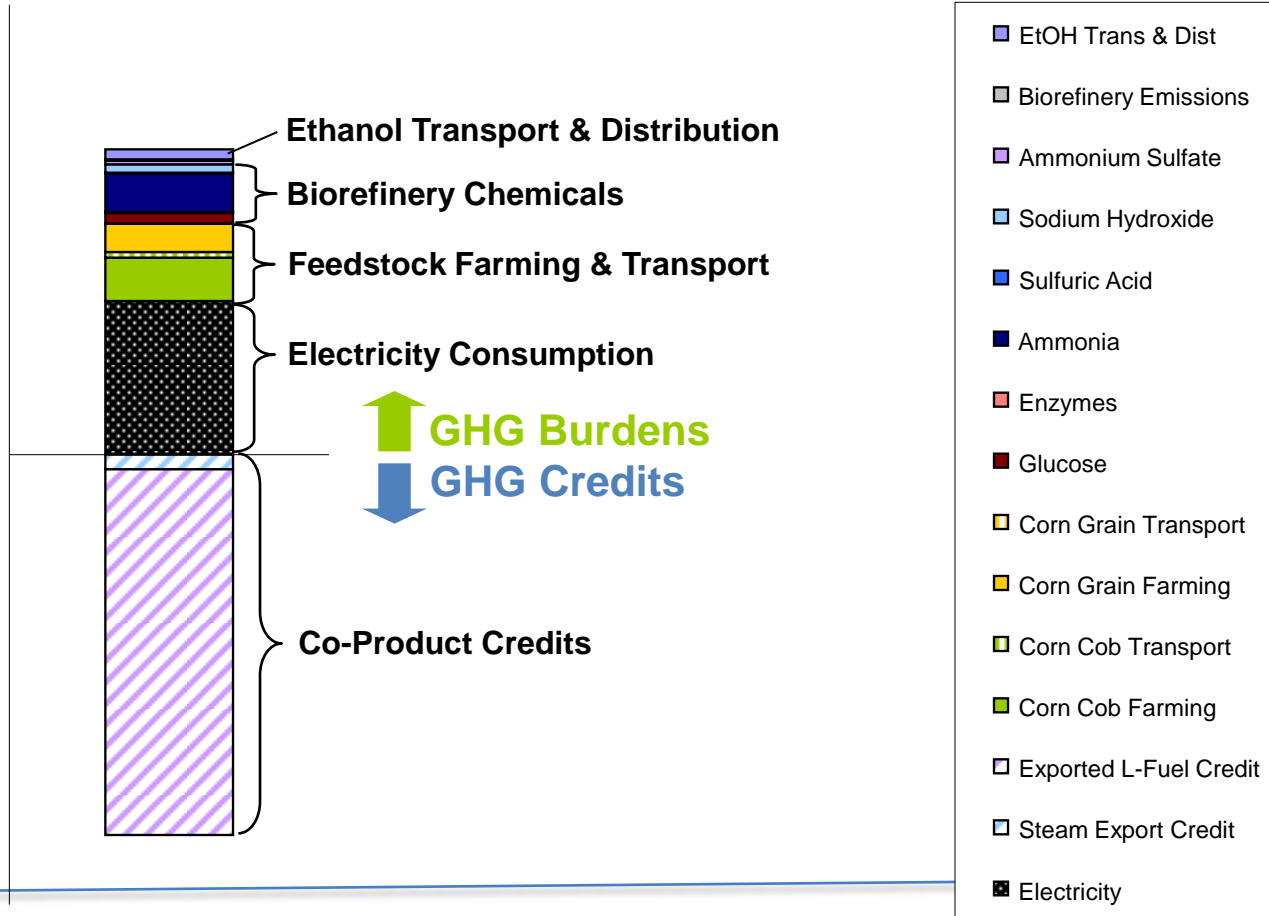
The DDCE Biorefinery



LCA Results:

What does the DDCE GHG Footprint look like?

Well-to-Wheels GHG Emissions
(g CO₂eq/MJ Fuel)

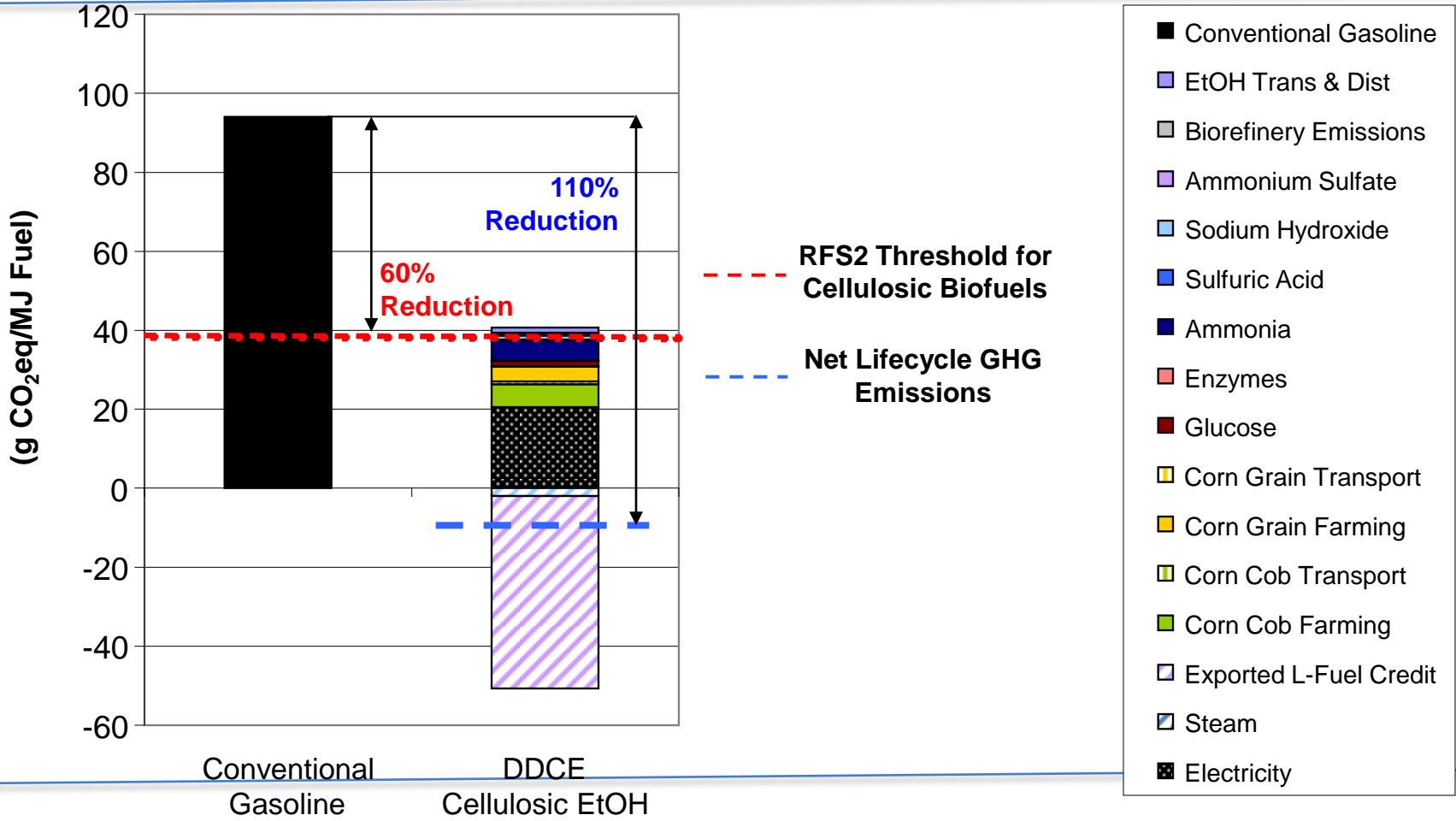


*Preliminary results represent future technology options.
LCA focus on the immediate supply chain (no ILUC).*

LCA Results:

Comparison versus the Renewable Fuel Standard

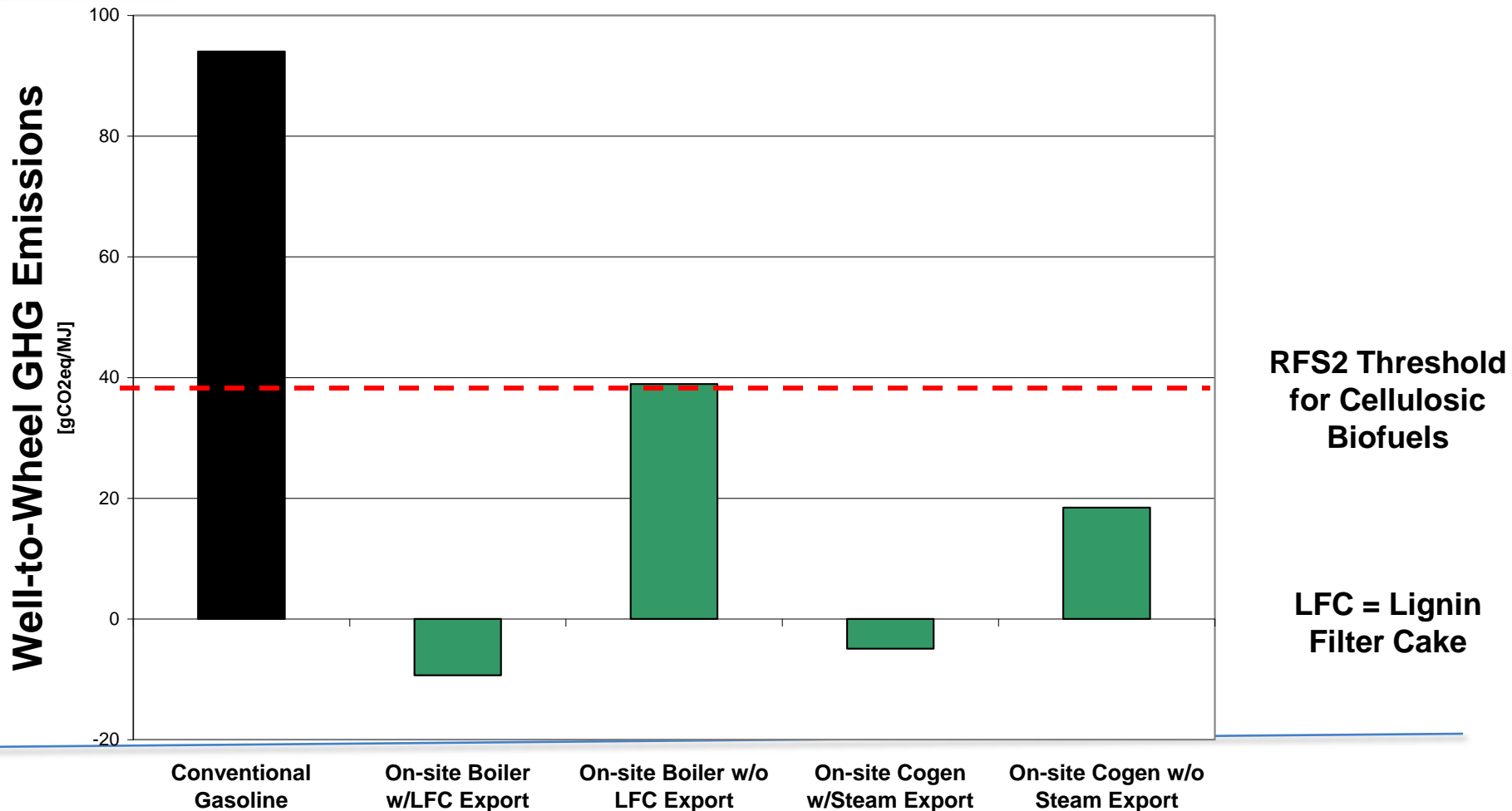
Well-to-Wheels GHG Emissions



Preliminary results represent future technology options.

LCA focus on the immediate supply chain (no ILUC).

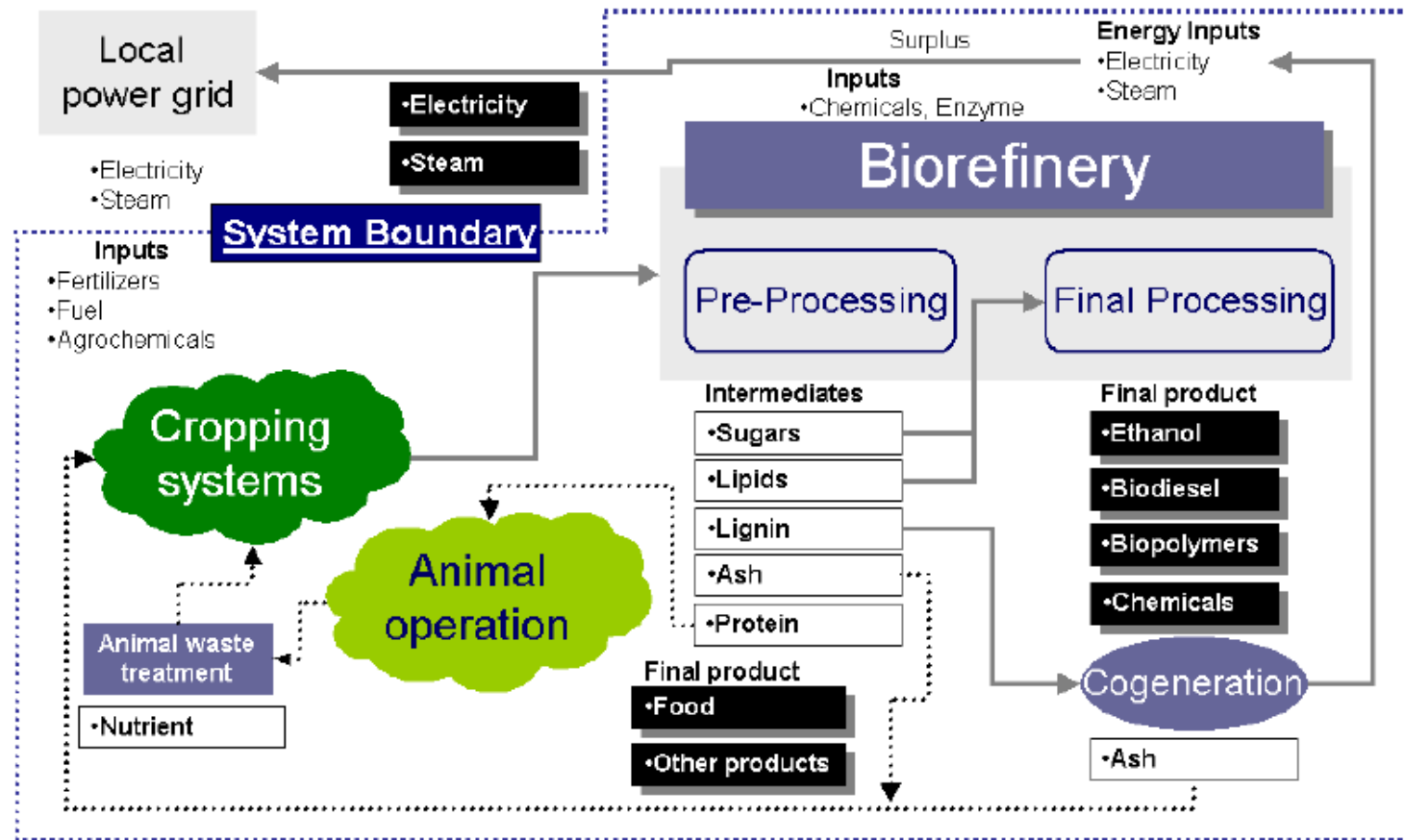
LCA Sensitivities: Energy Management & Co-location



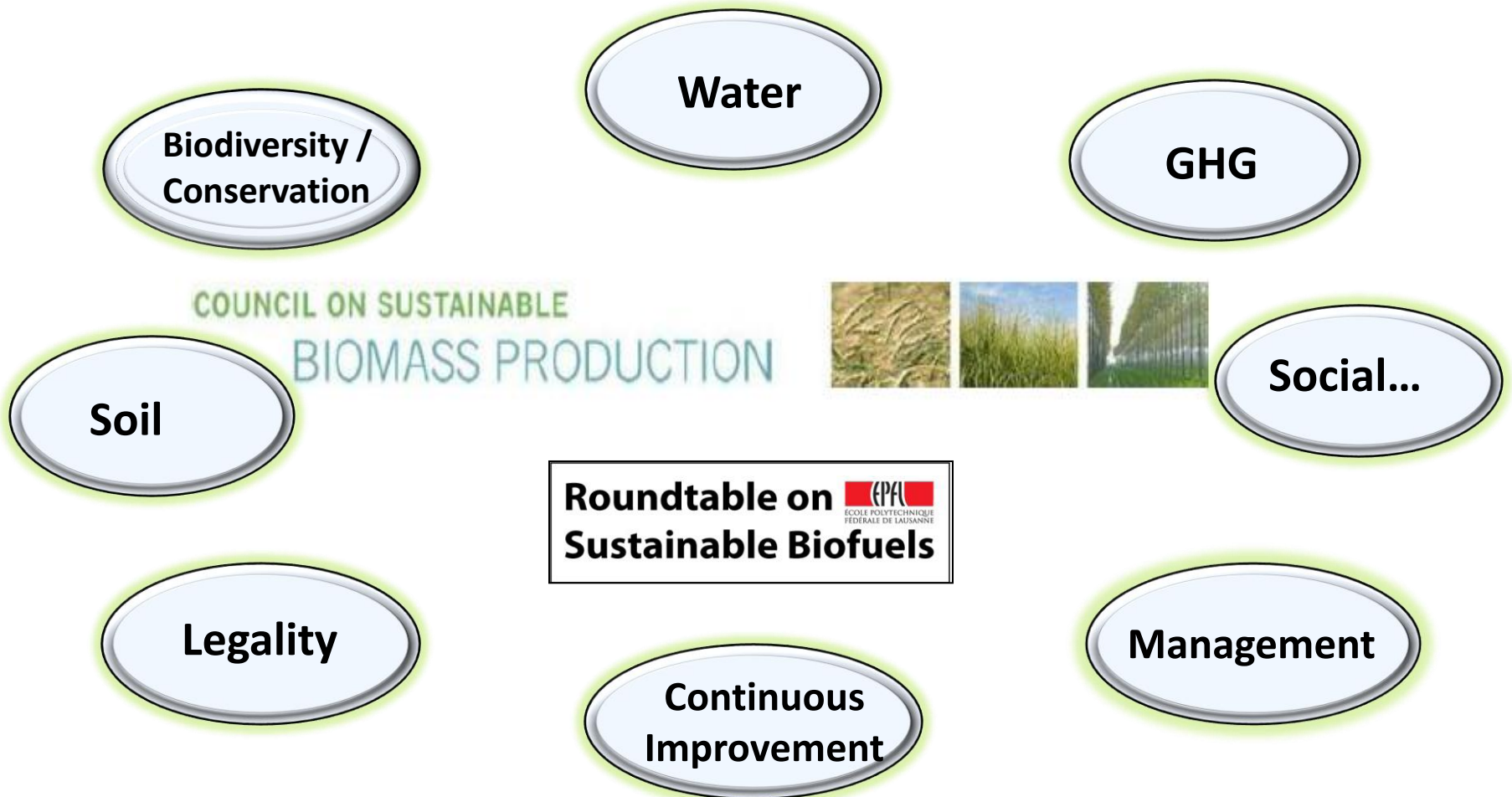
*Preliminary results represent future technology options.
LCA focus on the immediate supply chain (no ILUC).*

Biorefinery: Co-Location Options

INDUSTRIAL ECOLOGY MODEL



Emerging Sustainability Standards Go Beyond GHG Emissions



DDCE Sustainability Vision

▶ Deliver comprehensive cellulosic ethanol solutions with competitive social, economic, and environmental benefits

▶ Integrate sustainability into all business practices and decisions:

- process design
- site selection
- feedstock supply
- co-product management



▶ Assess environmental well-to-wheel impacts early and often, to understand consequences of business and technology choices

▶ Engage stakeholders in dialogue on sustainability



Thank you

Robin Jenkins

robin.e.jenkins@usa.dupont.com

Carina Alles

carina.alles@usa.dupont.com

Chris Johnas

christopher.m.johnas@usa.dupont.com
