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*Prepared for: ADSA Discover Conference 19
“Key Issues in Sustainability of the Dairy Industry”*

May 12, 2010

“Greenwashing”

1. Carbon-free sugar
2. Organic rocks
3. Certified organic sea salt
(*NaCl*)
4. Organic cigarettes
5. No-calorie energy drinks
6. Organic charcoal
7. Carbon-neutral insurance
8. Zero-carb alcoholic drinks
9. Carbon-free shipping
10. Carbon-free computing

US EPA Website

**ISO 14040 to 44
Europe (Switzerland)**

**PSA 2050
British**

Total GHG (greenhouse gas) emissions caused directly and indirectly by an individual, organization or state in a given time

- Measured in CO₂-equivalents in terms of environmental heat capturing capability

1
CO₂

23
CH₄

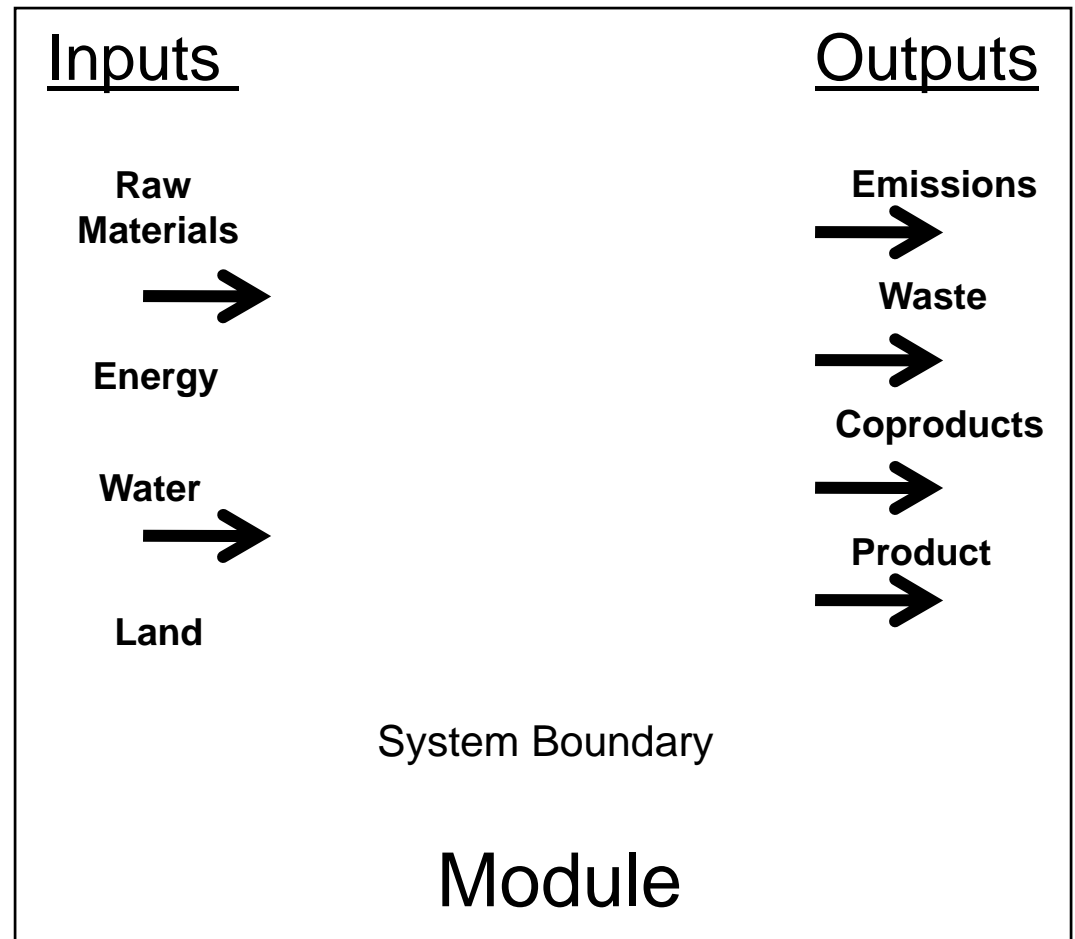
298

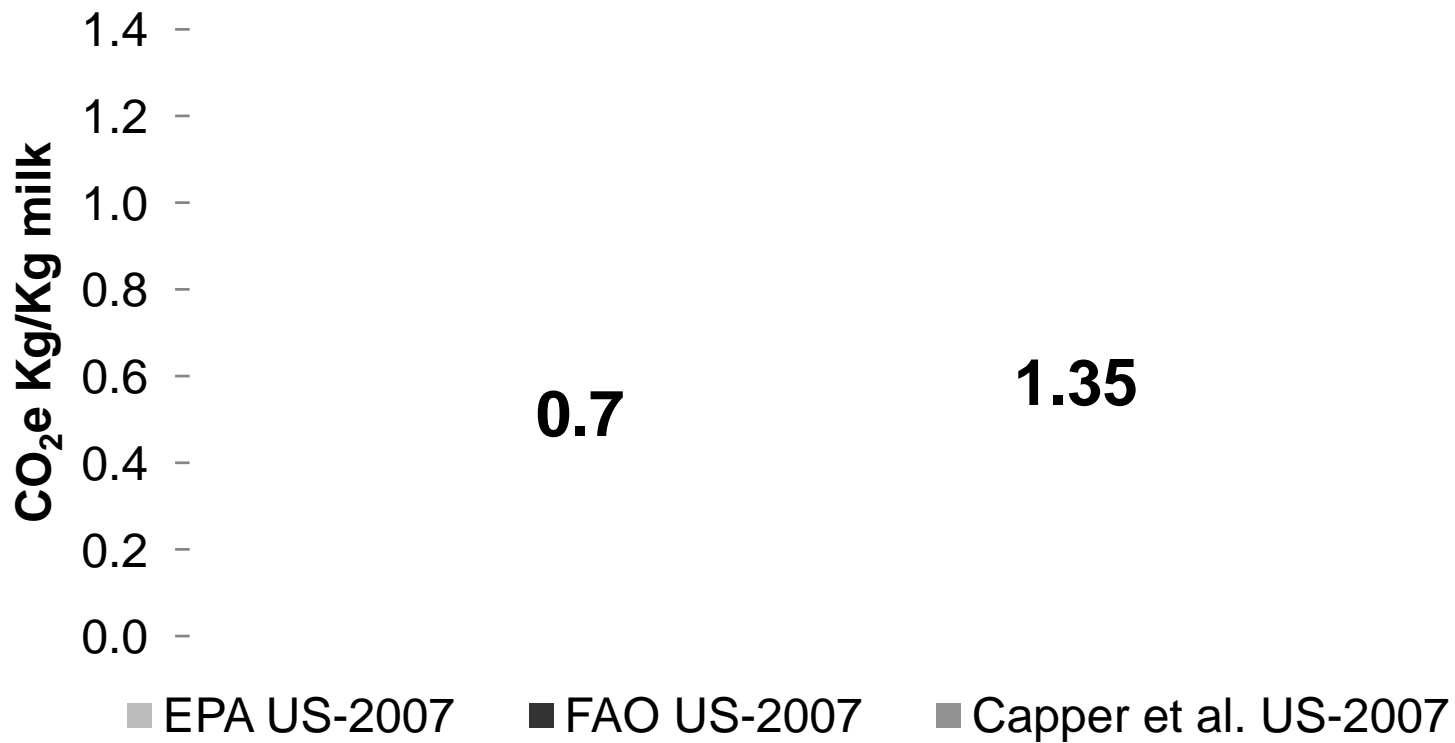
N₂O

The Carbon Checkbook Must Balance

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- Goal & Scope
 - Establish functional unit
 - System Boundaries
- Inventory Analysis
 - Inputs
 - Outputs
- Impact Assessment
 - Manufacture process
 - Resource flows
 - Assumptions
- Interpretation

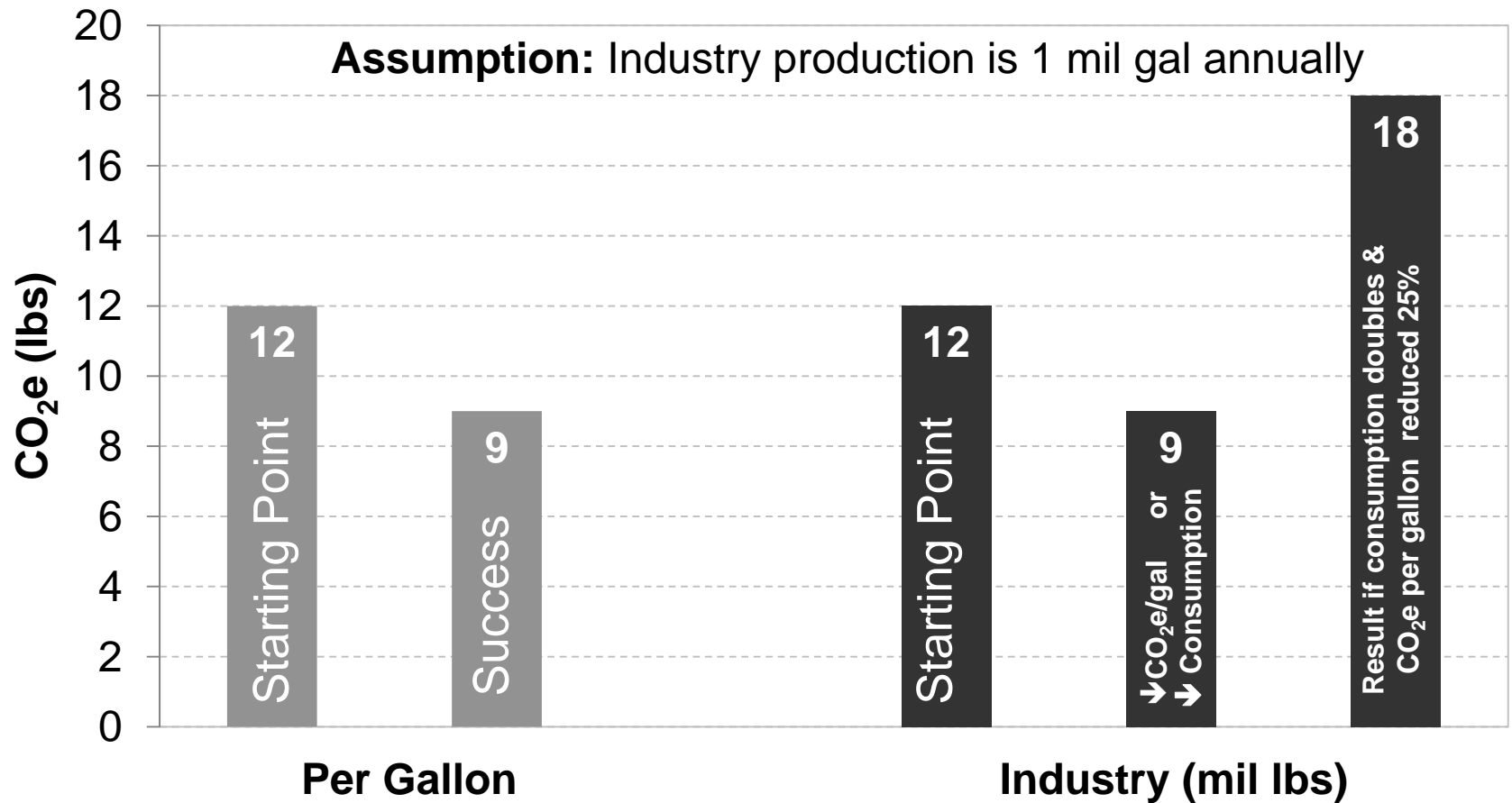


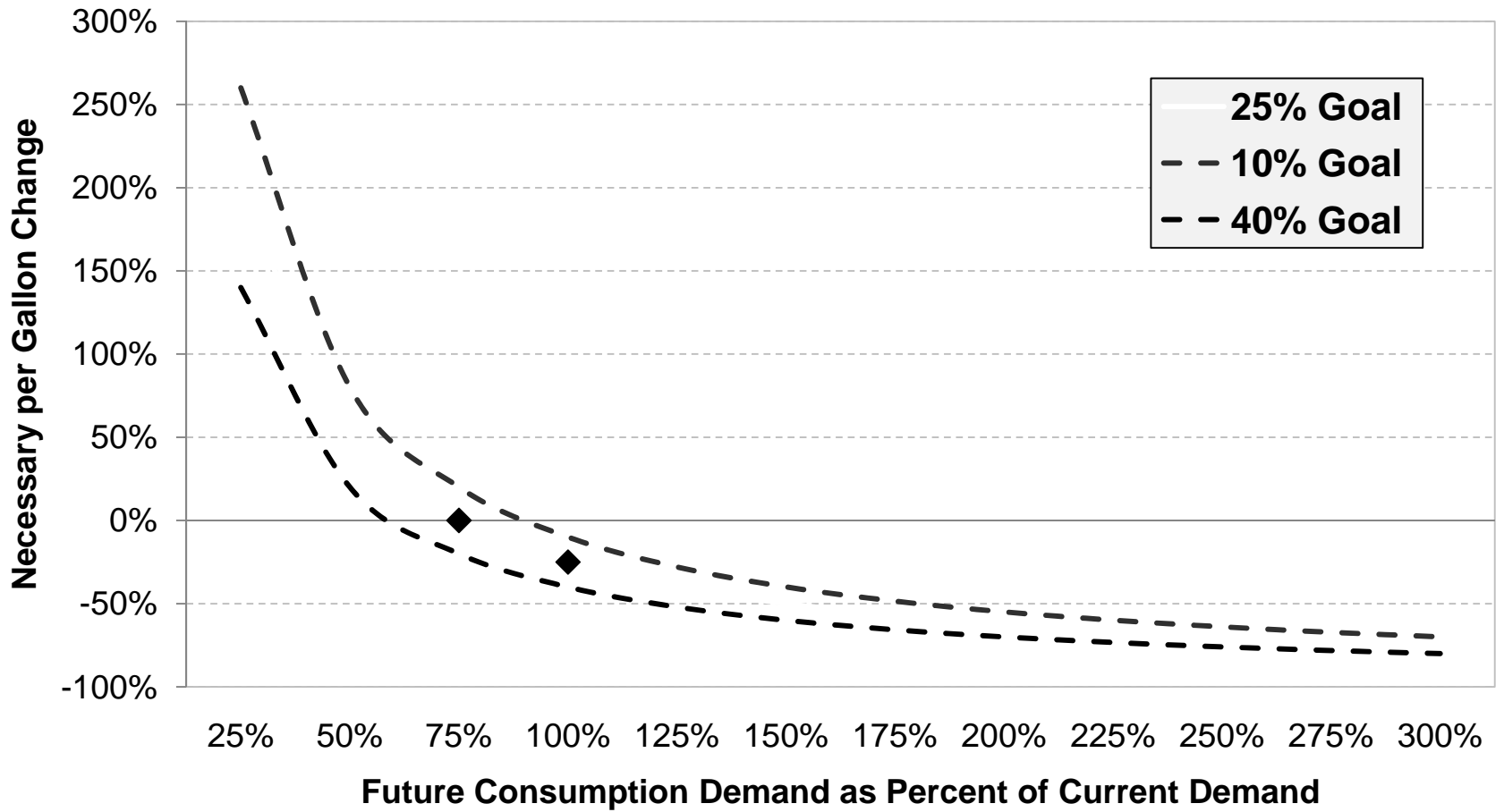


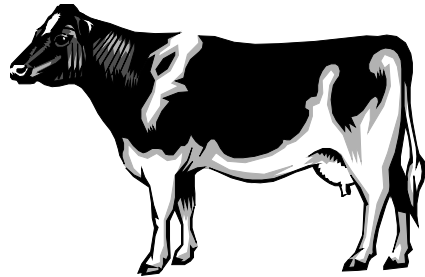
Sources : U.S. EPA (2010) "Inventory of U.S. Greenhouse Gas Emissions and Sinks:1990-2008"
 UN-FAO (2010) "Greenhouse Gas Emissions from the Dairy Sector: A Life Cycle Assessment"
 Capper, et al. (2009) "The Environmental Impact of Dairy Production, 1944 vs. 2007", J. An Sci.

- **Goal** (e.g.. gallon vs. industry)
- **Boundaries** (e.g. supply routes)
- **Functional unit** (e.g. mpg vs. people mpg)
- **Resource flows** (e.g. appropriate partitioning & ratios)
- **Assumptions** – common source of disagreement

Stated Goal is to Reduce GHG Emissions 25%







+



$\frac{1}{8}$ of a Dry Cow

+

97% of a Heifer

Increases

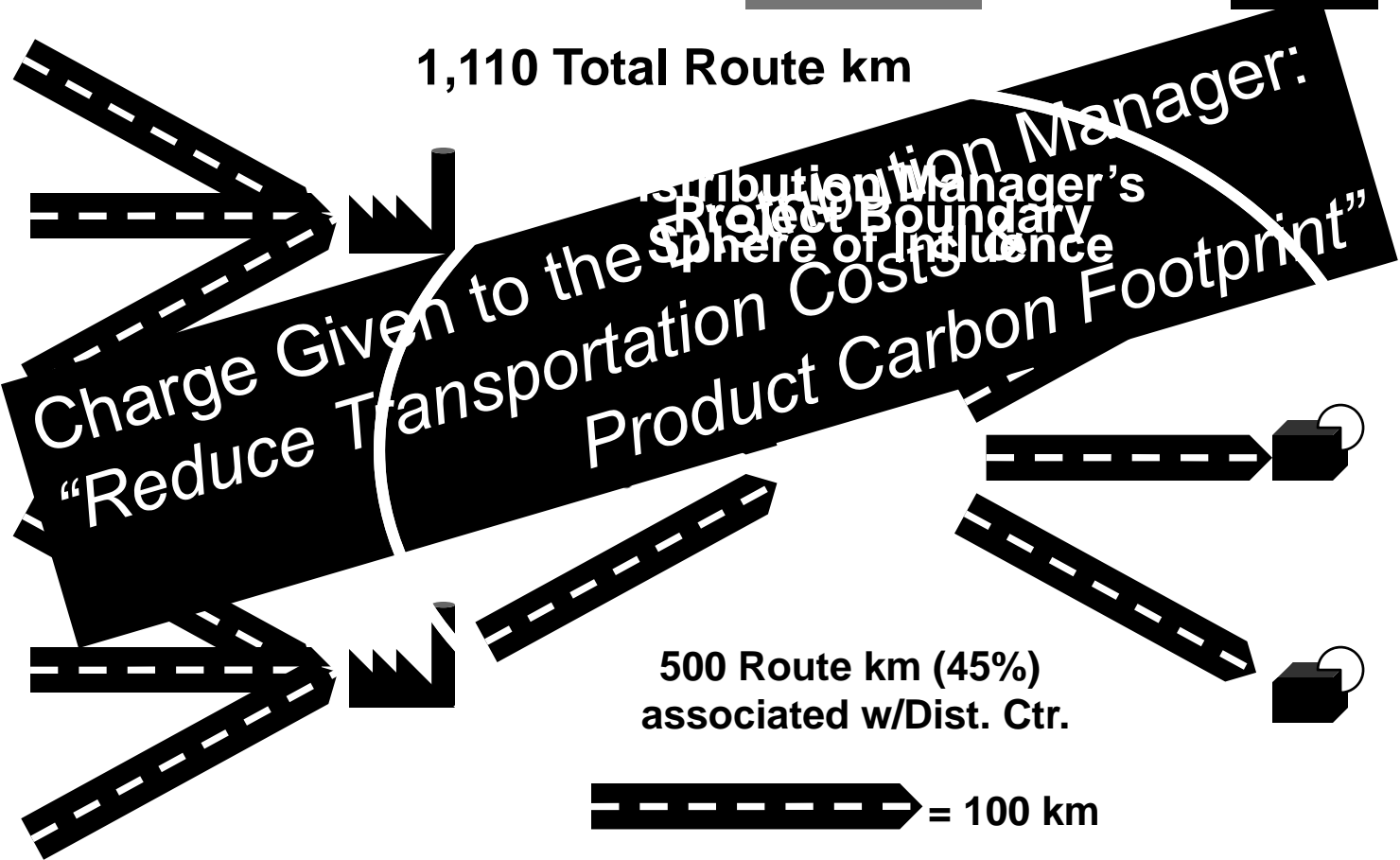
- Maintenance Feed
- Water
 - Intake
 - Sanitation
- Greenhouse Gases (*Carbon Footprint*)
 - CO₂ - Carbon Dioxide
 - CH₄ - Methane
 - N₂O - Nitrous Oxide
- Land
- Manure
- Fuel
- Electricity
- Herbicides & Pesticides

Factories

Distribution Center

Retail Stores

1,110 Total Route km

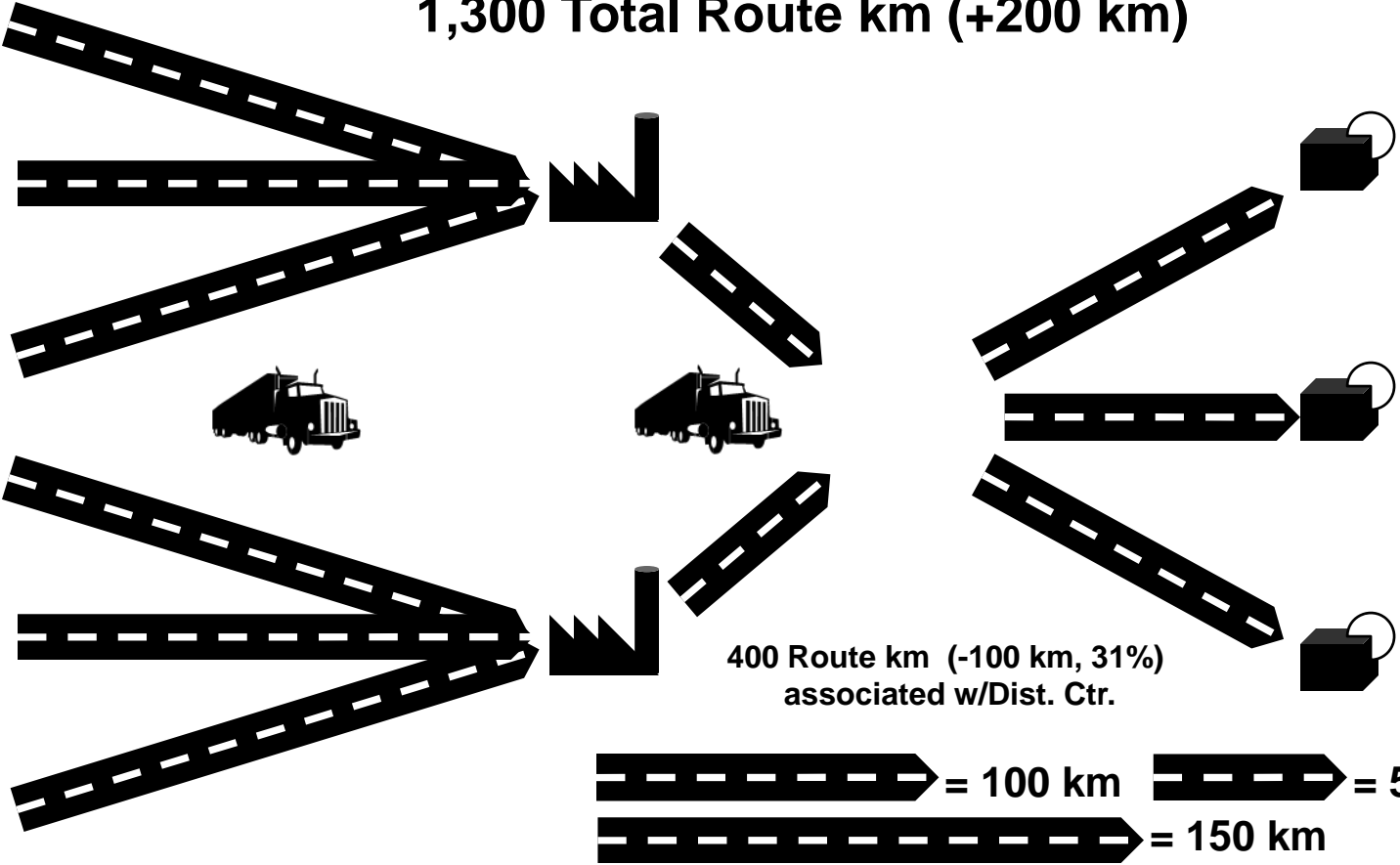


Factories

Distribution Center

Retail Stores

1,300 Total Route km (+200 km)



Vehicle 1

Vehicle 2

Fuel Burned in 5 hrs:

70 gal

10 gal

} **Production
Process**

Distance Traveled:

350 mi (5 mpg)

350 mi (35 mpg)

Passengers:

50

4

People Miles:

17,500

1,400

People MPG:

250

140

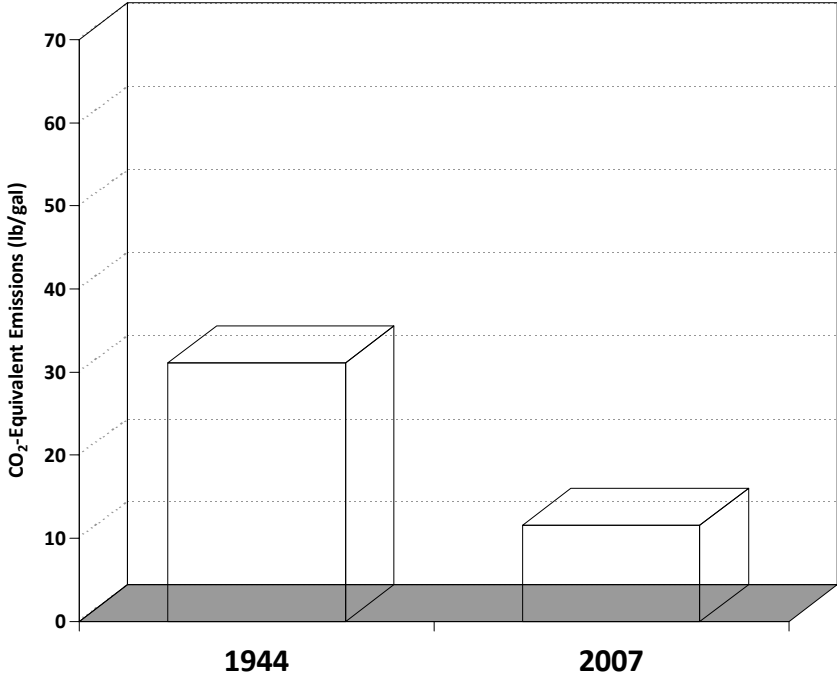
} **Work
Output**

Winner

Carbon Footprint of the Cow Has Doubled



Carbon Footprint per Gallon of Milk Reduced 2/3



Source: Capper et., al., JAS, 2009

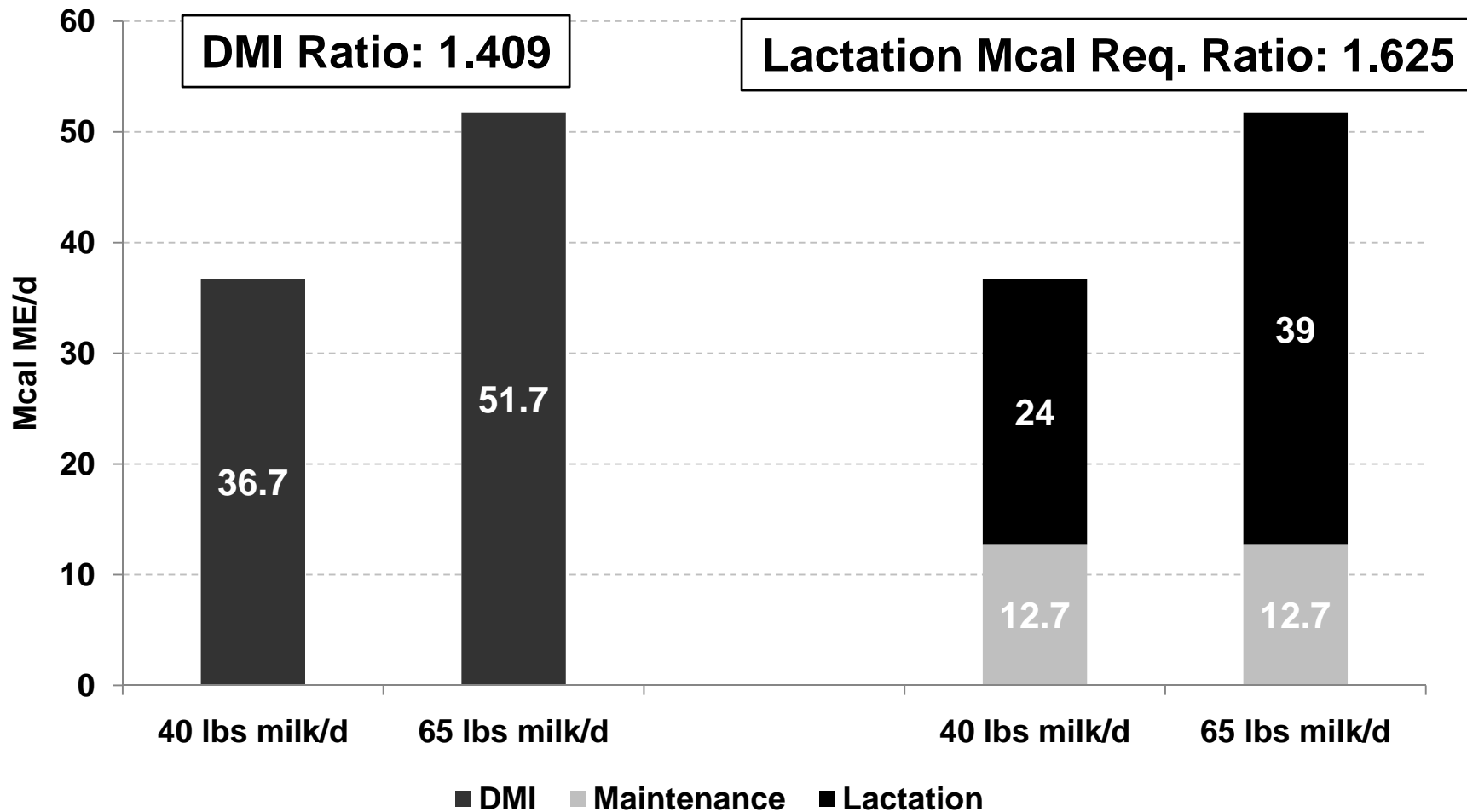
- **Dairy** – per unit of milk (*e.g. lb, kg, g, or ℓ*) or dairy product (*e.g. cheese*)
- **Meat** – per unit of meat (*e.g. lb or kg*) and/or no. of specific type of cut
- **Eggs** – per number of eggs

Three States of Activity to Account for in an LCA

Physical Plant (<i>Machine</i>)	Animal Corollary
Off	Deceased
Idle	At Rest (<i>Maintenance</i>)
Performing	Production (<i>Growth, Lactation, Reproduction</i>)

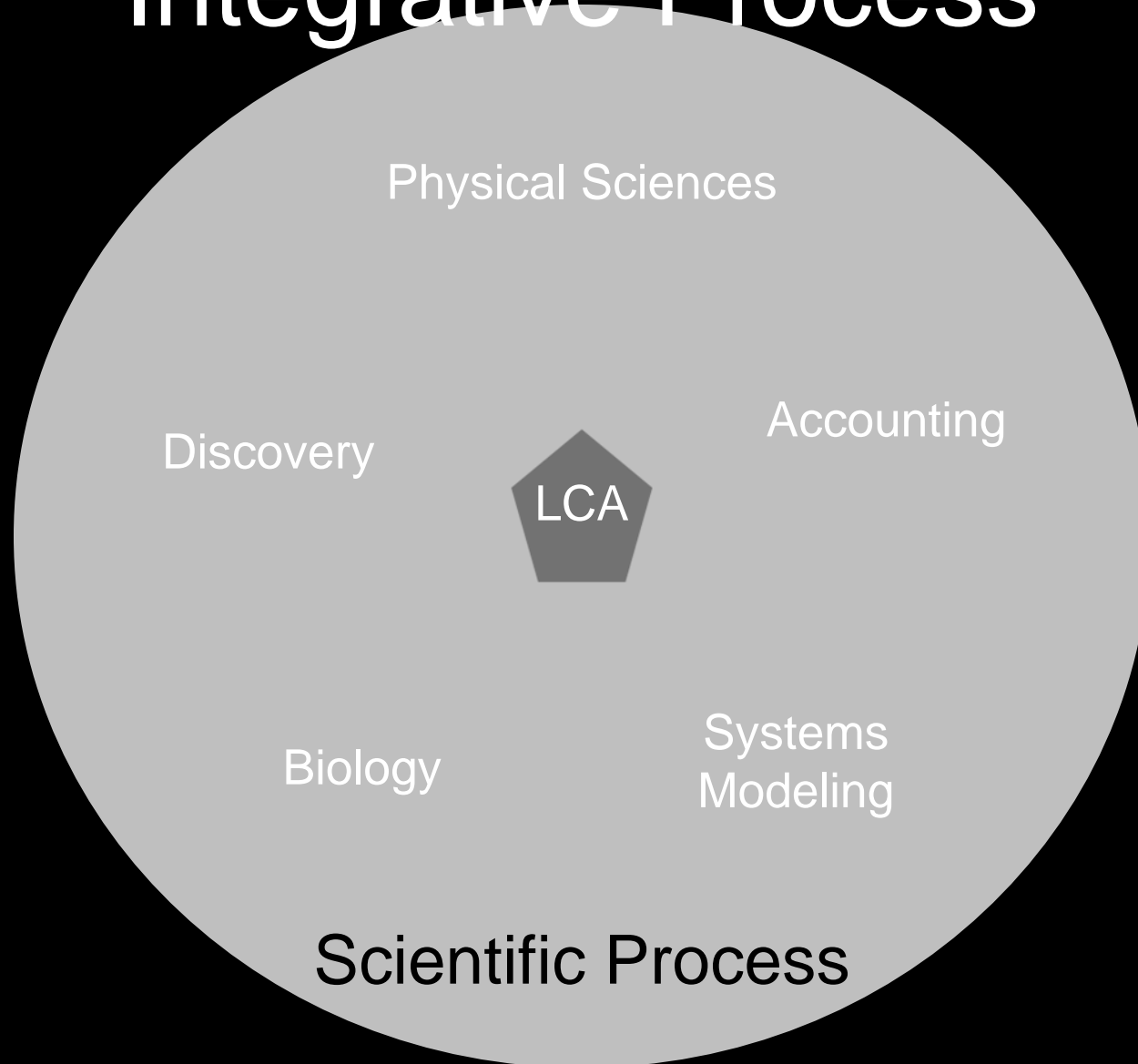
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Source: Created as an example by Jude Capper, WSU & Roger Cady, Elanco, 2010 based on AMTS dietary needs for a 1,500 lb Holstein Dairy Cow, 3.8%F, 3.1%P

Life Cycle Assessment is an Integrative Process



- Verification
- Validation
- Repetition
- Poses more questions than answered
- Refinement
- Discovery
- Builds upon itself
- Delta provides more information than a singular number

- Determine what matters from what matters least (*set priorities*)
- Basis for prescriptive action
- Variability of the difference less than variability of main effects

Questions?