DEPARTMENT OF ECOLOGY
State of Washington

Welcome!

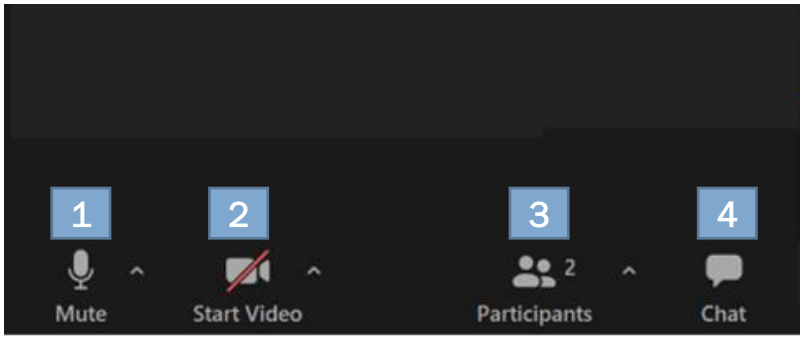
Clean Fuels Program: Agriculture and Forestland Carbon Capture & Sequestration Advisory Panel

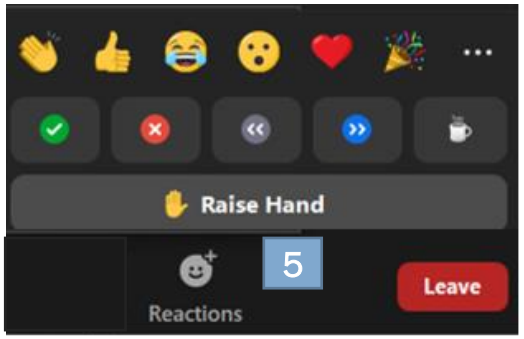
June 28, 2022

Using Zoom

The Zoom menu bar appears at the bottom of the Zoom window once the meeting begins.

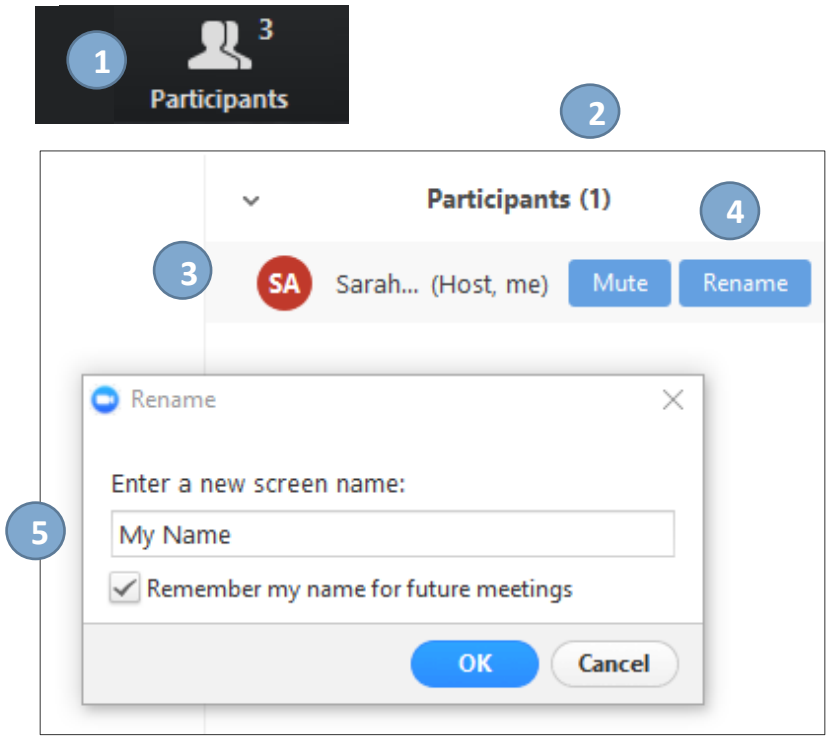
If you don't see the menu bar, move your mouse slightly and the bar should appear.





Using Zoom – Renaming Yourself

1. To change your name, click on “Participants”.
2. The Participants list will pop out.
3. Toggle over your name.
4. Options will appear. Select more and then select rename.
5. You will see another popup. Enter your name and affiliation. Click “Ok.”



Start Recording

We will begin recording at this time.

Opening & Welcome

Ecology Staff

- Abbey Brown – Technical Lead
- Joel Creswell – Climate Policy Section Manager
- Debebe Dererie – Fuel Pathway Specialist
- Janée Zakoren – Outreach & Engagement Specialist
- Rebecca Sears – Clean Fuel Standard Project Manager and Partnerships Specialist

Ross Strategic Staff

- Susan Hayman, Facilitator
- Heather Christopher, Co-Facilitator

Agenda

1. Opening & Welcome
2. Extended Introductions
3. Level Setting Presentations & Discussion
4. Advisory Panel Work Planning
5. Next steps & wrap-up

For Today…

- Please leave your video on as much as possible
- Please keep your microphone muted unless speaking
- Actively participate in the group
- Demonstrate attentiveness when others are speaking
- Behave constructively and respectfully towards all participants
- Respect the role of the facilitator to guide the group process

Extended Introduction

Ross Strategic

Extended Introductions, Part 2

Part 1 (new): Round-robin (name, affiliation, work you do)

Part 2: Informal Networking

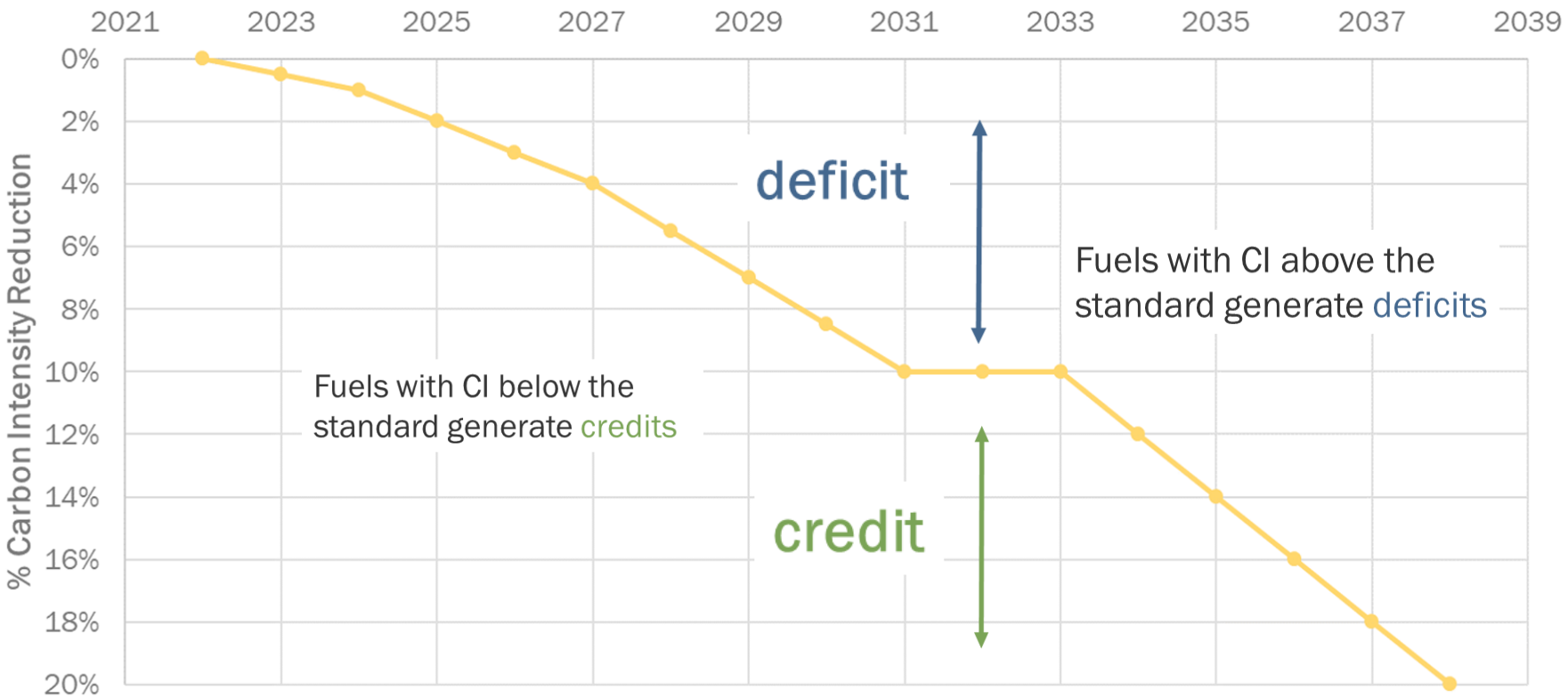
What do you hope to give to/get from this Advisory Panel?

- Three Rounds
- Three People
- Five minutes

The Clean Fuel Standard from the Ground Up

--Abbey Brown, Ecology

Background

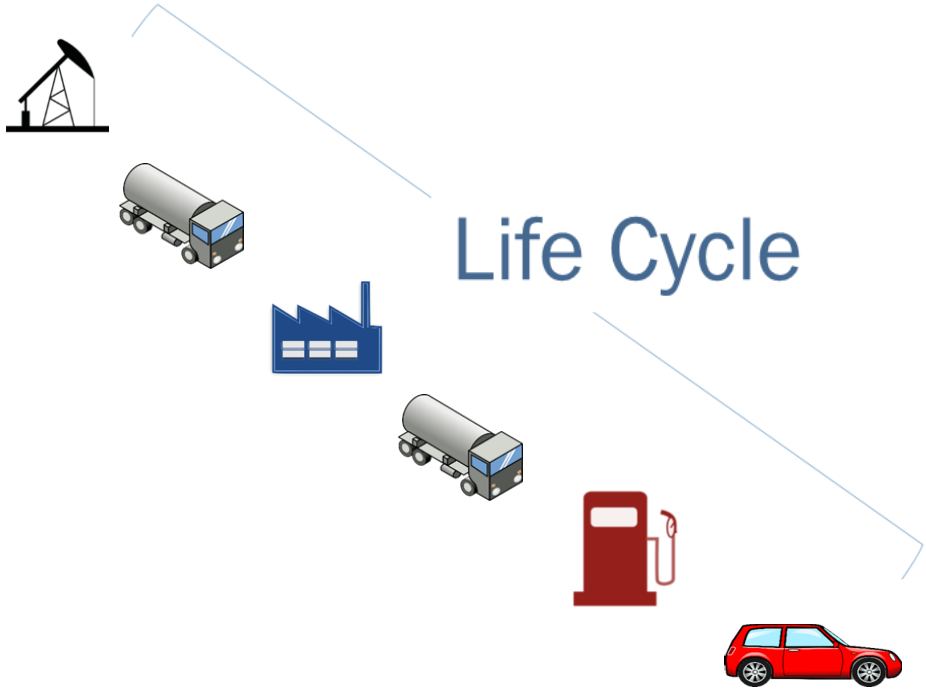


Must reduce transportation carbon intensity 20% below 2017 levels by 2038

Background

How is carbon intensity measured?

"The quantity of life-cycle greenhouse gas emissions, per unit of fuel energy, expressed in grams of carbon dioxide equivalent per megajoule (gCO_2e/MJ)"

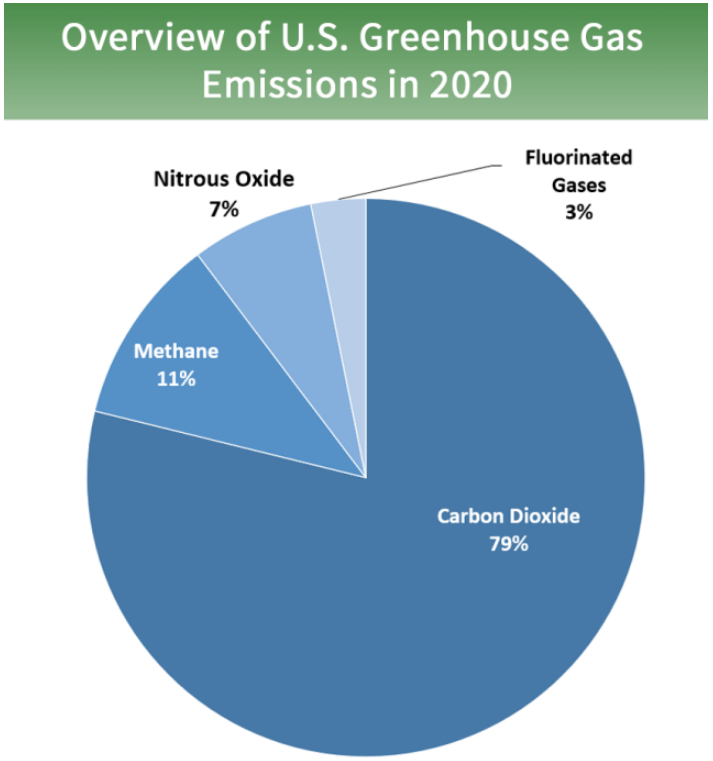


Carbon Capture & Sequestration

Types of GHGs

- *Carbon dioxide (CO_2)*
- *Methane (CH_4)*
- *Nitrous oxide (N_2O)*

Fluorinated gases:
Hydrofluorocarbons (HFCs)
Perfluorocarbons (PFCs)
Sulfur hexafluoride (SF_6)
Nitrogen trifluoride (NF_3)



Global Warming Potential: "a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2)" (*EPA*)

Graph source: EPA https://www.epa.gov/ghgemissions/overview-greenhouse-gases

Carbon Capture & Sequestration

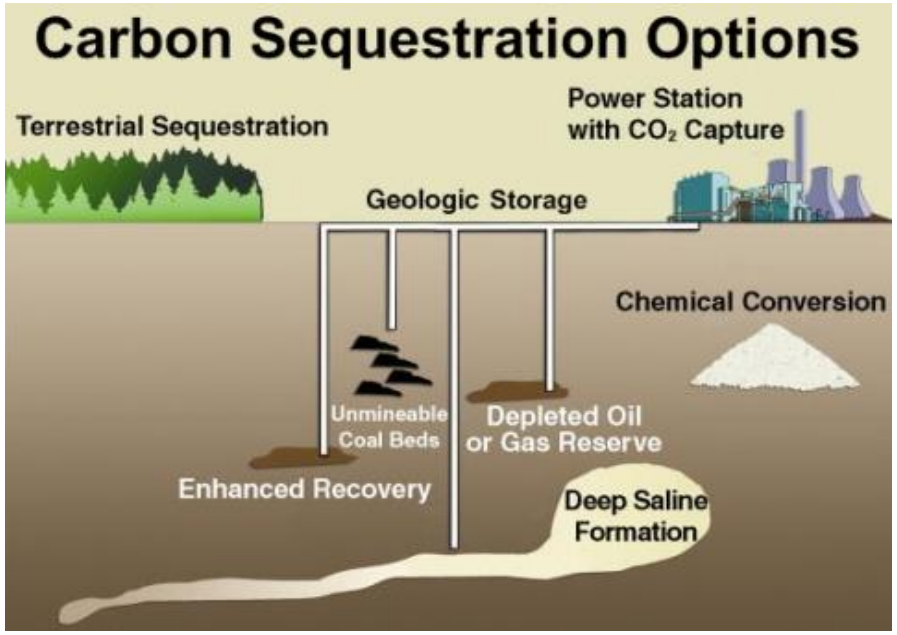
Capturing and storing atmospheric carbon dioxide.

Geologic sequestration

The storage carbon dioxide (CO2) in underground geologic formations. (*USGS*)

Biologic sequestration

The storage of atmospheric carbon in vegetation, soils, woody products, and aquatic environments. (*USGS*)



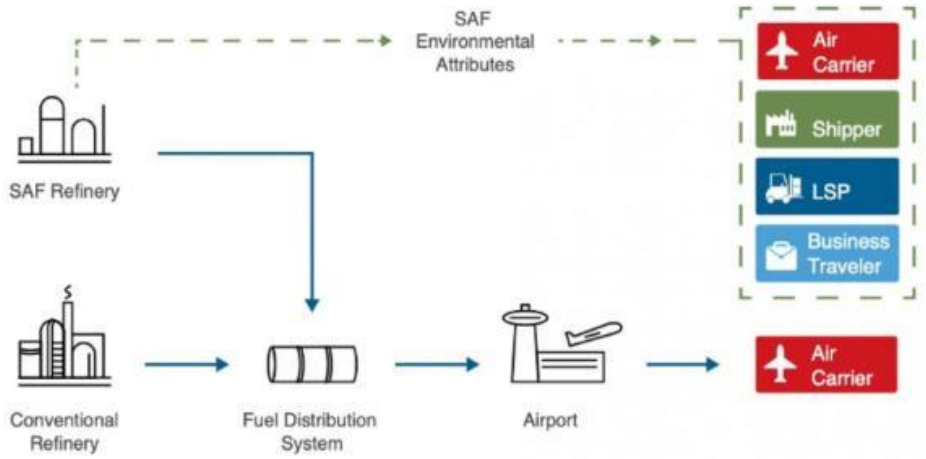
Source: Environmental Defense Fund

Carbon Capture & Sequestration

How do you account for CCS in a Clean Fuel Standard?

In lifecycle analysis, and in book-and-claim accounting:

- The *chain-of-custody model* in which decoupled environmental attributes, such as Renewable Energy Certificates (RECs), are used to represent the ownership and transfer of transportation fuel under the LCFS without regard to physical traceability. (*CARB*)



Source: DHL

Additional Questions/Discussion?

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Break

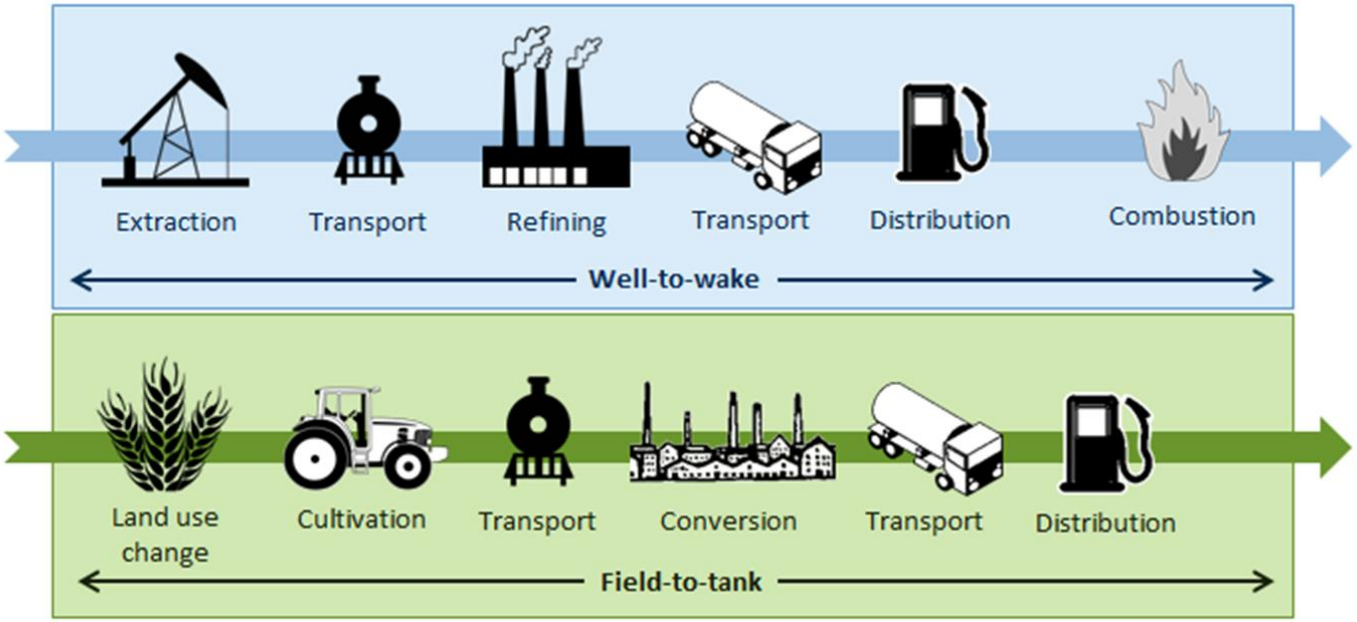
(Please return at 10:05 AM)

Life Cycle Assessment and Carbon Capture and Sequestration related to Agricultural and Forestry Practices

--Debebe Dererie, Ecology

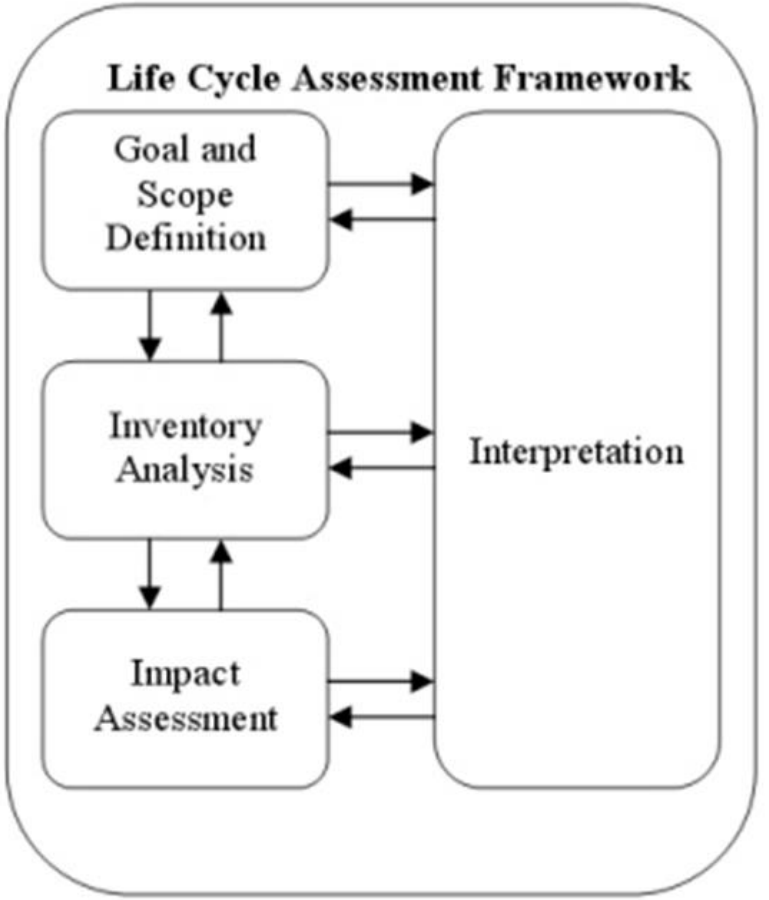
Life Cycle Assessment

- Life Cycle Assessment (LCA) is a methodology for assessing the environmental impacts associated with the entire life cycle of a particular product or process.
- Synonyms: Cradle-to-cradle (well-to-wheel), cradle-to-grave (well-to-tank, farm-to-tank), cradle-to-gate
- Benefit of LCA - Identify and avoid burden shifting



Steps of Life Cycle Assessment – ISO 14040

- **Step 1. Defining goal and scope**
  - Modeling choices consistent with the objective of doing the LCA
- **Step 2. Life Cycle Inventory Analysis:**
  - Materials and energy inputs & outputs
- **Step 3. Life Cycle Impact Assessments**
  - Environmental impact categories:
    - **Climate Change (GHG emissions)**
    - Eutrophication
    - Acidification
    - Eco-toxicity
    - Ozone Layer depletion
- **Step 4. Interpretation**



LCA Types and Uses

Attributional LCA:

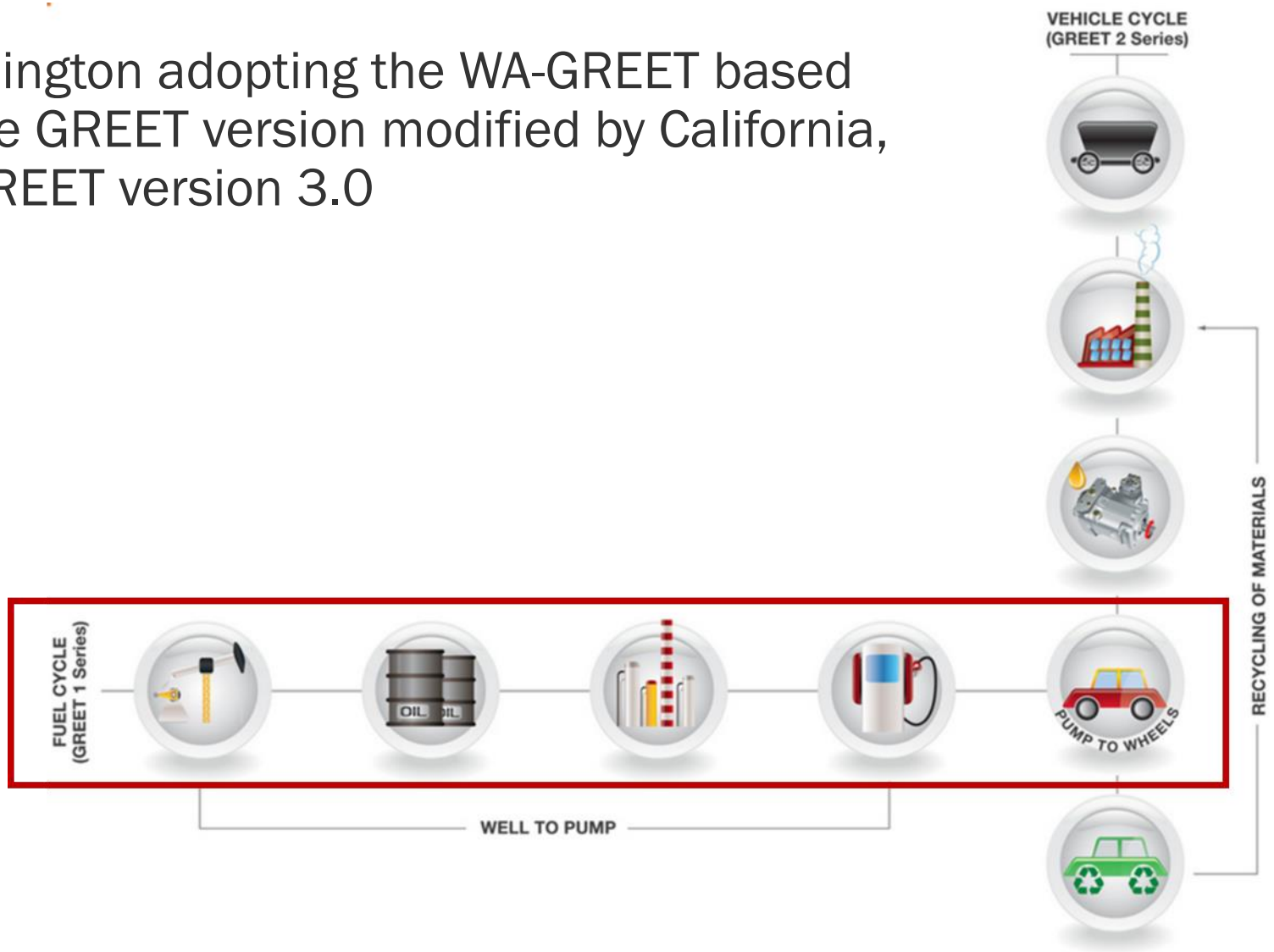
- The goal is to assess the total environmental burden that can be attributed to a particular product.

Consequential LCA:

- Here we are considering a total change in environmental burden that may occur due to the product's existence under different scenarios adopted.

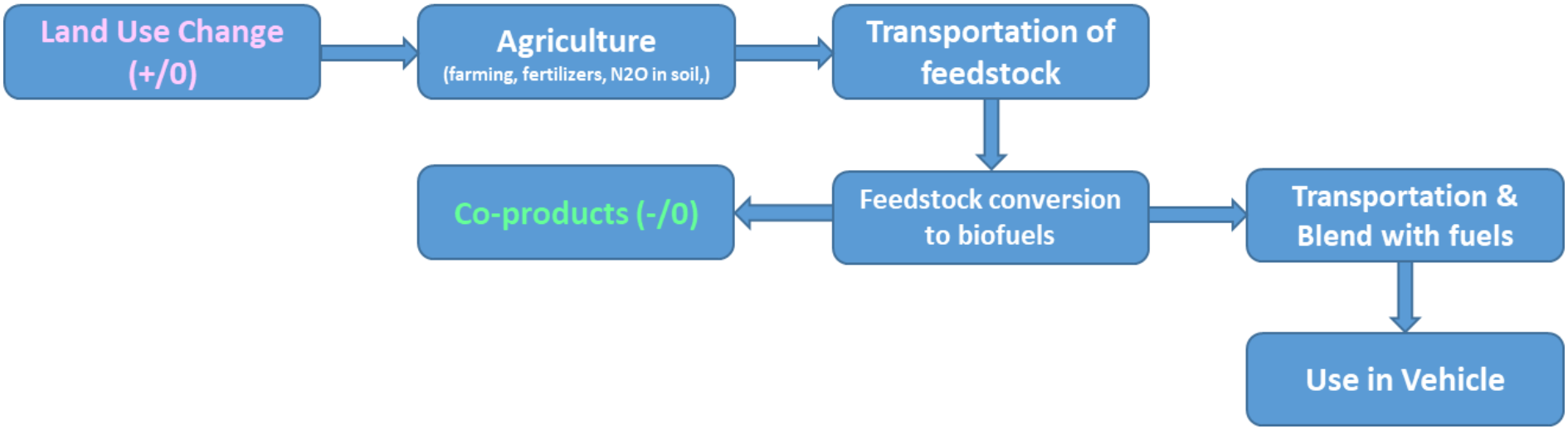
Carbon Intensity Calculation

- Washington adopting the WA-GREET based on the GREET version modified by California, CA-GREET version 3.0



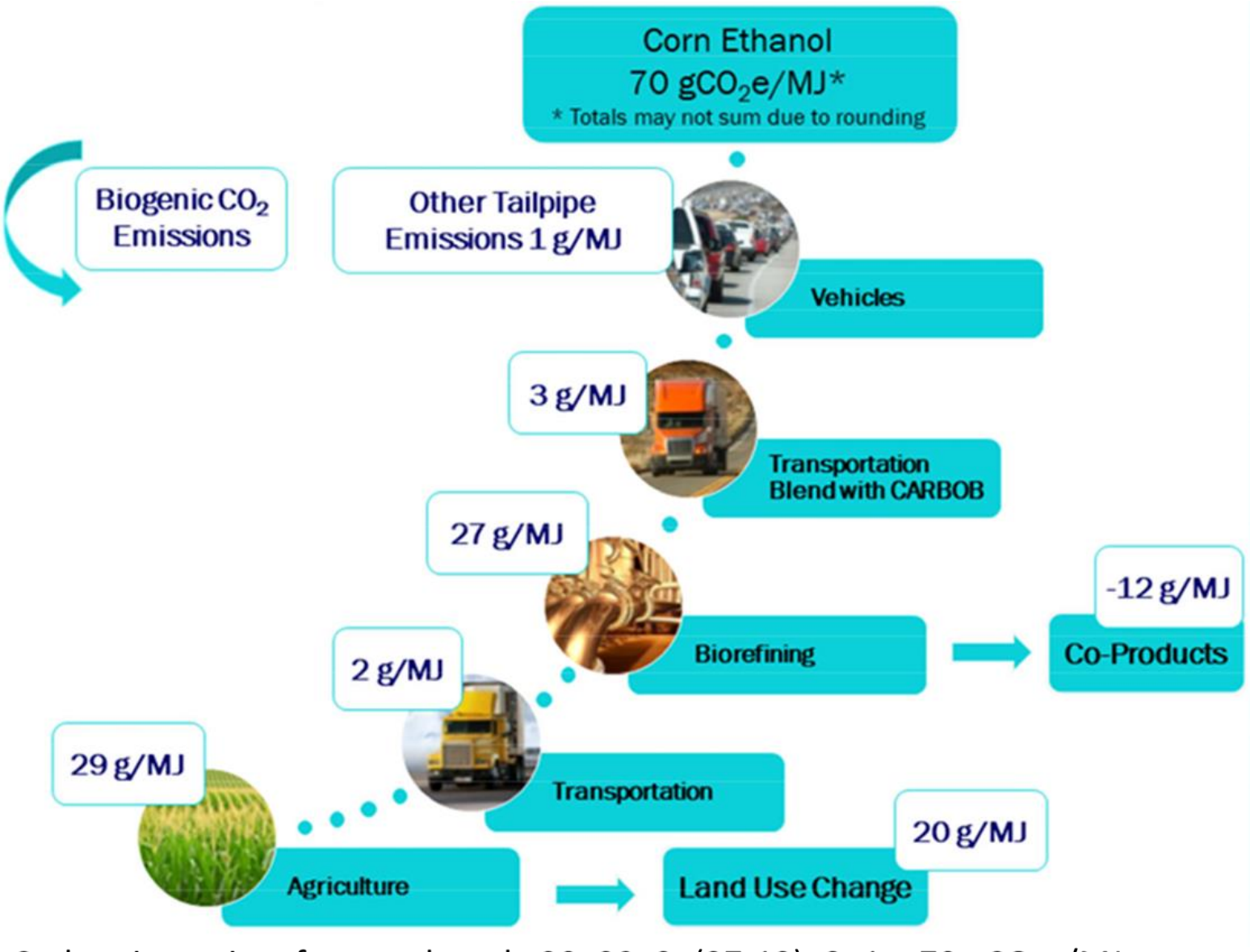
Carbon Intensity Calculation (cont'd)

- **Carbon intensity**
  - Life Cycle GHG emissions per energy of the fuel, gram carbon dioxide equivalent per mega Joule of fuel energy (gCO2e/MJ).
- **Energy Economy Ratio (EER)**
  - EER is the dimensionless value that represents the efficiency of a fuel as used in a powertrain as compared to a reference fuel.
  - EERs - comparison of miles per gasoline gallon equivalent (mpge) usually with gasoline or diesel.



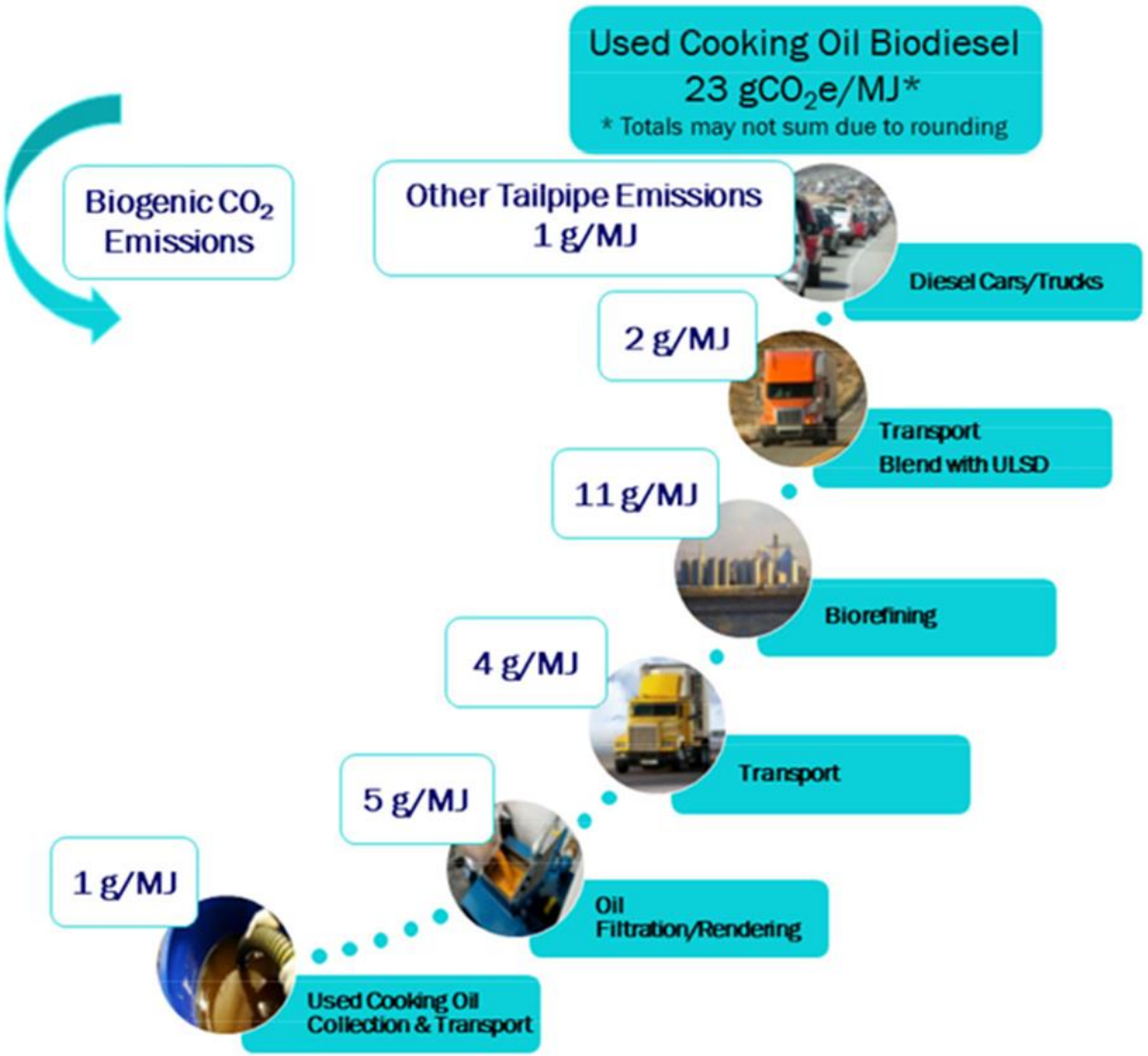
Land Use Change emission (gCO2e/MJ)			
	CARB	OR-DEQ	WA Draft
Corn Ethanol	19.8	7.60	TBD
Sorghum Ethanol	19.40	19.40	19.40
Sugarcane Ethanol	11.80	11.80	11.80
Soybean Biodiesel or renewable diesel	29.10	29.10	29.10
Canola Biodiesel or Renewable Diesel	14.50	14.50	14.50
Palm Biodiesel or Renewable Diesel	71.4	71.40	71.40

CARB Example: Carbon Intensity of Corn Ethanol



Carbon intensity of corn ethanol= 20+29+2+(27-12)+3+1 = 70 gCO_2e/MJ

CARB Example: CI of Used Cooking Oil Biodiesel



Carbon intensity = 1+5+4+11+2+1 ~ 23 gCO_2e/MJ

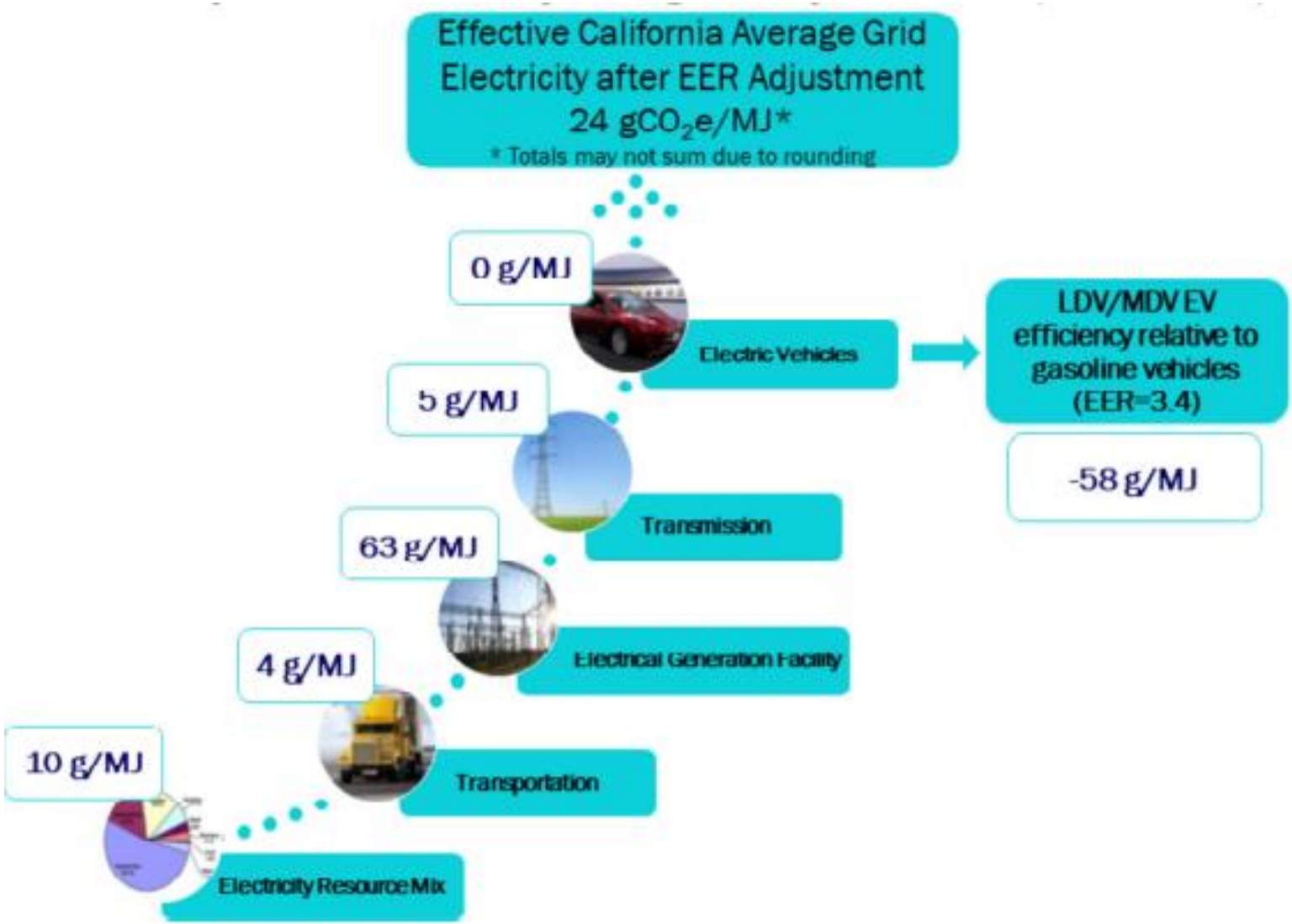
Note: Use of waste resources

CARB Example: Carbon Intensity of Landfill Gas to CNG

Carbon intensity = 1+32+16+3+5 = 57 gCO_2e/MJ

Note: CNG Trucks efficiency relative to gasoline vehicles, EER=3.4

CARB Example: Electricity in Light Duty Vehicles



Carbon intensity = 10+4+63+5+0-58 = 24 gCO_2e/MJ

Note: LDV/MDV EV efficiency relative to gasoline vehicles, EER=3.4

Challenges in Using LCA - Uncertainty

Areas of uncertainties

- Data – multiple life cycle stages
- Methodological choices: multi-inputs, multi-output,

Treatment of uncertainties

- Reducing uncertainty:
  - Scientific approach: more research, better data
  - Social approach: stakeholders engagement, agreed upon data & methods
  - Legal approaches: data and methods adopted by authoritative bodies
- Incorporating uncertainty through statistical approach

Verification

Additional Questions/Discussion?

Advisory Panel Work Plan

--Mural Board

Next Steps & Wrap Up

Next Steps

- Post presentation slides/recording on AF-CCSAP webpage by July 1
- Draft summary to panelists for review by July 11
- Panelist comments back to Ecology by July 18
- Final summary posted on webpage by July 22

Next Meeting: **August 31**, 9am-12pm

Contacts

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Thank you for attending!