




## Low Carbon Fuel Standards: Ensuring Biofuels Meet Greenhouse Gas Reduction Goals



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## Climate Solutions

- Climate Solutions mission is to accelerate practical and profitable solutions to global warming by galvanizing leadership, growing investment and bridging divides.
- Harvesting Clean Energy program works with agricultural communities on opportunities including biofuels, including policy advocacy.



## Today's Talk

- Greenhouse emissions from biofuels
- Varying GHG performance of biofuels
- Renewable Fuel Standards
- Low Carbon Fuel Standards
- Basics
- California implementation
- Similar moves elsewhere
- Implementation issues

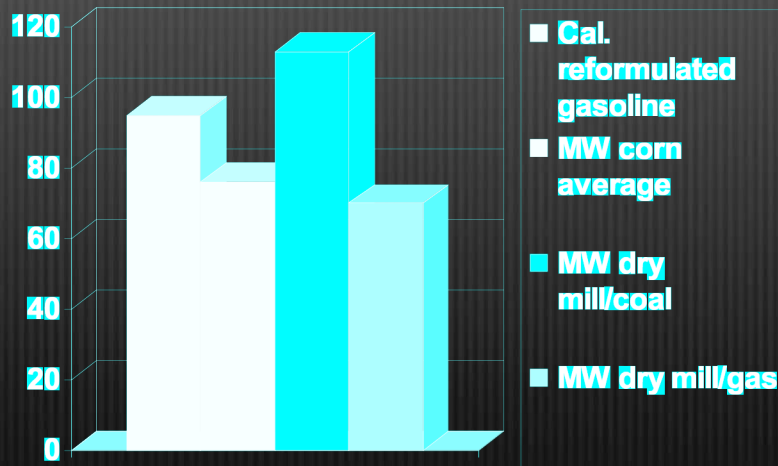


## Do biofuels really reduce greenhouse gases?

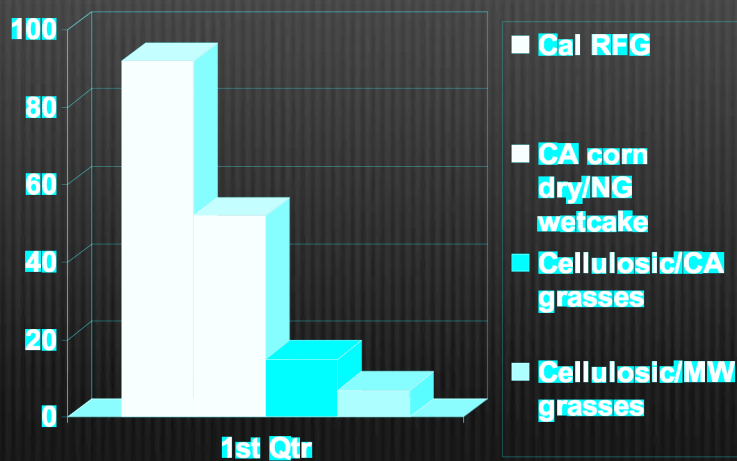
- Growing biofuels feedstocks involves emissions of nitrous oxide from fertilizers, methane and carbon dioxide from soils and carbon dioxide from running farm equipment.
- Making biofuels involves carbon dioxide emissions from natural gas or coal for process heat and electricity.



## Emissions vary greatly



## Emerging options dramatically cut emissions



## Relevant factors

- **Agricultural impacts – perennial grasses require far less fertilizer, and eliminate annual tillage, significant source of soil emissions**
- **Process energy at plant – The major source of GHGs in biofuels lifecycle, so efficiency and use of renewable energy yield major reductions**



## Renewable Fuel Standards do not capture differences

- **RFS sets goals for percentage of fuels in overall mix – ethanol and biodiesel – does not distinguish by feedstocks or production process**
- **U.S. RFS does provide additional credit for cellulosic to recognize superior environmental performance –**
  - **1 gallon cellulosic = 2.5 gallons corn for compliance with standard**



## Low Carbon Fuel Standards credit the differences

- LCFS takes full lifecycle into account from farm field to fuel tank.
- Sets goals for reduction in carbon and carbon equivalent (N<sub>2</sub>O) intensity in overall fuel supply.
- Fuel companies must comply individually or buy credits
- Lets all options compete on level playing field, including emerging biofuels such as Fisher-Tropsch diesel, natural gas and electricity – doesn't pick winners.



## Prospective LCFS benefits

- Drive improved sustainability in agriculture overall by providing premium market for feedstocks grown with low GHGs
- Drive fuels innovation and technology by opening market space for most efficient low GHG options



## California LCFS

- First of a kind
- Jan. 2007 - Gov. Schwarzenegger orders 10 percent reduction in carbon intensity of Calif. Fuels by 2020 – A.B. 32 authority
- Sept. 2007 - California Air Resources Board begins regulatory proceedings
- Jan. 2009 – CARB to adopt plan to achieve goals, complete regulations
- Jan. 2010 – LCFS goes into effect



## Other LCFS and similar moves

- S. 1324: National Low-Carbon Fuel Standard Act of 2007 – Obama introduced in May 2007
- UK Renewable Transportation Fuel Obligation – like RFS but with GHG monitoring
- EU – GHG monitoring in 2009 with reductions beginning in 2011



## **Will LCFS work? Tricky issues:**

- **Rationalization – An LCFS in individual states will cause fuel marketers to shift existing products to serve market, but no real change in world.**
- **Capital risk – If companies invest under one set of assumptions about biofuels benefits and they change, risk of stranded assets**
- **Interaction with carbon cap and trade – LCFS must be separate from hard cap**

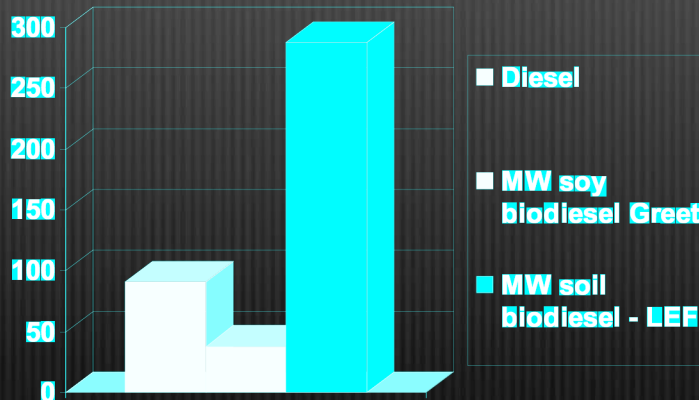


## **Lifecycle Analysis: Central challenge**

- **Most LCAs use GREET model, California will use modified GREET model, but concerns exist about lack of capture of agricultural impacts – N<sub>2</sub>O, CH<sub>4</sub>**
- **Much scientific uncertainty about land use impacts, emissions can vary field to field.**



## Extreme example: Biodiesel



## How to resolve LCA? California responses:

- Existing data sufficient for implementation with estimate of land use impacts included and used in early years.
- Participate in developing standard methodology for land use change and include emerging data to enhance standards.



## LCA for Washington State?

- Need for legislative authority as in A.B. 32
- Possible inclusion in 2008 Responsible Limits on Carbon legislation



## Further questions

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