

Agenda Item E Indirect Land Use Change and Other Indirect Effects – August 5, 2010

<u>Fuel Type</u>	<u>Potential Indirect Effects</u>	<u>Potential Level of Impact</u>	<u>Reasonably Quantifiable?</u>
Gasoline/ Diesel	H2 accounting: Air Products says H2 = 2% of energy in CA gasoline yet merchant H2 plants are excluded from the GREET model.	Medium	Medium
	How are petroleum coke and other petroleum co-products accounted for?	Low	High
	With respect to weight reduction strategies, what is the GHG impact of replacing steel with aluminum in vehicles beyond the direct fuel economy benefit (Delucchi).	Medium	High
	Issues raised in the report prepared by Life Cycle Associates for the New Fuels Alliance	Medium	Medium
	Environmental carbon impacts of spills	High	Medium/Low
Crude oil	The LCFS assumes carbon intensity is constant for the base year. What happens to the carbon intensity in the future as the mix of crudes changes in California? Will need to track progress of the Crude Oil Screening Workgroup.	Medium	Medium
	Some issues discussed by the Crude Screening Workgroup (from Jacobs presentation):		
	- Primary vs. secondary vs. tertiary extraction methods	Medium	High
	- Venting/flaring	Low	High
	- Reservoir characteristics (depth, pressure, oil/water ratio, gas/oil ratio)	Low/Medium	Medium
	- Treatment of produced water and gas	Low	High
	- Change in reservoir properties over time	Medium/High	High
	Oil sands issues	High	Medium
	Short-, medium-, and long-term marginal crude oil sources.	High	Medium
	Environmental carbon impacts of spills		

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BEV & PHEV	Battery materials production, transport, battery manufacturer + transport, and end-of-life recycling requirements excluded from LCFS	Medium	Low
	Lithium mining	Medium	Medium
Electricity	Battery production life cycle issues (noted above)	Medium	Low
	BP/SCE Pet coke CO2 "sequestration" is being used for EOR; this "co-product" should be "credited" as a debit...	Medium	Low
	Short-, medium-, and long-term marginal source of electricity? Coal? 'Mountain top removal'?	Medium/High	Medium
Natural Gas	Conventional gas is being systematically replaced with shale gas, tight gas and CBM. Horizontal drilling + high pressure multi-stage fracking of marine shale involve higher energy use (e.g., production and use of proppant used in injections)	High	Medium/Low
Hydrogen	Energy for precooling associated w/ SAE J 2601 5 kg/3 min (60 g/s) adjusted for parity between veh. 1 + 3 refill times.	Low	Medium
	Methanol production (for methanol reformer PEM) and indirect effects of increased production	Medium	Low
	PEM lifecycle and rare earth metal indirect effects	Medium	Low
Biofuels	What are the indirect effects not currently captured in ARB's analysis?		
	Delucchi has cited the following as potential indirect effects:		
	- Methane from soil/plants	Low	Low
	- Changes in albedo	Low	Low
	- Changes in evapotranspiration	Low	Medium
	- Changes in hydrodynamics as a result of irrigation	Medium/Low	Low
	- Agricultural dust	Medium	Low
	Impact of increased nitrogen content of DGS on N2O from manure handling operations	Low/Medium	Low

Source: CARB presentation by the Indirect Effects Sub-Workgroup to the Expert Workgroup, July 15, 2010