

*Positive Environmental Impacts from Reduced Levels of
Energy Transportation
– A Hidden Benefit of Self-Sufficiency?*

Case Study on Energy Transport

Involving fuel going into and out of the USA

Impact measured in CO2 equivalent emissions

Estimate of WW annual equivalent carbon emissions from fuel transport							
		t CO2e/ t_km	t CO2e/ t_km	t CO2e/ t_km			
		0,000012	0,000037	0,000107			
Fuel transported	Interregional trade in MT annual	km by Ship	km by Rail	km by Road	MT CO2e Ship	MT CO2e Rail	MT CO2e Road
Coal	3006	3 000	400	200	108	44	64
Oil	1084	6 000	100	100	78	4	12
Total Emissions from Fuel Transport					186	48	76
Total Emissions from Freight transport					1102		2190
Fuel Transport Emissions as a % of total freight transport emissions					17%		3%

Introduction

WW Energy Transport

Footprints



Shrink That Footprint



Methodology

Welcome to DECC's BEAC (Biomass Emissions And Counterfactual) Model.

The purpose of the BEAC model is to help answer the following questions:

- What are the greenhouse gas impacts of different bioenergy pathways, considering the emissions associated with growing, processing and transporting the biomass, as well as the consequences of 'counterfactual' land-uses?
- What is the energy requirement of these different bioenergy pathways?

In the tab, Results_Biopathways, the user is able to investigate the greenhouse gas impacts and energy input of different bioenergy pathways. There are set scenarios which can be investigated by selecting a scenario (Macros must be enabled for this function). The user can also consider other land types and technologies (e.g. heat, liquid fuels) and make their own scenarios from the drop down lists.

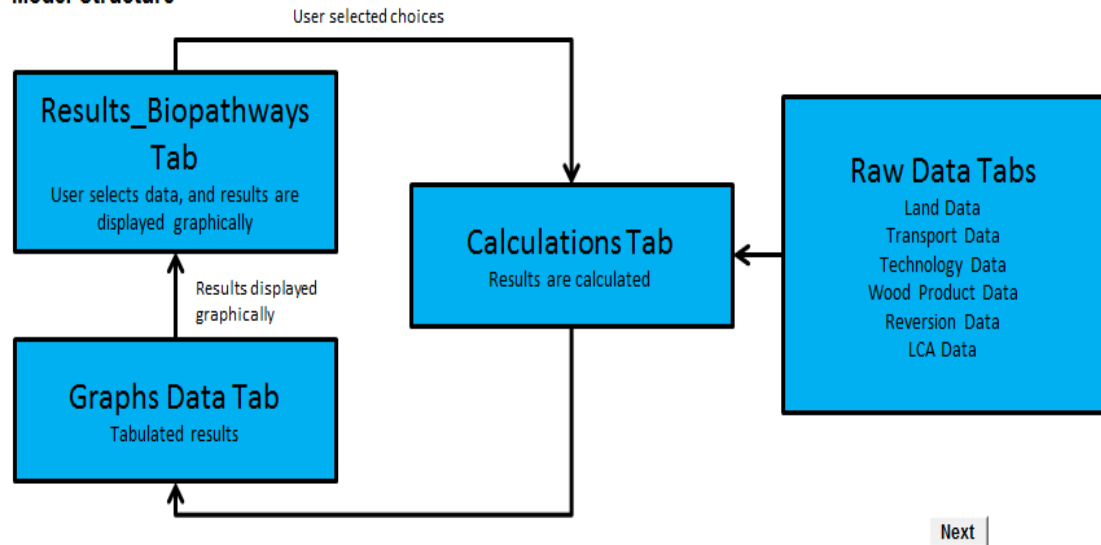
Model Information

Version BEAC2015
Last updated 09/01/2015

Developer Contact Details:

beac_model@decc.qsi.gov.uk

Model Structure



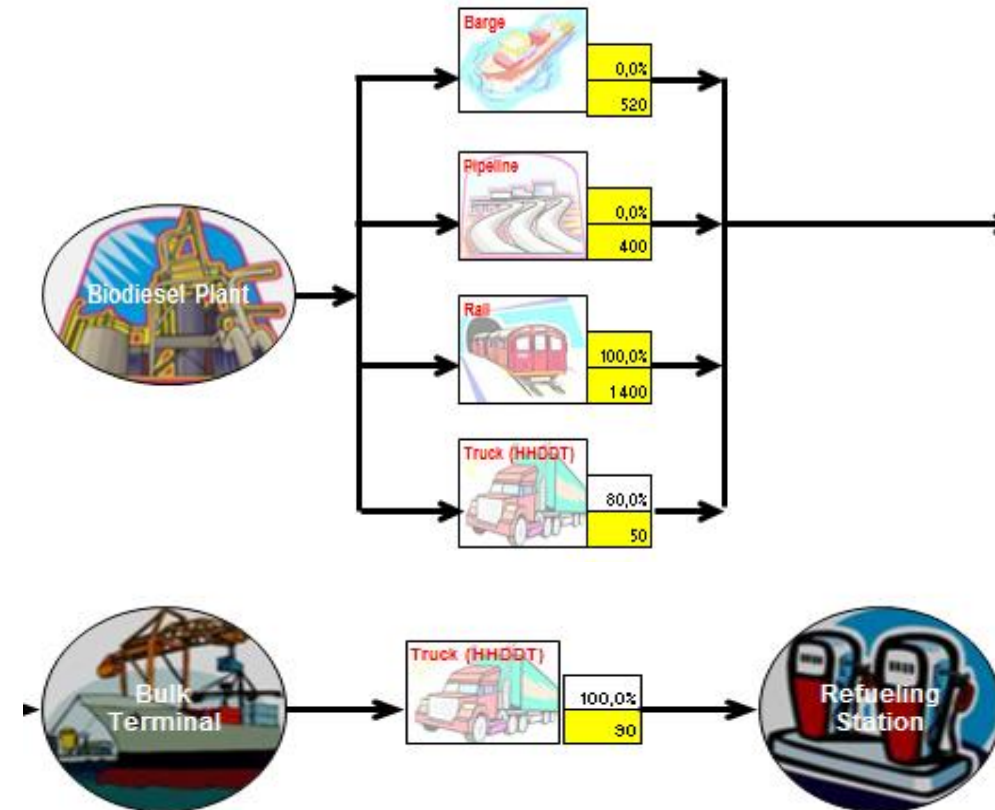
GREET Version 1.8b

Developed by

Systems Assessment Section
Center for Transportation Research
Argonne National Laboratory

September 2008

47. Biodiesel



The York Case



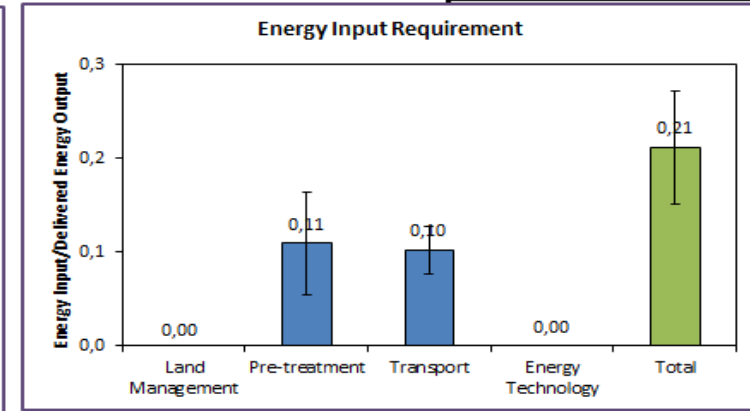
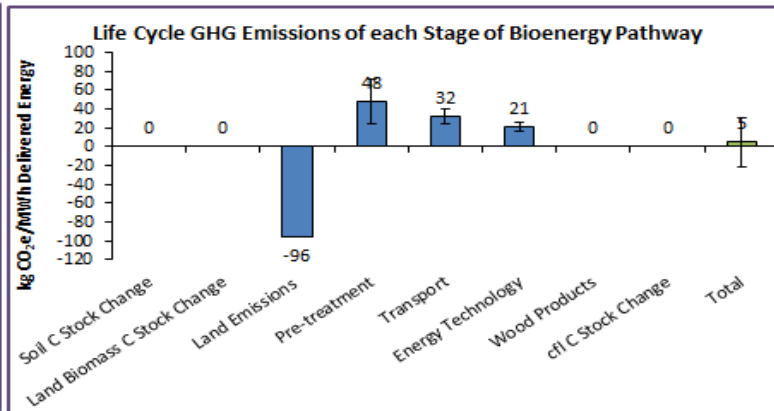
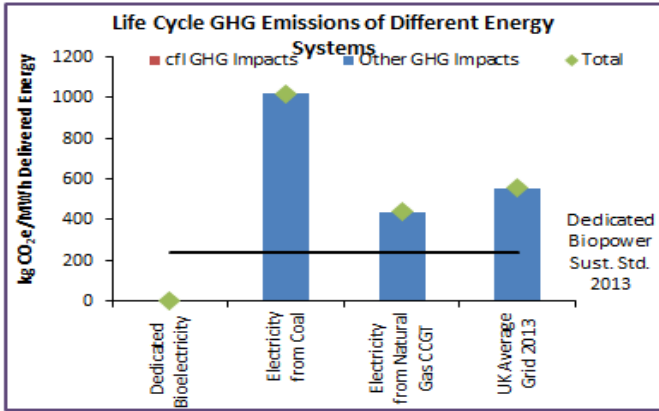
The York Case

Select Scenario

Last scenario ran was:

Scenario 1: Electricity from pellets produced from saw mill residues in South USA. No drying. cfl = burn as a waste.

Reset to Last

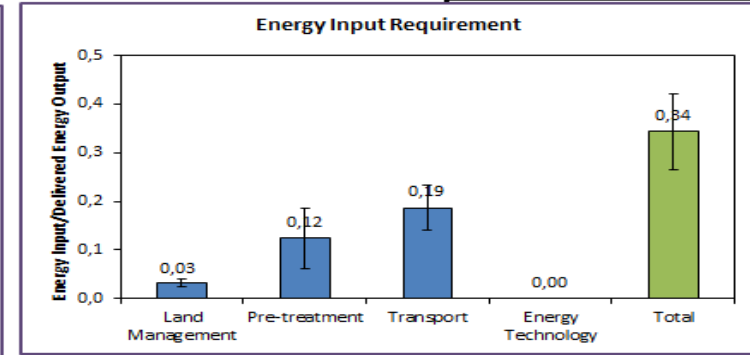
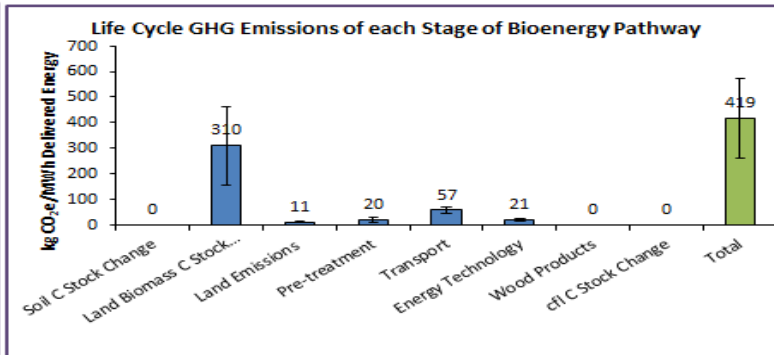
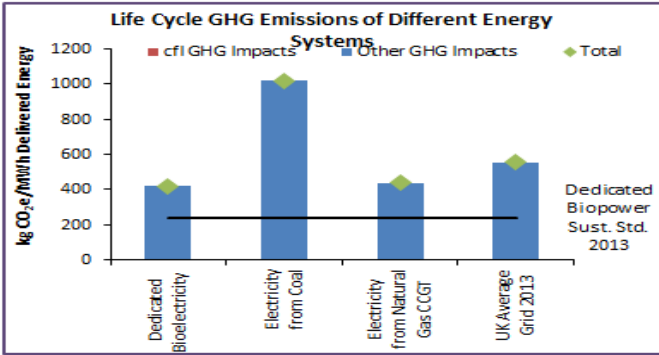


Select Scenario

Last scenario ran was:

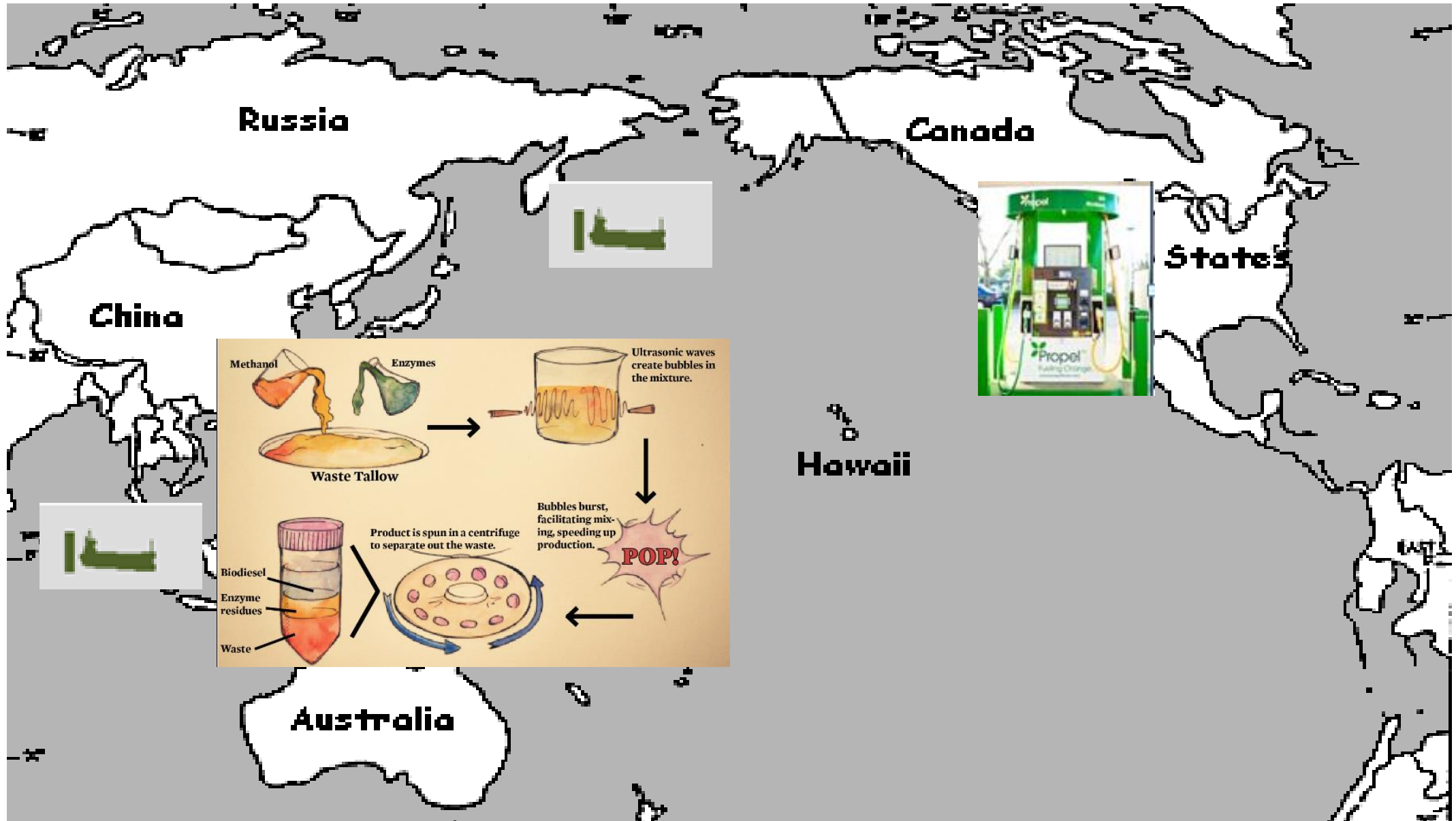
Scenario 9: Electricity from pellets produced from wood killed by Mountain beetle in British Columbia. cfl = decay in forest.

Reset to Last



Comparative values for Case A		emissions for life cycle transportation only			emissions for electricity production	
Scenario	Short Description	kg CO ₂ e/mwh	kgCO ₂ e/Mbtu	gCO ₂ e/MJ	Input/Output	difference coal to wood
BEAC 1	wood pellets from Southern USA	32	9.38	8.89	1 to 10	+ 300 to 800 kg CO ₂ e/mwh
BEAC 9	wood from British Columbia	57	16.71	15.83	1,9 to 10	+ 300 to 800 kg CO ₂ e/mwh
BEAC 19	same as 1) + indirect Brazil to USA	53	15.53	14.72	1,7 to 10	+ 300 to 800 kg CO ₂ e/mwh
BEAC 32	wood locally sourced in the UK	2	0.59	0.56	0,1 to 10	+ 300 to 800 kg CO ₂ e/mwh

The LCFS Case



The LCFS Case

LCFS CI Pathway coefficients *all values are expressed in g CO2e / MJ*

	Feedstock Trpt	Diesel Trpt	Total Transport	WTW before credits	Comments
Default Dec12 Tallow Calif	1.52	0.76	2.28	35.28	penalized by high CI for rendering process
40 Neste RD Tallow Aus. Mar13	3.95	5.79	9.74	36.43	before credit of -3 for propane richoff-gas
48 Dansuk S. Korea Mar13 UCO	0.00	3.49	3.49	10.53	feedstock co-located so no transport plus UCOME advantage
175 Biocom Spain Nov15 UCO	5.01	5.15	10.16	21.55	high transport but UCOME advantage for production
181 Neste Mixed UCO Nov15	9.84	5.98	15.82	33.03	high transport but low CI for production

LCFS Transfer Types and Distances

distances expressed in miles

	Feedstock Type	Feedstock Distance	Diesel Type	Diesel Distance	Comments
Default Dec12 Tallow Calif	primarily rail	1400	road	140	
40 Neste RD Tallow Aus. Mar13	primarily ship	4548	primarily ship	7677	
48 Dansuk S. Korea Mar13 UCO	none	0	3.49	4628	
175 Biocom Spain Nov15 UCO		na		na	distances hidden in application
181 Neste Mixed UCO Nov15	primarily ship	11500	primarily ship	7677	

Comparative values for Case B (Bio Diesel Fuels)		emissions for life cycle transportation only				Emissions for full fuel cycle (well to wheel)	Emissions for full fuel cycle (well to wheel)
Scenario	Short Description	kgCO2e/gal	kgCO2e/Mbtu	gCO2e/MJ	Transport % Total	kgCO2e / MJ	relative to std diesel
LCFS Def	Default Dec12 Tallow Calif	0.33	2.41	2.28	6%	35.28	37%
LCFS 48	Dansuk S. Korea Mar13 UCO	0.51	3.68	3.49	33%	10.53	11%
LCFS 40	RD Tallow Australia Mar13	1.41	10.28	9.74	27%	36.43	38%
LCFS 175	Biocom Spain Nov15 UCO	1.47	10.72	10.16	47%	21.55	22%
LCFS 181	Neste Mixed UCO Nov15	2.29	16.69	15.82	48%	33.03	34%

Conclusions

- **Transportation of energy to get it to point of use was not the primary decision driver in the cases studied but it is definitely a significant factor:**
 - For the York case (Wood pellets from USA to UK for electricity production) the transport is 10% to 19% of the total CO2 eq emissions (versus 1% for the local default)
 - For the LCFS case (Renewable Diesel fuel shipped to California) the transport makes up 27% to 48% of the total CO2 eq emissions (versus 6% for the local default)
- **In these cases the environmental subsidies actually encourage international fuel transport : all of the fuels involved could be used locally with greater reductions in WW carbon emissions but the suppliers prefer to sell internationally because the price is better**
- **Production technology options were the driving force in all the final decisions**
 - The advantage of wood over coal was the key driver in the York case, locally sourcing wood was not an option (the UK remembers the 17th century deforestation for fuel crisis and protects their forests)
 - In the LCFS cases, the Asian processes have a number of advantages like a ready supply of waste fats, highly efficient processing plants that use low amounts of energy for rendering
- **Ship transport has a big advantage over road and even rail and this handicaps many of the US based suppliers into the LCFS program**