

WASHINGTON STATE LOW CARBON FUEL STANDARD VALUATION

Governor's Executive Order, 09-05
Dept. of Ecology, Air Quality Program
Bob Saunders

Revised WA Schedule draft

<u>New Date</u>	<u>New Topic</u>	<u>Format</u>
Mar 25	Alternatives Input; possibly review econ input highhlights, i.e.investment,	Workshop
May 18	MAY BE CANCELLED	
Jul 17	Economic Analysis results, administrative issues, possible discussion of alternatives work?	Workshop
Sep 8	Draft Report & Alternatives analysis	Workshop
Oct 13	Draft Recommendations to Management	
Nov 3	Submit Final Report, appendices, data	
Nov 15	Final Report Due	

LCFS Evaluation

- Report: By Nov 15, 2010 Ecology will recommend
 - Whether to adopt a LCFS for Washington, or an alternative way to reduce transportation emissions
 - What LCFS provisions best fit Washington
 - How to best implement a program, if recommended
 - Rule, or
 - Statute

LCFS Evaluation Process

- 6 workshops for input from interested parties
- TIAX has developed CI values for WA
- Economic Analysis for WA will be done

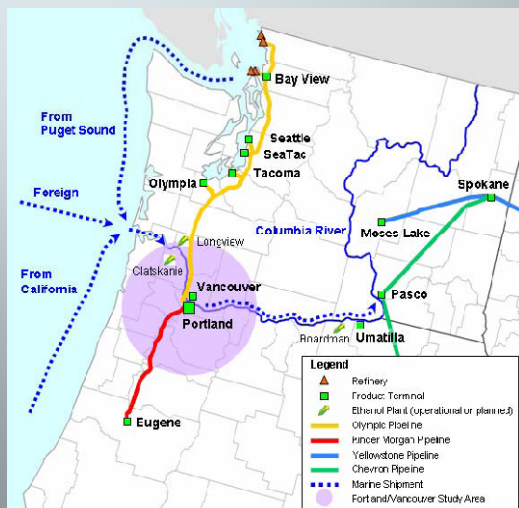
LCFS Evaluation Process

- ❑ Develop CI values
- ❑ Choose compliance scenarios
- ❑ Generate economic modeling inputs (REMI)
- ❑ Evaluate economic impacts of scenarios
- ❑ Consider all the issues:
 - ❑ Feasibility
 - ❑ Costs
 - ❑ Benefits
 - ❑ Administration
- ❑ Make Recommendation to Governor
- ❑ She decides next steps

Economic Analysis Overview

- ❑ Estimate baseline fuels, prices, vehicles, etc
- ❑ From compliance scenarios estimate costs of alternative fuels, derived from volumes
- ❑ Estimate difference between cost of scenarios and baseline costs
- ❑ 5 main results from economic analysis
 - Change in costs of transportation fuel
 - Change in overall state economic output
 - Change in personal incomes and employment
 - Change in investment (e.g. CARB estimated 25 new biofuel facilities)
 - Changes in tax revenues

Where do Washington's refined fuels come from?



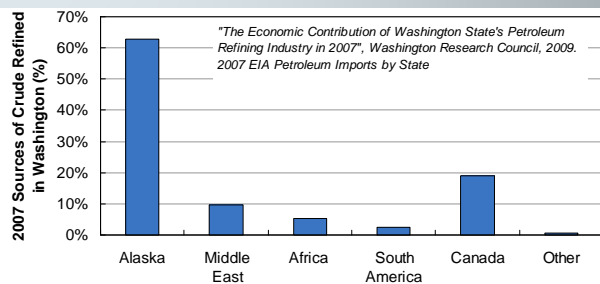
- 89% From WA Refineries
- 10% From MT Refineries
- <2% From Utah Refineries
- Negligible foreign and CA imports

Source: ICF International

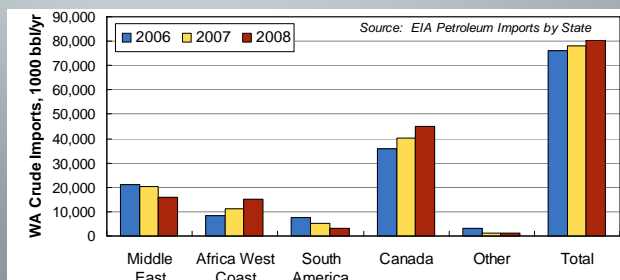
7

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Sources of Crude Oil Used in Washington Refineries



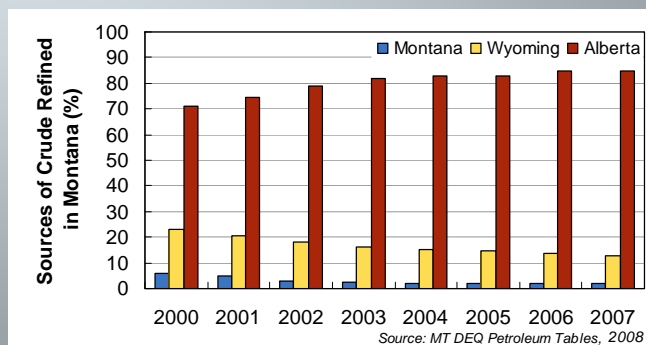
- More than 60% from Alaska
- Largest foreign source: Canada
- Canadian and African imports growing
- West Africa, mostly Angola
- South America, mainly Argentina



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Sources of Crude Oil Used in Montana Refineries

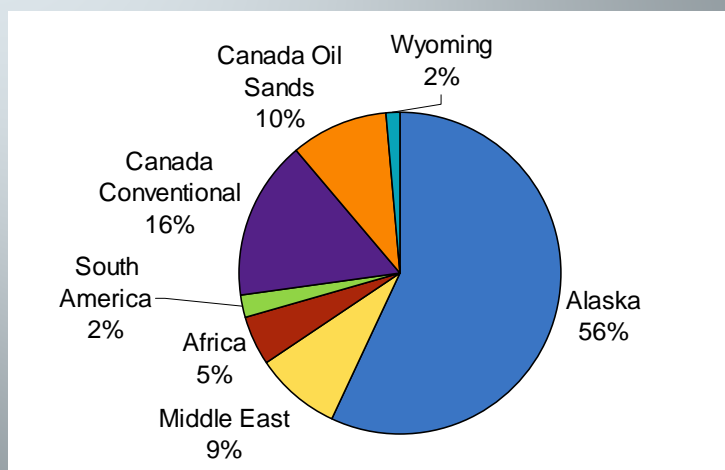
- Montana supplies about 10% of WA gasoline blendstock and diesel fuel
- 85% of the crude oil refined in Montana comes from Alberta via the Terrasen Express Pipeline



9

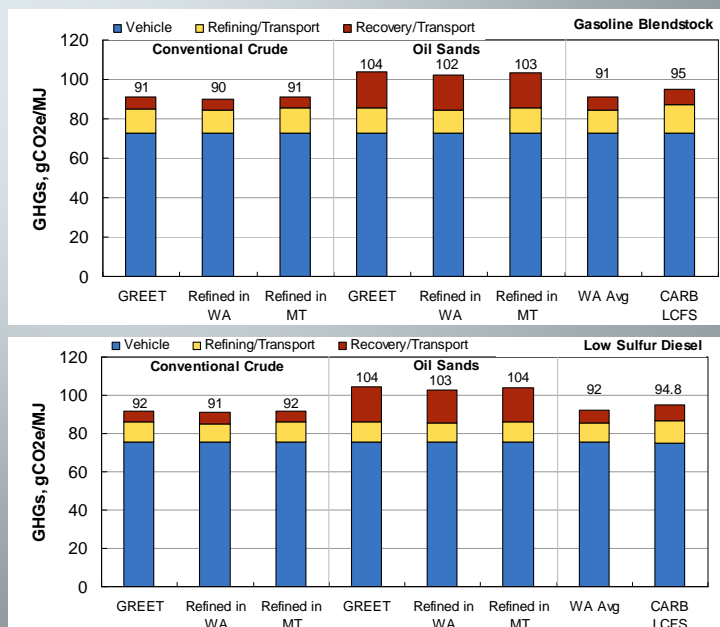
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Crude Resources for Finished Fuels Consumed in Washington



10

Gasoline & Diesel CI Values WTW Carbon Intensity *Petroleum*



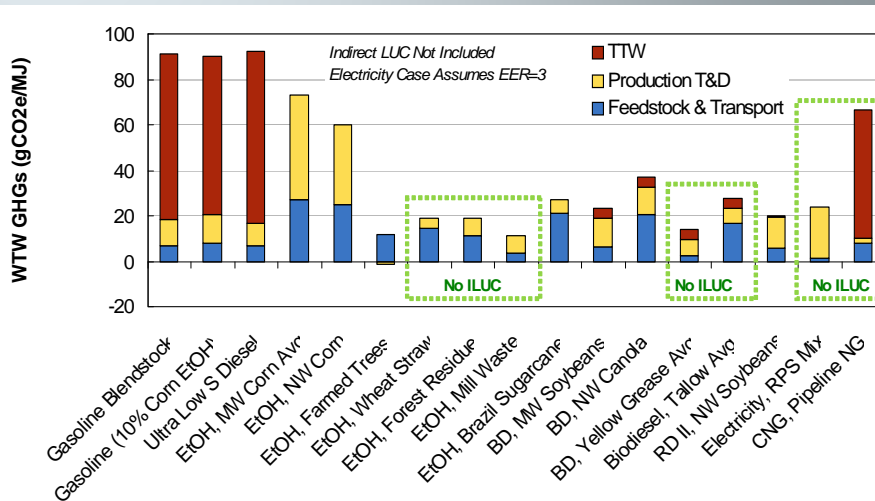
Fuel Pathways Considered:

- Definitely In (8)
 - Gasoline blendstock (w/o the ethanol)
 - ULSD
 - MW Corn Ethanol
 - (Ethanol) NW Production, MW Corn
 - RD Soybean Biodiesel, NW Production, MW soy oil
 - CNG (pipeline NG)
 - LNG (pipeline NG)
 - Electricity (marginal load or grid average ??)
 - Hydrogen (on-site NG reforming)
- Gasoline baseline will be a combination of corn ethanol and blendstock
- Other Options
 - Cellulosic ethanol (poplar, corn stover, forest residue, switchgrass, wheat straw, mill waste)
 - Sugarcane ethanol from Brazil
 - Biodiesel or Renewable diesel (canola, brassica juncea, camelina, palm oil)
 - Biodiesel or Renewable diesel (yellow grease, tallow)
 - LNG from biogas
 - CNG from biogas
 - Electricity (grid average)
 - Hydrogen (NG reforming, central plant, electrolysis)
 - Other? Food processing waste

Fuel Pathways Evaluated:

- Ethanol, MW Corn Average
- Ethanol, NW Production, MW Corn
- Ethanol, Farmed Trees
- Ethanol, Wheat Straw
- Ethanol, Forest Residue
- Ethanol, Mill Waste
- Ethanol, Brazil Sugarcane
- *Ethanol, Food Processing Waste*
- Biodiesel, MW Soybeans
- Biodiesel, NW Canola
- Biodiesel, Yellow Grease Average
- Biodiesel, Tallow Average
- RD II, NW Production, MW Soy Oil
- Electricity, WA Grid Mix + RPS
- CNG, pipeline NG

WA Fuels and CI



CI Values + ILUC

Fuel Pathway	Direct Emiss	CA ILUC	CA Tot	EPA ILUC	EPA Tot
Gasoline Blendstock	91.3		91.3		91.3
Gasoline, 10% corn ethanol*	90.2	30	92	30	92
ULSD Diesel	92.1		92.1		92.1
Ethanol, MW Corn, Avg	73.4	30	103.4	30	103.4
Ethanol, NW Prod, MW corn	59.8	30	89.8	30	89.8
Ethanol, Farmed Trees	10.7	5	15.7		10.7
Ethanol, Wheat Straw	18.7		18.7		18.7
Ethanol, Forest Residue	19		19		19
Ethanol, Mill Waste	11.5		11.5		11.5
Ethanol, Brazil Sugarcane	27.2	46	73.2	4	31.2
Biodiesel, MW soybeans	23.2	62	85.2	40	63.2
Biodiesel, NW Canola***	36.9	62	98.9	40	76.9
Biodiesel, Yellow Grease, Avg	13.8		13.8		13.8
Biodiesel, Tallow Avg	27.7		27.7		27.7
Renewable Dies, NW, MW soy	20.1	62	82.1	40	60.1
Electricity, WA Grid Mix + RPS	23.6		23.6		23.6
CNG, pipeline NG	66.4		66.4		66.4

Carbon Intensity Highlights

- ▣ WA Gasoline (E10) = 92
- ▣ MW corn ethanol, dry mill, wet DGS, NG = 90
- ▣ Brazilian Sugarcane = 73 (31, EPA)
- ▣ Electricity, WA grid + RPS = 24
- ▣ NW wheat straw ethanol = 19
- ▣ NW farmed trees = 15
- ▣ WA Diesel = 92
- ▣ MW soy biodiesel = 85 (63, EPA)
- ▣ NW yellow grease biodiesel = 14

Compliance Scenarios Draft Ideas

	ETHANOL			DIESEL		
	1	2	3	4	5	6
General Principle	Max in-state eth	Min in-state eth	Max out-state adv ethanol	Max in-state biodiesel	Min in-state biodiesel	One Pool
Target	10%	10%	10%	10%	10%	10%
Key Inputs	Large in-state ethanol Large NW adv eth	Small in-state ethanol Large MW & Brazil ethanol	Small in-state eth Large out-state <u>adv</u> eth	Large % canola Max waste to diesel	Smaller % canola Max waste to diesel	
EVs	Min EVs	Max EVs	Min EVs			

Tracking the LCFS Evaluation

□ Ecology LCFS website:

www.ecy.wa.gov/climatechange/2009EO.htm

Click: "Low Carbon Fuel" at left side of page