California’s Low Carbon Fuel Standard
Potential Implications for Crude Oil

Crude Oil Quality Association
Salt Lake City, UT
June 9, 2011

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Western States Petroleum Association
Outline of presentation

- California Low Carbon Fuel Standard (LCFS)
  - Overview of regulation
  - Crude oil treatment issues
Who we are

- Non-profit trade association
- Represents 26 petroleum companies in 6 western states: California, Washington, Oregon, Nevada, Arizona, Hawaii
- 7 offices, 21 employees, annual budget of $14 million
Reducing carbon from the transportation sector

- Vehicles
  - Emissions
  - CAFE

- Consumers
  - Vehicle choice
  - Fuel choice
  - VMT
  - Land use engineering

- Lower carbon fuel
California
Low Carbon Fuel Standard Overview
California LCFS - overview

- Governor’s E.O. S-01-07
- California Air Resources Board regulation (4/09 adoption)
- Designed to reduce the per-gallon carbon intensity of gasoline and diesel fuel 10% by 2020—backend loaded
- Performance-based standard with flexible credit trading within the program; there is no mandate to sell any particular type of fuel
- Intended to drive market toward innovative, low carbon fuels, off-oil
- Applies to all refiners, blenders, producers or importers
- Does not apply to other transportation fuels (e.g. jet fuel, bunker fuel)
- Does not apply to non-transportation petroleum (e.g. lube oils)
California LCFS – overview (cont.)

- Reporting only in latter part 2010
- Compliance “began” January 1, 2011 but program still not finalized
- CARB adopted resolution on November 18, 2010
  - Discussed “enforcement discretion”
  - Identified items that need to be addressed
  - Credit trading system
  - Indirect land use change impact reassessment
  - Crude oil screening
- Includes periodic reviews – 2011, 2014
- CARB Board revisions to regulation late 2011
## LCFS Compliance Schedule for 2011 to 2020 for Gasoline and Fuels Used as a Substitute for Gasoline

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Carbon Intensity (gCO2E/MJ)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Reporting Only</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>95.61</td>
<td>0.25%</td>
</tr>
<tr>
<td>2012</td>
<td>95.37</td>
<td>0.5%</td>
</tr>
<tr>
<td>2013</td>
<td>94.89</td>
<td>1.0%</td>
</tr>
<tr>
<td>2014</td>
<td>94.41</td>
<td>1.5%</td>
</tr>
<tr>
<td>2015</td>
<td>93.45</td>
<td>2.5%</td>
</tr>
<tr>
<td>2016</td>
<td>92.50</td>
<td>3.5%</td>
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<tr>
<td>2017</td>
<td>91.06</td>
<td>5.0%</td>
</tr>
<tr>
<td>2018</td>
<td>89.62</td>
<td>6.5%</td>
</tr>
<tr>
<td>2019</td>
<td>88.18</td>
<td>8.0%</td>
</tr>
<tr>
<td>2020 and subsequent years</td>
<td>86.27</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Source: California Air Resources Board, Low Carbon Fuel Standard, Modified Regulation Order
## LCFS compliance schedule - diesel

Table 2. LCFS Compliance Schedule for 2011 to 2020 for Diesel Fuel and Fuels Used as a Substitute for Diesel Fuel.

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Carbon Intensity (gCO2E/MJ)</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Reporting Only</td>
<td></td>
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<tr>
<td>2011</td>
<td>94.47</td>
<td>0.25%</td>
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<tr>
<td>2012</td>
<td>94.24</td>
<td>0.5%</td>
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<td>2013</td>
<td>93.76</td>
<td>1.0%</td>
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<td>2014</td>
<td>93.29</td>
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<td>2015</td>
<td>92.34</td>
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<td>2016</td>
<td>91.40</td>
<td>3.5%</td>
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<td>2017</td>
<td>89.97</td>
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<td>2018</td>
<td>88.55</td>
<td>6.5%</td>
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<tr>
<td>2019</td>
<td>87.13</td>
<td>8.0%</td>
</tr>
<tr>
<td>2020 and subsequent years</td>
<td>85.24</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Source: California Air Resources Board, Low Carbon Fuel Standard, Modified Regulation Order
### Table 6: Carbon Intensity Lookup Table for Gasoline and Fuels that Substitute for Gasoline

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Pathway Description</th>
<th>Direct Emissions</th>
<th>Land Use or Other Indirect Effect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gasoline</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest average: 80% Dry Mill; 20% Wet Mill; Dry DGS</td>
<td>69.40</td>
<td>30</td>
<td>99.40</td>
<td></td>
</tr>
<tr>
<td>California average: 90% Midwest Average; 20% California: Dry Mill; Wet DGS; NG</td>
<td>65.44</td>
<td>30</td>
<td>95.66</td>
<td></td>
</tr>
<tr>
<td>California: Dry Mill; Wet DGS; NG</td>
<td>50.70</td>
<td>30</td>
<td>80.70</td>
<td></td>
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<tr>
<td><strong>Ethanol from Corn</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest: Wet Mill; 80% NG; 40% coal</td>
<td>75.10</td>
<td>30</td>
<td>105.10</td>
<td></td>
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<tr>
<td><strong>Ethanol from Sugarcane</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Brazilian sugarcane using average production processes</td>
<td>27.40</td>
<td>48</td>
<td>73.40</td>
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<tr>
<td>Brazilian sugarcane with average production process, mechanized harvesting and electricity co-product credit</td>
<td>12.20</td>
<td>48</td>
<td>58.20</td>
<td></td>
</tr>
<tr>
<td>Brazilian sugarcane with average production process and electricity co-product credit</td>
<td>20.40</td>
<td>48</td>
<td>66.40</td>
<td></td>
</tr>
<tr>
<td><strong>Compressed Natural Gas</strong></td>
<td></td>
<td></td>
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<tr>
<td>California NG via pipeline; compressed in CA</td>
<td>67.70</td>
<td>0</td>
<td>67.70</td>
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<tr>
<td>North American NG delivered via pipeline; compressed in CA</td>
<td>68.00</td>
<td>0</td>
<td>68.00</td>
<td></td>
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<tr>
<td>Landfill gas (bio-methane) cleaned up to pipeline quality NG; compressed in CA</td>
<td>11.26</td>
<td>0</td>
<td>11.26</td>
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</tr>
<tr>
<td><strong>Liquefied Natural Gas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overseas-sourced LNG delivered as LNG to Baja; re-gasified then re-liquefied in CA</td>
<td>93.37</td>
<td>0</td>
<td>93.37</td>
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<tr>
<td><strong>Electrity</strong></td>
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<tr>
<td>California average electricity mix</td>
<td>124.10</td>
<td>0</td>
<td>124.10</td>
<td></td>
</tr>
<tr>
<td>California marginal electricity mix of natural gas and renewable energy sources</td>
<td>104.70</td>
<td>0</td>
<td>104.70</td>
<td></td>
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<tr>
<td><strong>Hydrogen</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed H₂ from central reforming of NG (includes liquefaction and re-gasification steps)</td>
<td>142.00</td>
<td>0</td>
<td>142.00</td>
<td></td>
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<tr>
<td>Liquid H₂ from central reforming of NG (no liquefaction and re-gasification steps)</td>
<td>133.00</td>
<td>0</td>
<td>133.00</td>
<td></td>
</tr>
</tbody>
</table>
| **Source:** California Air Resources Board, Low Carbon Fuel Standard, Modified Regulation Order
LCFS issues

- The program is INCOMPLETE
- Structural flaws – e.g. oil industry should not be obligated to provide fuel or buy electricity credits for electric vehicles
- Program may not provide a realistic path for adequate, reliable and affordable transportation fuels
- Integration and harmonization with other fuel and vehicle programs unknown; includes EPA and EU; inability to match up future vehicles, fuels and consumers
- Lower carbon fuel needs of other programs increases need for additional supply of those fuels
- Ongoing research/analysis creates lack of certainty with associated consequences
LCFS Crude Oil Treatment Issues
Optional approaches to crude oil treatment

**Screening/differentiation**
- Current approach
  - No/minimal regulation change required to incorporate screening process

**No screening/differentiation**
- Requires regulation change
- Crude is crude – baseline average value changes over time
What the LCFS regulation says

Crudes segregated into two categories

- Those that get the “average” Lookup Table CI gasoline/diesel values
  - Crudes in the 2006 CA baseline >2% by volume
  - Crudes that are not HCICO

- Those that get unique CI values
  - High Carbon Intensity Crude Oil (HCICO), defined as > 15.00 gCO$_2$e/MJ for production and transportation steps
  - Refiners that use designated HCICO have an incremental deficit on their CARBOB and diesel production. Requires offsetting blendstock/other to compensate for deficit
  - Must report HCICO derived product volumes
LCFS Crude Oil treatment

- If using a crude not in baseline mix, CARB to provide approval process for deriving the C.I. of the fuel → Crude Oil Screening Process – either non-HCICO or process identifies whether high/not

- Methods used to produce and transport crude can result in a relatively high carbon-intensity rating for a feedstock as part of the gasoline/diesel pathway; wide variation depends on extraction & refining process, use of cogeneration, etc.

- CARB would develop one or more pathways with high carbon intensity crude oil - may include oil sands, TEOR, upgraded…

Source: California Air Resources Board, Low Carbon Fuel Standard; Alberta Energy Research Institute, Life Cycle Analysis of North American and Imported Crude Oils
Initial screening steps

- 4 sequential steps
- 257 MCONs screened
- Test takes a few minutes...
- *If MCON has been coded & all source fields are listed for TEOR country MCON*
- Zero “unknown” results
- 1 false “pass”

**Step A** – Does marketable crude oil name (MCON) originate from a 2006 Base Line country?

- No
- Yes

MCON is not a potential HCICO

**Step B** – Does MCON originate from a country that has an average flaring intensity greater than 10.0 m³/bbl for the most recent year?

- No
- Yes

MCON is a potential HCICO

**Step C1** – Does MCON originate from a country that has any Thermally Enhanced Oil Recovery (TEOR) operations per the most recent O&GJ annual survey?

- No
- Yes

**Step C2** – Are any of the MCON source fields listed as TEOR?

- No
- Yes

MCON is a potential HCICO

**Step D** – Is the MCON sourced from any mining activity or output from any form of upgrading facility?

- No
- Yes

MCON is a potential HCICO

MCON is not a potential HCICO

Source: California Air Resources Board
Summary of screening results

* Drops to 35 if EIA oil production & updated NOAA data used to calculate flaring intensity

Source: CEC Analysis.
California “Crude Basket”
Marketable Crude Oil Name Imports
Updated for 2010

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<td>Totals</td>
<td>36</td>
<td>41</td>
<td>41</td>
<td>45</td>
<td>34</td>
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</tbody>
</table>

* Kuwait Portion

Between 22 & 28 additional MCONs imported from non-2006 Base Line countries

Sources: CEC Analysis of PIERS Data
Potential high carbon intensity crude oils

Source: CEC Analysis of EIA Company Level Import Data
Canada’s energy reserves

**Comparative Oil Reserves** (billions of barrels)

*Source: Oil & Gas Journal, 2007*

- **Alberta**: 175 barrels
- **USA**: 20 barrels
- **Mexico**: 15 barrels
- **Venezuela**: 75 barrels
- **Libya**: 40 barrels
- **Iraq**: 115 barrels
- **Iran**: 125 barrels
- **Saudi Arabia**: 250 barrels
- **Russia**: 60 barrels

*Source: Government of Alberta, Oil & Gas Journal*
Importance of Canadian petroleum supply

- **US Oil Reserves** (21.8 Billion Barrels)
- **Canada’s Conventional Oil Reserves** (5.2 Billion Barrels)
- **Canada’s Oil Sands Reserves** (173.2 Billion Barrels)
- **Canada’s Oil Sands Ultimate Potential** (315 Billion Barrels)

Source: Government of Alberta, Canada
WSPA Position

- What is realistic?
- What is scientifically defensible?
- What is simple?
- What is best for oil industry (upstream & downstream)?
- What will ARB/environmental reps/others accept?
- What is comparable with other feedstocks, so fair treatment?
- What is implementable and enforceable?
WSPA Position

- Crude treatment latter part of 2011
  - Extension of crude oil equivalency to year-end [contracts]; March 2012 [delivery]
- Credit treatment
  - Credits carried into 2012
- Revert to crude equivalency or nondiscrimination
  - Global average basket that evolves on periodic basis (e.g. every 3 years)
Goal – restore equitable "crude is crude" treatment for all crude oil

- Opportunity in 2011 to reverse CARB’s crude oil treatment approach
  - Letters/visits to CARB, Governor, legislators
  - Hiring contractors to explain potential impacts
  - CARB Advisory Panel – report to Board by 1/1/2012
  - CARB Board hearing (late fall?) for regulatory revisions
  - Engage Canadian government and industry
  - Engage other potential HCICO countries
  - Fuel users, allies
We are leaders in alternatives and renewable fuels