The ongoing University of Minnesota low carbon fuels policy study

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Funding

- IREE/RDF
- Energy Foundation
- State of Minnesota / Office of Energy Security
- Center for Transportation Studies (partner)
The problem

• Greenhouse gases are messing with the climate

• Most of our GHG emissions are in the form of carbon dioxide

• Most of our CO2 emissions come from electricity production and from transportation

• Compared to these, nothing else matters

• So, to reduce GHG emissions, we’ve got to do something about transportation
How to reduce emissions from transportation

- Drive less
- Drive cleaner vehicles
- Use cleaner fuel
“low carbon fuels standard”

- The average carbon intensity...
- of all transportation fuels...
- consumed (or produced?) within Minnesota...
- must decline over a stated time...
- relative to a stated base line.
Policy Context

- Minnesota 2009 proposed legislation
- MGA LCFP recommendations
- California LCFS
- Other GHG-reduction policies: new RFS, new CAFE/Clean Car....
Political context

• Most of our motor fuel is made from oil

• Most of this oil comes from Canada

• All of our “renewable” fuel is made from crops

• Most of these crops are grown in Minnesota
Economic context

Percent Job Losses in Post WWII Recessions, aligned at maximum job losses

- 1948
- 1953
- 1958
- 1960
- 1969
- 1974
- 1980
- 1981
- 1990
- 2001
- 2007

Months, Aligned at bottom of Recession
http://www.calculatedriskblog.com/
The logic of a LCFS

<table>
<thead>
<tr>
<th>feedstock</th>
<th>Carbon score</th>
<th>Current use</th>
<th>Current carbon</th>
<th>New use</th>
<th>New carbon</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>5</td>
<td>9</td>
<td>45</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
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<tr>
<td>total</td>
<td>10</td>
<td>48</td>
<td>10</td>
<td>46</td>
<td></td>
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</tbody>
</table>

Average fuel carbon intensity

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Average fuel carbon</td>
<td>4.8</td>
</tr>
<tr>
<td>intensity</td>
<td>4.6</td>
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</tbody>
</table>
Key LCFS elements

• How “low” do you go
• What is “carbon intensity”
• What is a “fuel”
• Who is responsible
• How measure success
• What knock-on effects
• What about other policies
The Minnesota LCFP study

• Examine economic and environmental implications IF Minnesota adopts LCFP

• Suggest possible numbers to use IF Minnesota adopts LCFP

• Discuss possible institutional arrangements IF Minnesota…
Study components

Locally relevant life-cycle numbers

Policy linkages model

Economic sectors model

Environmental aspects
1. Life-cycle GHG measurement

- “All” on-road transport fuels
- Field → shipping → fuels plant → shipping → combustion
- Land use change effects only within Minnesota
- Emphasis on Minnesota averages and protocol
2. Policy linkage model

- Joint with Great Plains Institute for MGA

- “What–if” model, not a “what–should–we–do” model

- Emphasis on how policies might change activities
3. Economic sectors model

- Crops, livestock, fuels, forestry
- Sub-state regions
- Track prices, quantities, and expenditures under various LCFP policy scenarios
4. Environmental aspects

- Systematically estimate human and non-human environment effects of fuels’ production and use

- Consider great range of uncertainty for some impacts, for some fuels
Key LCFS elements

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- What about other policies
ECS default conditions
ECS policy setting (carbon tax)
ECS output (carbon tax)
ECS output (carbon tax)

Energy Choice Simulator

Emissions Generated by Sector

<table>
<thead>
<tr>
<th>Year</th>
<th>Electric</th>
<th>Transportation</th>
<th>Primary Sectors</th>
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<tbody>
<tr>
<td>2000</td>
<td>42.4</td>
<td>15.4</td>
<td>13.79</td>
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<tr>
<td>2010</td>
<td>42.4</td>
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<td>13.81</td>
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<td>2015</td>
<td>39.0</td>
<td>12.1</td>
<td>13.48</td>
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<tr>
<td>2020</td>
<td>35.4</td>
<td>11.7</td>
<td>12.84</td>
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<tr>
<td>2025</td>
<td>32.4</td>
<td>12.6</td>
<td>12.28</td>
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<tr>
<td>2030</td>
<td>30.0</td>
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<tr>
<td>2050</td>
<td>21.4</td>
<td>12.6</td>
<td>11.85</td>
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</tbody>
</table>
UM study (hypothetical)

Total Annual Life Cycle Emissions from transportation fuels

Million Metric Tons

- Reference
- LCFP Basic

2005 2010 2015 2020 2025 2030 2035
UM study (hypothetical)

Total Annual Life Cycle Emissions from transportation fuels
policy combinations

Million Metric Tons

2005 2010 2015 2020 2025 2030 2035
Key LCFS elements

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• What about other policies
Of all men’s miseries the bitterest is this: to know so much and to have control over nothing. (Herodotus)