

An overview of national, international and state low carbon fuel policies

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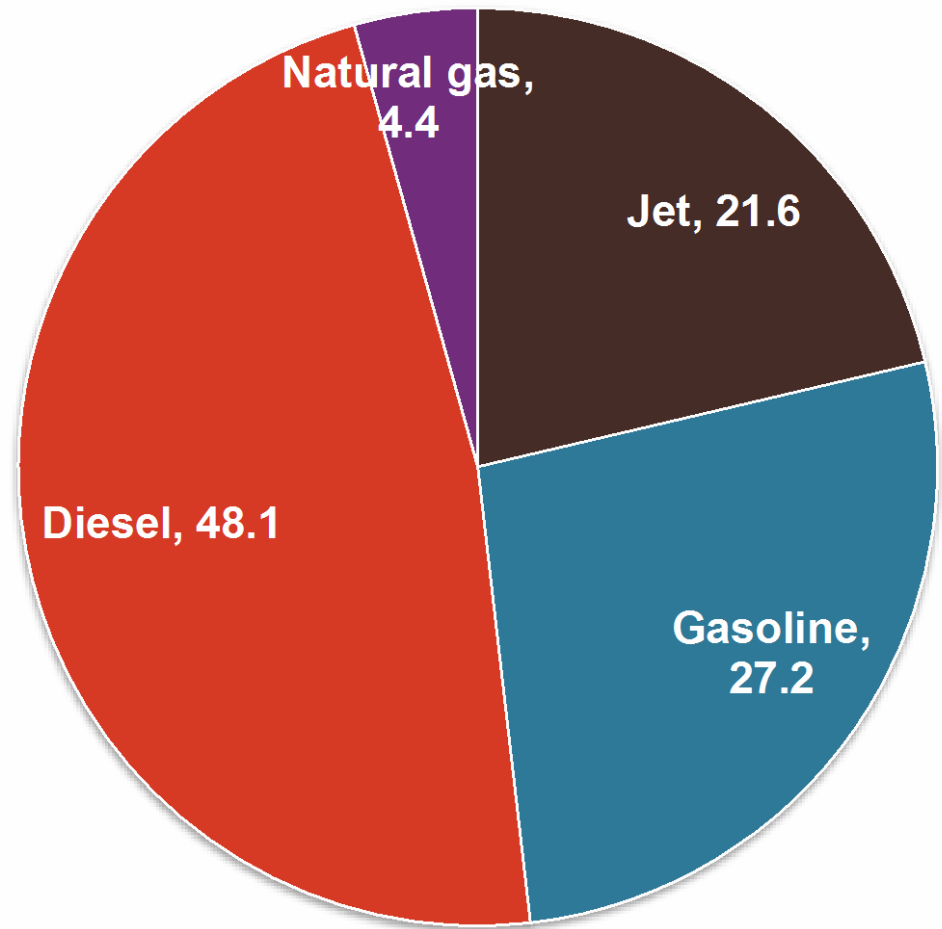
**Packard grantees meeting,
June 2015**



Context: The market for liquid fuels

- World Energy Council, 2013 2050 'symphony' energy scenario
 - 120 EJ of total transport energy demand
 - 105 EJ of liquid fuel demand
 - 95 EJ of fossil fuel demand

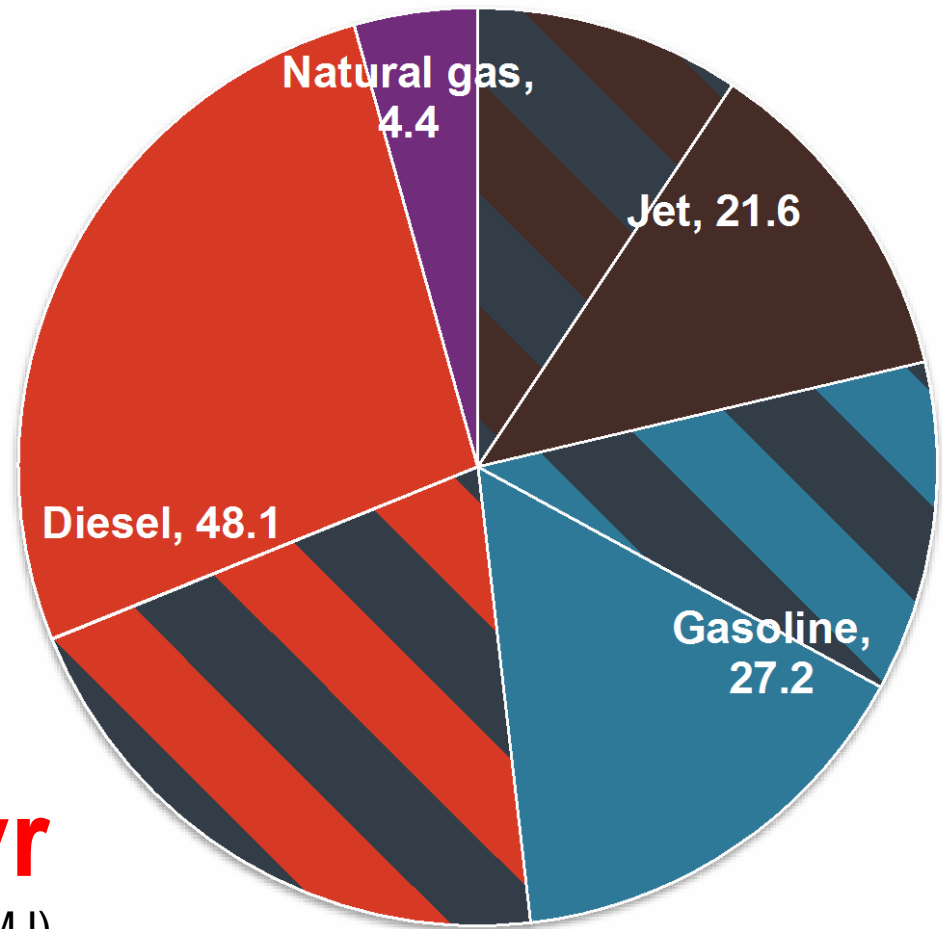
Exajoules of transport fossil 2050



The potential market for unconventional oil

- Up to 44 EJ of liquid fuels could come from unconventional oil by 2050

Exajoules of transport fuel (alt.),

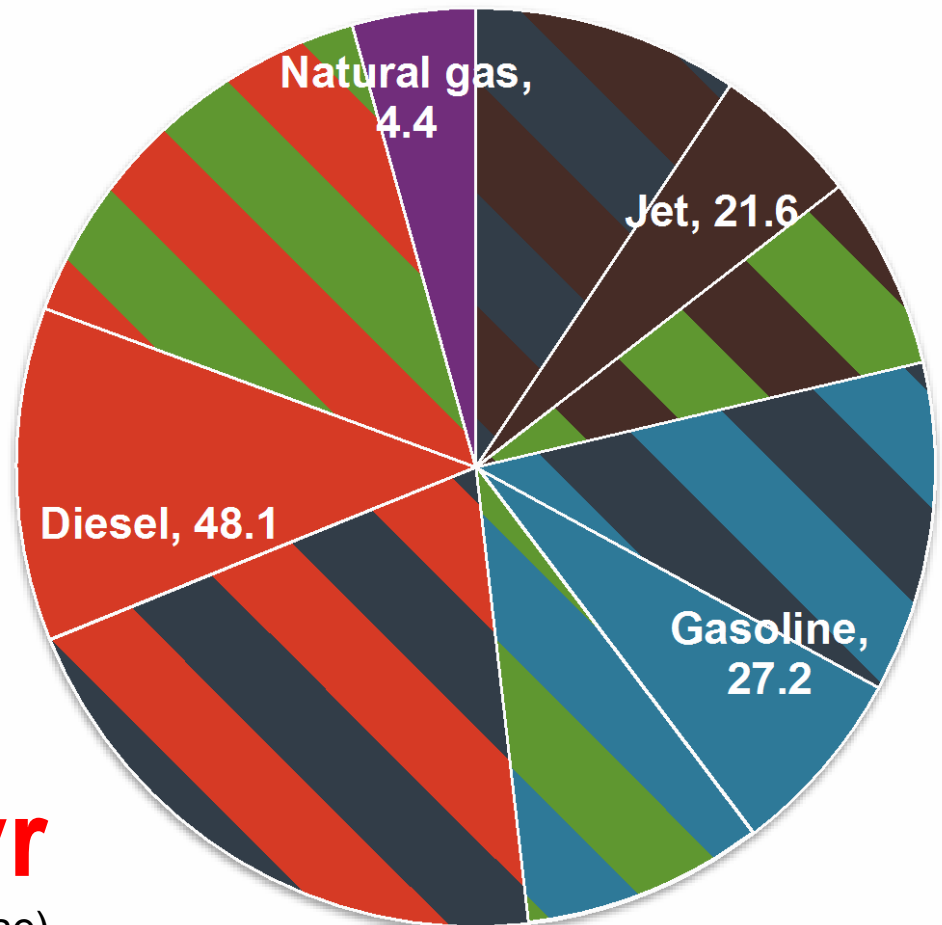


~ 700 MtCO₂e/yr

(at a carbon differential of 15 gCO₂e/MJ)

The potential market for biofuels

- IEA estimates that up to 33 EJ of liquid fuels could be supplied by biofuels
- Exajoules of transport fuel (alt.),



~ 500 MtCO₂e/yr
(increase in 'worst' case)

~ 1,500 MtCO₂e/yr
(saving in 'best' case)

Key policies

Biofuel mandates

EU – status

- The Renewable Energy Directive as primary policy
- Still target 10% renewable energy in transport (2020)
- The ‘ILUC Directive’:
 - Cap the contribution of food-based fuels at 7 of the 10 percent
 - A 0.5% target for fuels from a defined list of second gen feedstocks
- 2030:
 - An overall 27% renewable energy target
 - Unclear whether [alt/bio] fuels will have an EU level target

EU – observations

- The commitment to delivering cellulosic fuels must be demonstrated at MS level (e.g. Italy)
- There is considerable difference of opinion over the future of food-based biofuels
 - Shut down
 - Phase out
 - Freeze
 - Ramp up
- Enhanced focus on waste and residual feedstocks, ILUC avoidance
- Post 2020 is highly unclear

US – federal policy

- The Renewable Fuel Standard remains effective at dictating supply of renewable and advanced fuel
- Lack of clarity over likely evolution of volumes to 2022
- Standard blend levels a barrier to increased fuel deployment
- The cellulosic mandate remains challenging, but cellulosic RINs are now being generated
 - Biogas from landfill
 - Cellulosic ethanol
- How to set the cellulosic mandate?
 - Companies have missed targets in past
 - Excessively low targets could however suppress growth

Other major markets

- Brazil
 - Sugarcane ethanol blend levels remain high, relatively stable around 25%
 - Favorable tax treatment for ethanol is being used to offset falling gasoline price
 - Biodiesel at 7%
 - Modest ethanol exports in 2015 (1.3 billion litres)
- Indonesia
 - Introduction of a new palm export levy to fund biodiesel subsidy
 - Fund may also support land rehabilitation, smallholder replanting
 - By 2025:
 - 25% biodiesel for road transport
 - 5% biofuel for aviation
 - 20% ethanol for road (5% by 2020)

Key policies

Low carbon fuel
standards

California

- Successful LCFS re-adoption
- Revised pathway values and process
- Increased certainty: re-adoption + introduction of credit clearance mechanism
- LCFS credit values increased to over \$80 per tonne
- Potentially more important now as an investment driver for new technologies

Germany

- LCFS-like implementation of the Fuel Quality Directive (FQD) since start of 2015
- Replaces biofuel volume mandates
- No indirect land use change accounting under FQD
- Unclear whether and which other EU Member States might follow suit

Pacific region

- Oregon Clean Fuels Program moving forward
- British Columbia RLCFRR continues
- Washington Clean Fuels Standard stopped by political action
- Limited prospect for additional LCFSs in the near term

Key policies

Aviation

Market based measure for global aviation

- Being developed by International Civil Aviation Organization (ICAO) to help aviation meet target for carbon neutral growth from 2020
- Offset program, with credits for biofuel use as one emissions reduction option
- Unlikely on its own to offer enough value to bring new fuels to market (will require complementary incentives)

Key policies

Oil

Carbon intensity reporting for oil

- California
 - MCON reporting continues
 - Carbon intensities set on each oil stream coming to California
 - Credits for ‘innovative’ emissions reduction projects
- Europe
 - Modifications to the fuel quality directive introduce oil origin reporting
 - Upstream emissions reductions to be eligible towards FQD compliance

Closing thoughts

Closing thoughts

- Cellulosic fuel production incentives may be firming up again
- Adoption of biofuel policies in developing world has slowed but not stopped
- New fuel technologies will raise new sustainability questions

Look, progress!



Thanks for listening!
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