



# Life Cycle Analysis of Biofuels

## Regulatory Environment in Canada

Paul Wieringa, Executive Director  
October 18, 2011

# Low Carbon Fuel Requirements in Canada

Low Carbon  
Fuel  
Requirement

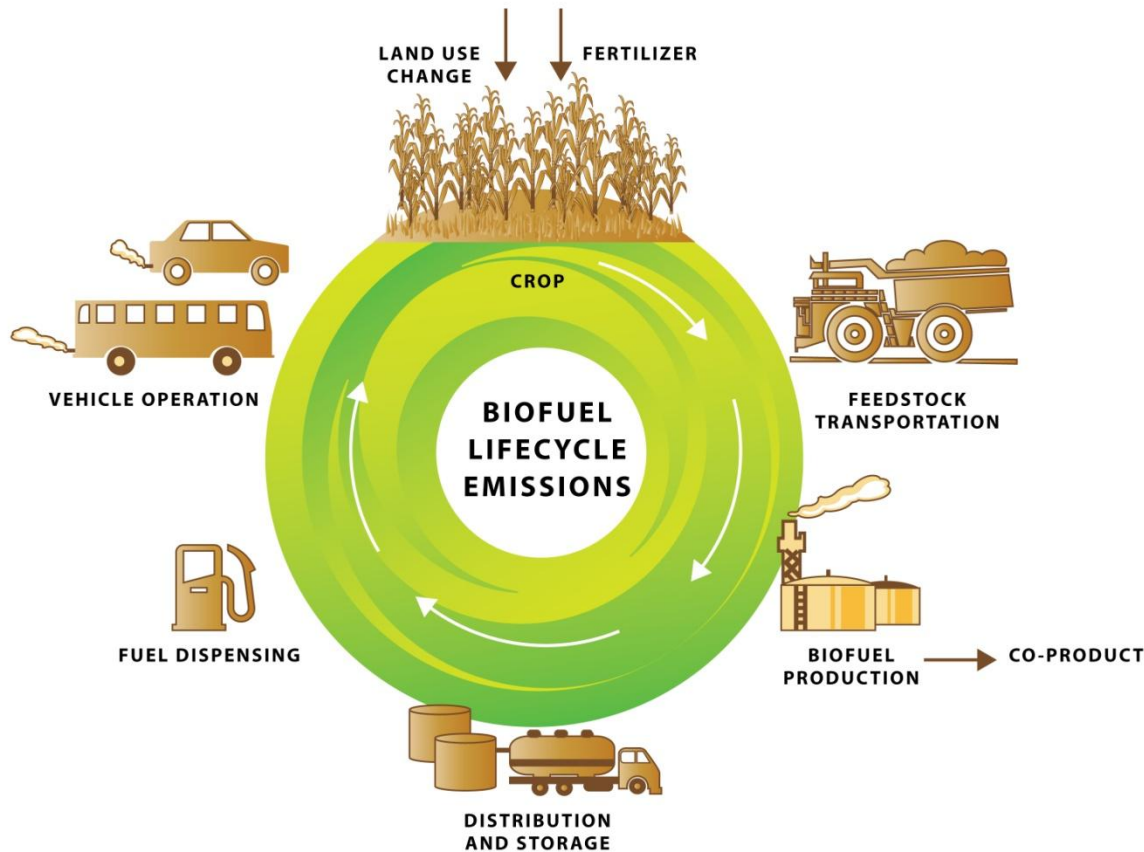




# Life Cycle Assessment in Canada

- Calculation of LCA for Transportation in Canada
- Alberta's Emissions Eligibility Standard
- BC's Low Carbon Fuel Requirement
- Challenges and Lessons Learned
- Opportunities for Improvement
- Future Areas of Research

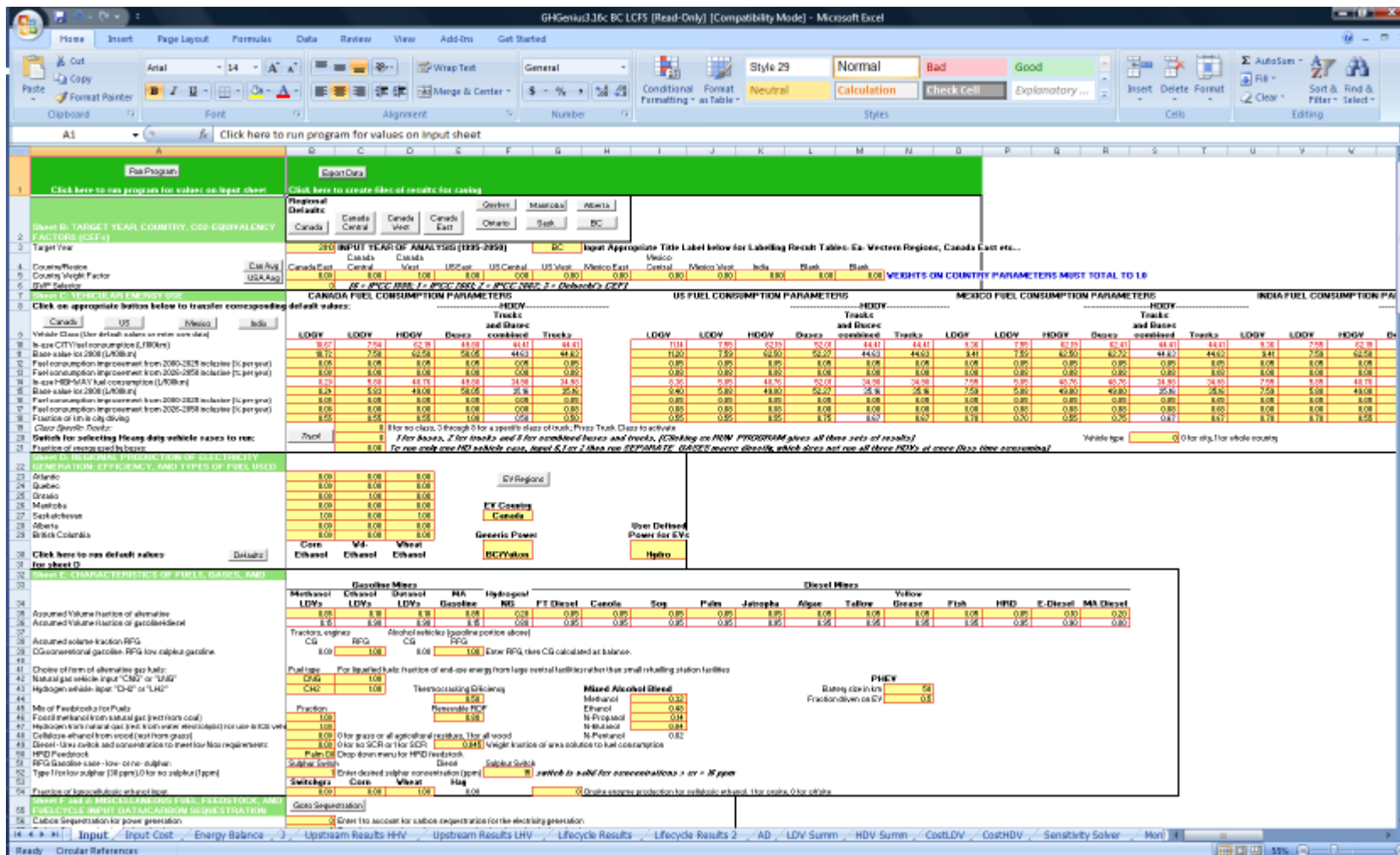
# LCA for Transportation in Canada



- GHG Genius
- ISO 14040 and 14044
- Data for fuels used in Canada



# What is GHGenius?



GHGenius 3.6c BC LCP5 (Read-Only) [Compatibility Mode] - Microsoft Excel

Click here to run program for values on input sheet

Click here to create files of results for saving

Section 1: Vehicle Class

Section 2: Fuel Type

Section 3: Engine Specifications

Section 4: Vehicle Class

Section 5: Fuel Type

Section 6: Engine Specifications

Section 7: Input Parameters

Section 8: Output Results

Section 9: Summary

Section 10: Sensitivity Analysis

Section 11: Life Cycle Assessment

Section 12: Carbon Footprint

Section 13: Greenhouse Gas Emissions

Section 14: Air Quality

Section 15: Noise and Vibration

Section 16: Safety

Section 17: Health and Environment

Section 18: Social and Economic

Section 19: Policy and Legislation

Section 20: Conclusion

Section 21: References

Section 22: Appendix

Section 23: Glossary

Section 24: Index

Section 25: About

Section 26: Help

Section 27: Contact

Section 28: Feedback

Section 29: Privacy Policy

Section 30: Terms of Service

Section 31: Disclaimer

Section 32: Warranties

Section 33: Limitations

Section 34: Exclusions

Section 35: Force Majeure

Section 36: Assignment

Section 37: Severability

Section 38: Entire Agreement

Section 39: Governing Law

Section 40: Jurisdiction

Section 41: Arbitration

Section 42: Dispute Resolution

Section 43: Notices

Section 44: Amendments

Section 45: Revisions

Section 46: Updates

Section 47: Version History

Section 48: Release Date

Section 49: Copyright

Section 50: Trademark

Section 51: Patent

Section 52: Intellectual Property

Section 53: Confidentiality

Section 54: Non-Disclosure

Section 55: Assignment of Rights

Section 56: Indemnification

Section 57: Insurance

Section 58: Liability

Section 59: Damages

Section 60: Remedies

Section 61: Waiver

Section 62: Release

Section 63: Acknowledgment

Section 64: Consent

Section 65: Assent

Section 66: Approval

Section 67: Authorization

Section 68: Ratification

Section 69: Confirmation

Section 70: Validation

Section 71: Verification

Section 72: Vouching

Section 73: Attestation

Section 74: Certification

Section 75: Accreditation

Section 76: Authorization

Section 77: Approval

Section 78: Consent

Section 79: Assent

Section 80: Confirmation

Section 81: Validation

Section 82: Verification

Section 83: Vouching

Section 84: Attestation

Section 85: Certification

Section 86: Accreditation

Section 87: Authorization

Section 88: Approval

Section 89: Consent

Section 90: Assent

Section 91: Confirmation

Section 92: Validation

Section 93: Verification

Section 94: Vouching

Section 95: Attestation

Section 96: Certification

Section 97: Accreditation

Section 98: Authorization

Section 99: Approval

Section 100: Consent



# Calculation of Carbon Intensity

Fuel Dispensing
Fuel Distribution and Storage
Fuel Production
Fuel Transmission
Feedstock Recovery
Land Use Change
Fertilizer Manufacture
Gas Leaks and Flares
CO <sub>2</sub> and H <sub>2</sub> S Removed
Emissions Displaced
Fuel Use



# Alberta's Renewable Fuels Greenhouse Gas Emissions Eligibility Standard

- Must demonstrate 25% fewer gas emissions than the equivalent petroleum fuel
- GHGenius version 3.19



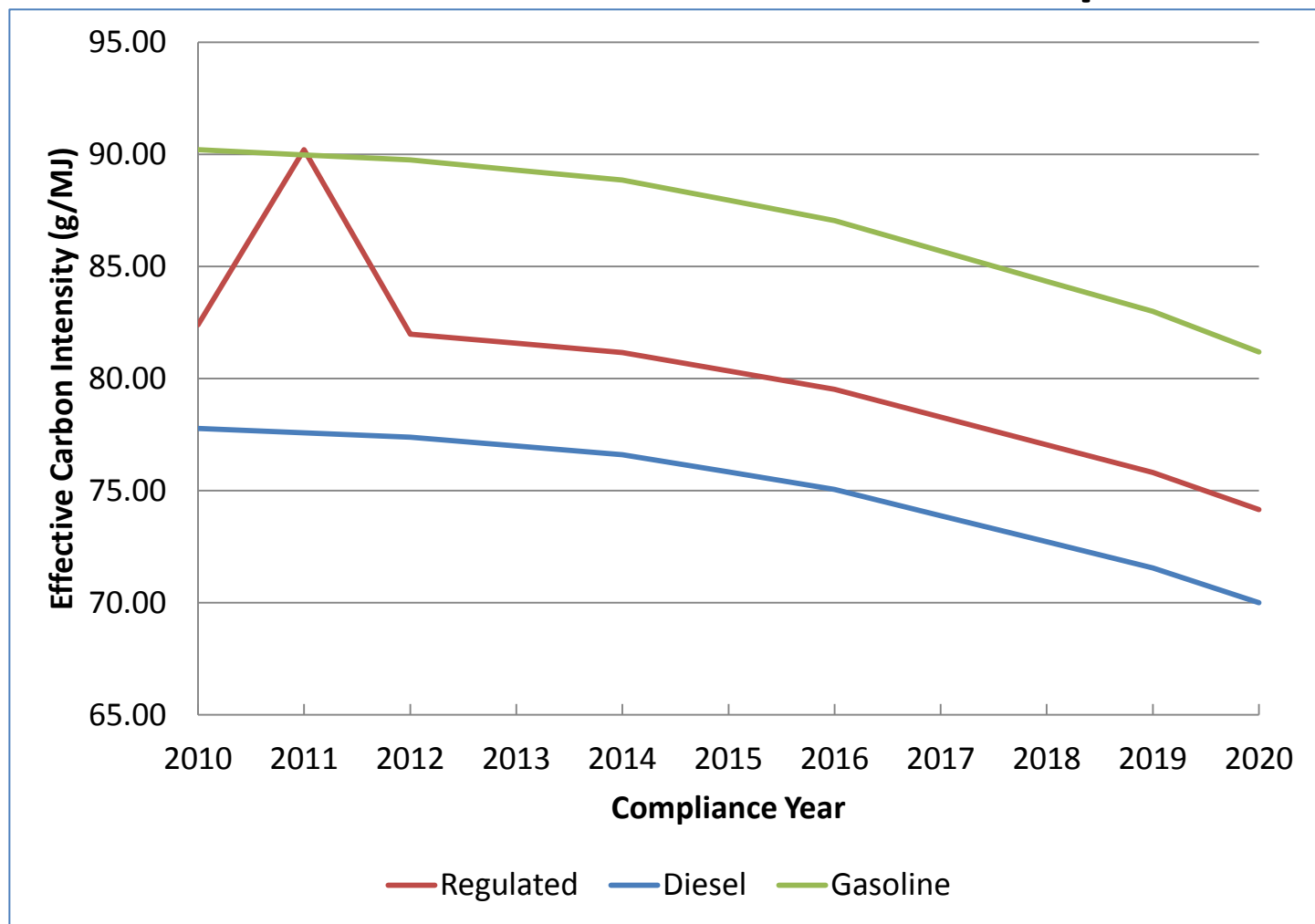
# BC's Renewable and Low Carbon Fuel Requirements Regulation

- 5% provincial annual average renewable content in gasoline
- 4% renewable content in diesel in 2011; 5% for 2012 onward
- 10% reduction in carbon intensity by 2020
- GHGenius version 3.16c





# The How: Low Carbon Fuel Requirement





# 2010 Reported Carbon Intensity Values

Fuel	Prescribed Carbon Intensity	Average Reported Carbon Intensity
All Fuels	82.40	82.40
Gasoline Class	90.21	88.56
Diesel Class	93.33	77.07
Gasoline and Diesel		83.66



## Results of 2010 Reporting Year

<b>Volume of gasoline class renewable fuel supplied</b>	<b>Total volume gasoline class fuel supplied</b>	<b>Percent</b>
301,084,967.00	4,760,228,028.00	6.33

<b>Volume of diesel class renewable fuel supplied</b>	<b>Total volume diesel class fuel supplied</b>	<b>Percent</b>
95,758,137.00	3,026,771,175.00	3.16

<b>Total renewable fuel supplied</b>	<b>Total fuel supplied</b>	<b>Percent</b>
396,843,104.00	7,786,999,203.00	5.10



# Challenges and Lessons Learned

- Sustainability/Indirect Land Use Change (ILUC)
- Credit trading and validation
- Gasoline to Diesel
- Compliance Pathways
- New Fuels



# Opportunities for Improvement

- Harmonization with other jurisdictions leading on climate change such as Alberta and California
- New technology and markets





# Future Areas of Research

- Sustainability/Indirect Impacts
- Economic Impact Assessment
- Compliance Pathways
- Impact of Other Legislation
- Marketing/Role of Consumers



Thank you

Paul Wieringa

250-952-0651

Paul.Wieringa@gov.bc.ca

<http://www.empr.gov.bc.ca/RET/RLCFRR>