Integrating innovative technologies and policies for biofuels

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Outline

1. Today's innovative jurisdictions
   - Dynamic policy environment
2. Canada's Renewable Fuels Strategy
   - Foundation important
3. Sending strong signals
   - Complementary policies and programs

Context: Energy policy drivers

- Energy security
  - *Strategic diversification*
- Environment
  - *Greenhouse gas (GHG) emissions*
- Economic development
  - *Competitive advantage*
- Ease *of implementation*
  - *Do-ability*

Context: Biofuels

- Transportation GHG emissions 27% of Canadian total
- Canadian transportation energy use over 99% based on petroleum products

Paradigm shift required to drastically reduce GHG emissions

References: Environment Canada, 2007; NRCan, 2007

1. Innovative jurisdictions today

Dynamic policy environment

California's Low Carbon Fuel Standard (LCFS)

- California (January 2007) announced the intent to regulate that the **life cycle carbon intensity** of transportation fuel must be reduced by 10% from 2010 to 2020
- Details currently being developed
  - Goal: rough draft of regulation around Fall 2008
  - Goal: enforceable regulation by January 2010

Reference: Schwarzenegger, 2007

Other Jurisdictions
Low Carbon Fuel Standard (LCFS)

- Momentum after the California announcement
  - European Commission (January 2007) made a very similar announcement
  - British Columbia (February 2007)
  - Ontario (May 2007)
  - Discussions and proposals at national level in the US

References: European Commission, 2007; Ontario, 2007; BC 2007

United Kingdom

- Renewable Transportation Fuel Obligation (RTFO)
  - 5% renewable content in fuels by 2010/2011.
  - MANDATORY carbon and sustainability reporting
  - Aim to reward biofuels based on carbon savings while evolving sustainability reporting
  - Exploring voluntary labelling scheme for fuel providers
- Interest in harmonizing initiatives in a European Union context

References: RTFO, 2007

Netherlands

- Legislation requiring biomass and biofuels to meet mandatory sustainability criteria is being developed
- There are 6 themes for sustainability criteria:
  - Transportation fuels will need to have a **life cycle GHG balance** at least 30% better than their fossil reference
  - *Other themes:* Environment (water, solid waste, etc.); Competition with food; Biodiversity; Economic prosperity; Well-being (human rights, worker pay, etc.)
- Interest in harmonizing initiatives in a European Union context

Reference: Kwant, 2007

Germany

- Biofuel Quota Law passed (January 2007)
  - There is an ordinance for a mandatory sustainability requirement.
  - Organized between various German ministries
  - **Life cycle sustainability criteria** are expected
- Interest in harmonizing initiatives in a European Union context

Reference: Fritsche, 2007

2. Canada's Renewable Fuels Strategy

Foundation important

Canadian Biofuels Production

- Ethanol
  - Current: ~ 800 million litres per year
    - Canadian ethanol plants range in size from 10 million litres to 200 million litres
  - Expected: ~ 1.5 billion litre per year by 2008
- Biodiesel
  - Current: ~ 100 million litres per year

Canada's Renewable Fuels Strategy

Four key elements of Canada's Renewable Fuels Strategy:

1. Regulation to establish demand
2. Production incentive to stimulate domestic production
3. Support for farmer participation in biofuels production
4. Support for deployment of next-generation technologies

1. Renewable Fuels Standard

- Intent to regulate announced December 2006
- Average renewable content of 5% based on the gasoline pool by 2010 and 2% in the diesel and heating oil pool by 2012
  - ~2.3 billion litres of renewable alternative(s) to gasoline
  - ~500 million litres of renewable alternative(s) to diesel
    - Represents nearly 5 times current Canadian production
  - Expected to have ~ 4 Mt GHG emissions reduction in the transportation sector
- Regulatory development process is on-going

2. ecoENERGY for Biofuels

- Announced July 5, 2007
- Up to $1.5 billion over 9 years (up to 7 years per plant)
- *Focus:* operating incentive to producers of renewable alternatives to gasoline and diesel
  - Effective April 1, 2008
  - Up to $0.10 for renewable alternatives to gasoline & $0.20 for renewable alternative to diesel for 3 years, declining thereafter
- Encourage development of sustainable renewable fuels industry and encourage production towards regulation

3. Agricultural Programs

- Announced April 23, 2007
- $200 million over 4 years under ecoAgriculture Biofuels Capital (ecoABC)
- *Focus:* repayable capital incentive based on the level of farmer participation
- Encourage farmer participation in value-added biofuels production by addressing capital access issue
- Biofuels opportunities for Producers Initiative (March 2007) - $20 million to help agricultural producers develop business cases, feasibility

4. NextGen Biofuels Fund™

- Announced September 12, 2007
- $500 million provided to Sustainable Development Technology Canada (STDC)
- ***Focus:*** large-scale demonstration facilities producing second-generation biofuels
  - Eligibility - first-of-kind, located in Canada, representative feedstock, pilot scale
  - Funding criteria – technology/process, sustainability, etc.
- Addresses risk associated with pre-commercial technology deployment

Complementary Measures

- Complementary measures announced include:
  - ecoENERGY Technology Initiative - $230 million for clean energy RD&D
  - Forestry Innovation - $127.5 million for competitiveness issues in the forestry industry
  - Agriculture Bioproducts Innovation Program - $145 million for research networks in agricultural bioproducts & bioprocesses
  - Agri-Opportunities Program - $134 million for commercialization of new agricultural products, processes, or services
- SDTC has existing $550 million SD Technology fund

Further Information on Canada's Renewable Fuels Strategy

Renewable Fuels Strategy: www.ecoaction.gc.ca

Renewable Fuels Regulation: http://canadagazette.gc.ca

ecoENERGY for Biofuels: http://alternativefuels.gc.ca

ecoABC: www.ecoaction.gc.ca

NextGen Fund™: www.sdtc.ca

3. Sending strong signals

Complementary policies and programs

Context: Bioeconomy

Biomass Feedstocks

- Trees
- Grasses
- Agricultural Crops
- Agricultural Residues
- Animal Wastes
- Municipal Solid Waste

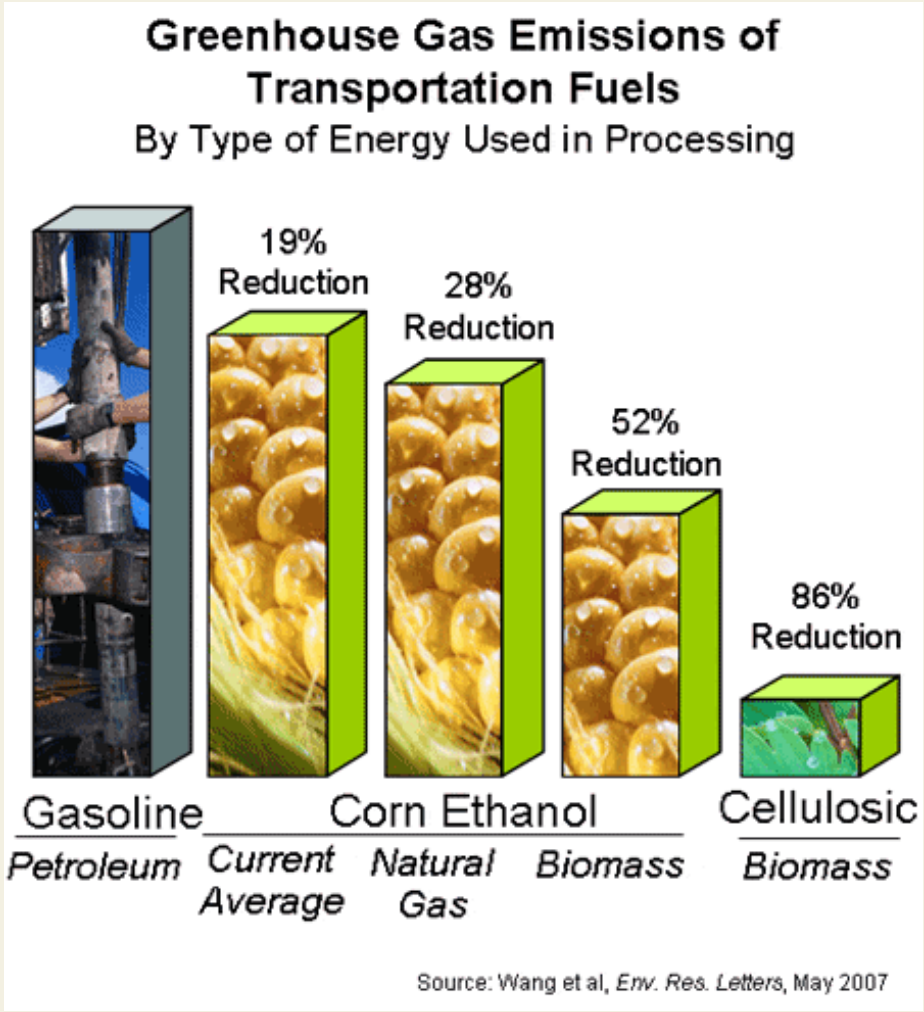
Bioconversion

- Enzymatic Fermentation
- Gas/liquid Fermentation
- Acid Hydrolysis/Fermentation
- Gasification
- Combustion
- Co-firing

USES

- Fuels
- Electricity
- Heat
- Chemicals
- Food and Feed

Context: Potential for life cycle GHG emissions



What we hear about

- Specific **fuels**
  - Cellulosic ethanol, butanol, etc.
- Specific **technologies**
  - Enzymatic hydrolysis, gasification, etc.
- Specific **policies**
  - Mandated volumes, LCFS, etc.
- Specific **concerns**
  - Cost, water use, etc.

What we should keep in mind

- Biofuels not the "**silver bullet**"
  - GHG, energy supply, crude oil prices
- **Next-generation** biofuels have **potential**
  - Commercial success is complex
- **Practical challenges** of implementing long-term policies
  - Not to be underestimated

Practical challenges of implementing long-term policies

- **Discounting** short-term noise
  - Focus on long-term trends
- **Bringing together** stakeholders
  - Many and varied
- **Harmonizing** methodologies
  - Life cycle assessment, land use changes, etc.
- **Balancing** sustainable development goals
  - Environmental, social, and economic priorities

What we need to do

Design long-term fuel policies that:

- **Reduce** overall **demand**
  - Efficiency, conservation
- **Recognize** opportunity costs and trade-offs
  - Finite resources and best use
- **Facilitate solutions** by providing direction
  - Private sector can deliver innovative technology
  - Encourage global trade

How we can do it

- Long-term policy **framework**
  - Embrace multiple drivers
  - Short-term actions in context
- Set clear **targets**
  - Evaluate desired outcomes
  - Allow the market to develop solutions
- **Align** policies and programs
  - Along innovation chain
  - Between sectors

Closing thoughts

- Dynamic time
  - *Paradigm shift?*
- Strong foundation required
  - *Remember the basics?*
- Complementary policies and programs
  - *Integrated strategy?*

Thank you for you attention.

Questions? Comments?

Contact information

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Back-up Slides

References

BC, 2007. British Columbia Speech from the Throne. 2007. http://www.leg.bc.ca/38th3rd/4-8-38-3.htm

EC, 2007. Environment Canada. 2007. Canada's Greenhouse Gas Inventory: 1990-2005. National Inventory Report. Greenhouse Gas Division. May.

European Commission, 2007. Press release http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/120&type=HTML&aged=0&language=EN&guiLanguage=en

Fritsche, 2007. Presentation at 15th European Biomass Conference and Exhibition, Berlin, Germany. May 9.

Kwant, 2007. Presentation at 15th European Biomass Conference and Exhibition, Berlin, Germany. May 9.

Natural Resources Canada. 2007. Comprehensive Energy Use Datatables. **http://oee.nrcan.gc.ca/statistics**

Ontario, 2007. Press release http://www.premier.gov.on.ca/news/Product.asp?ProductID=1281&Lang=EN

RTFO, 2007. UK Department of Transportation http://www.dft.gov.uk/pgr/roads/environment/rtfo/

Schwarzenegger, 2007. Press release http://gov.ca.gov/index.php?/press-release/5074/

Wang, M., Wu, M., and H. Hong. 2007. Life-cycle energy and greenhouse gas emission impacts of different corn ethanol plant types. Environmental Research Letters. April-June.

Governance

- Government of Canada has announced its support for biofuels and development of a comprehensive strategy
- Three key federal departments are responsible for elements of the Renewable Fuels Strategy
  - Agriculture and Agri-Food Canada, Natural Resources Canada, Environment Canada
  - Other departments (e.g. Health Canada, Industry Canada) collaborated on strategy development
- Federal Government developed strategy in consultation with various stakeholders (e.g. provinces, industry)

Clean Energy: Biofuels Benefits

- Basis for benefits:
  - GHG emission: reductions due to CO2 sequestration during feedstock growth & from co-products: reductions in energy use look at fossil energy
- GHGenius model for biofuels:
  - Grain-based ethanol: 30-40% ↓ GHG emissions; 50% ↓ fossil energy use
  - Biodiesel: 60% ↓ GHG emissions; 80% ↓ fossil energy
  - Cellulose-based ethanol: potential for greater GHG emission and fossil energy reductions (e.g., 60-80% ↓ GHG emissions)

Provincial policies

Provinces	Renewable Fuel Mandates	Renewable Fuels Incentives
British Columbia	5% in diesel by 2010	Road Tax Exemption: $0.145/L for ethanol, $0.09/L for biodiesel
Alberta	-	Direct Producer Incentive for Renewable Fuels: $0.14/L, 4-years
Saskatchewan	Mandate effective October 2006 for average 7.5% ethanol in gasoline.	Fuel Distributor Tax Credit: $0.15/L for ethanol produced in SK Variable Rate Producer Incentive Based on Farmer Participation: $0.02/L to $0.10/L
Manitoba	Passed legislation requiring 10% ethanol content in 85% of gasoline.	Provincial Fuel Tax Credit: up to $0.25/L ethanol (in E10); $0.10/L biodiesel.
Ontario	Mandate effective January 1, 2007 for average 5% ethanol in gasoline.	Variable Rate Producer Incentive for Ethanol: $0 - $0.14/L, 12-years
Quebec	Goal of 5% ethanol in gasoline by 2012 with expected cellulosic contribution.	Variable Rate Income Tax Credit for Ethanol: up to $0.19/L