

New Market Opportunities in the Bio-Economy

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(S&T)² Consultants Inc.
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Agenda

- **Bio-Economy Drivers**
- **The World Scene**
- **Where Does Canada Stand?**
- **What are the Challenges?**
- **What needs to be done?**

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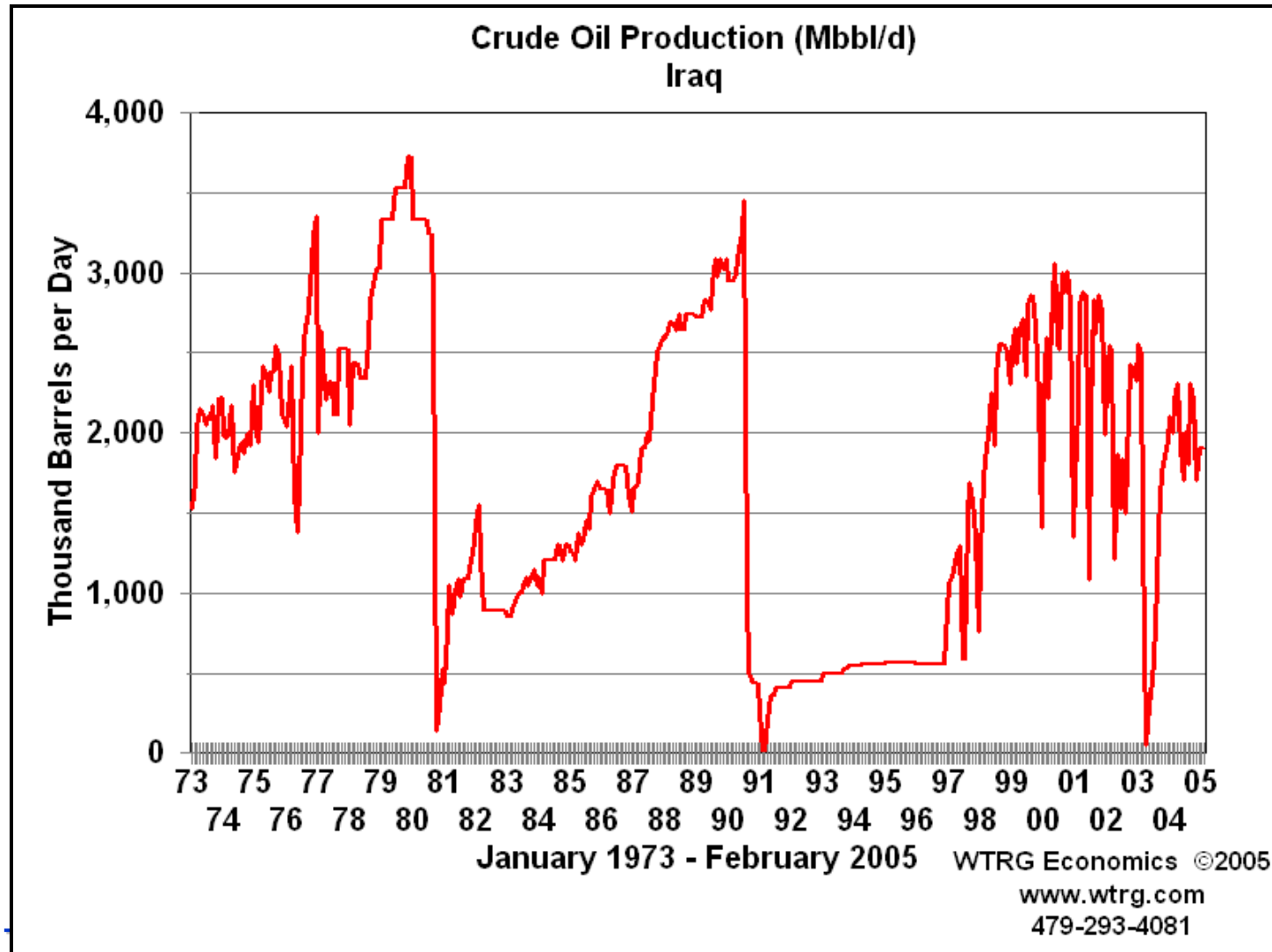
Biofuel Drivers

- **Energy Diversity and Security**
 - A very significant driver in many regions of the world but less so in Canada.
- **Air Quality and Climate Change**
 - Over the years the air quality aspect of biofuels has lost traction as a result of vehicle improvements and changes in gasoline quality. Climate changes is replacing air quality as the environmental driver.
- **Rural Economic Development**
 - The real economic development benefits of biofuels are starting to become apparent in many regions.

Energy Diversity and Security

- Canada is a net exporter of most types of energy so energy security is not a big driver in Canada.
- But more than 50% of the crude oil refined in Canada is imported oil.
- In the event of a world oil disruption, this imported oil will be curtailed and we will be obligated to maintain our exports.
- Canada does get impacted by the world oil price and we get the same economic signals as the rest of the world to reduce consumption and increase supply.

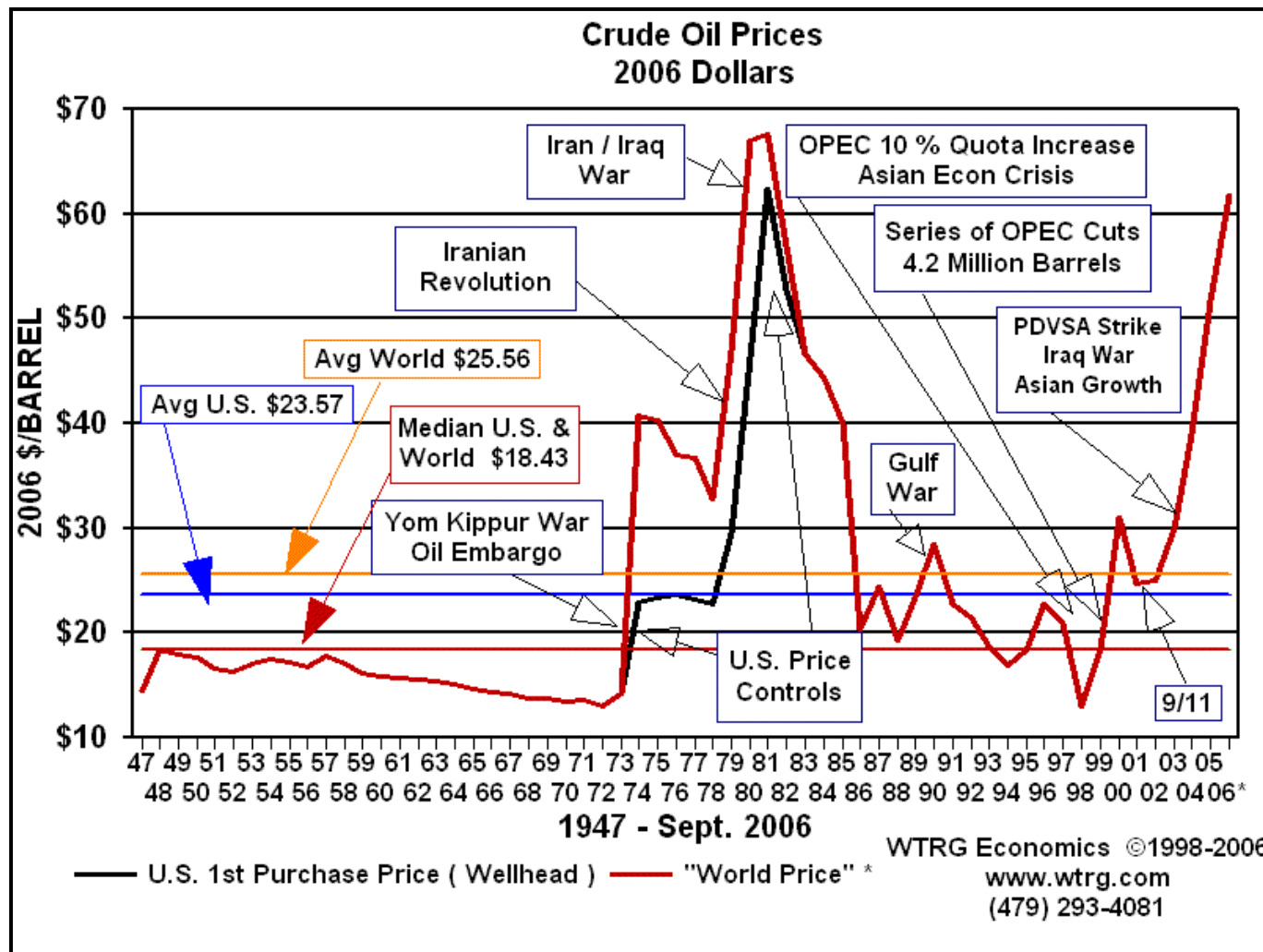
Supply Disruptions



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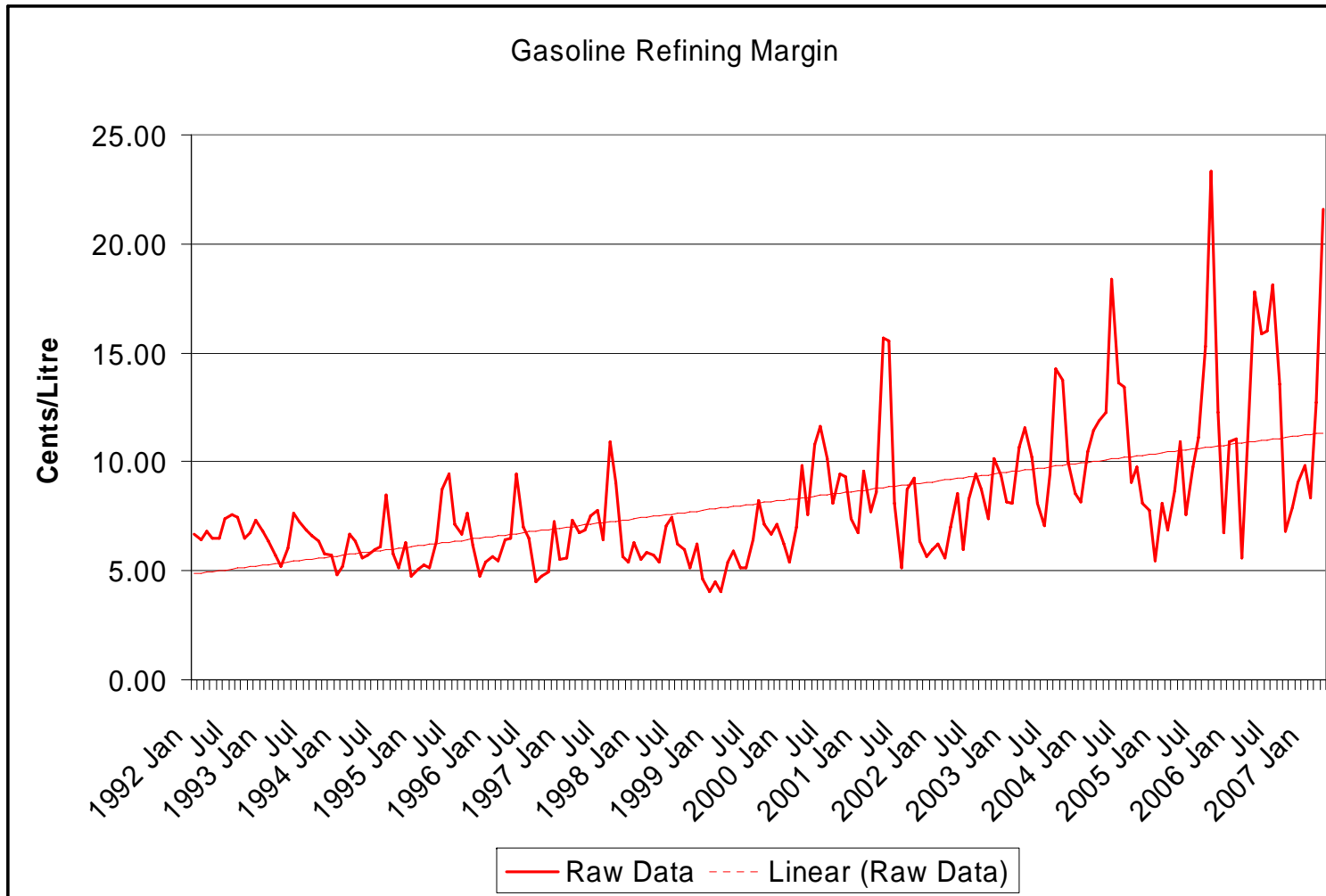
World Oil Prices



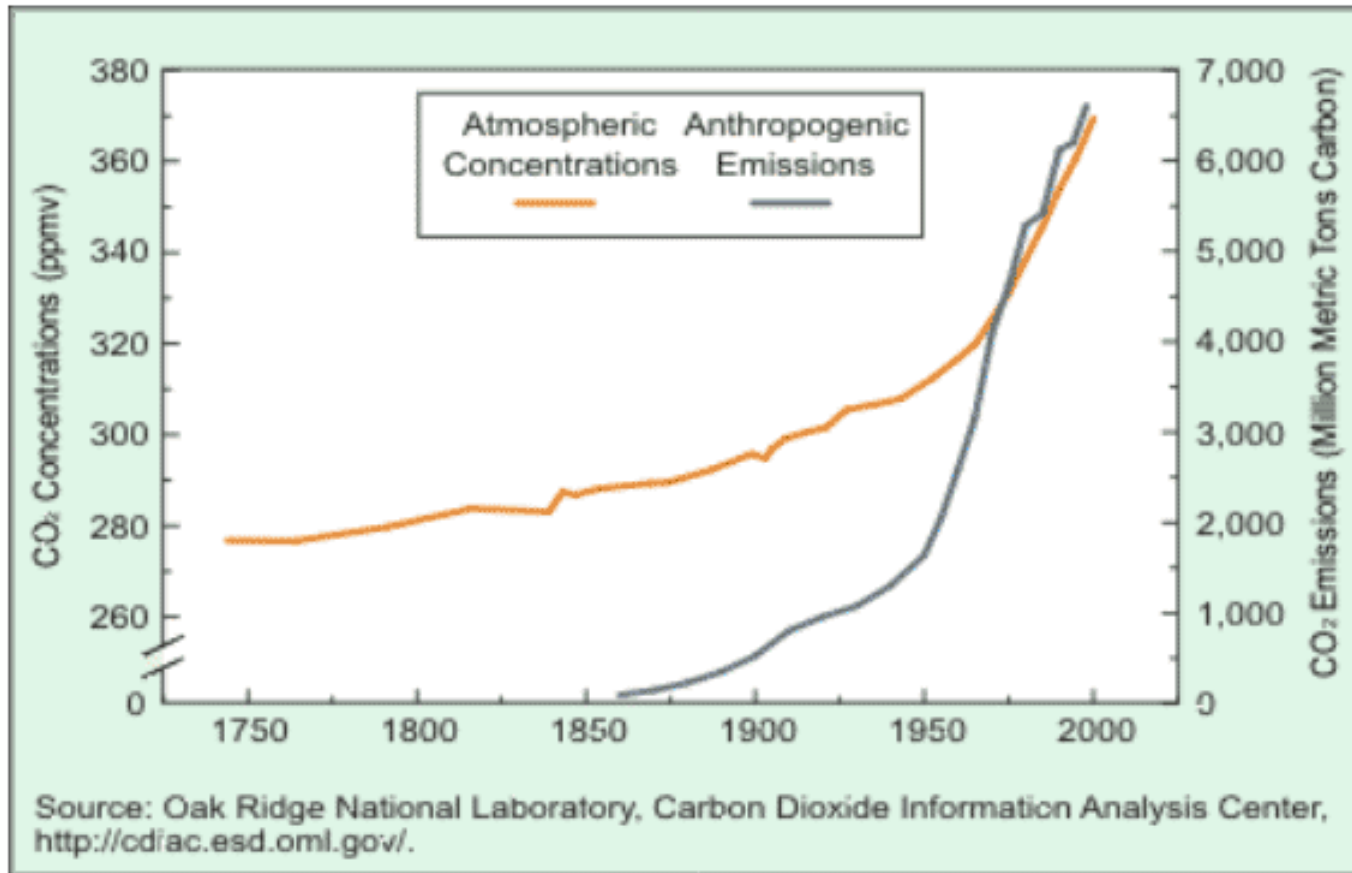
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Refining Capacity Shortages?



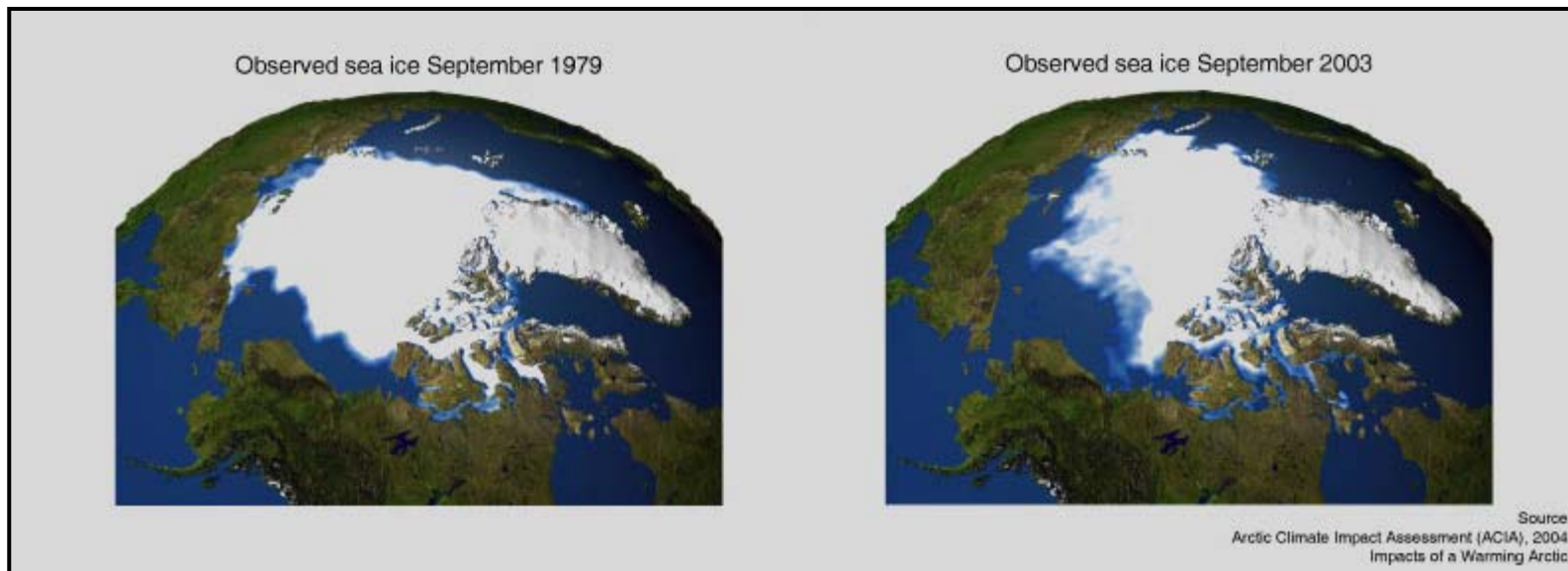
Climate Change



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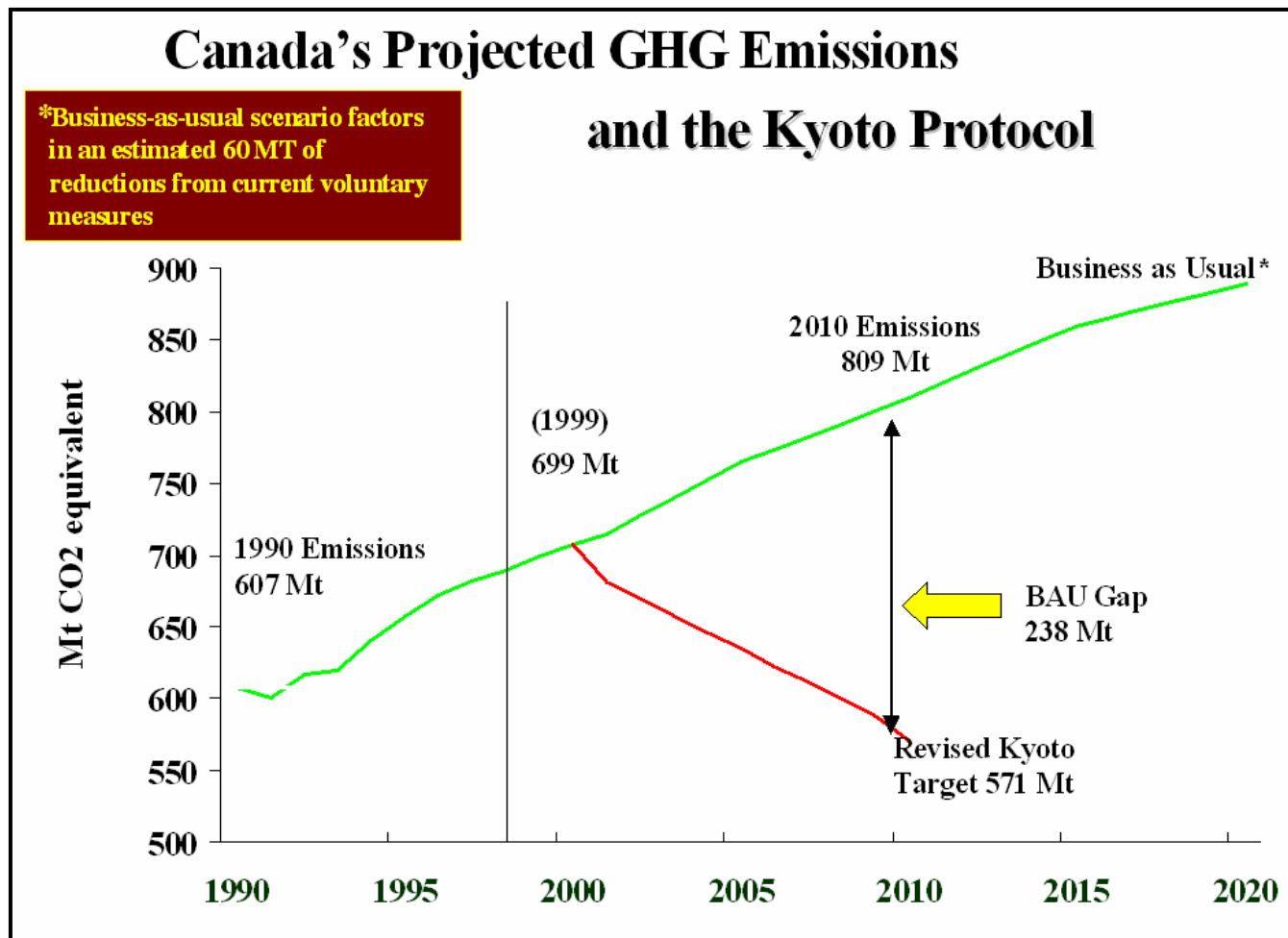
Climate Change



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Canada's GHG Emissions



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Biofuels and the Environment

- Despite the controversy in the popular press, the benefits of biofuels with respect to climate change appear to be accepted by most governments.
- The discussion is starting to turn to how can the benefits be maximized.
- 2 Billion litres of ethanol will reduce GHG emissions by almost 3 MT.
- 1 Billion litres of biodiesel will reduce GHG emissions by almost 3 MT.

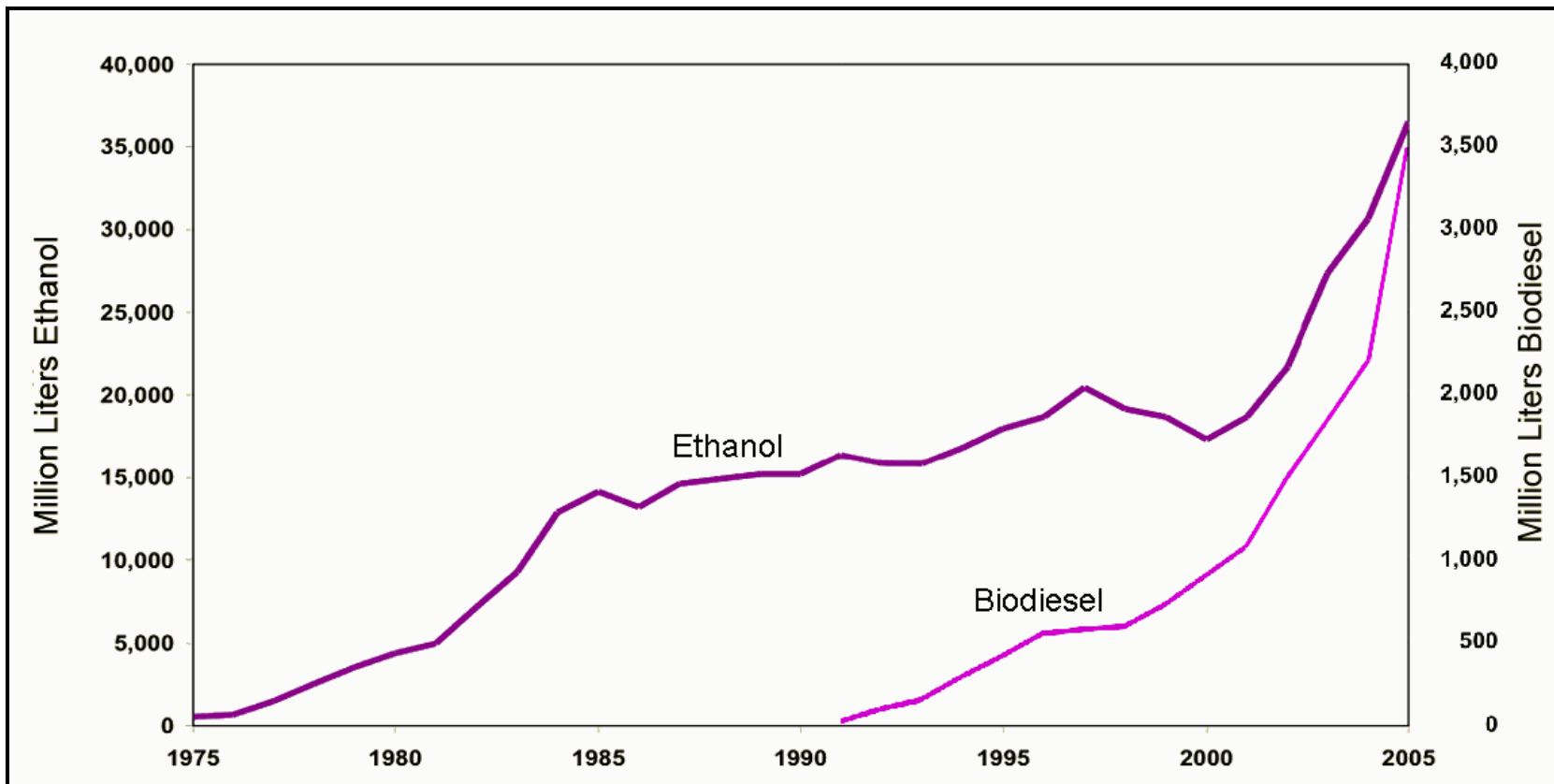
Rural Economic Development

- The OECD estimates that the world spends about \$250 billion per year on payments to support agricultural production.
 - This is a huge subsidy so consumers can experience low cost food.
- Whether the payments are part of a regular program or ad hoc they are a large burden on governments.

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World Biofuel Growth



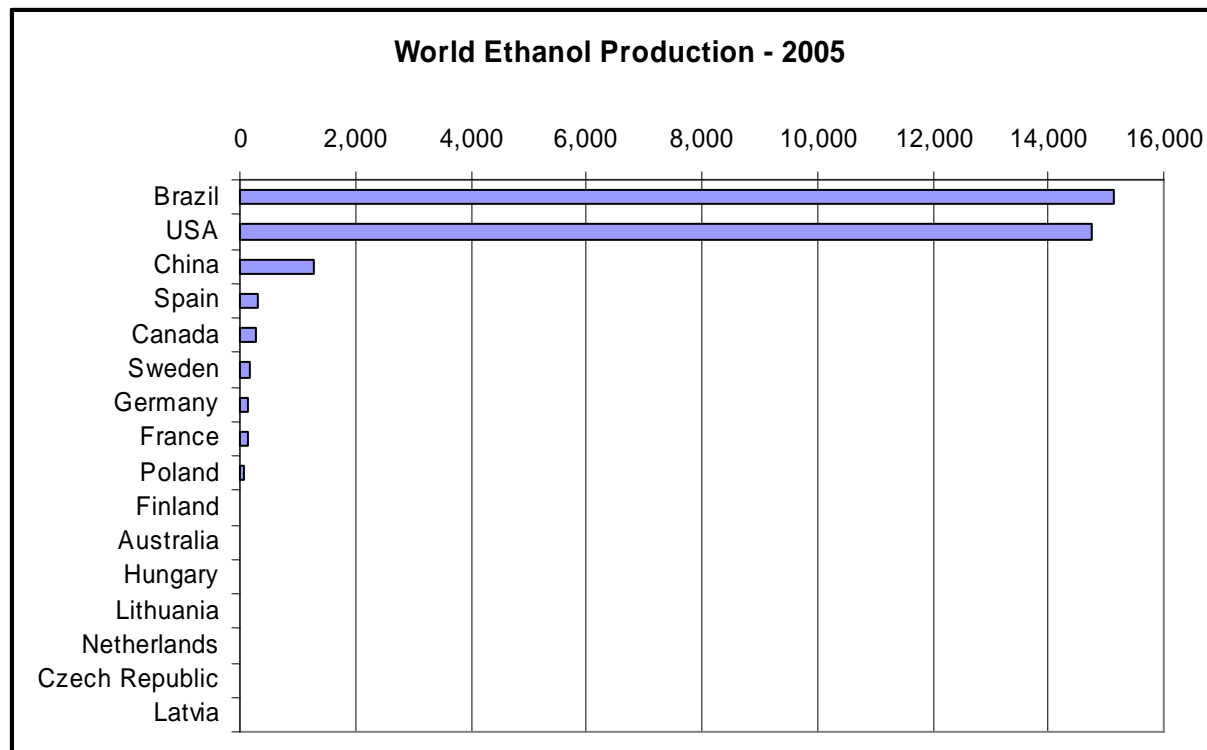
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Who are the Players?

➤ Ethanol

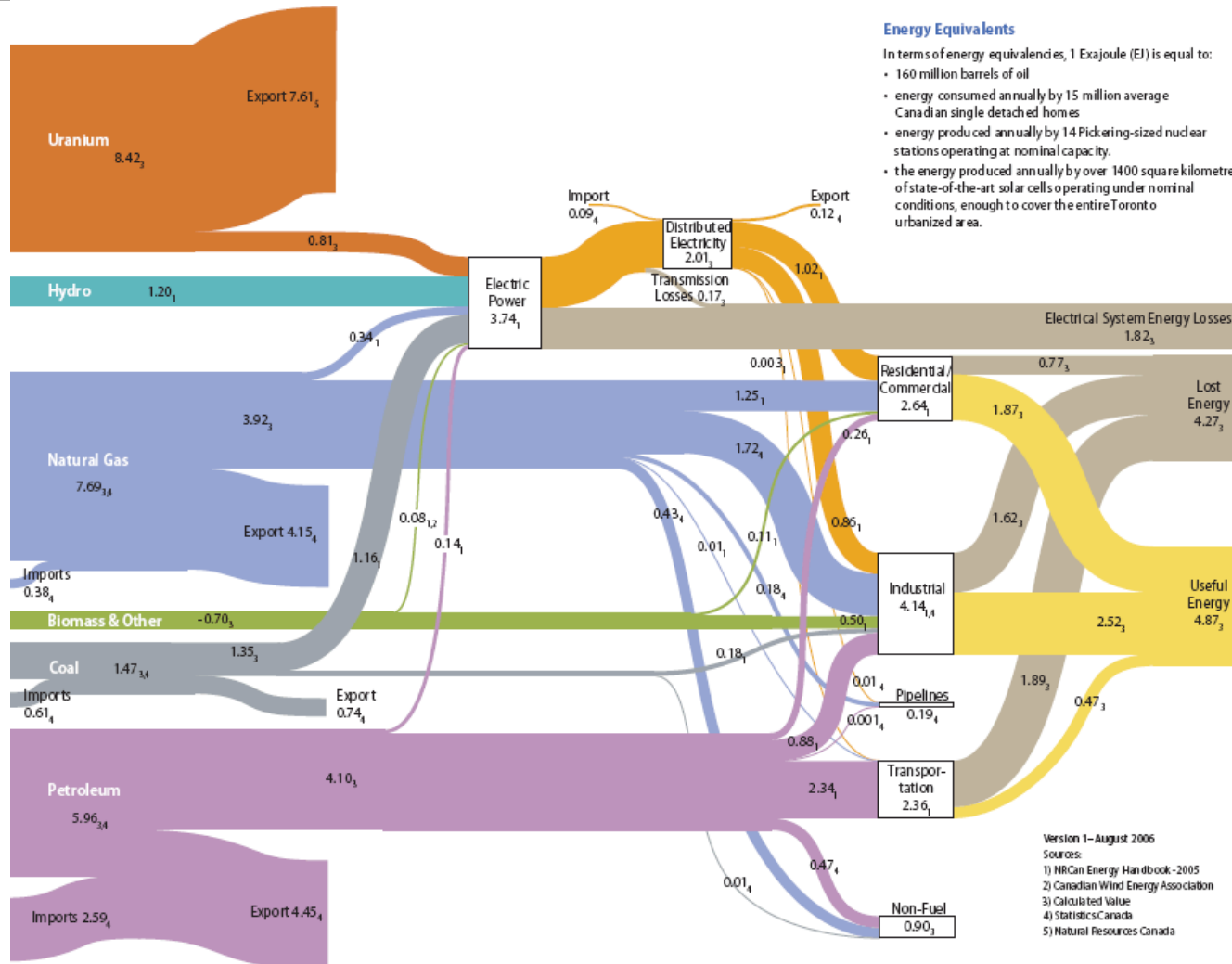
- The US and Brazil account for more than 90% of the worlds ethanol production.



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Energy in Canada

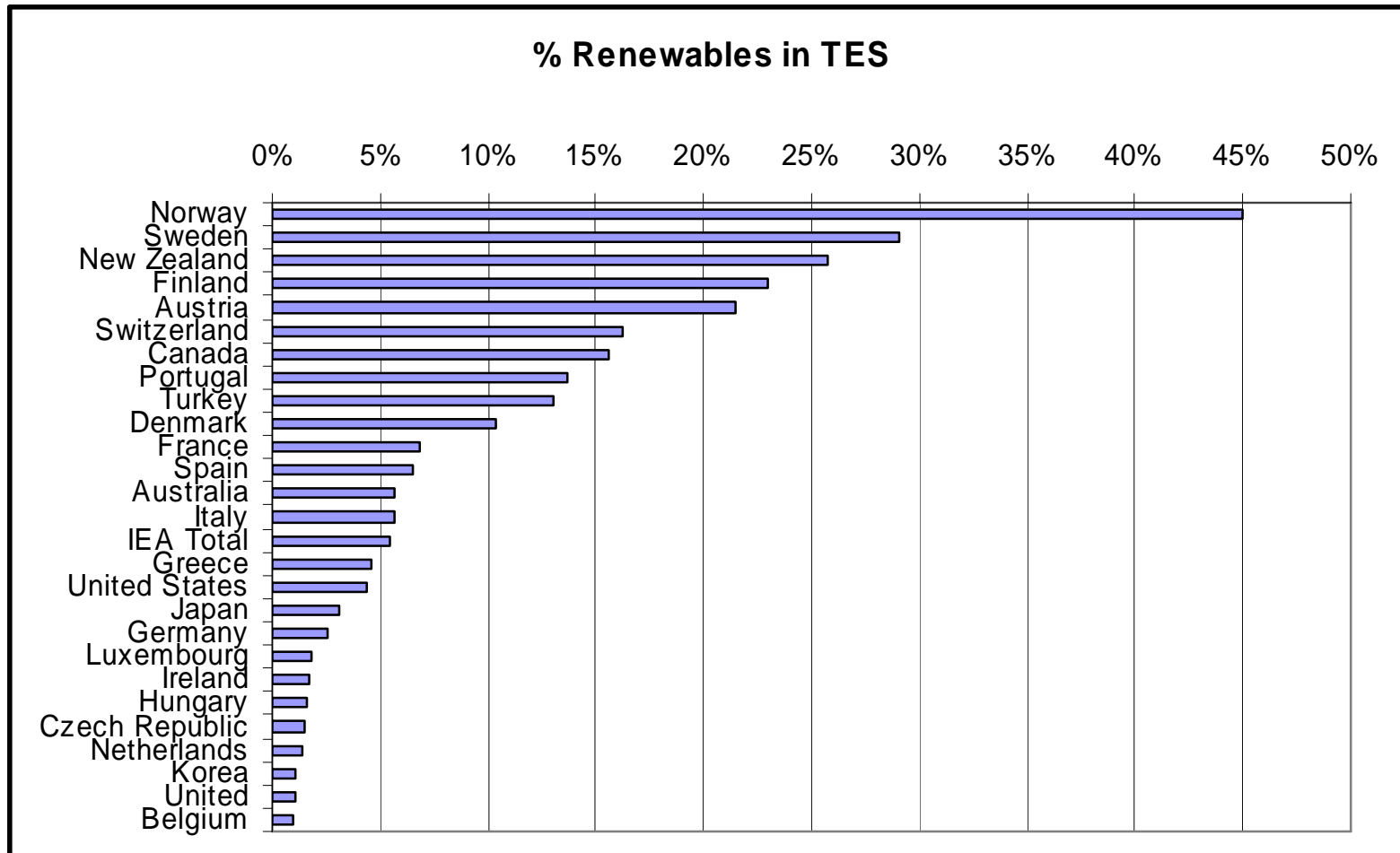


Version 1-August 2006
 Sources:
 1) NRCan Energy Handbook-2005
 2) Canadian Wind Energy Association
 3) Calculated Value
 4) Statistics Canada
 5) Natural Resources Canada

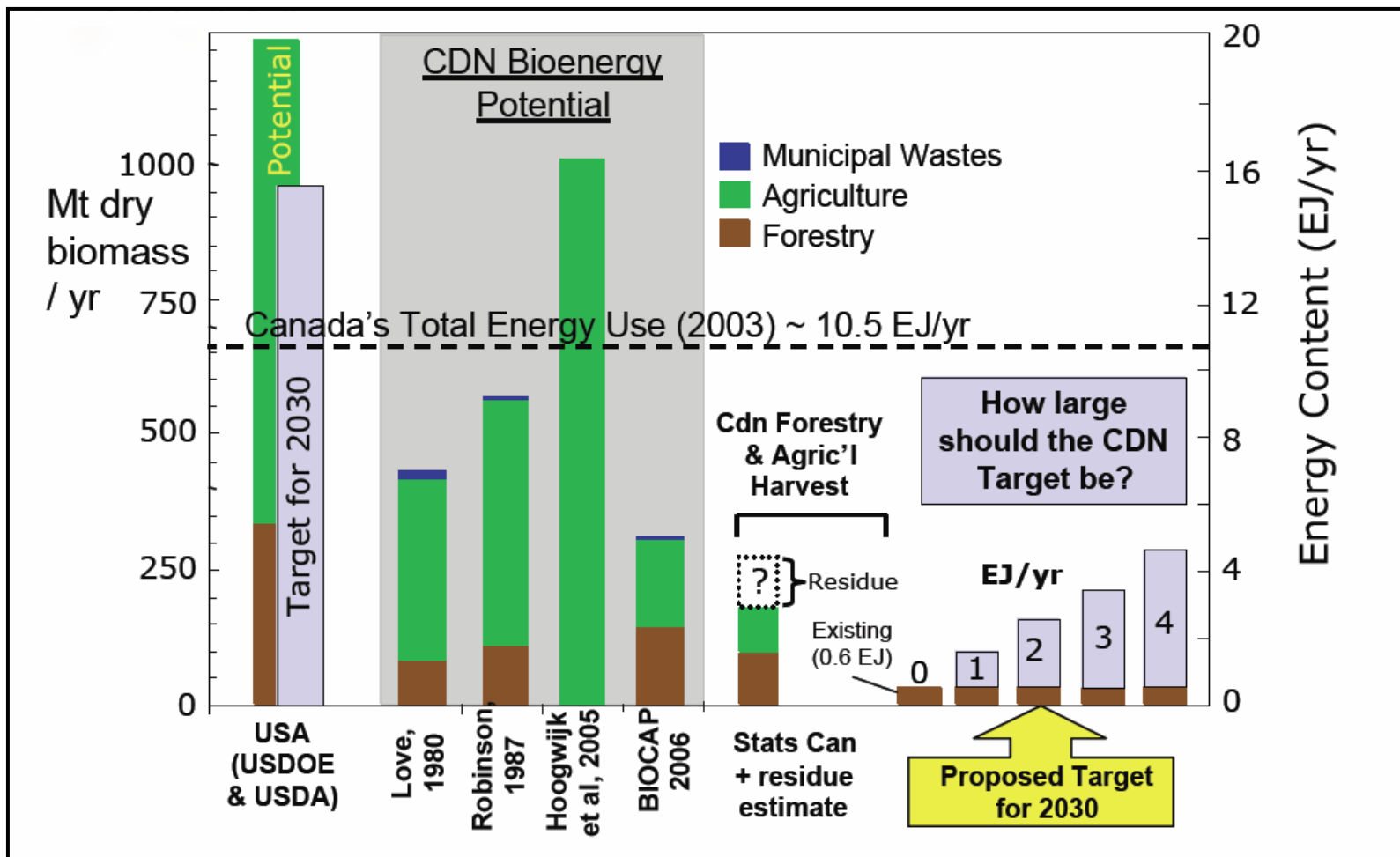
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Renewables in The Total Energy Supply



Bioenergy Potential



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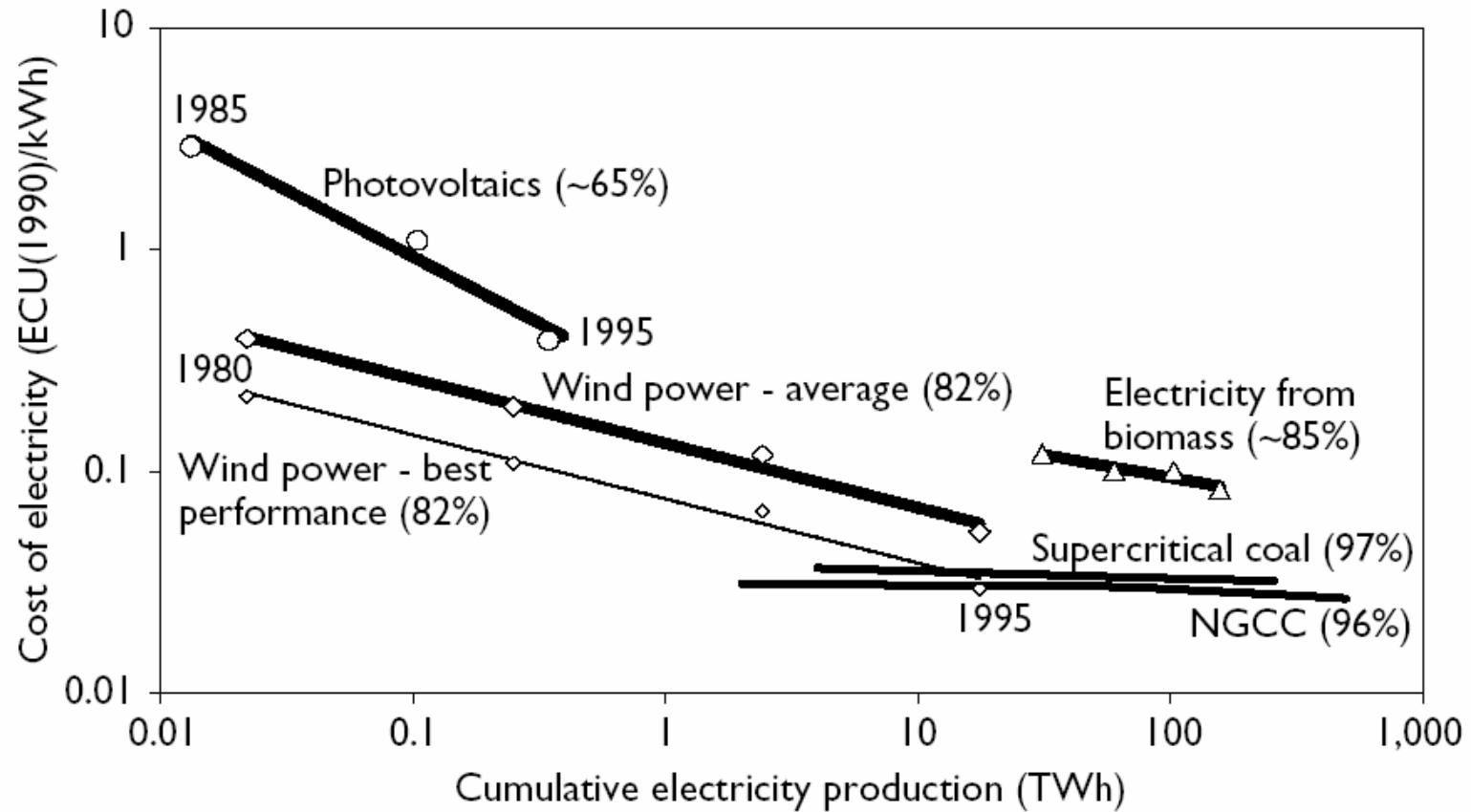
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Market Barriers

Barrier	Barrier Type
Uncompetitive Market Price	Normal
Price Distortion	Market Failure
Information	Market Failure
Transactions Costs	Market Failure
Buyer's Risk	Normal
Finance	Normal
Inefficient Market Organization	Market Failure
Excessive/ Inefficient Regulation	Market Failure
Capital Stock Turnover Rates	Market Failure
Technology Specific Barriers	Normal

Progress Ratios - Electricity Generation in EU

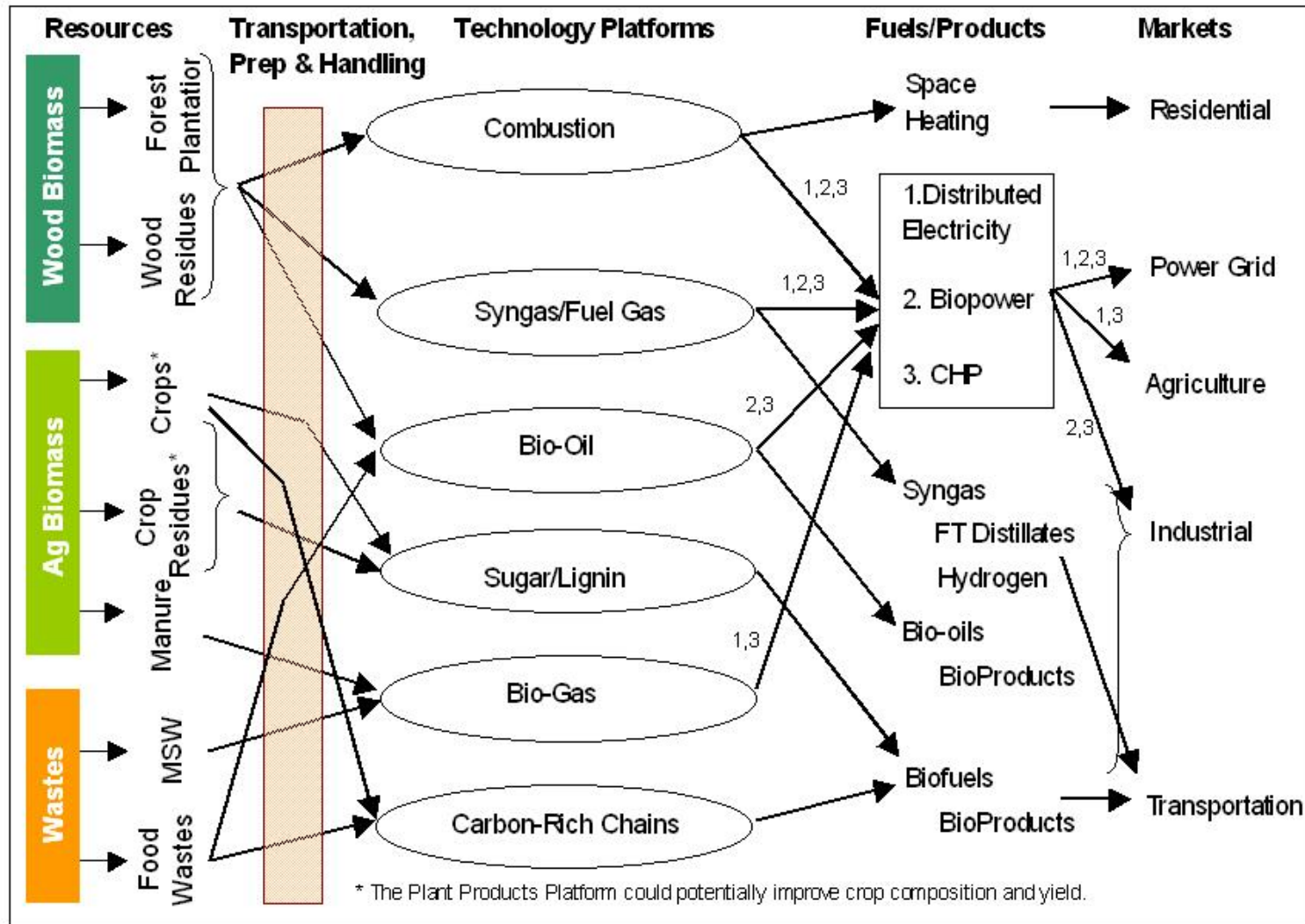


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The Development of Other Energy Sources

- \$40 billion in direct Federal Government incentives to the fossil energy over the past 30 years.
- At least a \$1 billion per year in tax savings to existing fossil fuel industry.
- There would be no Canadian nuclear industry without the government involvement.
- Much of the electric power infrastructure has been and continues to be developed by Governments.

Bioenergy and Biofuels



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There is No Silver Bullet

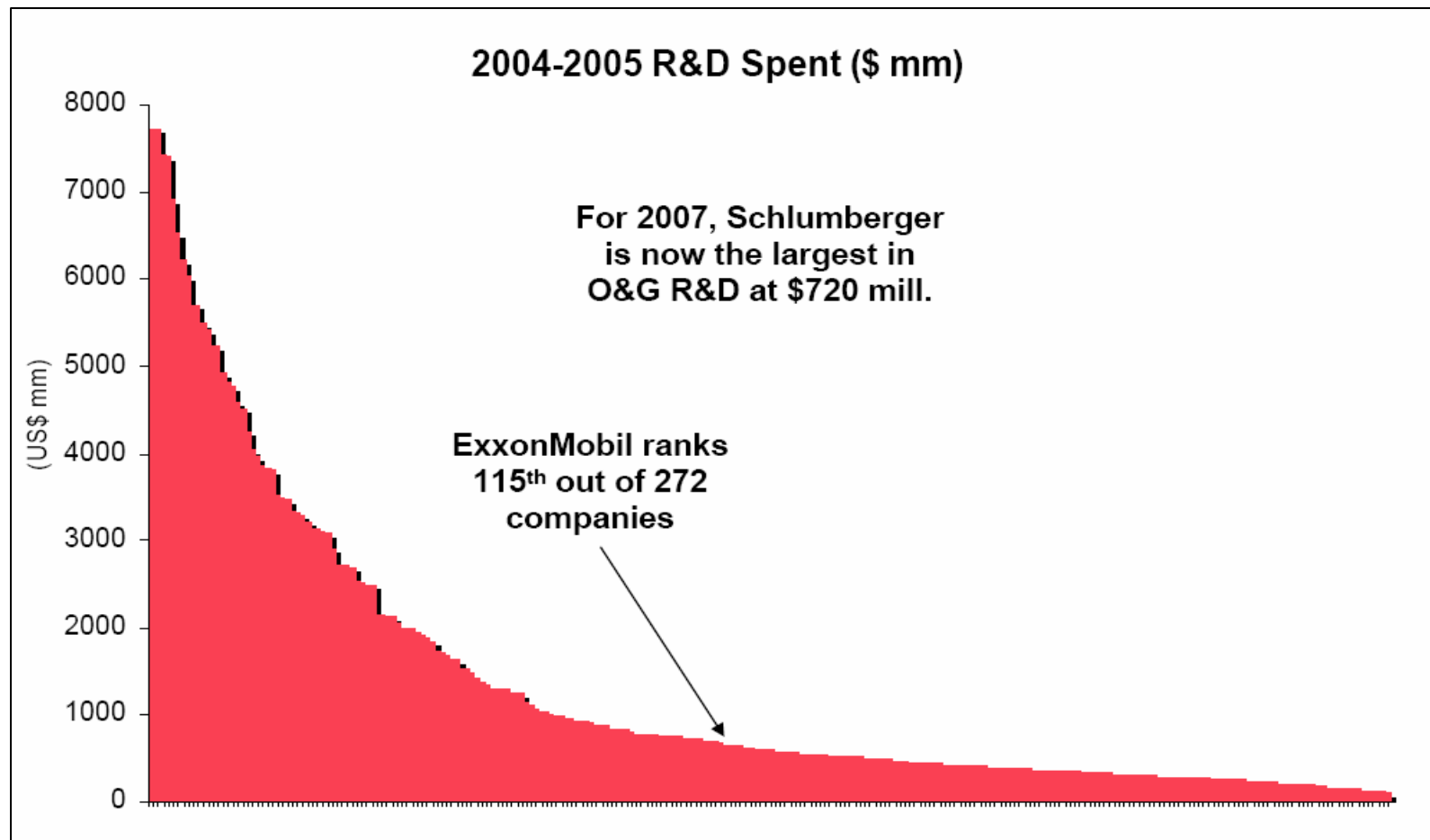


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Traditional Energy Industry R&D

Rank		R&D, 1,000	Revenue 1,000	R&D % Rev	Industry
8	Atomic Energy of Canada Limited	\$264,092	\$286,567	92.2	Energy
19	Suncor Energy Inc.	\$108,000	\$11,084,000	1.0	Energy
23	EnCana Corporation	\$96,933	\$20,356,092	0.5	Energy
29	Ballard Power Systems Inc.	\$91,466	\$65,103	140.5	Energy
38	Imperial Oil Limited	\$68,000	\$27,797,000	0.2	Energy
50	Syncrude Canada Ltd.	\$44,400	nd		Energy
55	Shell Canada Limited	\$41,000	\$14,171,000	0.3	Energy
80	Petro-Canada	\$23,000	\$17,585,000	0.1	Energy/
97	Xantrex Technology Inc.	\$15,052	\$172,674	8.7	Energy

It is Not Just Canada!



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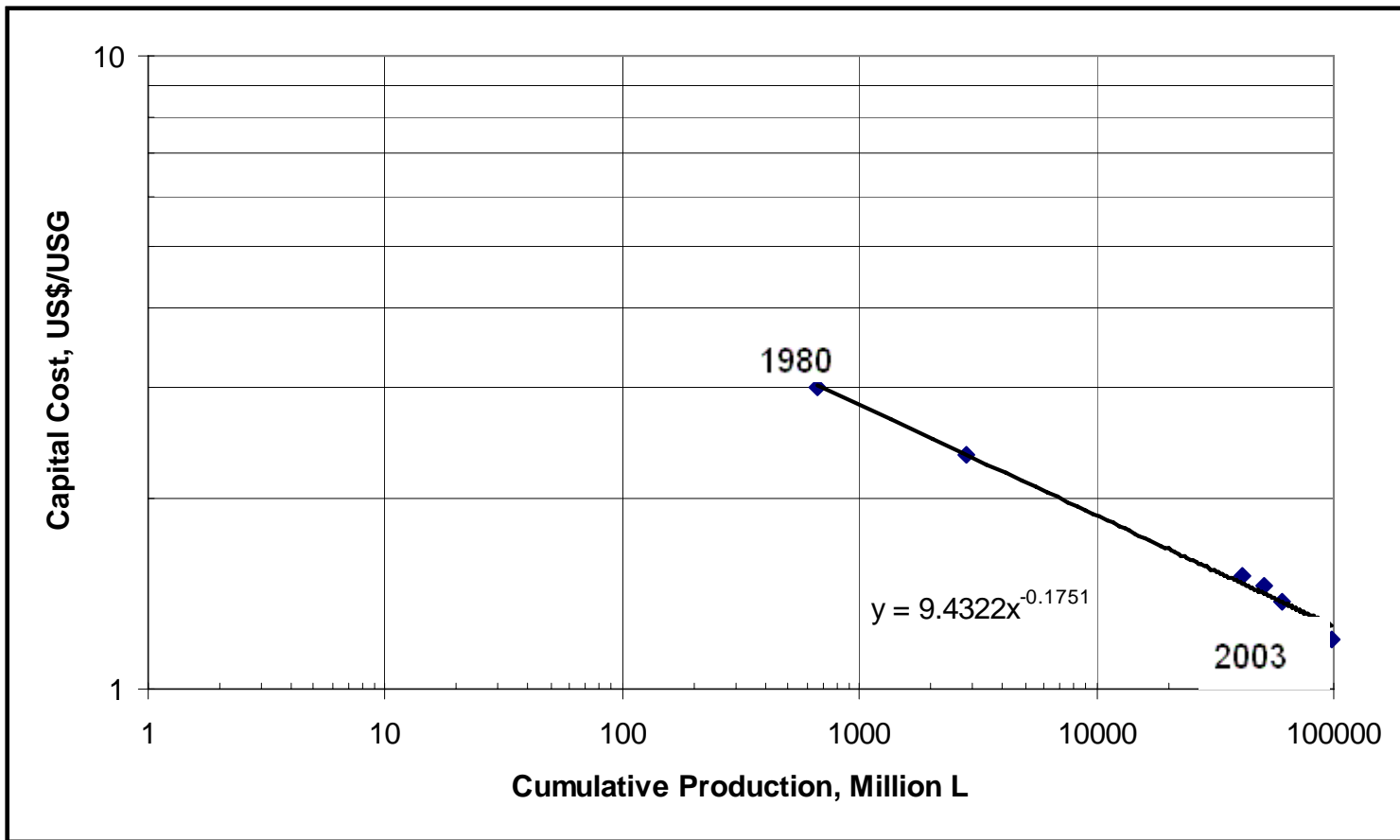
IEA – Creating Markets

“The technological and market developments required to transform the energy system will be conceived and implemented largely in the private sector. But success in this endeavour will not be determined exclusively by market forces. Governments that value the wider benefits of cleaner and more efficient energy technologies will work in partnership with market actors to ensure there are real opportunities for technologies to make the difficult transition from laboratory to market.”

Ethanol Market Development

- Brazil
 - Mandated market share.
 - Provide capital for biofuel production.
 - Reduced taxes on ethanol to eliminate the price disadvantage.
- United States
 - Reduced taxes on ethanol to eliminate the price disadvantage.
 - Provide capital for biofuel production.
 - Encouraged and then mandated market share.

US Ethanol Experience Curve



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Biodiesel Market Development

- Germany is the world leader in biodiesel production
 - Provided capital for plant construction.
 - Provided tax incentives to eliminate the price gap.
 - Has now moved to mandated market share with reduced tax support.
- Similar initiatives have been used in other countries (United States, France, Austria, etc.) to create markets and ensure domestic production.

Biofuel Market Development

- Lessons Learned
 - The established biofuel players have:
 - Solved “Market Access” barrier.
 - Addressed “Uncompetitive Price” barrier.
 - They have also facilitated the reduction in finance barriers and reduced business risk.
 - The markets have initially focussed on single solutions and them work.
 - The solutions are not easy and it takes effort and dedication to make them work.

Summary

- Interest in the bio-economy and biofuels has never been higher than in recent years. This has been driven by higher oil prices, which biofuels may or may not be able to address, and energy security concerns.
- Climate change concerns are providing additional momentum for development.
- The real benefit that biofuels have started to provide is economic, but it is addressing rural economics and not energy economics.



Thank You

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