GHG Inventory-based Carbon Credit Protocol --
Land Use, Land Use Change and Forestry

Woodlands Module: Recommended Protocol Design Principals

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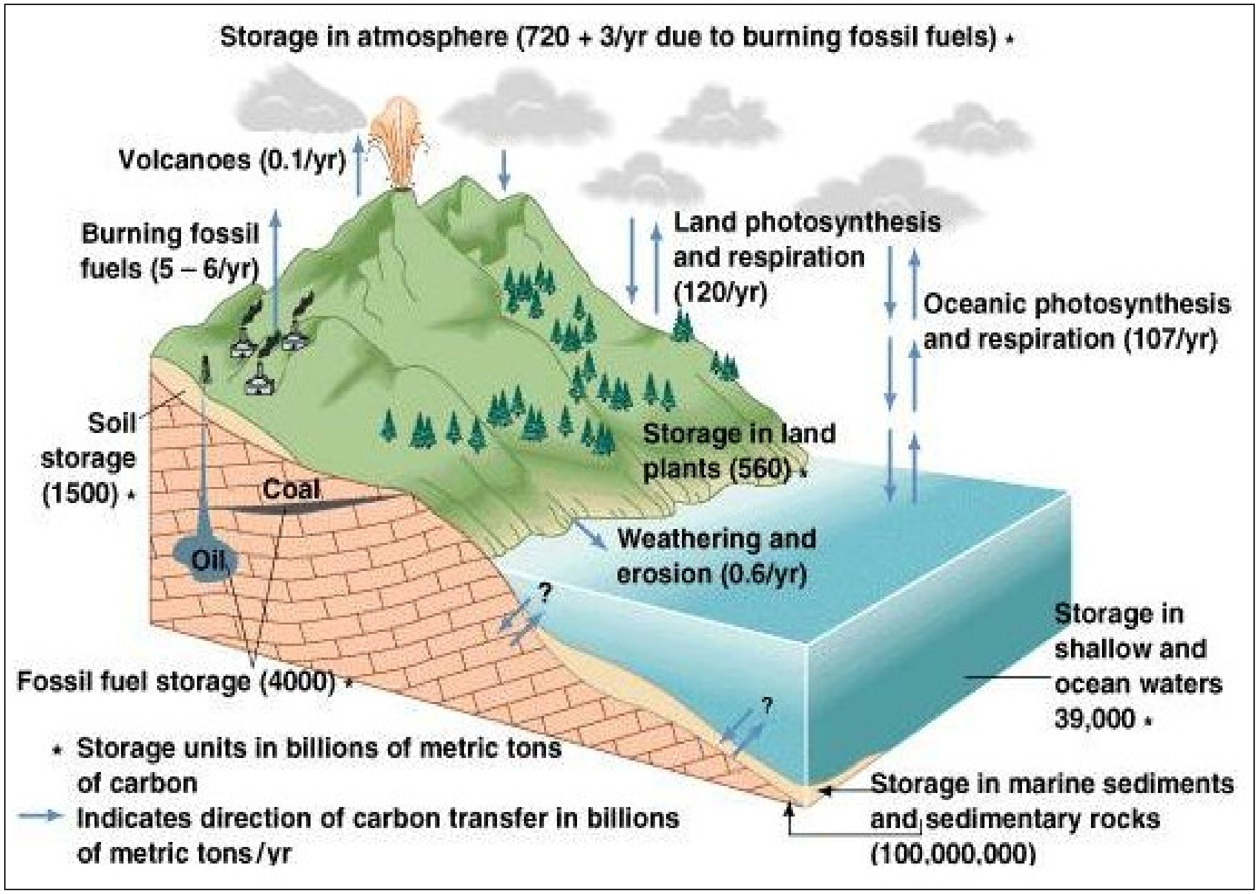
Why “Global Carbon Markets, Version 1.0” are Unsustainable

…and the opportunity for Canada to lead in the development of sustainable Carbon Markets Version 2.0

Global Carbon Cycle: A Closed System



- Total supply of carbon is fixed; cannot increase or decrease.
- Human enterprise may affect rate at which carbon is transferred from one storage unit to another
- Too much carbon loading in the atmosphere may be eroding its capacity to sustain species and ecosystem health

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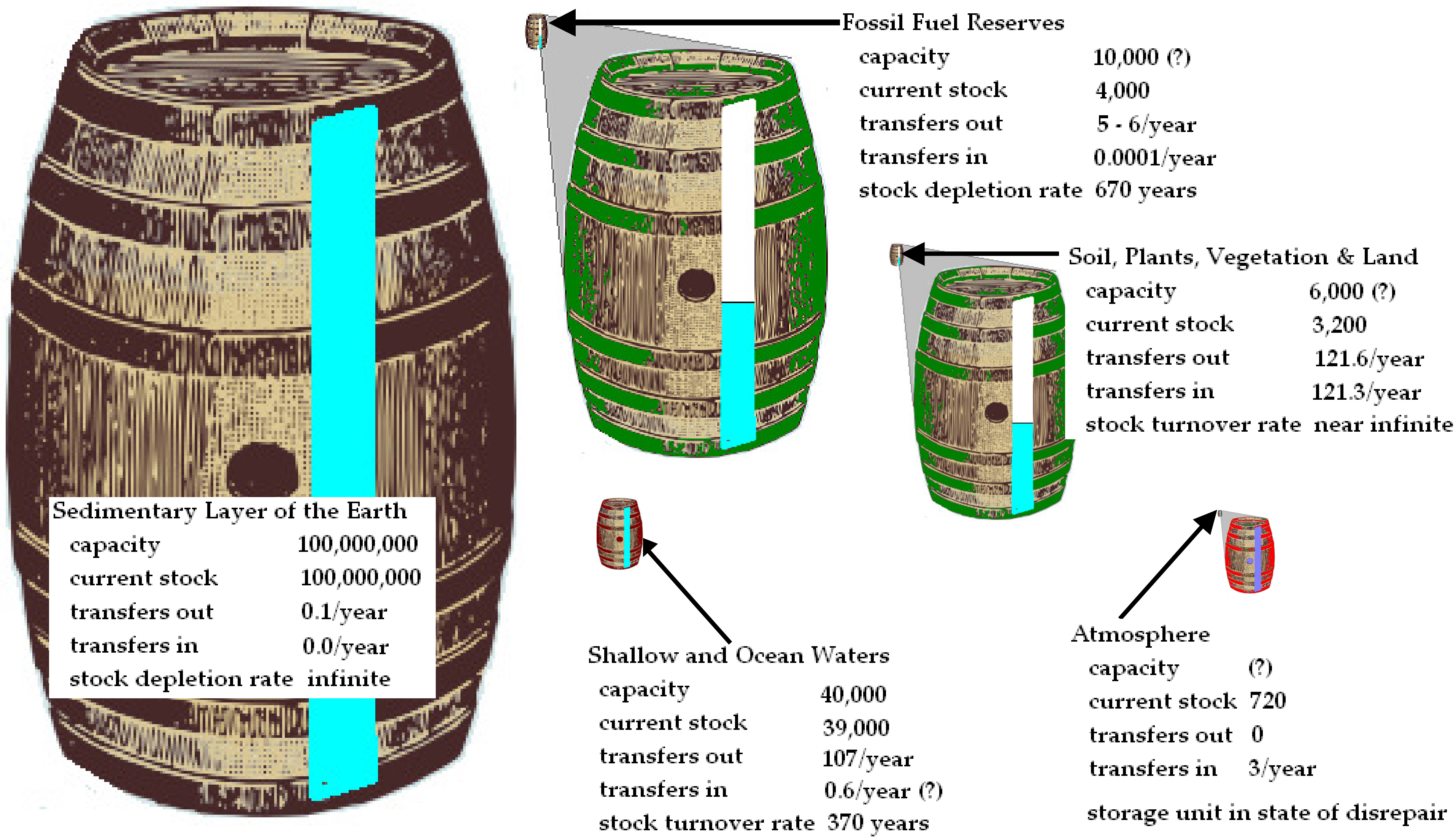
Global Carbon Cycle: Barrels in Your Wine Cellar



Where Humans Fit In

- Humans and other species are like small bacteria that live in the Atmospheric barrel, which barrel sits on top of and depends on continuous draws of essential nutrients from the Soil, Plant, Vegetation & Land and Waters & Oceans barrels (the "biological reserves"), as well as useful elements from the Fossil Fuels barrel (one of two "geological reserves").
- Largely but not uniquely due to human intervention, nutrients and elements are now being continuously transferred from all of the other barrels to the Atmospheric barrel, and humans rely on those transfers to sustain a certain "quality" of life.
- When humans draw carbon into the atmospheric barrel, the **carbon DOES NOT DISAPPEAR**. It remains in the atmospheric reserve unless/until it is transferred back to a biological or geological reserve. Most carbon is naturally transferred from the atmospheric to a biological reserve after 150+/- years of residency in the atmosphere. Undisturbed carbon is then naturally transferred from the biological and hydrological reserves to the geological reserves after 100s of 1000s of years of residency therein.

The *Challenges*

- To determine if and how we can return carbon from the atmospheric barrel for temporary or permanent storage to other barrels without risking the decomposition of those reserves, faster than the natural schedule for such transfers, and
- To reduce the rate at which we draw carbon from those other reserves and deposit it in the atmospheric barrel; and
- To determine if and how we can draw derivatives of carbon from the other carbon reserves without permanently transferring the carbon itself into the atmospheric reserve. (For example, some enhanced geothermal projects use heat exchanger and refrigerant technologies to draw heat and energy from the earth's massive sedimentary and hydrological carbon reserves into the atmospheric reserve without physically transferring carbon.)

…a note about *Climate Change Risk*

- Existing climate science suggests that the capacity of the atmospheric reserve to accept more carbon stock transfers is almost used up. But there is a great deal of uncertainty about the actual capacity of the atmospheric reserve to hold carbon.
- Look back at the barrels and their relative sizes/capacities. Note, in particular, that the atmospheric barrel's carbon carrying capacity is estimated to be a small fraction of the total capacity of the fossil fuel barrel. In fact, the **carbon carrying capacity of the atmosphere is a fraction of the carbon stock remaining in the fossil fuel reserve**.
- Let's assume that climate science is currently underestimating the remaining capacity of the atmosphere to store carbon by 200%. Or even 500%.
- The carbon stock remaining in the fossil fuel reserve barrel is still orders of magnitude larger than the larger estimates of the remaining capacity of the atmosphere to absorb carbon. In other words, it is unlikely we can afford to accelerate the rate at which we transfer carbon from the fossil fuel reserves to the atmosphere unless we match that rate of increase with offsetting transfers from the atmosphere to one of the three terrestrial reserves.

The Problem With Global Carbon Markets Vers. 1.0

- Every government-issued carbon offset credit or “allowance” (a carbon quota unit)—is a bankable, tradable financial derivative instrument that represents a government authorization to transfer one more unit of carbon nutrient to the atmospheric barrel from one of the other barrels. *(Note: carbon offset credit certificate is a financial derivative instrument, even when traded in a spot—not only when it is traded in a forward or futures market.)*
- In theory, each offset creation protocol restricts the issue of each carbon offset credit (also a unit of quota) to persons or entities who have demonstrated that they have either:
  - (1) reduced the rate at which they/their enterprise draws carbon from other barrels to the atmospheric barrel; and/or
  - (2) removed a unit of carbon from the atmospheric barrel for temporary or permanent storage in another barrel.
- **But in practice, *all* existing mandatory and voluntary carbon credit creation protocols discriminate *against* activities that remove carbon from the atmospheric to another reserve (“sequestration”, or acts of transferring carbon stocks from the “atmospheric barrel” to any of the other reserves) *in favour of* activities that simply *move carbon around within* the atmospheric reserve even when transfers from the fossil fuel reserve to the atmospheric reserve continue at increasing rates.**

The *Primary* Objective of Carbon Markets Must Be To Shift Carbon Stocks from the Atmospheric Reserve to Other Reserves

- But all existing offset market accounting methods—the foundation for what I am calling "Global Carbon Markets, version 1.0" — have created a single currency that equates a permanent carbon transfer from the atmospheric to biological, fossil fuel and hydrological reserves on the sequestration side of the market to a shift in carbon location within the atmospheric barrel on the energy and process emissions side of the market.
- There is *no* intrinsic environmental return on actions that simply shift carbon location within the atmospheric reserve/barrel. The act of shifting carbon around in the atmospheric reserve does not, in and of itself, increase the capacity of that barrel to store carbon or effect a transfer of carbon from that reserve to a terrestrial reserve.
- In fact, all existing offset market constructs (including the emerging international REDD) undervalue sequestration unless the carbon stock transfer from the atmosphere to a biological or geological reserve, while they fully credit shifts of carbon discharges among energy consuming and industrial process sources — even when these shifts demonstrably fail to effect any reduction in the rate or reversal in the direction of transfers between the fossil fuel and atmospheric reserves. Credits not backed by carbon stock transfers have no underlying environmental value.
- ***Because the large majority of global carbon offset credit certificates have no underlying environmental value, all existing carbon offset markets must inevitably fail.***

The *Opportunity*

- Note that some of the same individuals and accounting methods that defined the development and design of the unsustainable global credit default swap markets have been very influential in the design and development of Global Carbon Markets, Version 1.0
- The opportunity exists for Canada and/or the provinces of Canada to develop the first carbon offset market(s)—Global Carbon Markets, Version 2.0—in which every credit certificate issued actually has intrinsic environmental value.
- Such a market does not assign the same value to locational shifts within a reserve that it assigns to a real transfer of carbon from the atmosphere to a terrestrial reserve or the cancellation of a recognized future right of carbon transfer from terrestrial reserves to the atmosphere.
- Electing to develop an uniquely disciplined Canadian carbon market is no different from having elected to develop an uniquely disciplined Canadian banking sector.
- In any suitably disciplined, sustainable carbon market, every entity with value-adding Canadian operations has a global competitive advantage.

An Example of Over-crediting in Existing Carbon Markets

- Cement Plant A substitutes biomass waste for coal to fuel its kilns. Plant A's coal consumption declines both absolutely and per unit of cement output.
- Reduced coal consumption combined with increased cement production translates into 4,500 TCO2e/year in reduced GHG discharges from Plant A's kiln.
- But also implicit in the carbon offset credit creation standard are the assumptions that the coal that Plant A no longer consumes is:
  - no longer produced;
  - no longer transported to any consumer;
  - no longer transferred from the global "fossil fuel barrel" to the atmospheric barrel
  - to be held in the fossil fuel barrel in perpetuity.
- And the credit creation protocol also assigns title to reductions that will theoretically occur in the cement plant's feedstock supply chain to the owner of Cement Plant A.
- The protocol further credits the cement plant with "reductions" in landfill gas emissions, assuming that any biomass that will now be combusted at the cement plant would otherwise have been released as CH4 from a landfill, even though those "baseline" CH4 emissions do not appear in any official provincial or national GHG inventory or forecast. (continued)

The One-Sided Over-Crediting Issue (1)

- So the global standard credit creation protocol assigns title to a total of 17,500 TCO2e/year in carbon offset credits to the owner of Cement Plant A, when actual reportable change in the physical regional/global GHG inventory is between +13,000 and -4,500 TCO2e/year, depending on actual origina and final disposition of coal that is no longer delivered to Cement Plant A.
- The global standard credit creation protocol defines this annual "reduction" in carbon discharges as "permanent", without any proof that: (1) the coal that the cement plant no longer consumes has been contractually retained in its original or any other geological or biological reserve, or (2) there has been any change in the rate of reduction of carbon stocks in the geological reserve or transfers from that reserve to the atmospheric reserve.
- …but the same international credit creation standards prescribe that an action that effects a verifiable transfer of carbon stocks from the atmosphere back to a geological, biological or hydrological reserve is only creditable if/when the operator of the receiving reserve can prove an increase in its carbon stocks and commits to sustain that increase for at least 100 years. (continued)

The One-Sided Over-Crediting Issue (2)

- The net results are:
  - a shift in the location of carbon within the atmospheric reserve is deemed, by market administrators, to be permanent and creditable even when it can be demonstrated that there was no reduction in the stock of carbon in the atmosphere;
  - the credit creation protocol, by fiat, effects a carbon inventory title transfer to the cement plant operator from the operators of the coal mine, the coal transport company and the landfill, without the prior permission or knowledge of those other parties.
- If/when the coal producer reacts to the cement plant's cancelled order by cutting the price of coal and shipping to a new customer, the offset credit creation protocol is successfully verified even though there is no net reduction in the rate at which coal is being transferred from the fossil fuel barrel to the atmosphere.
- If/when the coal producer reacts by cutting coal production in the short term, in assigning the resulting reduction in the rate of carbon transfers, the offset market authority has unilaterally expropriated reductions that will physically occur in the coal production facility, transport companies' and landfill operators GHG inventories to the cement plant owner.

The One-Sided Over-Crediting Issue (3)

- Note that in <u>*every*</u> existing carbon market, the offset project verifier/auditor <u>*does not ascertain*</u> whether or not the coal that the cement plant no longer demands is retained in its geological reserve. To determine that the carbon credit issuance is valid, the verifier only determines that the emission factors used to represent a theoretical retention of coal in the geological reserve are reasonable.
- So if/when the coal producer reacts to the cement plant's cancelled order by cutting the price of coal and shipping to a new customer, the offset credit creation claim attracts an approving verification/audit even though the claim demonstrably overstates the actual GHG reduction that will occur.
- In aggregate, existing carbon offset and allowance market administrators issue 2 to 20 offset credits to owners of energy consuming and industrial processes for every TCO2e in reportable carbon discharges to the atmosphere—without no "permanence" liability—and less than 1 offset credit to land managers who permanently transfer 1 TCO2-equivalent of carbon from the atmospheric reserve to the biological reserve.

The Carbon Market *Failure*

- Carbon sequestration, energy efficiency and measures that transfer heat and energy from underground reserves to the surface for human use without physically transferring carbon are the *only* activities that:
  - reduce the stock of carbon in the atmospheric reserve; and/or
  - reduce the rate at which we transfer carbon from other reserves to the atmospheric reserve.
- But biological and geological sequestration projects will *never* appear to be "competitive" relative to projects that fail to reduce atmospheric carbon stocks as long as long as generally accepted carbon accounting standards allow for over-crediting of projects with little or no intrinsic environmental value (in that they effect no transfer of carbon stocks from the atmosphere to other reserves).
- In a market that properly accounts for carbon stock transfers, does not confuse localtional shifts within the atmospheric reserve with transfers from the atmosphere to terrestrial reserves, **biological and geological sequestration will prove cost-effective climate change mitigation strategies.**

It Gets Worse: The No-Double-Entry-Accounting Issue

- Cement Plant A now has clear title to 17,500 offset credits (authorizations to add carbon in CO2-equivalents to the atmospheric barrel), even if there was no change in the rate of carbon transfer from the fossil fuel reserve to the atmosphere.
- Cement Plant A transfers clear title to those credits to, say, the Pacific Carbon Trust or the TD Bank.
- Under Canadian GHG reporting regulations, however, Cement Plant A reports actual physical plant emissions, without booking a balancing emission inventory entry to reflect the fact that the plant owner transferred real title to the approved 17,500 offset credits to a third party.
- So when we sum up the inventory reports of Cement Plant A and the purchaser of these offset credits, the combined inventory reports will understate the entities' combined physical emissions by at least 17,500 TCO2e/year (because the credit vendor failed to book a 17,500 TCO2e debit to their plant-level/corporate GHG inventory, and possibly as much as 30,500 TCO2e/year.

Let's Look at the Numbers – by Entity

	actual emissions	credits/ surplus allowances issued	credits sold
Energy Consuming or Industrial Process Emitter A		*TCO2e/year*	
opening GHG inventory (transfers of carbon from another reserve to the atmospheric reserve)	300,000		
resulting from fuel switching investment	(4,500)	(17,500)	17,500
closing physical GHG inventory after project	295,500		
closing GHG inventory after project and credit issuance		282,500	
closing GHG inventory after project and credit issuance and proper accounting for credit transfers			313,000
reported closing GHG inventory under current accounting methods	**295,500**		
closing GHG inventory as it should be reported with appropriate accounting methods			**313,000**
			credits/ allowances bought
Offset Credit Buyer B			
opening GHG inventory (transfers of carbon from another reserve to the atmospheric reserve)	1,000,000		
transferred from Emitter A			(17,500)
closing physical GHG inventory after project	1,000,000		
closing GHG inventory after project and credit issuance		1,000,000	
closing GHG inventory after project and credit issuance and proper accounting for credit transfers			982,500
reported GHG inventory under current accounting methods			**982,500**
closing GHG inventory as it should be reported with appropriate accounting methods			**982,500**

To Whom Will Governments Assign This Unfunded Liability After the Carbon Market Version 1.0 Crash?

Sum of Entity A + Entity B Reported GHG Inventories			*TCO2e/year*	*marked-to-market @ CAD$25/TCO2e*
	Actual			
	opening balance before project	1,300,000		
	closing balance after project	1,295,500		
	net change in combined inventories	(4,500)		
	As Currently Reported			
	opening balance before project	1,300,000		
	closing balance after credit purchase	1,265,000		
	net change in combined inventories	(35,000)		
	Unaccounted for GHG Liability (emissions that simply disappear) under current carbon offset accounting methods*		**30,500**	**$762,500**

*** When carbon quota and credits are marked-to-market on entities' balance sheets, the current accounting methods result in combined entity asset overstatement equal to 30,500 TCO2e multiplied by the perceived market value of credits.**

What is the Real "Price of Carbon" in a World Without Over-Crediting?

We don't know. But we can present a "reference price" by asking: What would it cost (per TCO2e reduced) to: (1) acquire two large US power generation utilities; (2) shut down all of their coal-fired generation capacity (writing off purchase price and repaying all long term debt for which they act as security), (3) replace that generation capacity with CCGT, and (3) capitalize the differential between the electricity price required to generate a return to capital invested in the new supply and the pre-replacement project price? This particular project earns us roughly **145 MM TCO2e/year** in reduced combustion GHGs.

Sample: Two Large US Power Generators		**10 year amortization**		**20 year amortization**
Total Potential GHG Reduction (per year)		145,574,696		145,574,696
Total Asset Acquisition Cost	$	17,618,976,703		17,618,976,703
Acquisition plus LT Debt Retirement Cost	$	26,372,316,703		26,372,316,703
Cost Per TCO2e of Achieving Reductions by Substituing Natural Gas for Coal Power Generation Capacity				
purchase	$	12.10	$	6.05
purchase + LTD	$	18.12	$	9.06
nat gas premium	$	8.07	$	8.07
coal compensation (represents cost of "permanence")	$	19.26	$	19.26
cost per tonne CO2s including cost of permanence	$	57.55	$	42.45
cost per tonne CO2s excluding cost of permanence	$	38.29	$	23.18

Some Lessons Learned from the *"Expropriation/Compensation"* CO2 Reduction Cost Analysis

- Expanding the analysis illustrated on the previous slide to include all entities that own and operate coal-fired power generation in Canada and the 20 largest US utilities suggests that the marginal cost of reducing 1 billion TCO2e from North American sources ranges between roughly US$25 and US$60/TCO2e in 2010 $s in the "expropriation/compensation" reference case, depending on whether or not "permanence" is built into the analysis (where permanance means coal suppliers have to be paid to keep coal in the ground) and amortization term.
- So, over the next decade or so, anyway, offset credit and allowance markets that reveal prices lower than US$25 per certificate are likely to be markets that are flooded with certificates with a face value of 1 TCO2e but which represent less than 1 TCO2e in verifiable carbon stock transfers/retention to/in terrestrial reserves.
- And offset credit and allowance markets that reveal price in excess of US$60/TCO2e for any sustained period are highly inefficient markets, for one reason or another.

What Makes a Carbon Market Inefficient?

- An inefficient market is one in which:
  - the price signals that derive from the combined implementation of tax, energy and environmental policies appear distant from points of relevant ***primary*** demand decisions*.
  - for any number of reasons, a carbon credit certificate or allowance must pass through many hands to get from its point of issue/creation to the point at which it will be used/retired **.
- I agree with NRTEE-sponsored and other leading Canadian analysis that suggests that a carbon-based consumption tax will likely have to range between CAD$190 and CAD$210 to have a mitigating effect on aggregate Canadian carbon demand. But—as is apparent in previous slides—I also believe efficient North American carbon markets should reveal prices in the CAD$25 to CAD$60/TCO2e range. How? Most carbon-based consumption taxes are highly inefficient behavioural change mechanisms and this is reflected in the price required to achieve change through consumption taxes.
- Most carbon-based consumption taxes have and will continue to prove to be inefficient policy tools: largely because the price signals they generate rarely appear at government's intended point of demand, and they even more rarely appear at points of ***primary demand decision-making***.

* What is a Point of Primary Demand Decision-Making?

The consumption decisions a person or entity makes are ***primary*** or ***secondary***. Decisions to buy or rent cars or homes are, for the most part, primary. Consumers' final choices reflect a range of needs, including but not restricted to perceptions of: safety, comfort, access, affordability, energy efficiency.

Most decisions to consume energy are secondary, or derived from a combination of primary consumption decisions including but not limited to car purchase and home location decisions.

If a carbon tax is applied on an energy purchase invoice, it will prove an inefficient carbon demand management measure relative to a carbon tax applied closer to the primary demand decision, such as:

- applied to a car purchase —

  where the car tax reflects the vehicle emissions rating (GHGs/km) and weight, and

  where the home purchase tax reflects the home's energy demand rating (MWh-equivalents/m2 of space), fuel use mix and area.

- applied to a car annual re-registration/insurance bill —

  where the car tax reflects the vehicle emissions rating (GHGs/km), weight, and kilometers of use since last registration.

- applied as a tax on a home's annual insurance or property tax bill —
  where the home purchase tax reflects the home's energy demand rating (MWh-equivalents/m2 of space), fuel use mix and area

Because even well-educated consumers demonstrate very high internal discount rates, the closer the tax is to a capital expenditure (as opposed to an operating expense) the more efficient it will be.

** Defining Efficiency in Carbon/Emissions Markets?

Unfortunately, many expert analysts declare allowance/quota-based emission markets “efficient” if/when they see evidence of a high emission credit or allowance turnover rate.

High quota turnover rates can mean large returns to brokers, aggregators and other market makers. But in a truly efficient market, emission credits or allowances travel as directly as possible from the point at which they are issued to the buyer who will retire them, passing through the smallest number of intermediate commission-taking handlers. Most existing emission markets are highly inefficient by this standard.

Look, for example, at this representative sample history of one block of US SO2 allowances in the US Acid Rain marketplace:

Turnover To Date for series: 2007 vintage SO2 allowances serial 189076 through 190825			
transaction		seller	buyer
date	#		
03/29/2007	130503	US EPA (auction)	TransAlta Energy Marketing (US)
06/20/2007	136373	TransAlta Energy Marketing (US)	M F Global, inc
06/20/2007	136379	M F Global, inc	Duke Energy Corporation
06/20/2007	136386	Duke Energy Corporation	Swiss Re
08/01/2007	136911	Swiss Re	Duke Energy Corporation
08/01/2007	136918	Duke Energy Corporation	M F Global, Inc
08/02/2007		M F Global, inc	Swiss Re
08/02/2007	136928	Swiss Re	Duke Energy Corporation
08/02/2007	136930	Duke Energy Corporation	Bear Energy LP
03/14/2008	139756	Bear Energy	SO2 International Ltd.
07/21/2009	153191	SO2 International Ltd.	JPVE SO2
Number of allowances in this series:			**1,750**
Reported US SO2 Allowance Turnover for selected series only:			**19,250**
Churn rate:			**11**
Date certificates retired:			**not yet**

If Carbon Taxes and Existing Quota Market Models are Inefficient…what?

- *History shows us that when* consumption tax measures are inefficient, regressive or both (as, I would argue, carbon-based energy consumption taxes are), voluntary or mandatory product standards are the most efficient methods for addressing an environmental, safety or health risk.
- Most historically successful product standards allow for credit banking and "trading" (otherwise called "joint compliance").
- A well-designed voluntary Offset System should prove the best mechanism for testing and developing voluntary product standards which standards could become mandatory over time.
- Read the "Leaded Gasoline Case Study" in Annex A for an historical product standard illustration and an active comparison of product standards — with and without quota allocations — and pollution taxes.

The Offset Market: *Solutions* (1)

- The opportunity exists for Canada and/or the provinces of Canada to develop the first carbon offset market(s)—Global Carbon Markets, Version 2.0—in which every credit certificate issued actually has at least equal intrinsic environmental value.
- Such a market does not assign the same value to locational shifts within a reserve that it assigns to a real transfer of carbon from the atmosphere to a terrestrial reserve or the cancellation of a recognized future right of carbon transfer from terrestrial reserves to the atmosphere.
- We can build a sustainable carbon market from a carbon credit/allowance currency that represents:
  - **Option A**: a unit of reduction in carbon demand, without any "permanence" test anywhere in the market and without reference to actual reserve stock levels or transfers between carbon reserves (which market will produce a large volume of certificates that will trade at prices below the cost of shifting carbon stocks from the atmosphere to a terrestrial reserve);
  - **Option B:** a verified transfer of carbon stocks from the atmosphere to a terrestrial reserve, without a "permanence" test for all projects (i.e. one credit = one 1 CO_2e of carbon stock transferred and held for only 1 year)(lower volume of certificates, market price higher but still below cost of permanent carbon stock transfer);

The Offset Market *Solutions* (2)

- We can build a sustainable carbon market from a carbon credit/allowance currency that represents (continued):
  - **Option C**: a verified transfer of carbon stocks from the atmosphere to a terrestrial reserve, with a "permanence" test for all projects (i.e. one credit = one 1 CO2e of carbon stock transferred and to be held for 100 years)(lowest volume of certificates, market price equal to than true marginal cost of permanent carbon stock transfer from atmosphere to any terrestrial reserve);
  - **Option D**: a verified term-limited reduction in the rate of carbon transfers from terrestrial to atmospheric reserve, relative to an official baseline forecast (i.e. one credit = credit holder's underutilization of 1 CO2e of forecast-based right to withdraw carbon from the Province's terrestrial reserves (certificate and market price between Option B and Option C);
  - **Option E**: Option B plus Option D;
  - **Option F**: Option C plus Option D;
- Government must produce an official Baseline Provincial Forecast for carbon stocks and transfers and a related provincial GHG inventory as a prerequisite to implementing sustainable carbon market design options D through F.
- None of the market design options are sustainable unless the administrator/registry introduces ***double entry accounting for credit transfers***.

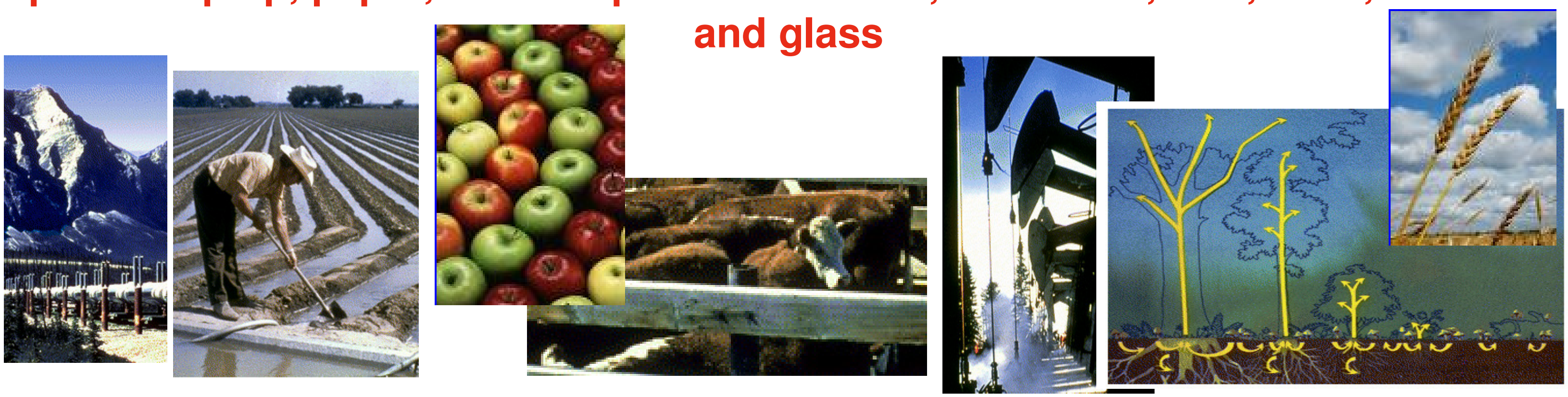
Can Any One Government Afford to Go It Alone?

- Yes, as long as we "go it alone" in carbon market discipline/design in a manner and for reasons similar to those that drove the government of Canada to maintain unique banking industry operating standards.
- Please note that every/any bankable carbon offset credit and/or GHG allowance that is/will ever be issued by any government is a unit of carbon discharge quota. An offset credit is a quota unit that is initially awarded to an entity whose right to produce is not covered by an obligation to hold quota. An allowance is a quota unit that is initially allocated to an entity whose right to produce is covered by an obligation to hold quota. But they are both units of quota and there is a practical absolute upper limit to any nation's ability to generate and issue quota.
- The primary argument against "going it alone" is the risk that other nations/provinces/states might then refuse to recognize/allow quota issued by the "alone" government to be traded at par in their markets with their domestic quota.
- Government decision-makers have to ask: under what circumstances would we ever approve carbon quota exports, anyway? (See next slide.)

"Cap and Trade" is a quota-based GHG supply management regime that sovereign provinces/states cannot sustain.

In markets governed by any form of bankable, tradable GHG quota, any one entity's, community's, state's or nation's Carbon or GHG Quota/Allowance supply governs the absolute combined rights of its residents to:

produce, transport fossil fuels + consume fossil fuels + produce beef, pork, grains + produce pulp, paper, tissue + produce cement, aluminum, iron, steel, chemicals and glass



Through GHG quota allocation or auction, provincial/state representatives propose to privatize and then permit free trade in sovereign control of carbon-based resources. If/when quota is perpetually bankable and tradable, any region's/corporation's GHG quota allocation will determine its long term share of the global market for the commodities listed above. Prudently governed provinces/states will never allow inter-state trade in carbon or GHG quota, unless the quota system is so watered down and unenforceable that it is no more than a carbon tax.

Annex I

Leaded Gasoline and Market Measures Case Study

The Leaded Gasoline Case Study
National Commitments, Policies and Measures

- Between 1972 and 1980, Canada, the US, Japan and the European Community formed the intention to compel gasoline retailers to remove lead from retail gasoline sales.
- All of these nations set the same target date for the full elimination of lead in gasoline used on road: 1990.
- Canada and the United States regulated product standards. Gasoline *distributors*' rights to release lead in gasoline was capped at 1980 levels in 1981. Distributors' lead content entitlements declined on a straight-line basis to 0 in 1986. Cdn. & US distributors could bank (through 1988 in Cda and 1990 in the USA) unused lead rights. Distributors complied on sales portfolio average basis (the lead standard did not apply to every tank of gasoline).
- Canadian distributors could also "comply jointly" (meaning lead credits could be created and traded without government intervention or credit market administration).
- In addition to regulating lead content standards (where distributors were the obligated parties), the US ruled that US distributors were *also* required to acquire and retire 1 US lead allowance for each specified unit of lead released to the market. In 1981, the US government freely allocated 98% a lead allowance supply equal to 1980 lead-in-gasoline *sales* levels to **US petroleum product refiners**. The free allocation of US lead allowances to US refiners declined on a straight-line basis to 0 in 1986. This meant that any US importer of leaded gasoline produced in Canada had to buy US lead allowances from US refiners to maintain their US gasoline market shares during the lead phase out, or accelerate their lead phase out schedules.
- European nations elected to introduce the "lead differential tax", to discourage leaded "petrol" (gasoline) demand and to raise revenues. EU nations committed to and did direct all lead differential tax revenues to RD&D and critical strategic refinery and auto industry investments to help refined petroleum product producers remove lead from gasoline and car makers design and introduce power train modifications. They also regulated *point-of-production* (not sale) lead content limits—enforced at the refinery level—but permitted refiners to "comply jointly" (i.e they could bank and trade lead production rights).

The Leaded Gasoline Case Study

Results: Canada and the United States

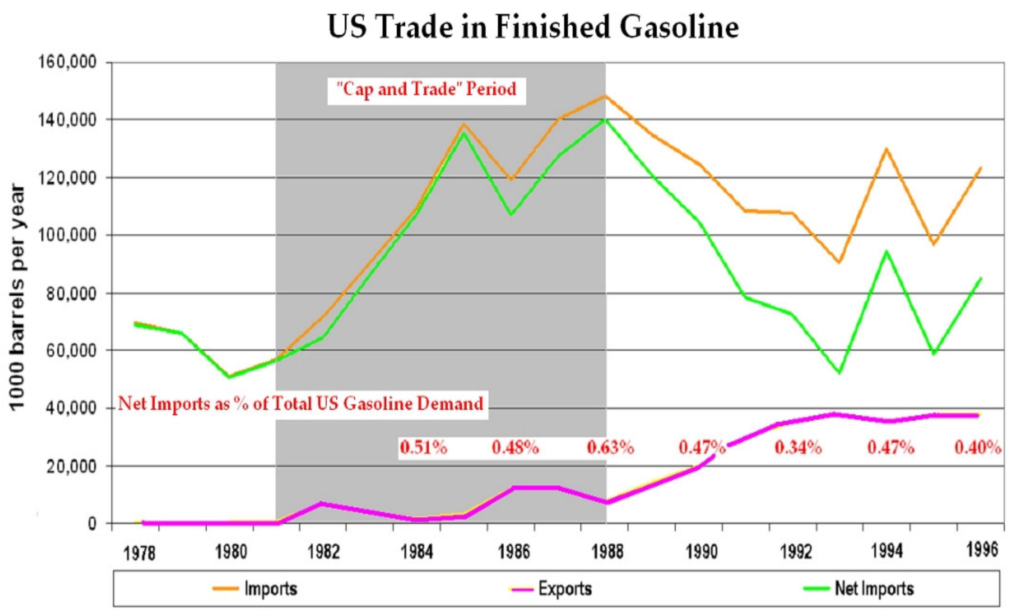
- Lead was essentially out of all gasoline sold at retail pumps in the US by 1992. Lead was essentially eliminated from Canadian retail gasoline sales by 1989.
- Canadian regulations also obliged Canadian refiners to stop making leaded gasoline and all of Canadian refining capacity was converted to unleaded by 1989. Original US regulations did not limit US refineries' leaded fuel production levels.
- The North American average premium for unleaded over leaded gasoline maxed out at about US$210/1,000 litres in 1983 through 1985. This was about ½ the price impact Cdn. economists had forecast would result from ordering the lead out of gasoline
- US Treasury officials say that foreign (inc. Cdn) purchases of US lead allowances (required to maintain US export market share during the phase out) largely financed US refiners' cost of plant modifications. They also estimate that less than 30% of the Cdn. Exporters US lead allowances acquisition costs were passed through to US customers.

Year	US Retail Motor Gasoline Prices, 1976-1990 (nominal US$s per litre)			
	Leaded Regular	Unleaded Regular	Unleaded Price Differential	% Difference
1976	$ 0.156	$ 0.161	$ 0.005	3.4%
1977	$ 0.164	$ 0.174	$ 0.011	6.5%
1978	$ 0.166	$ 0.177	$ 0.011	6.3%
1979	$ 0.227	$ 0.238	$ 0.011	4.7%
1980	$ 0.314	$ 0.330	$ 0.016	5.0%
1981	$ 0.346	$ 0.365	$ 0.018	5.3%
1982	$ 0.322	$ 0.343	$ 0.021	6.6%
1983	$ 0.306	$ 0.328	$ 0.021	6.9%
1984	$ 0.299	$ 0.320	$ 0.021	7.1%
1985	$ 0.296	$ 0.317	$ 0.021	7.1%
1986	$ 0.227	$ 0.246	$ 0.018	8.1%
1987	$ 0.238	$ 0.251	$ 0.013	5.6%
1988	$ 0.238	$ 0.251	$ 0.013	5.6%
1989	$ 0.264	$ 0.269	$ 0.005	2.0%
1990	$ 0.304	$ 0.306	$ 0.003	0.9%

1. <u>First lesson learned</u>: **Cdn. "product standard"-type regulation proved highly efficient.**
2. <u>Second lesson learned</u>: **But the US stung Canada by successfully executing an highly protectionist agenda through its addition and manipulation of a lead allowance allocation, on top of the product standard, in the world's first ever "cap and trade" regulation.**

US Lead Allowance Allocation…a Highly Protectionist Supply Management Regime

- The US Lead allowance allocation penalized US petroleum product marketers who imported leaded product and favoured vendors of product that was made by US refineries. It particularly favoured US refiners who added unleaded capacity to their plant sites but continued to manufacture leaded fuel (as opposed to those who modified existing plants to eliminate lead and make only unleaded gasoline).
- The US leaded gasoline supply management regime required petroleum product ***distributors*** to hold quota (allowances) for *only* ***US product sales***. This encouraged US refineries to continue to produce leaded fuel during and after the phase-out of US sales and to cultivate new export markets for high polluting US-produced leaded gasoline.
- The integrated US producers were slow to develop the capacity to distribute unleaded during the phase out, but quick to redirect their leaded production to export markets. The initial result was an increase in ***both*** US leaded gasoline exports and imports. The increase in import demand generated pure profits (from lead allowance sales to importers) for US refiners, who used revenues from US lead allowance sales to finance new unleaded fuel refining capacity. US refiners, however, did not significantly cut back their leaded gasoline production capacity until the late-1990s, when new US regulations required them to. The US importers exercised market power to deduct the cost of US lead allowances from exporters' margins. Treasury Board officials estimated that less than 30% of the price paid by foreign suppliers to US refiners for lead allowances was passed through to US customers as an increase in the retail price of gasoline.
- During the lead phase out, exporters' shares of the overall US gasoline market appeared to grow—but they realized that increase primarily in the terminal leaded fuel market; gains in the US unleaded market were small.
- Between 1981 and 1988, US refinery gasoline output grew 25%, the largest 7-year growth in refinery output in US history.
- After 1988, US gasoline imports crashed when US refiners took over much of the new domestic unleaded market and shifted now declining leaded gasoline production to export markets. US refiners continued to grow export market share after 1996 by substituting unleaded for leaded exports, when EPA rules finally prohibited US refinery production of leaded gasoline.



The Leaded Gasoline Case Study

Results: Europe

- Leaded gasoline meeting regulated refinery specs still dominated Eu-wide petrol supply through 1995, ***even though the price premium that EU consumers paid for leaded petrol, relative to unleaded, ranged from US$0.23 to US$0.91/litre in 1991.***
- In 1995, EU member states finally adopted North American-style product standard dictating full leaded petrol phase out by 2003.
- Leaded petrol meeting regulated refinery specs still dominated the EU petrol supply chain through 1999, except where directly outlawed, with the price premium that consumers paid for leaded petrol ranging from US$0.43 to US$1.41/litre in 1999.
- At end of 2008, however, low levels of lead remained in all petrol solid in 3 EU member states. Those states (Greece, Spain and France) refused to implement full final lead-free gasoline product standards because government could not afford to give up lead differential tax revenues.

Retail Price Differential in Europe: Premium Leaded over Premium Unleaded Petrol, US$/ litre

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Belgium	$ 0.61	$ 0.64	$0.92	$ 0.86	$ 0.91	$ 0.76	$ 0.76	$ 0.76	$ 0.82
Denmark	$ 0.93	$ 0.79	$0.41	$ 0.23	$ 0.23				
Germany	$ 0.87	$ 0.64	$0.67	$ 0.67	$ 0.75	$ 0.78			
Ireland	$ 0.31	$ 0.11	$0.34	$ 0.45	$ 0.48	$ 0.60	$ 0.83	$ 1.31	$ 1.41
Greece	$ 0.44	$ 0.54	$0.48	$ 0.44	$ 0.46	$ 0.50	$ 0.48	$ 0.45	$ 0.49
Spain	$ 0.23	$ 0.15	$0.23	$ 0.19	$ 0.37	$ 0.40	$ 0.26	$ 0.30	$ 0.43
France	$ 0.36	$ 0.39	$0.50	$ 0.49	$ 0.30	$ 0.37	$ 0.40	$ 0.41	$ 0.43
Italy	$ 0.39	$ 0.33	$0.48	$ 0.60	$ 0.55	$ 0.49	$ 0.47	$ 0.52	$ 0.44
Luxembourg	$ 0.52	$ 0.71	$0.92	$ 0.81	$ 0.86	$ 0.84	$ 0.83	$ 0.81	
Netherlands	$ 0.69	$ 0.69	$0.82	$ 0.79	$ 0.81	$ 0.89			
Portugal	$ 0.56	$ 0.58	$0.53	$ 0.15	$ 0.10	$ 0.31	$ 0.30	$ 0.30	
United Kingdom	$ 0.51	$ 0.60	$0.64	$ 0.70	$ 0.71	$ 0.63	$ 0.83	$ 0.95	$ 1.11

data source: European Commission Statistics Bureau, Eurostat,
http://epp.eurostat.ec.europa.eu/portal/page?_pageid=0,1136239,0_45571447&_dad=portal&_schema=PORTAL

How *Did* Canada and the US Get the Lead Out at a Cost of $0.02/L by 1988 while the UK Still Failed to Do So by 1999 with retail leaded fuel premiums between US$0.40 and $1.11/L?

- We interviewed numerous government officials and oil industry representatives and asked them this question.

- European government officials told us that as long as it was legal to sell leaded gasoline, the petroleum production wholesalers simply REFUSED TO OFFER unleaded gasoline for sale. Some governments ordered them to offer minimum volumes in the early 1990s. The companies, they said, complied by offering the legal minimum, but concentrated the supply at a small number of stations that were far apart, making access to unleaded a dream for most consumers. In response to this situation, some governments then required the wholesalers to guarantee minimum unleaded volumes at every station. Companies complied, by adjusted the wholesale prices of leaded and unleaded gasoline to maintain normal profits while ensuring that the retail price differential was not as large as the tax on leaded gasoline.

- Company representatives told us that when the government set a price for lead, in the tax measure, government removed 50% of the basis of competition in the European market. They said that in Canada and the US, given the legally binding product standard, companies competed to produce a compliant product at least cost. In Europe, however, government's commitment to set/manipulate price removed any market motivation to compete on price.

Beyond its Highly Regressive Nature, What Are the Killers in Carbon Tax Strategies?

Wholesale Prices of Fuel ***Will Always*** Increase Faster Than Taxes:

Increase in crude oil input cost per 1,000 litres of petrol, Europe, 1999 – 2008 = € 144.61

Assuming that 46% of the average barrel of crude refined in Europe was converted to gasoline, between 1999 and 2008, the cost of crude feedstock for gasoline in Europe increased €145 per 1,000 litres of gasoline. But wholesale (pre-tax) gasoline prices increased between €400 and €500 per 1,000 litres.

Even though there was little variation in crude supply and refining costs from state to state, there were large regional variations in the rate of increase of wholesale gasoline prices.

change per 1000 litres, 1999 - 2008			
Netherlands			
wholesale price	***total taxes***	*VAT*	*Other Taxes (1)*
€ 550.14	€ 187.83	€ 97.97	€ 89.86

change per 1000 litres, 1999 - 2008			
Sweden			
wholesale price	***total taxes***	*VAT*	*Other Taxes (1)*
€ 412.70	€ 155.69	€ 82.53	€ 73.16

change per 1000 litres, 1999 - 2008			
United Kingdom			
wholesale price	***total taxes***	*VAT*	*Other Taxes (1)*
€ 499.92	€ 122.41	€ 74.47	€ 47.94

change per 1000 litres, 1999 - 2008			
Germany			
wholesale price	***total taxes***	*VAT*	*Other Taxes (1)*
€ 555.00	€ 259.54	€ 105.88	€ 153.66

What was happening?

When governments announced their intentions to use taxes to raise commodity prices to the point of "demand destruction", prudent managers of enterprises that produced the tax-targeted commodity had no choice but to attempt to capture more of the market-will-bear price than the governments would get, and to do so faster. So wholesale gasoline prices increased faster than the tax increased—much faster than governments anticipated—as the private sector, protecting investor interests, sought to take a larger share of the market-will-bear price than government was going to get through taxation.

Small manufacturing sector job loss rates accelerated, particularly in the food processing, pulp paper & wood products, machinery fabrication and white goods-producing sectors—sectors least able to benefit from corporate income tax cuts that were partially financed with new lead differential tax revenues. New market entrants declined, because they could not benefit from income tax cuts in the short term. Lead differential tax-financed RD&D projects benefitted only market incumbents and differential tax-financed income tax cuts favoured profitable market incumbents who sold traditional taxed products over less profitable innovative new market entrants.