

MEETING KYOTO

APGEM LUNCHEON

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DAVID GRANT, P.ENG.

A DELICATE BALANCE

- EARTH'S AVERAGE SURFACE TEMP HAS HOVERED NEAR 300K FOR A LONG TIME
- PLANET MERCURY HAS A HOT SIDE, ALWAYS FACING THE SUN, MORE THAN TWICE AS HOT AS EARTH
- SOLAR SURFACE OVER 5000K
- THE VOLUME AVERAGE TEMPERATURE OF THE UNIVERSE IS CLOSE TO 0K

A DELICATE BALANCE

- OUR PRIMARY SOURCE OF HEAT IS EM RADIATION FROM THE SUN
- OUR HEAT SINK IS EM RADIATION INTO 'SPACE'

A DELICATE BALANCE

- THE AMOUNT OF HEAT ARRIVING FROM THE SUN CAN VARY WIDELY
- THE IGY NEARLY 50 YEARS AGO WAS PARTLY TO QUANTIFY THIS

A DELICATE BALANCE

- ATMOSPHERIC PROPERTIES AFFECT BOTH OF THESE RADIATION PROCESSES
- FOR A GIVEN AMOUNT OF ENERGY ARRIVING AT EARTH, THE NET EFFECT OF DAY-TIME WARMING AND NIGHT-TIME COOLING DETERMINES OUR AVERAGE TEMPERATURE

GHG=GREENHOUSE GASES

- WATER
- CARBON DIOXIDE
- MAN-MADE MOLECULES
- BIO BYPRODUCTS (METHANE ET CETERA)

SOURCES OF INSTABILITY

- MORE SNOW AND ICE-COVER RADIATES LESS AND ABSORBS LESS, MAKING EARTH COOLER
- WARMTH ENHANCES ROT, WHICH MAKES CO₂ AND METHANE, THUS WARMING THE EARTH
- WARMTH INCREASES THE WATER CONTENT OF THE ATMOSPHERE, WHICH WILL DECREASE OUR NIGHT-TIME COOLING AND, PERHAPS, DECREASE OUR DAY-TIME WARMING

WHERE'S THE CARBON?

- CARBON IS IN CARBONATE ROCKS, BIOLOGICAL MATTER, AND THE ARTIFACTS OF THAT BIO STUFF, LIKE COAL AND PETROLEUM
- THE STUFF OF CURRENT CONCERN IS IN THE AIR, JUST A FRACTION OF A PERCENT.

KYOTO: REQUIREMENTS

- CANADA AGREED THAT ITS AVERAGE GHG OUTPUT BETWEEN 2008 TO 2012 WOULD BE 6% LESS THAN IT WAS IN 1990.
- EACH OF US PRODUCES MORE GHG IN 2007 THAN IN 1990, AND THERE ARE FAR MORE OF US

BUDGETING

- THE AMOUNT OF CO₂ MADE BY CANADIANS IN 1990 CAN BE ESTIMATED
- THE TOTAL WHICH 'CONFORMANCE' WOULD ALLOW US TO MAKE IN THE NEXT FEW YEARS IS 6% LESS.

BUDGETING FOR CHANGE

- EACH CANADIAN ACTIVITY WHICH MAKES GHG MUST BE CONSIDERED
- EVALUATE REDUCTIONS IN EACH
- FIND TOTAL
- IF TOTAL IS NOT 6% LESS THAN 1990, REPEAT

BUDGETING FOR CHANGE

- SO YOU CAN SEE THAT THIS IS A LOT LIKE MAKING THE SPENDING CHANGES THAT WILL ALLOW YOU TO TAKE A BIG TRIP OR AFFORD A BIGGER HOUSE
- MAKING A BIG CHANGE WITHOUT A CAREFUL PLAN IS ALWAYS A MISTAKE
- BUDGETING IS THE CORE OF ANY GOOD NUMBER-BASED PLAN

GHG REDUCTIONS

- WE HAVE LITTLE OR NO CONTROL OF GHG CHANGES DUE TO VOLCANOES, PLANKTON BIOMASS, AND ROT
- THEORETICALLY, WE CAN REDUCE OUR PRODUCTION OF METHANE AND CO₂.

SEQUESTRATION OF GHG

- TOO FAR OFF TO HELP US MEET KYOTO
- COSTLY
- DANGEROUS

MANMADE CANADIAN CO2

	1995	2012
Agriculture	0.5 %	0.4 % OF 1995 Total
Commercial	5.4	5
Industrial	15.4	10
Non-combustion	7.6	5
Other	9.2	6
Pipelines	2.3	2
Power generation	20.4	16
Government	0.6	0.5
Residential	8.4	8
Transportation	30.1	20
Total	100 %	73 (27% reduction!)

MANMADE CANADIAN CO2

1995, % 2012

Agriculture 0.5 % 0.4 % OF 1995 Total

Small changes in ag practices can be made,
but a 20% reduction is pretty optimistic, in
1-5 years.

MANMADE CANADIAN CO2

	1995	2012
Commercial	5.4	5

In the short-term, offices and retail space cannot be closed, or significantly improved. A 10% reduction seems feasible.

MANMADE CANADIAN CO₂

	1995	2012
Industrial	15.4	10

**In a Kyoto-compliant Canada,
industrial production will be
reduced and much more efficient.**

MANMADE CANADIAN CO2

	1995	2012
Pipelines	2.3	2

If we make less oil product, we need to ship less of it.

Space heating and industrial natural gas use cannot be cut much, in the short term.

MANMADE CANADIAN CO2

	1995	2012
Power generation	20.4	16

It is easy to demonize this sector.

Business and residences need electricity.

Cutting petroleum production volumes will
reduce industrial demand for electric power.

MANMADE CANADIAN CO2

	1995	2012
Government	0.6	0.5

Government use is not all building heating.

Asking Civil servants to make fewer trips and teleconference might get this 16% cut.

MANMADE CANADIAN CO₂

	1995	2012
Residential	8.4	8

Intensive retrofits of windows, wall insulation, heating system and set-back controls might achieve an average 5 to 10 % savings in the few years remaining.

MANMADE CANADIAN CO2

	1995	2012
Transportation	30.1	20

This is the greatest discretionary fossil fuel use

MANMADE CANADIAN CO2

The 1995 numbers were on the StatsCan site; I am presuming the 1990 data to be similar in proportion, even if we know the total use has been increasing.

The 27% reduction is Not enough!

MANMADE CANADIAN CO2

The 27% reduction is Not enough!

My 2008 to 2012 numbers need to go lower.
Where would you make further cuts?

What to cut?

MANMADE CANADIAN CO2

What to cut?

This is an iterative process.

We see that the above list of possible cuts is not deep enough.

We can make greater cuts in transport.

Most of the other sectors cannot be cut more.

PETROLEUM FUEL USE

In the transportation Sector, I found the following data:

Sub-sector	1000 cubic meters, petroleum fuel		
	yr2004	yr2010	% change
• Rail	1959	1900	-3
• Air	5822	700	-88
• Marine	2803	2600	-7.8
• Truck/bus	7573	7100	-6.7
• Pipeline	25	20	-20
• Pump fuel	41192	26875	-35

PETROLEUM FUEL USE

- Rail 1959 1900 -3

While fewer goods will be moved, rail is our most efficient overland mode.

More intercity passengers will be moved by rail.

PETROLEUM FUEL USE

- Air 5822 700 -88

This is the biggest single reduction. Each ton of jet fuel is about 2.8 times as effective in global warming as a ton burned at ground level.

With teleconferencing and the elimination of air travel for pleasure, we could go to more than 88%, but not for a few more years.

This would not affect the daily life of an average Canadian.

It would drastically cut tourism, hotels, et cetera.

PETROLEUM FUEL USE

- Marine 2803 2600 -7.8

It may not be practical to reduce marine shipping this much.

Marine is very efficient; some shipment of goods may be reduced.

PETROLEUM FUEL USE

- Truck/bus 7573 7100 -6.7

While city and inter-city bus use will increase, inter-city trucking will be reduced.

More food will be local

Trucking price increases will reduce imports and exports in every region.

PETROLEUM FUEL USE

- Pipeline 25 20 -20%

As petroleum product volumes are reduced, less needs to move by pipeline.

PETROLEUM FUEL USE

- Pump fuel 41192 26875 -35

We cannot function as a society without private vehicles.

If we car-pool and plan/ combine our trips better, our current vehicles can serve us with much less fuel use.

35% less or 50% less ?

This is the area that will change our lives the most. If this is done, selling this life-style change and getting re-elected will be a big challenge for any Federal Government.

Since it will change our lives, getting public approval prior to making this change might be advisable.

PETROLEUM FUEL USE

- 59374 reduced to 39195 (34% reduction)
- If we are unable to make all the reductions in non-petroleum fuel use, this sector might face greater cuts.

PETROLEUM FUEL USE

- Don't like my choices? That is the beauty of this process! Change the numbers.
- Just make sure the reductions which you chose are big enough.

ALTERNATIVES

- MEDIEVAL "INDULGENCES"
- WE COULD INVOKE AN EXPENSIVE "LOOPHOLE" PROCESS.
- MOST OFFSET VENDORS CANNOT PROVE EFFICACY.
- WE NEED TO START DOWN THE PATH TOWARD "USING LESS".

SEQUESTRATION

- WHEN A BIG CO₂ POINT SOURCE IS CLOSE ENOUGH TO A PERMANENT STORAGE SITE, ONE NEED ONLY ADD "CUBIC DOLLARS" TO HIDE THE CO₂.
- WHEN THE WORLD IS HIDING ITS CO₂ IN A MILLION WELLS, THERE WILL BE PERIODIC, ACCIDENTAL CO₂ BURPS.
- These could kill millions of us.
- THE PRESSURE AND TEMPERATURE OF DEEP OCEAN TRENCHES COULD HOLD LIQUID CO₂.
- To keep the oceans from becoming too acidic, a membrane would have to keep the two layers apart.

THE NUCLEAR OPTION

- OVER ITS LIFE-CYCLE A FISSION REACTOR MAKES FAR LESS CO₂ THAN A COAL-TO-STEAM-TO-ELECTRICITY OR A GAS TURBINE PLANT.
- It takes decades to approve and build a new fission facility.
- Nuclear is not a factor in meeting Kyoto.

EXPORTING OUR GHG-INDUSTRIES

- WHEN WE BUY MANUFACTURED ITEMS FROM NON-KYOTO NATIONS, AND CLOSE OUR SMOKESTACK INDUSTRIES WE ONLY PRETEND TO LOOK GREENER.
- BUYING UREA FROM THE MIDDLE EAST CAN REPLACE LOCAL AMMONIA PLANTS, BUT THERE IS NO NET GHG SAVING.

MOTIVATION

- EVERY SINGLE 'PUBLICLY GREEN' ENTITY OUT THERE HAS AN INTEREST IN SCARING US.
- SOME WILL ASK YOU TO MAKE TRIVIAL CHANGES
- NONE OF THEM WILL TELL YOU OF ANY COMPREHENSIVE PLAN.

MOTIVATION

- 'GREEN' ENTITIES SEEK FAME AND FORTUNE BY SCARING US ABOUT GHG
- Al Gore already had more money than he could practically spend. He is now more famous than any other failed politician.
- "DONATE NOW" pages hit you when you visit green sites, but never an explanation of how that donation will reduce GHG.

MOTIVATION

- THIS HAS BEEN A "HOT TOPIC" FOR 10 YEARS.
- I find it ironic that our many news media spend a large fraction of their time scaring us, but so completely avoid showing any kind of overall plan.
- Print or broadcast, a newsroom is a profit source. Keeping the 'scary momentum' up keeps the audience size and advertising revenue growing.
- COULD THERE BE A LINK ?

BEYOND KYOTO

- It has recently been claimed by the UN that an 85% reduction could stabilize atmospheric CO₂ levels in a few decades.
- By then Canada may have 40+ million citizens.
- It is unlikely that that many people can be housed and fed here with such a CO₂ reduction. Do we de-populate 50% ?

BEYOND KYOTO

- We can meet Kyoto, with simple life-style changes.
- We can afford it, but do we have the will?
- Canada cannot house and feed our people, and still hope to meet the next round of targets.