Joint meeting €uropulp - Utipulp
Colmar - France
April 19, 2007

Wood, Pulp, Paper and Energy: A Crowded Marriage

It is a challenge preparing and then giving a speech to an industry where energy plays such a dominant role. As we enter a new era of dwindling fossil fuel reserves, new contenders also appear for our precious raw material, wood. A turning point.

This is not a new situation either. L'histoire se répète. In the early part of the 19th century, we in Europe had nearly completely robbed all the wood from the forests and were saved by cheap coal, later by cheap oil. Now we are running out fast of non-renewable resources because too cheaply priced for too long, which inherently leads to misallocation and waste on an unprecedented scale.

We are also confronted with opposite viewpoints, as was the case in the late 18th century. Adam Smith took a mildly euphoric position compared to Malthus with his deeply pessimistic and simple economic model. Malthus only looked at natural resources and labour as inputs, and overlooked the power of technical progress, of capital formation, of knowledge, of international specialisation and international trade. We remain convinced that again mankind will master the problem, provided the right pricing of all remaining non-renewables helps us to stretch its availability and provided we timely master new technologies of energy creation and conservation. But we will have to hurry.

Disclaimers:
1. The views I express are my own and they do not necessarily reflect official positions of Canfor,
2. Nor are they mainstream, sounding contrarian rather than following the latest shout-of-the-day.

We will talk about
1. Economy, energy and growth
2. Peak oil and gas: why we believe the end of carbons is closer than we think
3. What to do now that climate change zealots and politicians are diverting attention from the real problem: we are running out of cheap non-renewable energy
4. Paper and energy
5. The future

Economy, Energy and Growth

The transition point from „merchant capitalism" to „modern economic growth" happened around 1820. Technical progress did not come in big „Schumpeterian" waves but was a smoother and a more diffused process, driven by extended application of science to problems of economic production. The so-called "industrial revolution" was more an e than a re.

Since 1820, population increased 6-fold and total energy consumption 46-fold. Nearly all that consumption happened in the most developed countries of the N-Hemisphere. Please observe that energy from "modern sources" (coal, oil, natural gas, water, nuclear) was non-existent in 1820.

World Consumption of Primary Energy 1820-2001

(In Million Metric Tons of Oil Equivalent)

	Population in Bn	***Energy Consumption in Tons of Oil Equivalent [toe]***			
		Modern Sources	Biomass	Total	Per Capita
1820	1.0	13	208	221	0.21
1870	1.3	135	254	389	0.31
1913	1.8	735	358	1093	0.61
1950	2.5	1625	505	2130	0.84
1973	3.9	5369	674	6043	1.54
2001	6.1	9072	1094	10165	1.65
180 yrs	x 6	x 703	x 5	x 46	x 8

Source: Angus Maddison -
Contours of the World Economy and the Art of Macro-Measurement 1500-2001

Before 1820, growth of per capita GDP was negligible. Economic growth was strongest between 1870 and 1913 and from 1950 to 1973. Overall, growth rates increased over time, as did energy and population.

On a per capita basis, total energy from "modern sources" exploded from 6% or a fraction of biomass (wood, peat, dung, straw, other crop residues) to 8.3 times biomass. It was only somewhere between 1870 and 1913 that modern energy per capita became larger than biomass. Over the whole period, biomass per capita remained nearly constant around 0.2 to. Biomass has long been the major energy source with modern sources only being dominant for the past 100 years.

Per Capita Consumption of Primary Energy in toe

		Per Capita		Modern v
	*GDP growth	Biomass	Modern	Biomass
1820	0.14	0.20	0.01	0.06
1870	1.06	0.20	0.11	0.53
1913	1.57	0.20	0.41	2.05
1950	1.17	0.20	0.64	3.22
1973	*3.72*	0.17	1.37	7.97
2001	1.95	0.18	1.48	8.30
		x 0	x 119	

* For W-Eu, N-Am, Australia and Japany from 1500-1820;
then 1820 to 1870, a.s.o.

The more we progressed, the lower the increment in per capita consumption of modern energy became, from period to period. Where it jumped 10-fold between 1820 and 1870, the increment was only 4-fold between 1870 and 1913, slowing to 50% from 1913-1950 and 1950-1973 to drop to a low of 8% since 1973, year of the first oil crisis. Over time, per capita use of modern energy slows down, but as population grows, total consumption follows another path.

World population is estimated to grow to 9 bn by 2050 (a level demographics say to be the maximum). There are many reasons to believe that per capita economic growth will continue at historic high levels, but do we have enough energy to lift 9 bn people to our level of energy consumption?

On Peak Oil & Gas

At $ 8-9 trillion, energy is the world's largest industrial activity (estimates Simmons & Company), equal to 14% of 2005 world GDP in PPP terms and 19% when calculated the classic way (at official exchange rates). Every significant 20th century advance carries the watermark of modern, cheap energy. By the end of the century, the fairy tale went global.

The peaking of the hydrocarbon supply may well happen while we speak.
Peaking means: production of oil and gas can no longer grow.

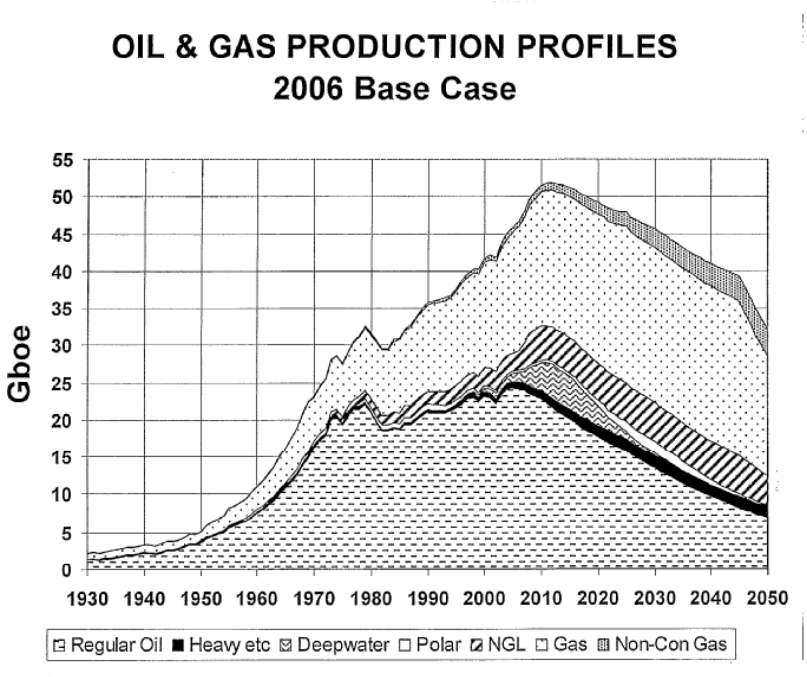
The problem:

- 95% of the world's proven oil & gas reserves are unaudited,
- We have hardly any data on decline rates and imprecise production data
- Gas is even more problematic as statistics are fewer and even fuzzier.
- The situation on the gas side is said to be even more dramatic than with oil. Gas is a vapour, declines faster and less noticed than oil.

The energy crisis we face is a classic case of exponential growth against a finite source, whereby price was not based on replacement cost but on free-for-all depletion. Free lunches are cancelled because of persistent success.

M. King Hubbert, an American Shell Oil Co. geophysicist developed a methodology to assess how output and decline of an oil well varies with time. In 1956, he correctly predicted the rise in production, the peak between 1966 and 1971 and the subsequent fall in output of oil fields in the USA. It peaked at 9.64 million b/day in 1970 (had dropped to 4.25 million barrels in 2005, according to the EIA).

What works for one oil reservoir works for the entire conventional oil industry. By applying this same process to global oil resources, Hubbert and other researchers estimated the peak in global oil production between 2005 and 2015.



Why do I believe in Peak Oil?

(a) The Power of 2

Was first mentioned in writing in 15th century Venice (Luca Pacioli) as rule of 70 (or 72).

This rule most likely was known before 1494, and is approximately one hundred multiplied by the natural logarithm of two or ln (2) = 0.693147181 x 100 = 69.3

For ease of calculation, it is dubbed the rule of 70. It is a rough and dirty method to estimate an investment's doubling time. The rule applies to exponential growth (and decay) and is therefore used for compound interest as opposed to simple interest calculations. A quantity grows *exponentially* when *its increase is proportional to what is already there*.

A common example is compound interest, where $100 invested at 7% per year annual compound interest will double in 10 years (70 divided by 7).

If a 'population' grows at 7% per year, it, too, will double in 10 years.

At 4% p.a. your capital/revenue etc doubles every 18 years; at 6% every 12. And if you want to see it doubled every 5 years you need a return of 70/5 = 14% p.a.

There's another beautiful consequence of this arithmetic.

If you take seventy years as a period of time it is roughly one human lifetime.

Any percent growth continued steadily for seventy years gives you an overall increase by a factor that's very easy to calculate.

For example 4% per year for 70 years, you find the factor by multiplying four two's together it's a factor of 16.

Apply this now to GDP growth rates of 10% in China and 8% in India. By extension, it also means that:

- Market capitalisation (or the stock market) cannot outperform profits
- Income from capital cannot outperform income from labour
- Growth of the value of property cannot outperform income from labour

New research from the McKinsey Global Institute (MGI) reveals that global energy demand is on a path to grow by 2.2 percent a year over the next 15 years or doubling every 32 years.

Oil consumption grows at 1.8% p.a., hence doubles every 40 years.

(b) The Unbearable Quickness of Doubling

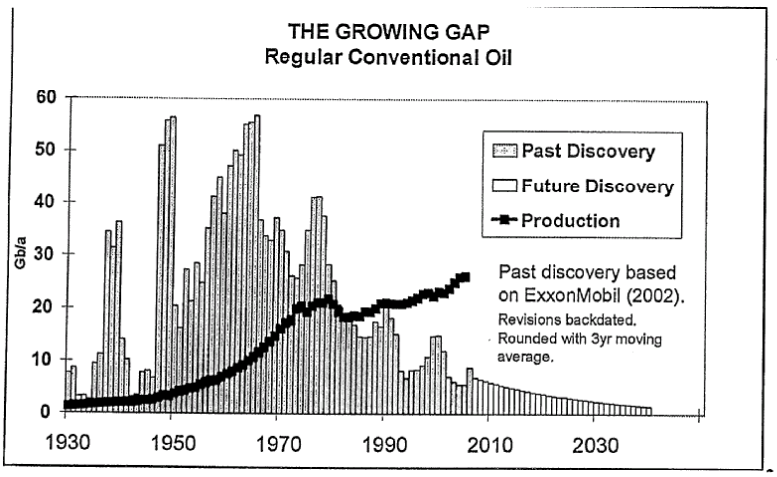
Sissa ben Dahir, Wazir of the court of King Shiram is said to have 'invented' chess. His boss loved the game so much that he offered Sissa any reward he could name. Perhaps trying to impress the king with his mathematical skills, Sissa asked for some rice, one grain on the first square of the chessboard, two on the second, four on the third, eight on the fourth, and so on.

1	2	4	8	16	32	64	128

We all know the story.
BUT: 1+2 = 4 minus 1 and 128 on the 8th square is 1 less than the sum of all 7 squares before. Hence, the last doubling is more than the sum of all doublings ever before.

Now put **(a)** & **(b**) together:

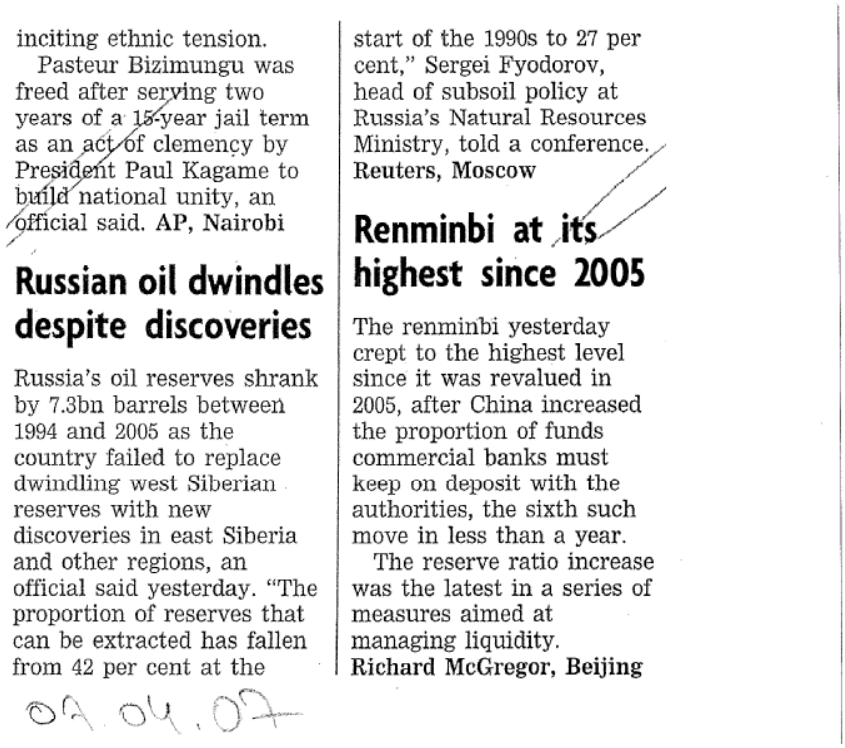
- Proven reserves are the oil resources that can be extracted profitably with at least 90 percent probability; they are sufficient to meet world demand *at current levels* for over 40 years. Those 40 years started a few years ago. Since Shell, we know what this means.
- But at current levels means we will not be able to increase consumption by 1.8% pa over the next 40 years; it means we have for 40 years left at + 0% p.a.
- Peak-oil is the 50% point: 50% depleted – 50% left
- On the upslope, oil is plentiful and cheap because demand (production line in the graph below) is below supply (past discovery), and supply is high because the authorities that 'own' the wells need income for their population or themselves and their satraps.



- On the down slope, oil gets scarce and expensive as demand outstrips supply (at a given price) and production can no longer grow.
- On a Btu basis, a 2% pa reduction in global oil supply equals loss of 80 nuclear power plants (and that every year).
- Energy is capital intensive and swings between sources are limited in the short run.
- Energy use can only be as high as energy supply (however high demand)

A few sobering facts:

- 40 years of intense exploration found little new oil (ExxonMobil says: *'global discoveries peaked 1963'*)
- Drilling costs increased 3-fold in the 90s and up to 5-fold since 2000, with dwindling possibility to find bigger fields, and few (if any) large finds
- Always divide any optimistic new discovered oil field by 85 million bbd which is what we consume daily; it lands you the number of days our world reserves increased;
- All big fields (depending their size, called Kings, Queens & Lords) are aging, and like humans, yield less;
- 50% of non-OPEC and non-FSU supply is in decline; Putin taxes away every dollar above $25/bbl at 95%.



inciting ethnic tension.
Pasteur Bizimungu was freed after serving two years of a 15-year jail term as an act of clemency by President Paul Kagame to build national unity, an official said. AP, Nairobi

Russian oil dwindles despite discoveries

Russia's oil reserves shrank by 7.3bn barrels between 1994 and 2005 as the country failed to replace dwindling west Siberian reserves with new discoveries in east Siberia and other regions, an official said yesterday. "The proportion of reserves that can be extracted has fallen from 42 per cent at the start of the 1990s to 27 per cent," Sergei Fyodorov, head of subsoil policy at Russia's Natural Resources Ministry, told a conference. Reuters, Moscow

Renminbi at its highest since 2005

The renminbi yesterday crept to the highest level since it was revalued in 2005, after China increased the proportion of funds commercial banks must keep on deposit with the authorities, the sixth such move in less than a year.
The reserve ratio increase was the latest in a series of measures aimed at managing liquidity.
Richard McGregor, Beijing

04.04.07

- Kuwait, Iraq, Iran, Oman, Yemen, Syria and Jordan have already peaked and so is Mexico's Cantarell field (peaked at 2.16 in 2004 and is expected 1.4 in 2008)
- Doubts all around that Saudi Arabia ever will reach its 2009 production target of 12.5 mb/d (plus 3 from 9.5 currently)
- All of the Middle East will produce (best case) 25 mb/d from now through 2025 (Dr Al-Husseini - retired brains of Saudi Aramco at London Oil & Money Conference – Sept 2005)

- Iran has old & heavily depleted fields, with output falling and reserves overstated. Needs nuclear plants before they start reducing exports (Business Week Dec 11th 2006). Some speculate that, within a decade, Iran might not even produce enough oil to export (FT, 10 April 2007).
- Below the ground risks: because hardly any profit was made between 1980 and 2000, the age of a rusting oil & gas delivery system (like some pulp mills), pipelines, refineries and people is alarming (FT March 31,2007: „Analysts estimate that about 8 per cent of US refineries is down due to fires and accidents").
- Above the ground risks: geo-political

Interim statement:
We ought to seriously embark on a conservation model. Climate change and reduction of carbon emissions allows politicians to sharpen their profile through subsidies and regulations. Our problem is not Climate Change but decoupling growth and progress from fossil fuel, and using less of any energy.

We still live, work, transport, construct as in the 19th century. In the US (and the rest of over-developed OECD most likely is not far off either), 66% of all energy goes into:
- Transportation (27%),
- Housing (21%) and
- Non-residential (18%): office buildings, schools, hospitals, shops etc.

It takes 10+ years to replace our car and truck fleet, up to 20 year for planes and trains, and more than 20 years to completely rebuild our houses, factories, shopping malls, offices etc. Meanwhile we have 2 bn+ Chinese and Indians with more to come from elsewhere who, with the same right, claim access to cheap energy.

Climate Change

Global warming is igniting a green-house-gas-industry with characteristics of the *'pensée unique'* of a contemporary religion. Doubt is forbidden and sinful. Deny and you will be ex-communicated. Allow me to share with you some of my doubts.

Climate is a complex system. Understanding complex systems is independent of knowledge and inherent to their unmanageable and unpredictable nature. All models and their inputs have a finite precision, and minor deviations translate in vast differences in outcome. With all our knowledge, satellites, computers and online information on temperature, pressure and wind movements all over the globe, we can't predict weather longer than 6 to 7 days out.

Let us list well-know facts to put them in perspective:
- Analysis of ice cores covering 750.000 years confirm that ice age is the default position of this planet
- Warming-up is the exception and happens approximately every 100.000 years caused by a combination of the earth's tilt and elliptical orbit around the sun (a 21.000 years cycle), the wobble in its orbit (a 41.000 year cycle) and the cycle of eccentricity (100.000 years variations in the shape of the earth's elliptical orbit). Then there are other causes such as solar reflectivity, heat retention, landmass distribution etc.
- Warming-up goes 3 times faster (5 to 6000 years) than cooling down (15-18.000 yrs)

- These warm periods are called interglacial periods and last between 15 and 20.000 year
- The last major glacial thaw started 18.000 years ago from temperatures on average 8°C lower than today; we reached today's temperatures some 11.000 years ago, since when temperatures hardly changed, only up or down fractions of one degree BUT at times this was enough to create a mini ice age (as from a peak around 1100-1200 to a trough that lasted from 1400 through 1850).
- During icy periods, carbon dioxide concentrations drop from a maximum of around 280-300 ppm to around 200. Today we are at 380 ppm. These 80 above all time highs are those man-made.
- Changes in both temperatures and CO2 happen generally synchronized and the earth always CO2 level always peaked around 300 ppm, shortly before it returned to the ice mode. There is evidence that climate warming can set up conditions that create a global chill.
- Till we can substitute carbon-based fuels, CO2 can only but increase further.
- The warm period of today is the longest on record (a bit longer than the one from 400.000 years ago). Is it possible, thinkable, plausible that this is the reason why mankind has developed uninterrupted and undisturbed for that long for the first time since the big bang?
- This globe is nearly un-inhabitable during icy periods; our dense tropical forest of today was earlier merely savannah or arid wasteland (read: deserts, ice or others)
- If we are in the year 18.000, and counting, of this interglacial vacation in our temporary Garden of Eden, then we may be closer to the end of our Holiday From Ice.
- Science only started measuring on a broad and scientific scale as from the mid 19th century. This coincides with the end of the mini-ice age. Who wonders that when we relate our readings of today to what was measured at the trough, only shows increases?

Climate change is inherent to this globe, always was and will. Just consider the following titbits from recent times:

- The desert from the Mediterranean to south of the Sahara was once (and not that long ago) one big forest. It was not cut to build the pyramids.
- Hannibal *probably* never saw glaciers when he crossed the Alps. Its glaciers started growing after 1200 and melting from 1850 onwards.
- In 1794, explorer Captain George Vancouver found Icy Strait choked with ice, and Glacier Bay was a barely indented glacier. That glacier was more than 4,000 feet thick, up to 20 miles or more wide, and extended more than 100 miles to the St. Elias Range of mountains. But by 1879 naturalist John Muir found that the ice had retreated 48 miles up the bay. By 1916 the Grand Pacific Glacier headed Tarr Inlet 65 miles from Glacier Bay's mouth. Such rapid retreat is known nowhere else. (US Department of the Interior: National Parks Service). Imagine this would have happened under Mr Al Gore's watch!
- What happened after the ice melted that once covered all of Europe north of the Alps and Pyrenees? What will happen, as the frozen tundra will turn to a swampy marsh? All those mouse, caribou, elk and ice bears, living as far north already as they can with no possibility to go any higher, will bog down in the new mud, which then will freeze, trapping them and their poor Bambis in an icy death grip. Has happened before in history, many times. Great times ahead for Disney Studio's.
- For the sake of time, I will now skip creationism!

"Scientific wealth tends to accumulate according to the law of compound interest," said Lord Kelvin. Our industry largely contributed to the development of secular knowledge and science. Until Gutenberg's printing shop started around 1450, most instruction was oral as in ancient Greece and Rome. By 1500, some 220 printing presses operated throughout W-Europe and had already produced 8 million books. A flood of new secular learning was doing away with wisdom and dogma of the past (with Rome trying to recoup lost territory by Inquisition and censorship).

Over the course of a few years, productivity in book production increased at least 200-fold. Before, a scribe needed one year to finish one book. The "creative destruction" that originated from our industry was unprecedented. Ask the monks, cheep and the whole knowledge industry of those days. Now comes the internet, and knowledge accumulates and distributes even faster than ever before. All this happened in the past 600 years. Just think how things would have panned out if we had gone straight into the next ice age after 1200?

Let us think back 150 years when Lord Kelvin lived**.** With perfect hindsight**,** we now know how GDP, population and wealth exploded with the accumulated application of science to problems of economic production. Most likely this would not have been possible without converting and depleting the cheapest energy sources.

We now also know that climate change is not an economic catastrophe (yet). Allow me to quote Martin Wolf: *"The probability is high that the next richer and very knowledgeable generation will be able to adapt quite well to those climate changes. The losses from climate change are not only hard to predict but also impossible to evaluate and by the time they have happened, will be irreversible".* (FT – 07.02.2007)

In my opinion, our problem is not one of climate change, but ***fixing our future energy needs*** by optimizing energy consumption where possible, using oil and gas only where no alternatives are available, hoping for politicians to implement the right policies, whereby:

1. Subsidies are disastrous (have been and always will be) as they mostly only cure the symptoms;
2. Regulation is nearly as bad as subsidies; just listen to that slavering sound (that is at least what I heard when those hundreds IPCC people were gathering next door to our Brussels office); the sound comes from all those bureaucrats hoping for well-paid secure jobs and consultants hoping for juicy contracts. To them, climate change is „ein Schlachtfest ohne Ende".
3. Taxation of non-renewables and ALL renewables with a poor energy balance, to force consumers and industry to more energy friendly consumption and production. Then use those revenues to offset consumer income by reducing other taxes and fostering R&D. The right price is the only strong deterrent of waste. That price should be high.
4. Every calculation must be based on sound Life Cycle Assessment [LCA]. Energy is too precious to be wasted.

Pulp, Paper and Wood

Facit: our industry not only converts a lot of "renewable carbon fibres" in to fiber-based products, but in the process it also destroys a lot of energy. Today it is the only way to produce paper, using lowest energy consuming state of the art technology. The general rise in energy costs now brings new and more 'powerful' competitors to the market for our cheap raw materials. Of course we don't like this.

The calculations to get to the energy that is embodied-consumed-wasted to produce one tonne of paper are rather complicated.

INPUTS:

- Trees are cut with feller-bunchers, transported by truck to the sawmill
- Sawmill residues (1 ton of chips have .3215 toe – tonne of oil equivalent – 3 tons chips equal one tonne of oil) are transported to pulp mill, mostly by truck
- A modern pulp mill is energy self-sufficient; we use 2.2 tons wood or 0.7 toe to end up with one ton of pulp that contains roughly 0.33 toe (using up 54% of the initial energy).
- Pulp then is shipped all over the globe by ship, train or truck
- A paper mill consumes huge amounts of energy in its process (refining, paper machine, coater) and all raw materials have high energy contents (wood for SGW/TMP, waste paper or pulp)
- And a lot of other raw materials like latex and chemicals, all oil and gas based

Take a modern paper machine producing UC WF

- Using 66% HW, 9% SW and 19% filler, the remaining 6% are water
- All pulps used are produced in a modern mill, using no fossil fuel
- SW chips travelled 300 km in 50 tons trucks to the pulp mill, 200 km for HW chips (45% yield/50% moisture)
- SW pulp moved 17000 km by ocean vessel to the paper mill, and 5000 km for HW

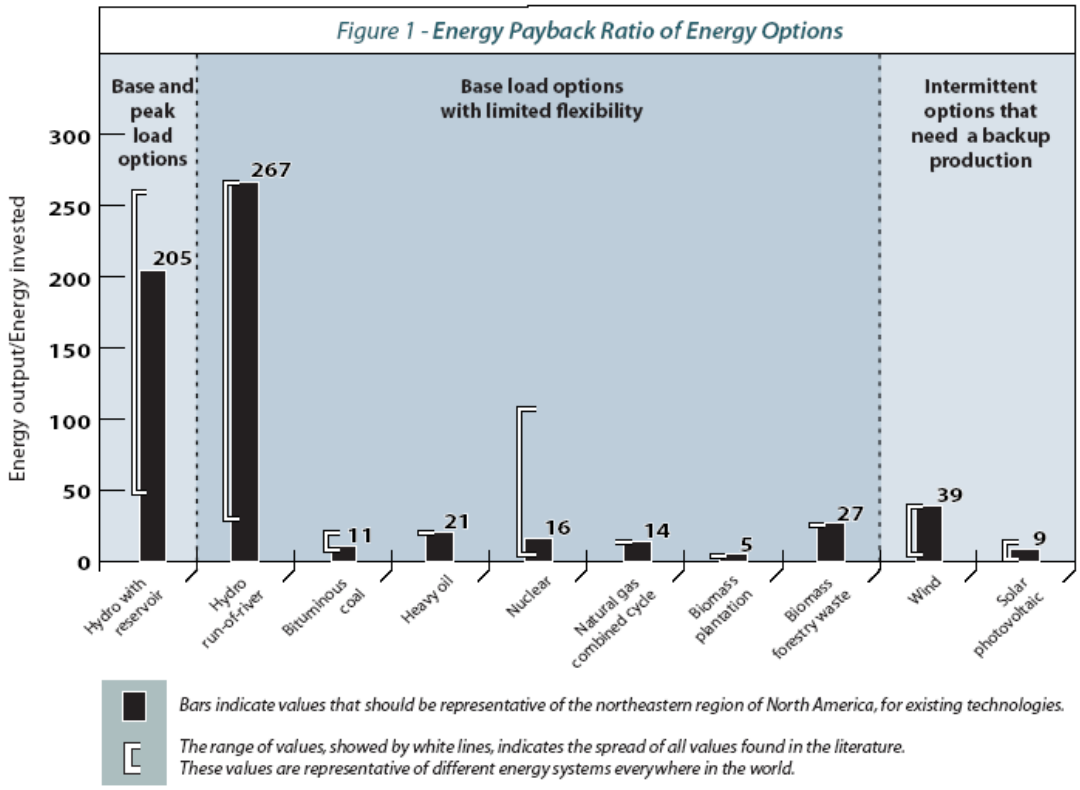
Based on the above model, my colleague and Director Technology, Mike Bradley, in cooperation with Springer Verlag and Stora Enso calculated (using LCA inputs) the following chemical energy numbers (this estimate doesn't include the energy to actually make the paper):

- 11 GJ total process energy, i.e. the energy used up to produce the products and get them to the mill gate;
- 2.8 GJ of these 11GJ was energy in the wood chips for a fossil free value use of 8.2 GJ;
- 38 GJ total extracted energy, i.e. energy that was depleted (or 35.2 GJ fossil free)

Conclusion: 27 GJ or 76% of the original energy content that were available on earth, were irreplaceably lost in the process because processes are not efficient, and energy is lost in conversion. Put another way: with the net calorific value of 1 tonne of oil at 42GJ, we extracted (and depleted) the equivalent of 905 kg oil, wasted 643 of them to bring an equivalent of 262 kg to the mill gate. Not a great example of efficient energy use. This study is downloadable from our Canfor technical website www.temap.com

The Future

Science hasn't come up with a cost effective substitute for oil, gas and coal yet. Workable alternatives must have a low "energy payback ratio". This ratio is the energy produced during the normal life span of that power generating system, divided by the energy required to build, maintain and fuel the equipment. A ratio of one means it consumes almost as much energy as it produces. The lower the ratio, the least it is preferable.



Based on LCA, Hydro Quebec compared the power generation options for a range of today available systems as alternatives to oil, gas and coal. For comparison: fossil fuel systems are in a range from 11 to 21.

- Hydro outperforms, always
- Wind comes next at an astonishing 39
- Followed by the stable (predictable) 27 for biomass from forestry waste (and only 5 when from plantations because of its higher energy input).
- With 16, nuclear is low and has a huge spread.
- Heavy oils (tar sands) at 21 and bituminous coal at 11 come in low. In the Peak-Oil graph earlier, tar sands (and other heavy stuff like shale) were shown, as a small black zone, but it will last way beyond 2050. To convert tar to oil, a lot of energy is needed, today predominantly gas, what explains its low energy payback ratio of 21.

Coal, coal-to-liquid and coal-to-gas are no help at all: not on the CO2 side, and little on the availability side. At today's rate of consumption, the World Energy Council says we would have enough for in excess of 200 years, but maximum 50% is recoverable. Then remember the rule of 70 and losses in the conversion to liquids! The IEA predicts coal usage to rise 32% from 2006 to 2015 (10years!!!), of which 86% in developing countries. Coal is the poor man's energy, and he cares a lot

about CO2 emissions. To reduce emissions of CO2 and sulphur, the scrubbing of sulphur and sequestering of CO2 (when commercially available) will involve huge amounts of energy.

Over the next years, a lot of new energy sources and technologies based on renewables will have to be used. In 2005, only 6% of US primary energy consumption was covered by 'renewables of any kind' of which 61% were used for electrical power and 23% industrial. We need a major breakthrough for those renewable energy sources to cover a substantial part of today's energy need. The drama of our industry is the caloric value imbedded in our basic raw material: wood.

Energy Content of selected Carbons

	Kcal/kg	Pellets = 100
Nat Gas Liquids	10750	225
Heating oil	10025	210
Coal	6200-7400	140
Wood pellets	4800	100
Pulp/Paper	4600	95
Air dry wood	4700-5000	100
Dry split wood	3225	70

At today's oil prices, wood delivers energy for a fraction of the cost of oil, as do all nearly all other energy sources. But wood is a ubiquity, low capital intensity, its technology age-old and it works, everywhere and always. Waste paper is no different. The table has been turned on us and we do not have a good hand.

The vigilance with which the EU (administration and politicians) are pushing through their Bio-energy policies and Biomass Action Plan (in which forest biomass plays a key role) makes the wood-pulp-paper industry problems irrelevant and trivial in the face of the overall problems.

Good news is the position of the Finnish MEP Eija-Riita Korhola statement that *"all renewable energy must be assessed with life cycle thinking (including peer review) including all emissions during production and transportation*." (Cepi – Issue 18 – November 2006)

WWF states that raw materials should be made and used in a sustainable way. Climate change and CO2 lead to a new hierarchy of uses. Wood for pulp and paper or for energy is not the issue; renewable energy is.

Sweden is the only country that has made up its mind. The Swedish Commission on Oil Independence wants to turn Sweden into an oil-free society by 2020 and its conclusions are:

- No oil for residential & commercial buildings
- Increase efficiency of energy use by 20%
- All transport to cut petrol/diesel usage by 45-50%
- Industry reduces oil by 25-40%

Meanwhile, our industry sends out mixed signals. CEPI's President Jan Astrom wants to re-establish fair competition between wood for biomass and for raw materials, dismantling subsidies and taxes. Very laudable! Signs are getting alarming that recovered paper is increasingly used for energy generation. Mr Henri Vermeulen

– Chairman CEPI Recycling and Product Committee – states: *„First priority is policies that do not disturb the market and that the paper industry has access to its valuable fibers with affordable prices, without having to face biased competition of subsidized energy generators". „Local authorities need clear guidance on how to organise the paper collection in the most sustainable way*". (Cepi – Issue 18 – November 2006). Hasn't the paper industry been subsidized for years by favourable recycling legislation, giving abundant cheap supply, collected by local authorities and paid for by taxing citizens?

Pöyry conducted a study for CEPI, comparing ***Value Added*** and ***Employment*** in the P&P Industry versus the Energy Alternative, using primary and secondary fibre. In the best-case-scenario, total VA amounted to €263 bn for P&PI v €33.8 bn and employment 2.95 million v 0.23 with bio-energy.

		Core Level	Total Impacts*
Value Added bn€	PPI	27.5	263
	Energy	6.3	33.8
Employment	PPI	264,200	2,950,000
	Energy	46,000	229,000

** = core + upstream + downstream + multiplier*

No wonder. P&P is one of the most capital-intensive industries and VA increases with the amount of capital tied up in the process. Then consider what we said earlier about *"76% of the original energy content that were available on earth were irreplaceably lost in the process."* If we were to be consistent with ourselves, we should promote the use of ULWC over toilet tissue because of its higher VA component. This example confirms again our statement about using LCA.

The closing slide of the CEPI Open Seminar "Bio-Energy – The Burning Issue" (29 November 2006) reads: *"Efficiency of the energy production from biomass should be a priority and should be monitored in order to avoid wasting the resource".* Q.E.D.

Can we really ignore the use of wood for energy?
Canadian wood pellets have a calorific value of just over 5.0 MWH per ton or 18.5GJ per ton. For a few years now, pellets to major power producers in Europe sell at prices stable around €27.5 per MWH. One tonne of pellets sells @ €27 * 5 = € 137.5/ton = $185 per ton, for a total production cost of around $115 at 90% energy efficiency. Compare this to paper and to oil.

Pulp and paper are capital intensive, its business volatile. Equity investors should receive a premium to the industry's weighted cost of capital, which already ranges 9% to 12% for prime companies.

Forestry companies need steady and secure buyers for its saw milling residues. It makes or breaks their profitability. As they produce large volumes of chips, pulp mills were prime outlets, once.

If one were to build a state of the art pellet plant, C$27.5 million buys you one, and you get four for C$110 million. Each plant consumes 400.000 Odmt of woodchips and other residues, and 1.6 million tons of chips for four of them are equivalent to what one state of the art NBSK (BC Interior) mill of 750.000 tpy would need, but then at an investment priced around U$ 1.3 bn, say C$ 1.5 bn rough and dirty.

For the sake of simplicity now: if we were to take a low 9% as the cost of capital (you need excellent credentials) and imagine that pulp mill up and running after only one year of construction time, then the 1.5 bn dollar at 9% would have siphoned away already C$135 million before the first ton of pulp was produced. This is more than the total investment in 4 pellet plants. Now again, imagine, you are the visionary CEO who has to convince his board of a C$1.5 bn investment in a new pulp mill. I presume you can catch my drift.

What are the alternatives?
During the transition period, renewable sources, no matter how optimistic you are, can only cover a fraction of our current consumption. When faced with seemingly insurmountable problems, it can be tempting to turn to alcohol. Bio fuels reduce emissions, but like other forms of alcohol, they are a palliative, not a cure:

- They increase food prices; modern agriculture once was the use of land to convert oil in to food; now we go in reverse (read: perverse).
- Cutting down rainforest is also not a nice way to save the planet
- Ethanol distilleries use coal/oil/gas

Ethanol from trees, grasses and other biomass is still too expensive though have a huge potential provided costs can be reduced dramatically. It has the potential to outperform sugar cane in Brazil with an 8.3 energy balance (12% consumed of final energy output). Wood isn't getting any cheaper any time soon. Our industry may well witness the end of cheap raw materials and cheap energy. Not very comforting.

Conclusions

It is time to wake up to the new and harsh realities. Our planet has always turned around by its own mechanism that supersedes the power and control of its leaseholders. Since 1500, mankind was able to unravel part of this mechanism as knowledge exploded. In that same process, we have depleted in as little as 100 years the best part of the non-renewable carbons that nature took more than 100 MILLION years to create.

What bothers me most is that climate change is turned into a scare, high-jacked for the wrong reasons. We must cut back on non-renewables, not because of the climate change, but because we are unnoticed and silently running out of them. All our progress and our whole political, economic and social system has been *"fuelled and propelled"* (sorry for my language) because energy was priced wrongly, and to a large extend was wasted. If energy is not reprised anytime soon (the ideas of Professor Ernst von Weizäcker from the Wuppertal Institute for Climate, Environment and Energy author of "*Factor Four: Doubling Wealth, Halving Resource Use"* can be a useful guideline), then politicians will do what they always do: go for the road of least resistance. The risk is that we will hit the wall having even fewer alternatives, with very unpredictable but surely unpleasant consequences.

Slower economic growth must not be the ultimate consequence. I am hopeful. Hopeful that linked knowledge will timely develop new energy 'converters and generators' based on renewables, decoupling growth and progress from the use of fossil fuel. In that transition, wood, pulp and paper will be reprised and our capital-intensive industry will face many unpleasant challenges. It will not be business as usual because at the same time, the Internet based knowledge economy starts making inroads. Remember our monks.