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Clean Energy, Climate and Carbon

by Peter J Cook
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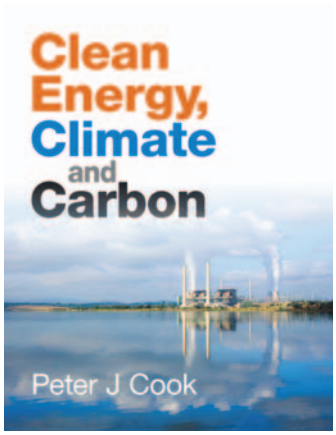

2010 was a record year for CO_2 emissions from burning fossil fuels and making cement. Globally, the equivalent of over 33.5 billion tonnes of CO_2 was added to the atmosphere. This was nearly 6% higher than the 2009 global estimate, and with the economies of countries like China and India powering ahead the current trend is likely to continue.

As a result, the earth's atmosphere will continue to warm; sea level will rise faster than it has in the last 2000 years; millions of people now living on low lying land will be forced to move; the oceans will become more acidic; there will be more extreme weather events as the atmosphere becomes more energetic; and the fossil fuels currently being consumed at record rates will become more expensive.

This is not a happy scenario, but it did not deter Peter Cook from arguing that Carbon Capture and Storage (CCS) can be a major weapon to decrease the current rate of CO_2 being added to the atmosphere.

Clean Energy, Climate and Carbon is an easy-to-read thorough analysis of all the main issues, and the diagrams are really good if you just have time to skim-read. It cuts to the core of the challenges humans face on planet earth as a result of climate change and increasing energy demands, including the science, engineering, economics, population (the elephant in the room) and of course the politics.

The book starts with a very good review of the evidence for human-caused global warming and why we are producing so much CO_2. It then goes on to discuss some of the technological options for decreasing CO_2 emissions and concludes that even with a mix of solar, wind, geothermal, nuclear and other 'renewables' it will be very difficult to reduce these emissions because of our huge reliance on fossil fuels.

This leads to CCS; where and how it is captured; how it is transported; where and how it can be stored; how the captured CO_2 can be monitored; and above all how much it is likely to cost. Of course the overall cost is very difficult to estimate because there are so many variables, and above all, because there is a dearth of examples of CCS in action. If you want to take a punt at the cost then $80–$140 per tonne of CO_2 avoided is suggested, but each case will have to be calculated on its own merit. To take one example: how should the CO_2 be transported from the source to its storage place? By ship or pipeline? Or another: how should the storage site be monitored and for how long?

In spite of these complexities it is argued that CCS can play a significant role in reducing the level of CO_2 in the atmosphere.

Finally, the technology and politics of clean energy are discussed – and if you think the science and engineering of CCS are complex, try the politics of clean energy!

It is pleasing to note that a lot of the research into CCS has been and still is being carried out in Australia and this is in no small measure as a result of the work of Peter Cook who established the CO2CRC and was its CEO from 2003 until 2011. I would highly recommend this book for anyone with a science background from year 12 and upwards. Furthermore, in Australia we can look forward to 2015 when the Gorgon gas project in Western Australia will start storing 3–4 million tonnes of CO_2 per year under Barrow Island – not long to wait and a real test of the technology.

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Too much of a good thing

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Can you remember several years back to the introduction of those great little USB connected hard disks that allowed people to send data sets between companies with ease? Man – these things were a great boost to productivity. No more tape drives, no more burning DVDs, just plug and play and get on with things.

The guy at the other end could plug it in, drag and drop his data onto his machine and then if he was sneaky – take the disk home and put a heap of music on it, videos, and family photos – and maybe even then send that to someone else to use to get a copy of his music collection.

It didn't take long until volumes of these disks began to pile up filled with valuable data, breaching security and antivirus systems everywhere, and creating an impossible archive situation where no one knew what disks had what data on them. The one labelled 'Mt Isa Located Magnetics and Gravity Data', actually had Barbra Streisand's Greatest Hits music collection and a nice array of photos of a previous exploration manager's kids on it. The one labelled 'North West Venture 3D Seismic' had a small collection of seismic data on it, but also included a 'Stuff' folder that had 2 Gb of porn, a second copy of Barbra Streisand's Greatest Hits, and the recently updated resume for the exploration manager that just left.

The great USB connected disk pool (or black hole) got larger and larger. The disks started to change shape. Some very small, others standing on their edge in a neat little stand, some with cool blue lights, others just a subtle stainless steel case complete with a total lack of cooling and anti-vibration systems that rendered them useless after 12 hours of continuous use. And let's not forget about all of the cables and plugs … yes … the snake drawer!

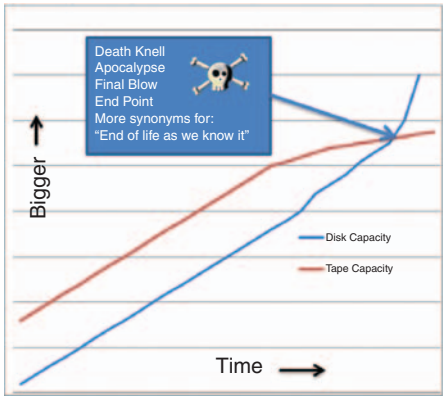
I remember reading the warranty on one hard disk that said something about the disk being perfect for home use and data storage, anytime and anywhere. In reading the fine print, it actually said something about 'anytime and anywhere' being less than 4 hours in any one 24 hour period in a cool, clean, and dust free environment. I'm not sure about most of your own homes, but my house operates 24/7, and with five kids it is never cool or clean.

Two years ago as this data management issue started getting worse, one major oil company declared that all USB connected HDDs will be used only once and were to be disposed of to avoid data loss – so all data was to be transferred to the network server for archiving as soon as the data arrives. Network administrators and backup engineers all took a deep breath and quietly went about crapping themselves wondering how their backup systems would cope with terra-bytes of unexpected data coming onto the network every few days.

Last year, the largest manufacturer of disk drives shipped 200 million disks. Rumour has it that almost 40% of these went into USB 'disposable' disks. That is only about 80 million USBs … nothing to worry about. Okay network administrators – you can go change your underwear now.

This trend is not going to stop. Disk manufacturers are trying to build hard disks that store more than tapes and they are getting closer. Once they do – the trend of USB connected disks will be more than just a fad – it will be the way of the future.

The following graph shows the race between these two technologies.



I do a bit of reading on this stuff (because I am a nerd) and no one from my point of view has a very good feel for where this will end up.

So how do we cope?

Well – you are going to continue using these very convenient disks aren't you … so you might as well use:

1. A server grade hard disk like a Hitachi Ultra Star. Not the cheapest, but it is a good quality disk that will last. The old adage of 'you pay for what you get' rings true in this situation without a doubt.
2. A good enclosure for the disk. Good ventilation, built in fan and a redundant power supply if possible.
3. A spreadsheet/database of files that are on it so you can locate them easily. No one wants to get a hankering for Barbra Streisand and not be able to find her.

And work with your IT manager to help you back this stuff up. Don't screw up his incremental backups with 2 Tb's of extra stuff when he least expects it.

As per the graph above, the two curves will meet, and when they do, someone will become very rich and someone named Barbra Streisand will go platinum posthumously as the most distributed artist of all time. The rest of us meanwhile will be searching for that critical data set on one of those disks.

May			2012
14–18 May	GeoConvention 2012: Vision http://www.geoconvention.com	Calgary	Canada
27–29 May	3rd International Conference: Geosciences and Environment http://www.agserbia.com	Belgrade	Serbia
29–31	3rd International Geosciences Student Conference http://www.3igsc.com	Belgrade	Serbia
June			**2012**
4–7 Jun	Copenhagen 2012: 74th EAGE Conference & Exhibition incorporating SPE EUROPEC 2012 http://www.eage.org	Copenhagen	Denmark
4–8 Jun	GPR 2012: 14th International Conference on Ground Penetrating Radar http://www.gpr2012.org	Shanghai	China
15–18 Jun	5th International Conference on Environmental and Engineering Geophysics http://www.iceeg.cn/english/index.htm	Changsha	China
July			**2012**
25–31 Jul	21st EM Induction Workshop http://www.21emiw.com	Darwin	Australia
22–27 Jul	IEEE International Geoscience and Remote Sensing Symposium: Remote Sensing for a Dynamic Earth http://www.igarss2012.org	Munich	Germany
August			**2012**
5–10 Aug	34th International Geological Congress http://www.34igc.org	Brisbane	Australia
20–24 Aug	Geobaikal 2012: Electromagnetic Research Methods and Integrated Geophysical Data Interpretation http://www.eage.org	Irkutsk	Russia
September			**2012**
3–5 Sep	Near Surface Geoscience 2012: 18th European Meeting of Environmental and Engineering Geophysics http://www.eage.org	Paris	France
10–14 Sep	EABS IV – Eastern Australasian Basins Symposium http://www.EABS2012.com.au	Brisbane	Australia
17–19 Sep	Istanbul 2012: Istanbul International Geophysical Conference and Oil & Gas Exhibition http://www.igcistanbul.com	Istanbul	Turkey
19–21 Sep	KSEG International Symposium: Geophysics for Discovery and Exploration http://2012symp.seg.or.kr	Jeju	Republic of Korea
November			**2012**
4–9 Nov	SEG International Exposition and 82nd Annual Meeting http://www.seg.org	Las Vegas	USA
December			**2012**
6–10 Dec	AGU Fall Meeting 2012 http://www.agu.org/meetings	San Francisco	USA

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