Going Green Gracefully

Questnet 2008

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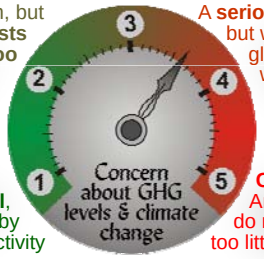
Part 1
Environment

What do you think?

Rising GHG levels could affect climate, but **no need to panic** because human ingenuity will save the day

Maybe a problem, but the economic **costs of fixing it are too high** – better just to adapt as the climate changes

A **serious problem**, but with urgent global action we may be able to limit the damage



Variation in GHG levels is **natural**, not caused by human activity

Catastrophe! Anything we do now will be too little, too late!

Inter-government Panel on Climate Change (IPCC)

Established 1988 by the United Nations Environment Program (UNEP) & the World Meteorological Organisation (WMO) …

… to **assess** on a comprehensive, objective, open & transparent basis the **scientific, technical & socio-economic information** relevant to … **climate change,** its potential **impact** and **options** for adaptation and mitigation

2007 Report

- **Fourth major report since inception**
- **Authored by many of the world's leading scientists and moderated by an even larger group of experts & policy makers**
- **Deliberately conservative view that probably understates the problem**

Photo by Kevin Dooley (see http://www.flickr.com/photos/pagedooley/386198516/)

The Planet is Getting Hotter!

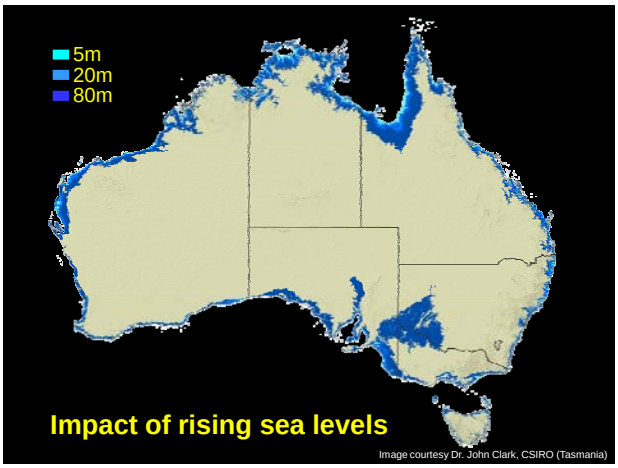
Global mean surface temperature has risen 0.74°C over the last 100 years

Further increase of 1.1 - 6.4°C by 2100

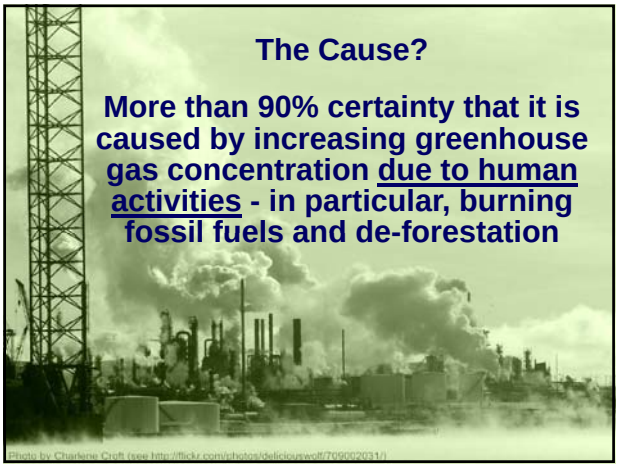
Sea level rise 18-58 cm, but this under estimates impact of glacial processes

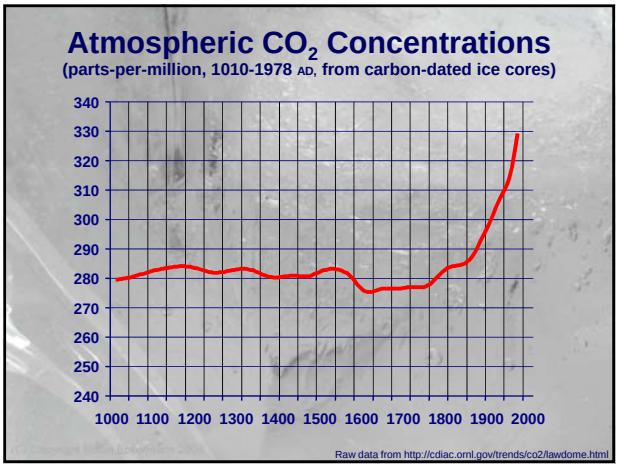
Beyond 2100, the decline of Greenland's ice sheet may contribute 4-6 m rise in sea level

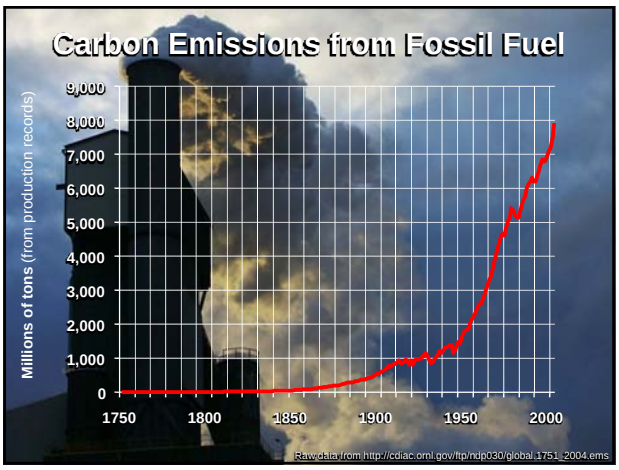
May 2007


5m
20m
80m
Impact of rising sea levels
Image courtesy Dr. John Clark, CSIRO (Tasmania)


A 5m rise in sea level looks a whole lot worse close up!
Google Earth with 5m inundation overlay generated from https://www.cresis.ku.edu/research/data/sea_level_rise/google_earth_links.html


The Cause?
More than 90% certainty that it is caused by increasing greenhouse gas concentration due to human activities - in particular, burning fossil fuels and de-forestation


Atmospheric CO_2 Concentrations
(parts-per-million, 1010-1978 AD, from carbon-dated ice cores)
340
330
320
310
300
290
280
270
260
250
240
1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000
Raw data from http://cdiac.ornl.gov/trends/co2/lawdome.html


Carbon Emissions from Fossil Fuel
Millions of tons (from production records)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1750 1800 1850 1900 1950 2000
Raw data from http://cdiac.ornl.gov/ftp/ndp030/global.1751_2004.ems

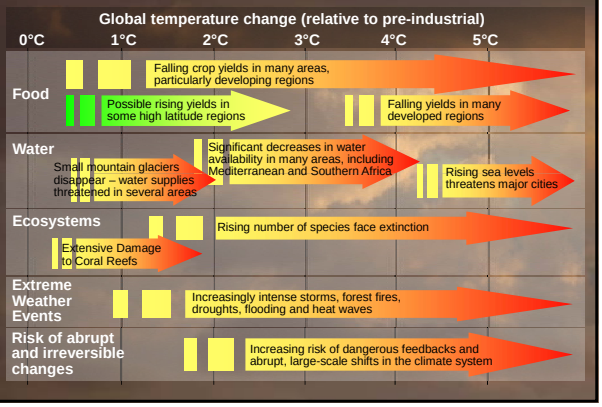

We are destroying the world's precious ancient forests like never before. An area of natural forest the size of a soccer pitch is cut down every two seconds.
A quarter of the forest lost over the last 10,000 years has been destroyed in the last 30 years.

ICT as part of the problem

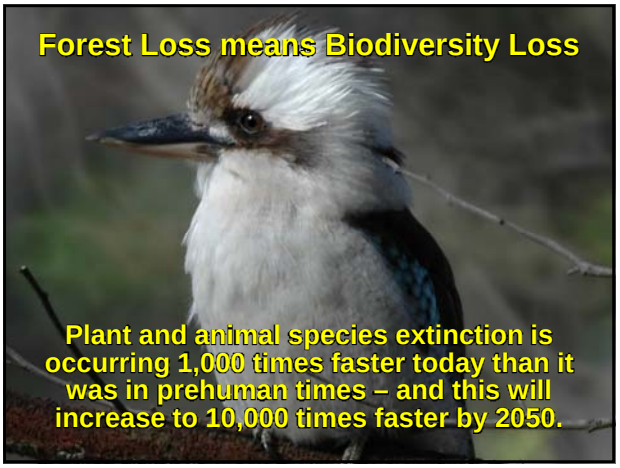
ACS audit of business ICT use in 2005:

- contributed nearly 8m tonnes of CO_2
- 1.52% of total CO_2 emissions
- about equal to civil aviation industry

Stern report (2006)

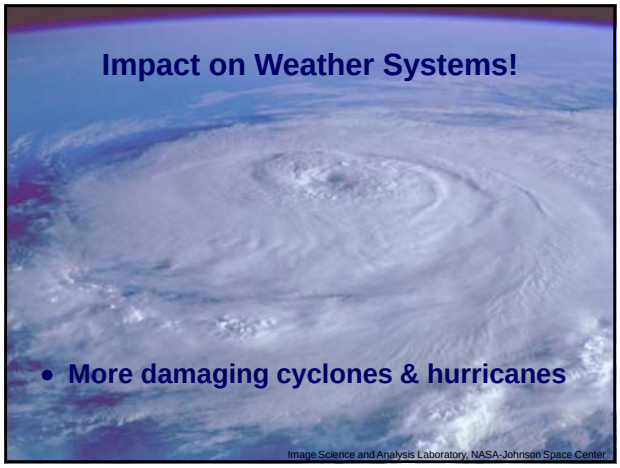


Forest Loss means Biodiversity Loss



Plant and animal species extinction is occurring 1,000 times faster today than it was in prehuman times – and this will increase to 10,000 times faster by 2050.

Impact on Weather Systems!



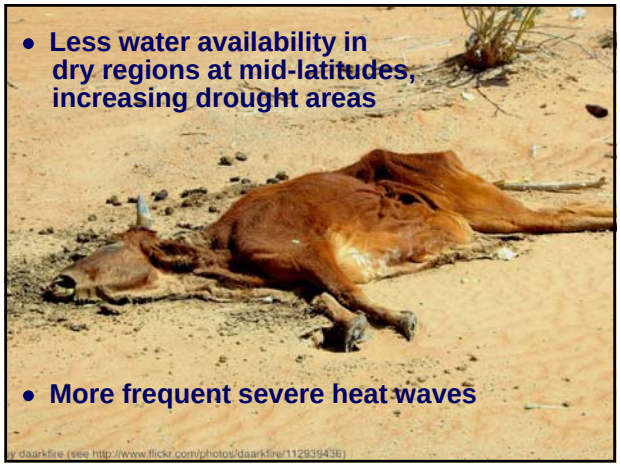
- More damaging cyclones & hurricanes

Image Science and Analysis Laboratory, NASA-Johnson Space Center

- More frequent flooding at high latitudes and in some wet tropical areas

Photo by Matt Ewalt (see http://www.flickr.com/photos/mattewalt/167718005/)

- Less water availability in dry regions at mid-latitudes, increasing drought areas



- More frequent severe heat waves

by daarkfire (see http://www.flickr.com/photos/daarkfire/112939436)

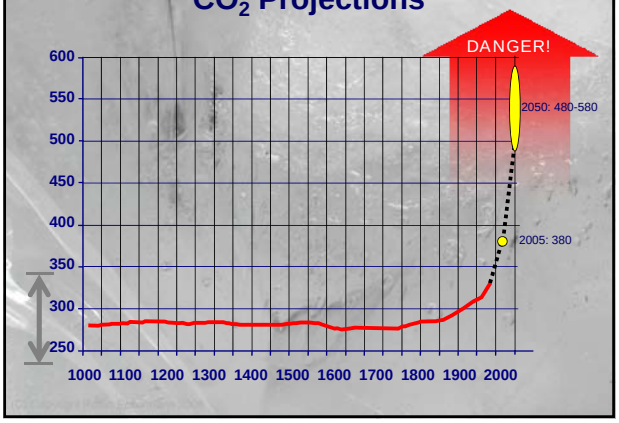
The livelihood, water resources and food security of hundreds of millions are under threat!

- Global food reserves at 25-year low
- Grain reserves to feed the planet for 57 days
- 18% food price inflation in China in 2007
- Oil US$140/barrel

"Combine the increase [in] oil prices and … food prices … you have the elements of a very serious [social] crisis in the future"

Jaques Diouf - Head of UN FAO

CO_2 Projections



Positive Feedback Mechanisms

Melt-water lubricates the slide of glaciers into the ocean

As ice-caps melt, darker surfaces absorb more of the sun's heat

Warming oceans melt ice shelves that otherwise block flow of ice into the ocean

Worst-case? Ocean currents grind to a halt, oceans stagnate & turn acidic

What sort of a future are we handing over to our children and their children?

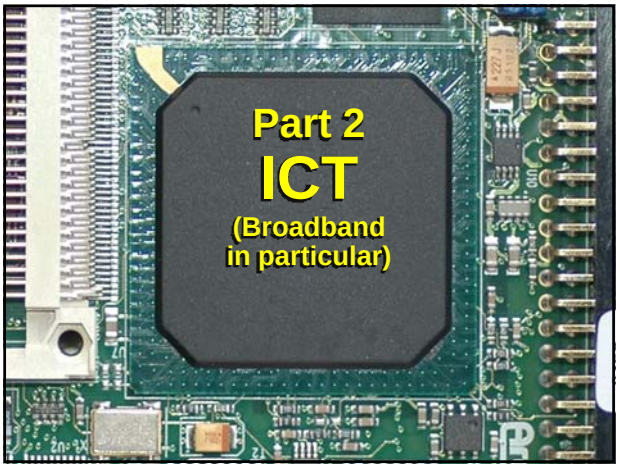
Grandchildren proudly produced by Robin Eckermann & family

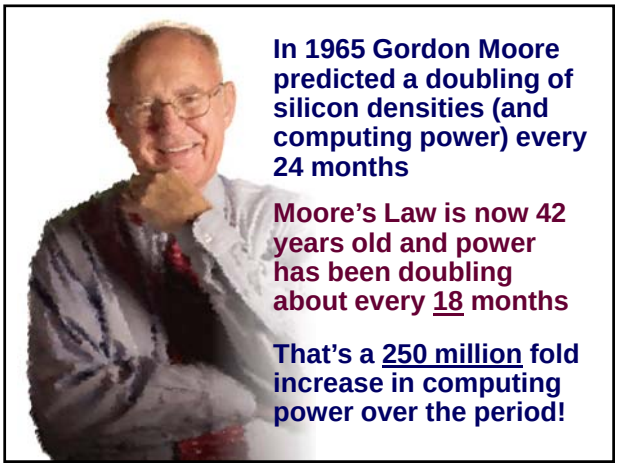
But is it proven?

… there's a cliff somewhere ahead
... you're driving in the fog
... your vehicle has poor brakes

IPCC Recommendations

- Urgent action to avoid catastrophic outcomes
  - Lifestyle & behaviour changes
  - Application of technology
  - Political will & effective policies *(including carbon price signals)*
- Best forecast outcomes rely on CO_2 emissions peaking by 2015

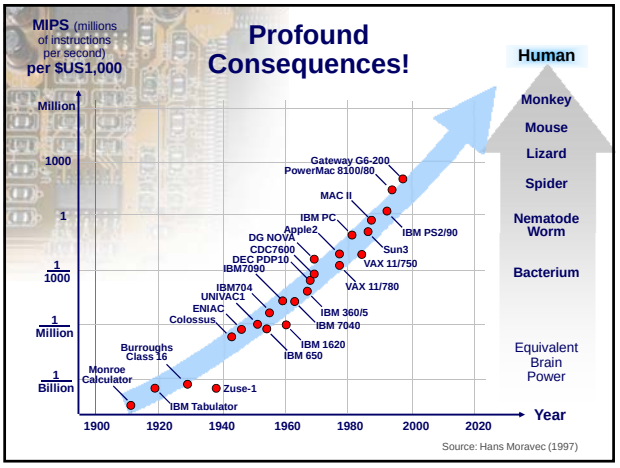




In 1965 Gordon Moore predicted a doubling of silicon densities (and computing power) every 24 months

Moore's Law is now 42 years old and power has been doubling about every 18 months

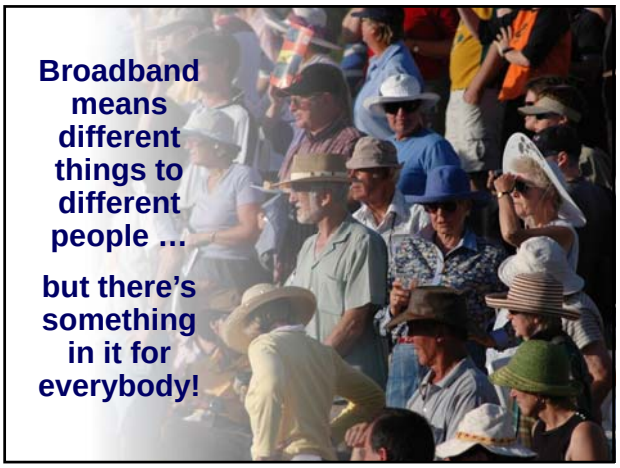
That's a 250 million fold increase in computing power over the period!



Impact on communications

(downloading a 2 hr DVD-quality movie = 4.7 GB)

1980: dialup @300 bps = 4 years
1995: dialup @50 kbps = 8.7 days
2000: ADSL @256 kbps = 41 hours
2007: FTTH @100 Mbps = 6.2 minutes

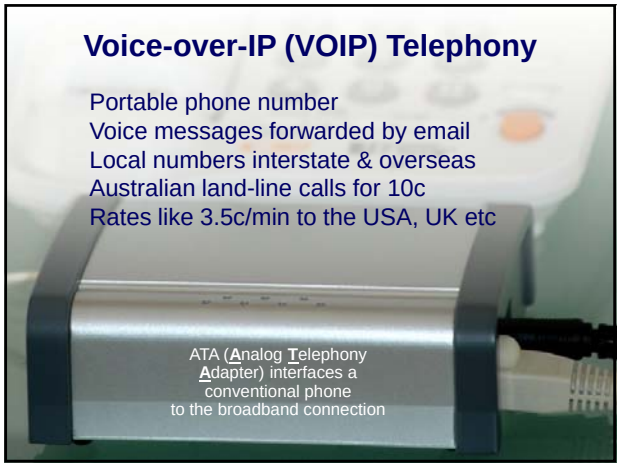


Broadband means different things to different people …

but there's something in it for everybody!

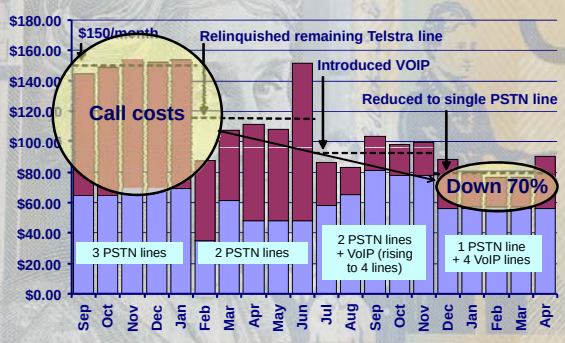
Voice-over-IP (VOIP) Telephony

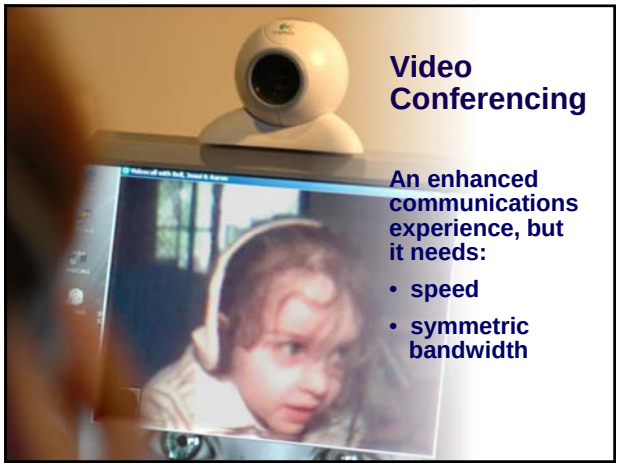
Portable phone number
Voice messages forwarded by email
Local numbers interstate & overseas
Australian land-line calls for 10c
Rates like 3.5c/min to the USA, UK etc



ATA (Analog Telephony Adapter) interfaces a conventional phone to the broadband connection

Big $savings





Video Conferencing

An enhanced communications experience, but it needs:

- **speed**
- **symmetric bandwidth**

High-end "Tele-Presence"

Dare to imagine that the "high end" business technology of today might filter its way down to consumer use tomorrow!

Photo courtesy of cisco

Video On Demand

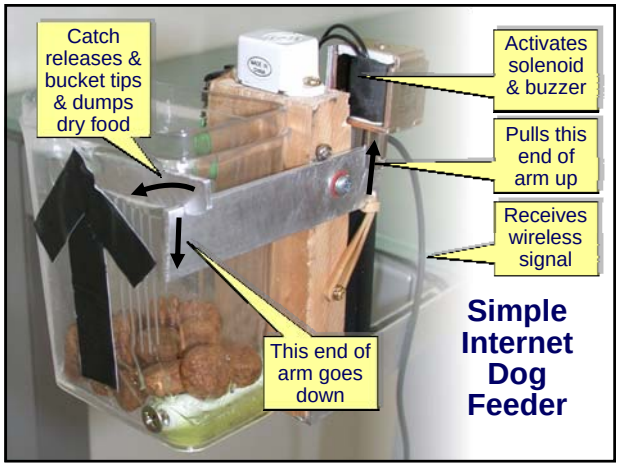

MP3 Music


New & better approaches to old problems


Check the premises from anywhere in the world via the Internet


Multi-camera view


Mobile Phone Access
Record on any camera
Alert others by SMS
Feed the dog
Open garage & record


Catch releases & bucket tips & dumps dry food
Activates solenoid & buzzer
Pulls this end of arm up
Receives wireless signal
This end of arm goes down
Simple Internet Dog Feeder

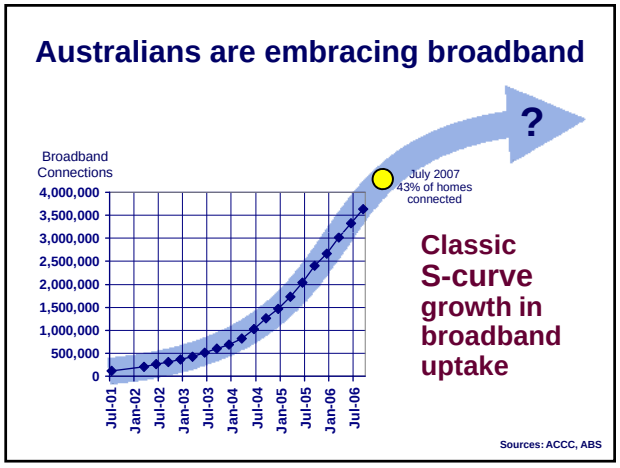

Dog feeder
under video
surveillance


The World's most Globally-fed Dog?

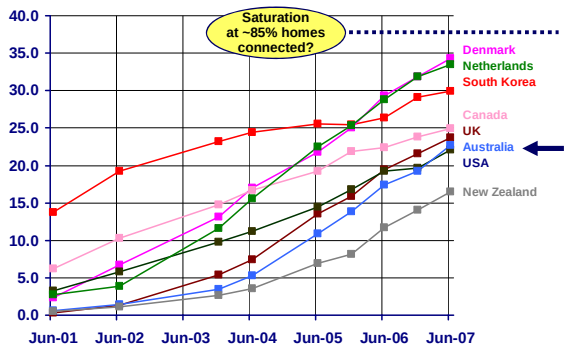

Sprung!
Caught in the act of trying to guess the password for the dog feeder
(nobody knows you're a dog on the Internet!)


Think about the possibilities in areas like aged care!
(helping older people live safely at home for longer)


Criminals are reinventing their business too!
New Risks


Australians are embracing broadband
Broadband Connections
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
July 2007
43% of homes
connected
?
Classic S-curve growth in broadband uptake
Sources: ACCC, ABS

We're about half way there!



Australia's infrastructure will not meet the needs of the future without multi-$billion investment

The need for higher speeds continues to grow, but many Australians are already operating at the limits that ageing network infrastructure will support

Broadband is now a Political Issue

It will affect Australia's ability to respond to emerging social, economic & environmental challenges

An essential utility service – critical infrastructure

NBN –Interim Step Only

FTTN will raise the limits and buy time

Lots of issues still to be resolved – cost, who will do it, impact on competition etc

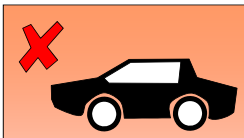
Pushing fibre closer to the user is the key to performance with any technology

Expect pressure for better infrastructure to rebuild … next time under the banner of fibre-to-the-premises (FTTP or FTTH)

Part 3
Putting it Together

(for the benefit of the environment)

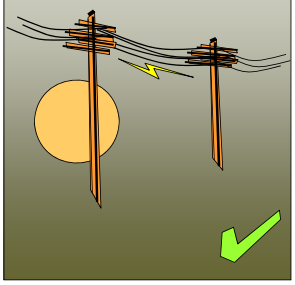
VOD - the Benefits



5 minute trip x 4

20 minutes driving
1 litre of fuel
40 (!) cubic meters of air
Wear & tear on vehicle
Wear & tear on road
Extra unwanted videos
Late fees
and
~3×10^{-3}% risk of being killed!

Selected from previews and delivered over network as a stream of light



Broadband for Environmental Sustainability Challenge

2007 2008

- **$10,000 prizes**
  - 2007 sponsors: Robin Eckermann, Greg Crew, Alcatel-Lucent, Water for Rivers, Multimedia Victoria
  - 2008 sponsors: Robin Eckermann, Alcatel-Lucent
- **Innovative ideas on using broadband for the benefit of the environment**

1989 BMW 535i	2007 BMW 525i
3.4 litres	2.5 litres
155 kW	160 kW
0-100 km/h in 8.6s	0-100 km/h in 7.9s
12.3 l/100km ⟷	9.4 l/100km

Smart engine technology *(embedded micro-computers & communications)* **accounts for most of the improvement**

Smart Grids do much the same for electricity supply networks!

Monitor all active elements
Rich communications
Smart appliances
Smooth & moderate demand
Anticipate looming problems
Extend asset life
Pinpoint faults

13-25% GHG Reduction!

Smart Hot Water System

(Mike Dennis & Haley Jones)

Using micros and communications:

- *learn usage patterns to predict demand*
- *obtain weather forecasts & energy prices*
- *anticipate what solar panels will deliver*
- *optimise supplementary energy usage*

Based on Usage of 200 Litres/day & Canberra Prices	Electric *	Gas *	Solar +Gas	Smart Solar +Gas
Annual Energy Consumption (kWh)	4,600	6,400	1,900	1,150
Annual CO_2 Emissions (kg)	4,800	3,000	1,100	700
Annual Operating Cost ($)	462-623+	301	209	174

* Note that these figures do not take into account distribution losses – highest for electricity

Tele-Working (Bob Nairn)

If on any given day 5% worked from home:

- Direct savings: trip to work
- Indirect saving: smoother traffic flows for the other 95%

17% GHG reduction in Sydney

Other Published Papers

Roger Saunders:

- Use of broadband to deliver information for better agricultural management

Tracy Dodd:

- More general paper on widespread opportunities
- US study estimates these at 10% of of total GHG emissions

ICT as part of the Solution

- Replace energy inefficient activities with environmentally friendlier lifestyle choices
- Re-engineer businesses, industries and products to reduce greenhouse impact
- Manage ICT infrastructure wisely to limit its direct impact on the environment

You can make a difference!

Understand the Threat
Promote Awareness
Demand Action
Reduce + Reuse + Recycle
Exploit ICT as a tool

Our future on the planet need not be bleak!

New Business Opportunities!

The best time to plant a tree is 20 years ago …

The 2nd-best time is now!

Photo by Antonio Martinez (see http://www.flickr.com/photos/popper/39888401/)

Thank You

for allowing me to share these thoughts with you!

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