Preparing for the next “911” event – Climate catastrophe

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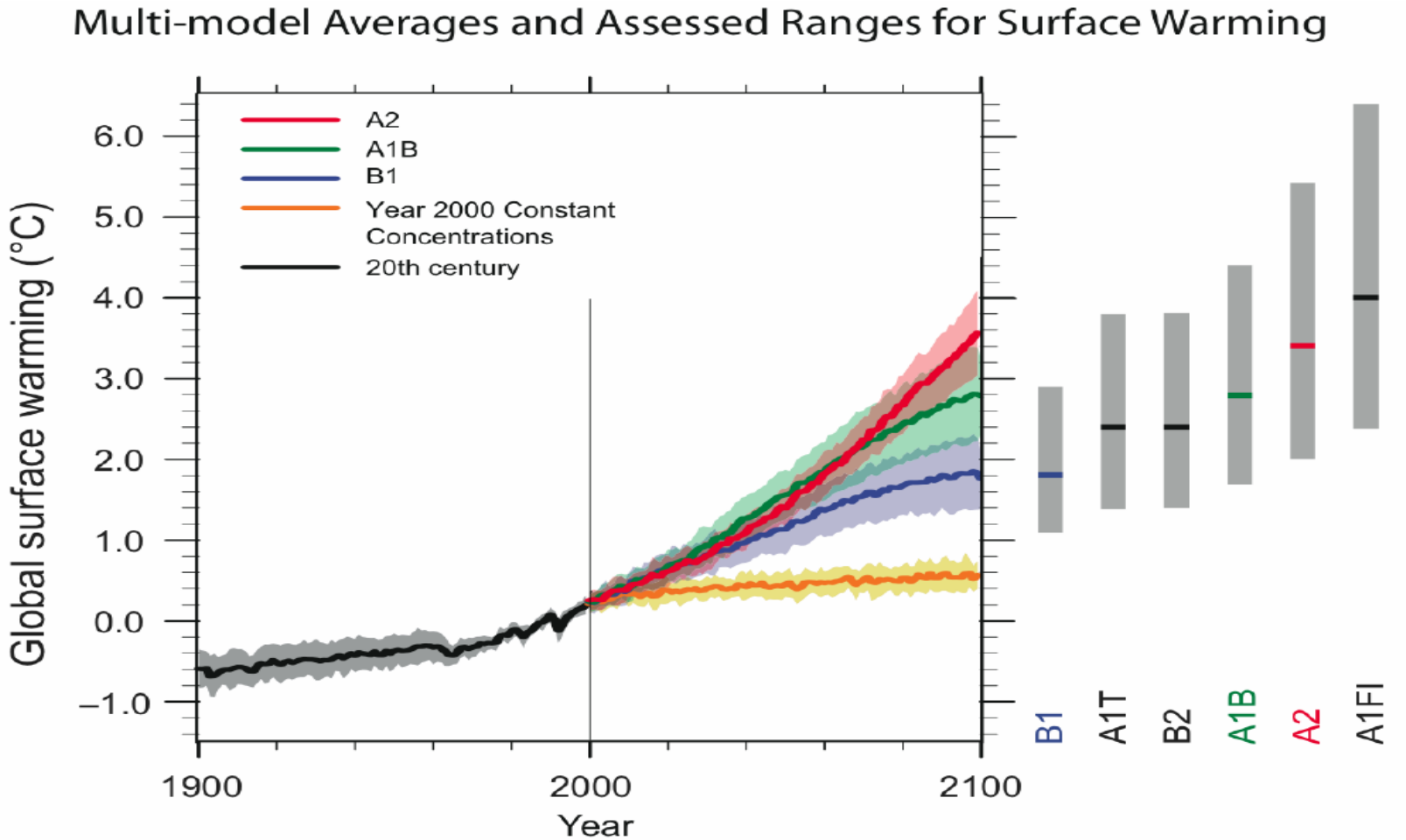
The Climate Change Imperative

- **One of , if not, the greatest threat to our future society and economy is global warming.**
- **15-30% cut in greenhouse gas emissions by 2020 will be needed to keep the temperature increase under 2 °C, and a deeper reduction by 60-80% may be needed by 2050.***
- **Past IPCC assessments have underestimated the pace of change**
  - Latest data indicates we are at the high end of projections
- **It will be necessary to go beyond incremental improvements in energy efficiency, current life-styles and business practices. Significantly more drastic measures will need to be undertaken**

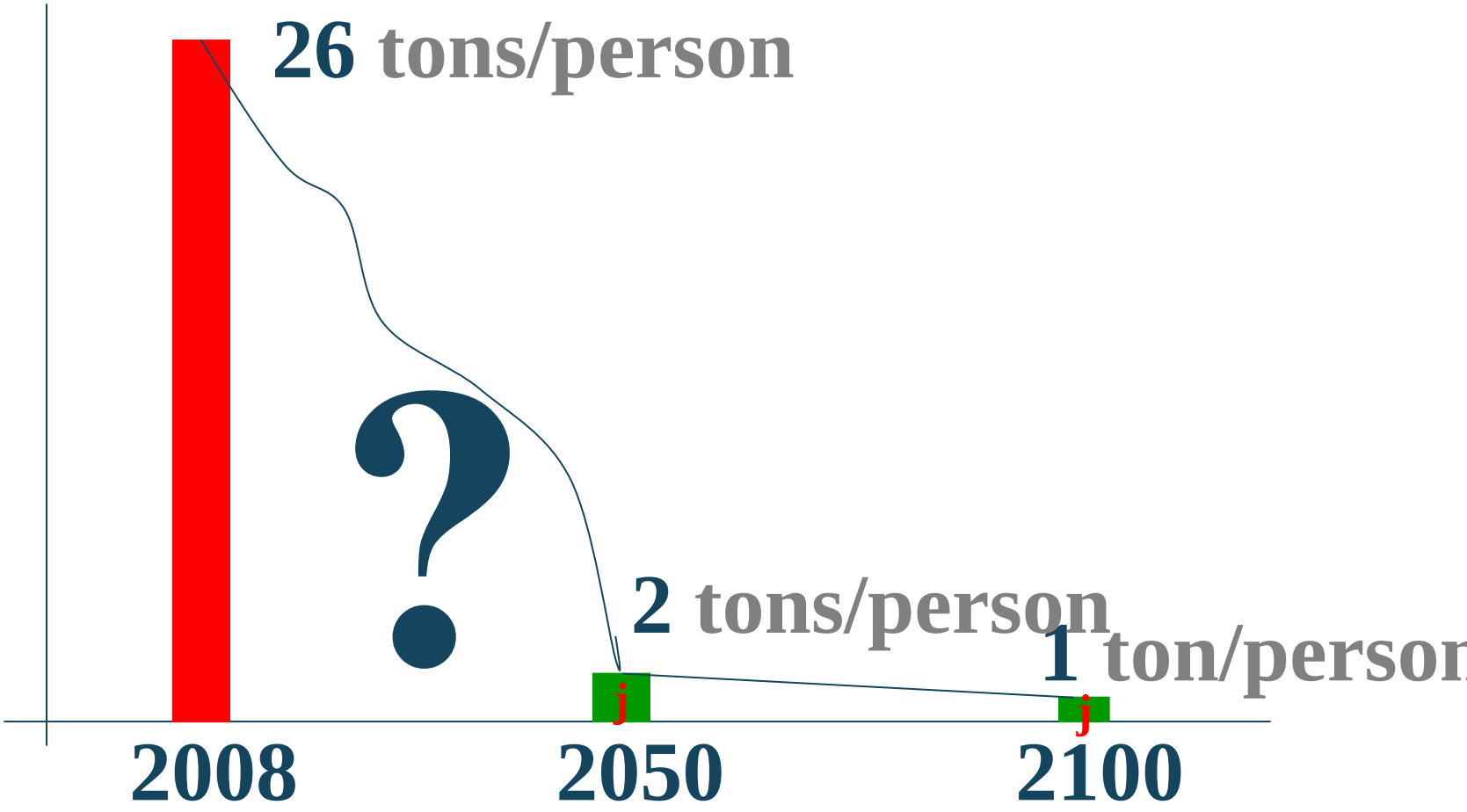
***International Panel on Climate Change**

Climate Forecasts



Source: IPCC WG1 SPM, 2007 http://www.ipcc.ch/SPM2feb07.pdf *Chris Hope - Cambridge*

Our Challenge



Source: Stern 2008

Possible climate “911” event

- **Massive drought, collapse of Ross ice shelf, ice free arctic, major super-storms**
  - http://climateprogress.org/2008/11/24/what-are-the-near-term-climate-pearl-harbors/
- **Are you ready?**
- **Governments are already starting to mandate carbon neutrality and track carbon costs of private sector projects**
- **What would your organization do, if governments ordered drastic reduction in CO2 from coal plants and transportation?**
  - How will this impact the global Internet?

Sustainability versus Climate Change

- **Number one problem facing the planet is climate change**
  - Lots of confusion between Green IT, energy consumption, energy efficiency, Clean ICT, sustainable IT, Corporate social responsibility
- **Turning off the lights or computers may not be the answer**
  - Also misleads people into thinking problem is easy to solve
- **Our focus should be on how ICT can reduce GHG emissions**
  - NOT energy consumption or energy efficiency
  - NOT Clean ICT such as computer waste etc
  - NOT sustainable IT
  - NOT Corporate Social Responsibility

The Falsehood of Energy Efficiency

- **Lots of confusion between energy efficiency and consumption versus CO2 emissions**
- **Most current approaches to reduce carbon footprint are focused on increased energy efficiency of equipment and processes**
- **This approach is doomed to failure because of Khazzoom-Brookes postulate (aka Jevons paradox aka rebound effect)**
  - Greater energy efficiency reduces overall cost and therefore promotes increased usage
- **We need a "zero carbon" strategy because increased usage due to decreased cost from efficiency will not change emission equation**
  - Anything times zero is zero

Zero carbon for the future Internet

- **With IT and networks we know that we will be installing more computers and network equipment**
  - Rate of growth of IT and Networks will be much greater rate of growth of any energy efficiencies
- **Contribution of ICT to CO2 emissions is expected to double every 4 to 6 years with current approaches**
- **Future Broadband- Internet alone is expected to consume 5% of all electricity**
  - http://www.ee.unimelb.edu.au/people/rst/talks/files/Tucker_Green_Plenary.pdf
- **Moving to a zero carbon strategy (not carbon neutrality) is key**

Why ICT and Internet is critical to reducing CO2

- Direct emissions of Internet and ICT are important at 2-3% of world emissions but, in order of impact, the most significant contribution we can make is through leveraged, or indirect, emissions reductions.

- According to SMART 2020 these represent as much as a 15% reduction opportunity in global emissions.

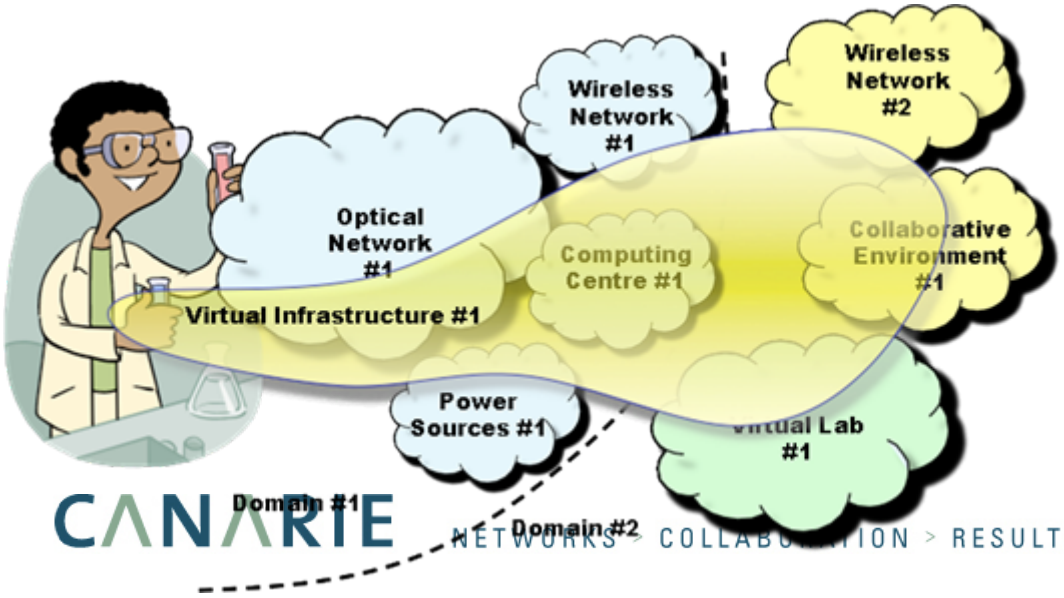
- (And SMART 2020 is one of the most conservative reports on the topic. Others identify even higher potential for savings).

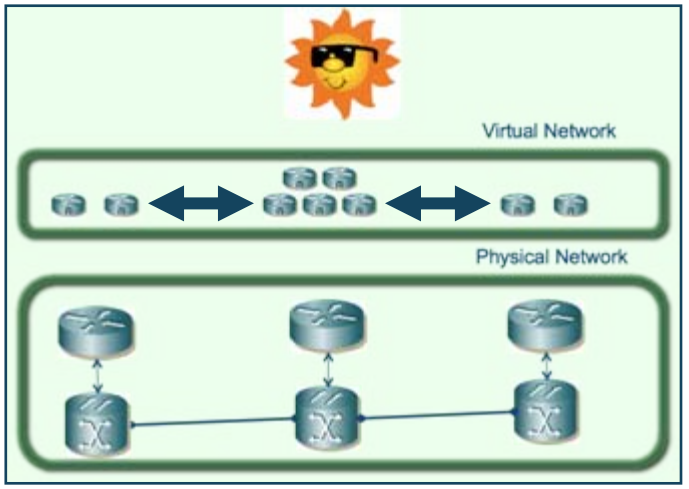
PROMPT – Next Generation Internet to Reduce Global Warming

Technology, Products and R&D

Virtualization, SOA and Hypervisors
Audit and Monitoring
Infrastructure as a Service (IaaS)
Wireless & Optical Networks
Cognitive Networks
IP Multimedia Subsystem
Smart Systems
Lifecycle Management

- **Research on router, optical, W/W-less and distributed computing architectures, applications, grids, clouds, Web services, virtualization, dematerialization, remote instrumentation and sensors, etc.**
- **Share infrastructure & maximize lower cost power by "following wind & sun" networks.**





Sources: GENI and Inocybe

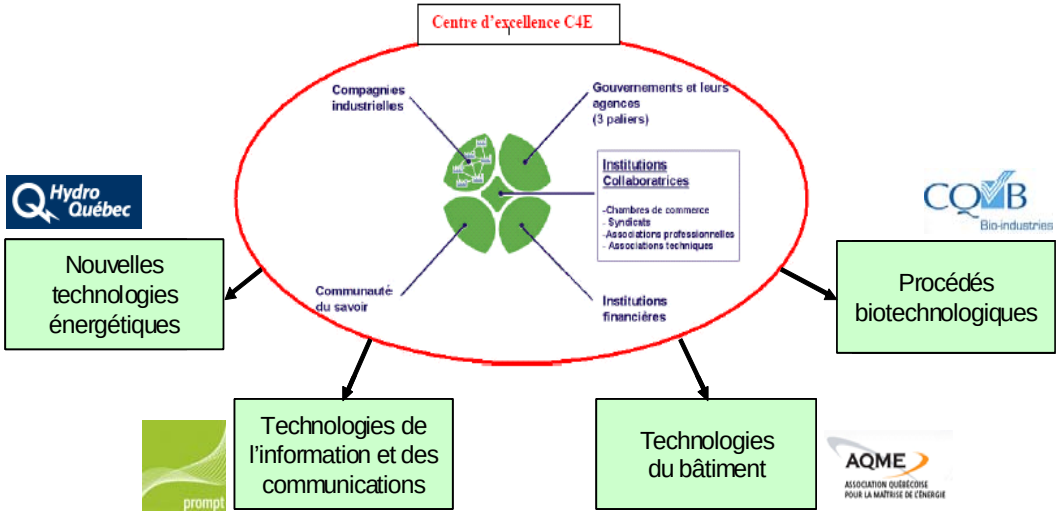
Possible research areas

- Dynamic all optical networks with solar or wind powered optical repeaters
- Wireless mesh ad-hoc networks with mini-solar panels at nodes
- New Internet architectures with servers, computers and storage collocated at remote renewable energy sites such as hydro dams, windmill farms, etc
- New routing and resiliency architectures for wired and wireless networks for massively disruptive topology changes due to setting sun or waning winds that power routers and servers
- New grid and data storage architectures with distributed replication and virtual machines (VM turntables, Hadoop) for “follow the sun” and “follow the wind” grids
- New stats and measurement analysis of bits per carbon (bpc) utilization, optimized “carbon” routing tables, etc

Innovative Research funding model

Commercialization Services

Carbon Offset for IP
Evaluation of CO2 Impact
Threat Avoidance
Innovative Business Models (Virtual Operations, Carbon Brokerage)



- Virtual carbon trading systems where carbon offsets are traded for access to grid computational cycles, wide area network bandwidth, research funding and or other virtual services;
- Creation of a multi-sector pilot of a generalized ICT carbon trading system including government, industry, and universities;

Strong Interest worldwide

- **Over $15M commitments by 11 companies, 15 Canadian universities & institutions and 11 international organizations;**
- **Open initiative: Expanding MOU across California, Canada & ROW.**

Policy approaches to reducing CO2

- **Carbon taxes**
  - Politically difficult to sell
- **Cap and trade**
  - Useful for big emitters like power companies
  - Addresses only supply side of CO2
- **Carbon offsets**
  - Immature market with no standards
  - But addresses demand side of CO2 by businesses and consumers
- **Carbon Neutrality imposed by law**
  - Growing in popularity especially as protests over gas tax escalates
- **But there may be an additional approach….**

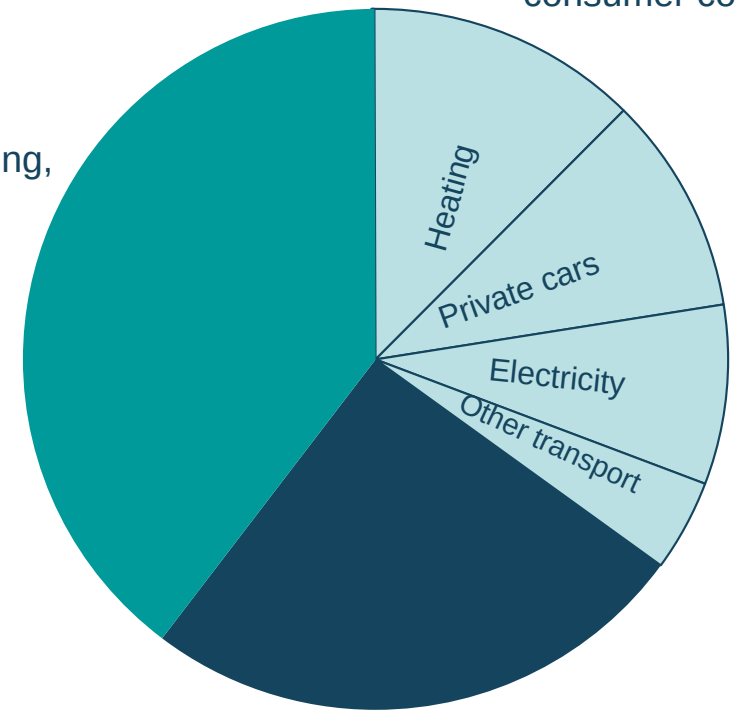
Carbon Rewards rather carbon taxes

- **Although carbon taxes are revenue neutral, they payee rarely sees any direct benefit**
  - No incentive other than higher cost to reduce footprint
- **Rather than penalize consumers and businesses for carbon emissions, can we reward them for reducing their carbon emissions?**
- **Carbon rewards can be “virtual” products delivered over broadband networks such movies, books, education, health services etc**
- **Carbon reward can also be free ICT services (with low carbon footprint) such as Internet, cellphone, fiber to the home, etc**

Consumers control or influence 60 per cent of emissions

Emissions under direct consumer control (35%)

Other sectors (40%)
(e.g. manufacturing, coal mining, export transport)



Consumer influenced sectors (25%)
(e.g. retail, food and drink, wholesale, agriculture, public sector)

http://www.cbi.org.uk/pdf/climatereport2007full.pdf

Carbon rewards rather than carbon taxes- gCommerce

- Providing free download music, video, and electronic books in exchange for carbon fees on parking, transportation etc
- Free distant learning courses rather than telecommuting
- Free advanced tele-presence systems in exchange for carbon fees assessed on business travel
- Free mobile cell phone using femto cell and Wifi on public transportation
- ICT and Internet is in the best position to dominate new world of ‘gCommerce”

Carbon Reward Strategy for last mile infrastructure

- **Provide free high speed Internet and fiber to the home with resale of electrical and gas power (ESCOs)**
  - http://www.newamerica.net/files/HomesWithTails_wu_slater.pdf
- **Customer pays a premium on their gas and electric bill**
- **Customers encouraged to save money through reduced energy consumption and reduced carbon output**
- **Customer NOT penalized if they reduce energy consumption**
  - May end up paying substantially less then they do now for gas + electricity + broadband + telephone + cable
- **Network operator gets guaranteed revenue based on energy consumption rather than fickle triple play**

Thank you

- **More information**
- **http://green-broadband.blogspot.com**
- **http://free-fiber-to-the-home.blogspot.com/**