Seminar on ITU-T Standardization Activities and other Key ITU Activities

(Havana, Cuba, 8-9 February 2011)

ICTs for abating climate change

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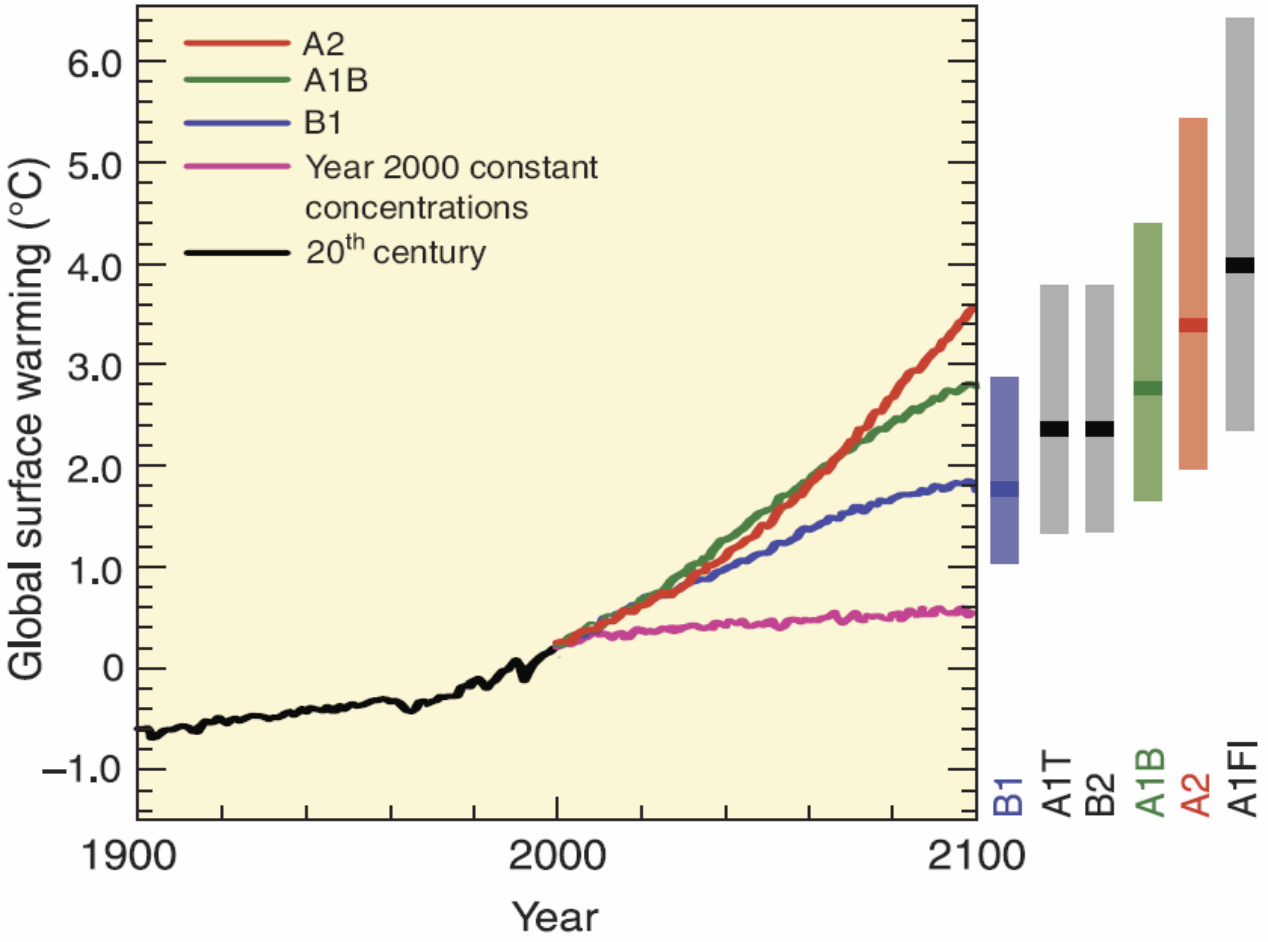
Objectives

- To highlight the problem posed by global environmental change
- To demonstrate why ICTs are a crucial part of the solution – i.e. Green Growth & sustainable development
- To highlight the role of the ITU

Global change & climate (1)

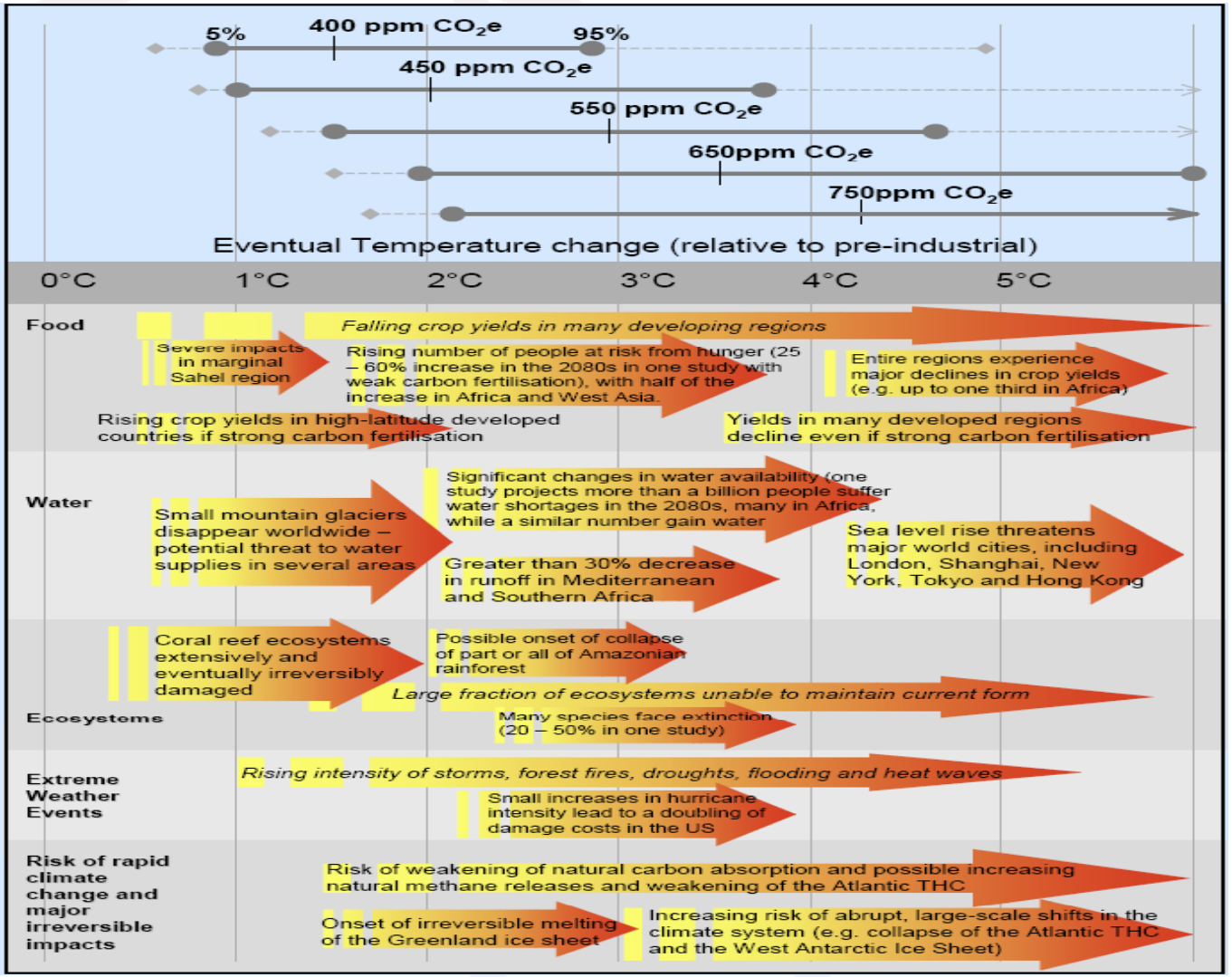
- Climate change is a real threat
  - Fossil fuel emissions tracking surface warming
  - If > 2 degree C rise, potential for cataclysmic change

IPCC Projections of surface warming as a result of increasing GHG emissions



IPCC. 2007. *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. IPCC. Core Writing Team, Pachauri, R.K. and Reisinger, A. (Eds.). IPCC, Geneva, Switzerland. pp 104. http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

Impacts from increasing GHGs levels in the atmosphere

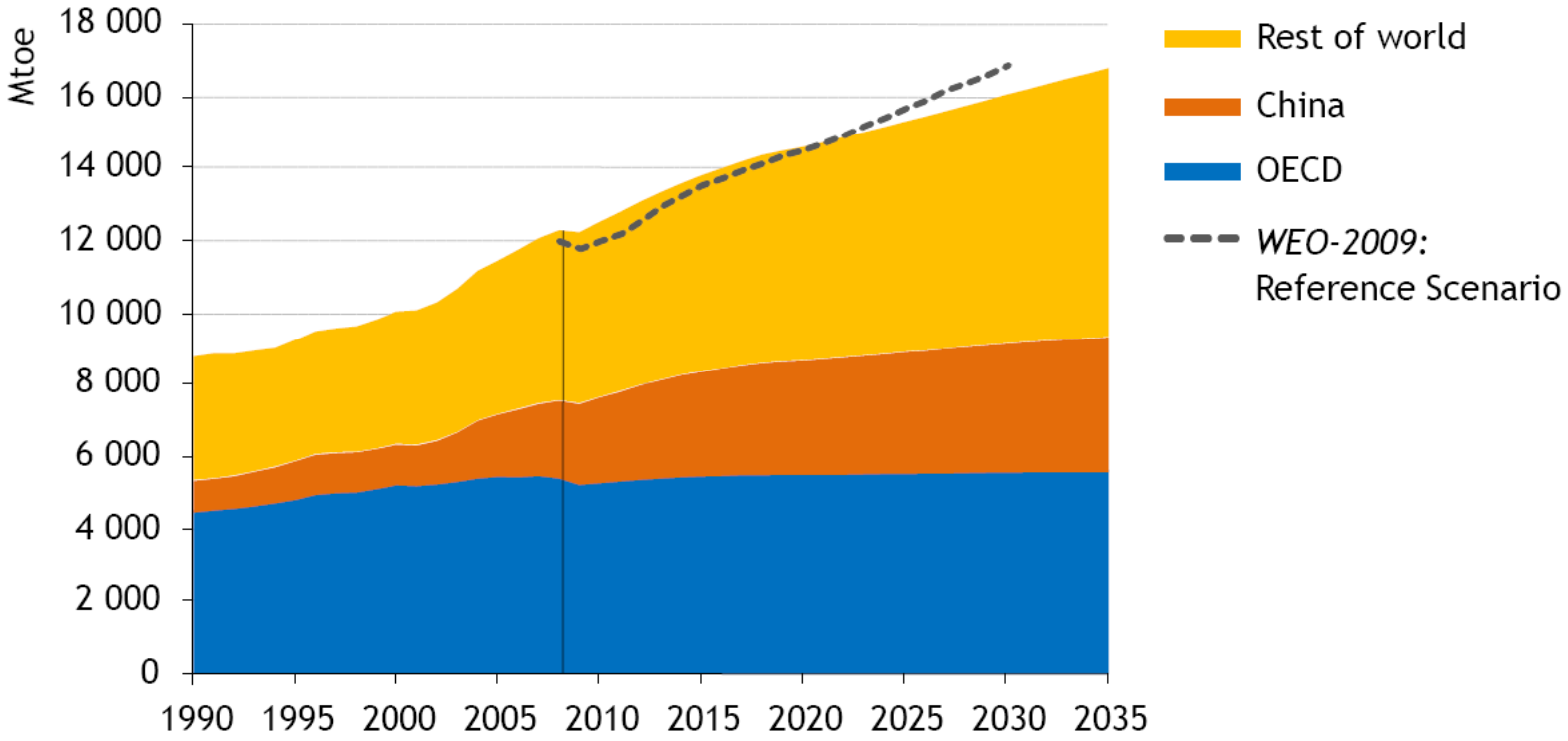


[1] Stern, N. 2006. *Stern Review on the economics of climate change (pre-publication edition).* Executive summary. HM Treasury. London. 27 pp. http://www.hm-treasury.gov.uk/sternreview_index.htm

Global change & climate (2)

- Growing population & affluence
  - Shift in global growth to emerging markets
- Increasing demand for energy & natural resources
  - Energy demand is growing at pace of worst case global warming scenario
  - Demand growing fastest in the developing world

World primary energy demand by region – IEA New Policies Scenario



Global energy use grows by 36% in 2008-2035, with the OECD share of world demand falling from 44% today to 33% in 2035

- IEA. 2010. *World Energy Outlook 2010*. N. Tanaka, Executive Director, IEA, Beijing, 17 Nov. 2010. PowerPoint presentation. 35 slides. http://www.energy.eu/publications/weo_2010-China.pdf

Global change & climate (3)

- Price, availability and security of energy supplies?
- Environmental risks associated with hard to access oil resources
  - Offshore & deep sea drilling
  - Drilling in sensitive ecosystems: the Arctic/Antarctic, coastal areas, etc.
  - Extracting heavy oil (Oil sands, heavy oil)
  - Hydraulic fracturing: shale gas

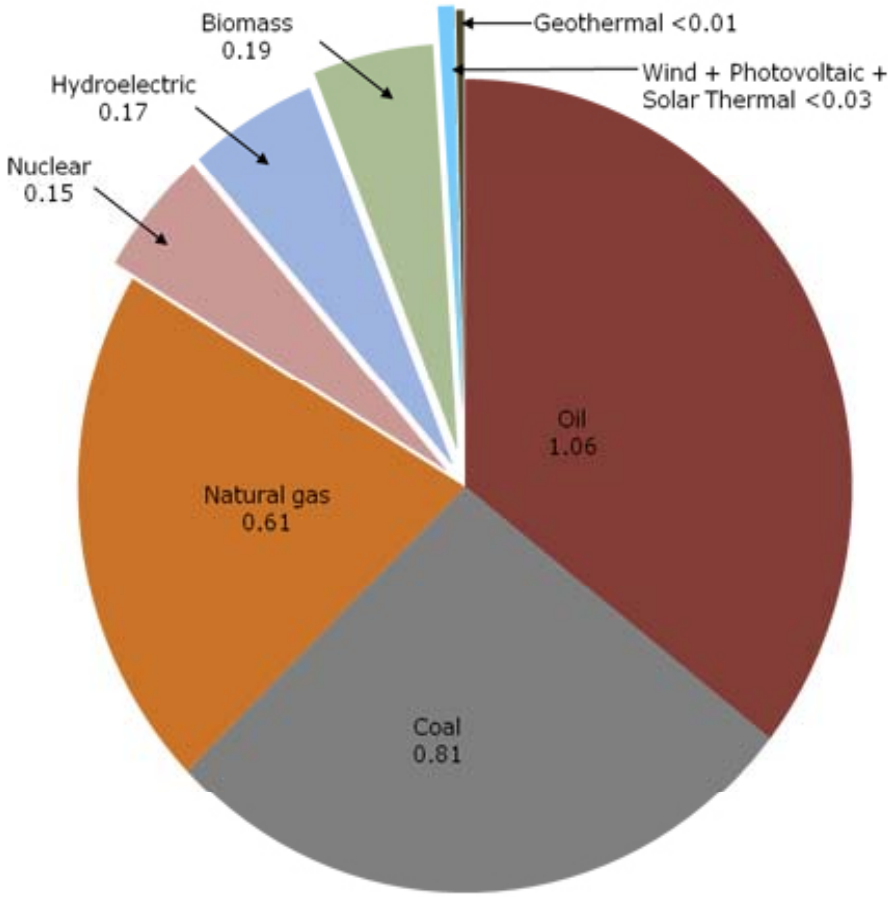
Global change & climate (4)

- Increased incidence & cost of power failures & blackouts
  - Old electrical grid is prone to failure
- Commodity prices increasing
  - Food riots, etc.
- Price, availability and security of essential minerals supplies (rare earths, etc.)

Global change & climate (5)

- Renewable energy still has a ways to go before being able to meet global needs

Proportion of energy expressed in CMO from different primary sources (2006 data)

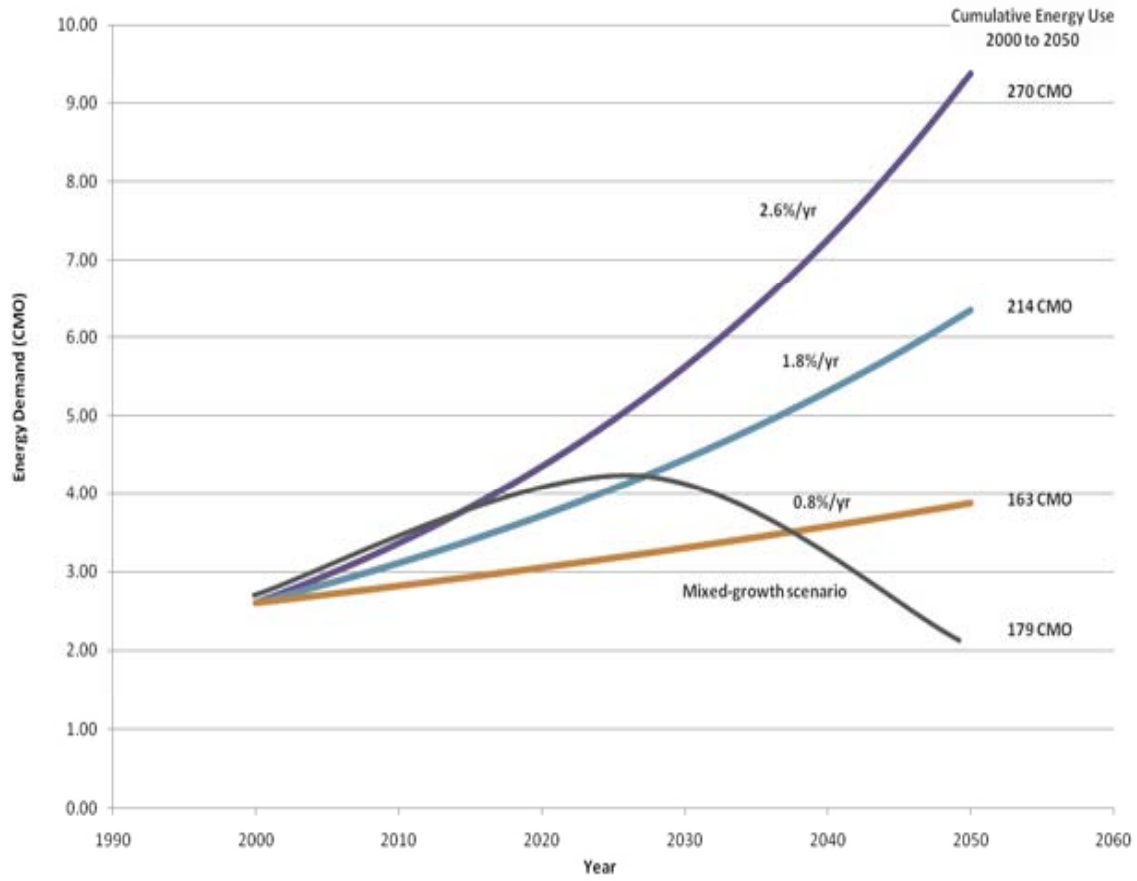


Crane, H.D., E. M. Kinderman & R. Malhotra. 2010. *A cubic mile of oil. Realities and options for averting the looming global energy crisis*. Oxford University Press, New York, 297 pp. http://www.oup.com/us/companion.websites/9780195325546/?view=usa

We have a problem!

- Renewables are plentiful but require massive investment to fully replace fossil fuels
  - 23,000 CMO / yr. from solar.. but…
  - Now using about 0.2 CMO/yr fm solar
  - For 1 CMO solar: 70,000 x 100 MW Spain Andasol solar thermal @ $ 14 Trillion
    - 27 Andasol projects/ week for 50 yrs!
  - At present rate of E demand – need 270 CMO by 2050!

Predicted global energy use in CMO under 4 different scenarios



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Global change & climate (6)

- Lack of unified commitment to UNFCCC process does not mean lack of action…

The top ten countries leading investment in clean energy technologies

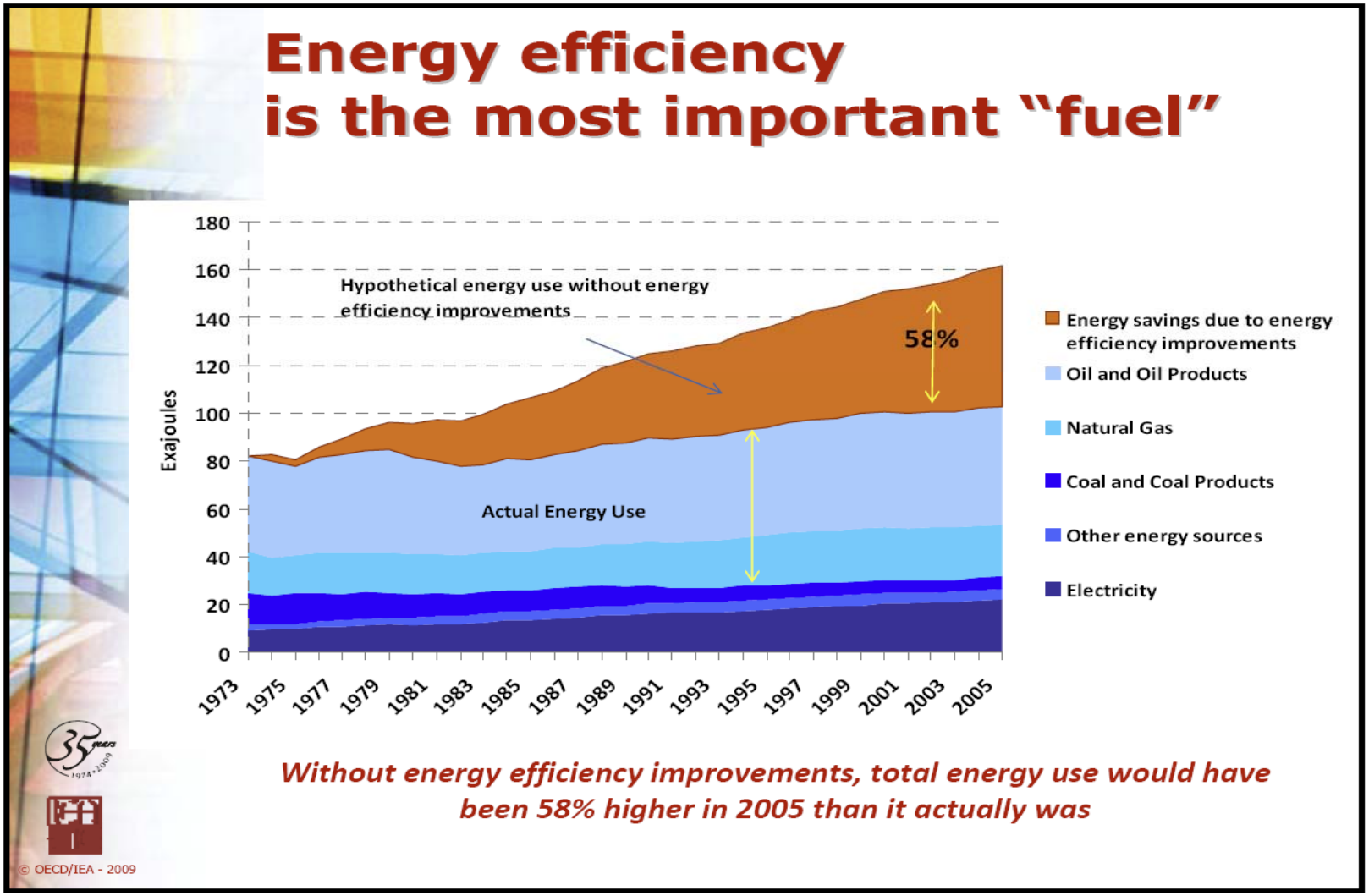
China	$34.6 billion
United States	$18.6 billion
United Kingdom	$11.2 billion
Rest of EU-27	$10.8 billion
Spain	$10.4 billion
Brazil	$7.4 billion
Germany	$4.3 billion
Canada	$3.3 billion
Italy	$2.6 billion
India	$2.3 billion

[1] Pew Charitable Trusts. 2010. *The clean energy economy. China Leads G-20 Members in Clean Energy Finance and Investment*. http://www.pewglobalwarming.org/cleanenergyeconomy/pr_24mar2010.html

Some elements of a solution

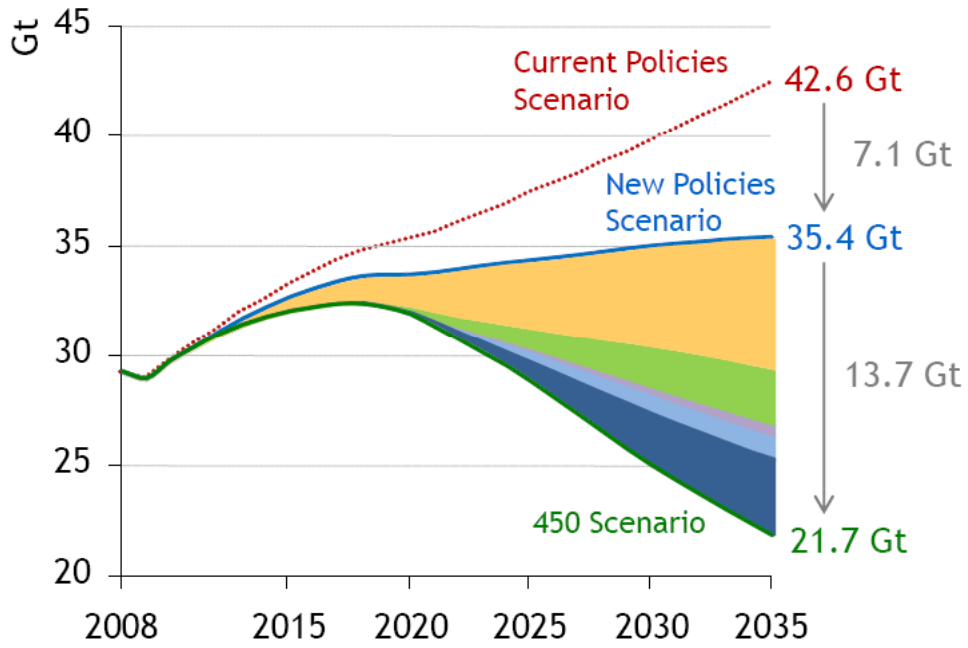
- No silver bullet (no single solution)
- Mix of approaches needed
- Efficiency and conservation very very important
- Transition from fossil fuels with focus on renewables & efficiency, CCS, +/- nuclear
- WWF 2011: possible to (mostly) replace fossil fuels with renewables by 2050... without nuclear or CCS

The past contribution of energy efficiency



Segar, C. 2009. *International energy co-operation and global energy security. International Energy Agency (IEA). Session on "Ensuring the sustainability of energy supply chain"*, Conference on Strengthening Energy Security in the OSCE area, Bratislava, 6 – 7 July 2009. PowerPoint presentation. http://www.osce.org/documents/eea/2009/07/38666_en.pdf

Energy efficiency will have major role to play in achieving low C future (IEA)



Share of cumulative abatement between 2010-2035	
Efficiency	50%
Renewables	18%
Biofuels	4%
Nuclear	9%
CCS	20%

In moving from the New Policies Scenario to the 450 Scenario, more expensive abatement options such as CCS play a growing role

IEA. 2010. *World Energy Outlook 2010*. N. Tanaka, Executive Director, IEA, Beijing, 17 Nov. 2010. PowerPoint presentation. 35 slides. http://www.energy.eu/publications/weo_2010-China.pdf

ICTs enhance efficiency & facilitate conservation by (1):

- Process efficiency
  - Doing things fast
  - Use less energy → emit less C
- Connecting everything:
  - The Internet of Things
- Measuring everything:
  - The Internet of Things
  - More info on energy use

ICTs enhance efficiency & facilitate conservation by (2):

- Controlling everything
  - Smart controls
  - Connect & control all motors & energy consumption (embedded controls)
- More options to reduce consumption: smart logistics /transport & cities

The negative impact of ICTs on GHG emissions

- Energy consumption from using ICTs
  - About 2-3 % of total emissions, growing to 6 %
  - Same as aviation industry
  - PCs & peripherals
  - Telecoms infrastructure
  - Data centres
  - ICT use is increasing and so are GHG emissions from ICTs

How to measure ICT impacts – the need for standards

- ITU working on standards for environmental impact assessment (EIA) of ICTs
  - Telecommunication Standardization Advisory Group (TSAG)
    - ITU Study Group 5 (SG-5)
  - Standards for measuring impact of ICTs
  - Universal power adapter and charger solution for mobile terminals and other ICT devices

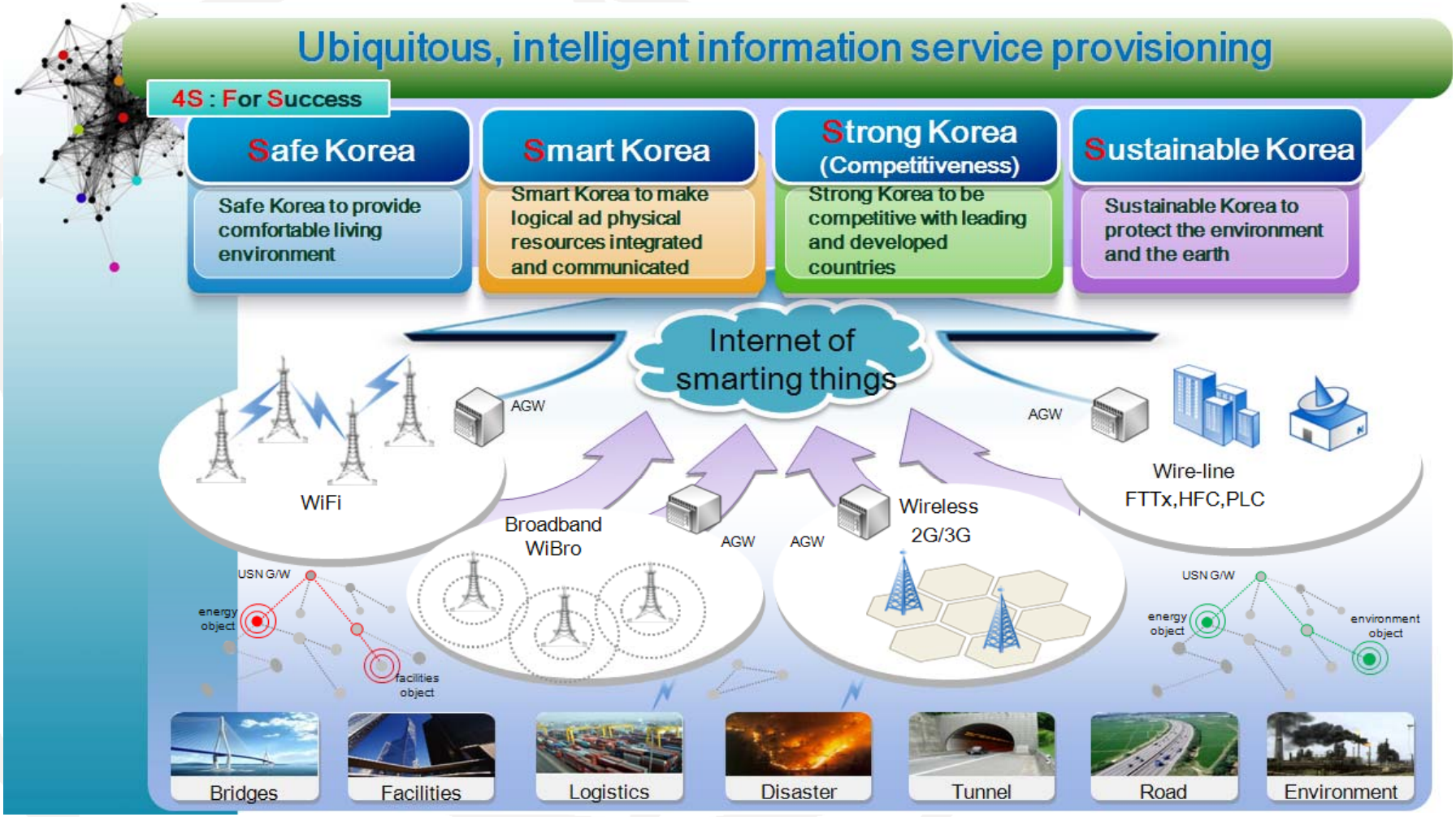
The positive impact of ICTs on GHG emissions

- ICT enabling effects
  - ICTs can save 5 times as much C as they consume – but likely much more
  - Essential for enhanced earth observation
  - In poorer countries and areas:
    - Enhance reach of services
    - Reduce cost of service delivery
    - Decreased energy use for accessing services

ICTs for earth observation

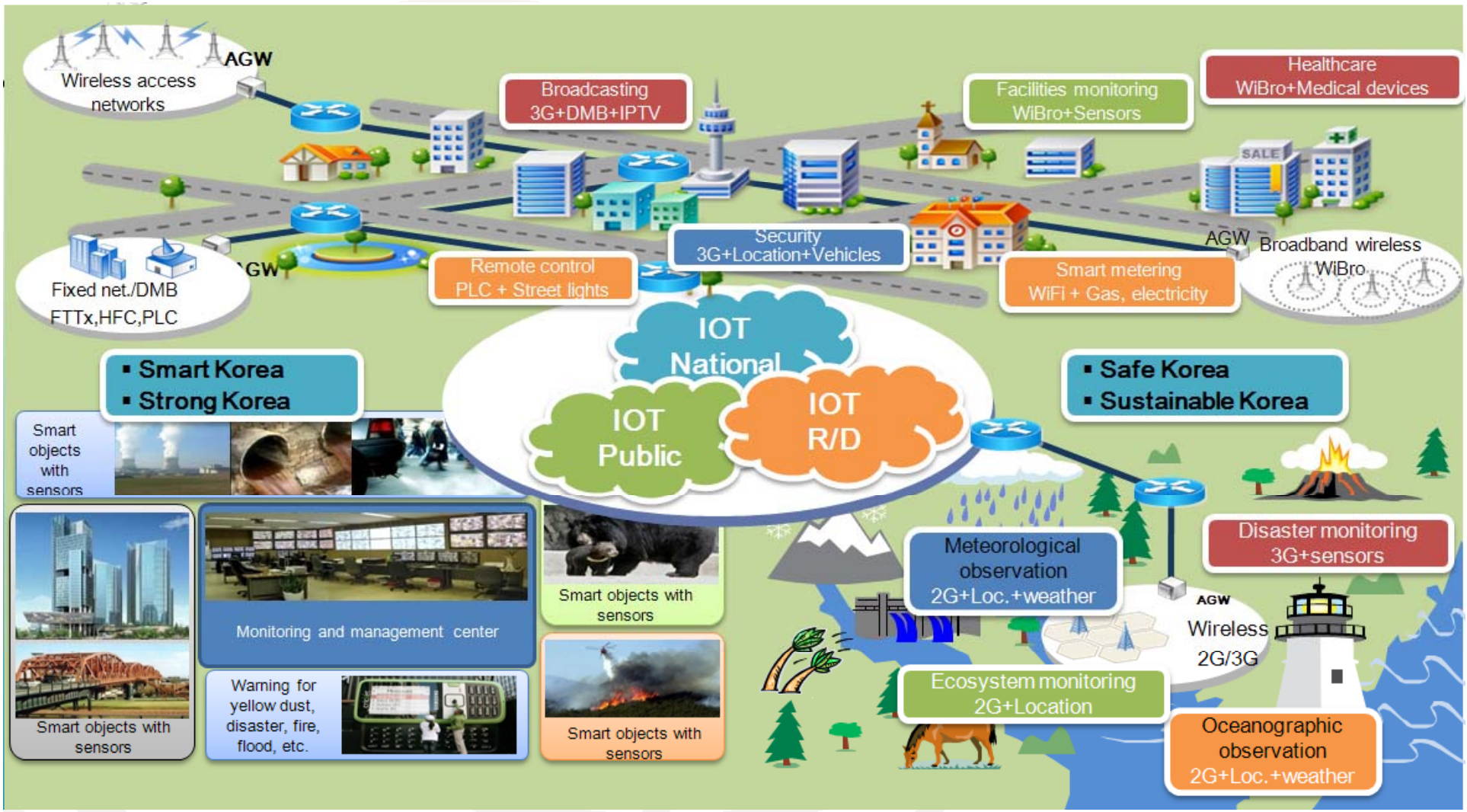
- Remote sensing:
  - Disaster risk reduction (tsunami, etc.)
  - Generates massive amounts of data
  - Data available through Cloud / Grid (GEOSS, etc.)
- Wireless sensor networks
  - The Internet of Things
  - Connected smart sensors gathering data at earth's surface (& below!)

Korea's vision of the Internet of Things (1)



Kim, Y.-W. 2009. Korean visions and policies for the Internet of Things. Presented on occasion of RFID Global Forum and the Internet of Things. CASAGRAS, EU Framework 7 Project.
http://www.rfidglobal.eu/page.asp?pageid=28&pagegroup=RFID%20Global&pagetitle=Final%20Conference%20Presentations

Korea's vision of the Internet of Things (2)



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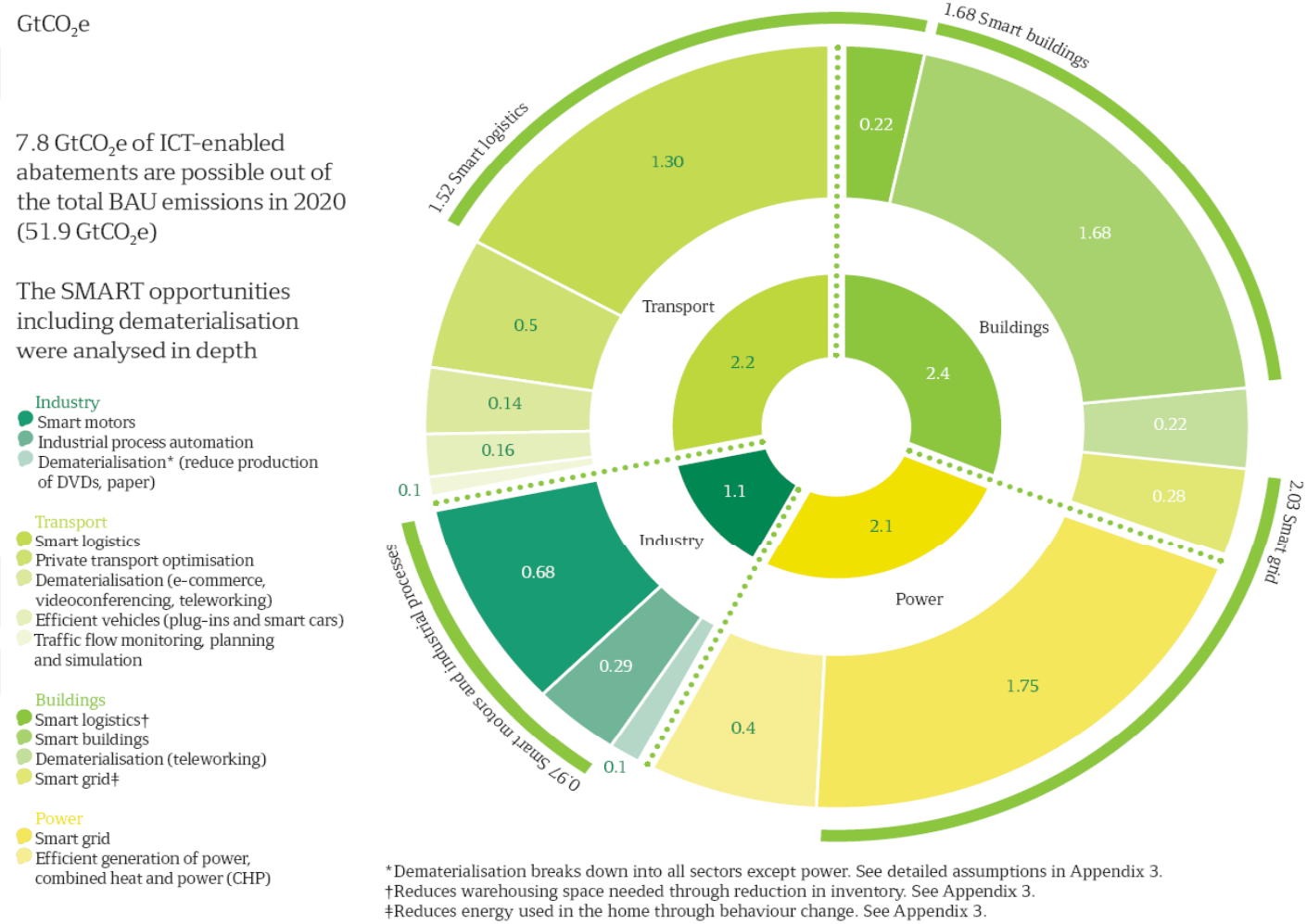
http://www.rfidglobal.eu/page.asp?pageid=28&pagegroup=RFID%20Global&pagetitle=Final%20Conference%20Presentations

ICT enabling effects: applications

- Smart grids
- Smart motor systems
- Smart buildings
- Smart logistics and transportation systems
- Virtual meetings and other forms of dematerialization, including travel replacement, server virtualization.

The enabling effect of ICTs (GeSI : Global e-Sustainability Initiative)



The Climate group and GeSI. 2008. *Smart 2020: Enabling the low carbon economy in the information age*. 87 pp. http://www.smart2020.org/

Smart grid components (1)

- Home area networks (HANs)
- Networks for wide area situational awareness (WASA)
- Enhanced substation supervisory control and data acquisition (SCADA) systems

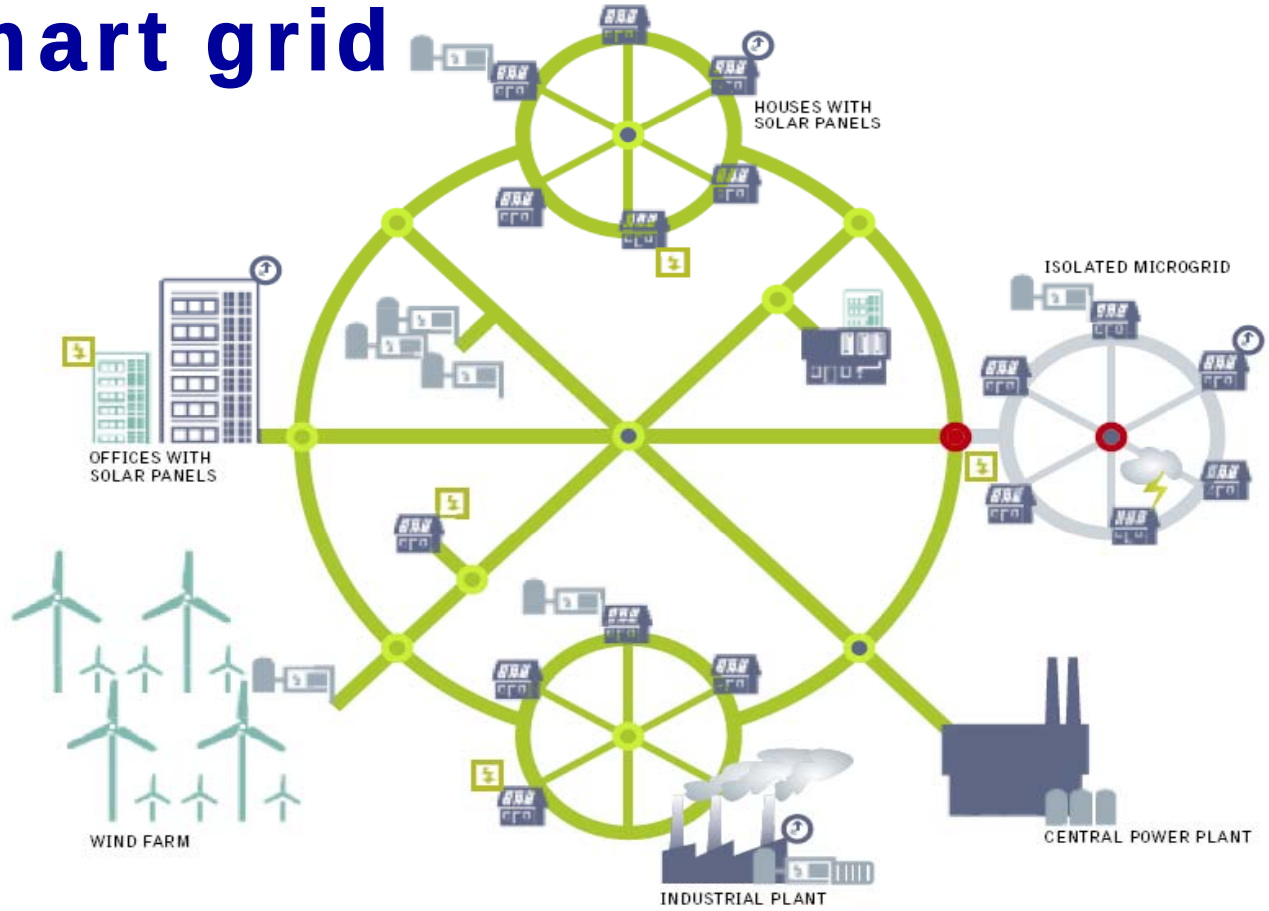
Smart grid components (2)

- Distributed generation monitoring and control systems
- Demand response and pricing systems
- Charging systems for plug-in electric vehicles.
- Part of the Internet of energy (Germany)

Smart grid

- Part of the Internet of energy (Germany)

The smart grid



Greenpeace and European Renewable Energy Council. 2010. *Energy [R]evolution: A Sustainable World Energy Outlook*. 3rd edition 2010 world energy scenario. June 2010. 260 pp. http://www.greenpeace.org/international/en/publications/reports/Energy-Revolution-A-Sustainable-World-Energy-Outlook/

Smart buildings (1)

- 40 % of C emissions from buildings
- 70 % of electricity consumption
- 75 % of human pop. live in cities

Smart buildings (2)

- Green design
  - Building information Modeling (BIM)
- Instrumenting buildings:
  - HVAC, power consumption, etc. with smart motors, sensors and actuators
- Connecting all motor driven systems to a network of sensors and control devices
  - Improve air quality
  - Reduce energy consumption

Smart transportation

- Advanced traveler information systems
  - Real time traffic information
- Advanced transportation management systems
- Smart transportation pricing systems
- Advanced public transportation systems
- Smart vehicles (communications with transportation system sensors, etc.)

Conclusions

- ICTs have a key role to play in instrumenting changes required to abating climate change
- Most decision makers do not understand role that ICTs play
- ICT players need to influence UNFCCC process
- Need to make clear role of ICTs

Recommendations

- ITU is key player in influencing UNFCCC
- ITU needs to work with key actors:
  - Govts of China, India, Brazil, etc.
  - Large ICT firms:
    - Google, HP, Cisco, IBM, Microsoft, Baidu, GSMA, etc.

Related info (1)

- Much of this presentation can be found in the ITU publication by Richard Labelle: "*m-environment – ICTs for abating climate change and promoting Green Growth and sustainable development*" which will be available online from the ITU site in March – April 2011.
  - The report will be published online by ITU and includes detailed references supporting all points made above.

Related info (2)

- A training program on ICTs for abating climate change and promoting Green Growth and sustainable development
  - To be offered by the UN APCICT (Asia Pacific centre for ICT Training) in Korea
  - As part of the Academy for ICT Essentials for Government Leaders
    - http://www.unapcict.org/academy
  - Starting Feb.22, 2011
  - Will be published online: detailed report, , accompanying PPTs & video tutorials (APCICT Virtual Academy

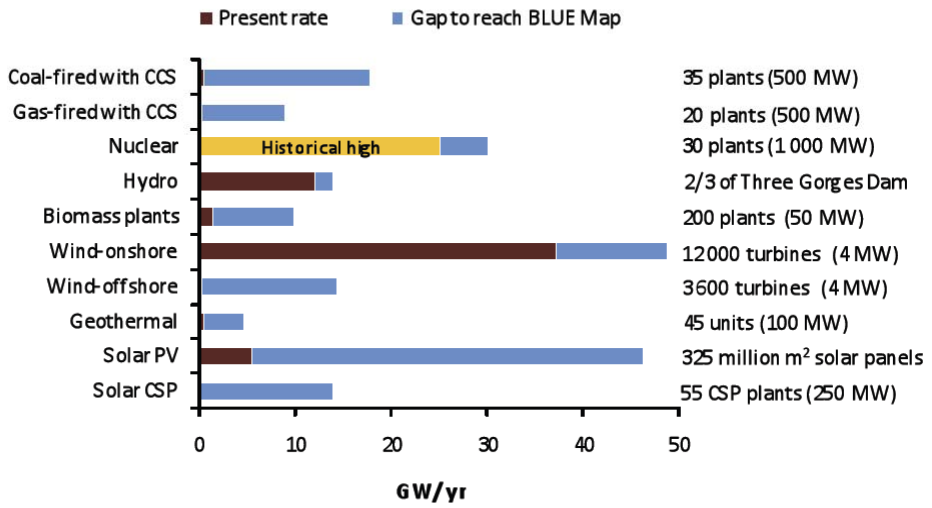
Notes

- Many thanks to the ITU for making my participation possible
- Thanks to the Govt. of Cuba for hosting this seminar.

Muchas gracia!

IEA estimate of renewable and other power technology investments for lowest GHG emissions

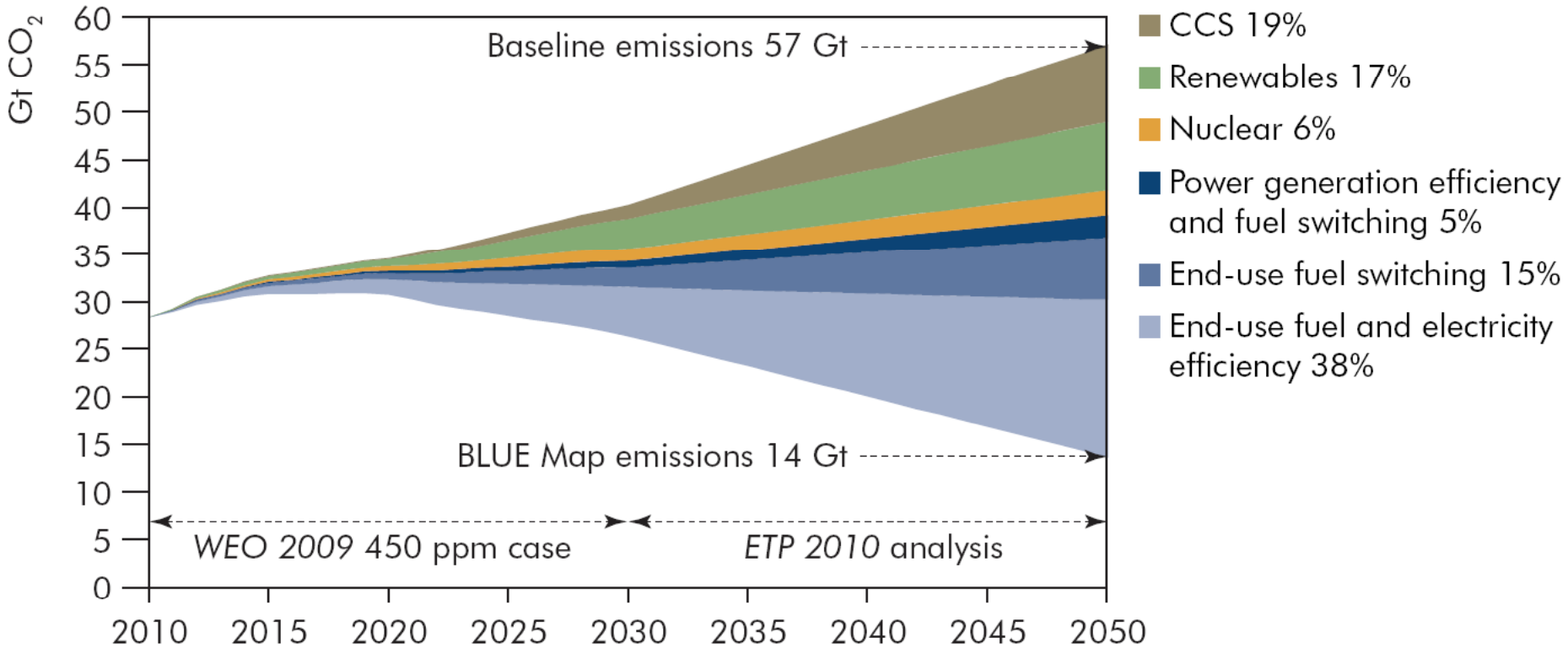
Average annual electricity capacity additions to 2050, BLUE Map scenario



Annual rates of investment in many low-carbon technologies must be massively increased from today's levels.

[1] IEA. 2010. *Energy Technology Perspectives 2010*. Lisbon, 21 October 2010. http://www.renewable.pt/pt/Noticias/Documents/2010_Nobuo_Tanaka.pdf

IEA: Key technologies for reducing CO2 emissions under the BLUE Map scenario



[1] IEA. 2010. *Energy Technology Perspectives 2010. Scenarios & strategies to 2050.* Executive Summary. OECD/IEA, Paris, 20 pp. http://www.iea.org/Textbase/npsum/etp2010sum.pdf