

Energy Drives The World

- Some basic facts

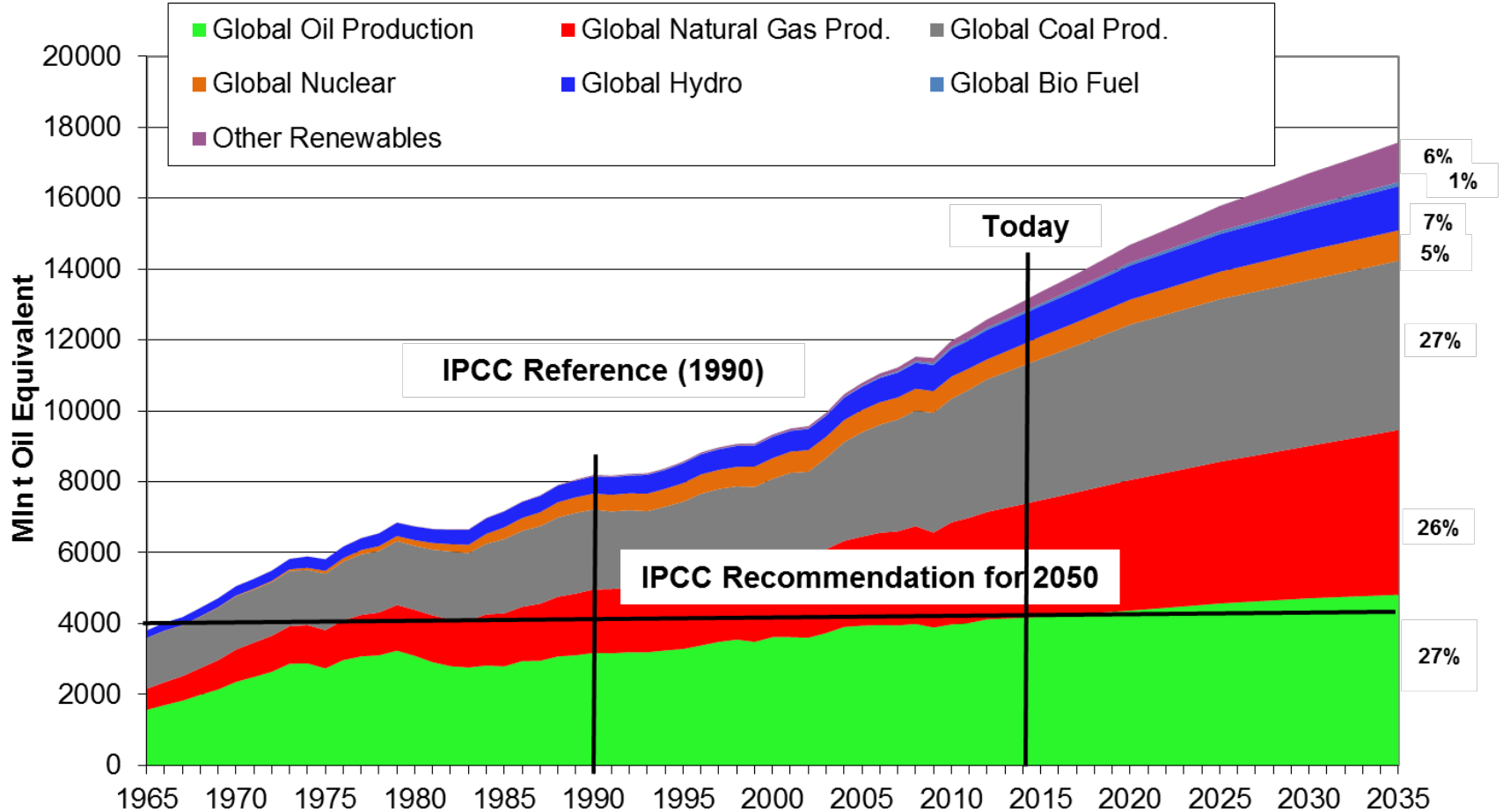
Introduction to today's VCW Conference

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Global Primary Energy Consumption/Outlook¹⁾ (in mln toe)

¹⁾ BP Statistical Review /Outlook of World Energy June 2013



- World primary energy consumption growth to continue with 1.0 % p.a. CAGR until 2035 (renewables: 1,1 % p.a.; average consumption of 2,0 toe per capita @ 8,8 bn people)
- Oil, Gas & Coal with similar market share; all fossils growing in absolute terms

Relations (2012)

Per capita Energy consumption Global:	1,9 toe p.a.
Per capita Energy consumption US:	5,9 toe p.a.
Per capita Energy consumption Germany:	3,8 toe p.a.
Per capita Energy consumption China:	2,0 toe p.a.
Energy generation by Humans (8 h/d; 365 d; 50 W):	0,05 toe p.a.

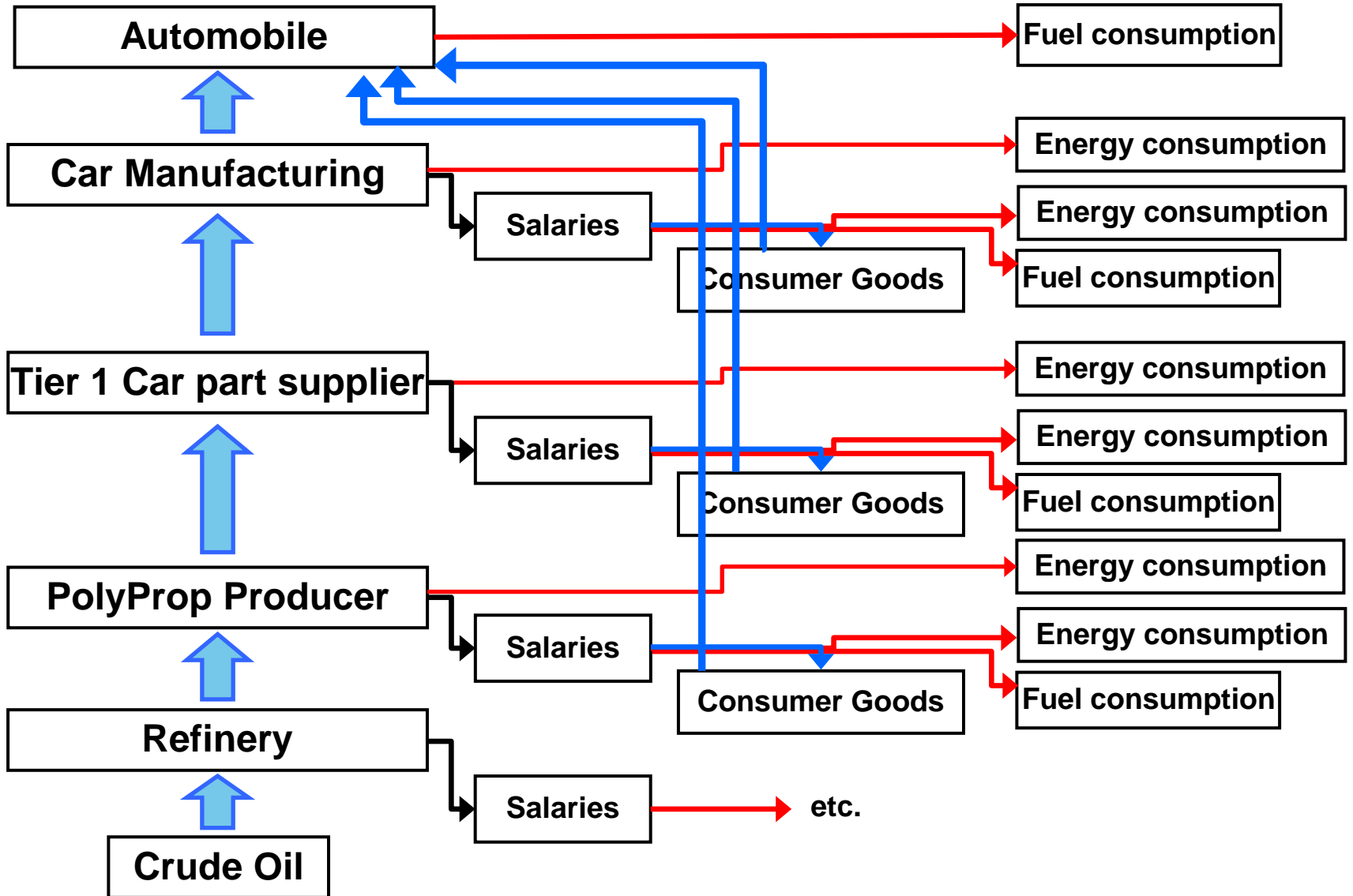
Conclusions - Energy

- Unprecedented growth in primary energy consumption over decades
- 85 % of global energy demand based and will be based on fossils (80 % in 2035)
- In 2035 globally a 6 % contribution of Renewables (w/o hydro and biofuel) anticipated (mainly wind power, solar, geothermic)
- Biofuels at 0,7 % (120 mio t) in 2035 only (despite major efforts in US, Brazil and South East Asia)
- No way to achieve IPCC goals in 2050 (today's infrastructure can not be rebuilt in such timeframe; no "incentive")

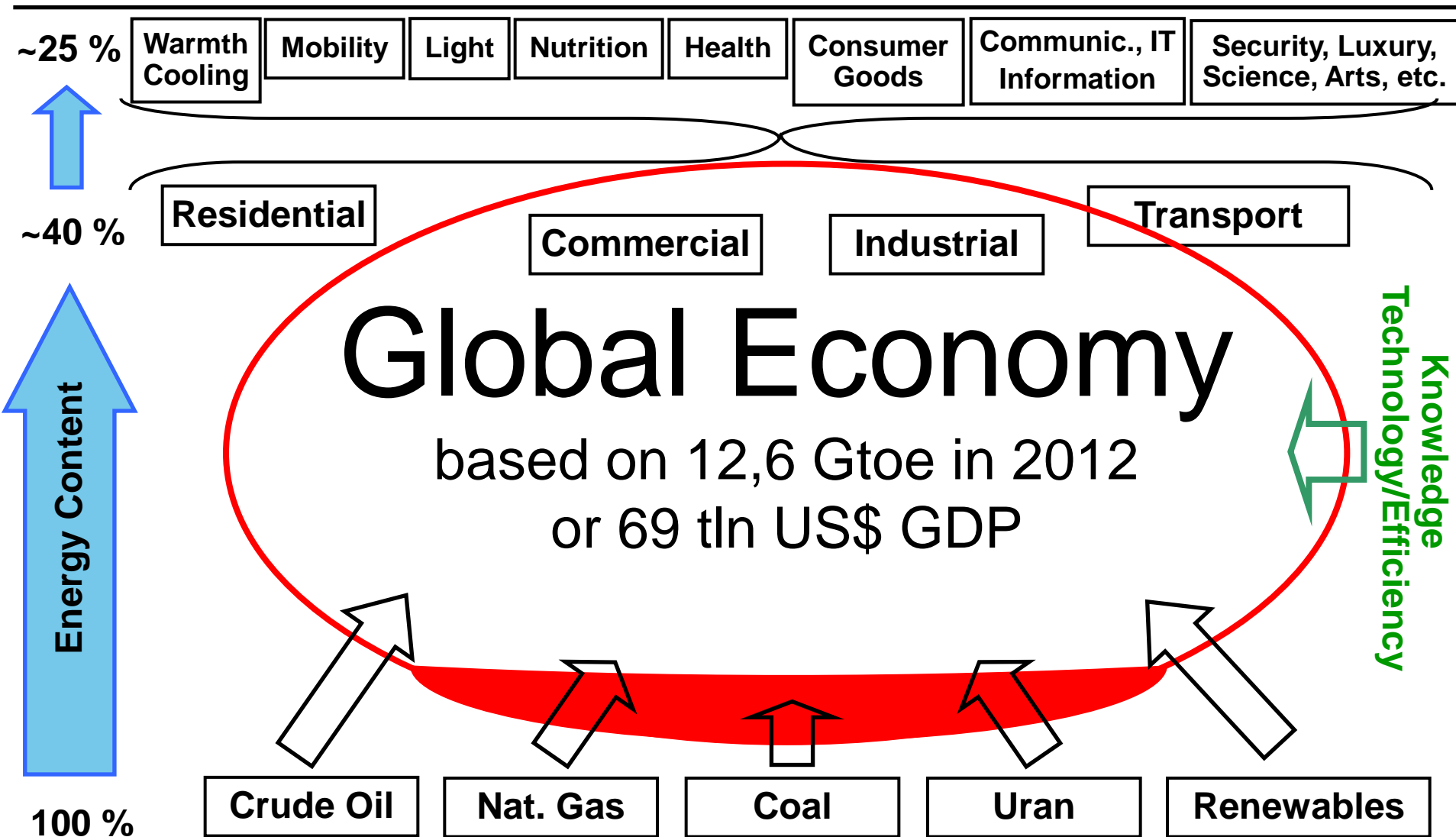
Simplified

Global Energy Flow – “Energy Value Chain”

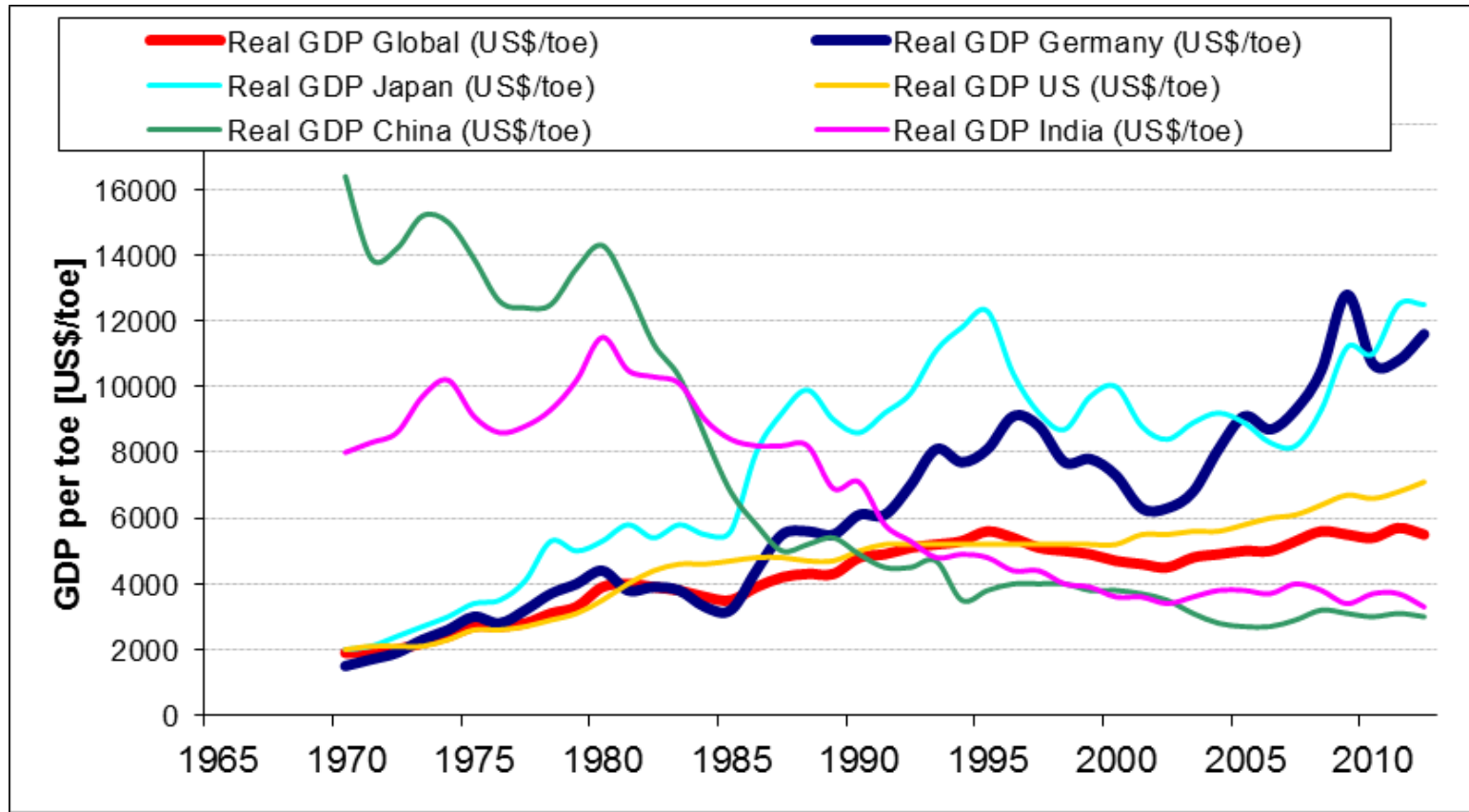
Example: Fuel/Energy Consumption during automotive life cycle



Global Energy Flow, Energy Losses and “Well-being”



Global/Country GDP per t Oil Equivalent (real US\$; 2012)



GDP 2012 (tln USD)	
Global:	69
US:	15,7
China:	8,2
Japan:	6,0
Germany:	3,6
India:	1,9

- Above average specific GDP in US and specifically in Japan (currency exchange rate effects) and Germany (efficiency & outsourcing of energy intensive industries)
- Low GDP per toe in China and India (energy intensive industries; low energy efficiency in the country; low priced exports to keep global competitiveness)

Conclusions - Global Economy & Well-being

- Today's global economy and Wellbeing driven by energy – nothing else!! (except for brain power)
- Strong correlation between primary energy demand and global GDP
- No sustainable decoupling of energy demand and GDP possible (w/o compromising on Well-being)
- Efficiency gains visible but limited global effects (GDP since 20 years around 5500 US\$/toe)
- Global economy needs continuous energy input – otherwise structures decay
- **Economic growth needs additional energy input**

Now, what is “Shale Gas”?

- Unconventional fossil energy - relatively easy to recover
- Safeguarding today’s competitiveness of the US industry and future US GDP
- Safeguarding today’s and future employment in the US
- Buying time to manage the transition to a solar based economy, desperately needed for the second half of this century