

Energy Perspectives in Central Europe

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Scanning the future of the European energy system

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My agenda

- Why we need to prepare for a major energy crisis
- Why we should search for a long-run shared vision
- Why most current energy strategies are inadequate

(3)

**Why most current energy strategies
are no adequate answers
to the coming energy crisis**

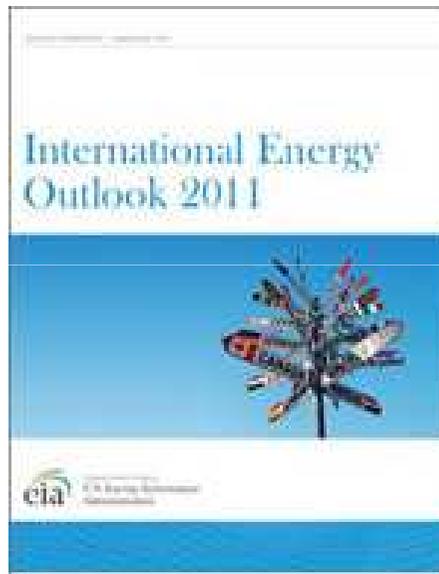
(1)



Why the world and Europe are running into a major energy crisis

International Energy Outlook 2011

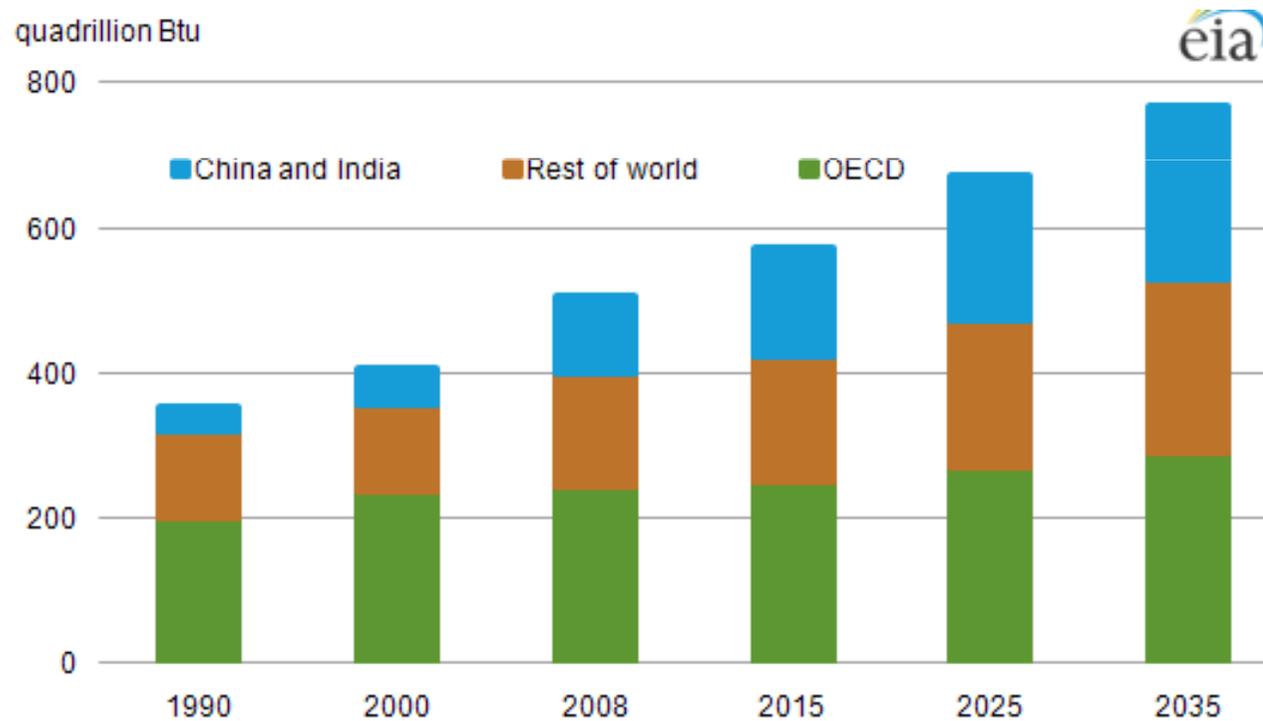
U.S. Energy Information Administration



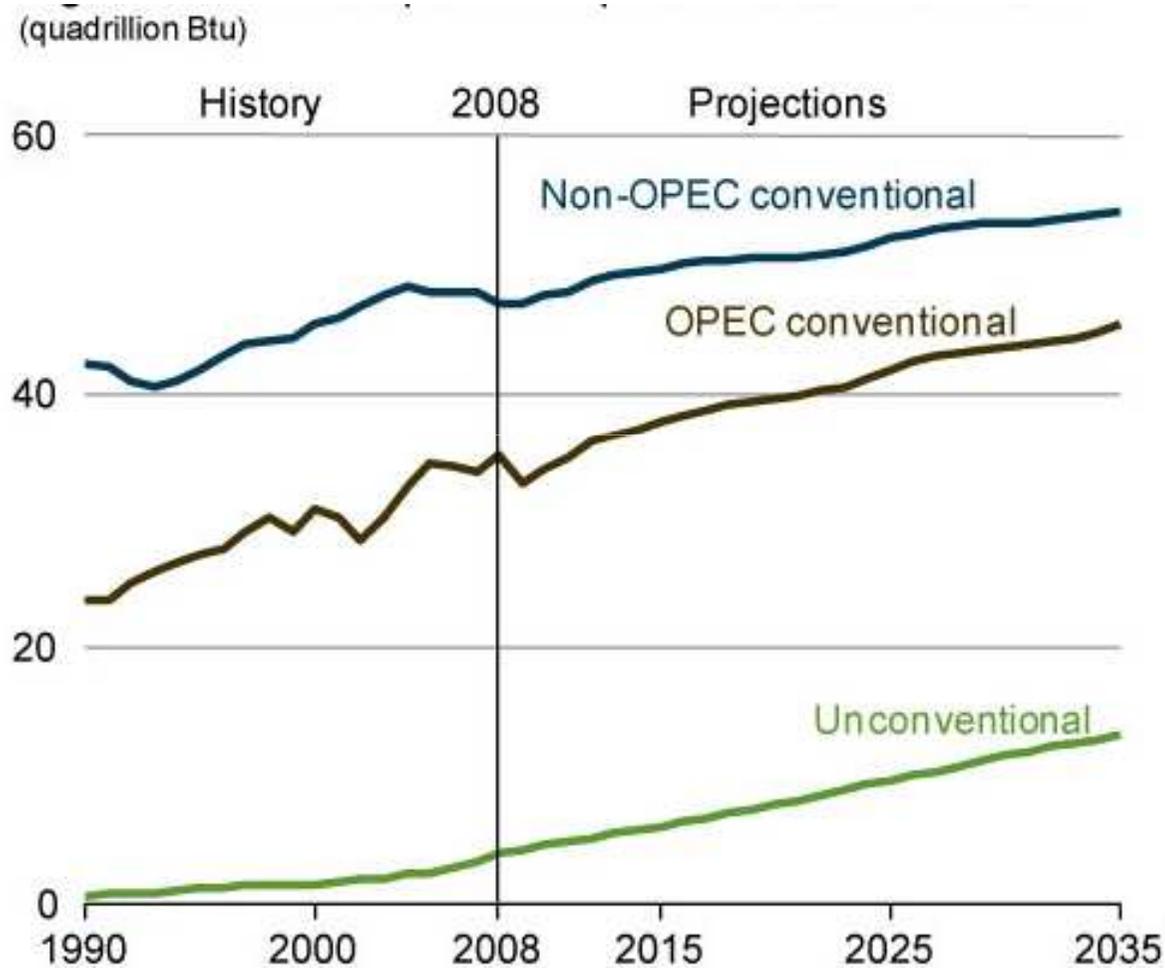
A reference scenario of the coming energy crisis?

Global energy consumption

Strong demand from places like China and India will drive global energy demand

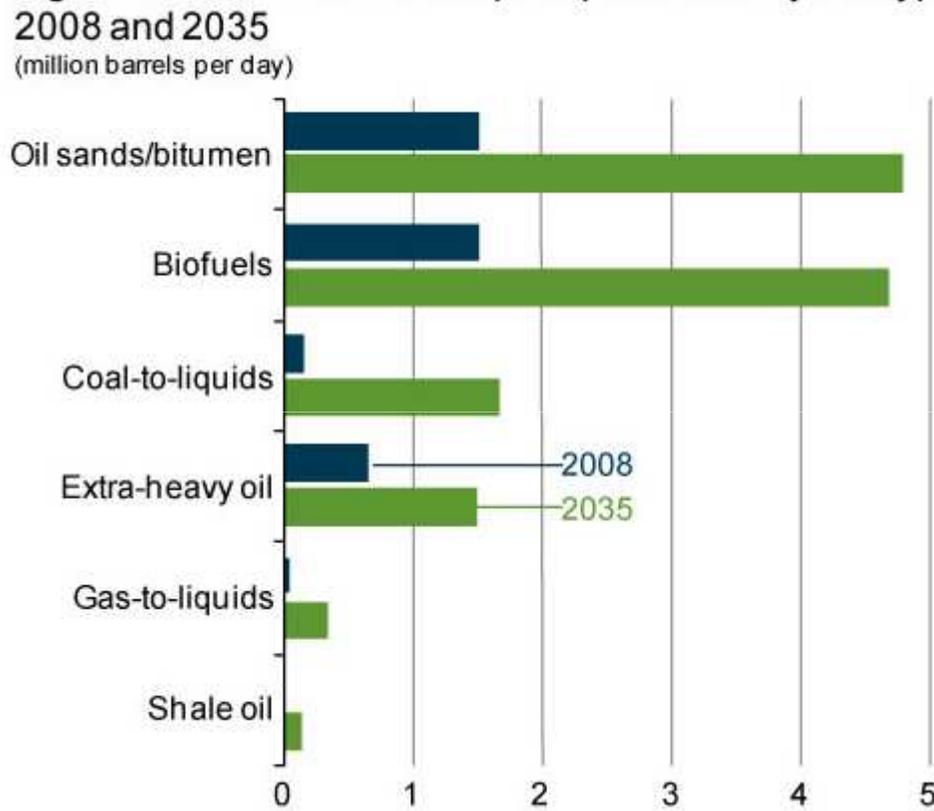


World liquid fuels production



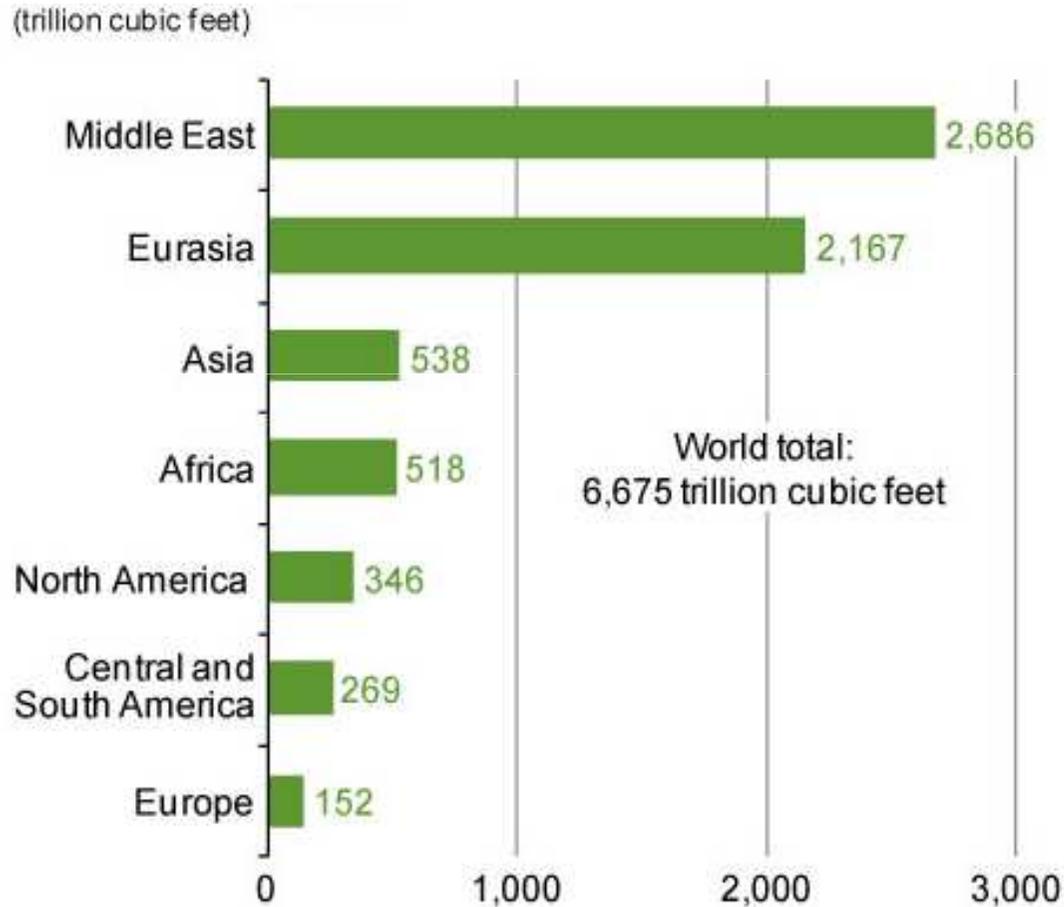
China and India alone would require total current global crude oil production if they would switch to EU per capita intensities

Unconventional liquids



All unconventional liquids are highly controversial

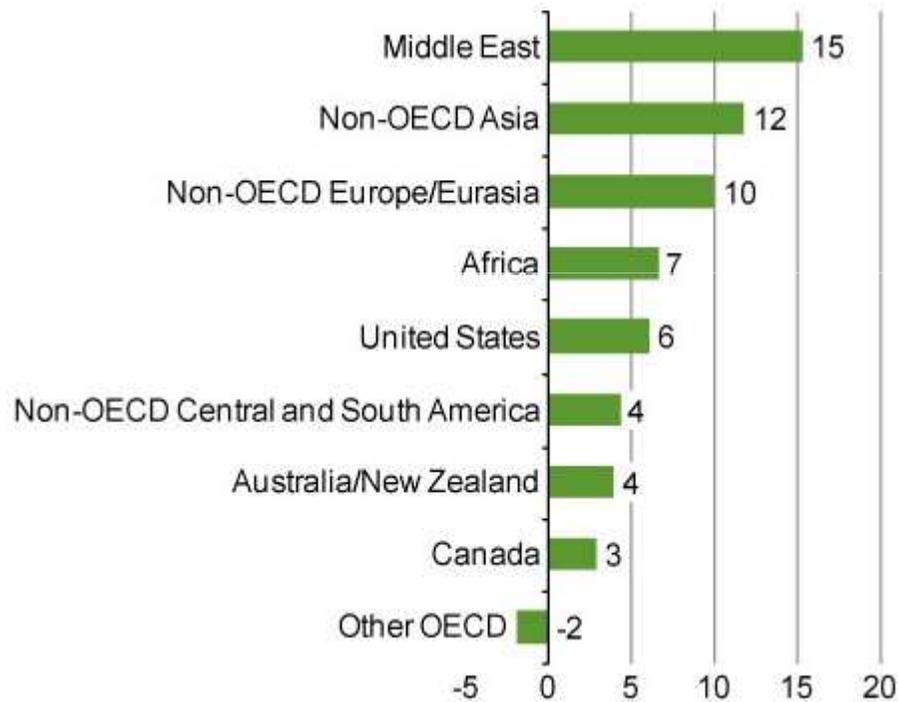
World natural gas reserves (January 2011)



Europe's gas reserves are almost depleted

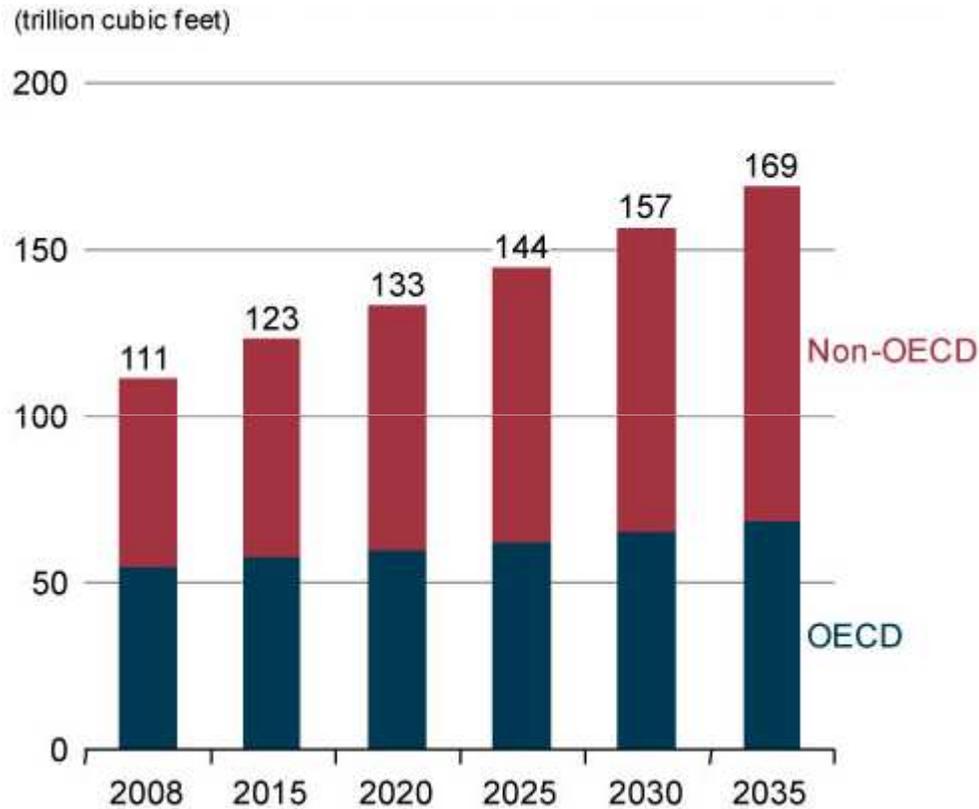
Change of world natural gas production

2008-2035
(trillion cubic feet)



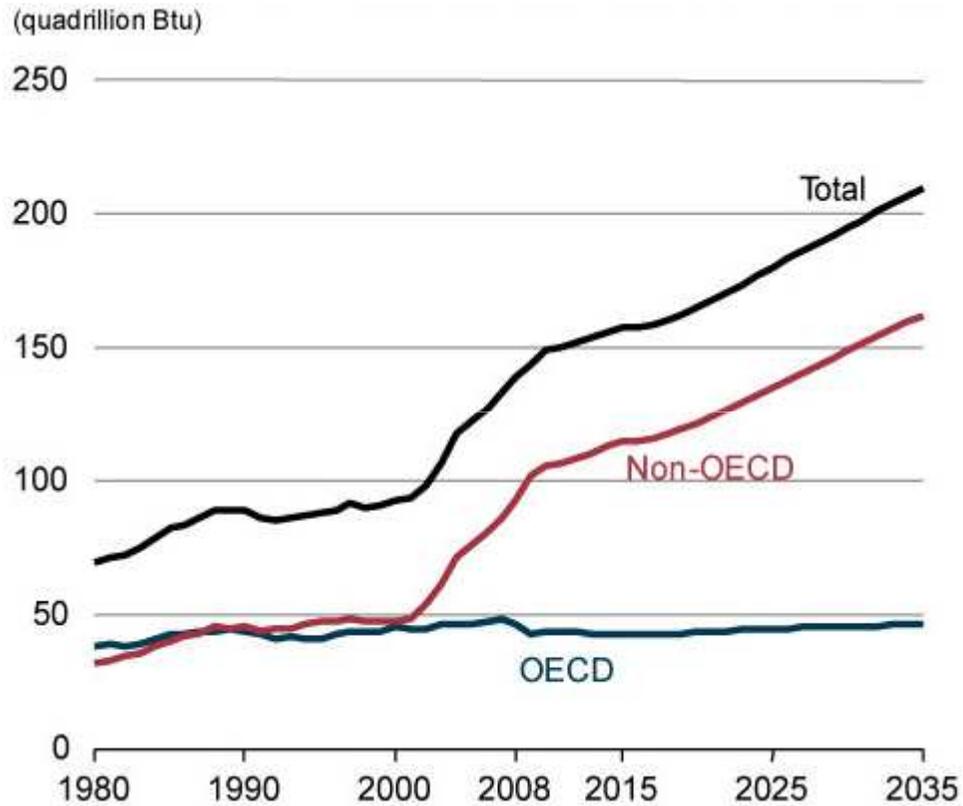
Europe's gas supply
has become extremely
vulnerable

World natural gas consumption



Non-OECD gas consumption is accelerating

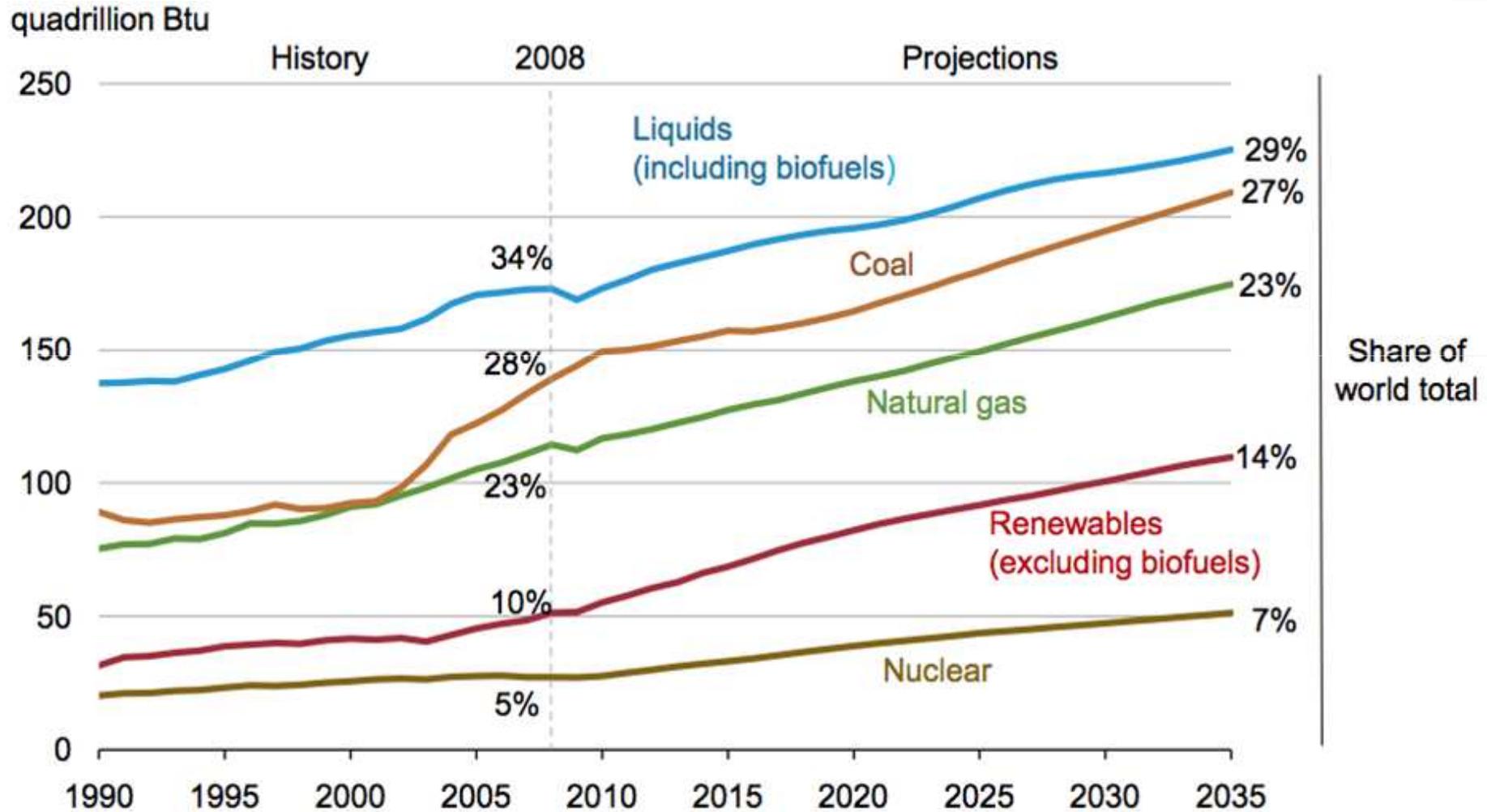
World coal consumption



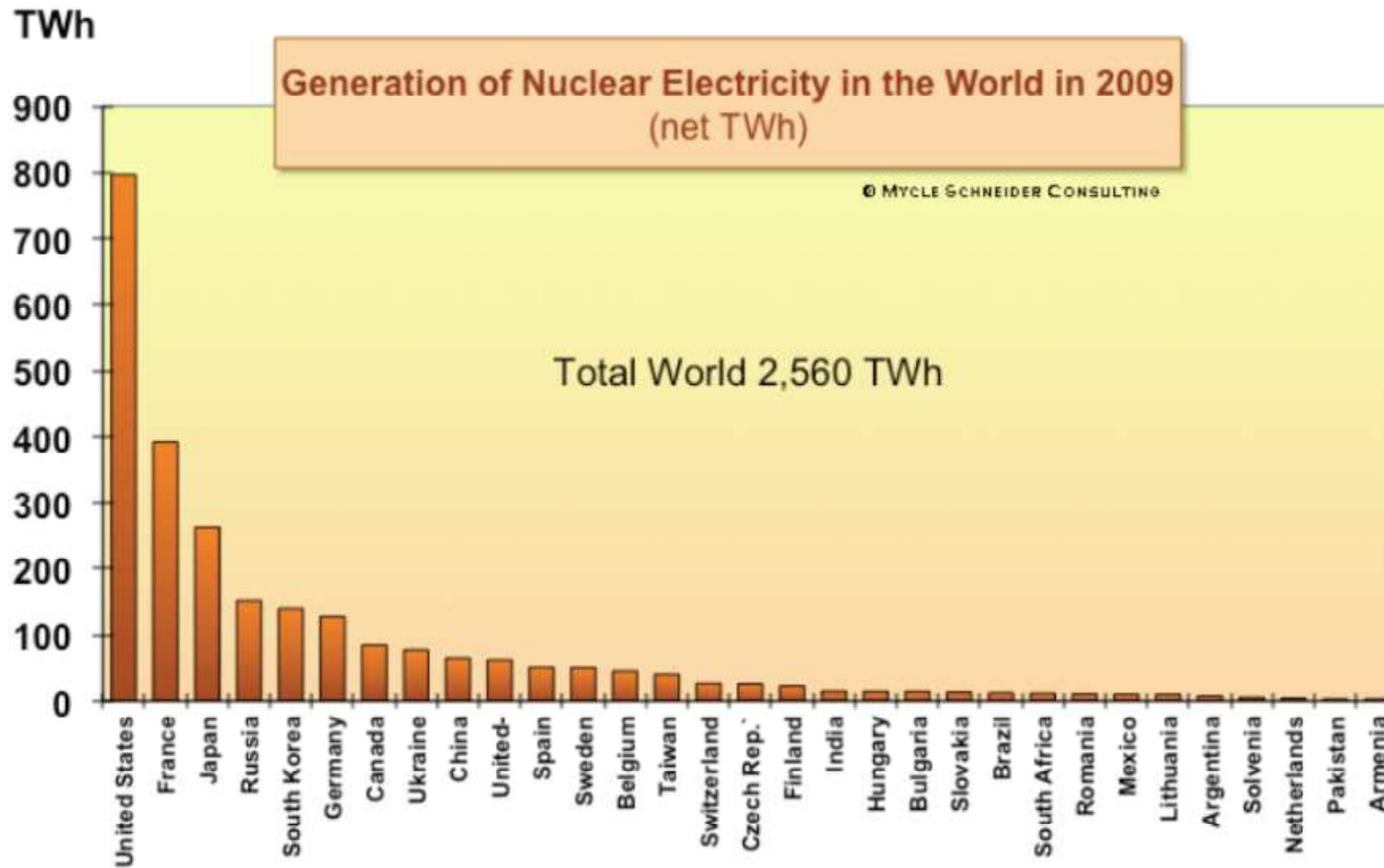
Non-OECD coal consumption is exploding

The global perspective

World energy consumption by fuel



Electricity from nuclear power



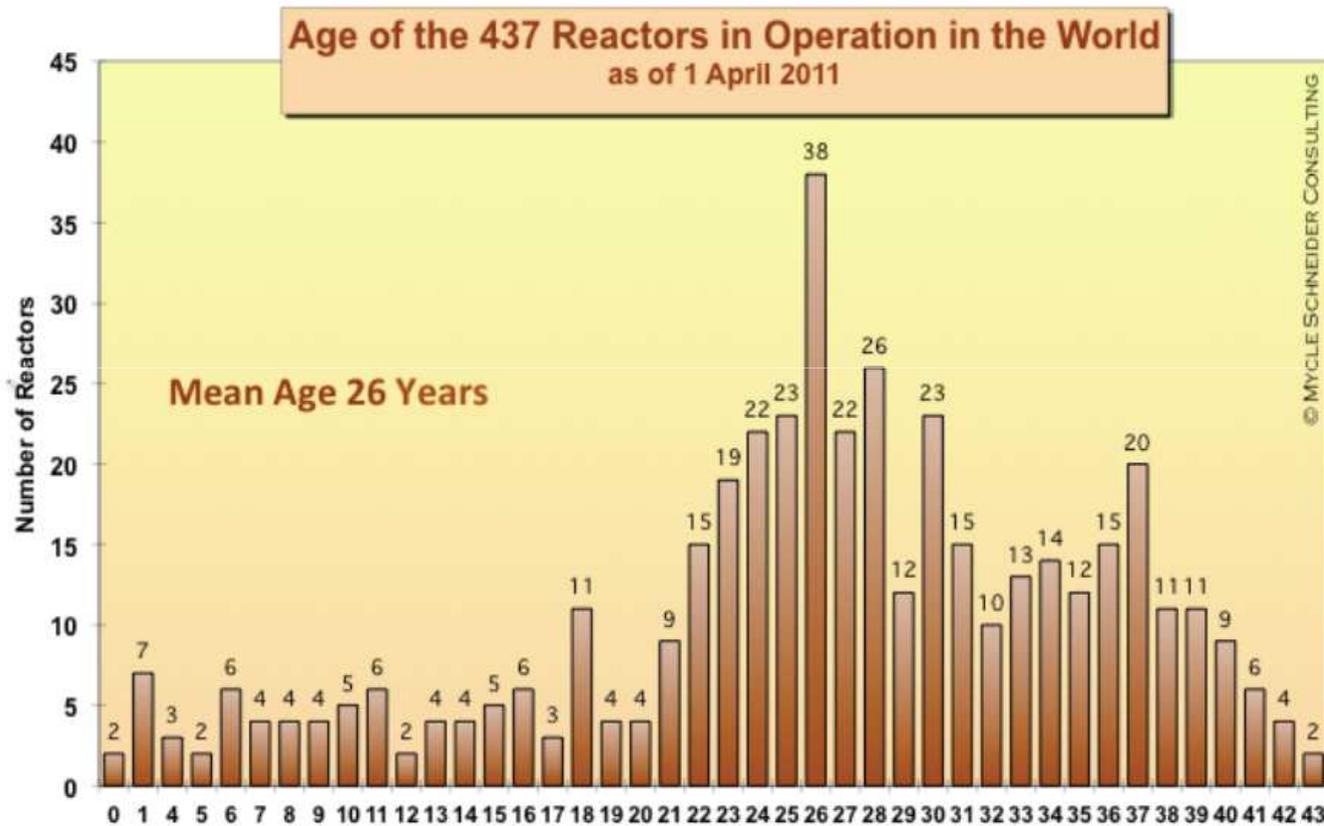
Sources: IAEA-PRIS, MSC 2011



Wegener Center
www.wegcenter.at

UZI
GRAZ

Age distribution of nuclear reactors



The emerging European energy crisis

A first summary

- **Shortages of electricity**
 - ↗ **Policy of shut-down of reactors**
 - ↗ **Age distribution of reactors**
- **Financial constraints for renewables**
 - ↗ **Sovereign debt crisis**
- **Vulnerability with respect to oil and gas**
 - ↗ **Quantities**
 - ↗ **Prices**

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**Why we should try to develop
a long-run
shared vision for our energy system**

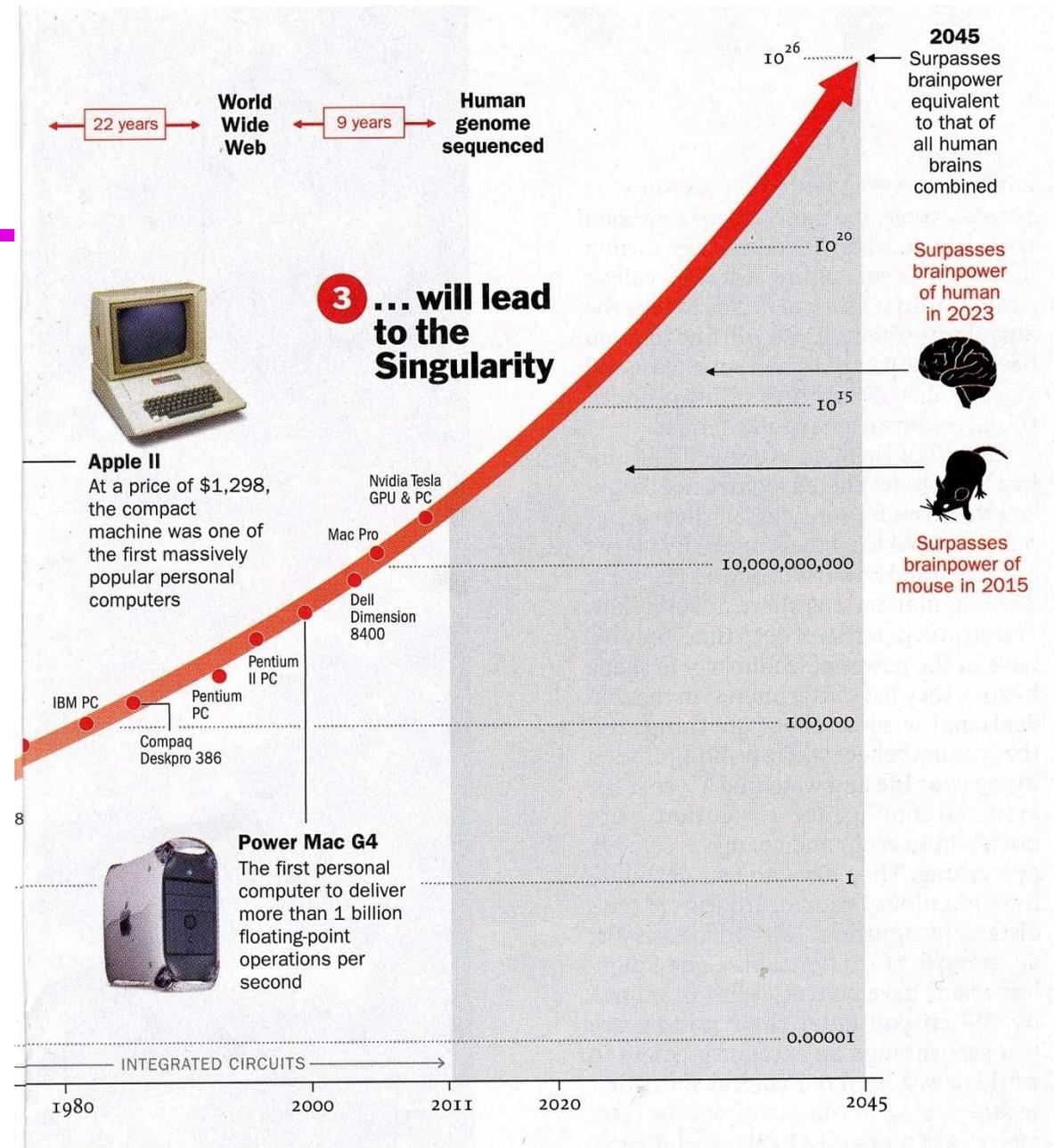
Singularity Hypothesis

2045 → **sin·gu·lar·i·ty**
n: The moment when technological change becomes so rapid and profound, it represents a rupture in the fabric of human history



Artificial intelligence

- Computer processing power keeps doubling every two years
 - MIPS for 1.000 USD
- By 2045 artificial intelligence might match human intelligence
- Potential impacts of this radical technological change
 - Aging society



The future of production

- 3D printers: fabricator – “fabber”

The Economist

Europe loses the mobile-phone war
Africa's new wealth
Japan's tea party
How to switch off the internet
The shoe-thrower's index

FEBRUARY 12TH-18TH 2011 Economist.com

Print me a Stradivarius

The manufacturing technology that will change the world

This violin was made using an EOS laser-sintering 3D printer (and it plays beautifully)

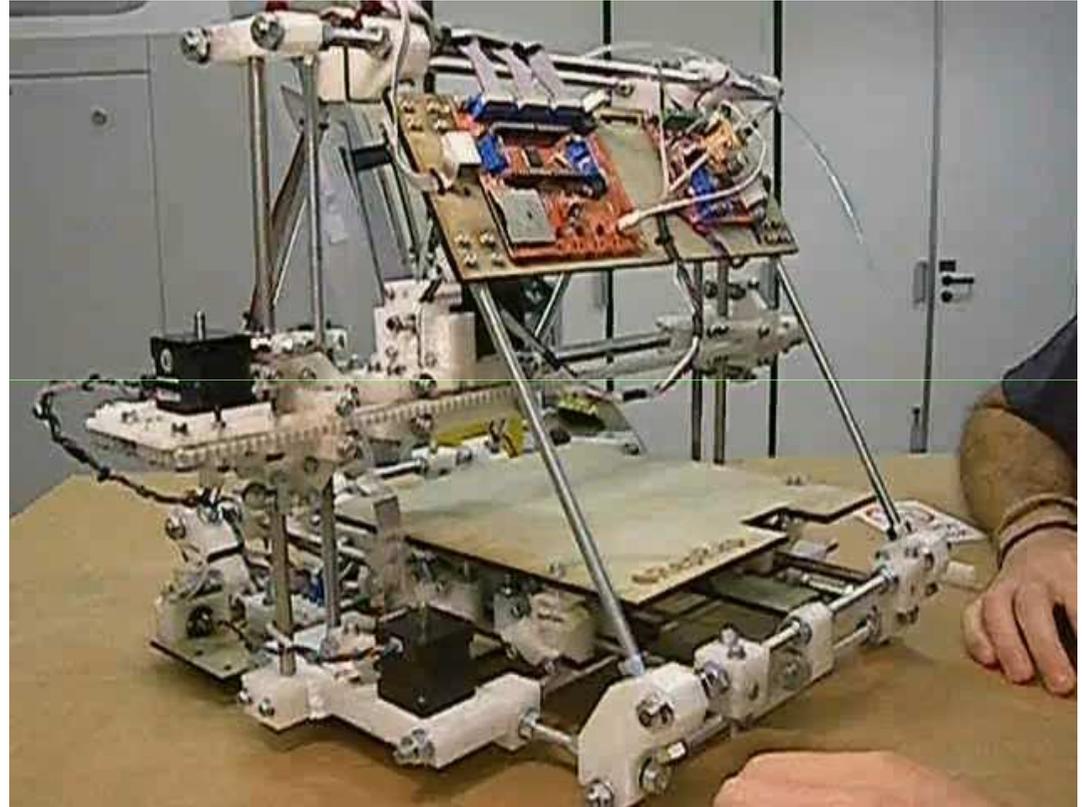
€5.50

9 770013 061190 07

Albania	ALL760	Croatia	HRK48	France	€5.50	Ireland	€5.50	Latvia	LVL3.90	Nigeria	Naira 700	Romania	RON24	South Africa	R45.00	
Austria	€5.50	Cyprus	€5.50	Gibraltar	€5.50	Israel	€5.50	Lebanon	€5.50	Norway	Nkr 50	Saudi Arabia	Rials 40	Sweden	SEK55	
Bahrain	Dinar 4.00	Czech Rep.	CZK150	Greece	€5.50	Italy	€5.50	Lithuania	€5.50	Poland	PLN2.5	Serbia	RSD 660	Switzerland	Sfr 10	
Belgium	€5.50	Denmark	DKK43	Hungary	HUF1,650	Kenya	€5.50	Luxembourg	€5.50	Portugal cont.	€5.50	Slovakia	€5.50	Turkey	TRY12	
Bulgaria	BGN13	Estonia	€5.69/EEK 89	Iceland	ISK700	Kuwait	Dinar 3.20	Malta	€5.50	Qatar	€5.50	Rials 40	Slovenia	€5.50	UAE	Dirhams 40

Products from nano structures

- Universal machines for production of (almost any) product
- Macroscopic products are generated from nano structures



Fabber products

- **Waste free**

- ↗ “Additive” instead of “subtractive”

- **Decentralized**

- ↗ “Downloading” of the file with instructions of the fabber



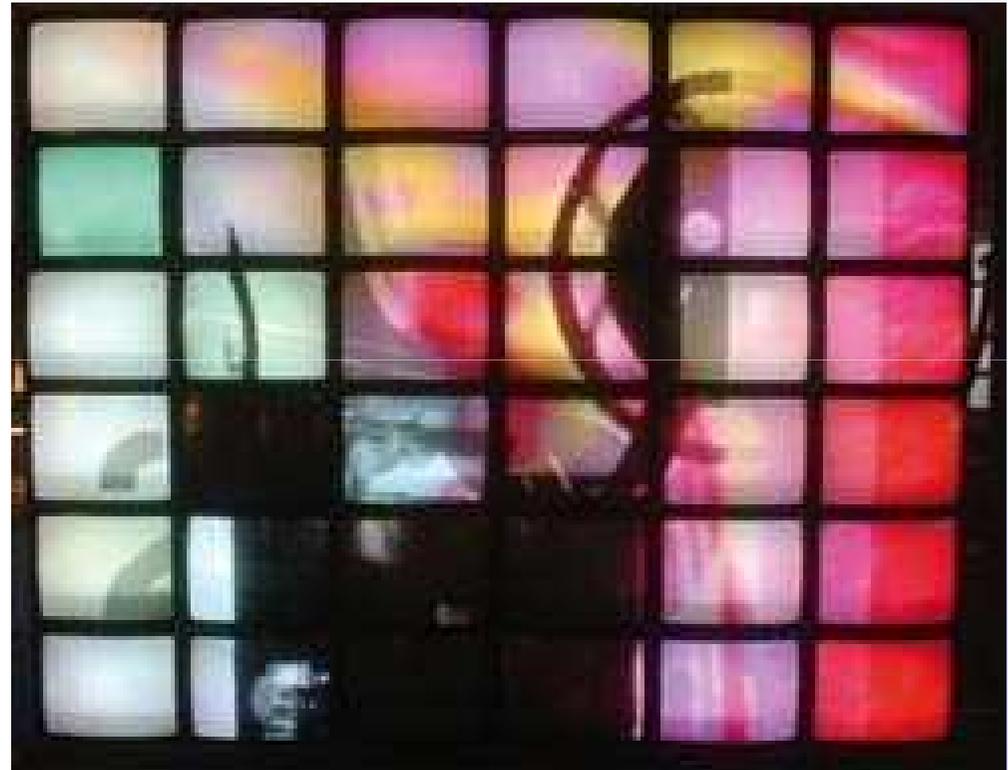
The future of mobility

- **Automover or “mover”**
 - Automatic Transport Module
 - Self-steering modular platforms
- **Merging of road and train transport**
 - Road traffic converges to train structures



The future of information and communication

- **Communication via Interactor or “Inter”**
 - **3D with emotional features**



This radical technological change has already started

A few examples

Innovative buildings



**Almost
zero-energy
standards**



The next step: Buildings become power plants

Plus-energy
standard

Gutau



Graz

Innovative mobility



Nissan Leaf

Mitsubishi MiEV



The next step: Multifunctional vehicles

Aptera Type-1

- 2(+1) persons
 - **386 kg** (90% composite)
 - > 190 km
 - < 0,9 l/100 km
- www.aptera.com



Multifunctional
Storage for electricity grid by plug-in Operation

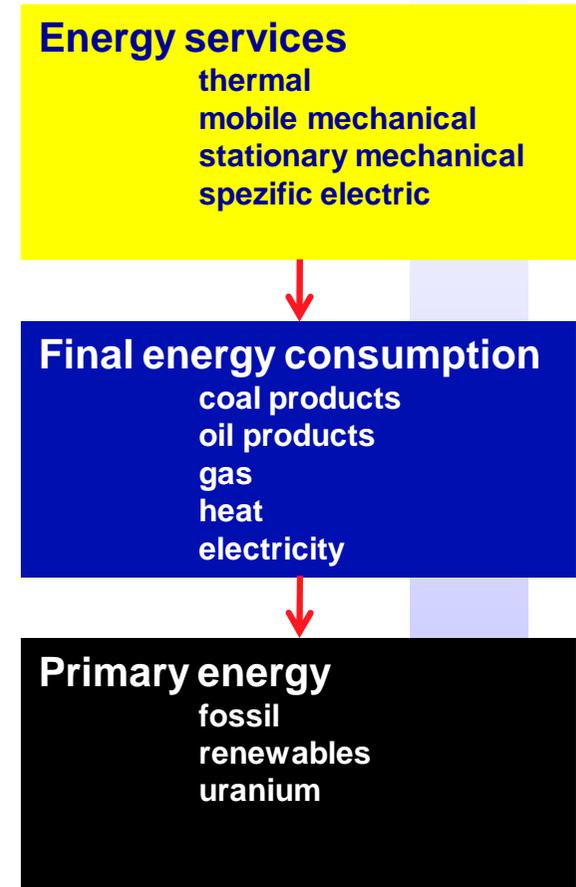
The services are sold, not the vehicle

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**Why most current energy strategies
are no adequate answers
to the coming energy crisis**

Changing the mind set

- Focusing on energy services
- Considering the cascade structure of energy systems

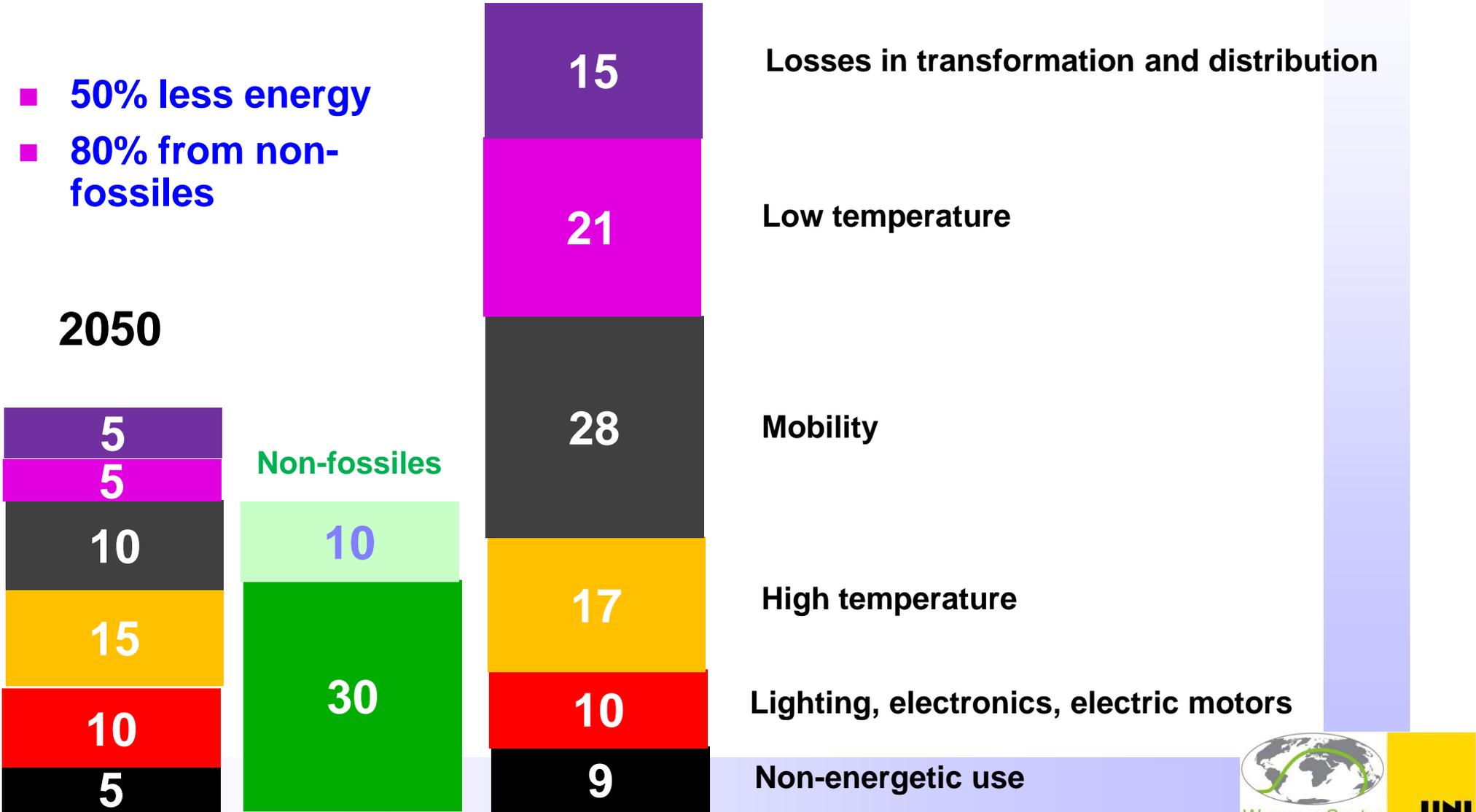


Envisioning the big transformation

2010

- 50% less energy
- 80% from non-fossiles

2050



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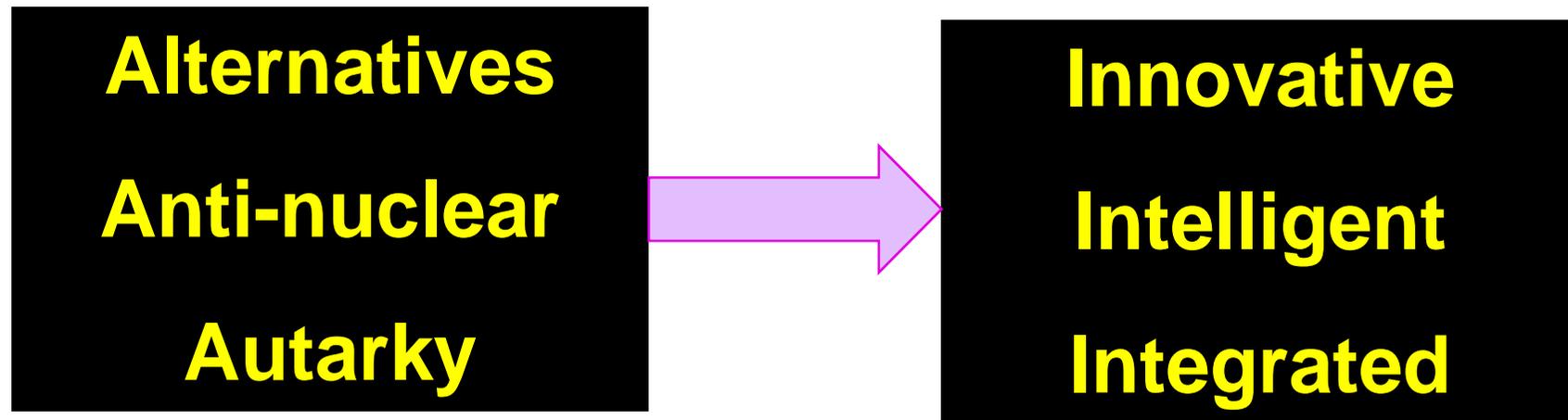
Preparing policy makers

- In a global but also European perspective the transformation to low-energy structures is inevitable
- Major additional investments will be required amounting to between 2 and 4 percent of GDP
- This will not necessarily increase the user costs of energy services

Potential dead ends of EU policies

- **Increasing the GHG emission reduction target for 2020 from 20% to 30%**
 - **Without an ambitious technology policy**
- **Aiming for a 80 % GHG reduction by 2050**
 - **Without a detailed and credible roadmap**

Changing the rhetoric of Member States



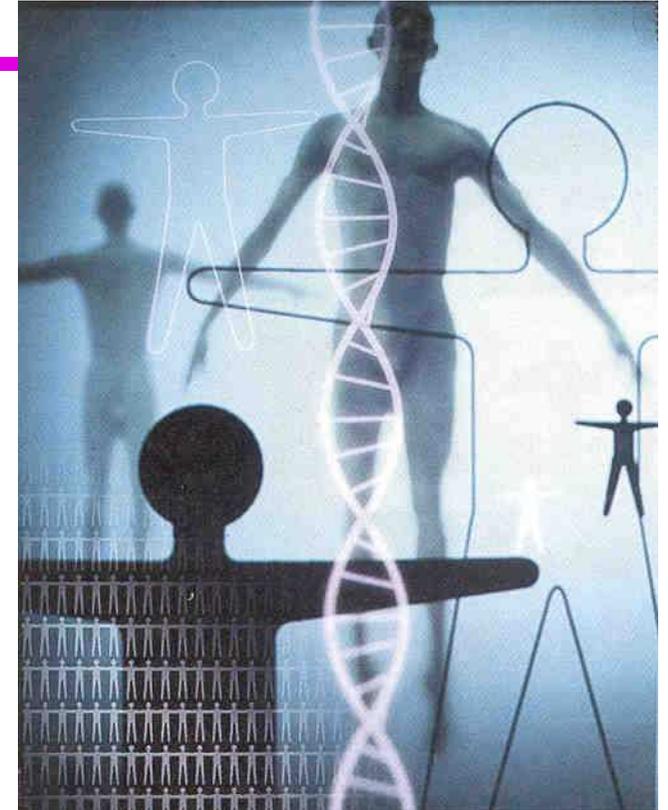
Thank You.

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Resources

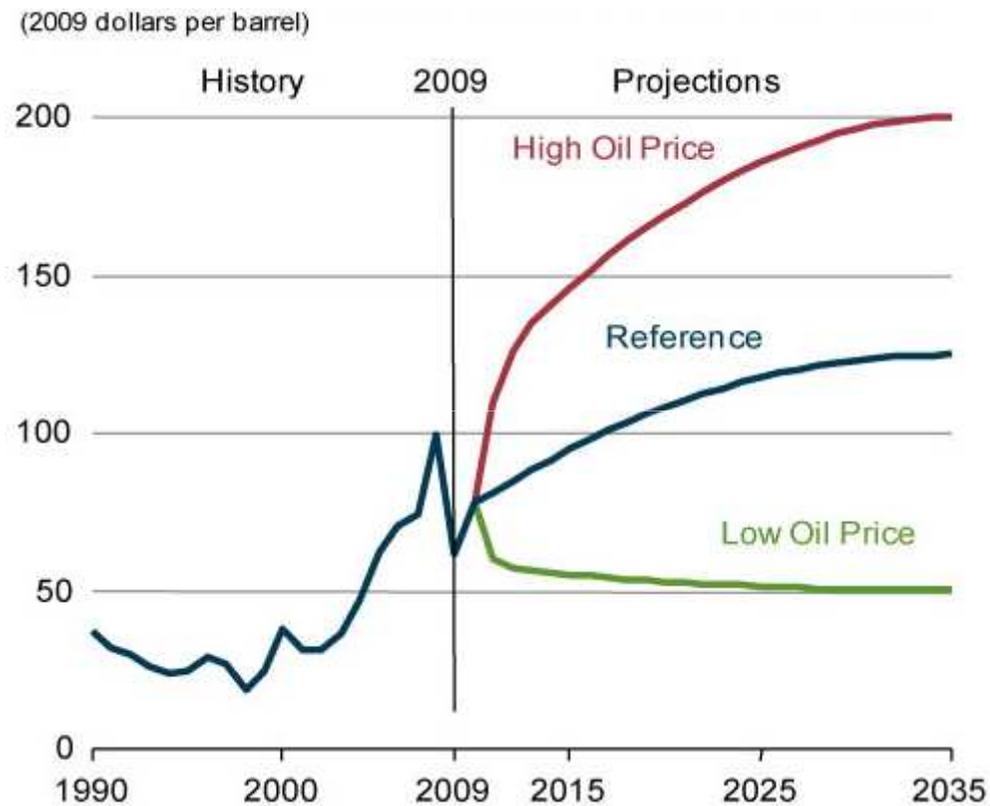
- International Energy Outlook 2011 (IEO 2011) by U.S. Energy Information Administration

- <http://www.eia.gov/forecasts/ieo/>

- Comments on IEO 2011

- http://www.theoildrum.com/node/8403?utm_source=pulsenews&utm_medium=referral&utm_campaign=Feed%3A+theoildrum+%28The+Oil+Drum%29

World oil prices



Oil prices will be increasing with high volatility

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