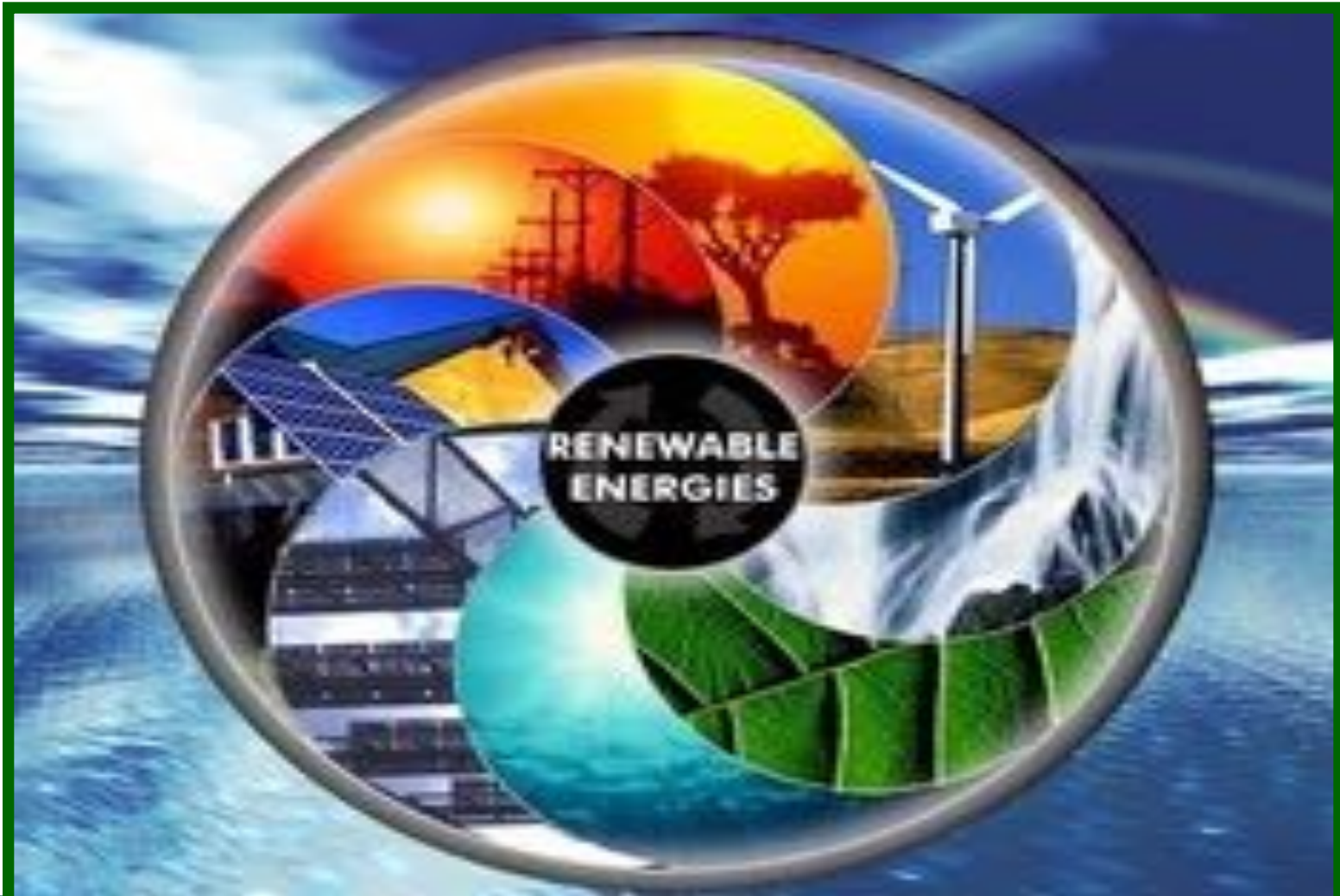


Renewables conquer the world energy markets

Hans-Josef Fell
President of Energy Watch Group
Member of German Parliament 1998-2013

11. International Energy Conference
Teheran, May 31th, 2016

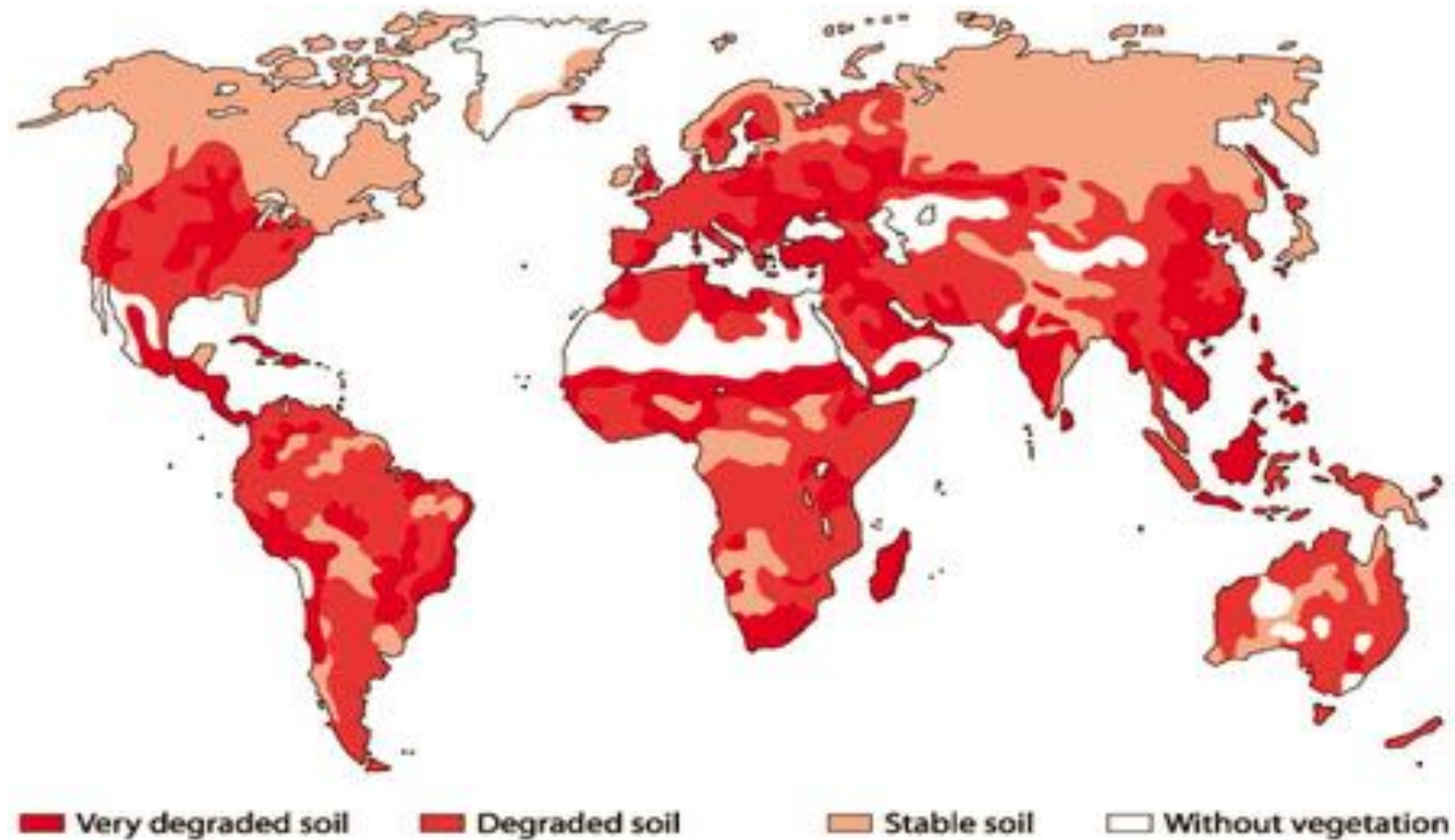
Coming Energy Production: 100 % Renewables



Where oil is, is mostly war



Distribution of degraded land in the different continents



COP 21: Stop Climate warming at 1,5 C

This means an emission free world latest at 2035

But at todays warming at 1° C is already unacceptable:
aridity and forest fires, floods and storms, sea level rising



The better choice is:
Global Cooling

Crises of climate warming can only be solved by two parallel strategies:

1. Stop greenhouse gas emission

(not only a reduction of emissions)

- switch to 100% renewables
- completely stop the use of fossil and nuclear energies in energy, chemistry, transport, agriculture

2. Take out carbon from atmosphere

- convert plants to humus soil (biocoal)
- reforesting big areas, greening the deserts
- Organic agriculture

The Target must be 330 ppm CO₂

This leads to global cooling, instead of global warming

Greening the degraded land:

20% greened degraded land areas with oleiferous plants can substitute for the global mineral oil demand



Around 2000 Gt CO₂ could be taken out of atmosphere in next 30 years

Iran could become an exporter of plantoil for the world

Millions new jobs in rural areas

Greened Egypt desert at Luxor with Yatropha brings oil & food

Agroforestry Systems in Spain, UK, France and Italy



oak-wheat (E)



poplar-barley (GB)



poplar-wheat (F)



walnut-lucerne (I)

Wood can replace coal on a sustainable way

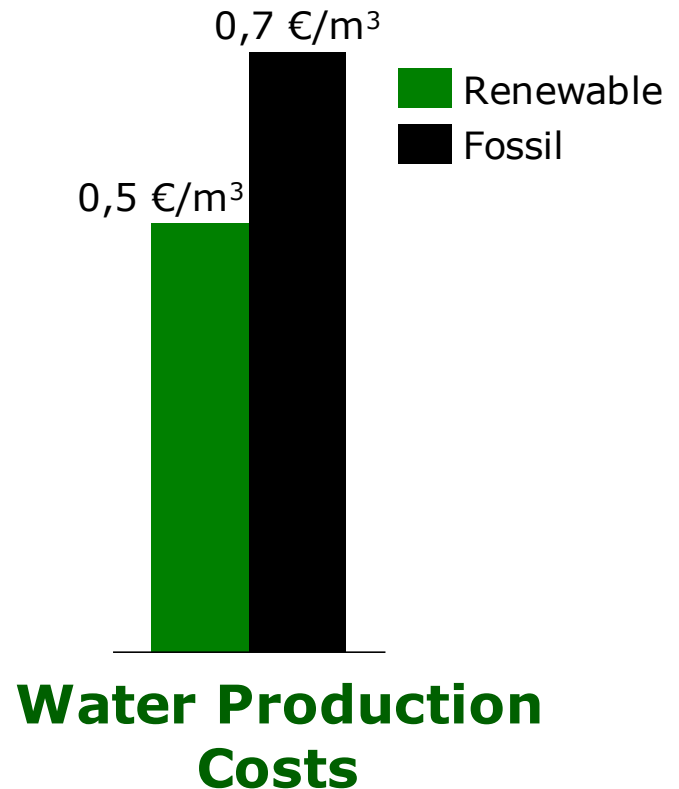
Wood brings shadow, energy, fruits, nuts, fiber

Agro-PV in Italy

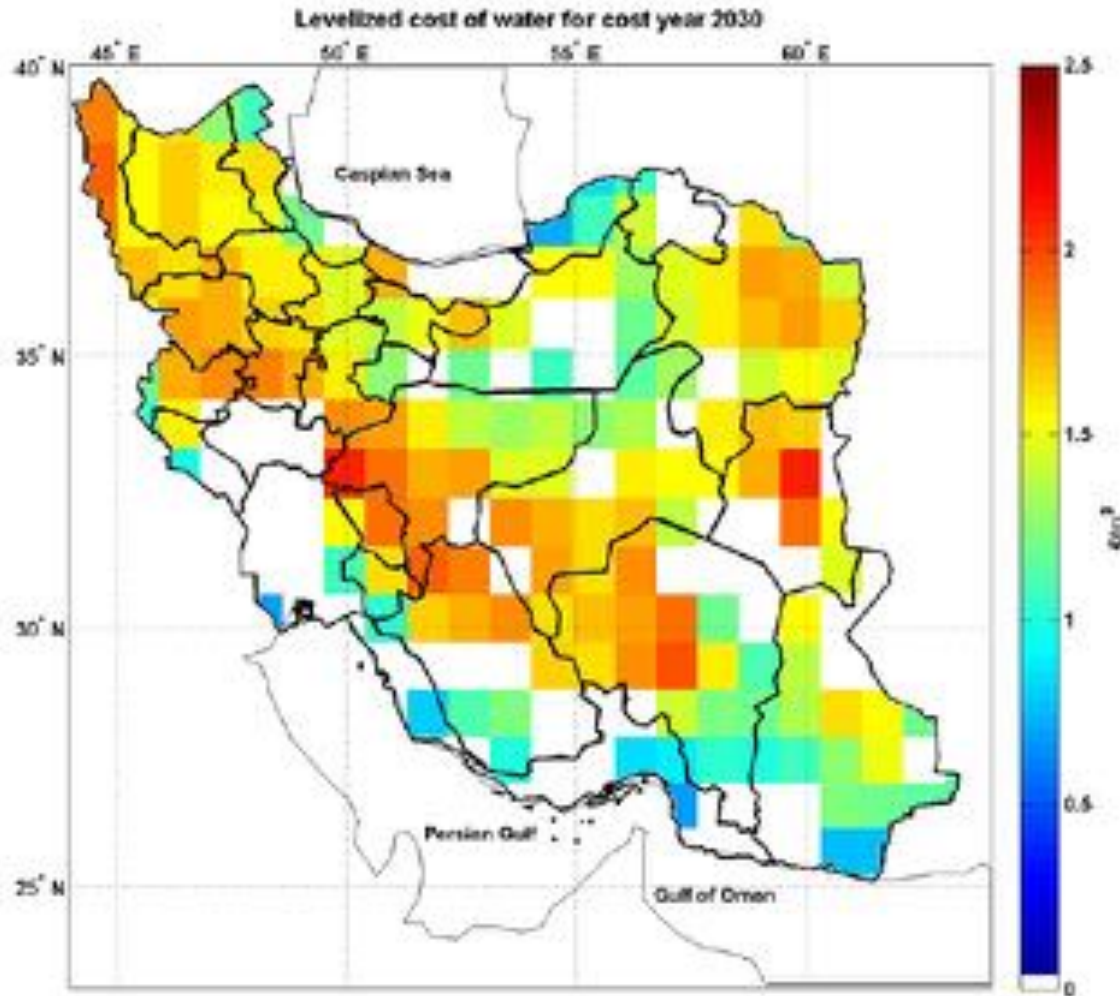
Twice yield: Solarelectricity and food
Shadowing saves water



Desalination: Renewable cheaper than Fossil



Desalination in Iran



- **Expensive transportation to high altitudes**
- **Total costs for water production, transportation and storage:**

0,5 – 2,0 €/m³

Water + Electricity from the same windmill



Water desalination: up to 1000 m³ per day
Electricity additional: up to 50 kW

Water cost: about 1 EURO per m³

Renewables conquer German Energy

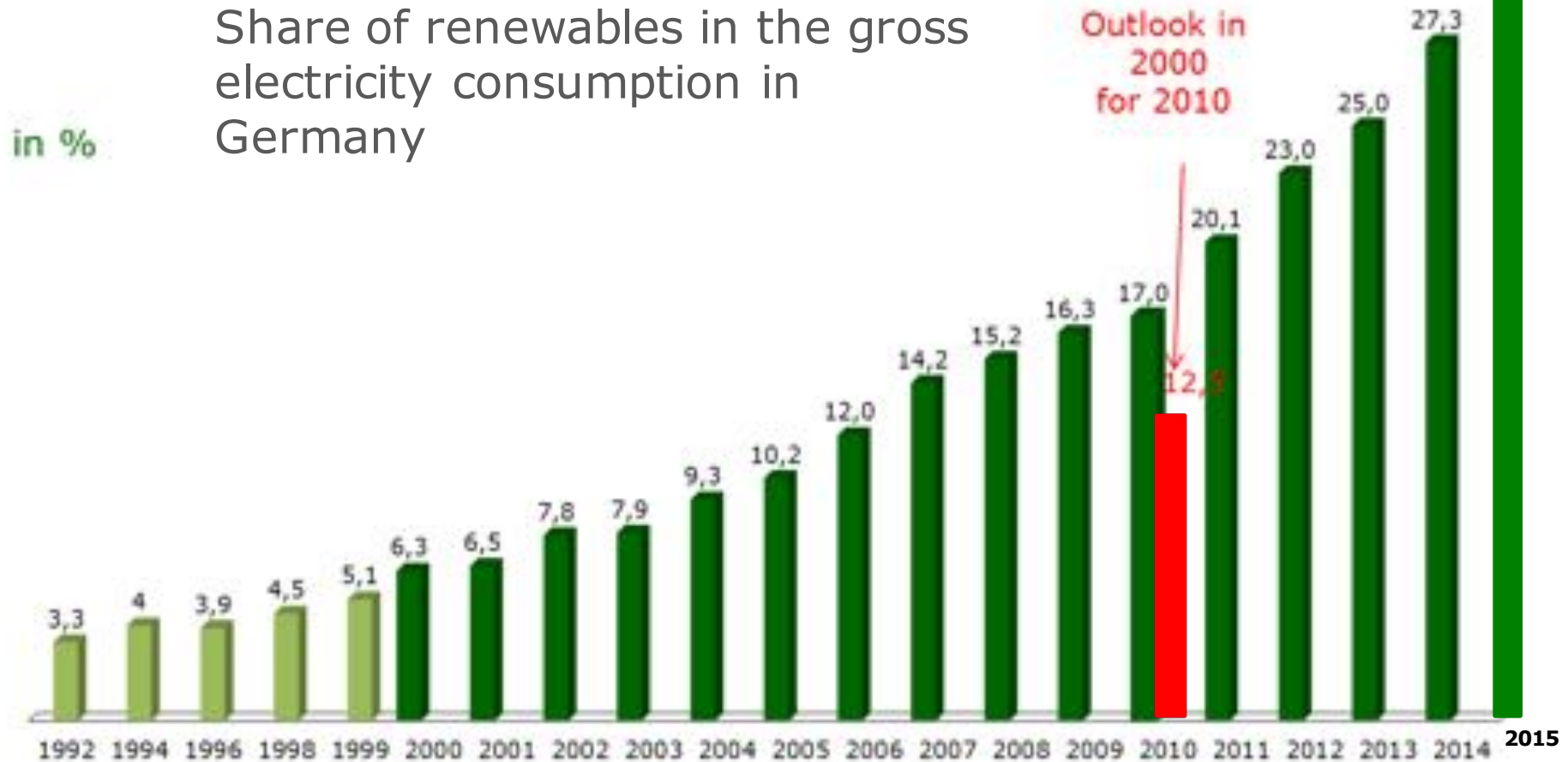
In the background:
**nuclear power plant
Grafenrheinfeld
shut off in June 2015**

In the foreground:
**Windpower named
„Hans-Josef Fell“
PV and
biogas farmland**



With political support renewable energy grows very fast

33



Renewables lower the german exchange electricity Price (Baseload) since 2010

€/MWh

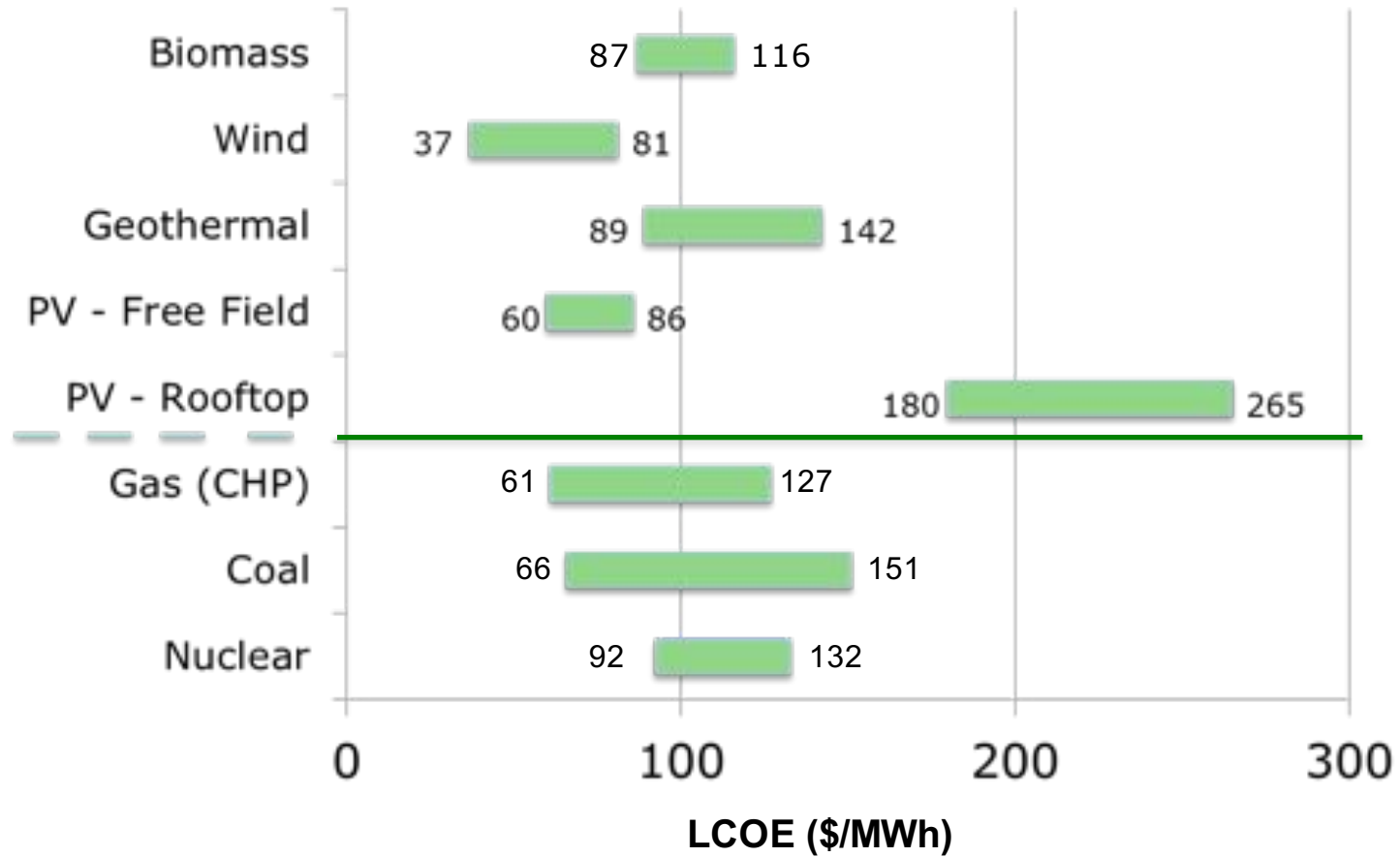


source: EEX(2015);
<http://www.finanzen.net/rohstoffe/eex-strom-phelix-baseload-year-future/Chart>

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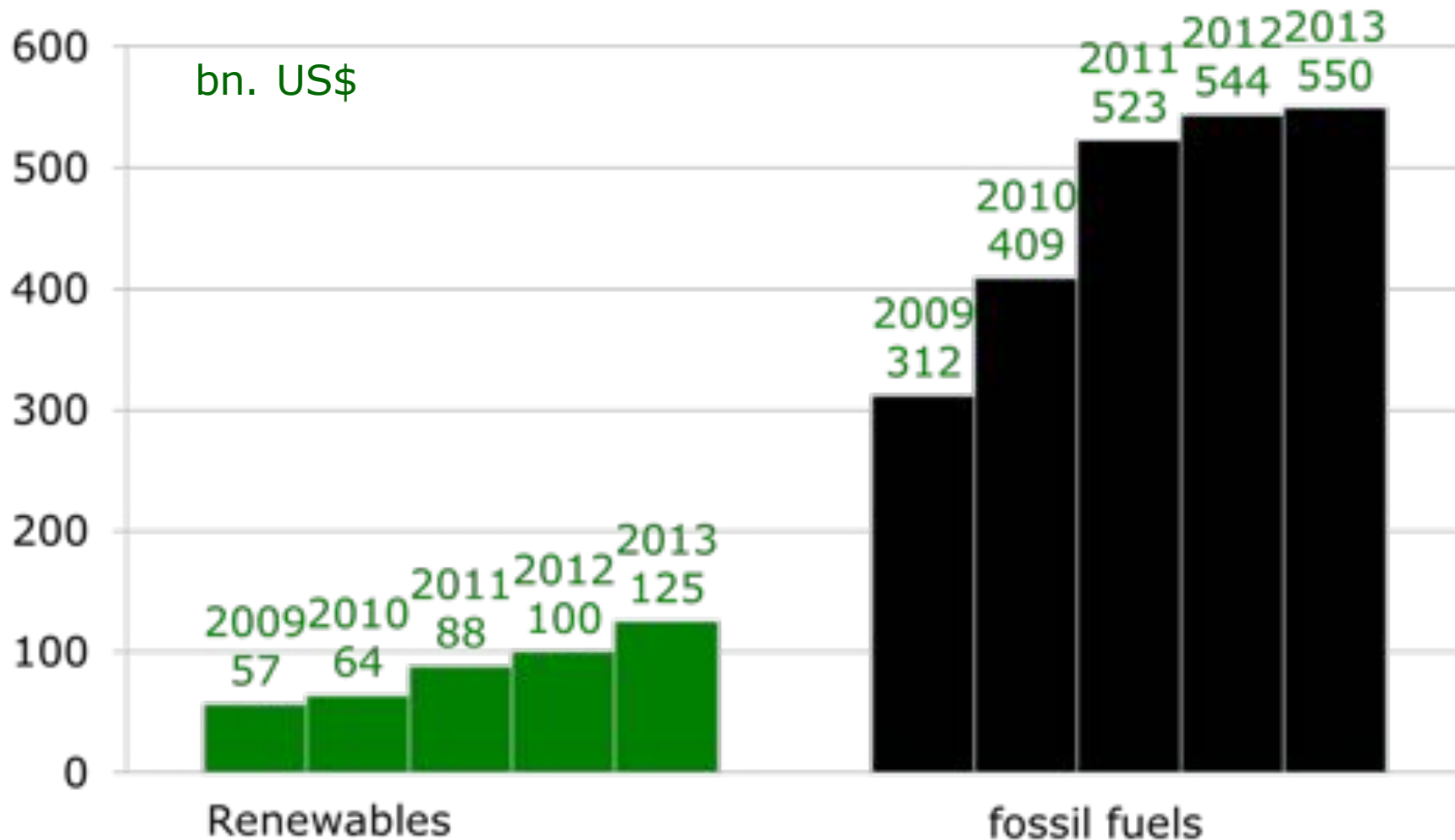
Levelized Cost of Energy Comparison

US Minimum and Maximum Price in March 2014



Global subsidies: renewables/fossil fuels

Global warming subsidies: 100 US\$/t CO₂





Countries with a 100% RE target

*Denmark; Sweden; Costa Rica;
Island; Scotland; Upper Austria*

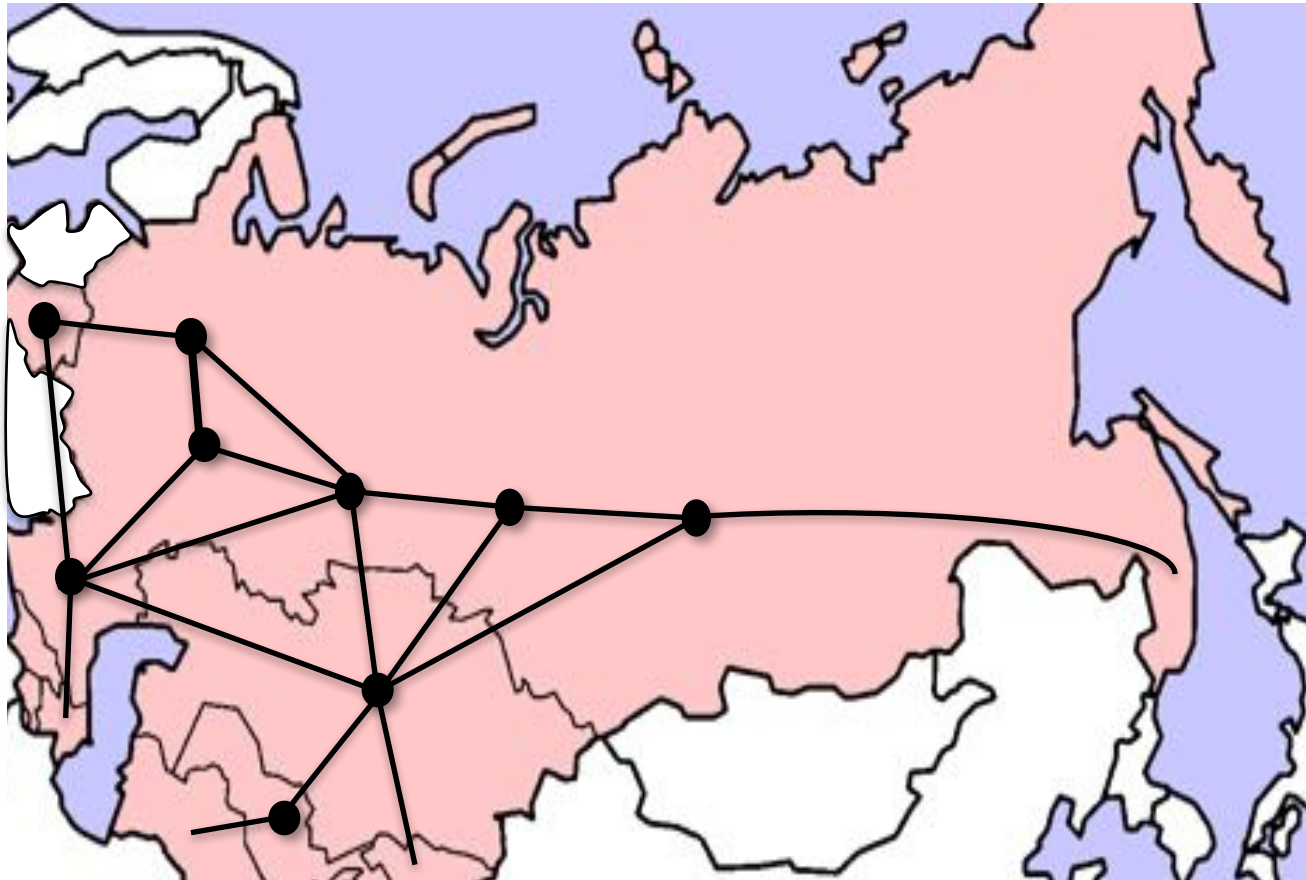
Cities with 100% RE target

*Barcelona; Masdar City; Munich;
Msheireb Downtown Doha; Vancouver;
San Francisco; Copenhagen; Sydney;*

Small Island States with 100% RE target

*Islands of Tuvalu; Maledives; Cook
Islands*

100% Renewables in Eurasia



Average cost for
Generation,
Distribution
and Storage:

5,2 ct/kWh

ENERGYWATCHGROUP


Source: Energy Watch Group (2015): The projections for the future and quality in the past of the World Energy Outlook for solar PV and other renewable energy technologies.

Hans-Josef Fell
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Batterie Storage Tinningstedt



First wind park in Germany with Vanadium Redoxflow storage. Wind power surplus is used in times of lacking wind. Technical Management by Plan 8 GmbH.

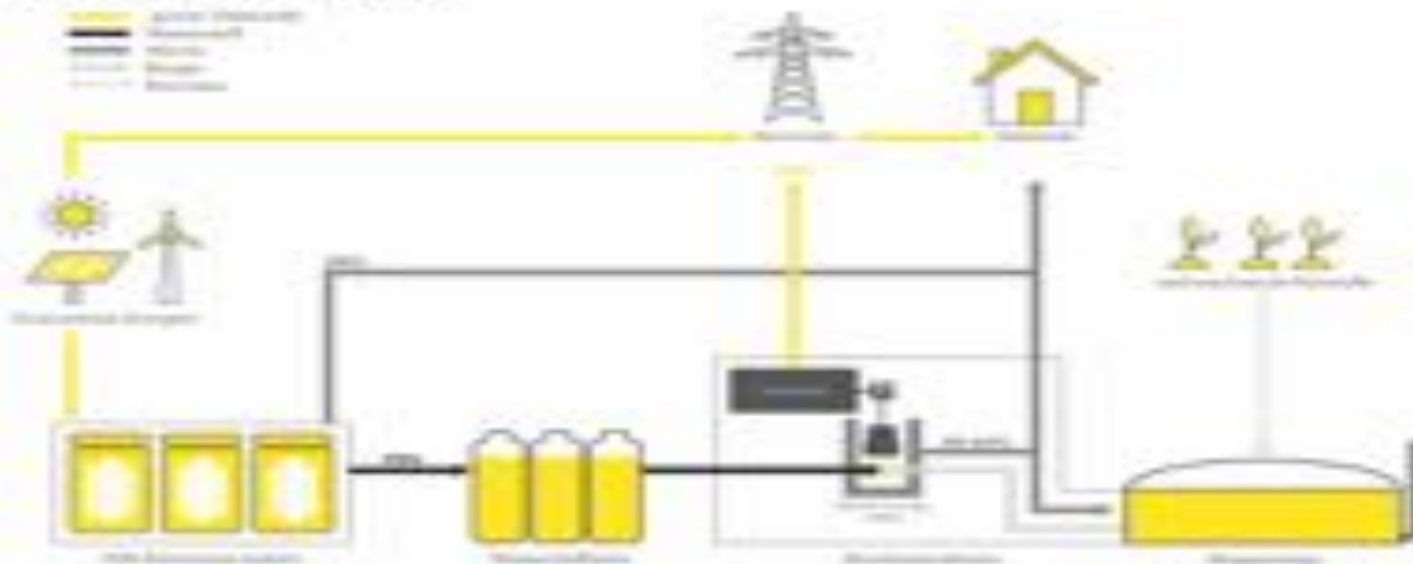
www.plan-8.de

Hydrogen from Solar and Wind for balancing fluctuations

GP JOULE
MAKING MORE ENERGY

Funktionschema Stromlückenfüller.

Energie nonstop.



Water Snail:

High efficient hydropower; zero fish mortality;
balancing solar-wind fluctuations



$$Q = 3 * 8.00 \text{ m}^3/\text{s}$$

$$H = 3.30 \text{ m}$$

$$P = 3 * 220 \text{ kW}$$

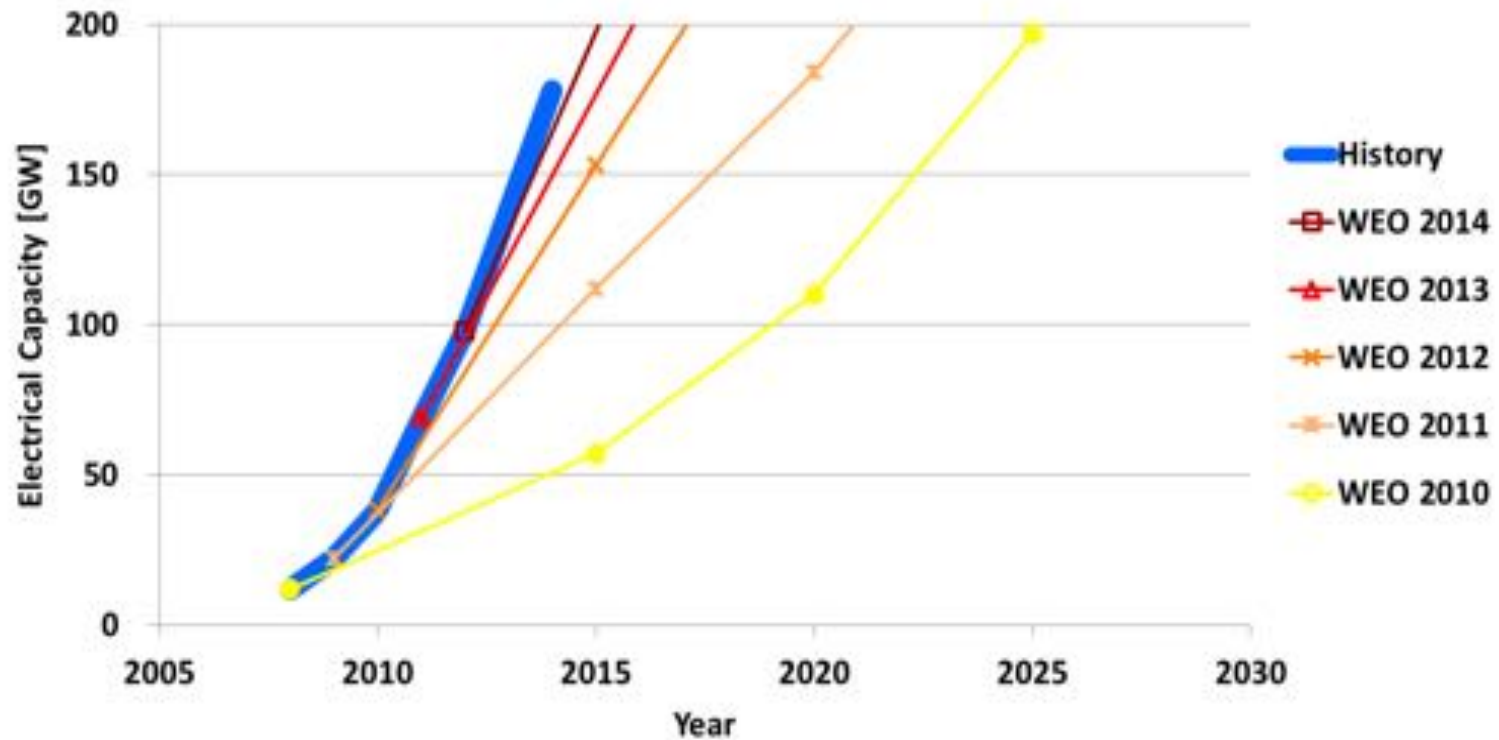
Nuclear Renaissance?

Only very few new plants

All are overbudget and late

- **Olkiluoto (Finland): start 2005**; forecasted cost 3 bn. €, ready 2009; **2015**: >9 years late, >5 bn. € overbudget, extension of facility cancelled:
- **Flamanville (France): start 2007**; forecasted: cost 3.3 bn. € and ready 2012; **2015** forecasted: >2018 ready, costs > 10.5 bn. €
Areva, the French nuclear construction company made therefore between 2011 and 2014 5 bn. € losses; has now 35 bn. Debts and nearly bankrupt.
- **USA**: Construction of 5 new nuclear power plant: all delayed and raising costs; Nuclear Power Plant **Fitzpatrick**, state New York will be closed by 2017: not economic with renewables

WEO Photovoltaic: Projections and Reality



Reality exceeded all projections of WEO by far.
PV, Wind grow much faster than by IEA projected.
Nuclear and fossil grow much less than projected

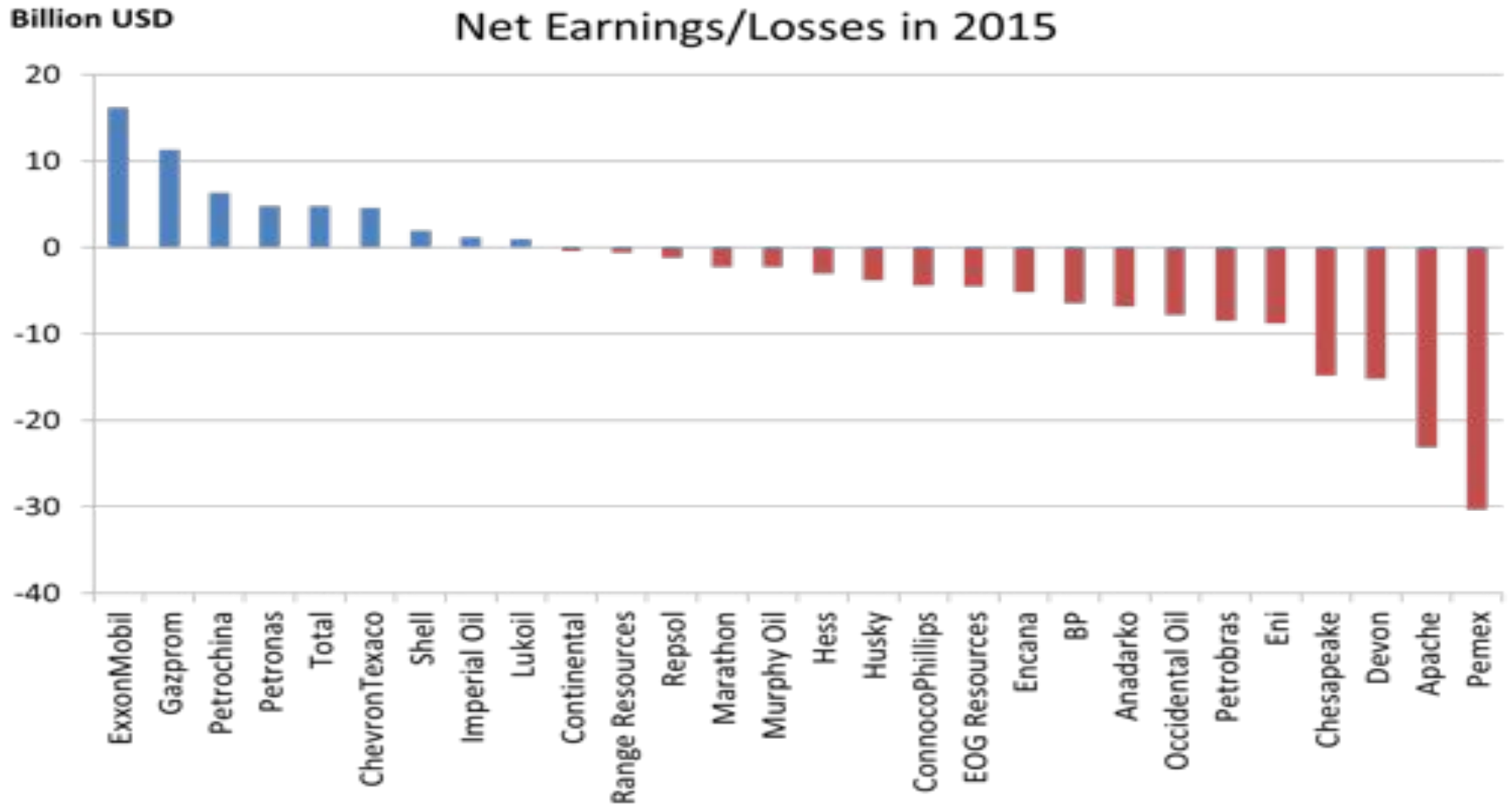


Carbon Bubble

Fossil/nuclear investments turn into stranded investment

- Coal/gaspower, nuclear is already stranded investment:
 - **E.ON; RWE** now will swap out coal and nuclear business and concentrate on Renewables and distribution
 - **AREVA** french nuclear company: 35 bn. € debts
 - **Peabody**: biggest coal company: bankruptcy in April 2016
 - **60 bankruptcy** in USA in fracking gas and oil industry
- China partly begins to ban use of coal (Beijing 2020)
- New nuclear plants in EU, USA: financial flops
- Oil nations in trouble: e.g. Venezuela;Nigeria;Russia
- Big banks warn about fossil investment
- Big funds leave fossil shares

Low oil price: Oil Companies in emergency



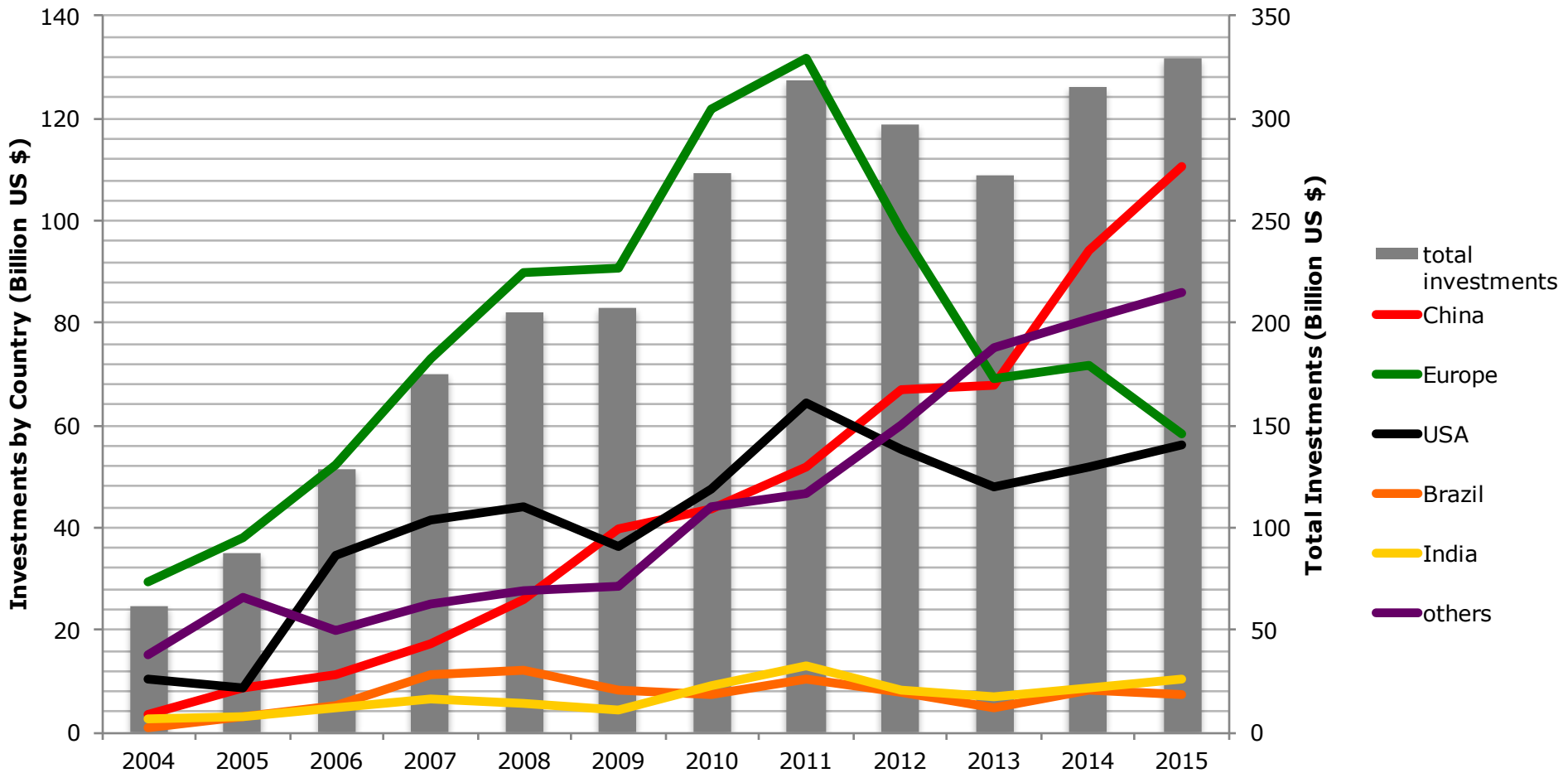
Double pitfall for fossil/nuclear business

- Rising oil/gas/coal/uranium prices
 - Energy consumers switch to renewables
- Declining oil/gas/coal/uranium prices
 - Financers stop financing
 - State budget on the way to bankruptcy

Both leads to economic pressure for fossil/nuclear companies

- \$3.4 trillion fossil fuel assets are flagged for divestment by more than 500 institutions and 2,040 individuals from 43 countries

Investment in Renewables since 2004



source: Bloomberg, Clean Energy Investment in Numbers, 2016
Own presentation

The world trend is clear:

The share of renewable energy will grow rapidly;
the share of fossil/nuclear energy will decrease

- Energy-consuming countries will go out of fossil fuels because of falling renewable prices and climate protection
 - Countries that are too late will face big economic problems
- Energy-producing countries must be aware of this trend
 - When they are too late to shift to renewables they will face a great economic disaster in the coming years

Global Cooling



Published in summer 2012

Paperback edition for 19 €

www.crcpress.com/9780415620772

www.globalcooling-climateprotection.net

***Thank You Very
Much for Your
Attention!***

www.hans-josef-fell.de