Challenges and opportunities for energy companies due to climate crisis and renewable energies

Input for the Energy Transition Dialogue in Luxembourg

Mondorf-les-Bains, October 24, 2019

Prof. Dr. Uwe Leprich

Uwe Leprich

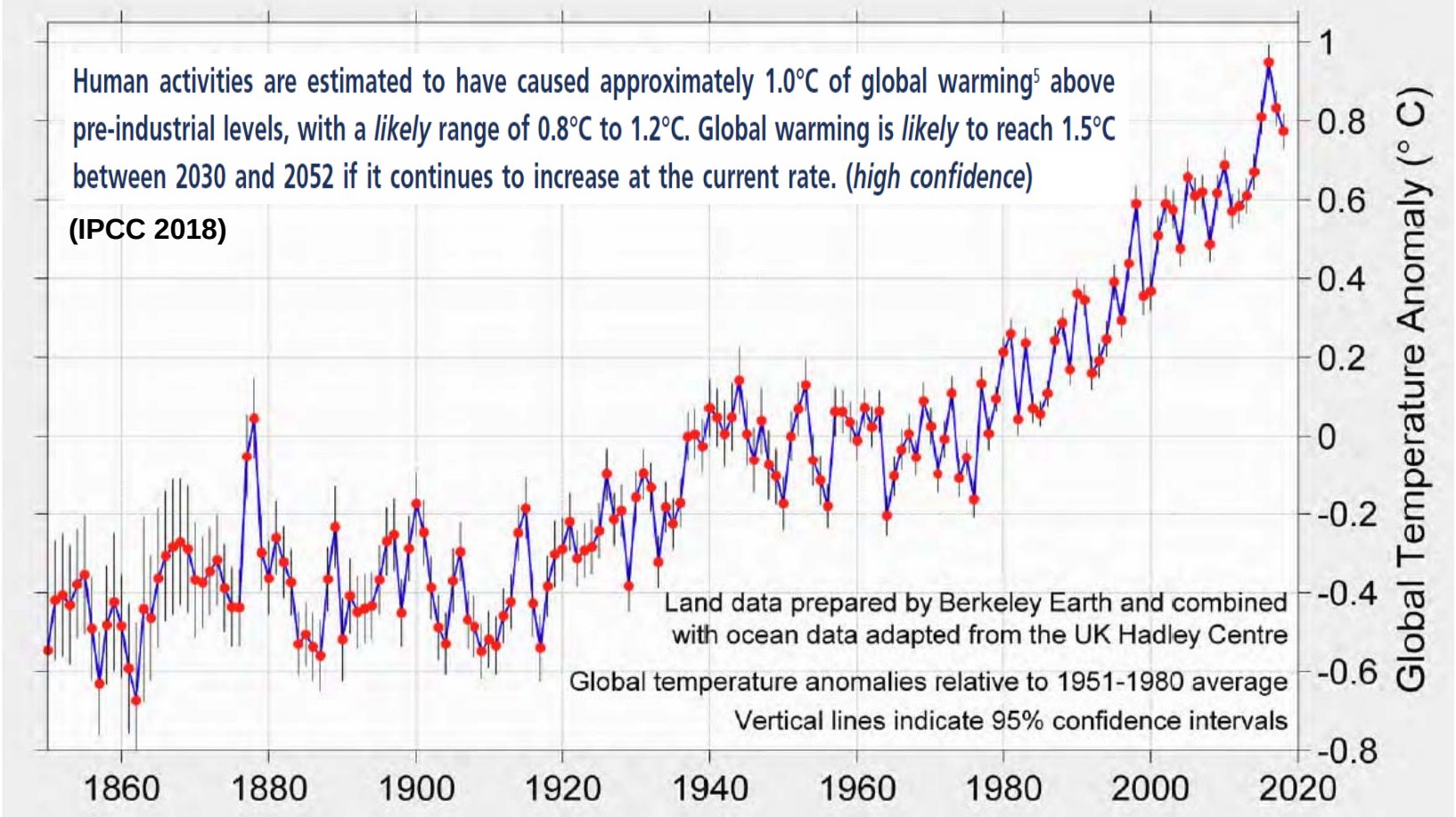
- Professor at the business school of the University of Applied Sciences in Saarbruecken since 1995
- From 2008 till 2016 scientific head of the Institute for Future Energy Systems (IZES), a university based research institute focussing on renewable energies, energy efficiency and decentralised power generation
- From 04/2016 till 03/2018 head of the department for climate protection and energy in the Federal Environment Agency (UBA)
- Alternate member of the Administrative Board of ACER (Agency for the cooperation of Energy Regulators) since 2011
- Author and co-author of several books and numerous articles on liberalised electricity markets, economic instruments and measures for supporting sustainable options in the energy markets, and climate protection policies

Quelle:

1. The climate crisis

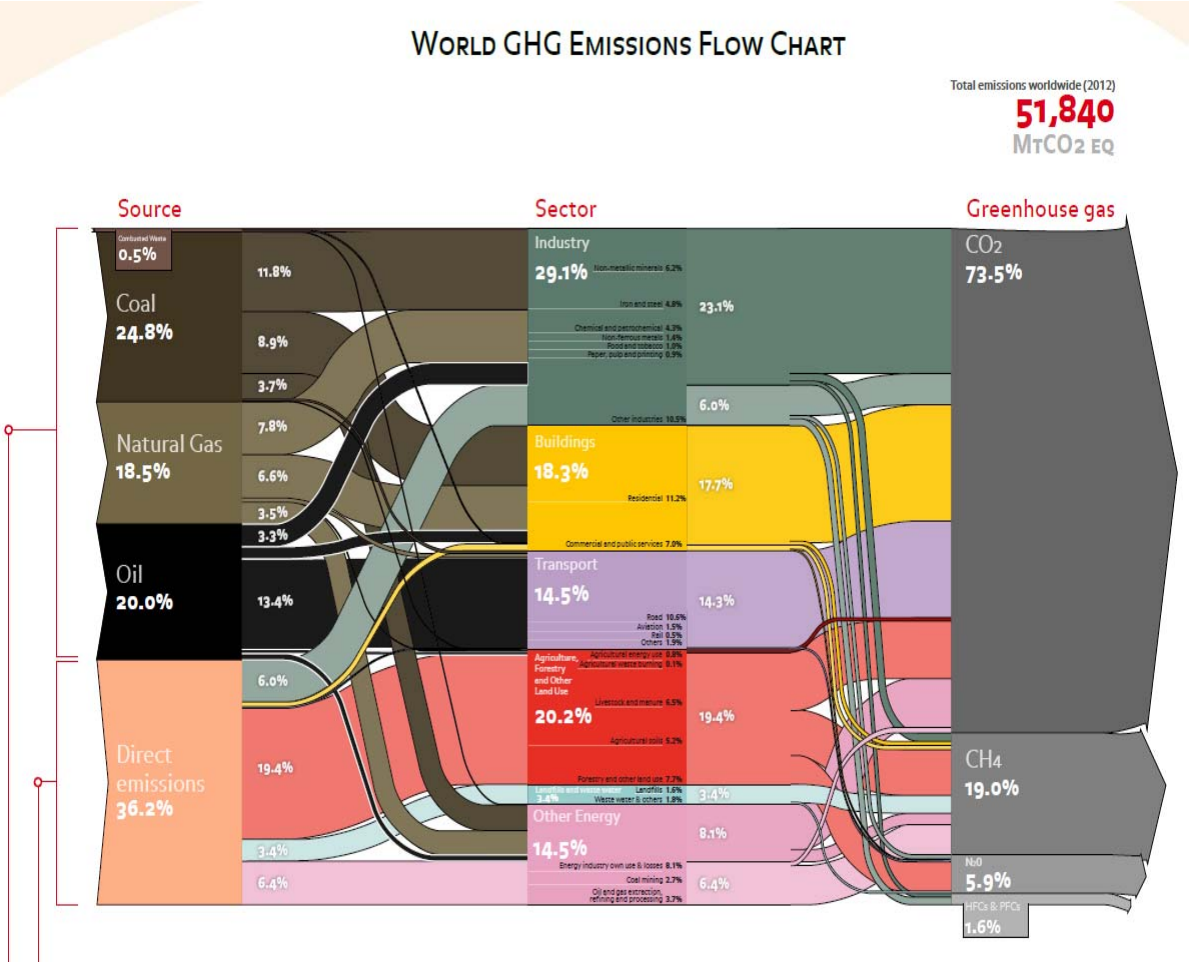
Quelle:

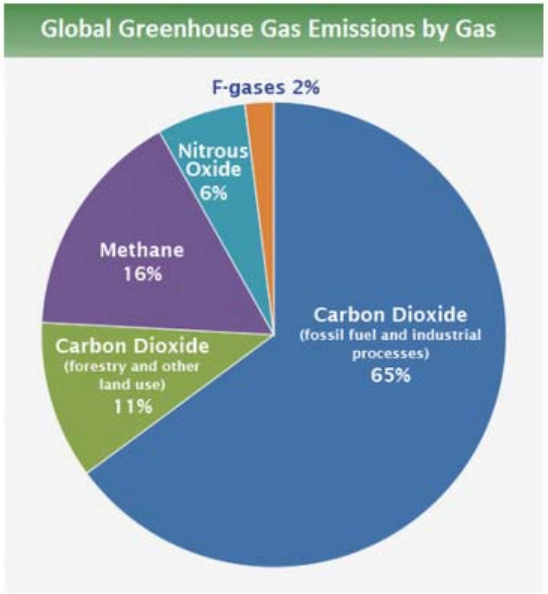
Global Average Temperature 1860-2018: It‘s getting warmer!



Quelle: Schellnhuber 2019

Shares of various greenhouse gases in the greenhouse effect: it's mostly CO_2

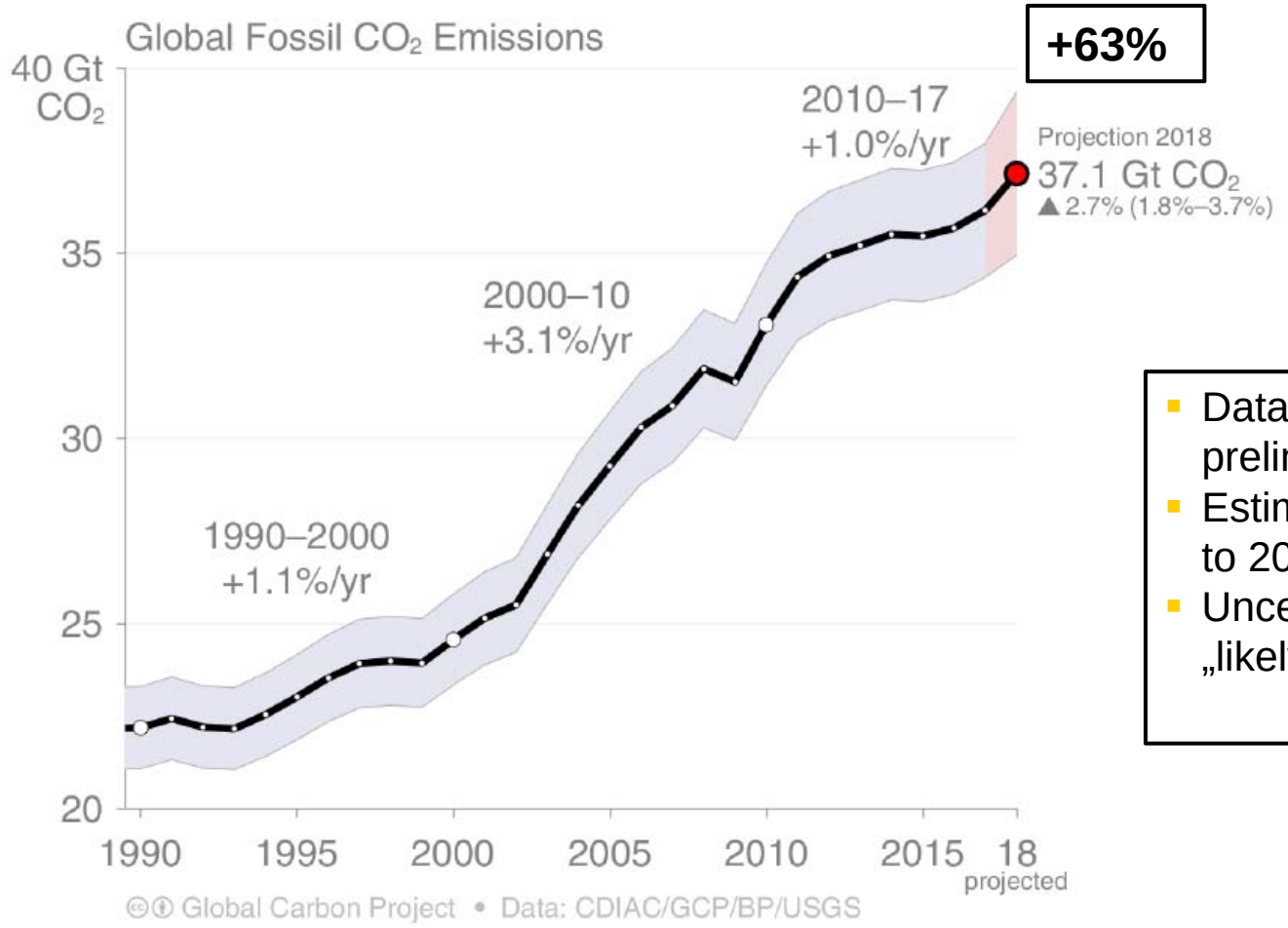




Source: IPCC (2014) EXIT based on global emissions from 2010. Details about the sources included in these estimates can be found in the *Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. EXIT

Quelle: Ecofys ASN 2016 / IPCC 2014

Development of the global CO_2 emissions

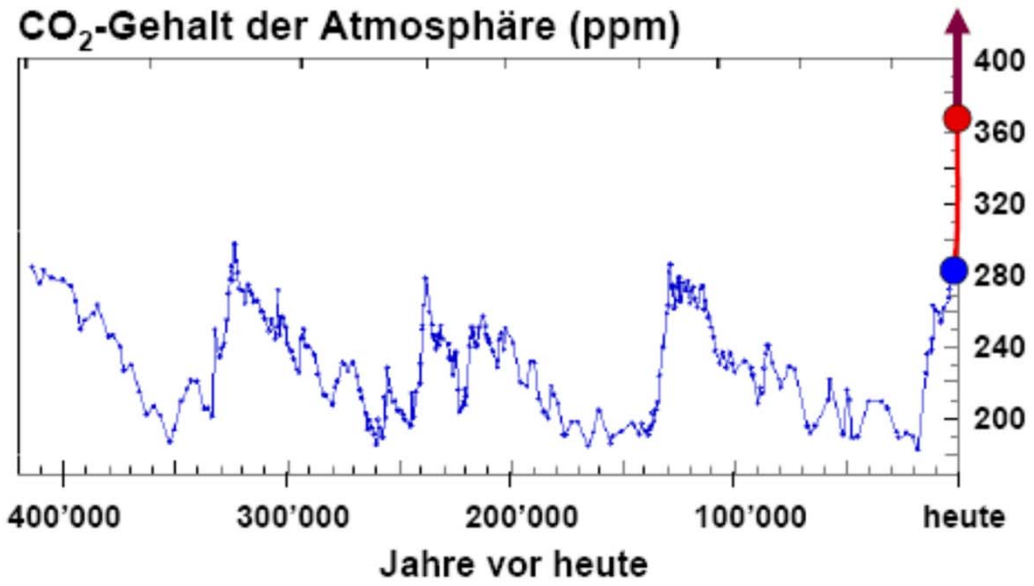


+63%

- Data for 2015-2017 are preliminary
- Estimate for 2018: +2,7% to 2017
- Uncertainty ± 5% (IPPC „likely“ range)

Quelle: Global Carbon Project 2018

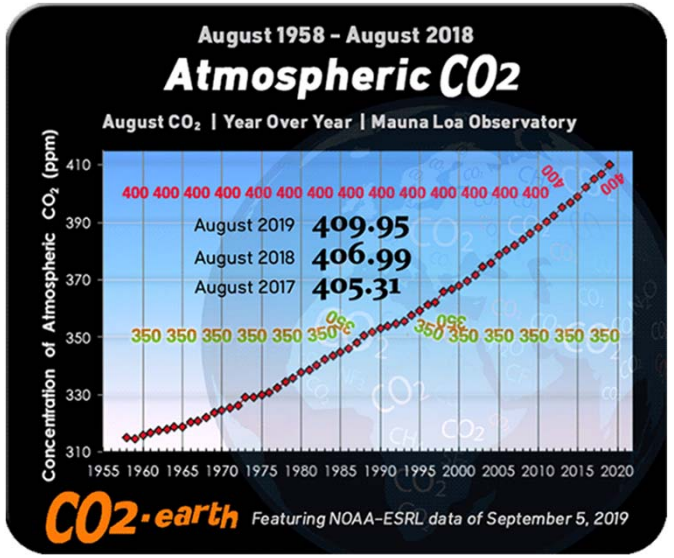
Global CO_2-concentration on the rise



2100: Szenarien bis 900 ppm

2000: Heute, 370 ppm

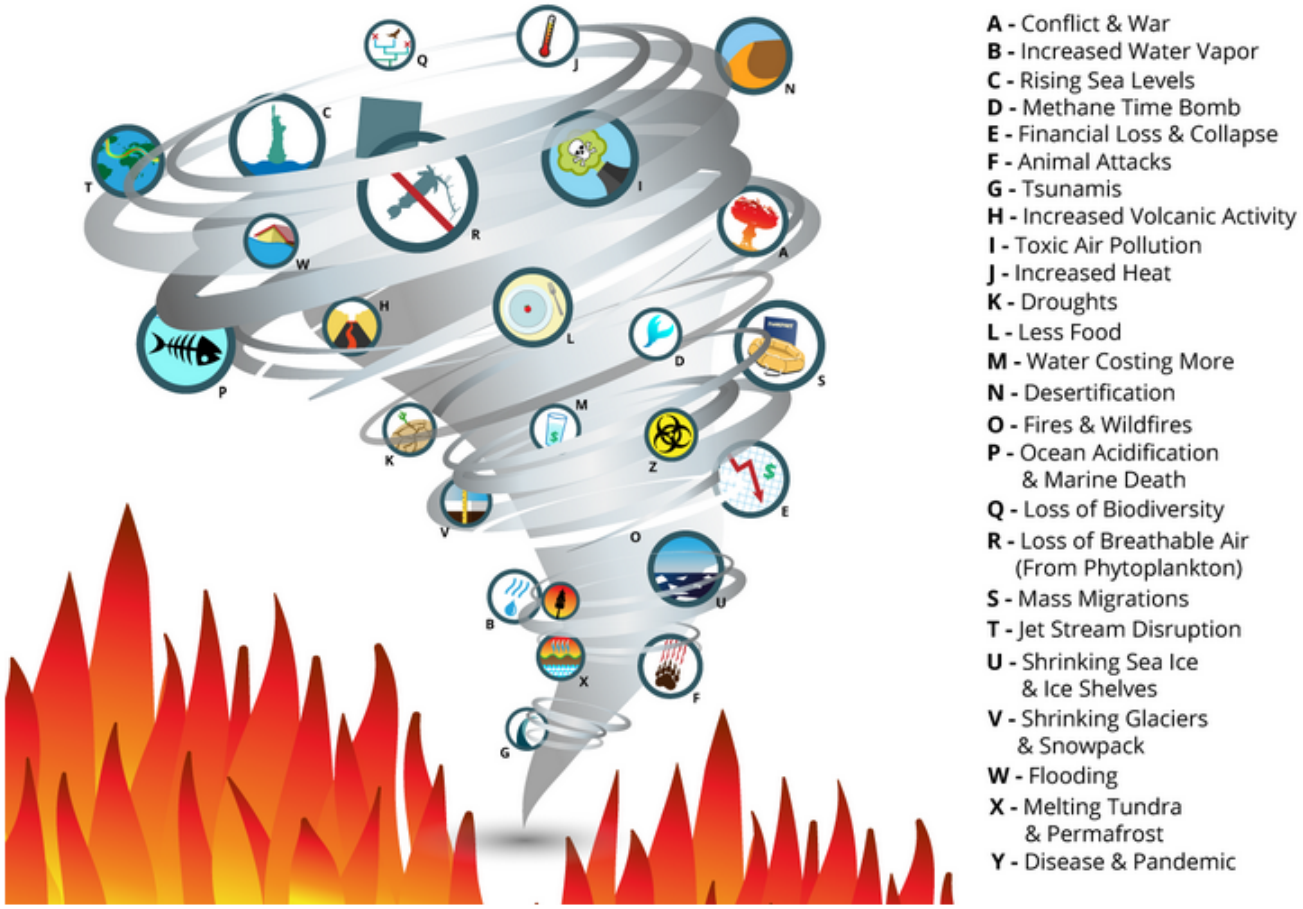
1800: Präindustriell, 280 ppm



The global CO_2 concentration increased by about 46% between 1750 (~277 ppm) and 2017 (405 ppm). 2016 was the first year to exceed the 400 ppm mark.

Quelle: https://www.co2.earth/daily-co2

Global warming consequences



Quelle: http://www.joboneforhumanity.org/the_financial_costs_and_consequences_of_the_escalating_global_warming_emergency

Sea-level rise in the Nile delta

Sources: Otto Simonett, UNEP/GRID Geneva; Prof. G. Sestini, Florence; Remote Sensing Center, Cairo; DIERCKE Weltwirtschaftsatlas.

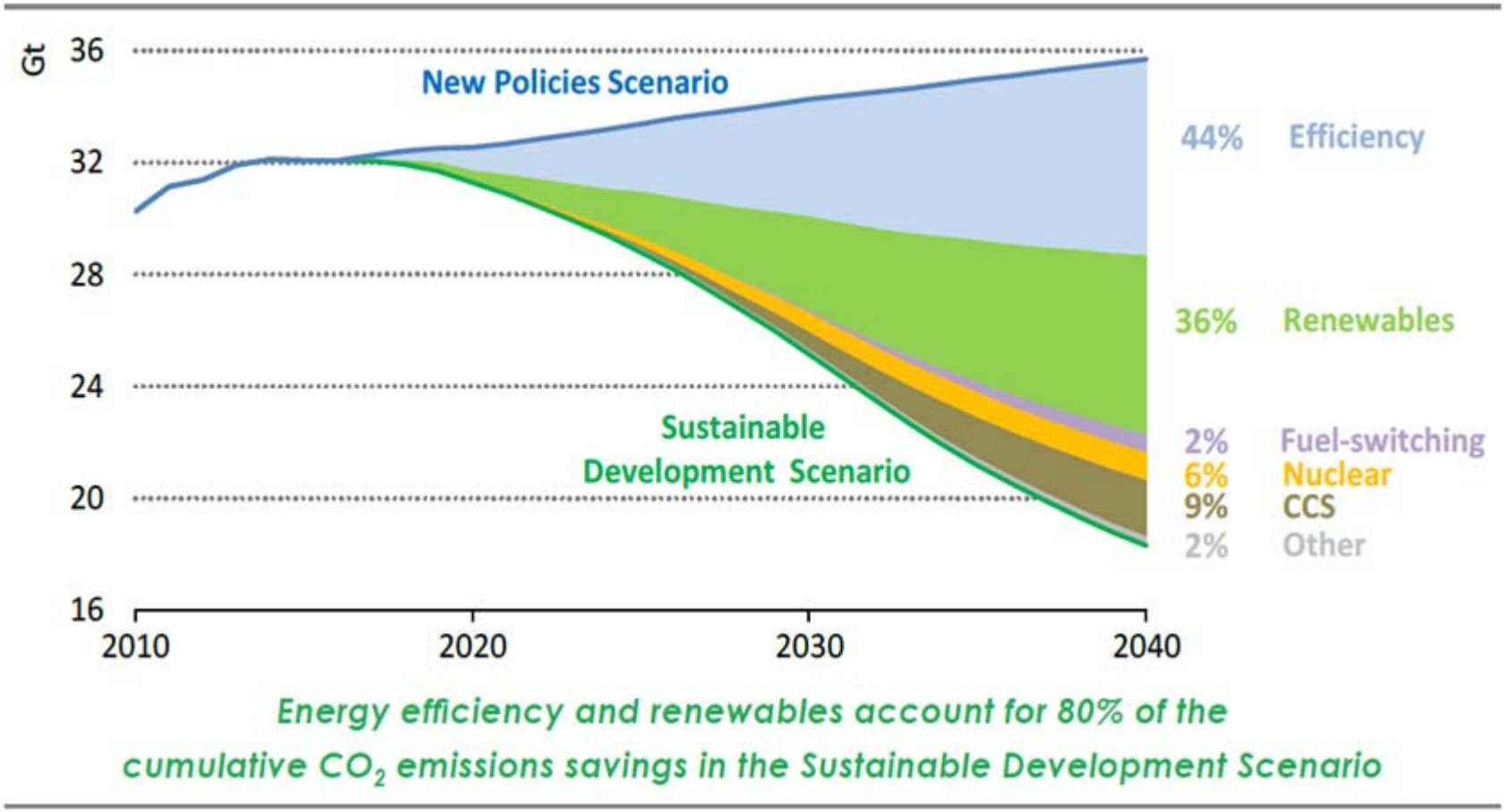
The IPCC reported that Alexandria's beaches would be submerged even with a 0.5-metre sea-level rise, while 8 million people would be displaced by flooding in Alexandria and the Nile Delta if no protective measures are taken. A 3C world threatens far greater damage than that.

Quelle: Kromp-Kolb 2018 / The Guardian, 3. November 2017

2. What can be done, and how fast?

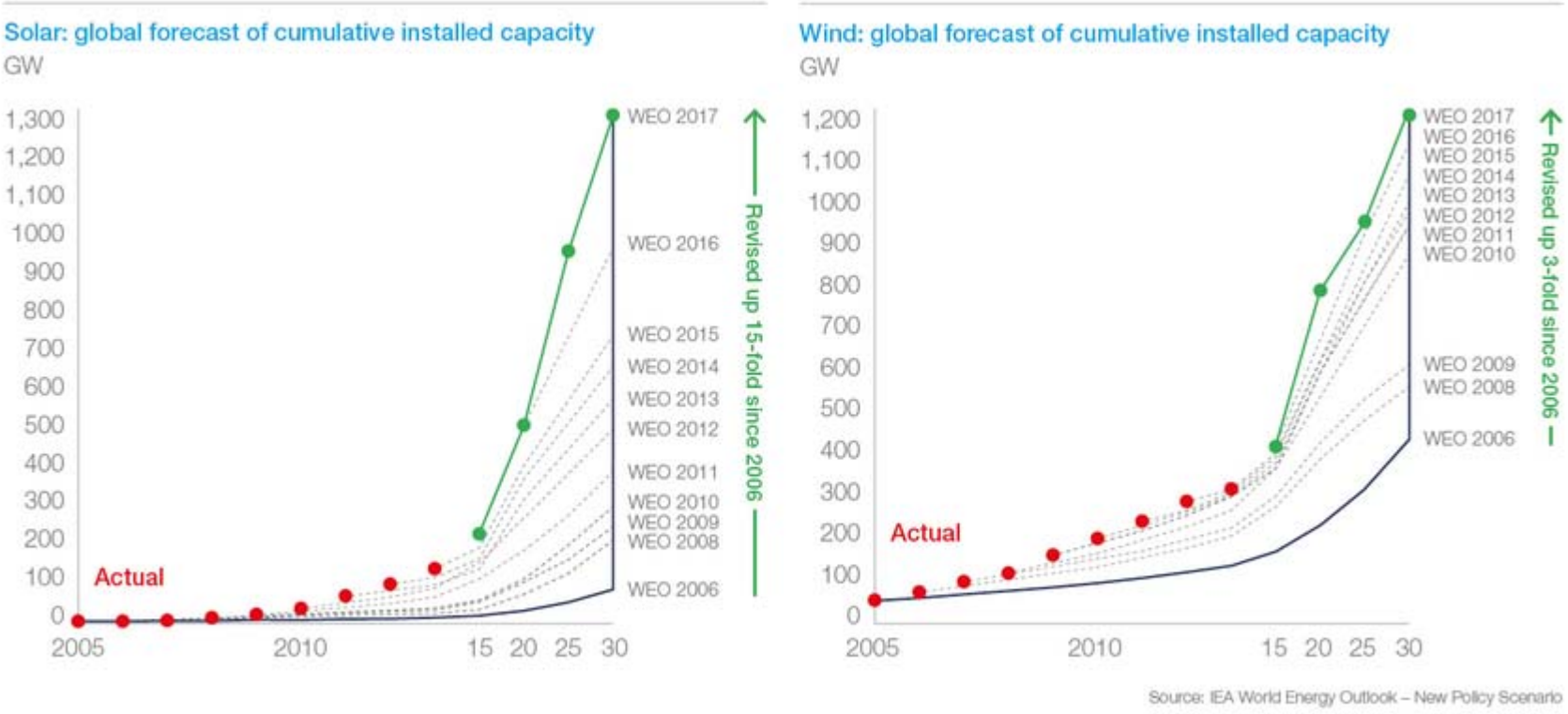
Quelle:

World Energy Outlook (WEO) 2017 as a compass



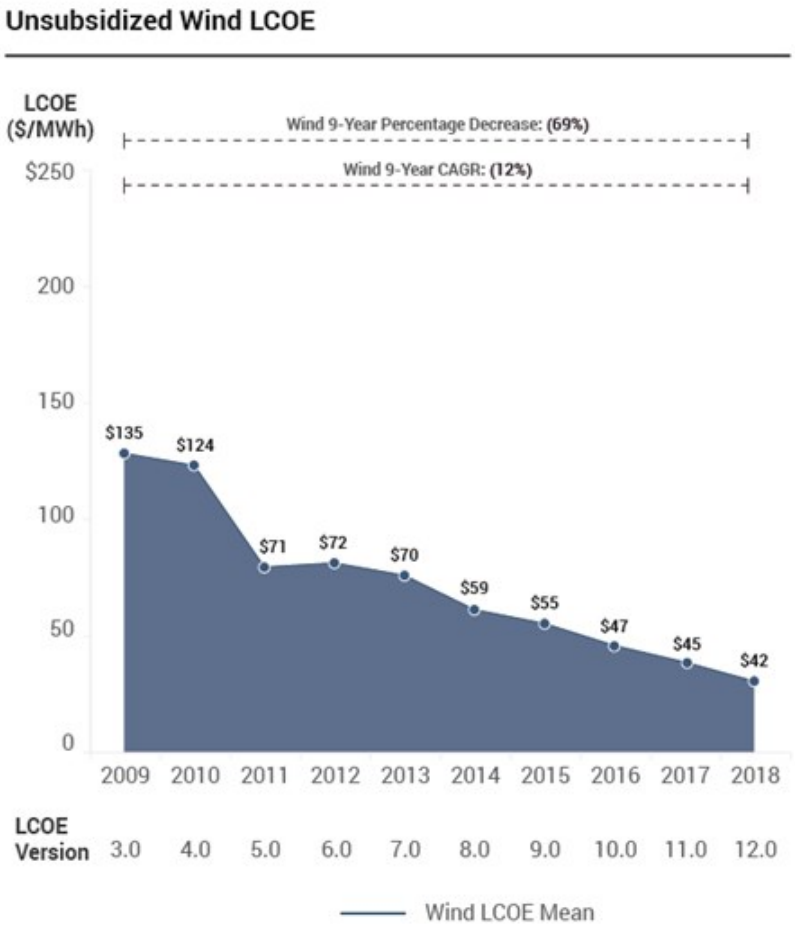
Quelle: IEA 2017

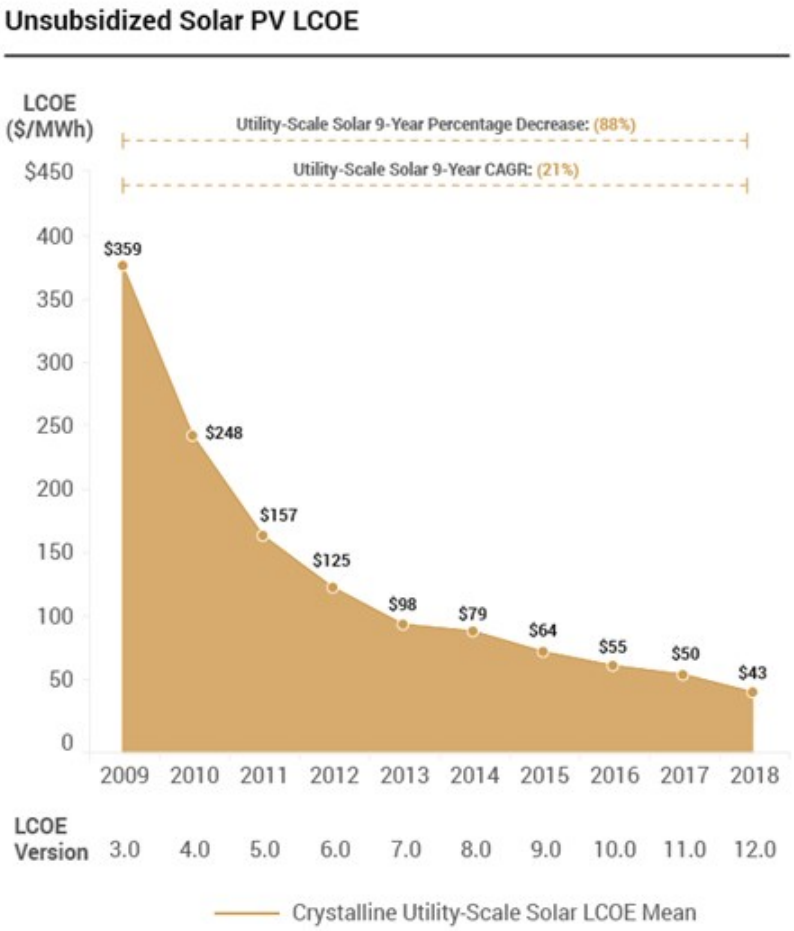
The „learning curve“ of the World Energy Outlook



Quelle: McKinsey 2018

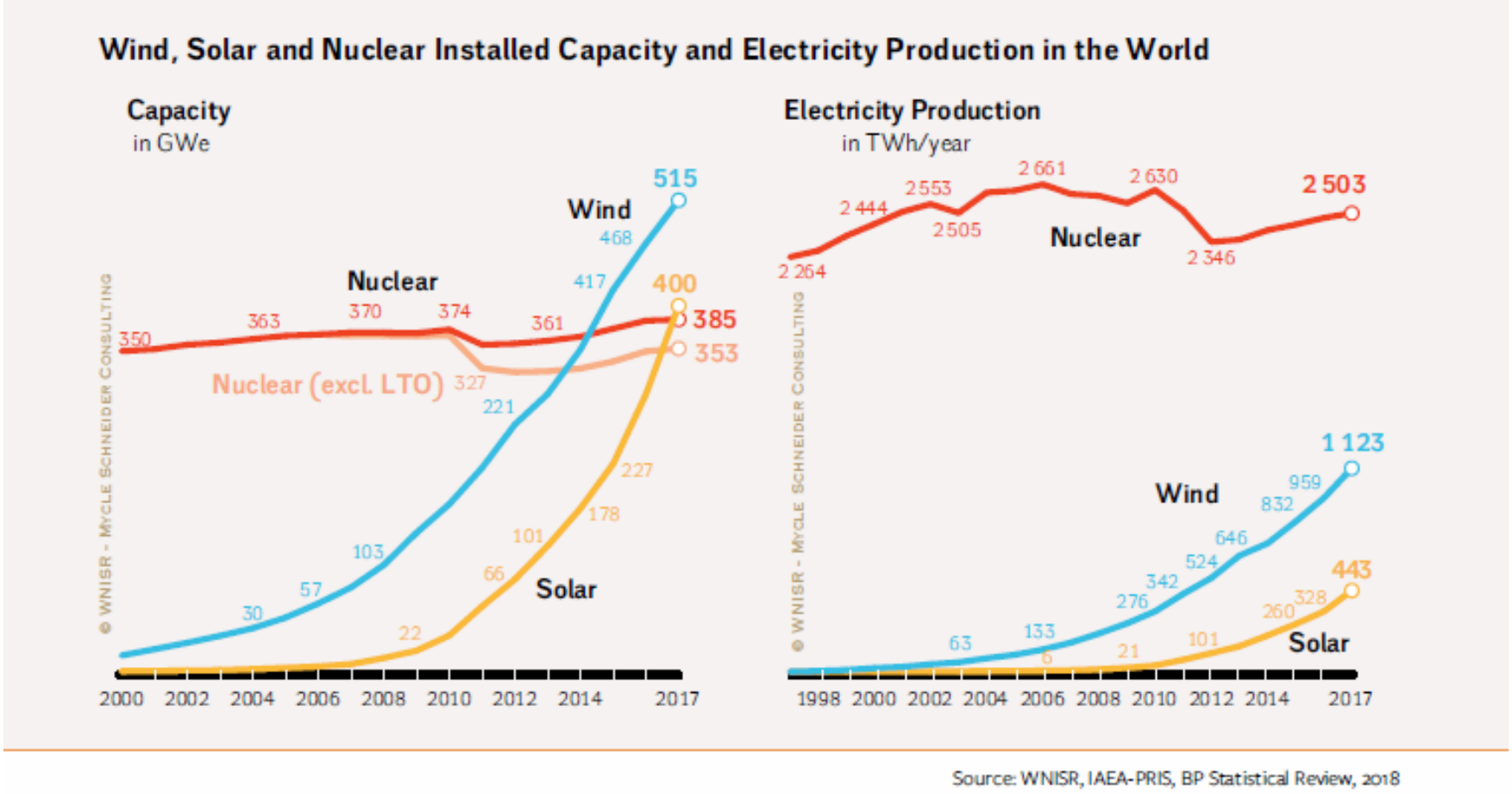
The unbelievable cost degression of wind and solar





Quelle: https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2018/

Comparison of electricity capacities and generation: nuclear, wind and solar energy



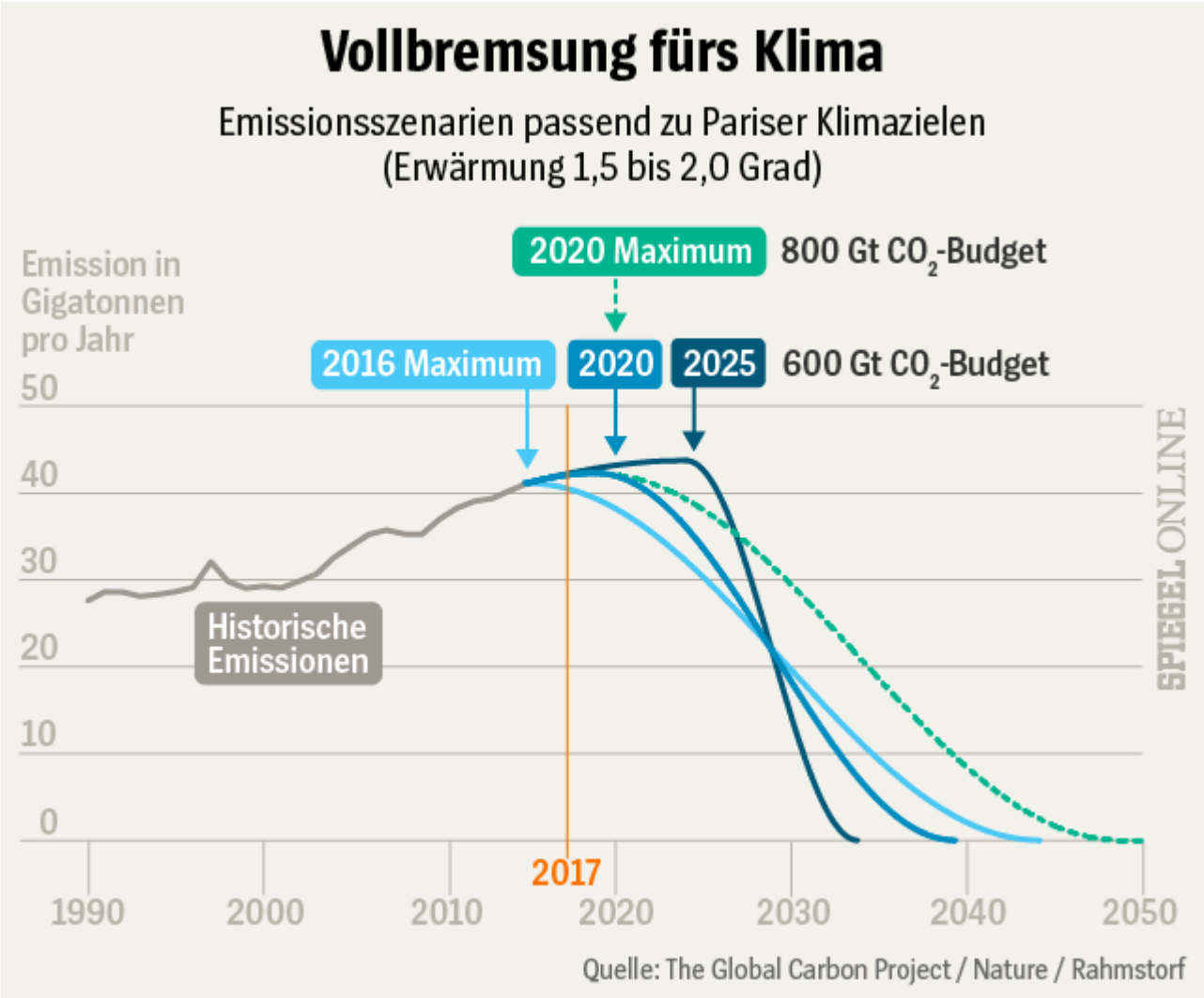
Quelle: World Nuclear Industry Status Report 2018

Renewable Energy Policies

		2017	2018
POLICIES[5]			
Countries with national/state/provincial renewable energy targets[6]	#	179	**169**
Countries with 100% renewable energy in primary or final energy targets	#	1	**1**
Countries with 100% renewable heating and cooling targets	#	1	**1**
Countries with 100% renewable transport targets	#	1	**1**
Countries with 100% renewable electricity targets	#	57	**65**
States/provinces/countries with heat obligations/mandates	#	19	**18**
States/provinces/countries with biofuel mandates[7]	#	70	**70**
States/provinces/countries with feed-in policies	#	112	**111**
States/provinces/countries with RPS/quota policies	#	33	**33**
Countries with tendering (held in 2018)	#	29	**48**
Countries with tendering (cumulative)[8]	#	84	**98**

Quelle: REN 21 2019

We have to be even faster!

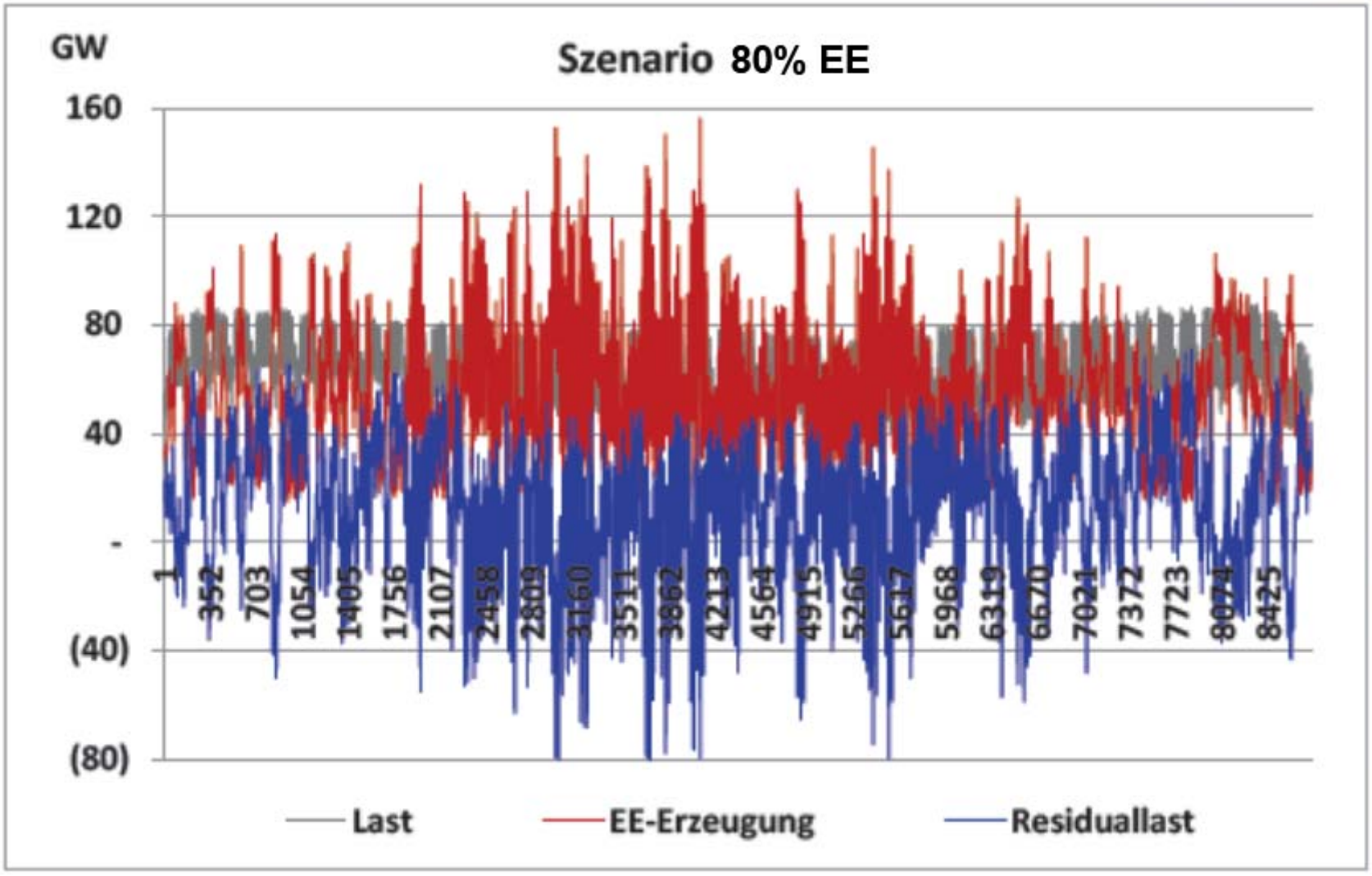


Quelle: http://www.spiegel.de/wissenschaft/natur/bild-1237234-1195806.html

3. Challenges and opportunities for energy companies

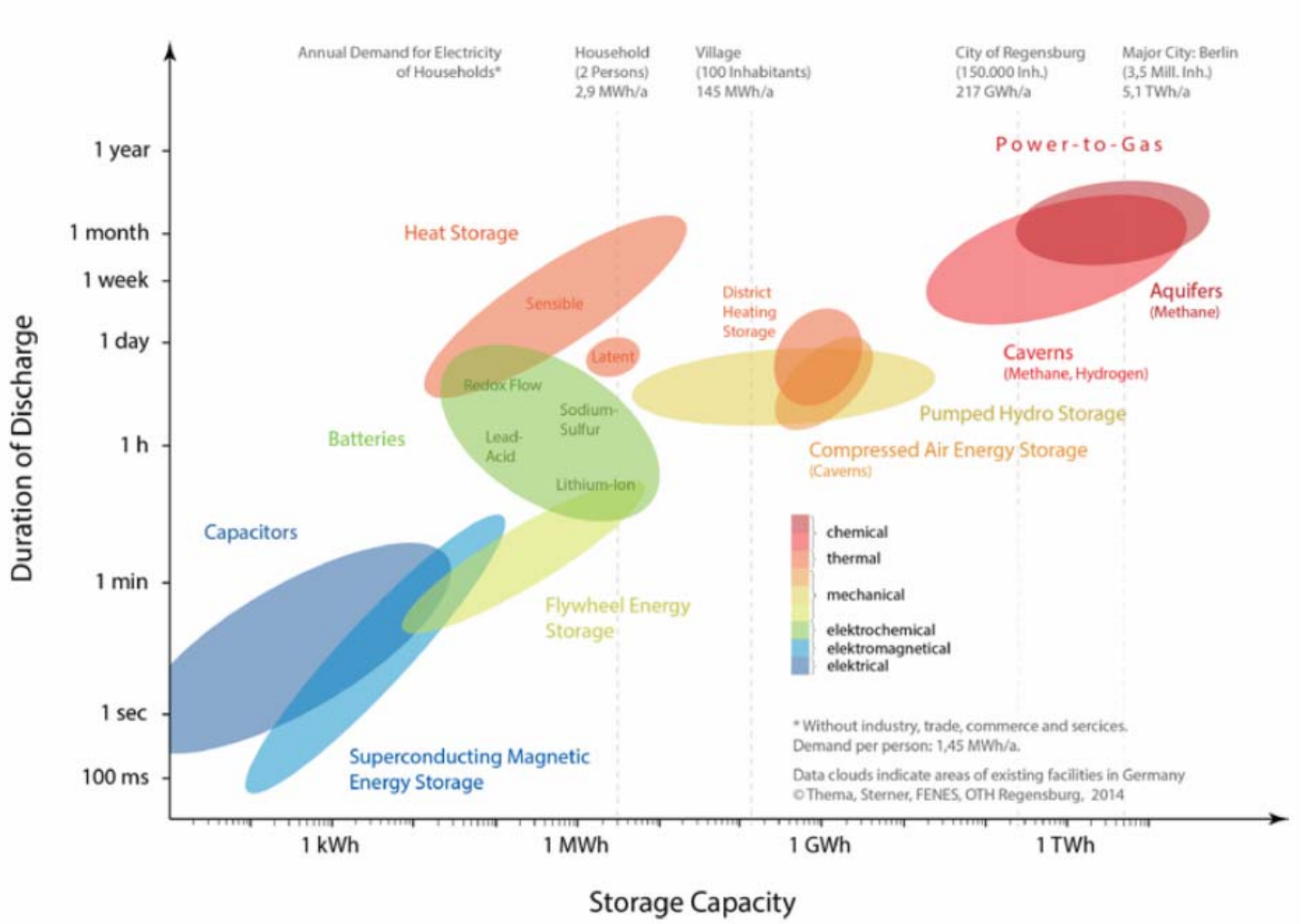
Quelle:

Residual load in a scenario with 80% renewables



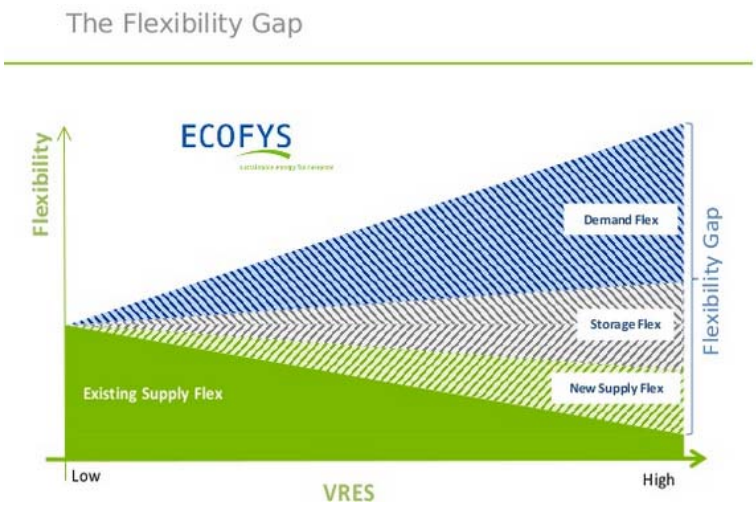
Quelle: Krzikalla 2013

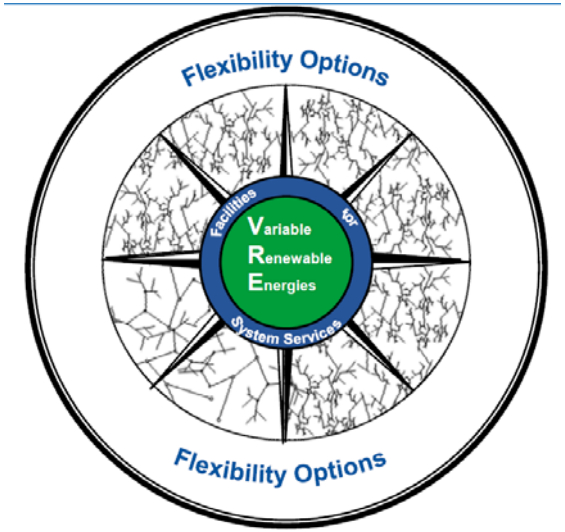
First approach: storages

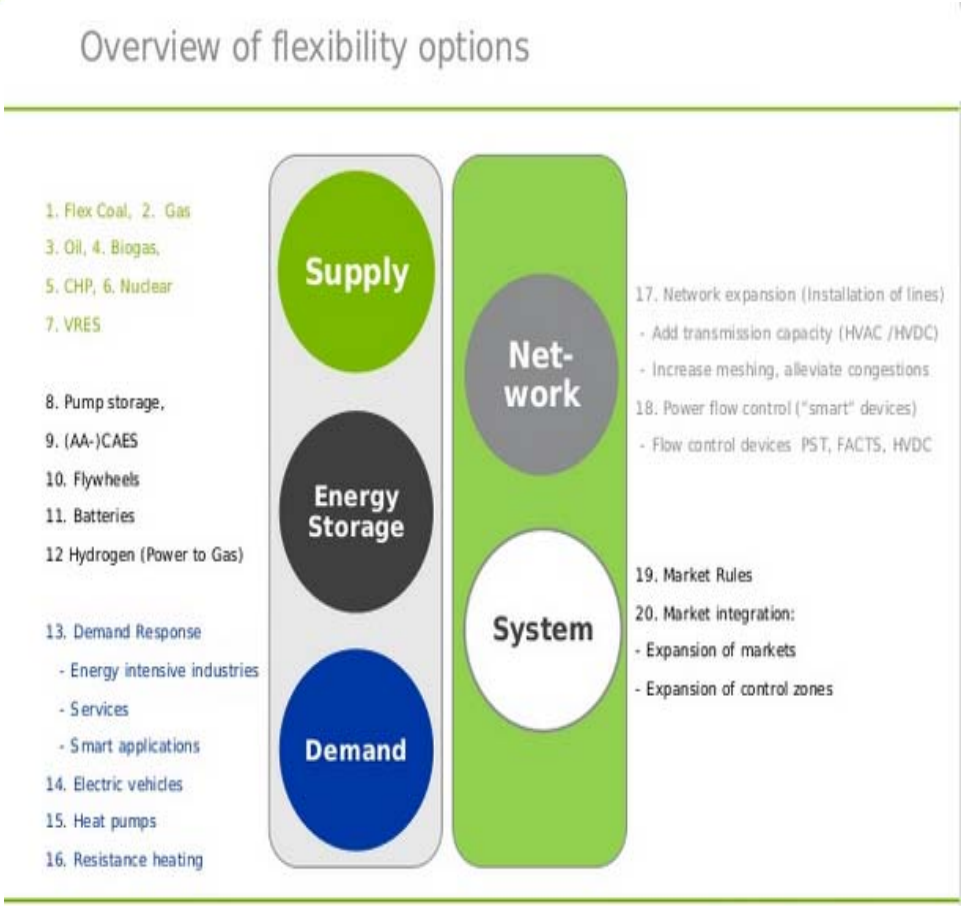


Quelle: Stadler/Sterner 2014

Broader approach: flexibility options

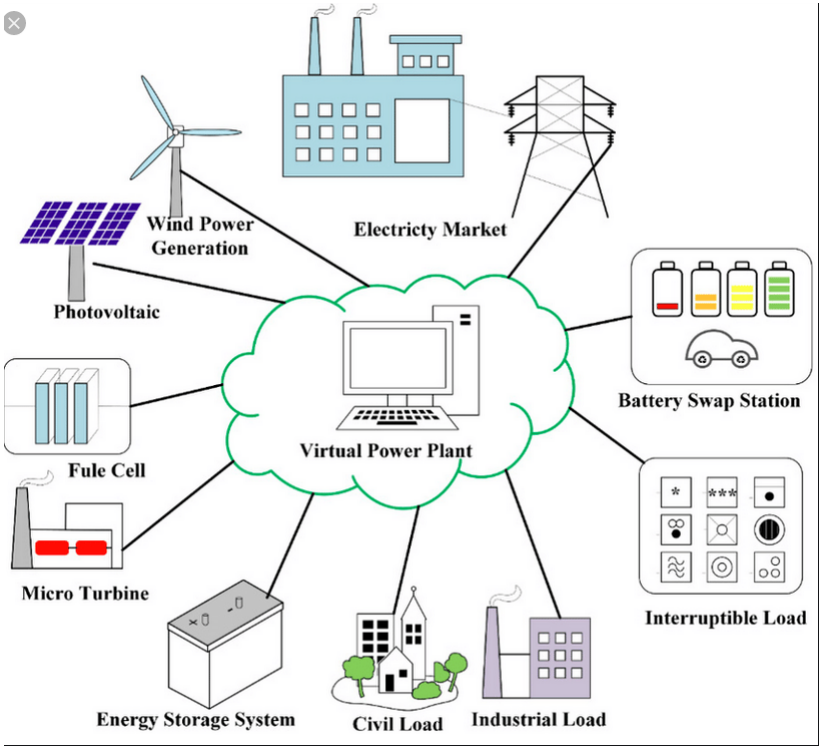






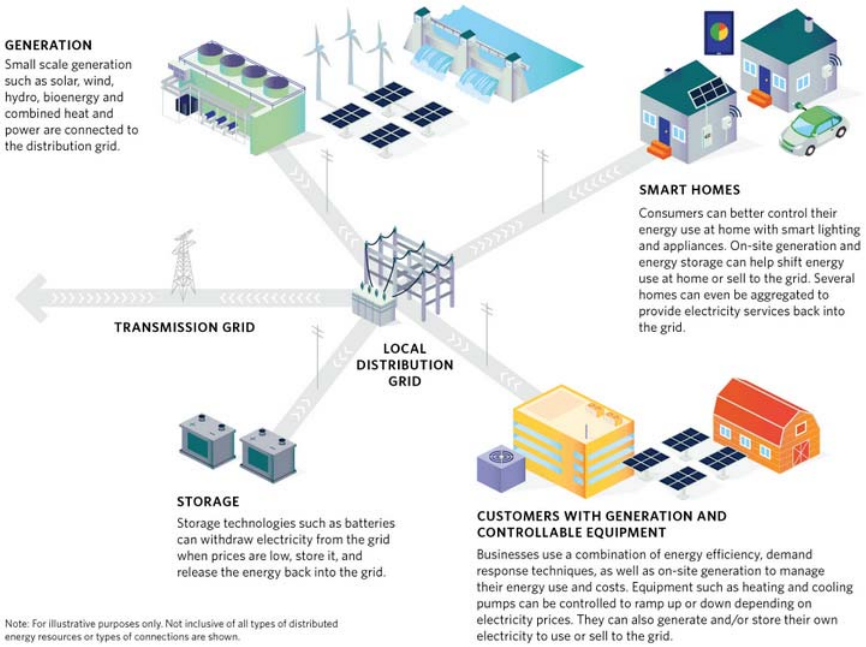
Quelle: Ecofys 2014

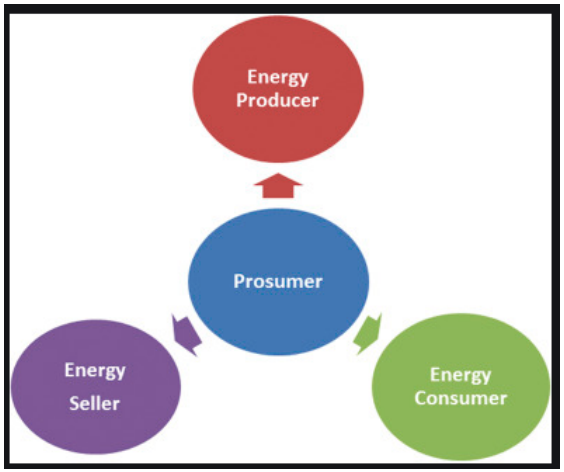
Aggregation and markets

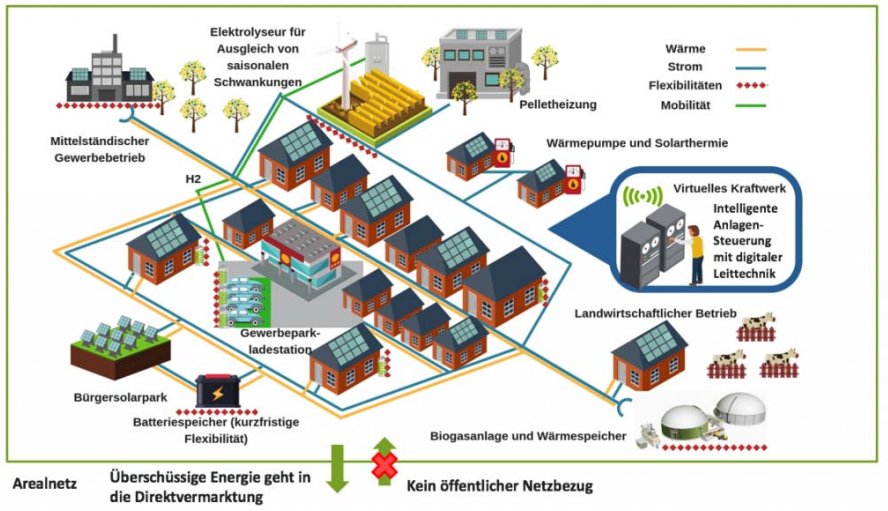


Quelle: Bai et. al. 2015

Energy systems with higher autonomy and prosumers







https://www.ecowert360.com/energetische-quartierskonzepte/

Quelle: http://www.ieso.ca/en/Powering-Tomorrow/Technology/Momentum-Grows-For-a-More-Networked-Decentralized-Energy-System-in-Ontario-and-Globally

Prospects

- The climate crisis is the most important driver for the transformation of energy systems
- Beside energy efficiency, renewable energies - especially wind and solar - are the most important building blocks for meeting the climate protection targets
- Wind and solar as variable renewable energies fundamentally change energy systems
- Only flexible supplementary options have a chance to play a role in the future
- Great opportunities in future energy systems arise for aggregators, decentralized networkers, sector couplers and prosumers supporters
- In this workshop we will get to know two of these companies, their conceptual approaches and some business cases

Quelle:

Thank you very much for your attention!

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Leprich, Mondorf, October 24, 2019

Quelle: