

Global Energy System based on 100% Renewable Energy – Power Sector

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COP21 target: Stop climate warming at 1,5° C

But today's warming of +1,3° C is already unacceptable: aridity and wild fires, floods and storms, sea level rising



The better choice is:
Global Cooling

Crises of climate warming and peak oil can only be solved with two parallel strategies:

1. Stop greenhouse gas emissions (best by 2030)

(not only a reduction of emissions)

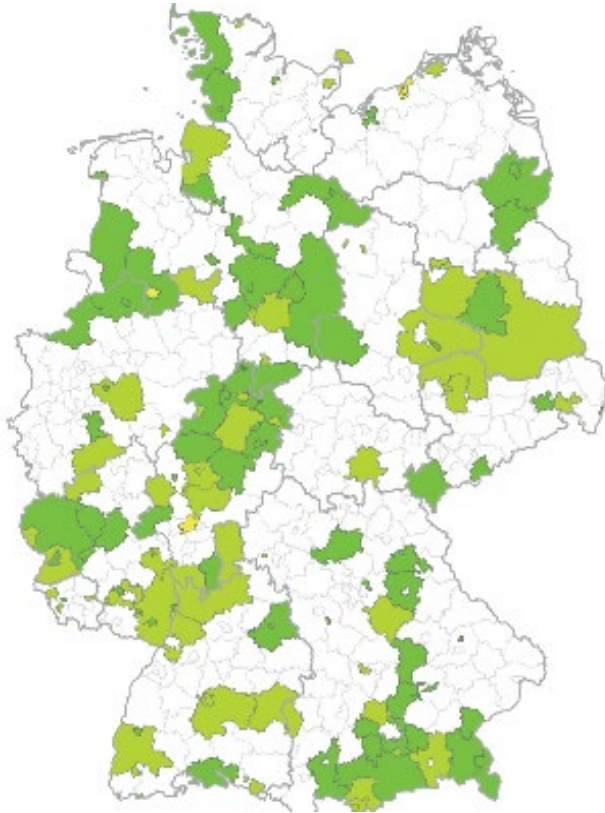
- Switch to 100% renewables
- Completely stop the use of fossil and nuclear energies in energy, chemistry, transport, agriculture

2. Take out carbon from the atmosphere

- Convert plants to humus soil (biocoal)
- Reforest big areas, green the deserts
- Organic agriculture

The target must be 330 ppm CO₂

This leads to global cooling, instead of global warming



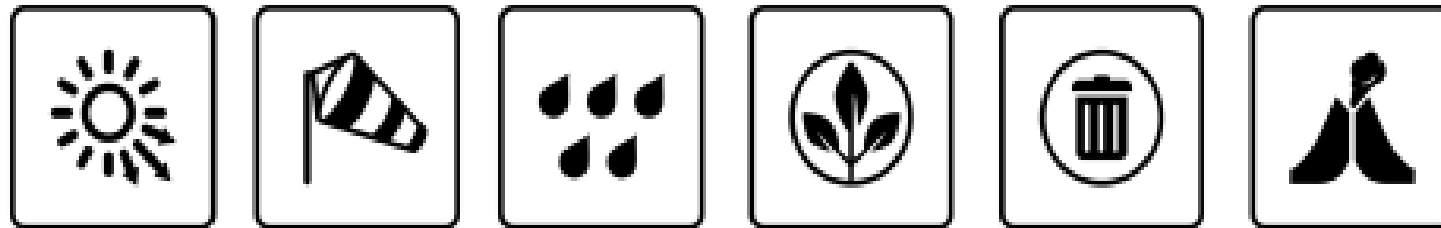
**Nov 2016, COP22, Marrakesh:
48 countries (Climate Vulnerable
Forum) decided for 100% RE target**

More Countries e.g.: Denmark; Sweden;
Costa Rica; Iceland; Cape Verde

Cities with 100% RE target e.g.:
Barcelona; Masdar City; Munich; Msheireb;
Downtown Doha; Vancouver; San
Francisco; Copenhagen; Sydney

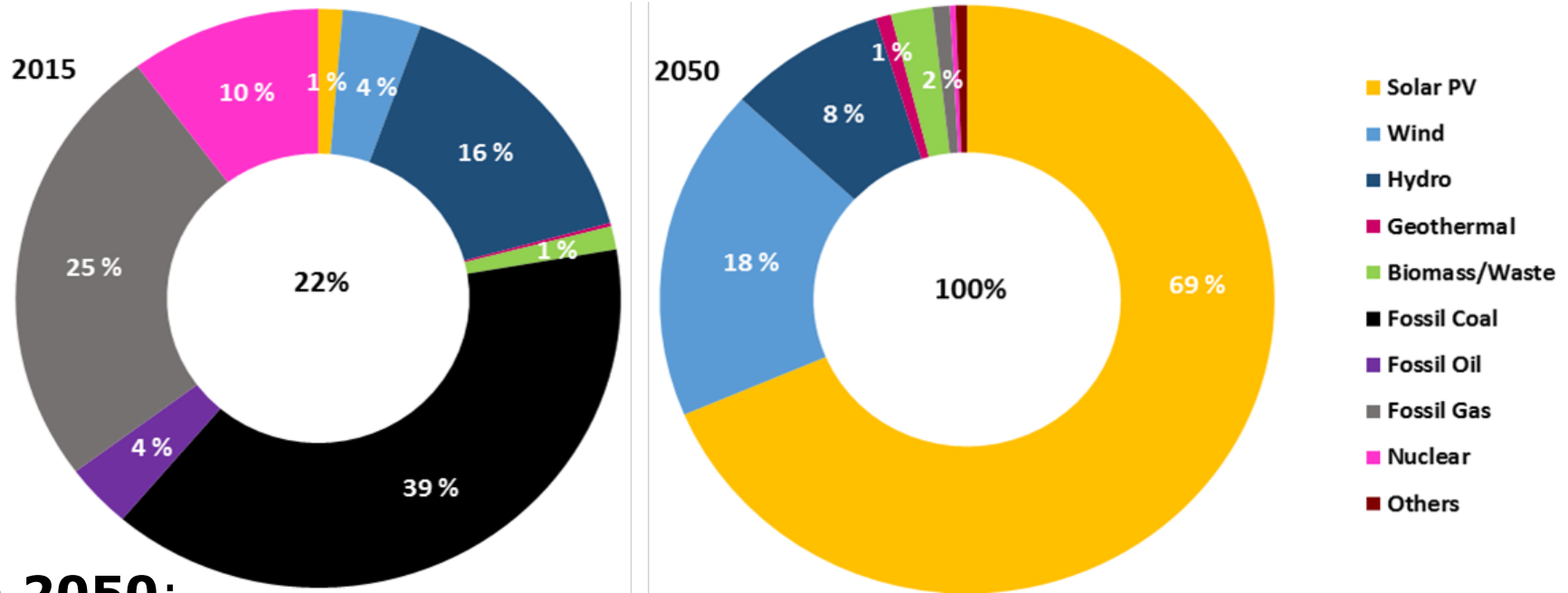
Companies with 100% RE target e.g.:
Google, Coca-Cola, Ikea, Walmart

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Study funded by the
German Federal Environmental Foundation (DBU) and
Stiftung Mercator GmbH

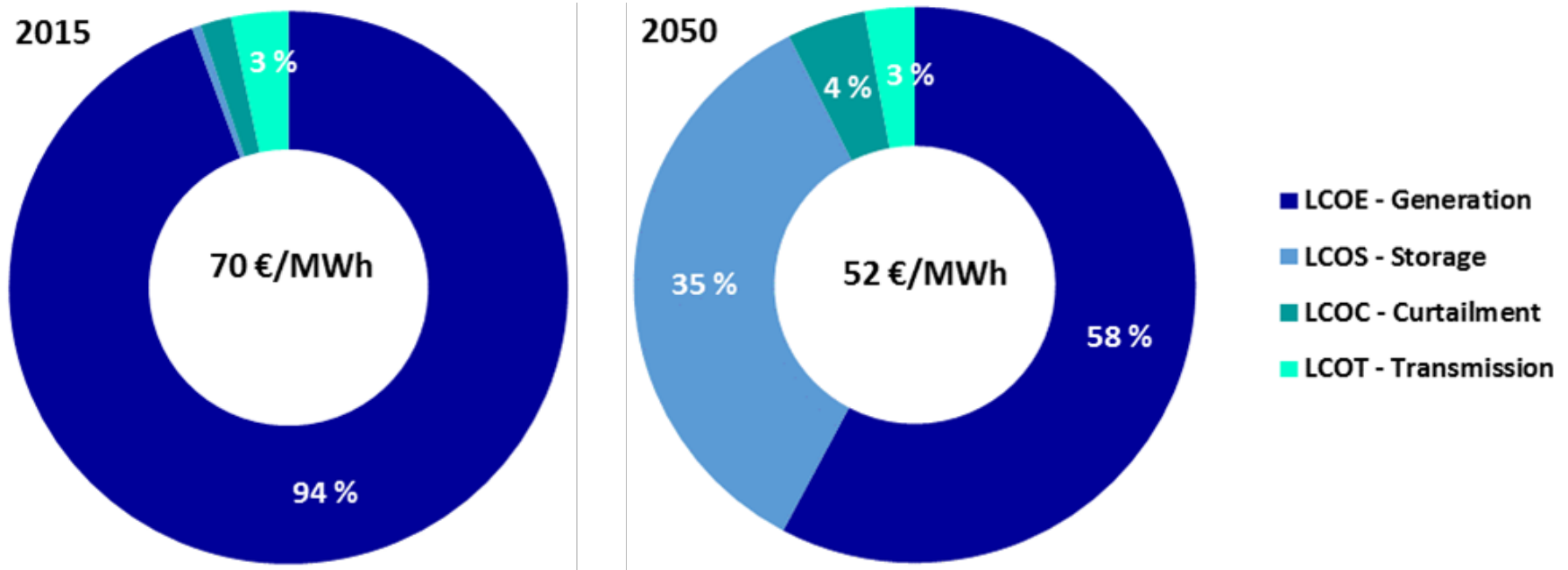
Electricity Generation 2015 and 2050



In **2050**:

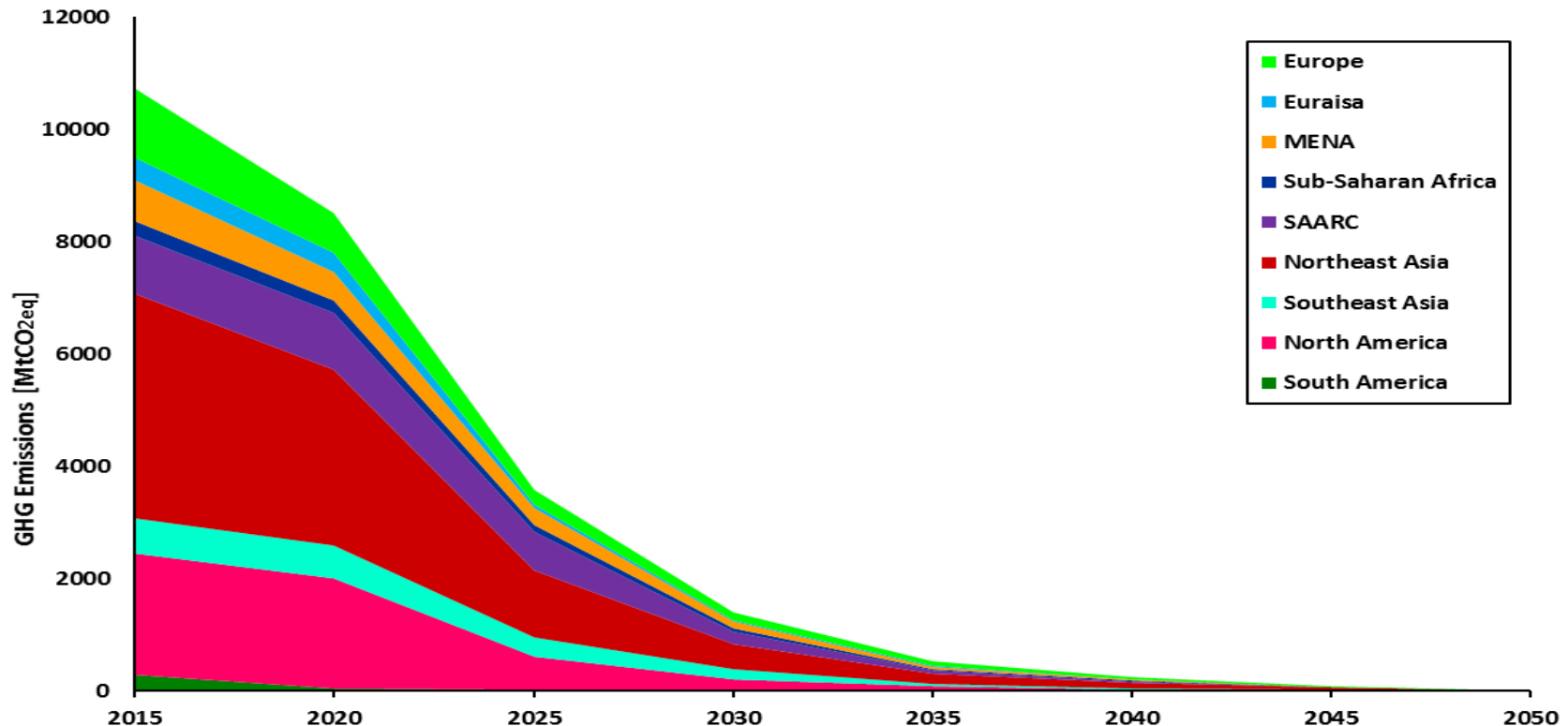
- **Solar PV 69%, wind 18%, hydropower 8%, bioenergy 2%** of total electricity mix globally
- Gas generation is only from renewable energy-based gas
- Nuclear power still accounts for negligible 0.3% of the total electricity generation, due to the end of its assumed technical life, but could be phased out earlier

Renewable electricity is cost-efficient



- Total levelized cost of electricity (LCOE) on a global average for 100% renewable electricity is **€52/MWh in 2050** (incl. curtailment, storage and some grid costs), compared to **€70/MWh in 2015**.

100% RE will reduce GHG to zero



Global greenhouse gas emissions significantly reduce in power sector from about 11 GtCO_{2eq} in 2015 to zero emissions by 2050 or earlier, as the total LCOE of the power system declines.

Policies necessary for renewable growth & climate protection

Laws to stimulate investment

- **Feed-in-tariffs (FiT)** (GET FiT for developing countries)
- Tendering above 40 MW, auctioning
- Others: premium options, net metering and many more

Cancelling subsidies for fossil & nuclear energy, fossil chemistry and intensive agriculture

Tax relief for renewables

Carbon tax

Research and education for renewables and organic farming

Reducing obstacles for approval

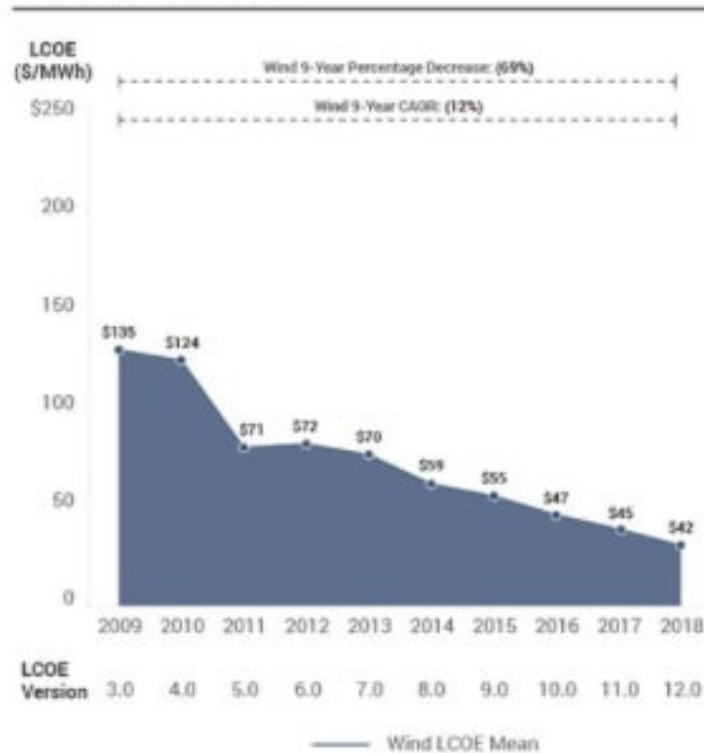
Dispose big areas for reforestation and greening

Not successful:

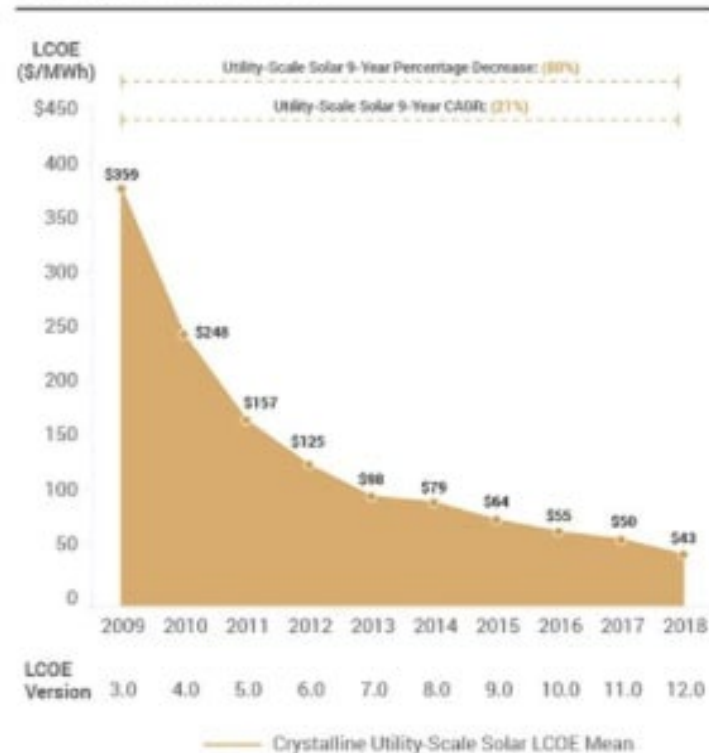
- Tendering under 40 MW or certificate systems
- Emission trading

Decline in cost of wind & solar energy from an historical perspective.

Unsubsidized Wind LCOE

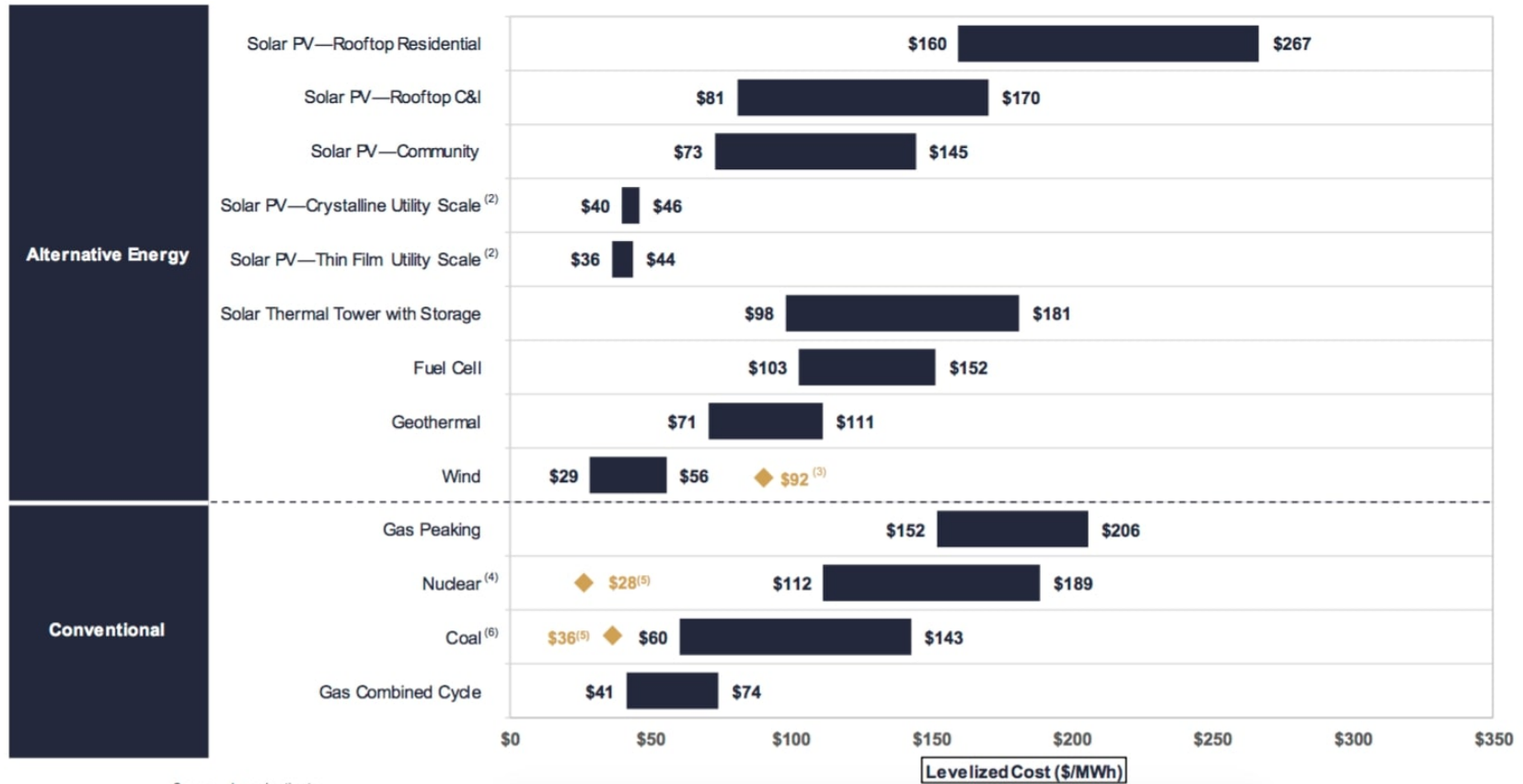


Unsubsidized Solar PV LCOE

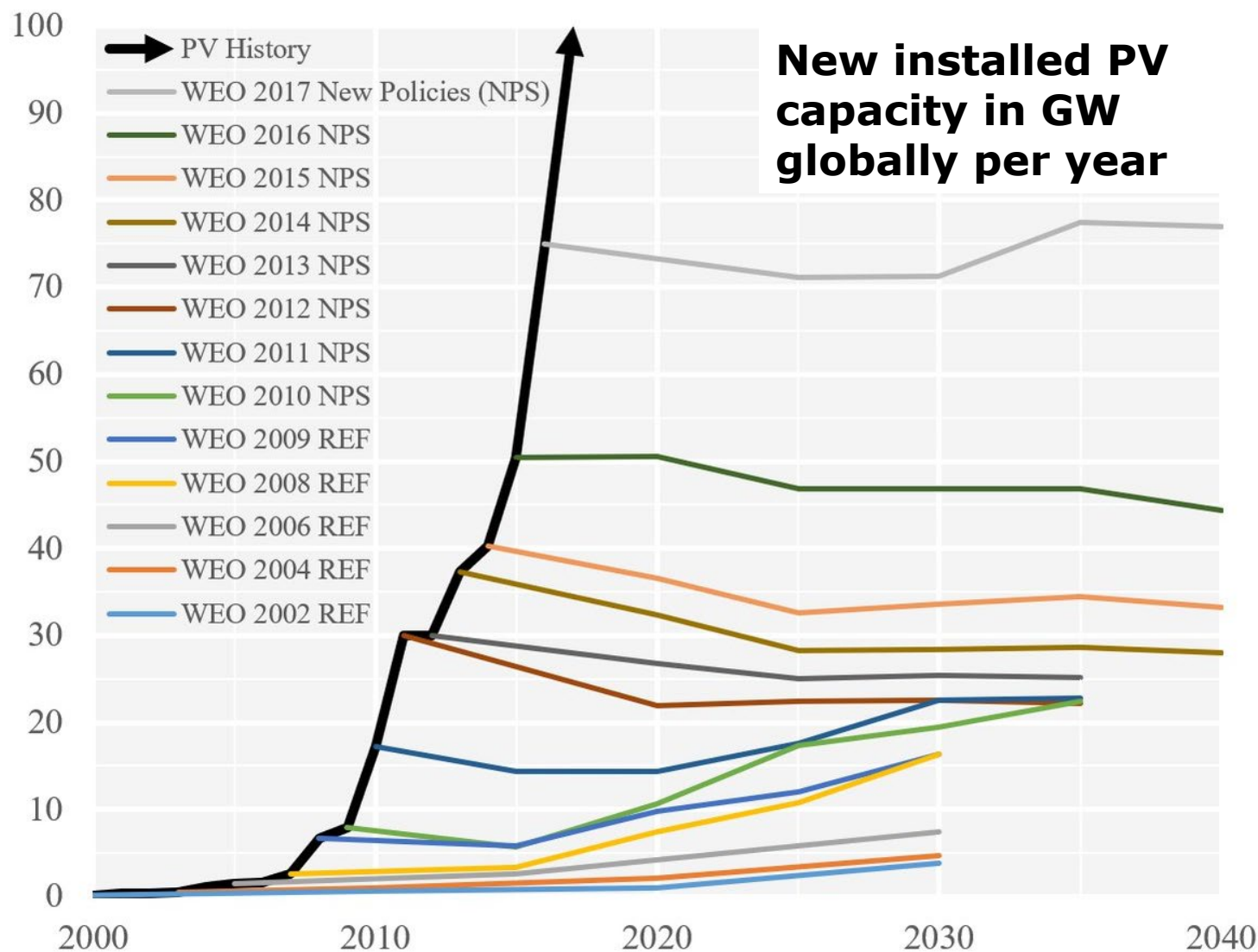


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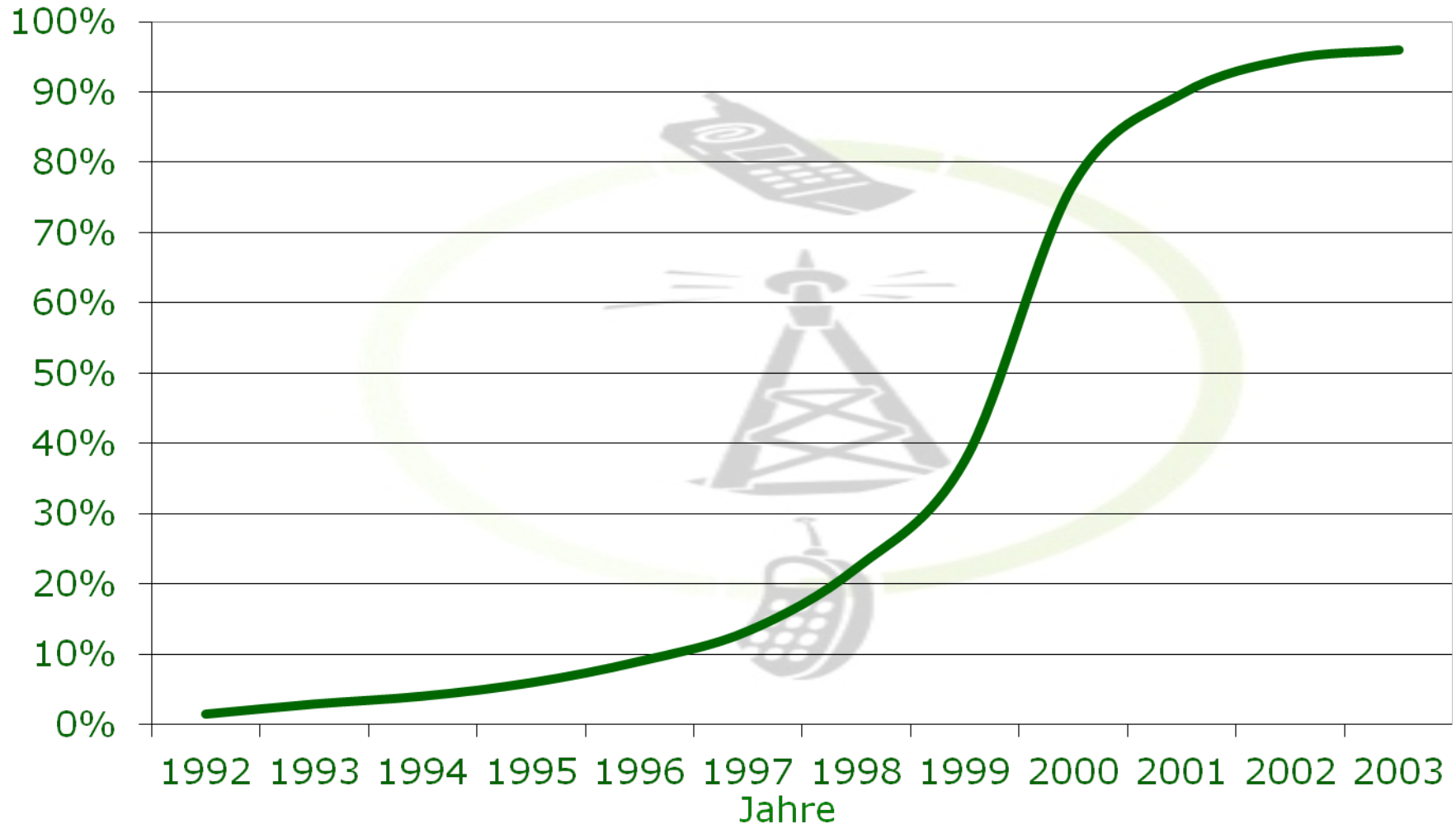
Wind and Solar now the cheapest Energy source: Lazard Nov. 2018



PV reality vs. IEA WEO projections



Mobile telephony in Germany – in only 12 years to full supply



***Thank you very
much for your
attention!***

www.hans-josef-fell.de

www.energywatchgroup.org