Instruments for renewable energy development

Kiev 10th October 2017

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

Political challenges

- Global warming
- Peak oil, energy security
- Nuclear and environmental disasters
- Oil wars, poverty, economic crises

All these challenges are connected with fossil and nuclear energies

→ **Renewables will solve these problems**

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Renewables conquer Germany's energy

In the background:
Nuclear power plant Grafenrheinfeld decommissioned in June 2015

In the foreground:
Wind power named "Hans-Josef Fell", PV and biogas plants, farmland

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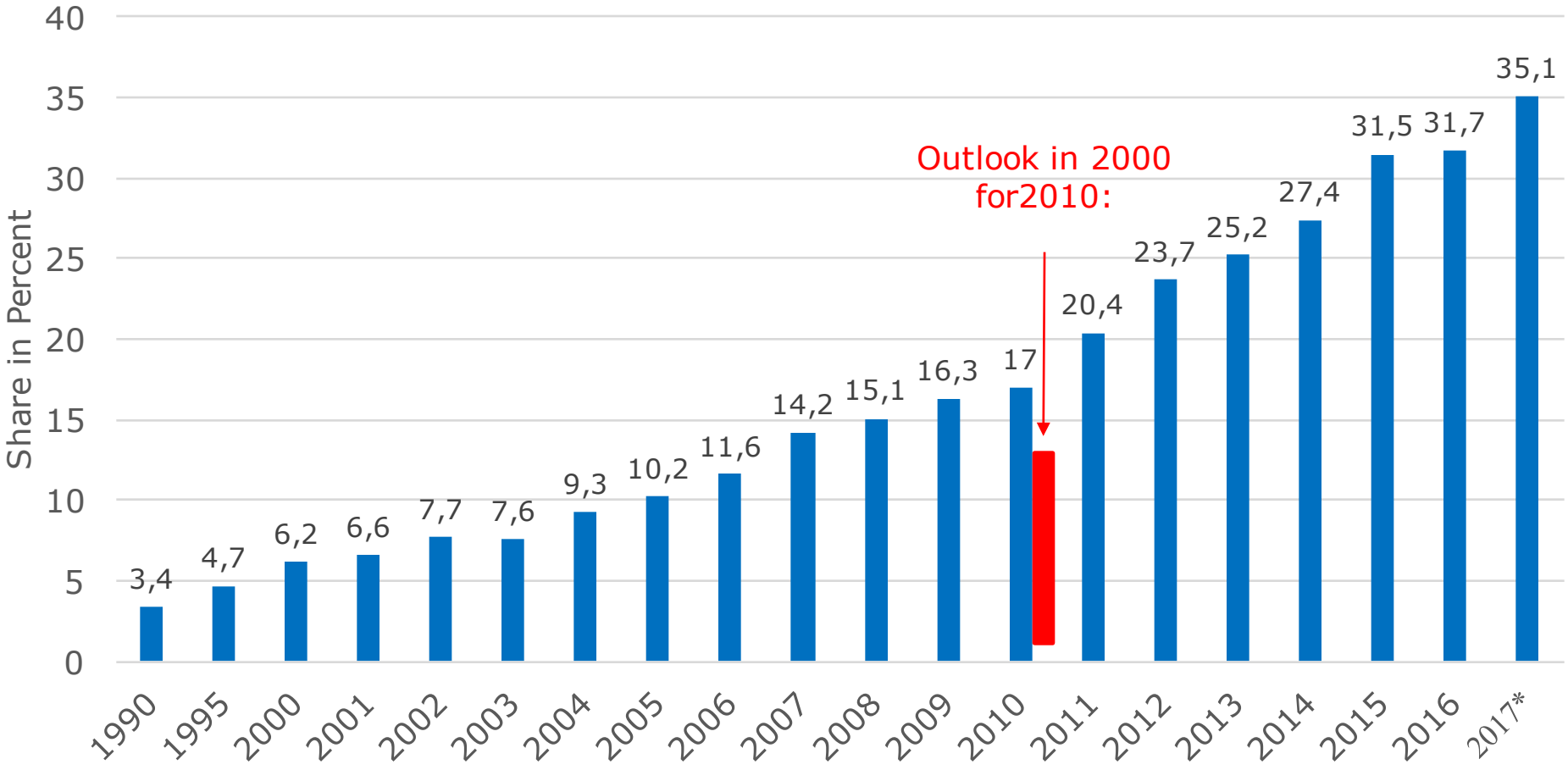
Political support stimulates renewable growth

Share of renewable electricity in Germany



Source: BMWi, AGEE-Stat, BEE

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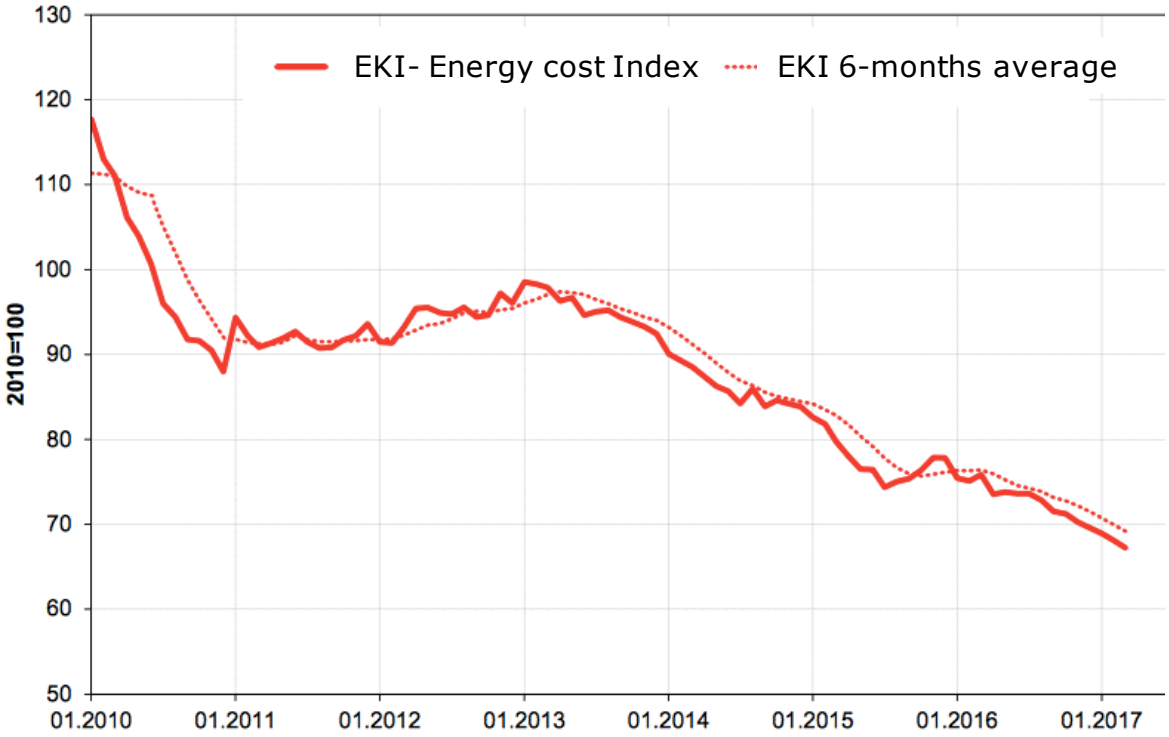
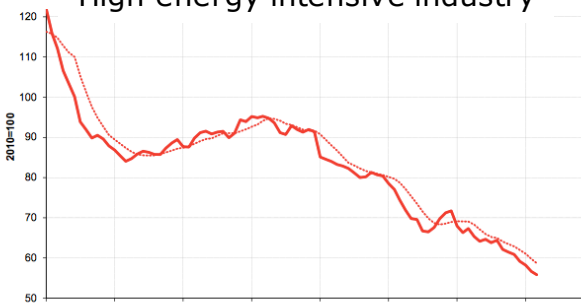
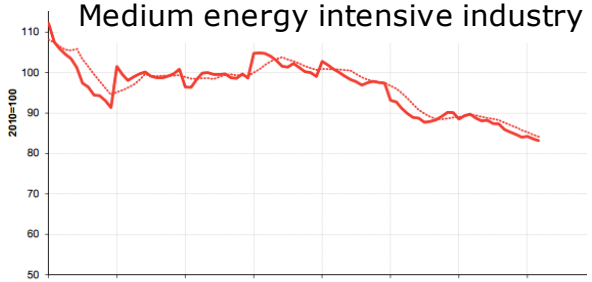
While renewables expanded, the energy costs of the German industry have been declining since 2010



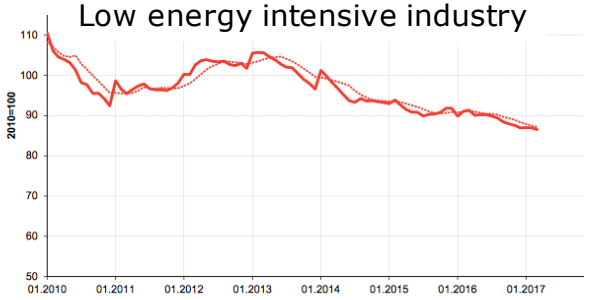
High energy intensive industry



Medium energy intensive industry



Low energy intensive industry



Source: Öko-Institut e.V.

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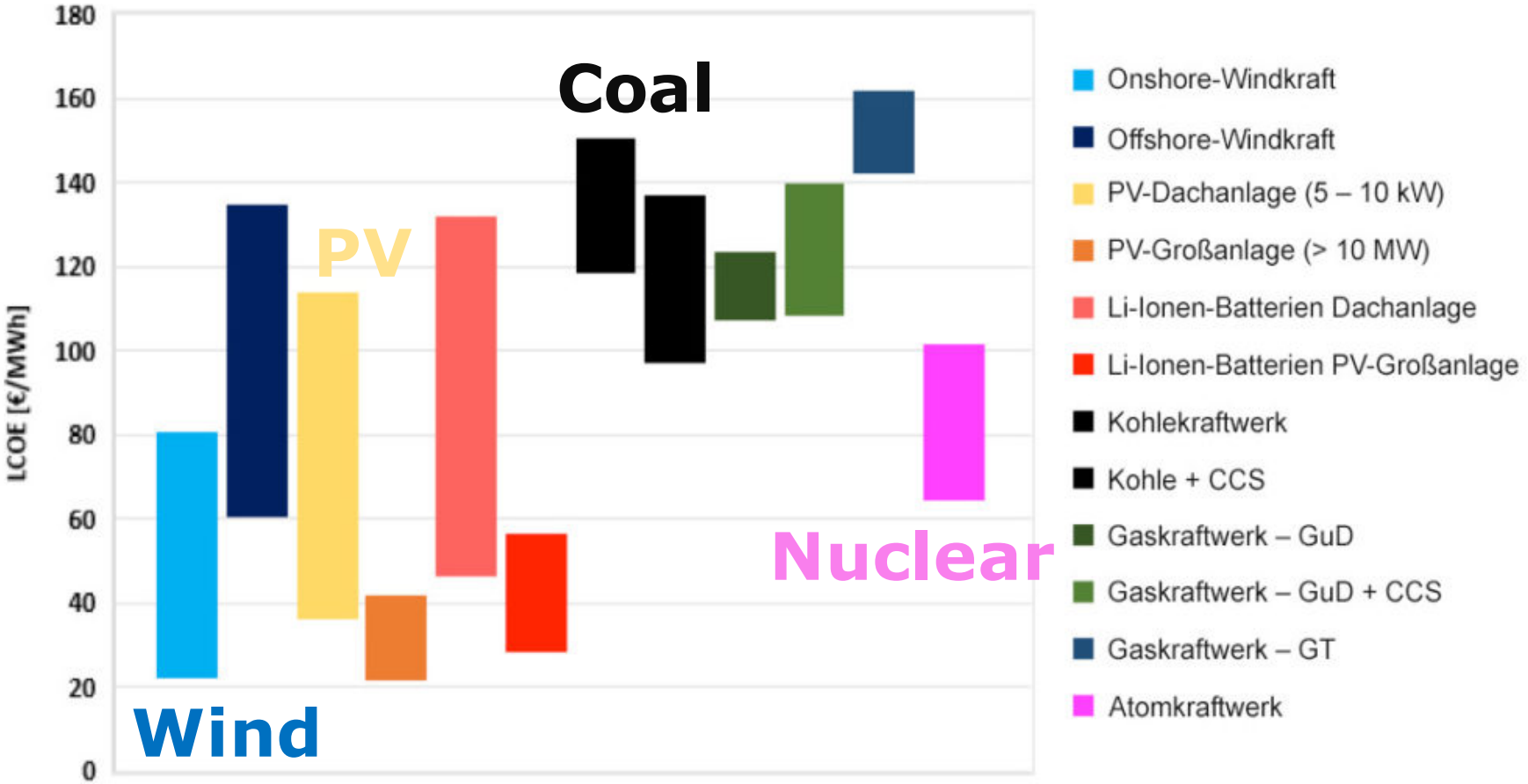
PV and wind power = cheapest energy in G20 States



Source: https://www.pv-magazine.de/2017/07/05/studie-photovoltaik-und-windkraft-spaetestens-2030-in-allen-g20-staaten-guenstigste-stromquelle/

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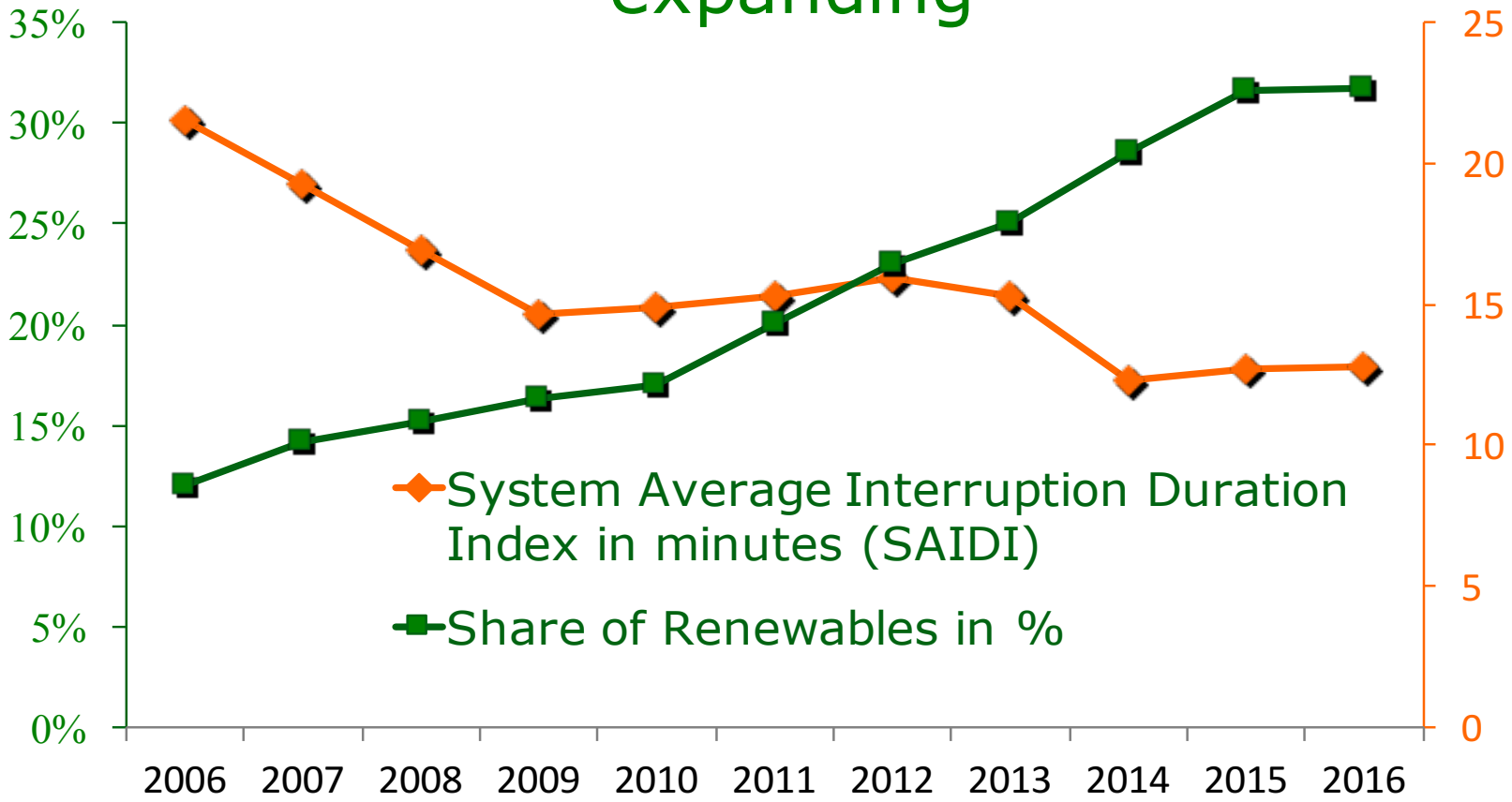
Reality in Germany: Increasing grid stability while renewables are expanding



Source: Bundesnetzagentur (2015); http://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/Versorgungssicherheit/Stromnetze/Versorgungsqualität/Versorgungsqualität-node.html ; BMU, BEE, bdew

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Key points for an effective Renewable Energy Act (Feed-in Law; EEG)

- Privileged grid access/priority dispatch
- Feed-in tariff has to be appropriate for economic operation, with variations depending on technology and size
- Funding of feed-in tariff via electricity rate
- No cap for feed-in of renewable energies
- Guaranteed period of remuneration
- Tenders below 40 MW do not make for a successful policy as they strongly restrict the plurality of actors*
- Also: No obstructions by a restrictive permission policy

* http://energywatchgroup.org/wp-content/uploads/2017/09/FIT-Tender_Fell_PolicyPaper_EN_final.pdf

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GET FiT

- GET FiT is the abbreviation of Global Energy Transfer Feed-in Tariffs for developing countries
- It is a concept for facilitating private sector investments in renewable energies in developing countries
  - Grants are used to supplement the existing FiT mechanism for the first five years
- First project in Uganda (launch in 2013):
- Ukraine could ask for GET FiT financed by EU

Source: Deutsche Bank, GET FiT

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Balance of solar and wind power fluctuations

- Flexibility in power generation
  - Hydro, biogas, geothermal power must produce dispatchable power for system security
- Flexibility of power demand
  - Consumers must balance their demand for power
- Storage investment
  - Hydro pump storage, batteries, hydrogen and synthetic methane from renewable power
- Grid investment: Low and high voltage
  - Expansion on distribution and transmission level

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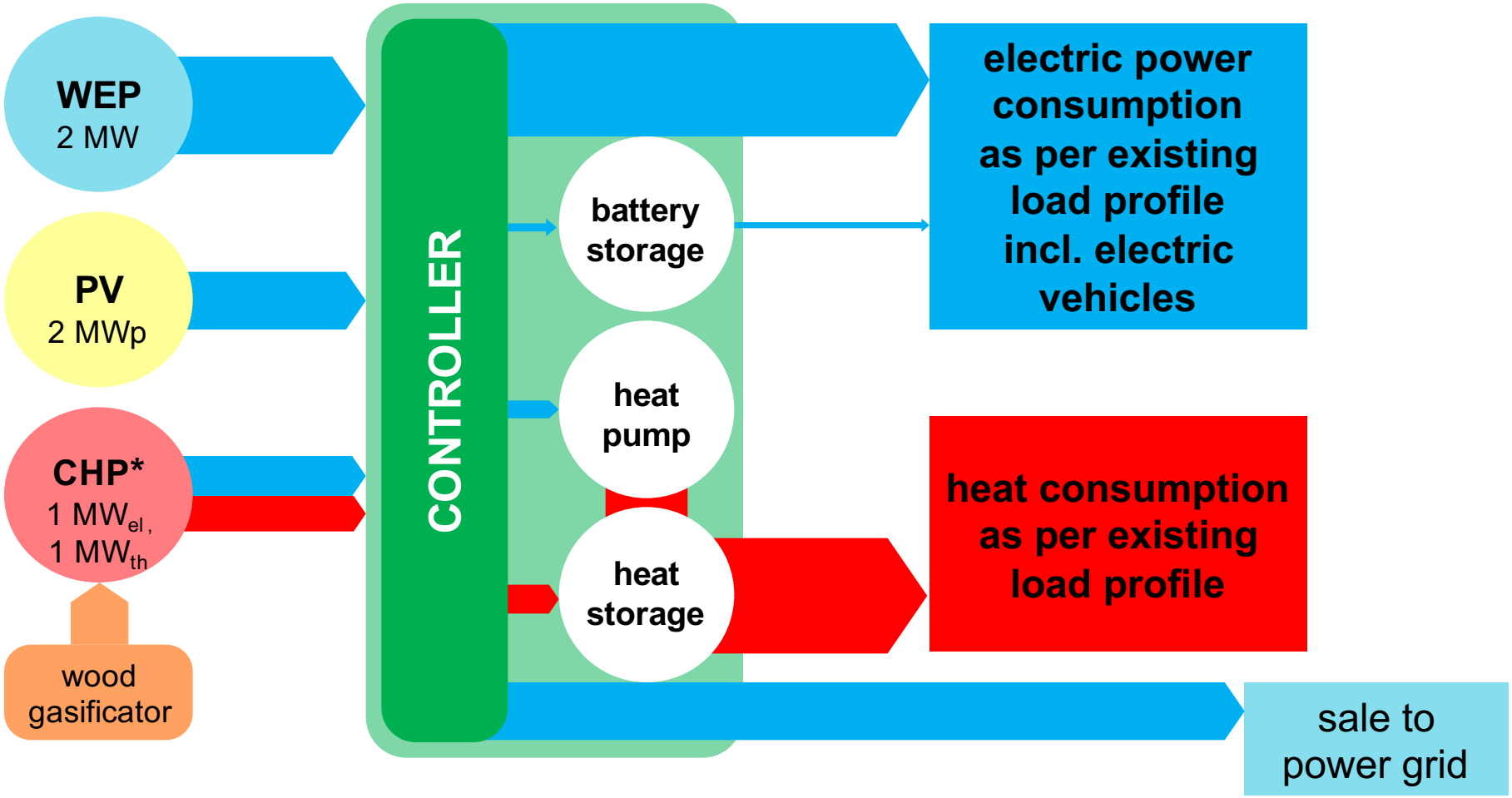
Energy flow in a combined power plant



*CHP supplies maximum load plus required redundancy, degree of self sufficiency 100%, proportion of own consumption approx. 75%

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Feed-in tariff for combined renewable power producer

- Tariff is paid for per law if:
  - Power generation meets demand each hour of the year
  - Mix of 100% renewable power generation
  - Frequency and voltage stability, reactive power is guaranteed

- Effects:
  - Grid stability is growing, decentralised bottom-up approach
  - Integration of heating/cooling and electro-mobility
  - Development of storage technology
  - Emergence of smart cities

For more information see https://www.hans-josef-fell.de/content/index.php/dokumente/documents-in-foreign-languages/english/921-09-2016-english-incentive-scheme-for-100-renewable-combined-power-solutions

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Präsident der Energy Watch Group

Overall concepts for 100% renewables

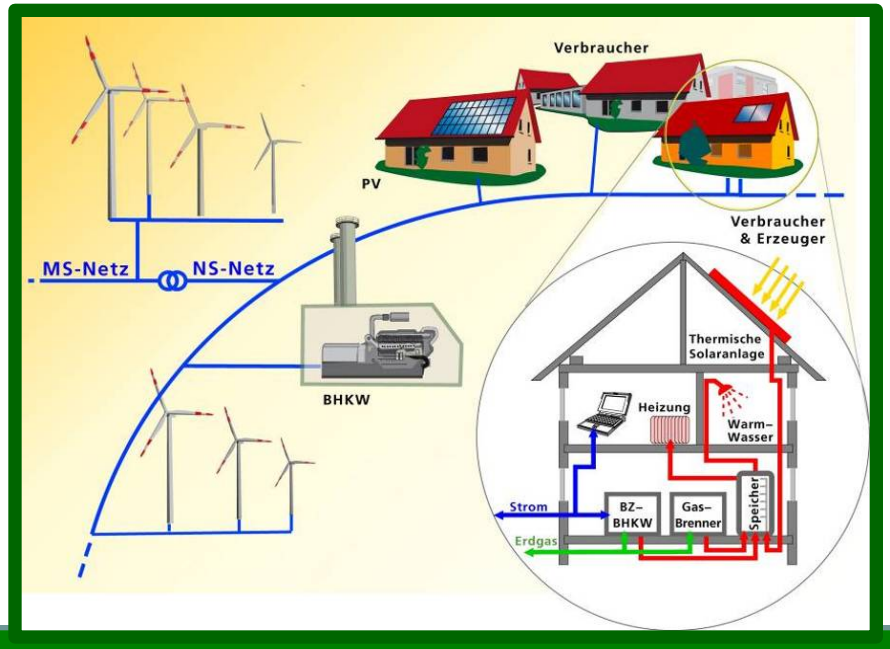
- Renewable energy for: heating, cooling, mobility, electricity, industry

  Wind, solar, hydro, waves, bioenergy, geothermal power

- Storage: hydro pump; batteries; power to gas; ice (heat) storage

- Big data; smart homes; smart cities

Hybrid/ electric vehicles



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Agro-PV in Italy
Double yield: Solar electricity and corn shadowing saves water

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Species-appropriate husbandry in PV farms

Double yield: Solar power and organic meat

Quelle: Zhenfa Energy Group, China

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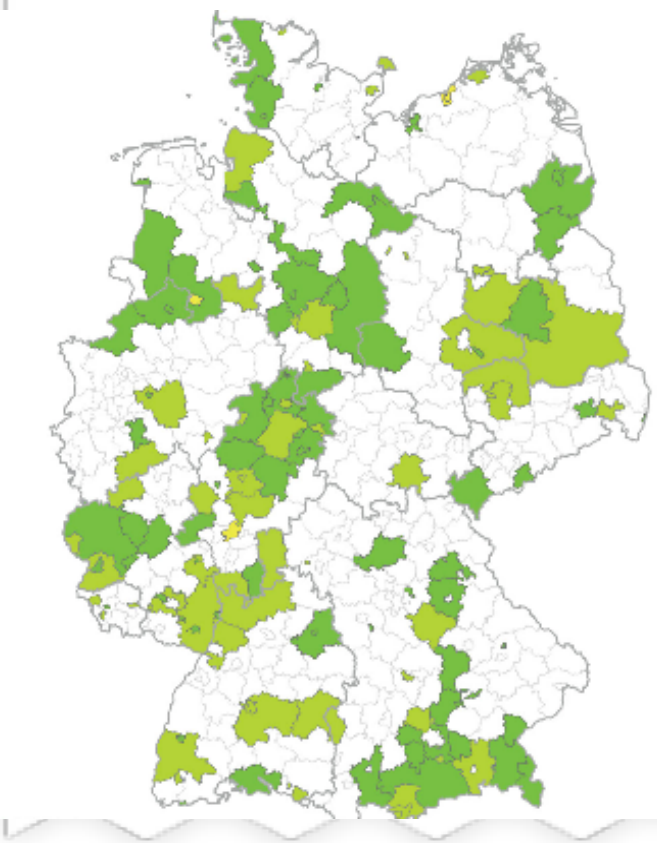
100% RENEWABLES

www.go100re.net



Nov 2016, COP22, Marrakech:
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; Masheireb; Downtown Doha; Vancouver; San Francisco; Copenhagen; Sydney;

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

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STUDY:

TRANSITION TOWARDS A 100% RENEWABLE ENERGY SYSTEM BY 2050 FOR UKRAINE

Key findings:

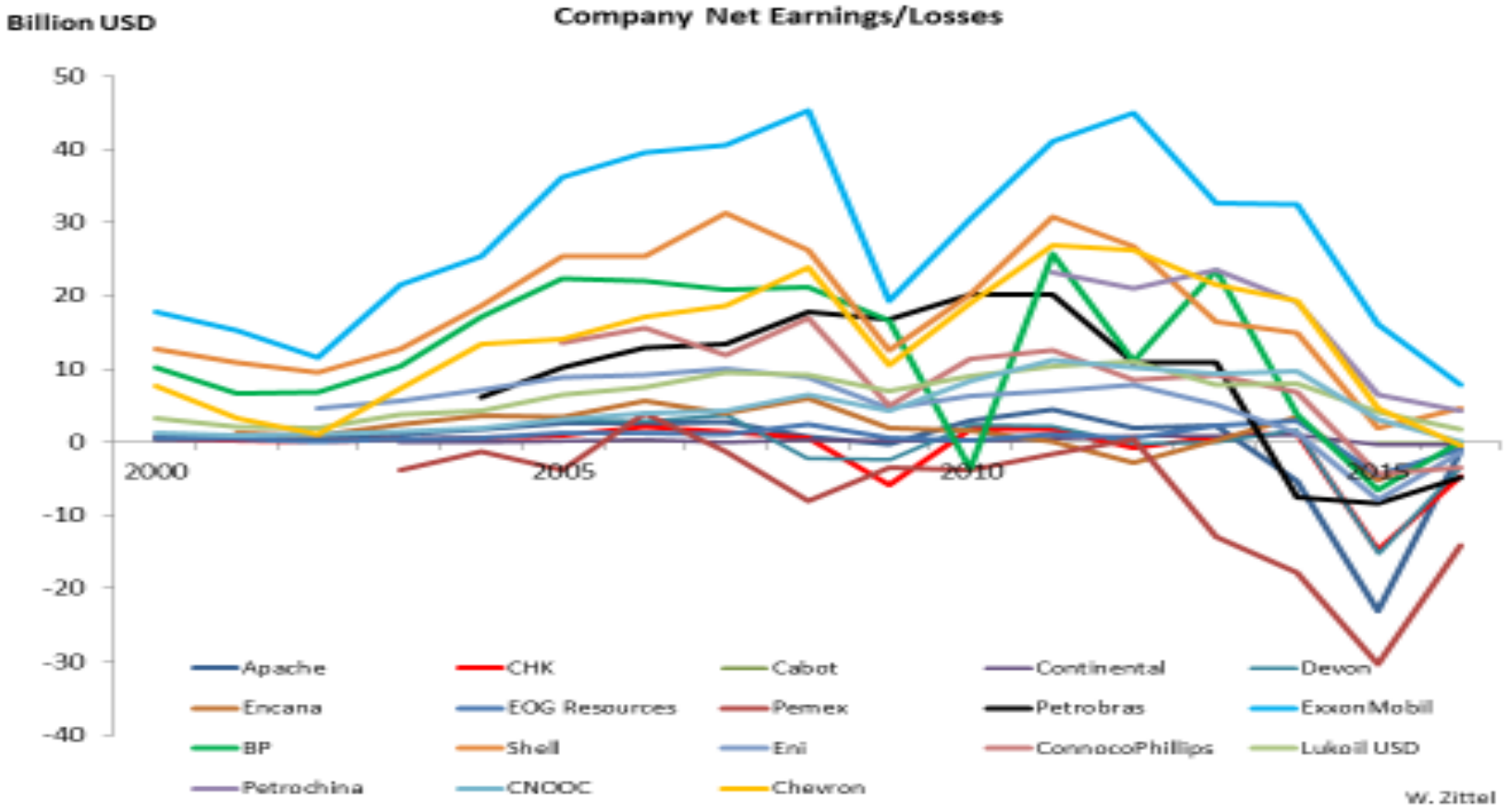
- 100% Renewable Power is technologically feasible
- 100% Renewable Power is feasible every hour the whole year
  - Baselaod of nuclear/coal power is not necessary
- 100% Renewable Power is cheaper than fossil/nuclear power

NEO CARBON ENERGY

Michael Child, Dmitrii Bogdanov and Christian Breyer
Lappeenranta University of Technology, Finland

https://www.researchgate.net/publication/315117520_The_role_of_storage_technologies_for_the_transition_to_a_100_renewable_energy_system_in_Ukraine

Western oil companies: Since the oil price decline, most companies only make losses



Source: Energy Watch Group, Werner Zittel

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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 investing
  - 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

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Thank you very much for your attention!

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