Introduction into the German Energy Market

Berlin, September 19, 2016

Dr. Claudia Weise

Agenda

1. Who is VGB?
2. Framework and German energy market
3. Flexible thermal power plants
4. Examples of the VGB-work
5. Outlook

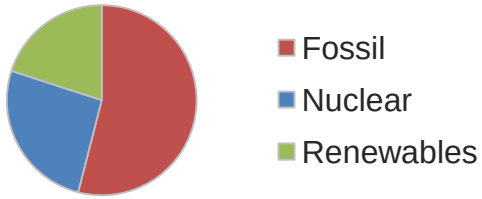
Our mission is…

…to support our members in their operational business.

…to support our members in strategic challenges.

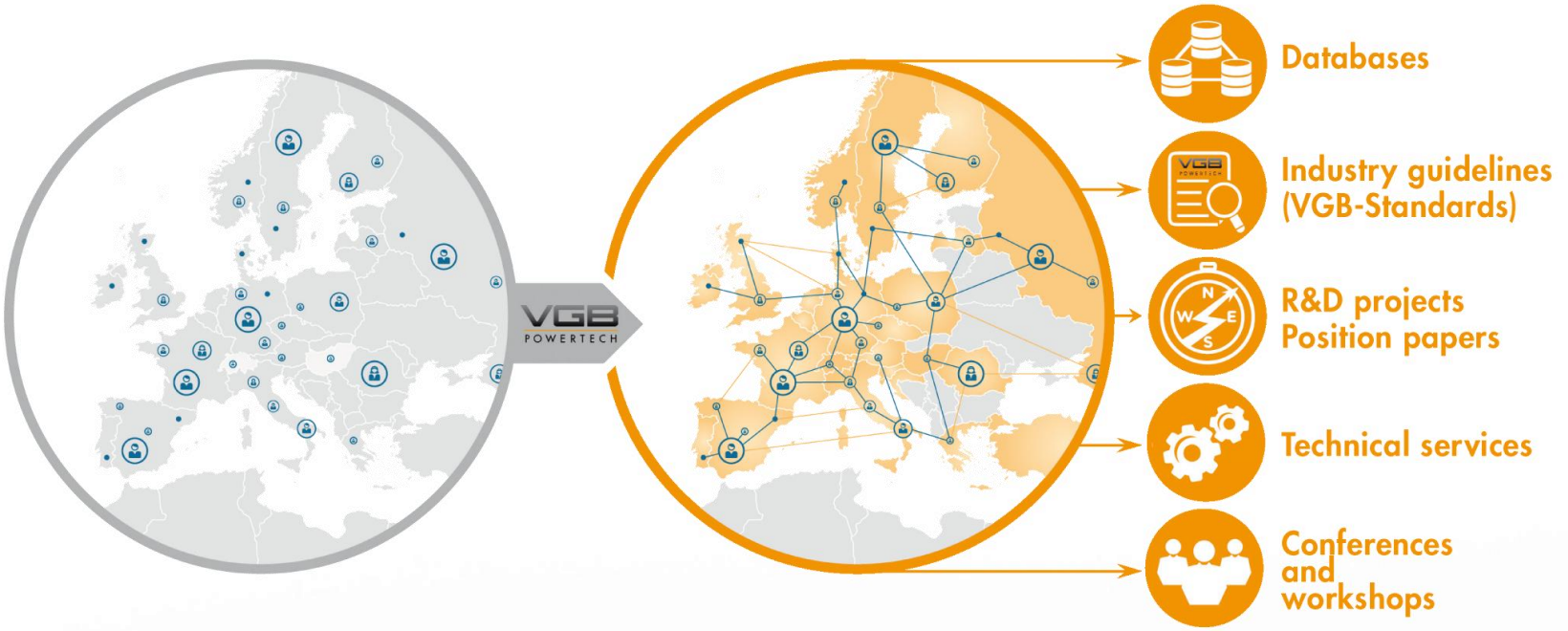
…to be a key contact for international energy stakeholders.

- We have **484 members in 35 countries**, over 90% are European based
- We represent an installed capacity of **458 GW** based on this energy mix:



VGB is the European Competence Center of Heat and Power Generators. Founded in 1920 it is based on a voluntary association of companies active in the energy business.

Over 1,700 experts are active in the VGB network.



VGB facilitates the exchange of experiences between the experts and document and disseminate the results for the benefit of all members.

1. Long-term co-operation with India

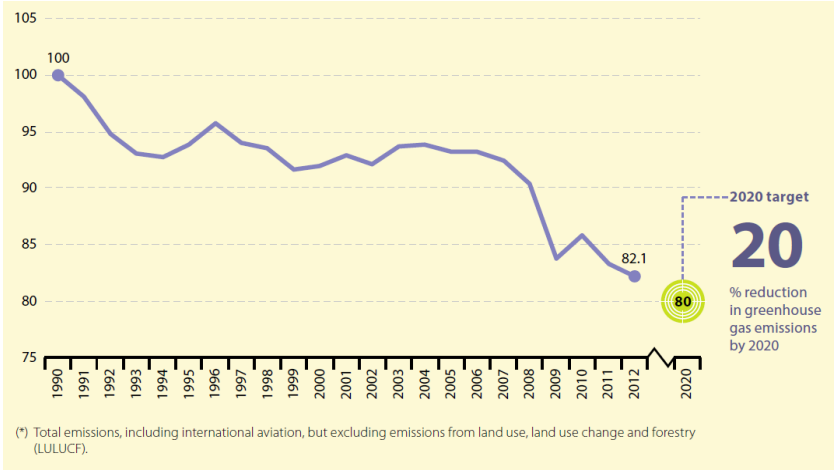
igef Indo-German Energy Forum

german cooperation
DEUTSCHE ZUSAMMENARBEIT

2. Energy Policy Framework

20/20/20 targets: CO_2 emission reduction, efficiency increase, share of renewables by 2020

40% CO_2-reduction target, share of renewables of 27% of energy consumption, 27% efficiency increase by **2030 framework**

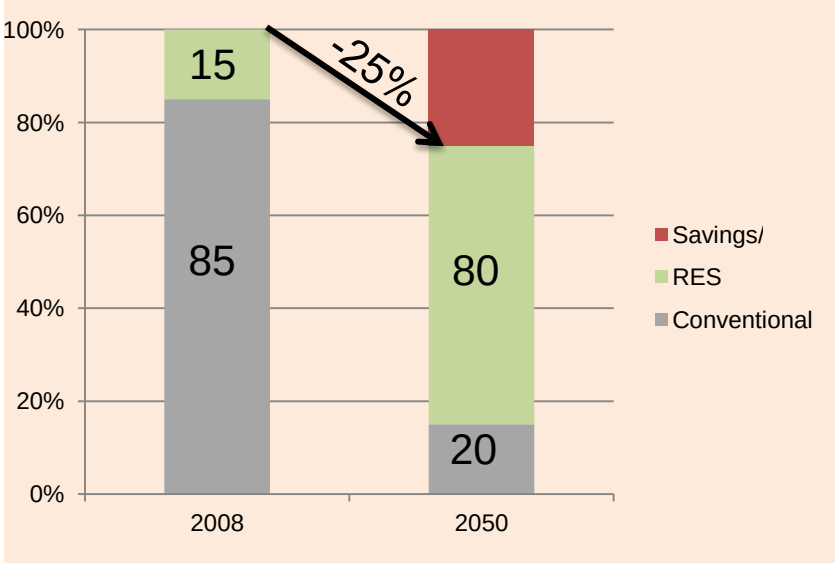


Source: Eurostat

Reduction of greenhouse gases by 40% in 2020, by 80% in 2050

Phase-out of nuclear power by 2022

Increase of the share of renewables up to 80%, reduction of primary energy consumption by 50% and decrease of electricity consumption by 25% in 2050

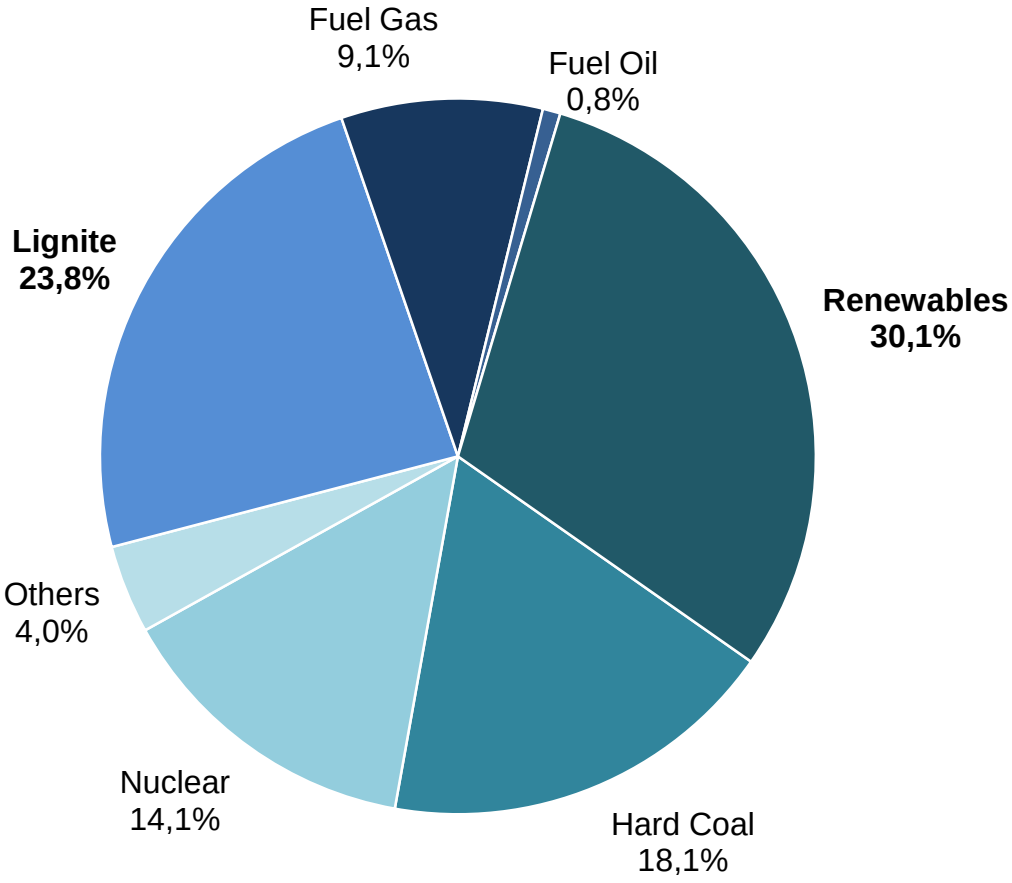


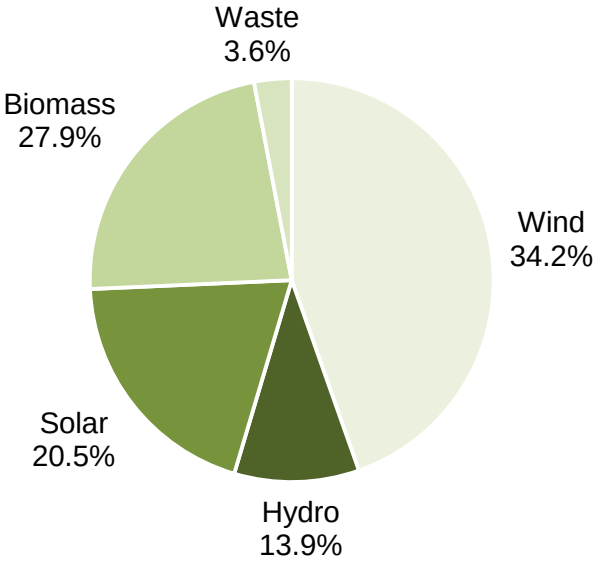
Reference year for CO_2-reduction:1990

POWERTECH

Power generation in Germany in 2015

- Installed capacity: 201 GW
- Gross power production: 652 TWh

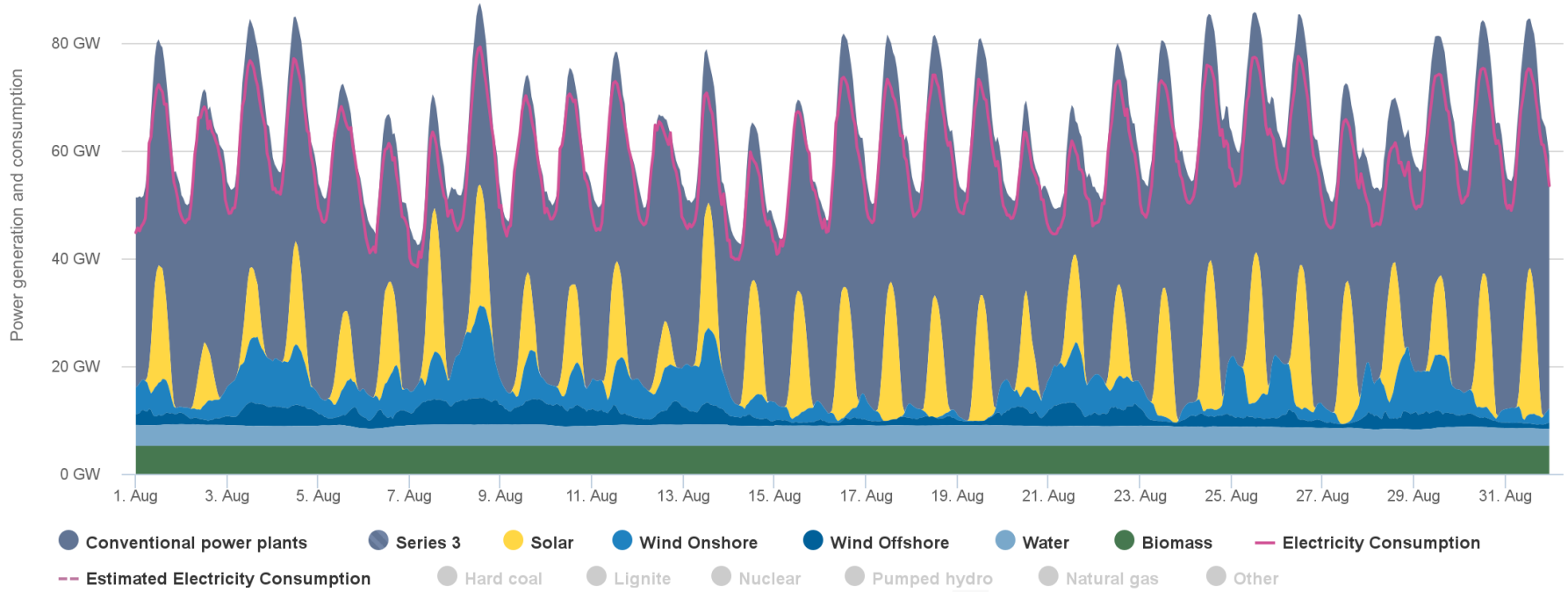




In 2015 for the second time renewables have outscored lignite as No. 1 electricity generation source.

2. Electricity Production in Germany

POWERTECH



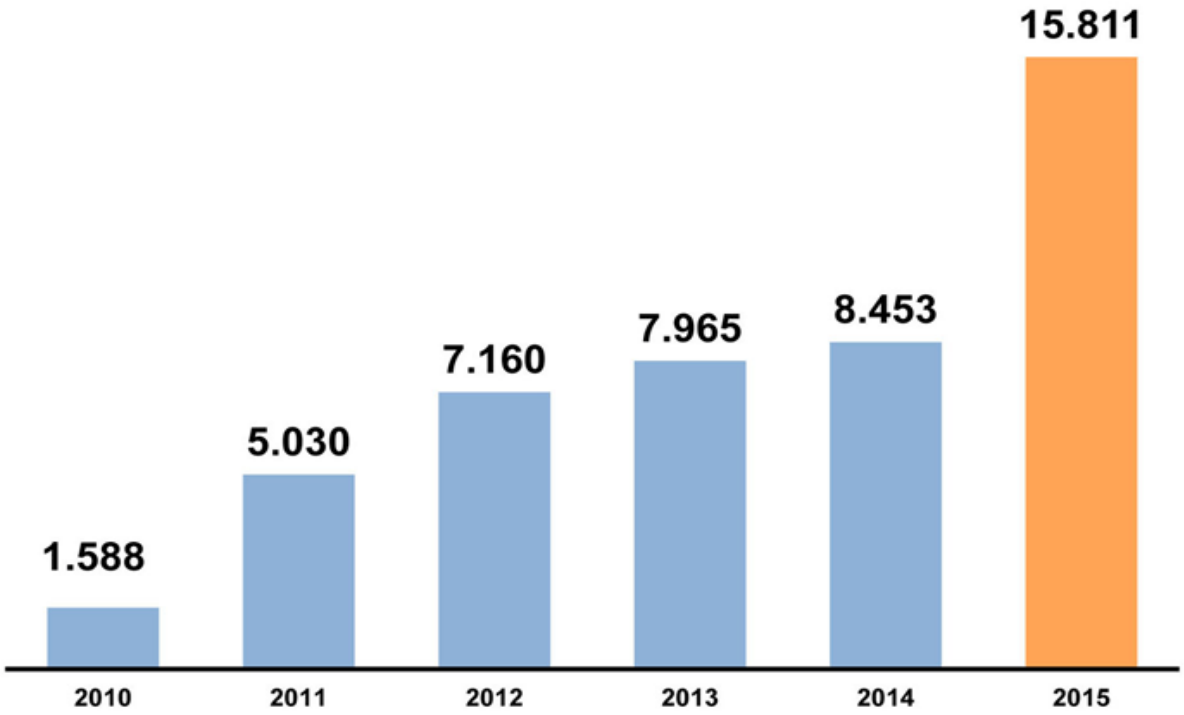
Agora Energiewende; Current to: 08.09.2016, 11:45

Lower prices and less operating hours have deteriorated the profitability of conventional power plants, even on marginal costs.

2. Development of re-dispatch-measures

POWERTECH

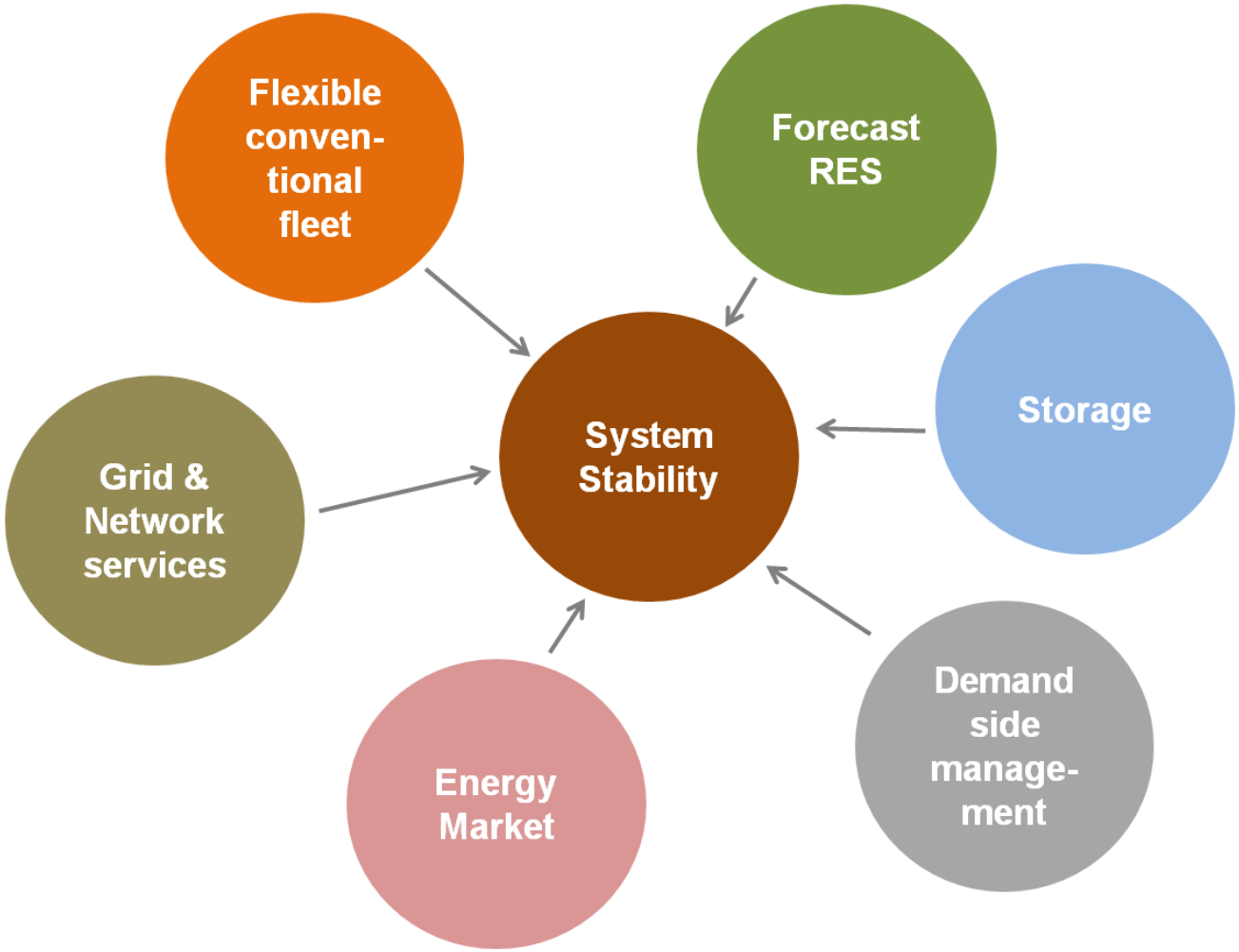
Amount of intervention incidents in the German transmission system (in hours)



Source: Bundesnetzagentur

The costs for re-dispatch measures and according load management of conventional plants amount to around 900 Mio Euro in 2015.

3. What keeps the grid stable?



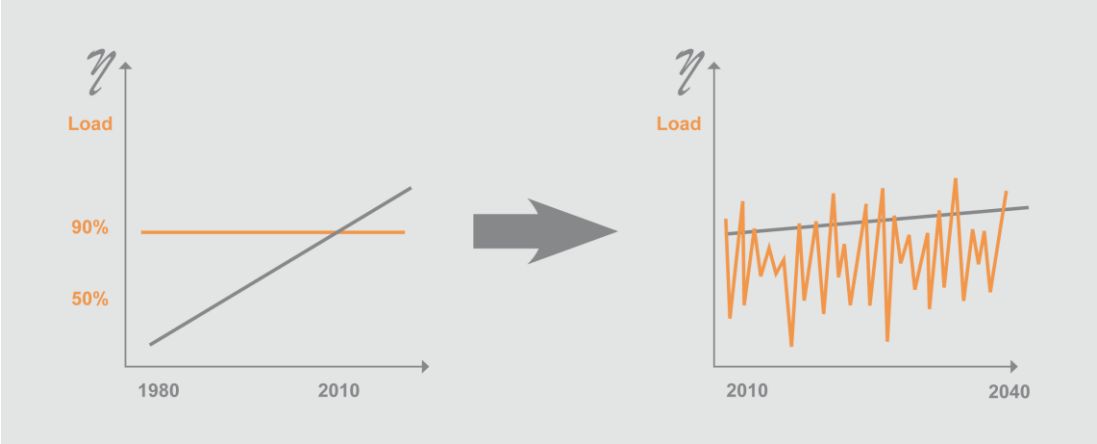
Achieving system stability is key to a successful energy transition. Therefore a flexible conventional power plant fleet is essential.

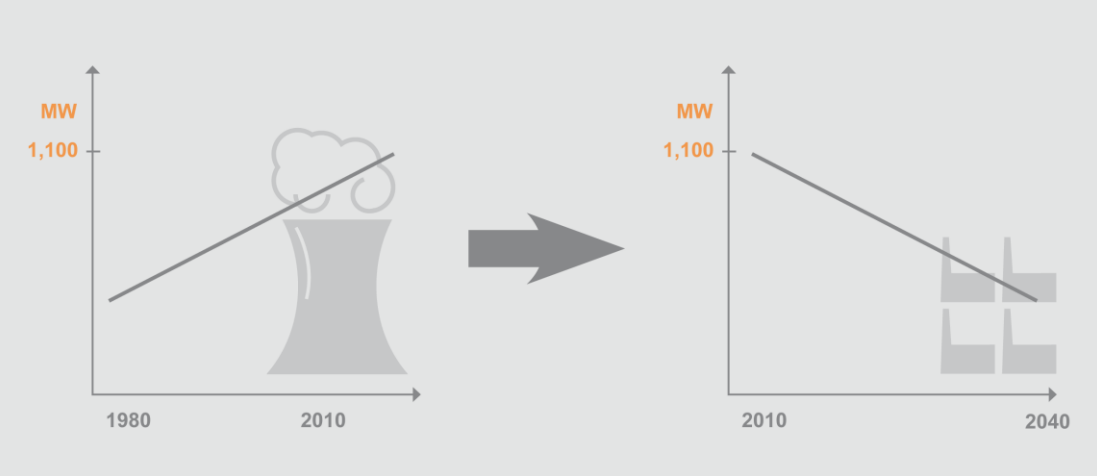
3. It is all about flexibility

The energy systems transforms from centralized and fossil-based to decentralized and renewable-focussed.

→ **the value of flexibility will overrule the value of efficiency**

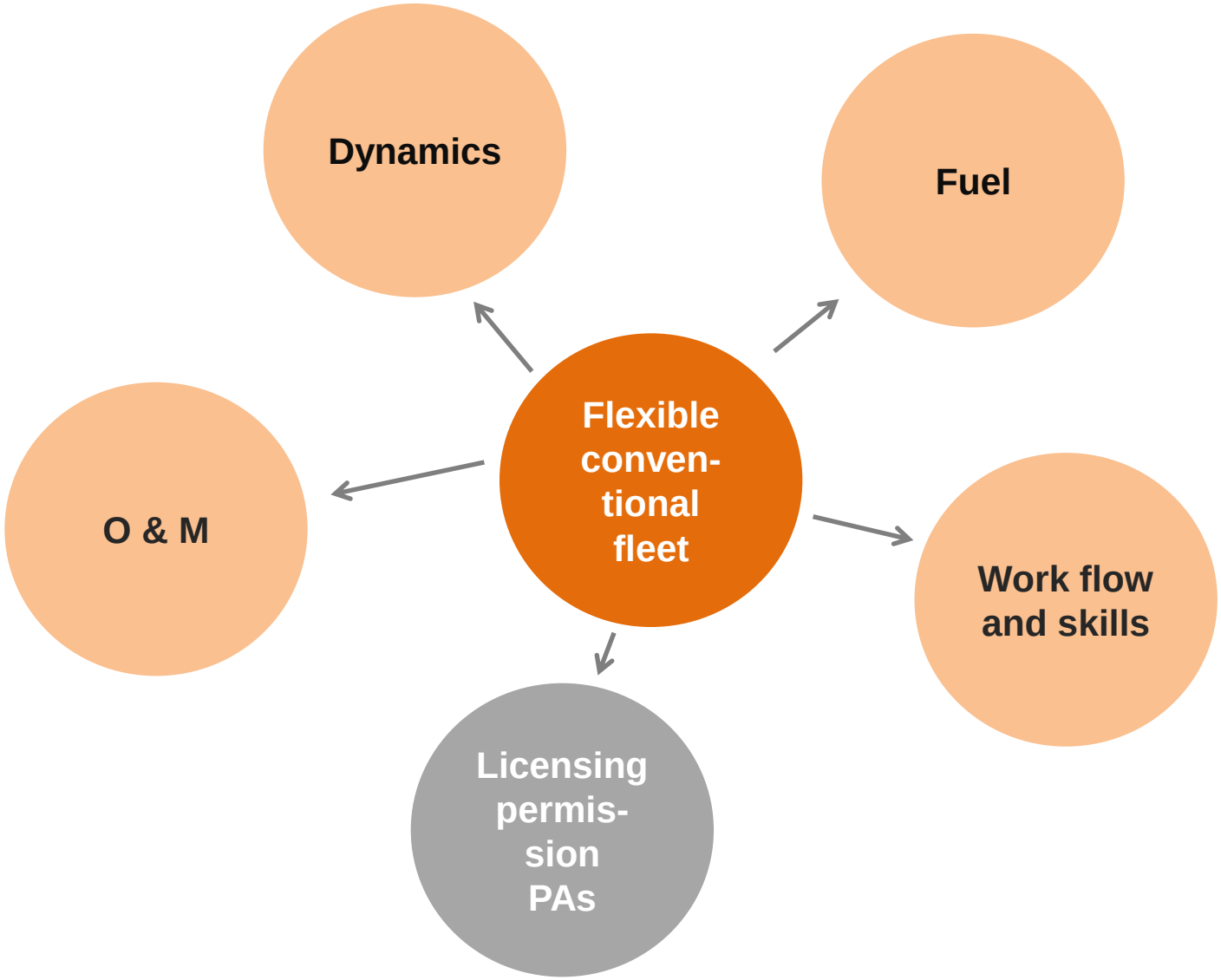
→ **the economy of scales will be replaced by a low-cost & low-risk approach**





Technology development and O & M concepts need to adapt to the changed market requirements. A new thinking towards smaller, flexible, low-cost plants is required.

3. What does flexibility mean?



3. Technical flexibility comprises several aspects

POWERTECH

Dynamics

- high operational gradients (load change rate)
- short ramp-up time for minimal and nominal load
- short minimal stand-still time

Operational flexibility

- high number of start-ups and load cycles
- low minimal load with high efficiency
- uniform high-level efficiency-profile at a wide load range

Fuel flexibility

- high plant availability in spite of coal blending and imported coal
- coal treatment technologies and plant modifications (e.g. combustion processes)
- biomass co-firing with a secure supply chain

…with potential consequences regarding:

- life time

- sufficient SCR-temperatures
- sufficient retention time
- flow profiles

- changing composition
- pollutant content, e.g. S

The flexibility potentials are limited by emission and dew-point values, efficiency and lifetime requirements as well as the minimum steam flow.

4. Examples of the VGB-work

Databases

- Qualified Products Database for qualified maintenance products
- Power Plant Information System / KISSY

Industry guidelines (VGB-Standards)

Recommendations for the Inspection and Overhaul of Steam Turbines; VGB-S-115-00-2016-01-EN

R&D projects
Position papers

- Partner Steam Power Plant
- Analysis of impacts of delivery of reactive power on electrical components

Technical services

Technical review for minimal load of Chilean CCGT- and coal plants

Conferences and workshops

- VGB-Congress 2016
- PowerTech Journal publications

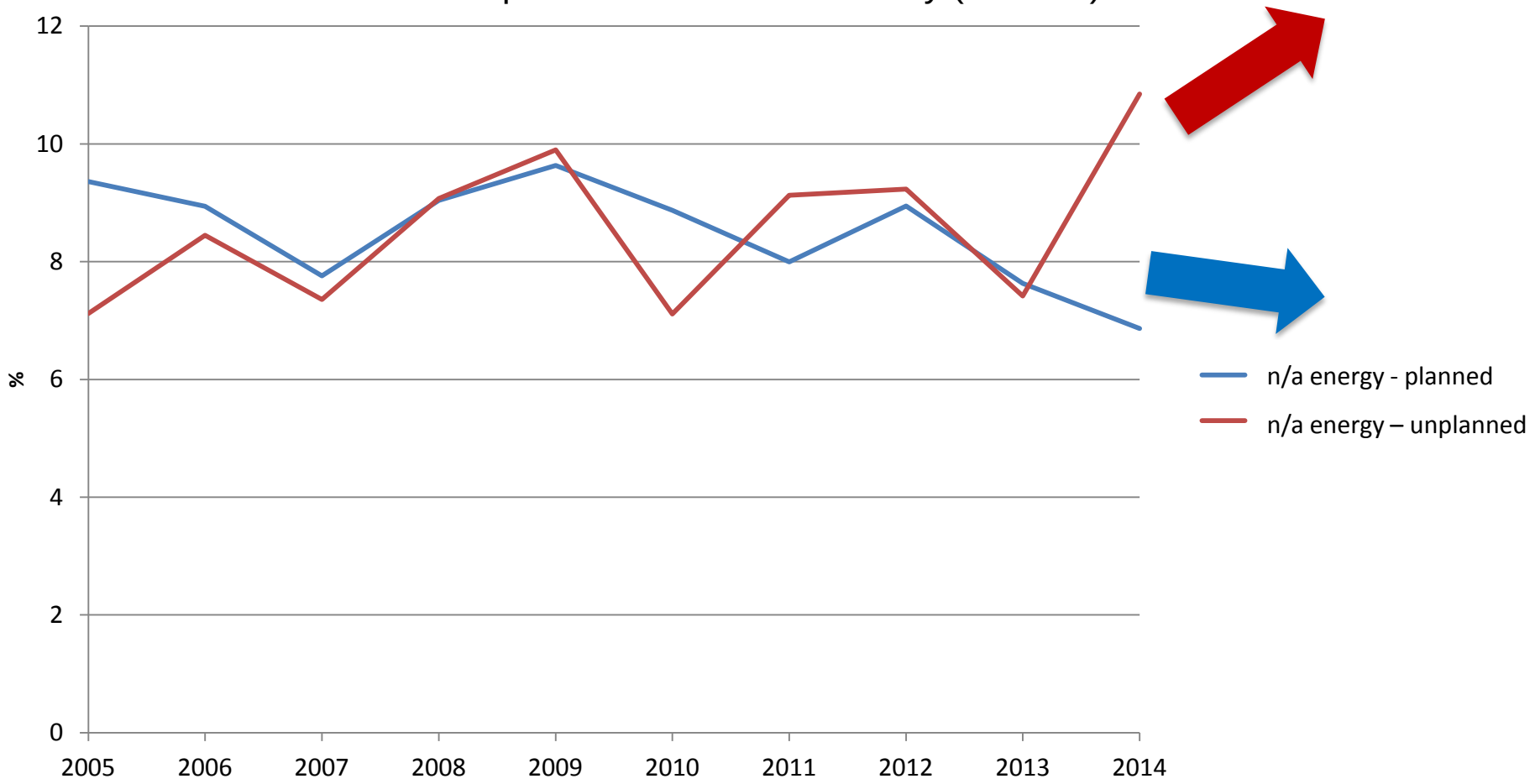
Flexibility is a very important topic for VGB members. Therefore it is reflected in all areas of the VGB-activities.

Analysis of power plant availabilities with VGB database KISSY

POWERTECH

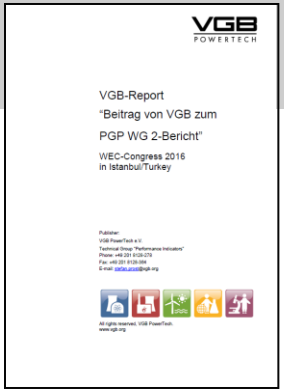
From: The influence of flexible operation on the availability of power plants

Trends of non-available energy of lignite and hard-coal fired units with a nominal output >= 200 MW in Germany (81 units)

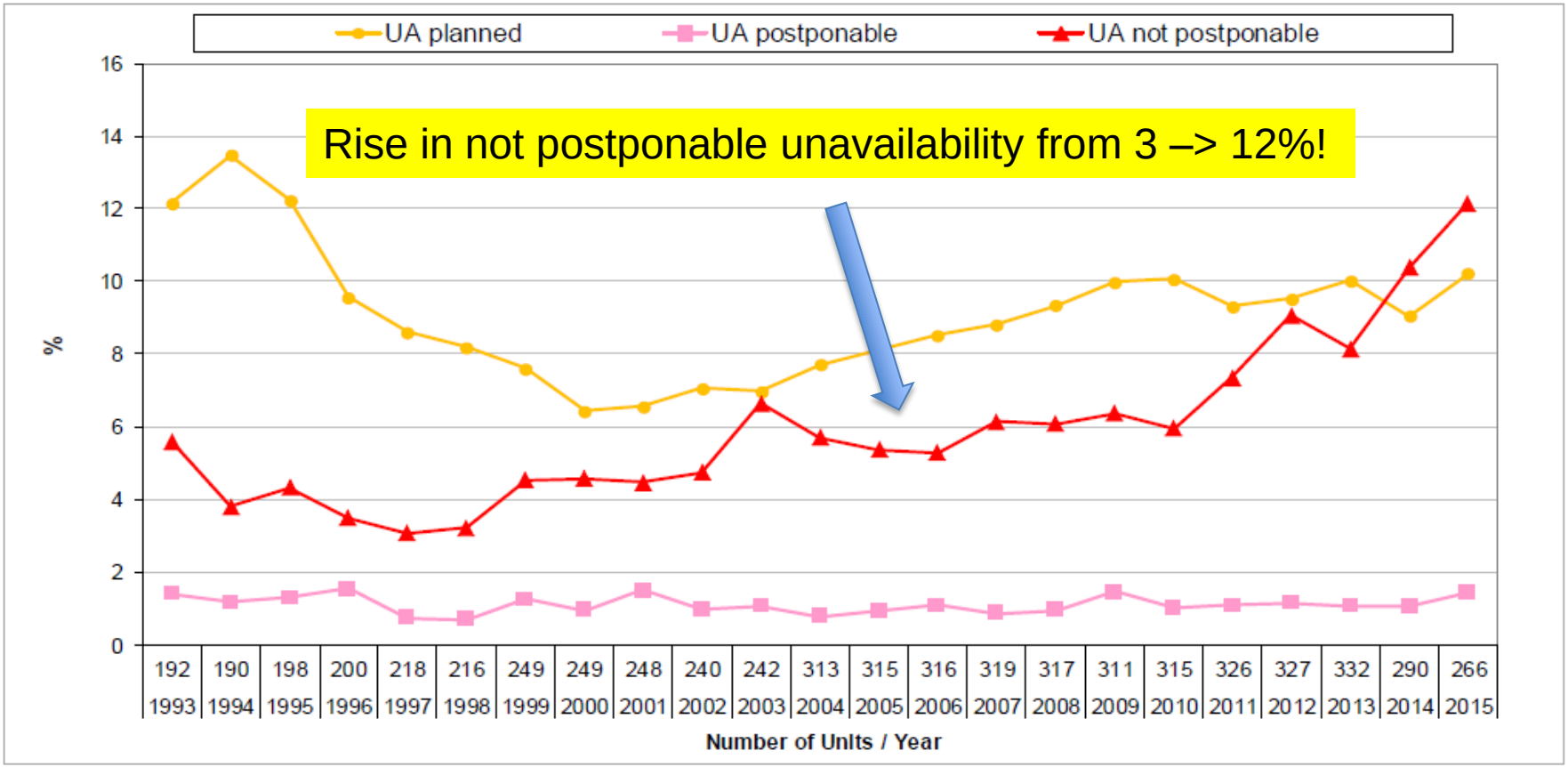


Within the last 10 years planned unavailabilities have decreased whereas un-planned unavailability has increased significantly.

Kissy based VGB / WEC availability report for Istanbul 10/2016



Time range: 1993 - 2015

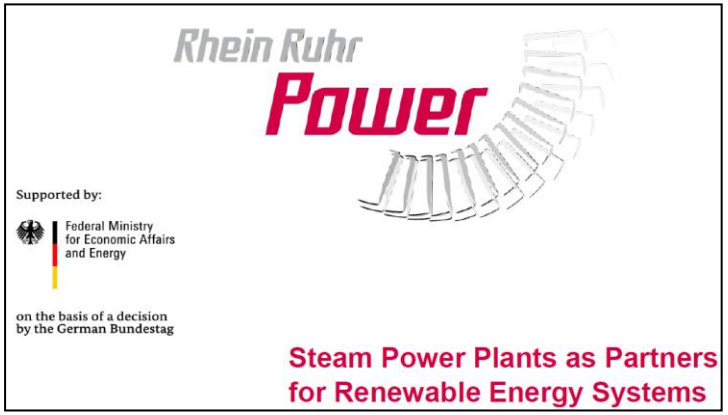


Annex 5: TSR 'Availability', A.2.1.1 Trend of fossil fired units without CCGT's, total

Recent example: R&D-project Partner Steam Power Plant

Elaboration of measures on how existing fossil-fired power plants can handle fluctuations of power generation of renewable energy:

- improvement of start-up and shut-down behavior
- reduction of minimum load
- increase of load change rate
- adjustment of steam parameters
- optimization of steam generator
- optimization of steam turbine
- integration of thermal heat storage in the power plant process

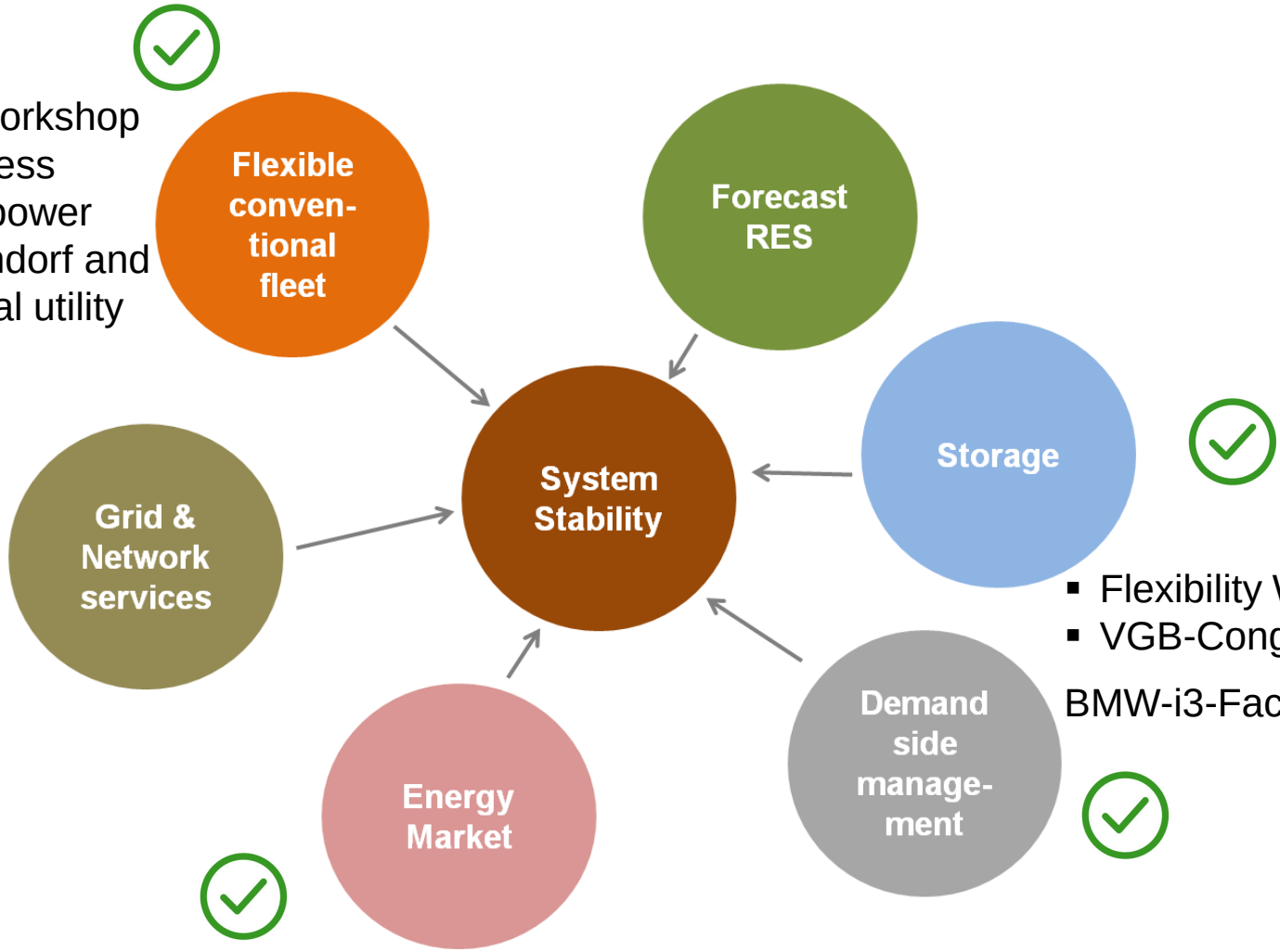


Project partners: E.ON, RWE, Steag, Vattenfall, University of Cologne, University of Dusseldorf, Mitsubishi Hitachi PSE and Siemens

The Partner-Steam-Power-Plant-project aims at the stabilization of the grids, the security of supply and the maximization of the application of renewables.

4. Outlook for the week

- Flexibility Workshop
- VGB-Congress
- Visit of the power plant Lippendorf and the Municipal utility of Leipzig



- Flexibility Workshop
- VGB-Congress

BMW-i3-Factory

- Flexibility Workshop
- VGB-Congress
- Visit of the municipal utility of Leipzig

5. Conclusions and outlook

- → **Flexibility** of thermal power plants is an important topic in the German and Indian market
- → Flexibility Study Tour is one activity initiated under the IGEF
- → Planned :
  - Technical study on flexibility enhancement in two Indian reference power plants
  - Flexibility workshop in Delhi on December 15 and 16, 2016
- → Experience exchange on **flue gas cleaning** e.g. for SO_x, NO_x and PM; workshops in Kolkata, Raipur and Hyderabad in November 2016

VGB is eager to support these activities together with the EEC as an important platform generating solutions for the Indian power sector.

धन्यवाद

Thank you
for your interest!

Contact:
Dr. Claudia Weise
Project Manager
Deilbachtal 173
45257 Essen / Germany
Phone: +49 201 8128 335
Mobile: +49 151 2524 8343
claudia.weise@vgb.org

www.vgb.org