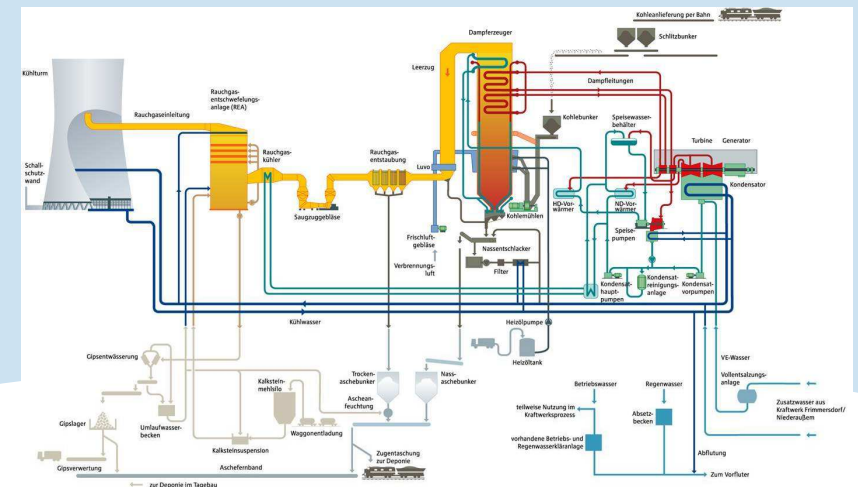


# Flexibilization of power plants

## Visit of the Indian delegation at TÜV Rheinland

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# Flexibilization of power plants

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Even if the share of renewable energies is growing rapidly:

Whenever the wind does not blow and the sun does not shine, fossil-fuelled power plants have to be switched on and then also have to react with maximum flexibility to the fluctuating feed-in of renewables. And that will remain the case for many years to come.

Since green electricity in Germany is fed into the grid on a privileged basis, the gaps for fossil-fuel power plants will become smaller and smaller as the share of renewables grows.

Nevertheless, additional fossil power plants are an indispensable back-up, even if only for a few hundred hours a year.

But who is going to build or operate these power plants if they are idle most of the time?

From a business point of view, renewables are ruining the power plant operators' business.

**KEYWORD:** Capacity market

In this case, investors no longer earn their money by selling electricity, but by keeping power plant capacities available.



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Legislative requirements in Germany



PED: Pressure equipment  
directive (RL 2014/68/EU)

- § Main requirements to manufacturing
- § Inspection during manufacturing
- § Responsibility of the manufacturer
- § Responsibility of the Notified bodies

for Steam Boilers:

Harmonized Standard EN12952

manufacturing



Ordinance on industrial safety and health

- § Installation is subject to monitoring
- § Permission by local authority
- § Inspection prior to putting into service
- § In-Service-Inspection and assessment of changes in the mode of operation
- § Responsibility of the operator
- § approved supervisory body (ZÜS)

operating

Notified Body ID-No. of TÜV Rheinland: **CE0035**

# Flexibilization of power plants

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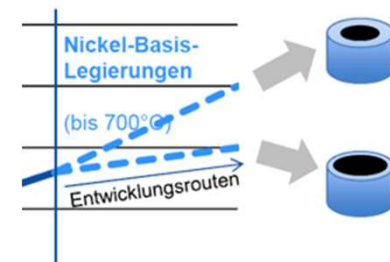
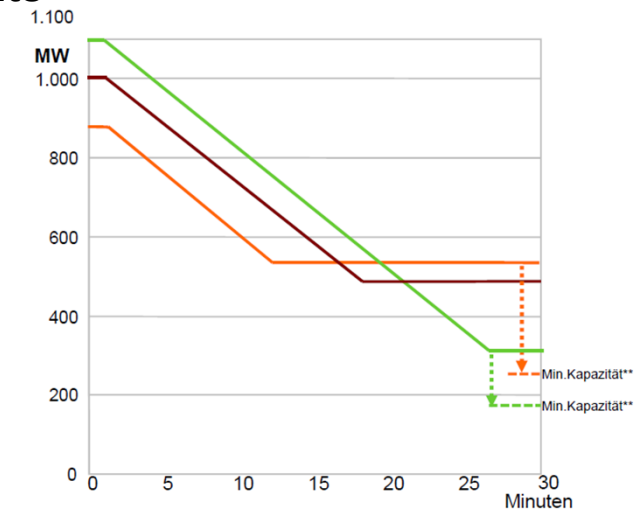
**What requirements must new and also existing conventional power plants meet in the changing energy supply environment?**

**KEYWORD: Flexibilization**

**Fast and economical provision of "capacities" (control energy) according to the feed-in from renewables an increased load change speed is required**

**Consequences:**

- Fewer annual operating hours (good for creep damage).
- Complete shutdowns (conservation) or keeping warm
- More frequent and faster start-up and shutdown (bad for alternating load exhaustion and wear rates)
- Redefinition and testing of minimum load points (lower design limit)
- Revision of maintenance and testing concepts

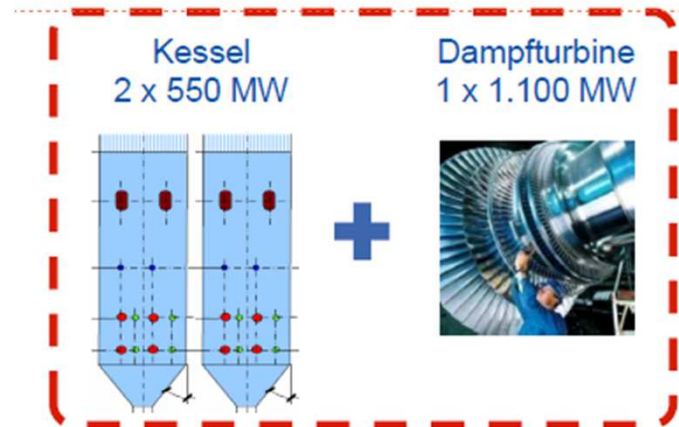


# Flexibilization of power plants

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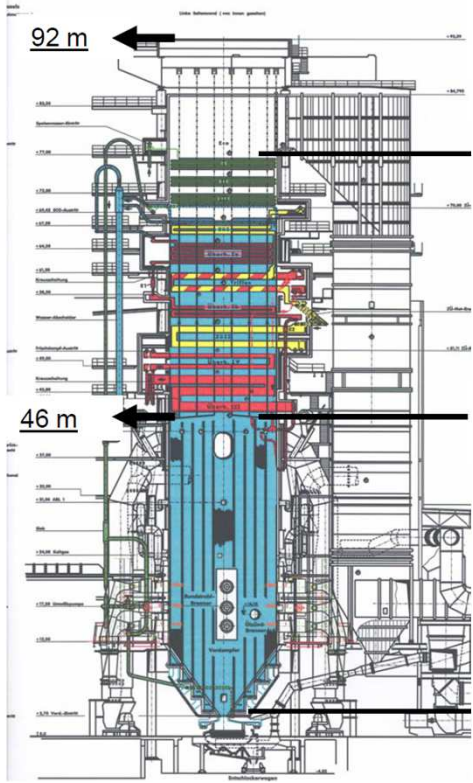
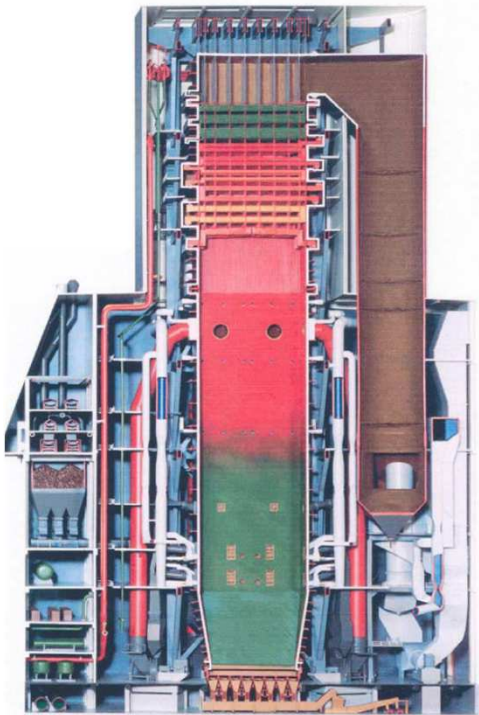
**Approaches to continue economic operation of existing coal-fired power plants by increased flexibility:**

- Optimization or conversion of the firing system to stabilize minimum firing rates
- further steam turbine retrofit measures
- Optimization of control technology (regulation) including sensors and actors
- Online monitoring of lifetime exhaustion
- Coupling with energy storage options
- Combination of coal-fired power plant and topping gas turbine
- Co-combustion of biomass or other substitute fuels
- Reduction of time for start up (less oil-fire)



# Flexibilization of power plants

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# Flexibilization of power plants

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Temperature gradients:

For a cold start or a warm start the maximum permissible start-up gradient up to 450°C is 8 K/min.

With a hot start, the gradient can be increased by 10K/min.

Reaching a temperature HP-outlet >450°C, a maximum of 5K/min is permissible.

Is it possible to increase these gradients provided that there are no component hazards?

→ analysis is required

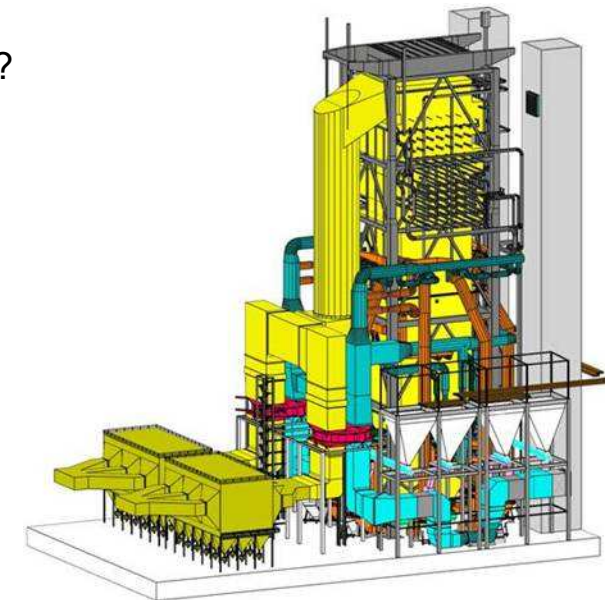
Start of the first mill:

These criteria serve to ensure a safe ignition process of the coal dust.

They are based on heuristics and derived from the experience of boiler manufacturers.

They may not represent an optimum. Can they be changed?

→ change/modification of burners required (see next page)





Thank you for your attention!