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Why is gas different from electricity?



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Gas ≠ Electricity

- ✓ Gas primary energy
- ✓ States more dependent on externally given conditions
- ✓ More substitute goods , e.g LPG, oil, coal
- ✓ Electricity secondary
- ✓ Electricity locally produced, choice of technologies and fuels
- ✓ No alternative



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Product Characteristics of Electricity and Gas

Gas;

- ✓ Few exploration sites, far away from demand
- ✓ Expensive lines
- ✓ Can be stored underground and as LNG
- ✓ Alternative transportation as LNG and CNG

Electricity;

- ✓ Cannot be stored - balance between production and consumption
- ✓ Needs to be transmitted via lines
- ✓ Diverse fuel sources, close to demand
- ✓ Low price elasticity of consumption
- ✓ Hardly substitutes



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Gas Market Characteristics

- ☐ No real Wholesale Market
 - ✓ Price coupling with Oil
- ☐ Long Term Contract - bilateral
 - ✓ Take-or-pay“ contracts with little flexibility
 - ✓ Little free tradable volumes
 - ✓ Monopolistic production structure
 - ✓ Capacities
- ☐ Emerging trading places – Hubs



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Electricity Market Characteristics

☐ Spot Market (Short Term)

- ✓ Energy is bought for delivery on the next day or the same day (Day ahead, intraday)
- ✓ Main Products „Base“ and „Peak“
- ✓ Low volume

☐ Forward Market (Long Term-Bilateral contracts)

- ✓ Energy can be bought week, month, years ahead
- ✓ Usually standardized products
- ✓ High volume traded compared to actual consumption
- ✓ To hedge against price risks
- ✓ More participants than in spot market
- ✓ A Forward price is what you pay TODAY for future energy delivery
- ✓ It DOES NOT tell the future price of energy



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Main electricity generation technologies;

☐ Coal plant

- Pulverised fuel (PF) steam plant;
- Circulating fluidized-bed combustion (CFBC) plant;
- Integrated gasification combined-cycle (IGCC) plant;

☐ Gas plant

- Open-cycle gas turbine (OCGT) plant;
- Combined-cycle gas turbine (CCGT) plant;

☐ Nuclear fission plant.

☐ Biomass - Bubbling fluidized-bed combustion (BFBC) plant;

☐ Wind turbines

- Onshore-Offshore

☐ Wave and Marine



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Security of Electricity Supply

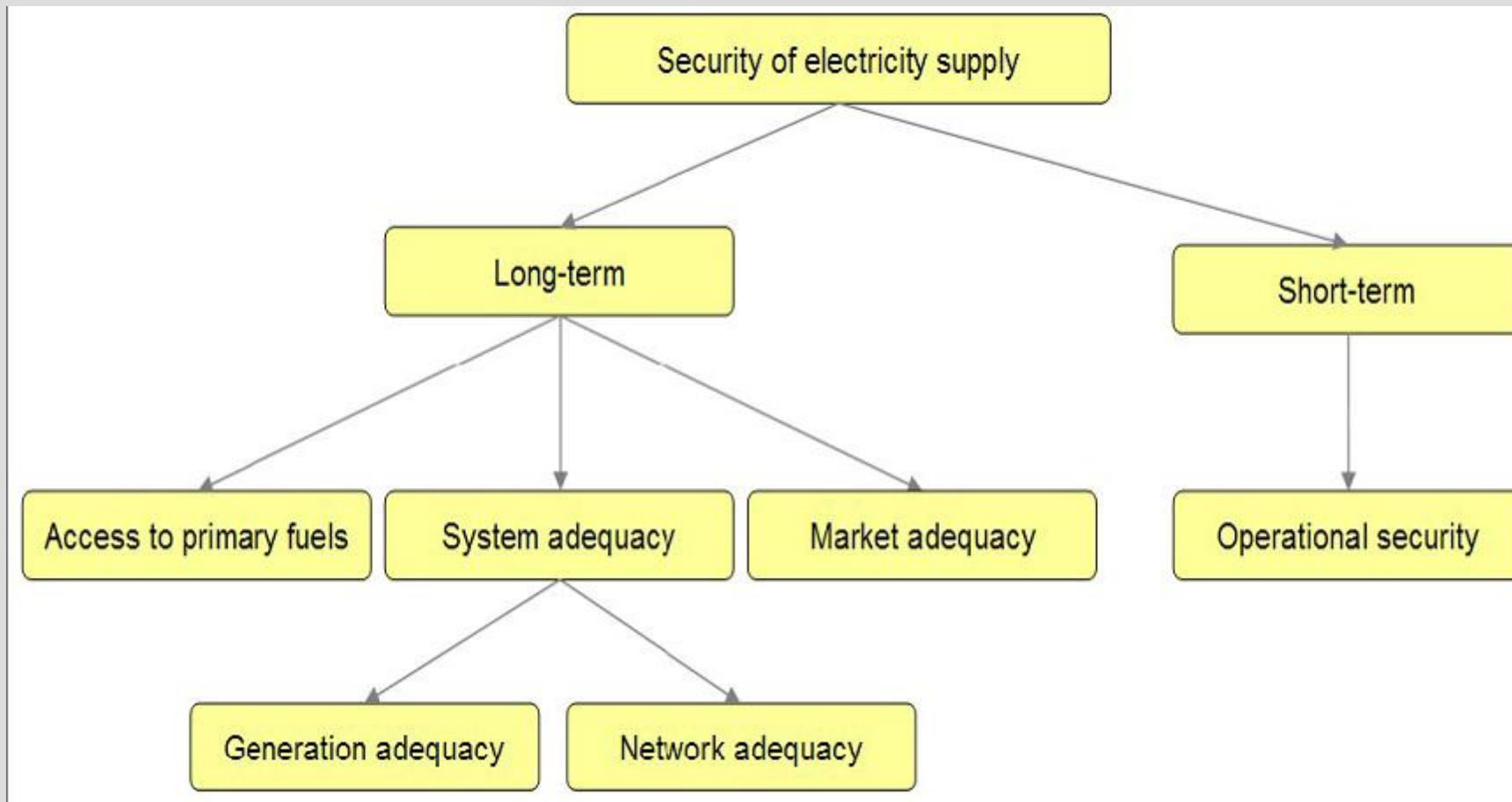
Security of electricity supply is the ability of the electrical power system to provide electricity to **end-users** with a specified level of **continuity and quality** in a sustainable manner, relating to the **existing standards** and contractual agreements at the points of delivery.



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❑ LONG-TERM SECURITY OF ELECTRICITY SUPPLY

Long-term security of electricity supply is the simultaneous adequacy of access to primary fuels, generation, networks and market.

Access to primary fuels;

Access to primary fuels means that electricity producers are allowed to choose freely from primary energy sources.

System adequacy;

System adequacy is the ability of the electricity system to convert primary fuels into electricity and transmit that electricity to end-users in a sustainable manner.

Generation adequacy;

Generation adequacy is the availability of **enough generating** (and import) capacity to meet demand.



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Network adequacy;

Network adequacy – covering both transmission and distribution and also cross-border interconnections – is the availability of **sufficient network infrastructure** to meet demand.

Market adequacy;

Market adequacy means the ability of the market to establish and maintain an efficient link between **producers** and **consumers** of electricity.

SHORT-TERM SECURITY OF SUPPLY

Short-term security of supply is the operational reliability of the system as a whole and its assets, including the ability to overcome **short-term failures** of individual components of the system.



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Security of Gas Supply

Security of supply may be defined as the **guarantee** that all the gas volumes, demanded by non-interruptible (firms or protected) **customers**, will be available at a **reasonable price**.

Ensuring security of supply;

- ✓ Diversification of sources
- ✓ Long term supply contracts
- ✓ Transportation infrastructure
- ✓ Storage
 - Underground Storage,
 - LNG and CNG



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Security of Gas Supply

What is storage?

Storage is the safest, most secure and **economically viable** form of ensuring supplies of natural gas. It is crucial for maintaining the **reliability of supply** needed to meet market demand.

There are 3 main types of such Underground Gas storage:

- reservoirs in depleted oil or gas fields
- aquifers
- salt caverns

Additionally, Above-ground Storage facilities can be built (i.e. LNG **peak shavers**). These differ from the Underground Storage in that they have significantly smaller capacity although higher deliverability rates.



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The role of storage

- ☐ Covering demand peaks
- ☐ Balancing seasonal variations in consumption
- ☐ Enhancing cost effectiveness of gas transport and production
- ☐ Securing gas supply
 - ✓ in case of interferences in production, transport or supply
- ☐ Increasingly for arbitrage / Trading opportunities

GAS STORAGE is an
important contributor to the
SECURITY OF SUPPLY!

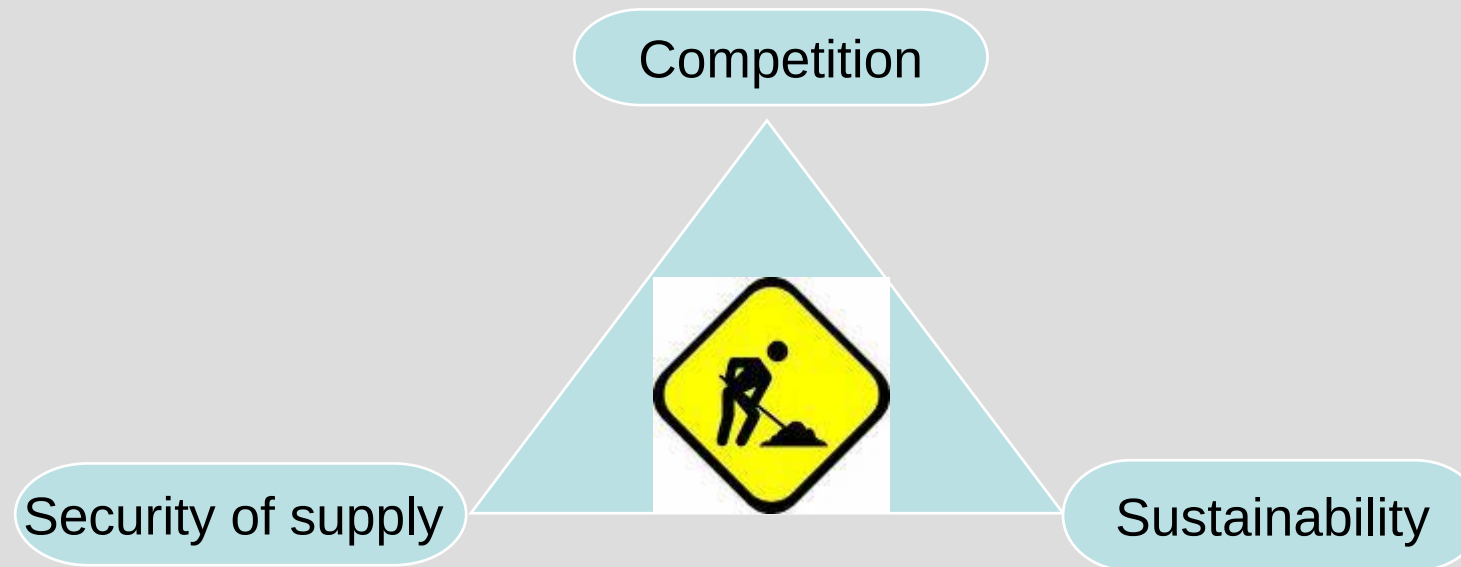


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The „trilemma“ of the regulatory approach



Transparency and Non-discriminatory treatment is also ensured