Safeguarding Security of Supply with High Shares of Renewables

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A dark side of the transition towards renewable energy generation?

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Wind and solar power are disrupting electricity systems

But that's no reason for governments to stop supporting them

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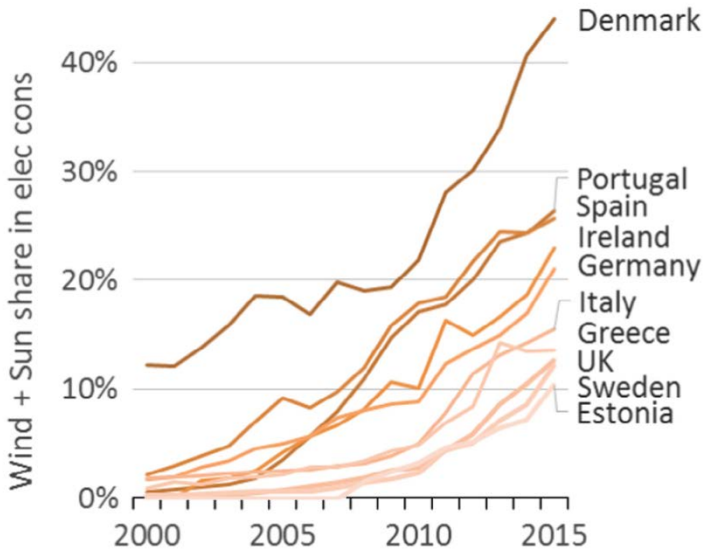
The nexus between the energy transition and security of supply



Intermittent renewables on the rise in Europe (Source: Hirth 2016, Appl. Energy)

Renewables deployment leads to:

- Volatile power feed-in
- New capacities with low capacity factors
- Spatial relocation of generation capacities
- Reduction of wholesale power prices (Merit-Order-Effect)
- Lower utilization of non-renewable back-up generation capacities

Guiding questions:

- (Why) Do issues of security of supply come along with an energy transition?
- How should they be addressed politically?

Outline

- Economics of security of supply
- Policy options to address security of supply
- Political economy of the German case
- Lessons learnt for Sweden

Building fossil-fueled power plants is not the only option to provide security of supply

- **Broad approach:** Security of supply = continuous match of supply and demand using all available options
- **Two dimensions** of security of supply:
  - Adequacy: Ability of the system to meet the aggregate power and energy requirement of all consumers at all times.
  - Security: Ability of the system to withstand disturbances (contingencies)

Potential problems of security of supply typically have multiple causes

General market and policy failures, e.g.,

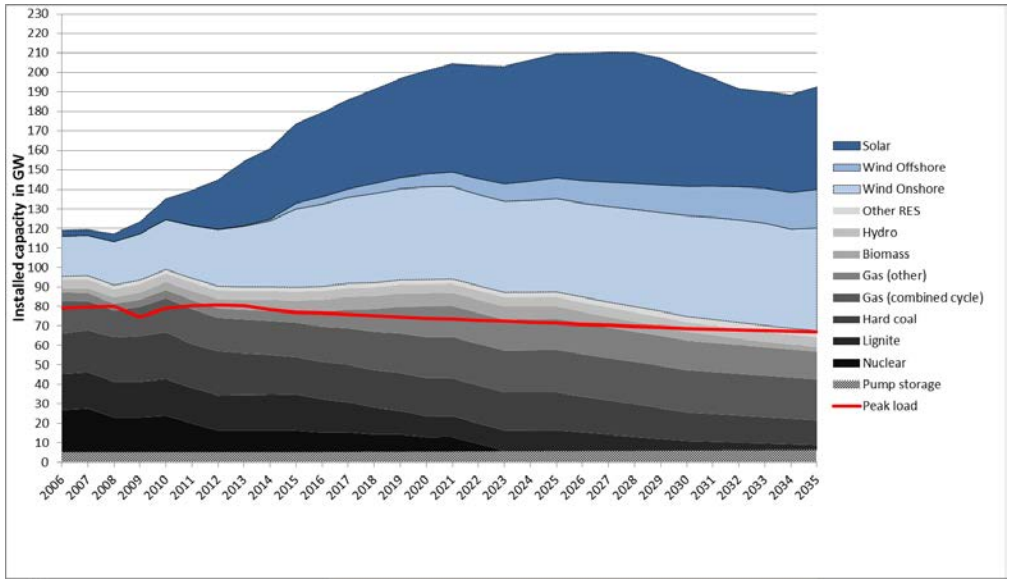
- Reliability as a public good
- Missing-money problem (due to politically set price caps)
- Market and political uncertainties
- Insufficient investment in grids, storage
- Inelastic demand
- …

… and challenges brought about by intermittent renewable generation

➔ Potential issues of security of supply must not be blamed on the energy transition (only)

Challenges to security of supply are highly context-specific and often uncertain

The German case



Projection of installed capacity (intermittent vs. non-intermittent) and peak load in Germany (Source: Lehmann et al. 2016, Wirtschaftsdienst)

	2010	2015
Interruption of supply per customer & year	14.9 min	12.7 min
Redispatch	67 GWh	16,000 GWh
RES curtailment	127 GWh	4.722 GWh
Deployment of network reserve capacity		1.220 GWh

➔ Unclear if and when issues of security of supply may materialize in Germany – and what the underlying drivers are

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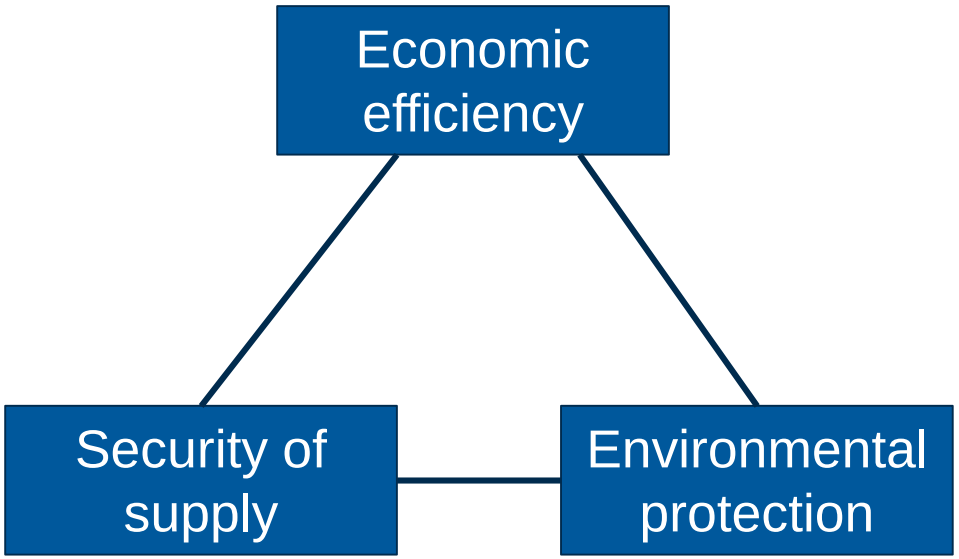
Security of supply should not be maximized by all means and at all costs

Triangle of energy policy



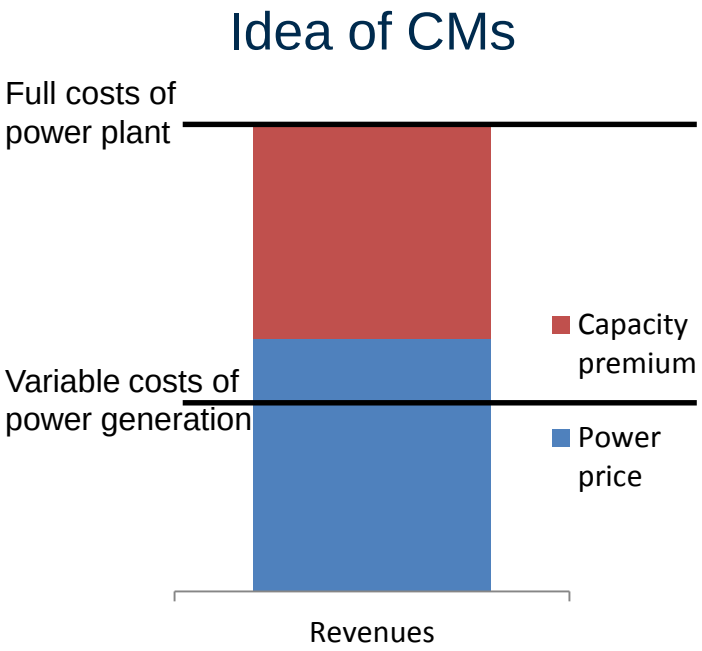
Example for trade-offs:

Meeting peak load by coal-fired generation

- Theoretically possible but
- Costly (relatively inflexible generation)
- Environmentally harmful (CO_2-intensive generation)

➔ Full sustainability assessment of policy options needed

Capacity mechanism (CMs) exhibit regulatory risks



CMs may be **effective in safeguarding adequacy of generation**, **but** they

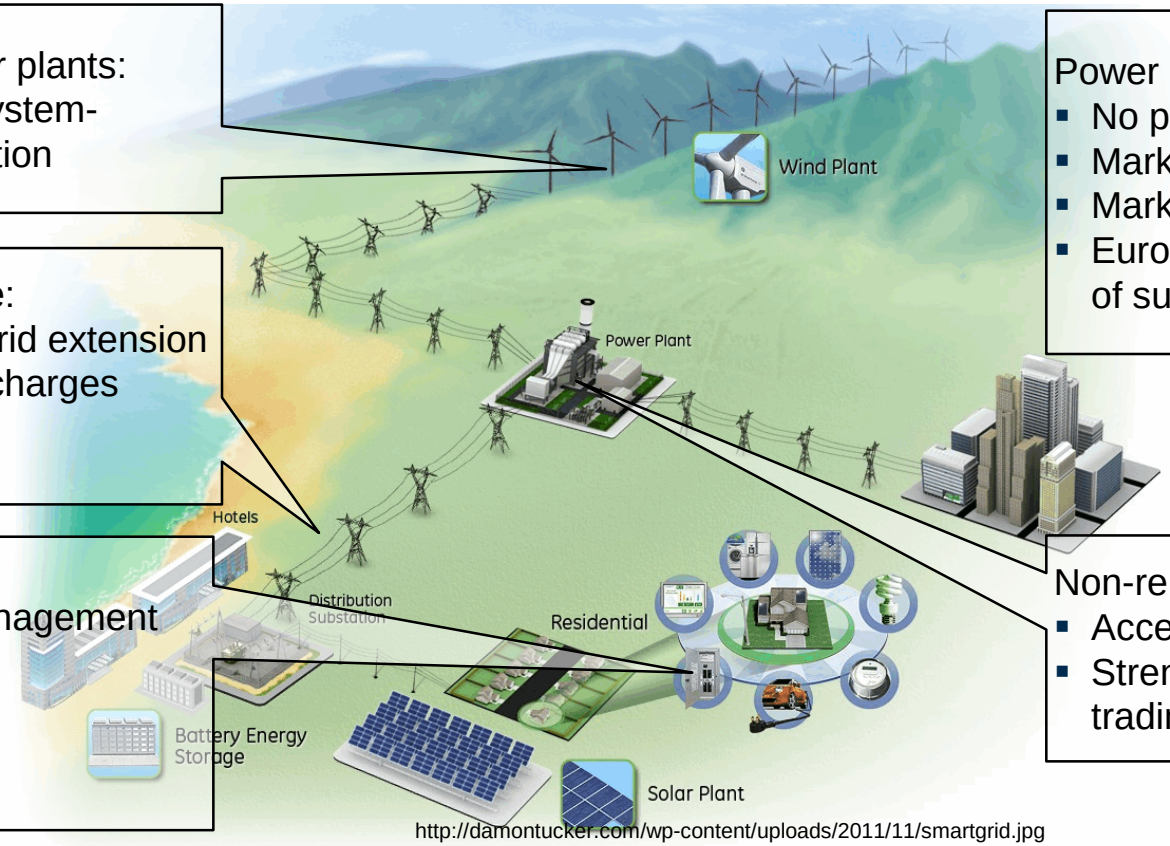
- do not necessarily incentivize **flexibility** options
- are not necessarily **cost-effective** (diverse sources of security of supply problems ignored, e.g. network bottlenecks)
- **redistribute income** from power consumers to power generators
- may impair the long-term transition towards renewables (**carbon lock-in**)
- are hard to revise/abolish (**uncertainty**)

Security of supply needs to be provided by an intelligent portfolio of policy measures

Renewable power plants:
- Promotion of system-friendly generation

Grids and storage:
- Regulation of grid extension
- Design of grid charges
- R&D support

Demand-side management
- Load reduction
- Load shedding
- Load transfer



http://damontucker.com/wp-content/uploads/2011/11/smartgrid.jpg

Power market:
- No power price caps
- Market liberalization
- Market splitting
- Europeanization of security of supply

Non-renewable power plants:
- Acceleration of permitting
- Strengthening of emissions trading

➔ Single-policy approaches (like capacity mechanisms) not suitable

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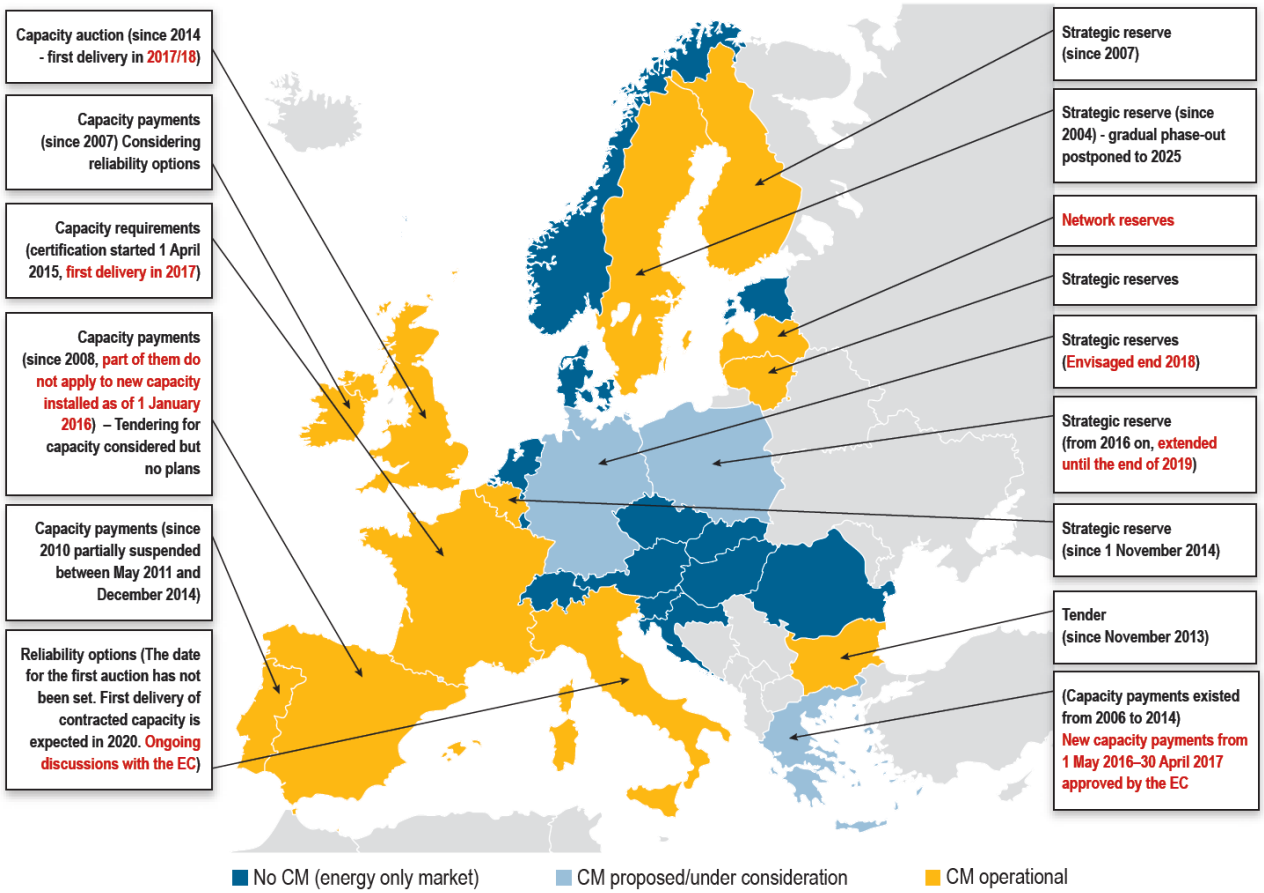
The assessment of national measures needs to include a European perspective



Source: ACER, 2017

- Efficiency gains of large-scale provision of security of supply
- Market interactions
- Legal provisions of internal market

- But: security of supply still nationally framed (political issue)

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Why a politico-economic perspective?

- **Theoretical result**: Safeguarding security of supply with high shares of intermittent renewables requires changes in the regulatory framework

- **Practical question**: Under which conditions are political stakeholders (politicians, bureaucrats, interest groups, voters) open for change?

➔ Impressions from the German case

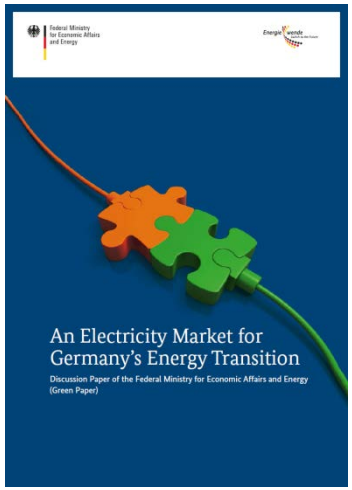
Towards a political solution – two fundamental positions in the debate

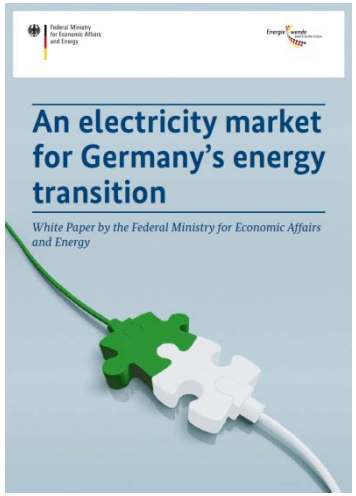
Strengthening the energy-only market (possibly incl. strategic reserve)

- Association of renewables industry
- Consumer organizations (business, households)
- Foreign energy suppliers
- Environmental NGOs
- Ministry of Environment (BMU)

Implementation of a new capacity market in addition

- Associations of energy industry and municipal utilities
- Unions
- BNetzA (grid regulator)
- (Environmental NGOs: focused capacity market)
- Ministry of Economic Affairs (BMWi)





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The German approach: Strengthened energy-only market with a safety net

Strengthening the energy-only market

- No price caps
- Reduction of entry barriers
- Balancing/control markets
- Grid regulation
- …

+

New reserves

- Capacity reserve (technology-neutral)
- Security stand-by (old lignite power plants)

Evaluation

+ policy mix, capacity reserve to account for uncertainty

− only vague measures for RES, grids, storage, demand; new subsidy for CO_2-intensive generation

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Political economy of the German approach

- **Risk-averse politicians** traded off individual interests: satisfy conflicting political targets, avoid political risk of black-out
- **Political path dependencies** have been minimized: minimal-invasive capacity reserve instead of capture-prone broad-band payments (capacity market)
- **Challenge of political uncertainty** remains open: market approach only works if additional capacity payments are ruled out credibly (self-fulfilling prophecy if not)
- **Issue linkage** lead to security stand-by: political debates on security of supply and coal phase-out/climate change mitigation were linked
- **Consultation process** (green and white paper) increased efficiency, transparency, and acceptance of political process

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Implications and open questions for Sweden

- **How big are issues of security of supply in Sweden really?**
  - Less intermittent generation mix, integrated Nordic power market, strategic reserve available

- **Only minor modifications to the Swedish regulatory framework necessary** (see also EFORIS panel project by Bergman et al.)
  - Relax price caps, reduce trading intervals, …
  - But do also think beyond the power market: RES generation, permitting of power plants, networks, storage, demand-side management (broad policy mix!)

- **Explicit option to implement extended capacity mechanism in the future if certain trigger values are surpassed?** (cf. Bergman et al.)
  - Consider drawbacks of broad-band capacity payments

- **And politics matter …**
  - Watch out for self-fulfilling political prophecy

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Read more …

Political Economy of Safe-guarding Security of Supply with High Shares of Renewables

Review of Existing Research and Lessons from Germany

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