INSTITUTE FOR SUSTAINABLE RESOURCES
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UCL

The political economy of electricity market decarbonisation: a comparison of recent reforms in Britain, Italy and California

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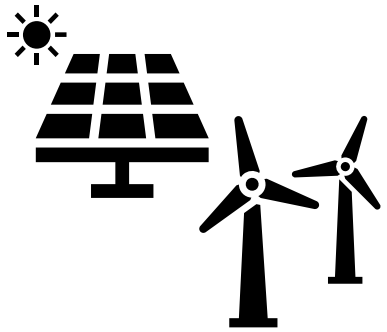
BIEE conference – September 2023

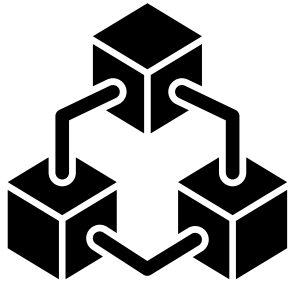
London-Loughborough EPSRC CDT
Centre for Doctoral Training in Energy Demand

Large shares of variable renewable energy changed power system dynamics initiating a second wave of power market reforms

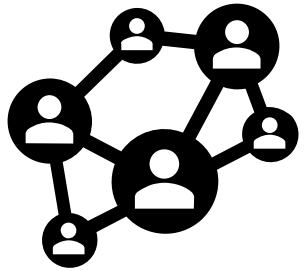


Growing shares of variable renewable energy generation

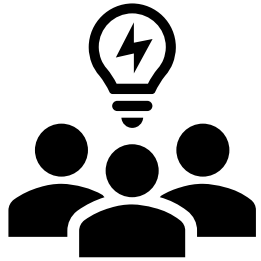
Rise of operational challenges related to intermittency



Traditional and new solutions for system flexibility



Renewables alter market dynamics in legacy systems



New wave of experiments in power markets

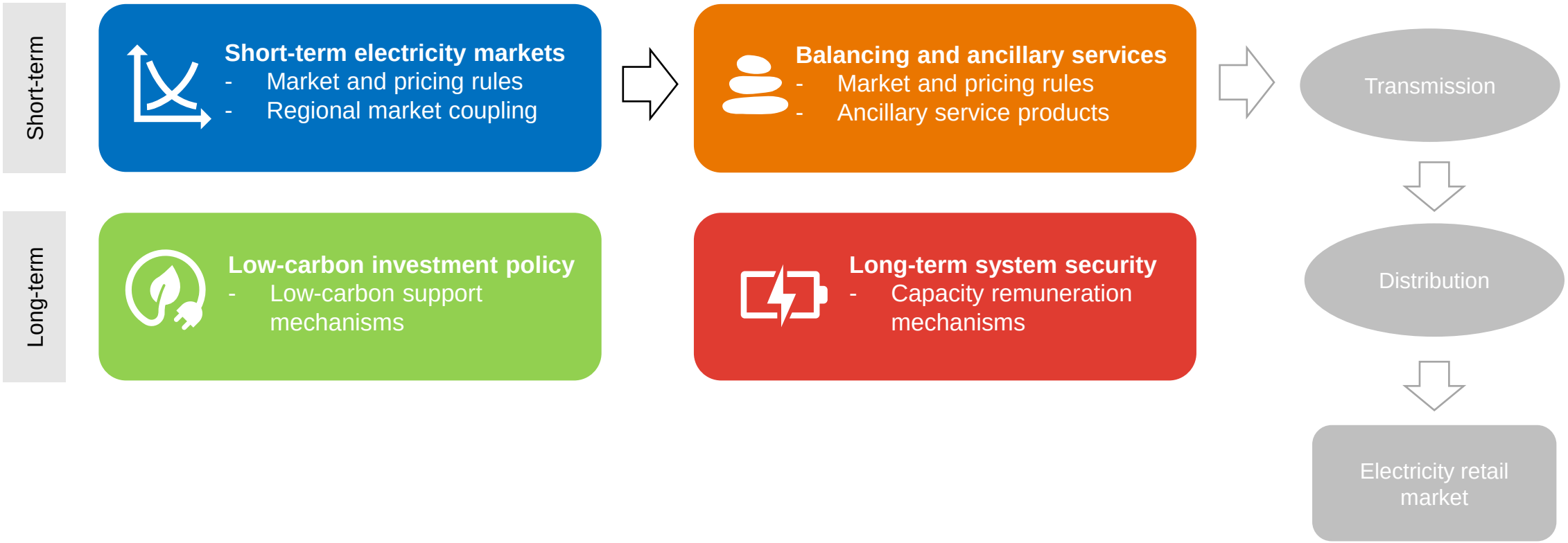
This study fills an important research gap by applying a political economy perspective to the study of recent power market reforms

1. What are the key wholesale power market reforms implemented in Britain, Italy and California to integrate a growing share of renewables on their power systems between 2013 and 2021?

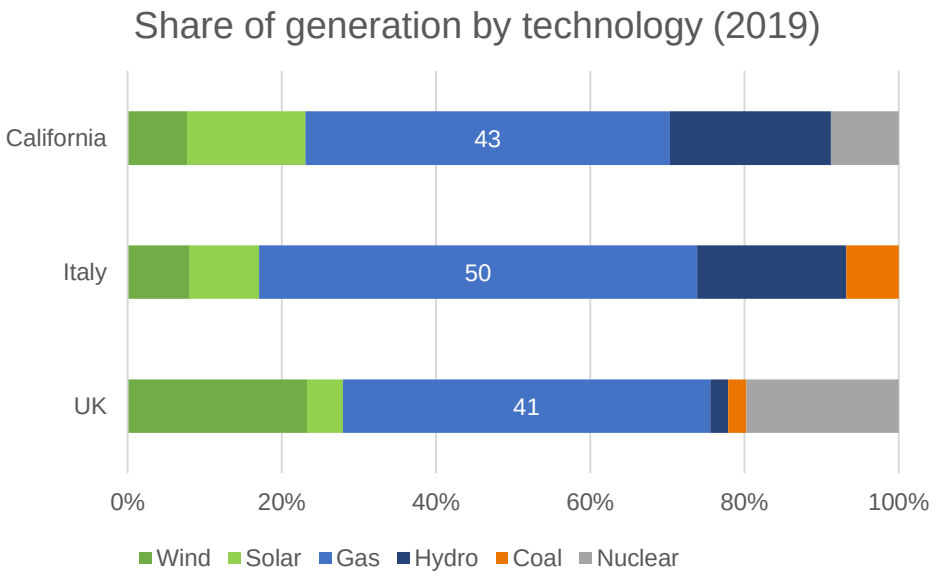
2. How have differences in the techno-economic and political economy contexts of these power systems affected the evolution, scope and nature of the reforms?

3. What are the implications for the design and governance of power markets in these jurisdictions and beyond?

Wholesale electricity market design can be understood as made of four key ‘modules’ each with its specific mechanisms…



Comparative case study analysis (most-similar systems design)



	Britain	Italy	California
GDP (USD/capita)	48711	44140	66661
Population (million)	66.4	60.4	39.5
Electricity demand (TWh)	326.9	315.8	284.4
Geographical area (Km2)	244820	301338	423970

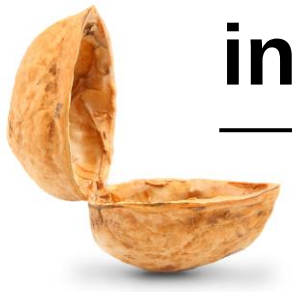
Data collection and analysis

53 in-depth interviews with key power system stakeholders from public and private sector

Over 300 policy documents, consultations, industry and academic reports

Qualitative thematic analysis (abductive approach)

Data sources: OECD, IEA, Energy Information Administration, California Energy Commission, Our World in Data



in a nutshell..

- The three jurisdictions experienced similar techno-economic challenges following VRE growth and introduced some important changes.
- There are some common policy trends but also important differences in the scope of change across market segments, mechanism design choices, resulting policy trade-offs and technological outcomes.
- To some extent, these differences mirror their specific techno-economic conditions (e.g. geographies, technologies, infrastructures, market dynamics etc.)
- Yet, findings consistently highlight that the evolution of power market design is also shaped by a set of key political economy and institutional conditions, pivotal to explaining patterns of change both within and across cases.

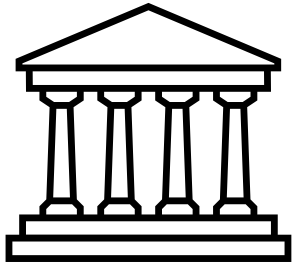
Comparison points to five key political economy conditions that explain differences in recent reforms

National political priorities

- Political priorities and political cycles
- Political acceptability of technologies and mechanisms
- Government stability, structure and capacity

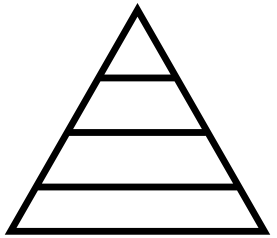
State-market relations

- Legacy political economy model
- Dominant ideas on the role of state and markets
- Degree of unbundling and privatisation



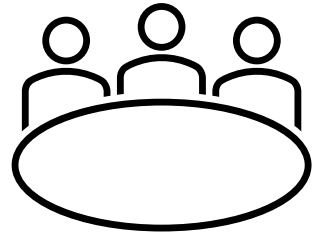
Sector-specific institutions

- Legacy market model and dominants operational philosophies
- Institutional missions and incentives
- Independence, capacity and influence



Multi-level governance

- Political homogeneity and relations with other systems
- Multi-level institutional arrangements (power, capacity and trust)
- Dominant ideas in multi-level institutions



Market structures and interests

- Market structures and ownership of key assets
- Variety and organisation of interest groups
- Policy access/influence
- Economic composition of electricity demand
- Energy sector turnover and employment

1. Short-term electricity markets

Britain

- Coupled and uncoupled day-ahead market.
- No major modifications to legacy day-ahead and intraday market rules – i.e. decentralised dispatch.
- Maintains half-hourly trading.
- No limits on wholesale prices.
- Maintains single national pricing but modifications in network charges.
- Ongoing major market design review.

Italy

- Coupled day-ahead and intraday.
- Significant change in intraday market rules - shift to ‘hybrid dispatch’ model.
- Introducing more granular trading in day-ahead and intraday markets.
- Yet to remove negative wholesale price floor.
- Retains zonal pricing model - discussions on exposing consumers to differentiated pricing.

California

- Coupled real-time but not day-ahead.
- Gradual modifications to market rules but legacy market model persists – i.e. ISO-led centralised dispatch.
- Introducing more granular trading in real-time and day-ahead markets.
- Maintains both positive and negative price caps but relaxed over time.
- Retains legacy locational marginal pricing model.

2. Balancing and ancillary services

Britain

- Introduced balancing single marginal pricing and an administrative scarcity reserve pricing mechanism in 2015.
- Ongoing comprehensive reform of ancillary services led launch of new products and participation of non-traditional providers.
- Trialing of local flexibility markets and DSO-led platforms.

Italy

- Single marginal pricing for balancing identified as target solution in 2019 but implementation delayed.
- Introduced administrative shortage pricing mechanism.
- Ongoing experimentation with new ancillary products and service providers yet to result in rule changes.
- Early-stage experiments with local flexibility procurement.

California

- Energy and reserves co-optimisation and early introduction of administrative scarcity pricing.
- New flexiramp product rewarding operational flexibility in reserves.
- New market participation frameworks and bid parameters for new providers.
- Limited experience with local flexibility markets but growing interest in local energy systems and microgrids.

3. Long-term capacity investment

Britain

- In 2014 major shift from energy-only-market to capacity market. Since then, gradual modifications to mechanism design parameters.
- Explicit flexible capacity procurement mechanism considered as part of ongoing market design review.

Italy

- In 2019, shift from capacity payment to capacity market with reliability options.
- Ongoing definition of mechanism for flexible capacity procurement following EU approval.

California

- Significant modifications to legacy decentralised obligations scheme – i.e. procurement, methodologies, targets.
- Explicit storage procurement targets from 2014.
- U-turn conventional plant retirements and new strategic reserve.

4. Low-carbon investment policy

Britain

- In 2014, contracts-for-difference (CfD), replaced decentralised renewable energy obligation.
- Incremental modifications to CfD – i.e., auctioning, funding for different technologies, and removal of compensation with negative prices.
- Recent introduction of a regulated asset base model for nuclear.

Italy

- Up to 2014, multiple RES support schemes including green certificates, feed-in-tariffs and net metering for distributed generators.
- Followed by reduction in renewable support and the rise of significant planning barriers.
- A CfD scheme with auctioning introduced in 2019.

California

- Legacy renewable portfolio standards scheme for utility-scale RES remains but adjusted over time – e.g. ramp in in RES targets.
- DG supported through net metering and other schemes.
- Introduction of integrated resource planning in 2015 – framework consolidated since.

Findings have implications for both theory and policy practice.

- Political economy approach extremely useful for understanding power sector evolution.
- No one-size-fits-all market design solution emerging, but there are some common trends.
- Long-term contracts and state-led mechanisms becoming a core part of market design rather than temporary fix – design choices depend on political economy context and lead to different policy trade-offs.
- Multiple solutions that make sense from an efficiency perspective are difficult to implement - ‘second-best’ designs often used to manage politics.
- Diversifying procurement of system services involves challenging legacy ideas on system operation and reforming incentives of key sector institutions to enable innovation.
- Whatever model is chosen, efforts should focus on ensuring coherence of emerging market designs and governance arrangements.

Thank you for listening!

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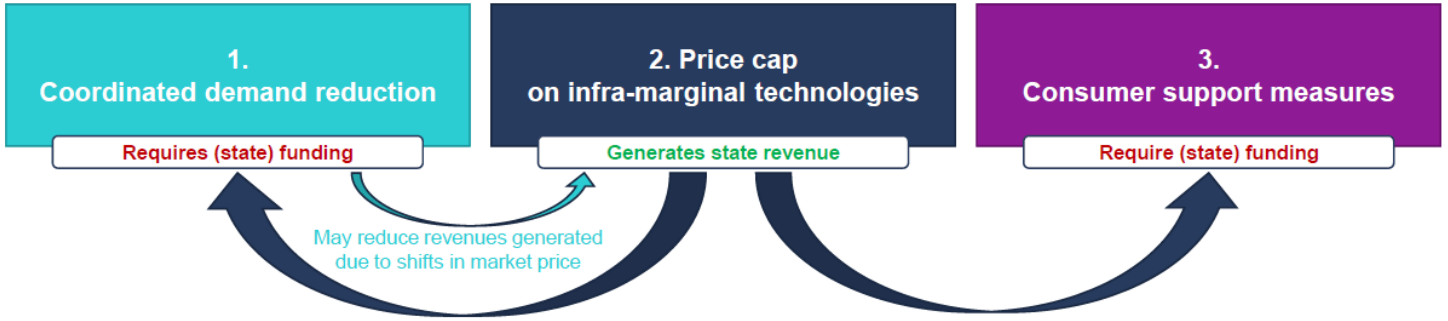
Overview of policy responses to the energy crisis in Europe



Source: European Commission (2022, September 9), *Proposal for a Council Regulation on an Emergency Intervention to Address High Energy Prices*, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022PC0473&from=EN.

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovenia	Slovakia	Spain	Sweden	United Kingdom
Direct subsidy for energy costs	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•		•	•	•	•	•		•	•	•
Reduced energy tax/ VAT	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	•
Decrease/ exemption from network tariffs	•							•			•				•	•						•			•	•		•
Retail price regulation	•		•			•	•	•		•	•		•					•	•	•	•		•		•	•		•
Wholesale price regulation										•									•				•			•		
Windfall profits tax/regulation			•										•		•						•		•			•		•

Source: Sgaravatti, G., Tagliapietra, S., Trasi, C., and Zachmann, G. (2023, March 24), *National Fiscal Policy Response to the Energy Crisis*, Bruegel, https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.