NERA
ECONOMIC CONSULTING

New Topics in Electricity Market Design

EPRG Winter Seminar, 2014

Richard Druce
Senior Consultant

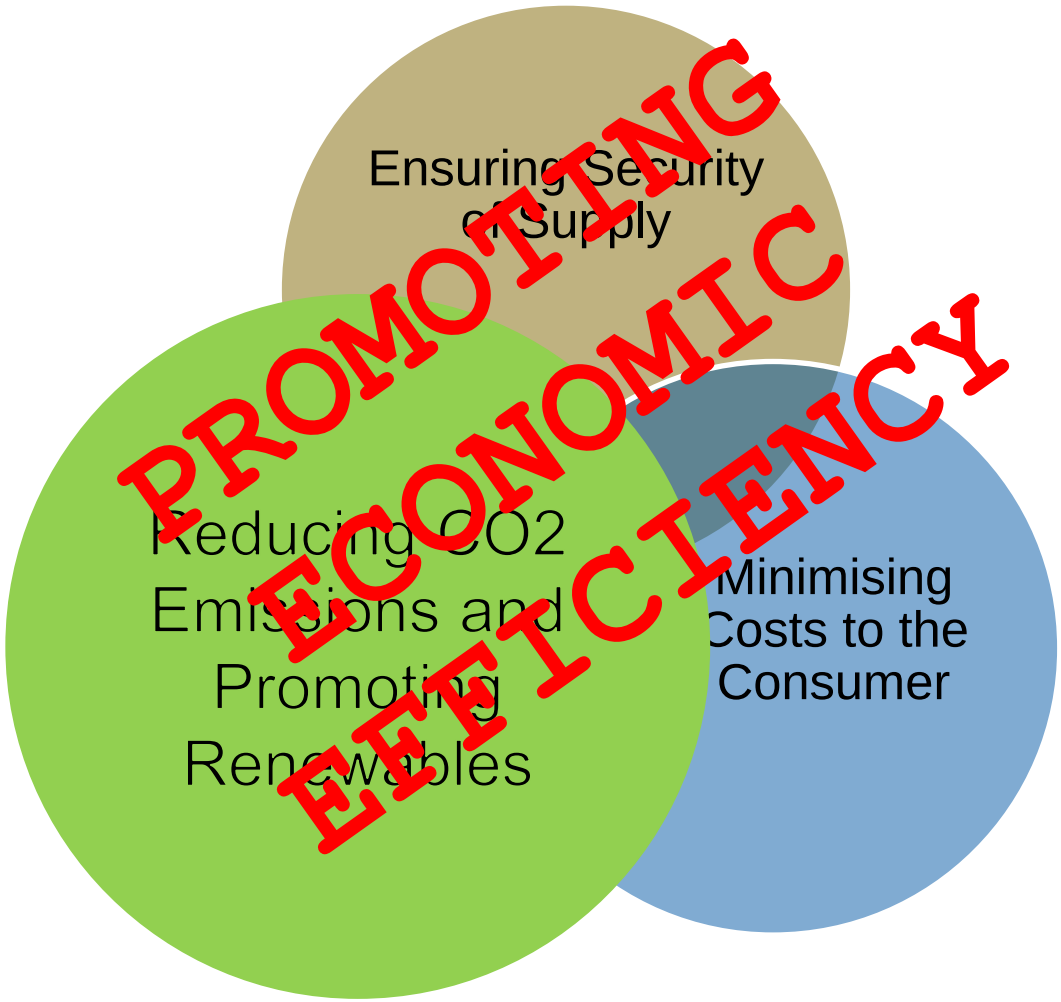
George Anstey
Senior Consultant

Cambridge

12 December 2014

Insight in Economics™

Market design, like all facets of energy policy, is being influenced by the "trilemma"

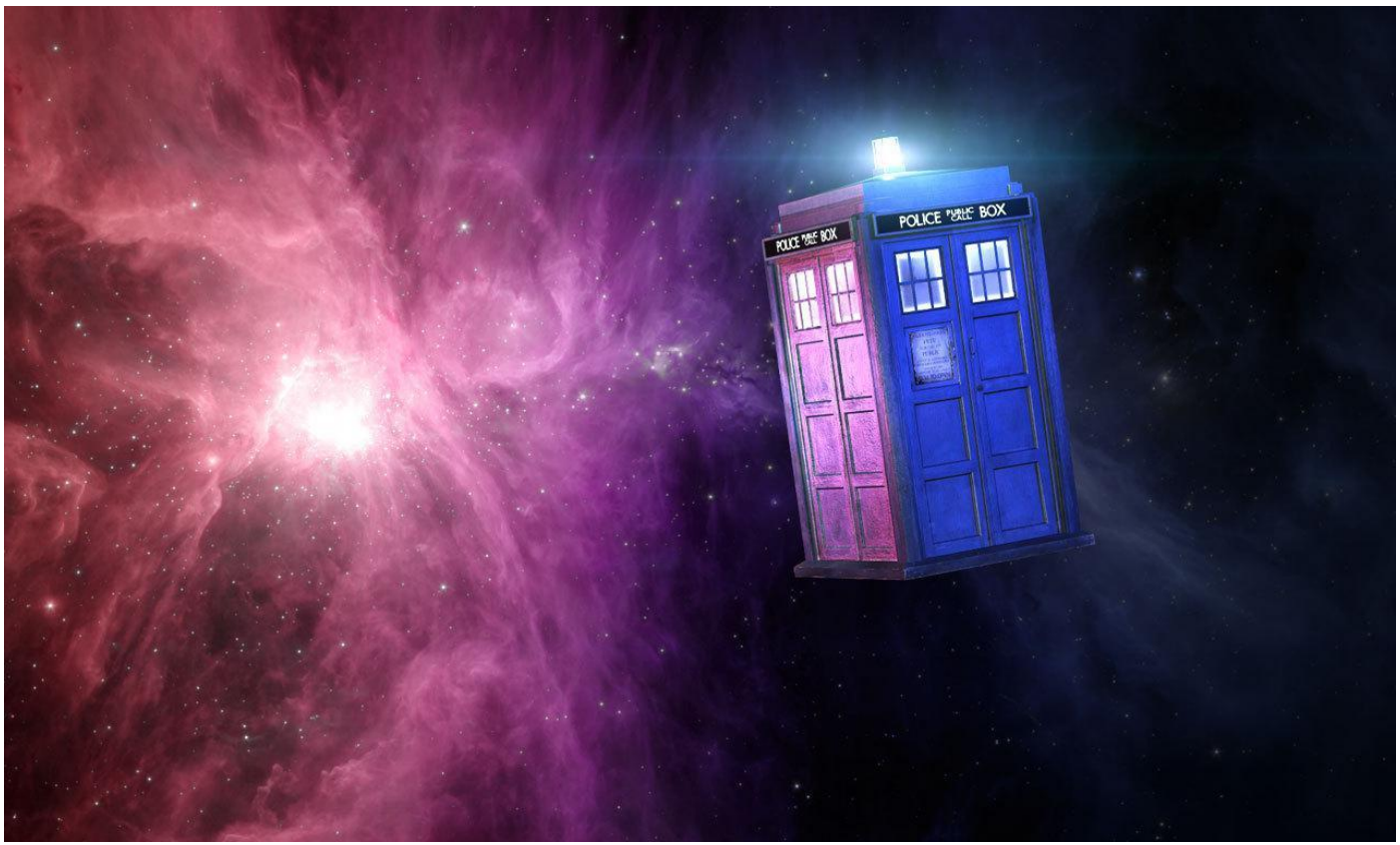


- For some years, EU policy debates on market design have needed to consider the "trilemma"
- In fact, all these policy aims can be supported by designing market arrangements to promote *economic efficiency*
- Primarily, this means sending price signals to market participants that reflect marginal cost

NERA
ECONOMIC CONSULTING

Sharpening Price Signals in the Energy Market

Electricity is limited in its capacity to traverse time and space!



Source: http://cardifflocalguide.co.uk/dr-who-experience/

Even in low carbon power systems, efficient markets are powerful tools for revealing information on how the value of energy varies over time and across different locations

(1) Space: Efficient locational signals can promote efficiency in power trading and the placement of generation

NERA
ECONOMIC CONSULTING

- Market arrangements should encourage efficient trade-offs between:
  - Locational variation in generators' own costs (wind speeds, access to fuel, etc)
  - Locational variation in power system costs and benefits, such as variation in T&D costs, and/or the value of the energy produced
- Theory provides a solution: locational marginal pricing of energy (LMP)

Setting pricing zones delineated by points of persistent congestion, as per the EU Target Model, would be a step in the right direction.

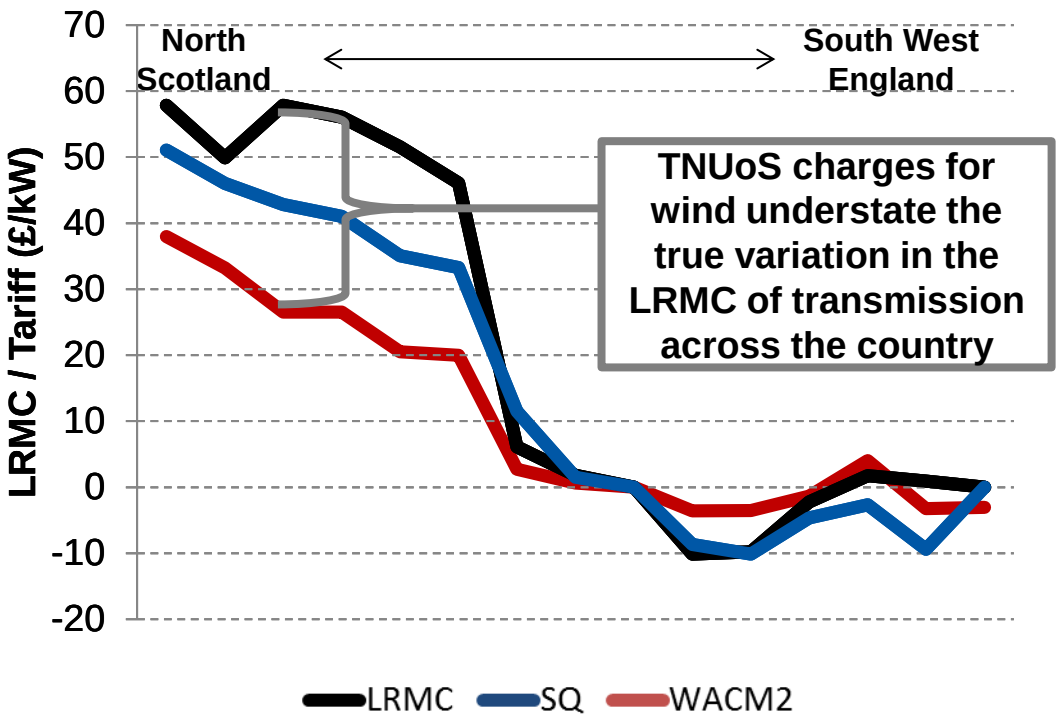
(1) Space: In the meantime, transmission charges could, in theory, convey the same efficient signals as LMP

- If the network is built efficiently, it is possible to set infrastructure charges that send signals, on average over the year, equivalent to LMP

  Σ_{hours} LMP / 8760
  => LRMC of Transmission
  => Efficient Transmission Access Price

- Ofgem's Project TransmiT sought to move transmission charges closer to this theoretical ideal, by pricing the infrastructure required to efficiently trade-off constraints and investment

LRMC of Transmission to Efficiently Accommodate Wind, vs TNUoS Charges



Source: NERA and Imperial College London (Feb 2014)

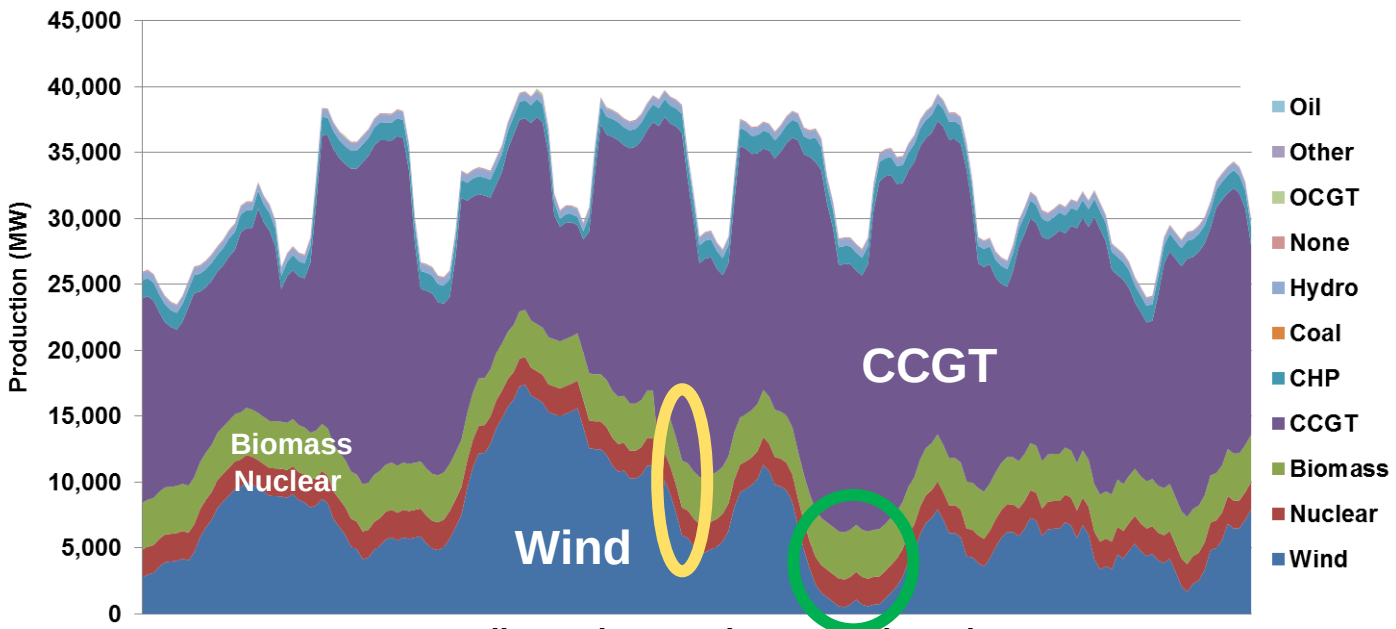
(2) Time: Efficient peak pricing is especially important in high-RES systems

Windy systems rely heavily on flexible plant to ramp up and down as wind speeds change, and to provide back-up capacity when it is not

Efficient peak pricing can signal that there is not enough capacity, or that it is responding too slowly. Some reforms are working towards this (e.g. Balancing Services SCR making prices "more marginal")

Some evolution in market design may further enhance efficiency:

- *Shorter trading intervals*
- *Real time pricing of ancillary services*



Illustrative Hourly Production Mix in GB – 7 Days During April 2025

Source: NERA Modelling

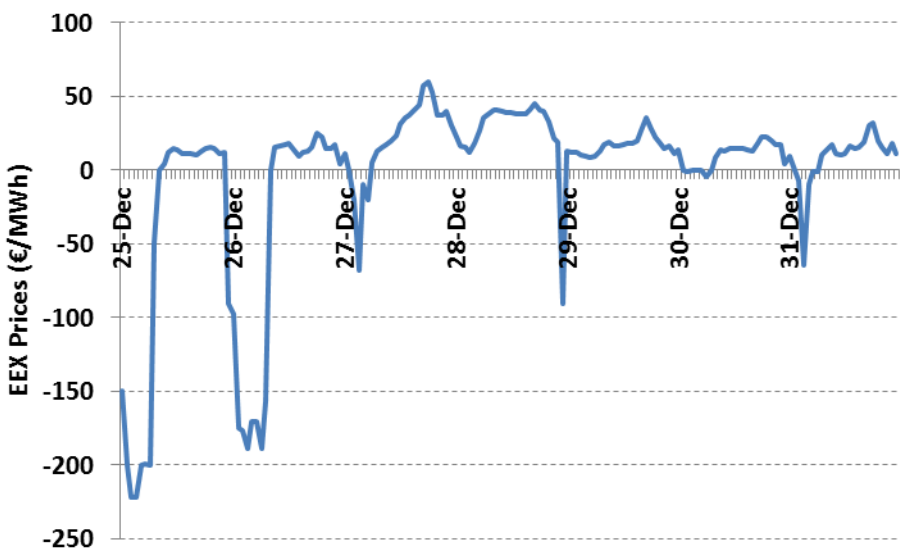
Making market price signals more efficient adds most value if subsidy schemes make use of them

NERA
ECONOMIC CONSULTING

	Support scheme	Balancing responsibility	Exemptions for RES-E	Level of balancing responsiblity
Austria	FiT	no	-	0
Belgium	Quota	yes	yes	2
Bulgaria	FiT	no	-	0
Croatia	FIT/Other	no	-	0
Cyprus	Premium	no	- (planned)	0
Czech Republic	FiT / Premium	no	-	0
Denmark	Premium	yes	none	2
Estonia	Premium	yes	none	2
Finland	Premium	yes	none	2
France	FiT	no	-	0
Germany	FiT / Premium	Premium only	none	1
Great Britain	Quota, FiT	yes	for FiT	1
Greece	FiT	no	-	0
Hungary	FiT	yes	yes	1
Ireland/N. Ireland	FiT / (SEM?)	only for SEM	yes	1
Italy	FiT/Premium/Other	party	yes	1
Latvia	FiT (Premium planned)	yes	yes	1
Lithuania	FiT	no	-	0
Luxembourg	FiT	no	-	0
Malta	FiT	no	-	0
Netherlands	Premium	yes	none	2
Poland	Quota (FiT planned)	yes	none	2
Portugal	FiT	no	-	0
Romania	Quota	yes	yes	1
Slovakia	FiT	no	-	0
Slovenia	FiT/Premium	Premium only	none	1
Spain	FiT/Premium	yes	none	2
Sweden	Quota	yes	none	2

0: no balancing responsibility for RES-E; If there is no balancing responsibility, the column "Exemptions for RES" typically does not apply.
1: RES-E are not fully exempted, but there is a specific balancing regimes for RES-E or there is a balancing responsibility only under certain support schemes;
2: Full balancing responsibility for RES-E.
Source: European Commission

- Across many EU jurisdictions, subsidised low carbon generation is taken out of the market
- A lack of exposure to market price signals, as well as energy-based subsidies can lead to perverse outcomes – see negative German power prices



Source: Platts Powervision

NERA
ECONOMIC CONSULTING

Capacity Remuneration Mechanisms (CRMs)

CRMs are interventions to protect security of supply

Source: http://blackadder.wikia.com/wiki/English_Civil_War_Baldrick

Source: http://www.tc.nationwide-bathrooms.co.uk/baths/tc-cromwell-freestanding-double-skinned-acrylic-bath-on-feet.html

The CRMs being rolled out across Europe run the risk of being like Baldrick's bath

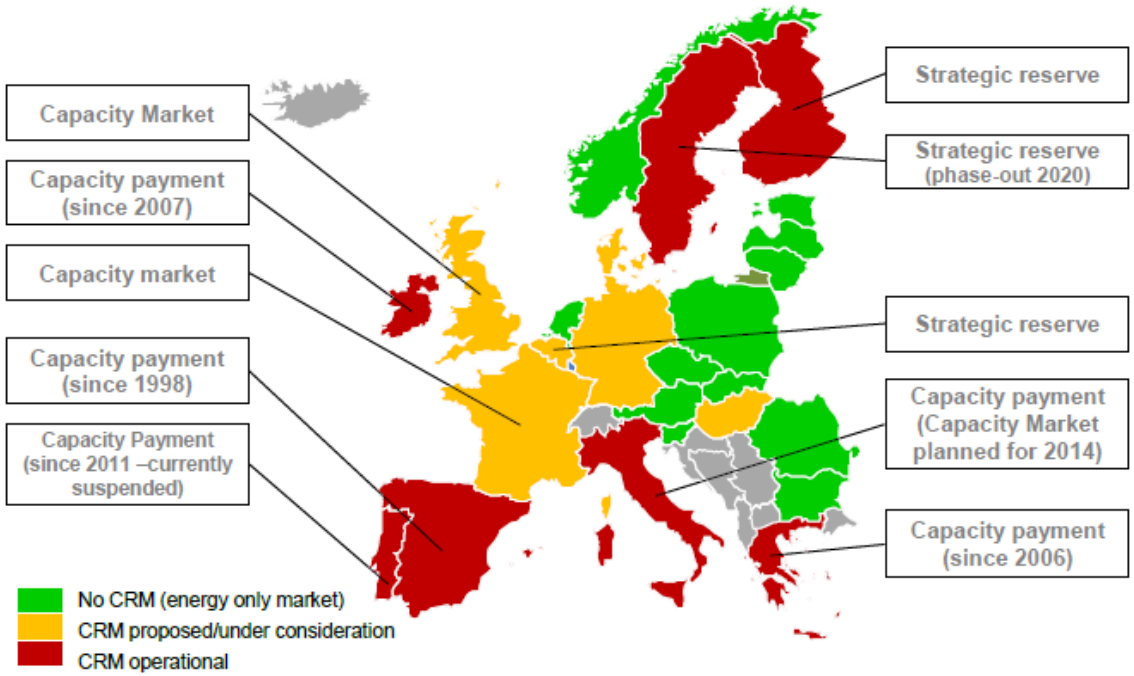
CRMs are a response to concerns that markets will fail to deliver

NERA
ECONOMIC CONSULTING

Possible Market Failures:

- *Explicit* price caps
- *Implicit* price caps
  - Credibility of volatile prices
  - Uncertain government policy
- … exacerbated by greater investment in intermittent capacity.

Capacity Remuneration Mechanisms (CRMs) by Jurisdiction (2013)



Source: ACER (2013), *Capacity Remuneration Mechanisms and the Internal Market for Electricity*, 30 July 2013, page 8

CRMs attempt to replace (non-credible?) volatile peak prices with a more credible, stable signal

In principle, a security of supply intervention could target price or quantity

NERA
ECONOMIC CONSULTING

Sharper Peak Prices

- Expose participants to marginal costs of their actions
- Fixes *explicit* price caps but may not deal with potential credibility problem
- Favoured by Commission

Capacity Payment

- Payment available to any market participant providing capacity (LOLP-related)
- Replaces missing money
- Commission staff working document favours procurement auctions

Targeted Mechanism

- Smaller apparent intervention
- Undermines peak prices and investment incentives for all non-contracted participants
- Commission staff working document favours over market wide schemes

Market-Wide Mechanism

- Competitive auction available to all market participants (in the UK excepting renewables)
- US heritage as a response to explicit price caps (e.g. $1,000/MWh)
- GB model

National authorities are increasingly favouring capacity *markets* over *payments* to provide stable, market-led signals for investment

Picture sources: freeflagicons.com, http://en.wikipedia.org/wiki/File:Irish_flag_english_flag_map_style.PNG, graphicsfuel.com, http://www.bbc.co.uk

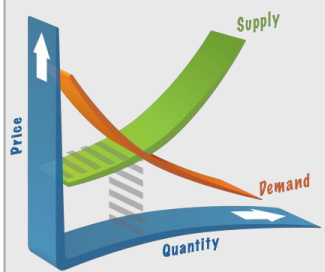
Prices in capacity markets depend on the *rules* as well as fundamentals

NERA
ECONOMIC CONSULTING

The (admittedly short) history of the British Capacity Market has already shown that rules may come under pressure

15-year contracts

Demand Side Response



Interconnectors and zoning

Arbitrage between T-4 and T-1

If the rules themselves are volatile, the capacity mechanism will not be credible

Picture sources: http://avenueright.com, http://www.saveoursavers.co.uk/, http://www.spenergywholesale.com/, telegraph.co.uk, newenergynews.blogspot.com, http://electrical-engineering-portal.com, www.fluentstream.com/, dreamstime.com

NERA
ECONOMIC CONSULTING

Conclusions

Conclusions

- Power market design should aim to promote economic efficiency through efficient pricing
- Policy measures to bring prices closer to marginal cost can help, but there may be limits on what they can achieve
- Capacity mechanisms can only solve any security of supply problem if they can provide a more stable and credible signal than the energy price signals they replace

NERA
ECONOMIC CONSULTING

Contact Us

Richard Druce

Senior Consultant
NERA—London
+44 20 7659 8540
richard.druce@nera.com

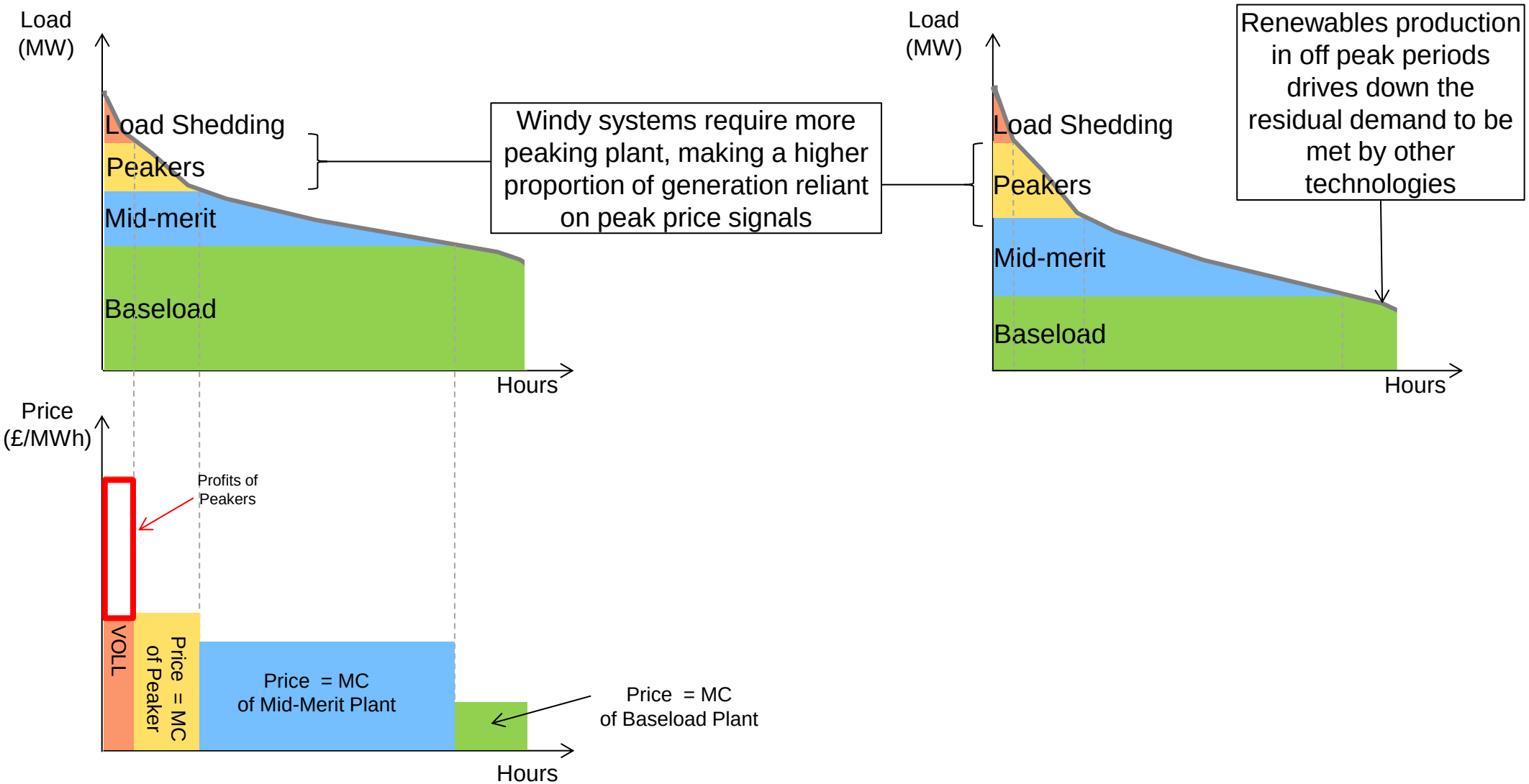
George Anstey

Senior Consultant
NERA—London
+44 20 7659 8630
george.anstey@nera.com

NERA
ECONOMIC CONSULTING

Back-up Material

Efficient peak pricing is especially important in RES-dominated power systems



Recent reforms have improved efficiency of peak pricing

Recent changes to the calculation of bid/offer prices will sharpen signals