

UK Electricity Market Reform: intelligent market decarbonisation or back to central planning?

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A New Target Model For European Electricity Markets

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<http://www.eprg.group.cam.ac.uk>

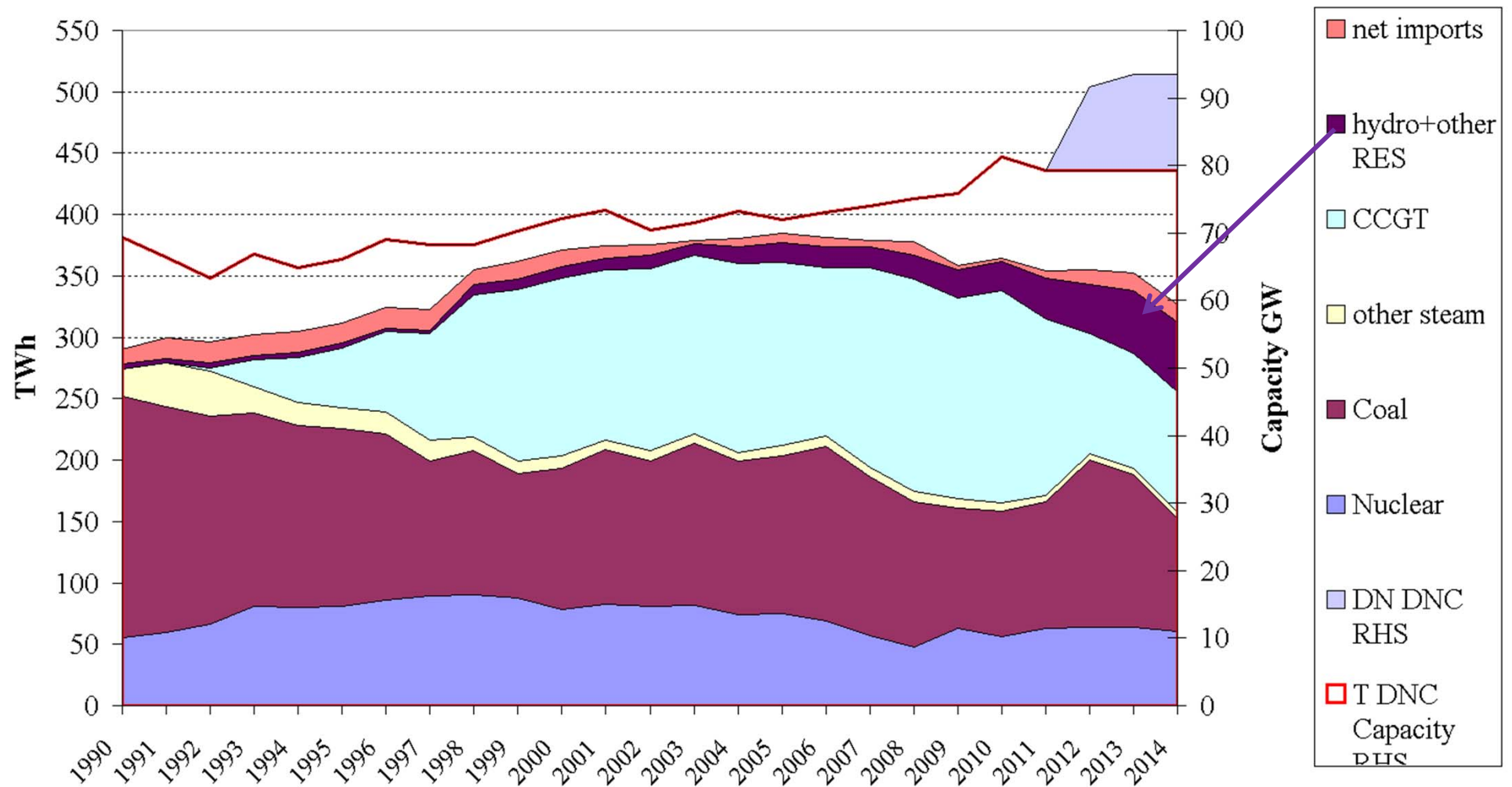
Outline

- Evolution of UK energy policy to EMR
 - EMR content
- EMR outcomes
- Criticisms: misguided and valid
- Adapting to the *Energy Union* agenda

***Disclaimer:** I am a member of the EMR Panel of Technical Experts but my comments do not reflect any official position and this presentation is based solely on what is in the public domain.*



Electricity supplied by, and capacity of, UK generators, 1990-2014



Source: DUKES, excludes pumped storage

Conservative policies 1982-97

‘Our task is rather to set a framework which will ensure that **the market operates** in the energy sector with a minimum of distortion ..’ (Lawson, speech to IAEE, 1982)

Labour policies 1997-2010 More objectives, less coherence

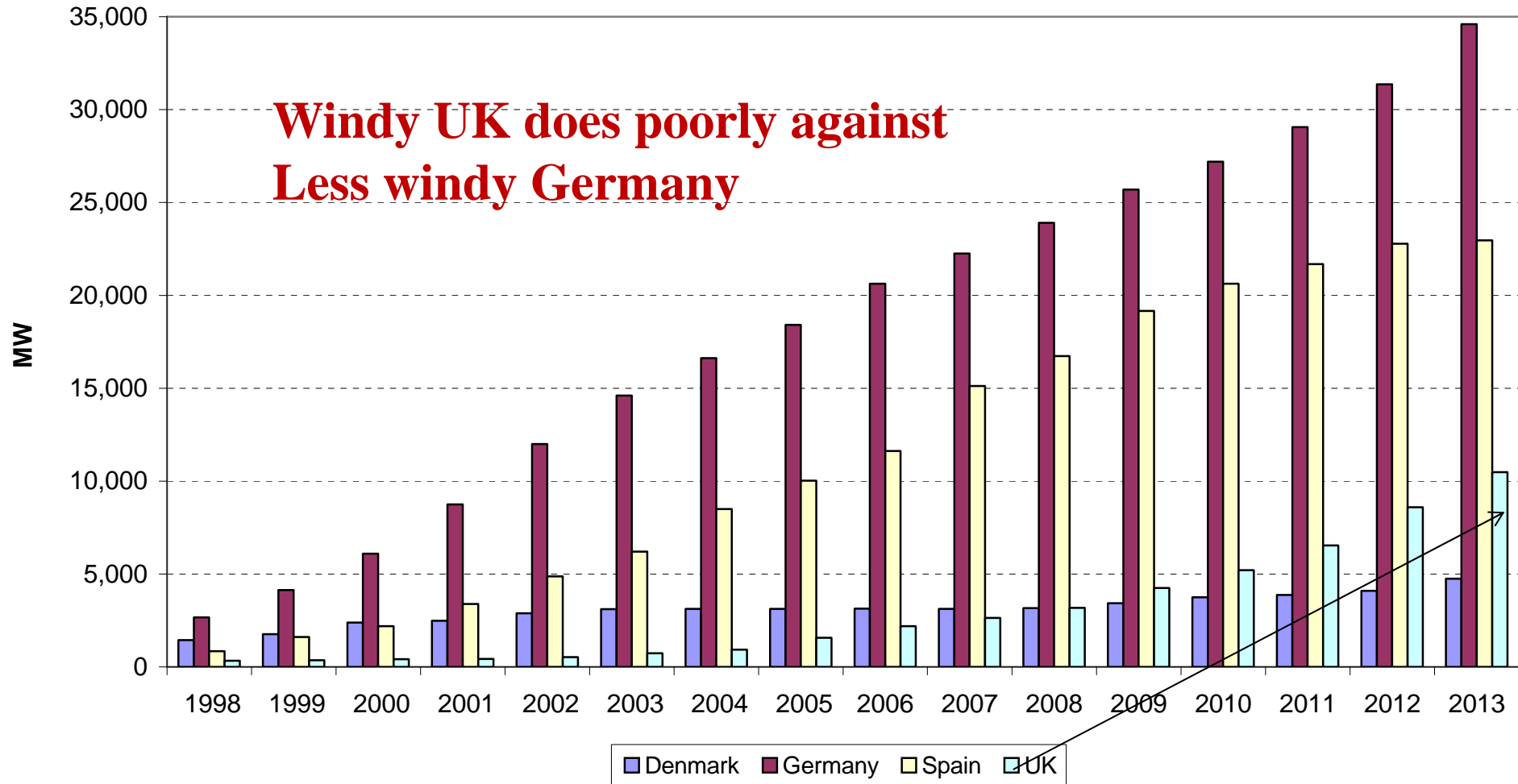
- Protect the environment **and** equity
- Protect coal **and** reduce CO₂ emissions
- Lower energy tax **but** pass on environmental costs
- Retain independent regulators **but** increase ministerial ‘guidance’ - *Utilities Act* 2000

Consensus: Climate Change Act 2008, EMR 2013

- Deliver **secure low-C electricity affordably**

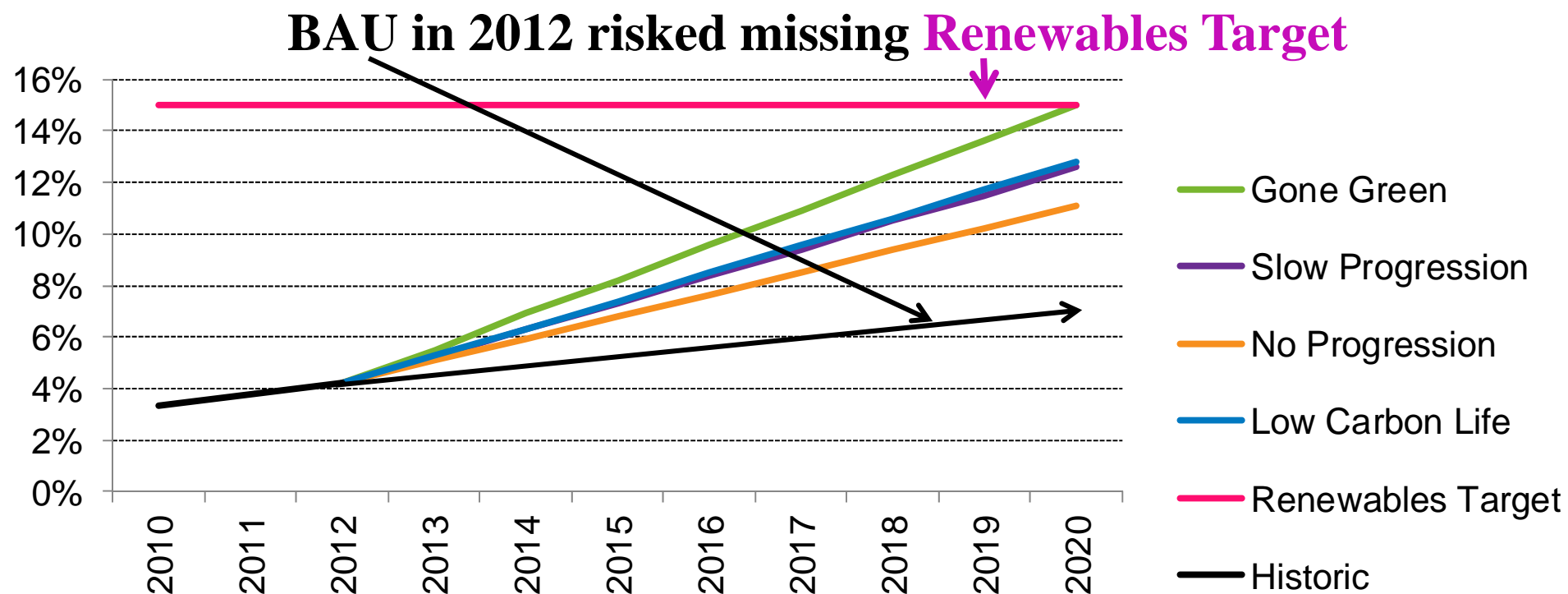


Installed wind capacity in MW



Sources: IEA to 2011, EWEA 2011-13

UK target for renewables: 2015 Future Energy Scenarios



Future energy scenarios 2015

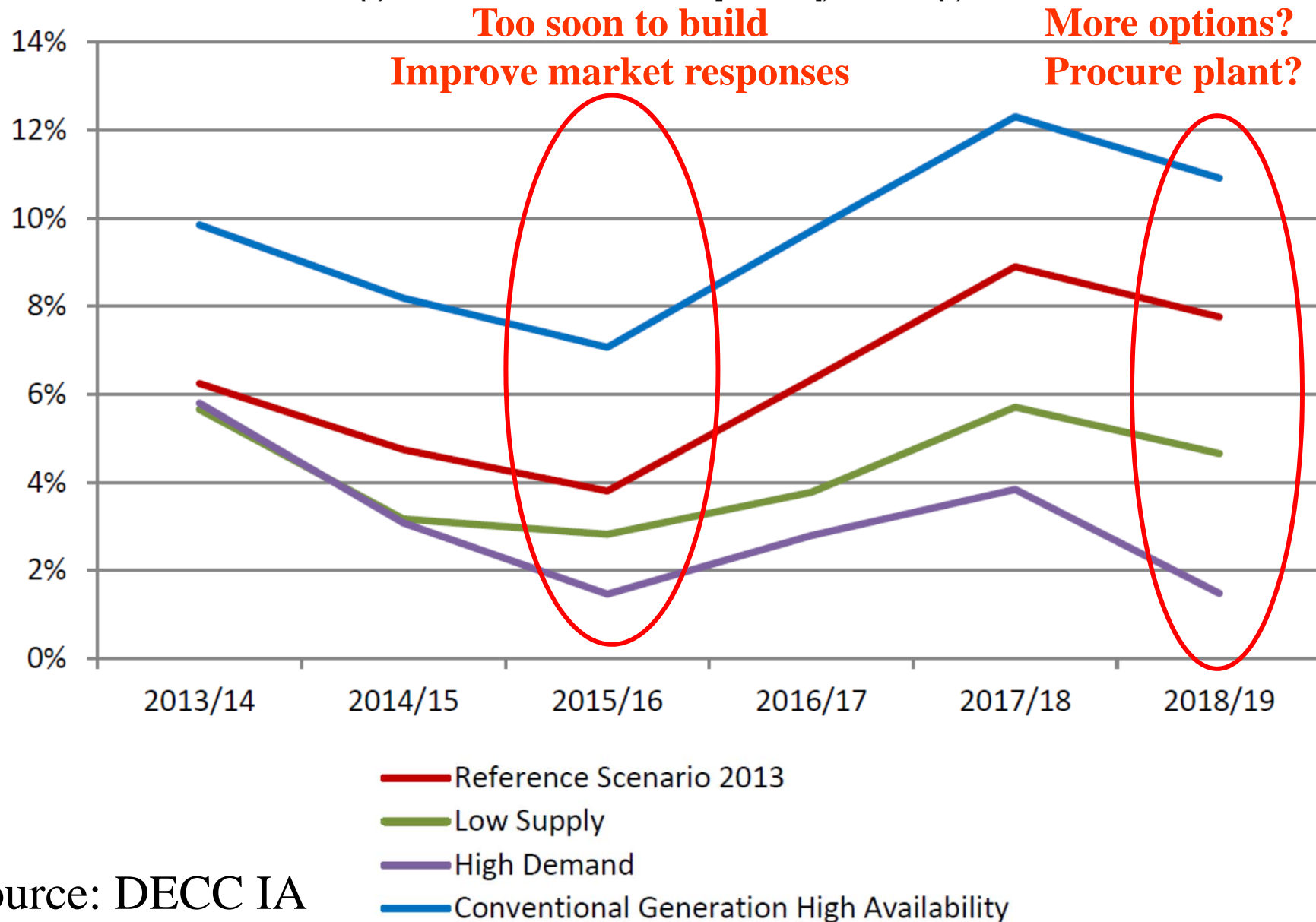
- Ambitious RES targets **increase intermittency**
 - Need flexible peaking reserves
 - Normally comes from old high cost plant = **coal**
 - Large Combustion Plant Directive 2016 limits coal
 - Integrated Emissions Directive further threat to coal
 - Carbon price floor + hostility to coal => **close old coal**
 - high 2014 EU gas prices and low load factors
 - **gas unprofitable**, new coal prohibited by EPS
- Future prices now depend on **uncertain policies**
 - on carbon price, renewables volumes, other supports
 - on policy choices in UK and EU

hard to justify investing in reliable power



What is the problem?

Ofgem's derated capacity margin



Source: DECC IA

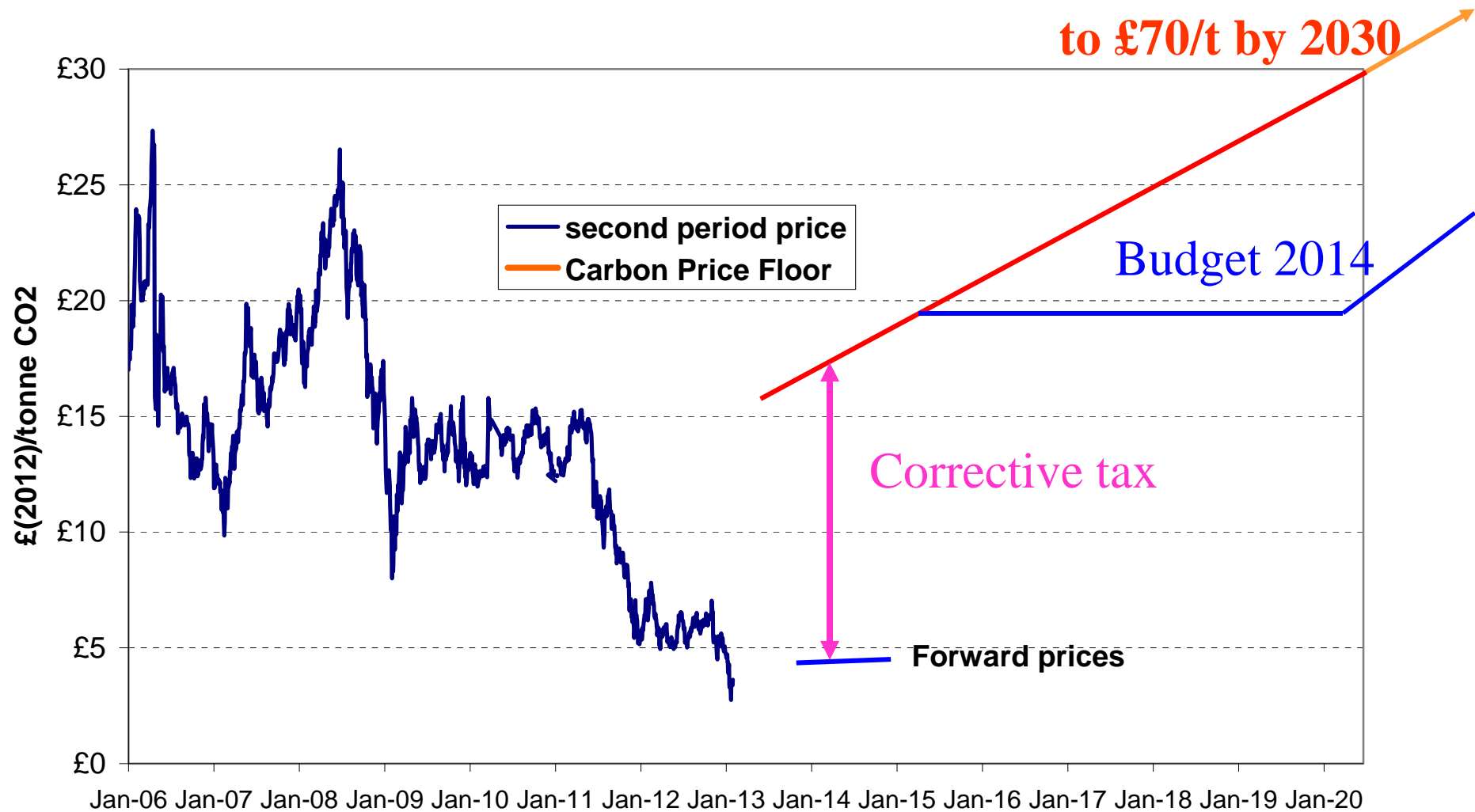
Electricity Market Reform

- UK Energy Act 18 December 2013 to address:
 - Security of supply and carbon/RES targets
 - Address problems with EU ETS & Market/policy failures
- To deliver secure low-C in UK affordably
 - => capacity payments
 - => Carbon Price Floor
- de-risk RES investment => CfDs to lower WACC
- Energy-only markets: capped, balancing market distorted, flexibility under-rewarded= *Missing Money* and *Missing Market* problems
 - => Capacity Auctions for long-term contracts
 - => competition *for* the investment market



UK's Carbon Price Floor - in Budget of 3/11

EUA price second period and CPF £(2012)/tonne



D Newbery 2013

10

Source: EEX and DECC Consultation

CfDs in *Energy Act 2013*

- 2013: **Government sets strike prices** and annual subsidy limit (Levy Control Framework)
 - CfDs uniform by technology set 2014-17
 - run **in parallel with ROCs to 2017**
 - => has to be made as attractive as ROCs
 - => comparable rate of return (rather high for on-shore wind)
 - => **undermines logic of lowering cost by lowering risk**
- **May 2014: replace with auctions for mature RES**
 - But prices **set by ROCs?** Indicates high risk premium

Finally DG COMP enforces sense



CfD 2015 auction results

Technology		admin price	lowest clearing price	2015/16	2016/17	2017/18	2018/19	Total Capacity (MW)
Advanced Conversion Technologies	£/MWh MW	£140	£114.39			£119.89 36	£114.39 26	62
Energy from Waste with Combined Heat and Power	£/MWh MW	£80	£80				£80.00 94.75	94.75
Offshore wind	£/MWh MW	£140	£114.39			£119.89 714	£114.39 448	1162
Onshore wind	£/MWh MW	£95	£79.23		£79.23 45	£79.99 77.5	£82.50 626.05	748.55
Solar PV	£/MWh MW	£120	£50.00	£50.00 32.88	£79.23 36.67			69.55

Source: DECC (2015)

Foolish bid - withdrew



- March 2015 start **negotiations** over a potential CfD for Swansea Bay Tidal Lagoon
 - 9 June 2015 **Planning** consent given
 - Surely no learning benefits, so **no case for support**
- April: threat of job-layoffs as HPC FID delayed
- 17 June Sec of State plans new Energy Bill to **end RO scheme for on-shore wind** early;
 - Communities to have **final say on wind farm applications**
- 2 June RenewableUK warns DECC of legal action over early onshore wind subsidy cut

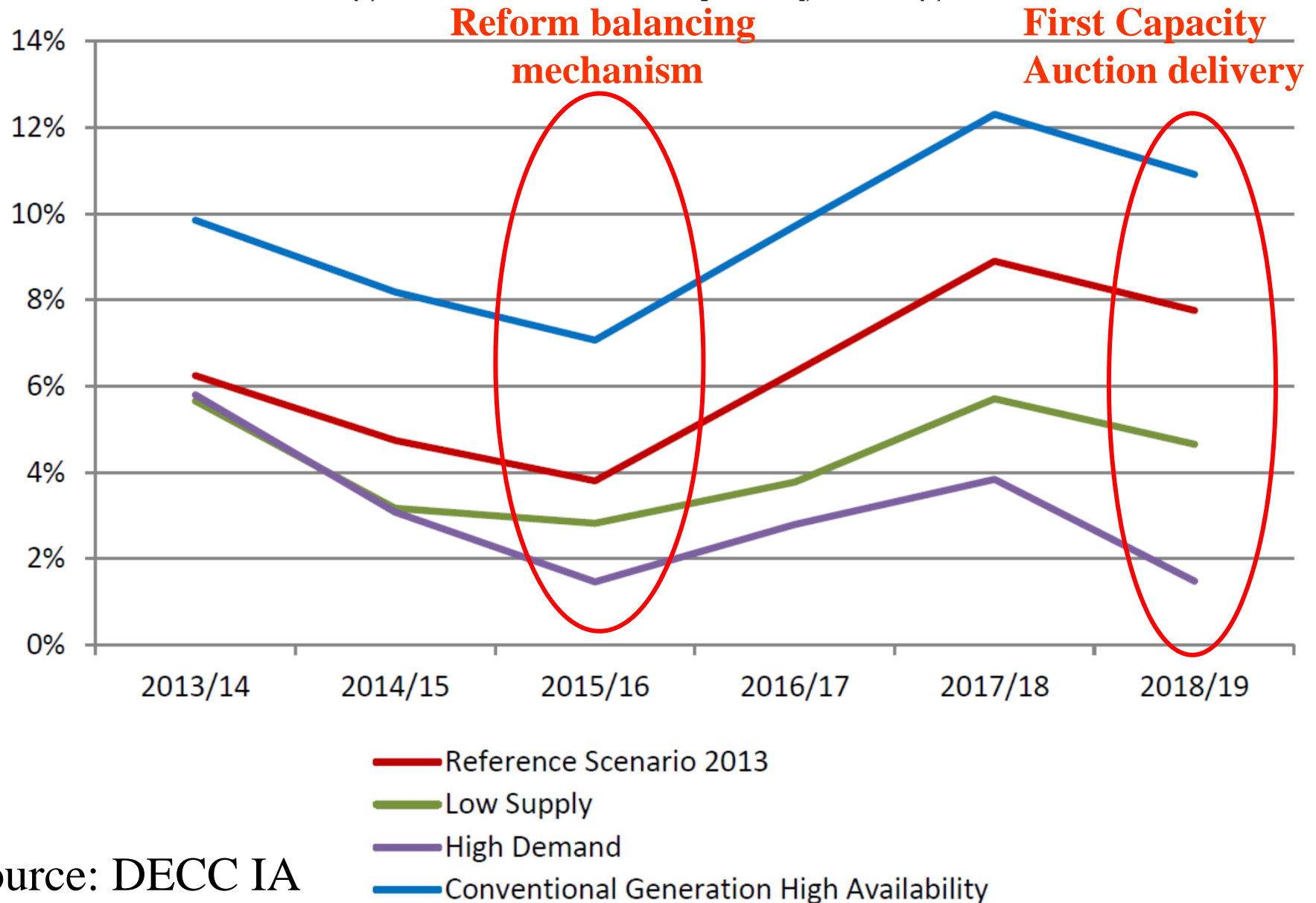
Finally sorting out mess of parallel RO and CfD?

- Measured by **Loss of Load Expectation**, LoLE
 - 3 hours per year => Value of Lost Load = £17/kWh
- But spot and balancing prices **capped**
 - Balancing actions costs will increase to £6/kWh
- Missing money = $(£17/-£6/\text{kWh}) \times 3 \text{ hrs/yr} = £33/\text{kW yr}$
=> **Pay-as-clear descending clock auction** in 2014 for 2018/19
- New build gets 15 yr contract at auction price
 - existing plant: 1 yr contract unless major refurbish
 - must be **price taker** unless good cause, **entrants set price**
 - existing plant can **delay** until later auction (2017)
- DSR auctioned from 2016: 1 yr contracts



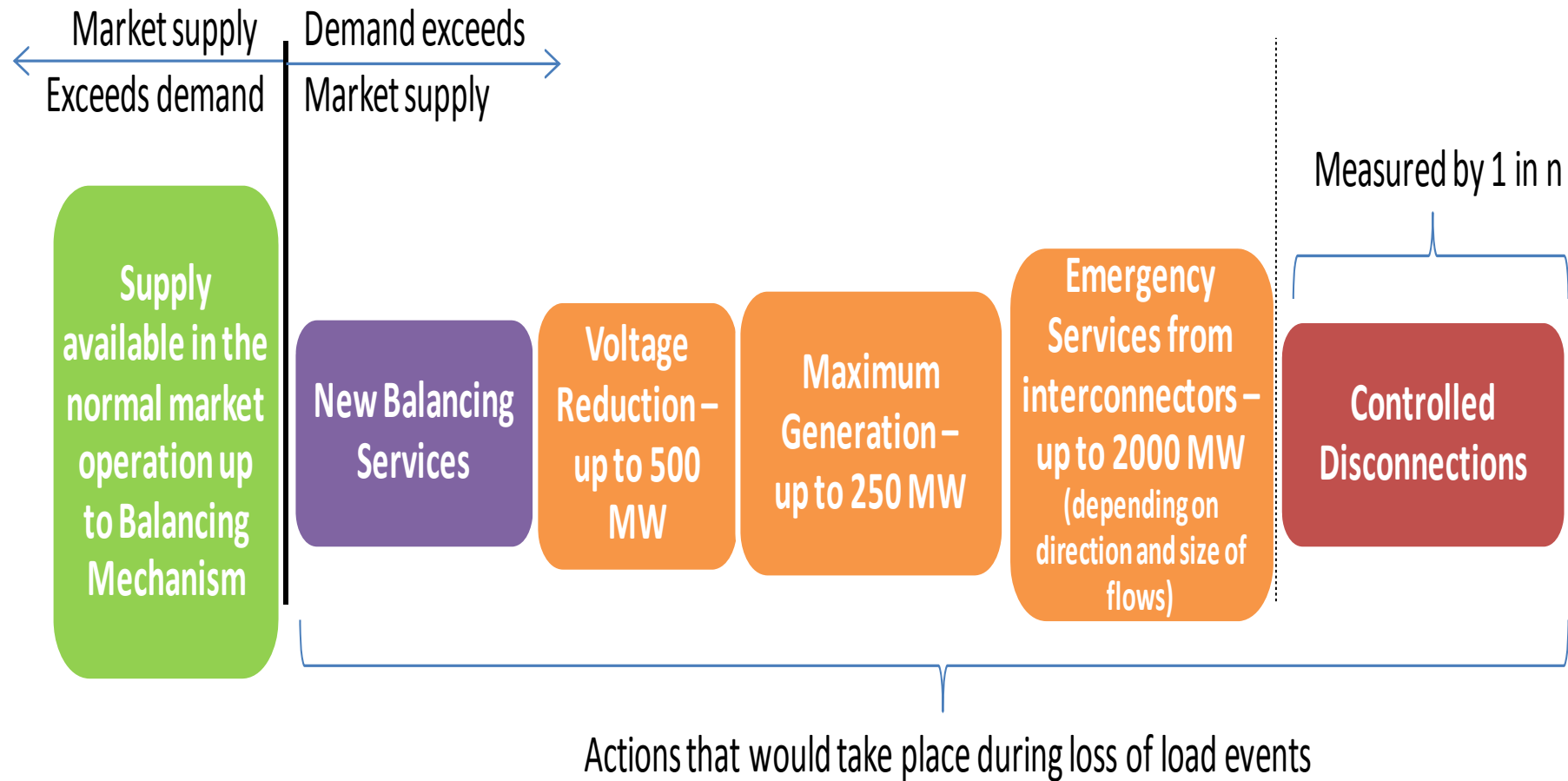
What is the problem?

Ofgem's derated capacity margin



Source: DECC IA

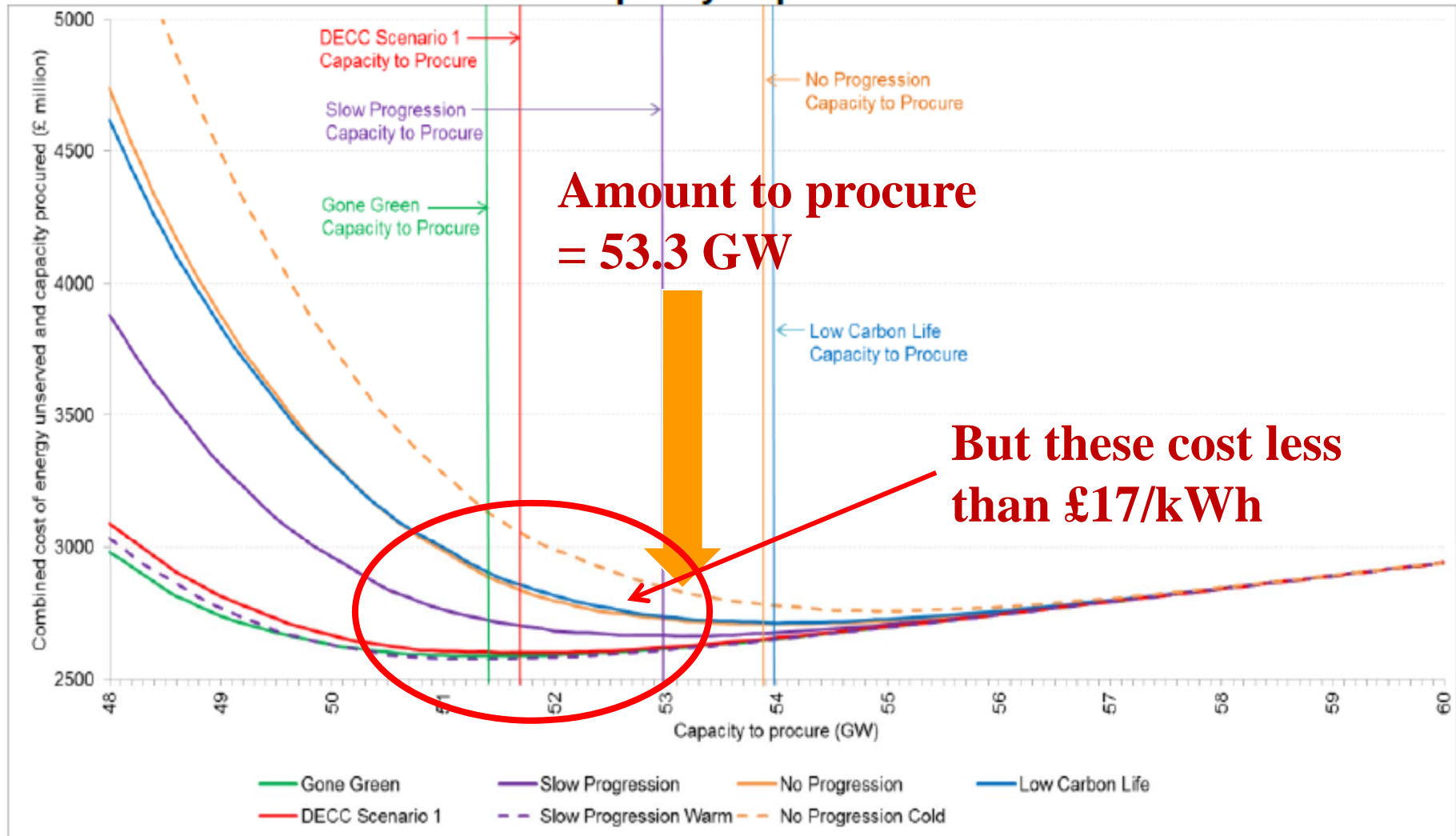
What does “Loss of Load” mean?



These actions have lower cost/value than £17/kWh

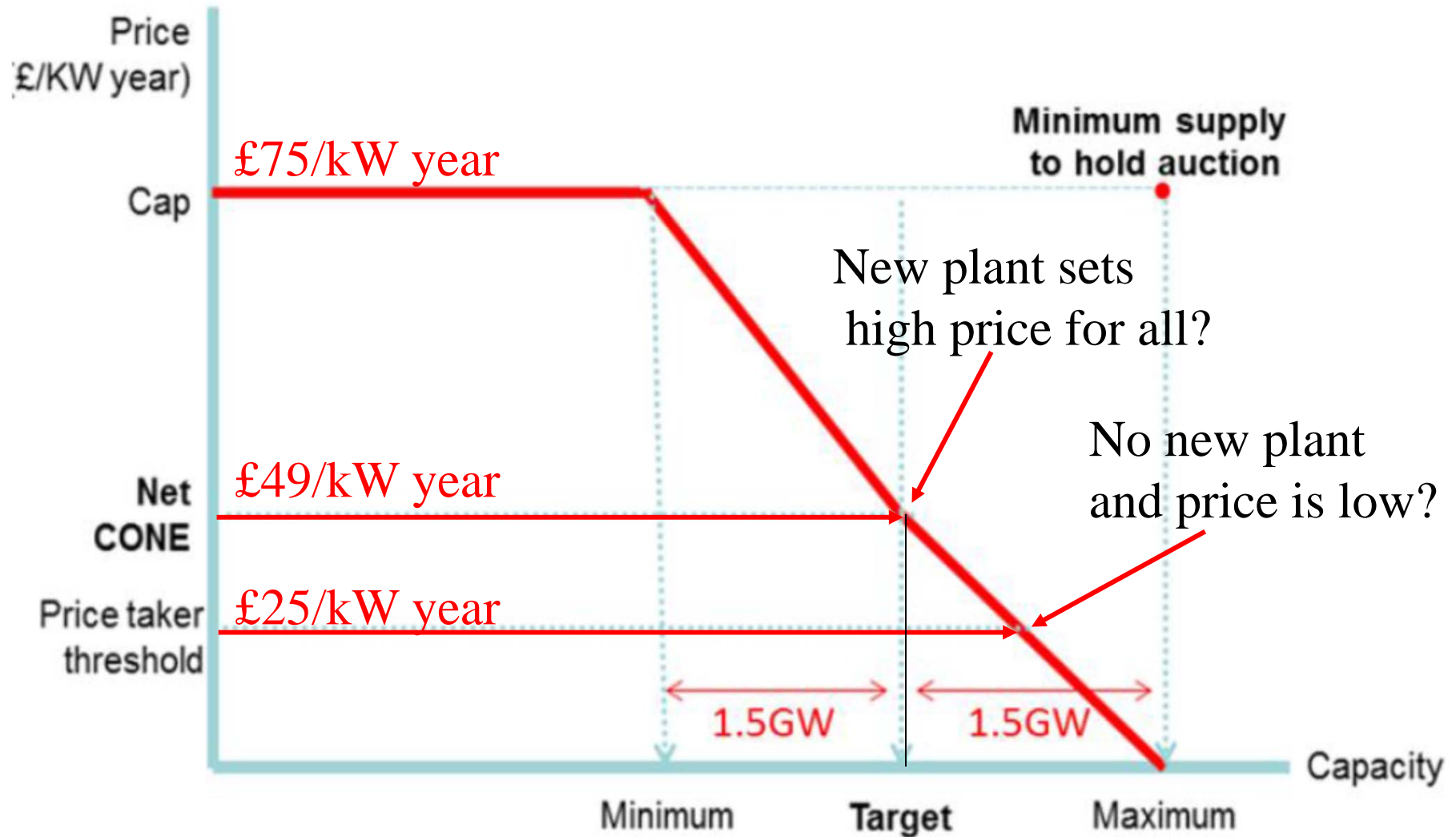
Cost of “energy unserved” = £17/kWh

Figure 12: Combined cost of energy unserved and procured capacity against capacity to procure



Source: National Grid (2014, p50)

Auction demand curve



Source: DECC-IA

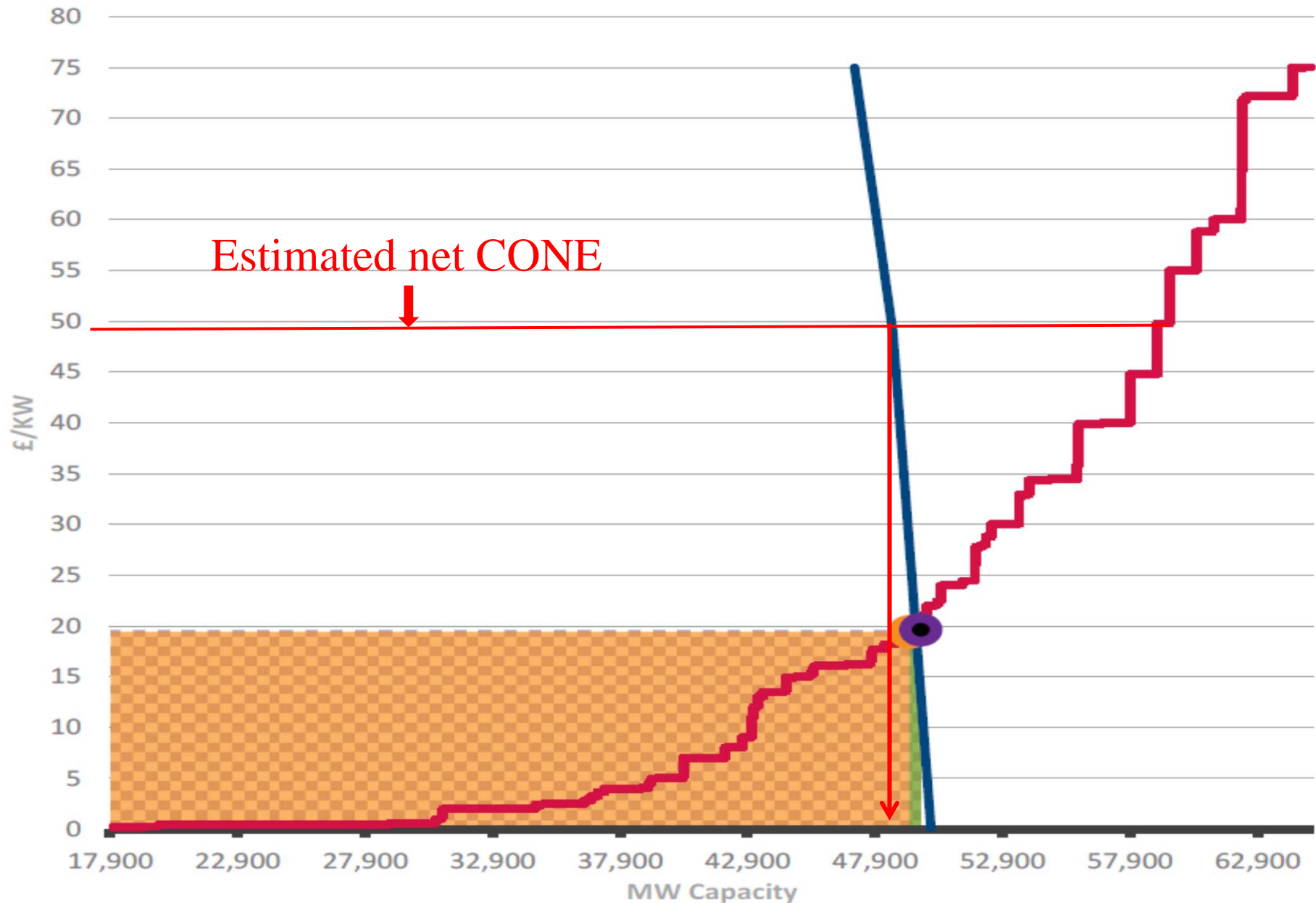
Consequences of excessive procurement

- Excess capacity in auction **depresses prices** post-2018
- Lower prices => higher payments for CfDs
- => LCF exhausted, reduces finance for renewables**
- Auction bid price for capacity set by Net Cost of New Entry
- Net CONE is total fixed cost less (**revenue** – opex)
- More capacity => fewer running hours => **less revenue**
- **Lower price => lower revenue => higher net CONE**
- Higher CONE sets price for all plant => paid by consumers
- Consumers not happy, not persuaded future wholesale price will reduce their bills => big political fuss

***Excess procurement exacerbates Missing Market problem
Locks us into Single Buyer Model***



GB Dec 2014 Capacity auction result



Source: National Grid (2014b)

- Capacity auction December 2014:
 - PTE criticized over-cautious procurement
 - and ignoring interconnector contribution
 - New entry price predicted at £49/kWyr for CCGT
 - Could have cost £2.5 billion
 - Market clearing price £19.40/kWyr, CCGT entered
=> ***auctions much better than bureaucrats***
 - PTE=>DG COMP forces interconnectors to be included
 - CfDs – those with fixed prices & FIDs did well
 - DG COMP requires market testing
- => Auctions to determine efficient cost***

Misguided criticisms of EMR

- “Contracts mark return to **Single Buyer Model**”
 - but all IPPs in 1990s were long-term PPAs
- “**Bureaucrats**, not markets choose investment”
 - but current RES support designed after intense lobbying by incumbents
 - => **auctions** to create competition
 - => contracts should incentivise efficient operation
- “Wholesale **price will be distorted by contracts**”
 - **CfDs are financial**, problem is **low variable cost plant** => consumer capacity payments / reliability options?
- Without govt. underwriting contracts no cheaper
 - need guarantees that are defensible under State Aid rules



Conclusions on EMR

- **Low-C** generation needs long-term contracts as no credible futures markets for **corrective carbon tax**
- FiTs make sense for unreliable RES (wind etc)
 - need to avoid exposure to balancing etc.
 - But price should reflect value (time, place, other costs)
- EMR hampered by existing RO scheme
 - more expensive than necessary
 - => Move to auctions and suspend RO scheme (**done for on-shore wind in June 2015 but for wrong reason?**)
- 2014 capacity market: good design, over-procured
 - Ignored interconnectors, option of waiting
- **2015 auction includes interconnectors: progress!**



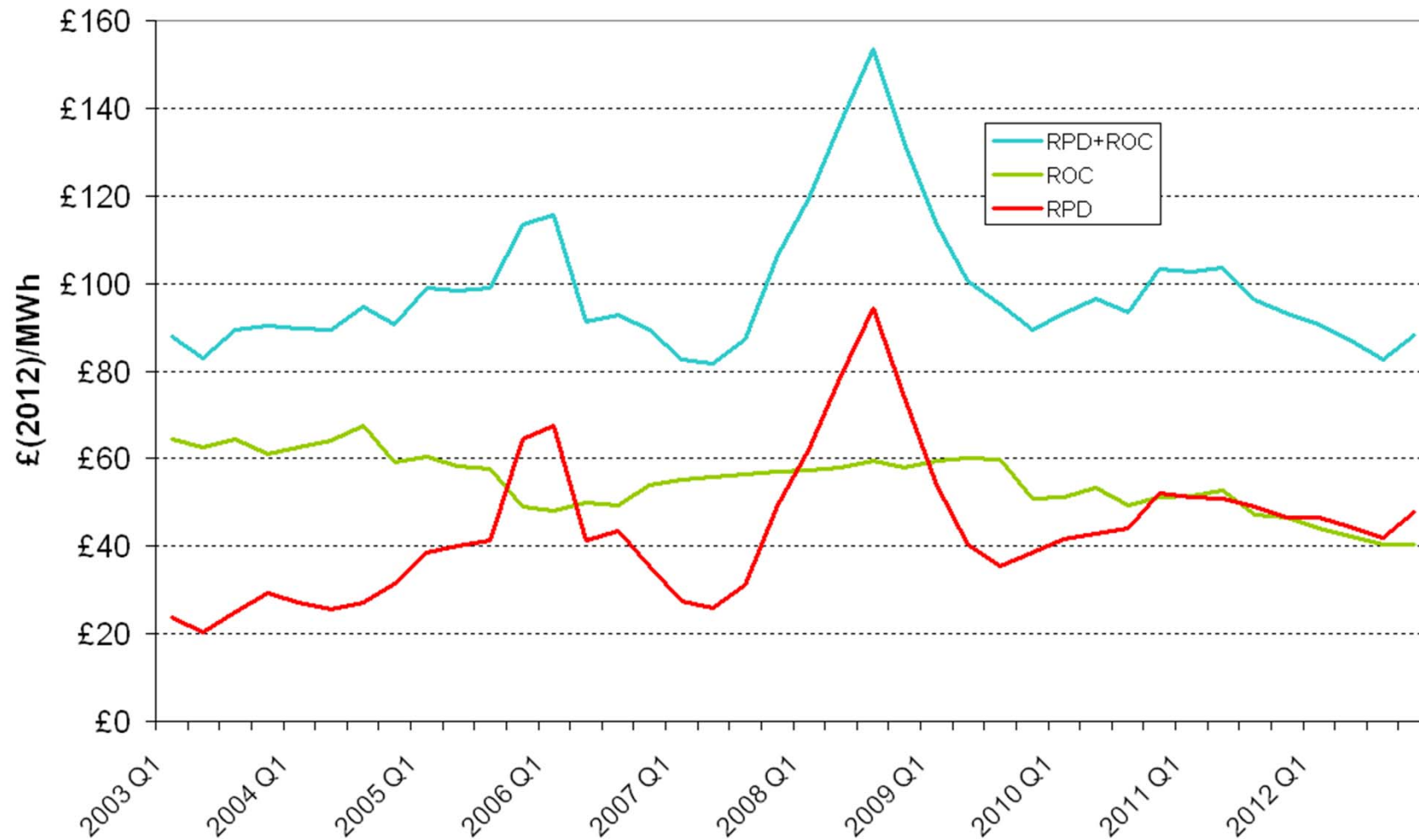
Energy Union 2015: Action point 5

- Creating a seamless internal energy market that benefits citizens, ensuring security of supply, **integrating renewables** in the market and **remedying** the currently uncoordinated development of **capacity mechanisms** in Member States call for **a review of the current market design**.
 - The Commission will propose **a new European electricity market design in 2015**, which will be followed by legislative proposals in 2016.



Premium FiT risky

Support to Wind under the ROC Scheme (real prices)



Renewable support models

- DG Comp wants **renewables integrated in the market**
 - Wind & PV depress prices in some hours
 - => **Premium FiT discourages excess supply automatically**
 - But raises **market and balancing risk**
- Hedge with CfD on metered output at spot price
 - Ideally offered by traders, perhaps with trader of last resort
 - ISO could offer insurance against balancing risk
- Any subsidies needed via capacity payment
 - Based on derated factor, paid on availability



- National Grid (TSO) advises DECC on EMR
 - Panel of Technical Experts critiques quality
- Minister chooses capacity to procure
 - Both would be blamed if “lights go out”
 - neither pays for capacity procurement
- Why not let regulator choose capacity?
 - Subject to parliamentary scrutiny
- What degree of subsidiarity for CRMs?



Challenges and lessons

- **Security** taken as over-riding, probably excessive
- Tension between **affordability and decarbonising**
 - Cost falls disproportionately on poor
 - Electricity price rises politically problematic
 - => freeze carbon price floor; remove some levies
 - **Better raise VAT, remove all levies => exempt production**

Successes:

- Cross-party support for Climate Change Act
- Market coupling, sharper balancing prices
- **Auction design, auctioning CfDs, ending RO?**



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Acronyms

AC	Average cost	
CCGT	Combined cycle gas turbine	
CfD	Contract for difference	
DG, DSR	Distributed Generation, Demand Side Response	
EMR	(UK) Electricity Market Reform	
EV	Electric vehicle	
FID	Final Investment Decision	
FiT	Feed-in tariff	
HMT	HM Treasury (Min of Finance)	
HPC	Hinkley Point C nuclear power station (proposed)	
ISO	Independent System Operator	
LMP	Locational marginal price or nodal price	
LoLE	Loss of Load Expectation = sum of LoLP = Loss of Load probability	
LT	Long-term	
PPA	Power purchase agreement	
PV	Photo voltaic	
RES	Renewable energy supply	
RO	Reliability Option	
SEM	Single Electricity Market of island of Ireland	
SMC	System marginal cost	
SMD	Standard Market Design (the US model) T&D	Transmission and distribution
VOLL	Value of Lost Load	
WACC	Weighted average cost of capital	

References

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