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Perspectives on Efficient Electricity Network Pricing – Why Substantive Reform is Required

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Richard Druce

Associate Director

Cambridge

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Insight in Economics™

Overview

- Network access pricing is crucial to ensuring the efficient functioning of the electricity industry, helping to balance network costs against other factors
- Hence, it has a major role to play in supporting the industry's transformation
- This presentation covers a particularly "hot topic": Transmission pricing and the reform of "embedded benefits"

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Transmission Access Pricing and “Embedded Benefits”

TNUoS charges emerge from a complex set of calculations to derive locational and non-locational elements

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- Core objectives of cost-reflective TNUoS pricing:
  - Recovering the Transmission Owners' allowed revenues
  - Sending efficient signals to users regarding the costs users impose on the network (and thus promote efficient competition, prevent undue discrimination, etc).
- TNUoS are structured to signal variation in the costs generators/consumers impose in different locations on the grid, and (to some extent) how different generation technologies signal costs
- TNUoS provide the main source of locational signals in the British market, given the absence of nodal/zonal energy pricing.

TNUoS Calculation for Demand

Component of Charge	Computation of Charge
Peak Security Charge	£/kW Zonal Charge x Triad Consumption
Year Round Charge	£/kW Zonal Charge x Triad Consumption
Demand Residual	£/kW Charge x Triad Consumption

TNUoS Calculation for Generation

Component of Charge	Computation of Charge	
	Intermittent	*Other*
Peak Security Charge	Exempt	£/kW Zonal Charge x TEC
Year Round Charge (Shared)	£/kW Zonal Charge x TEC x ALF	£/kW Zonal Charge x TEC x ALF
Year Round Charge (Non-shared)	£/kW Zonal Charge x TEC	£/kW Zonal Charge x TEC
Residual	£/kW Charge x TEC	£/kW Charge x TEC

TNUoS charges tend to signal higher costs of accommodating generation in the north, where there is a surplus of generation (and vice versa for demand)

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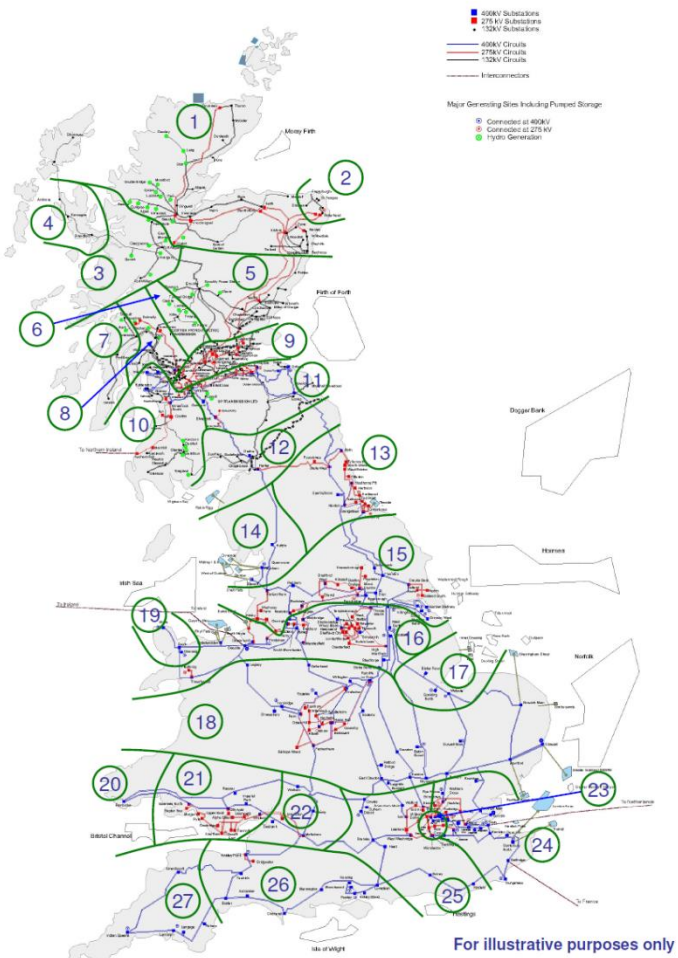
Current *Generation* Transmission Network Use of System (TNUoS) Charges: Seek to



Zone	Region	2016/17 Generation TNUoS by Technology (Load Factor)		
		Conventional (90%)	*Intermittent (30%)*	*Peaker (10%)*
1	North Scotland	23.28	12.48	12.67
2	East Aberdeenshire	18.37	10.55	12.90
3	Western Highlands	20.90	11.57	11.93
4	Skye and Lochalsh	18.34	13.04	9.37
5	Eastern Grampian and Tayside	19.00	10.73	10.91
6	Central Grampian	20.72	10.65	12.69
7	Argyll	21.31	13.47	14.95
8	The Trossachs	16.42	8.46	10.06
9	Stirlingshire and Fife	15.71	7.85	10.09
10	South West Scotland	14.42	7.96	8.49
11	Lothian and Borders	13.98	5.54	8.06
12	Solway and Cheviot	10.22	5.71	6.56
13	North East England	9.07	3.85	7.17
14	North Lancashire and The Lakes	7.10	3.80	5.20
15	South Lancashire, Yorkshire and Humber	6.31	1.46	5.92
16	North Midlands and North Wales	4.90	1.33	4.86
17	South Lincolnshire and North Norfolk	2.85	1.29	2.91
18	Mid Wales and The Midlands	2.41	1.27	2.52
19	Anglesey and Snowdon	7.51	1.78	6.25
20	Pembrokeshire	6.29	0.28	9.04
21	South Wales & Gloucester	3.53	0.25	6.35
22	Cotswold	-0.20	-3.88	-2.22
23	Central London	-5.54	-3.22	-7.56
24	Essex and Kent	-0.88	2.07	-2.90
25	Oxfordshire, Surrey and Sussex	-2.37	0.68	-0.70
26	Somerset and Wessex	-3.95	0.27	-1.17
27	West Devon and Cornwall	-5.36	-0.37	-0.87

Source: National Grid

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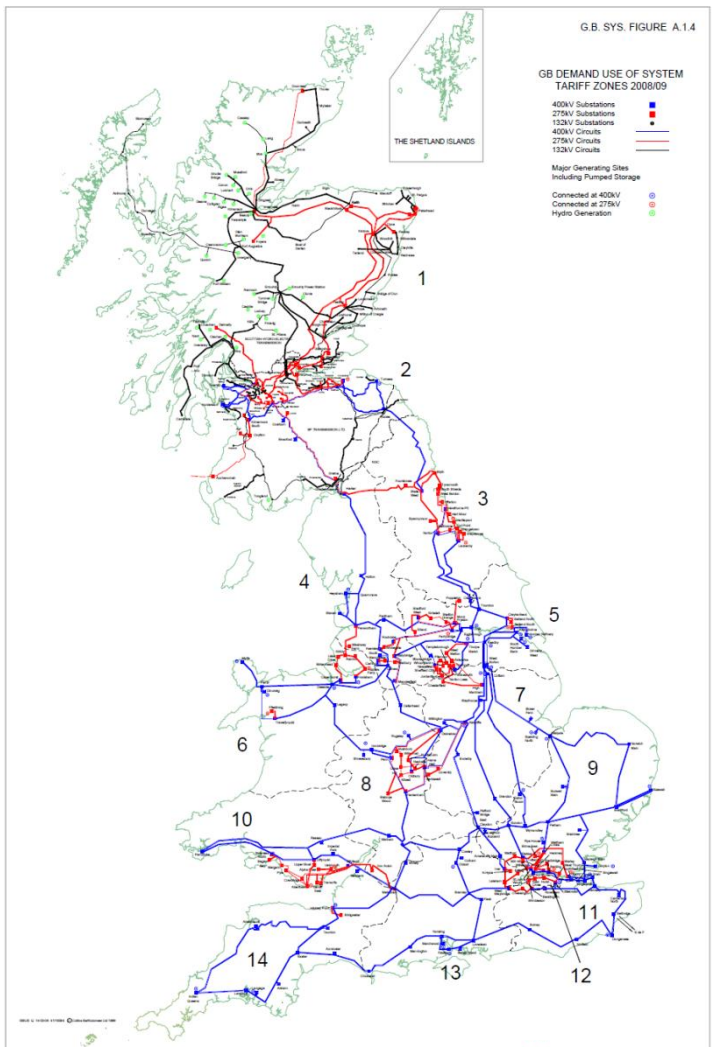
Current *Demand* Transmission Network Use of System (TNUoS) Charges



Zone	Region	2016/17 Demand TNUoS per kW of Triad Consumption
1	Northern Scotland	29.79
2	Southern Scotland	31.84
3	Northern	36.29
4	North West	40.09
5	Yorkshire	40.48
6	N Wales & Mersey	39.99
7	East Midlands	43.35
8	Midlands	43.96
9	Eastern	45.68
10	South Wales	41.82
11	South East	48.41
12	London	51.25
13	Southern	49.11
14	South Western	48.38

- These charges are levied on suppliers' demand at "triad", less output from contracted small/embedded generation.
- Hence, small DER will effectively *receive* negative D-TNUoS, which ought to be efficient if they reduce peak net demand, it is logical that they should be paid the negative of the demand TNUoS

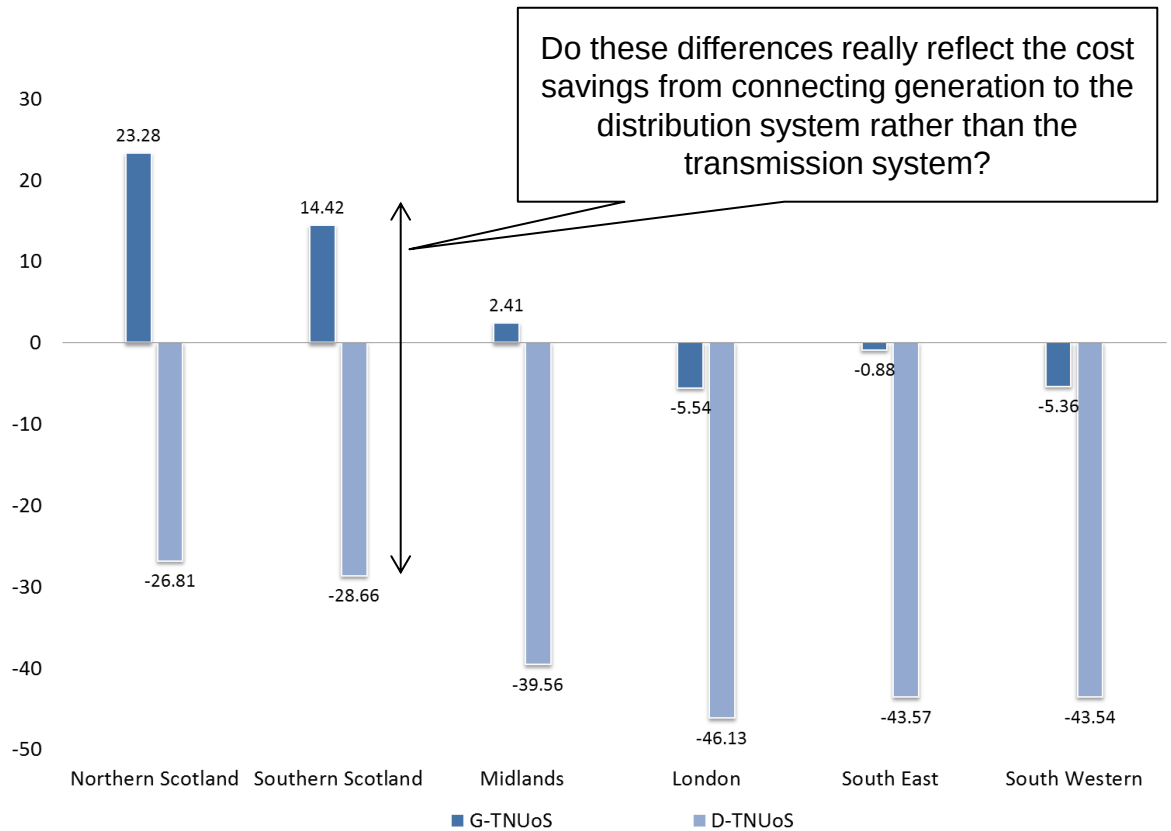
Source: National Grid

Embedded benefits are payments received (or costs avoided) by DERs reflecting the costs they save by not using the transmission grid

- There are many aspects to the embedded benefits enjoyed by DERs in Britain:
  - **Receiving negative D-TNUoS**
  - **Avoiding paying G-TNUoS**
  - Receiving a negative allocation of transmission losses
  - Receiving negative BSUoS payments, the charge through which system operation costs are recovered
  - Avoided capacity market demand charge

These elements of the "embedded benefit" have been the main focus of Ofgem/government reform efforts due to concerns over the distortions this difference creates

Differences Between the Overall TNUoS Paid by Large/Transmission-Connected Generators and Smaller/Embedded Generators

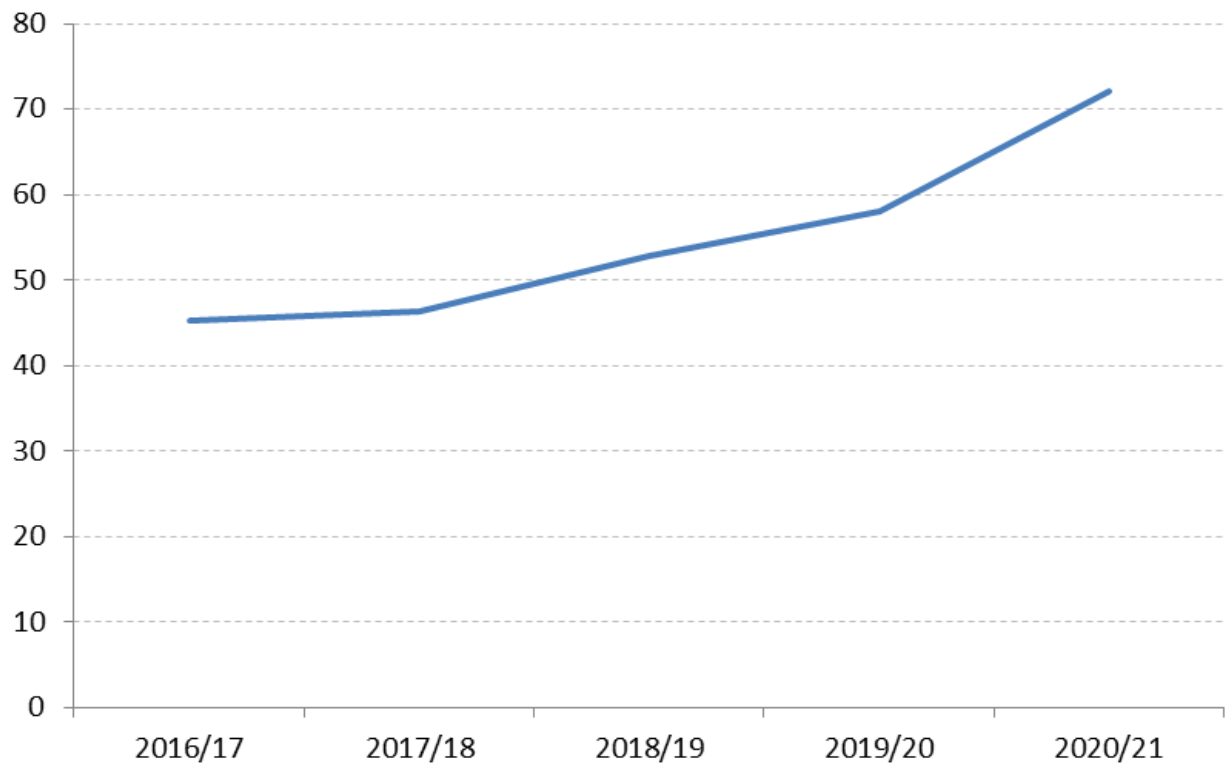


The main source of regulatory concern seems to be the "demand residual" element of the charge

"*We are particularly concerned about TNUoS demand residual payments which account for the majority of the embedded benefit and are forecast to increase significantly. We think that this element currently may be leading to the biggest distortions and that therefore there may be grounds to make changes to the charging arrangements in this area as a priority.*"

Ofgem (July 2016)

National Grid has Forecast Growth in the Demand Residual Element of the D-TNUoS Charge, the Largest Component of the Embedded Benefit (£/kW)



Source: National Grid (February 2016)

Ofgem and some in the industry have characterised the residual as a tax that is distorting market outcomes

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- Ofgem has characterised this residual as a charge to recover sunk costs and the other locational element of the charge as cost-reflective:

  "[Embedded generation] can receive payments for helping suppliers reduce their demand transmission charges including reducing their contributions towards fixed/sunk cost recovery. The connection of an increasing amount of sub-100MW [embedded generation] to the distribution system logically cannot help to avoid sunk/fixed costs of developing and maintaining the transmission network"

While intuitively appealing, this characterisation is overly simplistic and wrong, and the proposed reforms that aim arbitrarily to remove or restrict the residual are similarly unfounded

The locational element is only designed to signal variation in the costs generators/demand impose on the network – its level is meaningless

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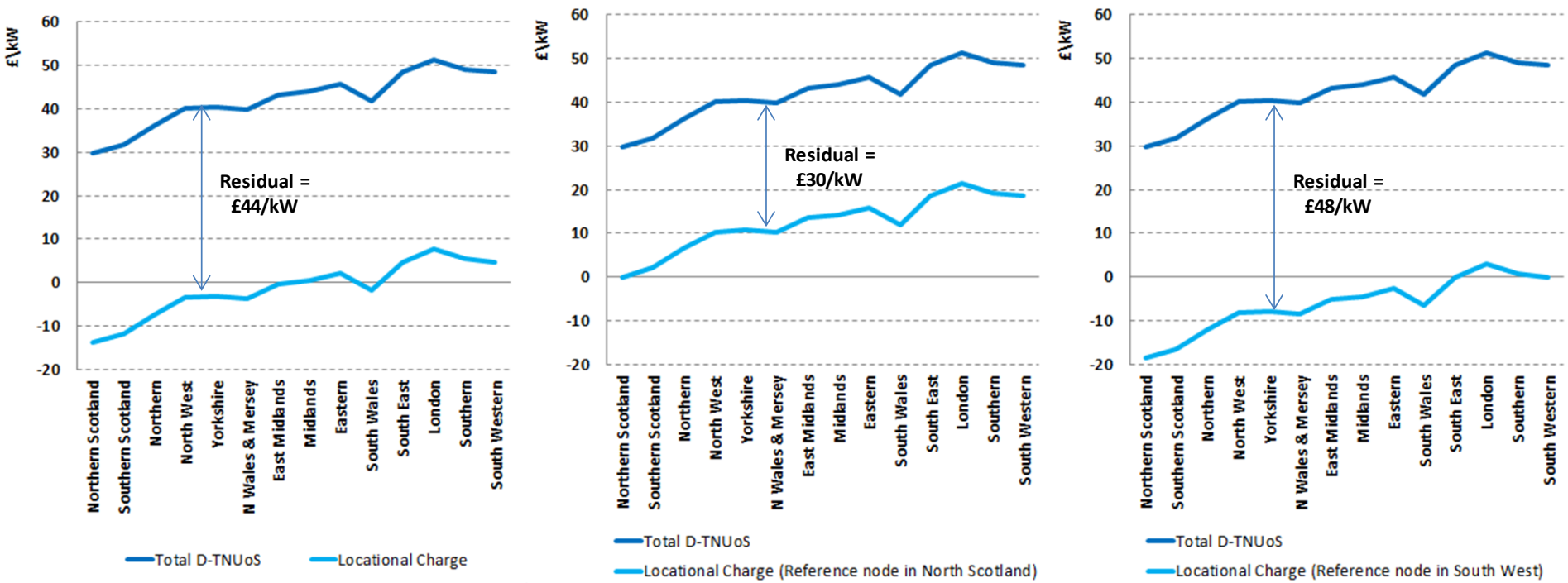
- The split between the locational element of the demand TNUoS charge and the residual depends on a technical / arbitrary choice of "reference node" on the transmission system
- This choice does not affect charges, so is irrelevant at present, but becomes pivotal if some parties no longer face one element of the charge

The Split Between the Residual and Locational Element of the D-TNUoS Charge (£/kW) Depends on the Choice of Reference Node



The residual recovers, not "fixed/sunk" costs, but whatever transmission revenues are not recovered through the locational charge, so the locational charge may be at fault

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- As well as varying with arbitrary technical choices on how to compute locational charges, there are also some flaws in the locational element of the charge
  - Hence, the locational element of the charge and not the residual may be at fault
- Problems with the locational element of the charge include:
  - No link between D-TNUoS and off-peak (net) demand
  - "Watered down" calculation of north-south differentials vs. a full marginal signal
- Low levels of revenue from locational charges is symptomatic of this problem

Transmission Revenue Recovered in 2016/17 (£m) Broken Down into the Various Elements of the TNUoS Charge

	Wider Locational Charge	Residual Charge	Local Circuit/ Substation Tariff	Total
Demand	-6.40	2,283	-	2,276
Generation	254	102	240	597
Total	248	2,385	240	2,873

Source: National Grid

A range of reforms proposed to address this "problem" may create new, serious distortions to market outcomes

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- Industry participants have proposed a range of "CUSC Modifications" that introduce elements of "gross charging".
- But the devil is in the detail – proposed reforms would introduce new distortions:
  - Gross charging distorts competition between DERs: embedded generation vs. demand response, etc.
  - Linking eligibility to pay TNUoS to factors other than those capturing the costs parties impose on the system distorts behaviour:
    - Linking charges to whether a plant has a Capacity Market (CM) agreement would distort CM bids
    - Linking charges to an arbitrary vintage of plant distorts closure incentives
  - And a number of other problems:
    - Proposals to remove the locational charge for some plant would distort locational incentives
    - Negative TNUoS charges linked to triad production reduce incentive to generate at peak

More fundamental reforms are needed. And industry working groups are probably the wrong forum to achieve them, where outcomes reflect a balance of vested interests.

Since 2015 Germany has been considering a host of reforms to network pricing to support its energy transition

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Uniform Power TSO Tariffs

- Legal Proposal (NEMOG) to equate power TSO tariffs across the country
- Currently each TSO (there are four) charges for the costs of the network (excl. offshore connections) and congestion management
- Move to “socialise” cost of energy transition

Removal of Embedded Generation Benefits

- Legal Proposal (NEMOG) to cease embedded benefits for new assets from 2021 and to phase out embedded benefits for existing assets till 2030
- Recognition that most embedded assets do not avoid grid expansion

Fixed multipliers for short-term gas transport contracts

- Regulatory ruling (BEATE) fixes multipliers to be applied to “less than annual” capacity bookings to ensure “appropriate” contribution to cost of the system
- Ruling also fixes max. allowable rebate on interruptible capacity

Cost allocation rules for entry/exit points

- Regulatory ruling (HOKOWÄ) sets fixed rules for allocating the revenue cap to tariffs for entry and exit points
- Ruling also sets identical entry tariffs for entire “market area” with cross-TSO transfers to cover cost differences

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Conclusions

Conclusions

- A transformation of the electricity sector should be supported by improved network access charges that improve the efficiency of signals conveyed to users
  - Locational signals, time of use signals, etc
- But, “sticking plaster” reforms are not sufficient; a more fundamental step-change in approach is required
  - Locational marginal pricing of energy is probably a good starting point
- After transmission pricing and embedded benefits, reform of distribution pricing should be next on the regulatory agenda:
  - More dynamic tariffs and more time variation can help realise the promise of smart meters
  - But, international experience also suggests that distributional effects and equity considerations need to be considered as part of the reform process

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Contact Us

Richard Druce

Associate Director
NERA—London
+44 20 7659 8540
richard.druce@nera.com