FTI·CL Energy

Cross border participation in the capacity mechanism

Sharing the spoils…

5 June 2015

First GB capacity auction led to payments of £1billion for c50GW of capacity

First capacity auction ran successfully in December 2014 with clearing price of £19.60....

Outcome of first CM auction

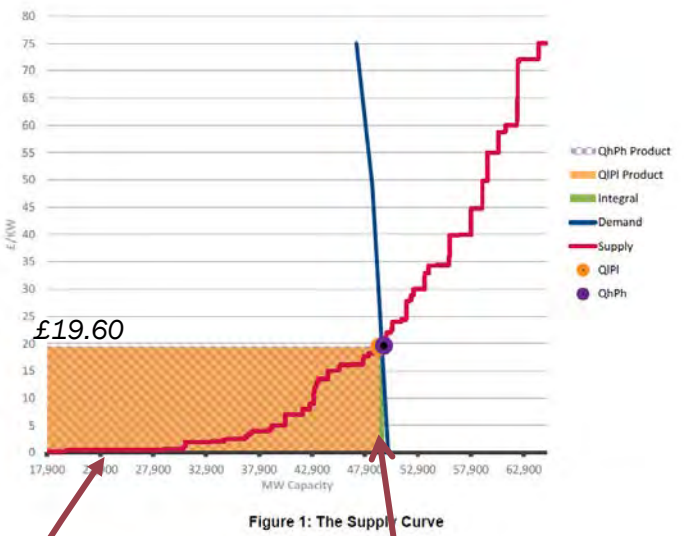
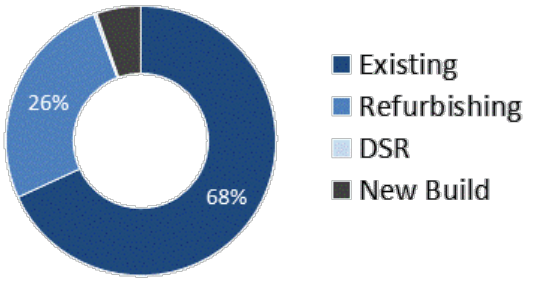


Figure 1: The Supply Curve

- Main recipient of CM revenues were existing plant and refurbished plant...

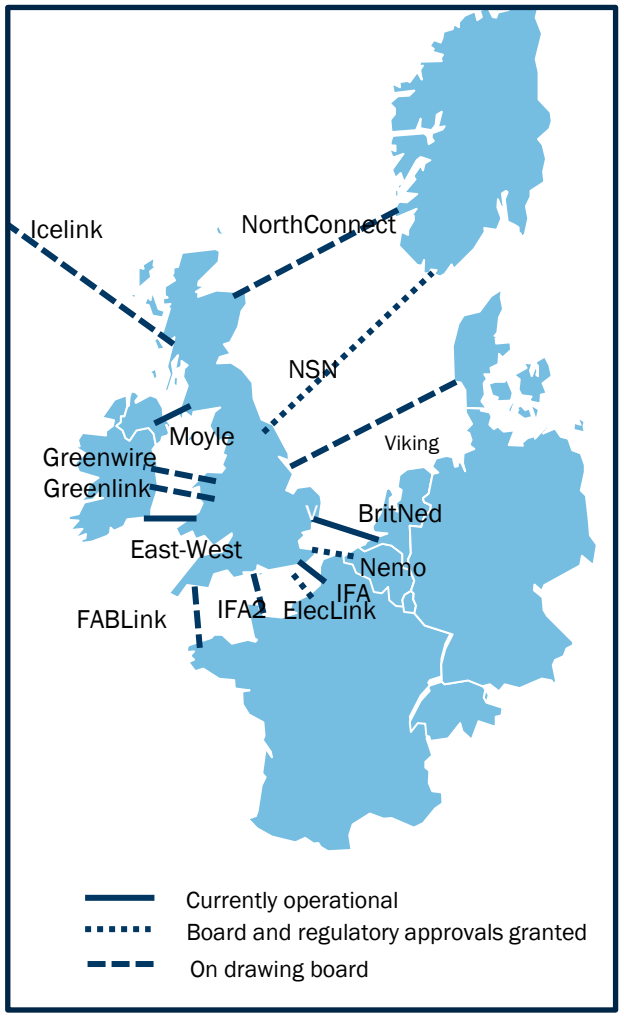


- ..with 2.6 GW of new capacity triggered.

Interconnectors did not actively participate in this first auction...

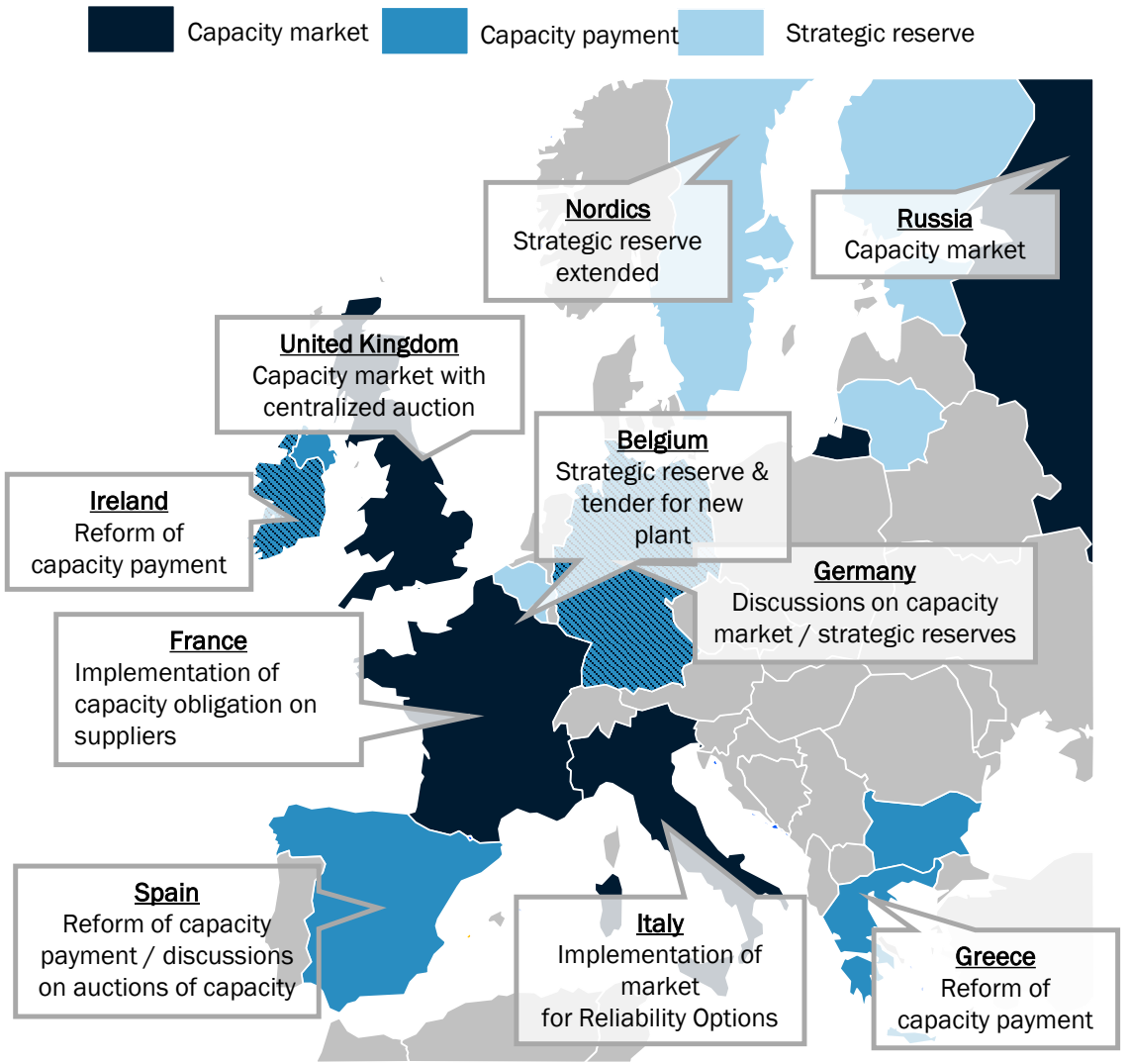
- Worth noting that security benefits of interconnectors were actually included by shifting demand curve...
- ...but (controversially) assessed to be net zero benefit – so no actual movement!
- Interconnectors excluded from actively participating in first auction
- DECC argued too difficult to design in time ...
- .....but have committed to be allowed to participate in 2015 (i.e will be in supply curve)

Current 4 GW of interconnectors are set to increase up to potentially c15GW over next decade or so.....



- Improvements in UK regulatory regime and attractive market fundamentals mean interconnectors are significant growth area for UK..
- But treatment of interconnectors in CM threatened to undermine investment programme:
  - CM will reduce market revenues to interconnectors...
  - ...but, unlike other players, would not be offset by capacity mechanism revenue
- Hence, developers have argued that reasonable for interconnectors to access to funding stream to preserve incentives to invest.

Emergence of plethora of national based CMs runs deeply against EC's view of how internal energy market should evolve



- Patchwork of different CM designs emerging across Europe
- Central premise of CM is one of autarky….
- …i.e. *national* security of supply.
- …rather than considering wider European interactions.

- EC therefore very keen also to have interconnection included in the way in which national CMs are designed…
- …reflected in State Aid approval in recent GB CM

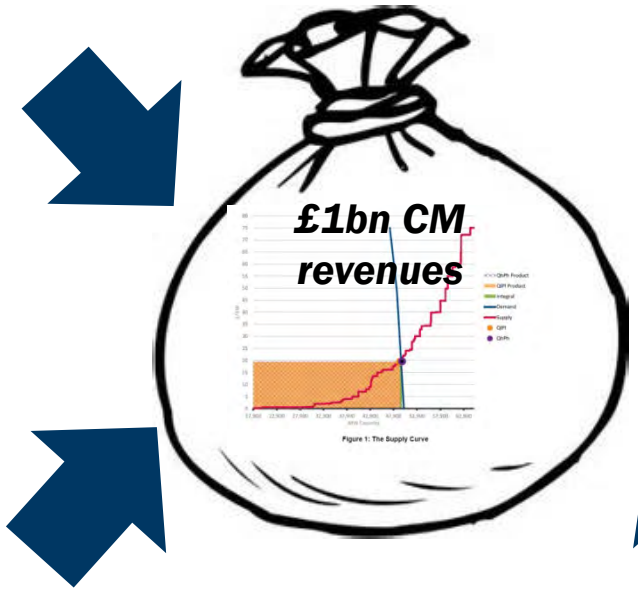
Scene set nicely for 4 way tussle on CM revenues....

Some Interconnector developers

ElecLink
nationalgrid Statnett

Foreign generators

eurelectric
ELECTRICITY FOR EUROPE



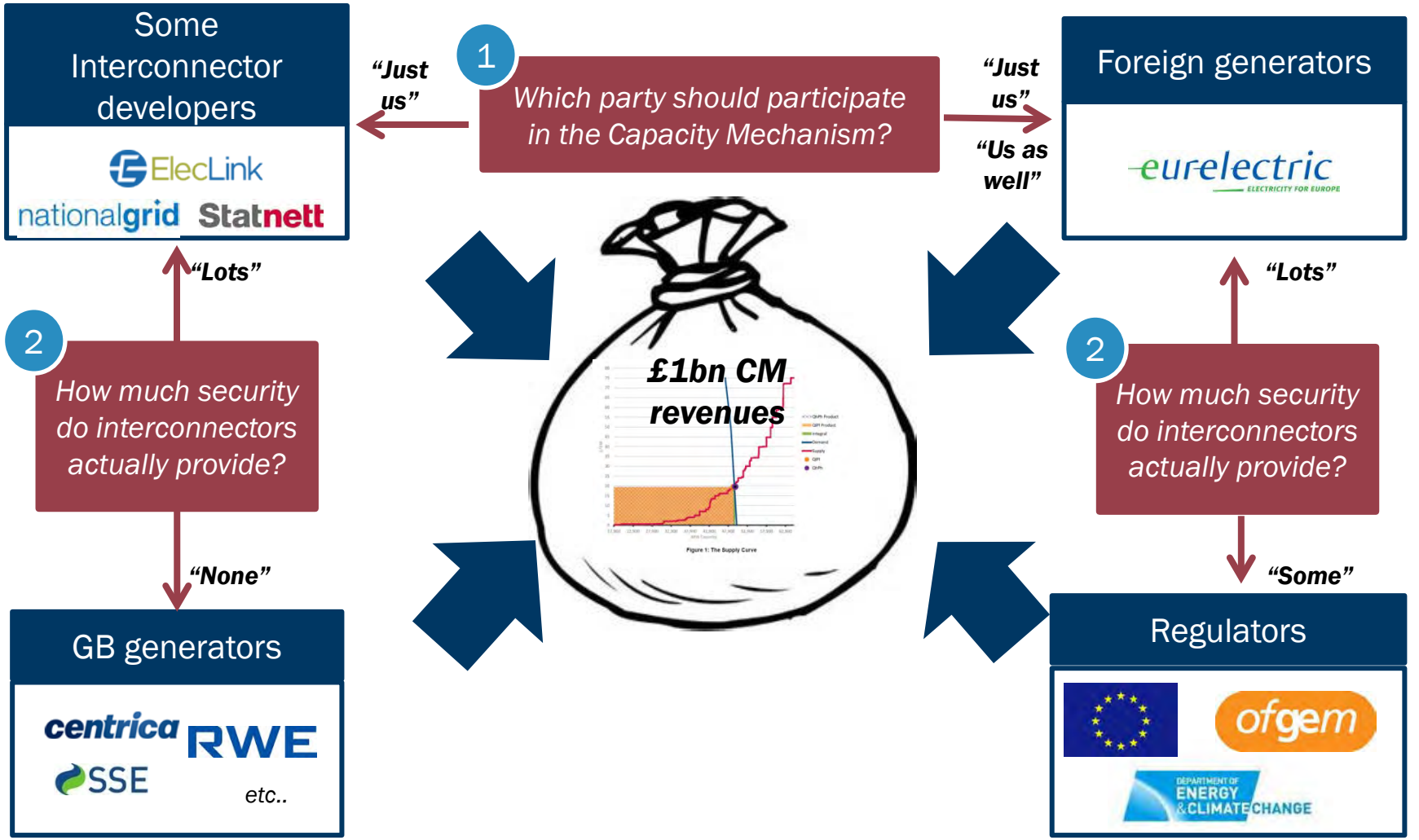
GB generators

centrica RWE
SSE
etc..

Regulators

ofgem
DEPARTMENT OF ENERGY & CLIMATE CHANGE

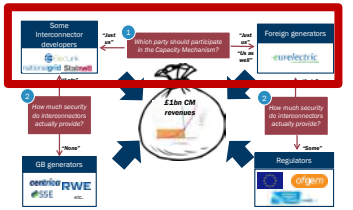
Two key issues are the battleground for the tussle....



...and, unfortunately, there is no "definitive" answer to either issue.

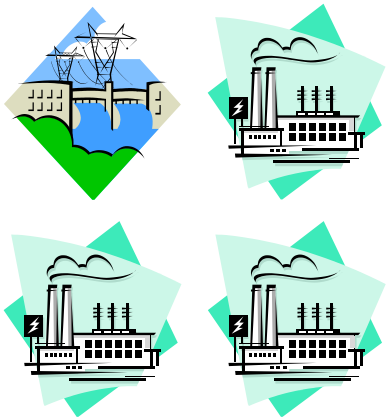
Alternative approaches are available to policy makers

Issue 1: Technically possible for either foreign generators *or* interconnectors to participate…

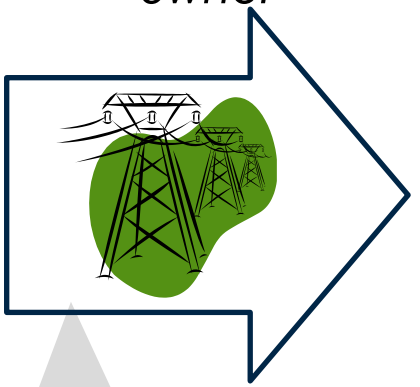


Having interconnector owner directly participate is reasonably straightforward…

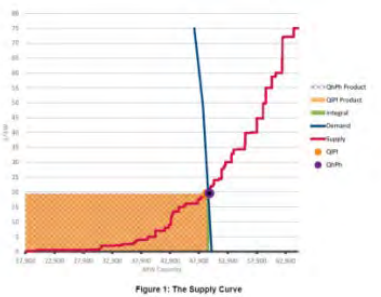
Neighbouring country



Interconnector owner



Great Britain Capacity Mechanism

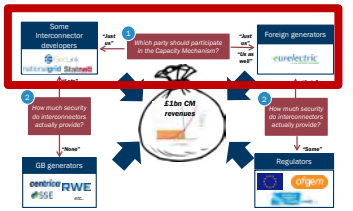


- Generators do not participate…
- …and receive no revenues

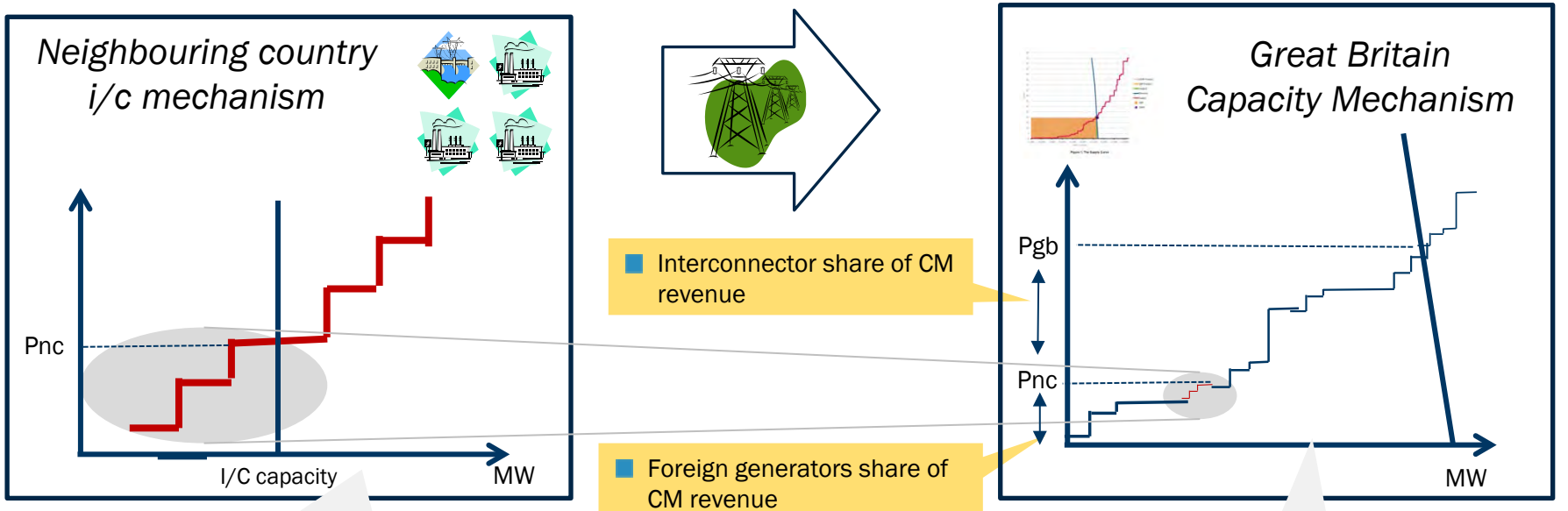
- Interconnector owner bids full (de-rated) capacity into GB CM
- Receives remuneration for capacity at clearing price
- Despatch as per Target model
- Pays penalty if does not deliver

- GB customers benefit as (*ceteris paribus*) capacity prices lower than would have been

Despite drawbacks, policy geeks (like us) could have great fun designing a model of foreign generator participation…



One such approach could model itself off implicit auctions…

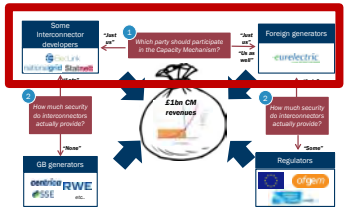


- Generators bid to get access to CM via interconnector
- Up to level of i/c capacity
- Receives some revenues at "local CM" clearing price
- Pays penalty if interconnector not delivers energy

- Interconnector submits revealed clearing bids into GB CM
- Receives some revenue from CM but pass on some revenue to generators
- Pays penalty only if technically unavailable

- GB customers benefit as (*ceteris paribus*) capacity prices lower than would have been

Generator approach has a three key drawbacks….



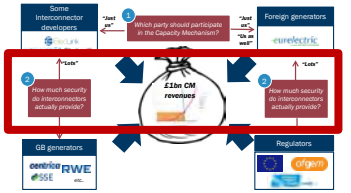
Additional cost/ complexity	■ Accreditation and monitoring to foreign generators ■ Develop auction for interconnector access ■ Offshore trading infrastructure
Geographic spread uncertain	■ Would neighbour's neighbours be able to bid in to GB CM? ■ May end up being forced to choose arbitrary cut off point
Penalty payments	■ Difficult to design appropriate regime for penalty payments… ■ ….some models envisage that may end up with a generator paying a penalty even though delivered on commitment ■ Other mooted approaches (such as "physical" TSO guarantees) might not be politically credible

…and in practice, for highly constrained lines (e.g. GB interconnections) nearly all value would end up going to the interconnector owner

- For example, Norway has 37GW of installed capacity and is proposing 1.4GW interconnector to GB
- …price likely to tend to zero (as all 37 GW likely to bid in for 1.4 GW of access)

- When interconnector constrained significantly (like GB) probably not worth effort
- For relatively unconstrained areas – may be worth developing generator participation model.
- Ideal might be "regional capacity zones" with interconnector only participation between zones?

Issue 2: How much security benefit do interconnectors actually provide?



No provider of capacity is 100% reliable…

GB CM "de-rates" GB generation capacity

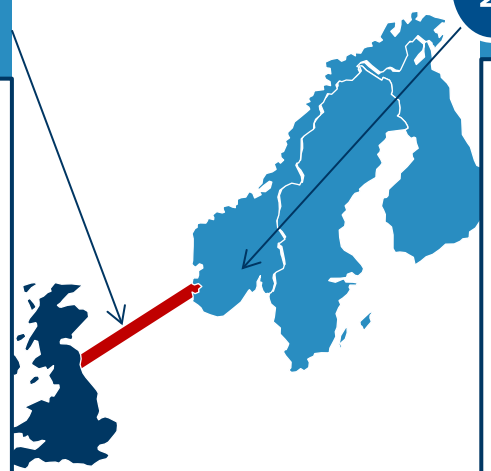
- Takes account of risk of not being available due to technical reasons
- Uses observed historic availability during winter peak hours over last 7 years…
- CCGTs de-rated to 88%; Nuclear power plant to 81%

Interconnectors should also, therefore, be de-rated to reflect risk of not delivering

- Methodology for determining de-rating interconnectors is effectively assessment of security benefits of interconnection…
- Two potential reasons for not being available…

1 Technical risk

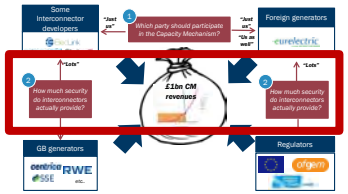
- Risk that cable is not operational at time when needed by CM
- Quite easy to derive method…
- Reliability c95-99%



2 Market risk

- Even if cable operational, risk that connected market does not deliver…
- Has proved more troublesome to assess….

One approach to assessing market risk is to consider historic price differentials....



Example

1 Agree price threshold that represents point of GB scarcity

- Choose price that has historically represented a point at which GB energy was relatively scarce.

Price: £**250**/MWh

2 Count occasions where price is above GB "scarcity threshold"...

- Count number of occasions over given sample period (say 7 years) when GB price has been higher than threshold price set in Step 1...
- ...represents "number of instances of GB scarcity"

Duration: **7** years
Occasions: **448** separate one hour periods when price greater than £250/MWh

3 Count occasions when price in connecting country even higher at times of GB scarcity

- Count occasions when price in connecting country is higher than GB price at those times that the GB price is above scarcity threshold price
- Represents times that, historically, during a "GB scarcity event" interconnector would not have flowed to GB, as local energy price even higher than GB at those times

Occasions: in **39** occasions of the **448** periods identified in Step 2, the price was even higher in the connected country

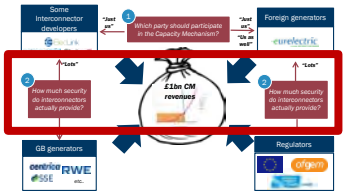
4 Calculate percentage to use in de-rating factor

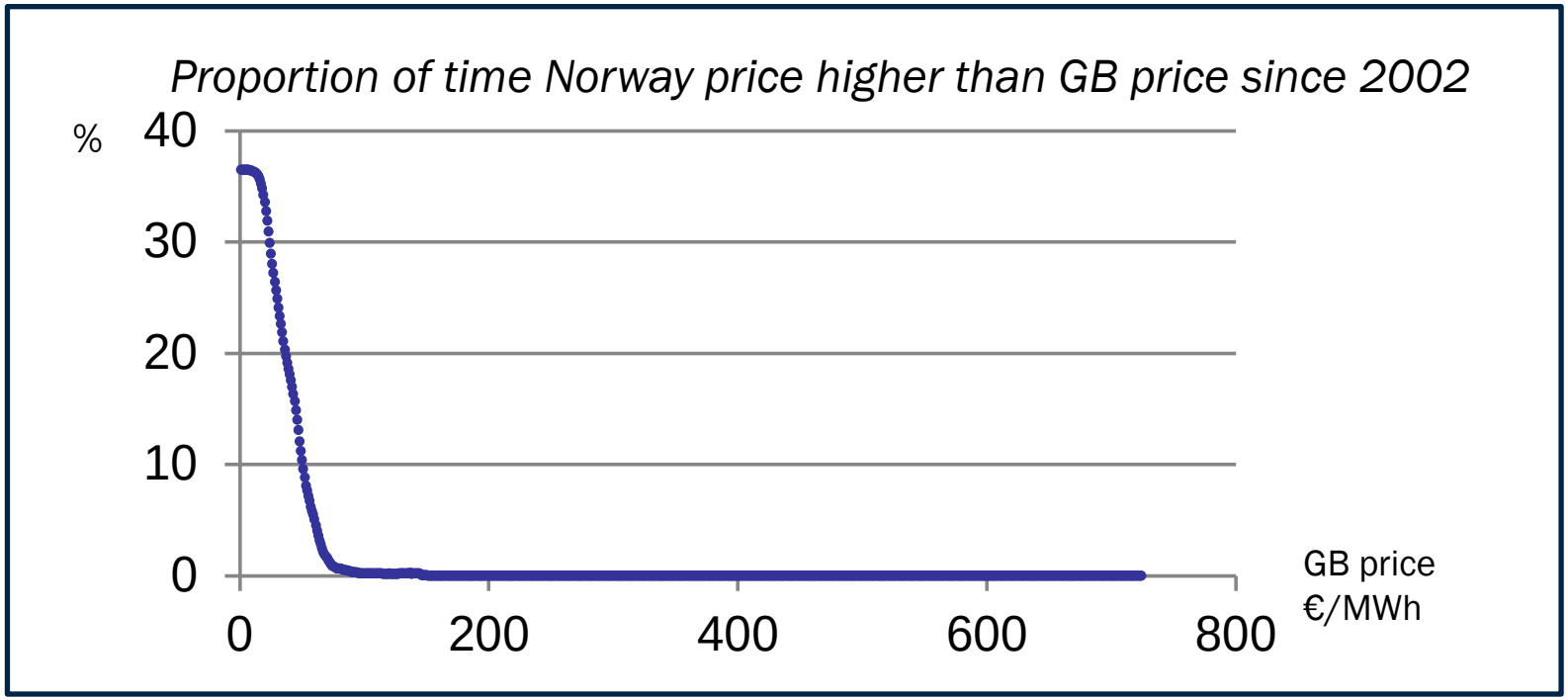
$$\frac{Number\ of\ times\ energy\ is\ scarcer\ in\ a\ connected\ country}{Number\ of\ times\ energy\ is\ scarce\ in\ GB}$$

De-rating factor is therefore:

$$1 - \frac{39}{448} = 91.3\%$$

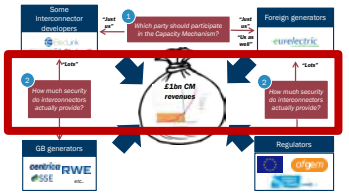
Method works quite well for Norwegian market…

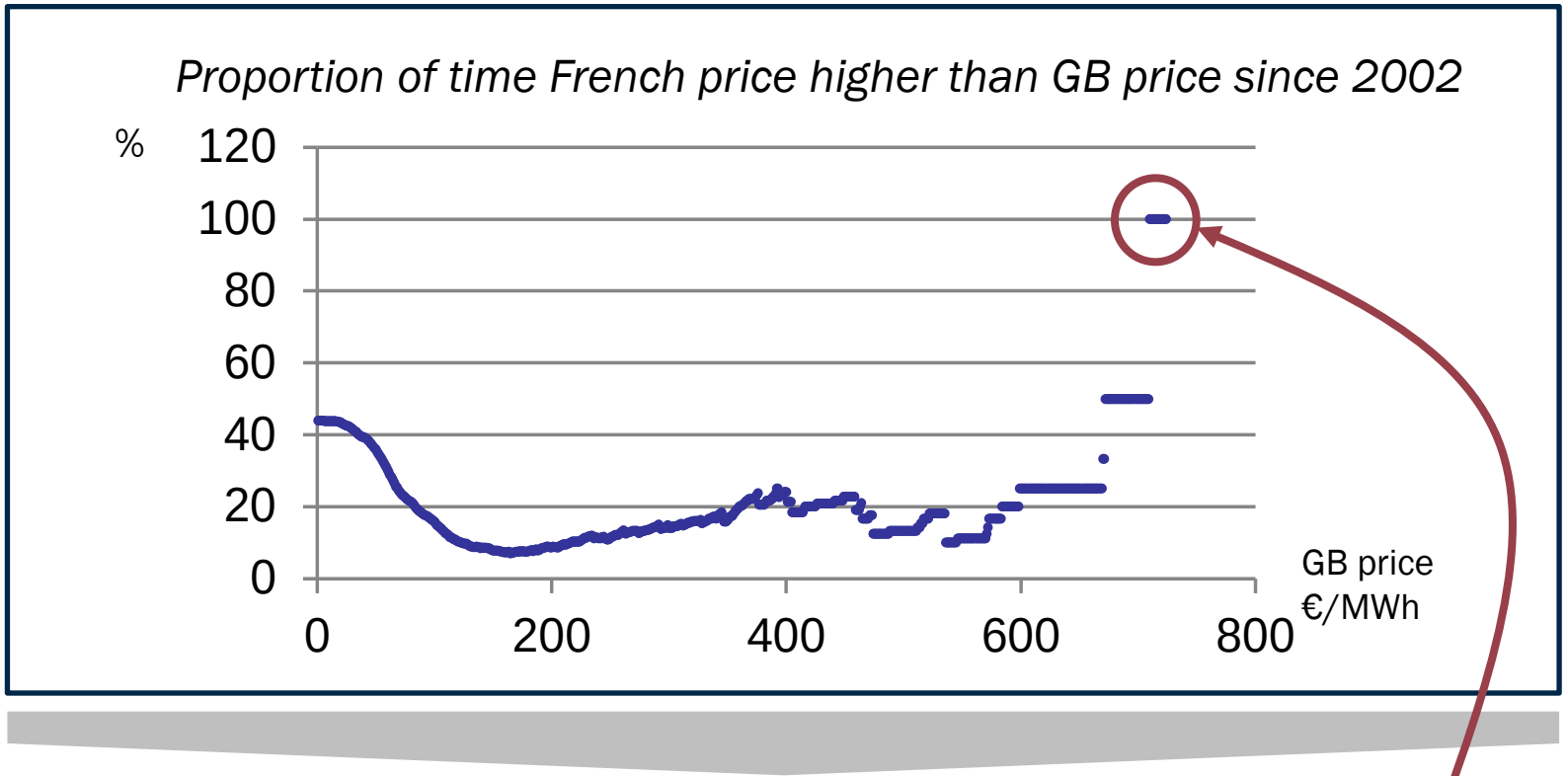




- Since 2002 GB prices have been greater than €100/MWh on c4,500 hours…
- Norway price has been higher than GB price on only one of these occasions
- Implies nearly certain that in scarcity event in GB Norway would be able to export to GB

....but not so well for French market



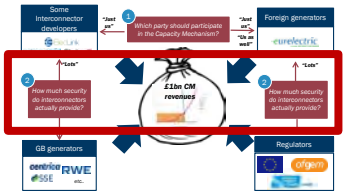


- At high GB threshold prices France price even higher
- E.g. On 15 Nov 2007, highest GB (hourly) price, but even higher in France.
- On that basis IFA would be de-rated to zero

- Hence, need to make judgement on what price constitutes "scarcity" in GB
  - Too low then might risk biasing results upwards...
  - Too high then have problem with low sample size

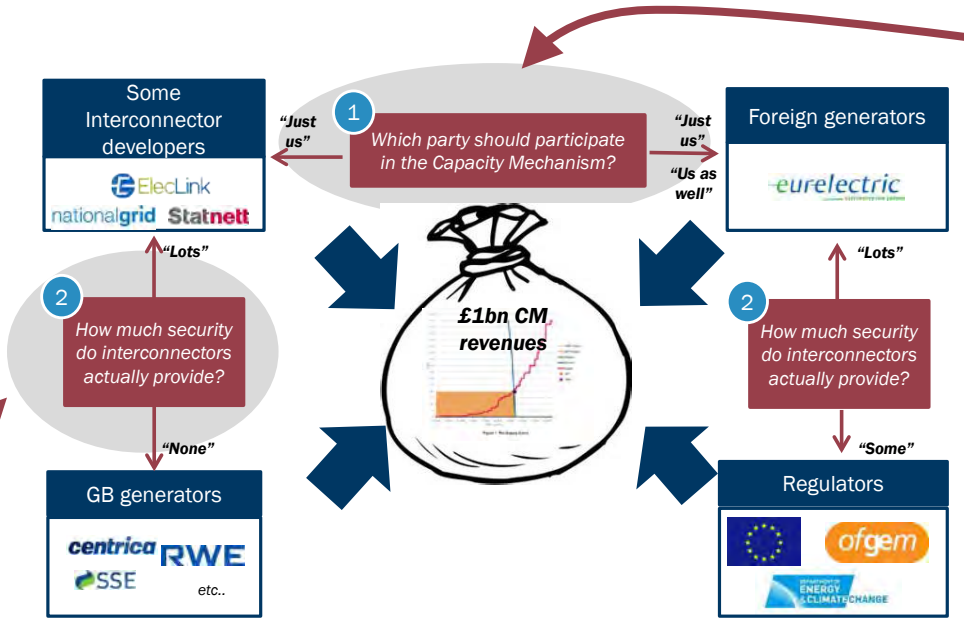
FTI·CL Energy

However, DECC appear to be adopting a slightly different approach…



Using €200/MWh as proxy for GB scarcity	448 occasions when hourly price in GB over €200 since 2002. ■ On 39 of these occasions France price even higher – implies de-rating for market risk for IFA of c16%.. ■ But zero occasions for Norway – implies derating for market risk of 0% ■ Would still need to add technical risk (of cable failure) to this
DECC has concerns about "historical" data	■ Worries arise from fact that does not incorporate how generation park in neighbouring country is likely to evolve… ■ Plus some concerns about using historical prices..
Hence, DECC developed "hybrid" approach	Details still uncertain. But indications are: ■ Will use historical data on prices and flows ■ But will augment by forecast of likelihood of loss of load (to be undertaken by National Grid SO)
Might create more problems than it solves	■ Forecasting by definition, introduces more judgement into the mix (and, given money at stake, more arguments and lobbying)… ■ ….particularly difficult to capture hydro storage (cf Rough incident) and where to draw boundary ■ Requesting National Grid to undertake forecast puts it in tricky position… ■ …..but given ISO talks by Ofgem, perhaps that is intentional

Lessons learned for key two issues....



Who participates?

- Very complicated to get foreign generator participation to work...
- Where interconnectors are typically constrained, then probably not worth hassle...
- Might be an argument for further consideration of generator participation model across "unconstrained" interconnectors
- "Regional capacity markets" are probably the answer

How much security do interconnectors provide?

- Answer is probably "quite a lot" – but quite how much will require a degree of judgement...
- Methods that introduce more judgement, rather than less, bound to create lots of arguments
- ...and probably be no more accurate.
- A more simple approach using historical data might be preferable to even more judgemental forward looking approaches