



Elecxit

Richard Green
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Electricity traders are like politicians...
they make expensive mistakes



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Elecxit: The Impact of Barriers to Electricity Trade after Brexit

Joachim Geske, Richard Green and
Iain Staffell

**Les interconnexions du système
électrique: Quelles perspectives de
développement post Brexit ?**

December 2019

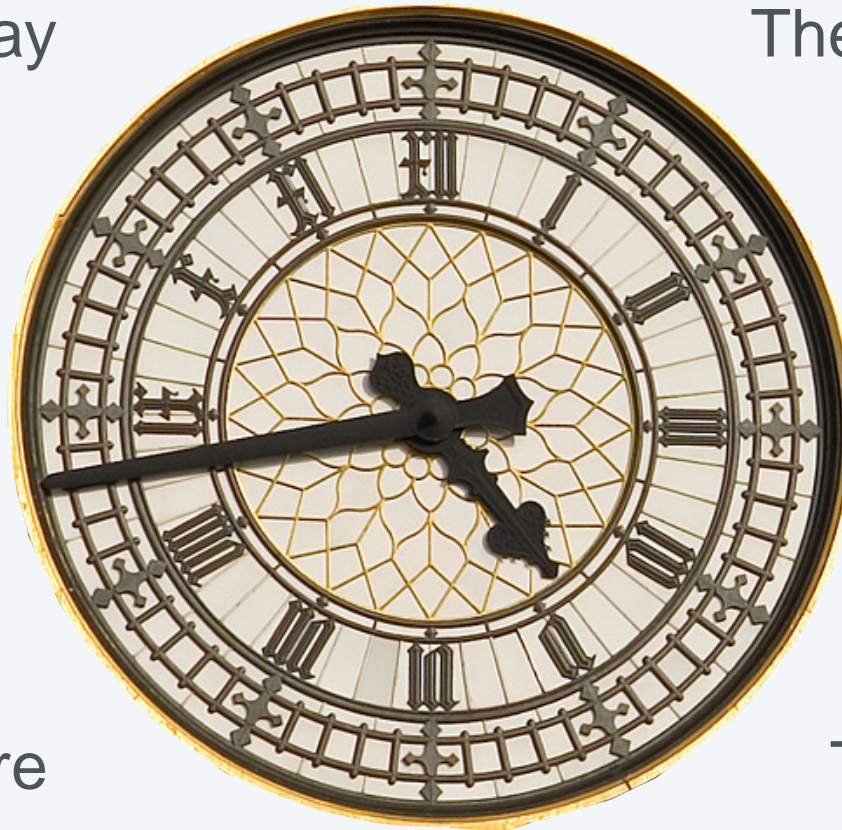
Forthcoming, *Energy Economics*

What to expect...

...over €700m in 2030

What Elecxit may
cost...

The Easy (EU) way to
trade electricity



What traders are
trying to do

The Hard way to
trade electricity

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The easy way to trade power

Life after Market Coupling



The easy way to trade power

Coupled markets: you only need to know your costs

Consumers



Consommateurs



Trader



Price is €40/MWh

Price is €40/MWh

Generators

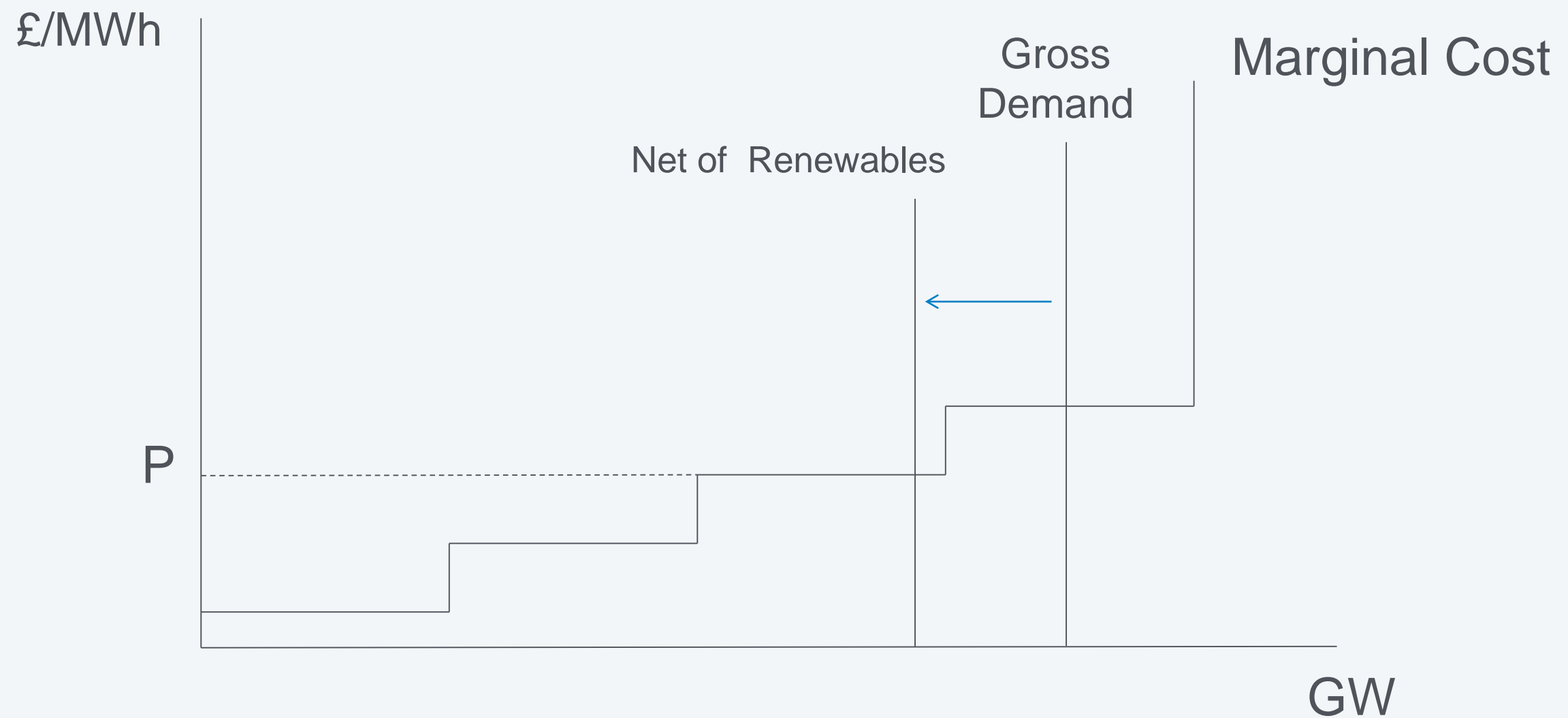


Générateurs



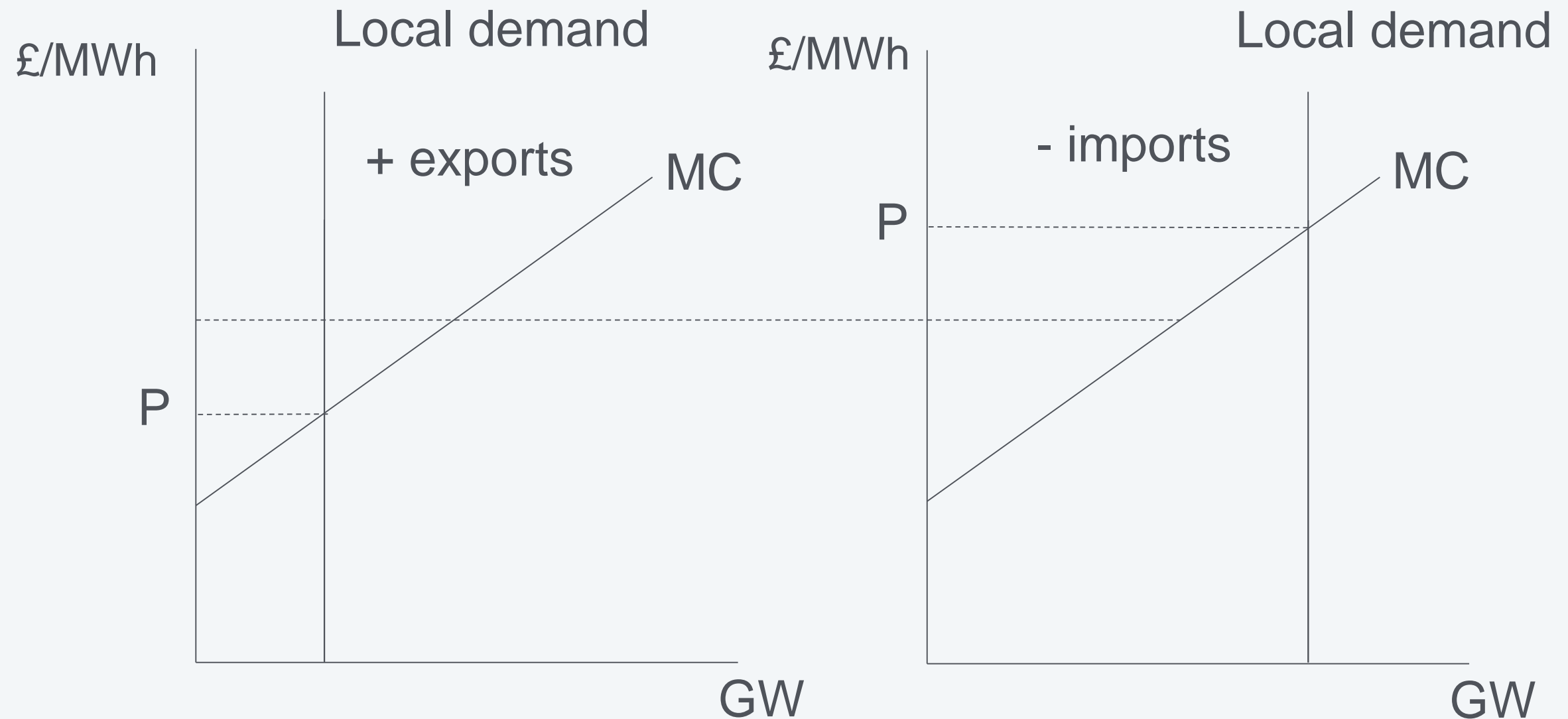


Dispatching electricity



The gains from trade

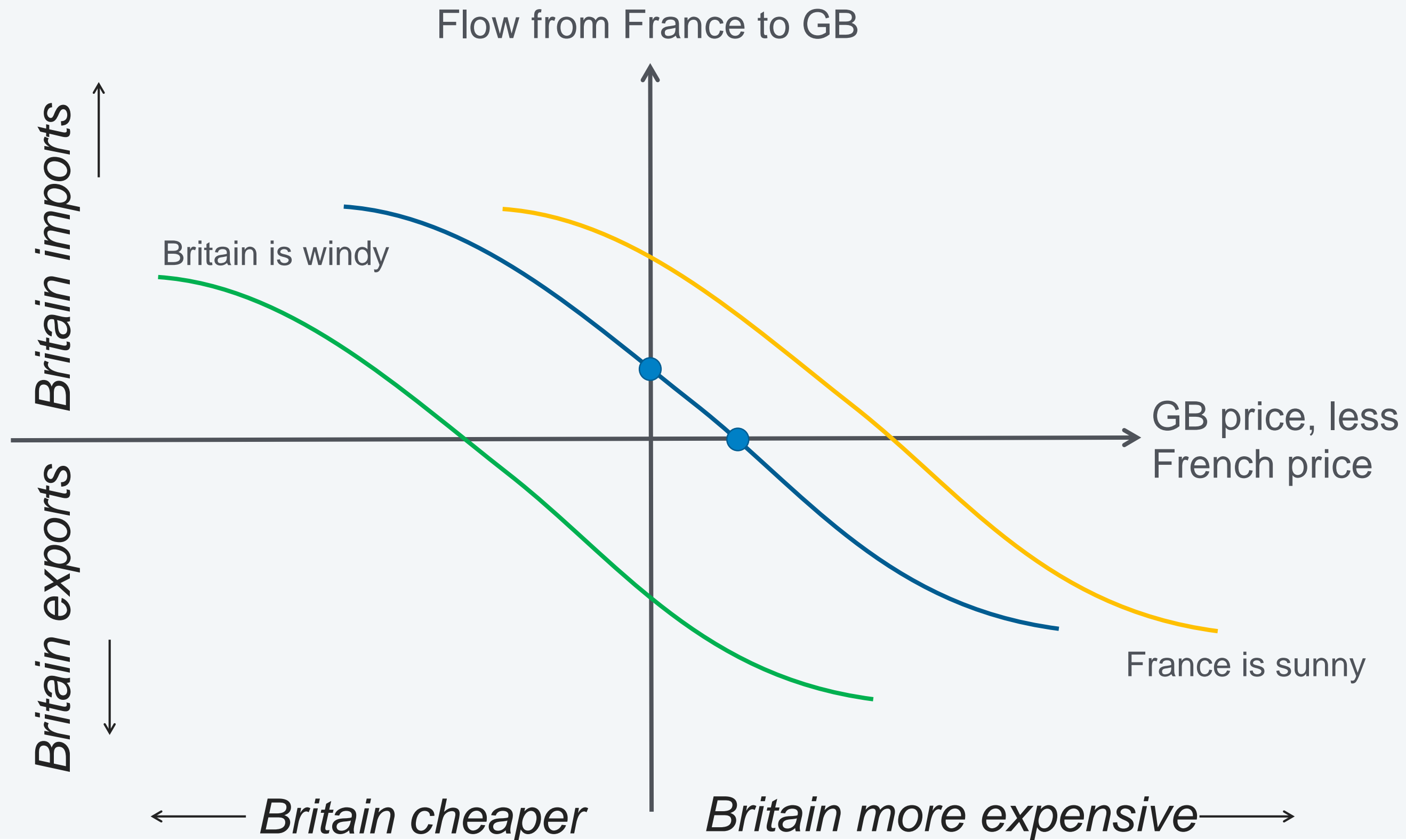
Unconstrained transmission line



Exports and imports between zones allow the prices to equalise

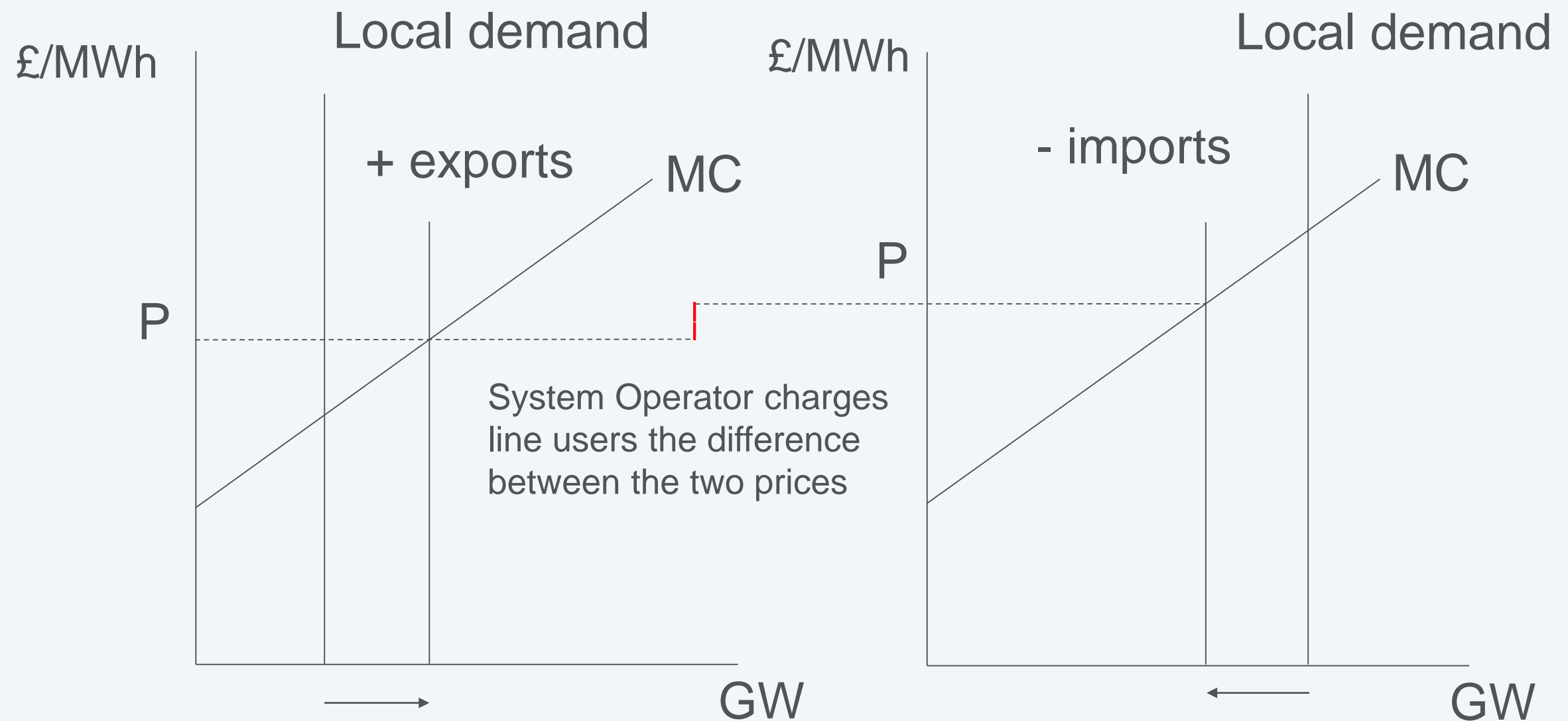


Flows and resulting price differences



Trade on a constrained line

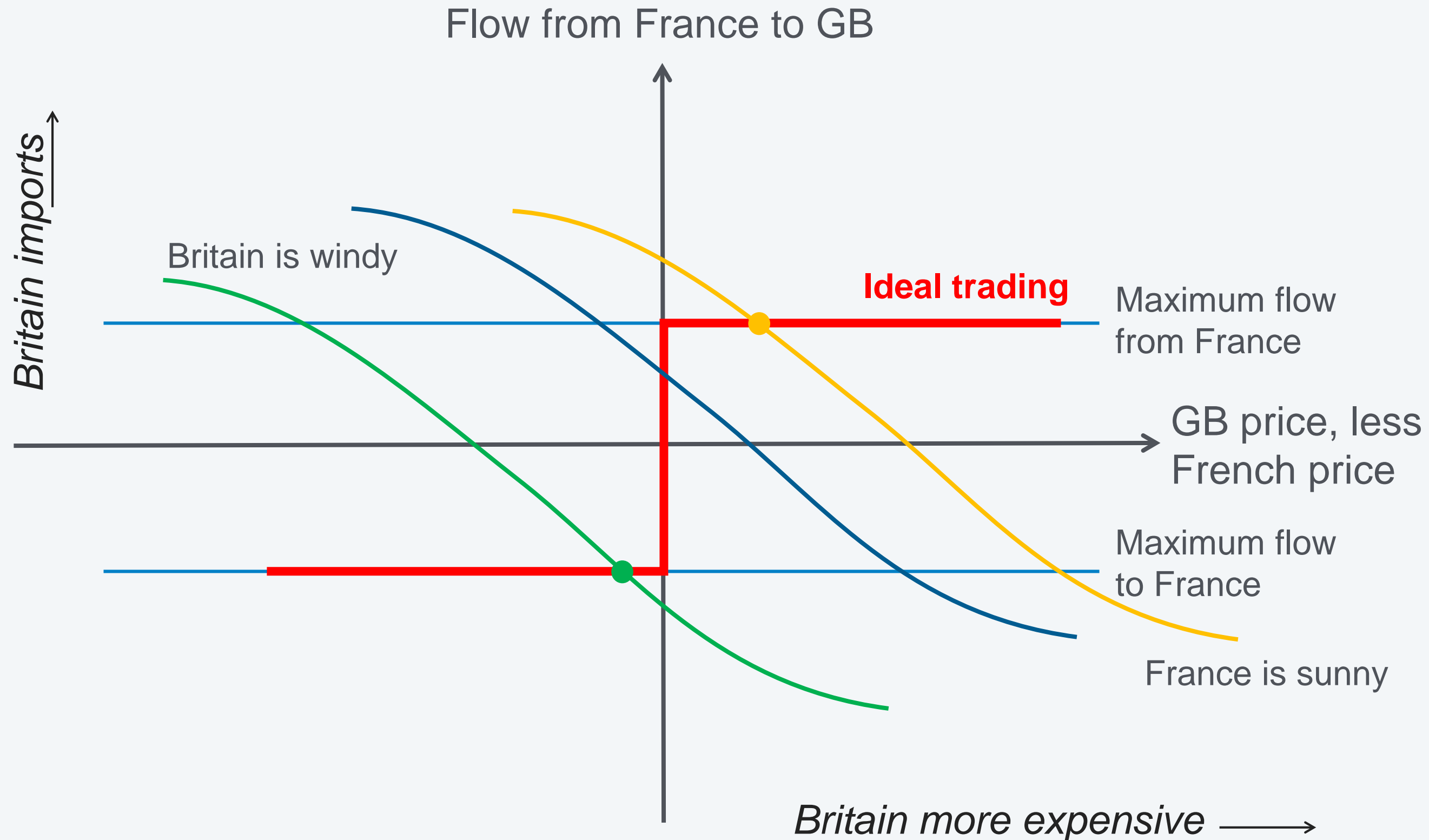
Power flows too low to equalise the prices





Flows and resulting price differences

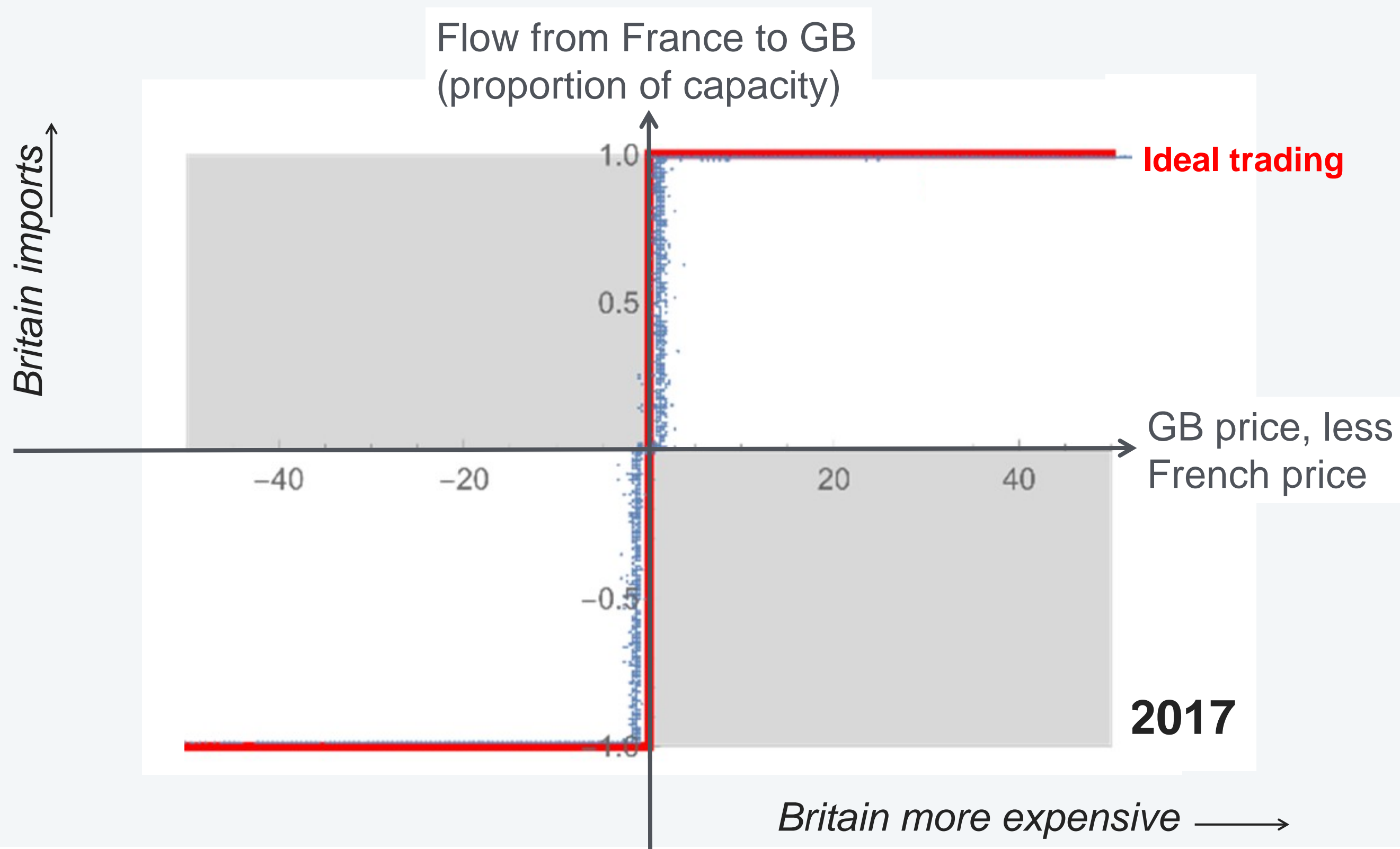
Capacity limits stop prices from equalising





The easy way to trade power

Shaded areas represent “buy high, sell low”





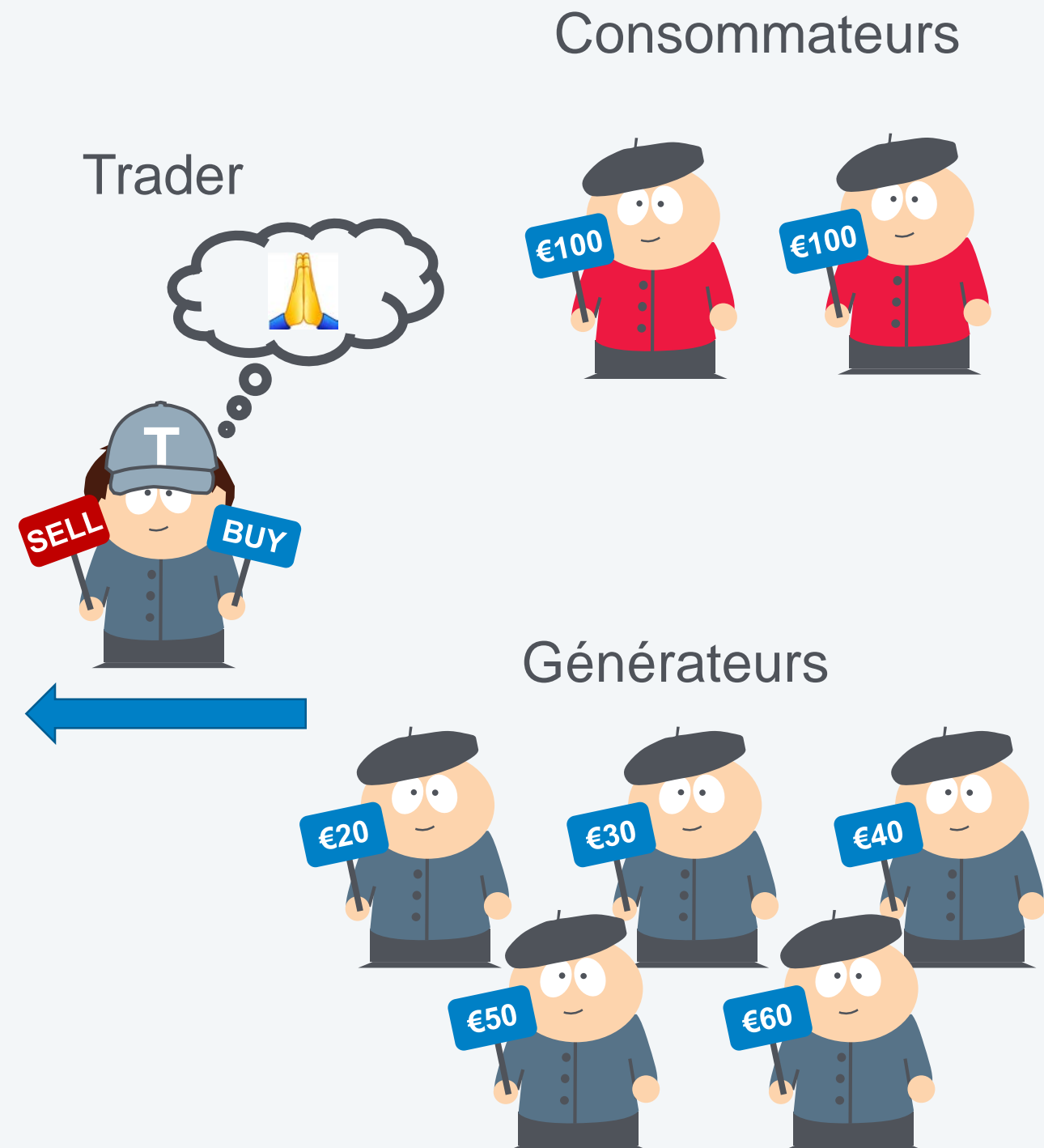
The hard way to trade power

Life before Market Coupling



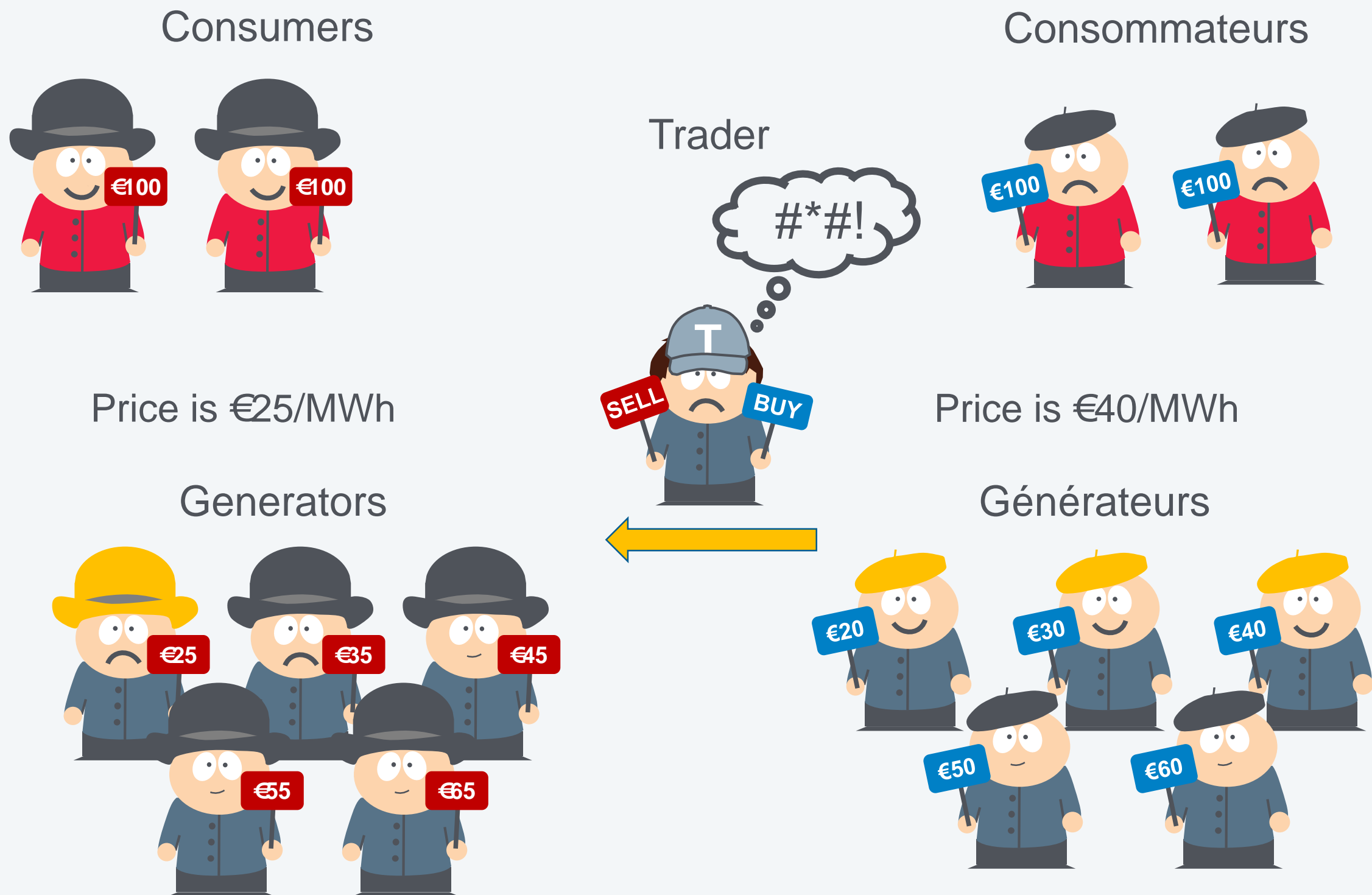
The hard way to trade power

Separated markets require forecasts



The hard way to trade power

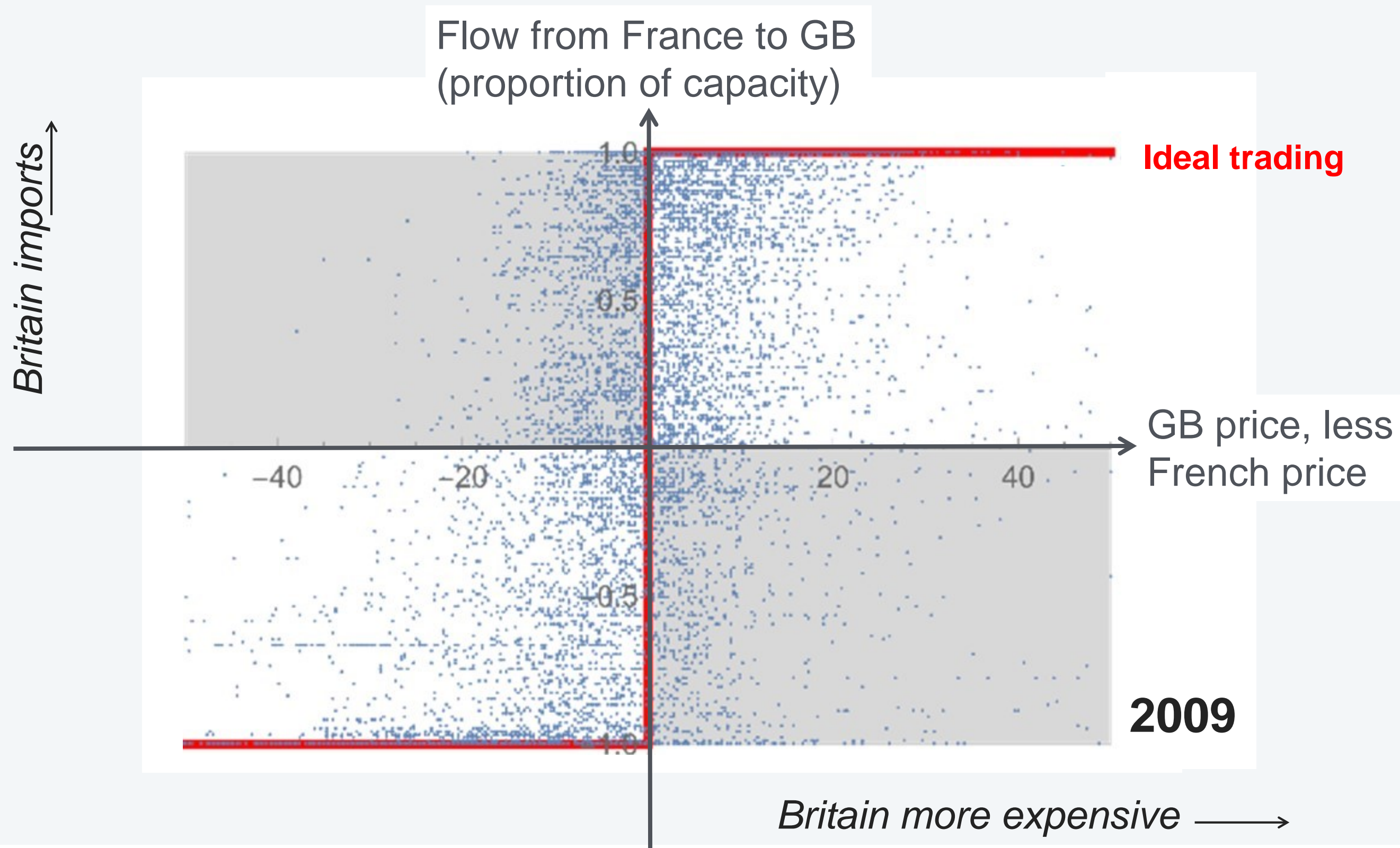
Separated markets require forecasts, which can be wrong...





The hard way to trade power

Shaded areas represent “buy high, sell low”



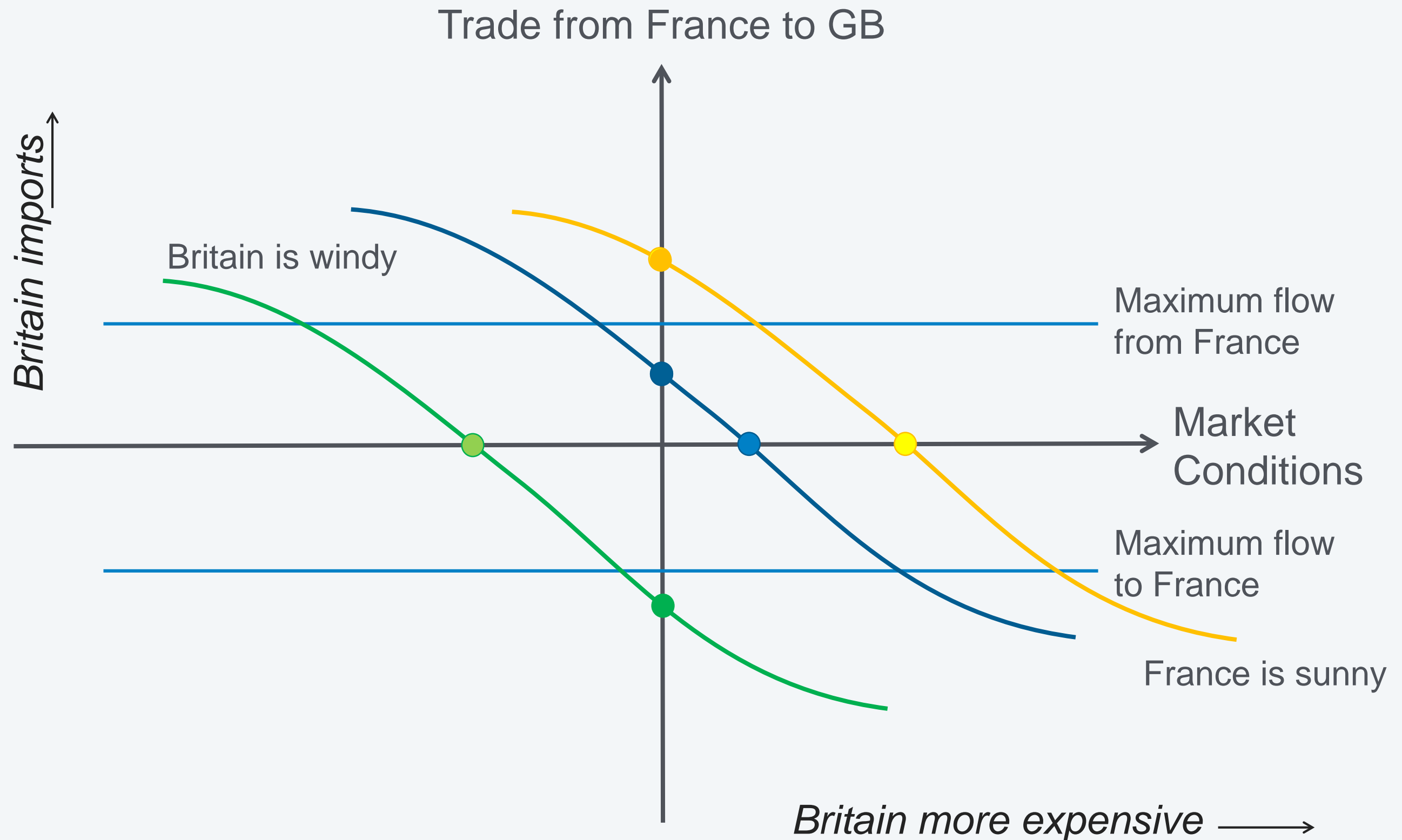
What were traders doing?





Desired flows depend on market conditions

“Conditional Trade” would equalise prices

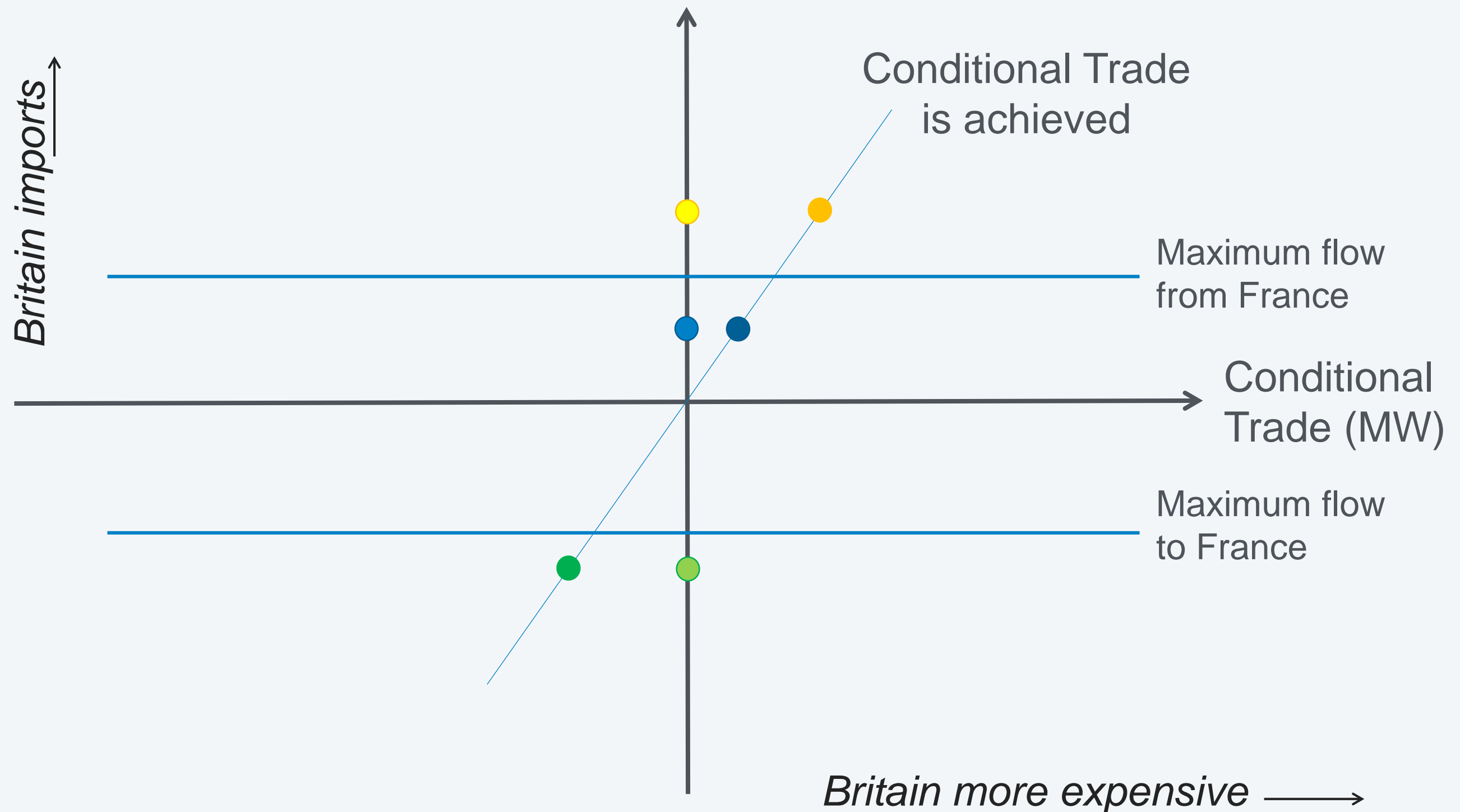




Actual flows must respect capacity limits

Conditional Trade often exceeds line capacity

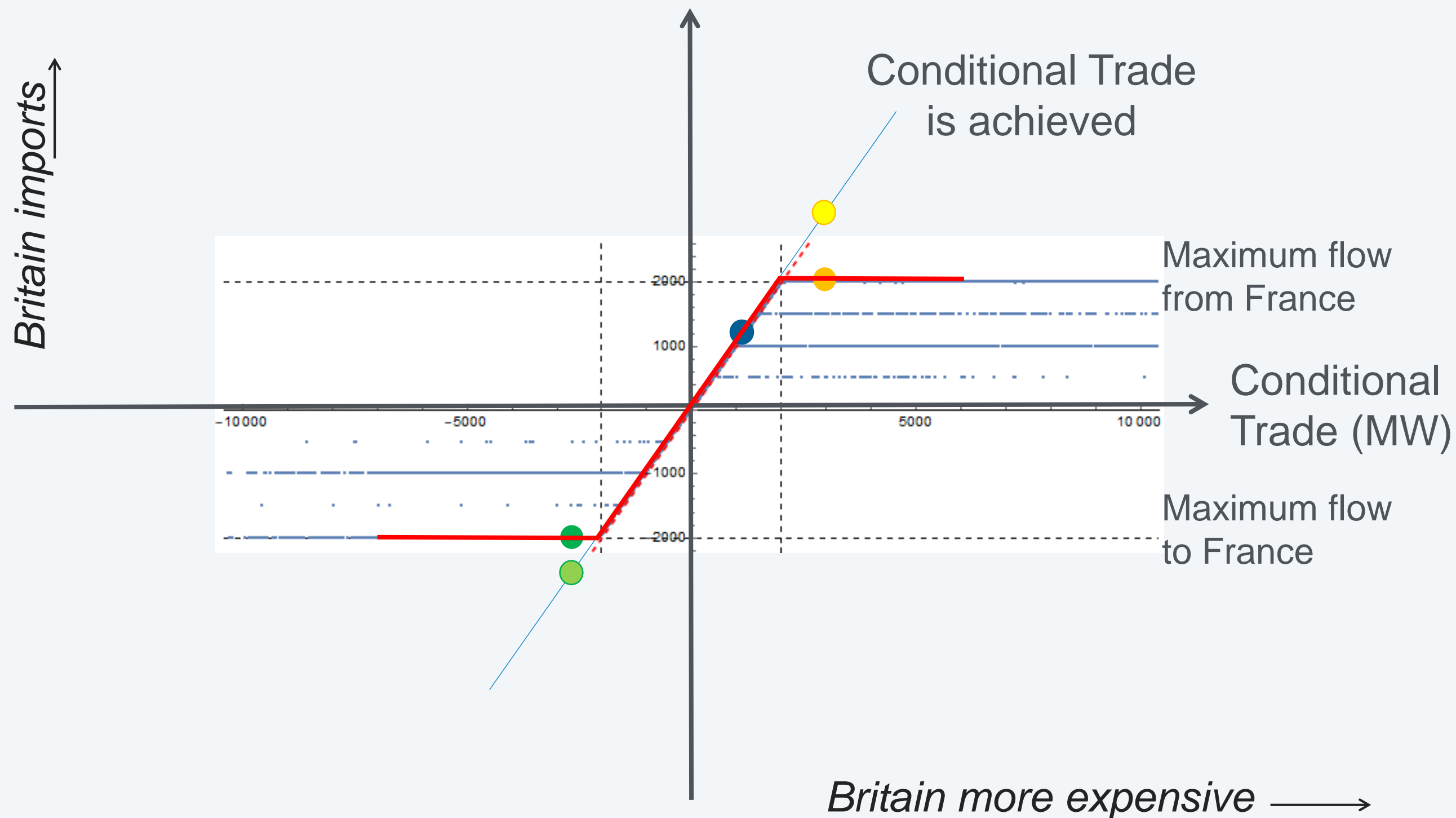
Actual Flow from France to GB (MW)





Predicted and actual flows under market coupling (2017)

Actual Flow from France to GB (MW)

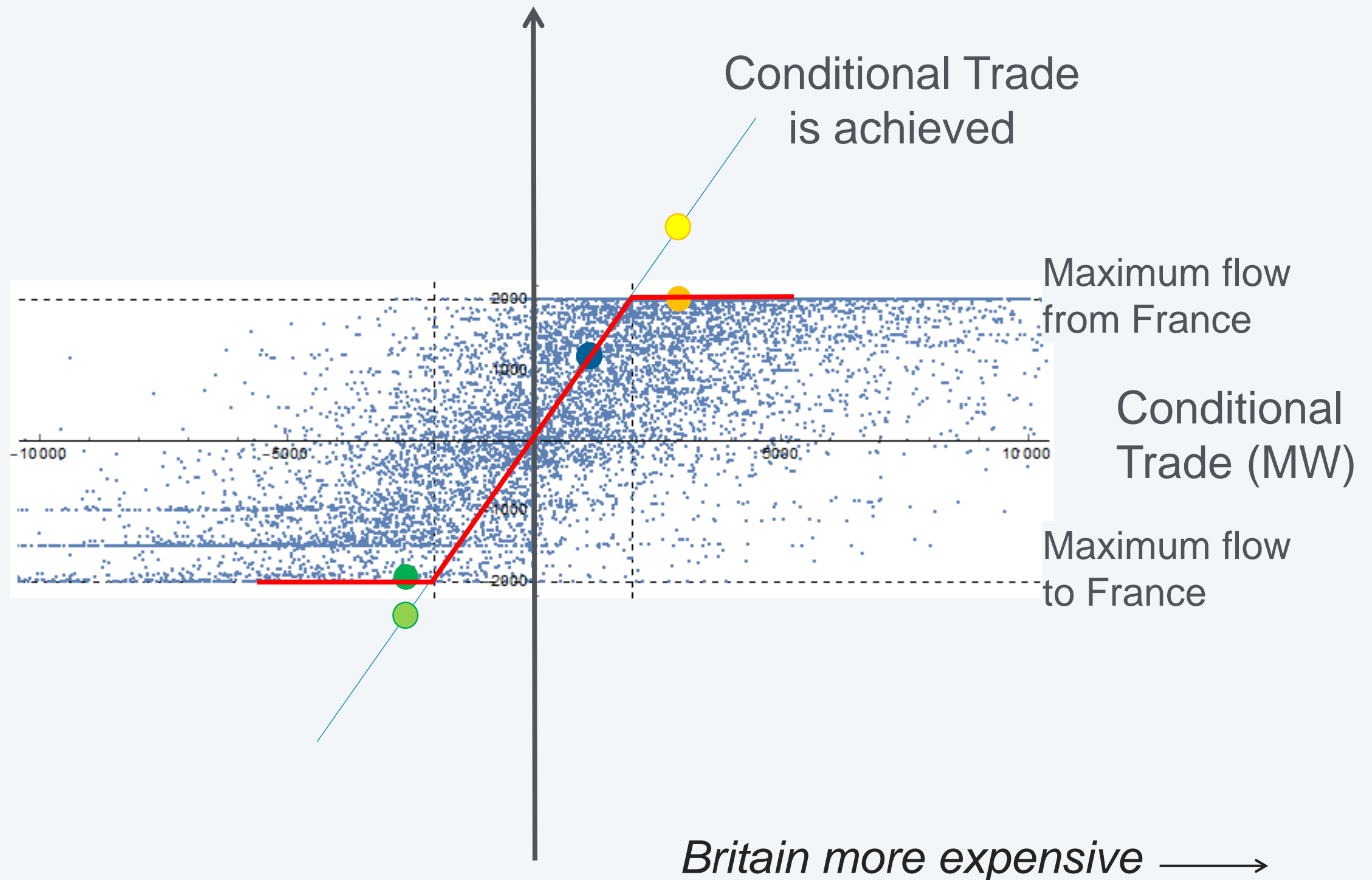




Predicted and actual flows without market coupling (2009)

Actual Flow from France to GB (MW)

Britain imports ↑



Estimating the relationship



How much were the lines under-used?

Tobit regression for “censored” data

We see Actual Trade_h and Available Capacity_h

We estimate:

$$\text{Desired Trade}_h = \alpha + \beta \text{ Conditional Trade}_h + \varepsilon_h$$

given:

$$\text{Actual Trade}_h = \text{Min}(\text{Desired Trade}_h, \text{Available Capacity}_h)$$



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Desired Trade_h: Amount traders would like to trade (given no capacity limits)
in hour h

Conditional Trade_h: Amount to equalise prices, given market conditions
in hour h

α and β are the parameters we estimate

ε_h is the error in our prediction

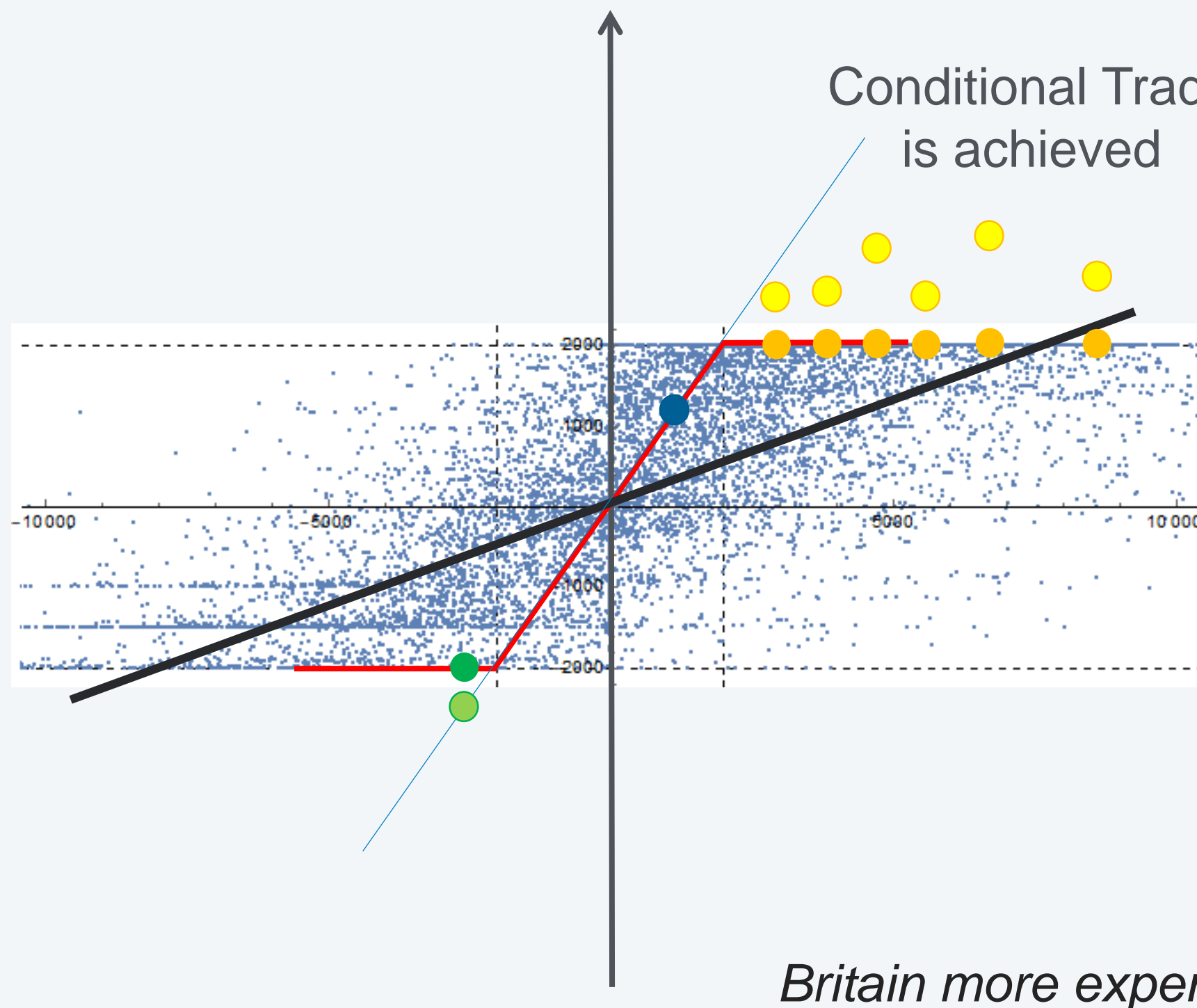


Predicted and actual flows without market coupling (2009)

Tobit regression line (black) shows Desired trade is 27% of Conditional

Actual Flow from France to GB (MW)

Britain imports \uparrow



Conditional Trade
is achieved

Maximum flow
from France

Conditional
Trade (MW)

Maximum flow
to France

Britain more expensive \longrightarrow

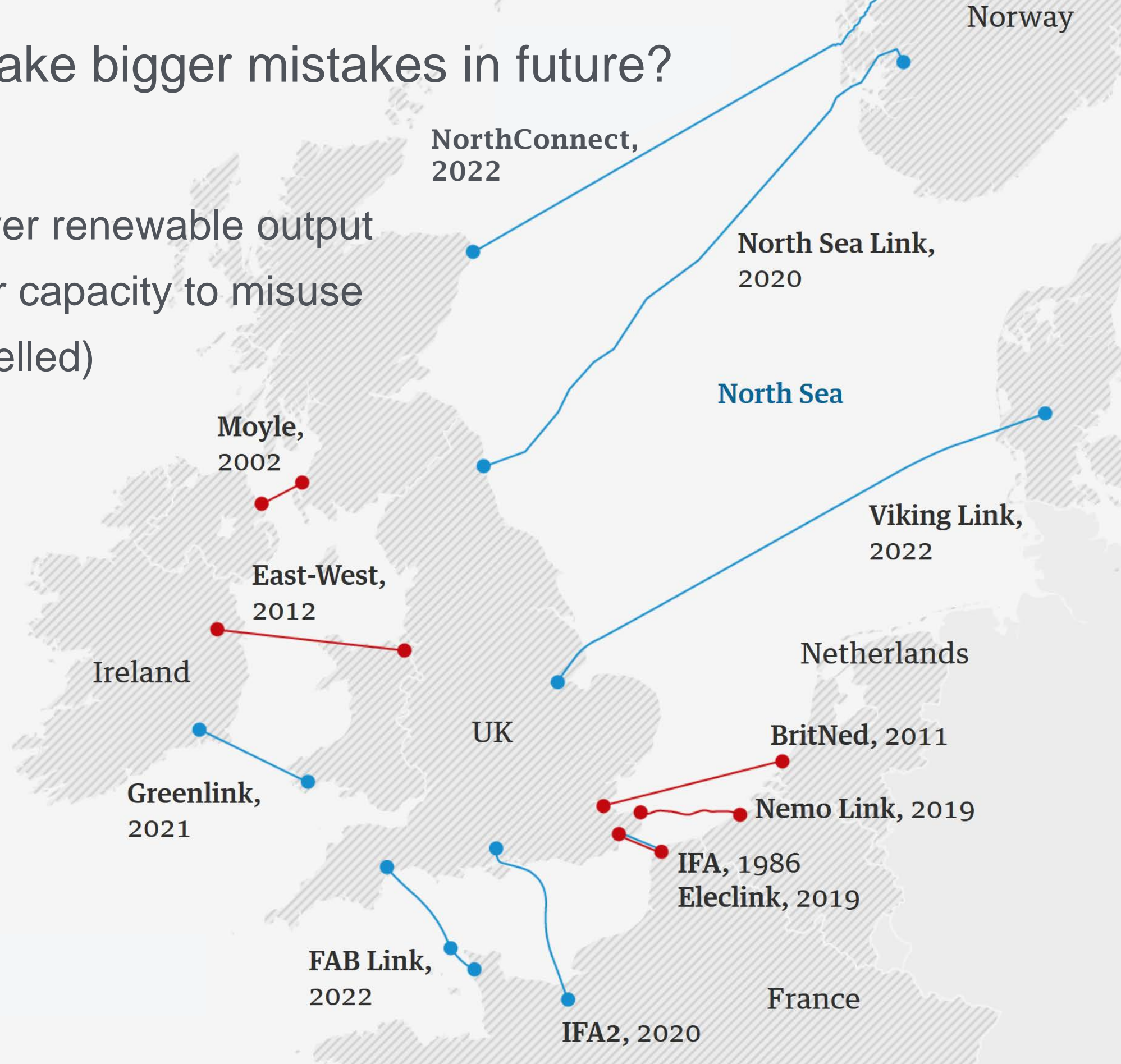


Using this “model of mistakes”

Scenarios for trading in 2030

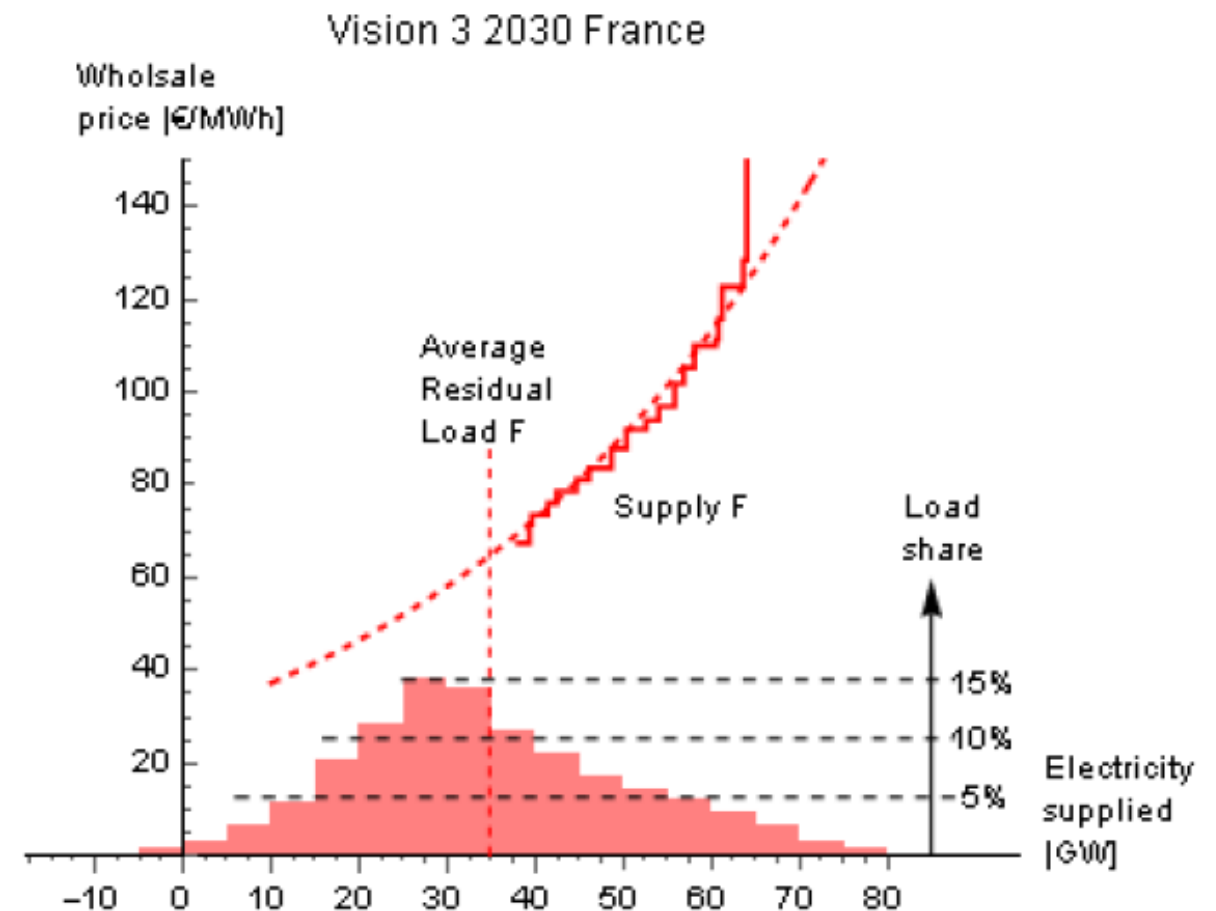
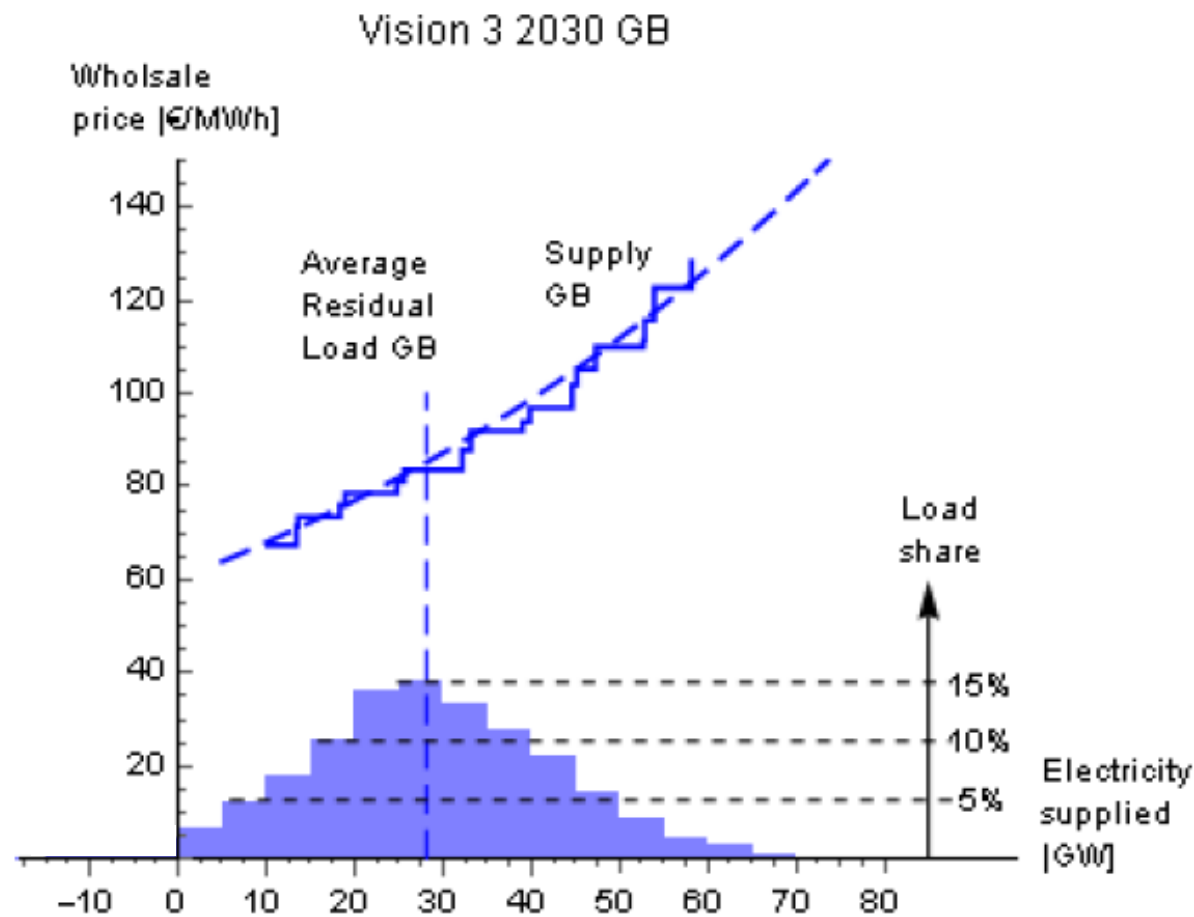
Could traders make bigger mistakes in future?

More uncertainty over renewable output
More interconnector capacity to misuse
(unless it gets cancelled)



Central scenario for 2030

ENTSO-E Vision 3 – “Green Transition”



Low fuel prices, high carbon price

Much more renewable capacity, less nuclear

More demand for electricity

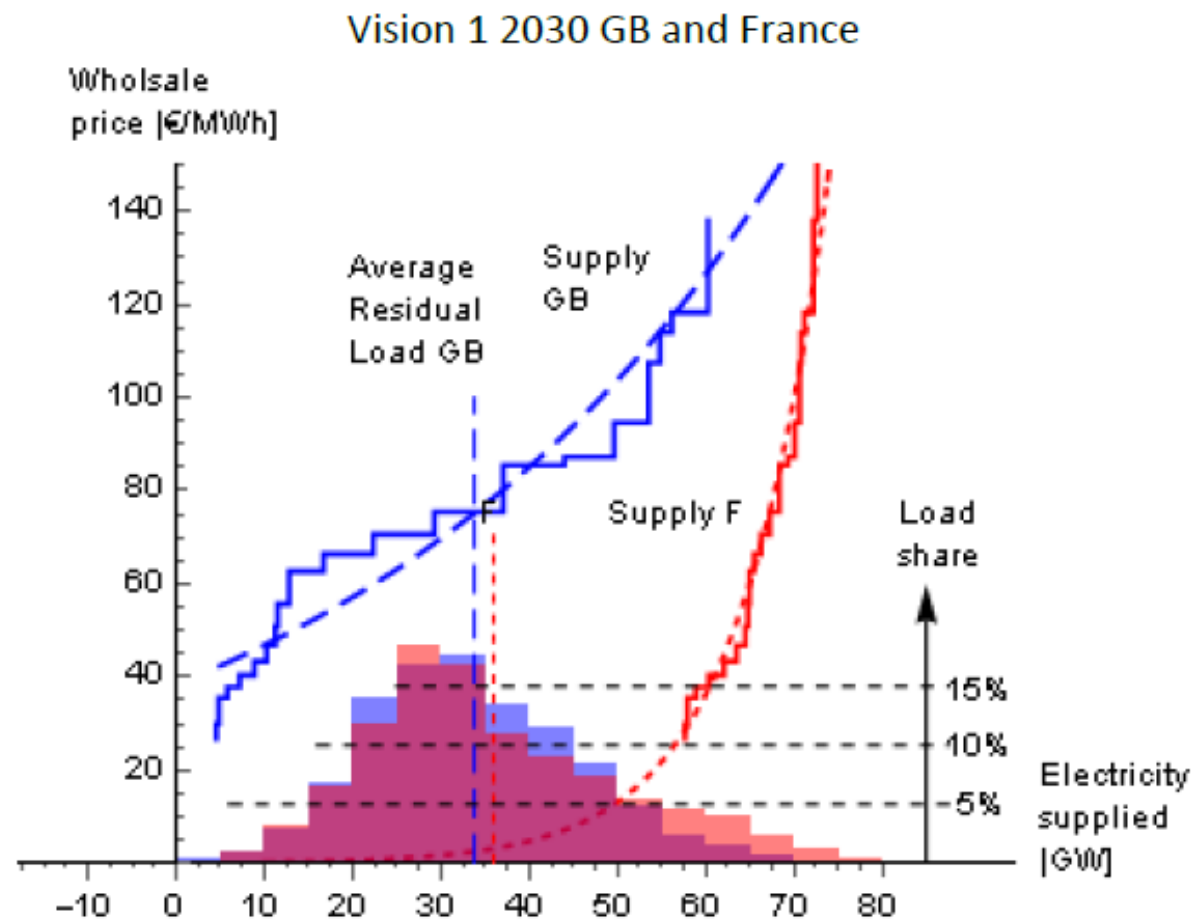
Results

ENTSO-E Vision 3 for 2030

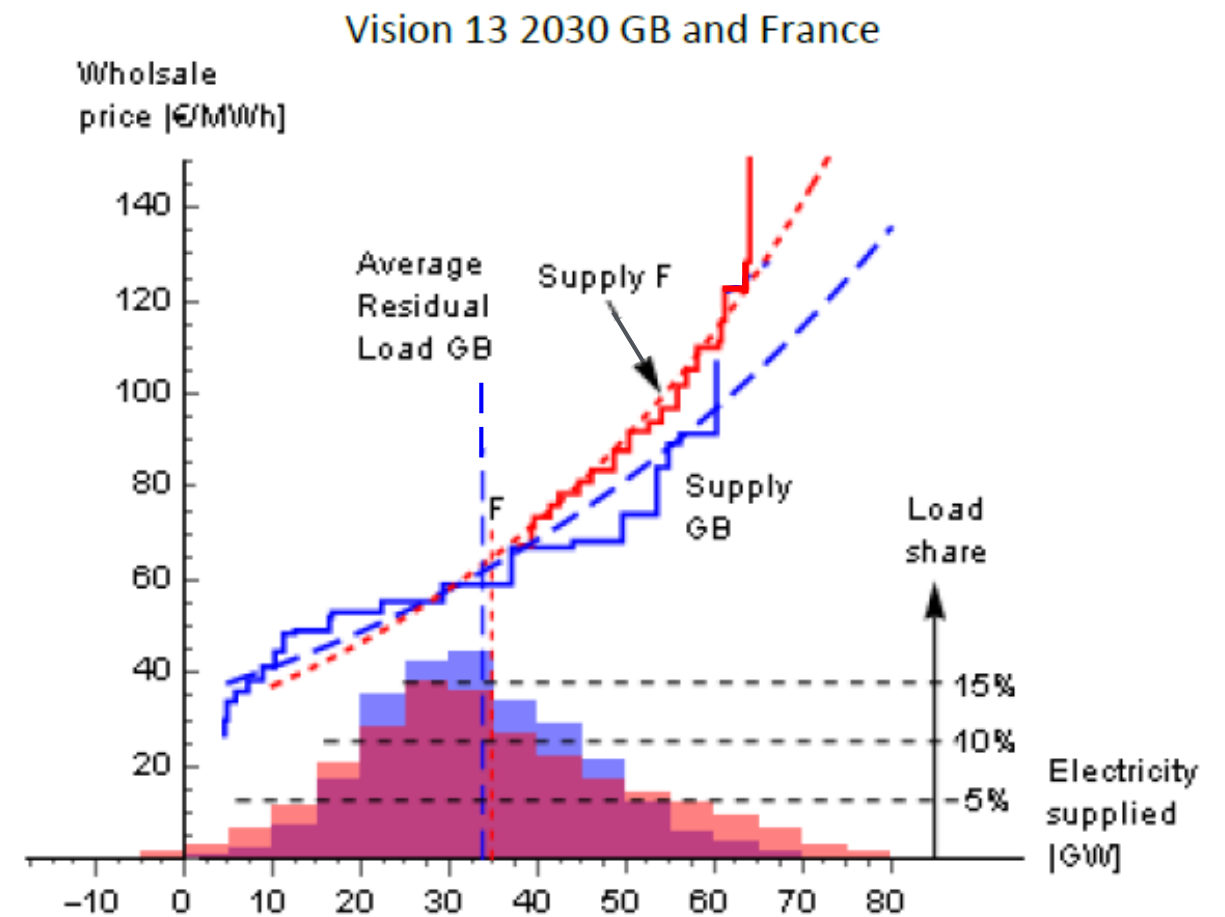
Elecxit type:		GB			France		
		Soft	Hard	Diff	Soft	Hard	Diff
Imports	TWh	6.1	2.2	-3.9	0.7	0.5	-0.2
Price	€/MWh	81	85	4	76	71	-5
CO2	mT	59	72	13	30	27	-3
Cons. pay	€m	22,176	23,037	861	26,037	25,167	-870
Gen rents	€m	3,663	4,325	662	10,864	9,691	-1,173
I/C rent	€m	263	168	-95	263	168	-95
Net Cost	€m	18,250	18,544	294	14,910	15,308	398
Cost	€m	33,160	33,852	692			

Other scenarios for 2030

ENTSO-E Vision 1



Slow Progress, low carbon price
Less renewable, more nuclear (F)
Demand growth is lower



Slow Progress in GB
Green Transition in France
Possible carbon border tax

Sensitivity analysis

Comparisons within scenarios of hard v soft Elecxit

Vision 1 (very different supply curves):

Combined cost rises by €2.7 billion

British prices rise by €2.4 billion, French fall by €3.2 billion

Vision 13 (similar supply curves, Britain net exporter):

Combined cost rises by €0.2 billion

British prices *fall* by €0.5 billion, French *rise* by €1.6 billion

Vision 13CP (British supply curve pushed back up by border carbon tax):

Combined cost rises by €0.8 billion

British prices rise by €1.0 billion, French fall by €1.3 billion



Thank you



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