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PRICE STABILITY AT WHAT PRICE?
THE ECONOMICS OF LIQUIDITY IN A DECARBONISING ELECTRICITY SYSTEM

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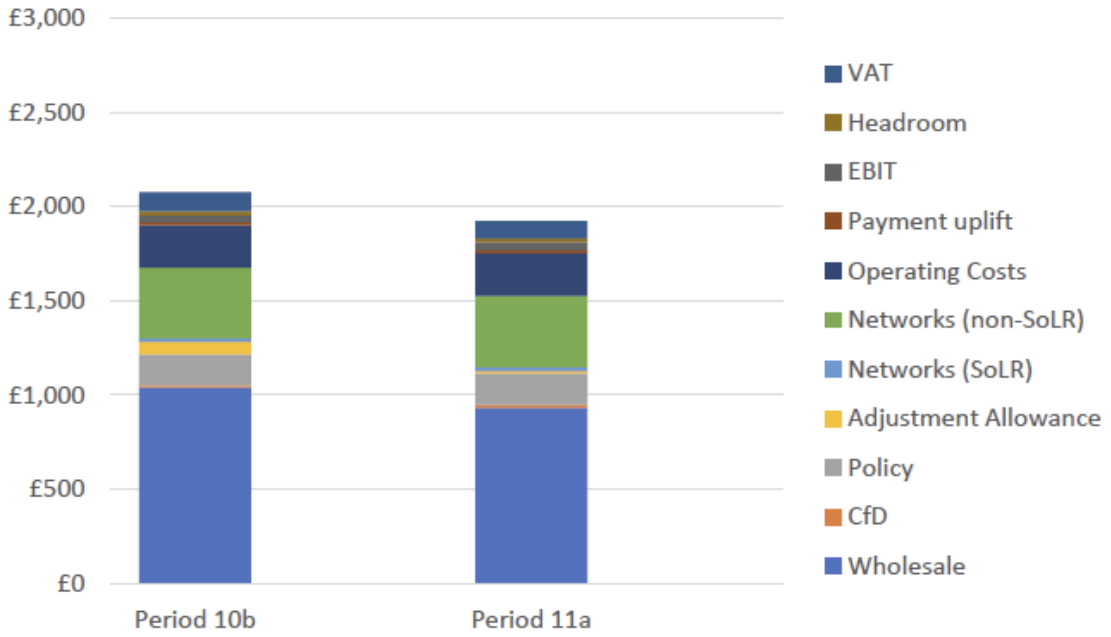
The recent energy crisis shone the spotlight on both the level and stability of end-user electricity prices

Ofgem's Default Tariff Cap (DTC) ensures electricity price stability for customers[1]



(1) Breakdown of the previous and current Energy Price Cap components, direct debit, dual fuel, Ofgem (25 August 2023), Energy price cap (default tariff) update from 1 October 2023

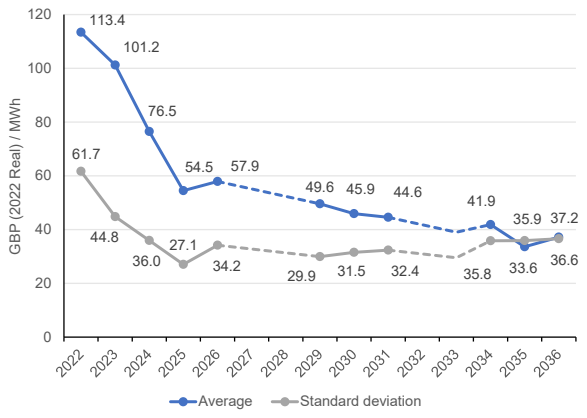
Suppliers manage wholesale electricity price risk by trading in the forward market for electricity

- The supply for hedges and the liquidity of forward markets impact the risk premia suppliers face in the forward market
- The economics of liquidity and hedge markets are frequently ignored and generally poorly understood in policy design, but are a significant driver of costs to customers
- NERA has developed a modelling approach for estimating the willingness to provide "hedges" for generators

In this presentation, I will explain our modelling approach and highlight areas where it can be a useful tool for evaluating the impact of changes in electricity market conditions or design on electricity forward markets

Our modelling framework consist of three main steps

Market Modelling

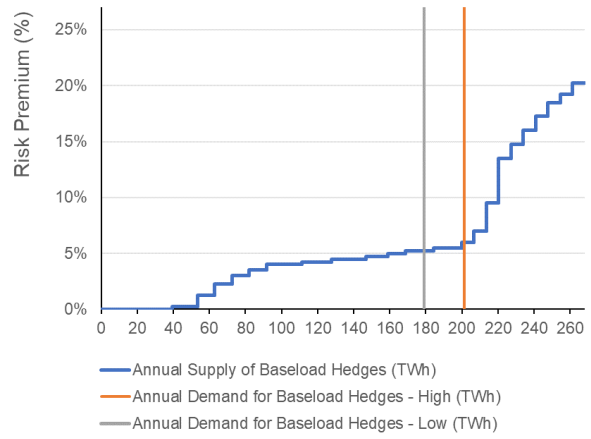


Value at Risk Framework

Generator Intermittent Renewables - Combined

Revenues	*Units*	Jan-23	Feb-23
Sales at Forward	£	6,254,787	5,730,068
Sales at Spot	£	3,718,062	3,409,163
Sales of Hedged Gas	£	0	0
RO Payment	£	6,329,242	5,986,508
CfD Payment	£	0	0
Total Revenue	£	**16,302,091**	**15,125,740**
Costs			
Collateral Costs	£	0	0
Transaction Costs	£	-9,287	-8,239
Fuel Cost	£	0	0
Cost of purchasing at Spot	£	-536,331	-359,063
O&M	£	-369,963	-349,929
Total Costs	£	**-915,582**	**-717,231**
Cash Balance	£	15,386,509	14,408,508
Cumulative Cash Balance	£	15,386,509	29,795,018
Total Generation	MWh	107,257	101,449
Outputs:			
Minimum Cumulative Cash Balance	£	15,386,509	
Total Generation	MWh	1,221,913	

Market Supply Curve



Our Value at Risk framework enables us to estimate willingness to provide hedges for different generator types

Our VaR model estimates generator cash balances in 4,000 states of the world (per year)

Summary of Monthly Cashflows

IR

Generator: Intermittent Renewables - Combined			
Revenues	*Units*	**Jan-23**	**Feb-23**
Sales at Forward	£	3,267,773	2,996,023
Sales at Spot	£	869,214	631,398
Sales of Hedged Gas	£	0	0
RO Payment	£	3,736,075	2,939,870
CfD Payment	£	0	0
Total Revenue	£	**7,873,062**	**6,567,291**
Costs			
Collateral Costs	£	1,090,938	-1,289,587
Transaction Costs	£	-4,992	-5,179
Fuel Cost	£	0	0
Cost of purchasing at Spot	£	-1,078,809	-1,248,266
O&M	£	-218,385	-171,844
Total Costs	£	**-211,248**	**-2,714,875**
Cash Balance	£	7,661,814	3,852,416
Cumulative Cash Balance	£	7,661,814	11,514,230
Total Generation	MWh	63,313	49,820
Outputs:			
Minimum Cumulative Cash Balance	£	7,661,814	
Total Generation	MWh	1,058,168	

Technologies Considered

Wind+Battery
Wind (CfD)
Wind (ROC)

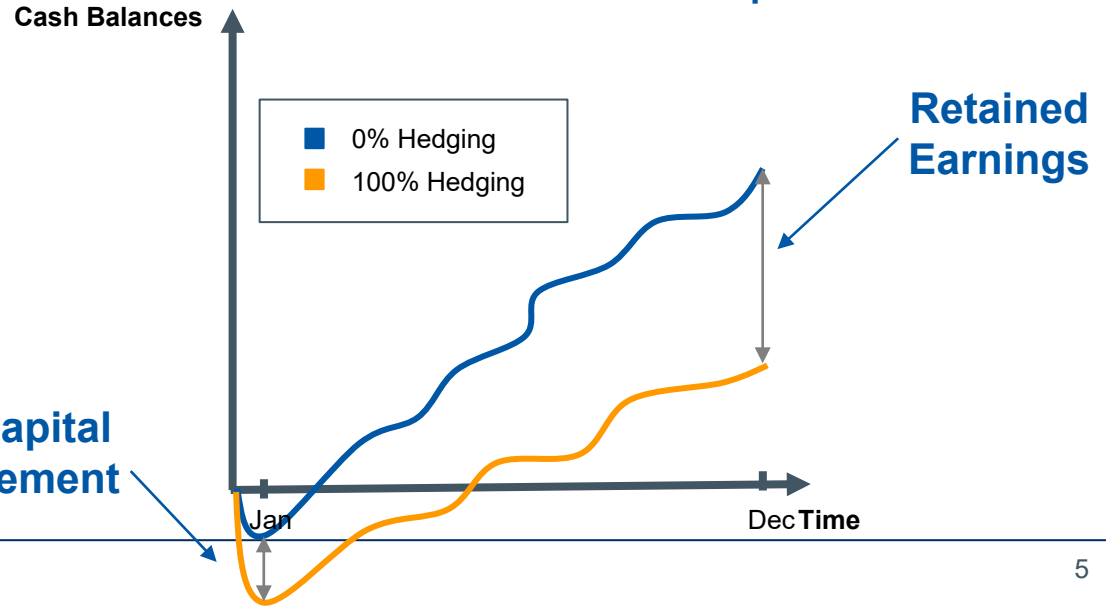
Nuclear

CCGT
OCGT

Hedging Strategy

- We assume each generator provides hedges according to the Default Tariff Cap profile
- We simulate the cost of providing 0%-100% of expected output in hedges

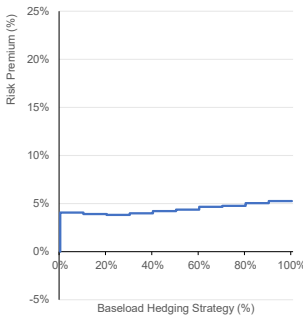
Illustration of VAR Model Output



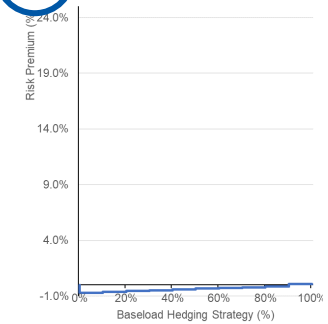
The final step in our framework involves aggregating individual supply curves to create a market wide supply curve for hedges

Individual Supply Curves for Hedges by Tech Type

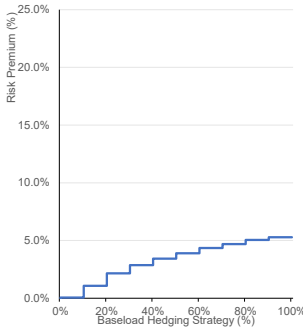
Wind+Battery



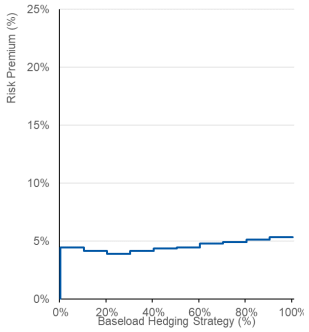
Nuclear



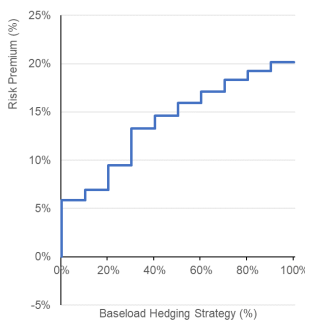
CCGT



Wind (ROC)

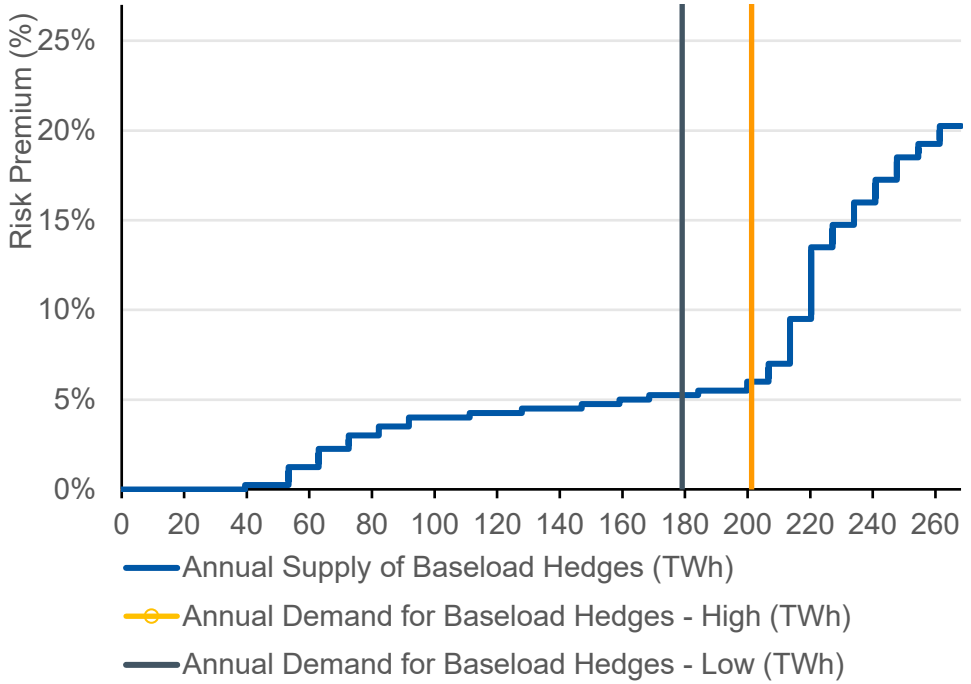


Wind (CfD)



We aggregate the individual supply curves using the capacity mix forecasted in NG ESO's Future Energy Scenarios 2022

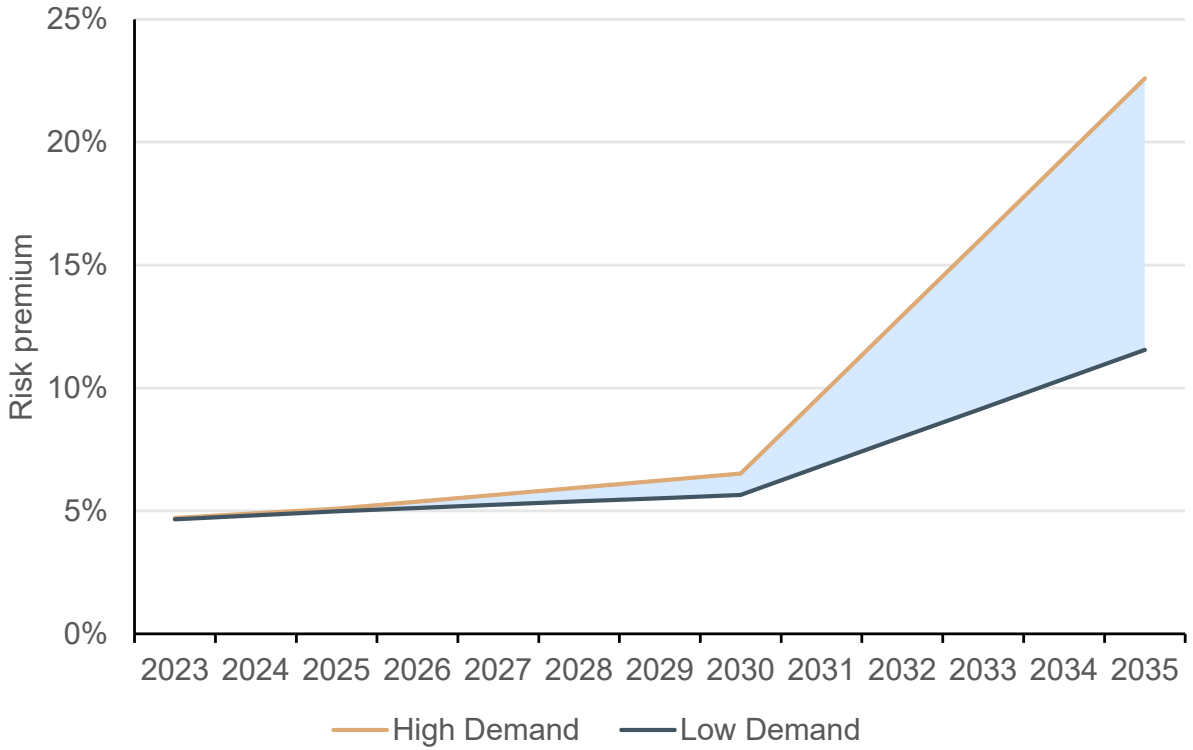
Market Supply and Demand Curves for Hedges



The intersection between our assumed demand curves and the supply curve for hedges identifies the market risk premium (i.e., the market price for hedges)

We find that the risk premia (as a % of the expected wholesale electricity price) increases gradually from 2023 to 2030 before spiking in 2035

Evolution of the Weighted Average Risk Premia



Key Assumptions

- We assume that both suppliers and generators hedge according to the current DTC hedging profile
- We assume that the current CfD framework and wider wholesale market design remain in place until 2035

Using BEIS' latest EEP electricity price forecast[1], the average risk premia will rise from £5.08 per MWh to £6.7 to £13.10 per MWh (low and high demand respectively).

1. Source: BEIS (October 2022), Energy and emissions projections 2021 to 2040, Annex M: Growth assumptions and prices, Sheet: Reference

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