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IGEES
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An Insight into Emergency Energy Security Group

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Dublin Economics Workshop - 16 September 2022

Economic & Evaluation Unit (DECC)

Outline

1. Energy Security Emergency Group Structure
2. Data & Modelling Sub-Group:
    - **Insight: Prices Analysis**
3. Policy Response Sub-Group:
    - **Insight: Windfall Tax**
4. Policy Implications

Energy Security Emergency Group

1. Avoiding Groupthink

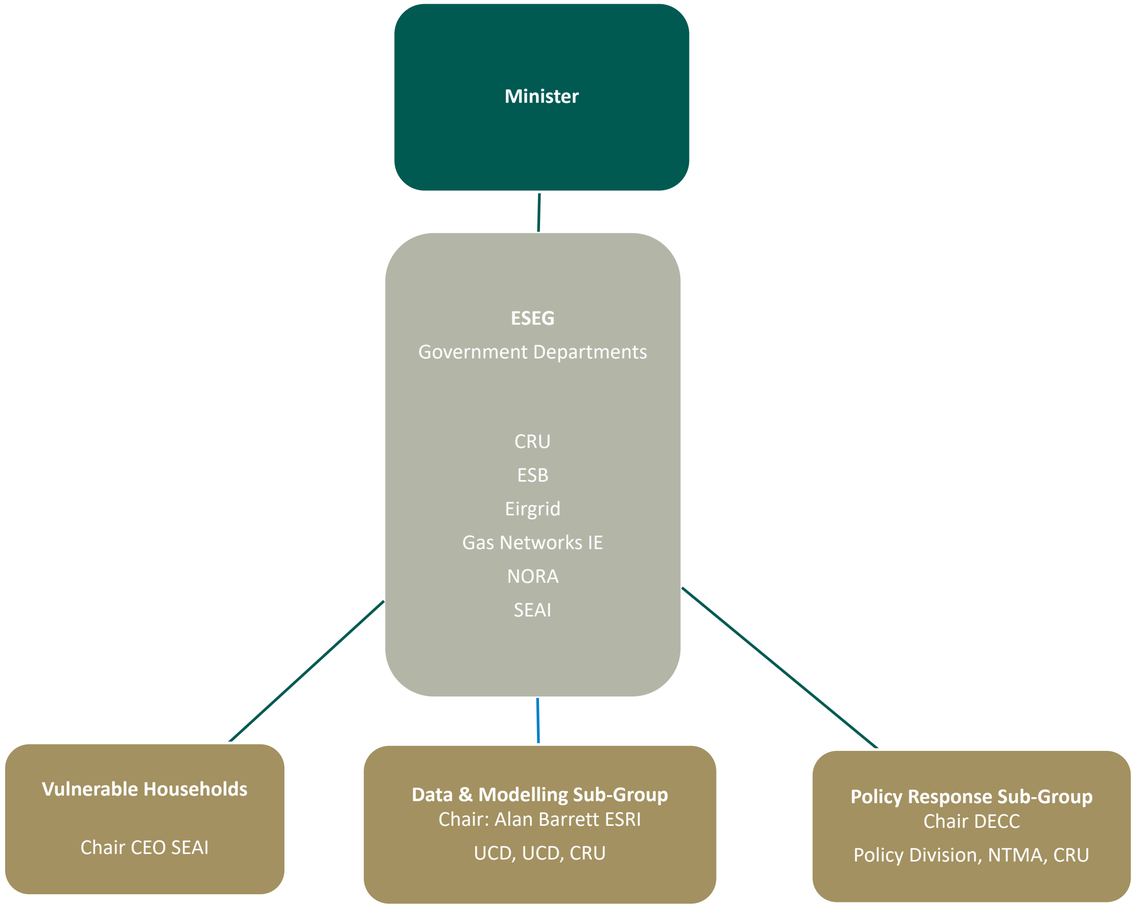
Janis, I.L., 2008. Groupthink. IEEE Engineering Management Review, 36(1), p.36.

2. Mix of Relevant Stakeholders

Mitchell, R.K., Agle, B.R. and Wood, D.J., (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. Academy of management review, 22(4), pp.853-886.

3. Importance of Data:

Watson, H., Finn, R.L. and Wadhwa, K., 2017. Organizational and societal impacts of big data in crisis management. Journal of Contingencies and Crisis Management, 25(1), pp.15-22.



Sub-Groups

Objectives:

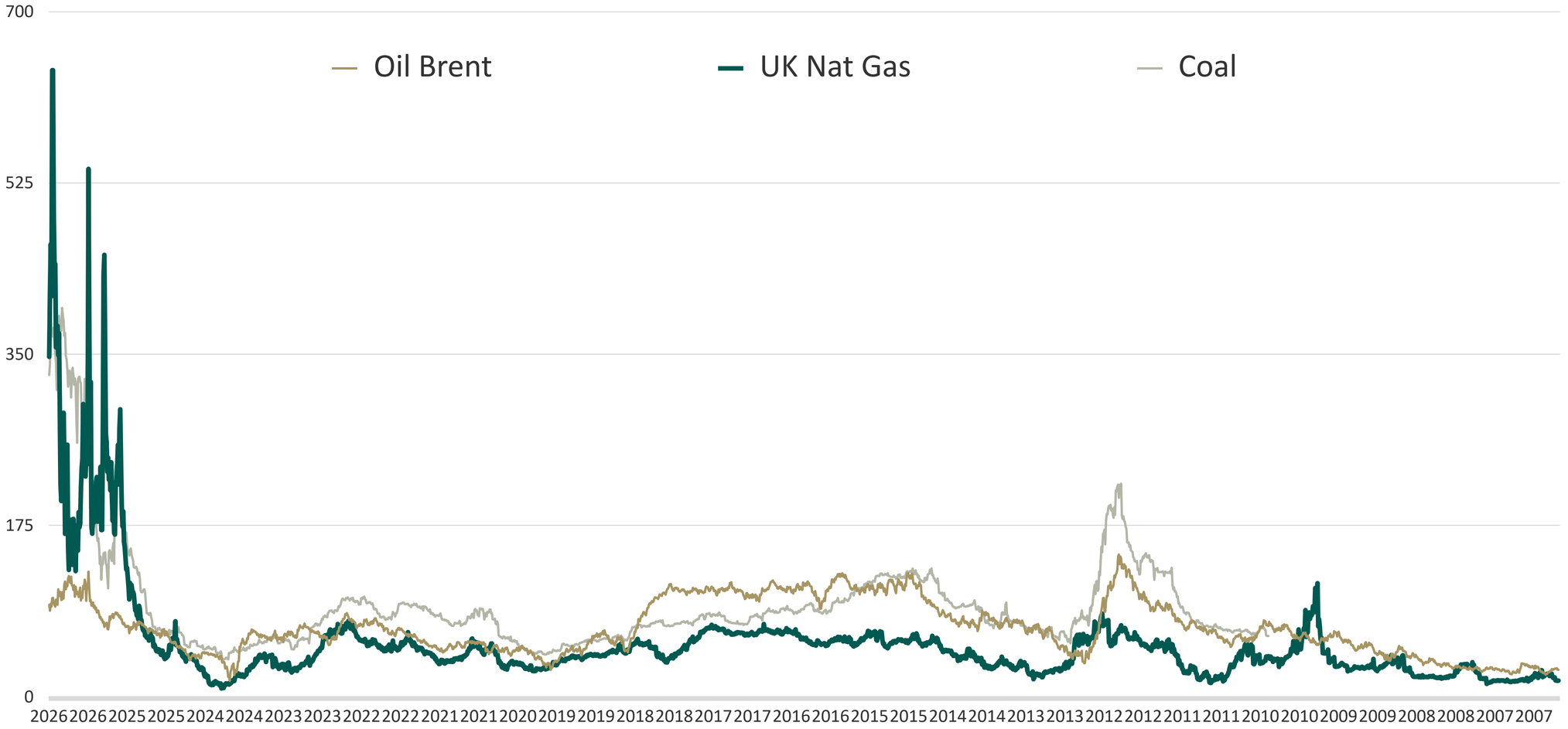
- Ensure the group is fully informed with data
- SMART
- Multiple Options
- Multi-Criteria Analyses
- Policy Options considered with best available evidence

Prices Summary

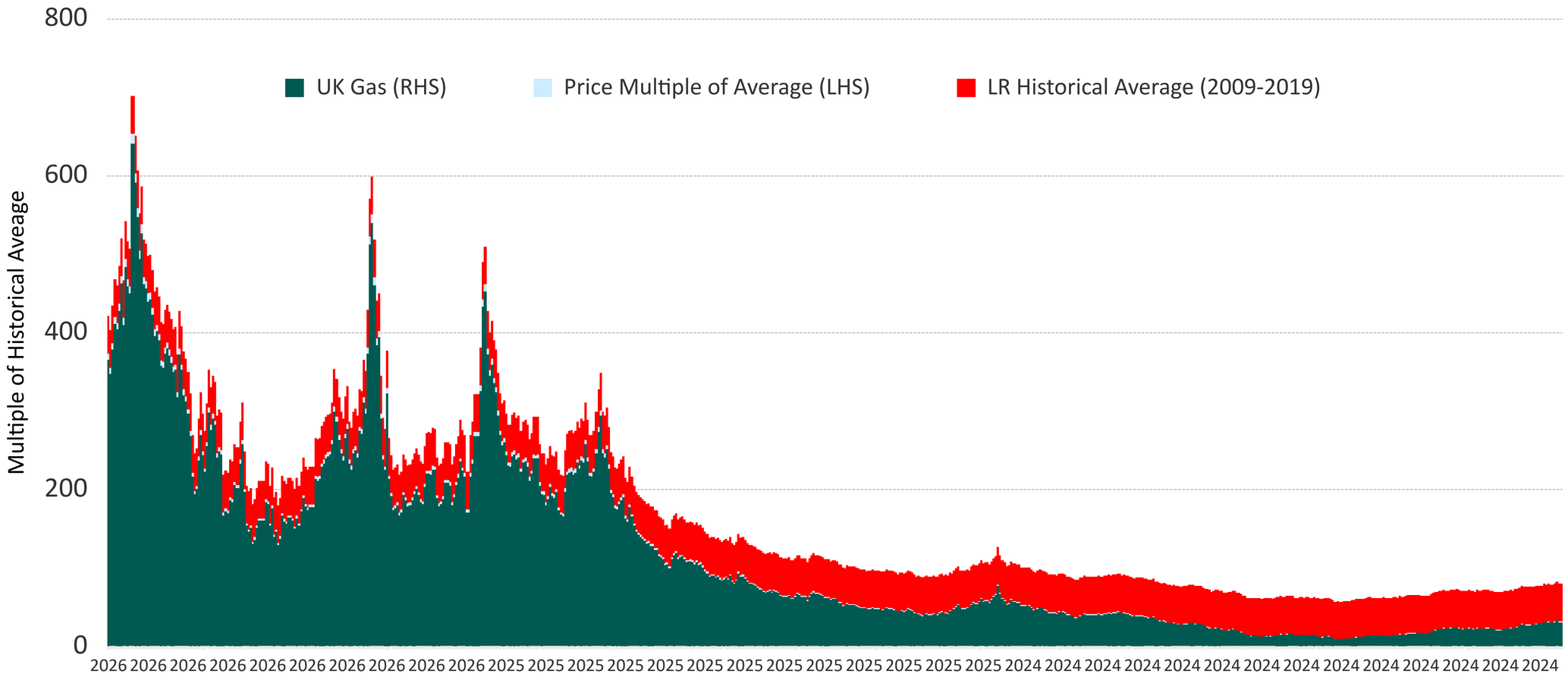
Indicator		Price	Metric	Data Frequency		Previous	Month	Year	Source	Commentary
				Reporting	Updated					
UK Wholesale Gas Price		365	pence/therm	daily		5%	-14%	138%	markets	UK natural gas futures fell a further 8% on Monday to around the 350-pence-per-thermmark, as European governments moved to take measures to contain soaring prices. However, prices are poised to remain elevated amid tightening supplies.
UK Gas Winter - 2022-Q4		438	pence/therm	quarterly	daily			79%	futures market curve	UK natural gas futures price expectations for Winter (2022-Q4 also fell and are currently close to the 440 pence-per-therm, around 2.5 times higher than the second quarter of this year and around 80% higher than the average level seen at the end of last year(2021-Q4).
UK Gas Winter - 2023-Q1		521	pence/therm	quarterly	daily			117%	futures market curve	UK gas forward looking futures prices at the start of next year (2023-Q1) also fell to around the 520 pence per therm at just under 3 times the average prices in the second quarter of this year and over double than at the start of 2022.
Oil Brent (Europe)		93	$/barrel	daily		-1%	-2%	27%	markets	Brent crude oil prices (at $94 a barrel) continue to trade in a narrow range as upward pressure on prices from supply concerns are being offset by concerns of ongoing lockdowns in China and the potential impact of rising interest rates to combat inflation.
Coal	Wholesale Price	336	$/1k metric tonne	daily		2%	-5%	96%	markets	Wholesale coal prices eased back further on Monday to under the $330 mark but remain around double the price compared to this time last year.
	Consumer Price Inflation	36%	annual % change	monthly				36%	Eurostat	In July, elevated wholesale prices passed through to consumer prices for coal which increased by 44% in annual terms, which was up from 36% in June. (See side 11 for trend)
Wholesale Electricity (average day ahead)		337	€/MWh	daily		-5%	-13%	72%	SEMOPx	Wholesale electricity prices surged in August but have since fallen back. Prices are currently around 13% lower than the average price in August and 72% higher than the average price in September last year.
Diesel		€1.95	€/litre	weekly		-1%	3%	36%	DECC reporting to EC	Prices as of 12 September.
Petrol		€1.84	€/litre	weekly		-1%	-2%	19%		
Domestic Electricity Bill		€2,131	estimated annual bill	monthly			29%	84%	CRU	In September the estimated weighted average electricity bill was ca. €2,100, an increase of 29% from August and 84% higher compared to September year. This is-line with announced prices rises for the winter period as EABs calculated in September take account of the price increases due to come in from 1st October.
Domestic Gas Bill		€1,819	estimated annual bill	monthly			34%	84%	CRU	In September the estimated weighted average gas bill was ca. €1.800, an increase of 34% from August and 84% higher compared to September year. This is-line with announced prices rises for the winter period as EABs calculated in September take account of the price increases due to come in from 1st October.
Consumer Price Inflation	Energy Products	40%	annual % change	monthly				40%	CSO	The flash estimate suggests that consumer prices for energy fell by 2.8% in the month of August but were still up by 40% in annual terms, a slowing from 48% in July.

Market Prices Updated as of 11:10 on 13 September

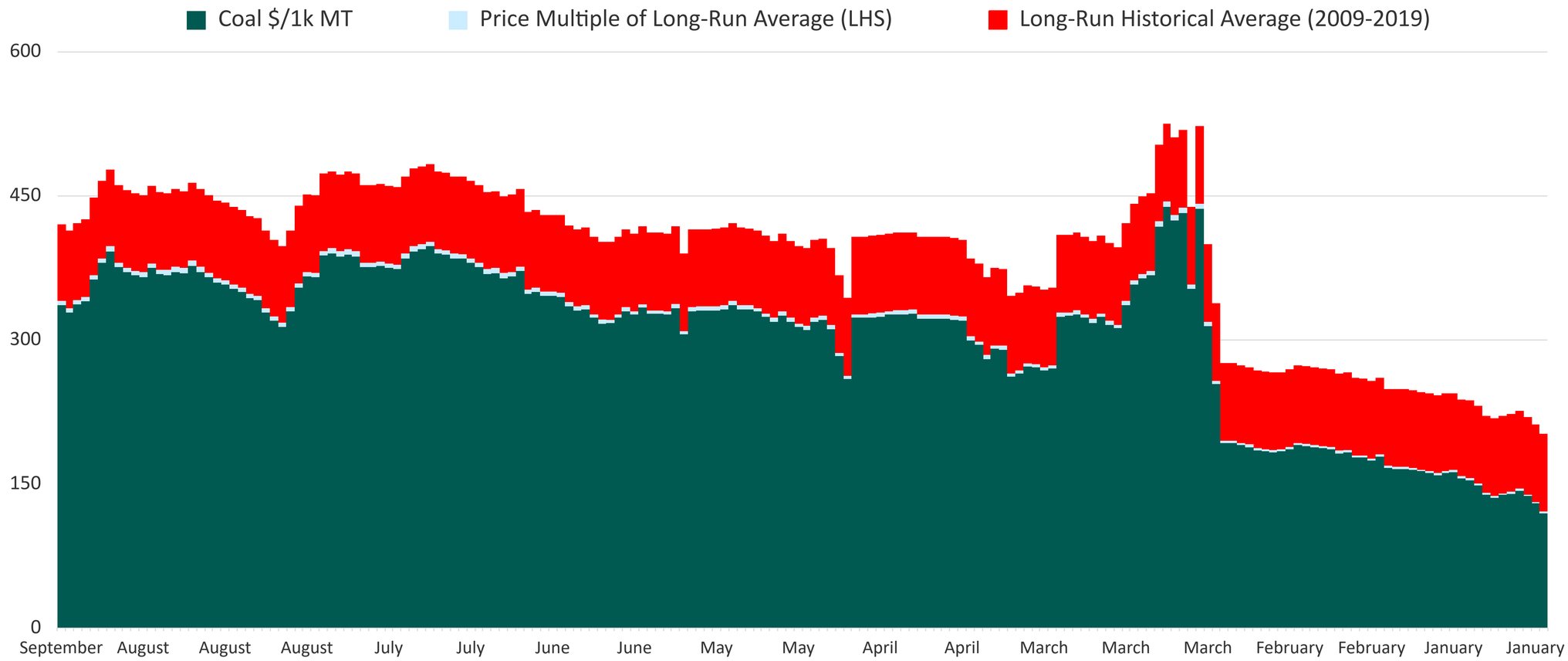
Market Prices in Context



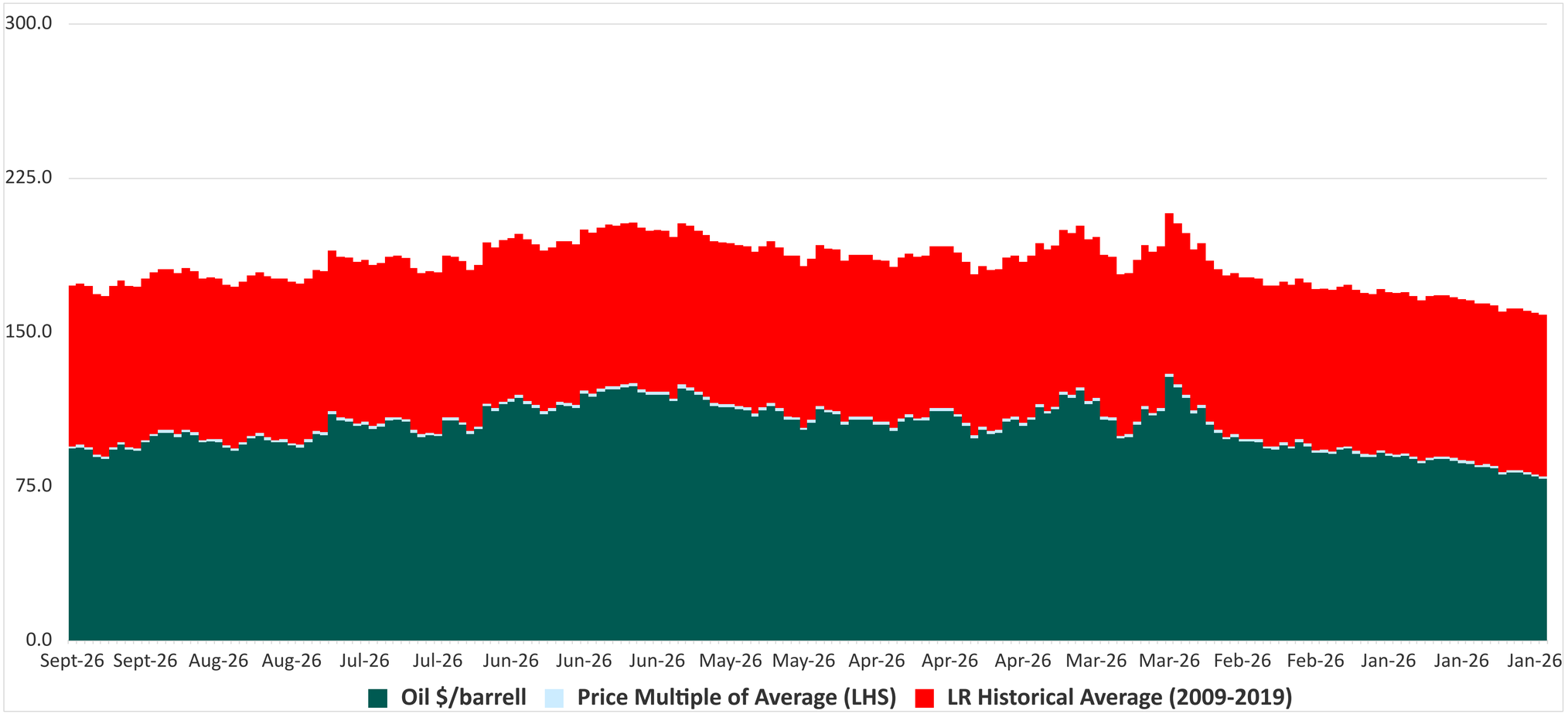
UK Gas Price 2022



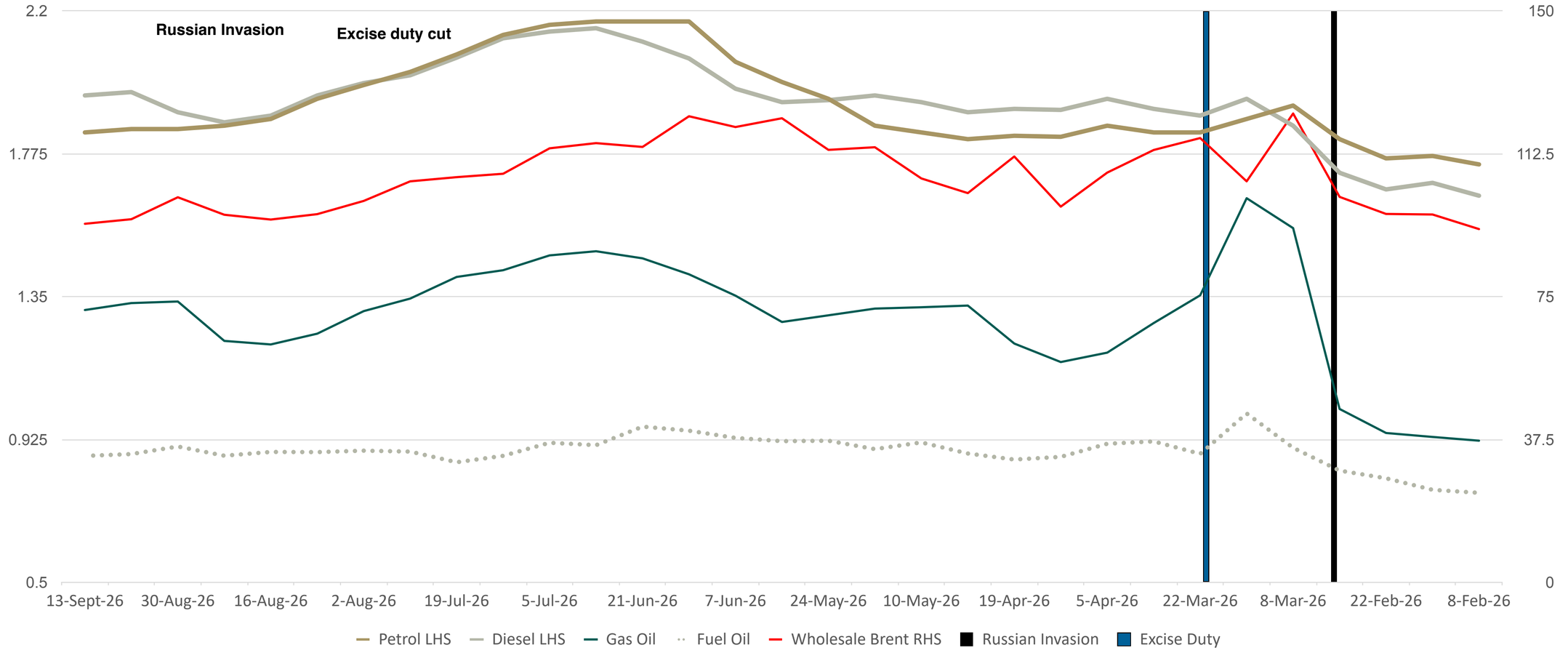
Wholesale Coal Price 2022



Wholesale Oil (Brent) Price 2022

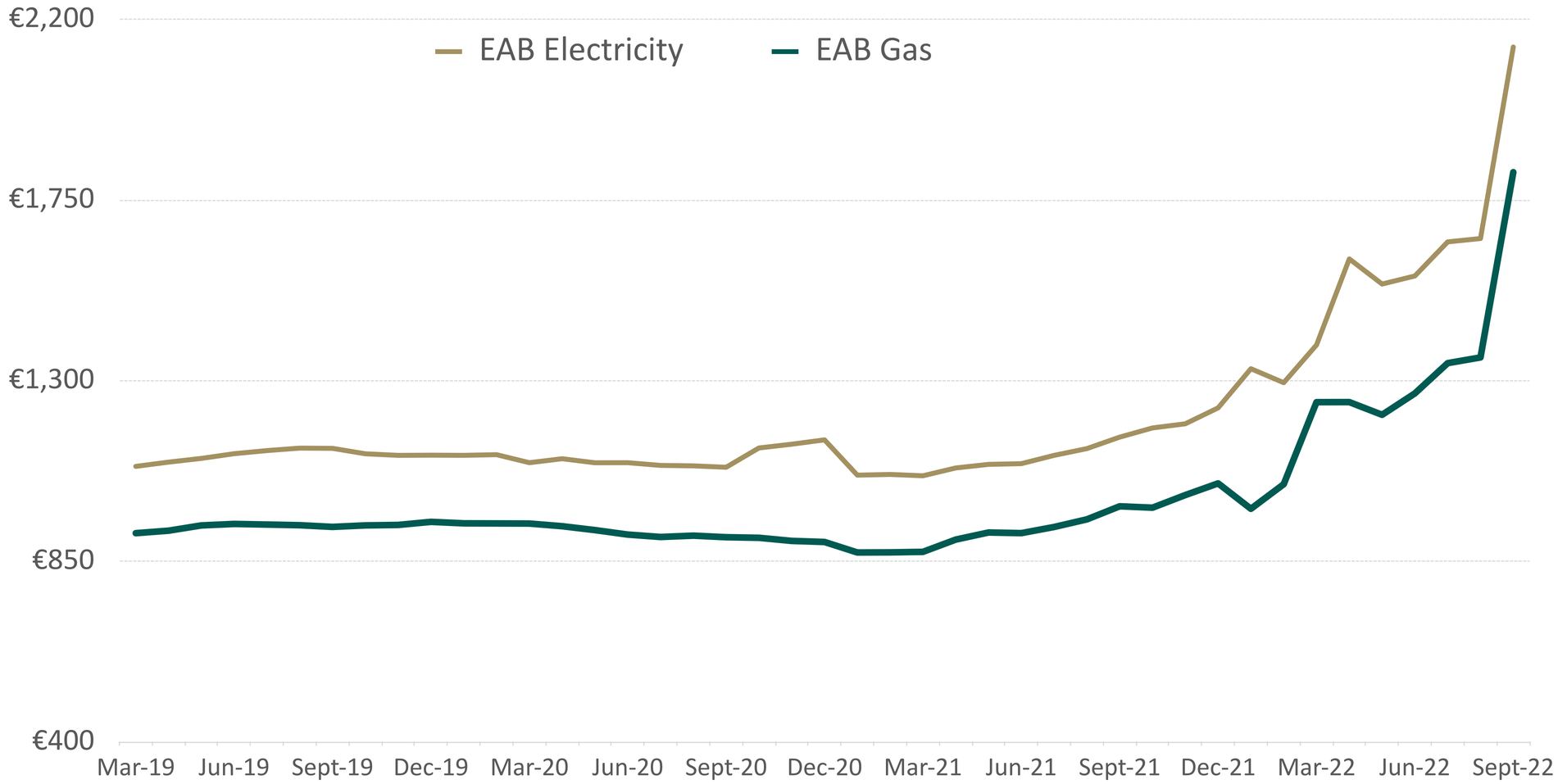


Domestic Oil Prices



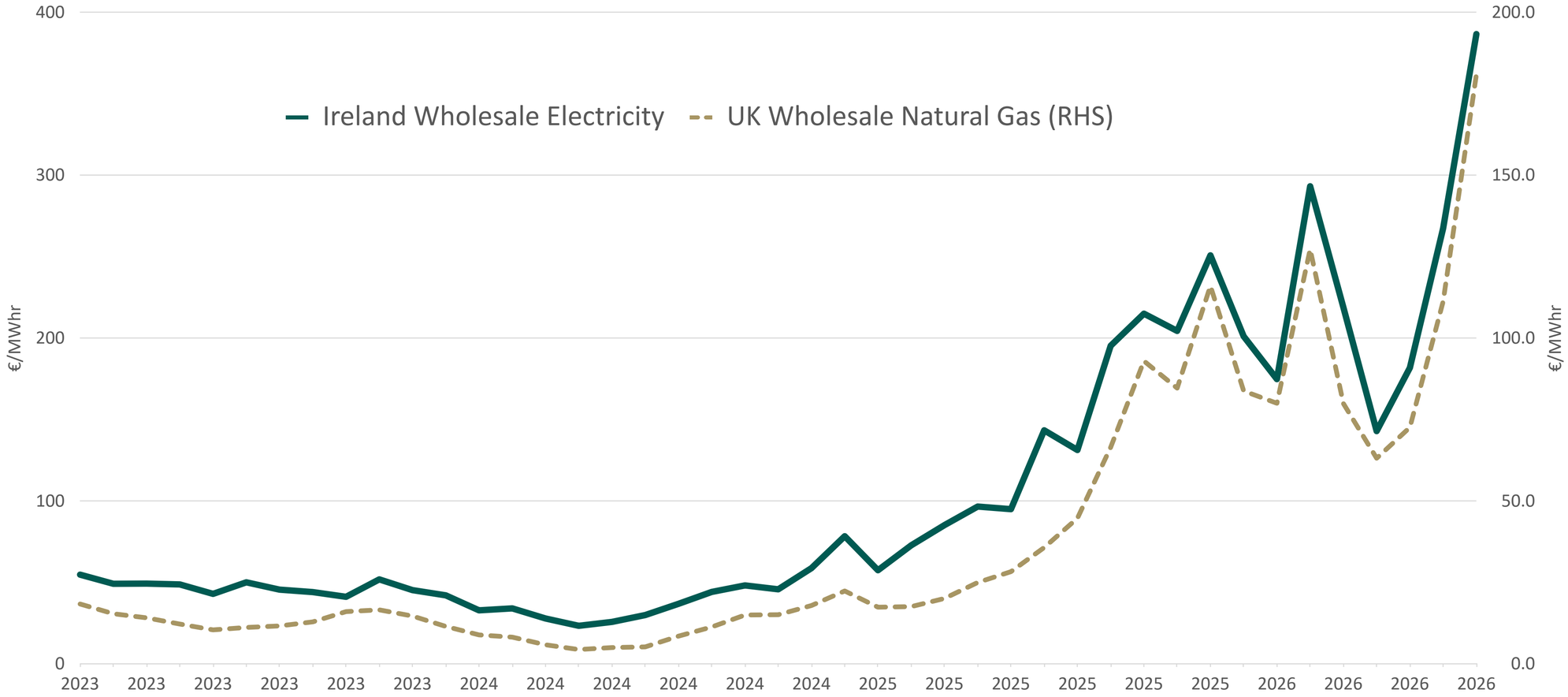
Source: Internal DECC data reporting to EC

Estimated Annual Bills

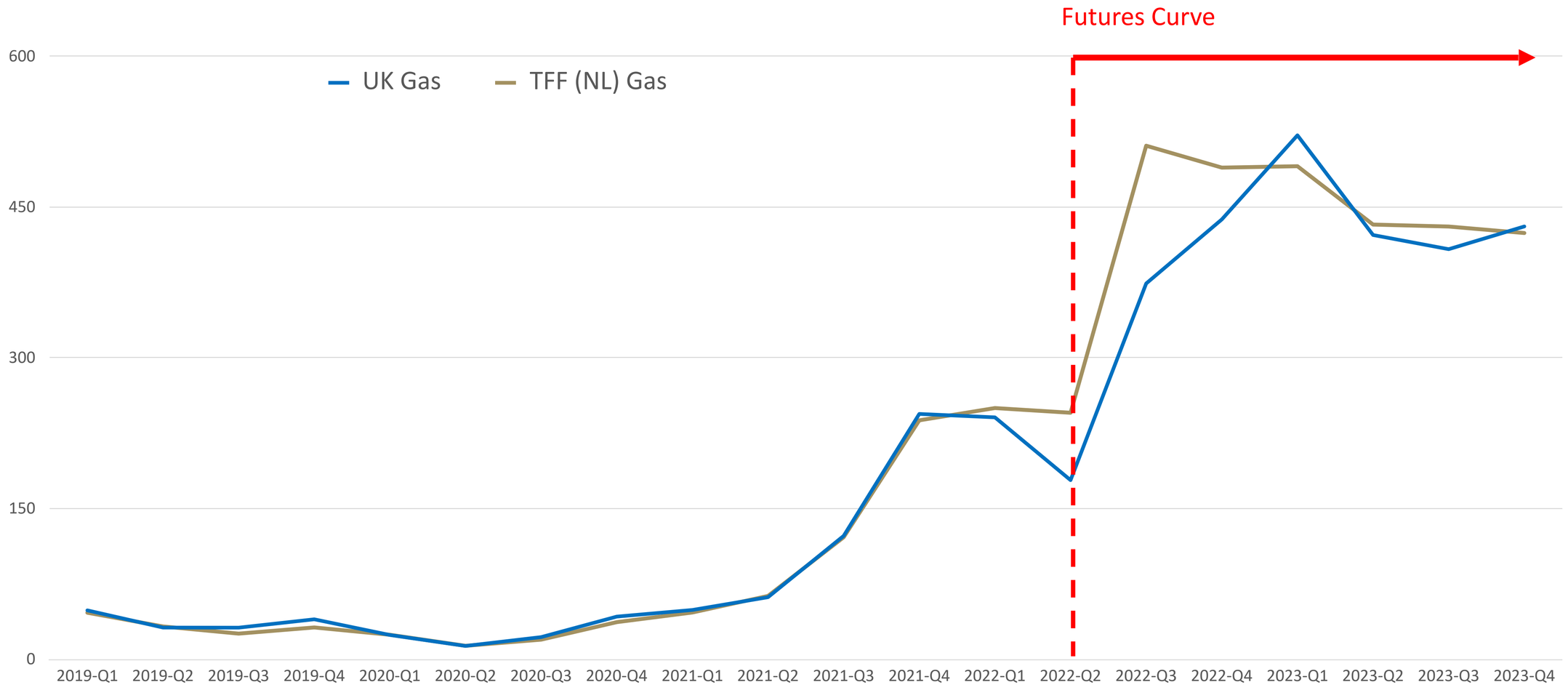


Source: CRU and DECC

IE Wholesale Electricity Price & UK Gas

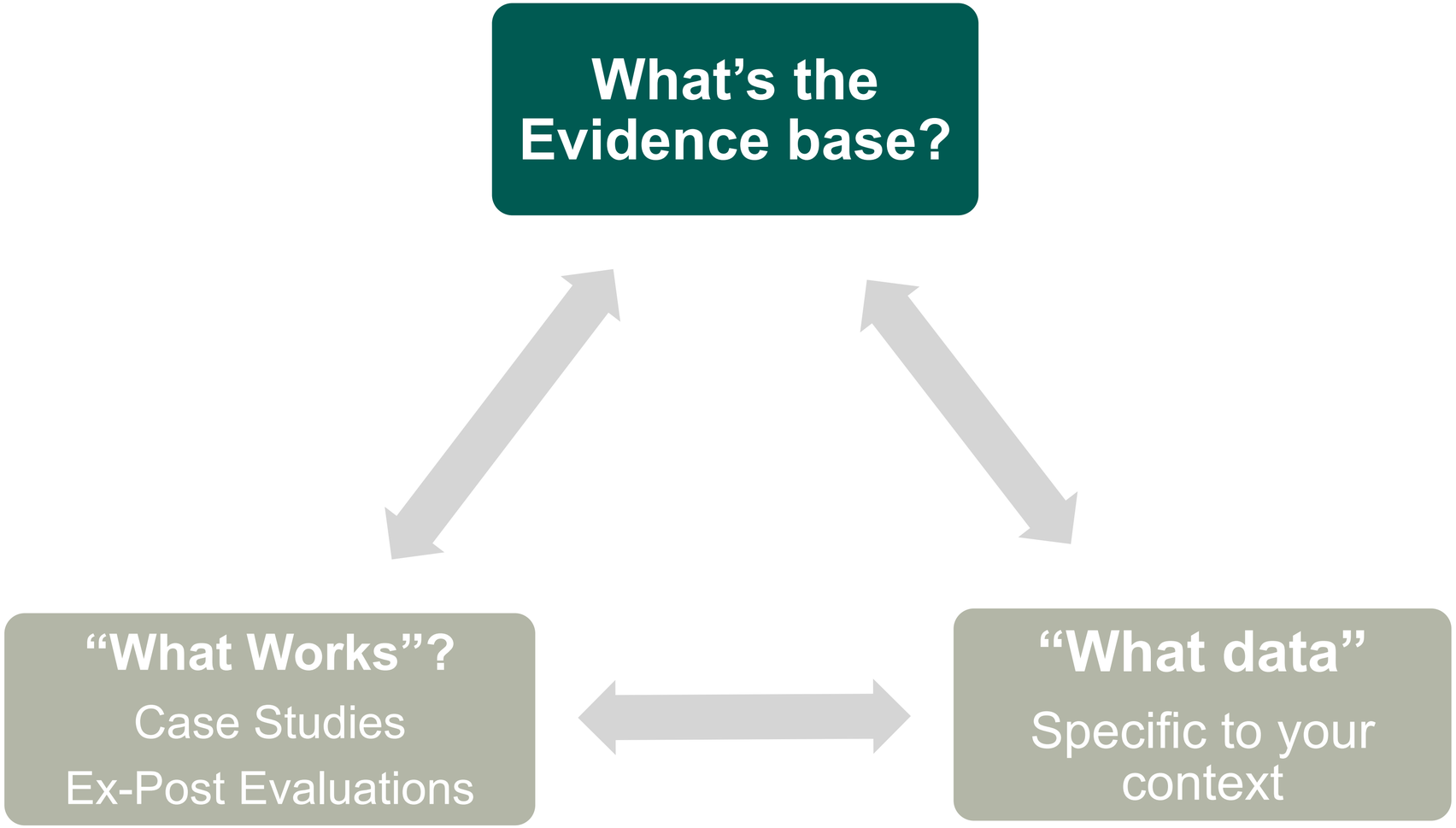


Gas Forward Prices



Source: Refinitiv Eikon and DECC calculations

Policy Response Group: Windfall



Windfall: “what works”

Case Study	Successful in meeting stated objective?	Comment	Source
1980 US Oil windfall tax:	No	• “Taken together the results suggest that taxes reduced domestic production in the 1980s”.	(Rao, 2018) (link)
1981 UK Bank Windfall Tax:	Partially	• Estimated: £400 million. Actual: £355 million.	(Seely, 2004) (link)
1997 UK Utilities Windfall Tax:	Yes	• "raised the total amount of expected revenue"	(Chennells, 1997) (link)
2006 Mongolia Mining Windfall Tax:	No	• investors withheld funds for the project until regulators agreed to drop the tax. Repealed in 2009	(Dugersuren, 2018) (link)
2011 UK North Sea Surcharge:	No	• IFS (2013) very critical. • After a “call for evidence” in 2014 on the impacts – Budget 2014 & 2015 reduced the sur-charge to 30% (2014) and the 20% (2015).	(Seely, Antony, 2022) (Link)
2012 Australian Mining Tax:	No	• "policy failure" by the authors	(Simone Valle de Souza, 2017) (link)

Baunsgaard, Thomas and Nate Vernon. 2022. “**Taxing Windfall Profits in the Energy Sector**” **IMF** Note 2022/002, International Monetary Fund IMF, Washington, DC. (link)

Windfall "What Data"

Prices

- Wholesale gas prices - markets
- Wholesale electricity prices – SEM
- €/MWh (time- and wind-weighted benchmark prices) – CRU *(*2021/22 & 2022/23*)*
- Future prices - markets

Capacity

- TSO connections – Eirgrid (Renewables & Non-Renewables)
- DSO connections – ESB (Wind & Non-Wind)
  - Project level, technology type, connection date (REFIT vs RESS), maximum export capacity
- Capacity factors – SEAI, Eirgrid, DECC estimates
- Corrib – Production Schedule

Cost

- Cost margins by technology type – SEM Committee *Reports* (2019 & 2020)
- Future Costs

Data limitations, asymmetric information

- Sensitivities
- Optimism bias
- **Hedging**
- Future Prices (+/-25%)
- Behavioural change (production & consumption)

Windfall “What Data”

TSO-Connected Non-Renewable Generation

Source: EirGrid - Last updated 01-Aug-2022

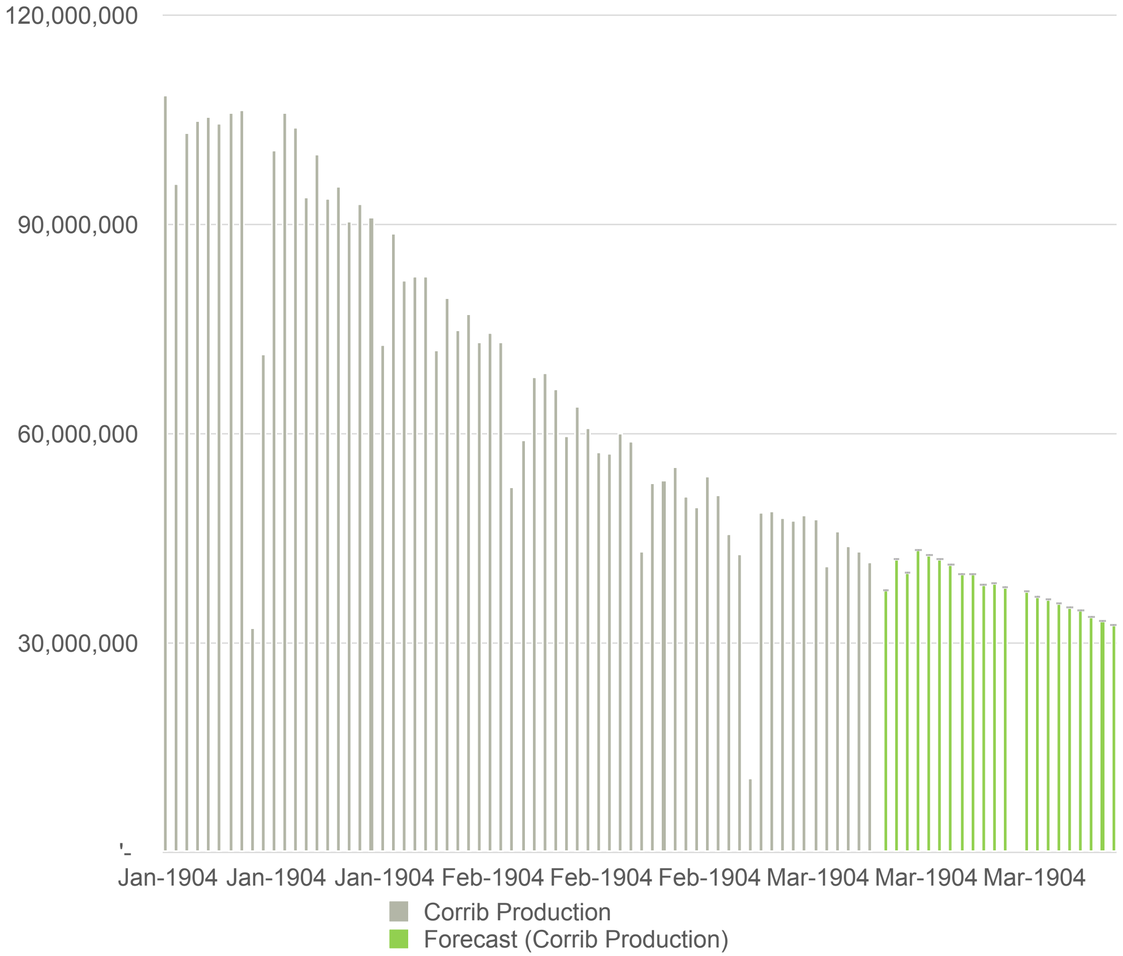
Link

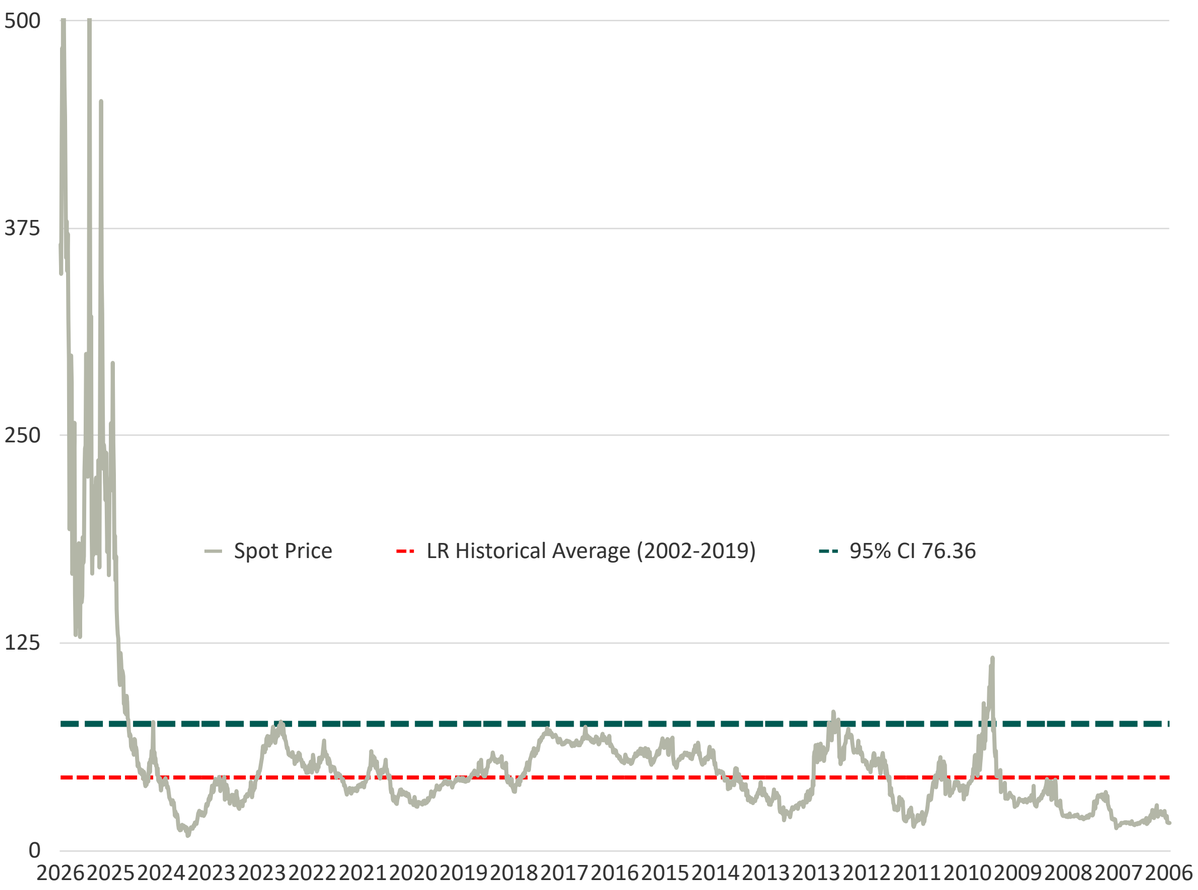
Conventional Generation

Generator	Type	MEC (MW)	Connection Date	Connection Node	Associated Voltage (kV)
Aghada (11)	Gas/DO	90	Pre 2000	Aghada	220
Aghada (12)	Gas/DO	90	Pre 2000	Aghada	220
Aghada (14)	Gas/DO	90	Pre 2000	Aghada	220
Aghada CCGT	CCGT	431	2010	Longpoint	220
Aughinish Alumina	CHP	162	2005	Aughinish	110
Dublin Bay Power	Gas	415	2002	Irishtown	220
Edenderry Peaking	OCGT	116	2010	Cushaling	110
Edenderry Power	Peat	121.5	Pre 2000	Cushaling	110
Great Island CCGT	CCGT	215	2014	Great Island	220
Great Island CCGT	CCGT	216	2014	Great Island	220
Huntstown (1)	Gas	352	2002	Huntstown	220
Huntstown (2)	Gas	412	2007	Corduff	220
Kelwin	Diesel	2	Jul 2018	Coolnanoonagh	110
Lough Ree Power	Peat	94	Pre 2000	Lanesboro	110
Moneypoint (1)	Coal	287.5	Pre 2000	Moneypoint	380

	2019		2020	
	Gross	Net	Gross	Net
All	24%	7%	24%	1%
Renewables	67%	17%	67%	13%
Hydro	52%	40%	48%	38%
Coal	-34%	-35%	-13%	-17%
Gas	8%	3%	9%	-6%
Peat	30%	14%	-21%	28%

Windfall: Gas Extraction – Corrib

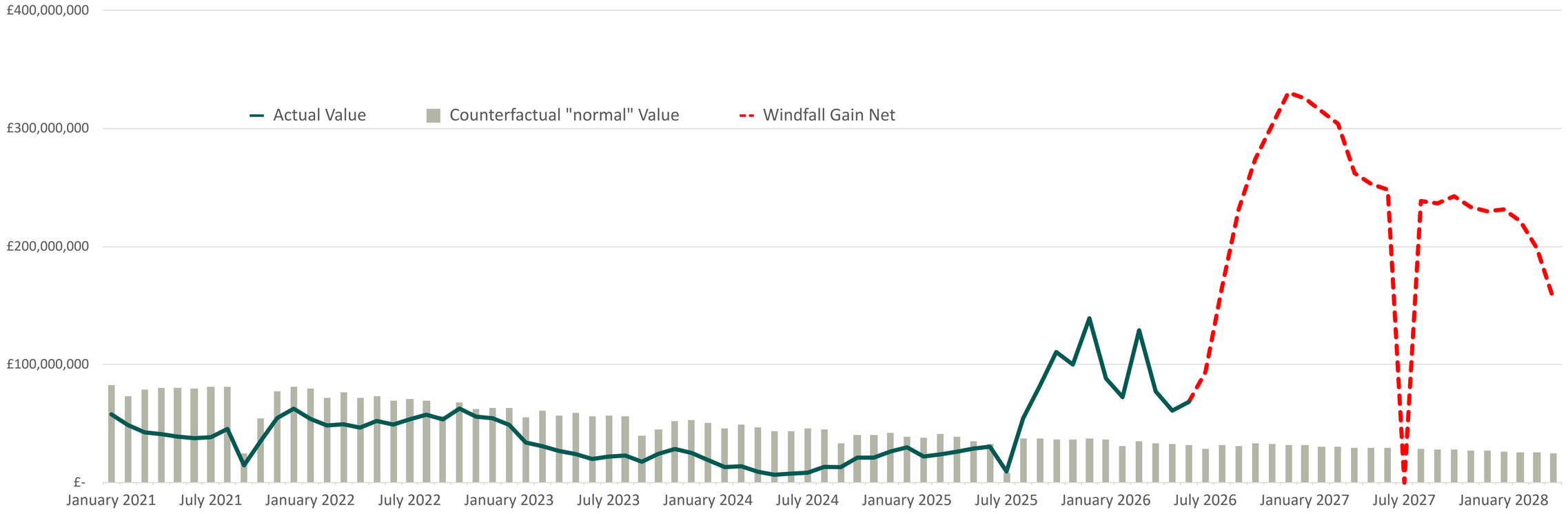




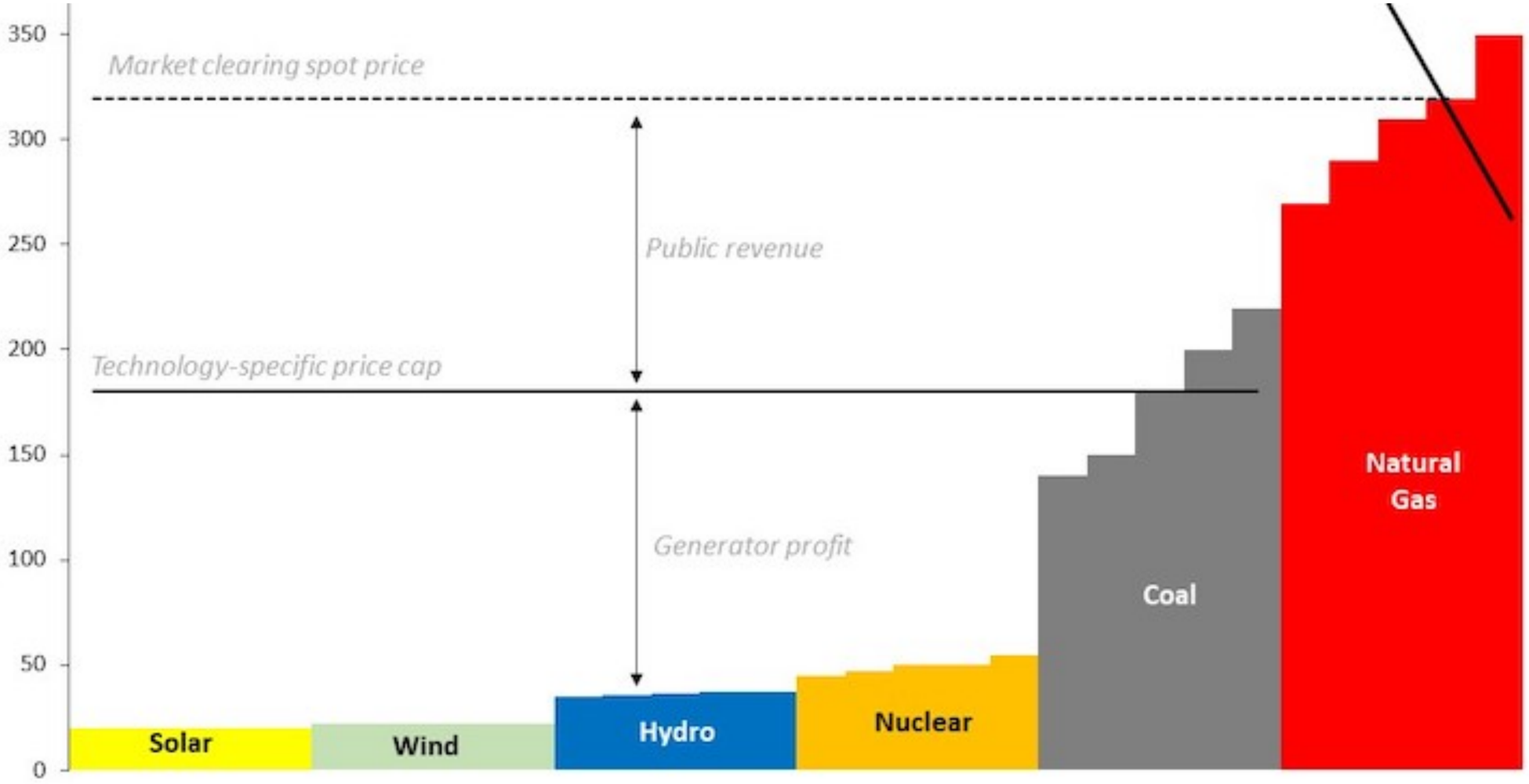
Windfall: Gas Extraction

Assumption	Input Parameter	Comment
Windfall Threshold	76 p/therm	Long Run Historical Mean is **44 p/therm** This is based on 4,522 observations from 2002-2019 76 p/therm at the 95% confidence interval
Hedge Strategy Assumption	60%	100% = full exposure to spot and futures
Tax	50%	tax rate applied
Optimism Bias	-10%	0% no modelling error

$$Revenue\ to\ State = [((((Forecast\ Production\ X\ (LR\ Average + (2\ X\ LR\ Standard\ Deviation)))$$
$$- (Forecast\ Production\ X\ (UK\ Gas\ Price\ Futures\ X\ Hedging\ Assumption)))$$
$$\div (EUR/GBP\ Conversion)\ x\ Tax]$$
$$x\ Optimism\ Bias\ Adjustment$$



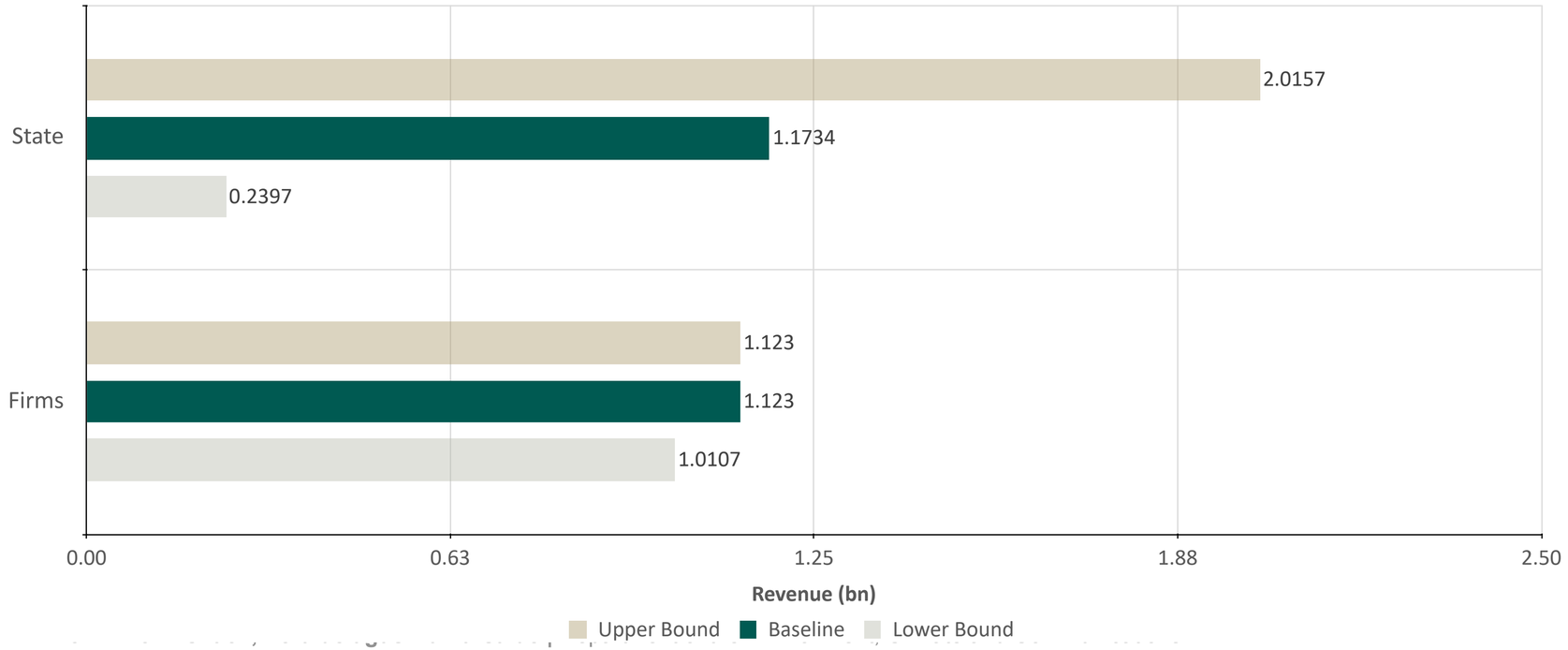
Windfall: EU Infra-Marginal Price Cap



Windfall: EU Infra-Marginal Price Cap

	Lower	Baseline	Higher
Price Cap	€180	€180	€180
Forward Prices	75%	100%	125%
Hedge Assumption	60%	80%	90%
Production Behavioural Change	90%	100%	100%
Optimism Bias (Modelling Error)	10%	10%	10%

$$\textit{Sum of } \textbf{\textit{December to March of}}\textit{:}$$
$$\left[\begin{array}{c}(\textit{Maximum export capacity} \times \textit{Production sensitivity}) \\ \times \\ ((\textit{Future wholesale electricity price} \times \textit{Hedging assumption}) - \textit{Price cap}) \\ \times \\ \textit{Capacity factor} \times 24 \times \textit{Days in the month}\end{array}\right]$$

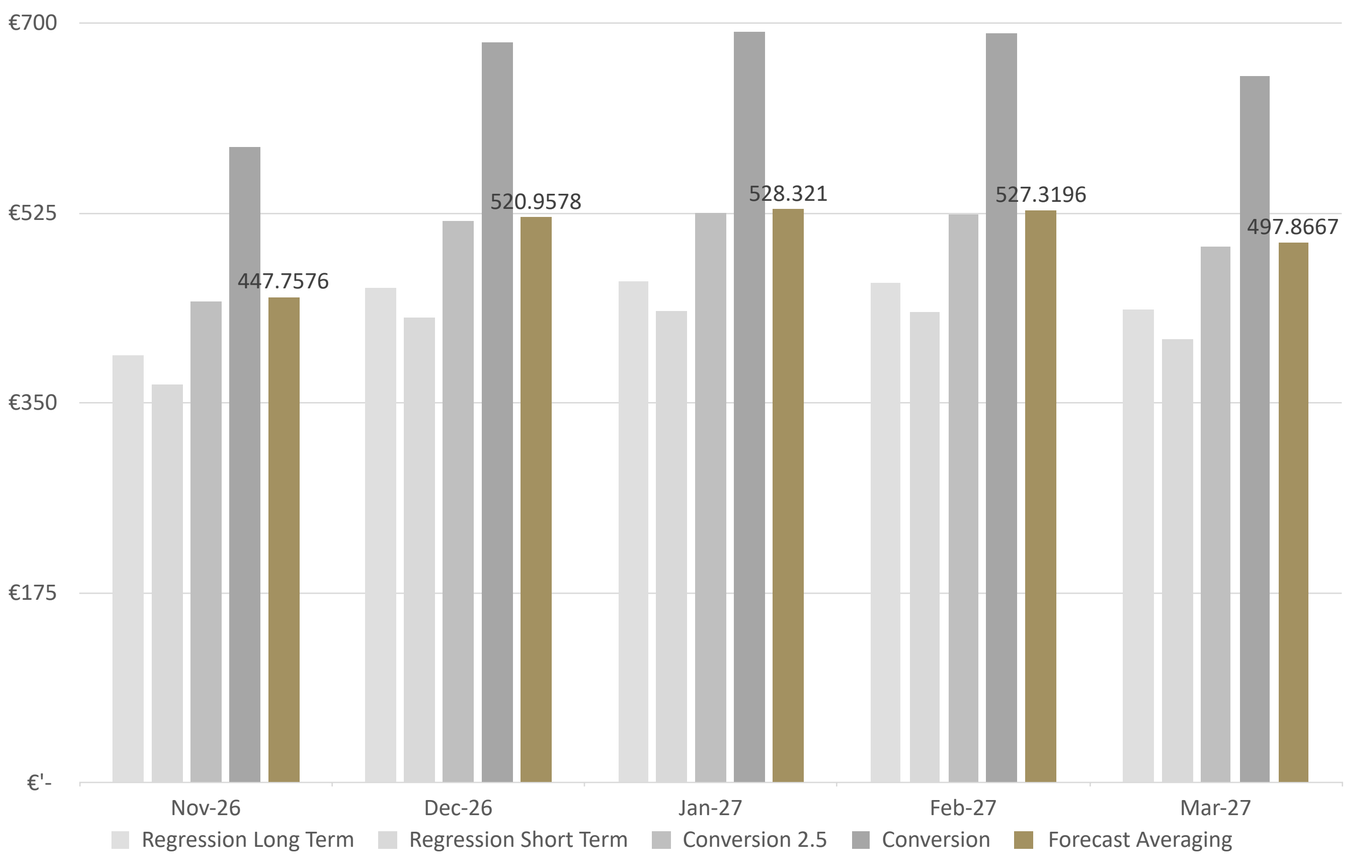


Windfall: EU Infra-Marginal Price Cap

- **Hedging: effective 50%**

- **Wholesale Electricity Prices IE:**
  - Ratio Conversion Factor
  - Technical Conversion Ratio
  - Empirical Conversion Ratio
  - Regression Analysis:
    - Augmented D Fuller – unit root
    - First order stationarity

- **Forecast Averaging:**
  - *Timmermann, 2006;*
  - *Clemen, 1989;*
  - *Makridakis, 2000)*



Policy Implications

- **Evidence:**
  - Data:
    - Windfall Gains (RoI > normal / expected return) being made in Generation.
  - History:
    - Optimism Bias, difficulty capturing -wont capture 100%
- **Data Limitations**
  - Estimation Uncertainty:
    - Conservative Hedging, Assumptions
    - Future Prices (+/-25%) scenarios
  - Asymmetric Information
    - Vertical Integration
    - CPPAs

- **Policy Recommendations:**
  - Rationale: Total Cost vs. Benefits
  - Objective: Capture economic rent:
    - Price Cap < €/mwh– EU, Corrib
    - Special Gross Profit Tax
  - Minimise impact on future investment
    - Investment clause
    - Deadweight, reduces immediate revenue – offset by minimising impact on investment
    - Why will Corrib not make a profit?
  - Efficiency:
    - 31% of generation (mwh) H1 ESB 2022, Coilte & Bord na Mona
    - Dividends

On-going Analytical Work & Contact

- Firm Liquidity: Collateral & Margin Requirements - EU Solution
- Demand Reduction Measures
- Commercial Estimated Annual Bills
- Fast-Tracking Renewables

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