The Future of UK power generation

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Centrica's vertically integrated business model has proved robust to commodity price movements

- **Centrica operates across the energy value chain**





Production / Generation → **Processing & Storage** → **Trading** → **Supply** → **Home Services**

- **Vertical integration model gives rise to financial stability**

Price Environment	High Prices	Falling Prices	Low Prices	Rising Prices
Upstream Margin	↑	→	↓	→
Downstream Margin	→	↑	→	↓
Group Margin	→	→	→	→

- Stable earnings
- Reduced cost of capital
- Consistent investment through commodity cycle
- Improved capital discipline
- Reduced costs (e.g. collateral)

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What is setting the future for UK generation

- **Environment and energy policy objectives**
- **Electricity market reform**

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Today's investment environment is uncertain

- **What the Government wants from the energy sector is clear …but not the how**
- **It wants:**
  - low carbon economy led by power
  - Security of supply
  - Affordable energy costs
- **But with low carbon prices, and low spark and dark spreads, no new generation investment makes sense on market economics**

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What do we know?

- **Renewables receive substantial support**
  - this has successfully delivered 5000MW of new wind generation
- **Emission limits for existing fossil stations are tightening**
  - Significant coal and oil plant closures by 2016
  - But significant new CCGT build also happening

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And Electricity Market Reform is coming…

- ***"This is one of the most important things we will do this parliament and it will be the most fundamental reform since privatisation 30 years ago," the minister said***
- **(C. Hendry 4th November 2011)**

- **But what is EMR?**
  - What it will not change is the wholesale electricity market of NETA/BETTA
  - But first a bit more background

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The Government has set challenging low carbon targets

- **34% reduction in GHG by 2020**
- **80% reduction in GHG by 2050**
- **15% renewable energy target by 2020**
  - (30GW+ of renewables)

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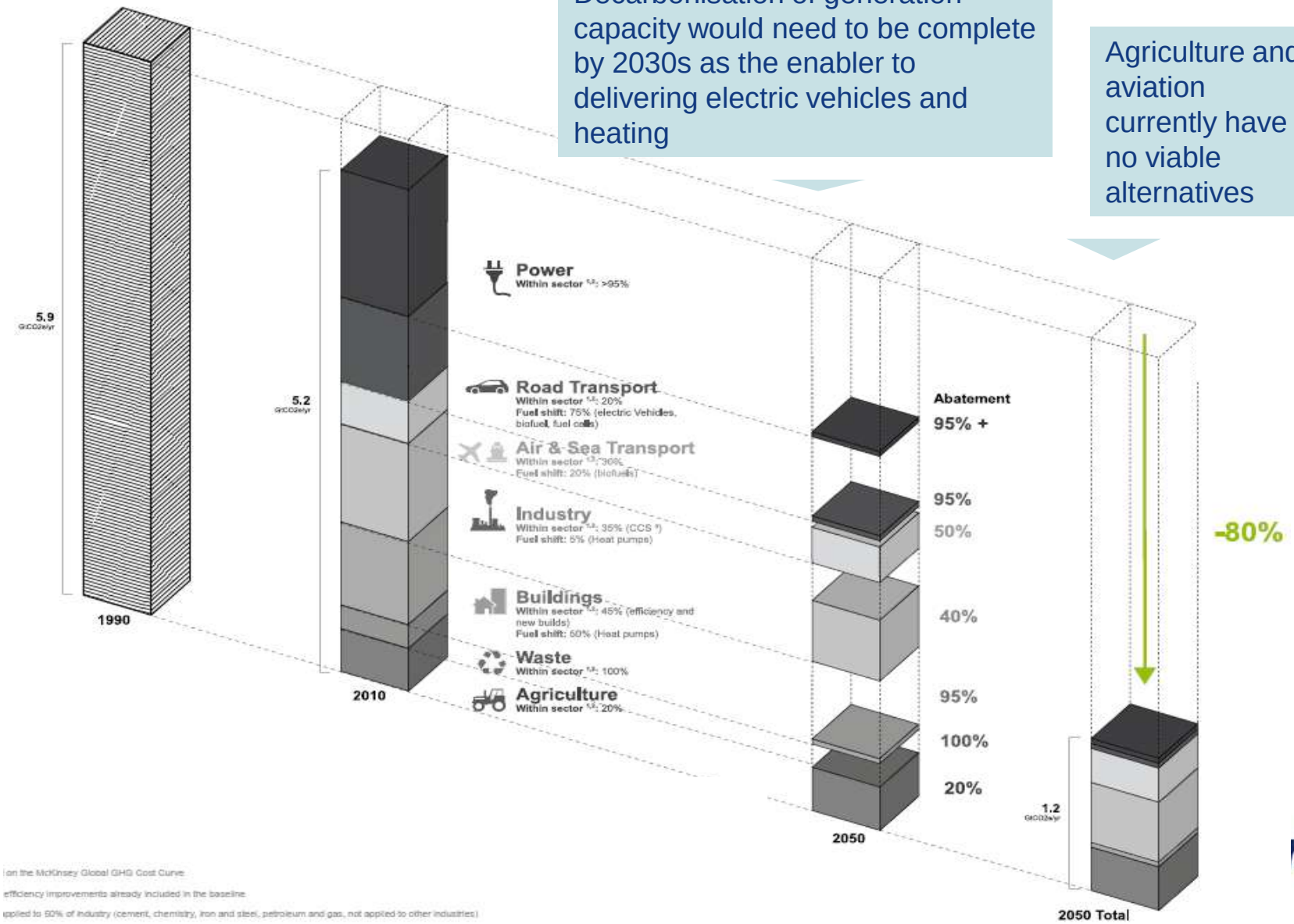
One path to 2050

Decarbonisation of generation capacity would need to be complete by 2030s as the enabler to delivering electric vehicles and heating

Agriculture and aviation currently have no viable alternatives



on the McKinsey Global GHG Cost Curve

efficiency improvements already included in the baseline

applied to 50% of industry (cement, chemistry, iron and steel, petroleum and gas, not applied to other industries)

Power stations ordered today will still be running in 2050

- **… So we need to influence today's decisions to deliver our low carbon future**

- **One lever is to ban what you do not want…**
  - Possible Emission Performance Standard
  - New coal generation to have at least 300MW CCS fitted from day one
  - Carbon Capture Ready for all new fossil fuel stations

- **Another is to change the economics of low carbon generation**
  - Carbon price floor to raise the "cost " of carbon emissions
  - Update market mechanisms to reward investment in low carbon generation => EMR

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Future generation mix – what do we know?

- As the DECC 2050 pathways work shows, there are various possible ways of delivering the 80% reduction target

- Common themes are:
  - Electricity is the easy energy source to decarbonise
  - heating and transport energy use must be heavily decarbonised by switching to electricity
  - Requires substantial de-carbonisation of power sector by 2030s

- New build nuclear is one of the lowest cost sources of low carbon electricity and it is reliable

- Nuclear cannot make a material contribution until after 2020 but needs to play a major part in delivering the long-term least cost solution

- Low carbon generation will progressively displace high carbon generation – fossil plant will increasingly fill in the gaps and peaks

But picking technology winners is a difficult task

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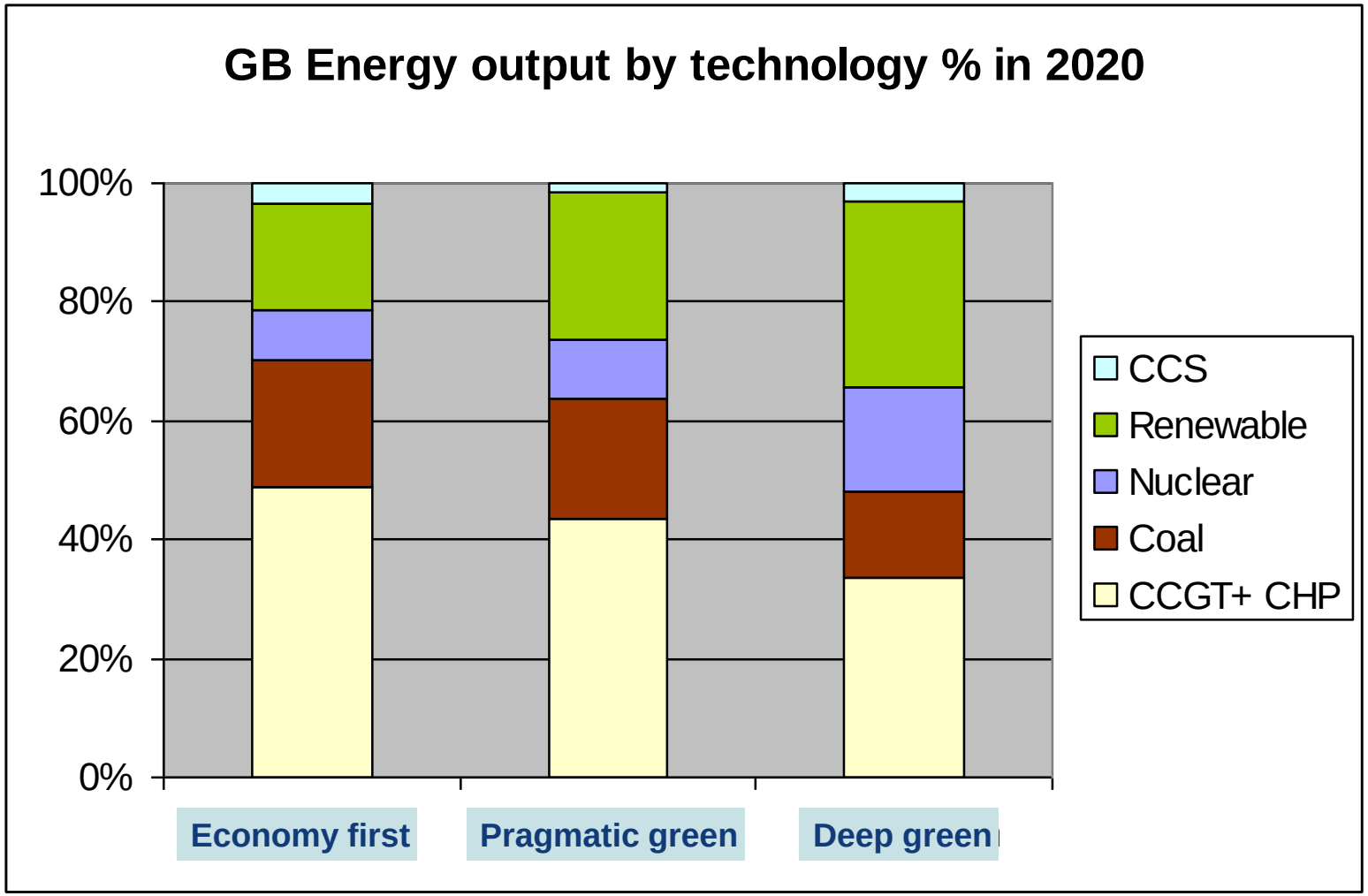
Three different views of 2020 depending on how hard the low carbon agenda is pursued



Post 2020, the mix between renewables and nuclear is impossible to call today

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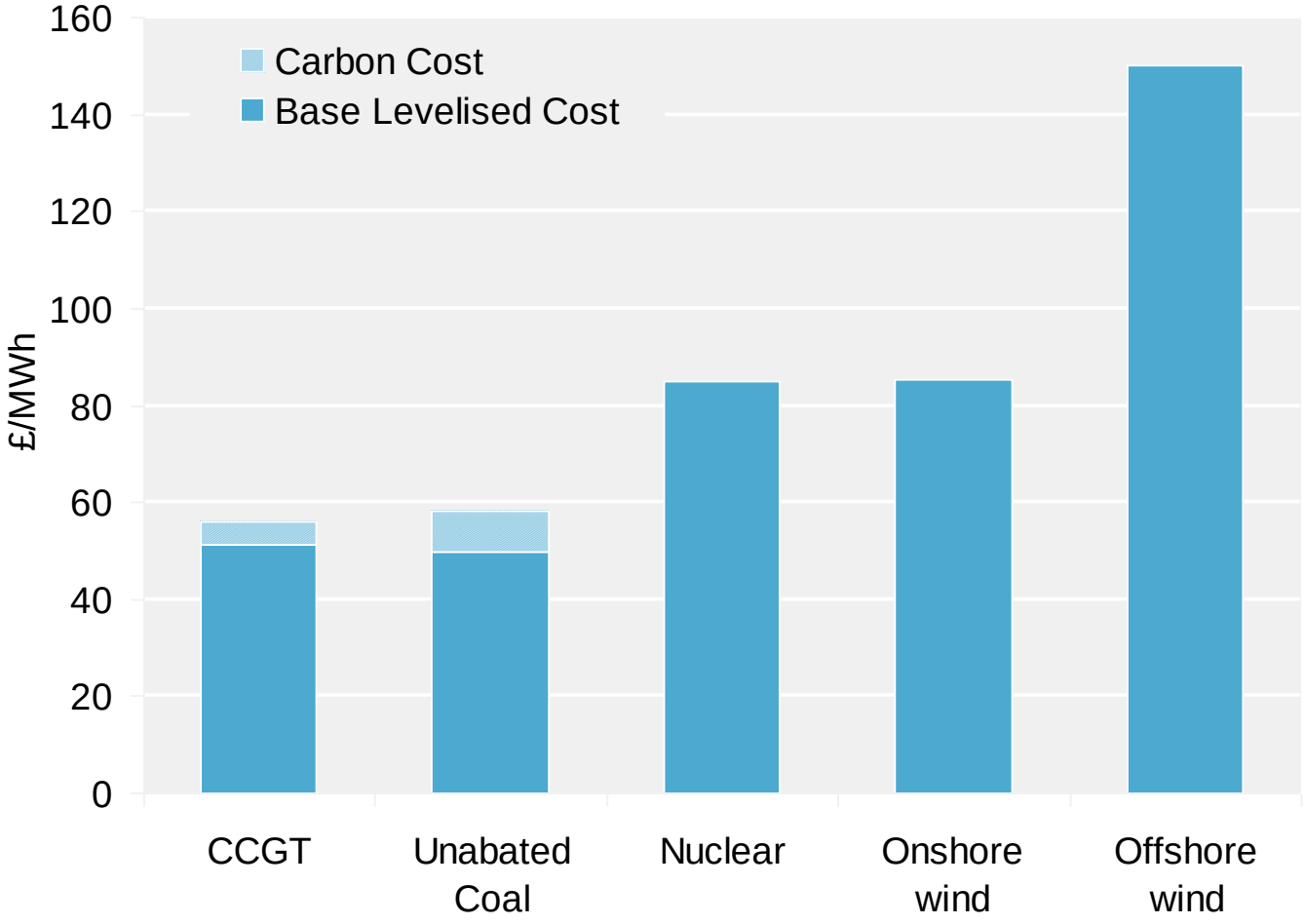
The ETS carbon price affects the marginal cost of coal vs. gas but is insufficient to bridge the gap to low carbon technologies

Indicative levelised Cost of Generation for Scalable Power Generation Technologies



Nuclear is least cost but not cost free

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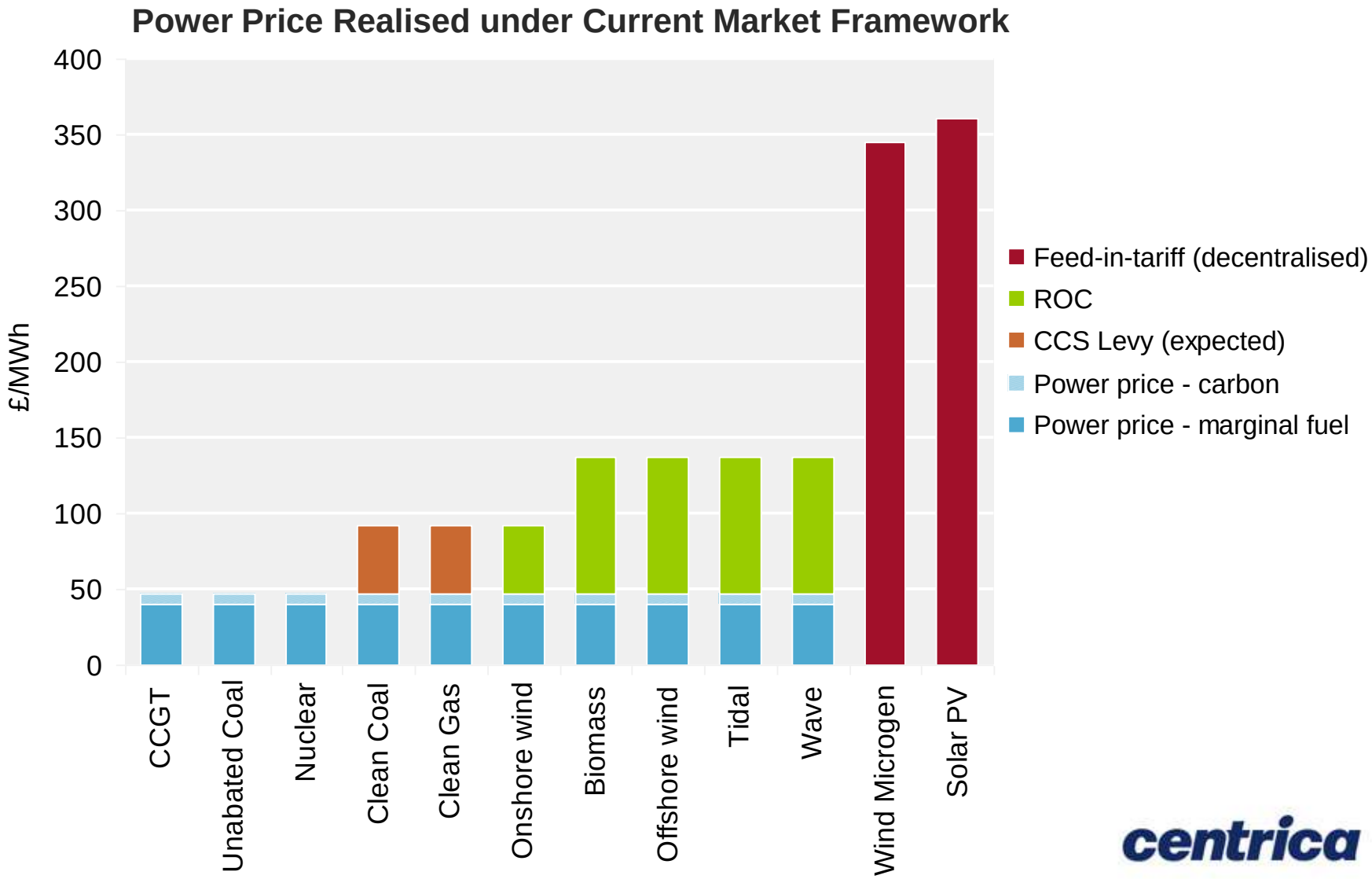
The support given to renewables under the current RO and FIT mechanisms vary according to need



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What are the key issues for EMR

- **We believe there are two main issues:**
  - How to enable all low carbon generation including nuclear to participate in delivering the least cost low carbon generation mix
  - How to maintain security of supply into the 2020s as the proportion of intermittent generation grows
- **The components of a solution could include:**
  - A carbon floor
  - A low carbon mechanism
  - A security of supply mechanism
  - An emission performance standard for some fossil plants
- **Various options have already been trailed by Regulators and Government**
- **The current project is to narrow the options and suggest a preferred solution**

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Current hot topics

- **Should support payments be "market plus" or through a feed in tariff?**
  - We think market plus (as with the current RO) is the right way to go
  - Taking away power price exposure from generators makes no sense
  - Support arrangements will work best next to the wholesale market not instead of it!
- **How to discover the "right" support price?**
  - We don't believe auctions are practical
  - We prefer to continue using the process that has evolved for the RO banding
- **What to do about security of supply?**
  - Wind intermittency is a growing issue – 5GW of wind now installed
  - Fossil plant load factors and profitability declining
  - The cheaper option may be to keep older flexible CCGTs running via some capacity payment rather than let them close
- **Future issues:**
- **Will the "owners" be able to raise enough finance?**
  - Lets worry about the second £50bn when we have spent the first!

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What about conventional fossil generation?

- **Economics of fossil plants will become more challenging**
  - CCS obligations
  - Tightening emission standards
  - Rising carbon prices
  - Falling load factors
  - Falling wholesale power prices
  - Rising price volatility
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- **Where does fossil generation fit?**
  - coal CCS will have to compete with other low carbon options
  - Flexible ccgts/ocgts are one way of supporting wind generation (with CCS?)

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With the necessary framework in place, the right mix of investments can be delivered to meet political objectives

	Centrica Investment Options	Secure	Low Carbon	Affordable
Upstream Gas	Exploration & development	✓		✓
	LNG	(✓)		✓
	Pipeline gas	(✓)		✓
Upstream Power	New nuclear	✓	✓	(✓)
	Offshore wind	(✓)	✓	
	New CCGT	✓	(✓)	✓
Downstream	Smart metering & related technology	✓	✓	
	Microgeneration	✓	✓	
	Energy Efficiency	✓	✓	✓
Storage	New storage	✓		(✓)

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Conclusions

- Traditional role of fossil generation providing bulk electricity is incompatible with a low carbon future
- The bulk of future investment will be in low carbon generation technologies
- Investment will flow in response to Government "incentives"
- Centrica is planning to invest some £15bn across nuclear, renewables and upstream oil and gas over the next decade
- By the 2030's the UK generation scene should look completely different from today

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