How much will it cost to generate UK's electricity energy?

By Dr Guy Doyle – Chief Economist, Energy, Mott MacDonald
Presented by John Cherrie – Business Development Director
The Nuclear Institute November 2010

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Agenda

- Context – DECC's 2010 report on generation costs
- What are levelised costs?
- Recent trends in EPC prices
- Build up of EPC and overnight capex costs
- Base case assumptions
- Current costs
- Outlook for levelised costs

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Technologies

Mainly looking “baseload” and >10MW

- CCGT, ASC Coal, IGCC + CCS variants
- Nuclear – EPR/AP1000
- Wind – on and offshore (+R3)
- Biomass combustion 50MW/ 300MW
- Gas and biomass fired CHP
- Bio-methane (LFG, Sewage, AD of agri wastes)
- Hydro reservoir +PSP

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What are Levelised costs

- All-in cost of generation including all developers costs, capex, fuel and other opex and any end-of-life liabilities expressed as a cost per unit generated
- Often called life-cycle costs
- Equal to discounted future costs divided by discounted future energy

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Levelised Cost - Main Components

- Pre-construction costs or development cost
- Capex including financing costs
- Annual overheads of plant (excludes central HQ overheads)
- Variable non-fuel opex (var. O&M, ash disposal, etc.)
- Fuel and carbon
- CO2 transport and disposal
- Decommissioning

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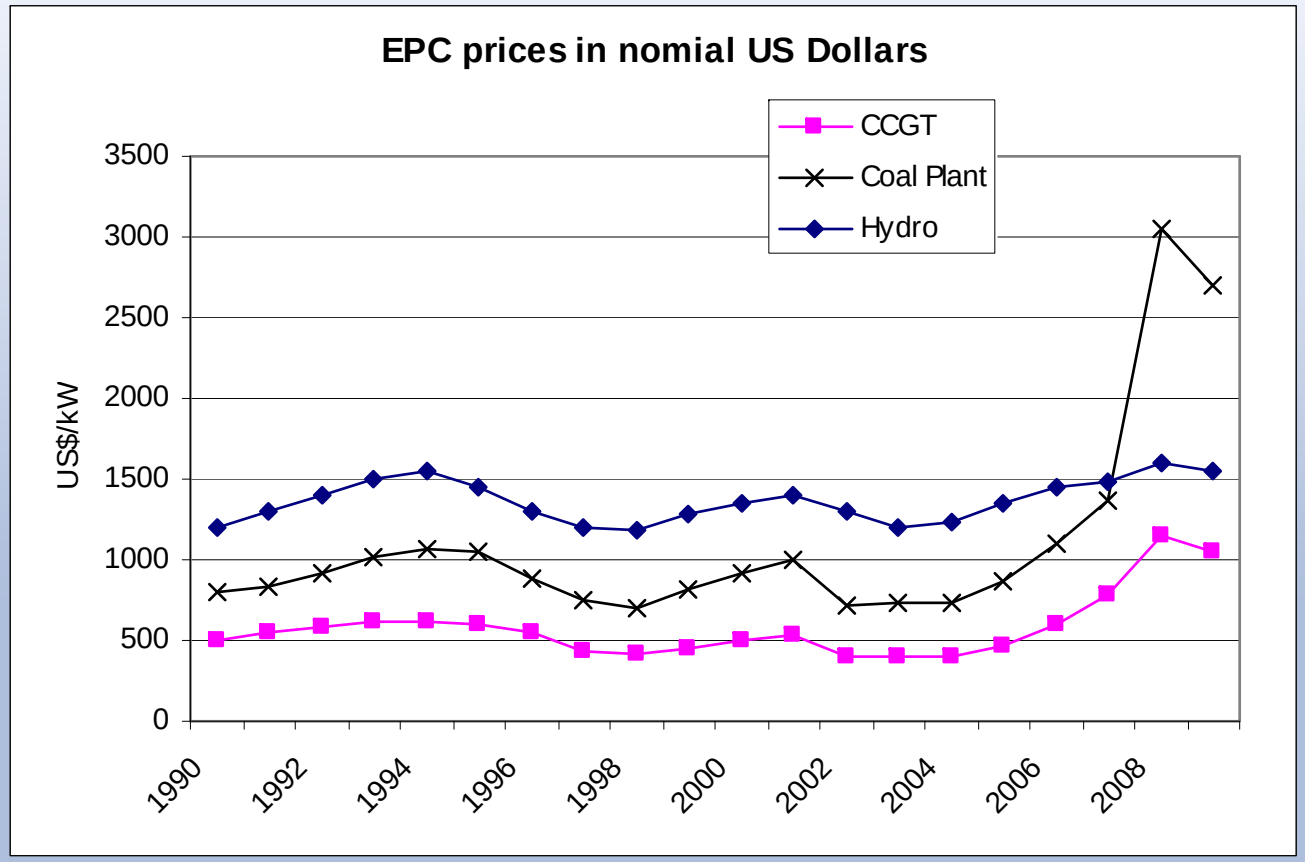
Representative EPC prices: 1990-2009



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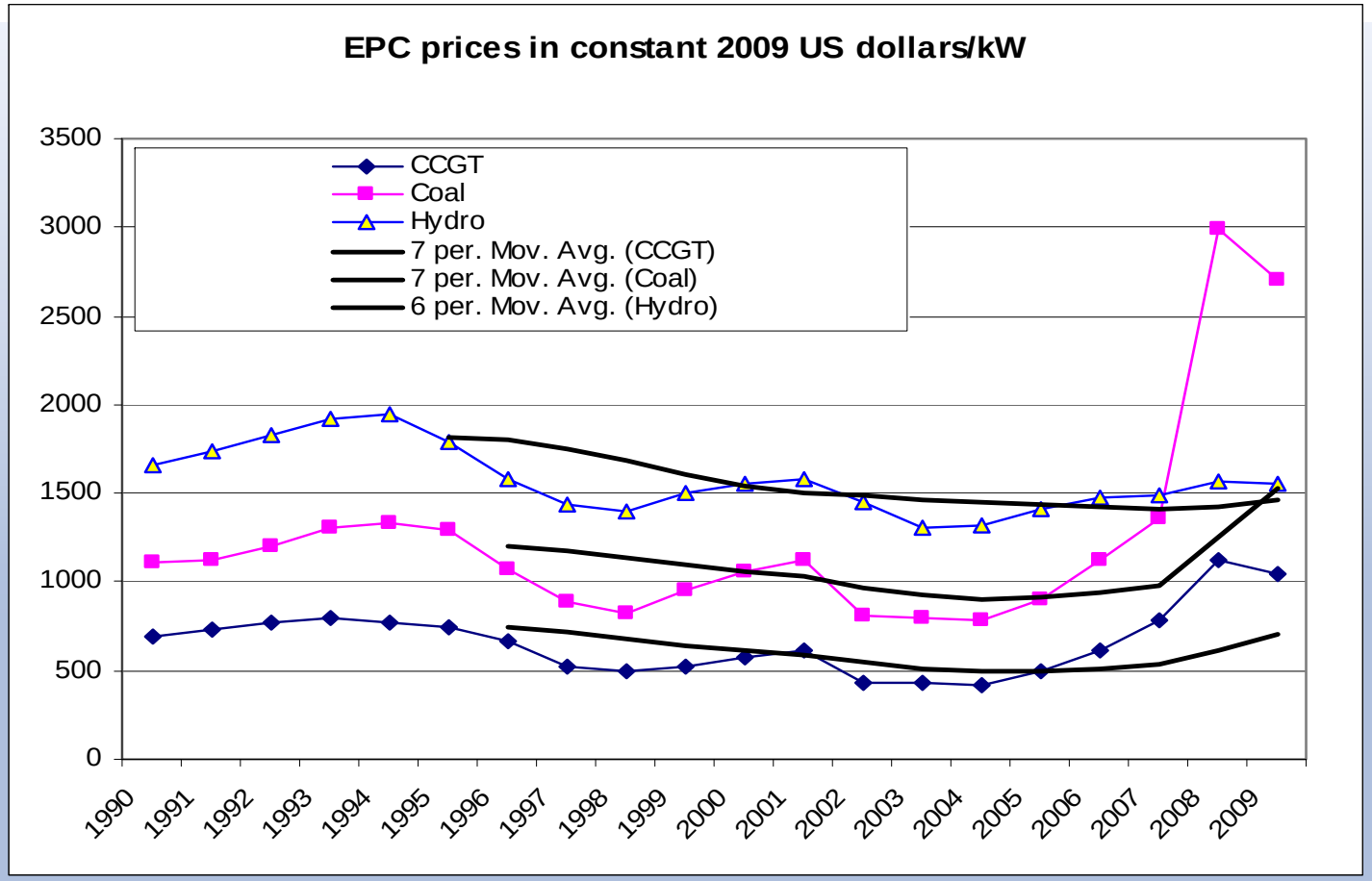
Until 2006 trend was down in real terms



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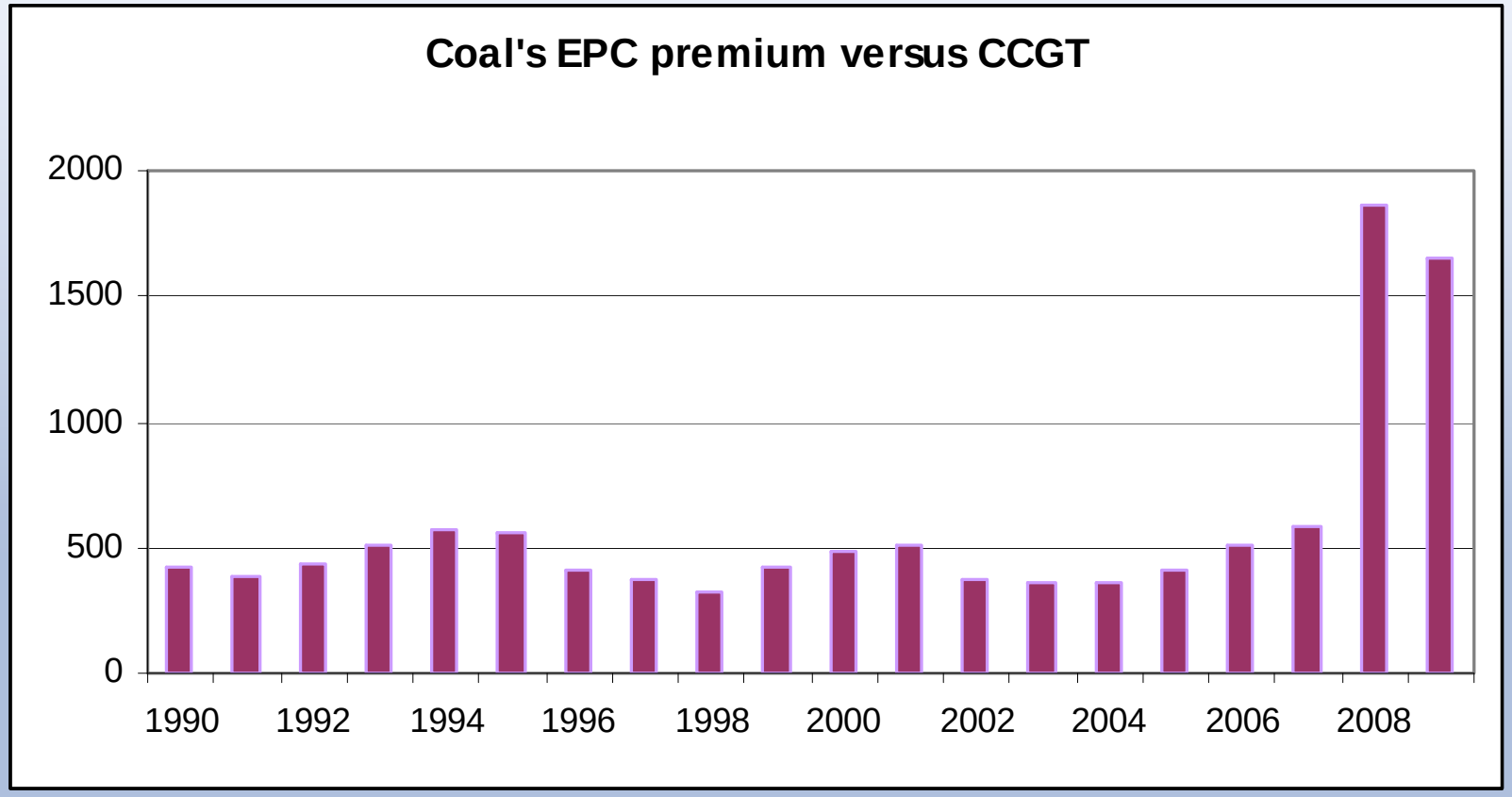
Coal has developed a huge premium versus CCGT



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Drivers of EPC price increases

- High and uncertain commodity prices
- Bottlenecks in supply chain
- Full order books for main OEMs and/or EPC contractors, both of which seen shortage of skilled workers/managers
- OEMs, 2nd tier vendors and EPC contractors factoring in contingency margins/ excess profit
- Exchange rate movements

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Other drivers of EPC costs

- Hardware/process complexity
- Economies of scale
- Maturity of technology
- Jurisdictional risk

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Indicative build-up of nuclear plant costs: $/kW

FOAK build up

Cost to build		**3500**
FOAK premium	*Learning premium = 700*	700
Contractor's normal profit		300
OEM's risk premium		250
Headline EPC price		**4750**
Owners allowed contingency	*Risk premium = 1800*	750
Unallocated over-runs		500
Total overnight EPC cost		**6000**

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Nuclear cost build-up – endpoint?

NOAK build up

Cost to build	**3500**	
Bulk discount/ supply chain upgrade	-300	
FOAK premium	0	
Contractor's normal profit	100	
OEM's risk premium	100	
Headline EPC price		**3400**
Owners allowed contingency		200
Unallocated over-runs		0
Total overnight EPC cost		**3600**

Maturity/scale up discount = 700

Risk premium = 300

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Base Case Assumptions

- Discount rate: 10%
- Used economic plant lives rather than loan terms
- Fuel prices taken from DECC projections – all scenarios higher than pre-2005 average
- Carbon prices - DECC central case - £200/t in 2050 – versus MM central case £30/t (~€35/t)
- General EPC prices – softening in medium term, then level

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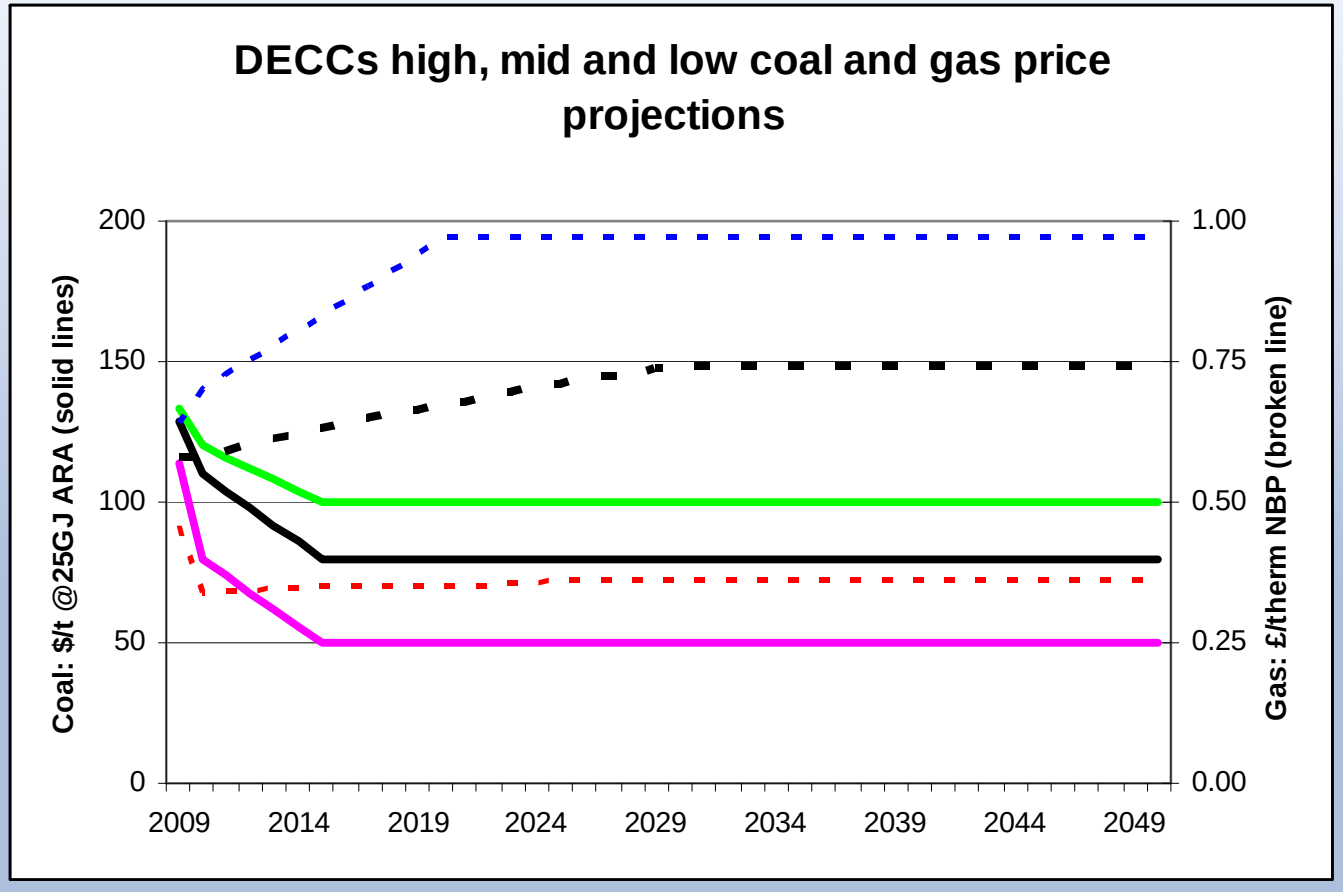
Fuel prices



Mid case has coal at £2.25/GJ ($80/t) versus gas at £7.70/GJ (73ppt).

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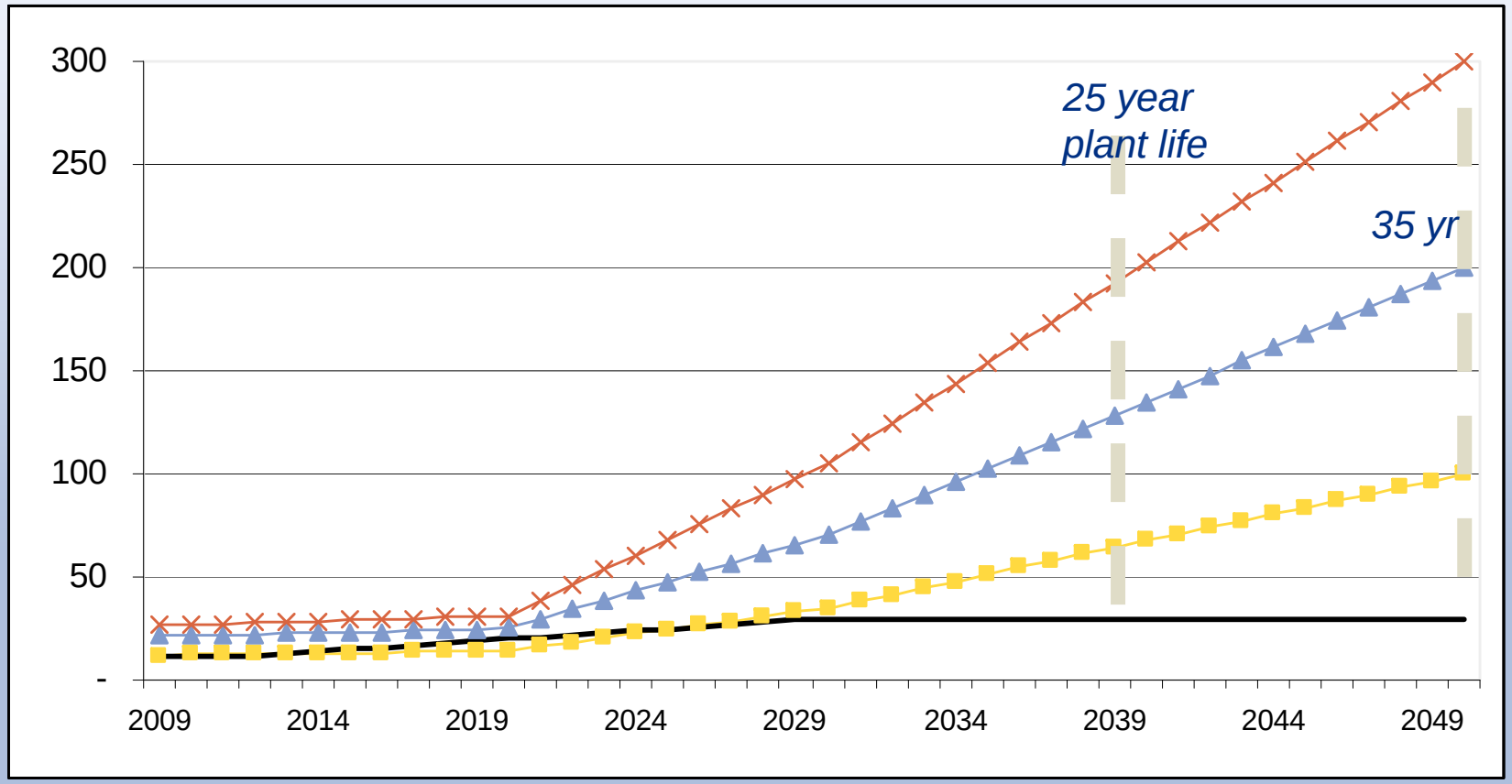
Carbon prices: £/tCO2, DECC versus MM



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Base Case Results

- ASC Coal and CCGT are lowest cost of main technologies excluding carbon, at £62/MWh
- Adding carbon at average price of €32/t makes CCGT least cost, at £74/MWh versus £81/MWh for coal
- CCGT+CCS and least cost coal+CCS costs £110-120/MWh, well above nuclear at under £99/MWh
- On-shore wind sits between ASC coal and nuclear at £94/MWh, while offshore wind well over CCS options at £157-185/MWh
- For comparison current UK annual forward price is £45/MWh

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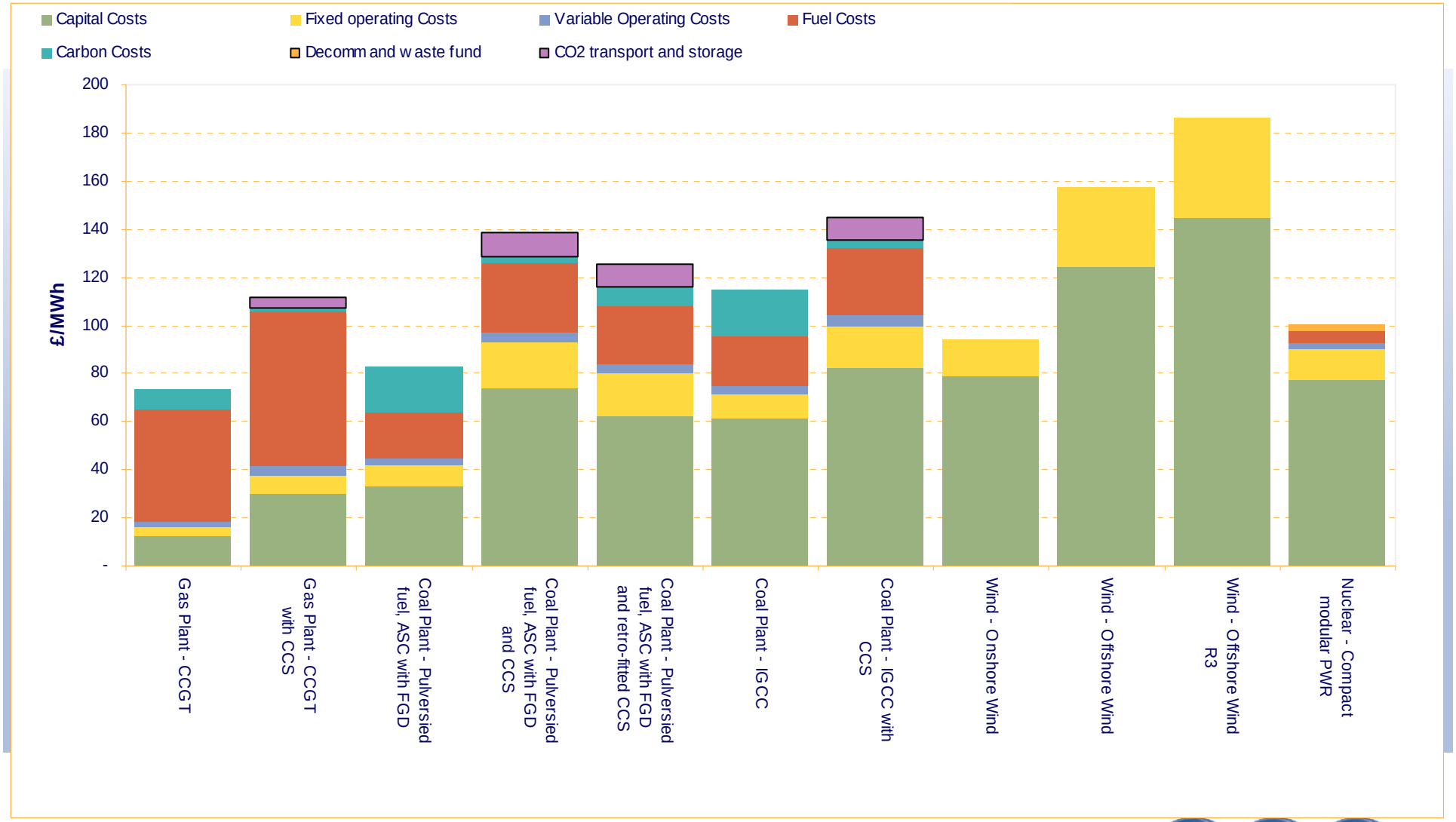
LEC main technologies, Base case – 2009 start



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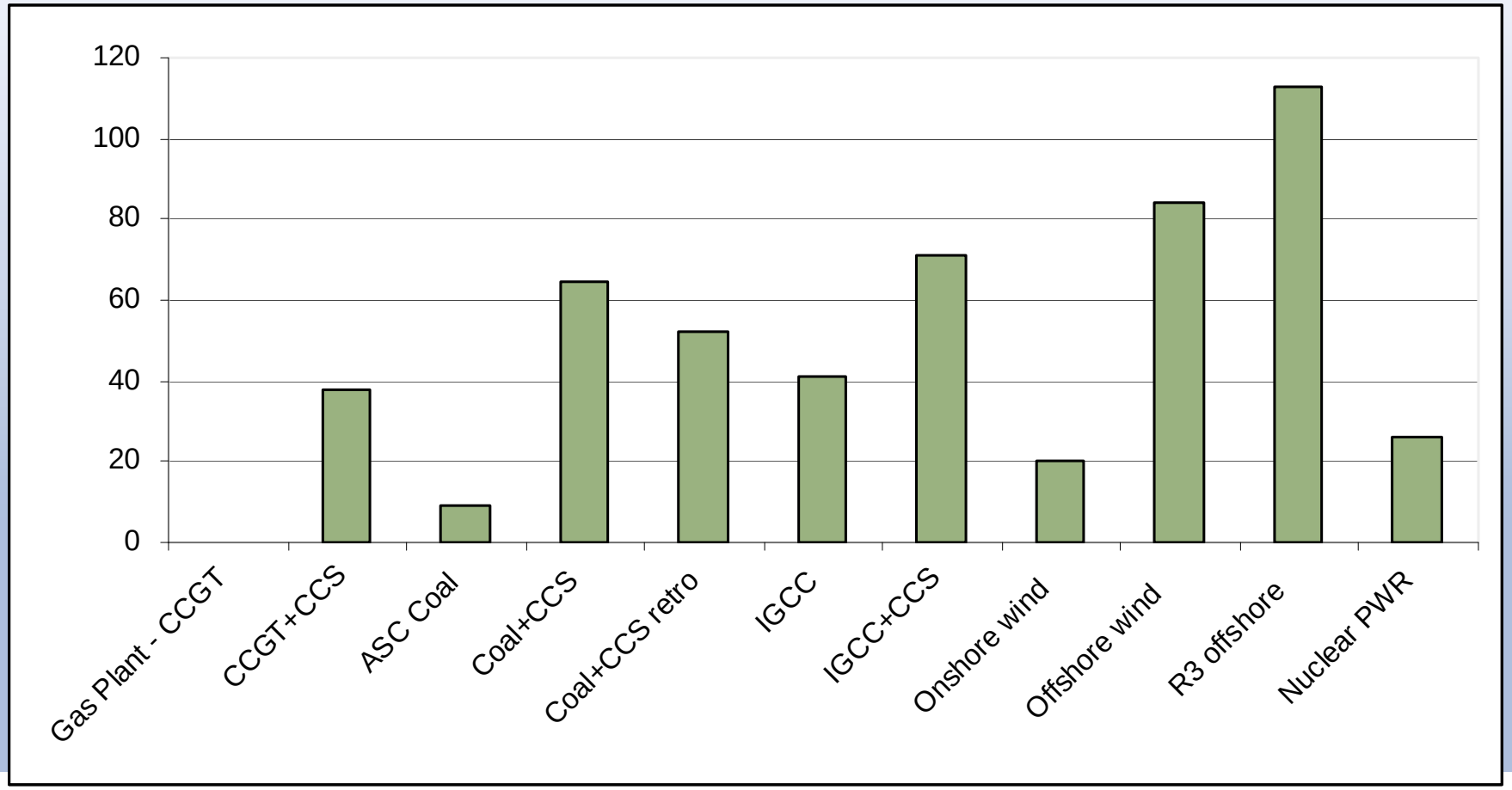
Cost premium versus CCGT, main technologies, Base case – 2009 start



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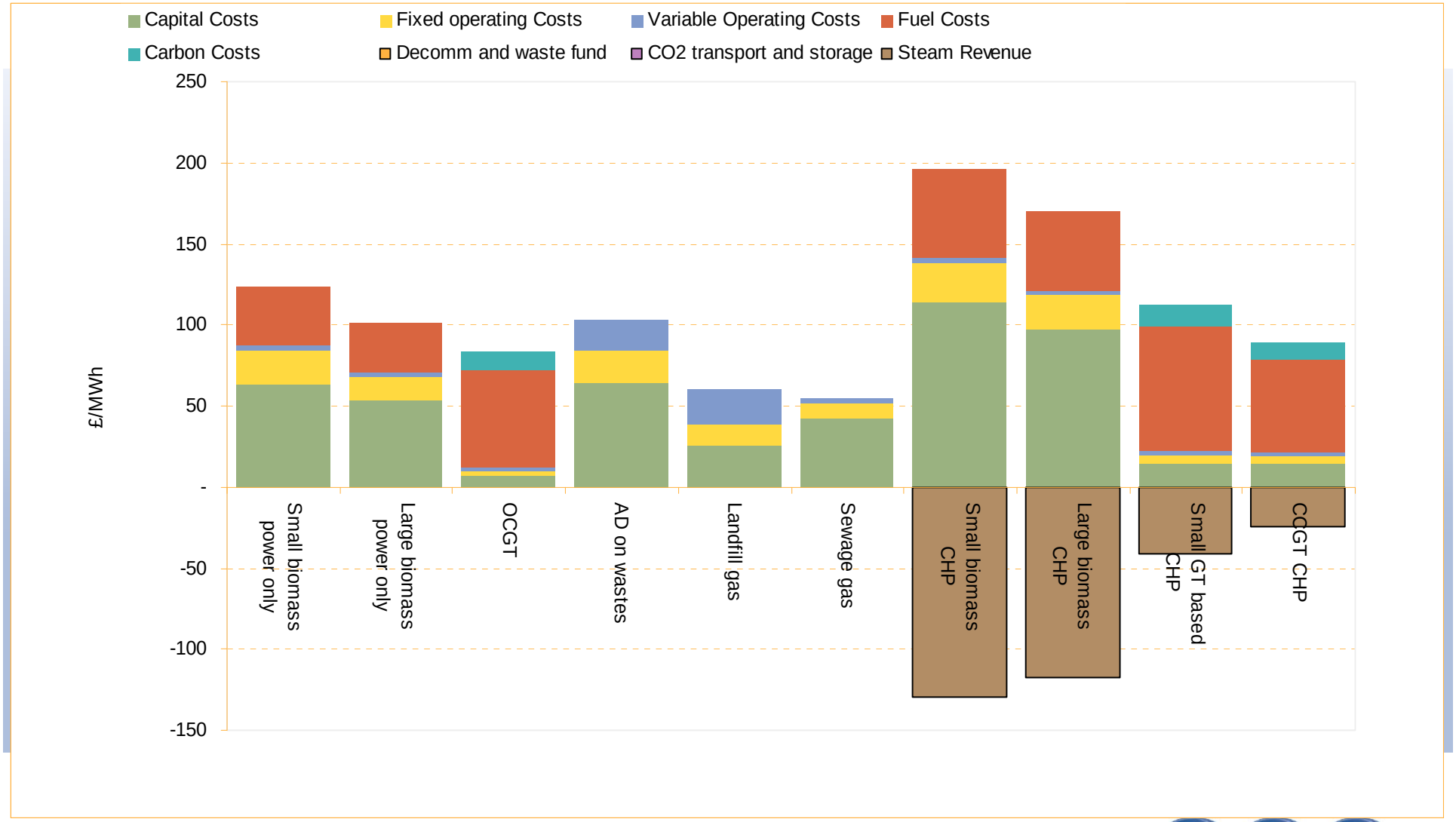

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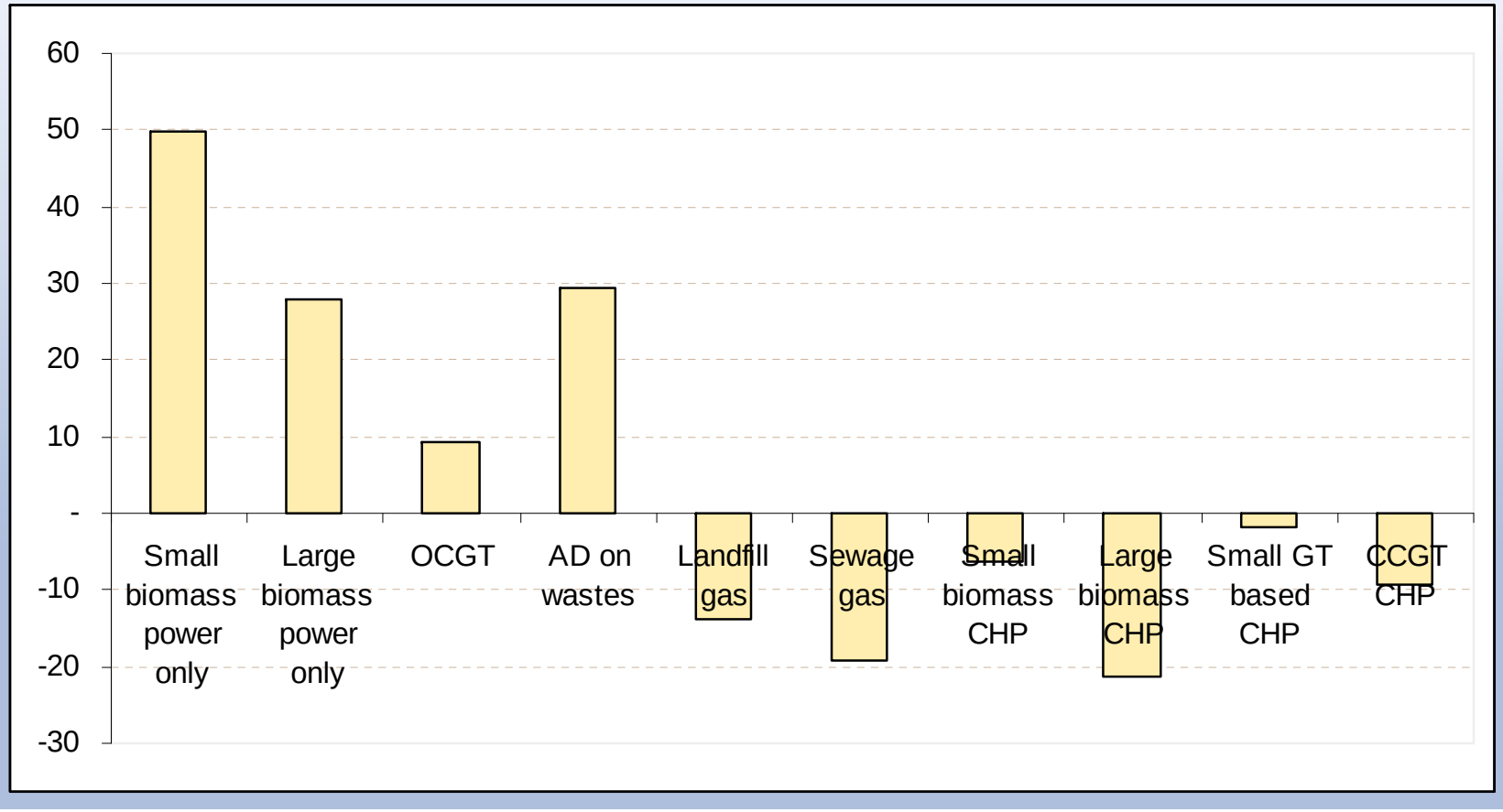
Cost premium versus CGGT, Base case – 2009 start



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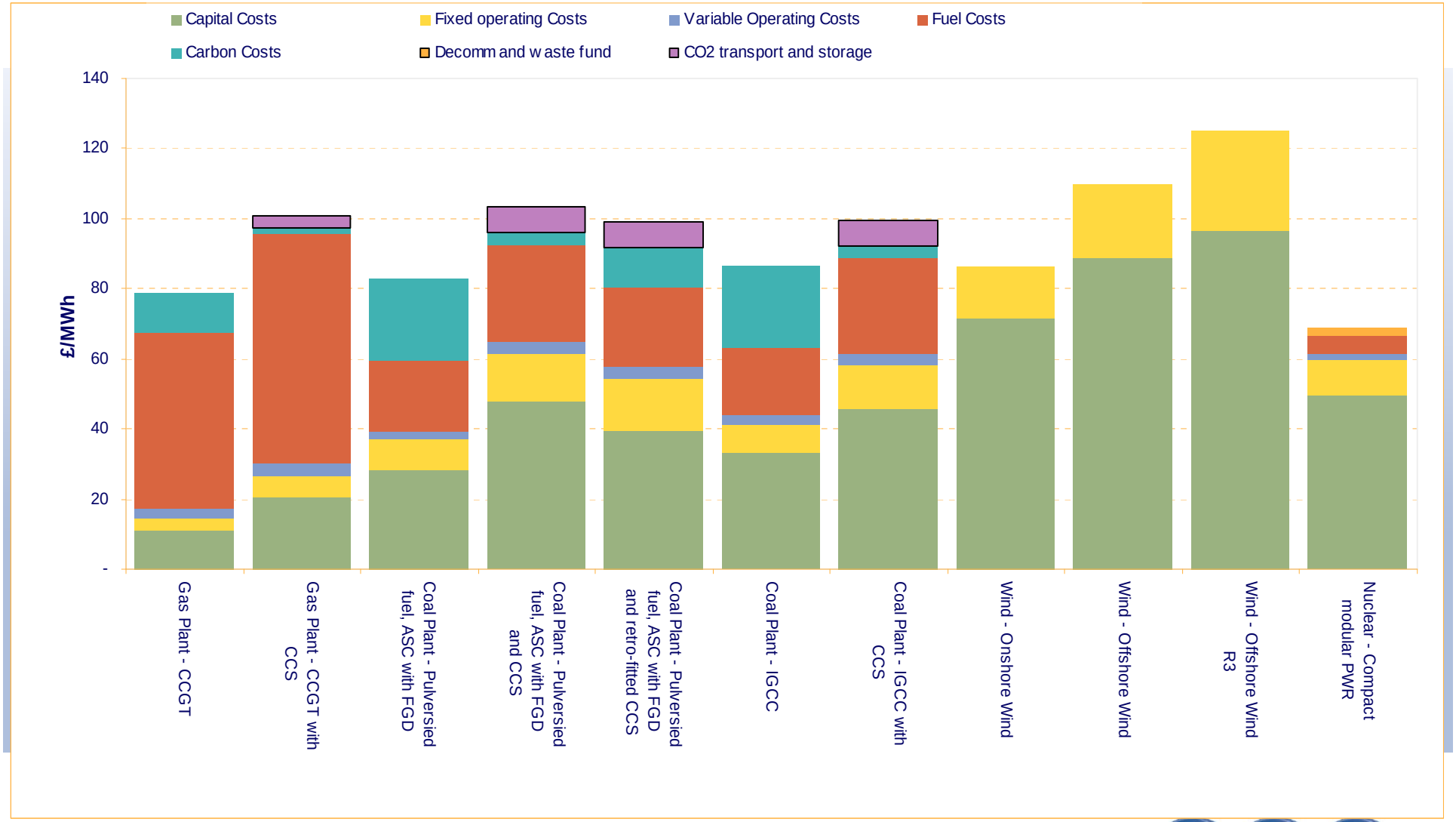
LEC main technologies, project start 2020



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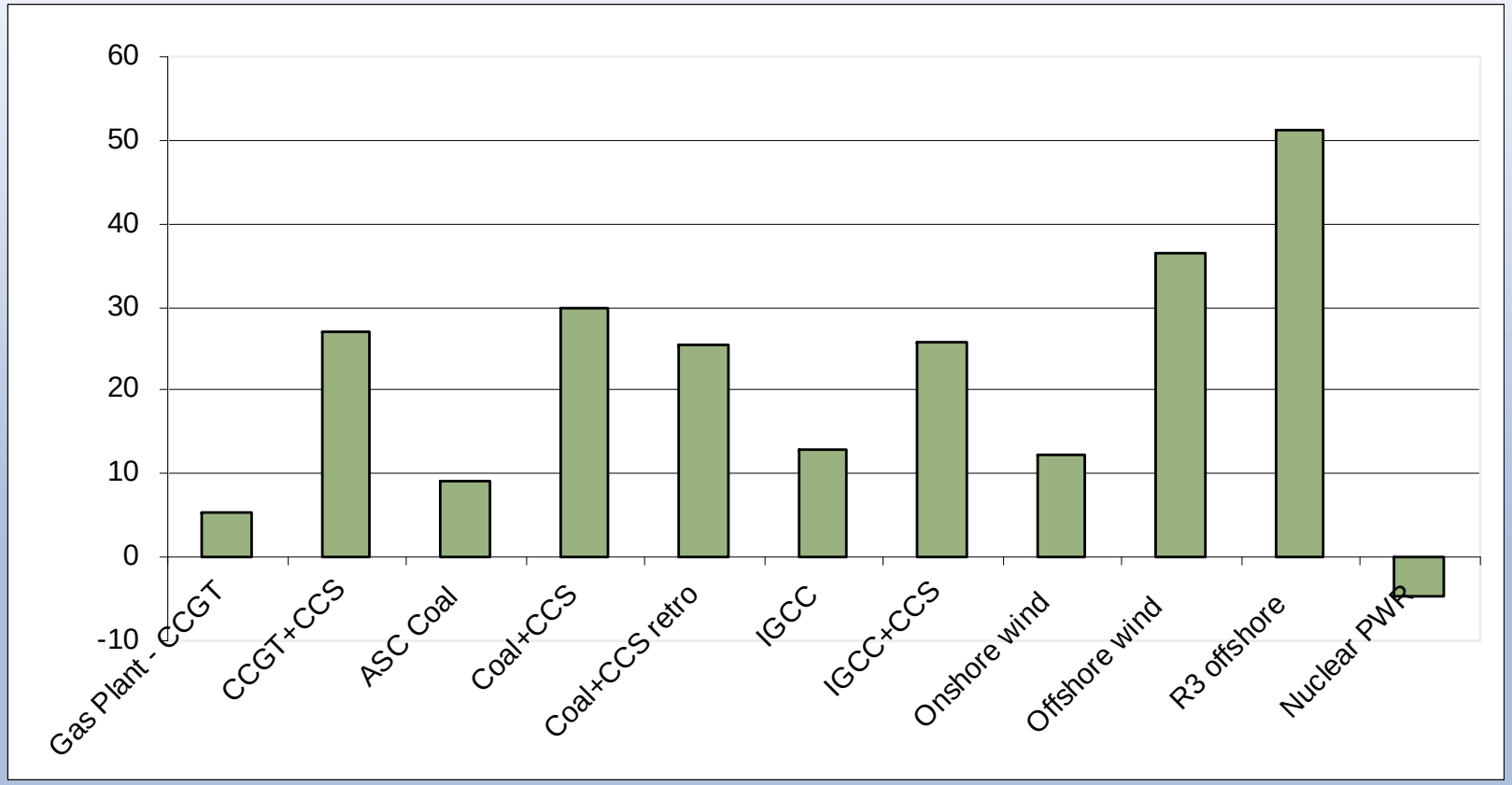
Cost premium versus CCGT (2009), main technologies, project start 2020



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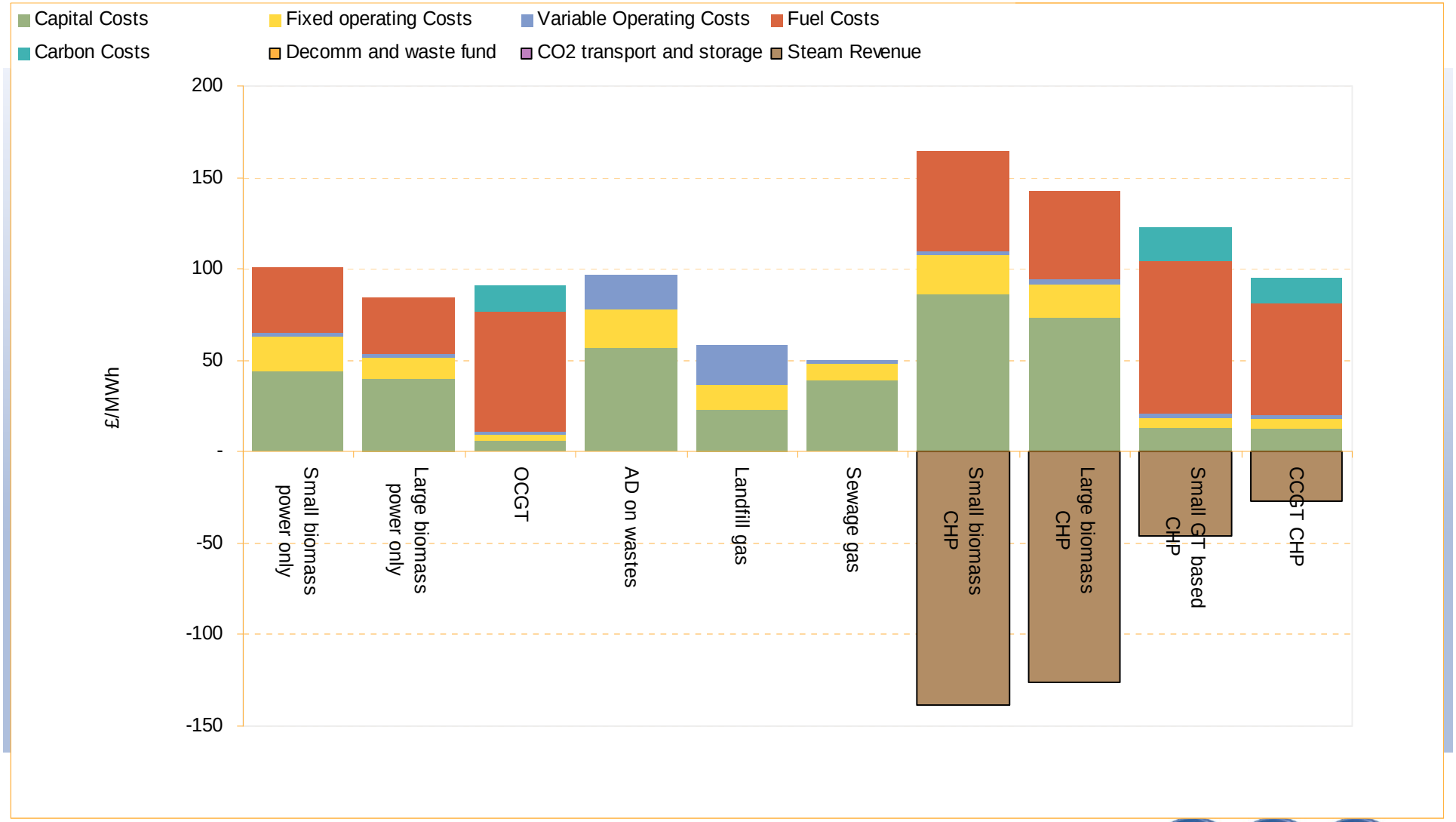
LEC minor technologies, project start 2020



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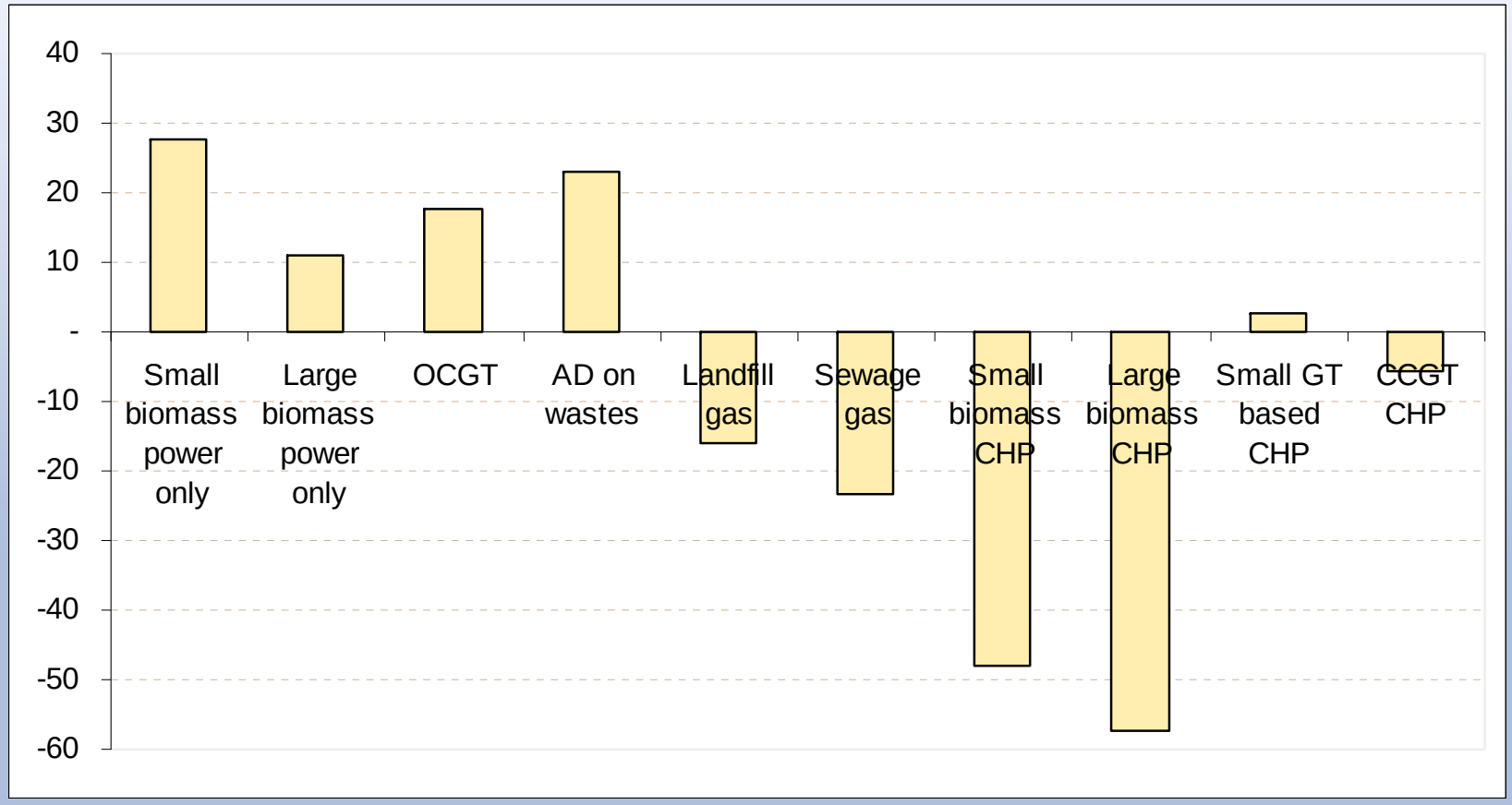
Cost premium versus CCGT (2009), minor technologies, project start 2020



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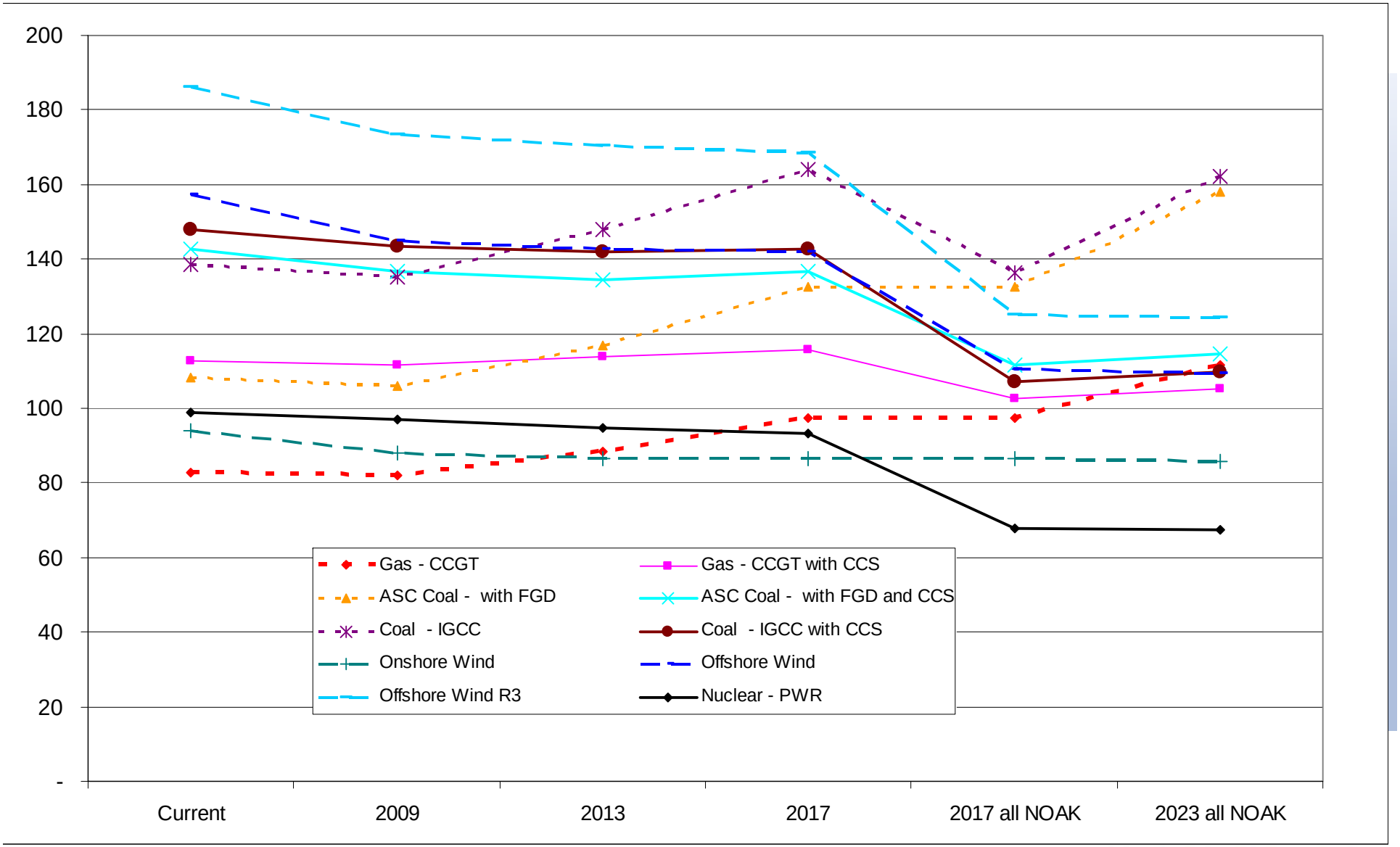
Results using DECC assumptions – main technologies



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Conclusions

- Levelised for new plant projected to be much higher (~double) than current prices
- CCGT will be the benchmark to beat in near to medium term – ASC coal £9/MWh above this, while nuclear and coal+CCS are £27-60/MWh above
- As nuclear, CCS and offshore wind move to NOAK status costs will fall markedly
- In longer term nuclear looks a good deal and should substantially undercut CCS and offshore wind, and could even be less than CCGT without CCS
- But high FOAK premium creates special funding challenge for first units, even assuming a benign regulatory and market environment

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Thank You

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Dr Guy Doyle – Chief Economist, Energy & Carbon, Mott MacDonald

+44 1273 365 171
Guy.Doyle@mottmac.com

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