

Costs and emissions

**Renewables policy:
making sure it delivers**

Presented to Ofgem

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OXERA assumptions on network costs (discounted £m)

	Onshore wind	Offshore wind	Marine	Energy crops
Network reinforcement (annuitised, cumulative)	1,476	333	73	58

Source: OXERA.



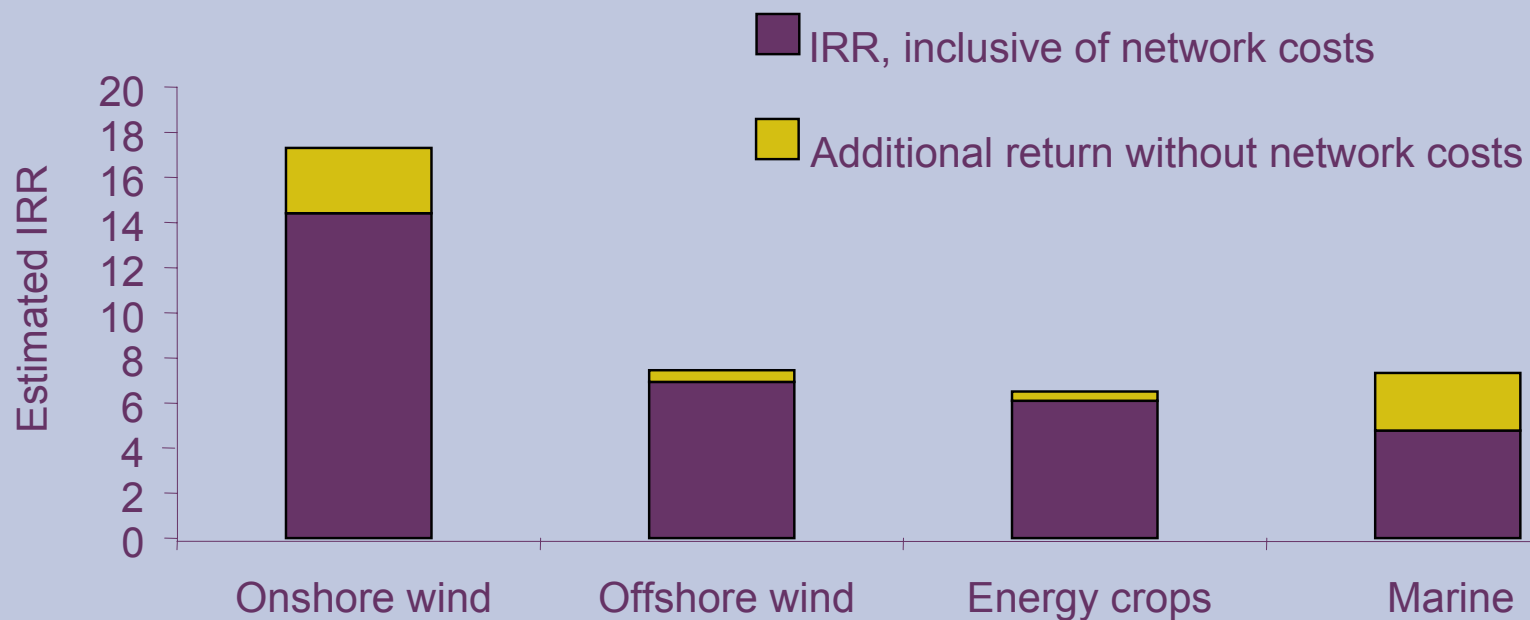
Impact of network costs (£/MWh)

	New-build cost <i>excluding</i> network costs		New-build cost <i>including</i> network costs	
	Onshore	Offshore	Onshore	Offshore
2004/05	30.1	55.0	35.5	56.8
2010/11	26.6	41.9	31.7	41.9
2015/16	25.5	38.2	30.6	37.8

Source: OXERA.



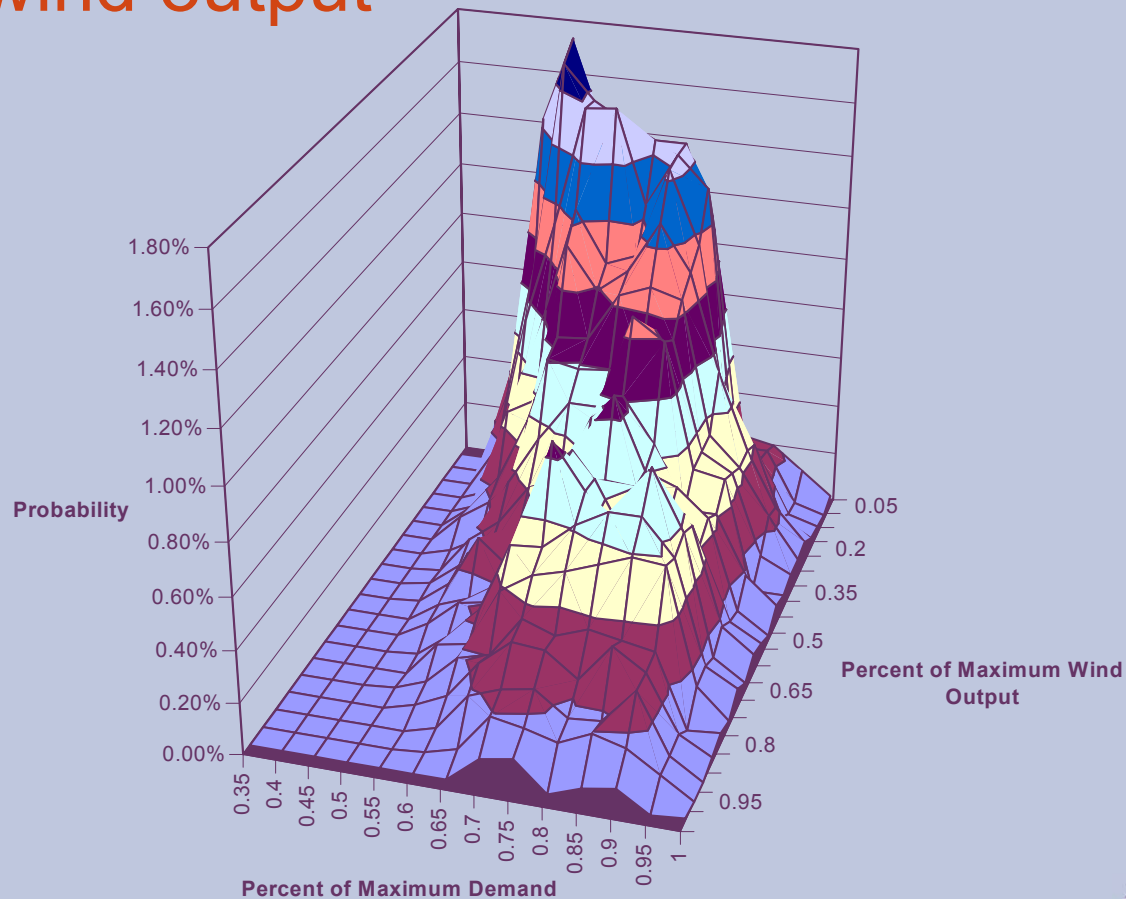
Impact of network costs: estimated IRR of projects commissioned in 2004/05 (%)



Source: OXERA.



Pattern of wind output



Source: OXERA.



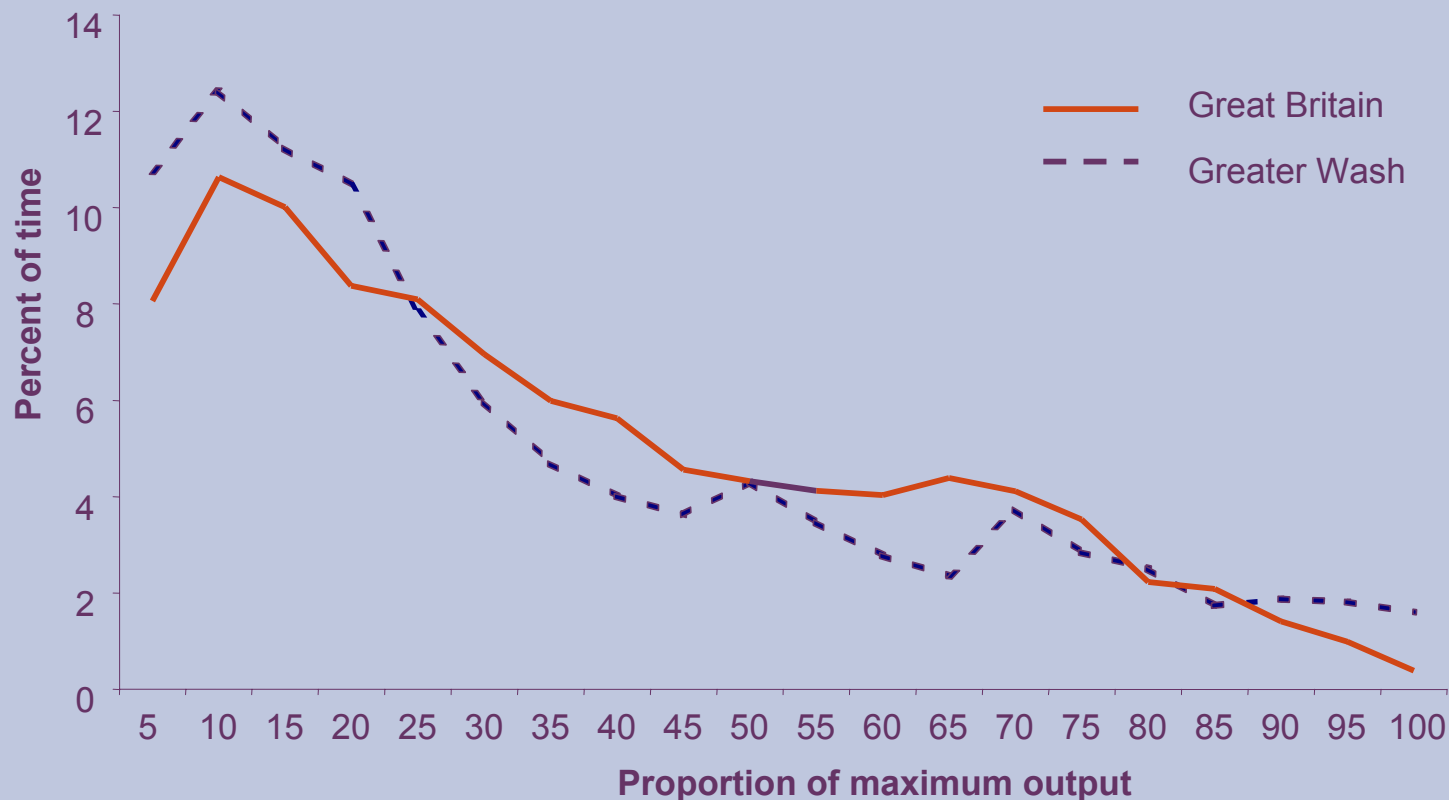
Matrix of coincident hours (%)

% of max. output	% of peak demand						
	40	50	60	70	80	90	100
10	0	276	517	399	339	88	23
20	0	123	420	437	472	140	23
30	0	73	264	348	396	186	55
40	0	39	177	263	338	174	29
50	0	27	103	196	259	161	34
60	0	17	74	205	201	181	38
70	0	7	61	201	214	230	33
80	0	1	46	125	152	161	21
90	0	0	14	87	86	103	17
100	0	0	1	30	39	43	8

Source: OXERA.



Portfolio effect (%)



Source: OXERA.



Capacity benefit

Types

- peak capacity ✓
- system balancing ×
- frequency response ×

Capacity benefit (£/MWh)

14 GW wind	0.1
New nuclear	0.6



Emissions benefits

	Base case	High wind	New nuclear
NOx emissions (kt)	121.6	119.6	98.9
SO ₂ emissions (kt)	51.6	52.7	40.2
Total saving (£/MWh)	–	0.2	2.3

Note: Based on a damage cost for NOx of £3,484/tonne and for SO₂ of £2,800/tonne.

Source: OXERA.



Summary

2020

	Generation cost	Electricity network infrastructure cost	Carbon benefit	Security of-supply benefit	Other emissions benefit	System cost	Total cost
Wind	25	3.8–9.9	–1.3	–5.1	–0.2	–0.1	22.1–28.2

Source: OXERA.



Co-firing

- assumptions

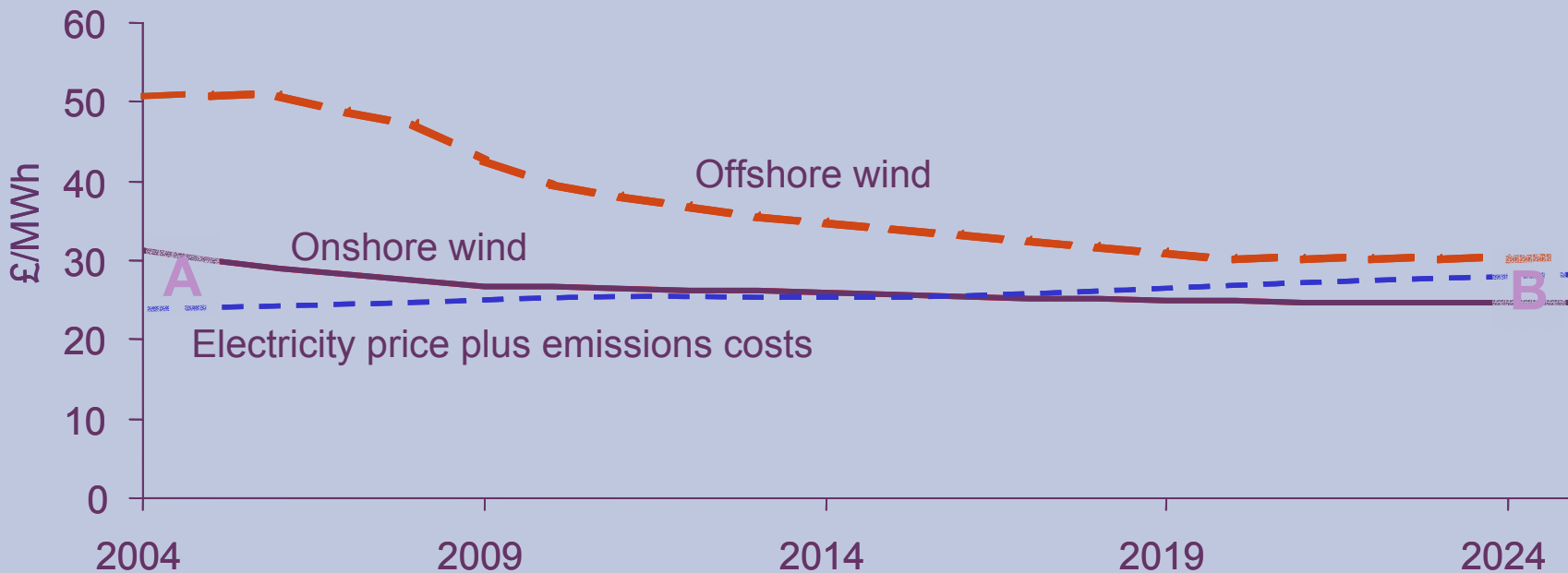
- fuel cost £60/t or £3.35/GJ
- ROC price £40/MWh
- proportion by calorific value 3%

- resultant change in coal station output

- GWh + 2%
- coal/CO₂ – 1.3%
- SO₂ – 1.4%



Programme costs: learning curves



Source: OXERA.



Programme costs: onshore wind (£/tCO₂)

	New build		Weighted average to date	
	<i>Excluding</i> network costs	<i>Including</i> network costs	<i>Excluding</i> network costs	<i>Including</i> network costs
2004	129	189	129	189
2010	76	131	94	149
2015	57	117	80	137
2020	41	107	70	129

Source: OXERA.



Programme costs: offshore wind (£/tCO₂)

	New build		Weighted average to date	
	<i>Excluding</i> network costs	<i>Including</i> network costs	<i>Excluding</i> network costs	<i>Including</i> network costs
2004	485	494	485	494
2010	212	216	290	296
2015	140	144	229	235
2020	98	102	190	195

Source: OXERA.



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