

# Benefits of marine technologies to a diversified renewables mix

Wave & Tidal 2009  
30<sup>th</sup> April 2009

Nick Screen  
Redpoint Energy

TO **CLIMB** A NEW ROUTE SUCCESSFULLY FOLLOWING  
CAREFUL **ANALYSIS** AND PREPARATION





# Redpoint Energy

**Redpoint Energy** is a specialist energy consultancy, advising clients on investments, strategy and regulation across Europe's liberalised power, gas and carbon markets.

Clients include utilities, banks, developers, policy makers and regulators

# The Challenge



- Power sector to be de-carbonised by 2050
- Requires huge deployment of renewables and other low carbon technologies
- Many renewables are variable and are non-dispatchable
- Too much concentration of single technology presents risks to the market
- There are benefits of having diversified mix of renewables

# The potential benefits



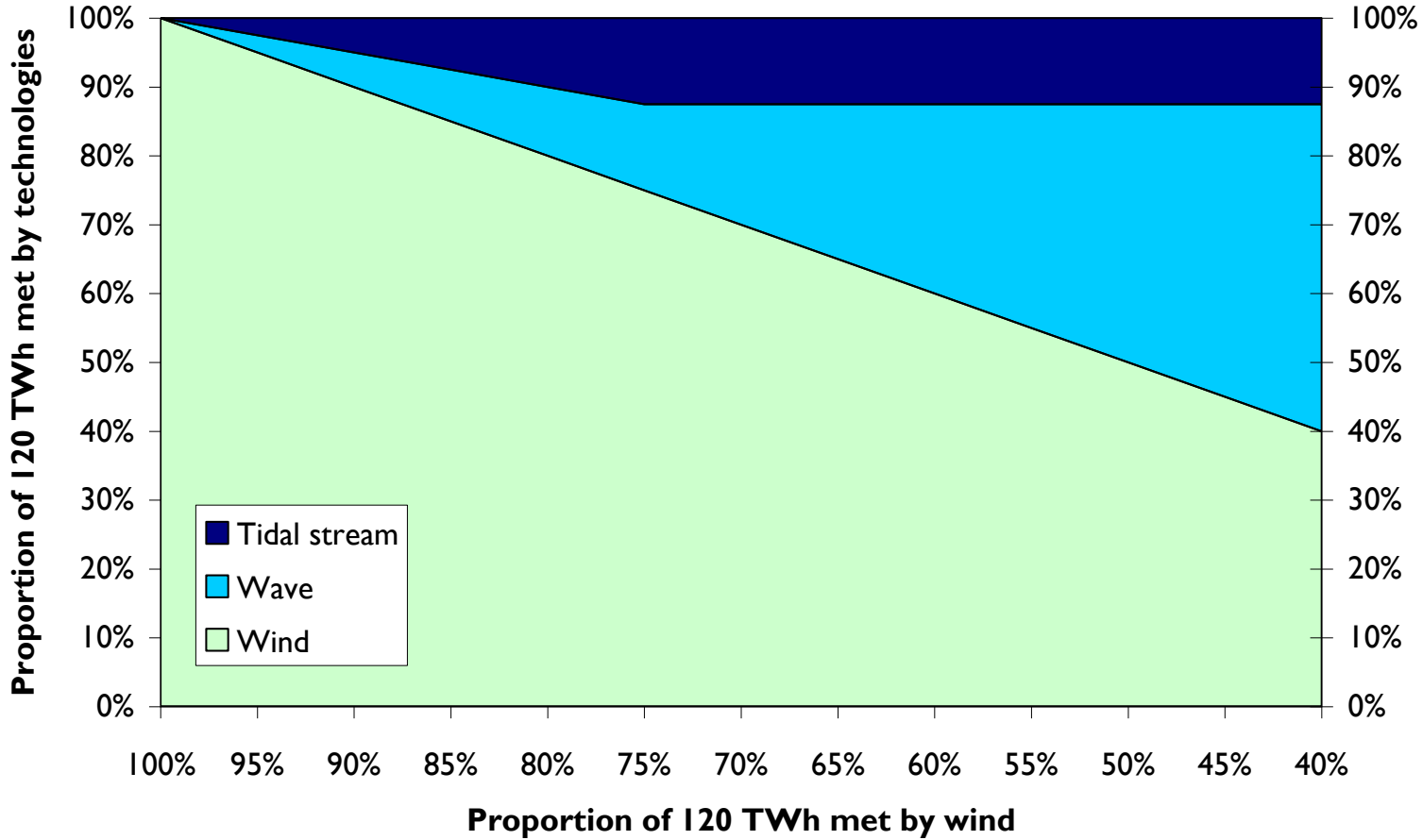
- Impact of diversified mix:
  - Less variability in combined output
  - Lower risk of extreme swings
  - Improved forecasting ability
- Potential benefits:
  - Reduced requirement for back-up
  - Reduced requirement for reserve
  - Less redundant investment due to spill
  - Lower carbon dioxide emissions and fuel use
  - Possible reduction in requirement for subsidy
  - (Better utilisation of the transmission system)

# Approach

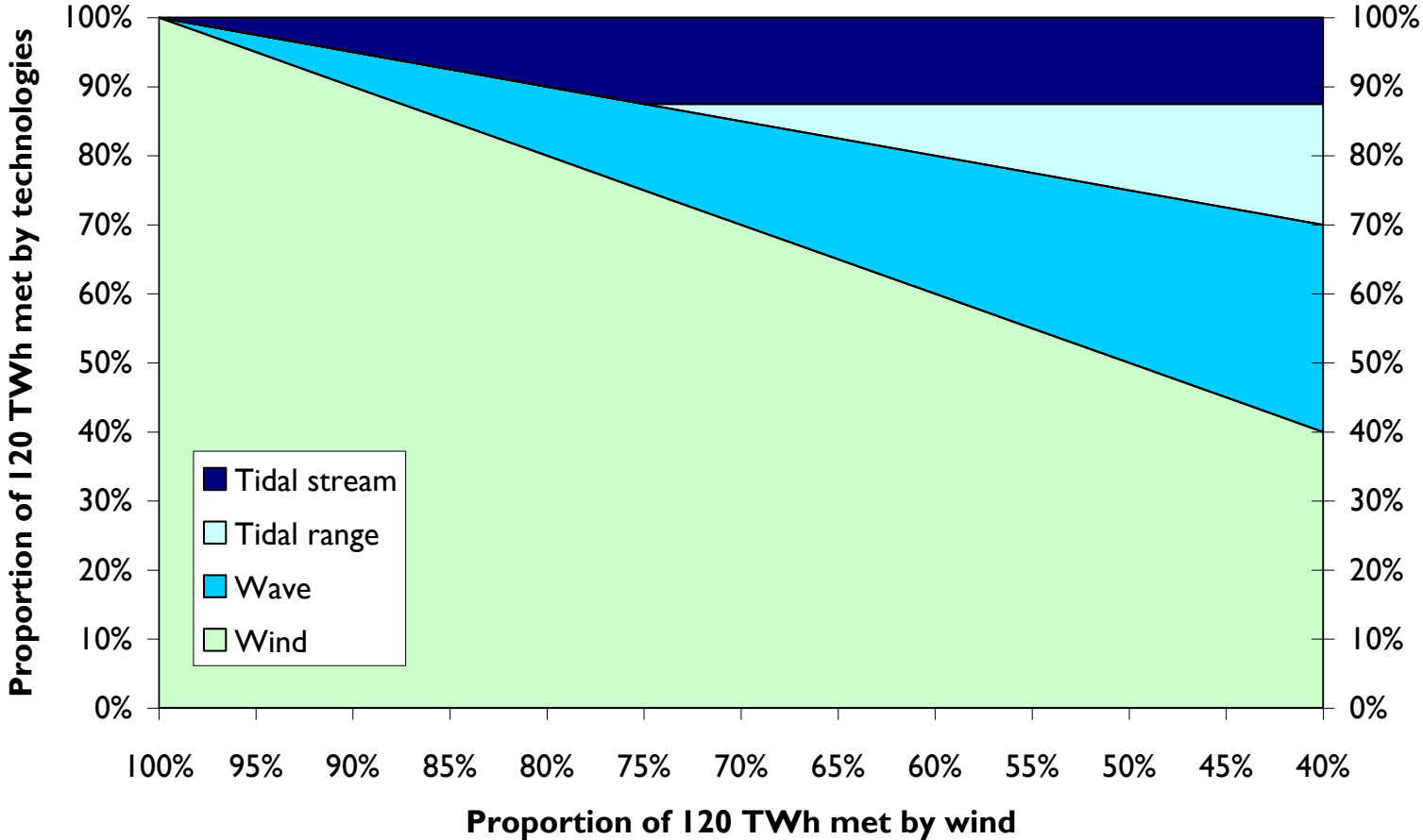


- Take hypothetical year around 2030
- 40% generation from renewables – the rest nuclear, CCS, gas
- Assume  $\frac{3}{4}$  of renewables is variable (~120 TWh/annum)
- Vary proportion of wind and marine technologies that make up the 120 TWh/annum
- Marine includes wave, tidal stream and tidal range
- Simulate the operation of the system and look at economic impact of different mixes

# Renewables mix – scenario 1



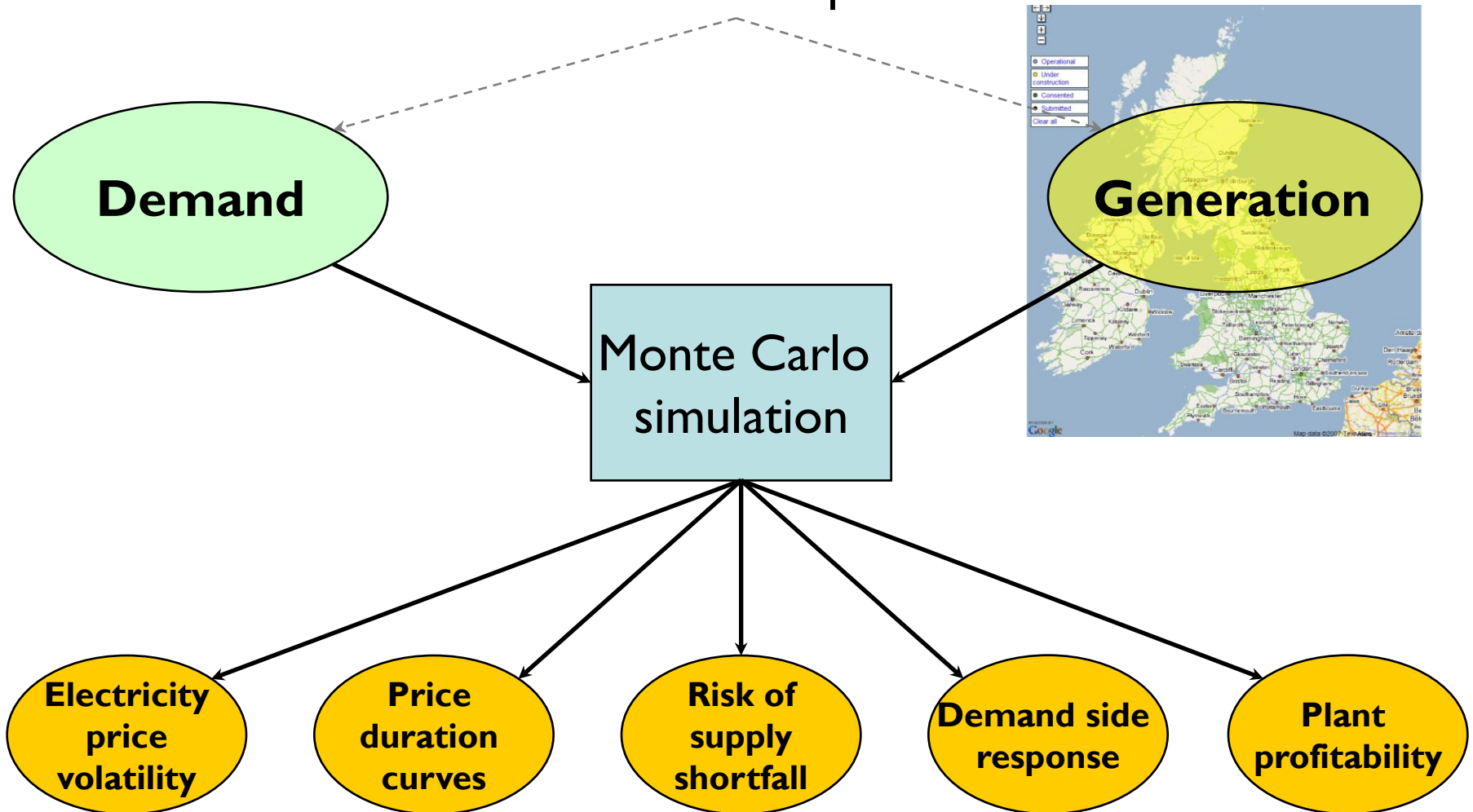
# Renewables mix – scenario 2



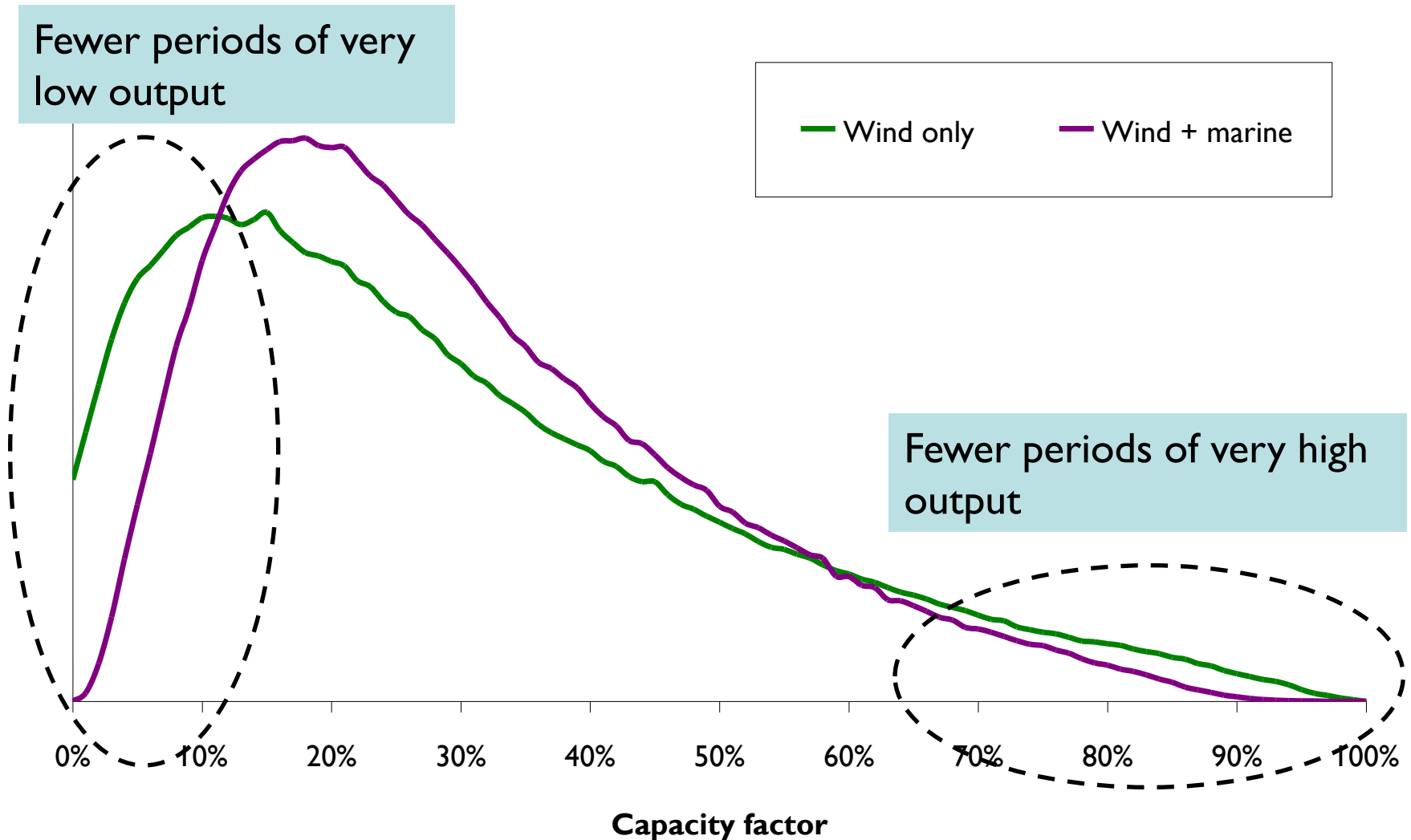
# Modelling framework



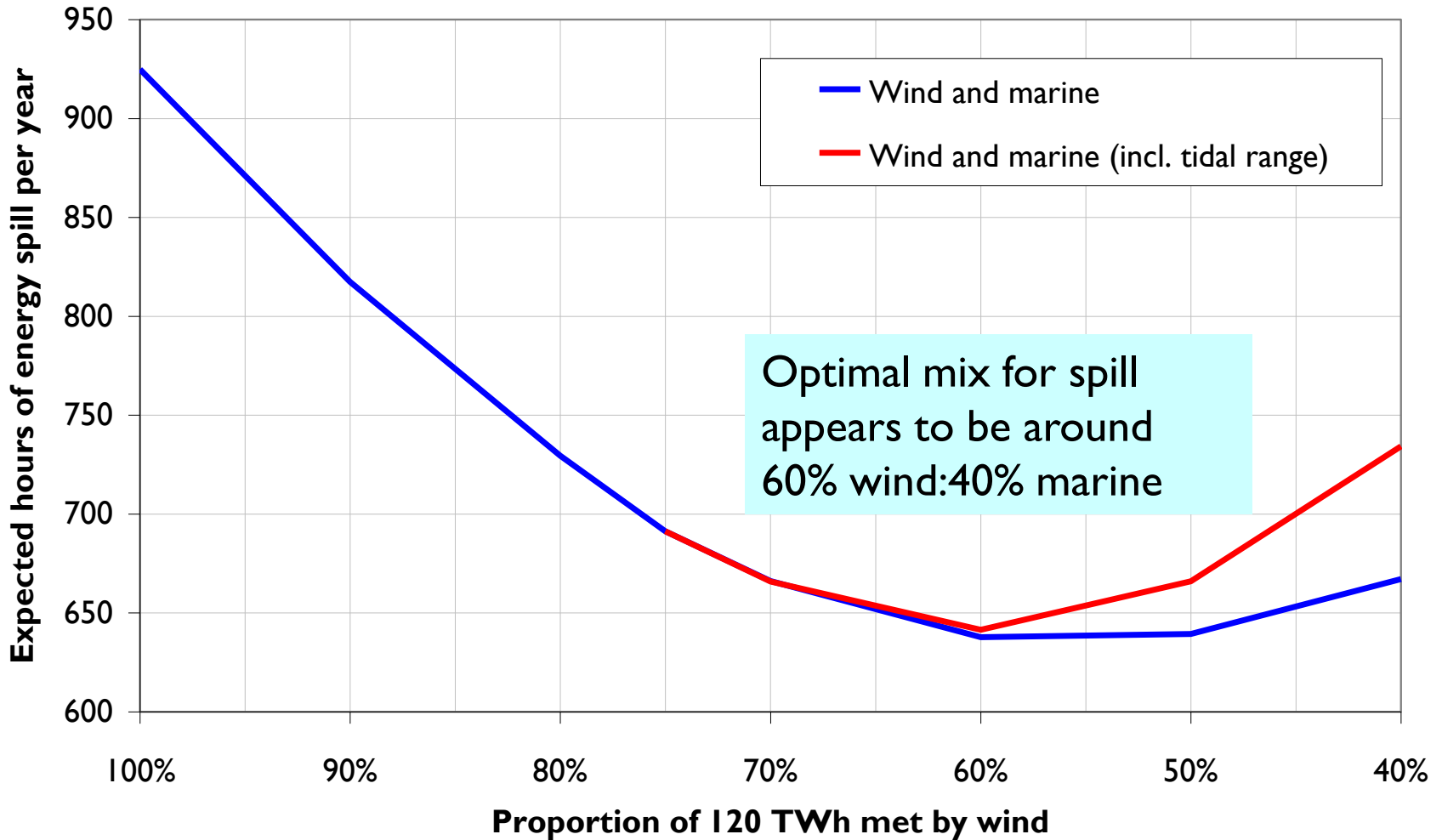
Calibrated inputs



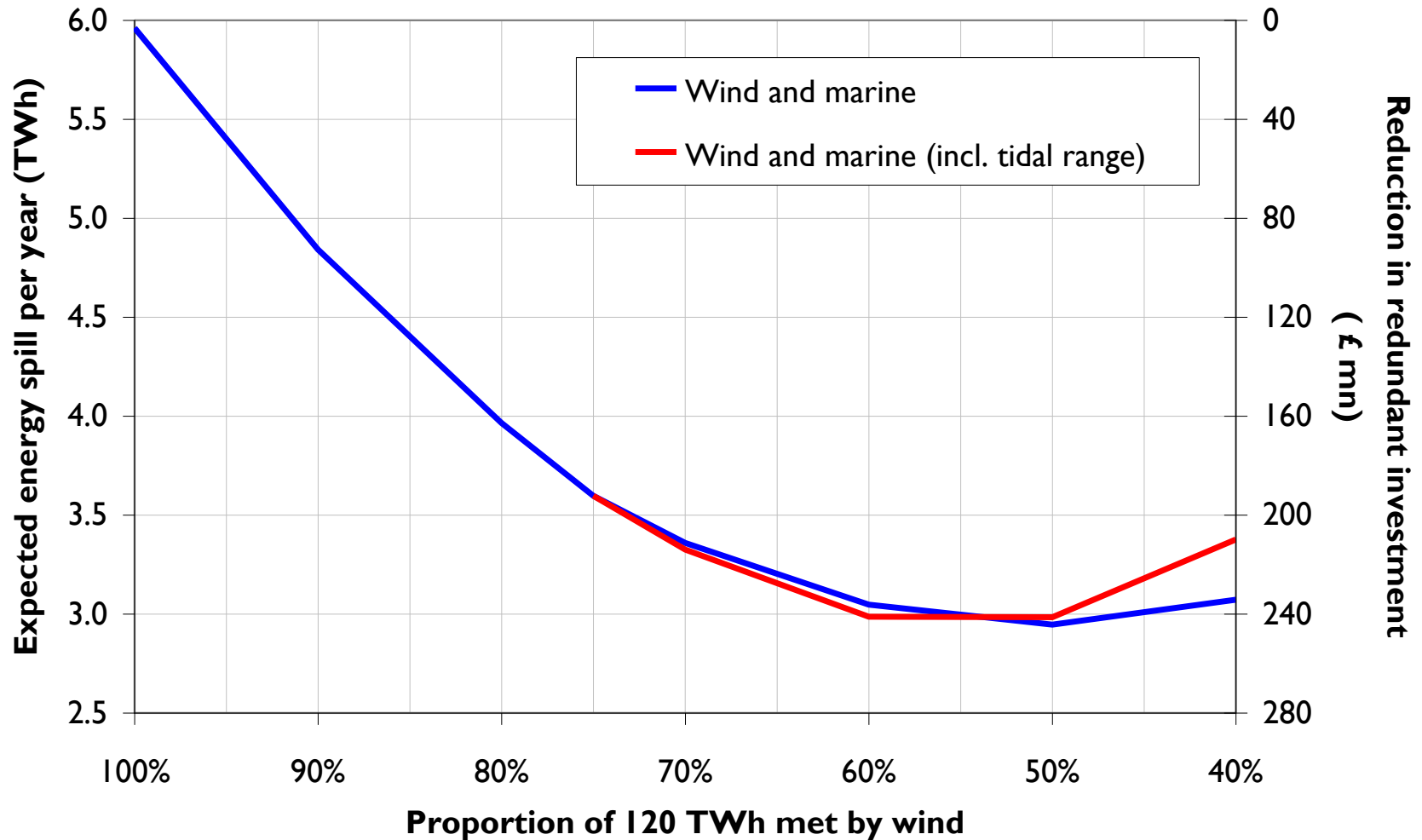
# Hourly output distributions



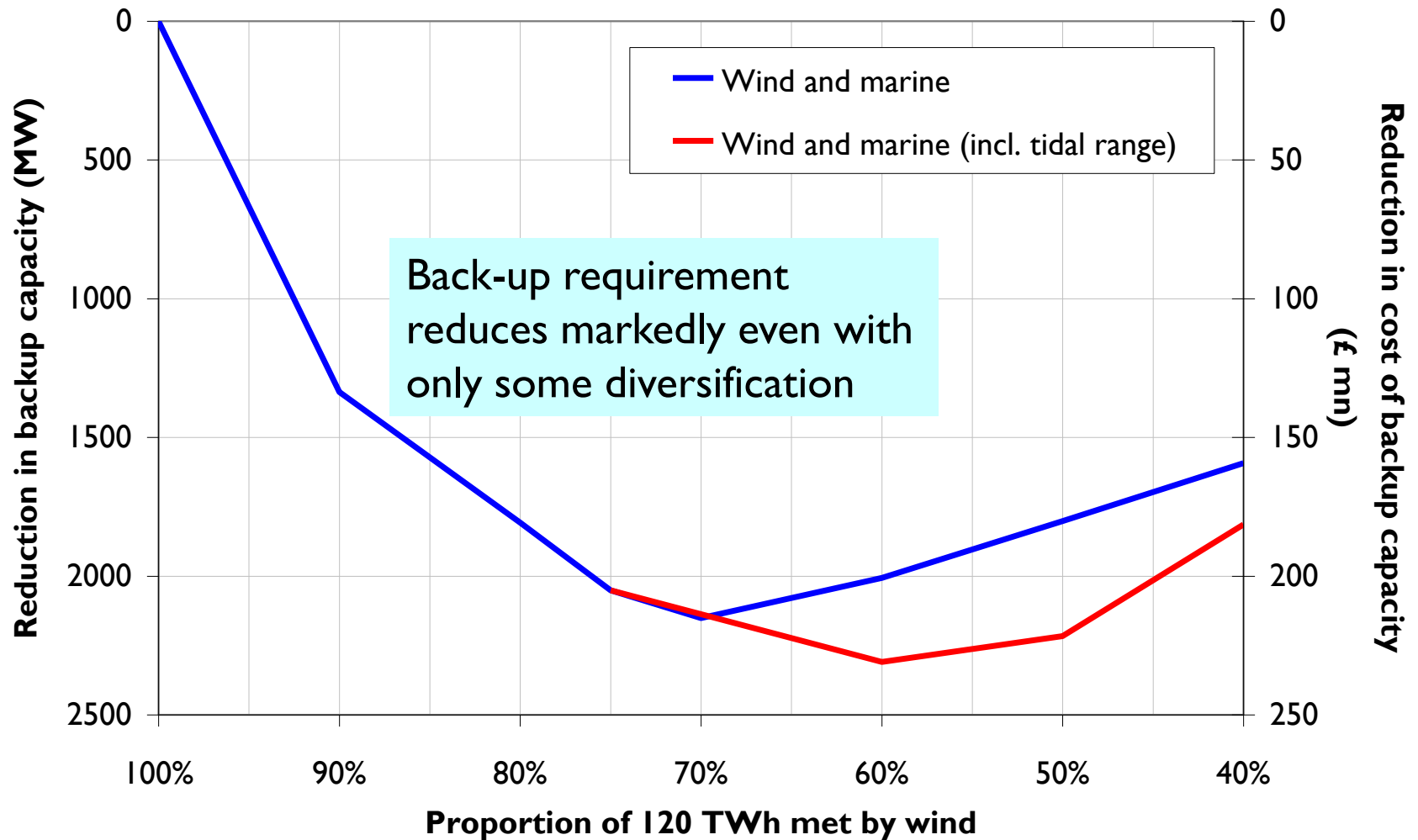
# Occurrence of spilled energy



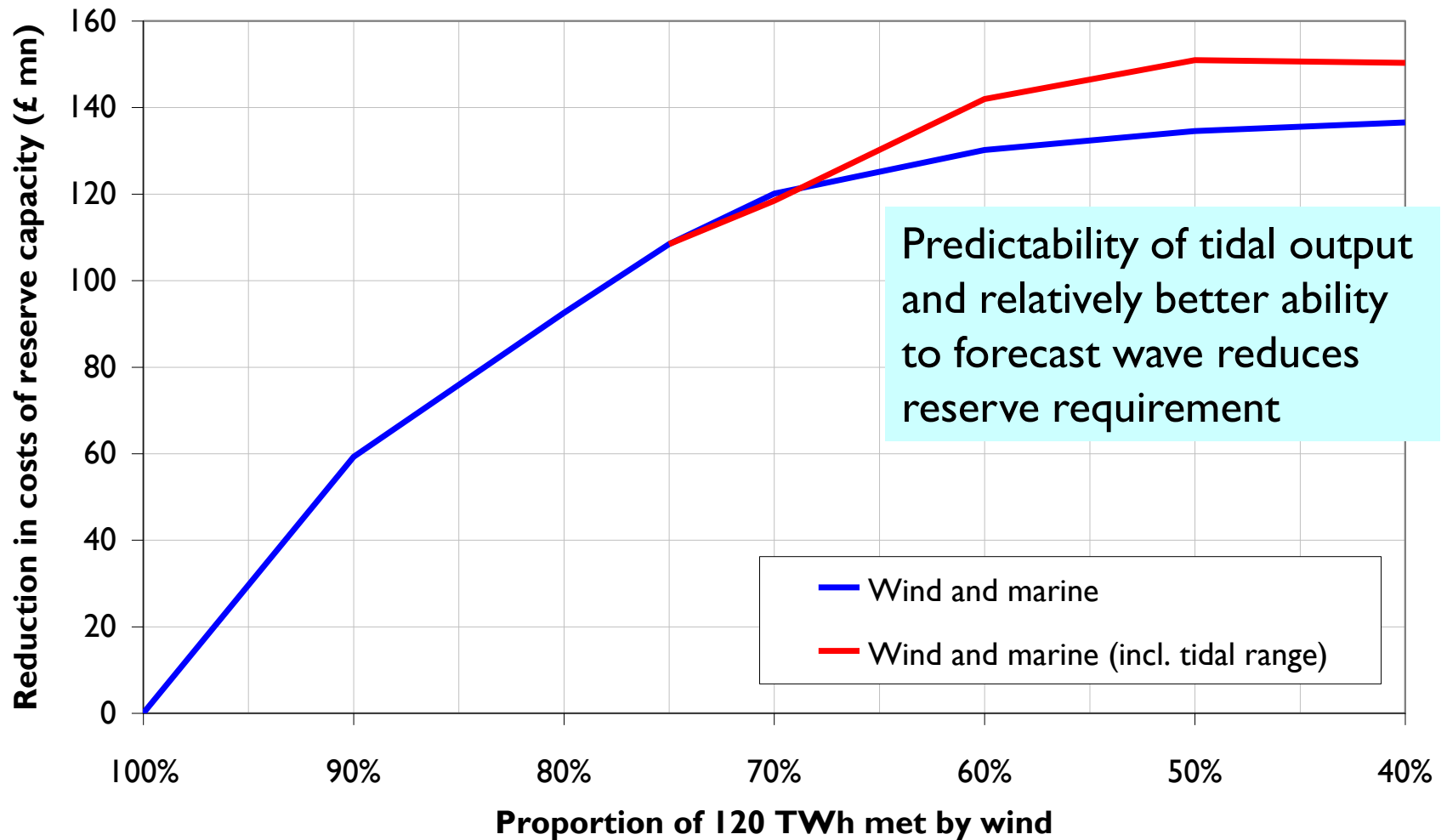
# Quantity and cost of energy spill



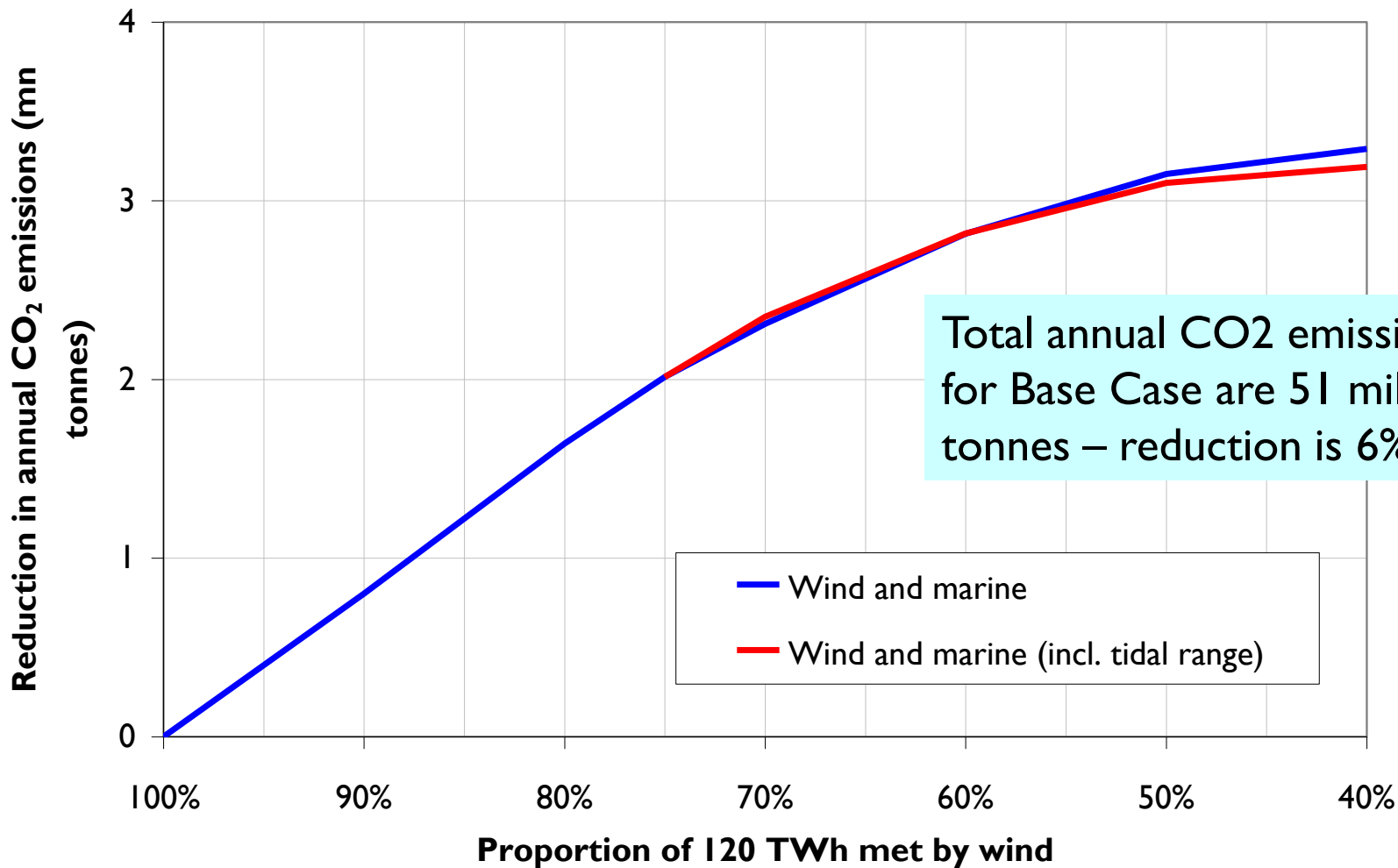
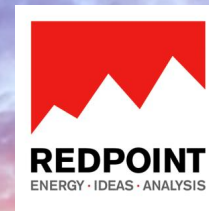
# Back-up requirement



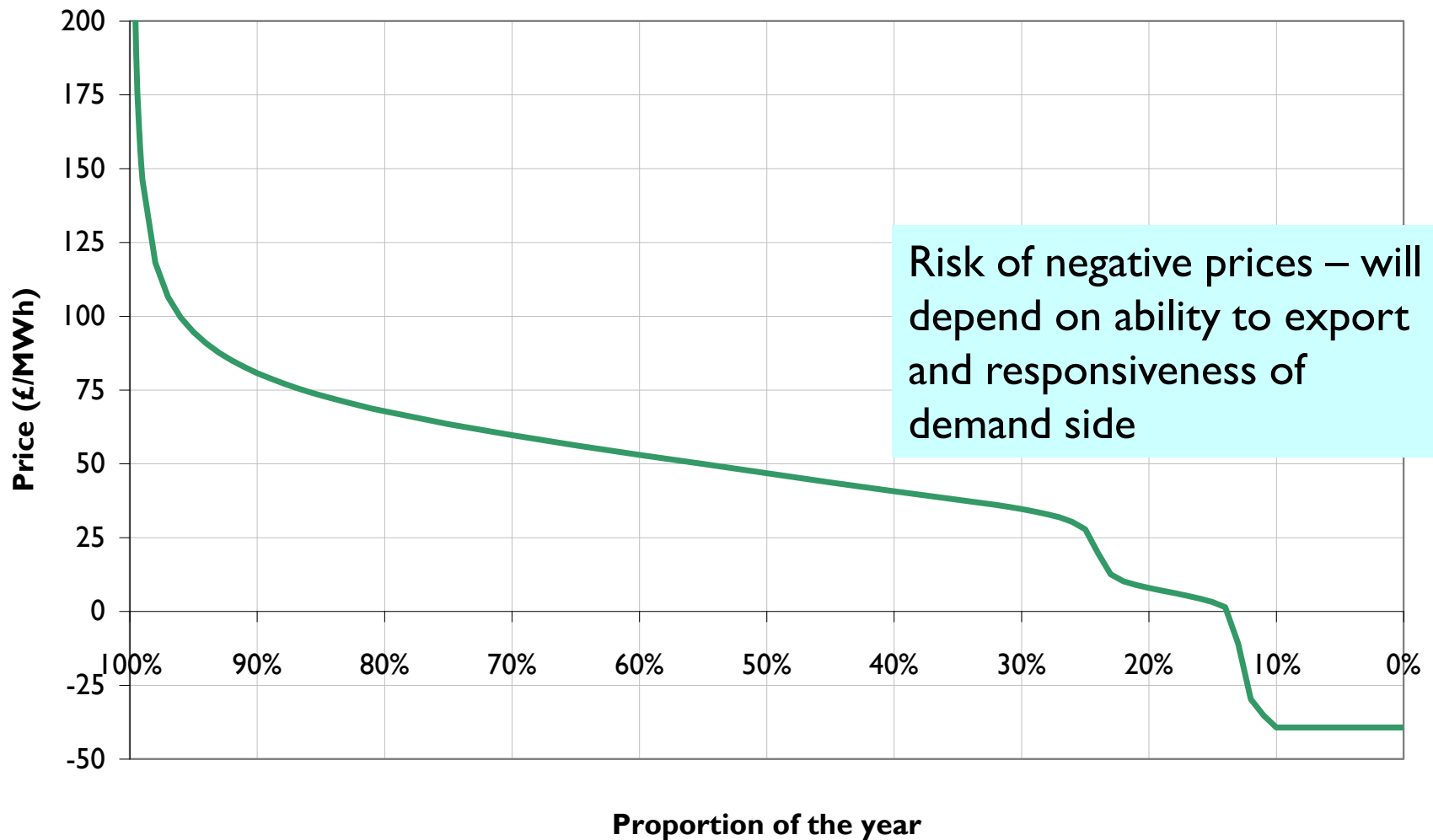
# Savings in reserve costs



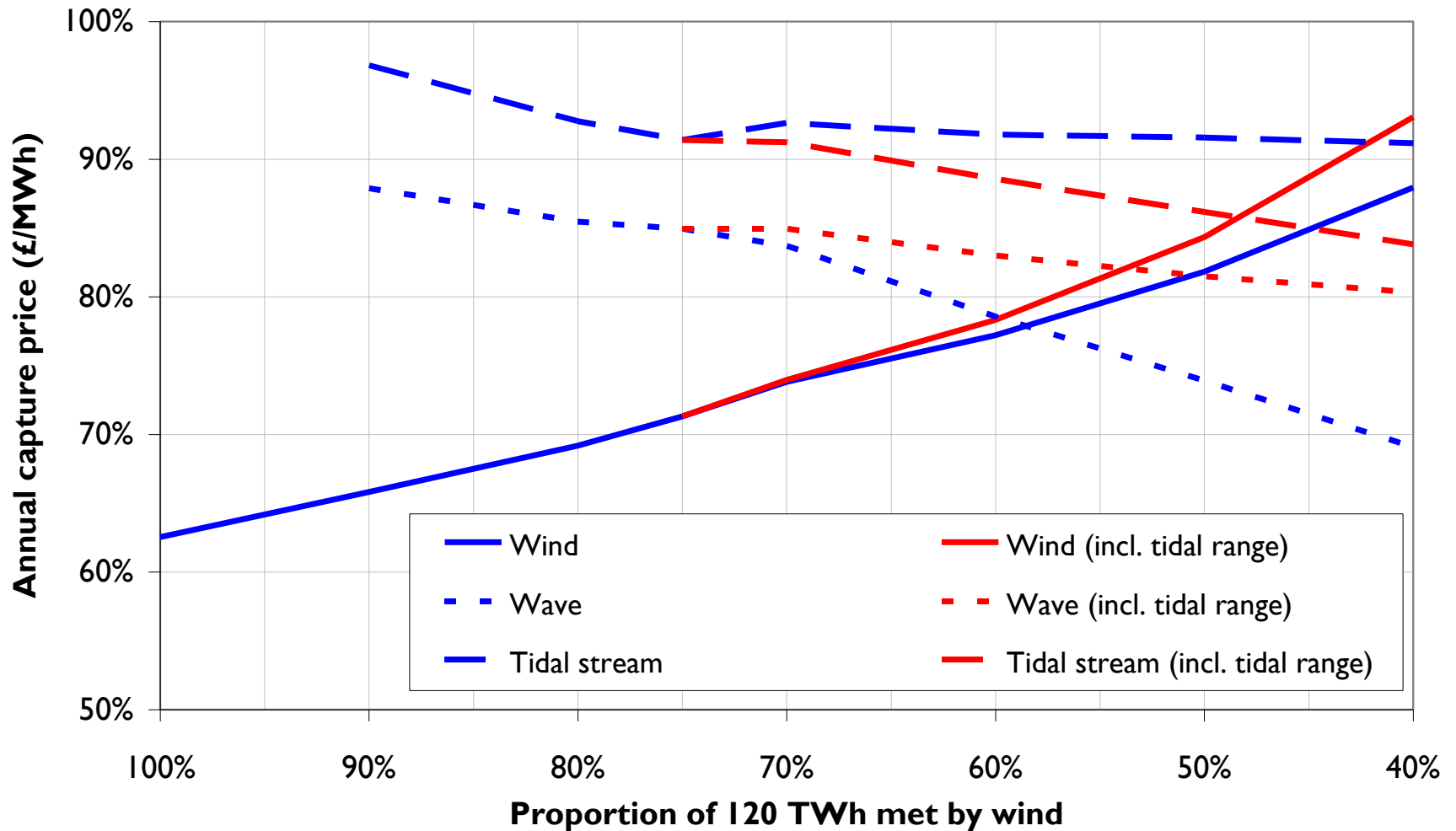
# CO<sub>2</sub> reductions



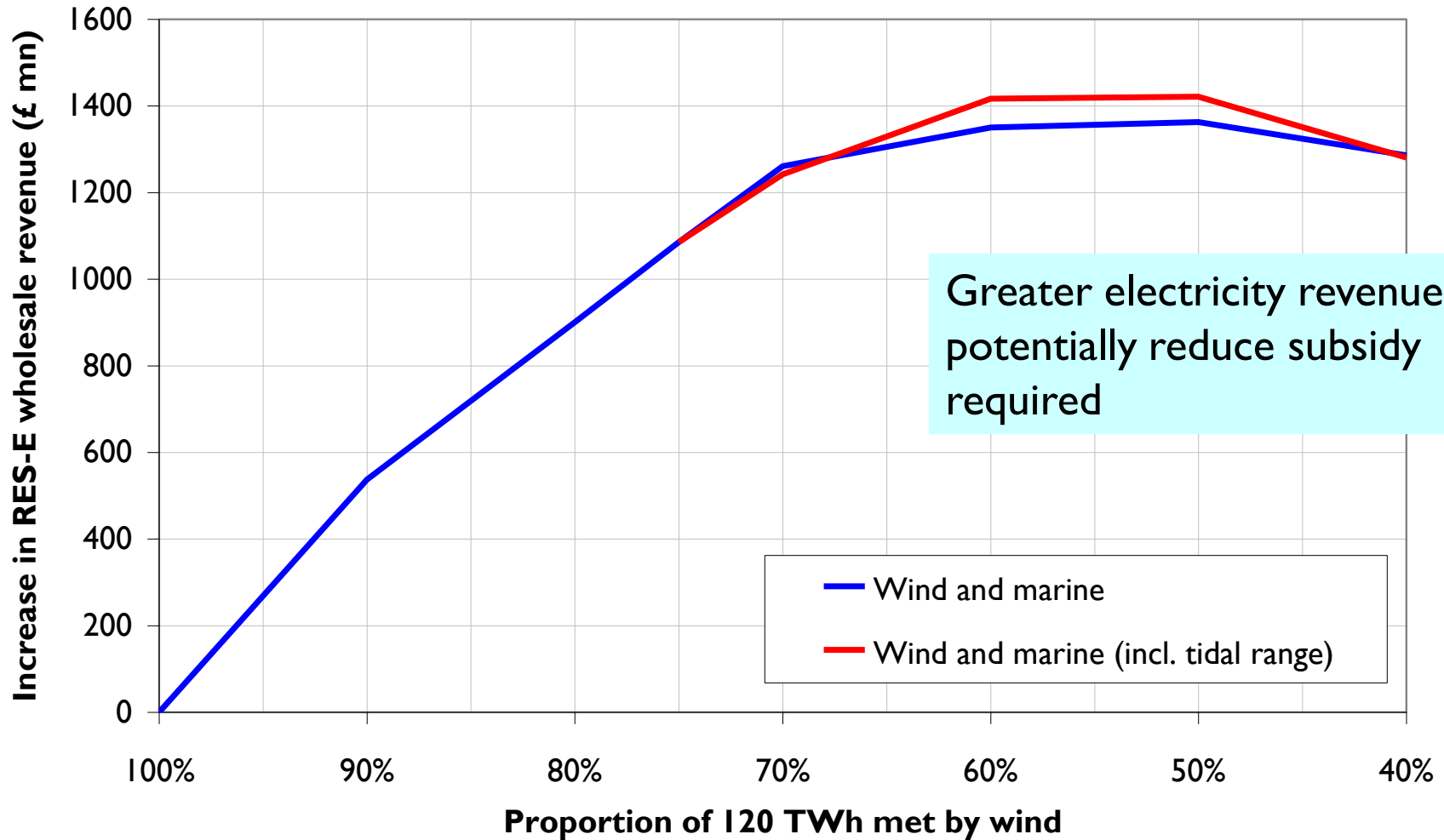
# Price duration curve (100% wind)



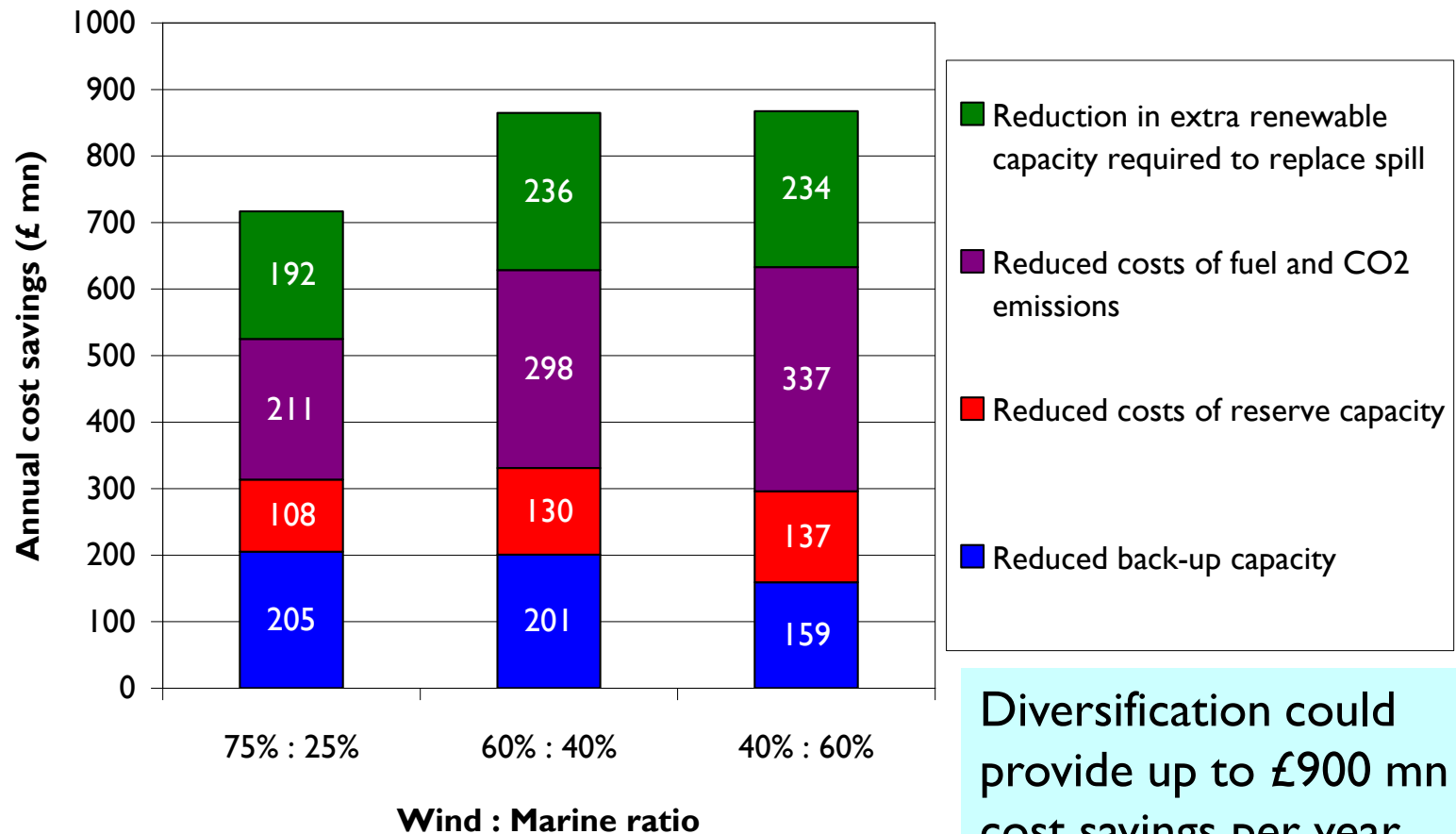
# Price capture



# Electricity revenues



# Economic benefits



Diversification could provide up to £900 mn of cost savings per year

# Conclusions



- More diverse renewables mix would reduce output variability and could improve ability to forecast
- We estimate that savings could be up to 3% of annual value of electricity market *plus* potential additional transmission cost savings
- Caveat: marine technologies will be more expensive than wind initially
- Diversifying the mix would allow the system to accommodate greater proportion of variable renewables

**Contact:**

**Nick Screen**

**[nick.screen@redpointenergy.com](mailto:nick.screen@redpointenergy.com)**

**020 7620 8484**

**[www.redpointenergy.com](http://www.redpointenergy.com)**

