



CENTRE FOR RESEARCH INTO  
ENERGY DEMAND SOLUTIONS

# interplay of demand and supply – a sketch



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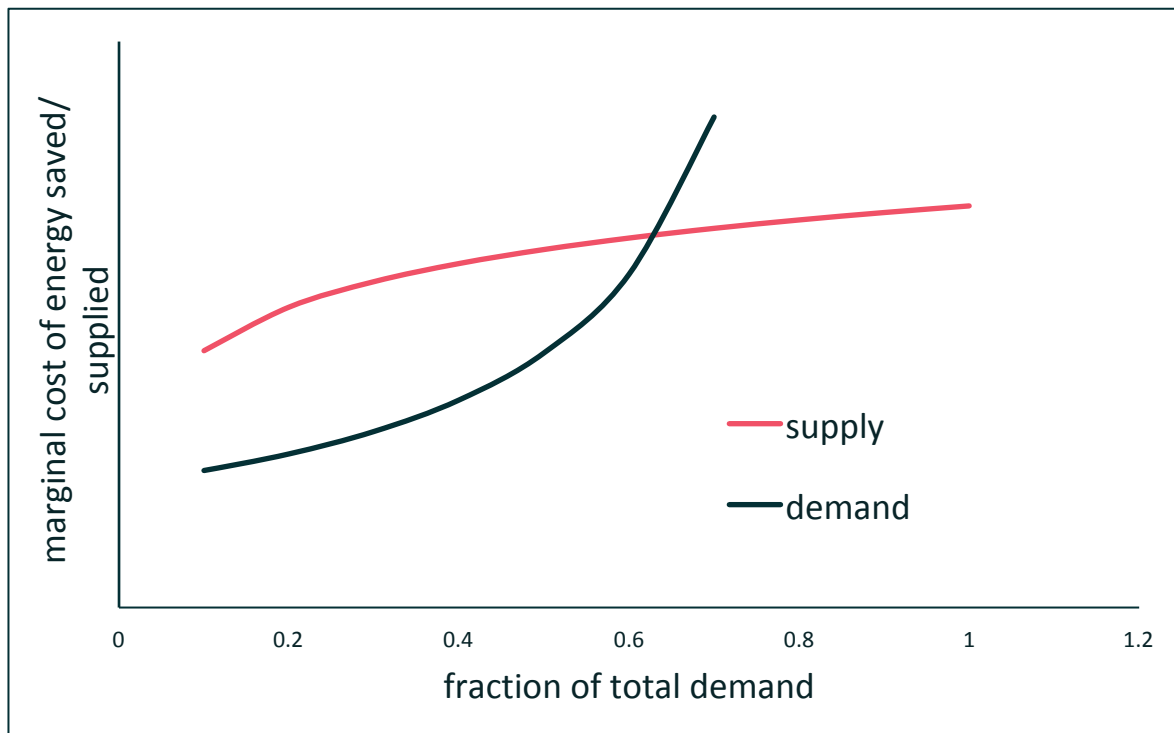


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# interplay of demand and supply – a sketch



## interplay of demand and supply – a sketch

generally problematic nature of the analysis.

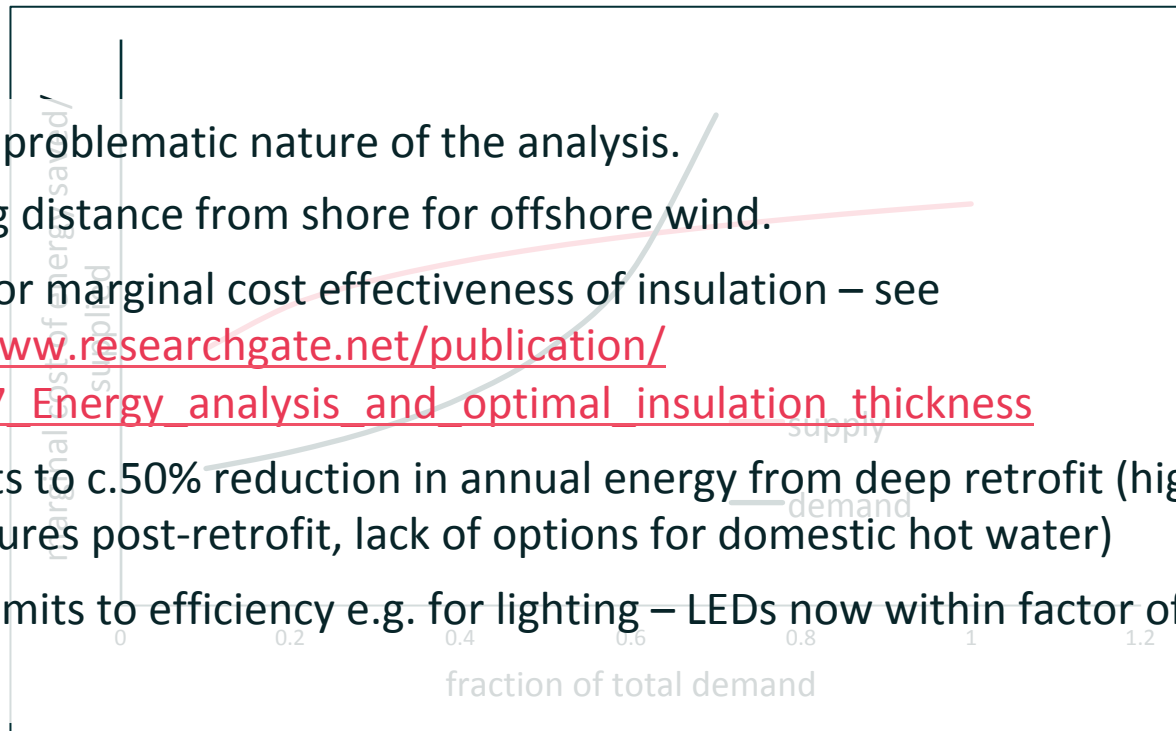
increasing distance from shore for offshore wind.

$1/t^2$  law for marginal cost effectiveness of insulation – see

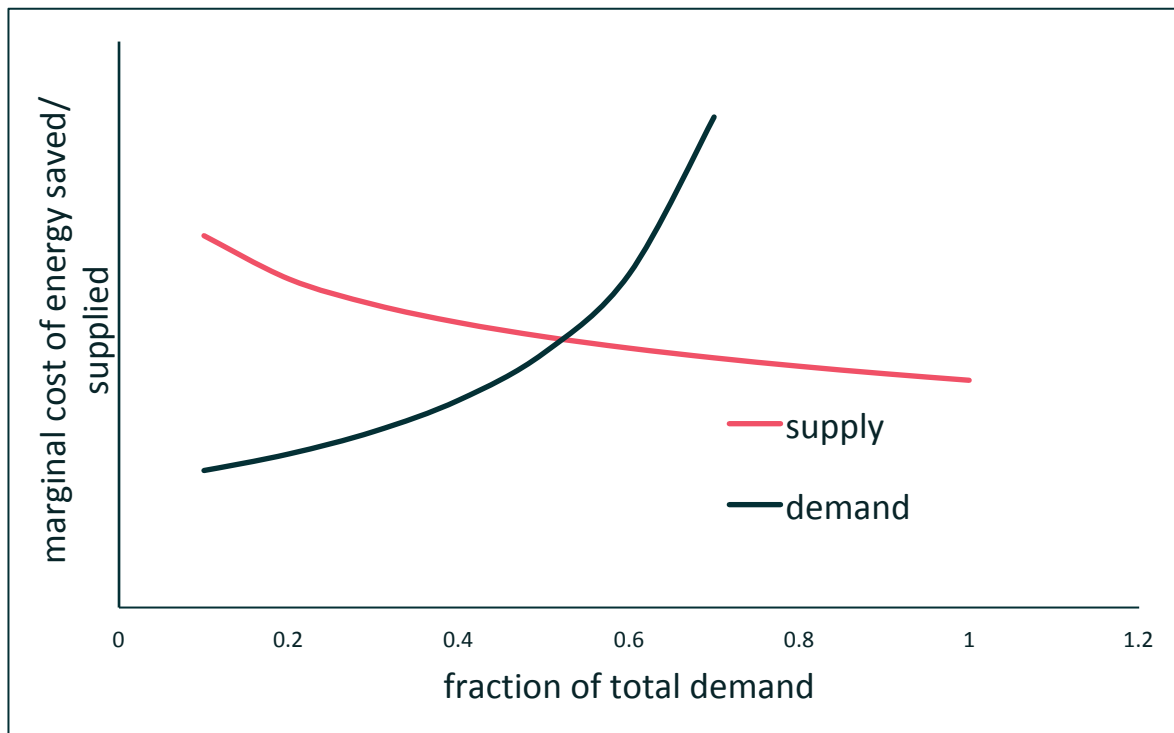
[https://www.researchgate.net/publication/32886737\\_Energy\\_analysis\\_and\\_optimal\\_insulation\\_thickness](https://www.researchgate.net/publication/32886737_Energy_analysis_and_optimal_insulation_thickness)

RftF points to c.50% reduction in annual energy from deep retrofit (high internal temperatures post-retrofit, lack of options for domestic hot water)

physical limits to efficiency e.g. for lighting – LEDs now within factor of 3 of quantum limit.



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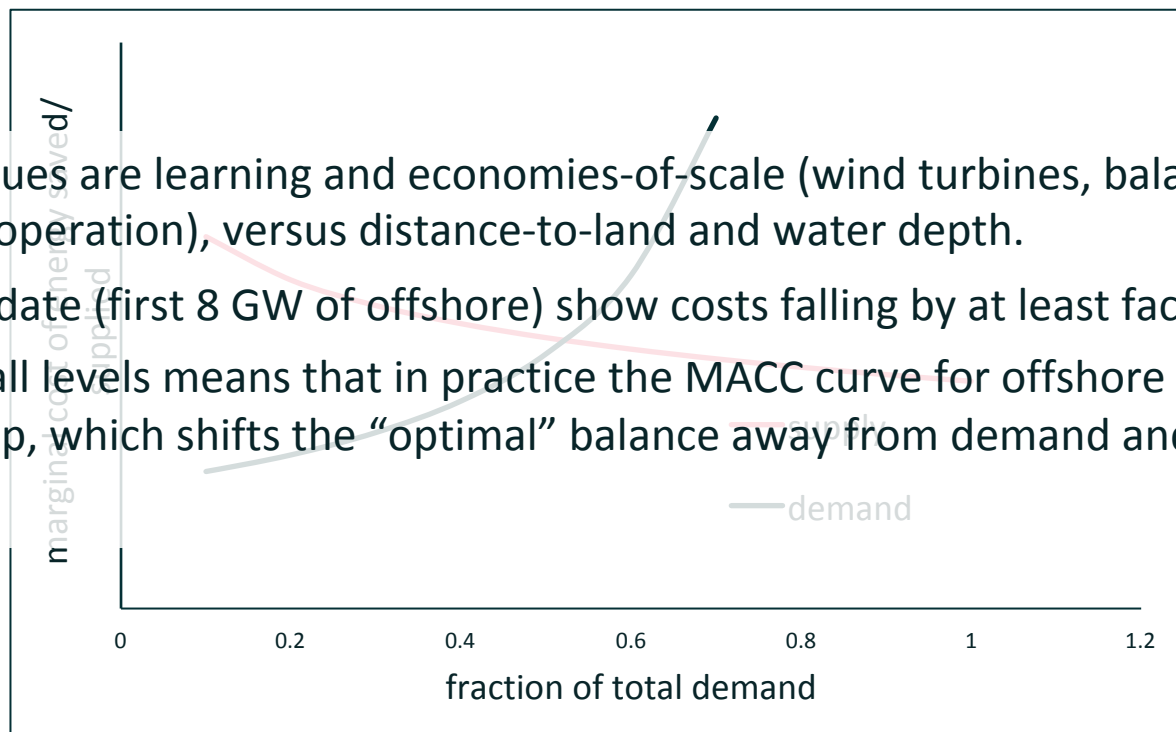


## interplay of demand and supply – a sketch

for wind, issues are learning and economies-of-scale (wind turbines, balance-of-system, installation operation), versus distance-to-land and water depth.

empirics to date (first 8 GW of offshore) show costs falling by at least factor of two...

learning at all levels means that in practice the MACC curve for offshore wind is going down, not up, which shifts the “optimal” balance away from demand and towards supply.



## interplay of demand and supply...

- energy demand will only get us so far - physical limits to efficiency
- dense webs of socio-technical constraints in buildings
  - each existing dwelling is like a prototype...
  - comparative simplicity on supply side
- demand and supply MACC curves must cross at some point
- decarbonisation of energy supply is essential

BUT...

## interplay of demand and supply...

- demand and supply do not add, they multiply, which means that...
- largely separate supply chains minimise logistical conflicts and allow deployment to proceed in parallel
- rates of change add, allowing faster overall rate of decarbonisation

See: <http://www.tandfonline.com/doi/abs/10.1080/09613210701238268>



## interplay of demand and supply...

- practical difficulty of coordinating actions on supply and demand. yet some coordination likely unavoidable – for example definition of heat supply areas
- practical impossibility of ensuring demand-supply cost optimality – need to accept that future will emerge as much from muddling-through as from coherent policy





## interplay of demand and supply...

- high likelihood of surprise – e.g. likely complex impact of onset of demand for cooling in dwellings on choice of energy carrier, and public perception of insulation as a good thing
- impact of residual CO<sub>2</sub> + methane emissions on future of gas grid
- impact of limits to existing supply chains in context of high rates of decarbonisation
- cost of CCS for residual emissions as means for setting long run carbon price – implicit in CCC 1.5C report.



## interplay of demand and supply...

- very large volumes of energy storage (10s of TWh) needed for fully decarbonised economy – some at level of individual buildings, but large economies of scale likely to require deployment within energy supply infrastructure
- probably best integrated into existing and emerging Transmission & Distribution systems at multiple levels
- strategic importance of interface between dwellings and rest of energy system - more important than level of insulation or energy performance of individual buildings



## obstacles to progress on building performance...

- deep-seated, very long-standing structural problems in construction industry
- large scale failures of EWI in high-rise in North-of-England and Scotland pre-dating Grenfell -  
<http://buildingdefectanalysis.co.uk/solid-wall-insulation-ewi/a-tale-of-two-ewi-failures/>
- catastrophic failures of EWI in low-rise –  
<https://passivehouseplus.ie/news/health/disastrous-preston-retrofit-scheme-remains-unresolved>
- necessity of reversing decades-long ideological hostility to regulation

