

# Characterisation of the Multidimensional Performance Risks Associated with Building Energy Retrofits

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"increases in anthropogenic greenhouse gas concentrations is very likely to have caused most of the increases in global average temperatures since the mid-20th century

IPCC 4AR 2007

- ▶ Current approach to measuring performance
- ▶ Interests, drivers and motivations of various stakeholders and potential conflicts among them







Raw Materials extraction



Transport



Manufacture



Packaging



Transport



Construction

**Initial Embodied  
 Energy / Carbon**



Use Phase



Renovation, maintenance

**Recurring Embodied  
 Energy / Carbon**



End of Life

**End of Life  
 Carbon**

- ▶ chosen solution may not work as promised, resulting in diminished returns in each of the performance strands



- ▶ commissioning of the solution may not be of sufficient quality or may take additional time and resources

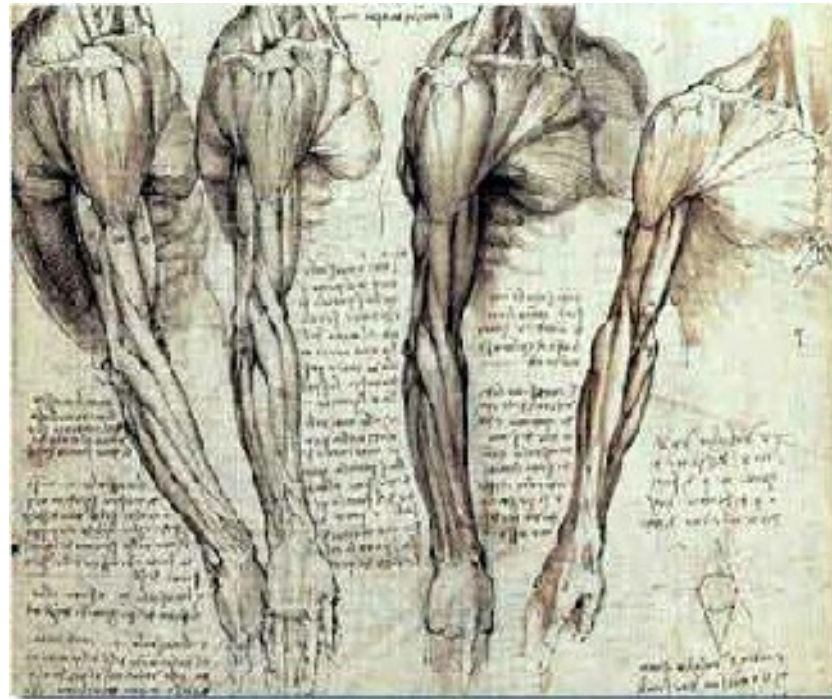




- ▶ the solution's lifespan may be less than planned



- ▶ the solution may not be used correctly or optimally by users resulting in reduced performance in each strand

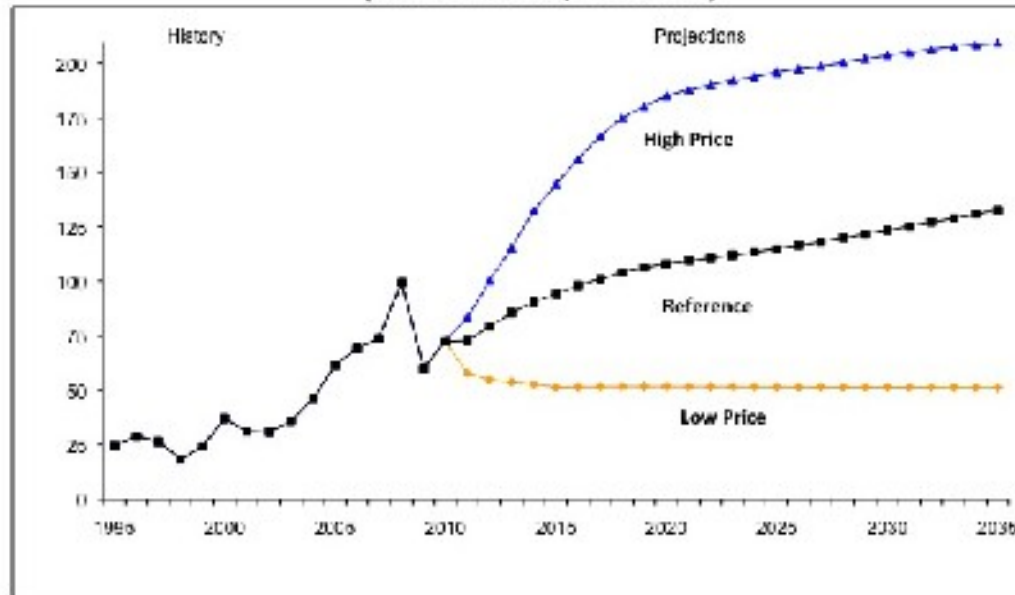


- ▶ the degree of upkeep required for the solution to achieve the required performance may be greater than anticipated



- ▶ cost of energy may move contrary to assumptions used in decision-making

**World Oil Prices in Three Cases, 1980-2035**  
(2008 Dollars per Barrel)

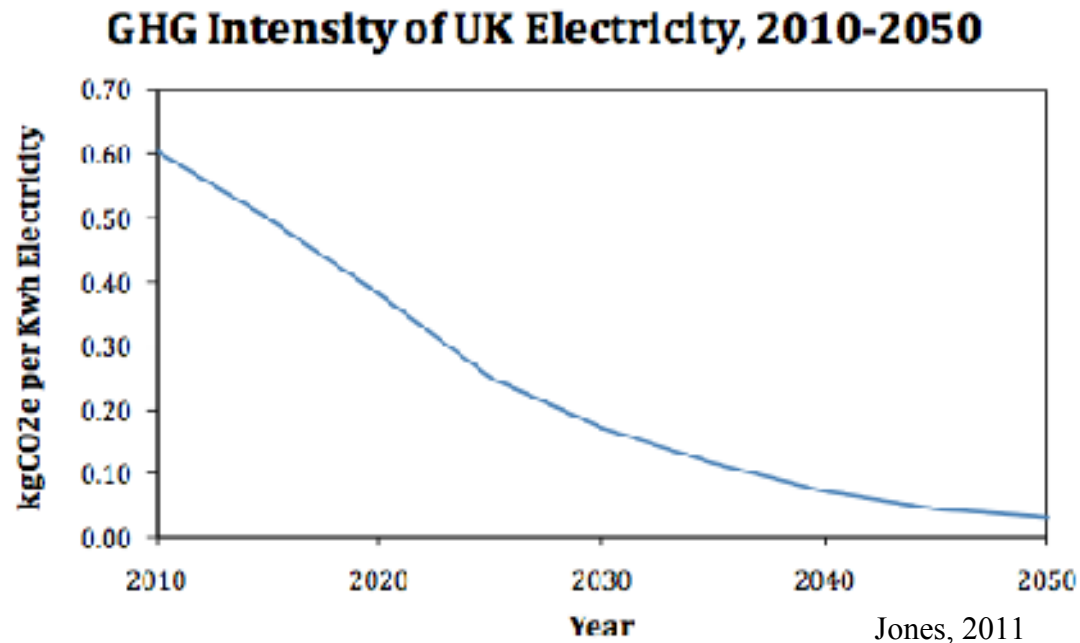


Source: Energy Information Administration, Annual Energy Outlook 2010

- ▶ envisaged end of life management of the chosen technology may prove not feasible



- ▶ energy saved, *i.e.*, avoided consumption, may have reduced carbon intensity



# Conclusions...



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