Analysing the potential benefits from a wind-PV hybrid renewable energy system at Hartwood farm

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Introduction

- Generating electricity and exporting it to the National Grid.
- Wind and solar energy sources are characterised by their uncertainties due to their dependence on the weather.

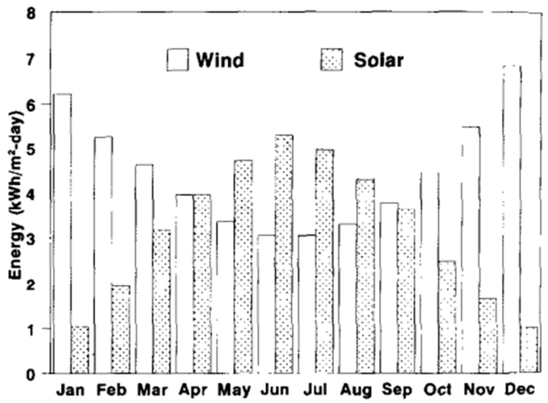


Figure: The monthly means of average daily solar and wind energy in the south of England.

- Analyse the coupling of wind energy with solar energy in terms of:
  - i. reduction in fixed costs
  - ii. potential benefits in terms of cash flows
  - iii. profit dependence on the correlation of wind and solar energy

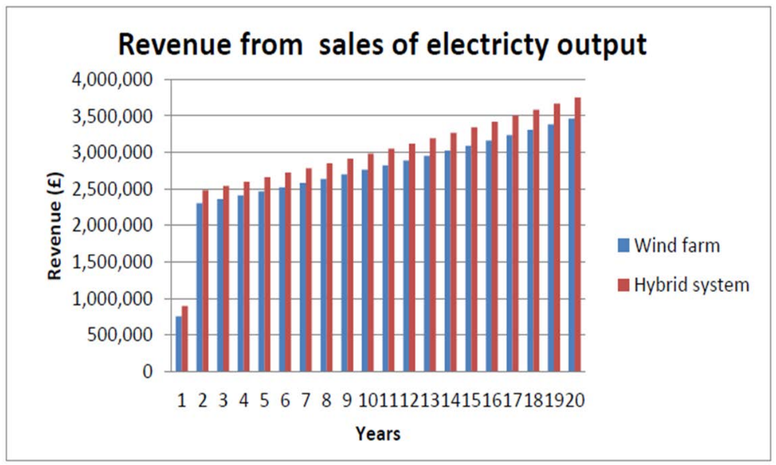
Methodology

- Financial Model compares NPV from wind farm and PV-wind hybrid system - MS excel
- Sensitivity analysis - Oracle Ball software
- Monte Carlo simulation - VBA

Results

Base case scenario

- Different systems generating the same level of voltage can share grid connection costs.
- Wind and solar are complementary in nature, thus, the farm can be benefit from a hybrid system in terms of monthly stable revenue.



- Hybrid system more profitable:

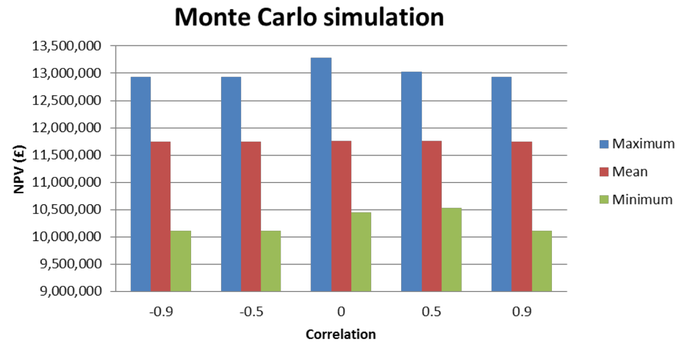
SUMMARY OUTPUT	Wind farm	Hybrid system
Post Tax Net Present Value	11,591,101	12,380,601
Post Tax Internal Rate of Return	11.7%	11.7%
Payback (years)	9	9

Sensitivity analysis

NPV is mostly affected by :

i. wind speed –wind turbines
ii. solar irradiation – PV panels

Monte Carlo Simulation



Conclusions - Recommendations

- Hybrid system more appropriate than wind farm solely
  - i. higher profit
  - ii. reduction in risk due to volatility of weather conditions
- Hybrid system can face the problem of security of supply from government's perspective.
- Government should set different FIT rates, ROC values depending on the availability of the renewable energy in each area .

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