Future Energy System of the UK by using ESME: A Cost Projection Analysis

Ioannis Antonopoulos

UNIVERSITY OF ABERDEEN
1 4 9 5

Introduction/ Objectives

Transition period for the energy system of UK. There is a need to find possible future energy systems, and long-term pathway models like ESME are a great tool for that, widely used.

Main subjects of interest for this study:
- Future capital costs of different technologies.
- Main drivers behind these future changes.
- How the revised capex will affect the energy system designs generated by ESME.

Methodology

- Searched the literature in order to find cost projections till 2050, cost breakdown and cost drivers for various technologies.
- Comparison between the energy system designs of ESME generated using its usual data, and the designs created by ESME using the revised capex found in the literature.

Capital Cost Projections

Six different energy technologies were studied: Solar, Offshore Wind, Nuclear, CCS, Heat Pumps, District Heat Networks.

Main cost drivers:
- Technological (e.g. efficiency and technological innovation.)
- Non-technical/economic (the cost of capital, standardization, market conditions, material prices, supply chain bottlenecks etc.)
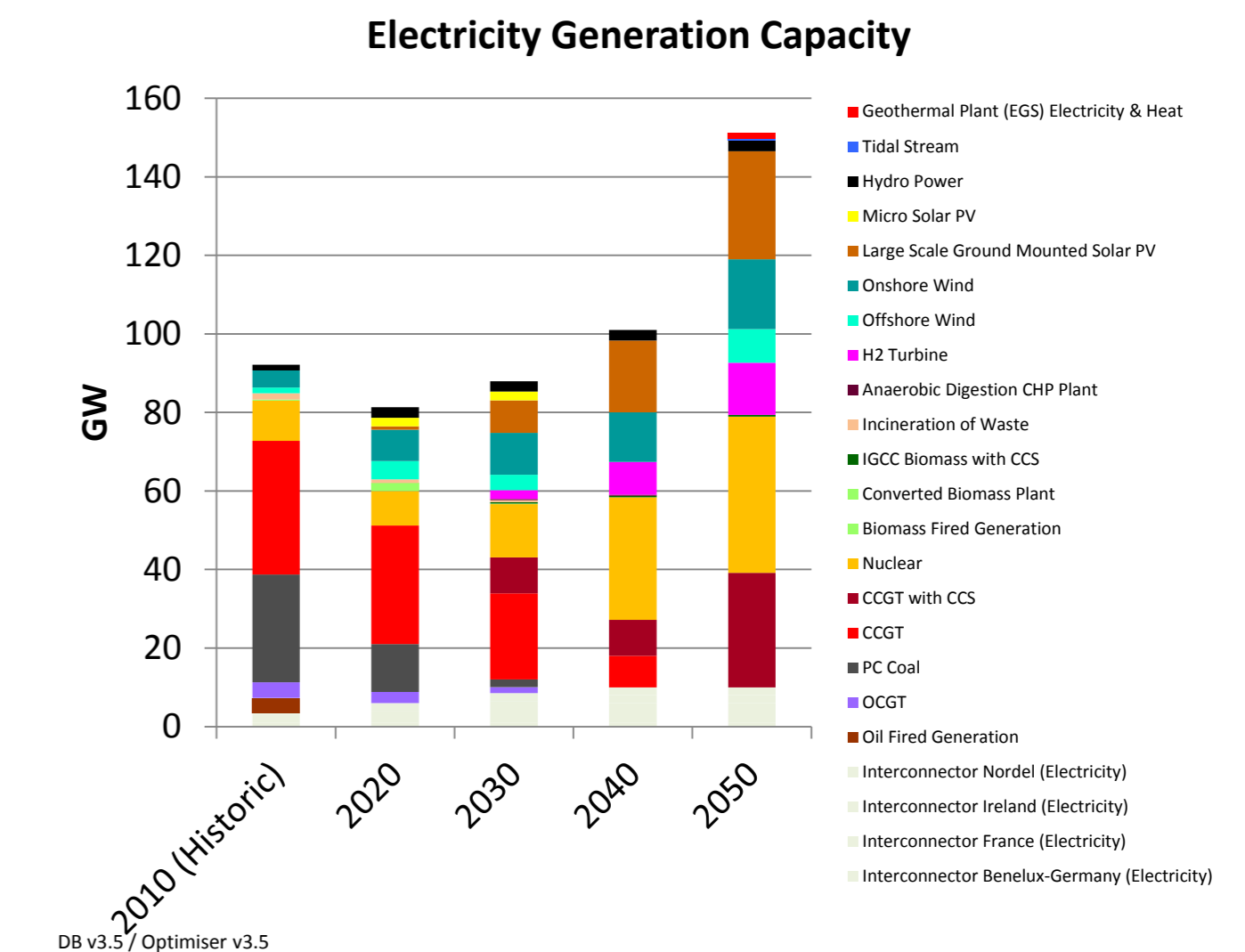
A diverse landscape with technologies having:
- significant capital cost reductions (Solar),
- high potential for the future (Offshore, CCS),
- small margin for cost reductions (e.g. DHN),
- possible cost escalations (Nuclear).

ESME Results

The baseline scenario (usual data):

Electricity Generation Capacity

DB v3.5 / Optimiser v3.5
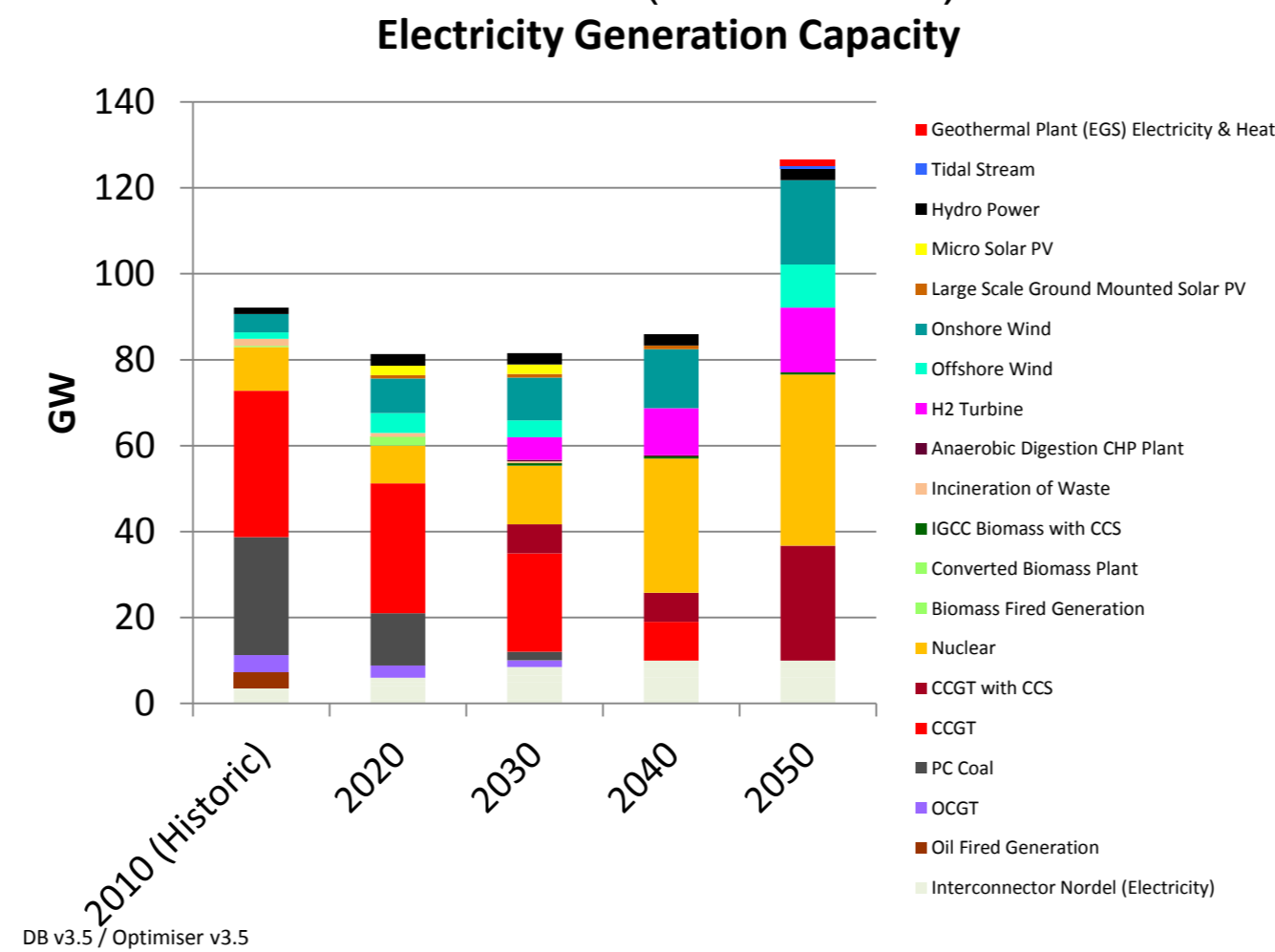
Indicative system design for revised solar inputs.

Electricity Generation Capacity

DB v3.5 / Optimiser v3.5

Except for the low-cost scenario of solar, also results were tested by creating two more scenarios (one for constant, and one for decreasing capital costs till 2050 in nuclear).

Conclusion

- A great variety of cost projections and cost drivers across the technologies.

- Capital cost projections are a really important input in ESME and in long-term pathway models in general, affecting greatly the results.