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Reducing Carbon Dioxide Emissions for EPower

Presented To:

EPower

Presented By:

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Background & Aims

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Power Sources

GAS

COAL

INTERCONNECT

NUCLEAR

WIND

HYDRO

Goals

- Determine an optimal power generation schedule for current circumstances (base case)
- Determine how a reduction in CO2 emissions affects the schedule
- Determine how the addition of a 7th power source and change in the wind output affect the schedule

Current Operations

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The Objective:

- To maximize daily profits

The Decision:

- The output for each of the energy sources for each time period

The Constraints:

- Maximum output for each source
- Total energy demand
- Emissions limits

TIME	DEMAND
12AM - 6AM	12000 MW
6AM - 8AM	18000 MW
8AM - 4PM	20000 MW
4PM - 8PM	22000 MW
8PM - 10PM	20000 MW
10 PM - 12AM	18000 MW

Base Case Operations Plan

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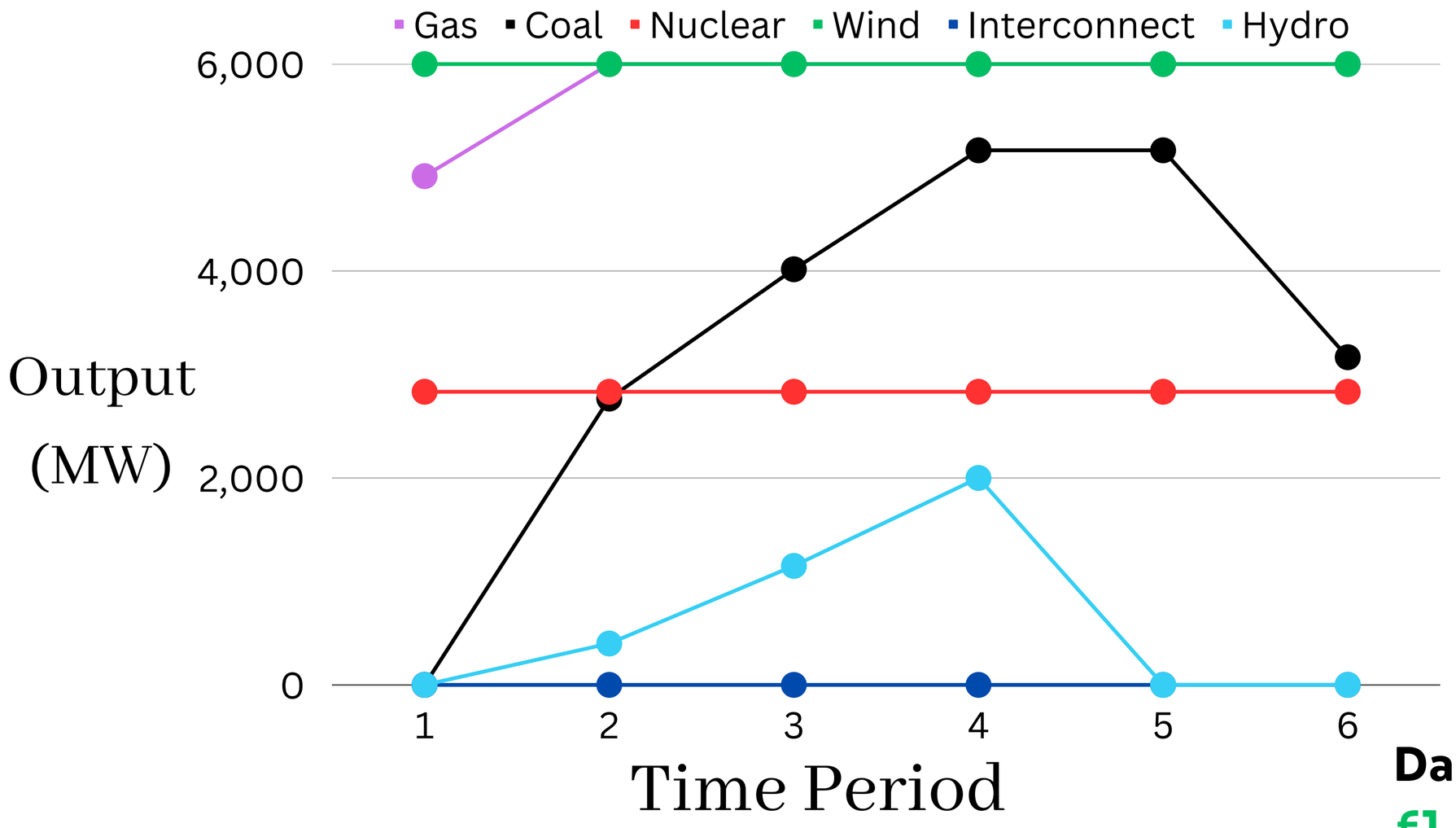

Daily Profit:
£1.81 million

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Carbon Dioxide Emissions Reductions

ENERGY SOURCE	CARBON DIOXIDE EMISSIONS (Units/MWh)
Coal	1.2
Gas	0.8

- The current carbon dioxide emission limit is 200000 units daily
- This limit is projected to reduce by 50% to 100000 units per day

Operations for New Emissions Limit

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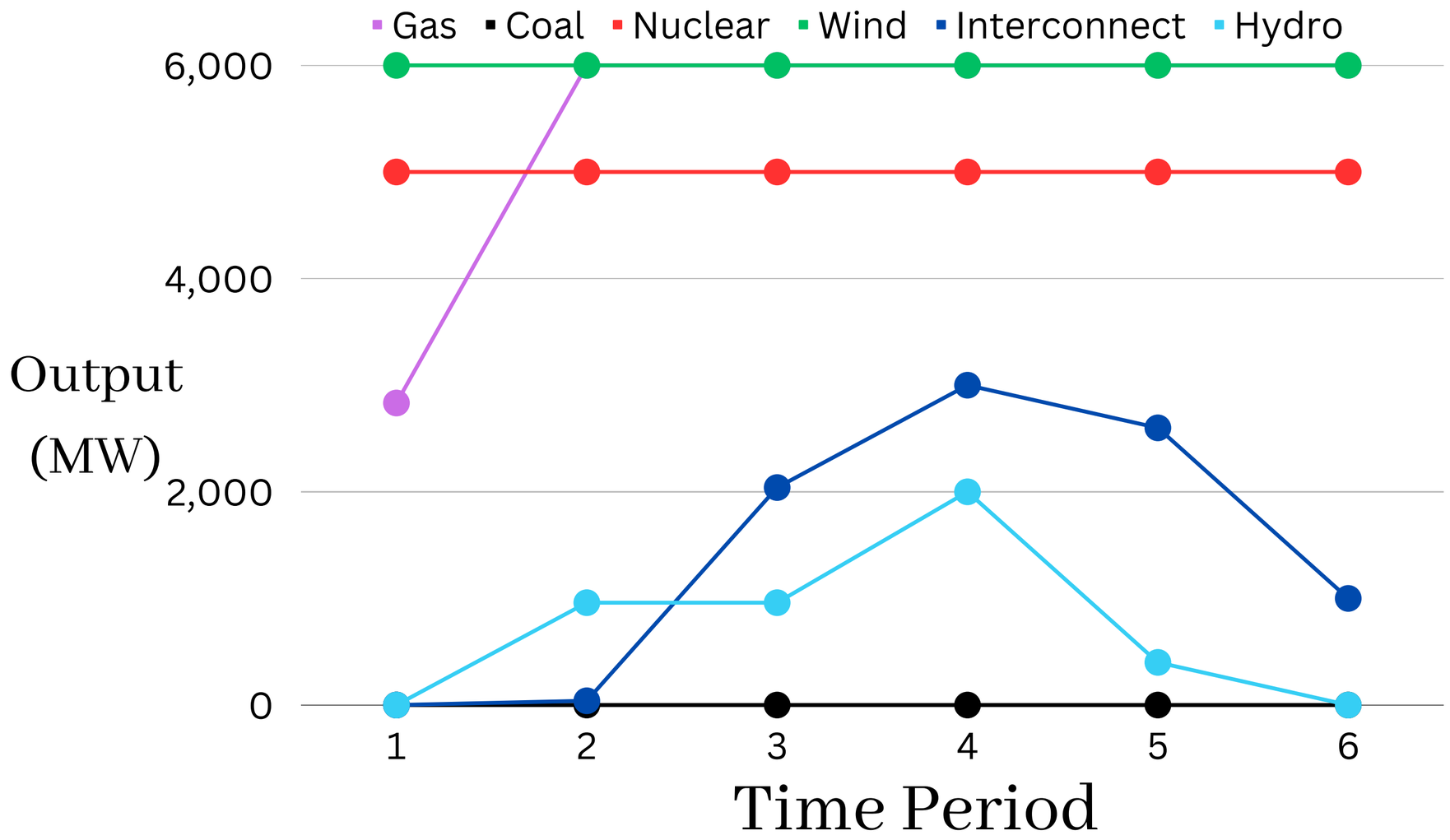

Daily Loss:
£1.46 million

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Solar Energy

- To limit the impact of reducing CO2 emissions, EPower will introduce solar as an additional power source.
- We will consider an arbitrary day in the Spring.
- We assume wind output to be zero.

TIME PERIOD	00-06	06-08	08-16	16-20	20-22	22-00
SOLAR OUTPUT (MW)	0	900	2700	900	0	0

Operations With Solar Energy

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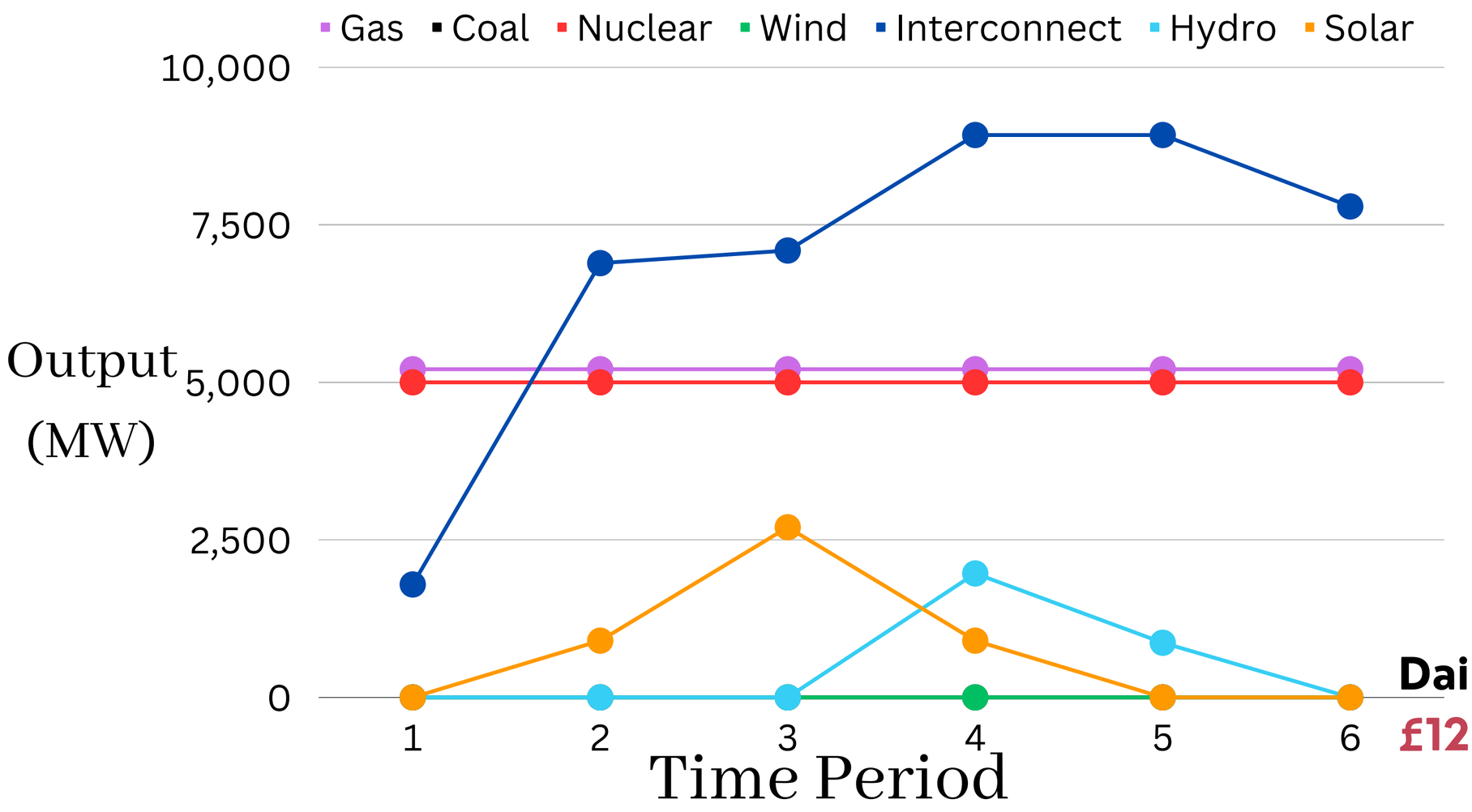
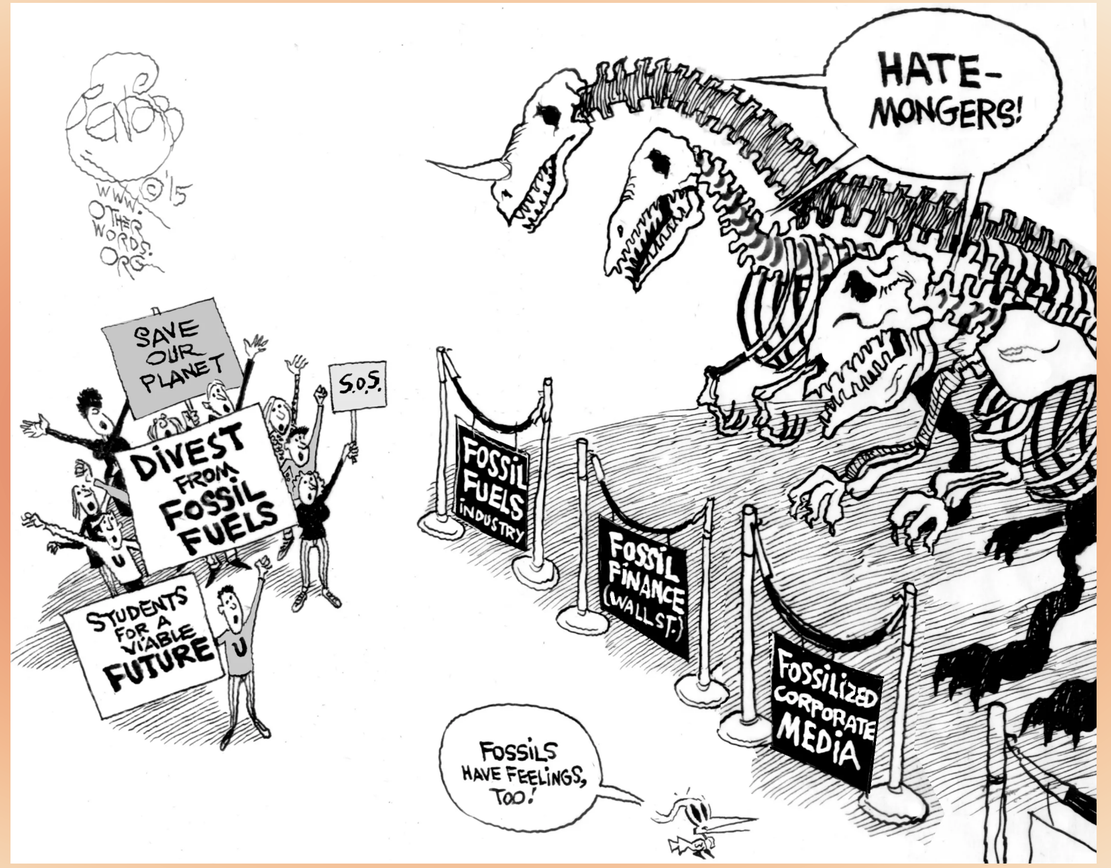


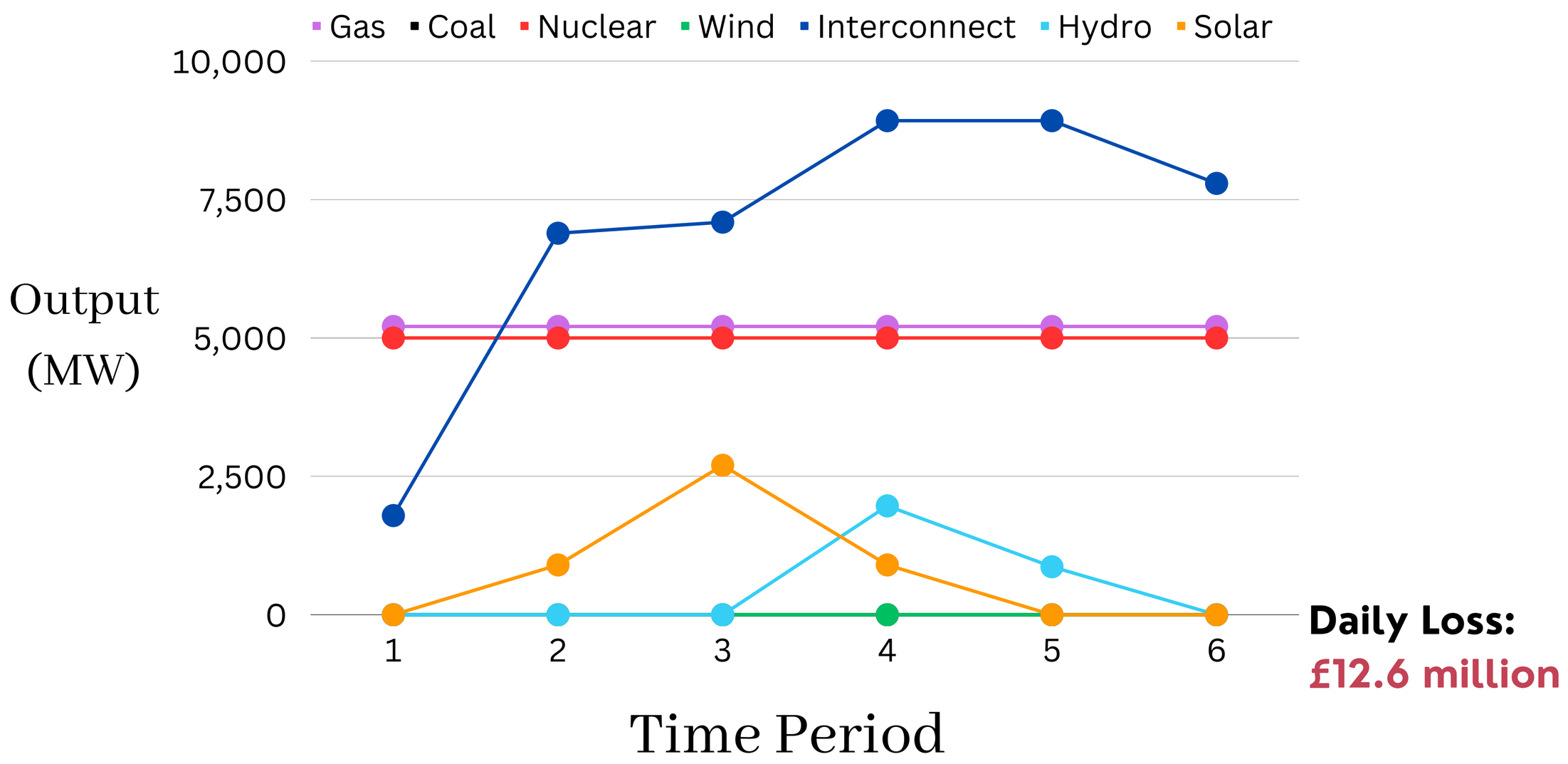
Daily Loss:
£12.6 million

Removing the 'dirty fuels' in turn

- To further reduce the emissions, EPower could eliminate the 'dirty fuels' of Gas, Coal and Nuclear.
- We will consider eliminating each one in turn to see the impact of removing each power source individually on carbon emissions.

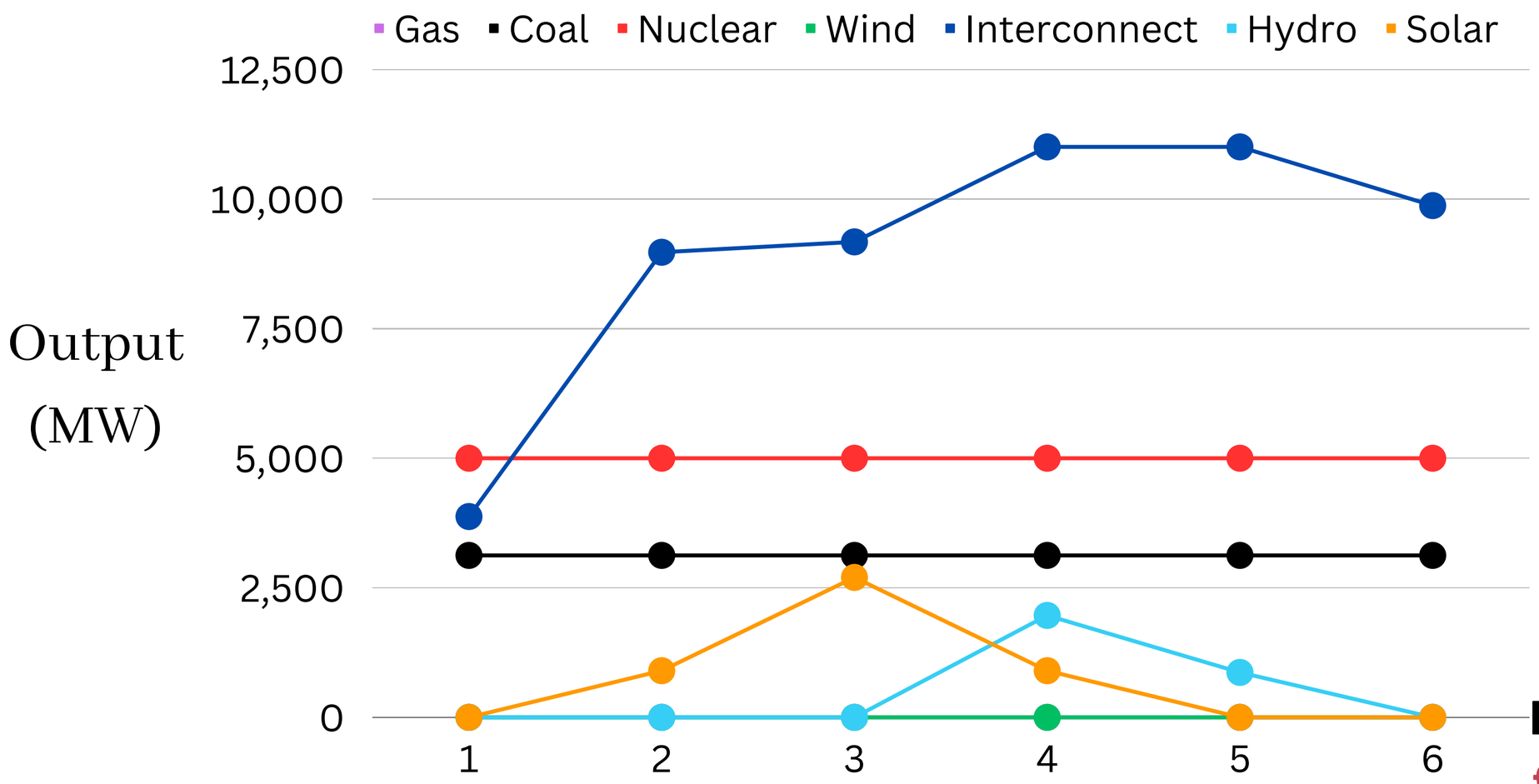


Operations without coal



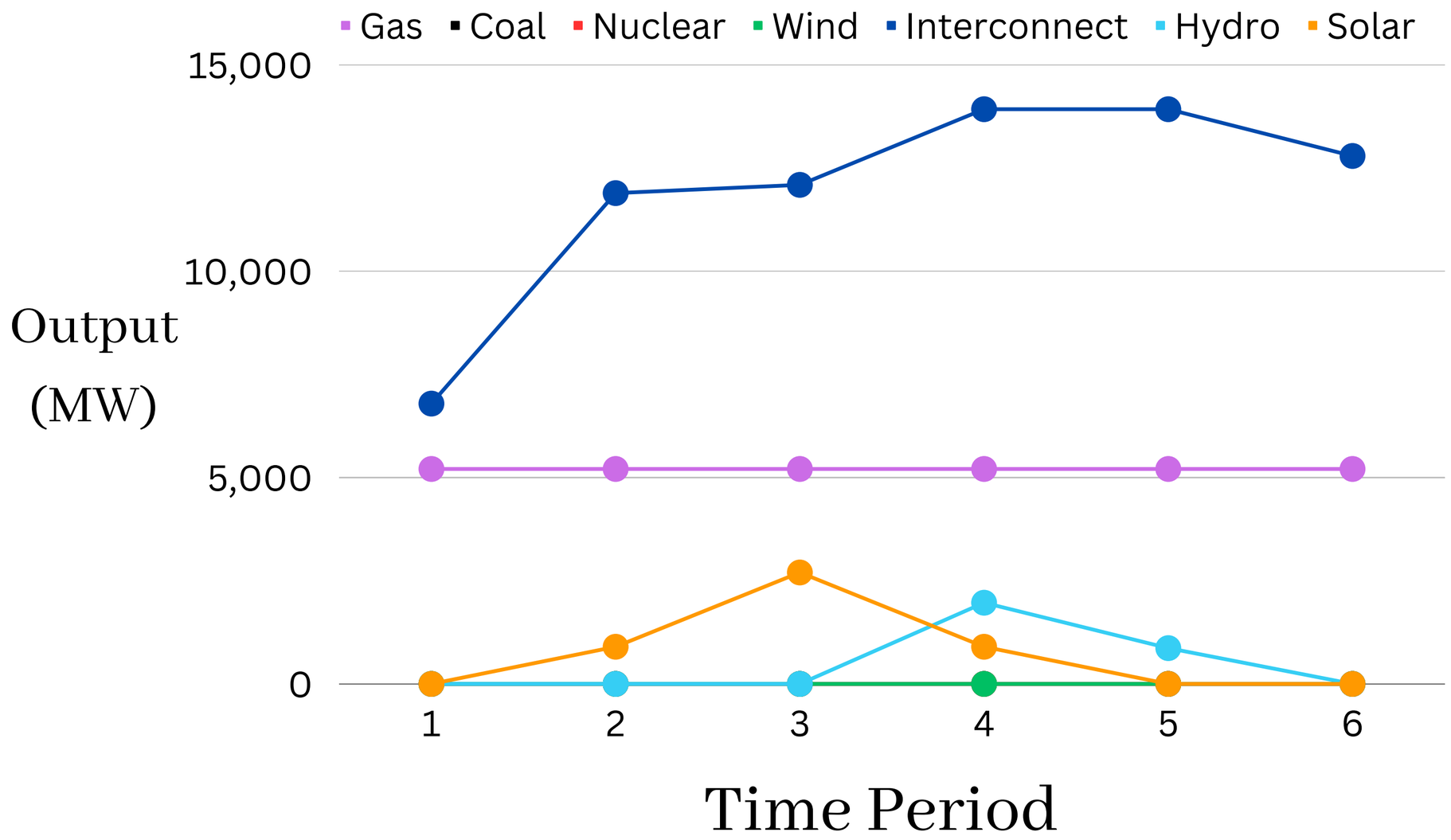
Daily Loss:
£12.6 million

Operations without gas



Daily Loss:
£14.8 million

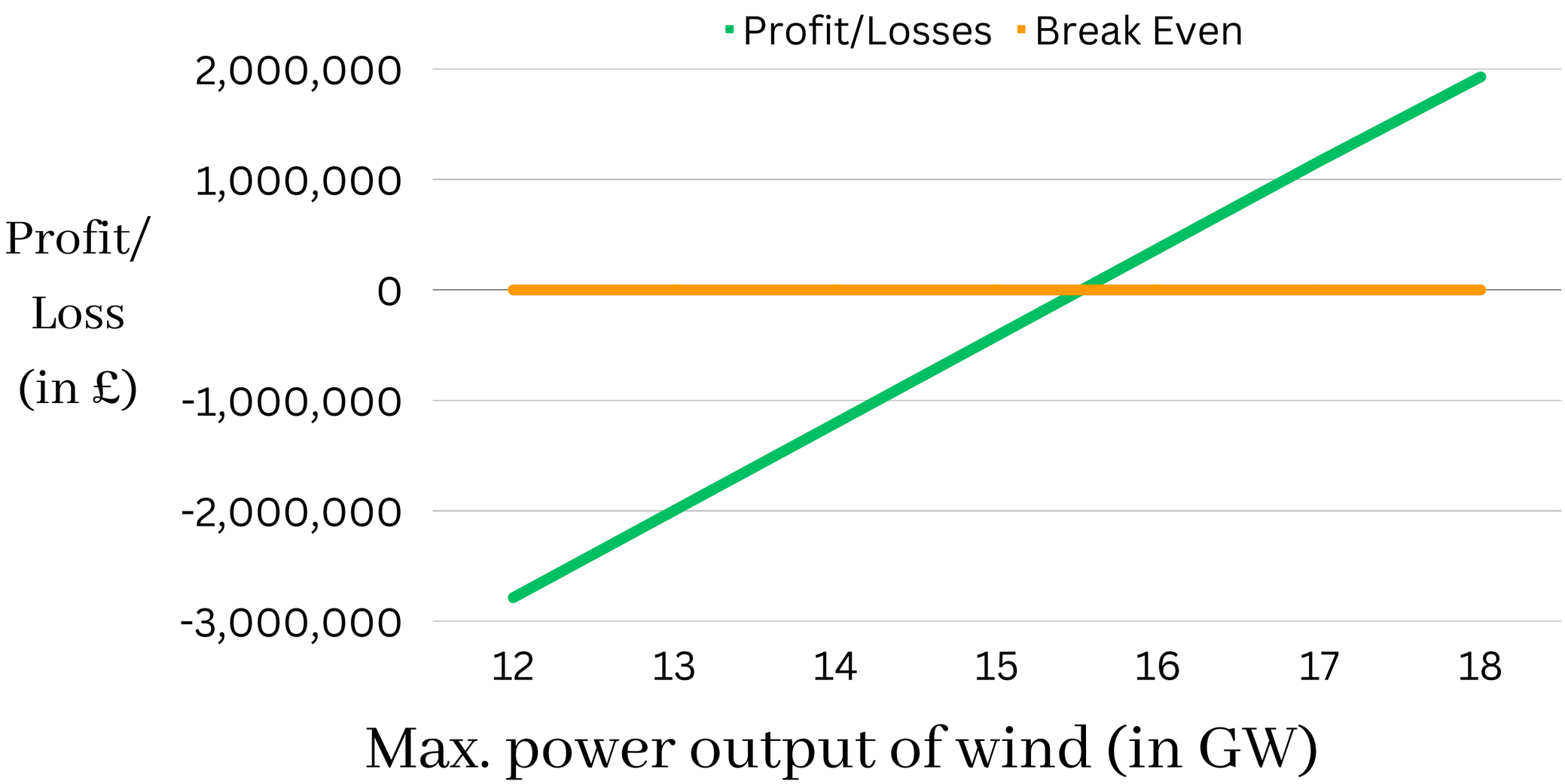
Operations without nuclear



Daily Loss:
£18.6 million

Increasing the Number of Turbines

On a day in spring where the wind generates 35% of the maximum output



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Further Investigations

- What are the emissions associated with interconnect?
  - Is outsourcing the power to another country actually reducing the environmental impact of EPower's operations?
- Are there any "clean" power sources that are less weather dependent which the company could explore?
  - Geothermal, Bioenergy
- Is there a way to increase demand?
  - Marketing and advertising to increase size of consumer base

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What Else Can We Offer?

- Developing further models to investigate how your operations should be adapted in various weather conditions and seasons
    - Can lead to a more comprehensive overview of annual operations plan which will vary dependent on seasons and other variables
- Modelling how your operations will be impacted if other emissions regulations are introduced
    - For example, further restrictions on carbon dioxide emissions or the effect of restrictions on sulphur emissions

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Thank You
We Welcome Any Questions