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Assignment 1 – Coordinate energy management for microgrid using reinforcement learning

IN5460 – Artificial Intelligence for Energy Informatics

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17-10-23

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# Introduction

This report represents our solutions to Assignment 1 ‘Coordinate energy management for microgrid using reinforcement learning’ in the course IN5460/IN9460 Artificial Intelligence for Energy Informatics.

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# Question 1.1-1.3

In this section, we represent RL solutions for the microgrid with only solar power, and the microgrid supplies energy to the energy load, in the three cases of 25 households, 100 households, and 200-500 households.

## Question 1.1

In this case, we have 25 households for the energy load. Figure 1 shows how the solar power generation changes before and after the learned RL policy.

|  |  |
| --- | --- |
| (LIM INN PLOT HER)  Figure 1: Solar power generation before and after the learned RL policy with 25 households |  |

(Compare the RL result with a random policy for energy management of the microgrid.)

(For the Question 1.1, 1.2, and 1.3, provide discussions and present insights in terms of how the decision-making changes and time complexity.)

## Question 1.2

The number of household profiles is 100. Figure 2 shows how the solar power generation changes before and after the learned RL policy.

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| --- | --- |
| (LIM INN PLOT HER)  Figure 2: Solar power generation before and after the learned RL policy with 100 households |  |

## Question 1.3

The number of household profiles is 200-500. Figure 3 shows how the solar power generation changes before and after the learned RL policy.

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| --- | --- |
| (LIM INN PLOT HER)  Figure 3: Solar power generation before and after the learned RL policy with 200-500 households |  |

# Question 2

In this section, we represent RL solution for the microgrid with solar and wind power, and the microgrid supplies energy to the energy load of 100 households.

Figure 4 shows how the solar and wind power generation shift before and after the learned RL policy.

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| --- | --- |
| (LIM INN PLOT HER)  Figure 4: Solar and wind power generation before and after the learned RL policy with 100 households |  |

(Compare the result with that where only solar power is considered.)

# Question 3

In this section, we represent RL solution for the microgrid with solar and wind power and gas turbine generator in comparison with a random policy for the energy management of the microgrid. The microgrid supplies energy to the energy load of 100 households.

Figure 5 shows how the solar and wind power generation change before and after the learned RL policy.

|  |  |
| --- | --- |
| (LIM INN PLOT HER)  Figure 5: Solar and wind power generation before and after the learned RL policy with 100 households |  |

(Compare the result with that where only solar power is considered.)

# Question 4

In this section, the energy cost is changed. We use the following equation to calculate the cost of energy purchase :

We represent RL solution for the microgrid with solar and wind power and gas turbine generator in comparison with a random policy for the energy management of the microgrid. The number of household profiles is 100.

Figure 6 shows how the solar and wind power generation change before and after the learned RL policy.

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| (LIM INN PLOT HER)  Figure 6: Solar and wind power generation before and after the learned RL policy with 100 households |  |

(Run the reinforcement learning and analyze how this change can affect the decision-

making of the learned policy.)

Table 1 lists…

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# References

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# Appendix

Code

Result Details