

Energy Storage in Microgrids: A comparative study

Natalia-Maria Zografou-Barredo
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Introduction

Microgrids



Image Sources:

<https://www.bbc.co.uk/news/science-environment-45775309>

<https://www.mirror.co.uk/news/uk-news/blackout-britain-fears-over-winter-2348035>

<https://www.expressandstar.com/news/uk-news/2019/08/10/national-grid-probe-seeks-to-learn-lessons-after-power-blackout-hits-uk/>

<https://decarbeurope.org/solutions/energy-communities/>

<https://www.lynda.com/Business-tutorials/Create-your-resilience-plan/718618/783276-4.html>

Microgrids



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Microgrids

ENERGY COMMUNITIES

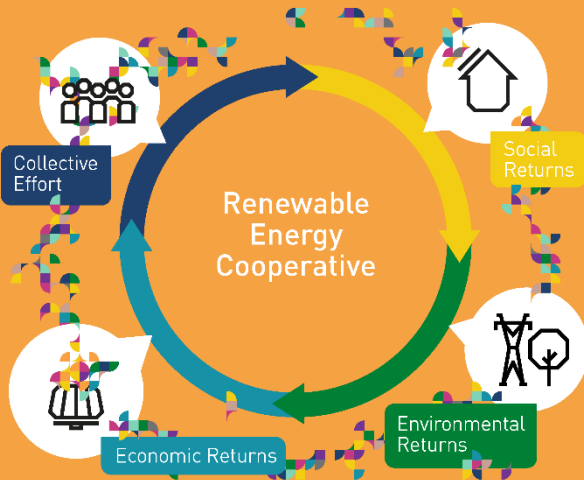


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Microgrids



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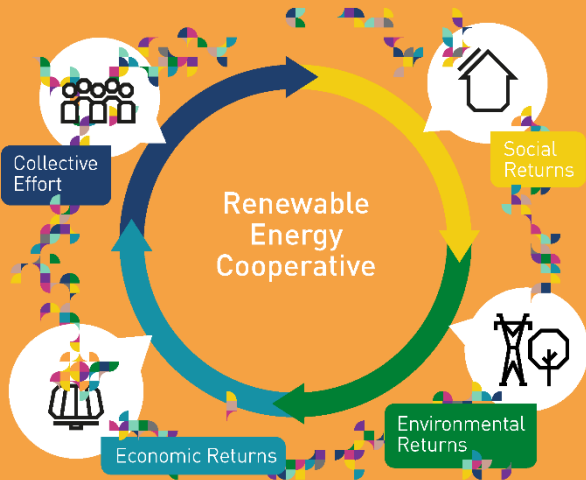


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Microgrid (MG) Case Study

& Methodology

MG as a Whole Energy System

Image Sources:

<https://videohive.net/item/before-sleeping-night-female-hand-pulls-lamp-switch-circuit-and-turns-off-light/23593249>

<https://www.petroleum-economist.com/articles/midstream-downstream/transport/2018/ev-market-accelerates-on-cost-parity>

<https://www.futurelearn.com/courses/solar-pv>

MG as a Whole Energy System



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MG as a Whole Energy System



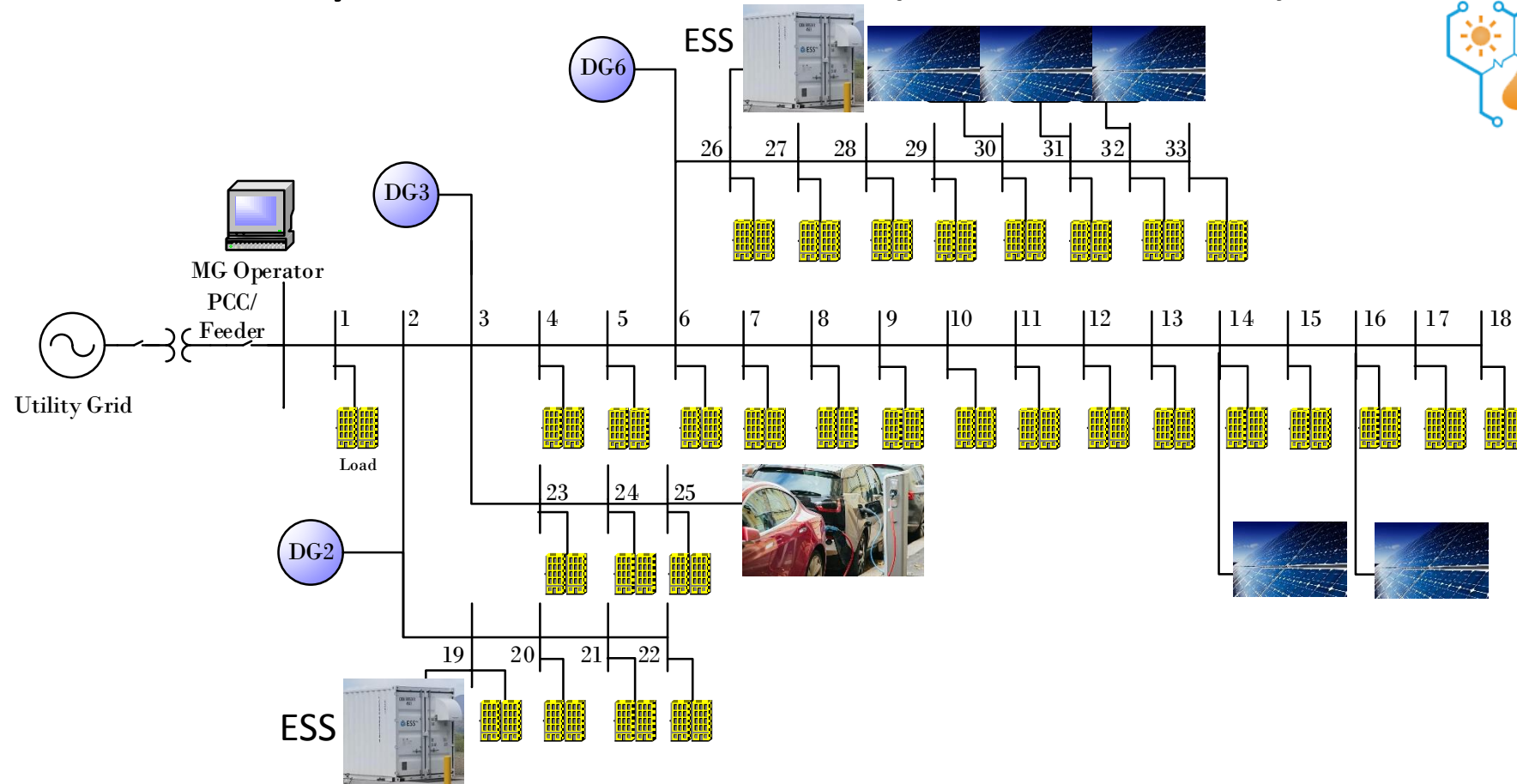
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<https://www.petroleum-economist.com/articles/midstream-downstream/transport/2018/ev-market-accelerates-on-cost-parity>

<https://www.futurelearn.com/courses/solar-pv>

Case Study: IEEE 33 bus(modified)



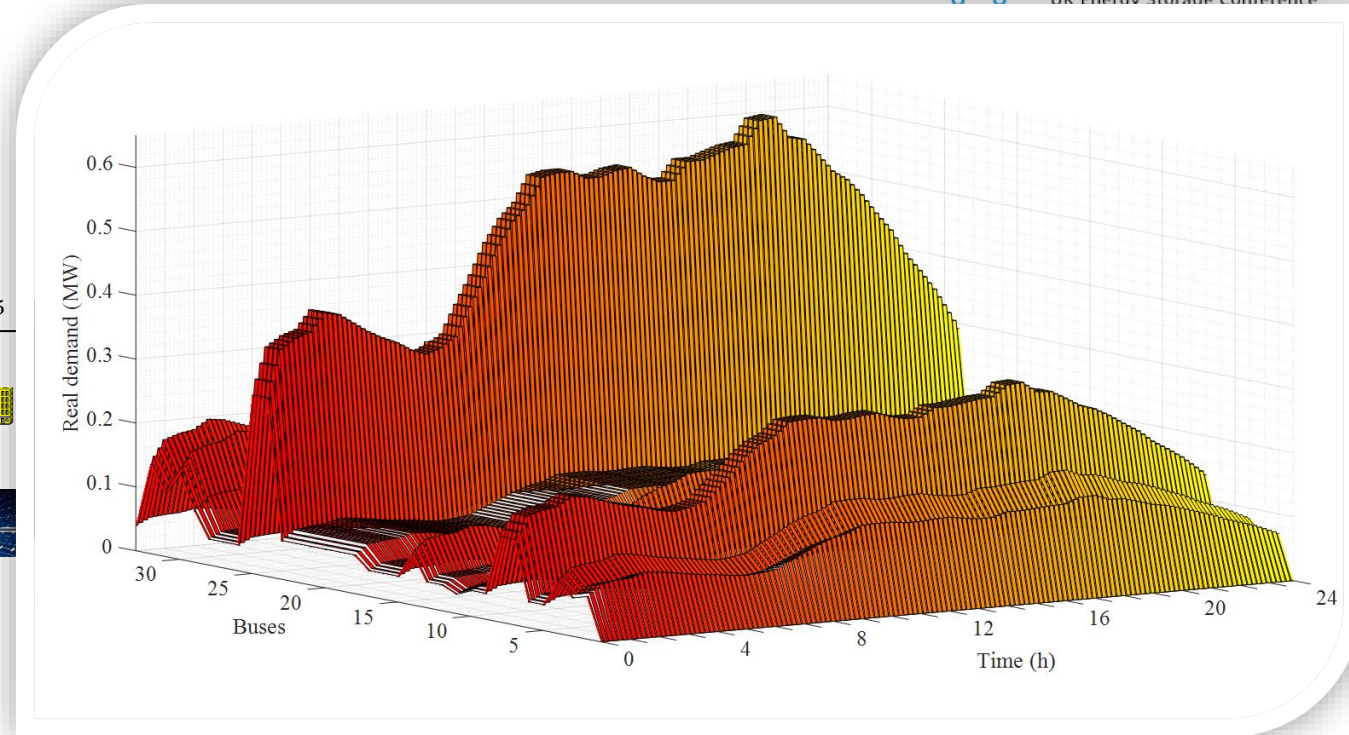
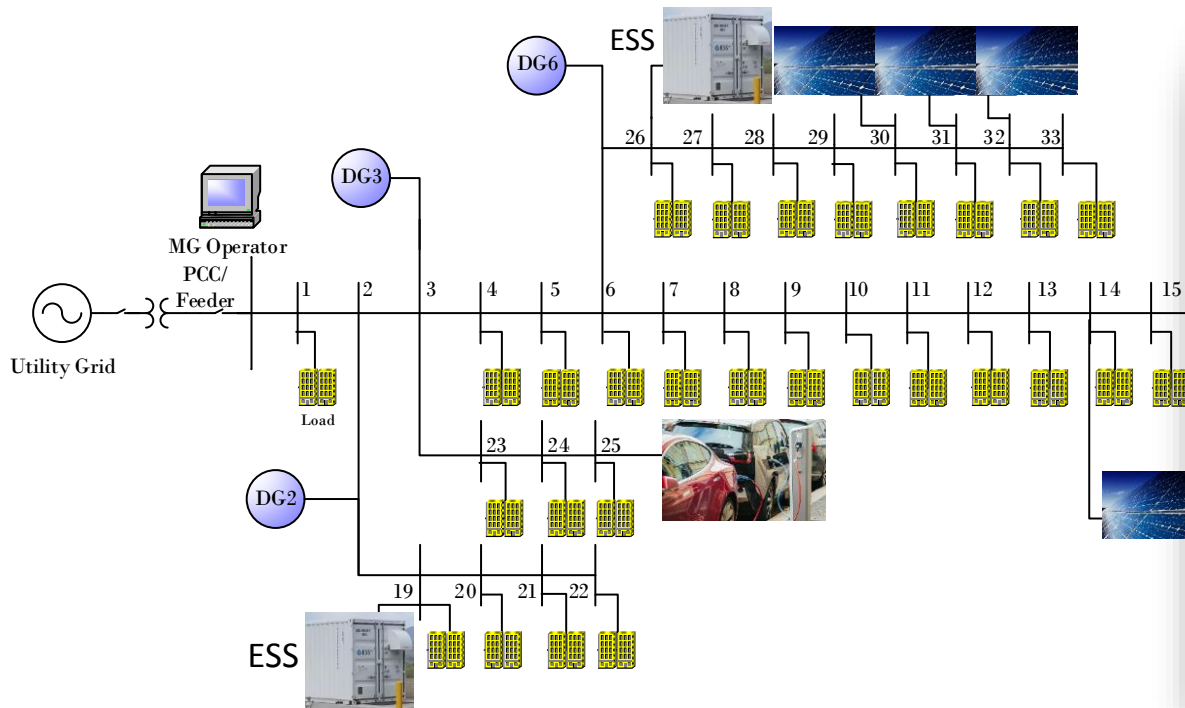
MG data - References:

- [1] A. Gholami, T. Shekari, F. Aminifar, and M. Shahidehpour, "Microgrid scheduling with uncertainty: The Quest for Resilience," IEEE Transactions on Smart Grid , vol. 7, p. 2849–2858, Nov 2016.
- [2] Newcastle University, "The urban sciences building and its facilities." [Online]. Available: <https://www.ncl.ac.uk/computing/about/usb/>.

Image Sources:

- <https://www.petroleum-economist.com/articles/midstream-downstream/transport/2018/ev-market-accelerates-on-cost-parity>
- <https://www.futurelearn.com/courses/solar-pv>
- https://www.solarnovus.com/camp-pendleton-marine-base-microgrid-with-8-hour-battery-backup_N11969.html

Real Demand



Real demand Calculation - References:

1. Data from a feeder in the North East of England.
2. M. E. Baran and F. F. Wu, "Network reconfiguration in distribution systems for loss reduction and load balancing," IEEE Transactions on Power Delivery, vol. 4, pp. 1401–1407, April 1989.

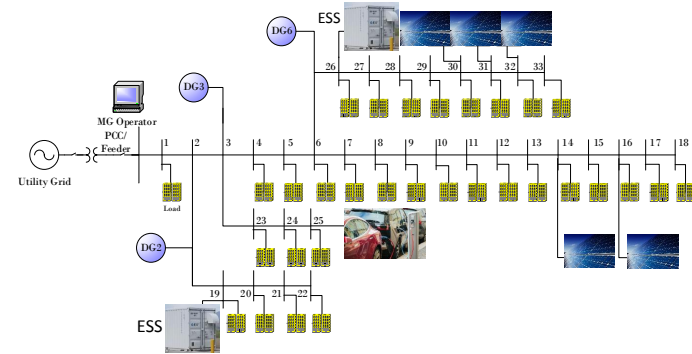
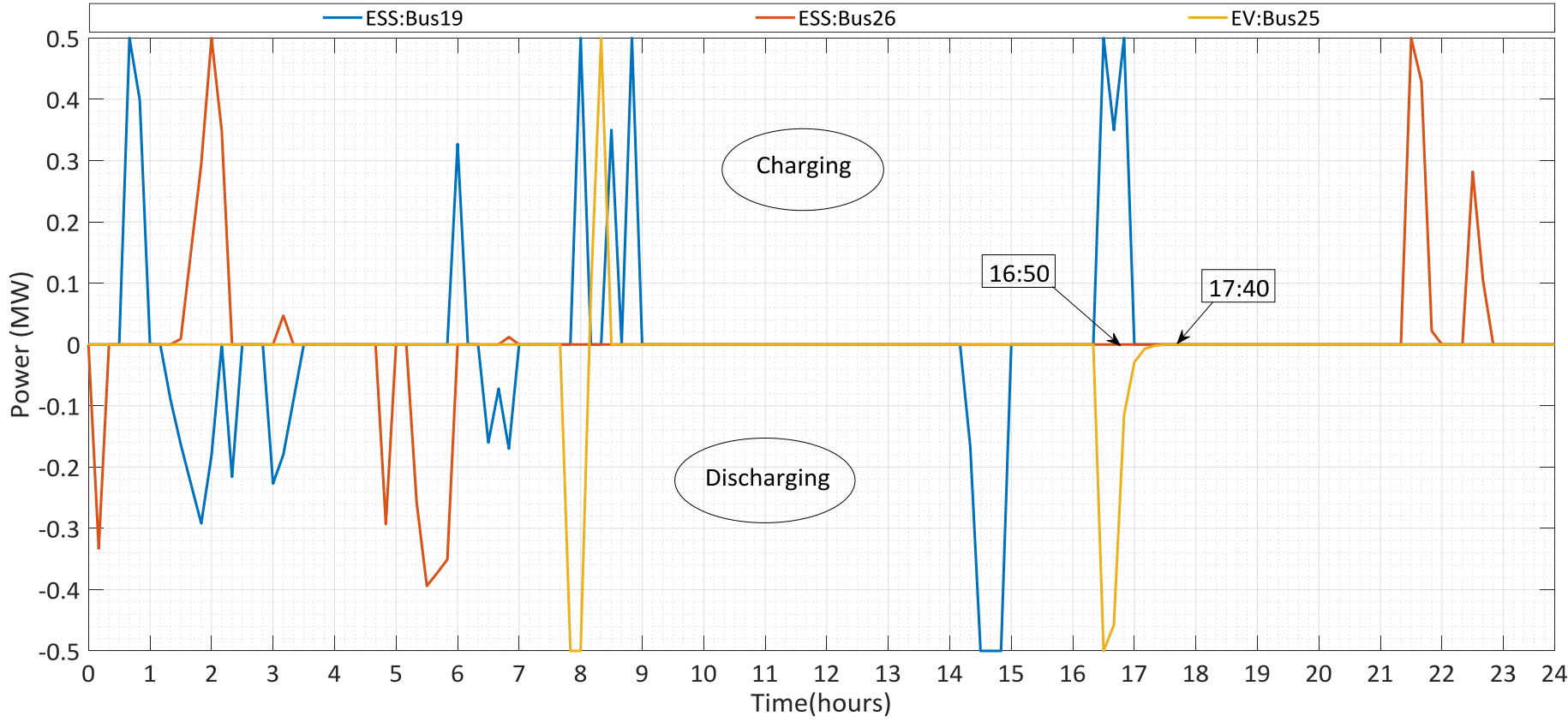
Computational experiments

Computational Experiments

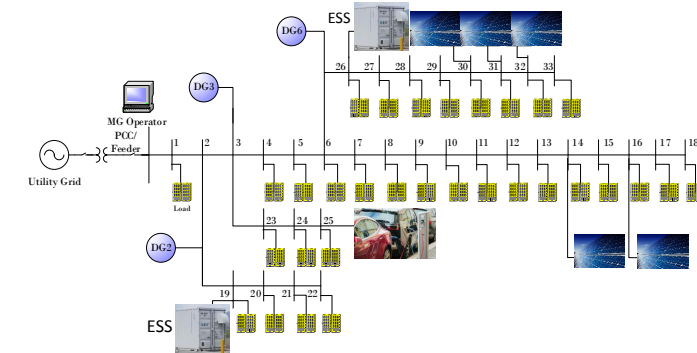
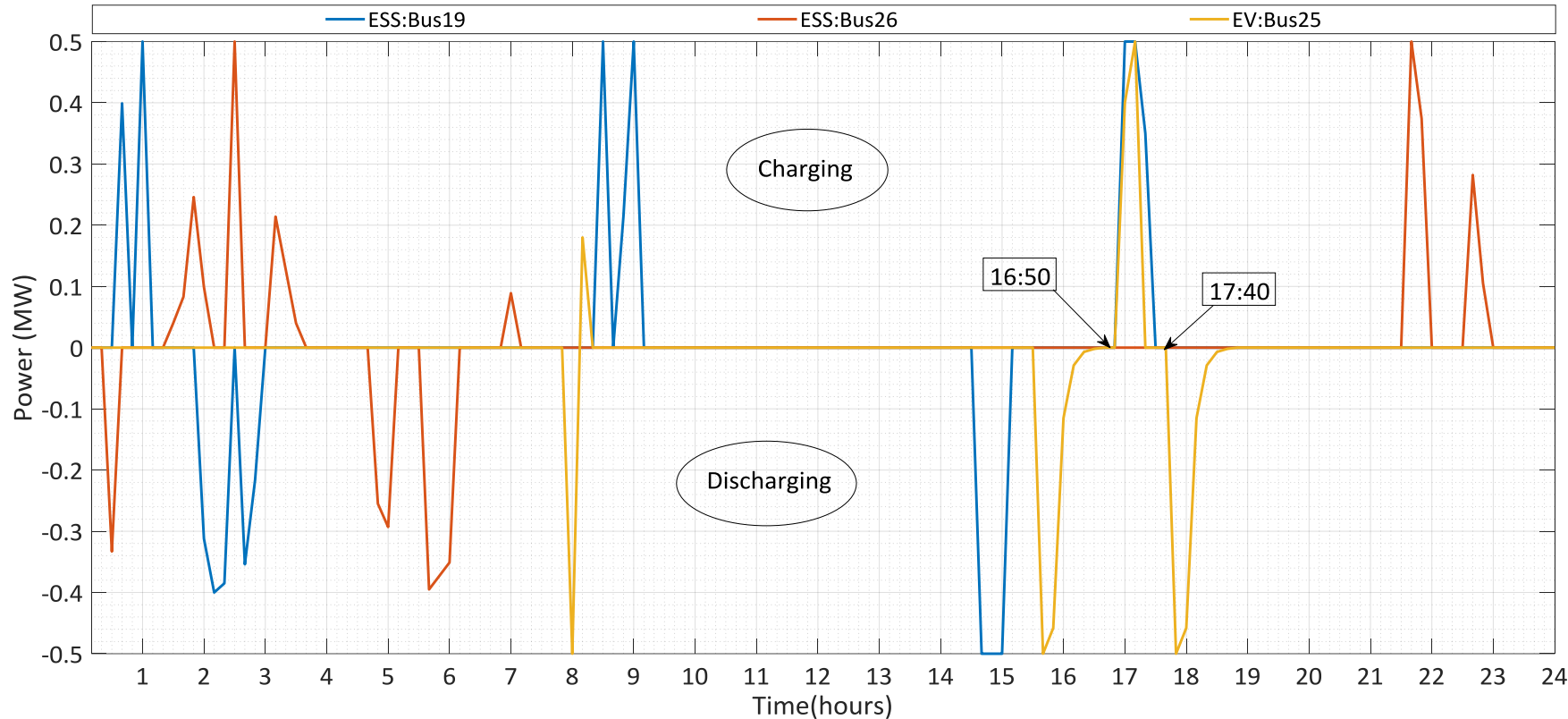
- ESS and EV schedule for scenarios:
 1. MG Grid connected at all times.
 2. MG islanded during UK power cut of Aug. 2019

- Comparison between Scenarios 1 – 2.

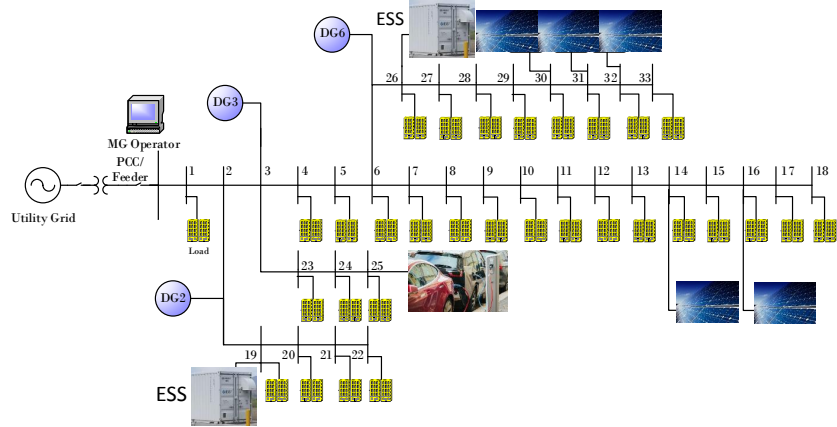
1. MG connected at all times



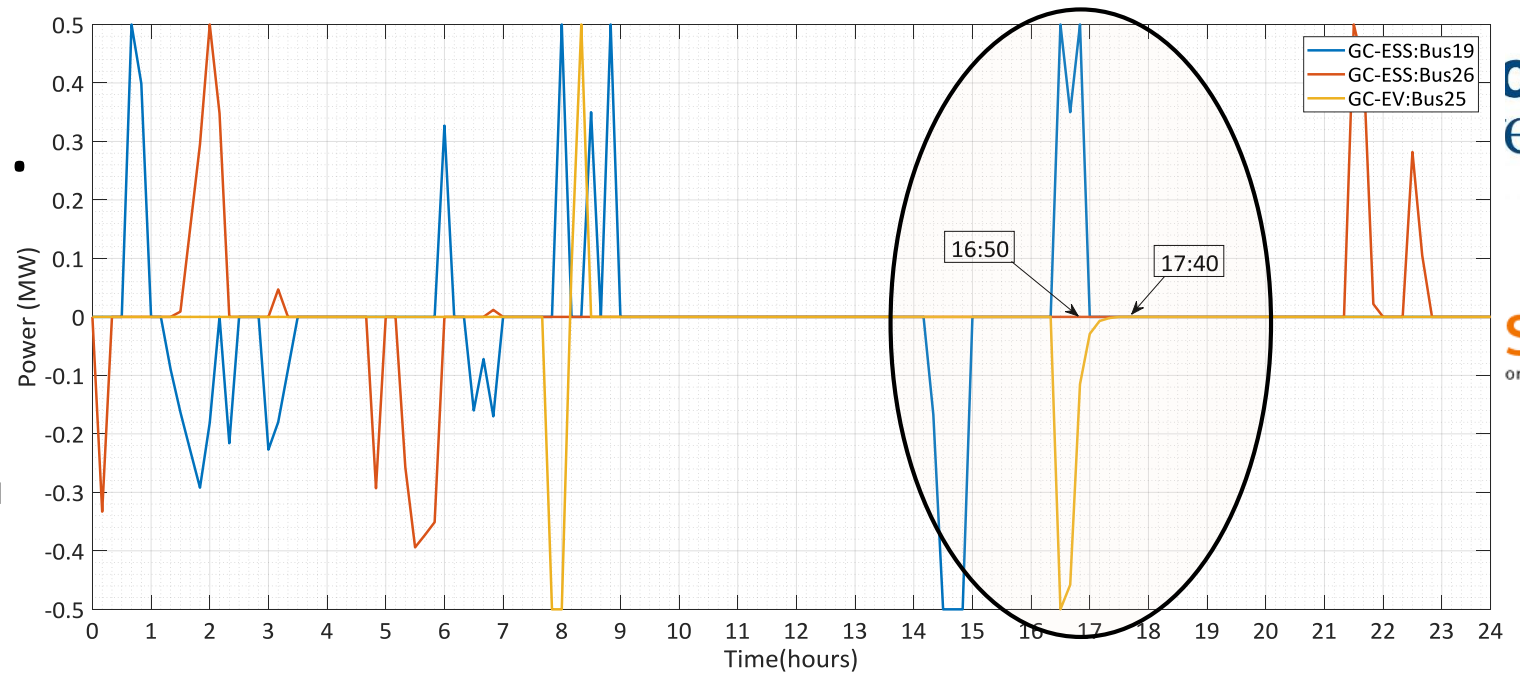
2. MG islanded during UK power cut of Aug. 2019



Comparison

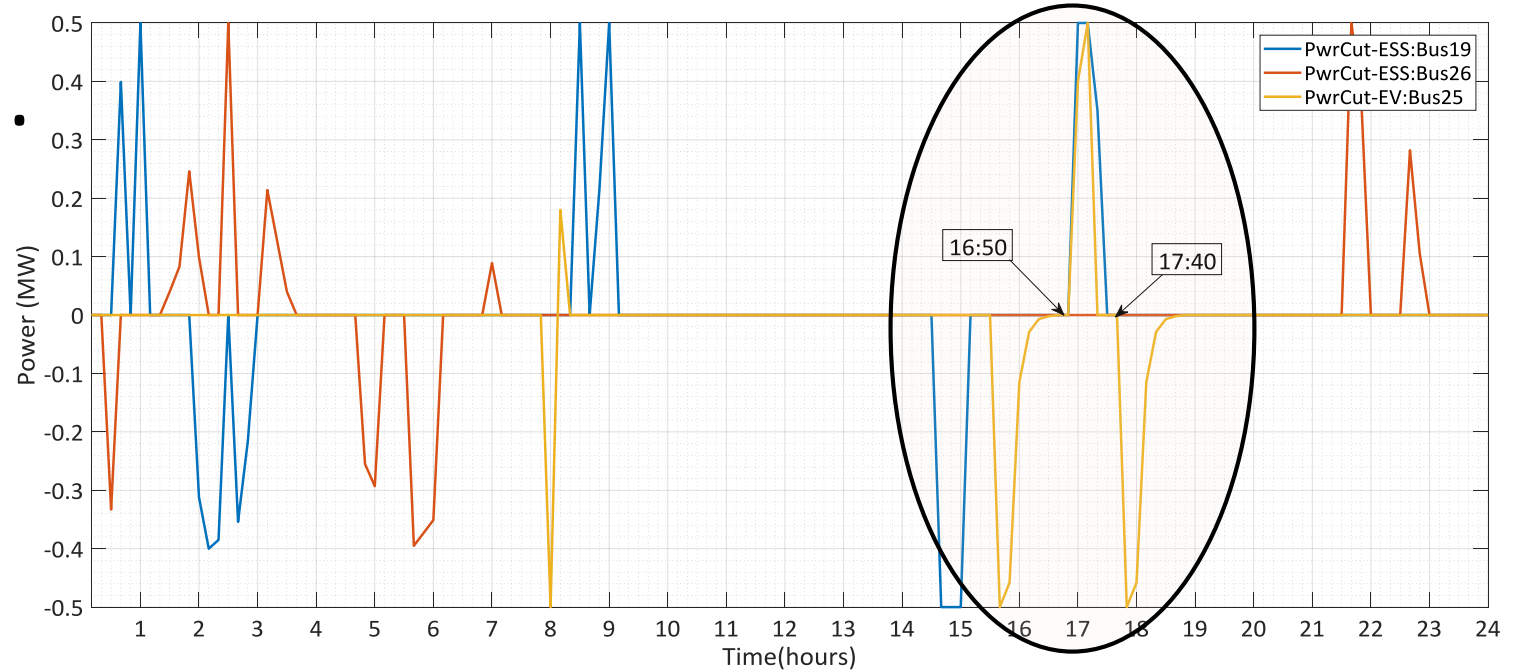


1.



1. MG Grid connected at all times.
2. MG islanded during UK power cut of Aug. 2019.

2.



Conclusion

Comments

- **ESS** schedule amended **during** power cut-off.
- **EV** schedule amended **before, during** and **after** power cut-off.
- Minor changes in **ESS** schedule in the hours **before** and **after** the power cut-off.
- Minor changes in **EV** schedule in the hours **before** and **after** the power cut-off.
- No load curtailment during power-cut.

- Current work...



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