Detailed Results Supporting Price Structures and PV Solar with Batteries and Peak Period Exports

Accompanying Appendix Nine to

Understanding the value of residential solar PV and storage in New Zealand

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Prepared for the Energy Efficiency and Conservation Authority

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Contents

Disclaimer

This appendix accompanies the report “Understanding the value of residential solar PV and storage in New Zealand”. The information and results are supplied in good faith and reflect the expertise and experience of the author. The model used to derive the results is subject to assumptions and limitations referred to in the document and model specification. Any reliance on the model results is a matter for the recipient’s own commercial judgement, taking into account the inputs and assumptions given. AMCL accepts no responsibility for any loss by any person acting or otherwise as a result of reliance on this document and the results.

1 Detailed results

This appendix provides detailed results supporting Section 6 of the main report. It is arranged as follows:

- Figure 1 to Figure 9 provide further detail of changes in rates of return for the results in Section 6.1 of the main report. These reference the retail price structures given in Table 7 of the main report and the buyback price structures given in Table 8 of the main report.
- Figure 10 to Figure 17 provide further detail of changes in rates of return for the results in Section 6.2.1 of the main report.
- Figure 18 to Figure 25 provide further detail of peak period payments for the results in Section 6.2.2 of the main report.
- Figure 26 to Figure 29 provide further detail of peak period energy exports for the results in Section 6.3 of the main report.
- Figure 30 to Figure 33 provide further detail of the average peak demand reduction by month of year for all cities, for the results in Section 6.3.1 and the Executive Summary of the main report.

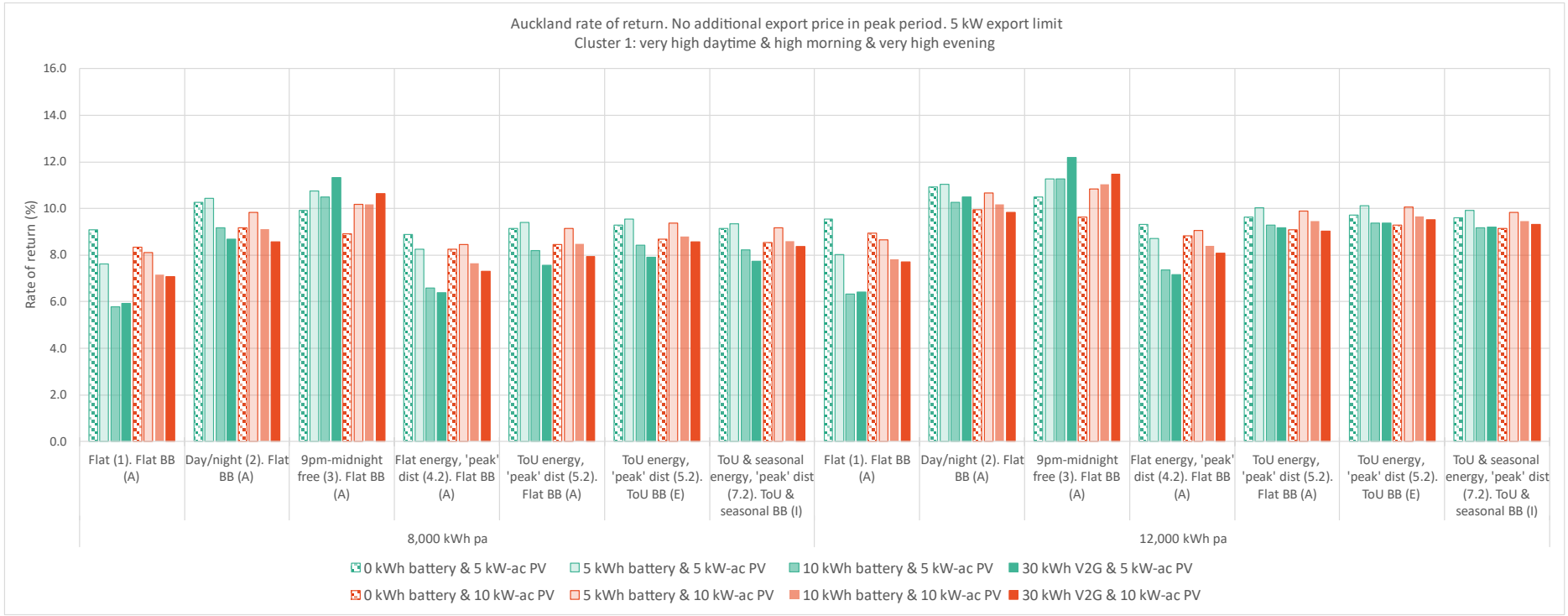


Figure 1: Auckland rate of return of PV solar with and without battery storage under various price structures.

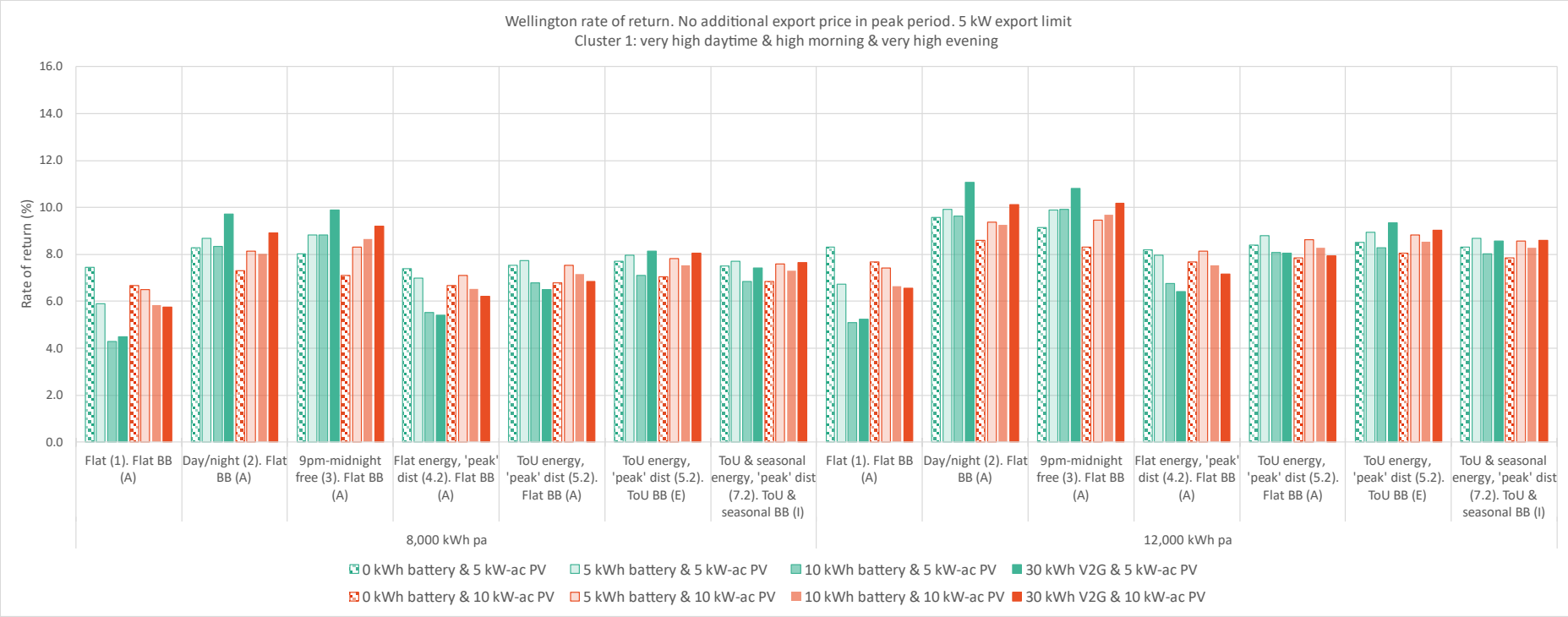


Figure 2: Wellington rate of return of PV solar with and without battery storage under various price structures.

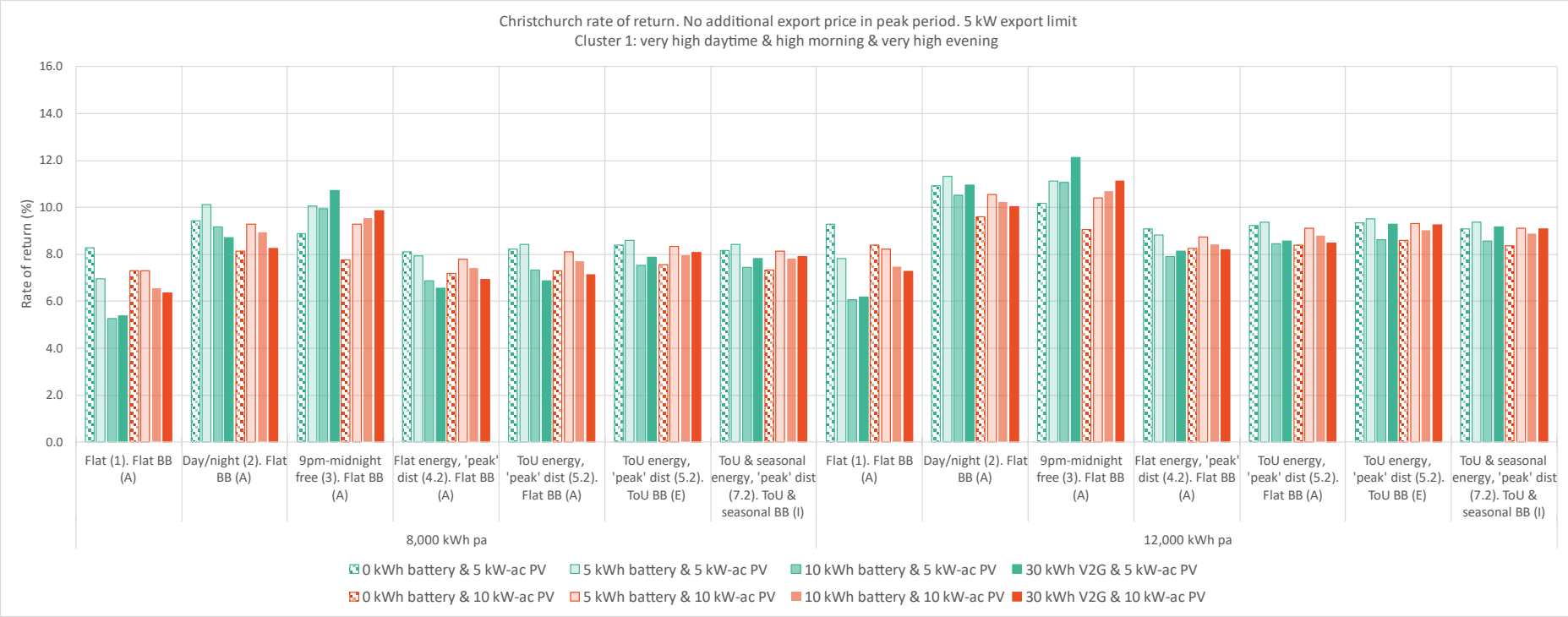


Figure 3: Christchurch rate of return of PV solar with and without battery storage under various price structures.

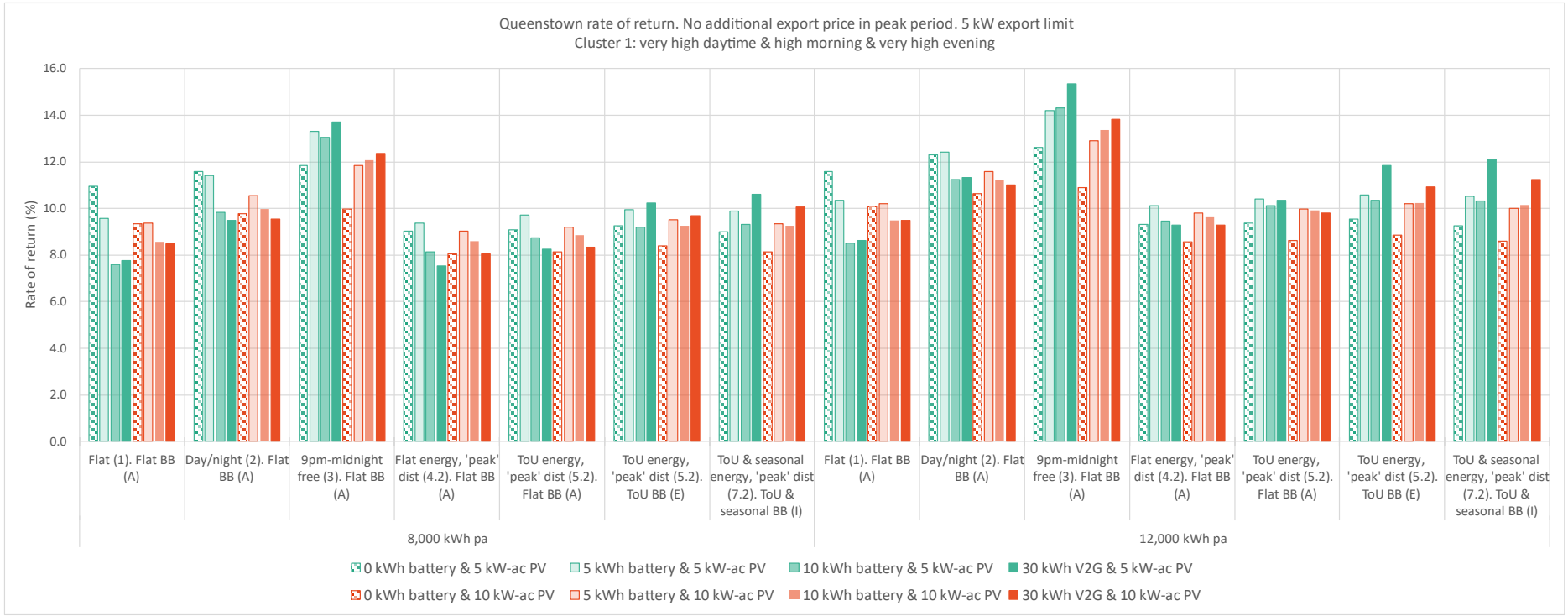


Figure 4: Queenstown rate of return of PV solar with and without battery storage under various price structures.

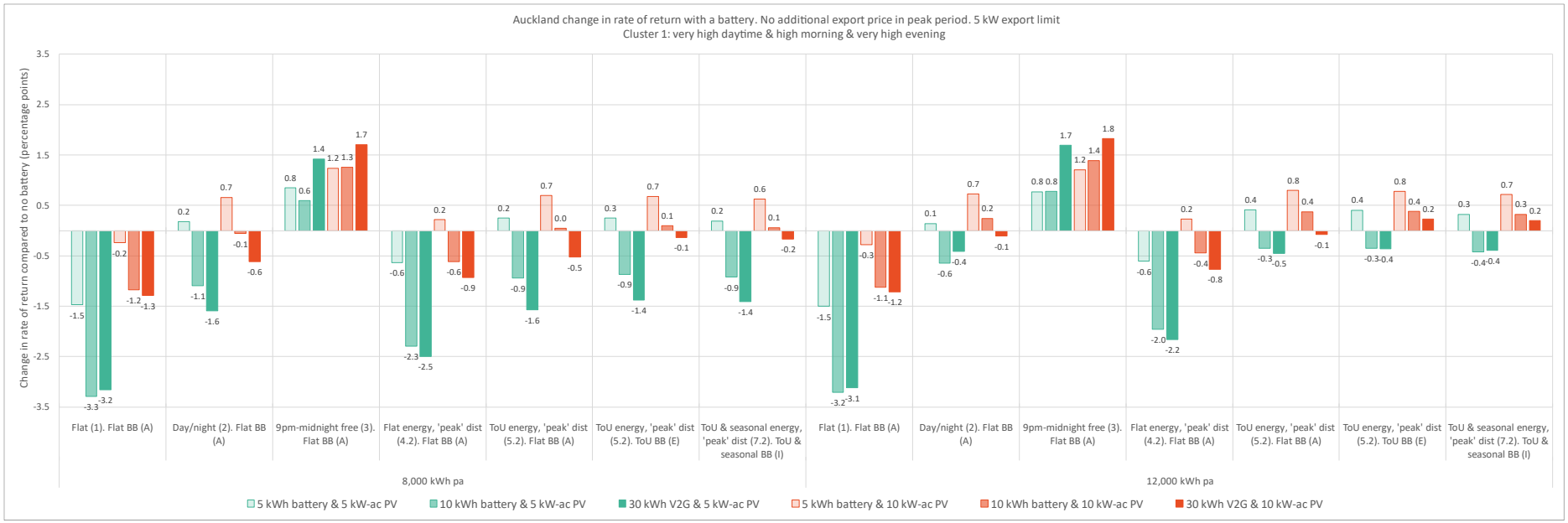


Figure 5: Auckland change in rate of return for Cluster 1 load type and a 5 kW export limit. Positive values are when the rate of return of PV with a battery has increased the rate of return.

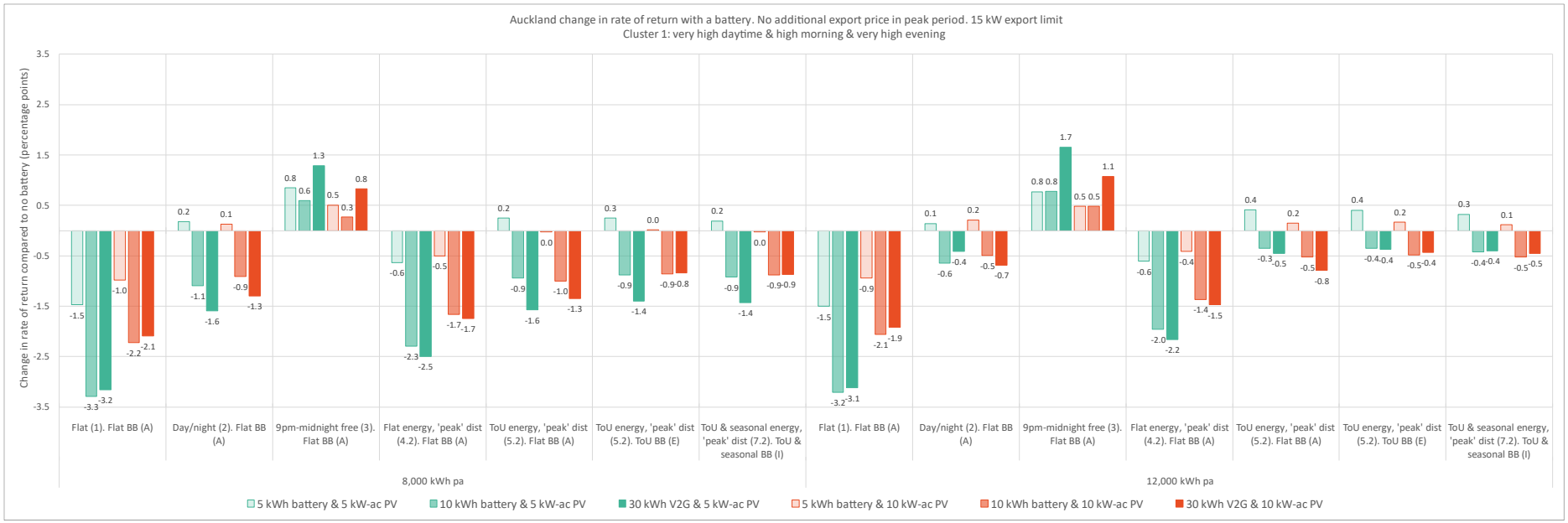


Figure 6: Auckland change in rate of return for Cluster 1 load type and a 15 kW export limit. Positive values are when the rate of return of PV with a battery has increased the rate of return.

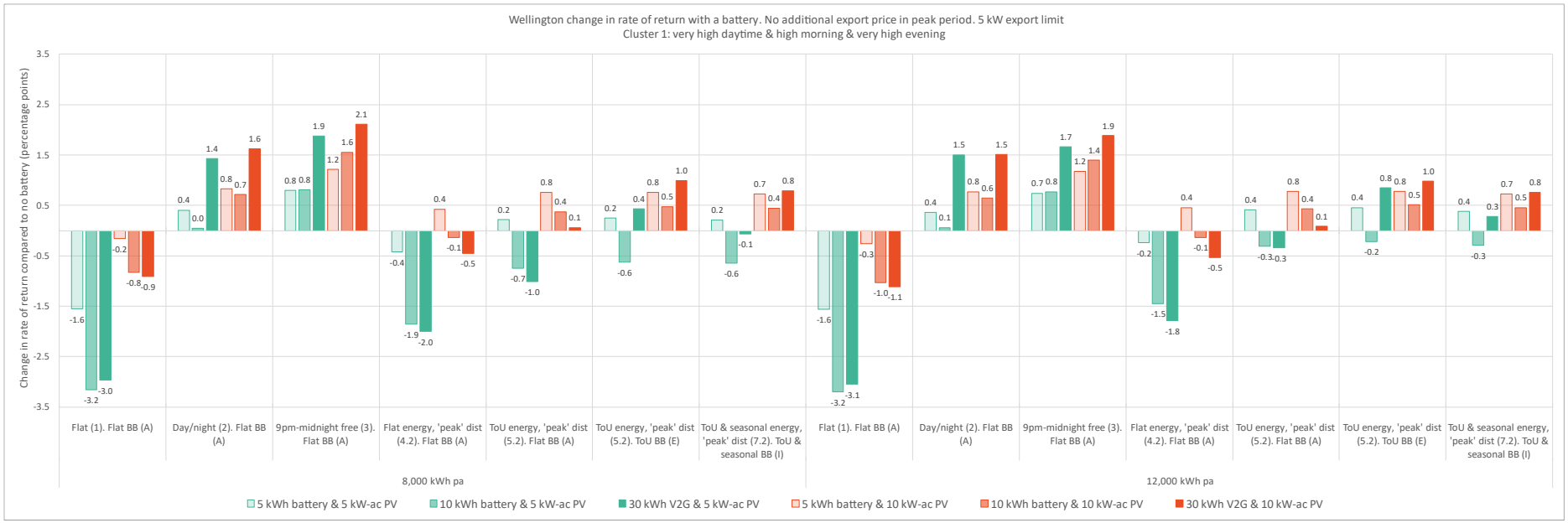


Figure 7: Wellington change in rate of return for Cluster 1 load type and a 5 kW export limit. Positive values are when the rate of return of PV with a battery has increased the rate of return.

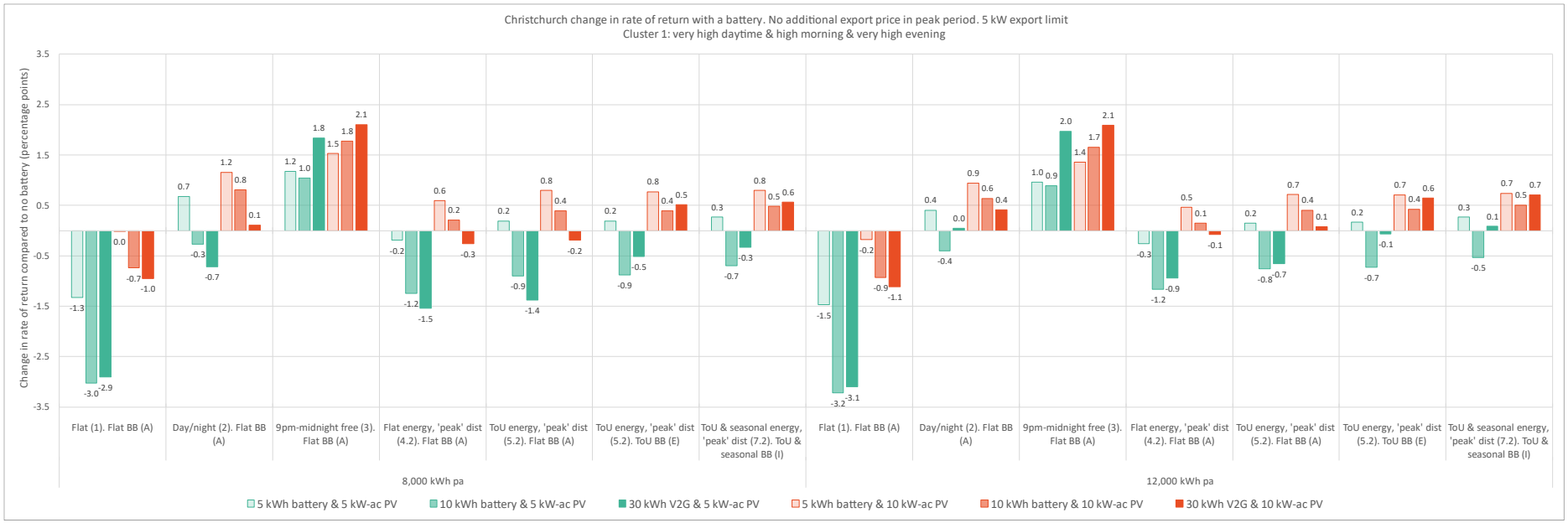


Figure 8: Christchurch change in rate of return for Cluster 1 load type and a 5 kW export limit. Positive values are when the rate of return of PV with a battery has increased the rate of return.

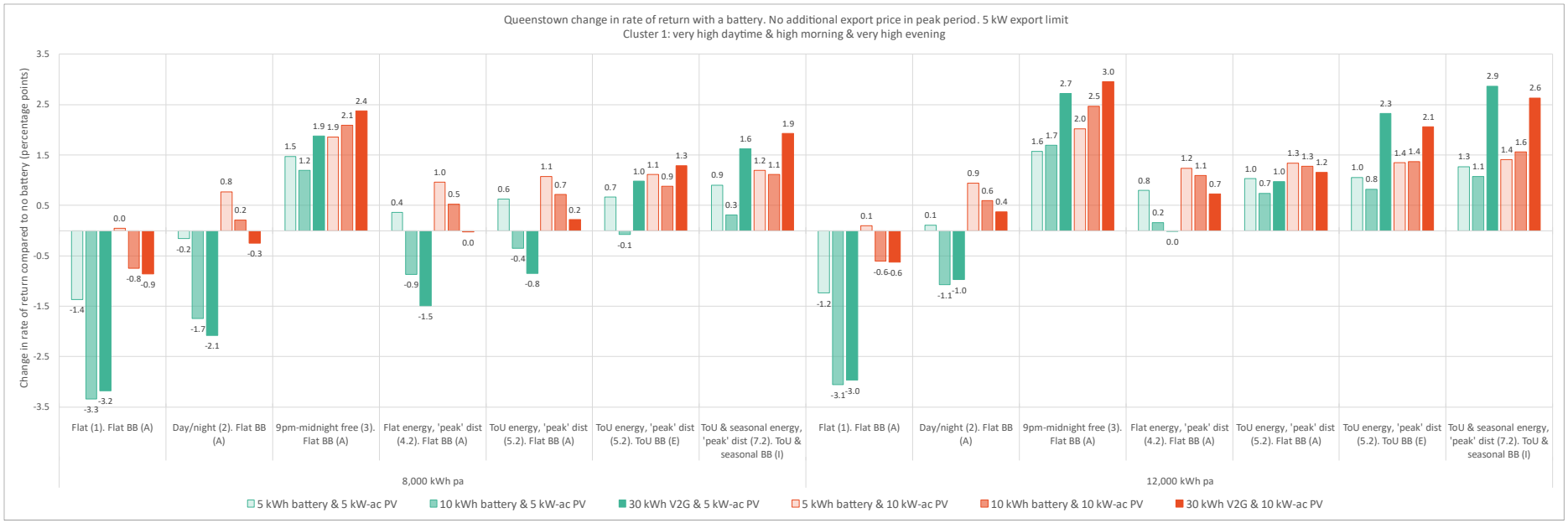


Figure 9: Queenstown change in rate of return for Cluster 1 load type and a 5 kW export limit. Positive values are when the rate of return of PV with a battery has increased the rate of return.

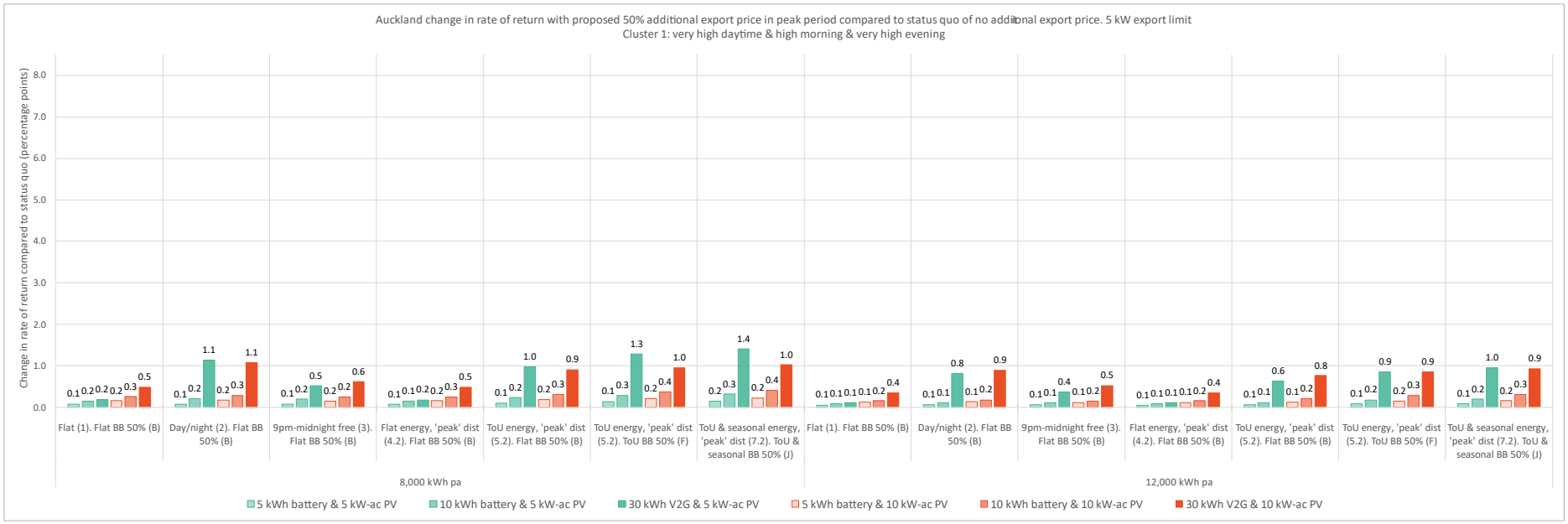


Figure 10: Auckland change in rate of return for Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

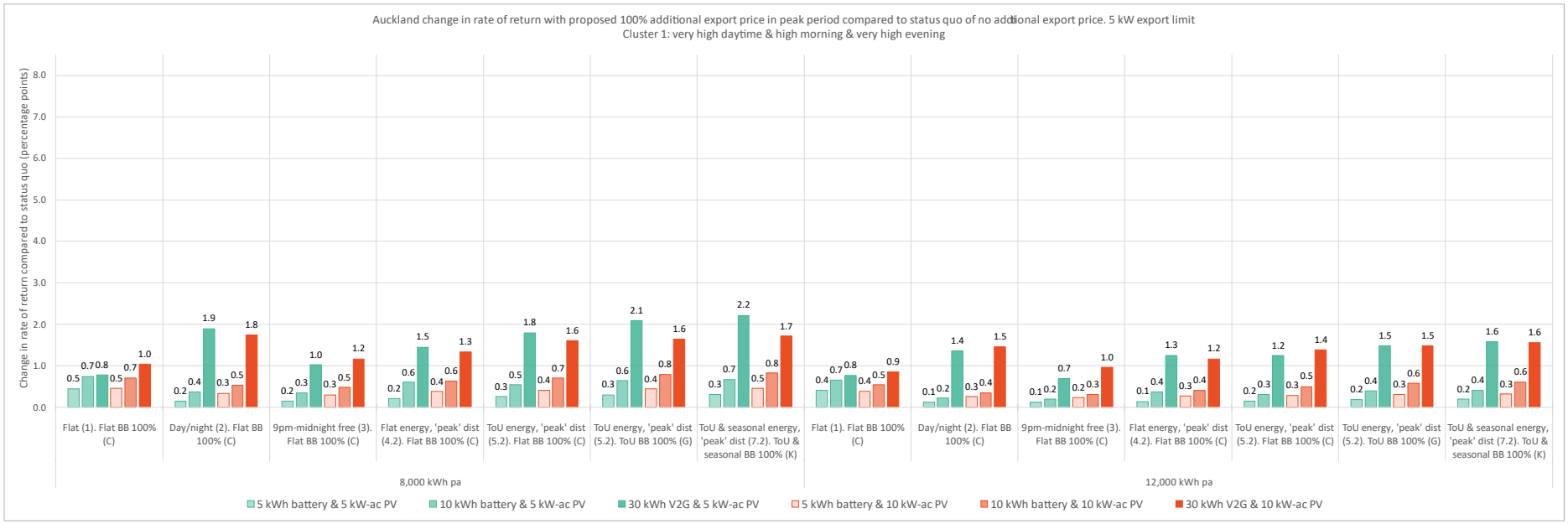


Figure 11: Auckland change in rate of return for Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

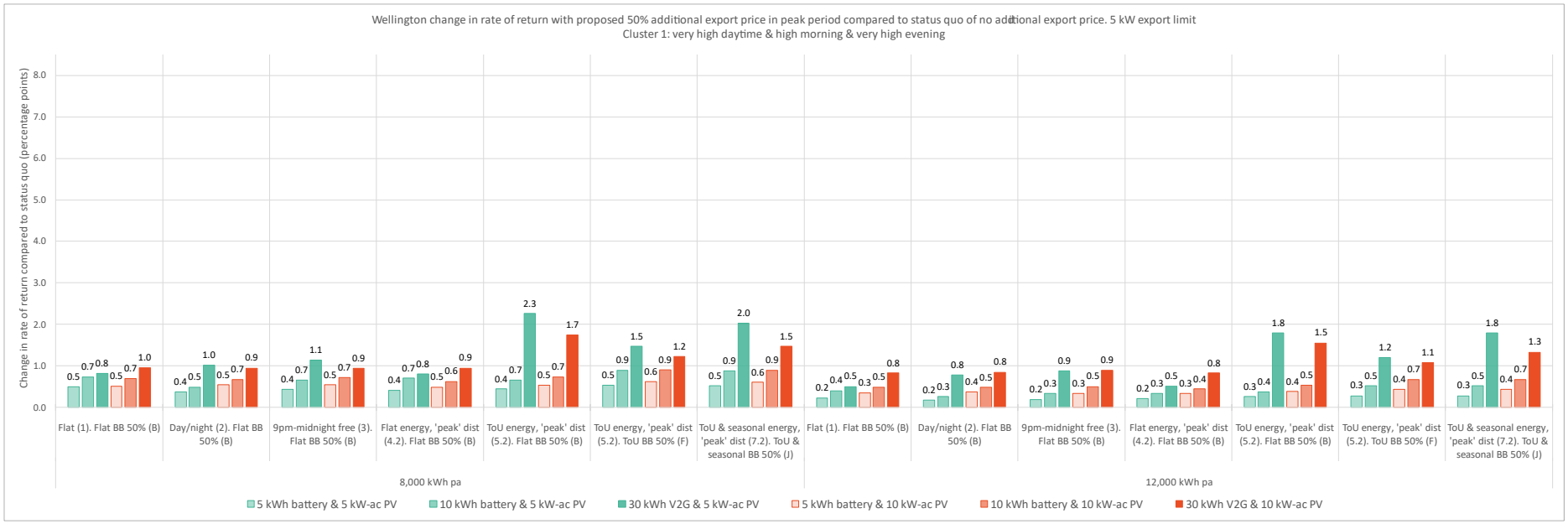


Figure 12: Wellington change in rate of return for Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

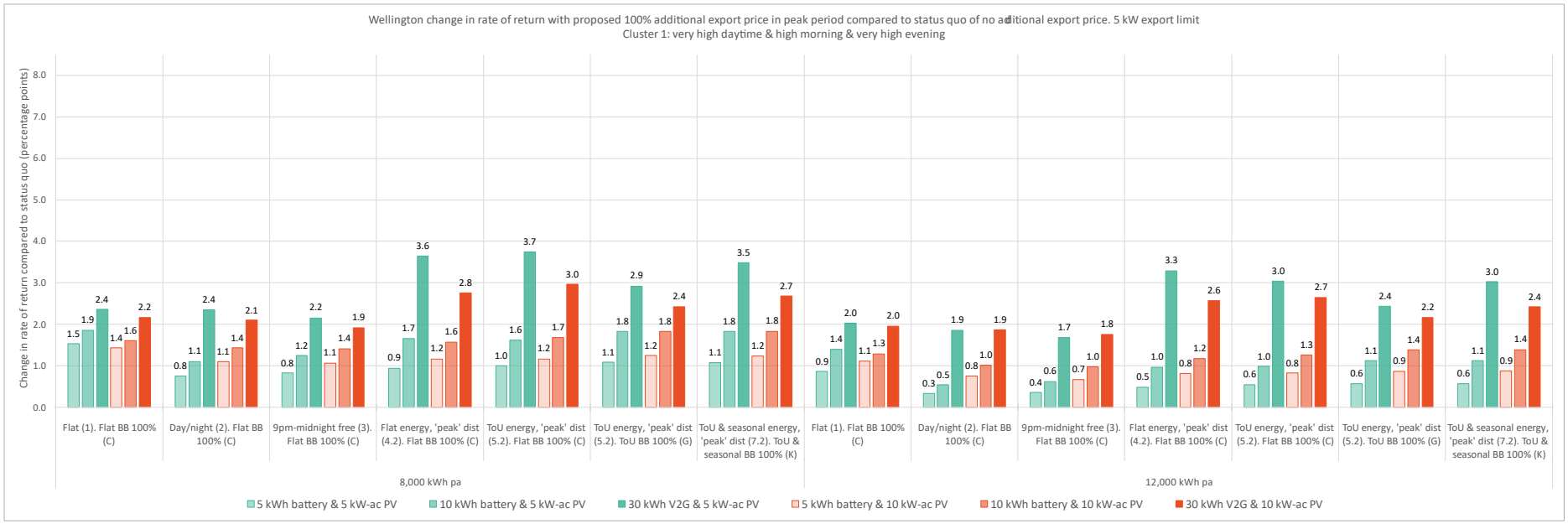


Figure 13: Wellington change in rate of return for Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

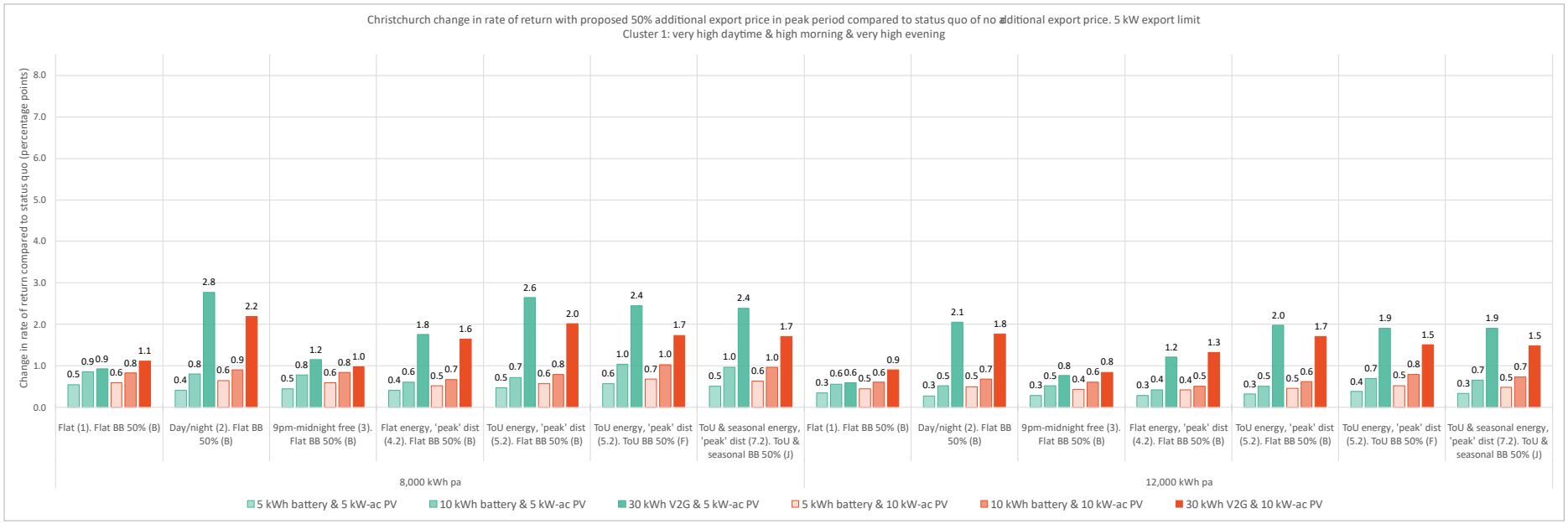


Figure 14: Christchurch change in rate of return for Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

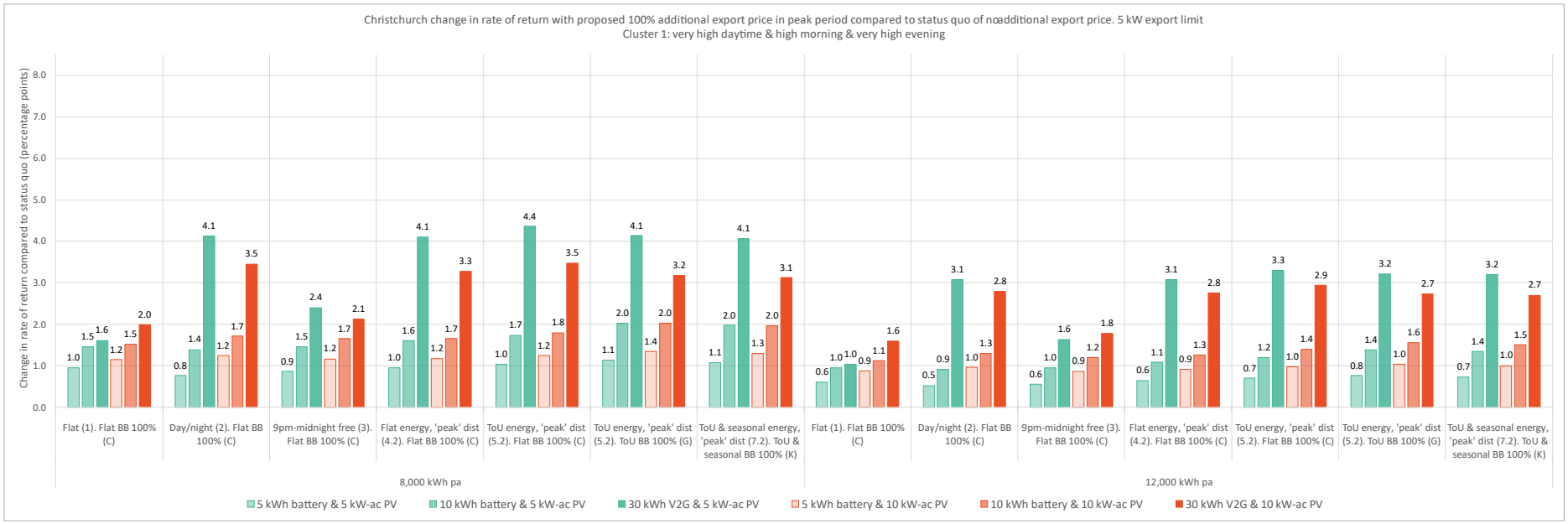


Figure 15: Christchurch change in rate of return for Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

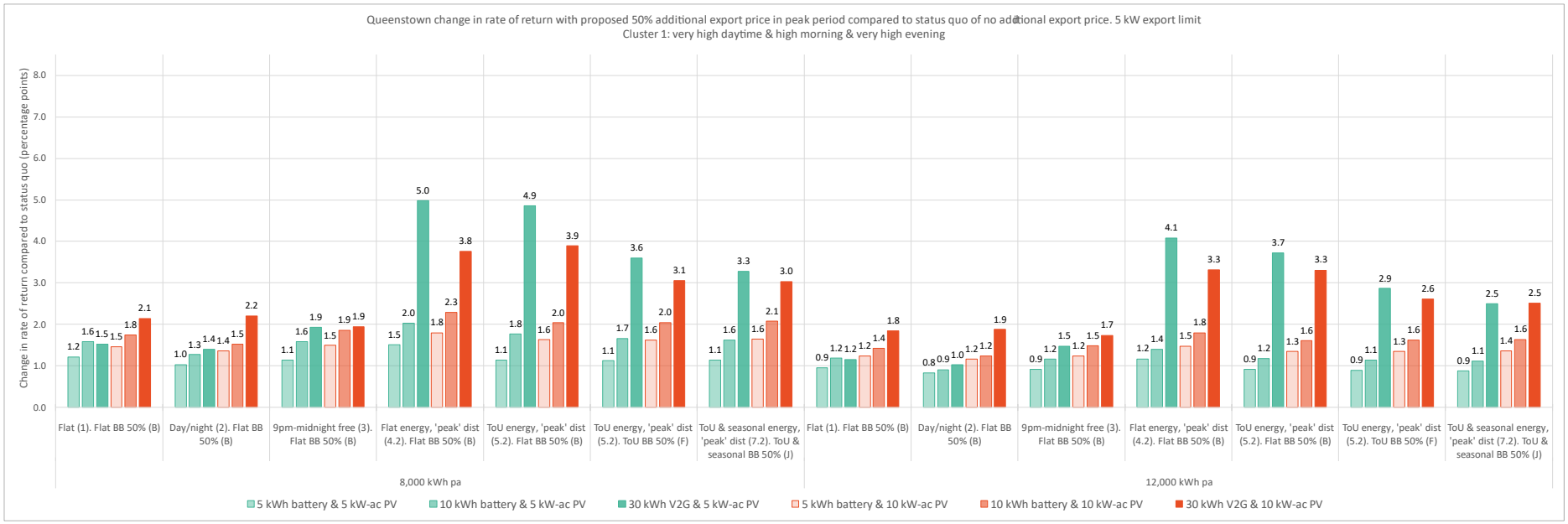


Figure 16: Queenstown change in rate of return for Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

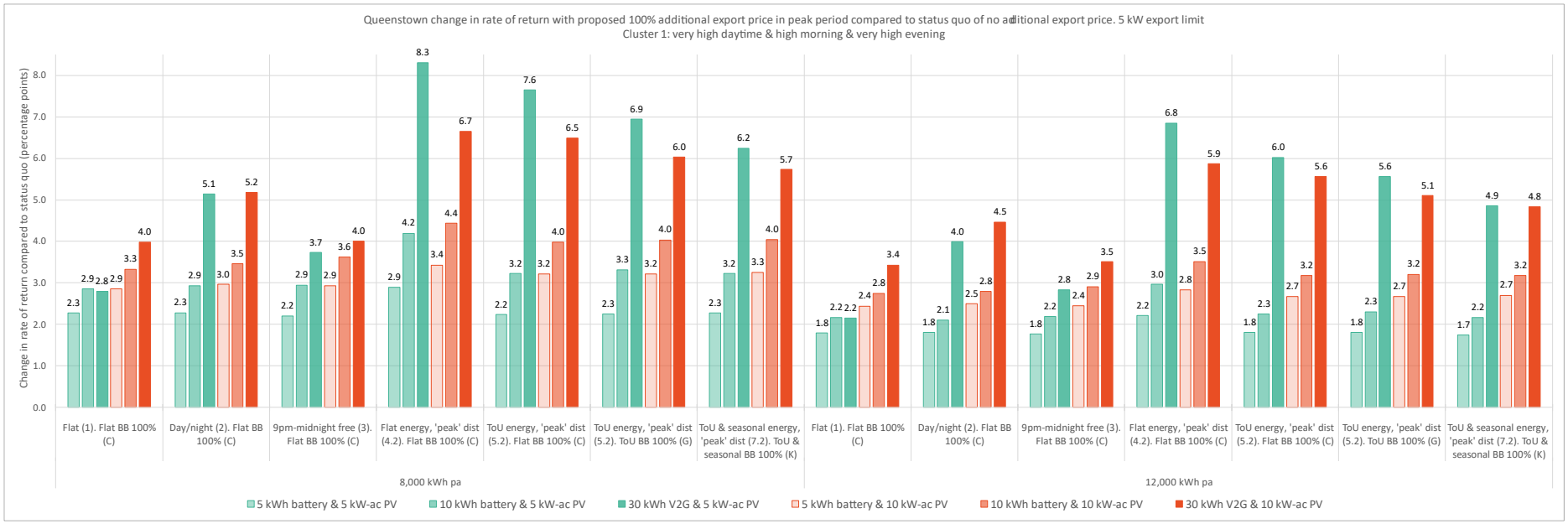


Figure 17: Queenstown change in rate of return for Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

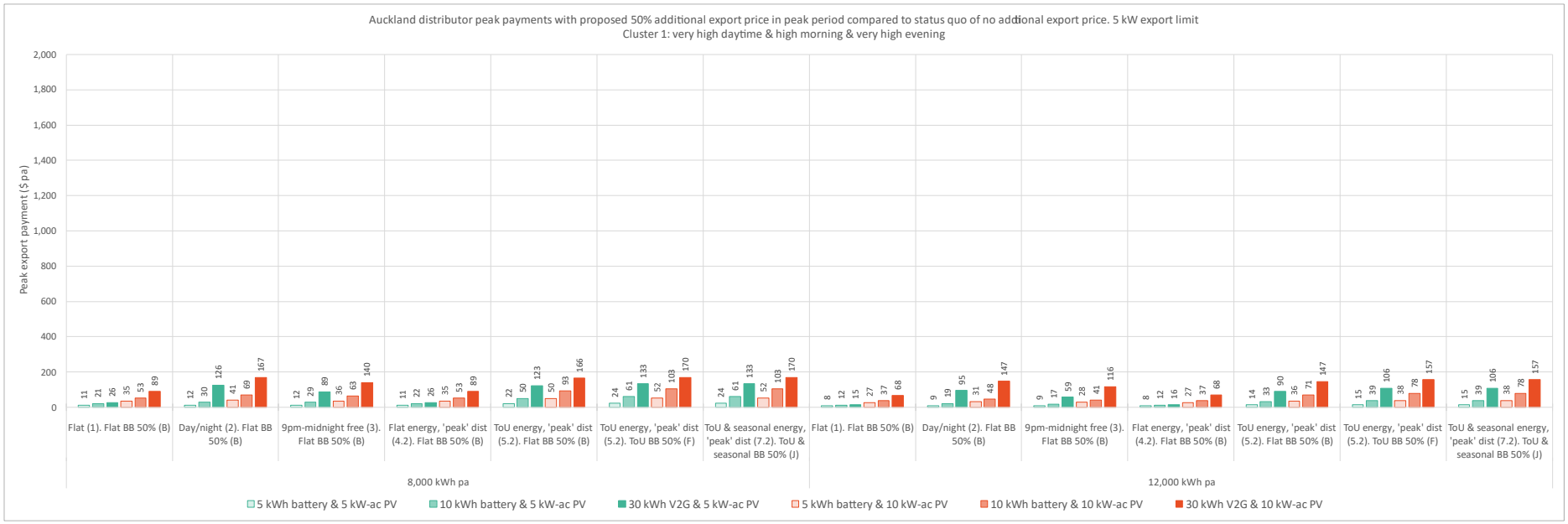


Figure 18: Auckland peak period payments for a Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

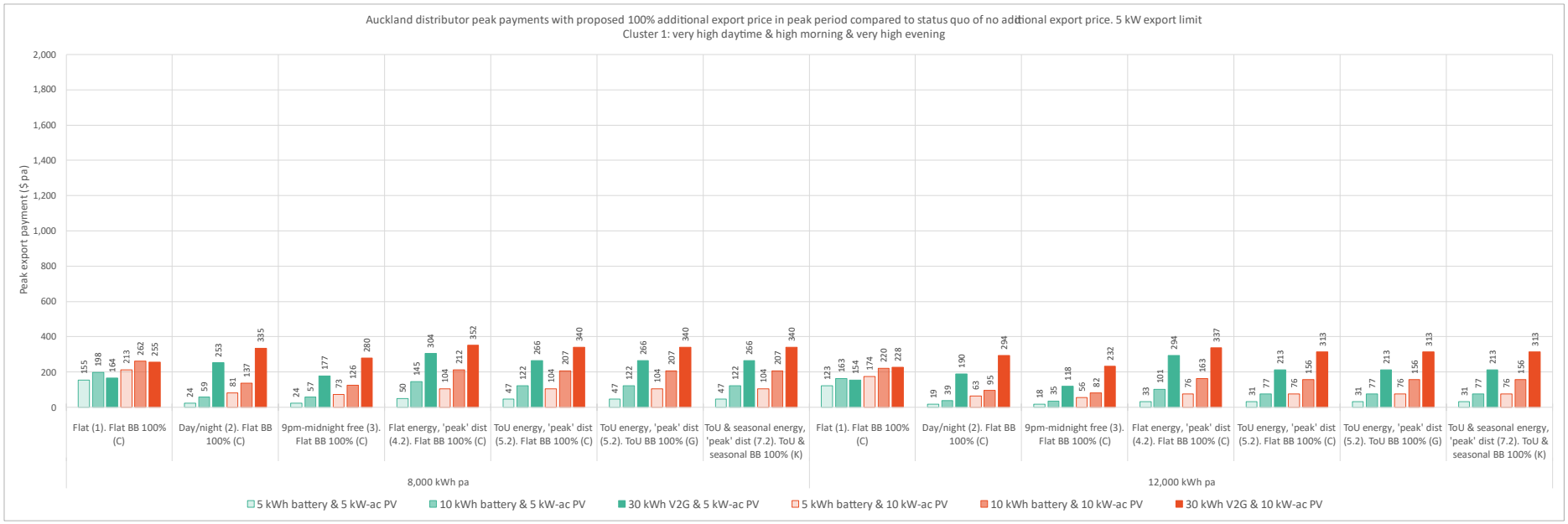


Figure 19: Auckland peak period payments for a Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

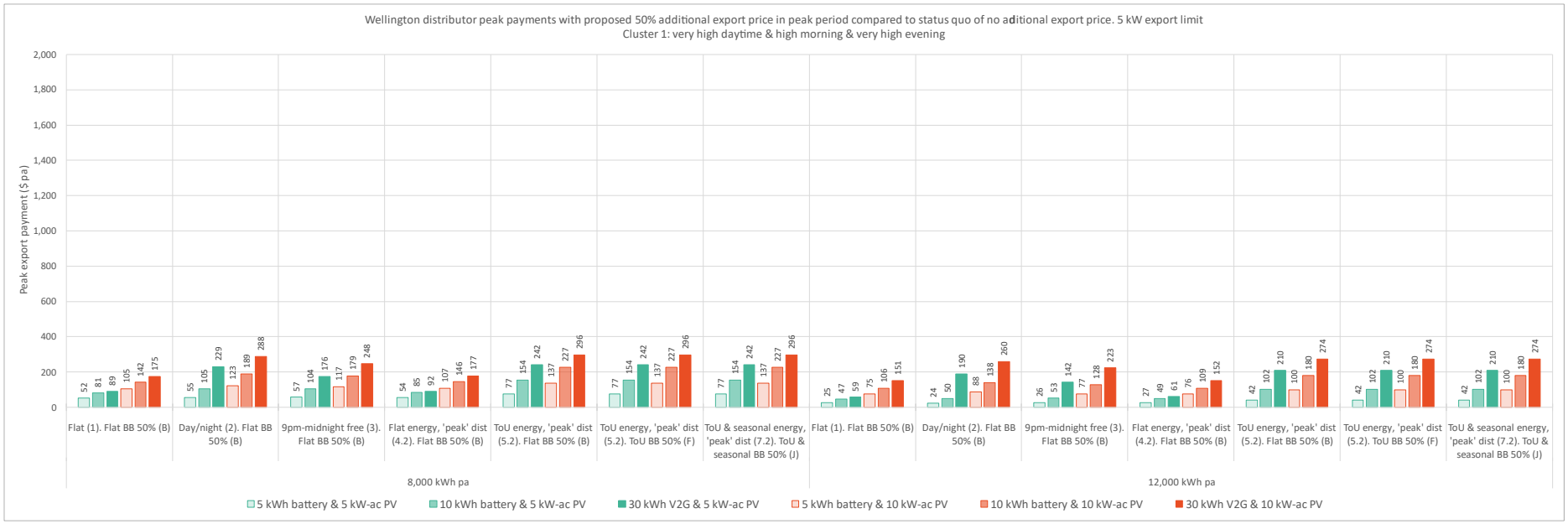


Figure 20: Wellington peak period payments for a Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

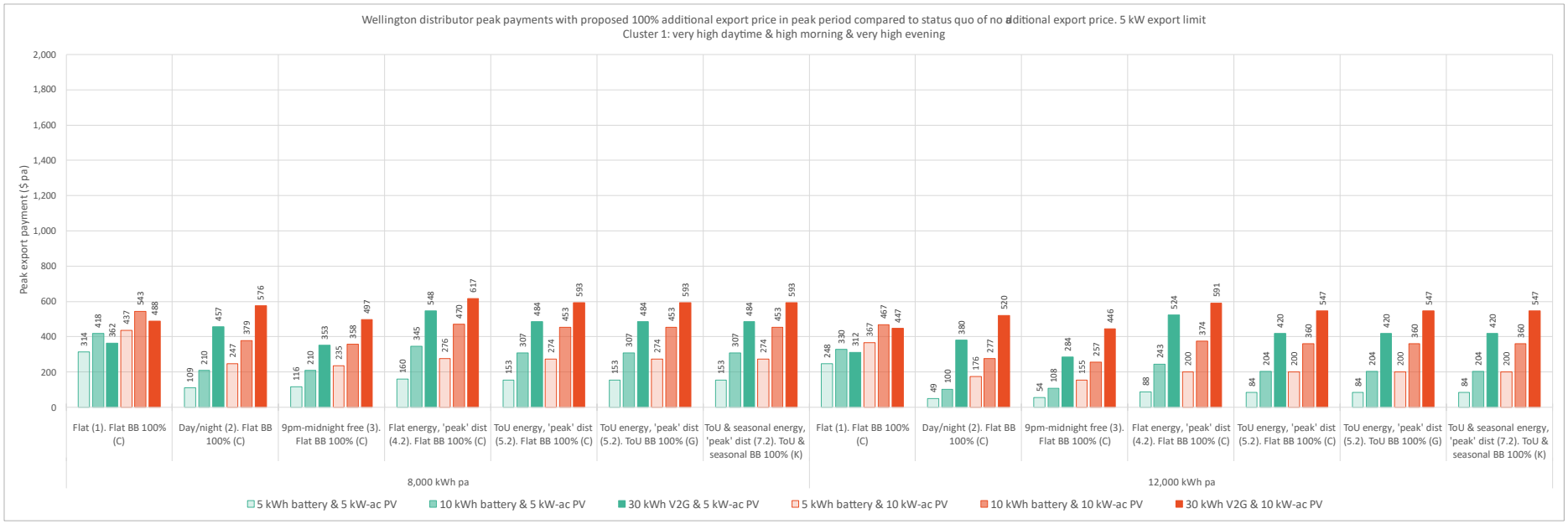


Figure 21: Wellington peak period payments for a Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

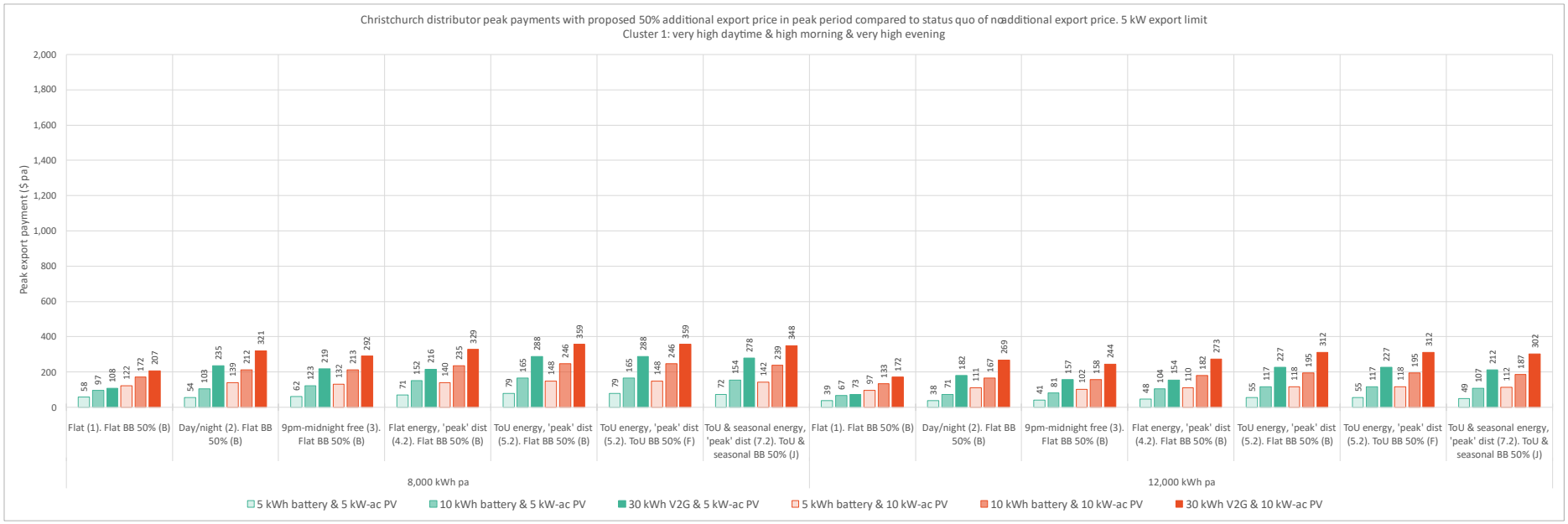


Figure 22: Christchurch peak period payments for a Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

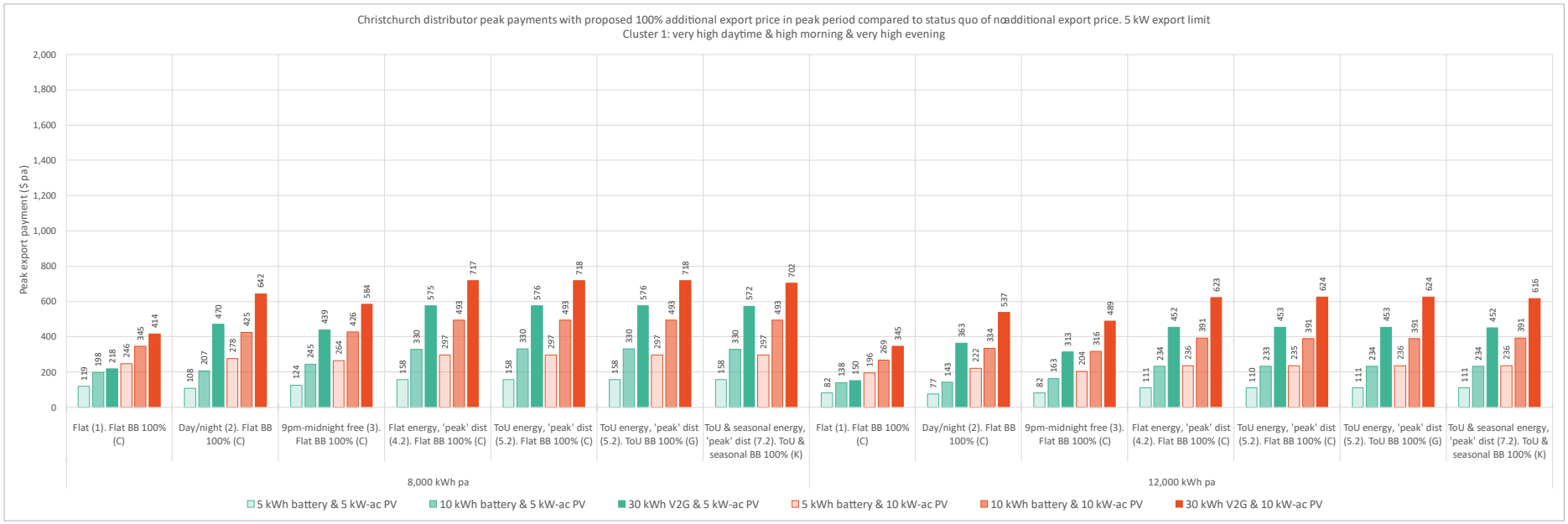


Figure 23: Christchurch peak period payments for a Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

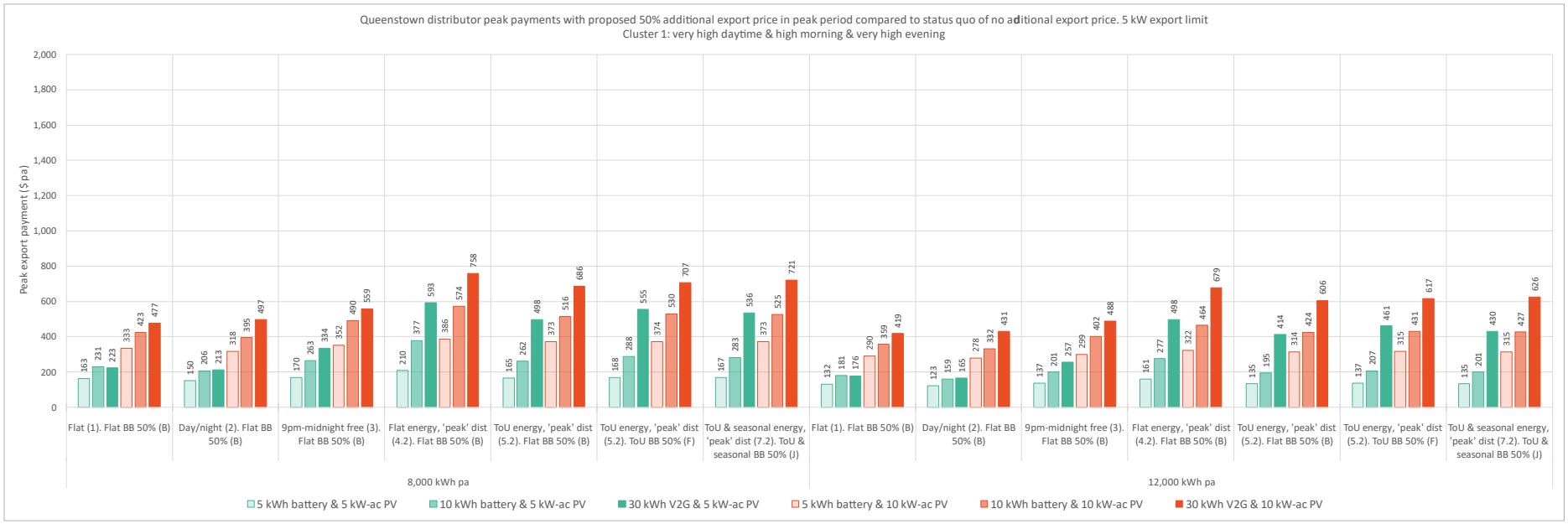


Figure 24: Queenstown peak period payments for a Cluster 1 load type and a 5 kW export limit when 50% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

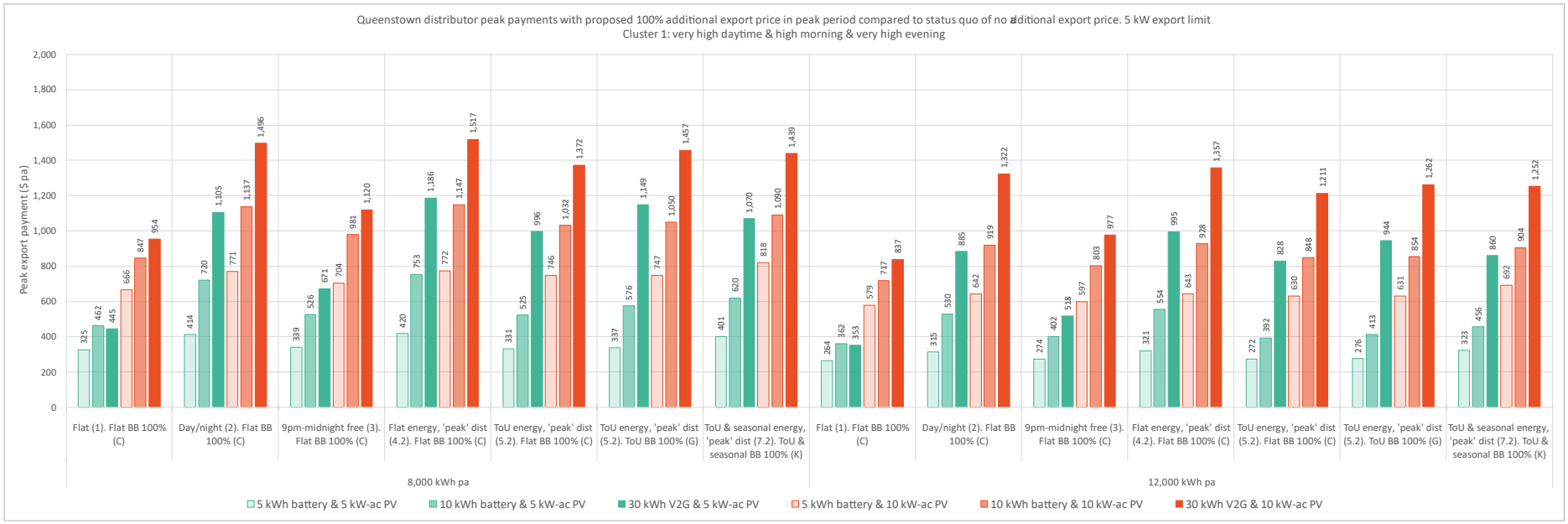


Figure 25: Queenstown peak period payments for a Cluster 1 load type and a 5 kW export limit when 100% of the distributor LRMC is added to buyback prices in the morning and evening peak periods. Peak periods are as defined by the distributor.

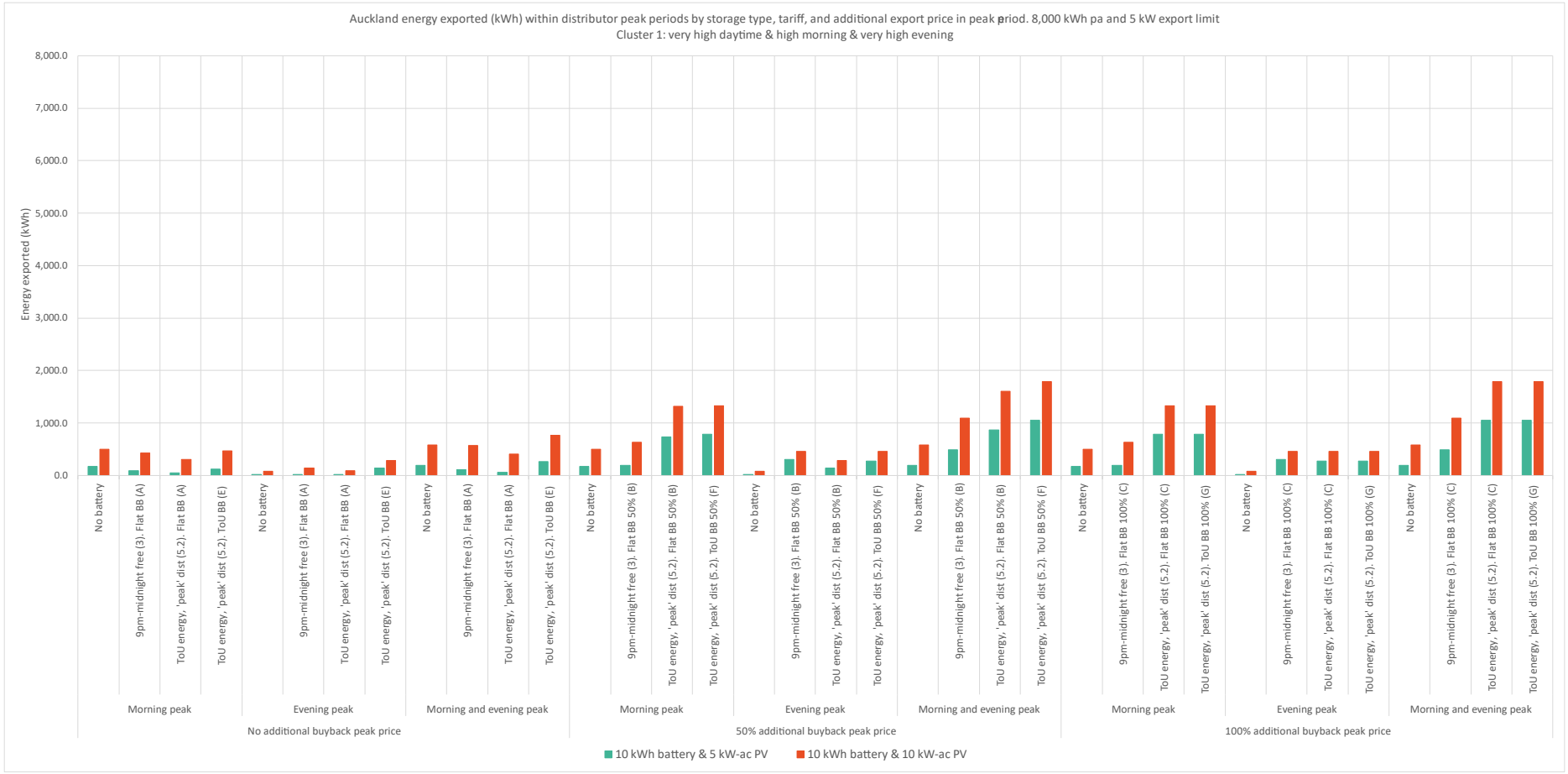


Figure 26: Auckland energy exported during the electricity distributor peak periods with various retail and buyback prices.

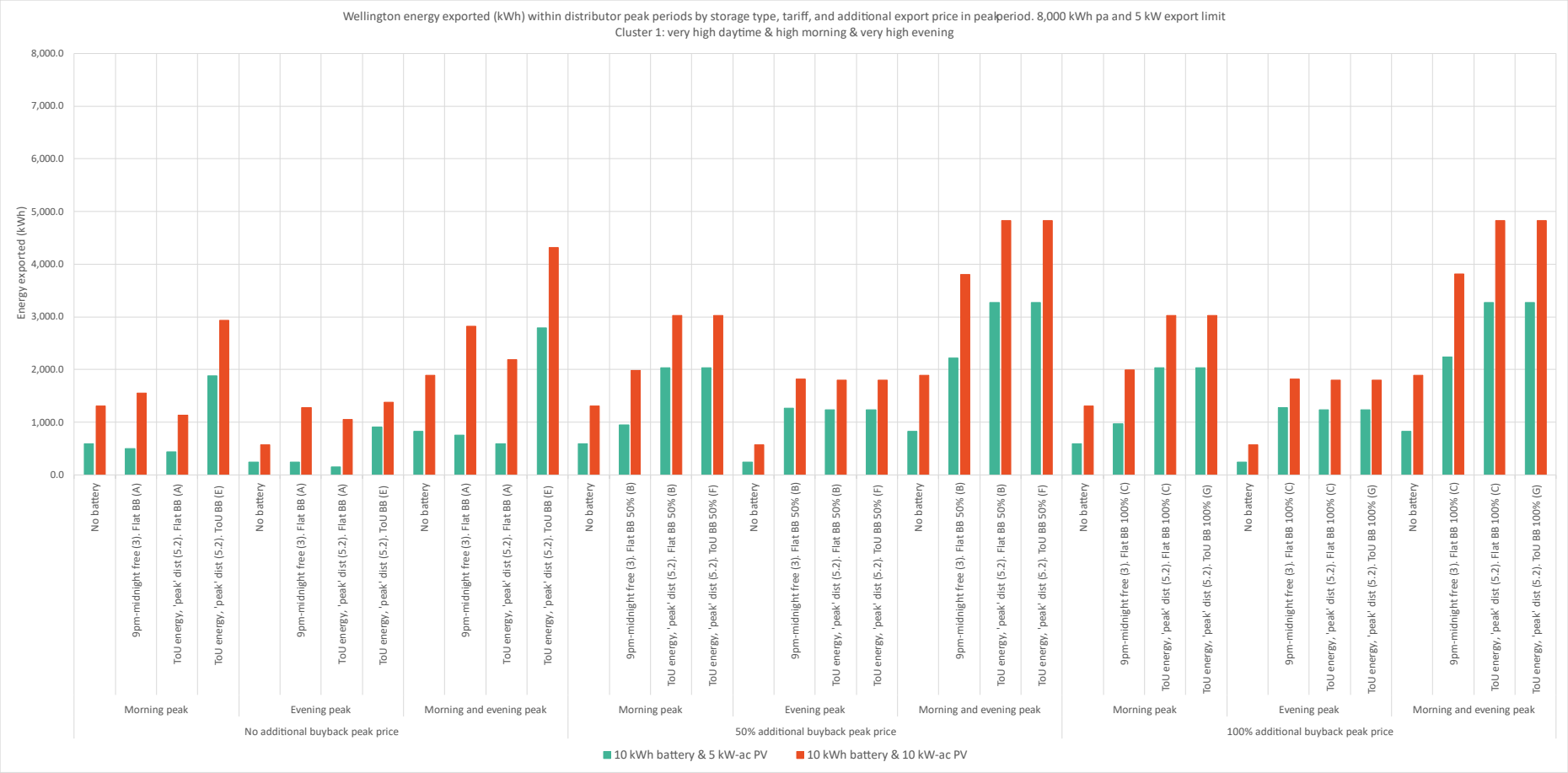


Figure 27: Wellington energy exported during the electricity distributor peak periods with various retail and buyback prices.

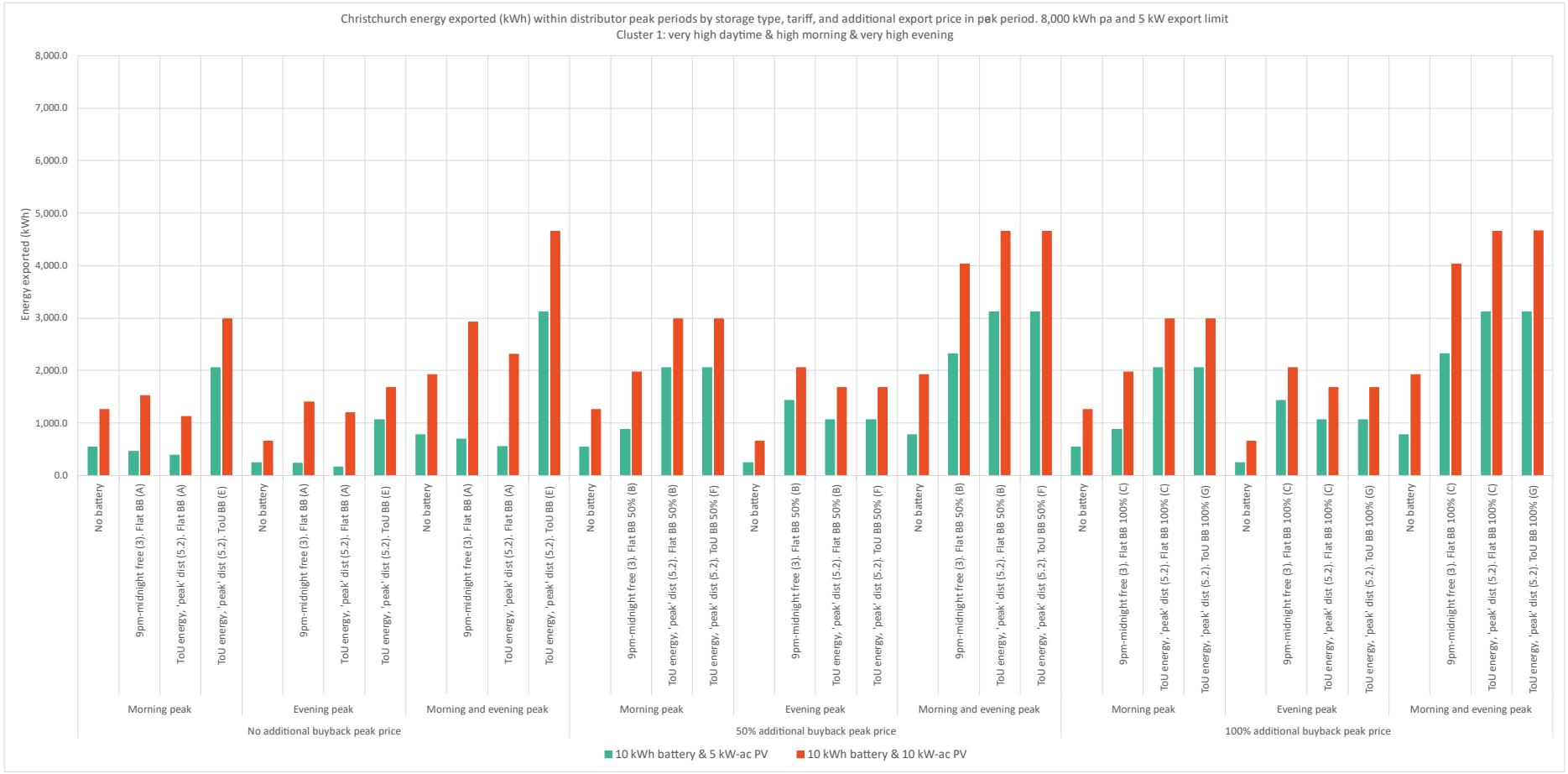


Figure 28: Christchurch energy exported during the electricity distributor peak periods with various retail and buyback prices.

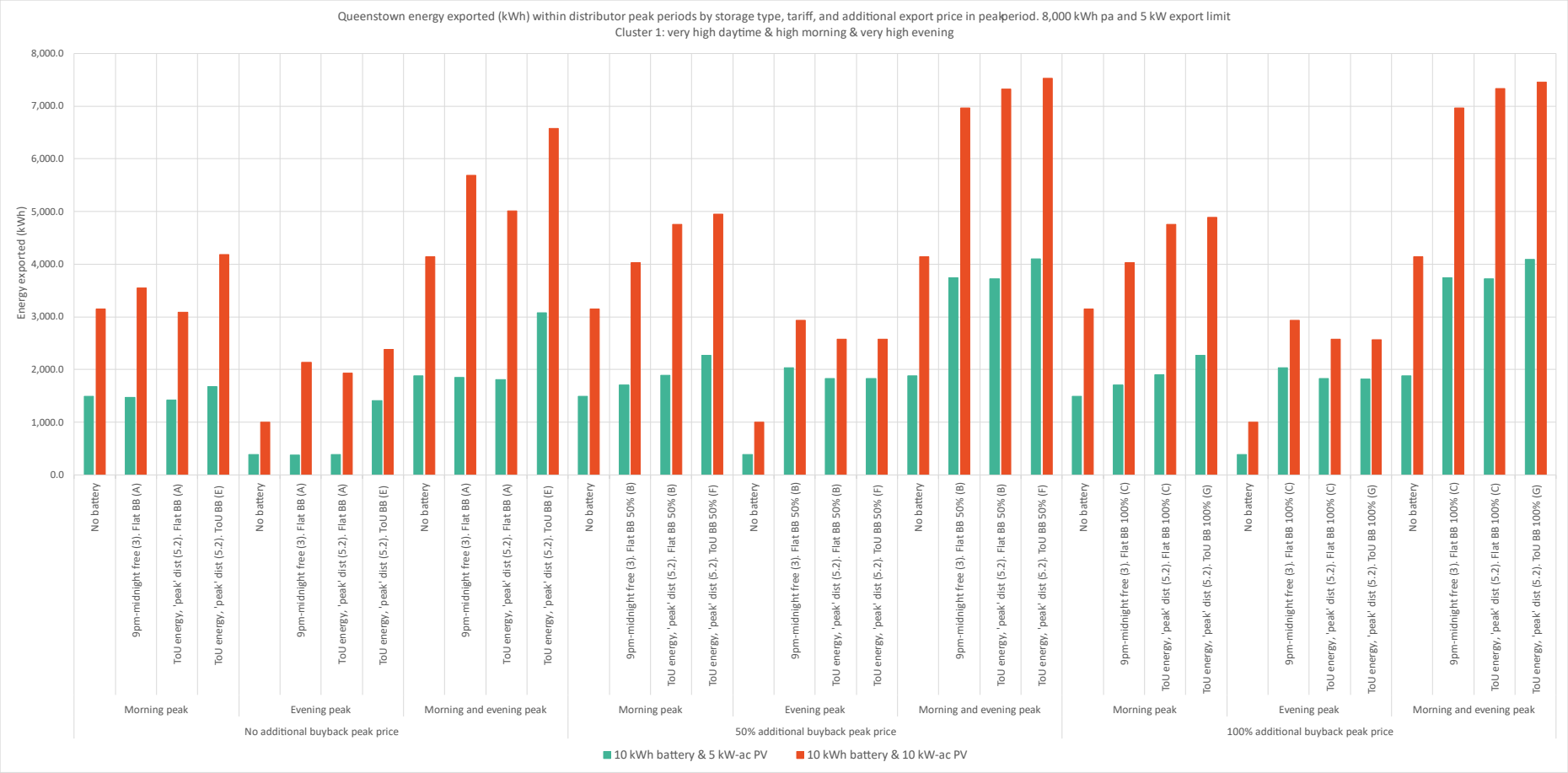
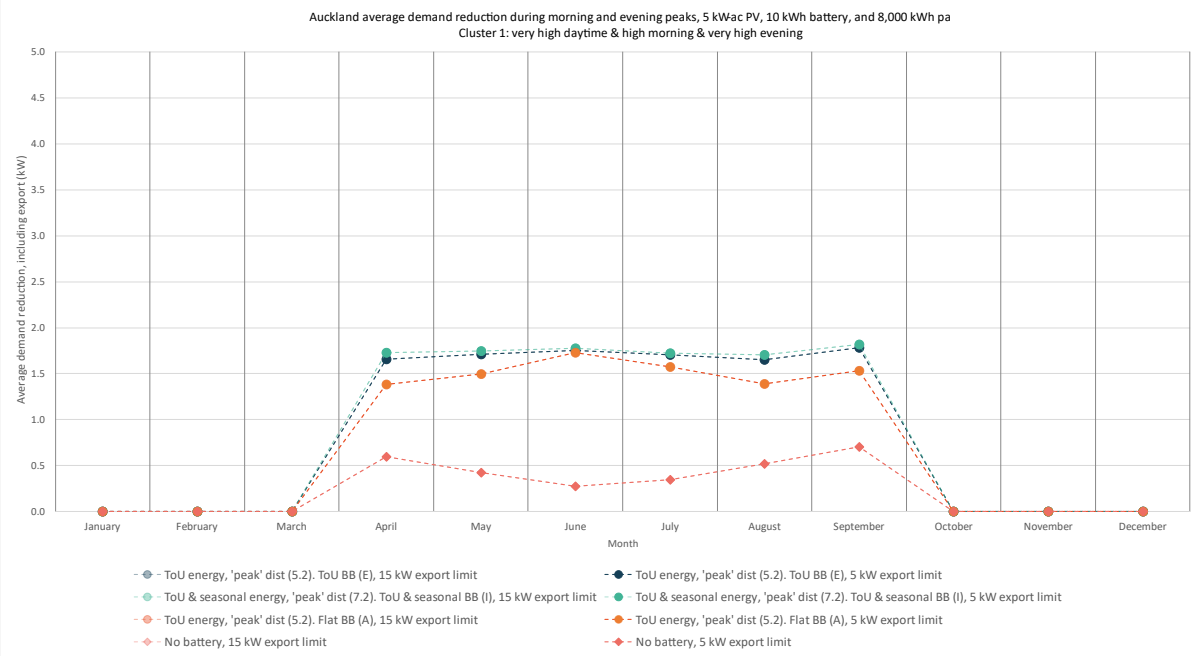
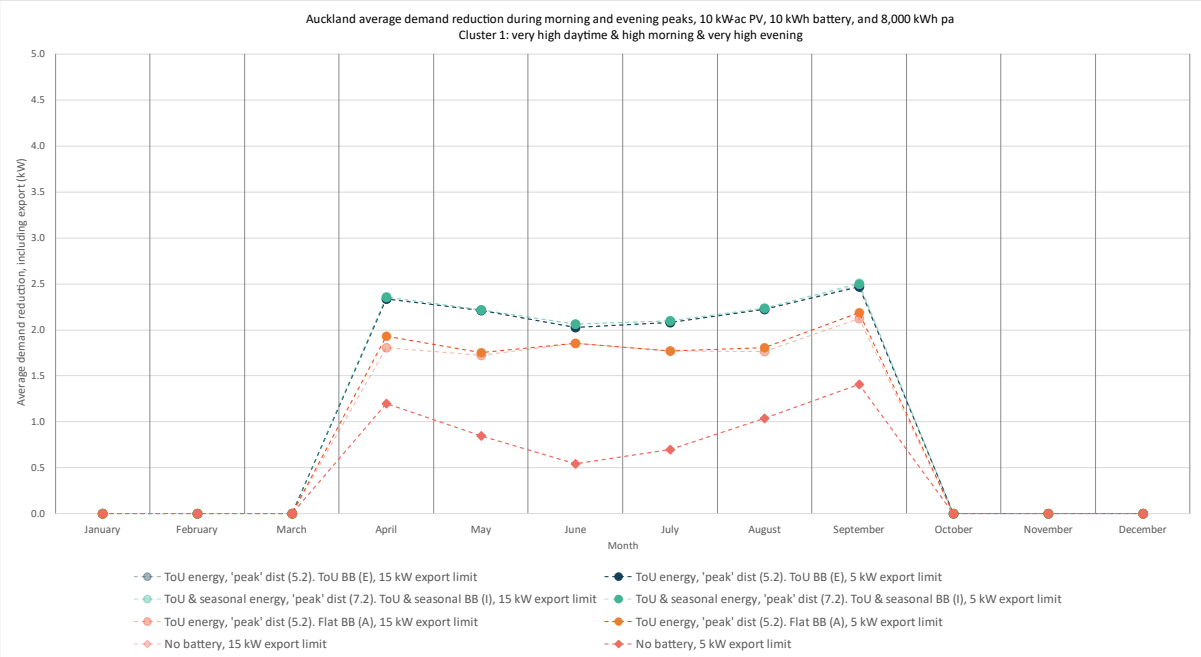


Figure 29: Queenstown energy exported during the electricity distributor peak periods with various retail and buyback prices.

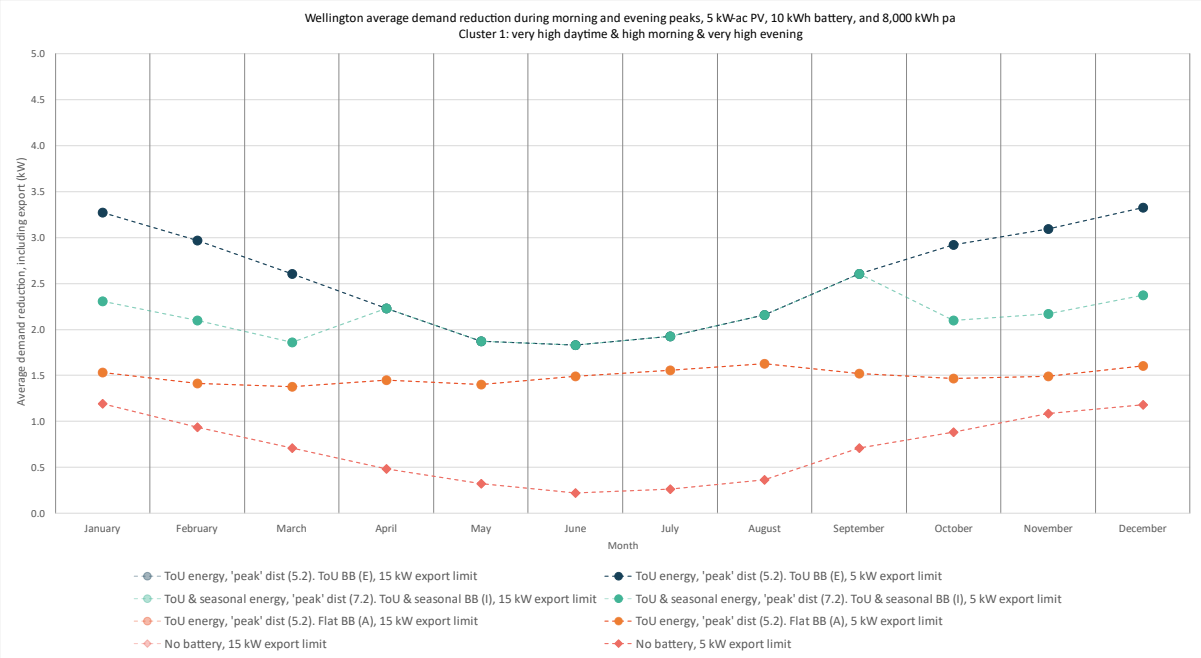


(a)

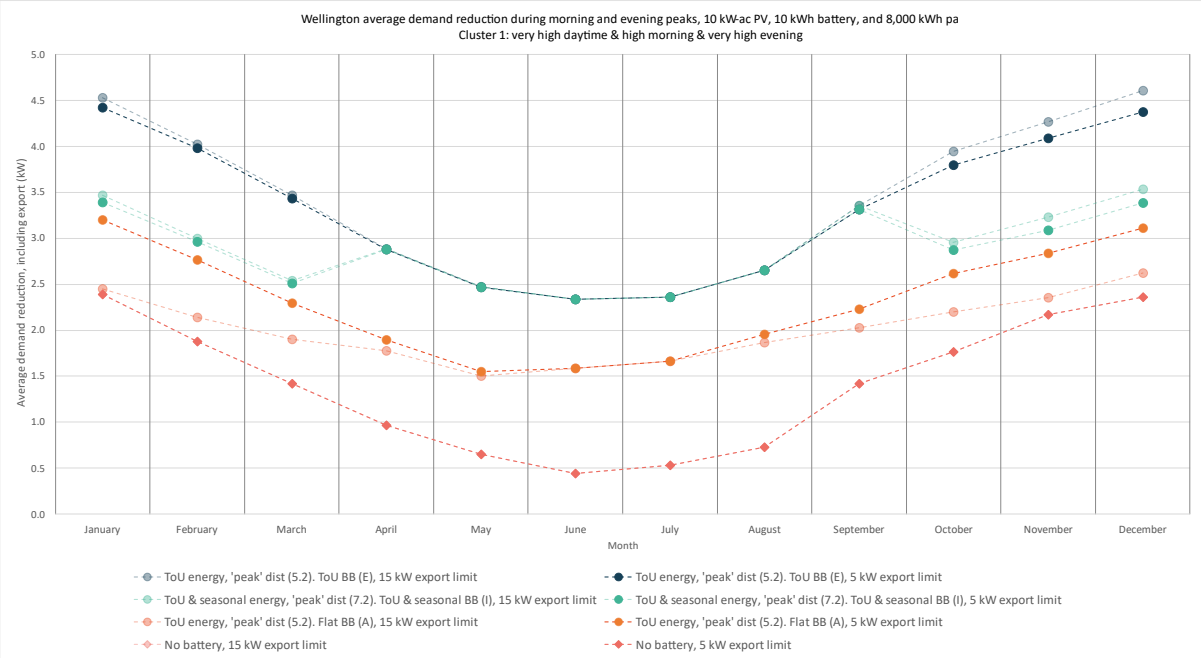


(b)

Figure 30: Auckland peak demand reduction with (a) 5 kW solar PV, where the 15 kW export limit points are directly below the 5 kW export limit points (lifting the export limit makes no difference because the inverter only produces a maximum of 5 kW, equal to the export limit), and (b) 10 kW solar PV. The summer months are shown as zero because the peak definition in Auckland is from April to September inclusive.

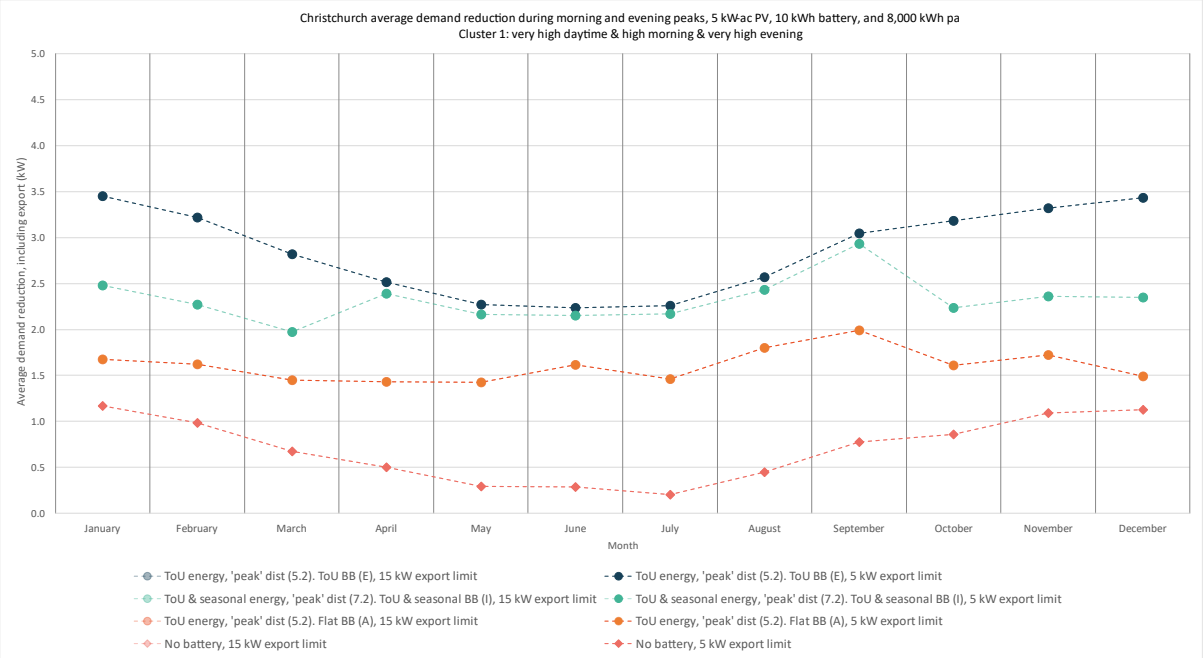


(a)



(b)

Figure 31: Wellington peak demand reduction with (a) 5 kW solar PV, where the 15 kW export limit points are directly below the 5 kW export limit points (lifting the export limit makes no difference because the inverter only produces a maximum of 5 kW, equal to the export limit), and (b) 10 kW solar PV.



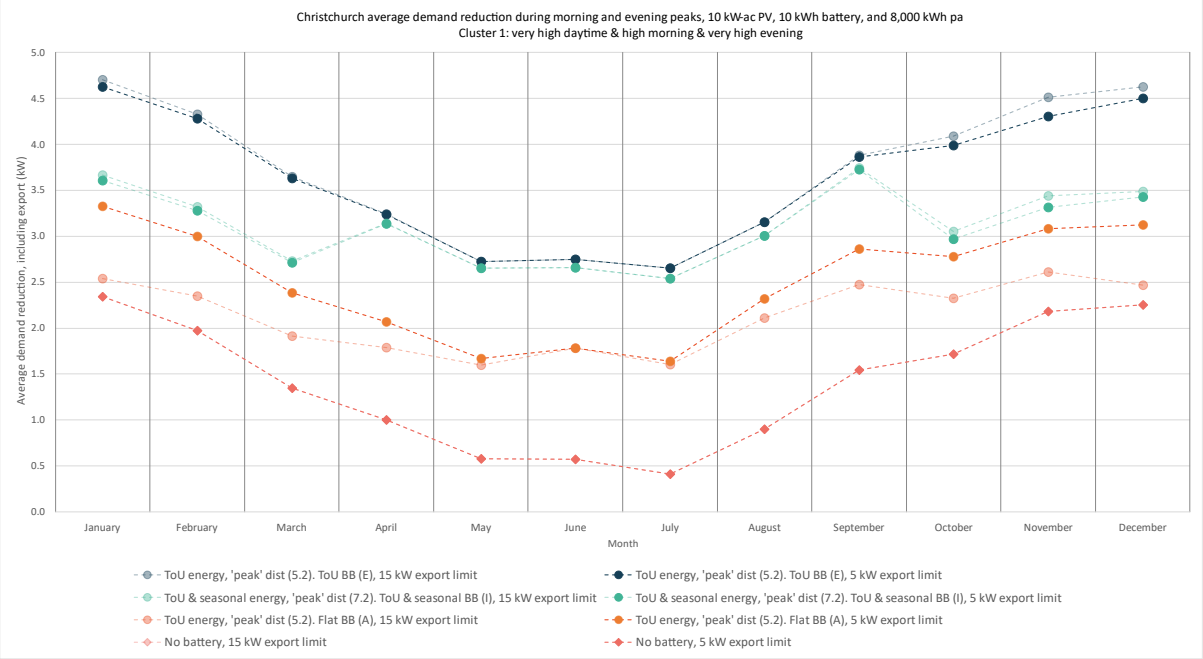
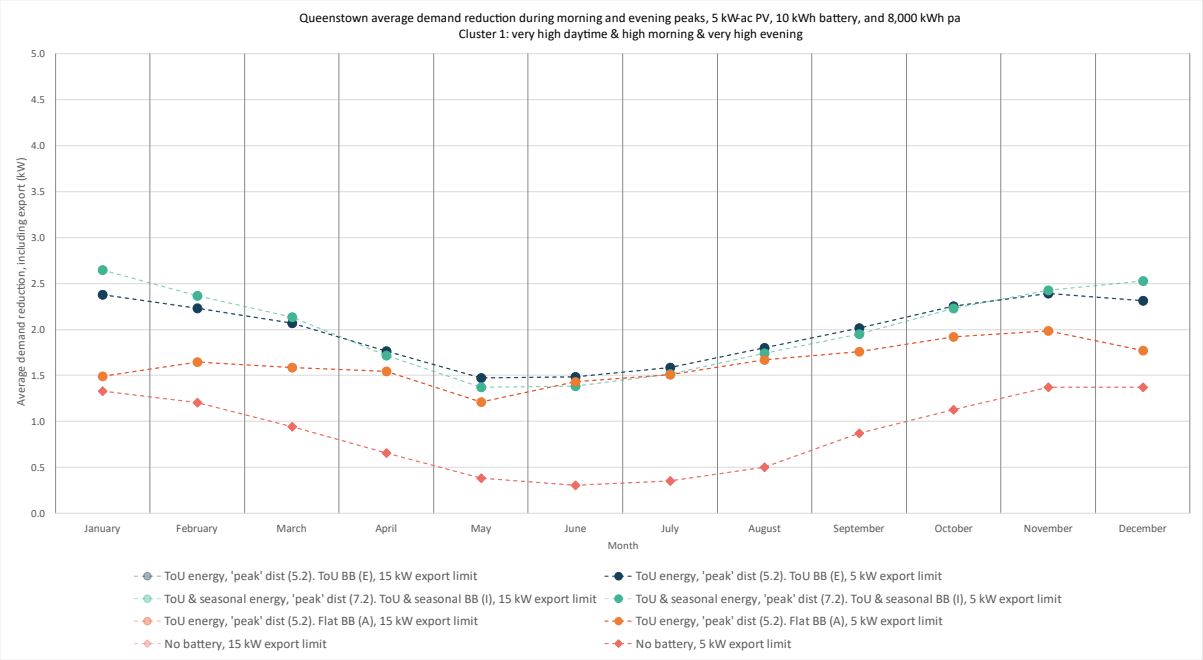
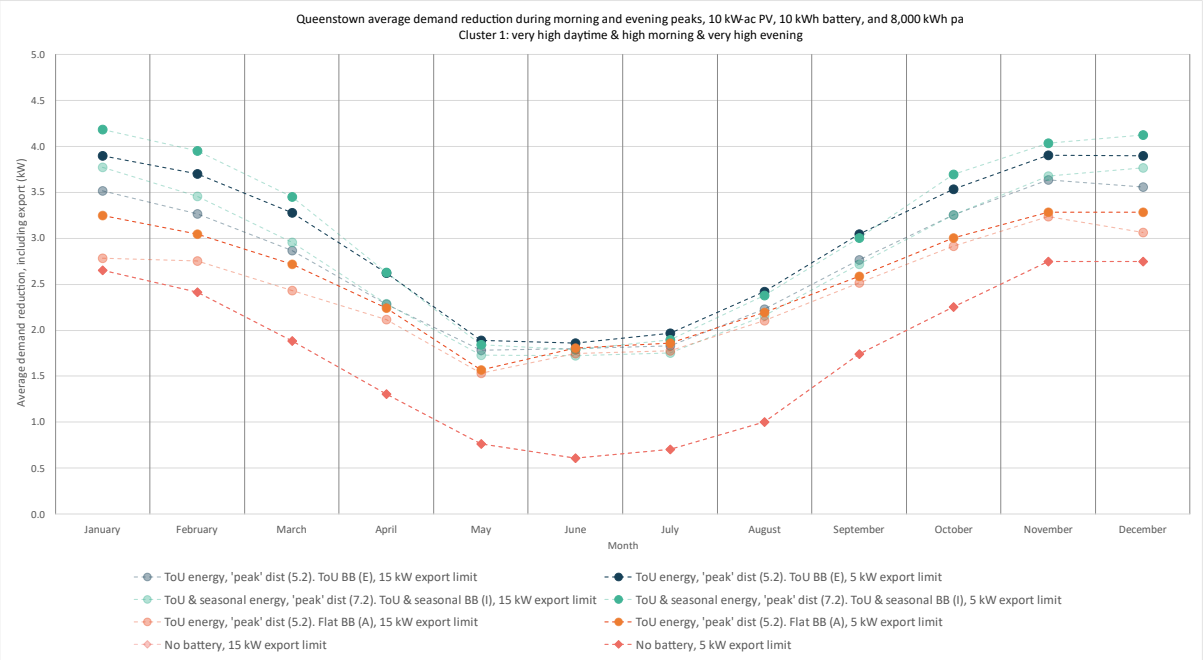


Figure 32: Christchurch peak demand reduction with (a) 5 kW solar PV, where the 15 kW export limit points are directly below the 5 kW export limit points (lifting the export limit makes no difference because the inverter only produces a maximum of 5 kW, equal to the export limit), and (b) 10 kW solar PV. This repeats the figures shown in the main report.



(a)



(b)

Figure 33: Queenstown peak demand reduction with (a) 5 kW solar PV, where the 15 kW export limit points are directly below the 5 kW export limit points (lifting the export limit makes no difference because the inverter only produces a maximum of 5 kW, equal to the export limit), and (b) 10 kW solar PV. The values are generally lower than other cities due to the longer peak period definition in the Queenstown network (5 hours compared to four hours).