



Wellington Network

Supplementary Information – Substation Load Characteristics

EECA

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Document History & Status

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Table of Contents

1. Executive Summary	3
2. Transmission/GXP Substations	4
3. Zone Substations	36
3.1 Electra	36
3.2 Powerco	43
3.3 Wellington Electricity	44

1. Executive Summary

The following figures illustrate the characteristics of the major electrical substations (both GXPs and Zone Substations) in the Wellington region. This document supplements the main report titled "*Wellington – Spare Capacity and Load Characteristics*".

For each GXP, the January 2023 through December 2023 apparent (MVA) and reactive loadings (MVAR) are presented. For each Zone Substation, the apparent power (MVA) or real power (MW) loadings only are presented. The data is presented in graphs of:

- The load profile for the entire year.
- The maximum and minimum loads for each of the 365 days.
- Load profiles for two weeks in summer and two weeks in winter.
- Typical daily summer and winter load profiles.
- A load duration curve for the entire year.

2. Transmission/GXP Substations

The characteristics of the transmission substation **apparent and reactive power loadings** are shown in the following:

- **Central Park 11 kV GXP:**
 - Figure 1. Central Park 11 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 2. Central Park 11 kV GXP: Reactive Power (MVar) load characteristics
- **Central Park 33 kV GXP:**
 - Figure 3. Central Park 33 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 4. Central Park 33 kV GXP: Reactive Power (MVar) load characteristics
- **Gracefield GXP:**
 - Figure 5. Gracefield GXP: Apparent Power (MVA) load characteristics
 - Figure 6. Gracefield GXP: Reactive Power (MVar) load characteristics
- **Greytown GXP:**
 - Figure 7. Greytown GXP: Apparent Power (MVA) load characteristics
 - Figure 8. Greytown GXP: Reactive Power (MVar) load characteristics
- **Haywards 11 kV GXP:**
 - Figure 9. Haywards 11 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 10. Haywards 11 kV GXP: Reactive Power (MVar) load characteristics
- **Haywards 33 kV GXP:**
 - Figure 11. Haywards 33 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 12. Haywards 33 kV GXP: Reactive Power (MVar) load characteristics
- **Kaiwharawhara GXP:**
 - Figure 13. Kaiwharawhara GXP: Apparent Power (MVA) load characteristics
 - Figure 14. Kaiwharawhara GXP: Reactive Power (MVar) load characteristics
- **Masterton GXP:**
 - Figure 15. Masterton GXP: Apparent Power (MVA) load characteristics
 - Figure 16. Masterton GXP: Reactive Power (MVar) load characteristics
- **Melling 11 kV GXP:**
 - Figure 17. Melling 11 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 18. Melling 11 kV GXP: Reactive Power (MVar) load characteristics
- **Melling 33 kV GXP:**
 - Figure 19. Melling 33 kV GXP: Apparent Power (MVA) load characteristics
 - Figure 20. Melling 33 kV GXP: Reactive Power (MVar) load characteristics
- **Paraparaumu GXP:**
 - Figure 21. Paraparaumu GXP: Apparent Power (MVA) load characteristics
 - Figure 22. Paraparaumu GXP: Reactive Power (MVar) load characteristics
- **Pāuatahanui GXP:**
 - Figure 23. Pāuatahanui GXP: Apparent Power (MVA) load characteristics
 - Figure 24. Pāuatahanui GXP: Reactive Power (MVar) load characteristics
- **Takapu Road GXP:**
 - Figure 25. Takapu Road GXP: Apparent Power (MVA) load characteristics
 - Figure 26. Takapu Road GXP: Reactive Power (MVar) load characteristics

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- **Upper Hutt GXP:**
 - Figure 27. Upper Hutt GXP: Apparent Power (MVA) load characteristics
 - Figure 28. Upper Hutt GXP: Reactive Power (MVar) load characteristics
 - **Wilton GXP:**
 - Figure 29. Wilton GXP: Apparent Power (MVA) load characteristics
 - Figure 30. Wilton GXP: Reactive Power (MVar) load characteristic

**Central Park
11 kV MVA**

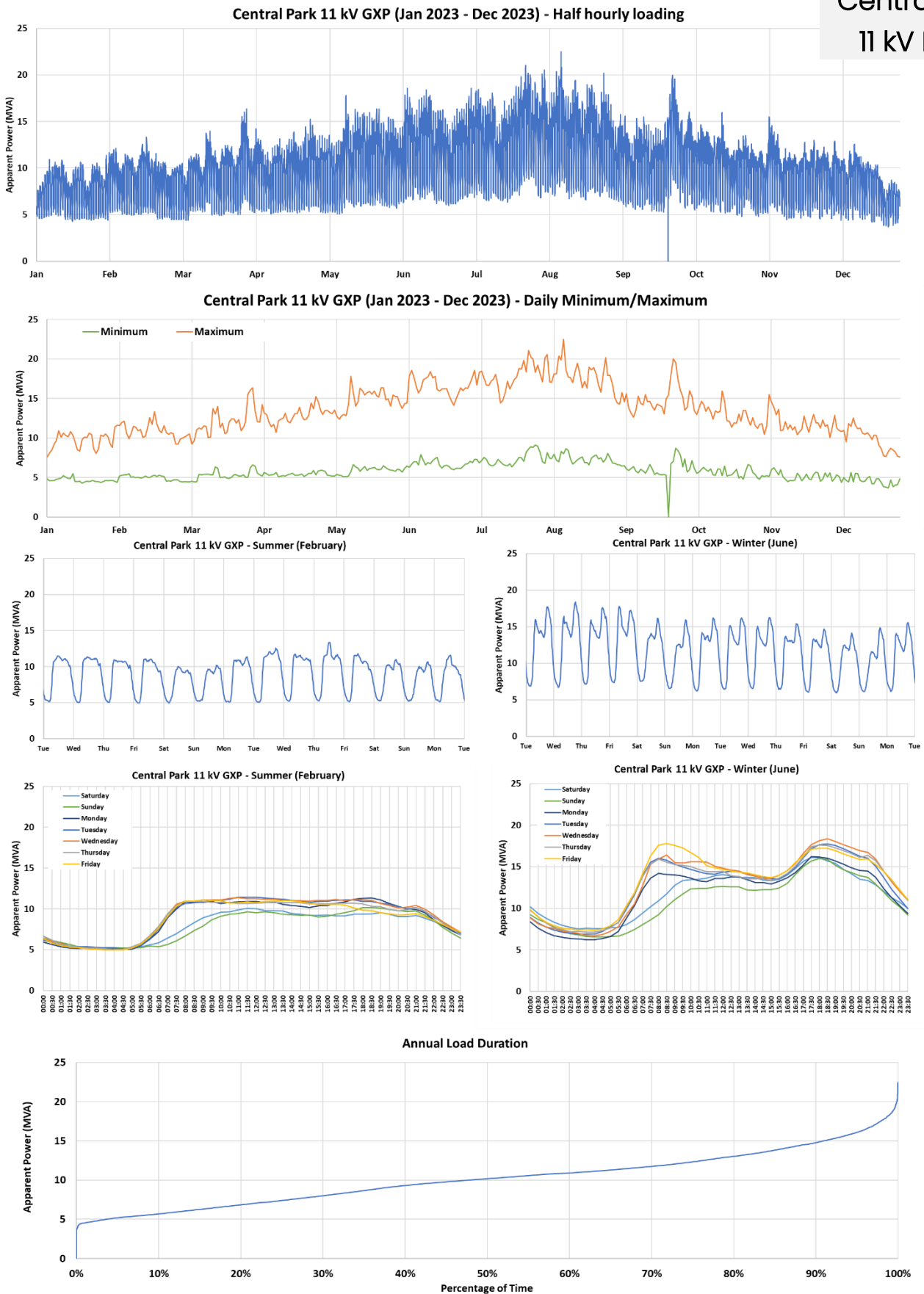


Figure 1. Central Park 11 kV GXP: Apparent Power (MVA) load characteristics

**Central Park
11 kV MVar**

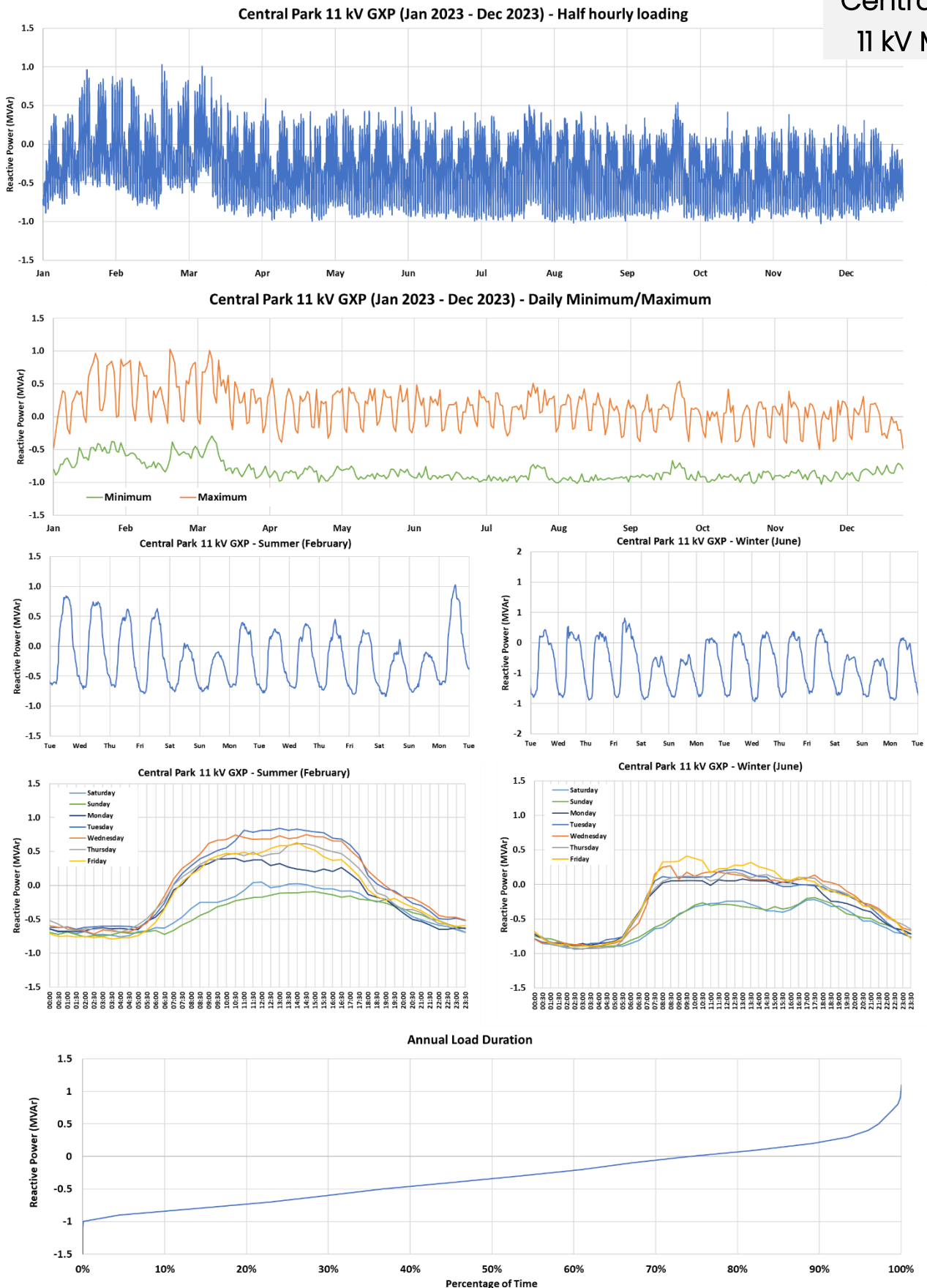


Figure 2. Central Park 11 kV GXP: Reactive Power (MVar) load characteristics

**Central Park
33 kV MVA**

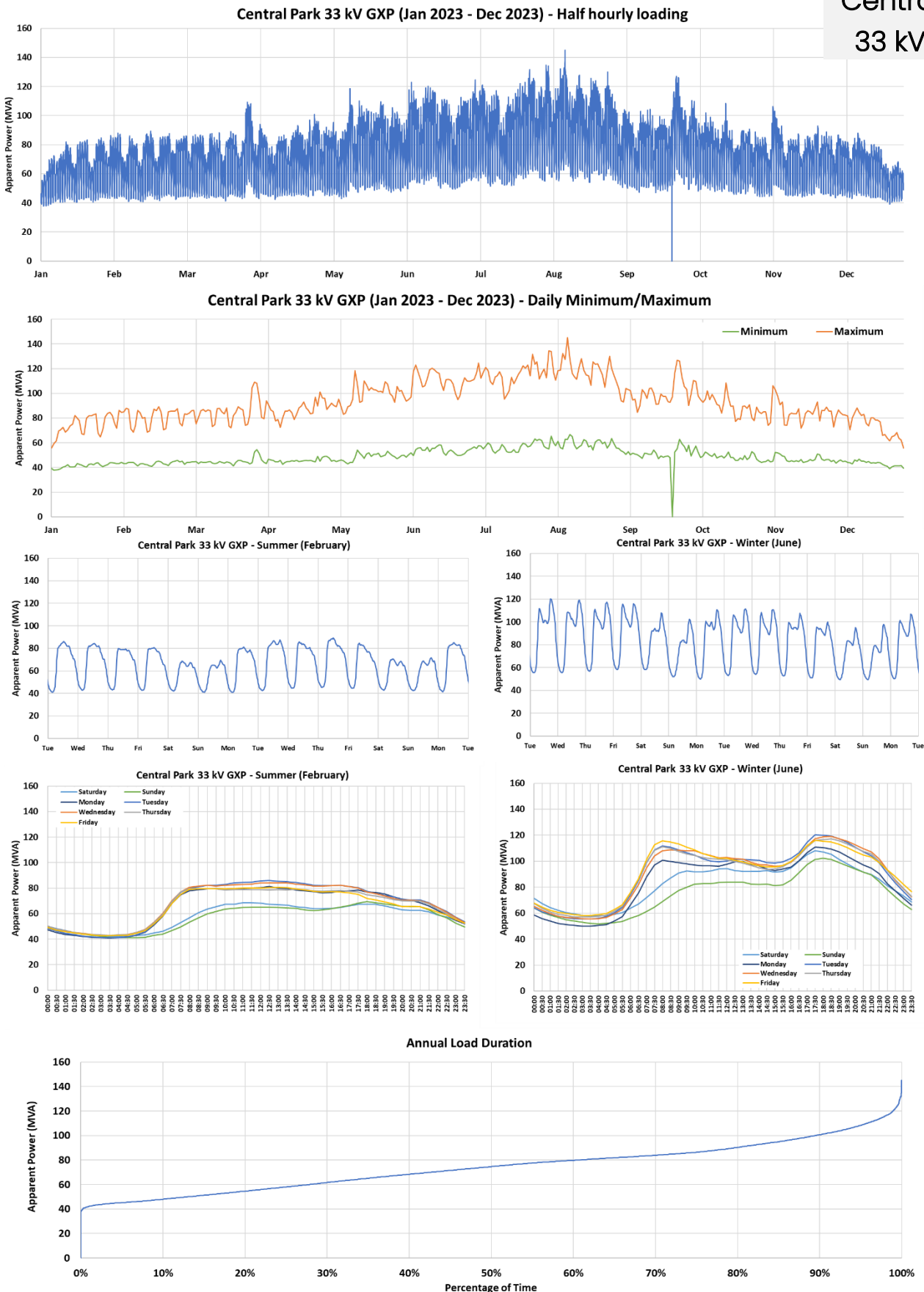


Figure 3. Central Park 33 kV GXP: Apparent Power (MVA) load characteristics

**Central Park
33 kV MVar**

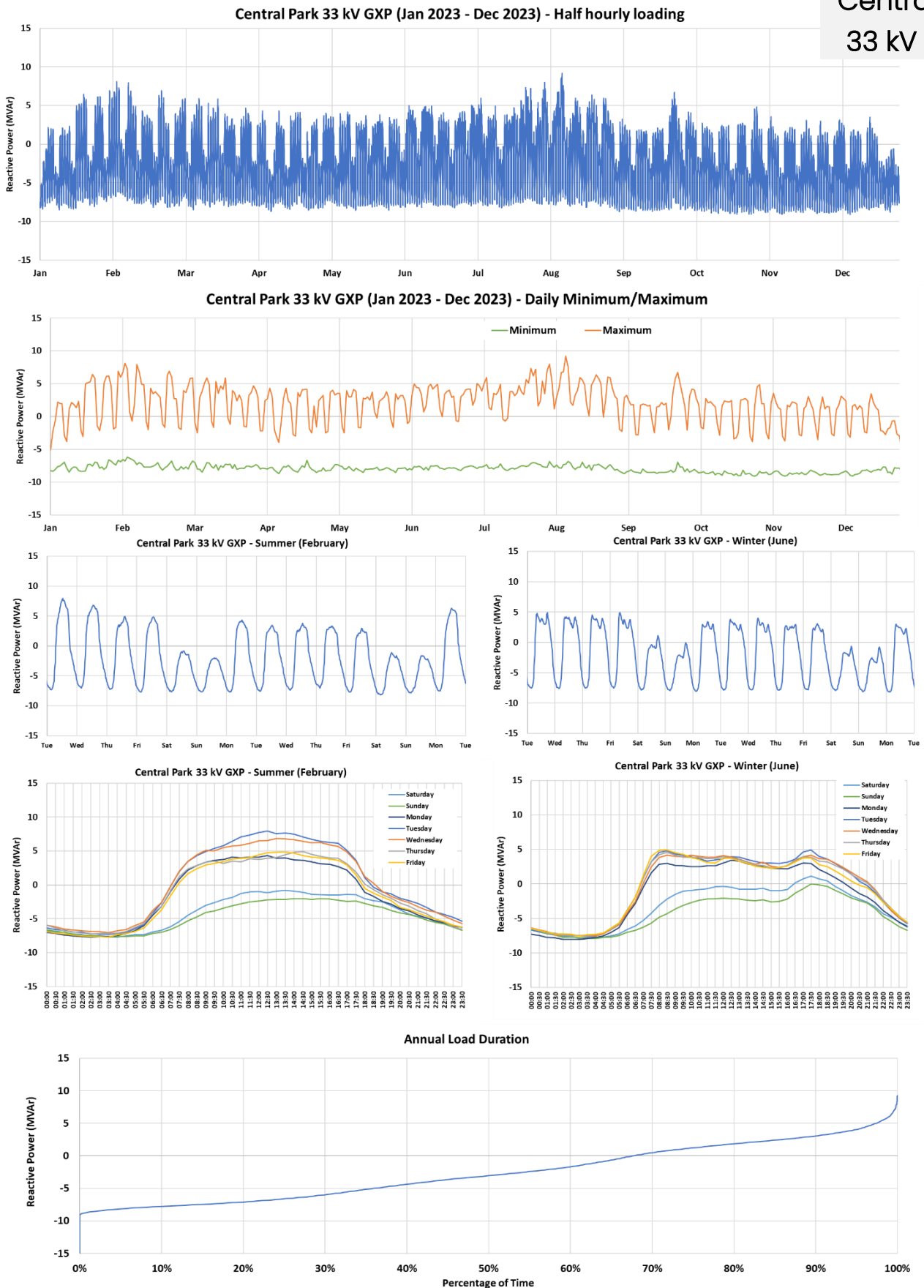


Figure 4. Central Park 33 kV GXP: Reactive Power (MVar) load characteristics

Gracefield MVA

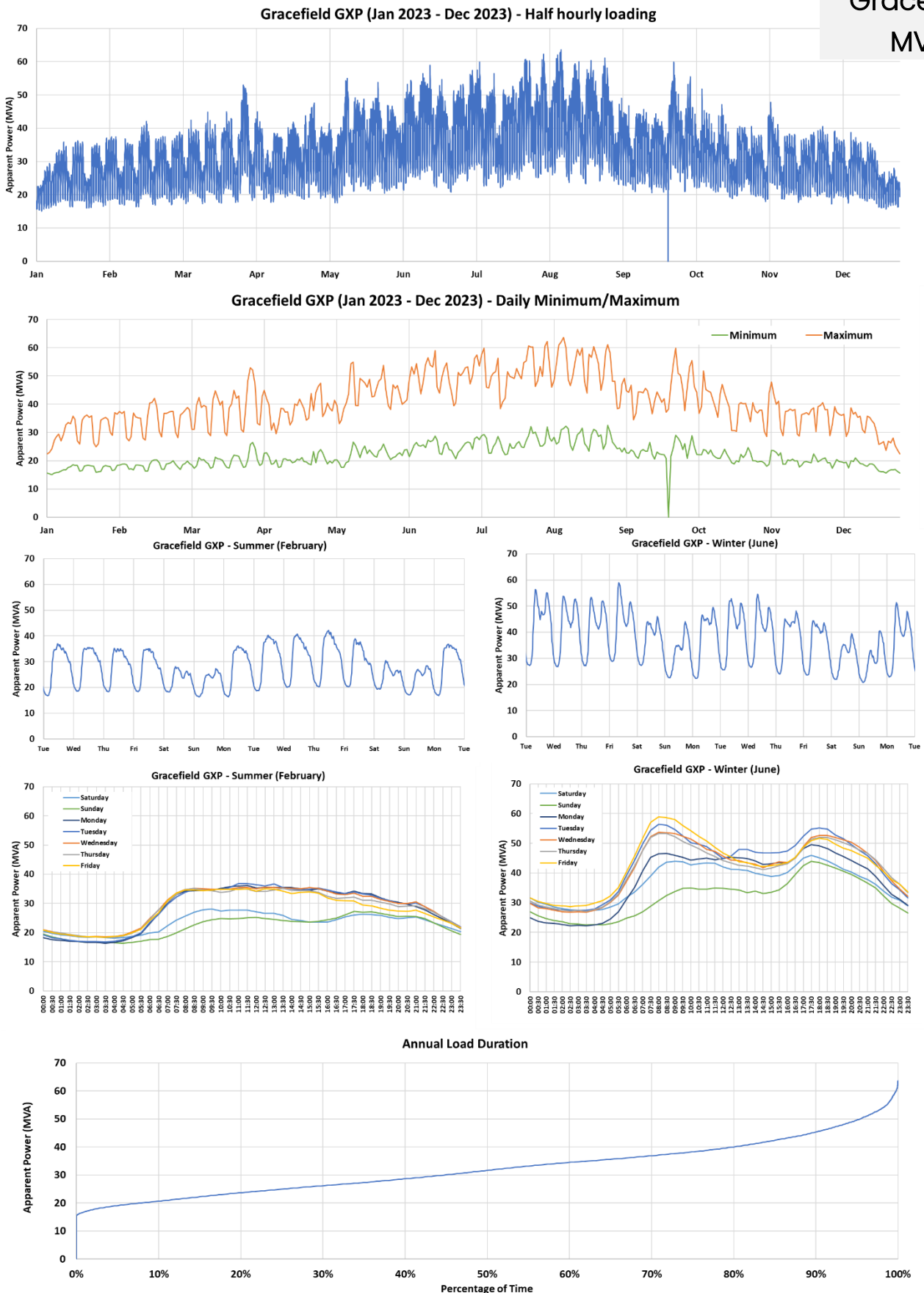


Figure 5. Gracefield GXP: Apparent Power (MVA) load characteristics

Gracefield MVar

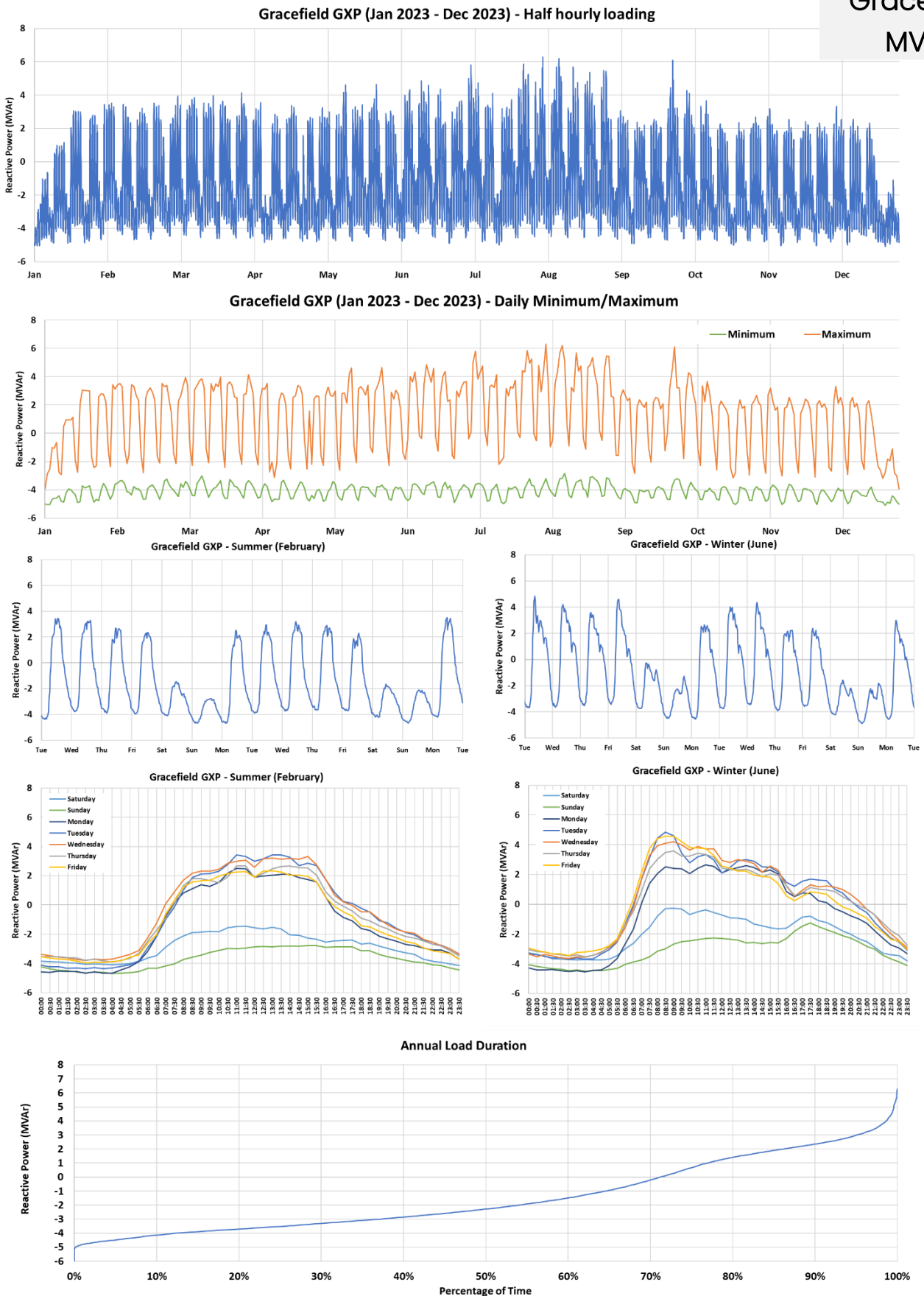


Figure 6. Gracefield GXP: Reactive Power (MVar) load characteristics

Greytown MVA

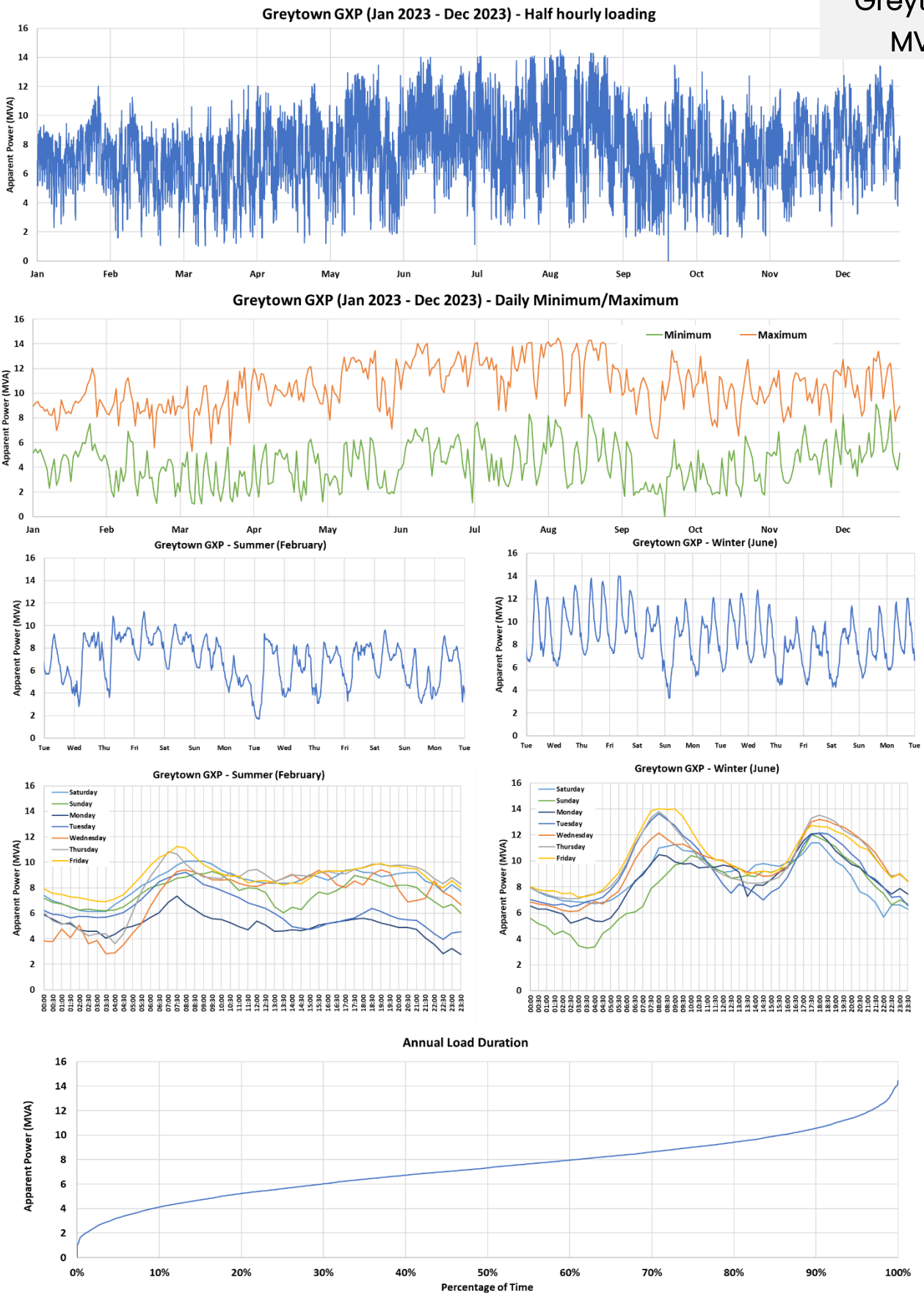


Figure 7. Greytown GXP: Apparent Power (MVA) load characteristics

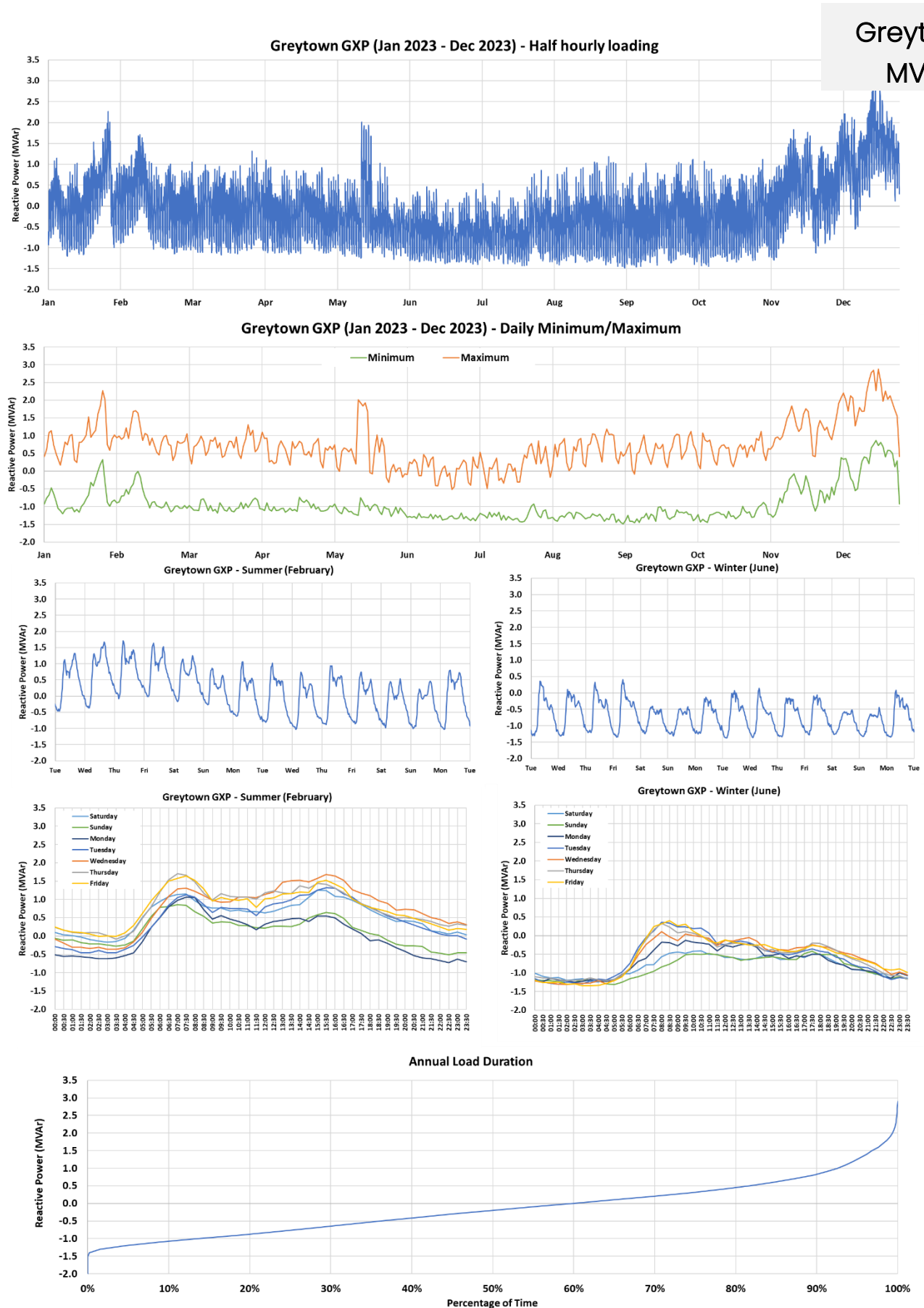


Figure 8. Greytown GXP: Reactive Power (MVar) load characteristics

Haywards 11 kV MVA

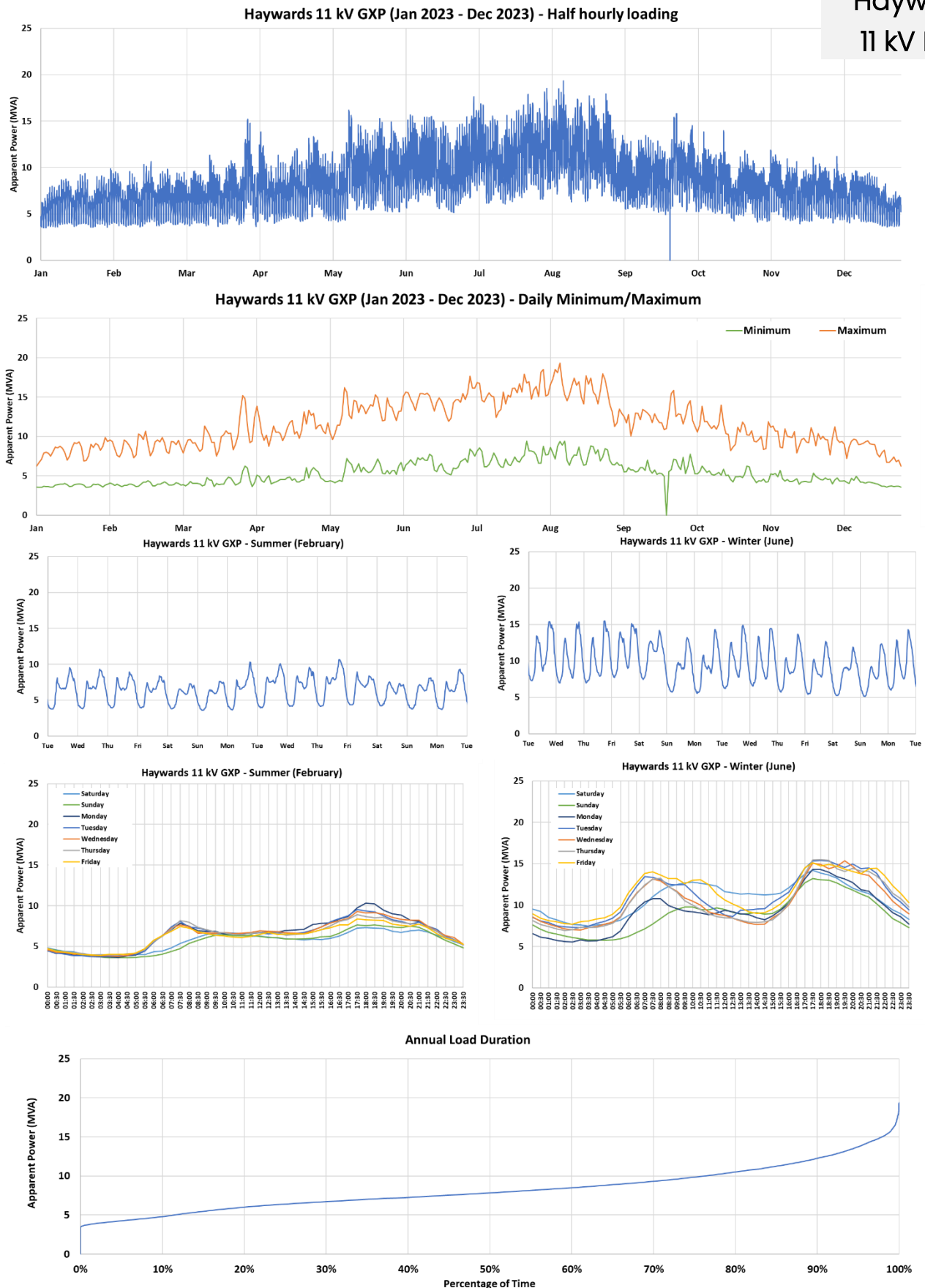


Figure 9. Haywards 11 kV GXP: Apparent Power (MVA) load characteristics

Haywards 11 kV MVar

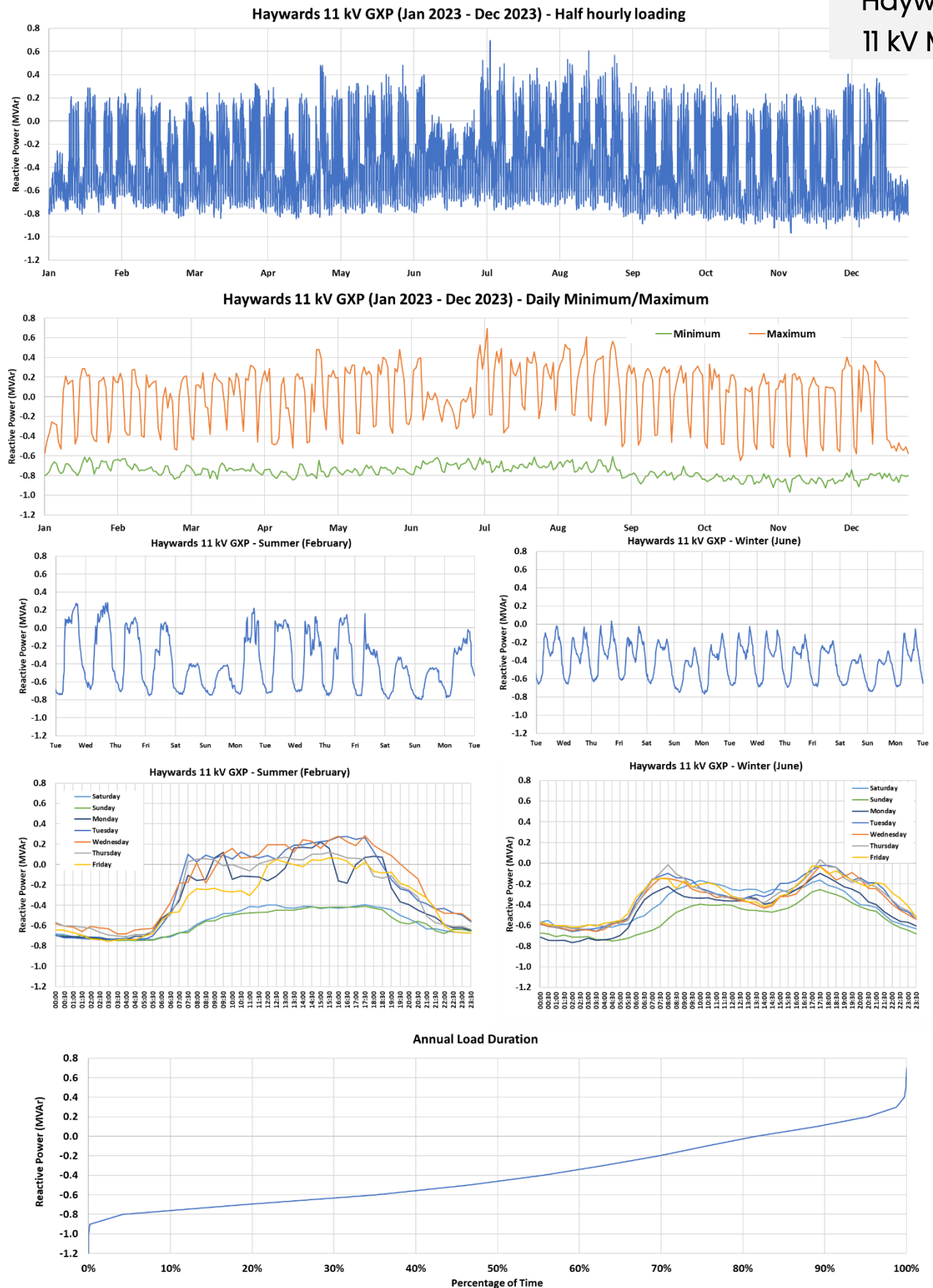


Figure 10. Haywards 11 kV GXP: Reactive Power (MVar) load characteristics

Haywards 33 kV MVA

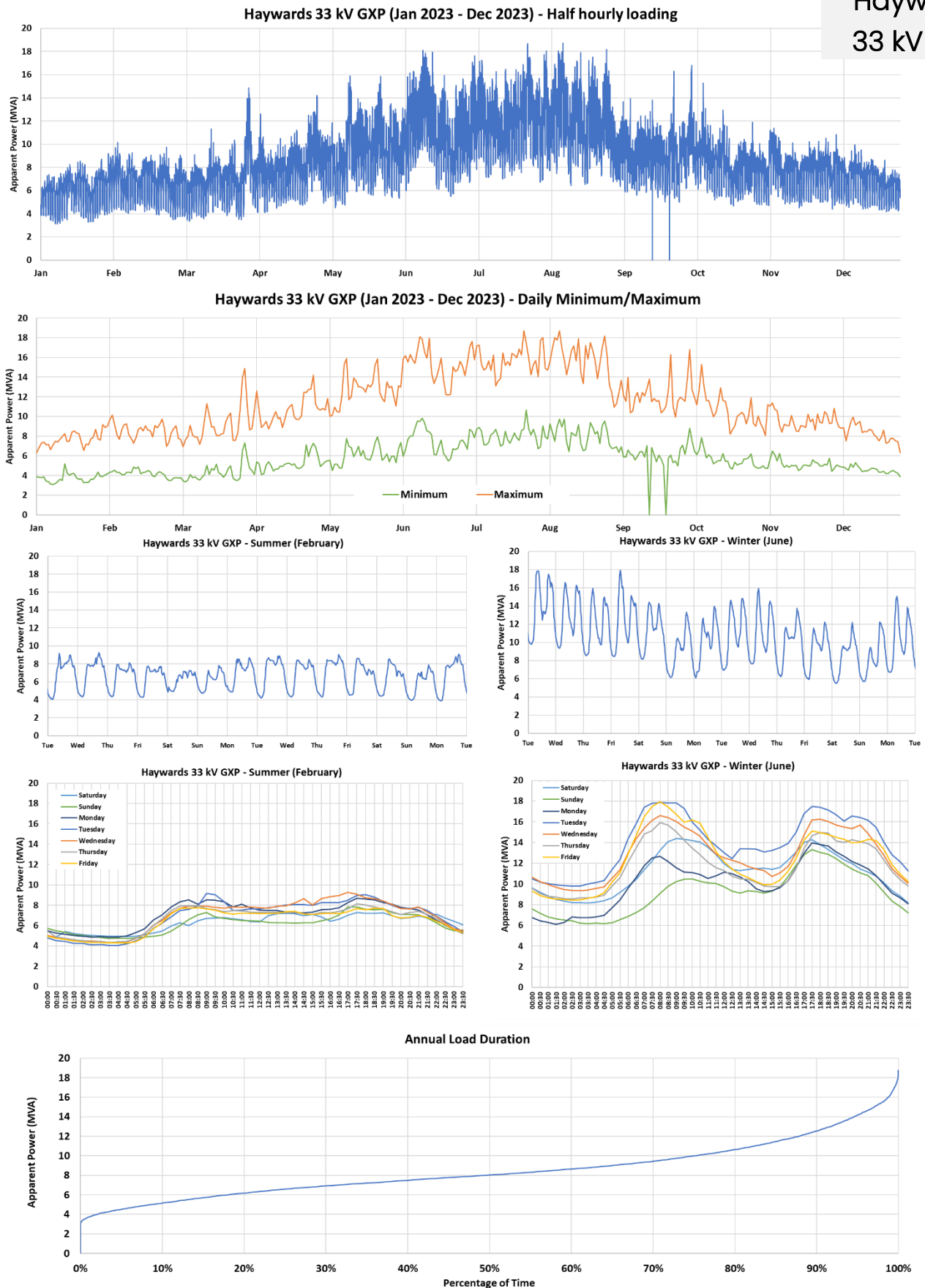


Figure 11. Haywards 33 kV GXP: Apparent Power (MVA) load characteristics

Haywards 33 kV MVar

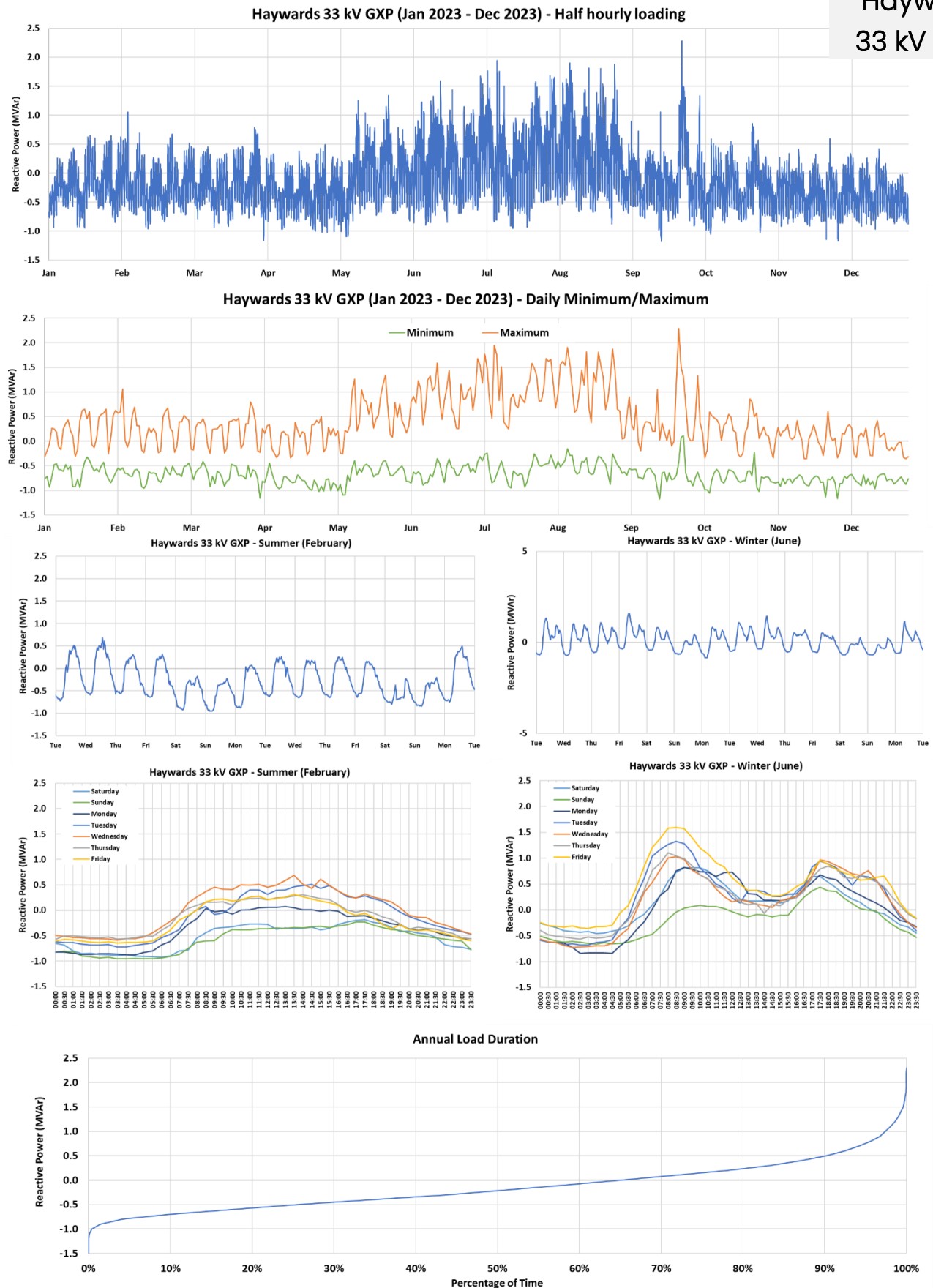


Figure 12. Haywards 33 kV GXP: Reactive Power (MVar) load characteristics

Kaiwharawhara MVA

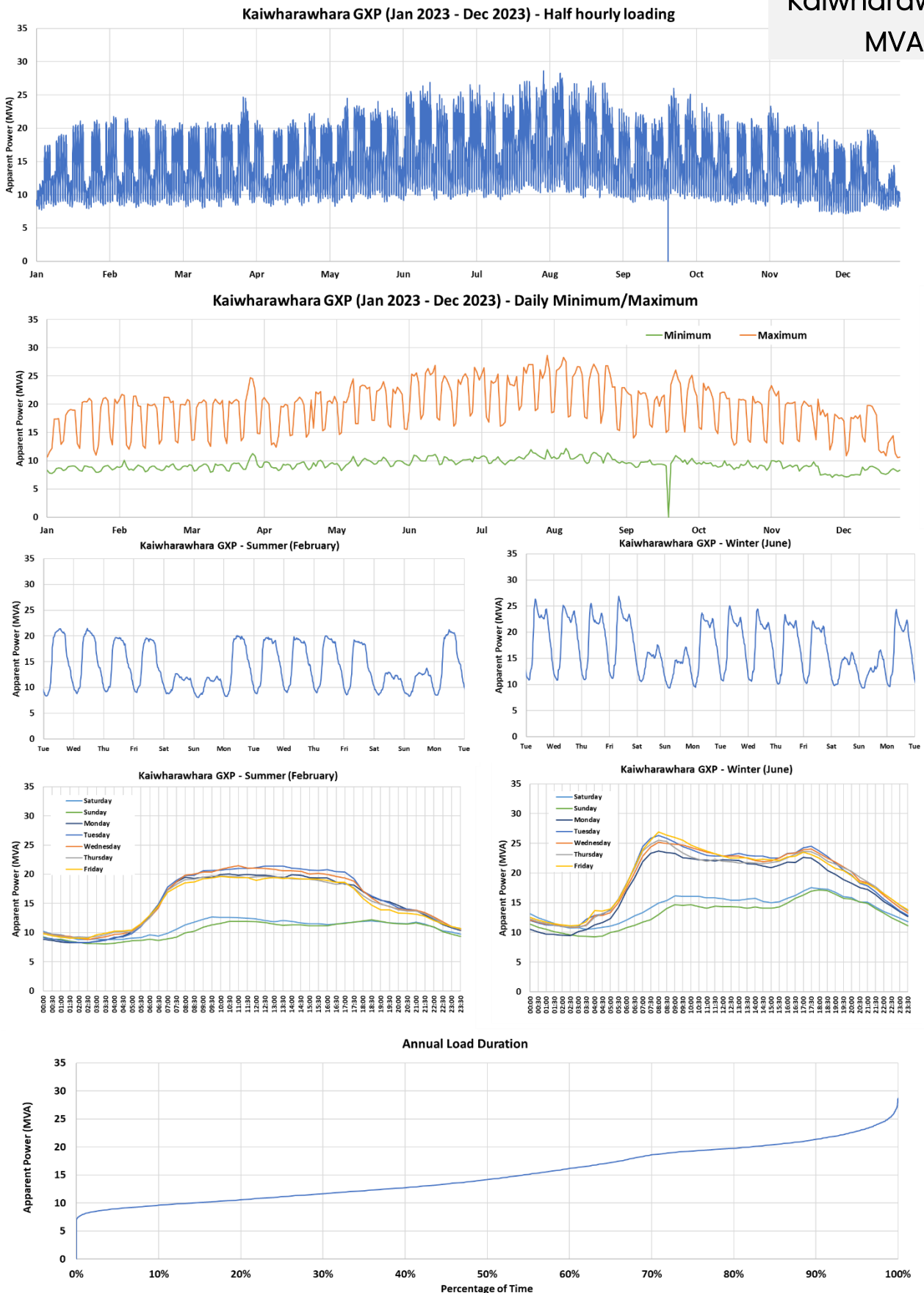


Figure 13. Kaiwharawhara GXP: Apparent Power (MVA) load characteristics

Kaiwharawhara MVar

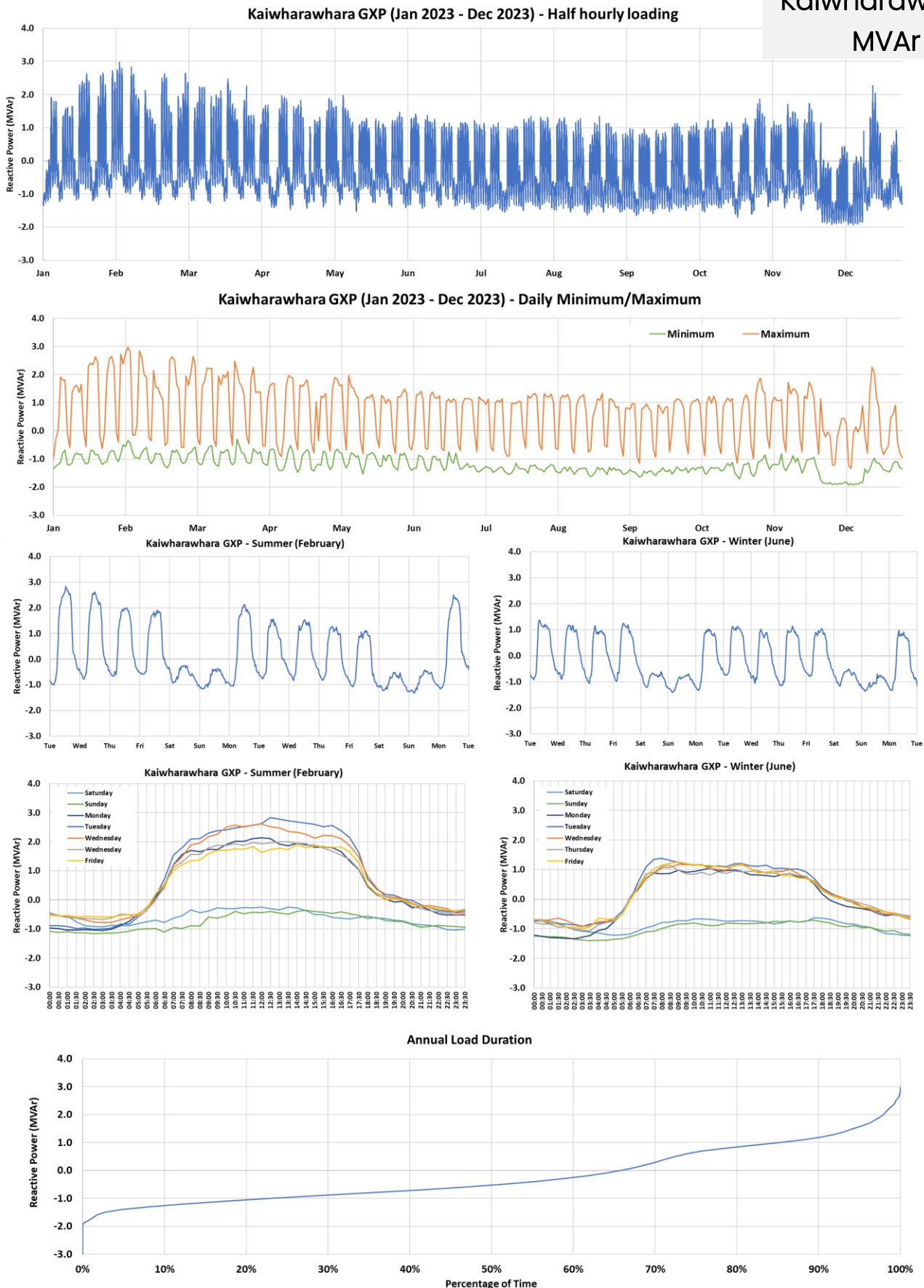


Figure 14. Kaiwharawhara GXP: Reactive Power (MVar) load characteristics

Masterton MVA

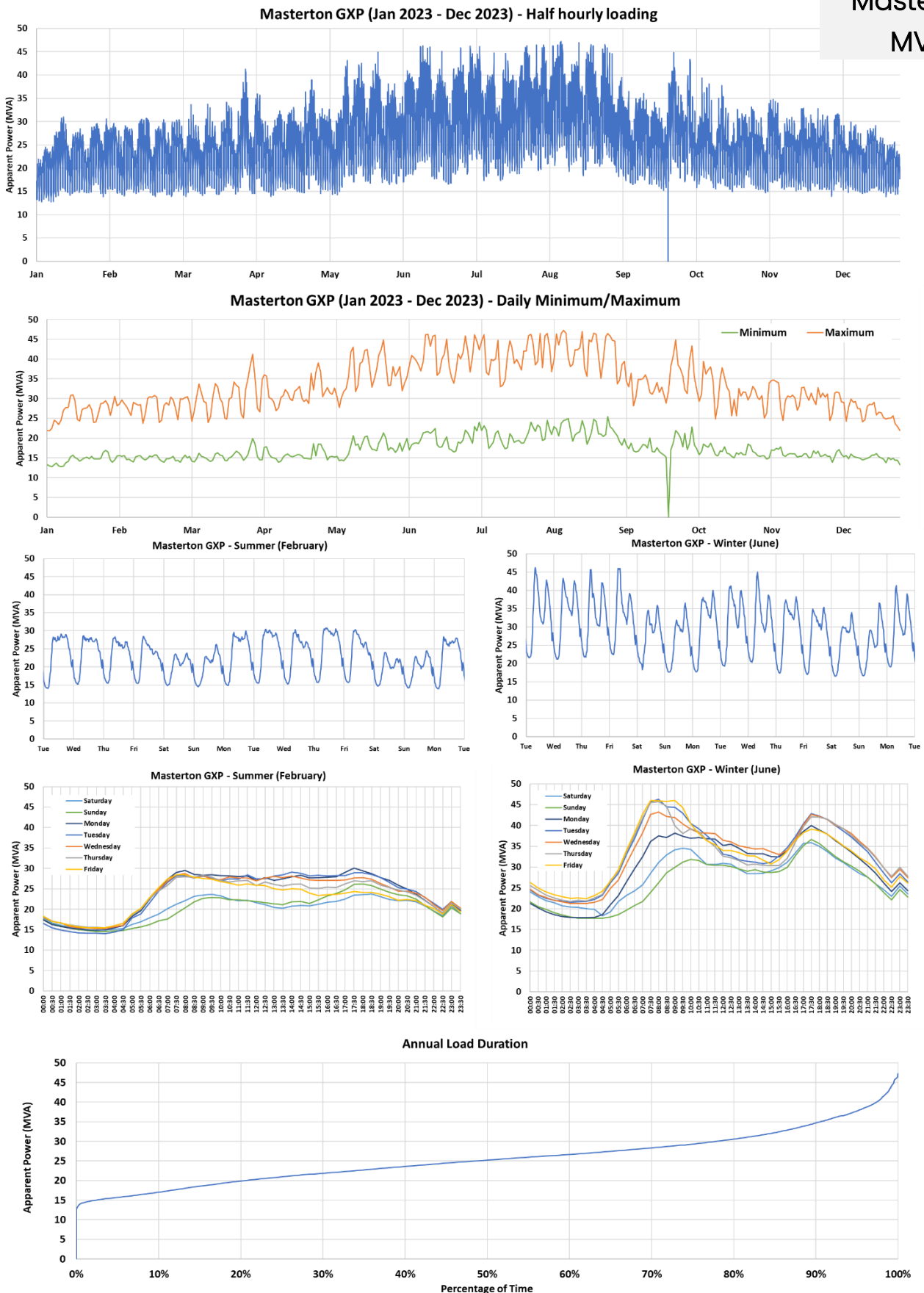


Figure 15. Masterton GXP: Apparent Power (MVA) load characteristics

Masterton MVar

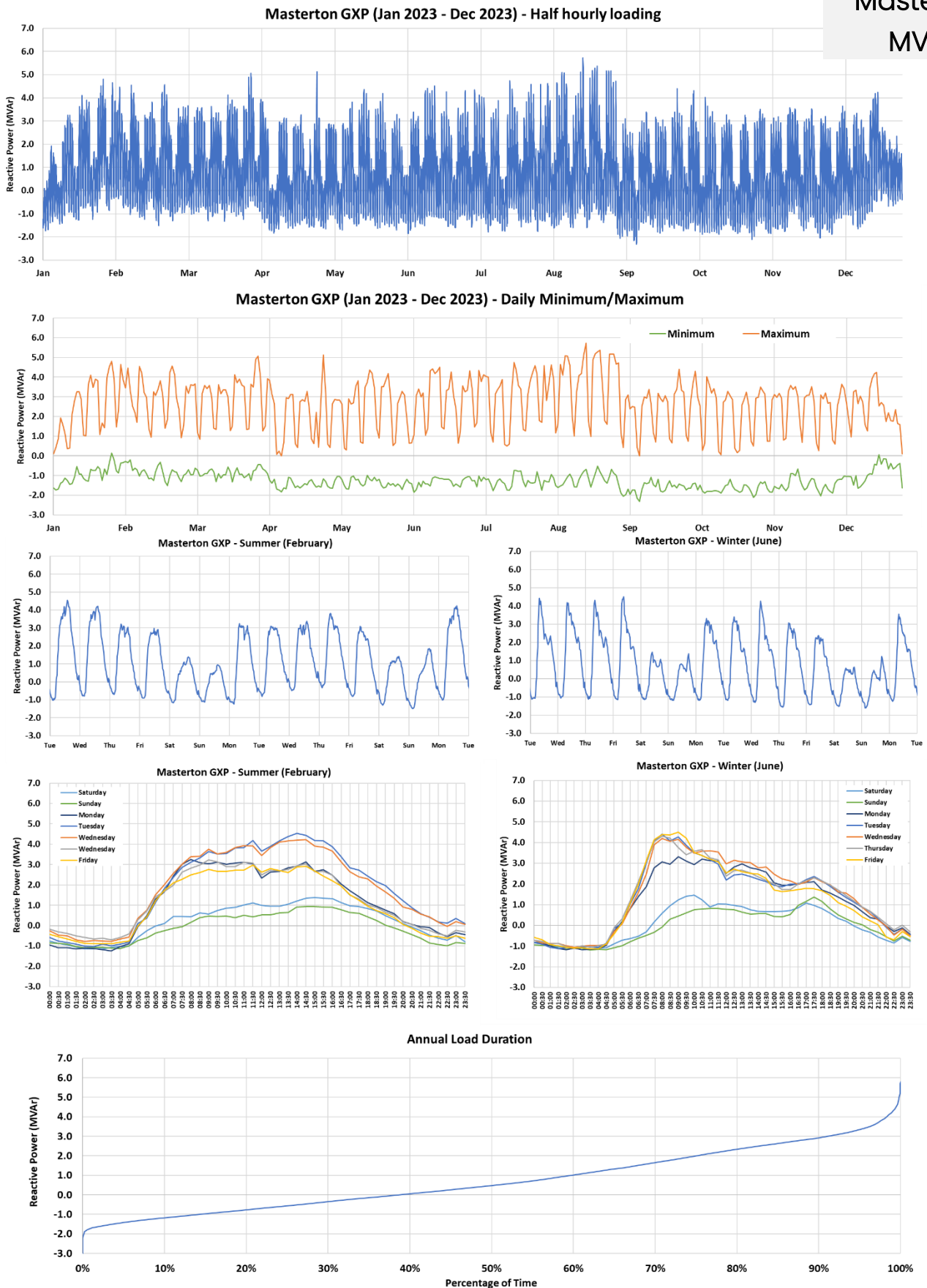


Figure 16. Masterton GXP: Reactive Power (MVar) load characteristics

Melling 11 kV MVA

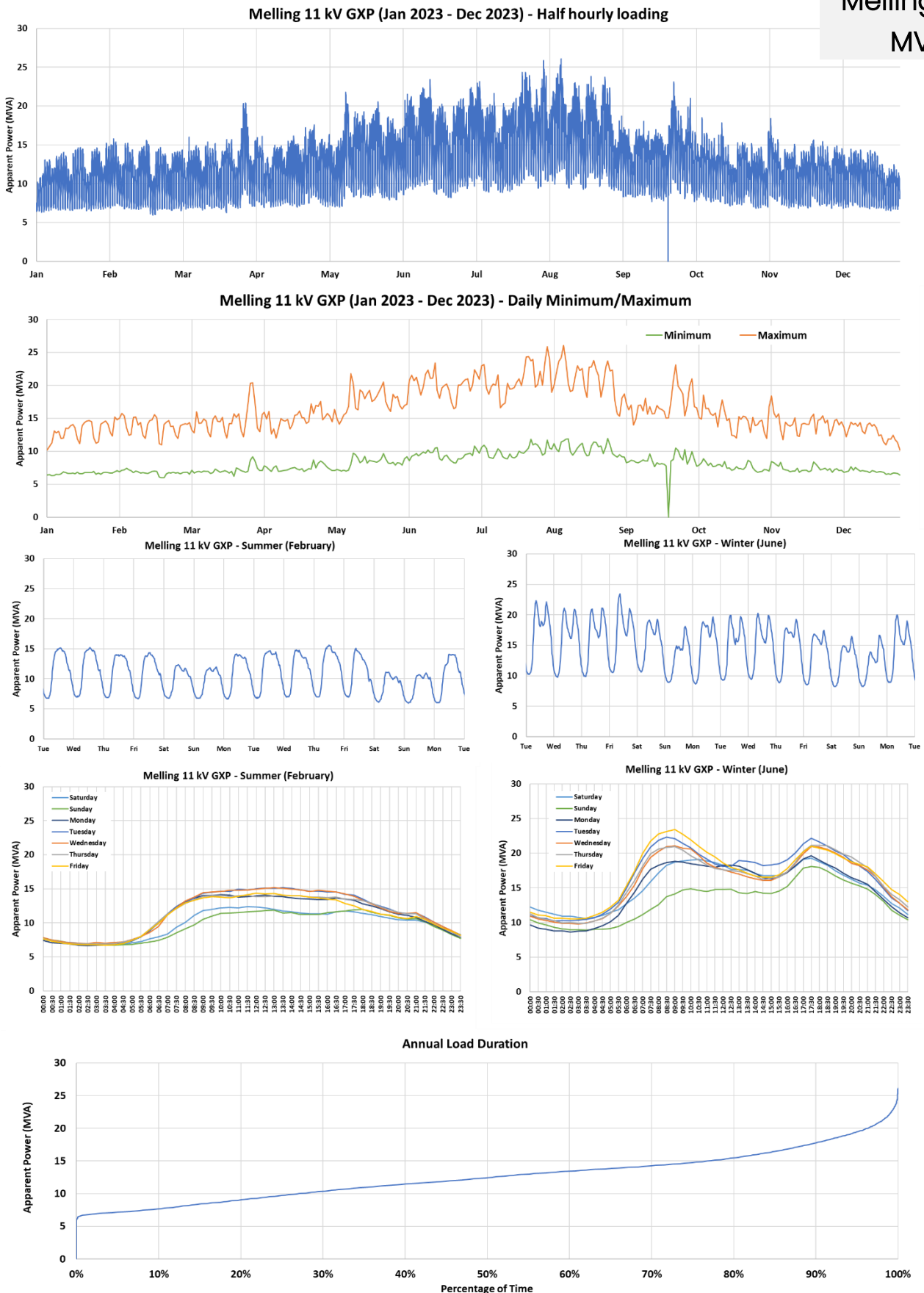


Figure 17. Melling 11 kV GXP: Apparent Power (MVA) load characteristics

Melling 11 kV MVar

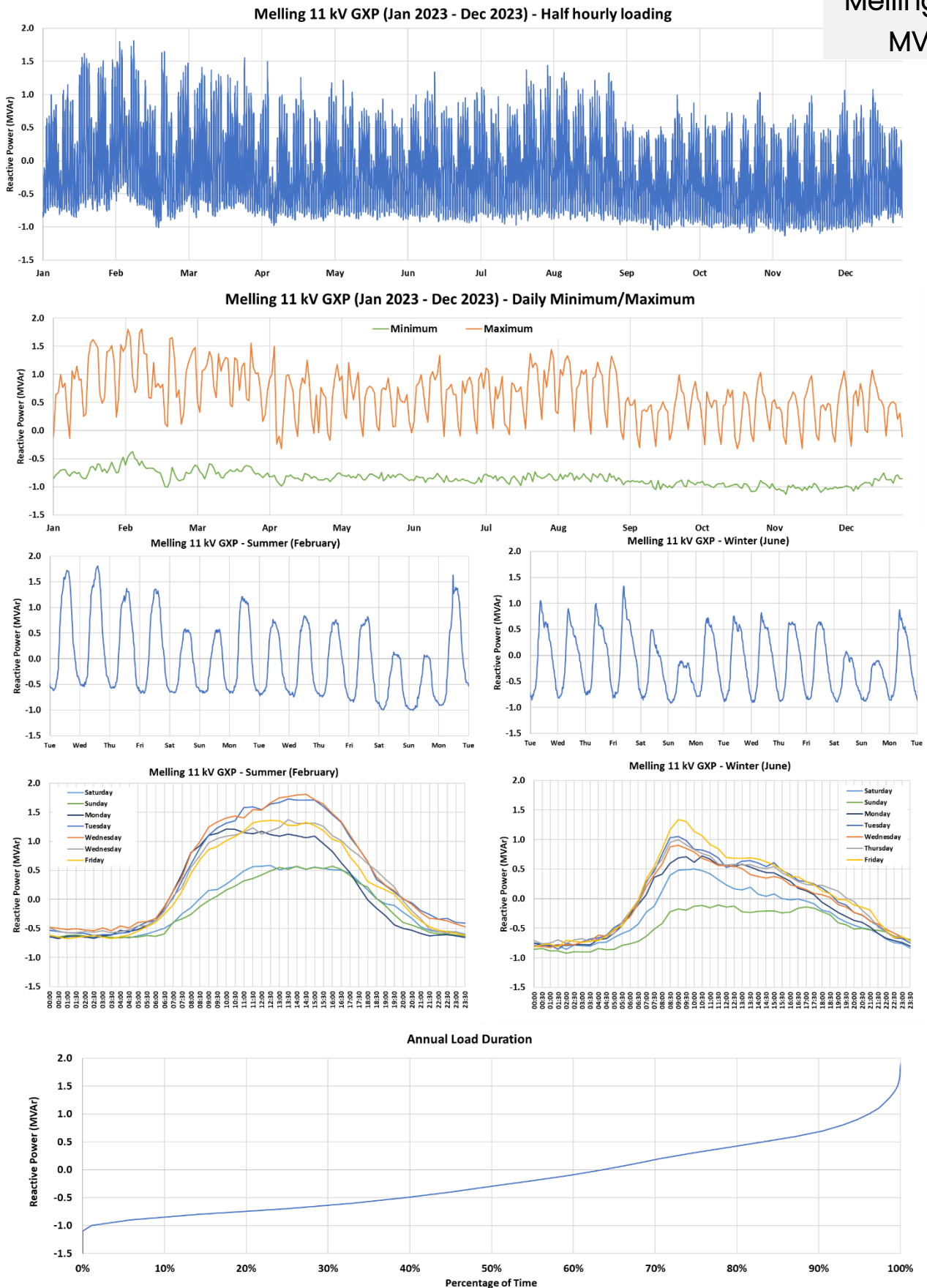


Figure 18. Melling 11 kV GXP: Reactive Power (MVar) load characteristics

**Melling
33 kV MVA**

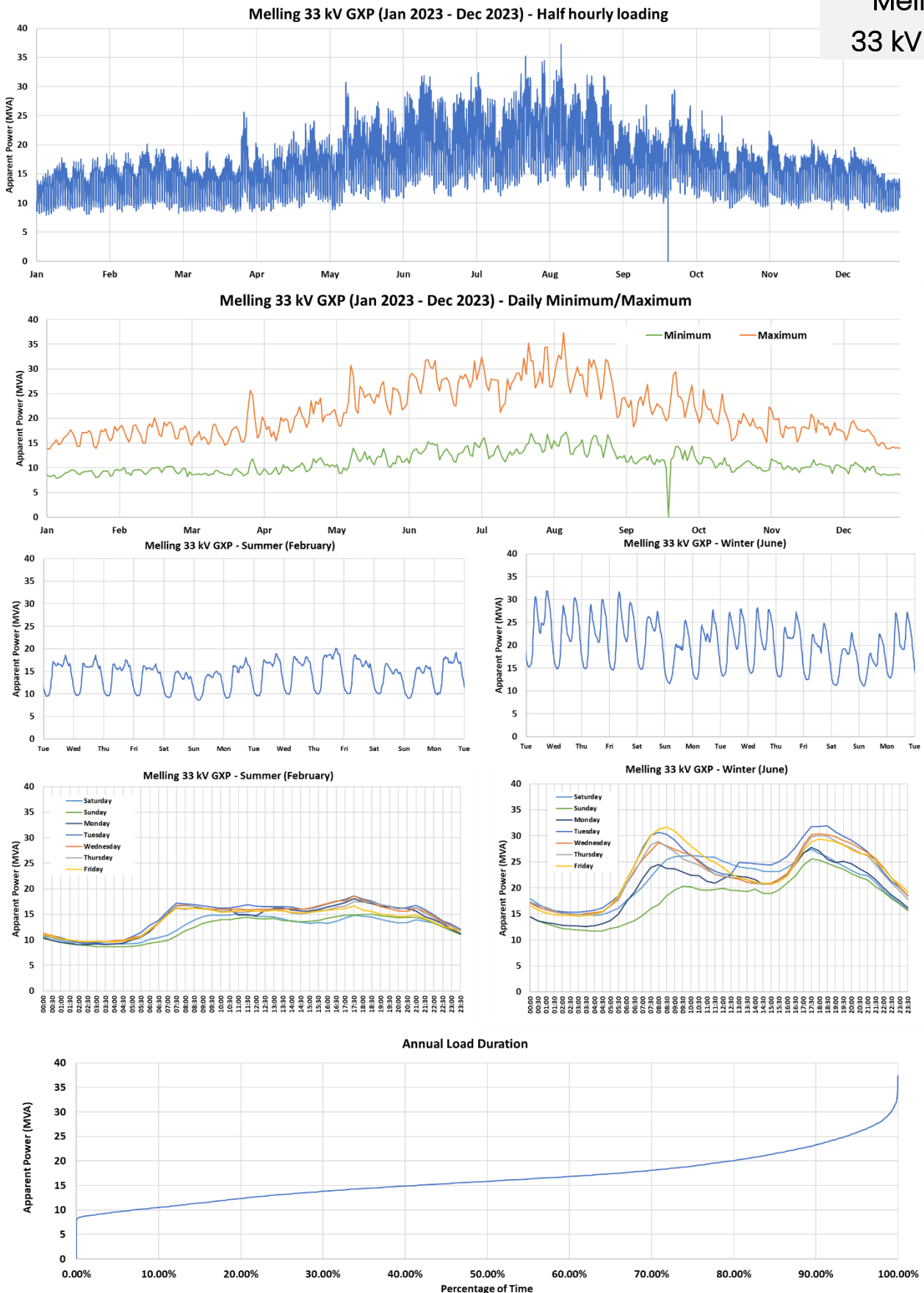


Figure 19. Melling 33 kV GXP: Apparent Power (MVA) load characteristics

Melling 33 kV MVar

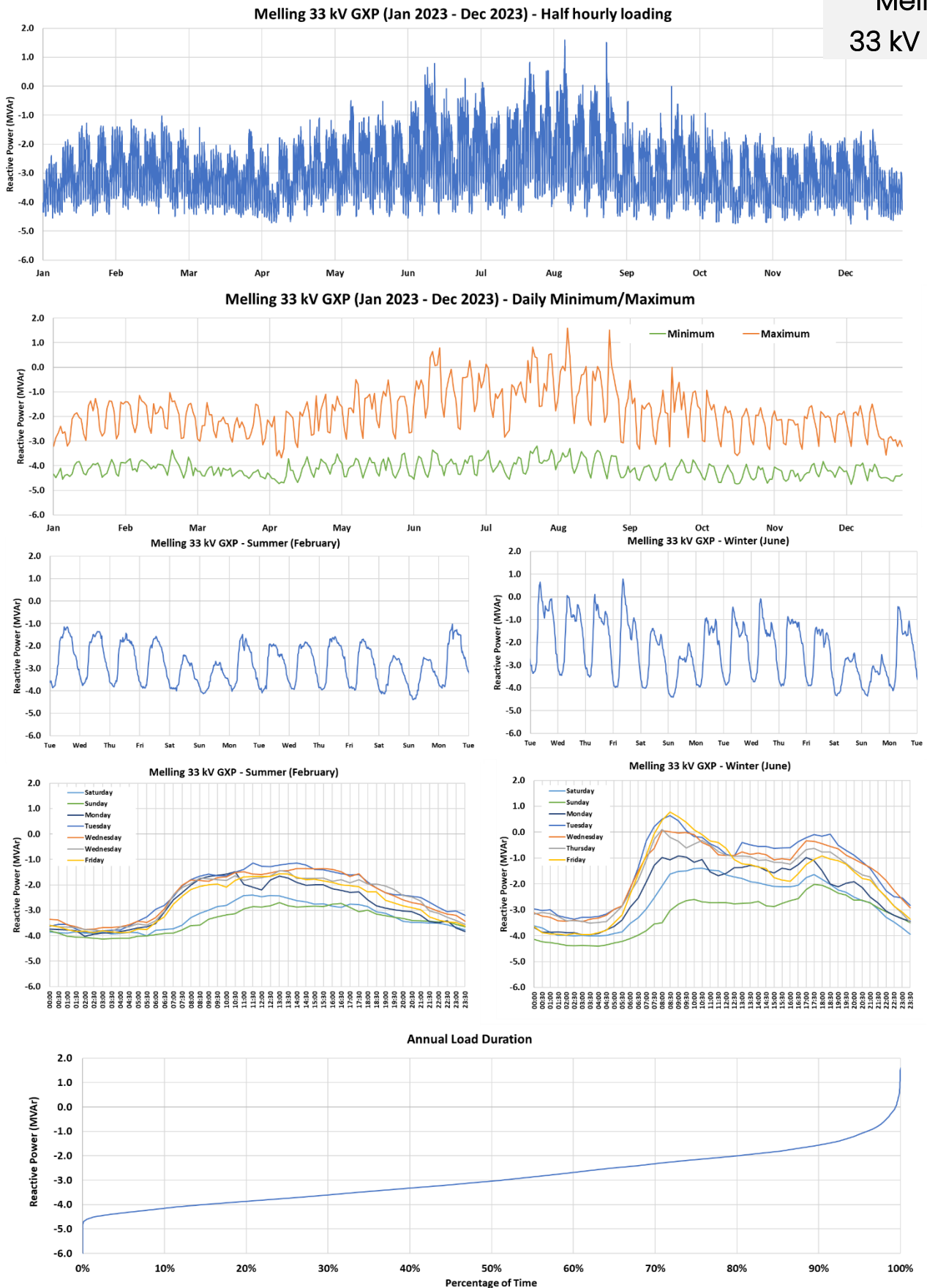


Figure 20. Melling 33 kV GXP: Reactive Power (MVar) load characteristics

Paraparaumu MVA

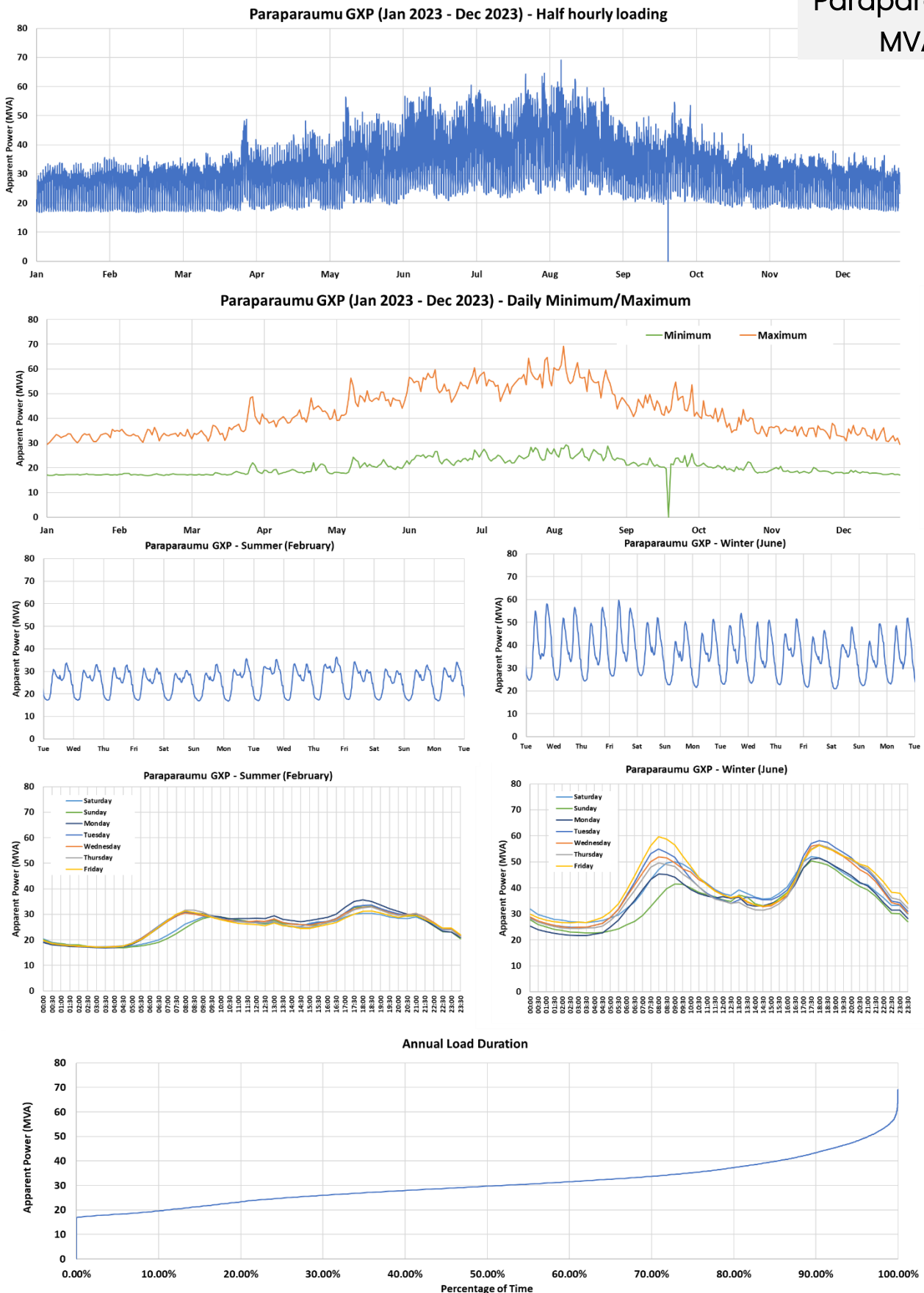


Figure 21. Paraparaumu GXP: Apparent Power (MVA) load characteristics

Paraparaumu MVar

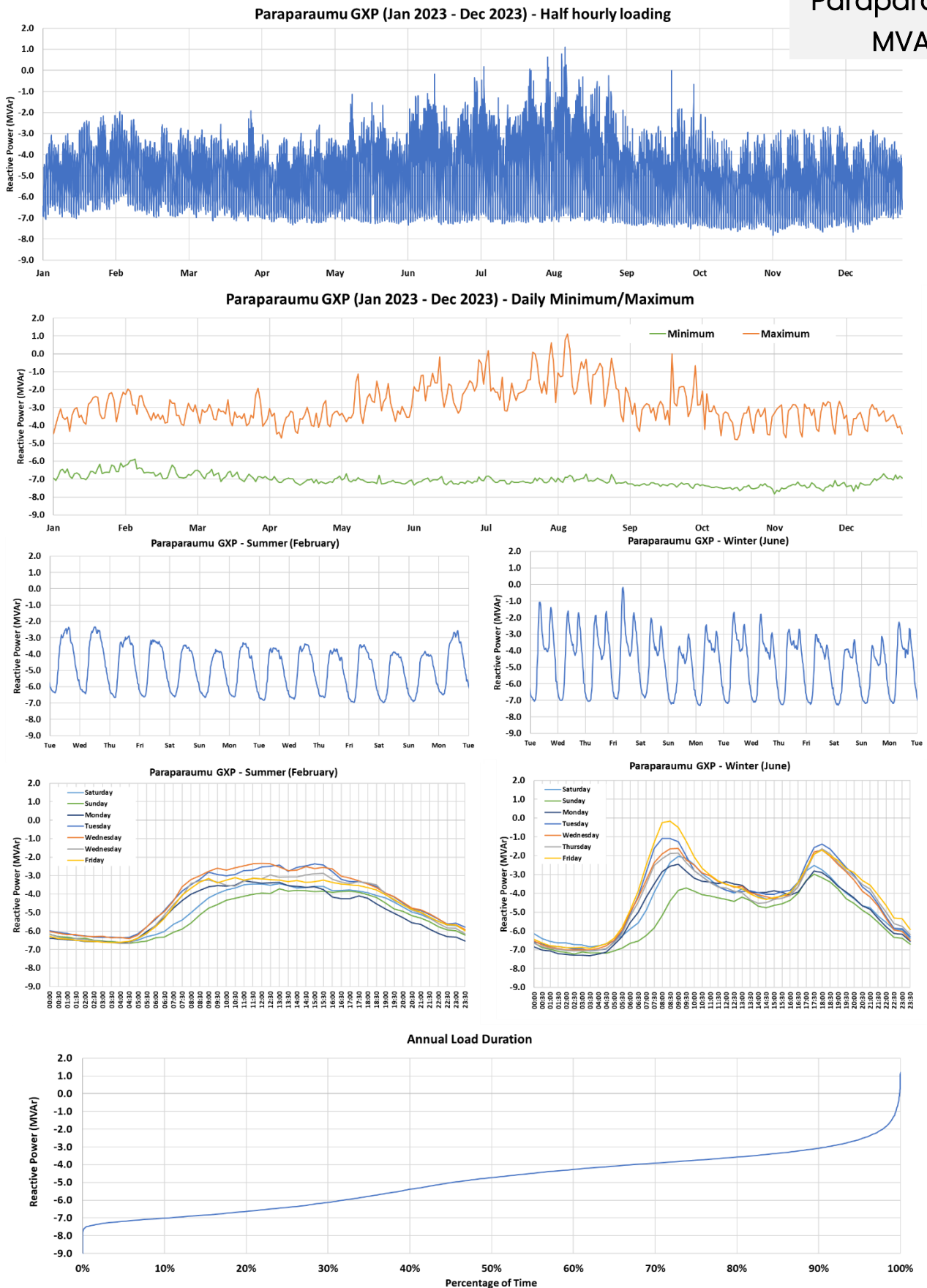


Figure 22. Paraparaumu GXP: Reactive Power (MVar) load characteristics

Pāuatahanui
MVA

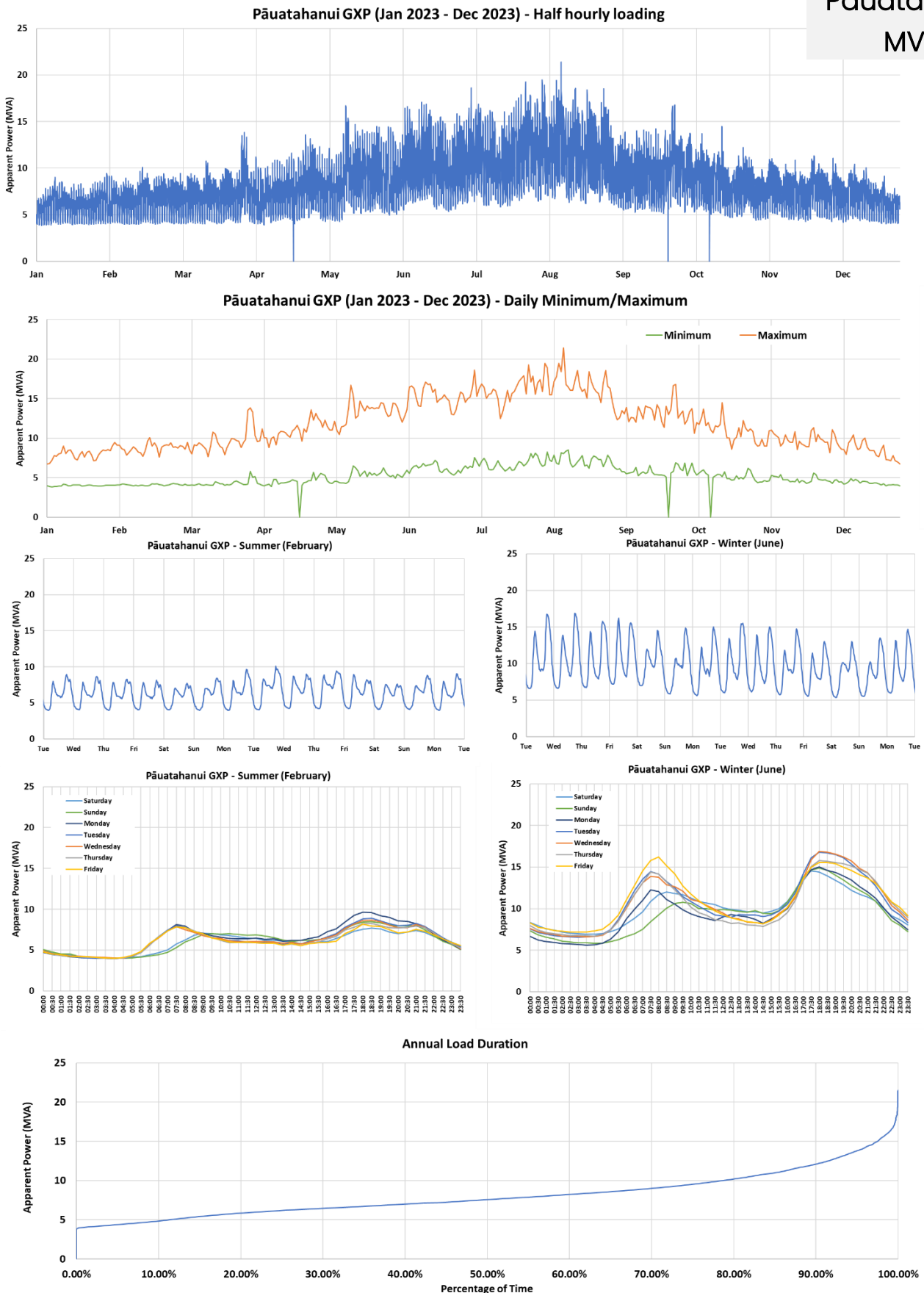


Figure 23. Pāuatahanui GXP: Apparent Power (MVA) load characteristics

Pāuatahanui
MVar

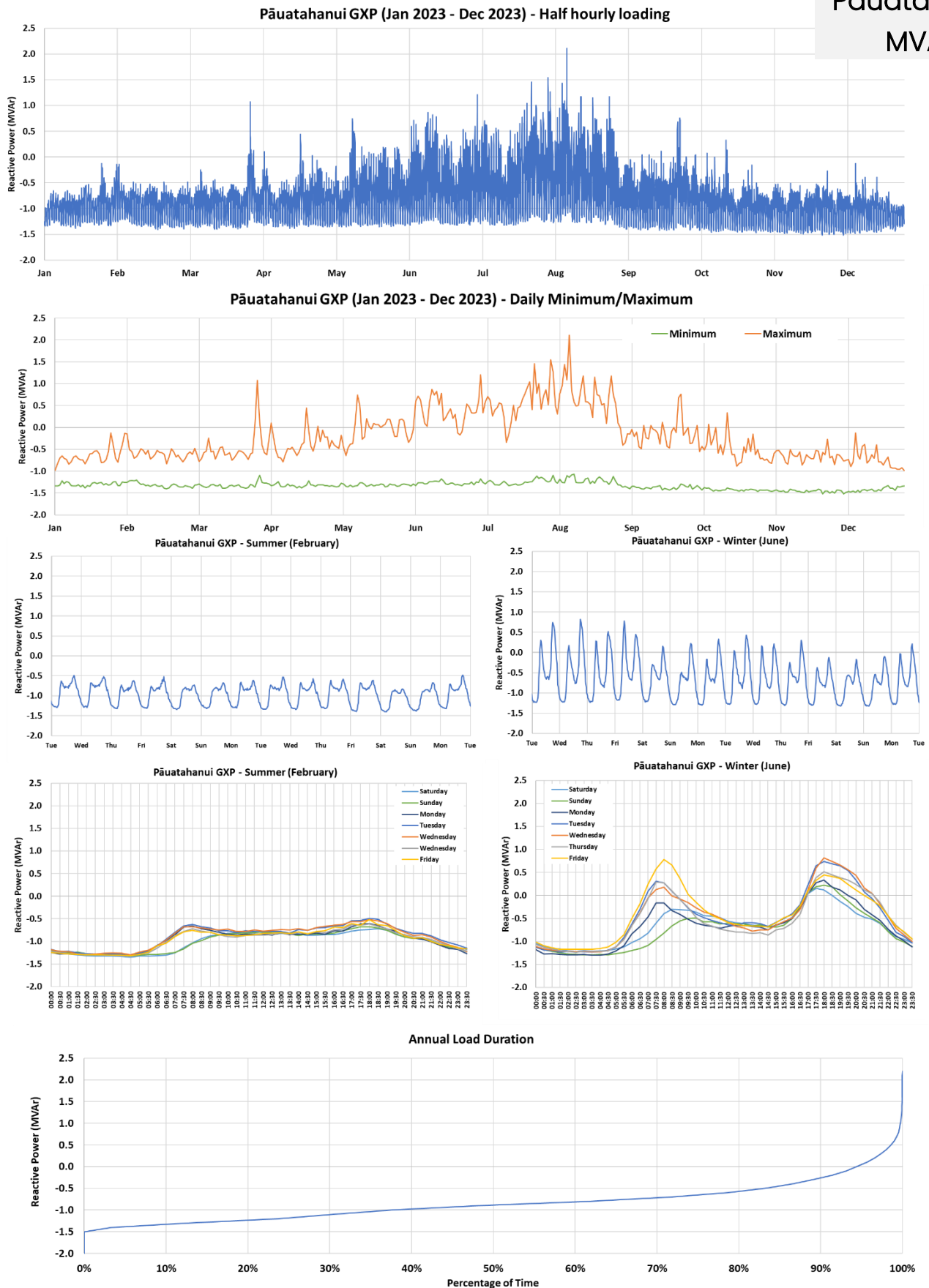


Figure 24. Pāuatahanui GXP: Reactive Power (MVar) load characteristics

Takapu Road MVA

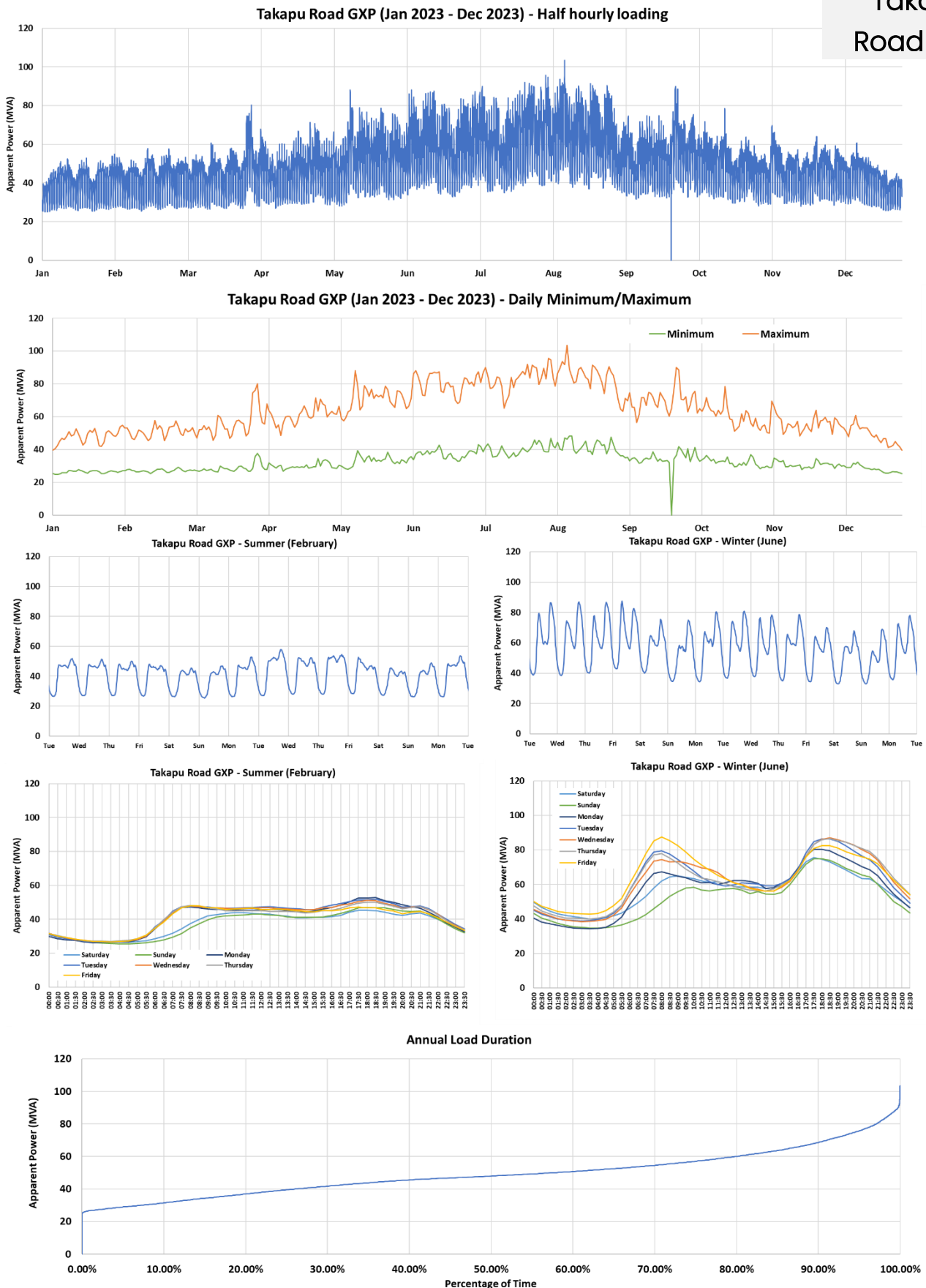


Figure 25. Takapu Road GXP: Apparent Power (MVA) load characteristics

Takapu Road MVar

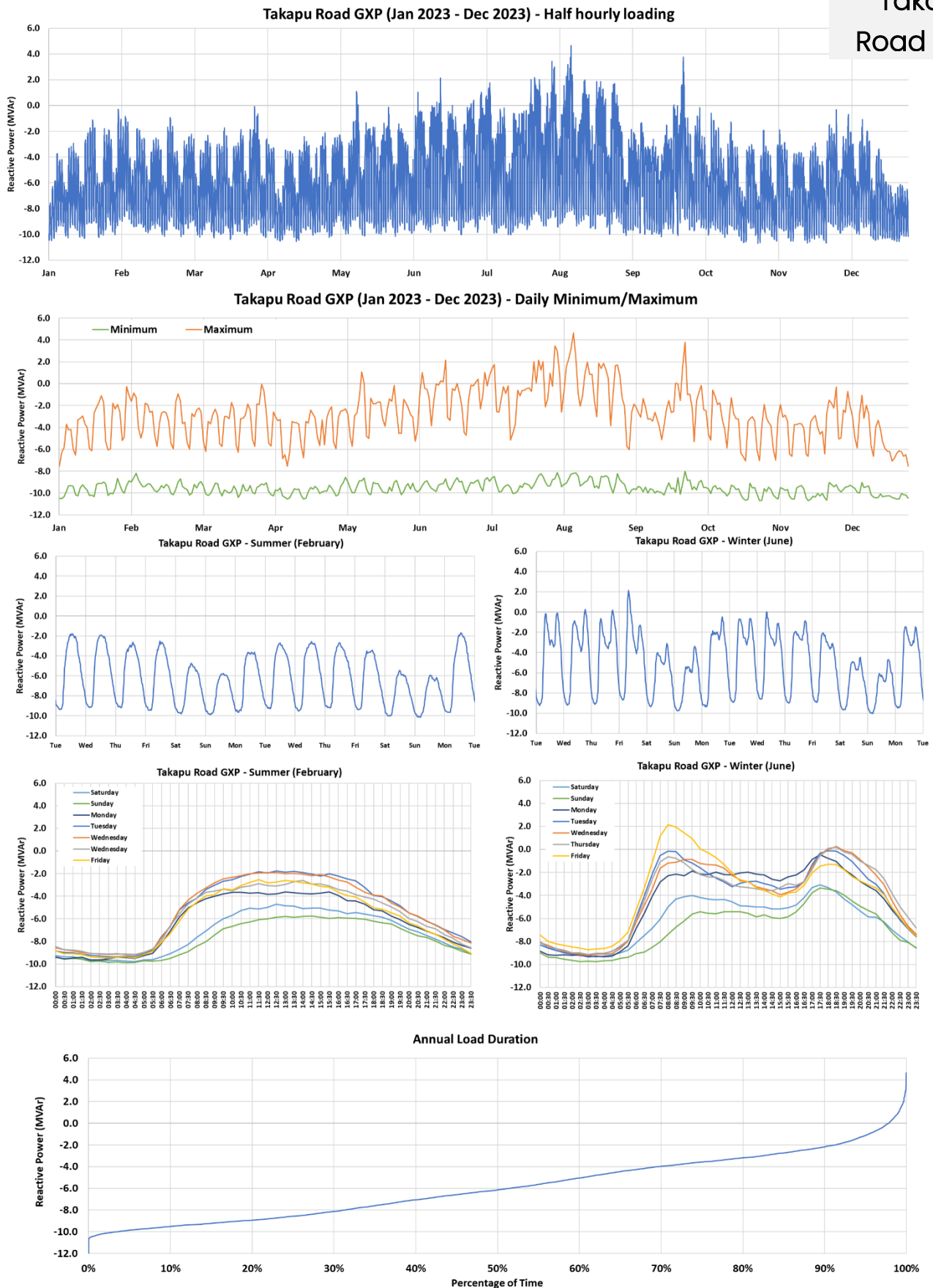


Figure 26. Takapu Road GXP: Reactive Power (MVar) load characteristics

Upper Hutt MVA

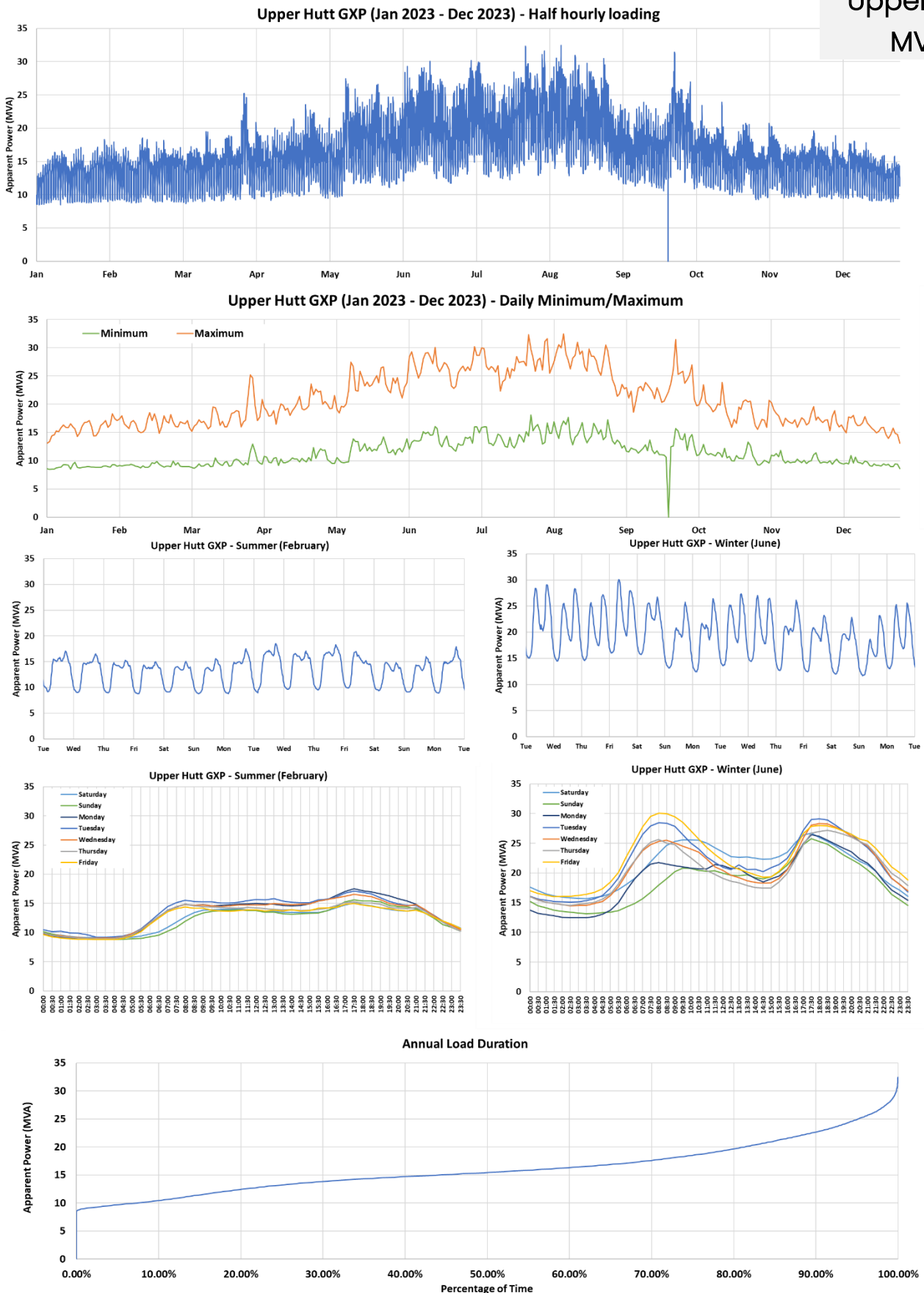


Figure 27. Upper Hutt GXP: Apparent Power (MVA) load characteristics

Upper Hutt MVar

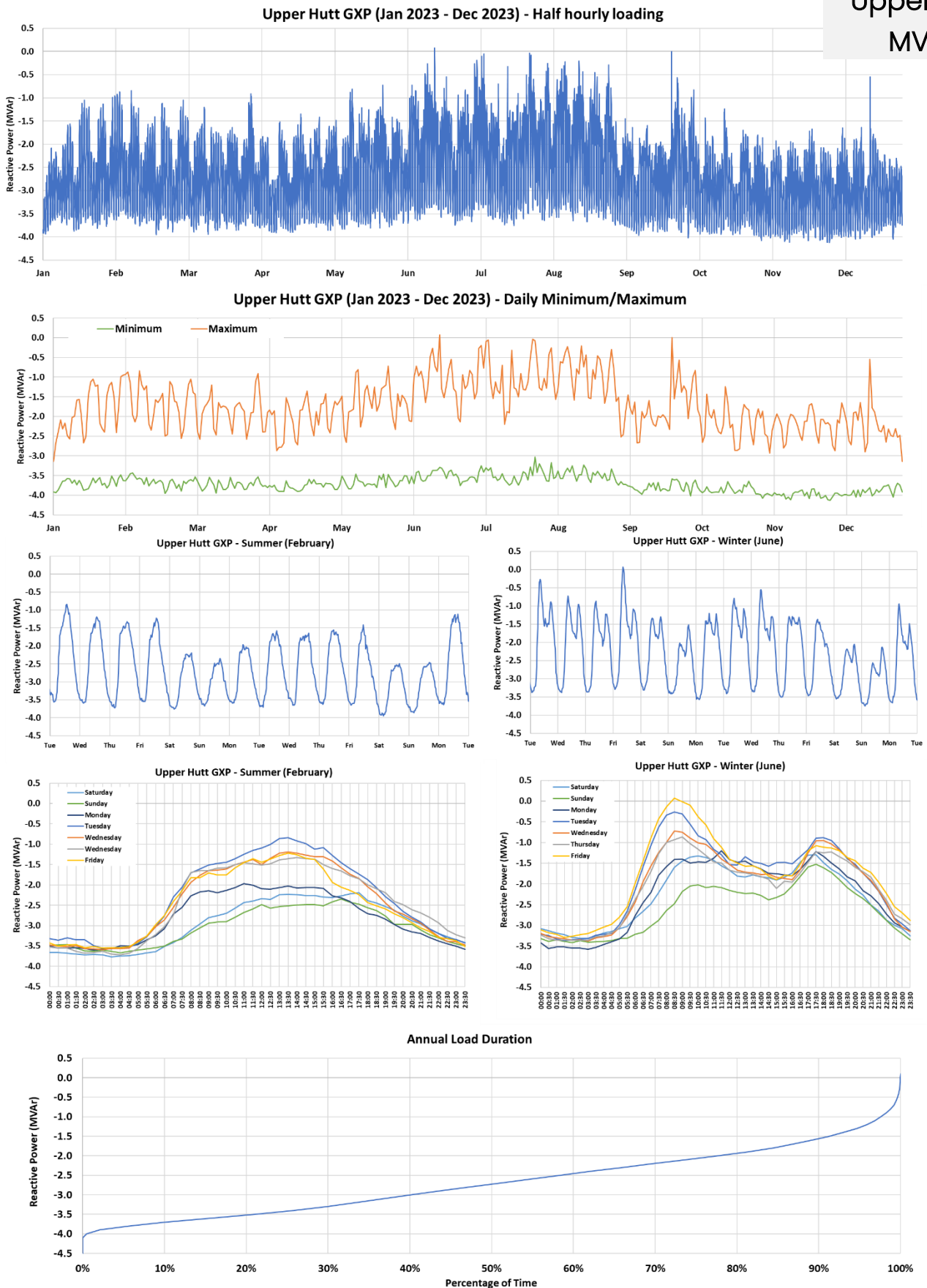


Figure 28. Upper Hutt GXP: Reactive Power (MVar) load characteristics

Wilton MVA

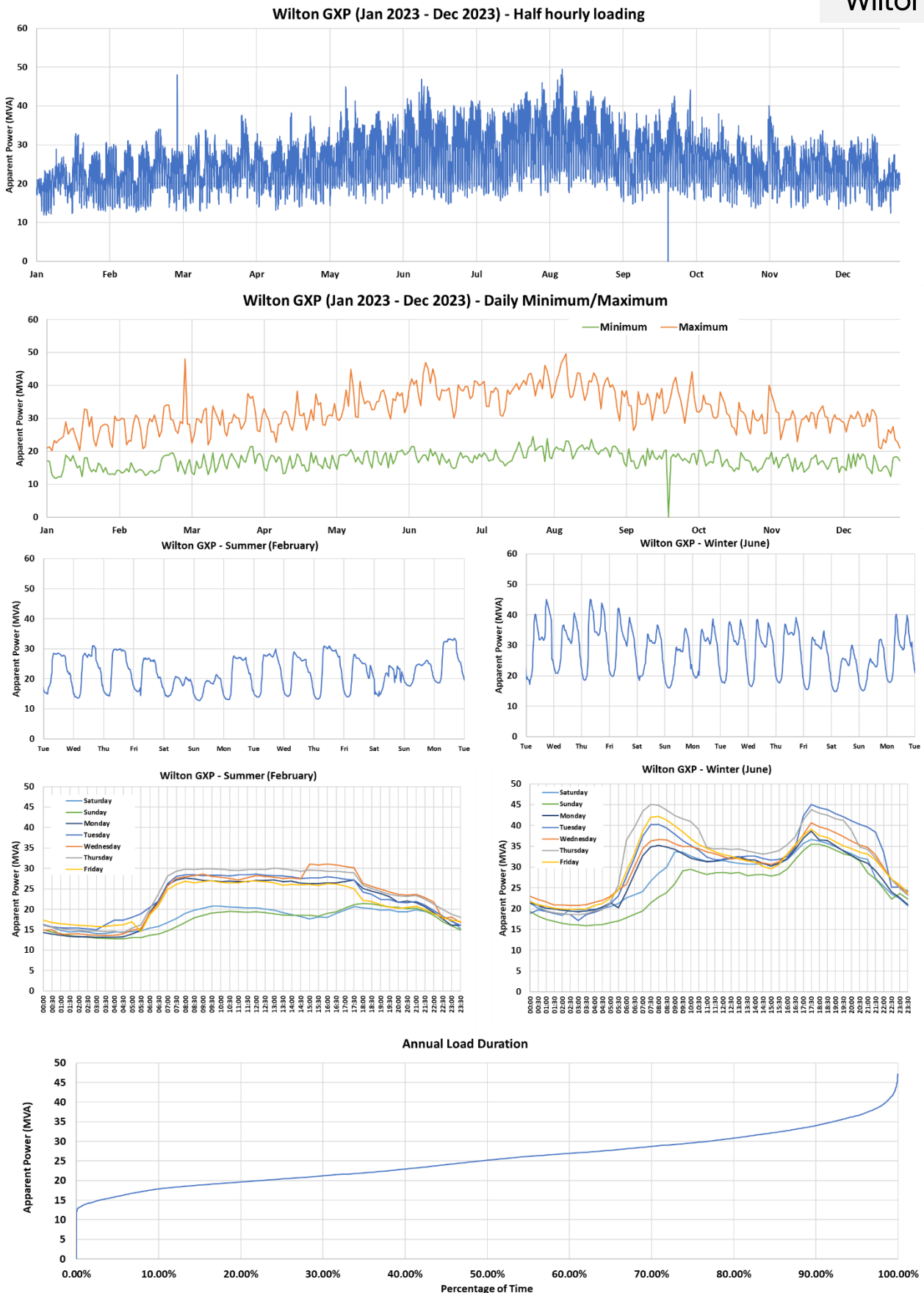


Figure 29. Wilton GXP: Apparent Power (MVA) load characteristics

Wilton MVar

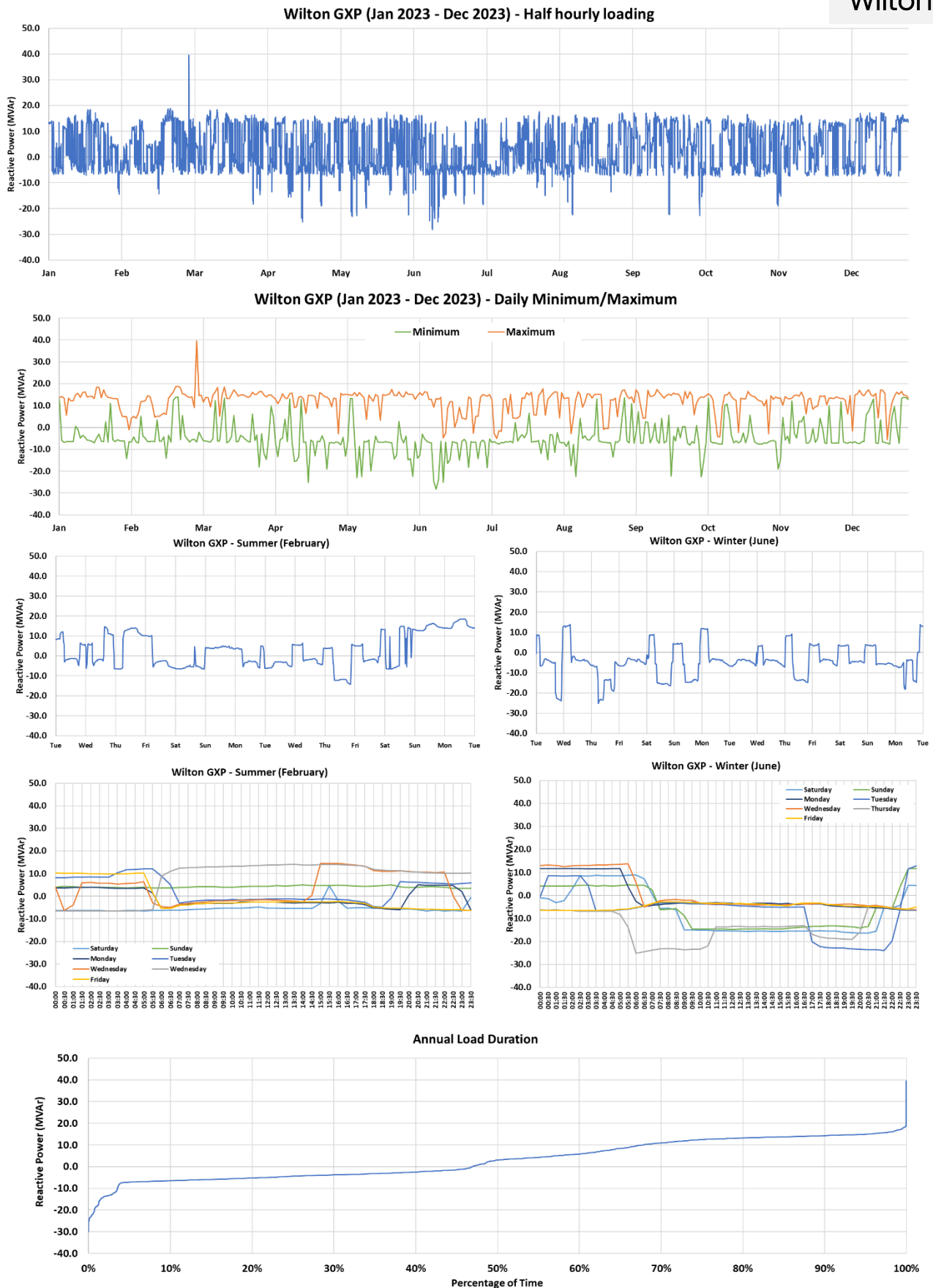


Figure 30. Wilton GXP: Reactive Power (MVar) load characteristic

3. Zone Substations

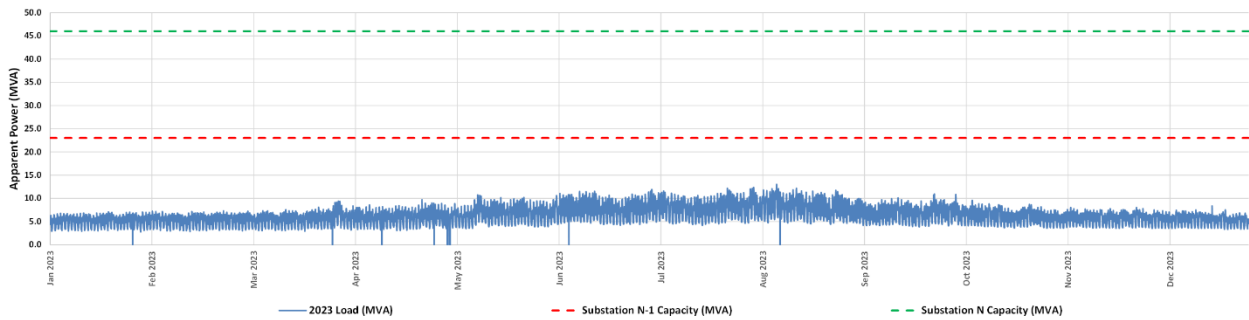
3.1 Electra

The characteristics of the zone substation **apparent power loadings** within Electra's network are shown in the following:

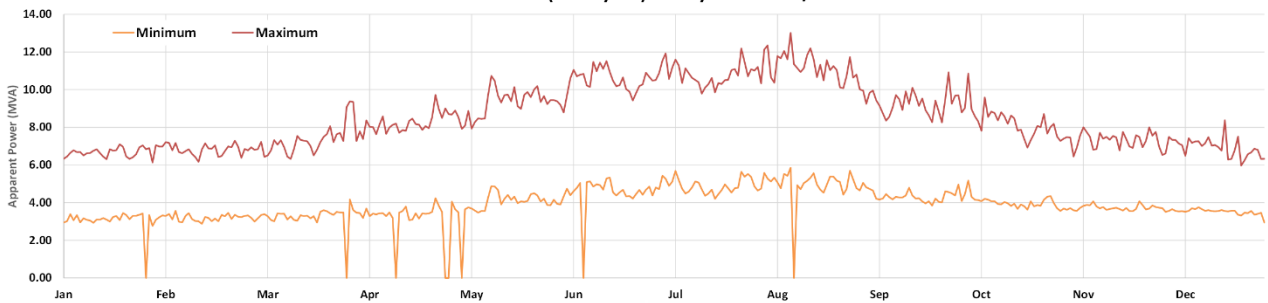
- Figure 31. Ōtaki 33/11 kV zone substation: Apparent Power (MVA) load characteristics
- Figure 32. Paekākāriki 33/11 kV zone substation: Apparent Power (MVA) load characteristics
- Figure 33. Paraparaumu East 33/11 kV zone substation: Apparent Power (MVA) load characteristics
- Figure 34. Paraparaumu West 33/11 kV zone substation: Apparent Power (MVA) load characteristics
- Figure 35. Raumati 33/11 kV zone substation: Apparent Power (MVA) load characteristics
- Figure 36. Waikanae 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Ōtaki MVA

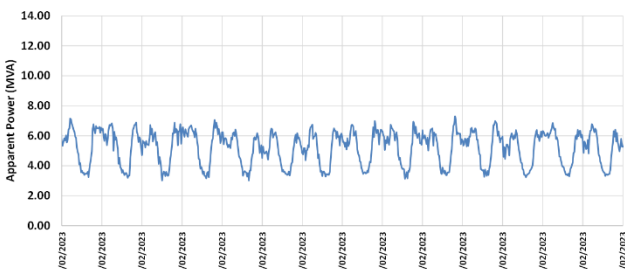
Ōtaki Zone Substation (2023 year) - Half hourly loading



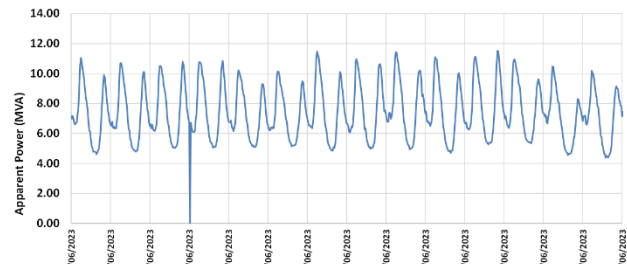
Ōtaki Zone Substation (2023 year) - Daily Maximum/Minimum



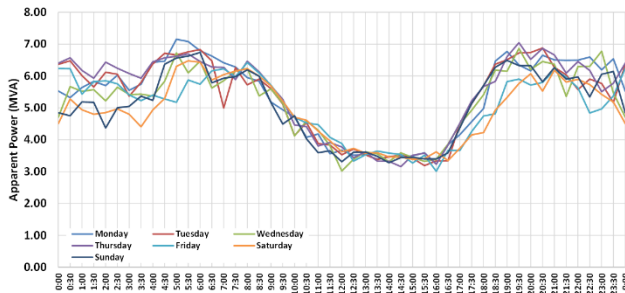
Ōtaki Zone Substation (2023 year) - Summer (February)



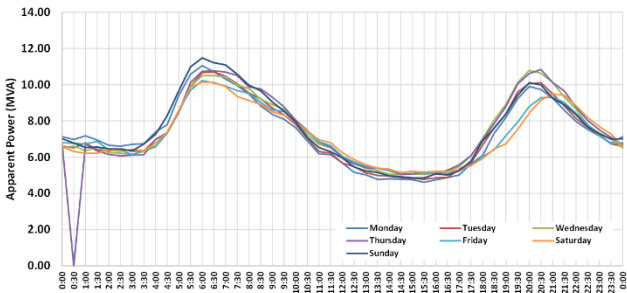
Ōtaki Zone Substation (2023 year) - Winter (June)



Ōtaki Zone Substation (2023 year) - Summer (February)



Ōtaki Zone Substation (2023 year) - Winter (June)



Ōtaki Zone Substation (2023 year) - Load Duration Curve

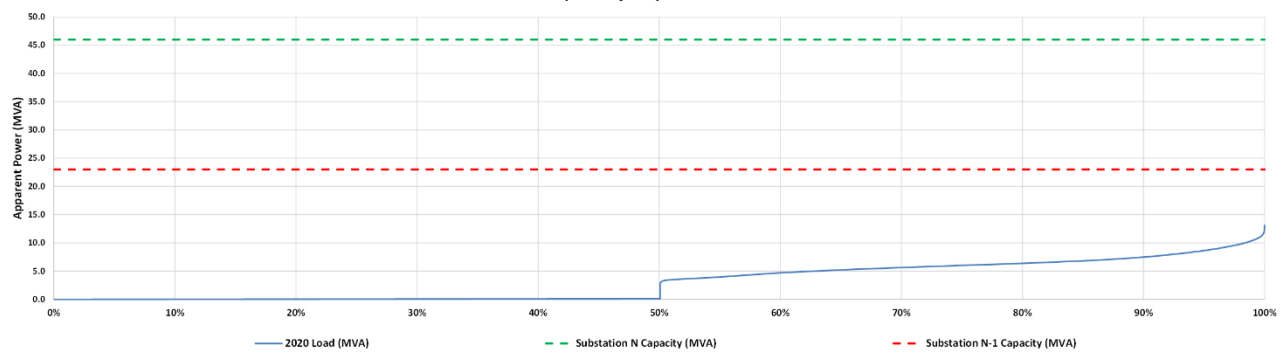
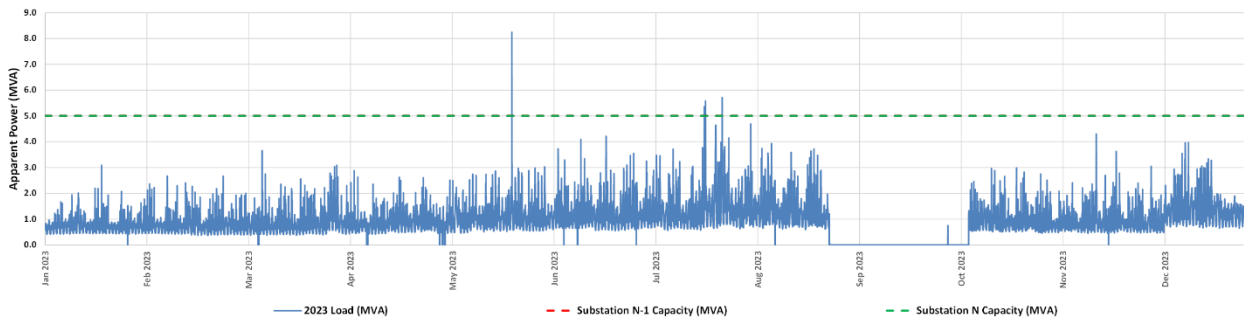


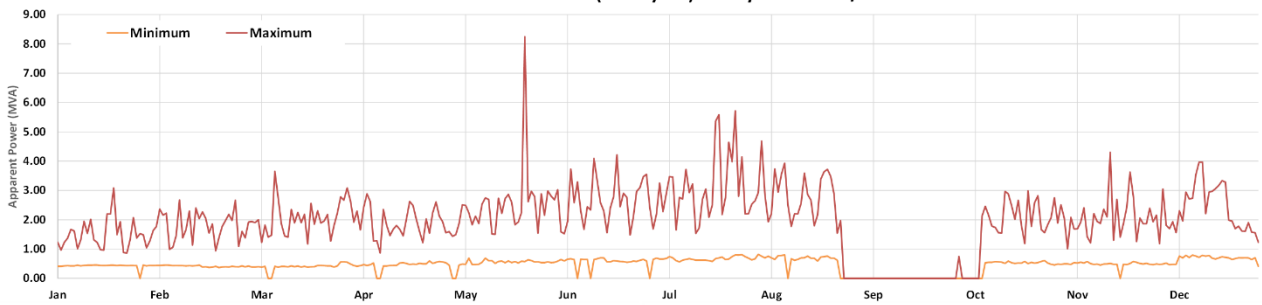
Figure 31. Ōtaki 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Paekākāriki MVA

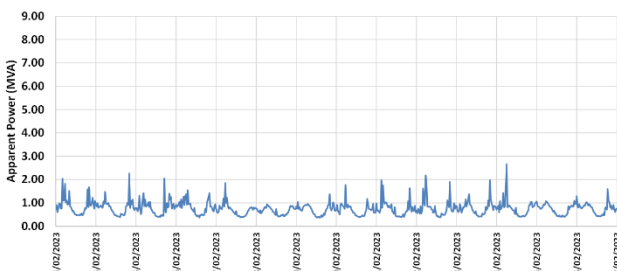
Paekākāriki Zone Substation (2023 year) - Half hourly loading



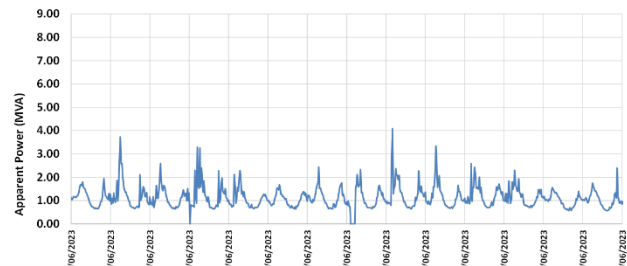
Paekākāriki Zone Substation (2023 year) - Daily Maximum/Minimum



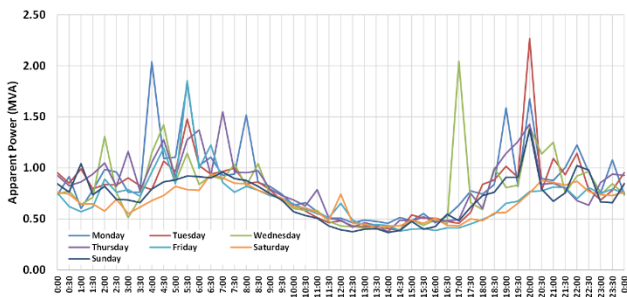
Paekākāriki Zone Substation (2023 year) - Summer (February)



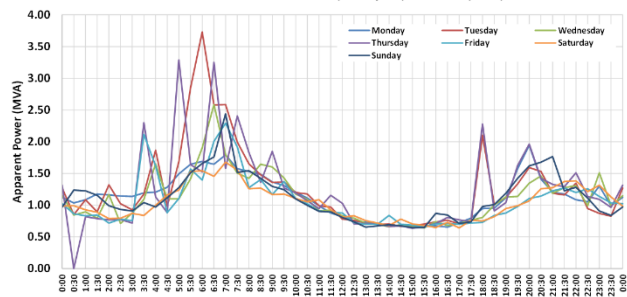
Paekākāriki Zone Substation (2023 year) - Winter (June)



Paekākāriki Zone Substation (2023 year) - Summer (February)



Paekākāriki Zone Substation (2023 year) - Winter (June)



Paekākāriki Zone Substation (2023 year) - Load Duration Curve

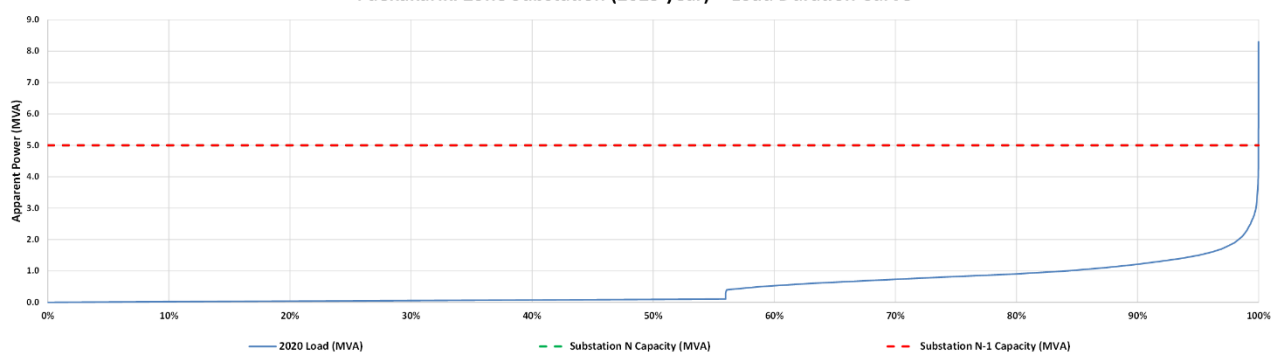
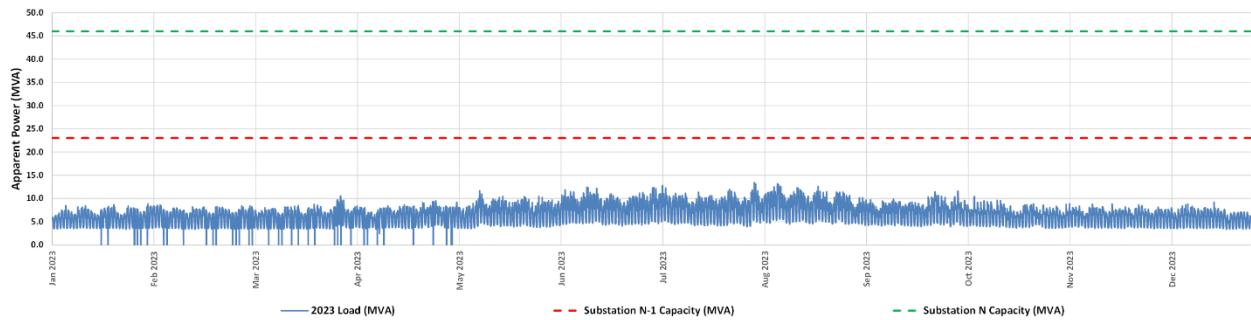


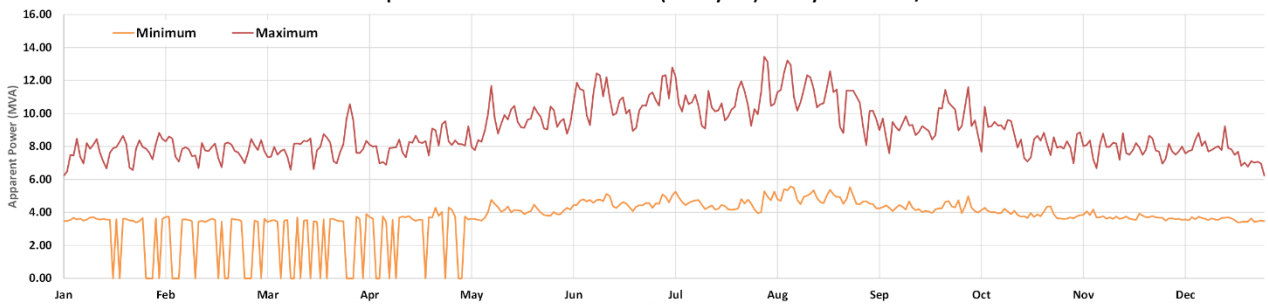
Figure 32. Paekākāriki 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Paraparaumu East MVA

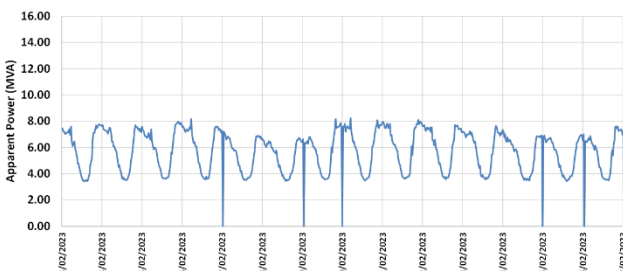
Paraparaumu East Zone Substation (2023 year) - Half hourly load



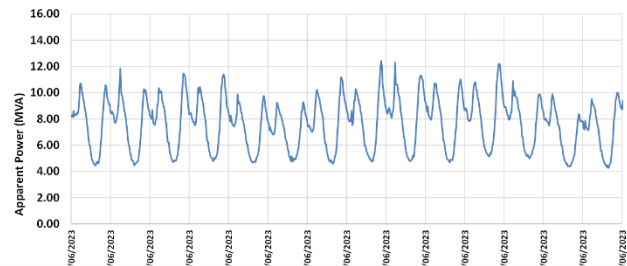
Paraparaumu East Zone Substation (2023 year) - Daily Maximum/Minimum



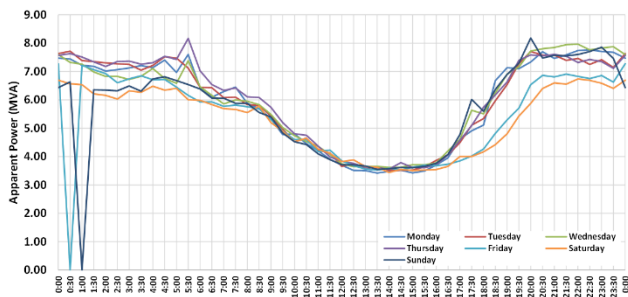
Paraparaumu East Zone Substation (2023 year) - Summer (February)



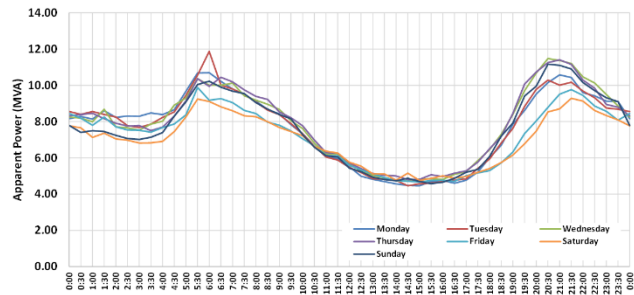
Paraparaumu East Zone Substation (2023 year) - Winter (June)



Paraparaumu East Zone Substation (2023 year) - Summer (February)



Paraparaumu East Zone Substation (2023 year) - Winter (June)



Paraparaumu East Zone Substation (2023 year) - Load Duration Curve

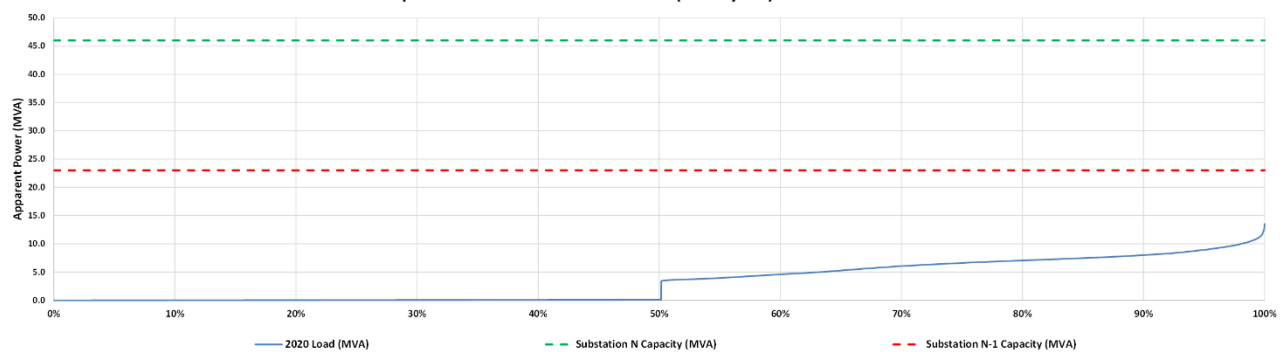
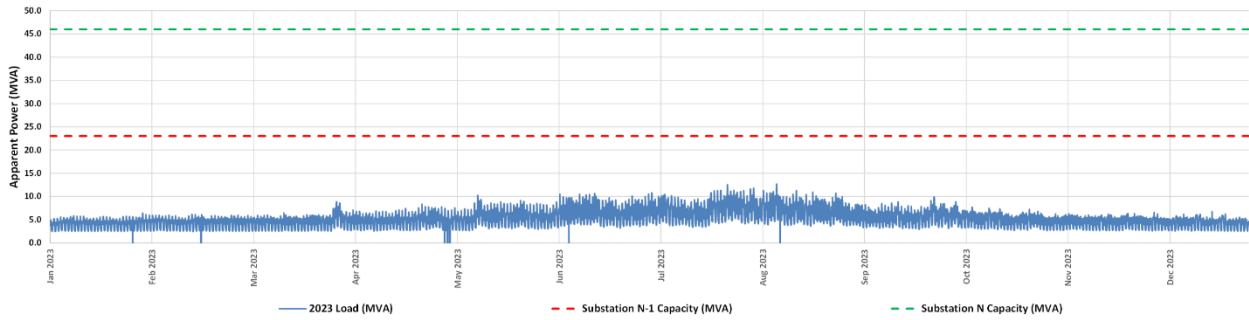


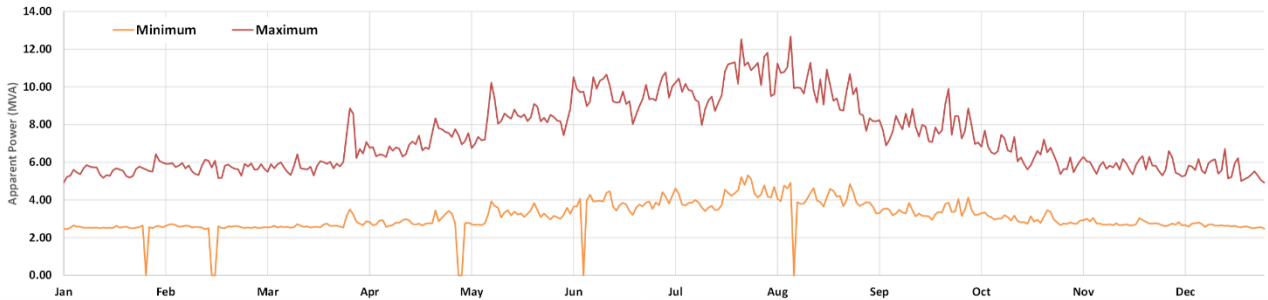
Figure 33. Paraparaumu East 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Paraparaumu West MVA

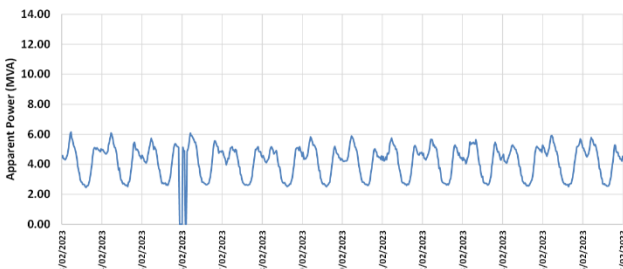
Paraparaumu West Zone Substation (2023 year) - Half hourly load



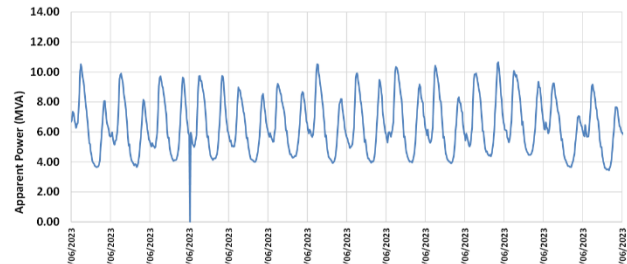
Paraparaumu West Zone Substation (2023 year) - Daily Maximum/Minimum



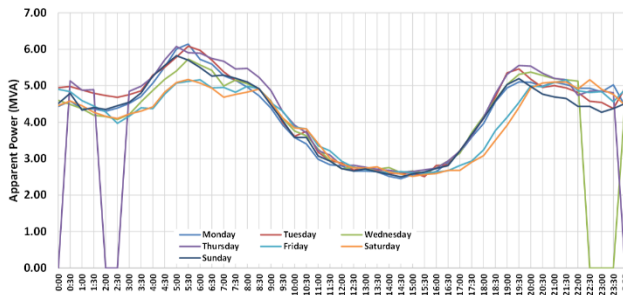
Paraparaumu West Zone Substation (2023 year) - Summer (February)



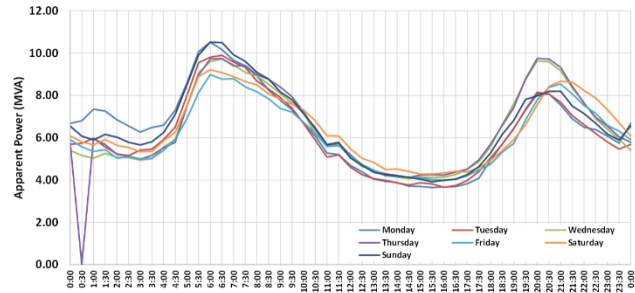
Paraparaumu West Zone Substation (2023 year) - Winter (June)



Paraparaumu West Zone Substation (2023 year) - Summer (February)



Paraparaumu West Zone Substation (2023 year) - Winter (June)



Paraparaumu West Zone Substation (2023 year) - Load Duration Curve

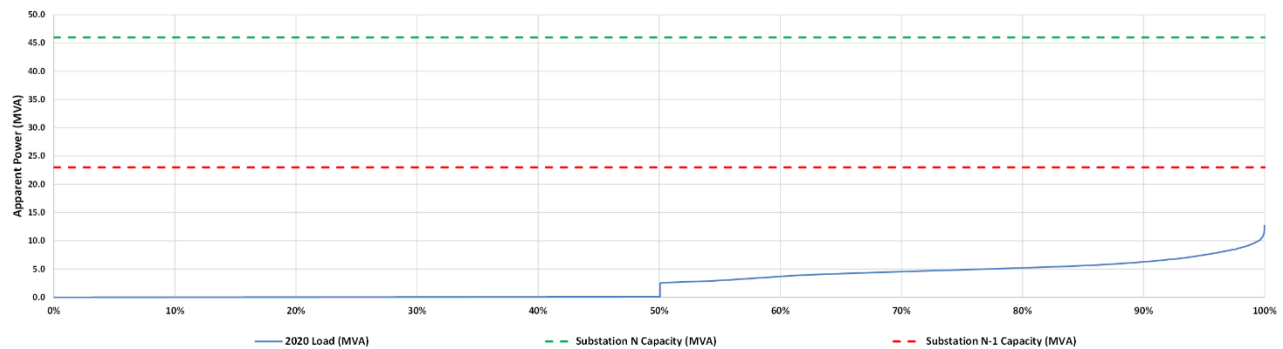
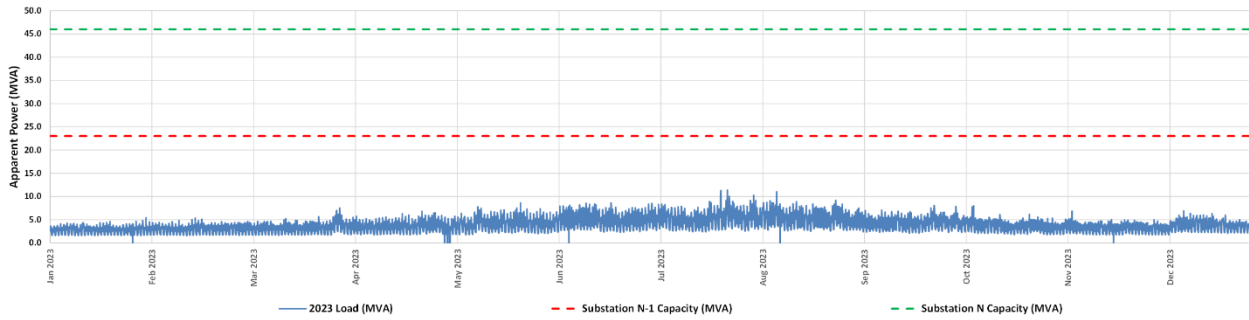


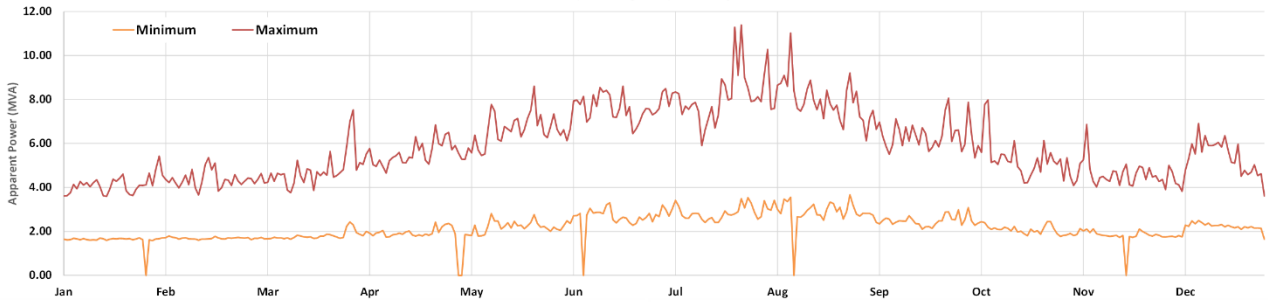
Figure 34. Paraparaumu West 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Raumati MVA

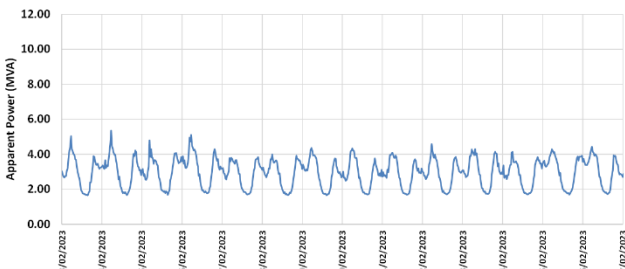
Raumati Zone Substation (2023 year) - Half hourly loading



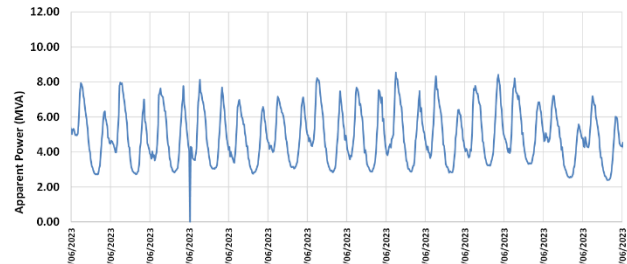
Raumati Zone Substation (2023 year) - Daily Maximum/Minimum



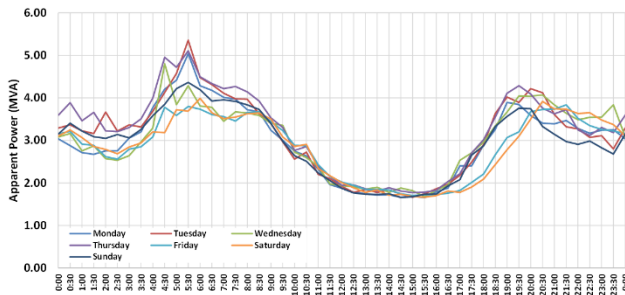
Raumati Zone Substation (2023 year) - Summer (February)



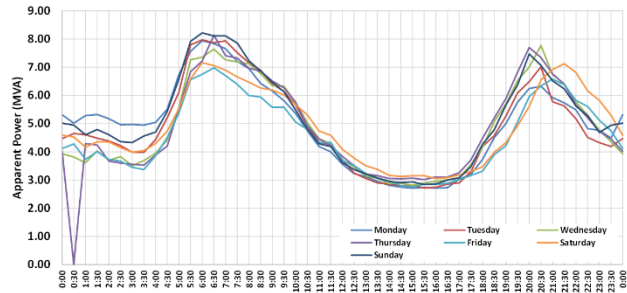
Raumati Zone Substation (2023 year) - Winter (June)



Raumati Zone Substation (2023 year) - Summer (February)



Raumati Zone Substation (2023 year) - Winter (June)



Raumati Zone Substation (2023 year) - Load Duration Curve

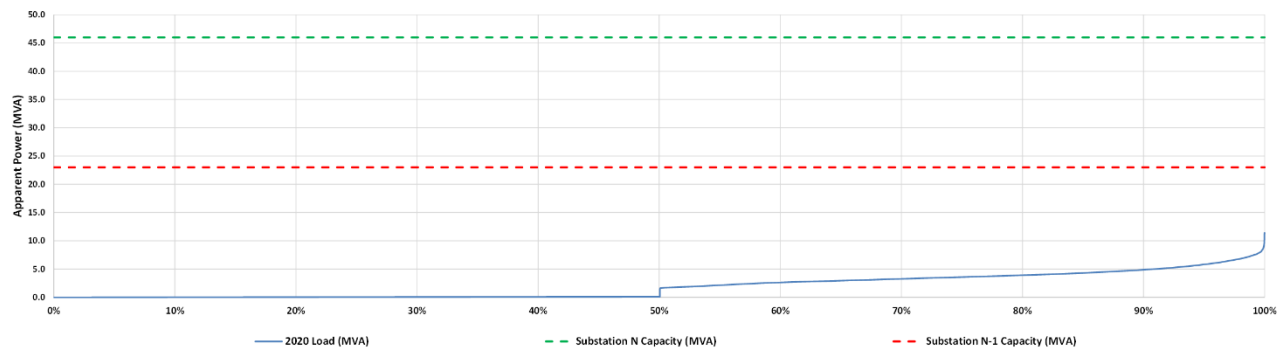
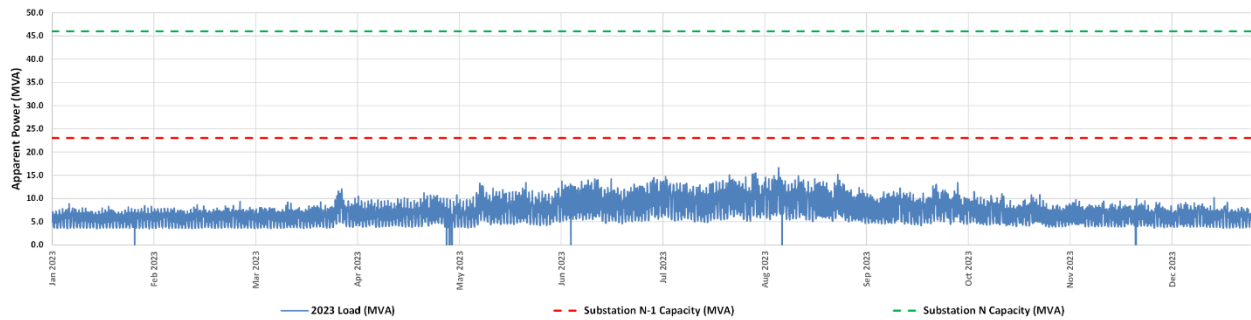


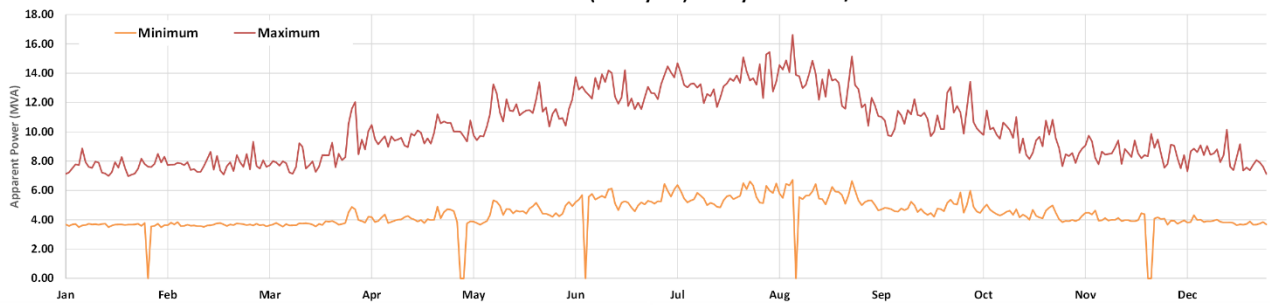
Figure 35. Raumati 33/11 kV zone substation: Apparent Power (MVA) load characteristics

Waikanae MVA

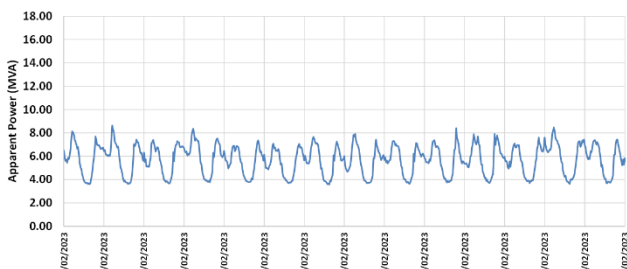
Waikanae Zone Substation (2023 year) - Half hourly loading



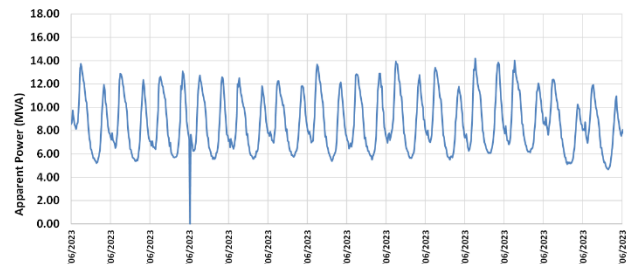
Waikanae Zone Substation (2023 year) - Daily Maximum/Minimum



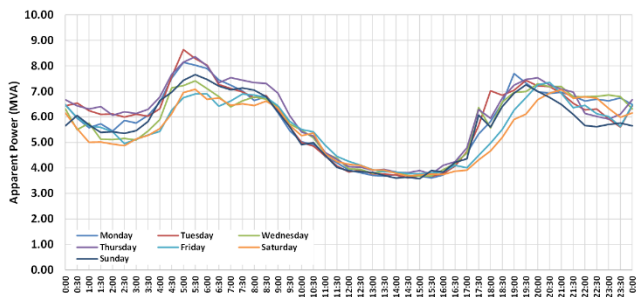
Waikanae Zone Substation (2023 year) - Summer (February)



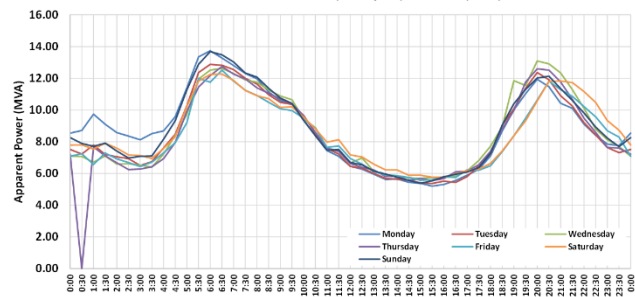
Waikanae Zone Substation (2023 year) - Winter (June)



Waikanae Zone Substation (2023 year) - Summer (February)



Waikanae Zone Substation (2023 year) - Winter (June)



Waikanae Zone Substation (2023 year) - Load Duration Curve

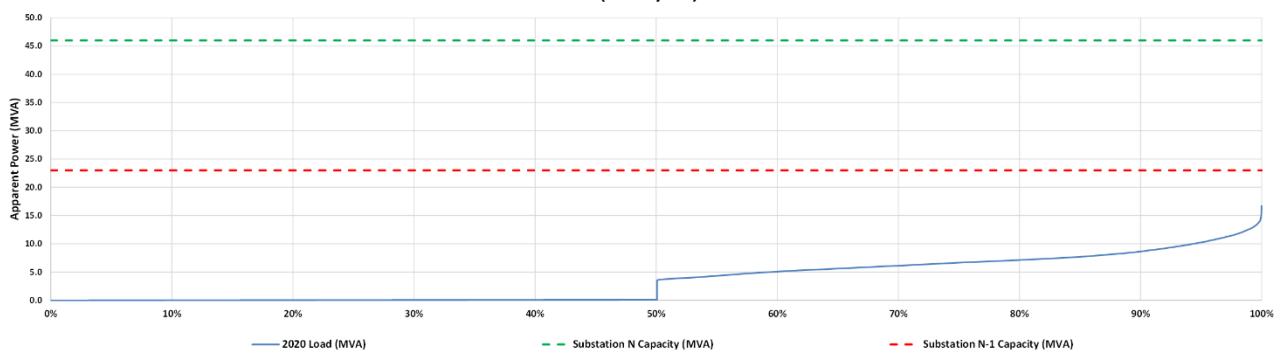


Figure 36. Waikanae 33/11 kV zone substation: Apparent Power (MVA) load characteristics

3.2 Powerco

Ergo did not receive zone substation load profiles from Powerco.

3.3 Wellington Electricity

Ergo did not receive zone substation load profiles from Wellington Electricity. However, Wellington Electricity takes direct supply from Haywards and Kaiwharawhara 11 kV GXPs, Trentham is the sole zone substation supplied from the Haywards 33 kV GXP, and Nairn Street is the sole zone substation supplied from the Central Park 11 kV GXP. Therefore, the load profile of these Transpower-owned substations can be considered analogous for the purpose of this assessment.