ERGO CONSULTING

Manawatū-Whanganui Network

Supplementary Information – Substation Load Characteristics

EECA

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Document History & Status

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A	Final

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1. Executive Summary

The following figures illustrate the characteristics of the major electrical substations (both GXPs and Zone Substations) in the Manawatū-Whanganui region. This document supplements the main report titled "*Manawatū-Whanganui – 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:

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  - Figure 2. Brunswick: Reactive power (MVAr) load characteristics.
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- Tokaanu GXP
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- Whanganui GXP
  - Figure 27. Whanganui: Apparent power (MVA) load characteristics.
  - Figure 28. Whanganui: Reactive power (MVAr) load characteristics.

Brunswick MVA

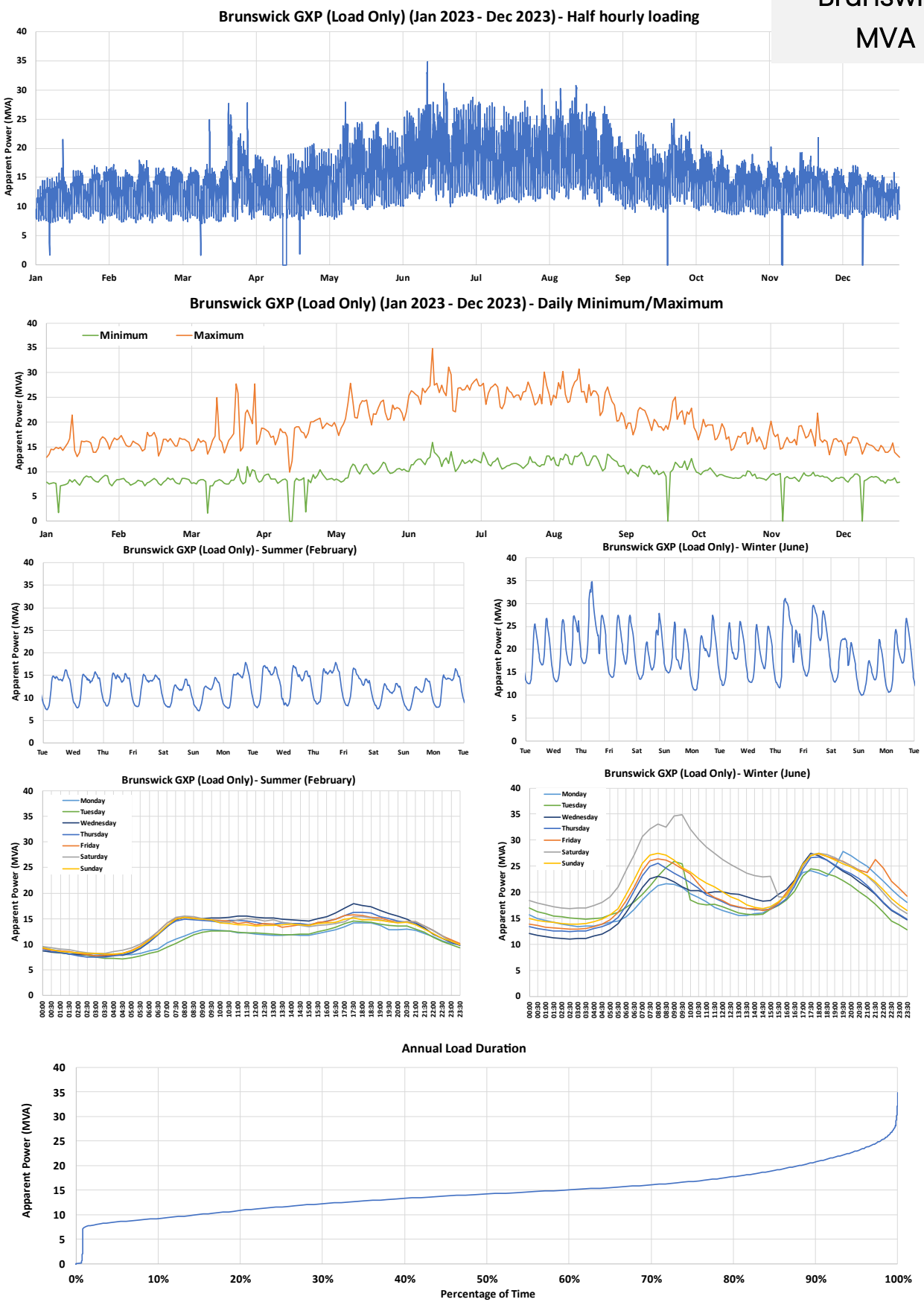


Figure 1. Brunswick: Apparent power (MVA) load characteristics.

Brunswick MVAr

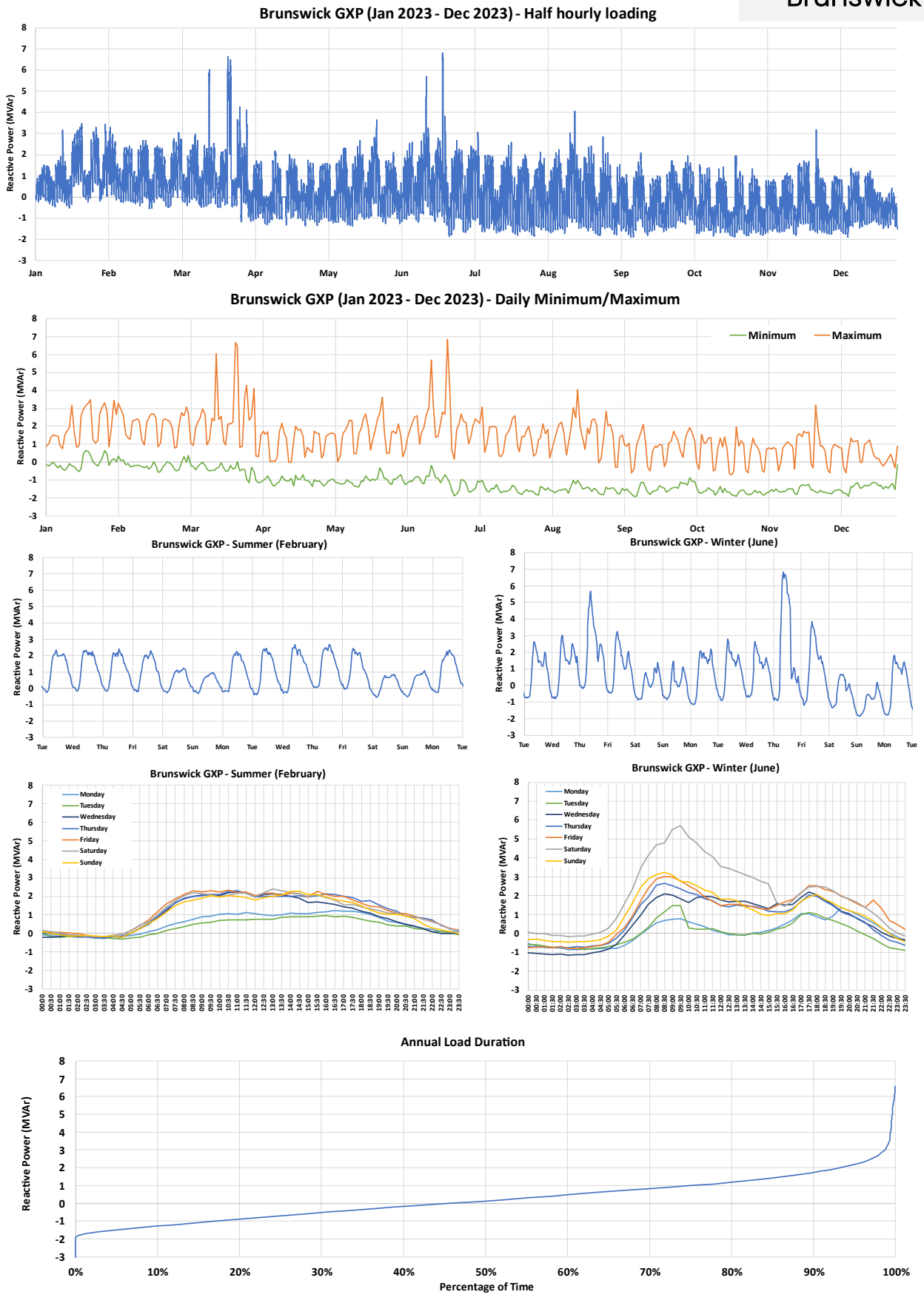


Figure 2. Brunswick: Reactive power (MVAr) load characteristics.

Bunnythorpe MVA

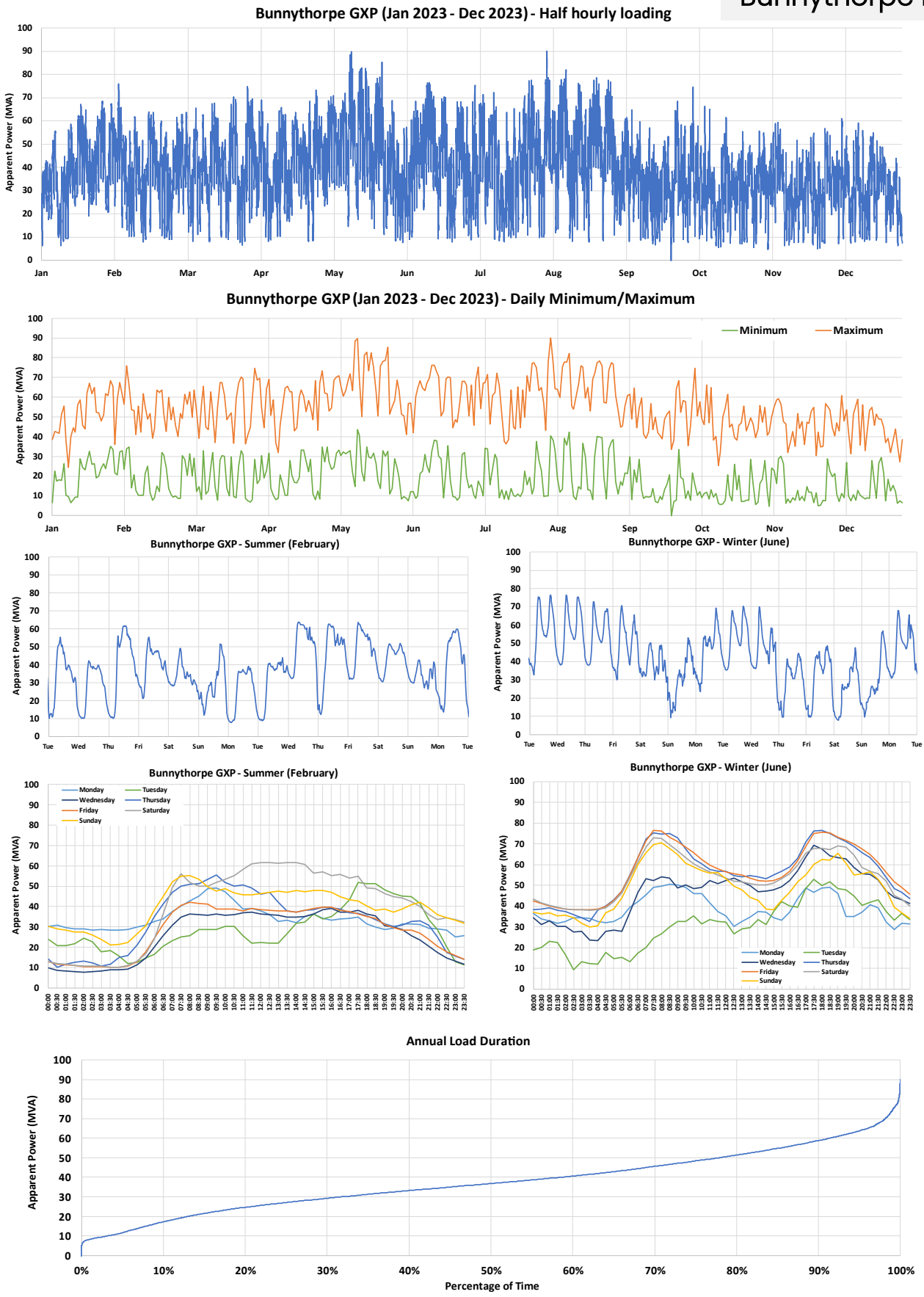


Figure 3. Bunnythorpe: Apparent power (MVA) load characteristics.

Bunnythorpe MVAr

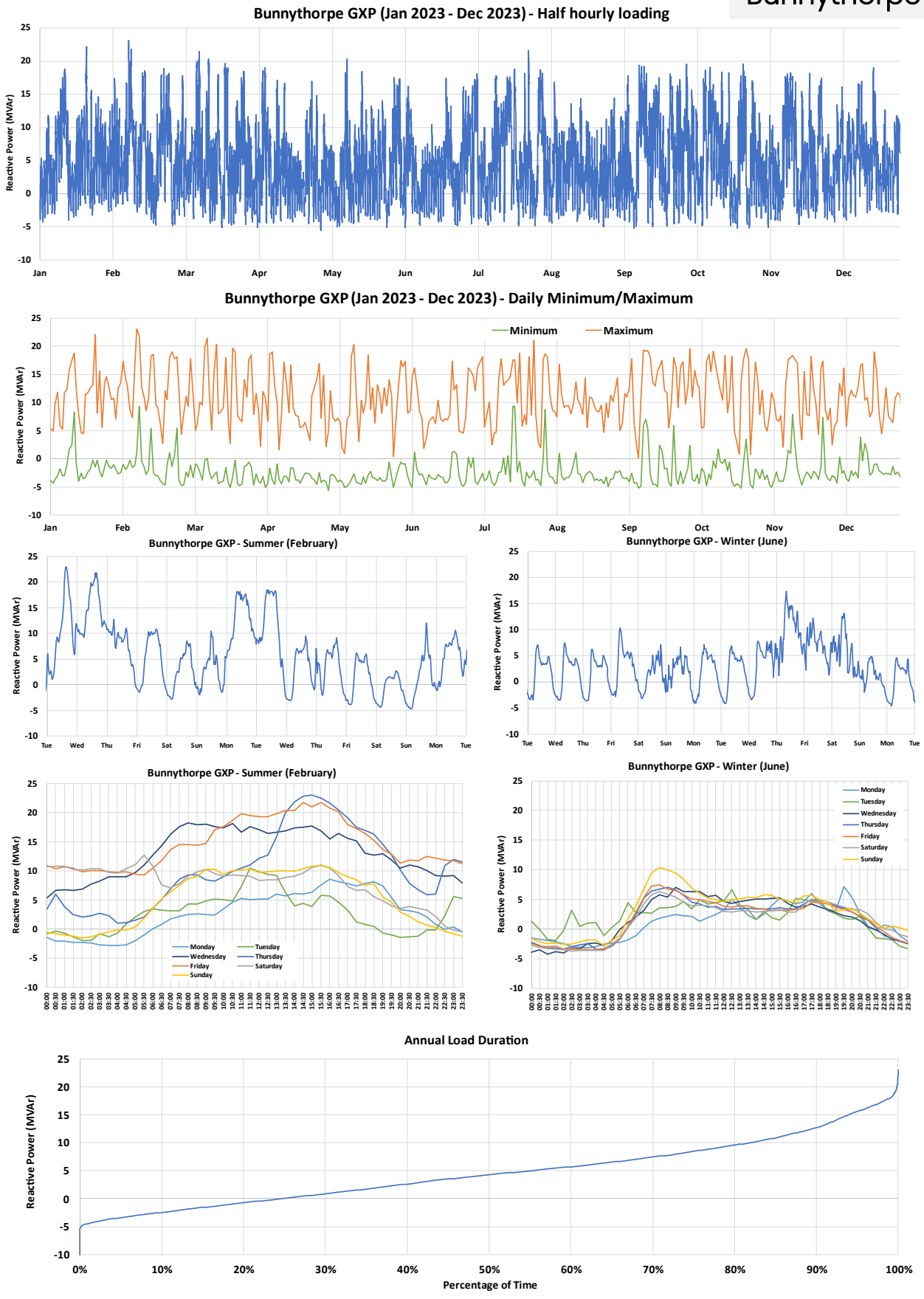


Figure 4. Bunnythorpe: Reactive power (MVAr) load characteristics.

Dannevirke MVA

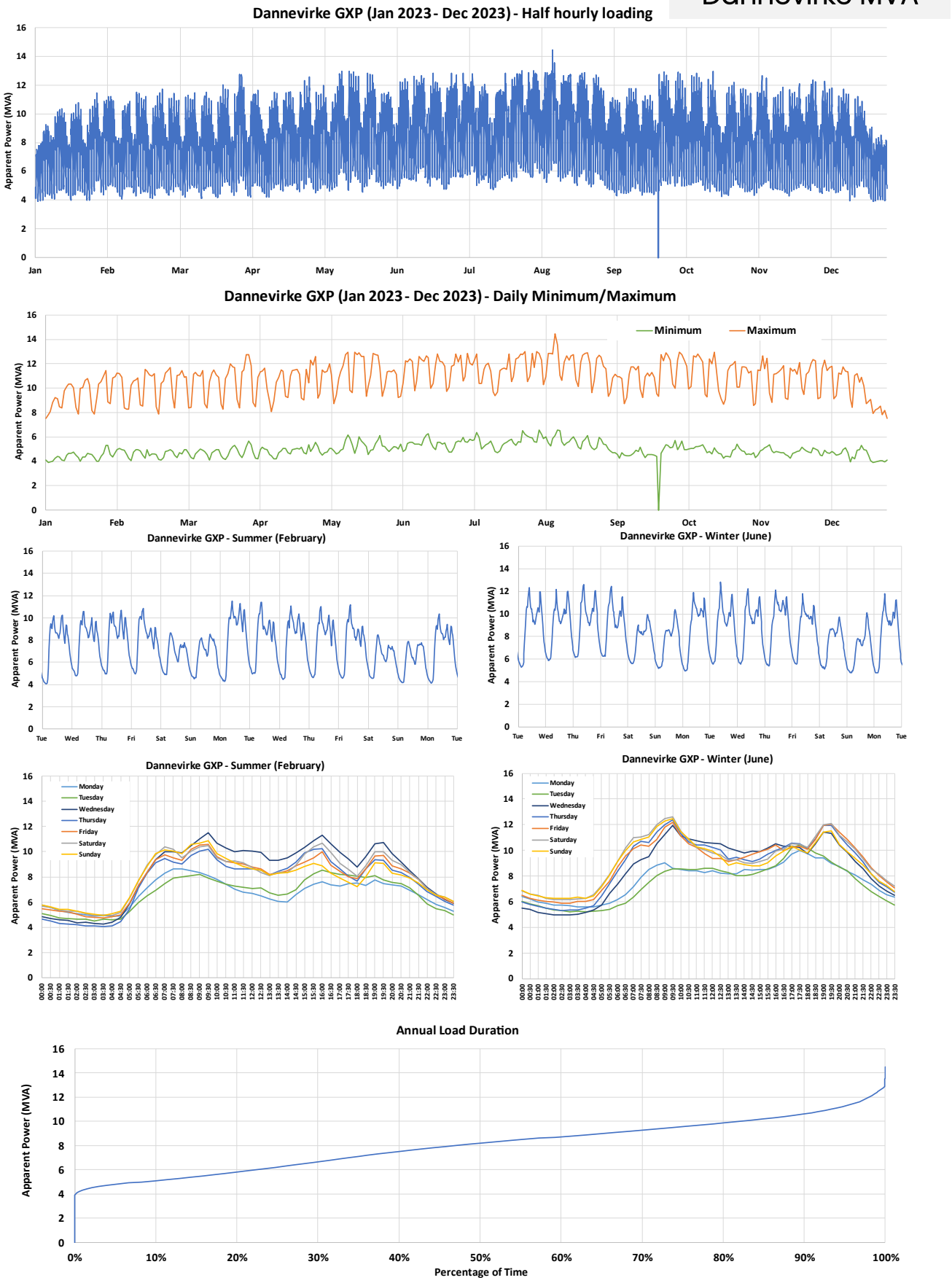


Figure 5. Dannevirke: Apparent power (MVA) load characteristics.

Dannevirke MVAr

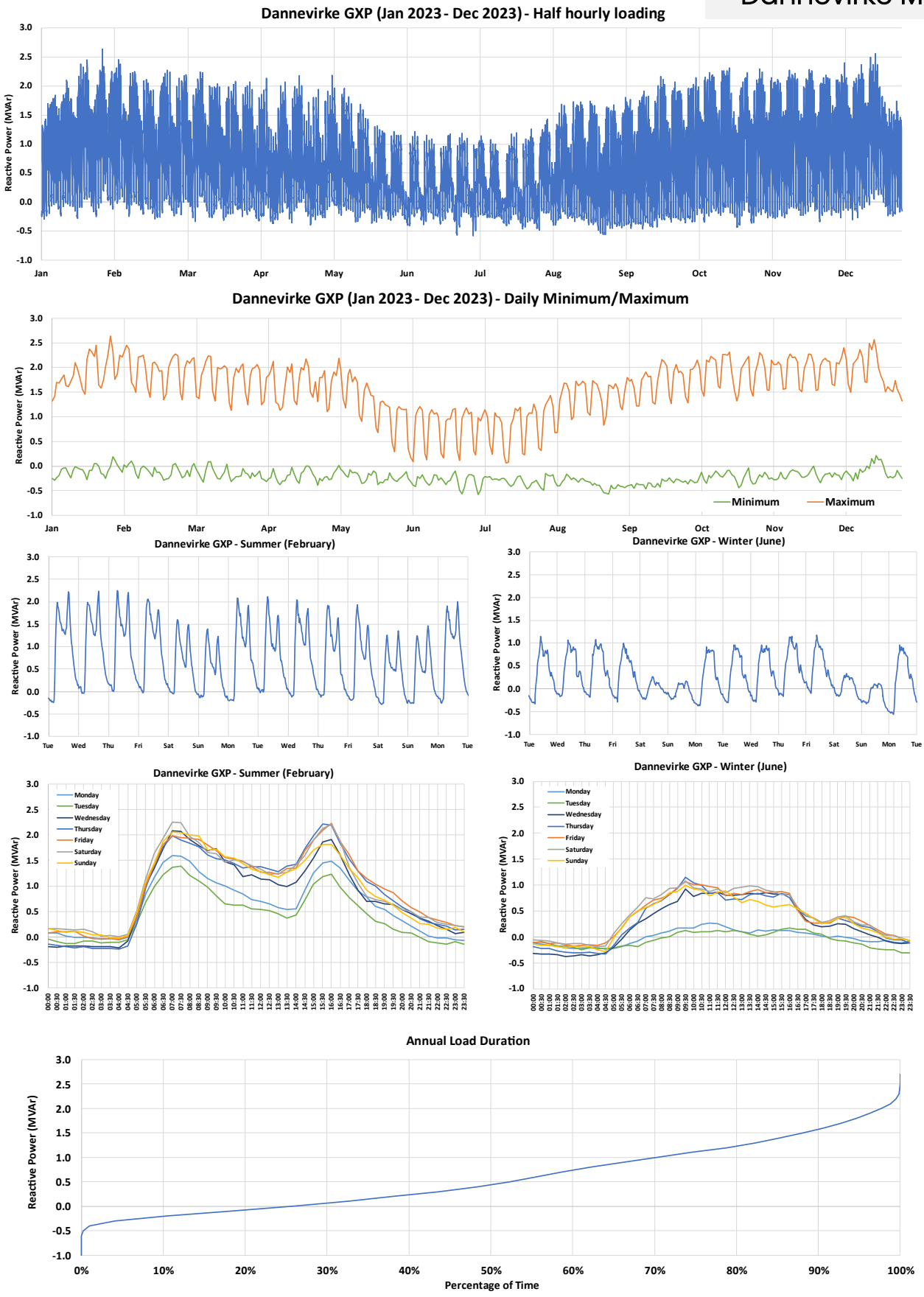


Figure 6. Dannevirke: Reactive power (MVAr) load characteristics.

Linton MVA

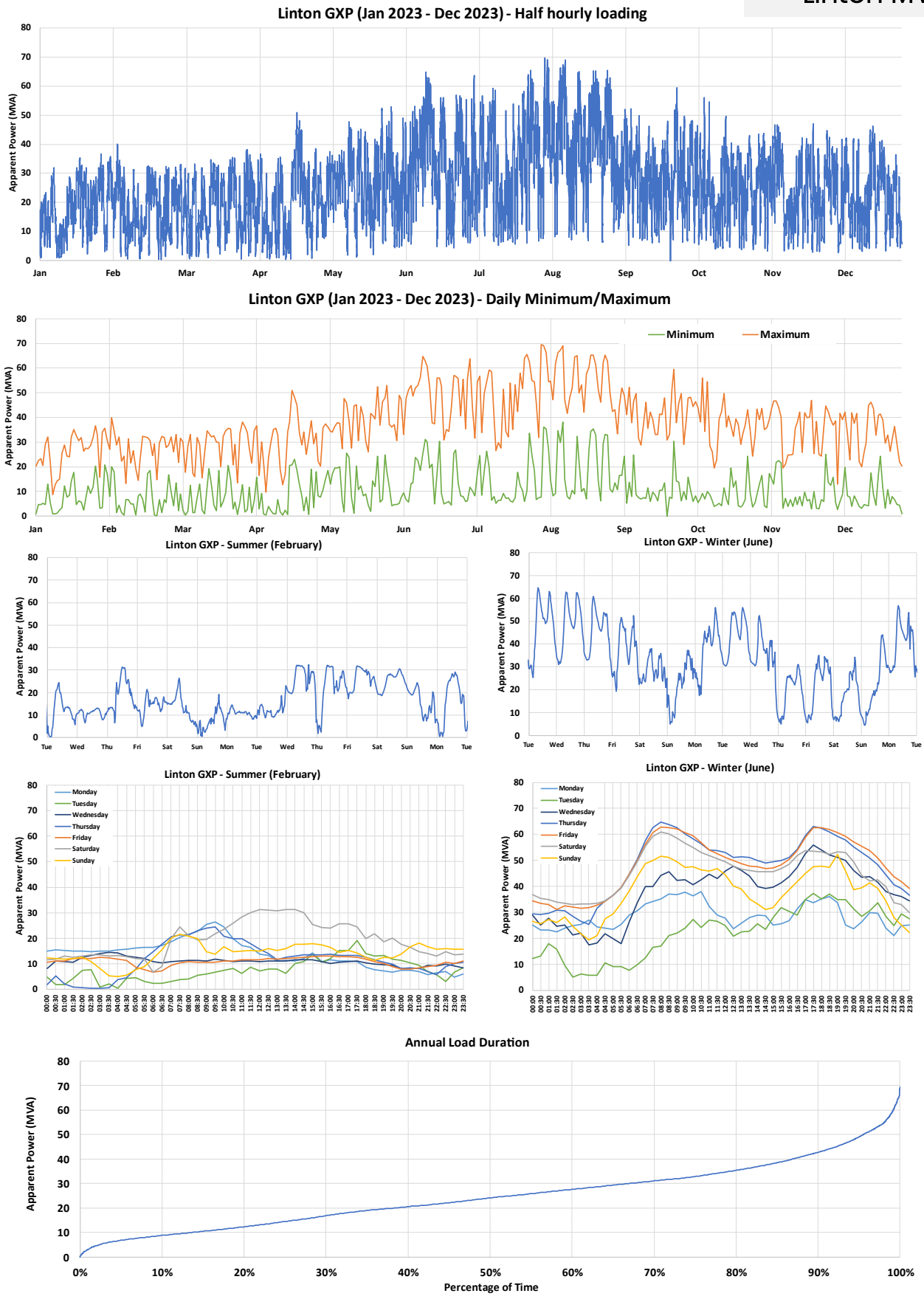


Figure 7. Linton: Apparent power (MVA) load characteristics.

Linton MVAr

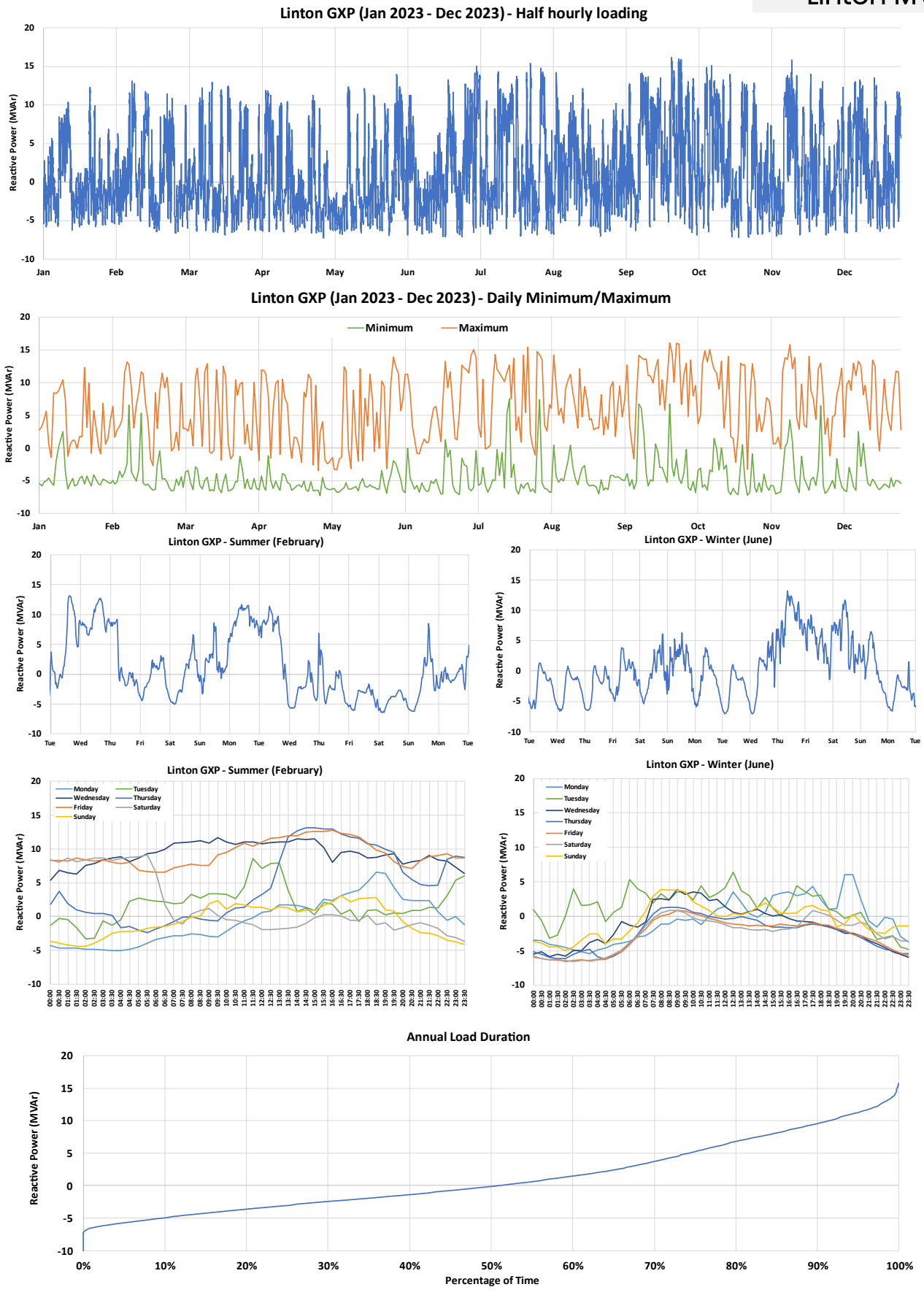


Figure 8. Linton: Reactive power (MVAr) load characteristics.

Mangahao
MVA

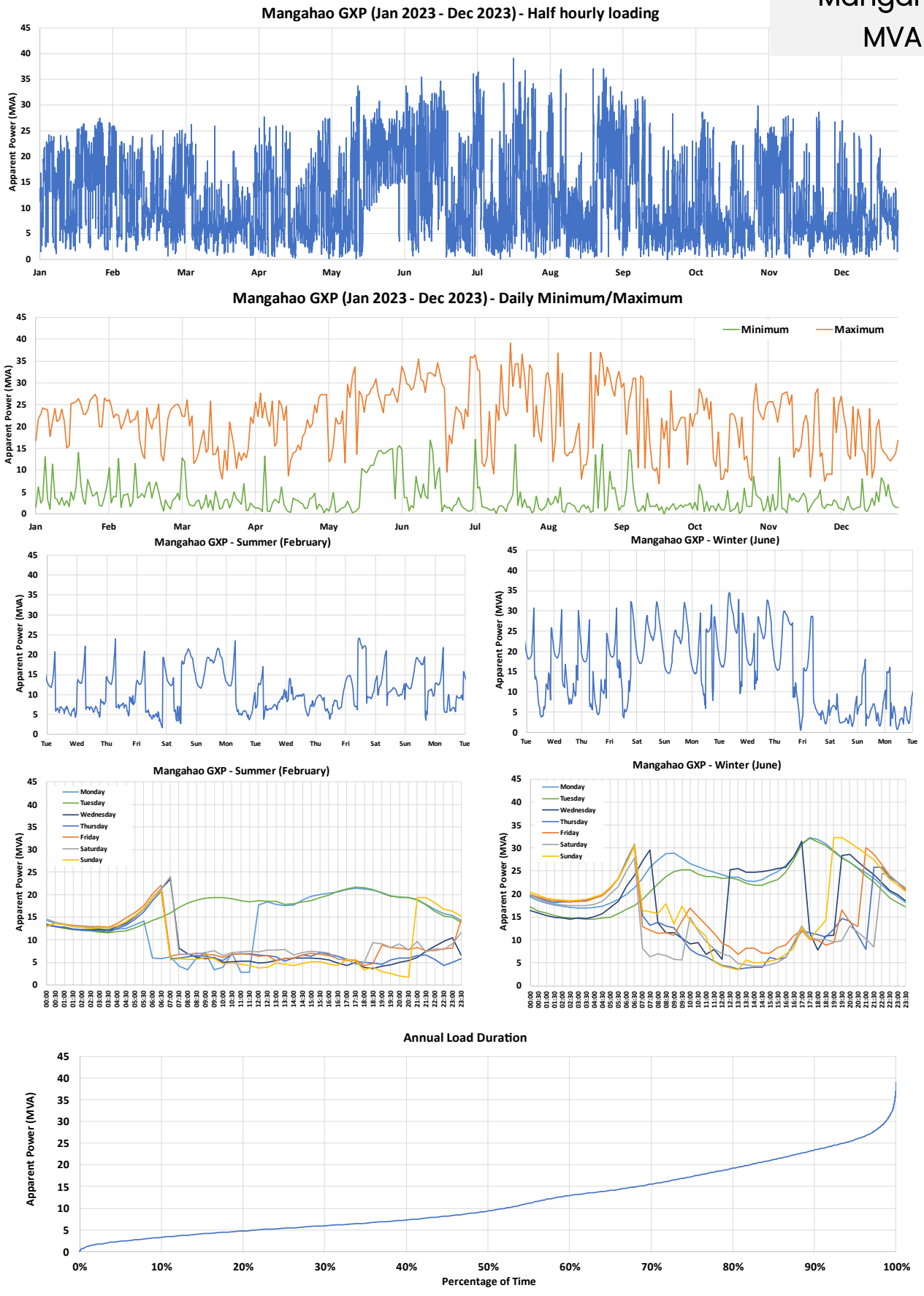


Figure 9. Mangahao: Apparent power (MVA) load characteristics.

Mangahao MVAr

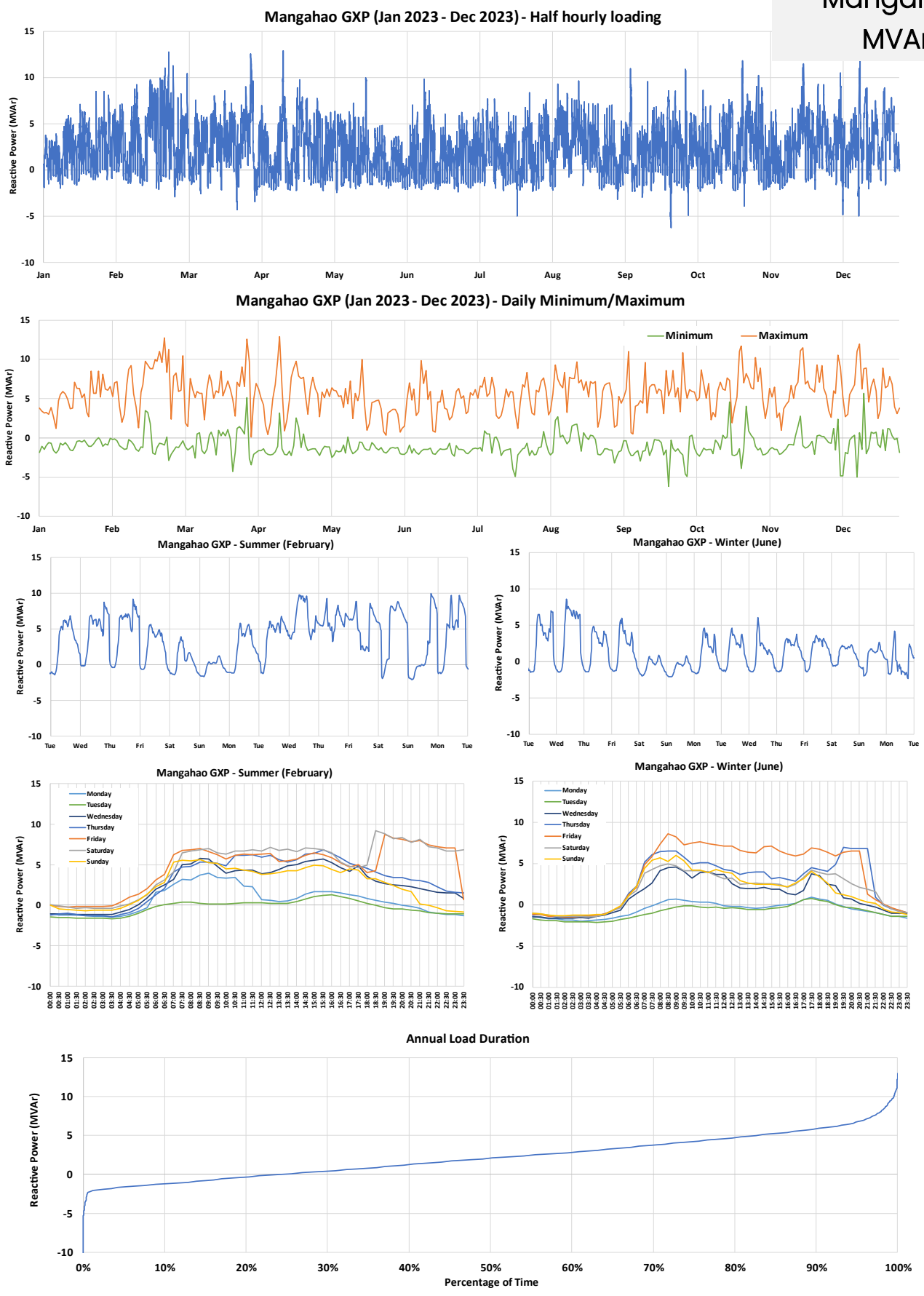


Figure 10. Mangahao: Reactive power (MVAr) load characteristics.

Mangamaire MVA

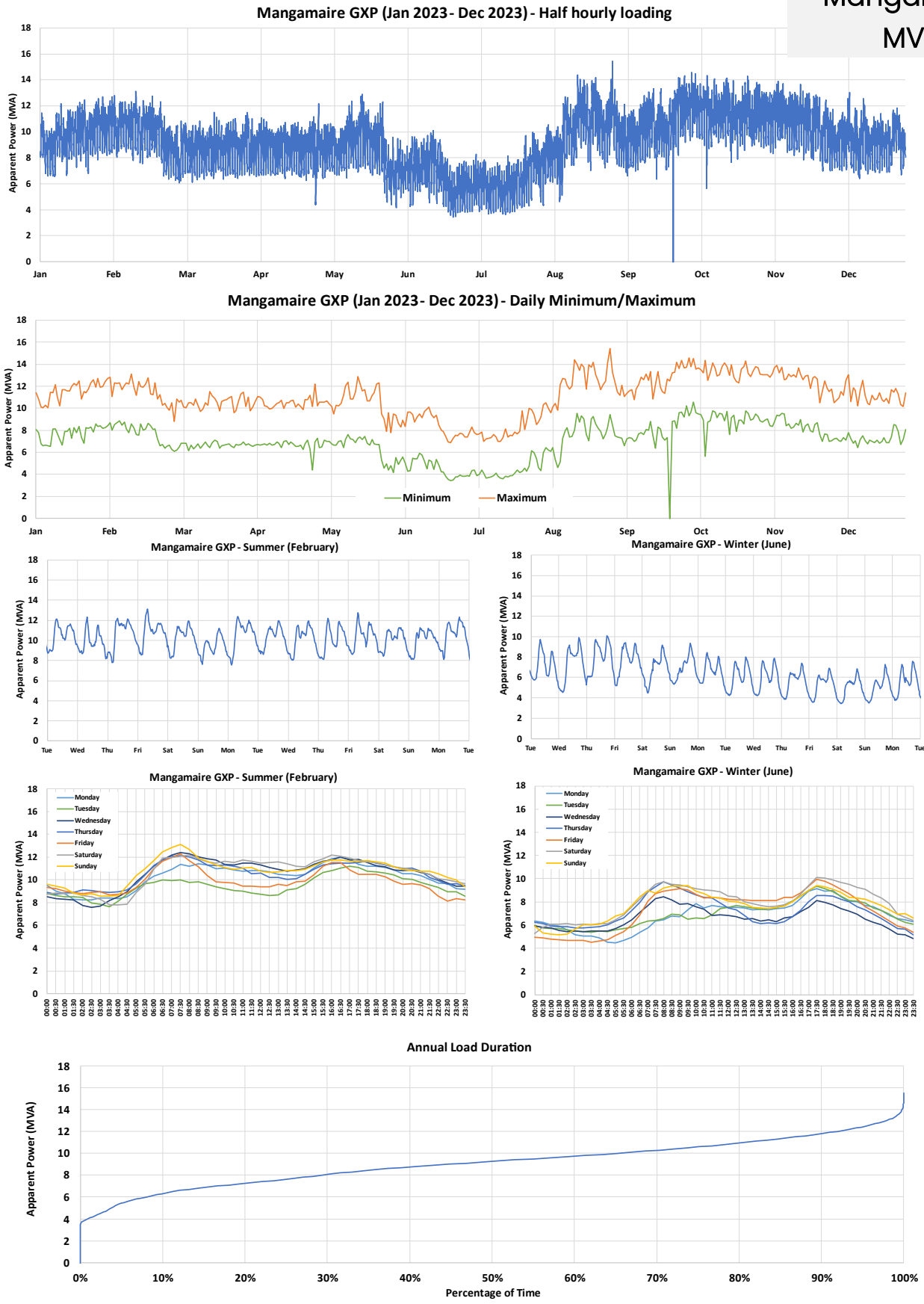


Figure 11. Mangamaire: Apparent power (MVA) load characteristics.

Mangamaire MVAr

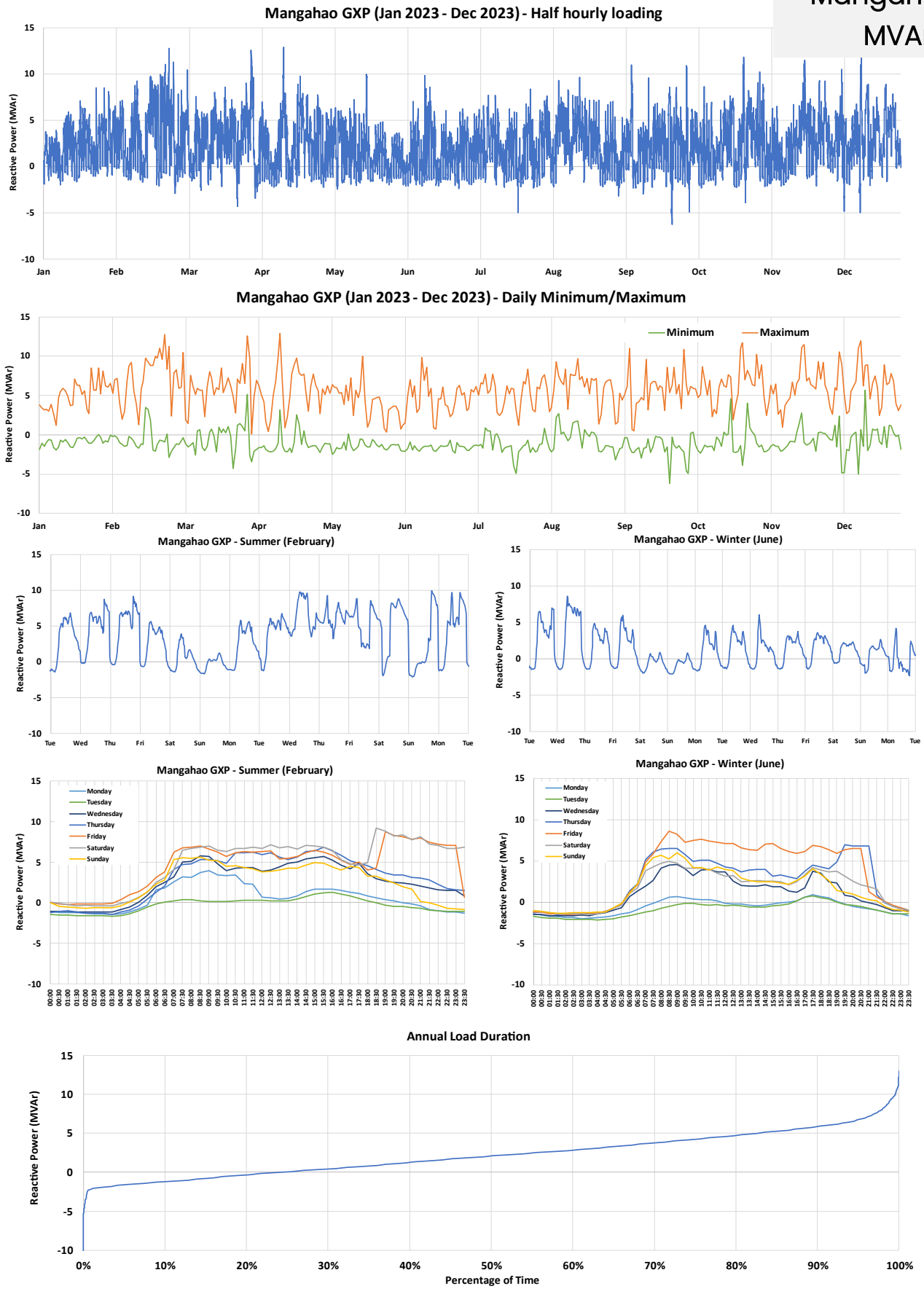


Figure 12. Mangamaire: Reactive power (MVAr) load characteristics.

Marton MVA

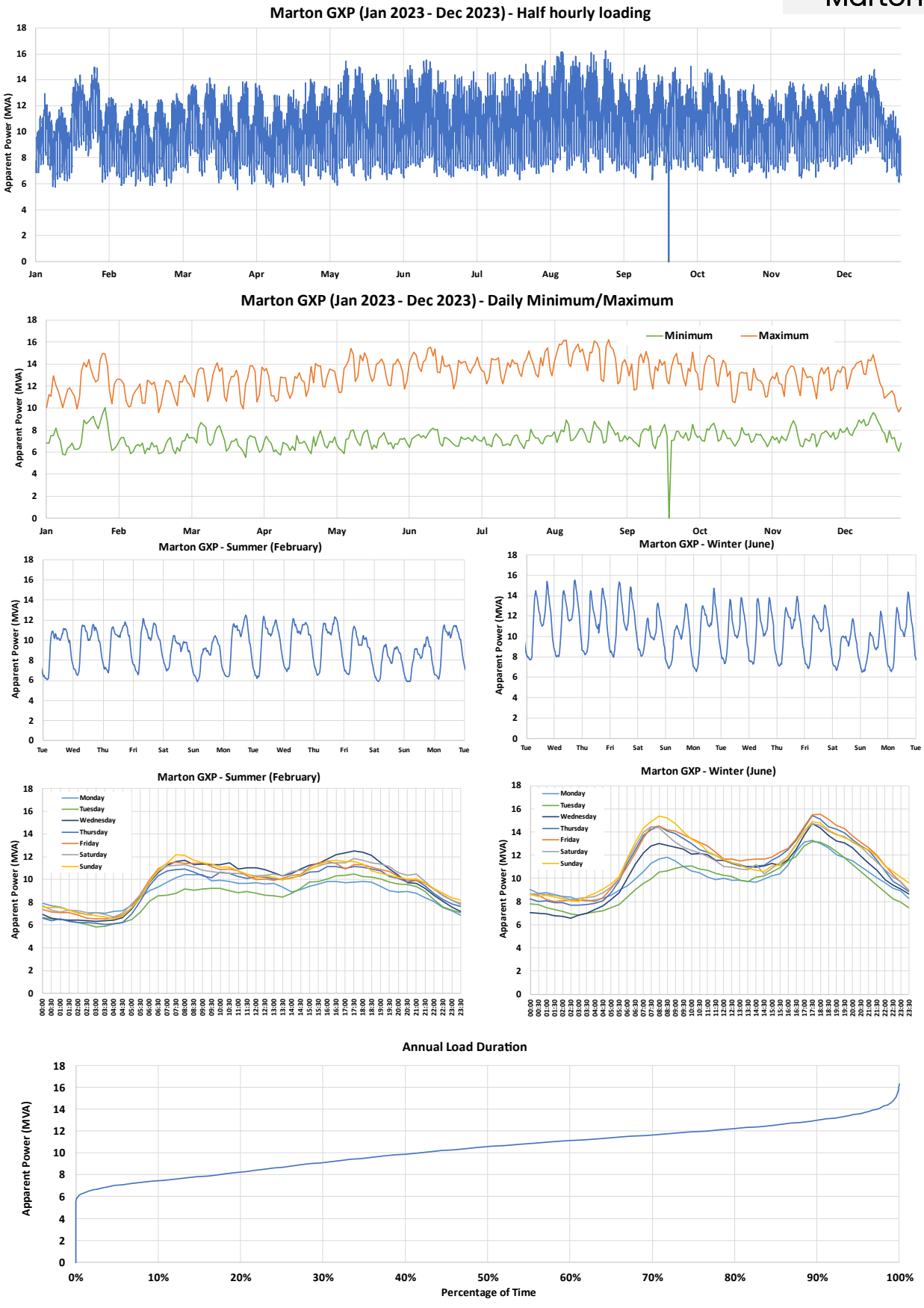


Figure 13. Marton: Apparent power (MVA) load characteristics.

Marton MVAr

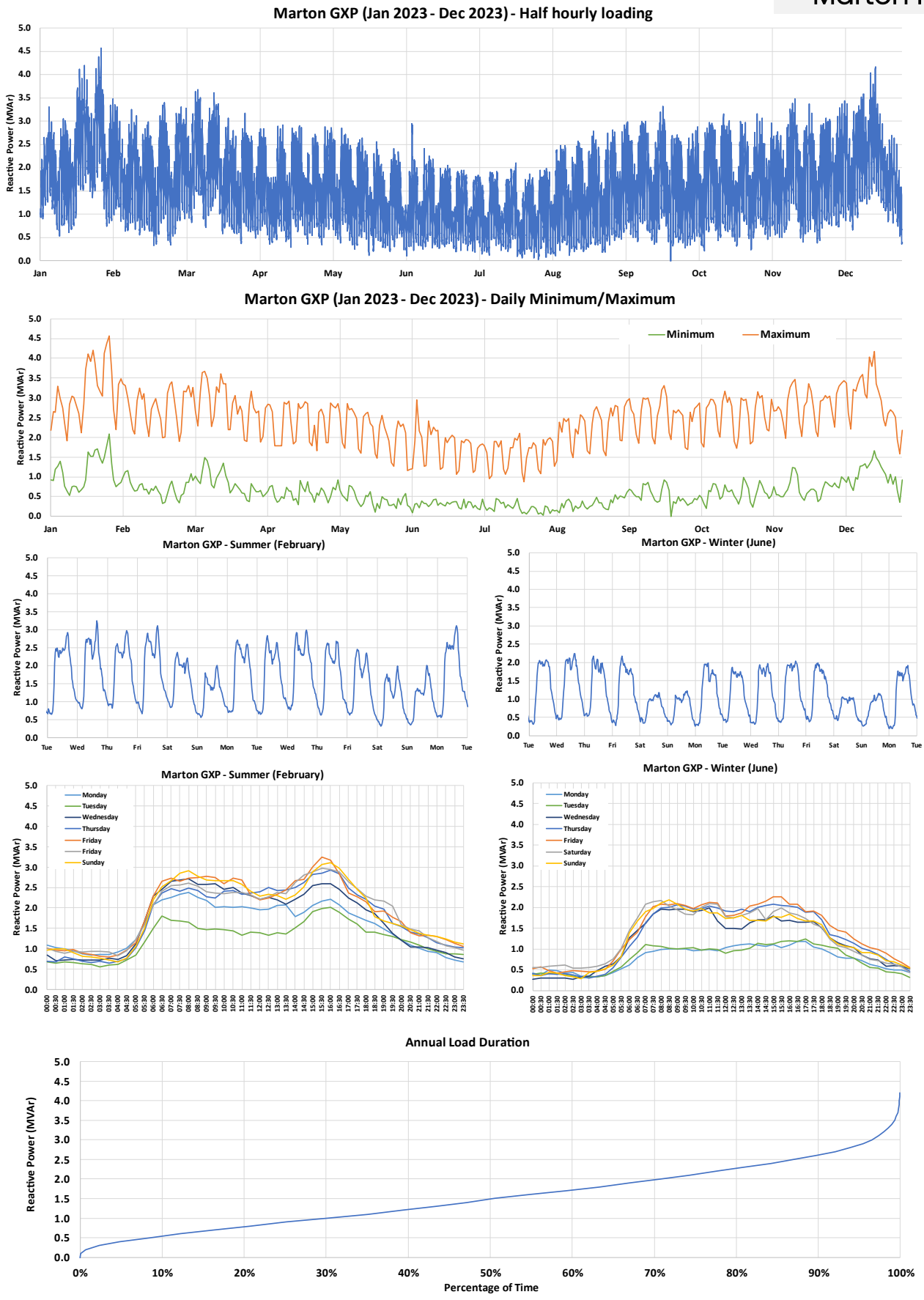


Figure 14. Marton: Reactive power (MVAr) load characteristics.

Mataroa MVA

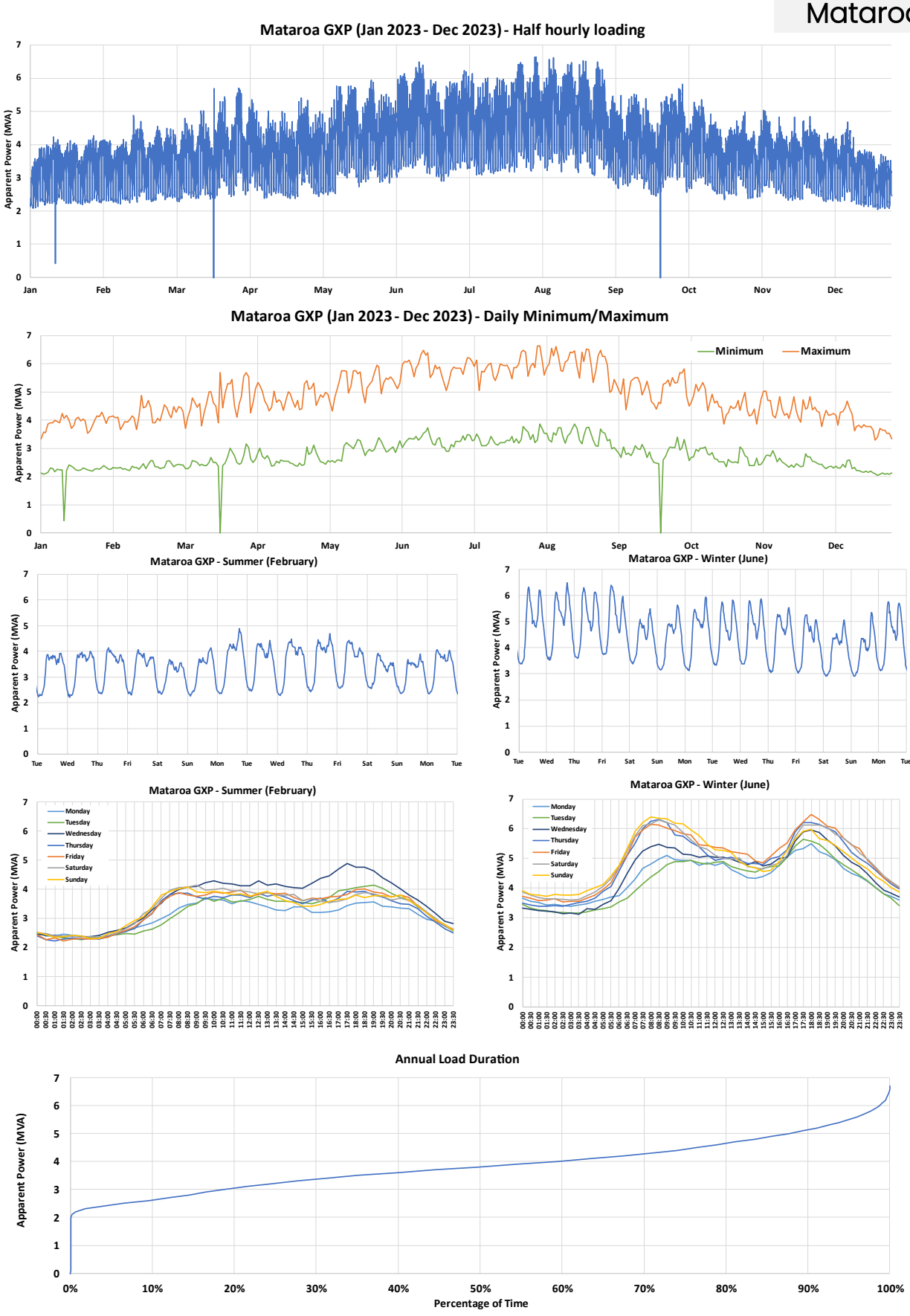


Figure 15. Mataroa: Apparent power (MVA) load characteristics.

Mataroa MVAr

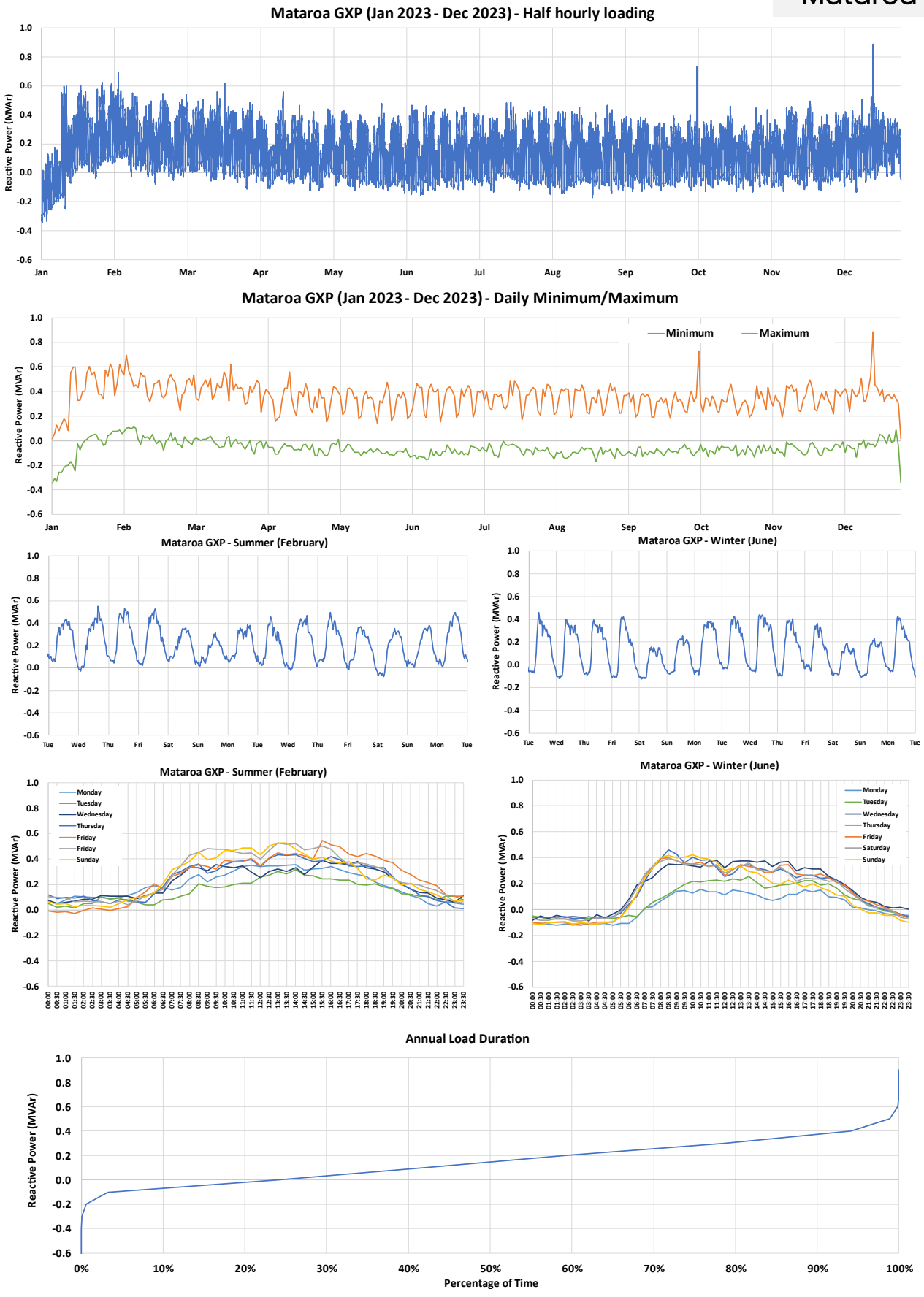


Figure 16. Mataroa: Reactive power (MVAr) load characteristics.

National Park MVA

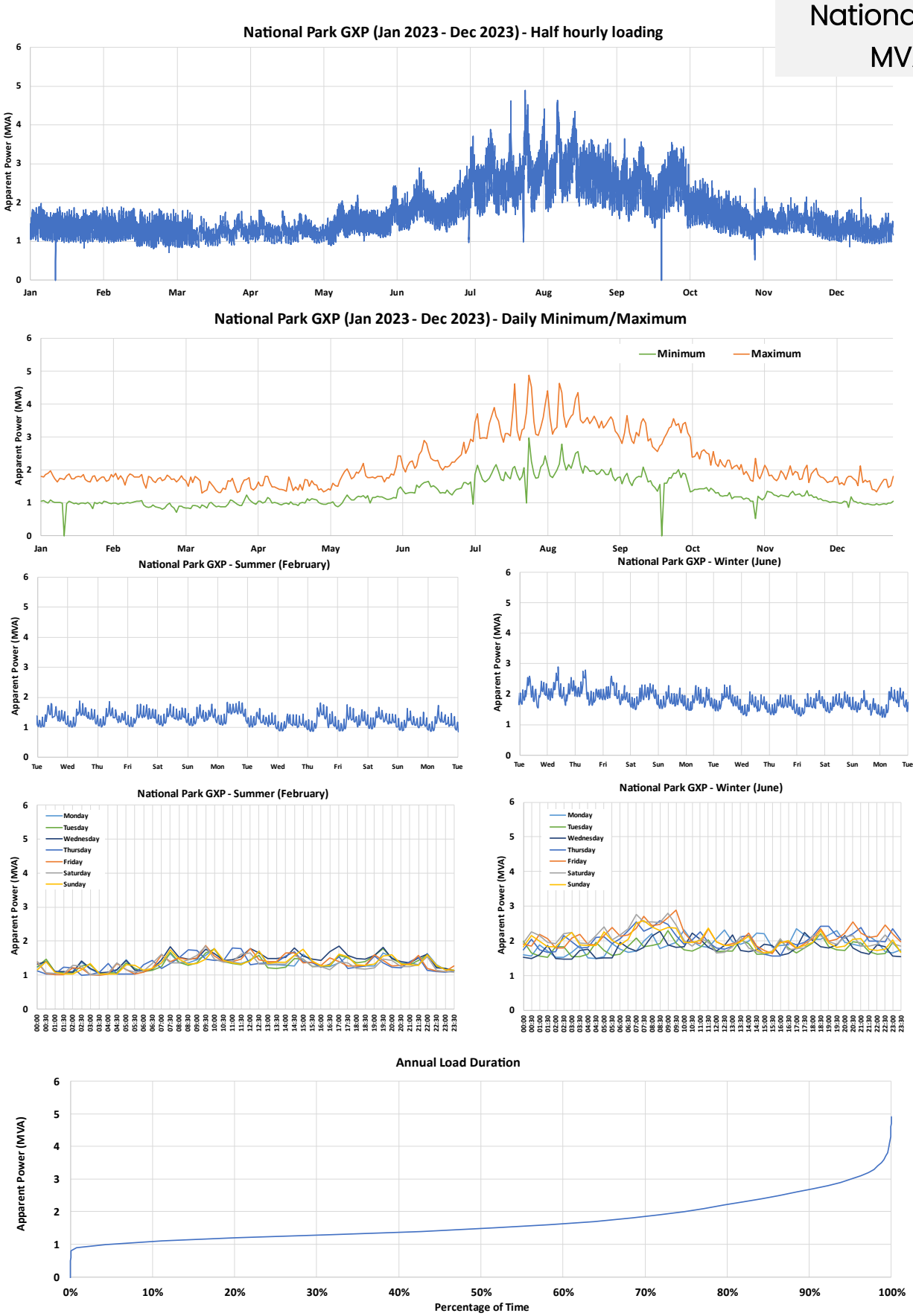


Figure 17. National Park: Apparent power (MVA) load characteristics.

National Park MVAr

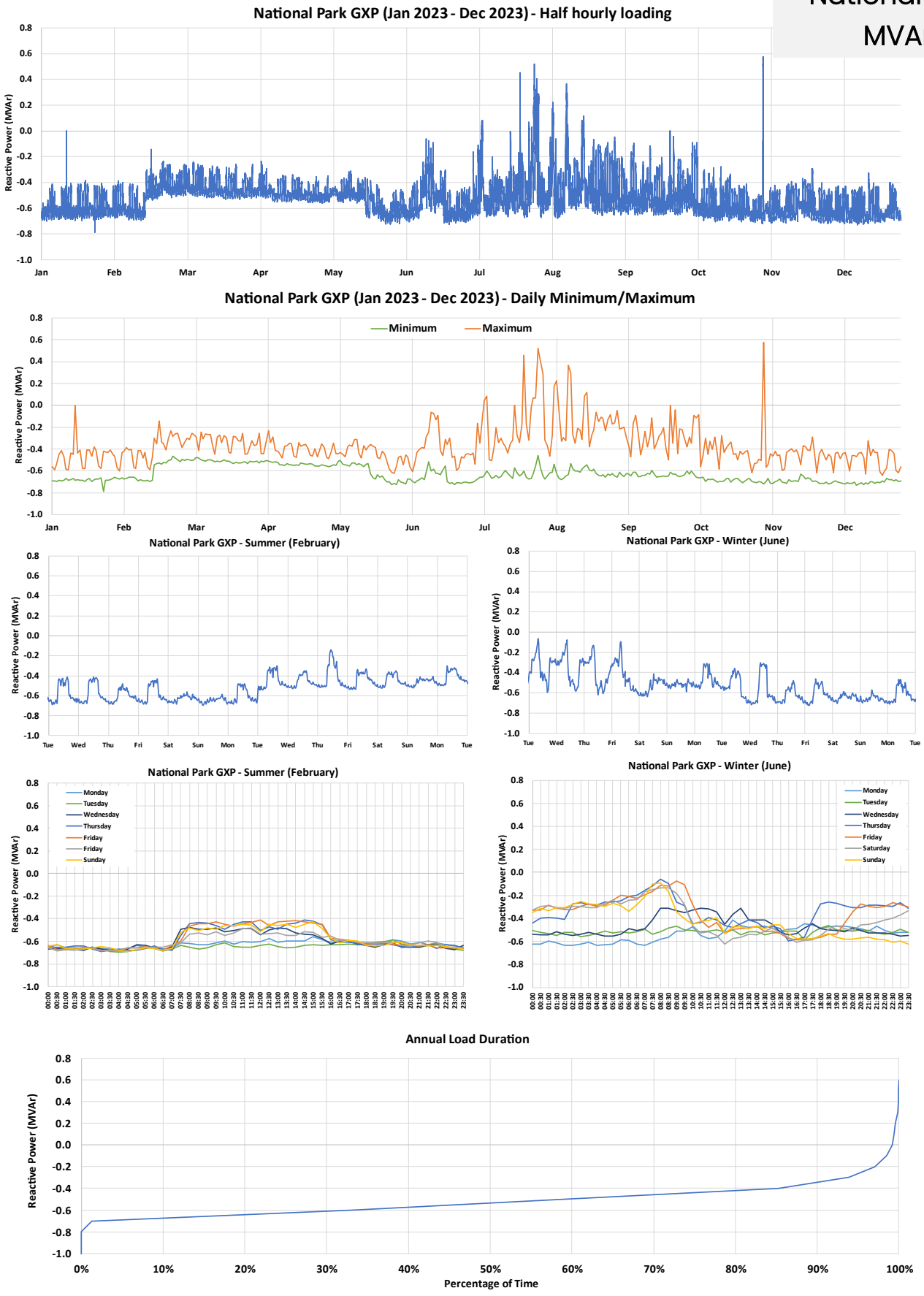


Figure 18. National Park: Reactive power (MVAr) load characteristics.

Ohakune MVA

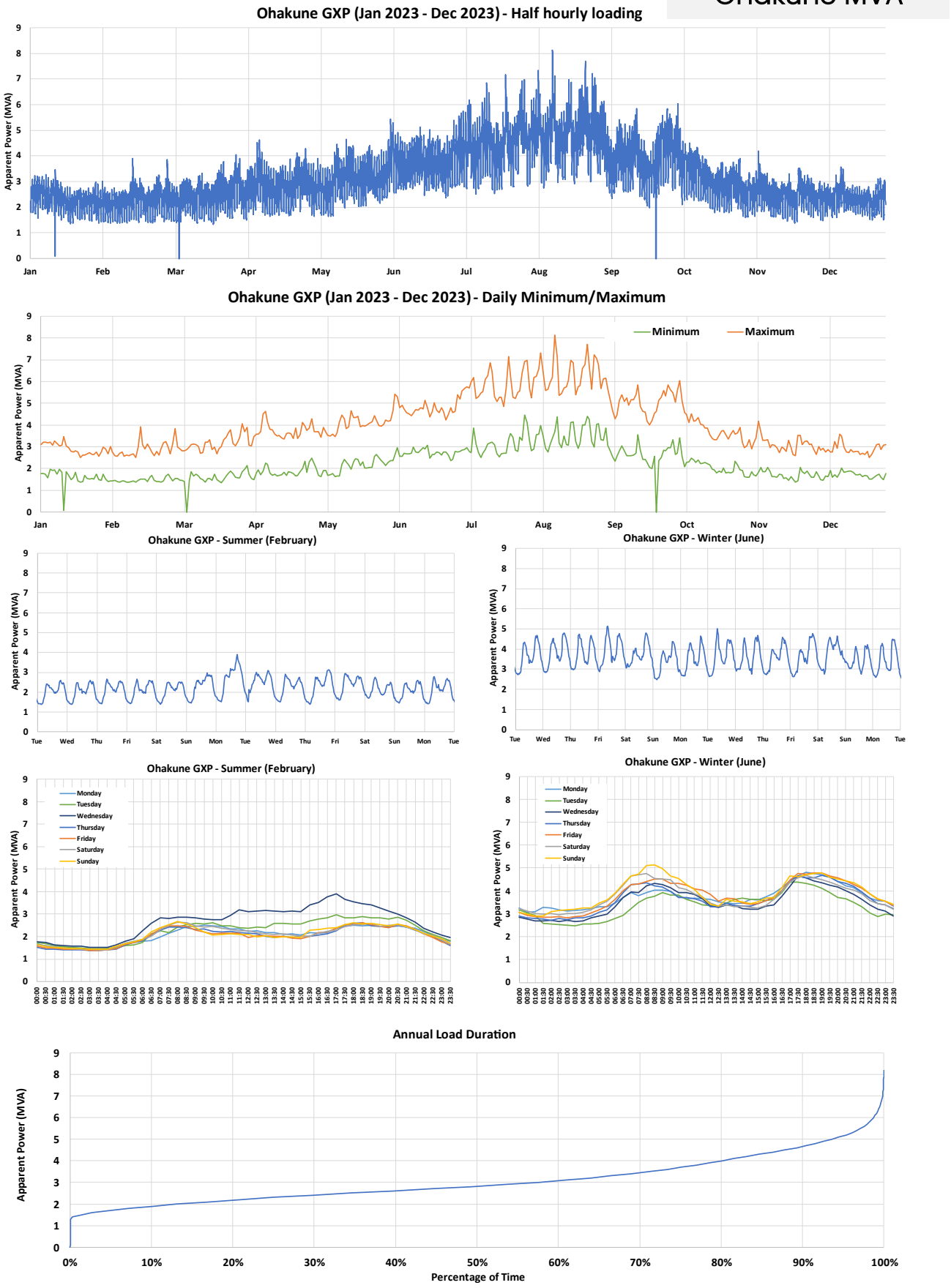


Figure 19. Ohakune: Apparent power (MVA) load characteristics.

Ohakune MVAr

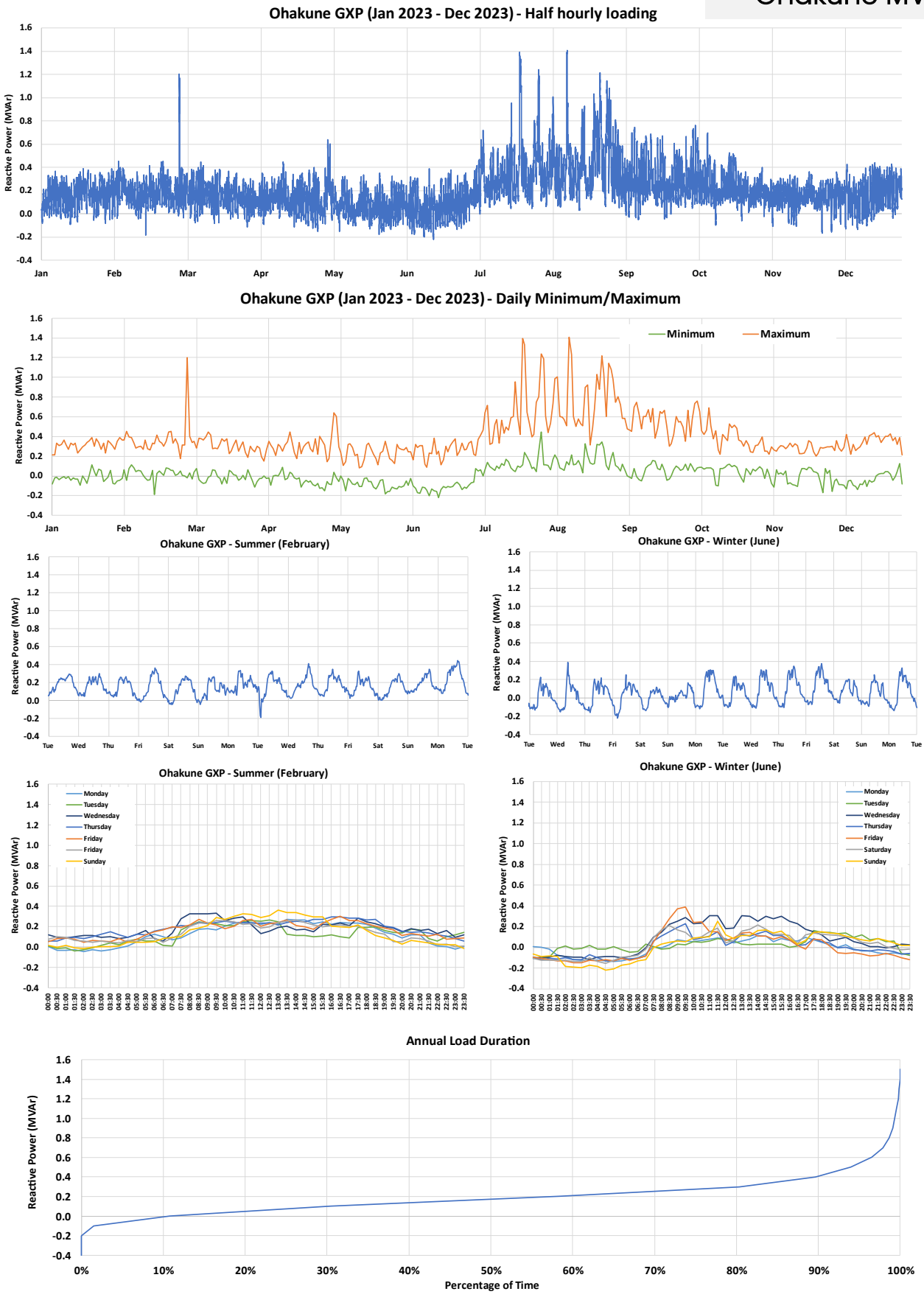


Figure 20. Ohakune: Reactive power (MVAr) load characteristics.

Ongarue MVA

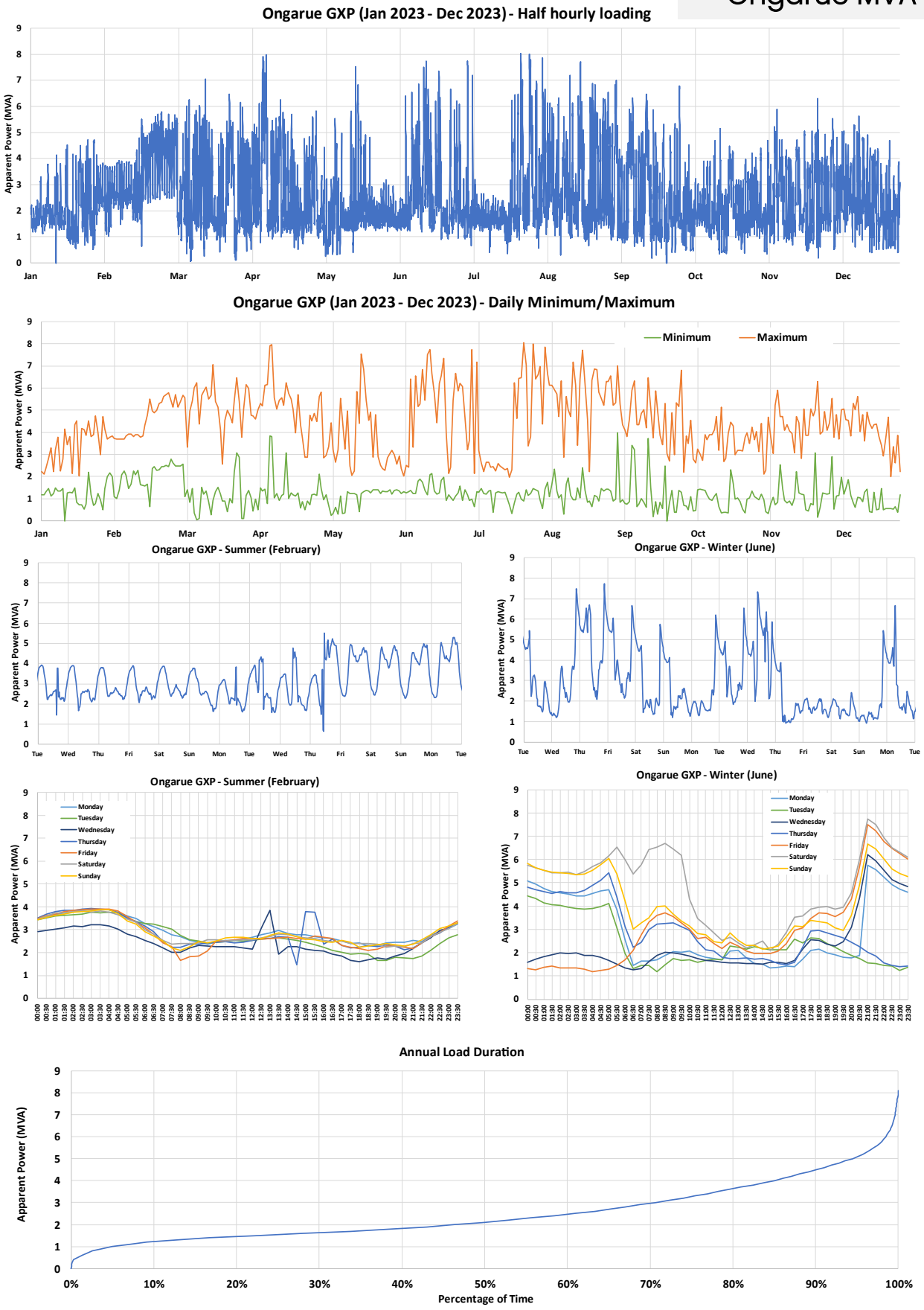


Figure 21. Ongarue: Apparent power (MVA) load characteristics.

Ongarue MVAr

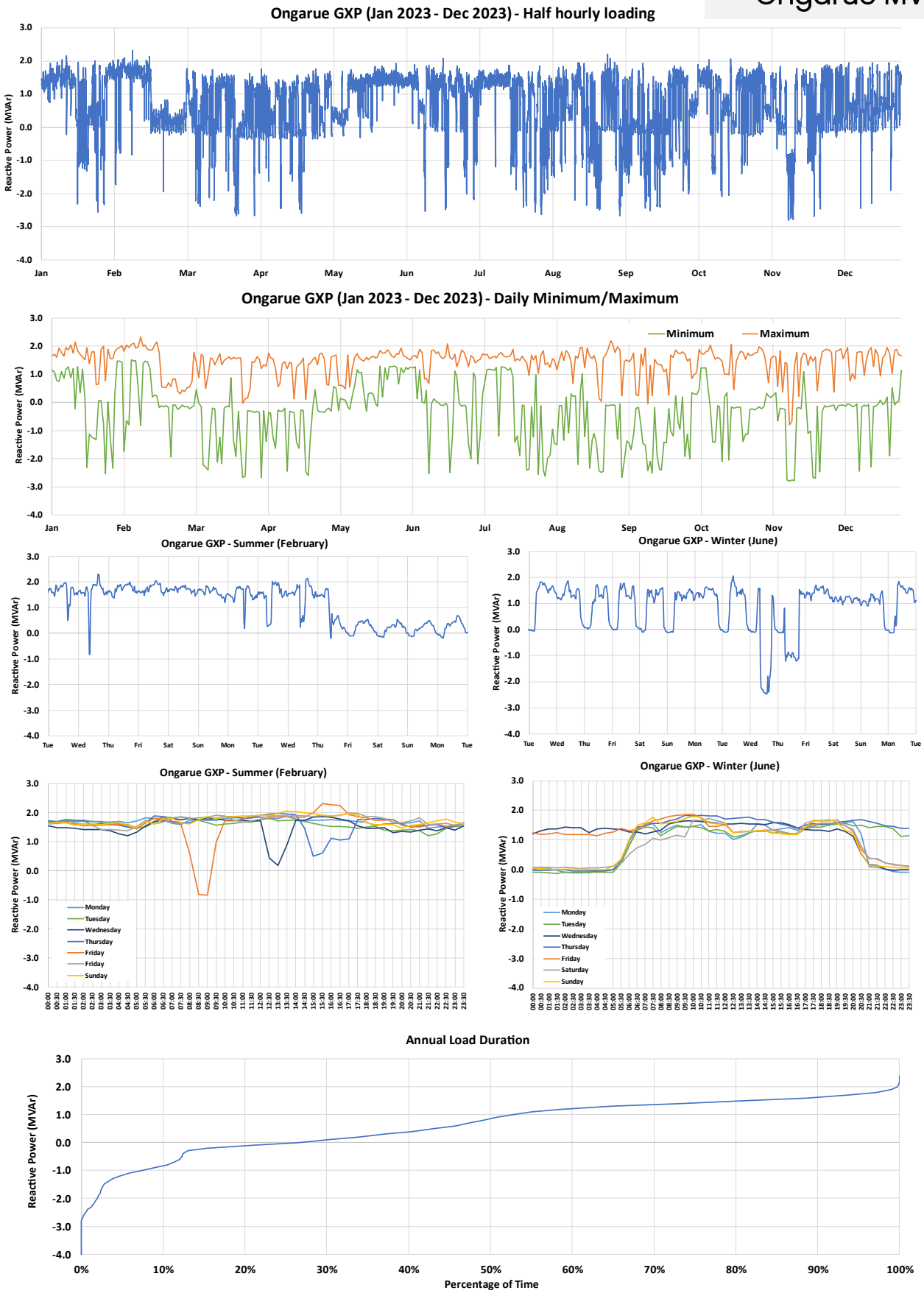


Figure 22. Ongarue: Reactive power (MVAr) load characteristics.

Tangiwai 11 kV MVA

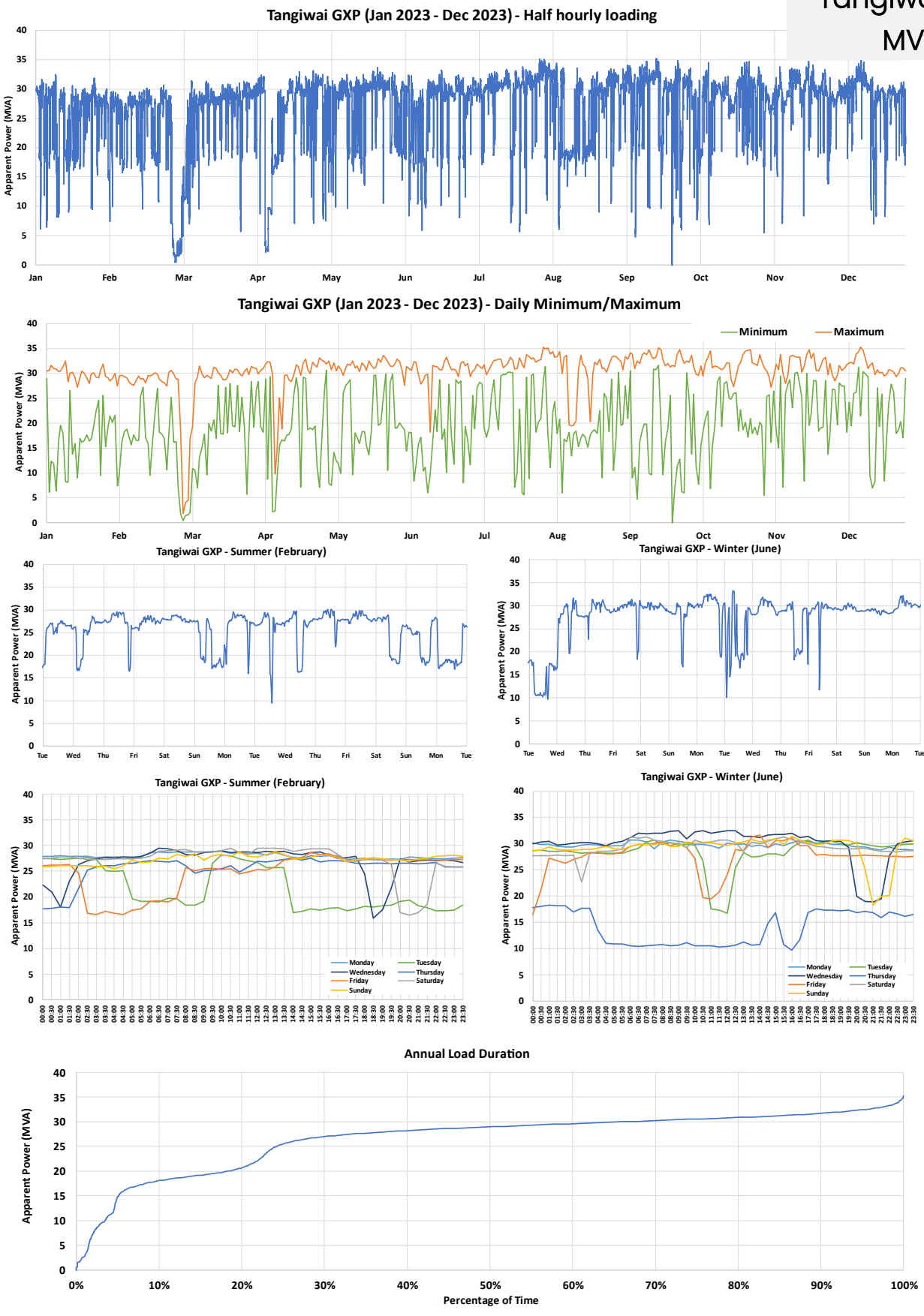


Figure 23. Tangiwai 11 kV: Apparent power (MVA) load characteristics.

Tangiwai 11 kV MVAr

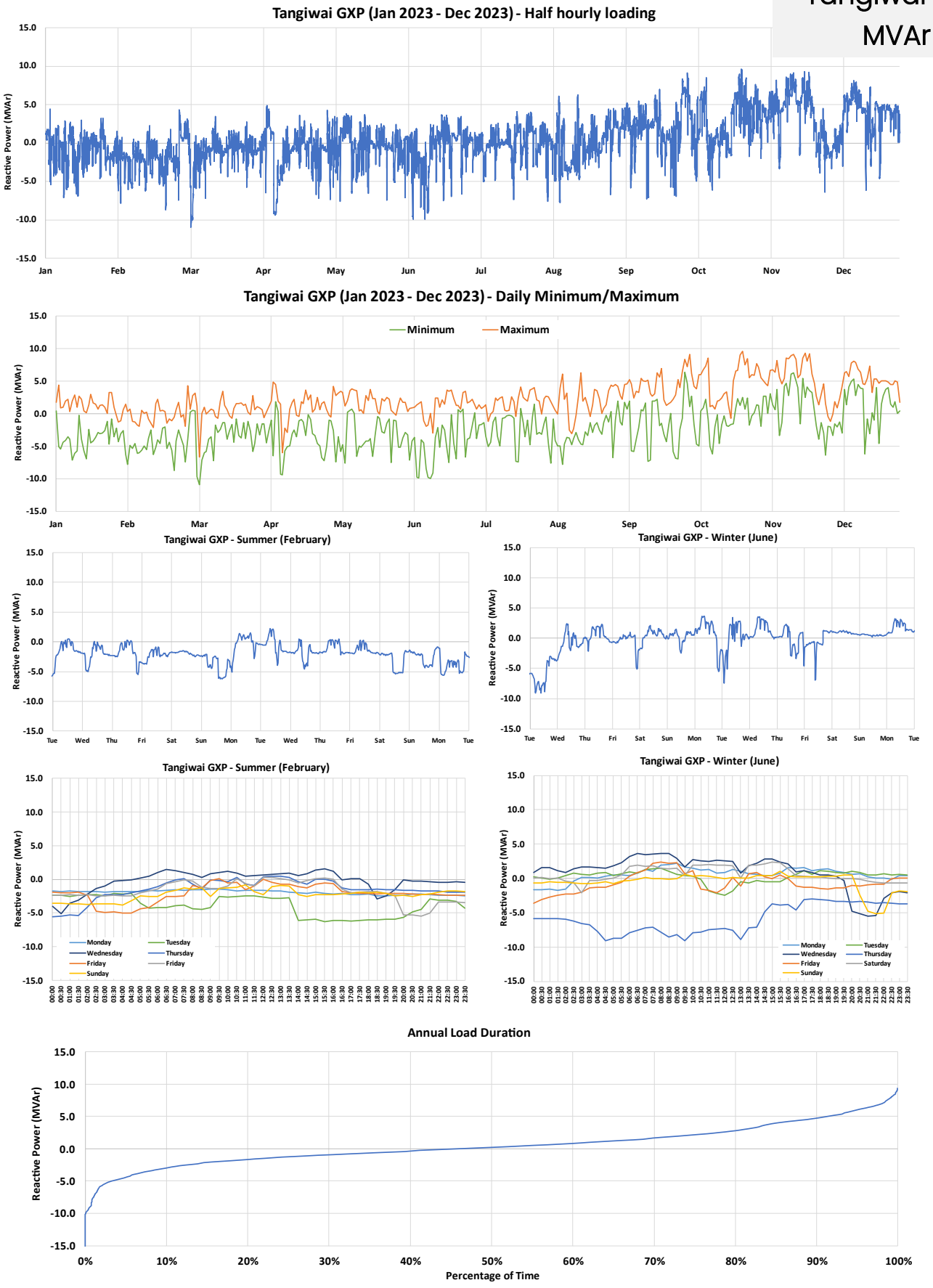


Figure 24. Tangiwai 11 kV: Reactive power (MVAr) load characteristics.

Tokaanu MVA

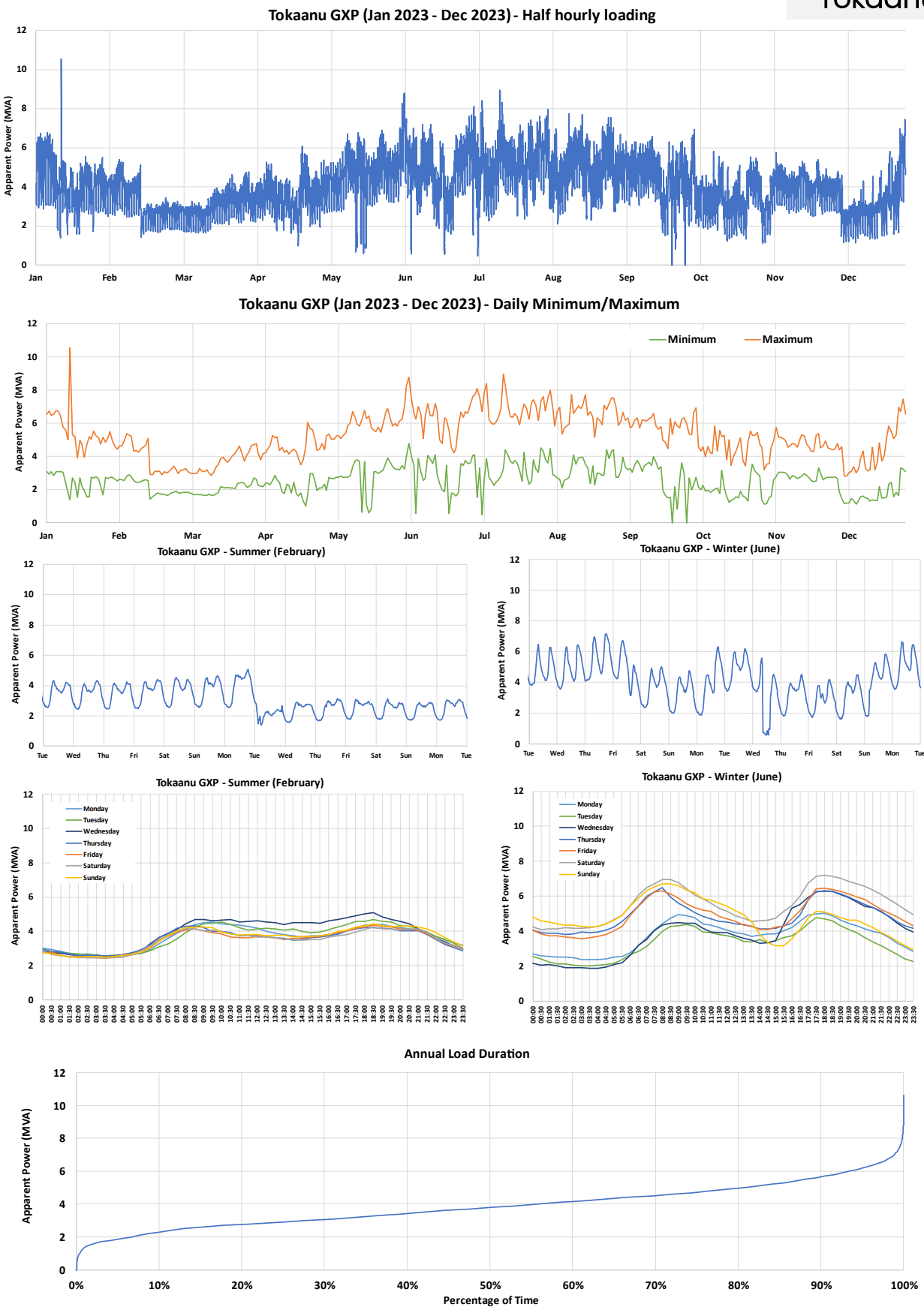


Figure 25. Tokaanu: Apparent power (MVA) load characteristics.

Tokaanu MVAr

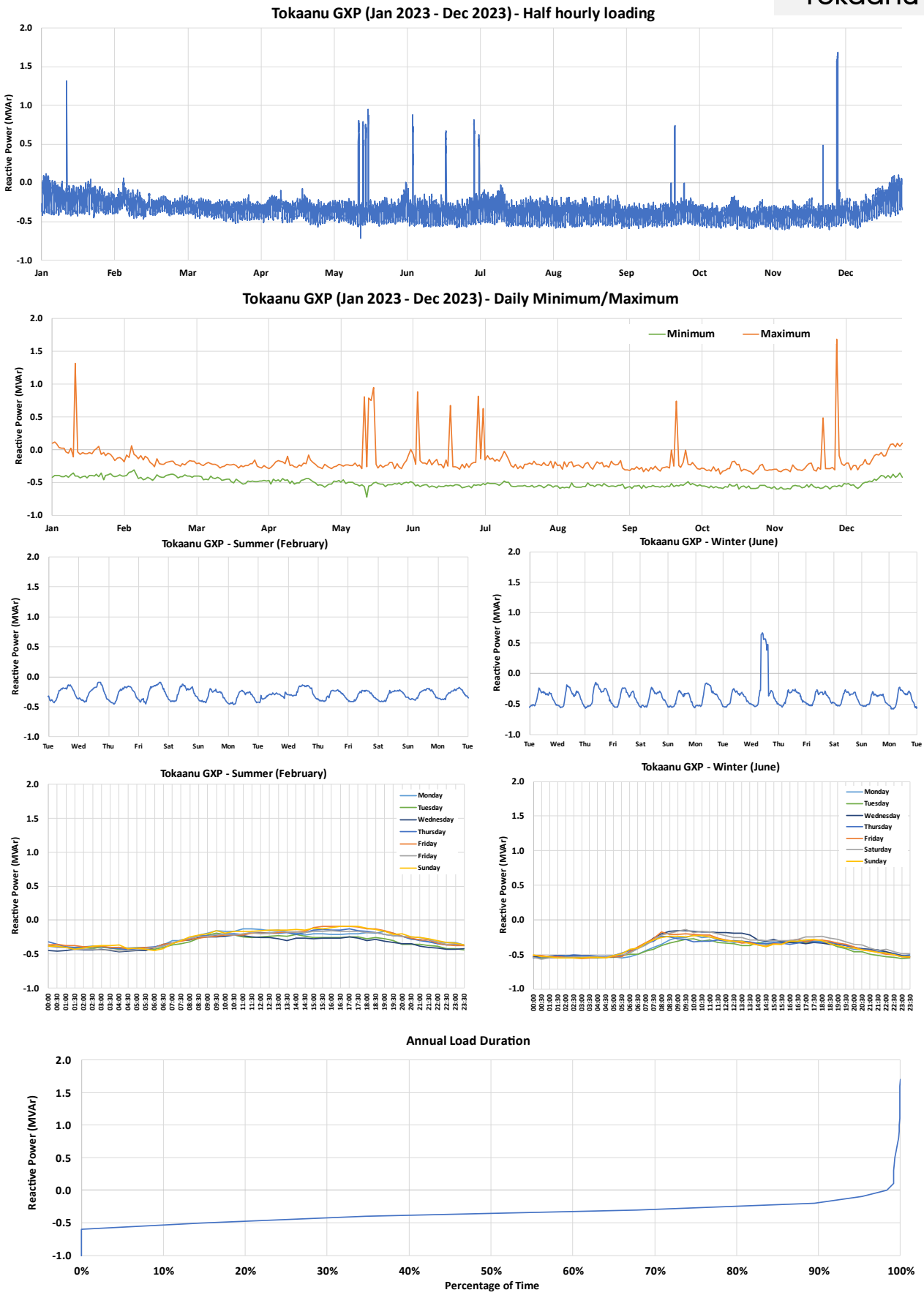


Figure 26. Tokaanu: Reactive power (MVAr) load characteristics.

Whanganui MVA

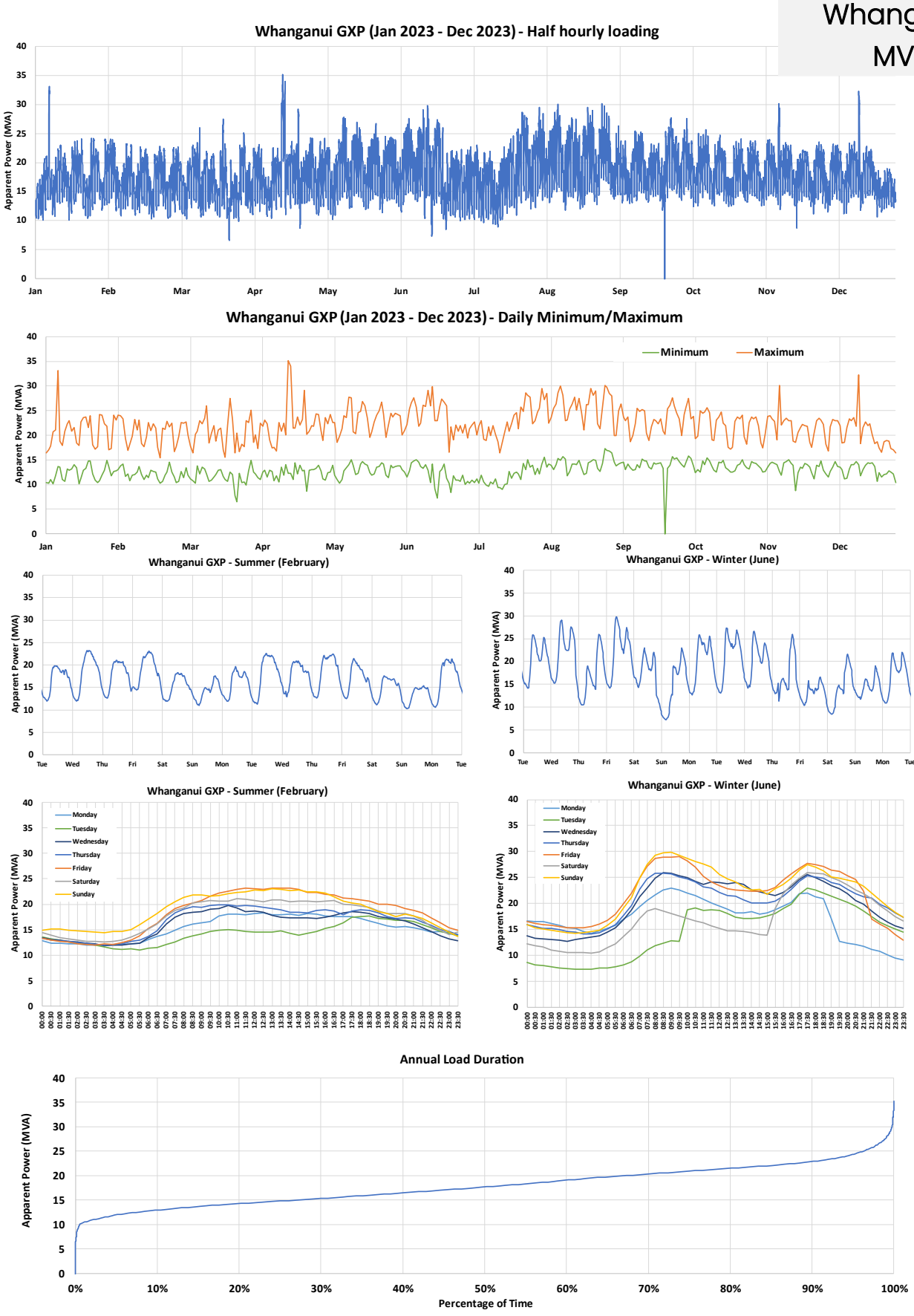


Figure 27. Whanganui: Apparent power (MVA) load characteristics.

Whanganui MVAr

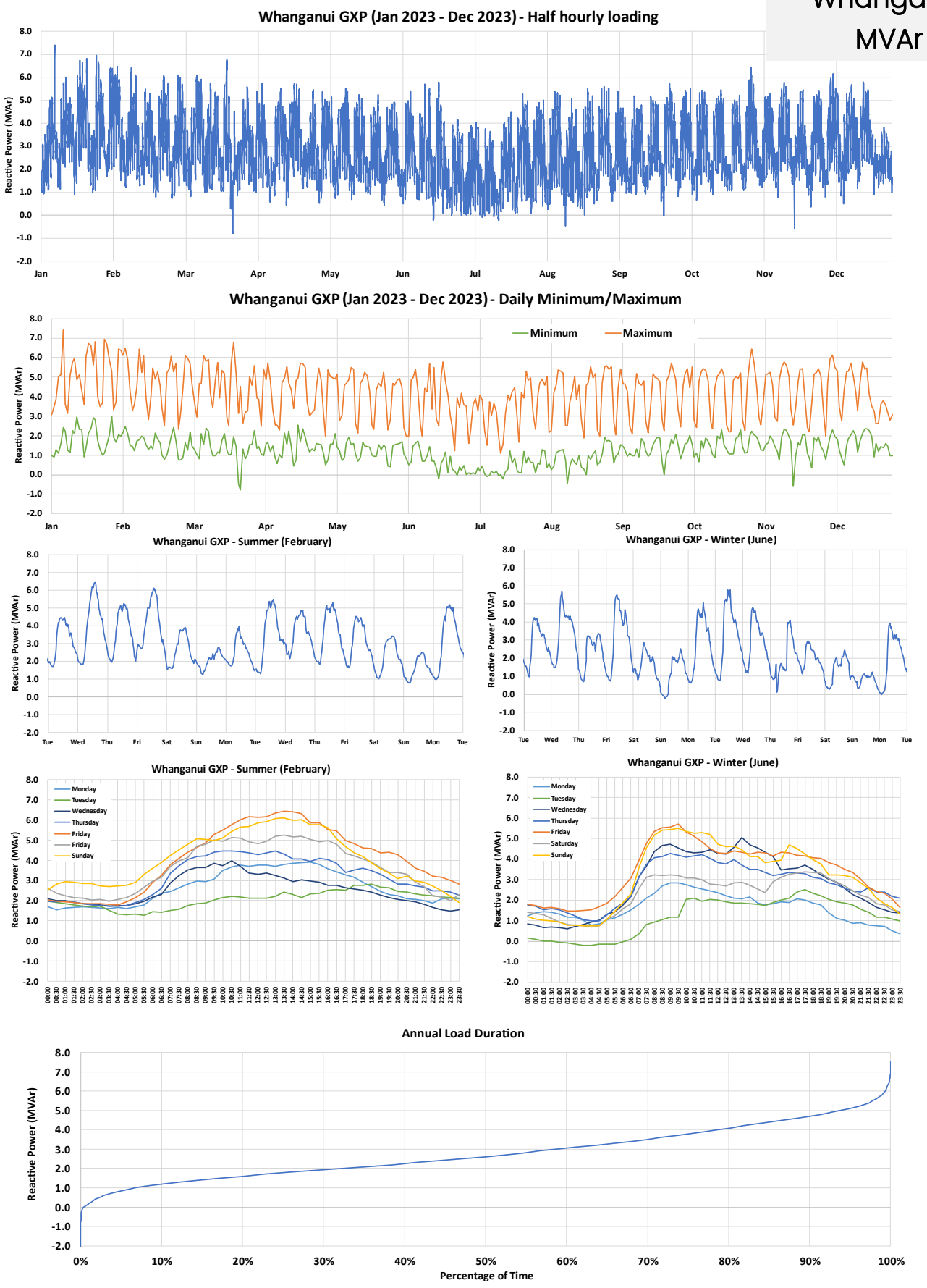


Figure 28. Whanganui: Reactive power (MVAr) load characteristics.

Woodville MVA

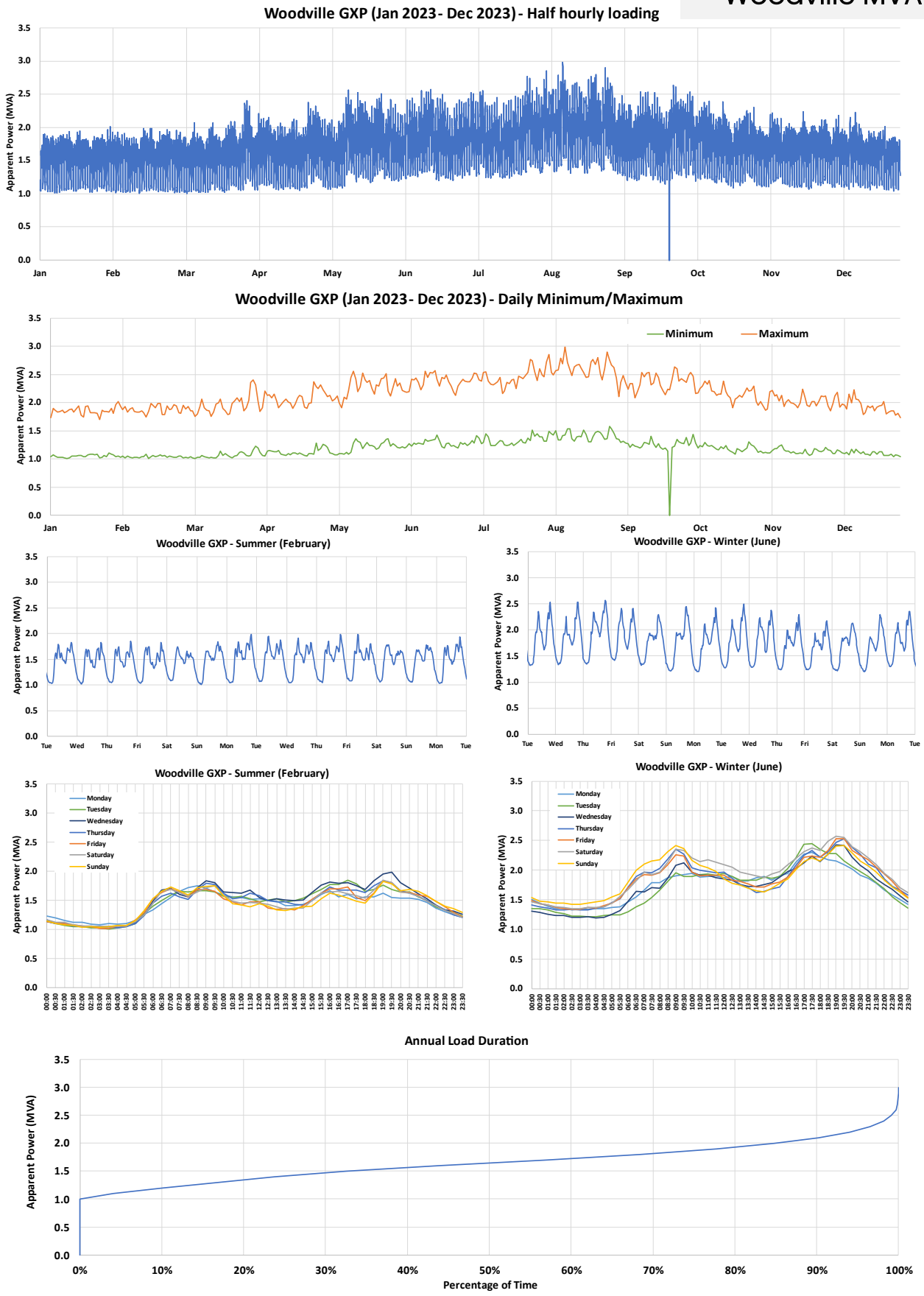


Figure 29. Woodville: Apparent power (MVA) load characteristics.

Woodville MVAr

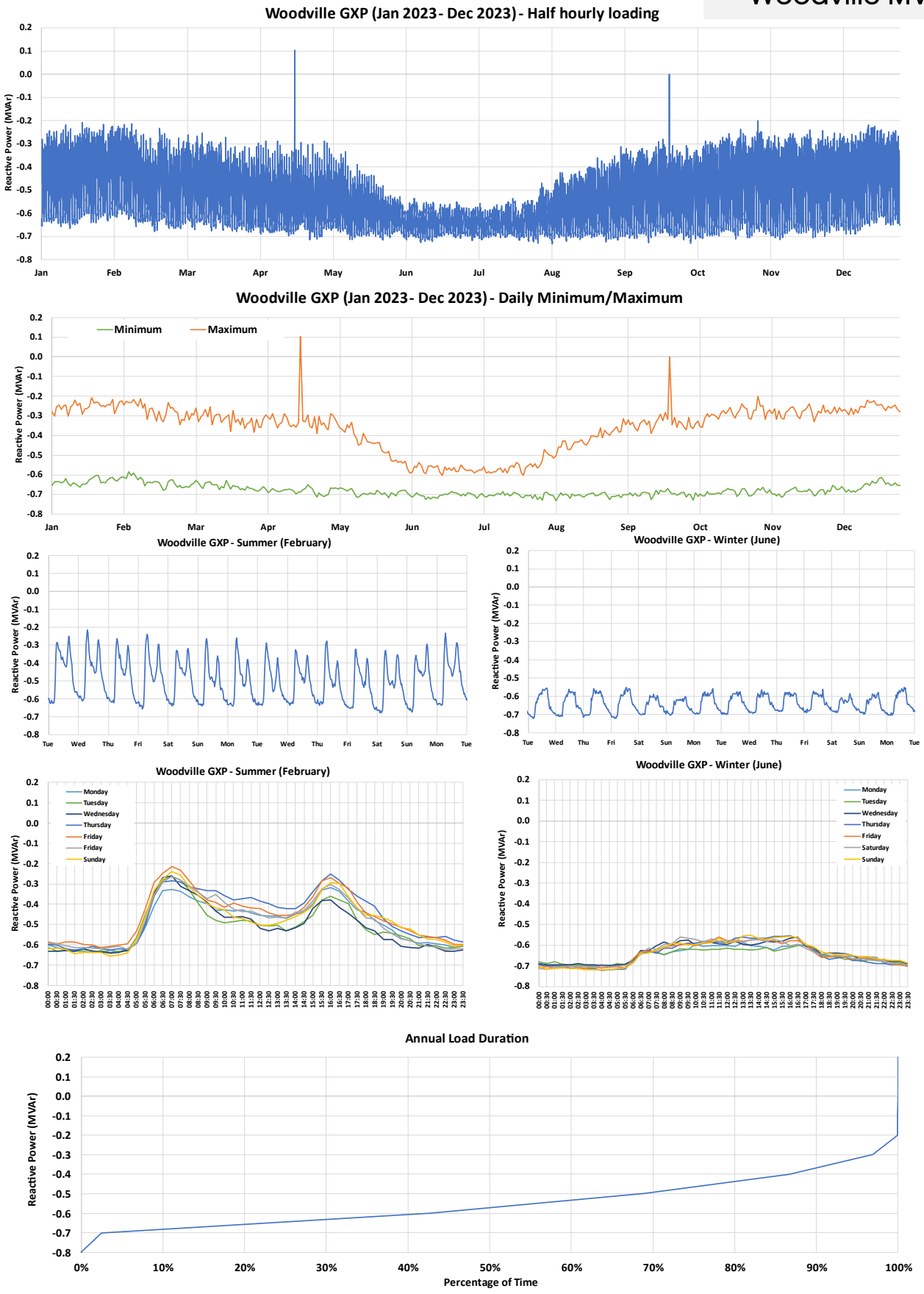


Figure 30. Woodville: Reactive power (MVAr) load characteristics.

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. Shannon 33/11 kV zone substation: Apparent power (MVA) load characteristics.
- Figure 32. Foxton 33/11 kV zone substation: Apparent power (MVA) load characteristics.
- Figure 33. Levin West 33/11 kV zone substation: Apparent power (MVA) load characteristics.
- Figure 34. Levin East 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Shannon MVA

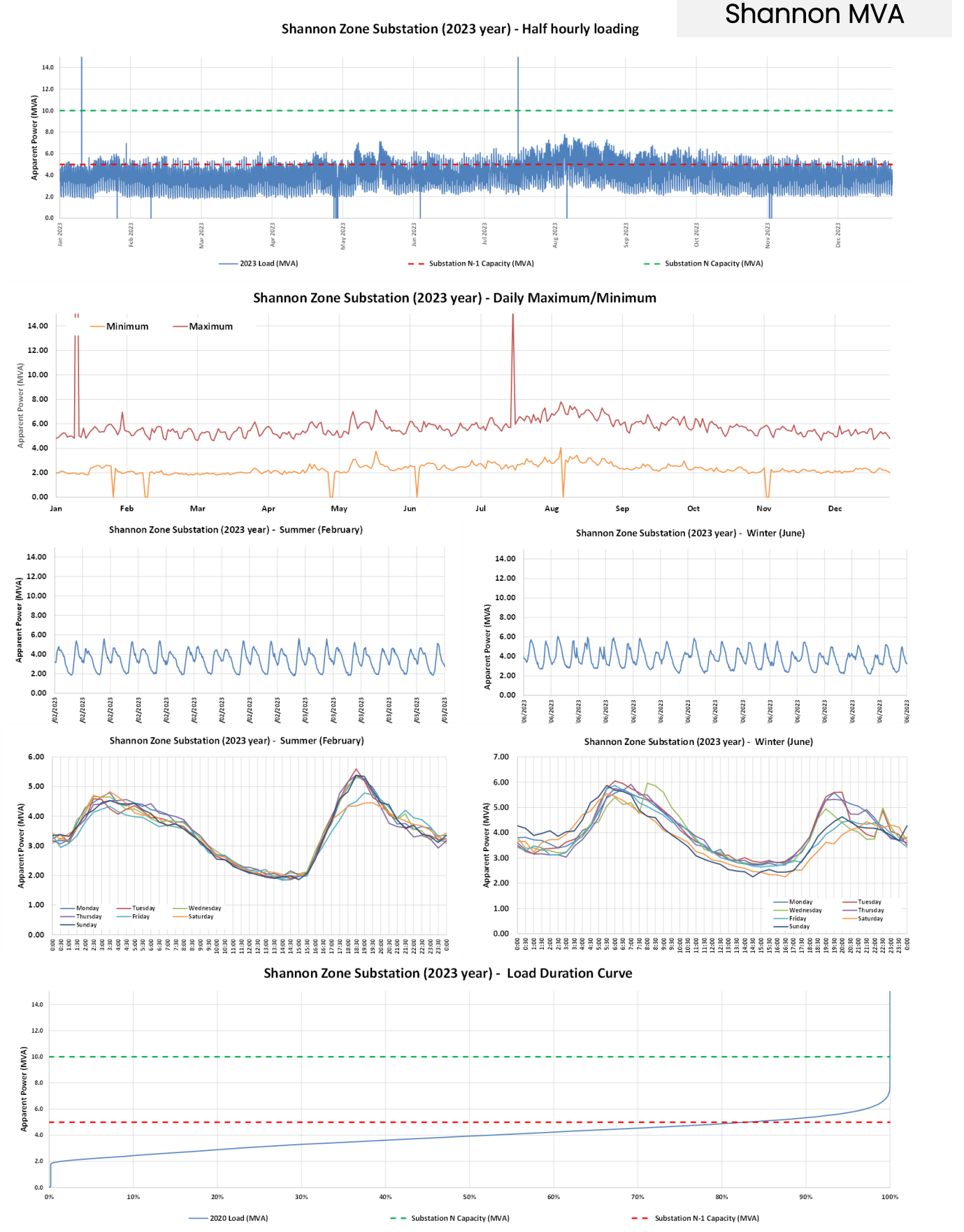


Figure 31. Shannon 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Foxton MVA

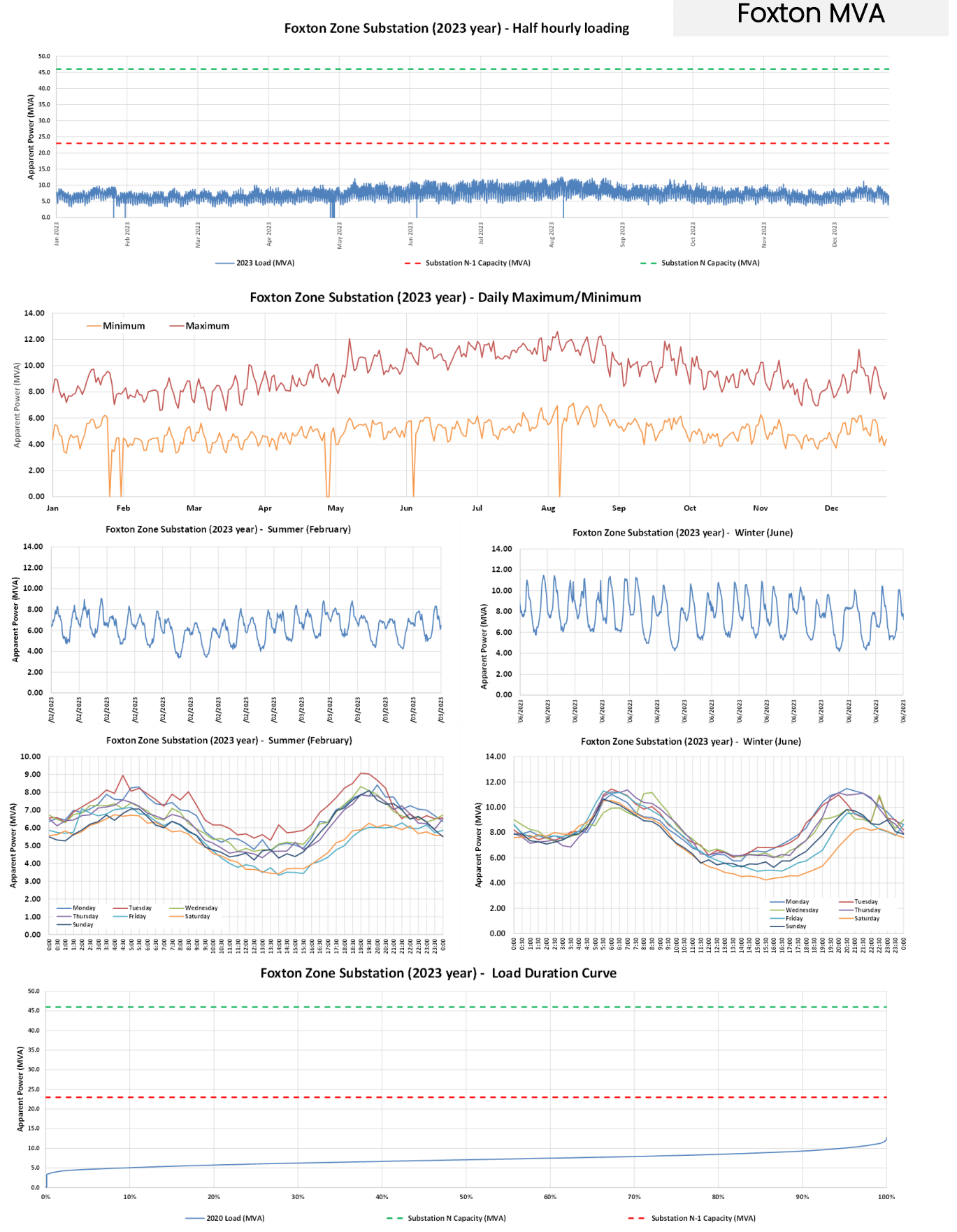


Figure 32. Foxton 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Levin West MVA

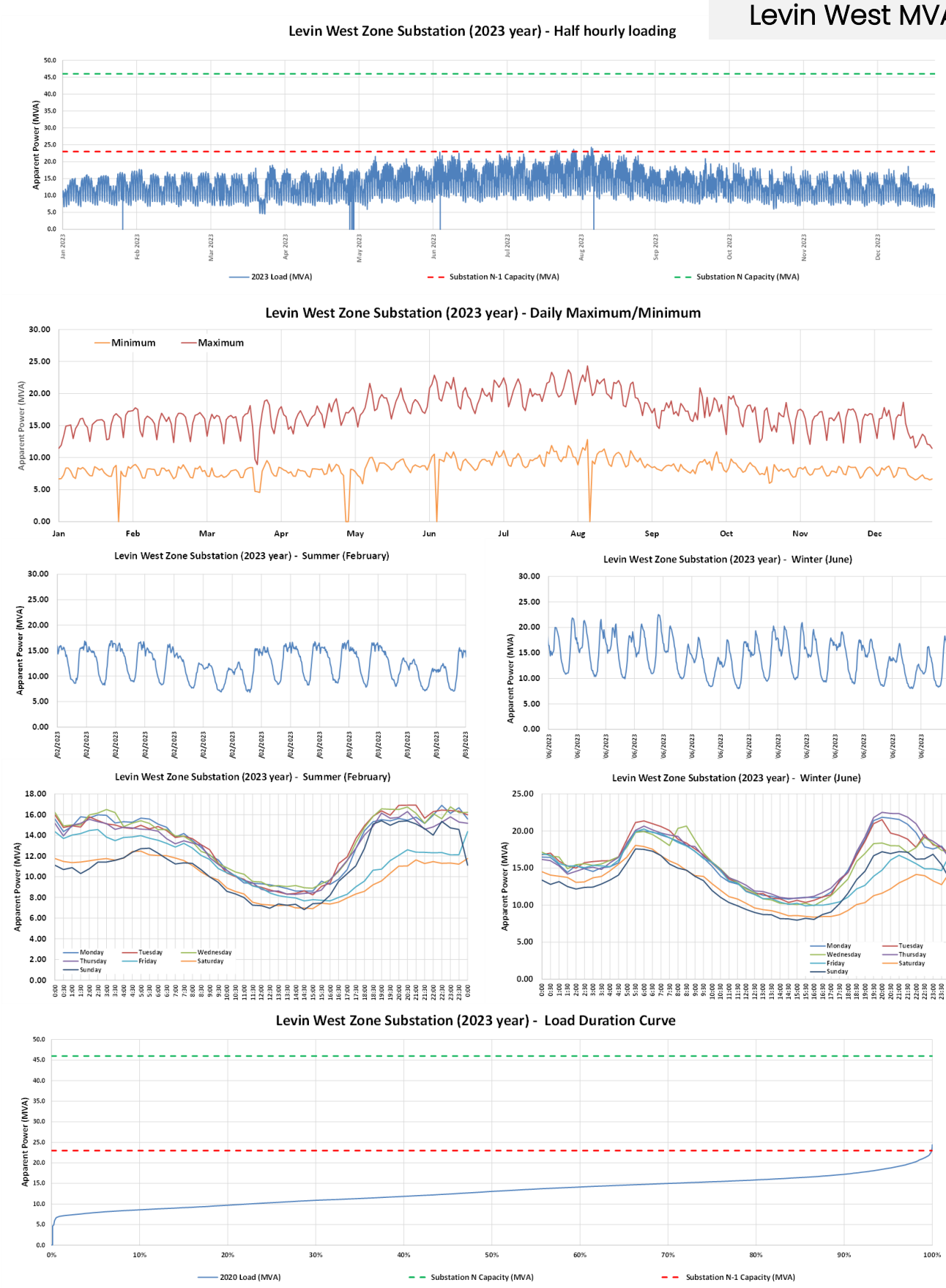


Figure 33. Levin West 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Levin East MVA

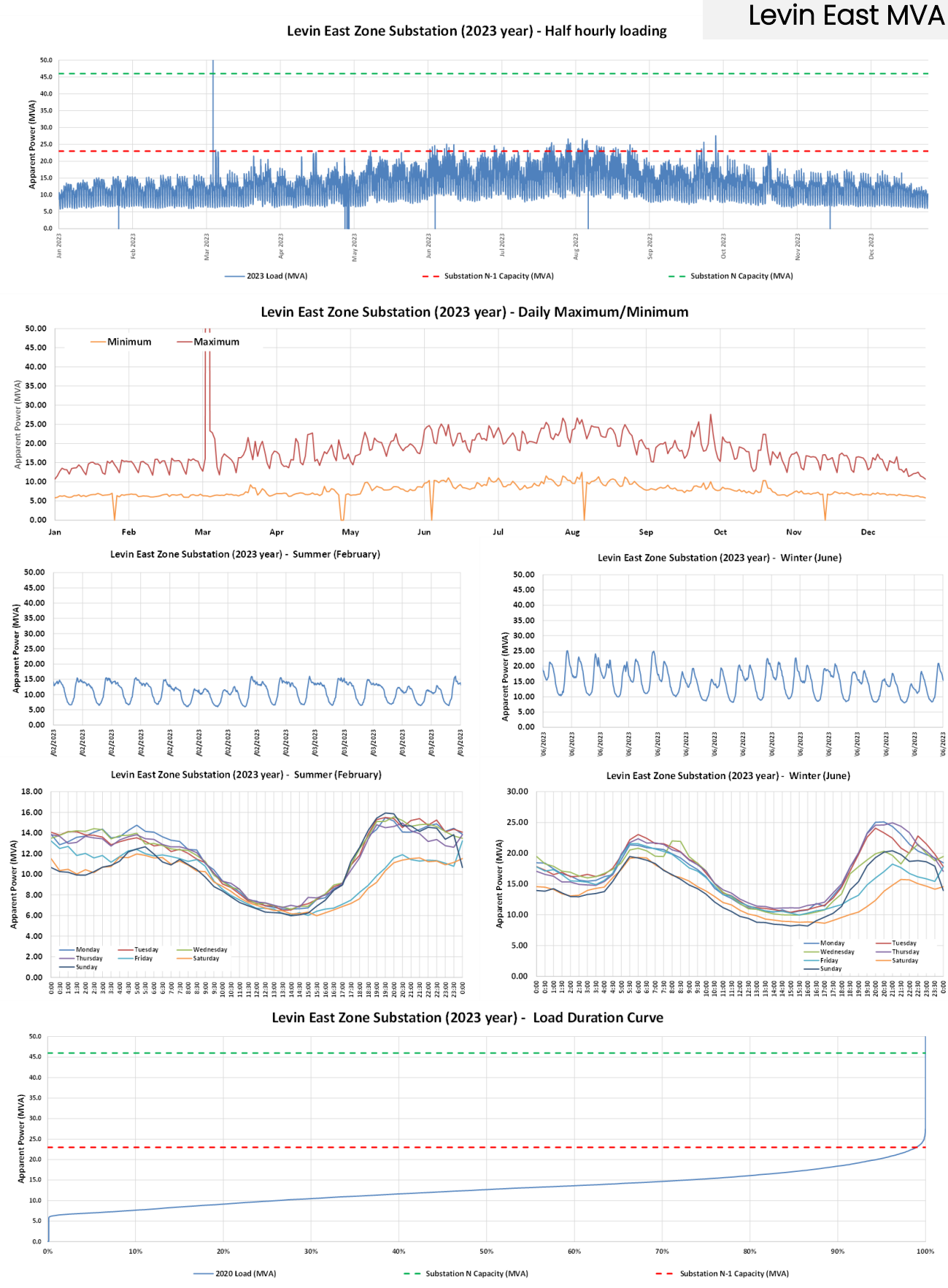


Figure 34. Levin East 33/11 kV zone substation: Apparent power (MVA) load characteristics.

3.2 The Lines Company

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

Nihoniho MVA

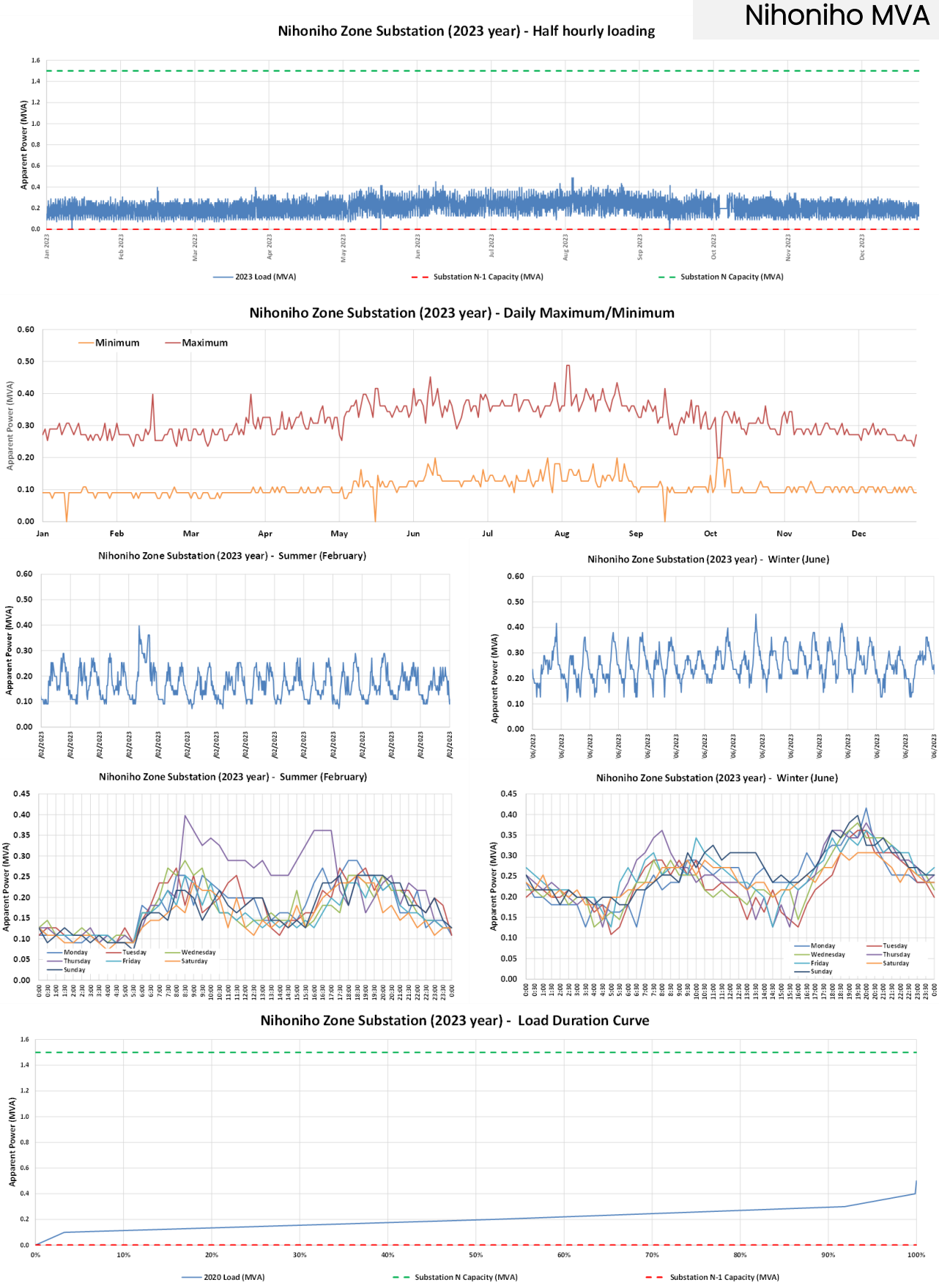


Figure 35. Nihoniho 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Borough MVA

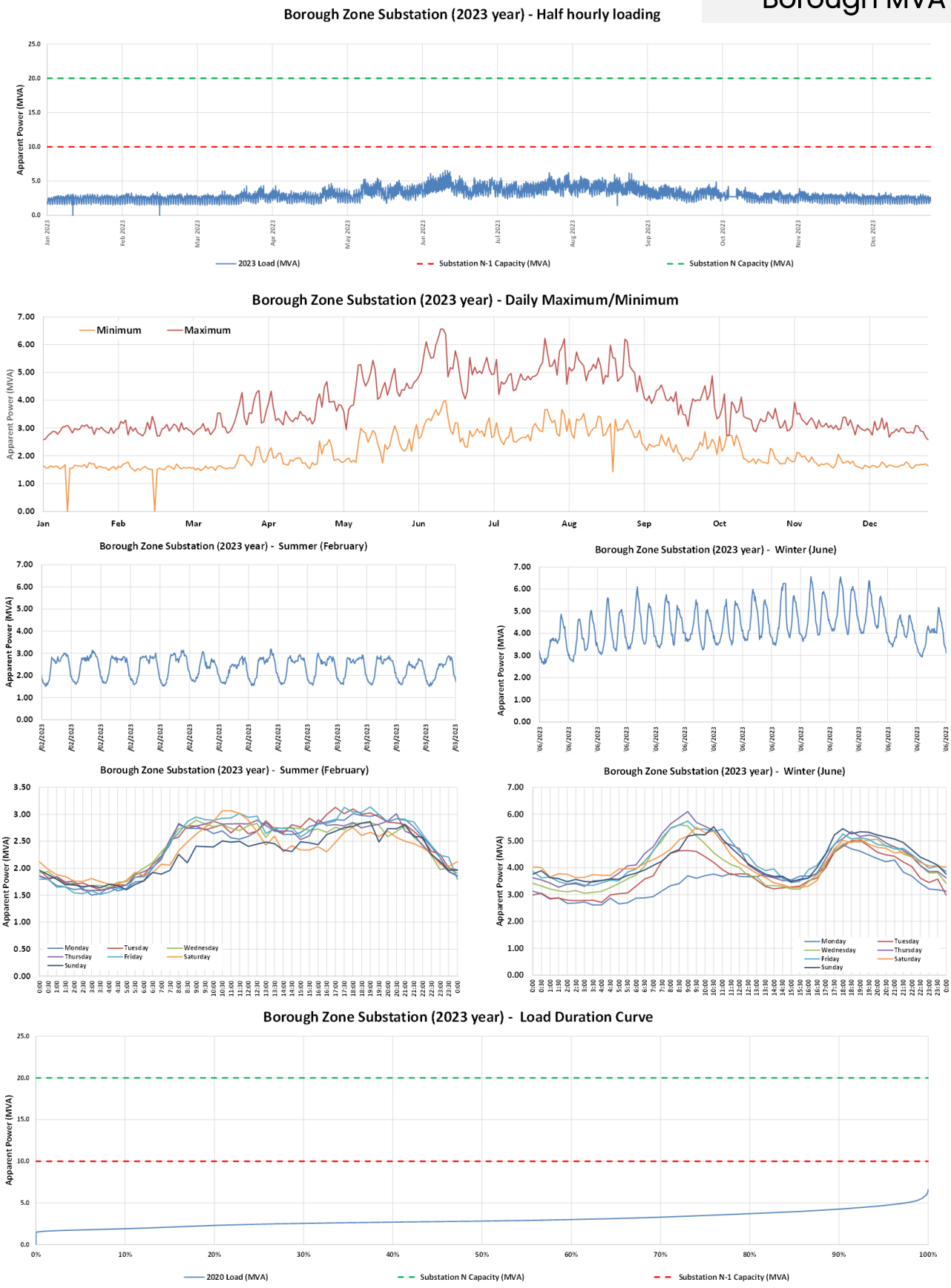


Figure 36. Borough 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Mananui MVA

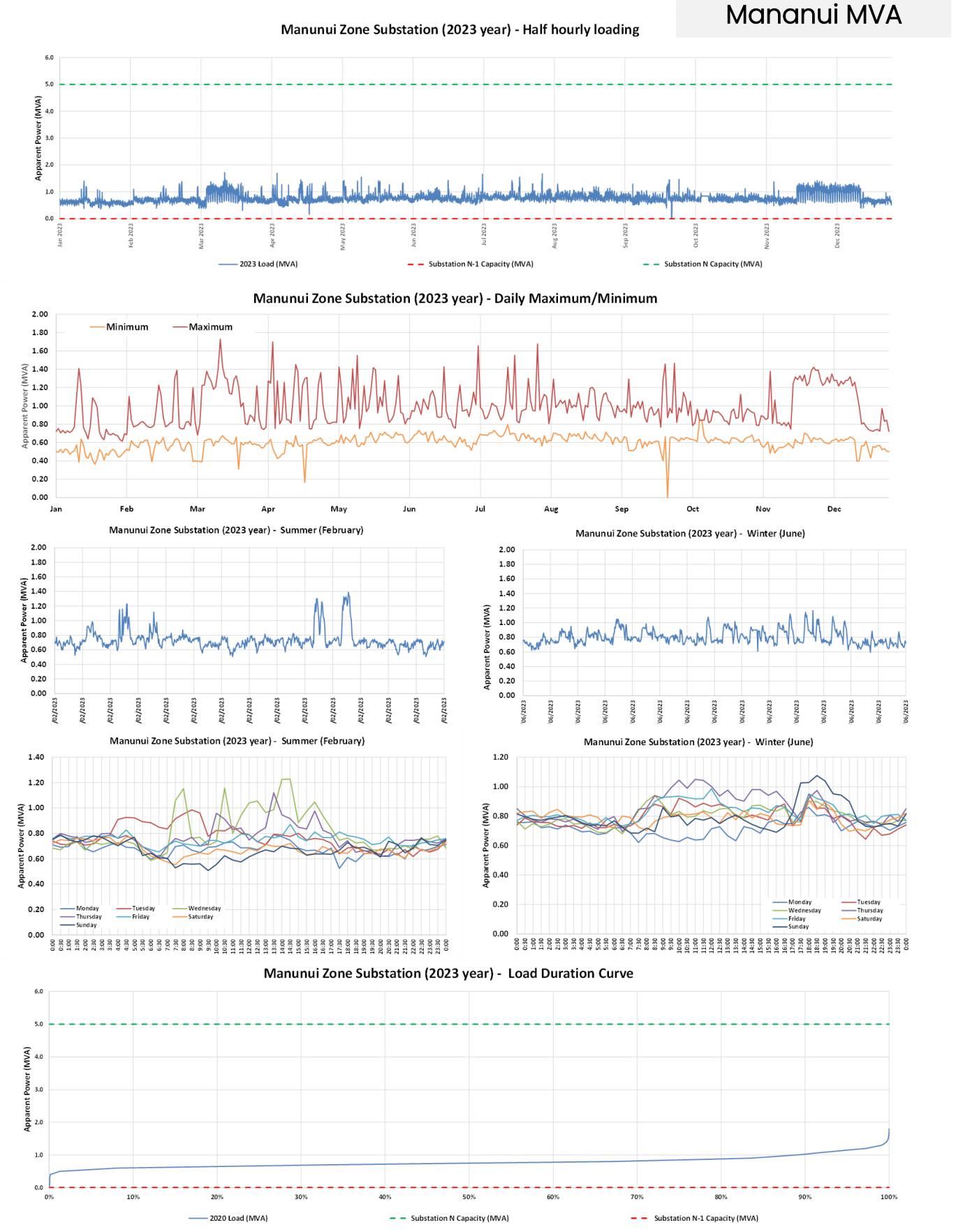


Figure 37. Mananui 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Kuratau MVA

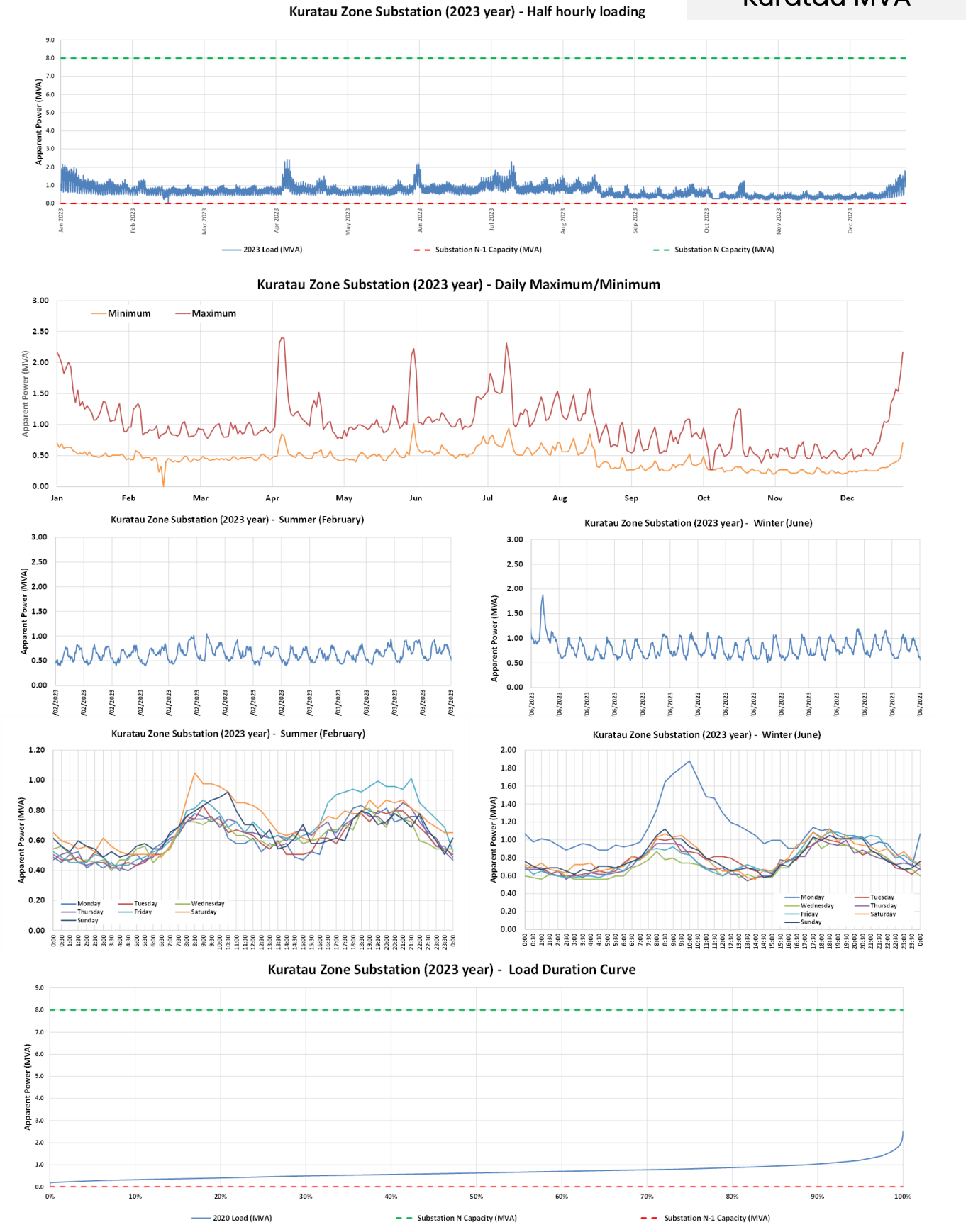


Figure 38. Kuratau 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Turangi MVA

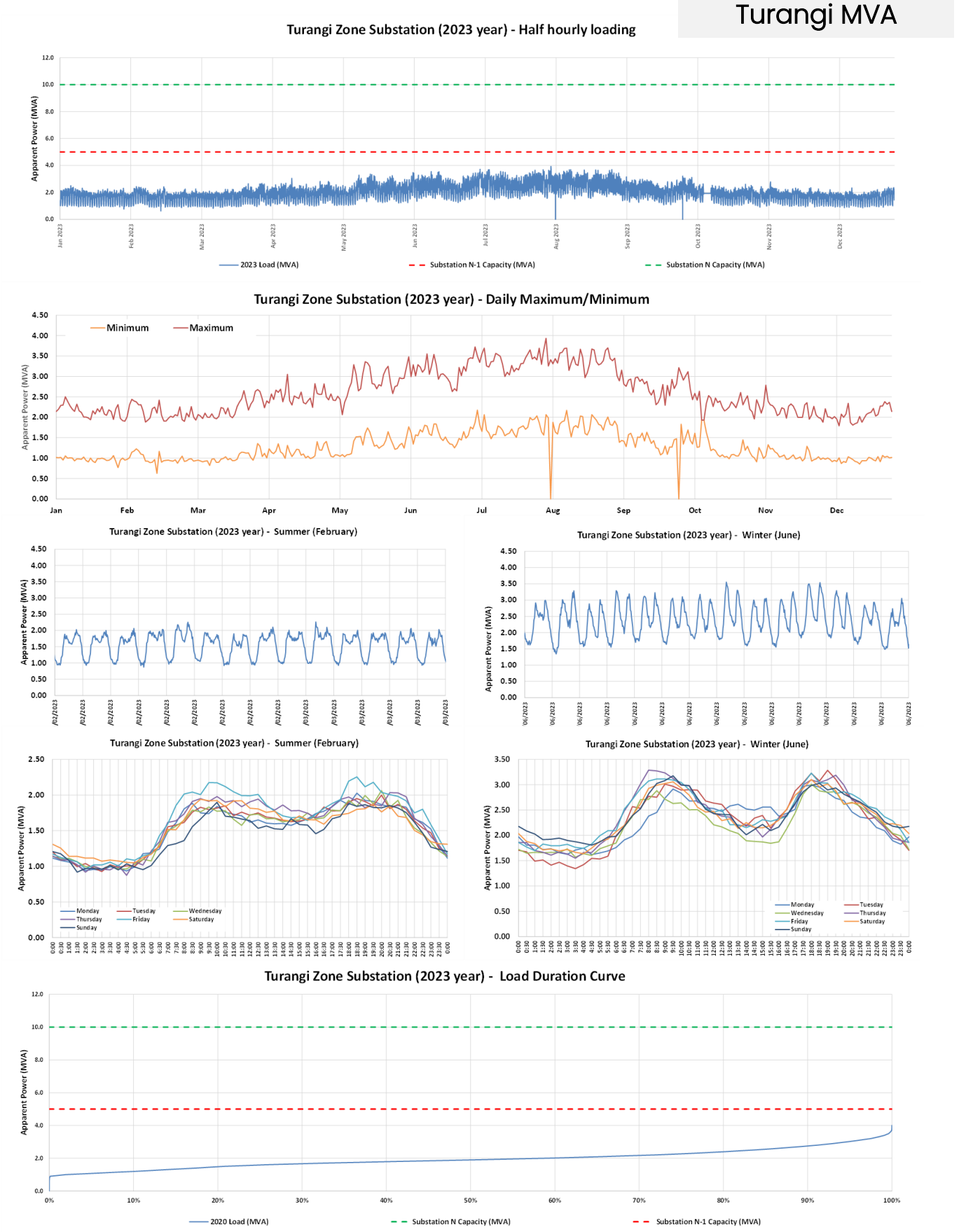


Figure 39. Turangi 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Otukou MVA

Figure 40. Otukou 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Tawhai MVA

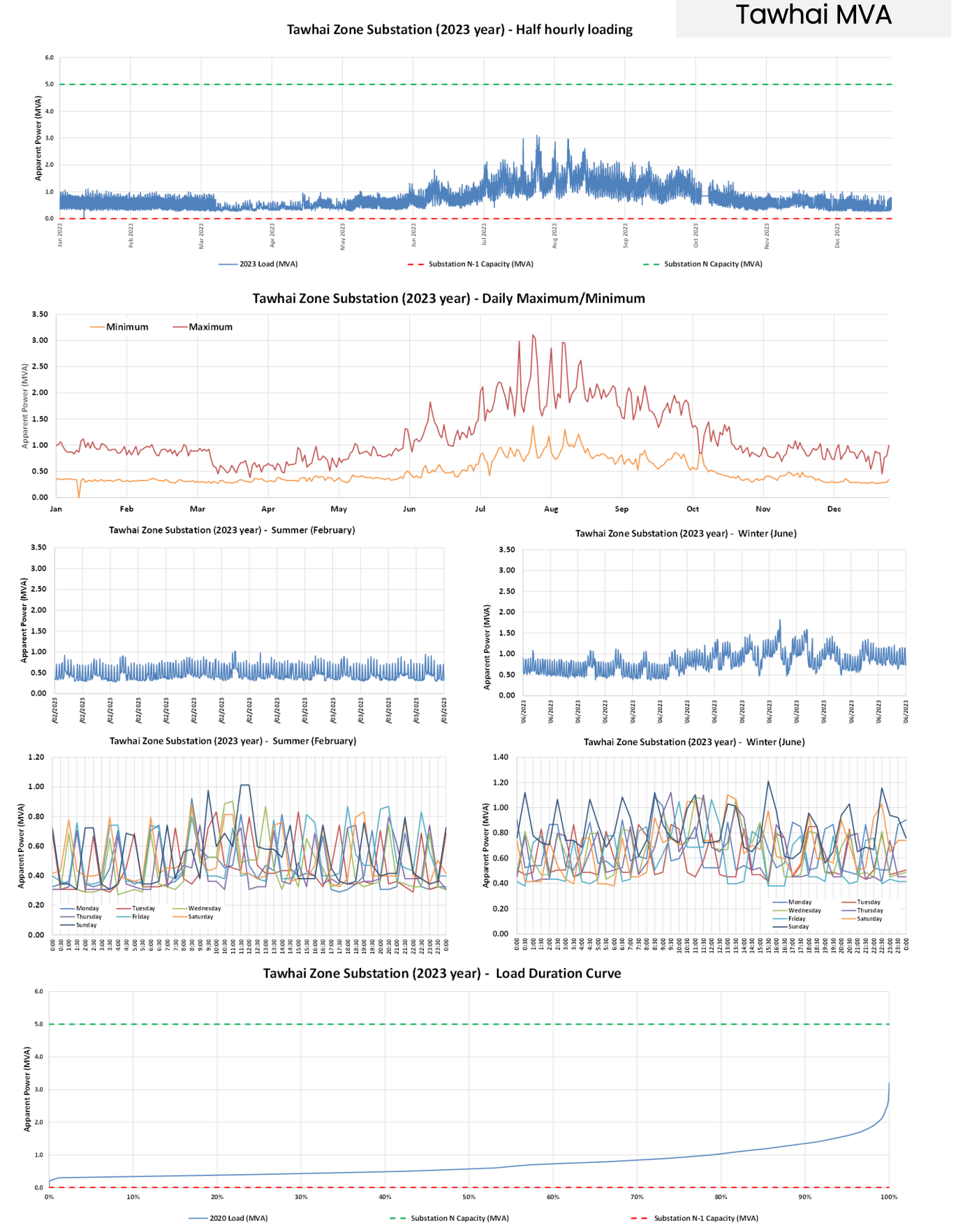


Figure 41. Tawhai 33/11 kV zone substation: Apparent power (MVA) load characteristics.

National Park MVA

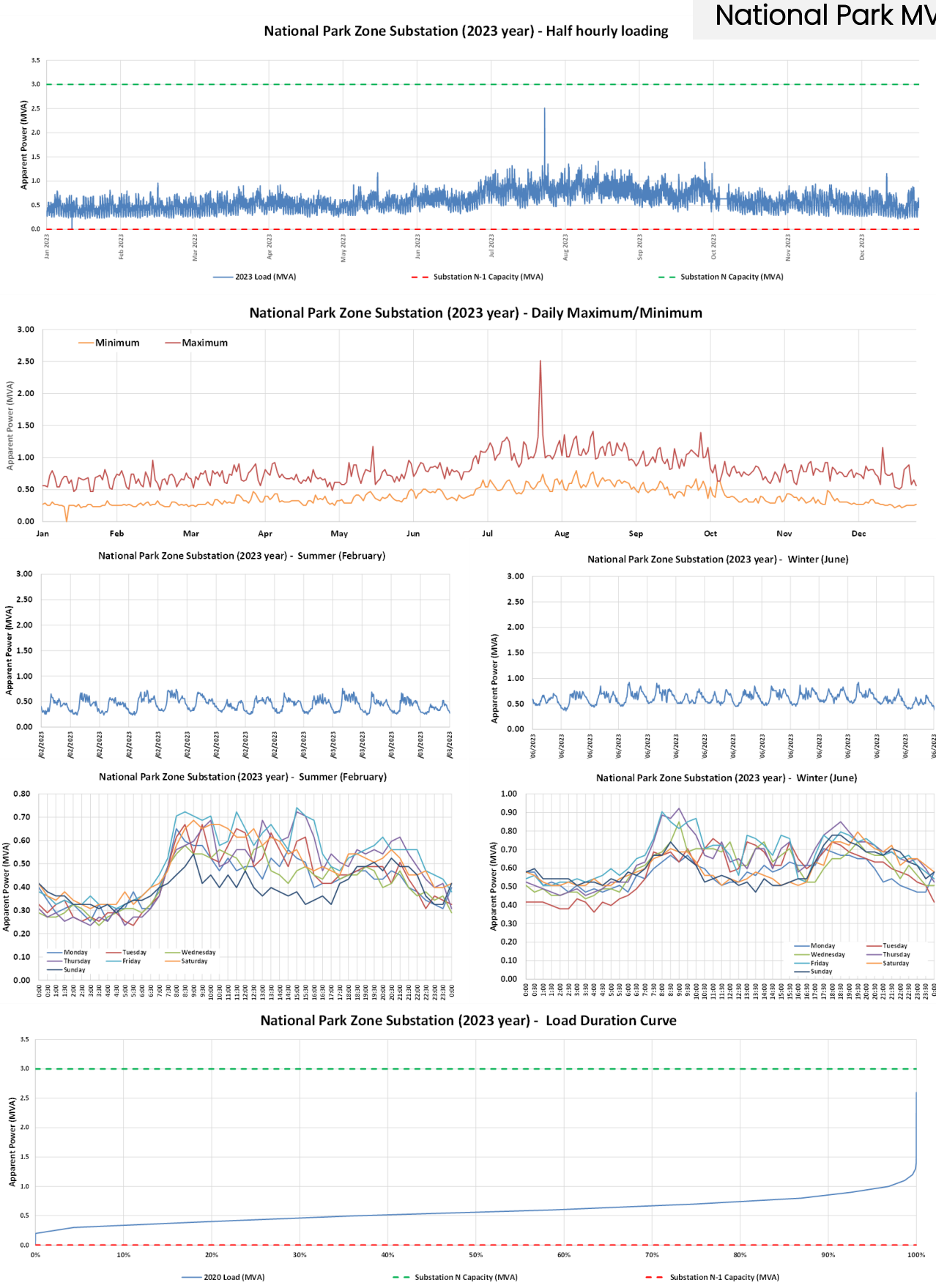


Figure 42. National Park 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Awamate MVA

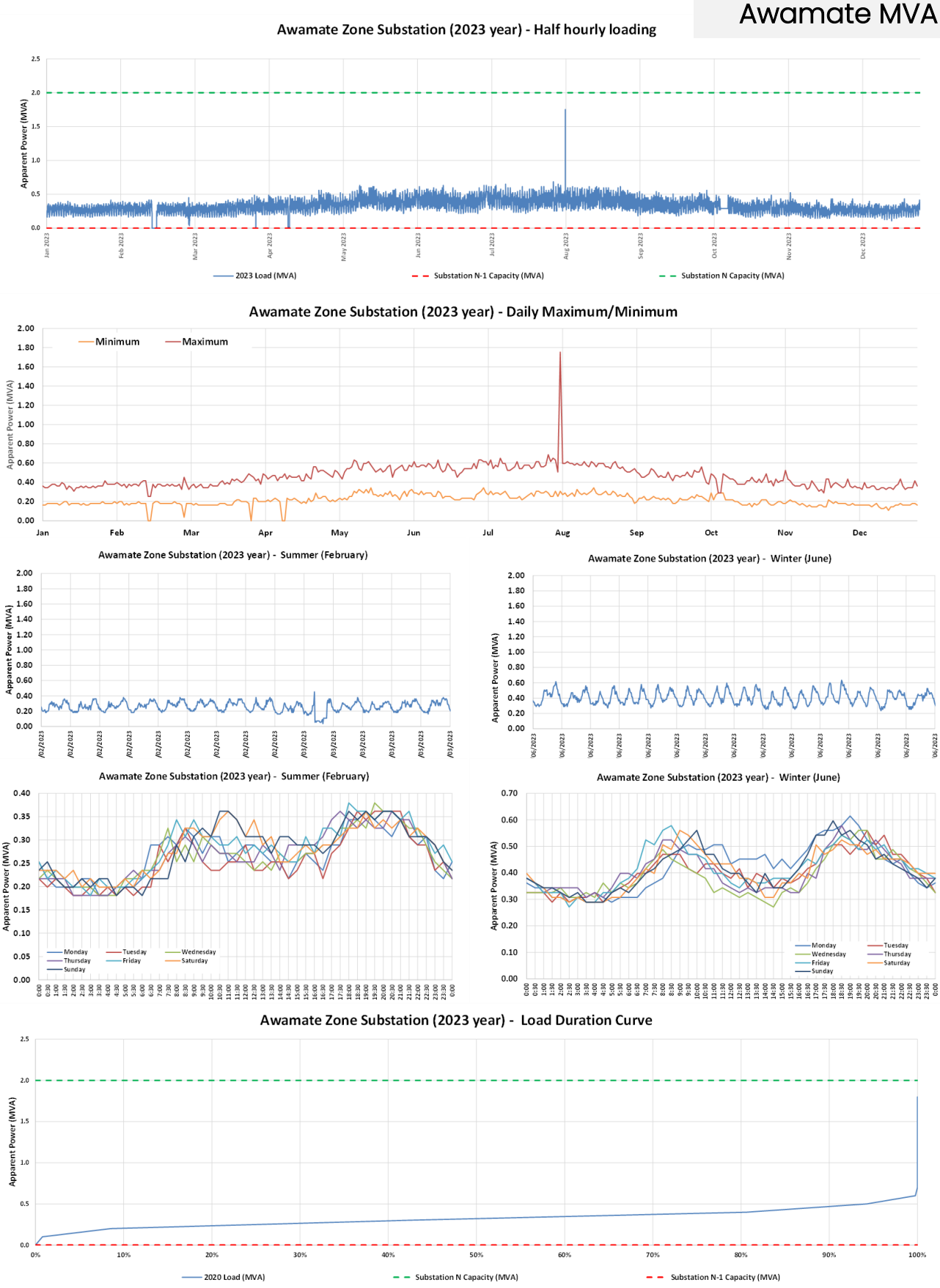


Figure 43. Awamate 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Figure 44. Tokaanu 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Waiotaka MVA

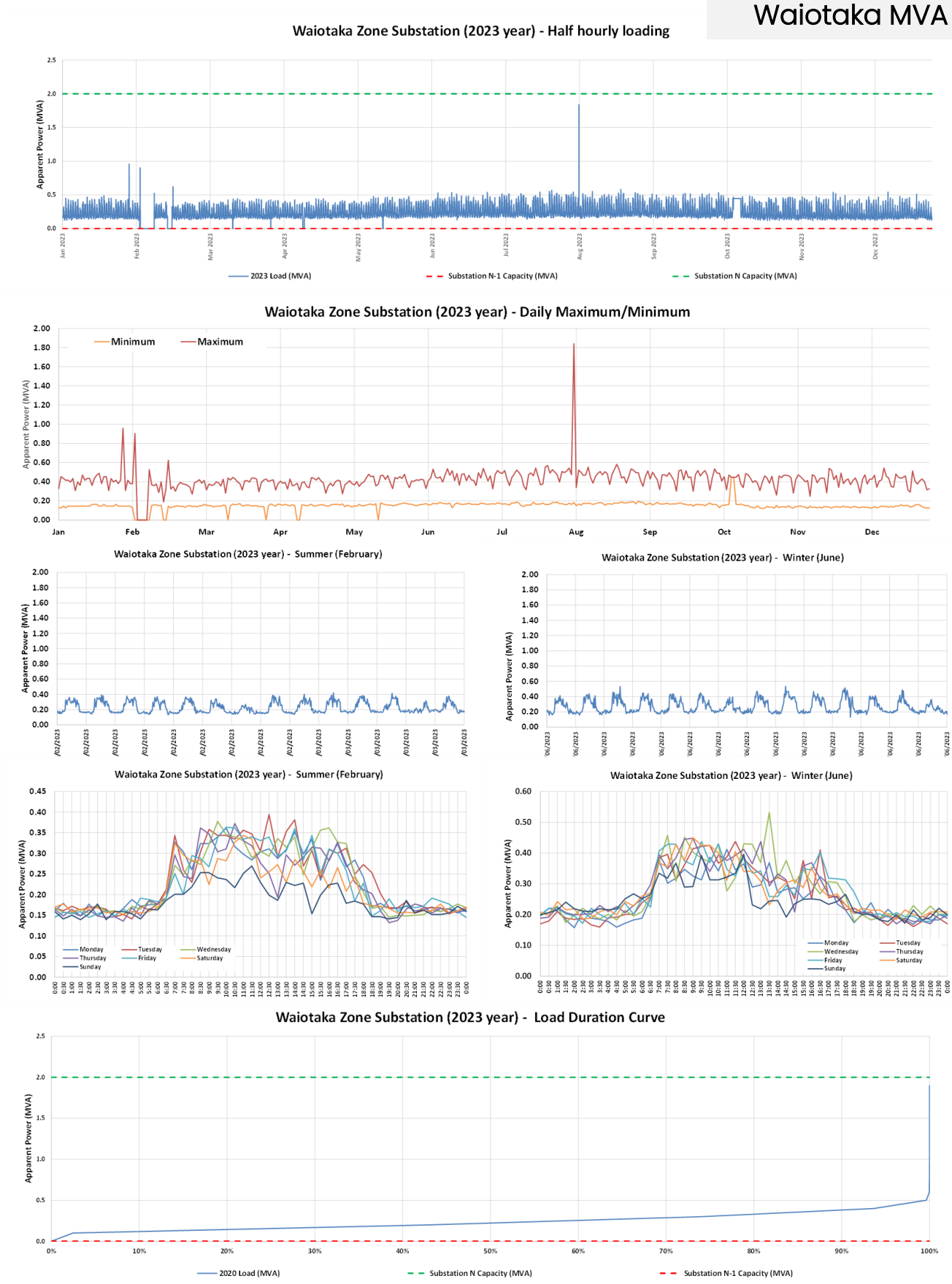


Figure 45. Waiotaka 33/11 kV zone substation: Apparent power (MVA) load characteristics.

Kiko Rd MVA

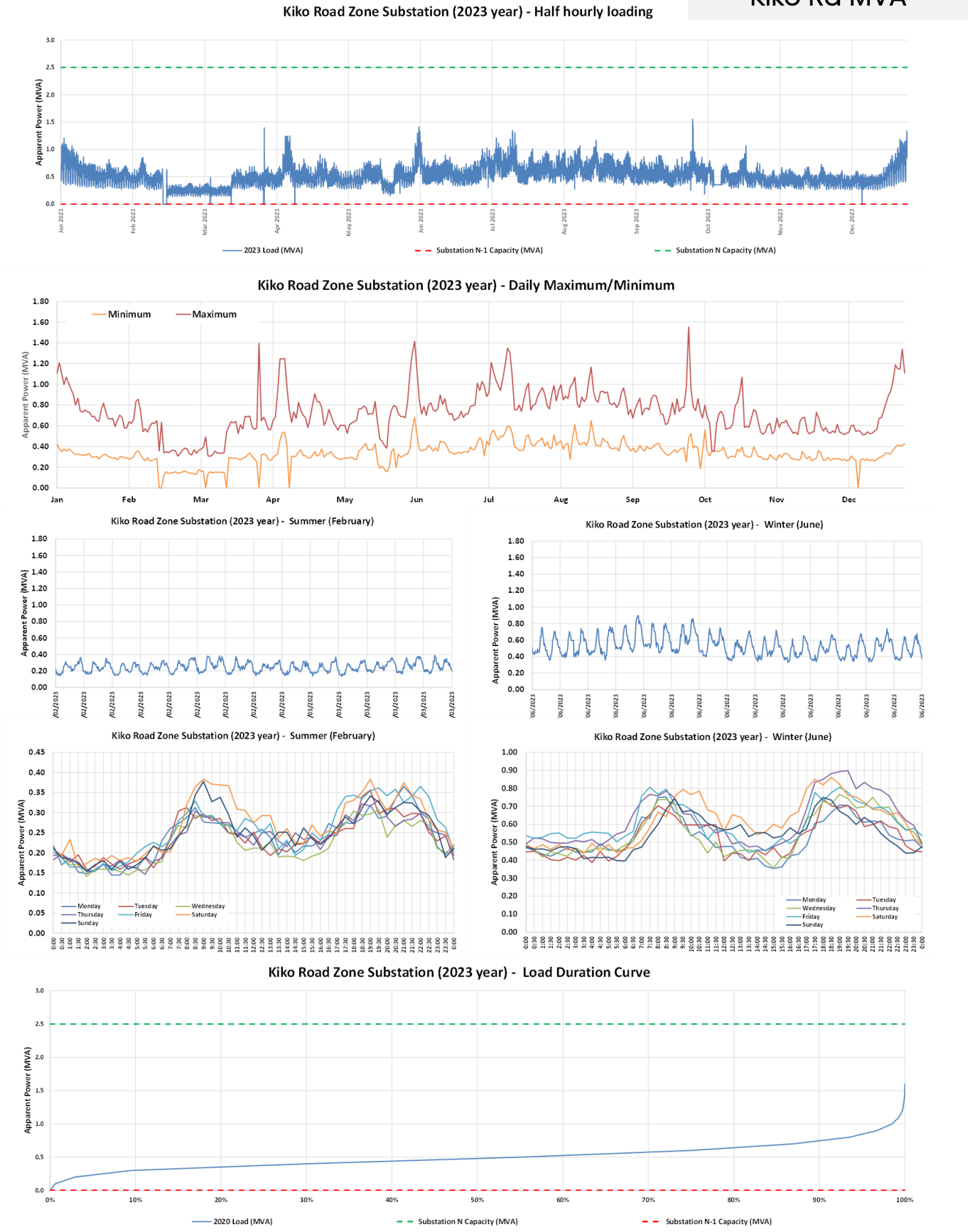


Figure 46. Kiko Rd 33/11 kV zone substation: Apparent power (MVA) load characteristics.

3.3 Powerco

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

Kai Iwi MW

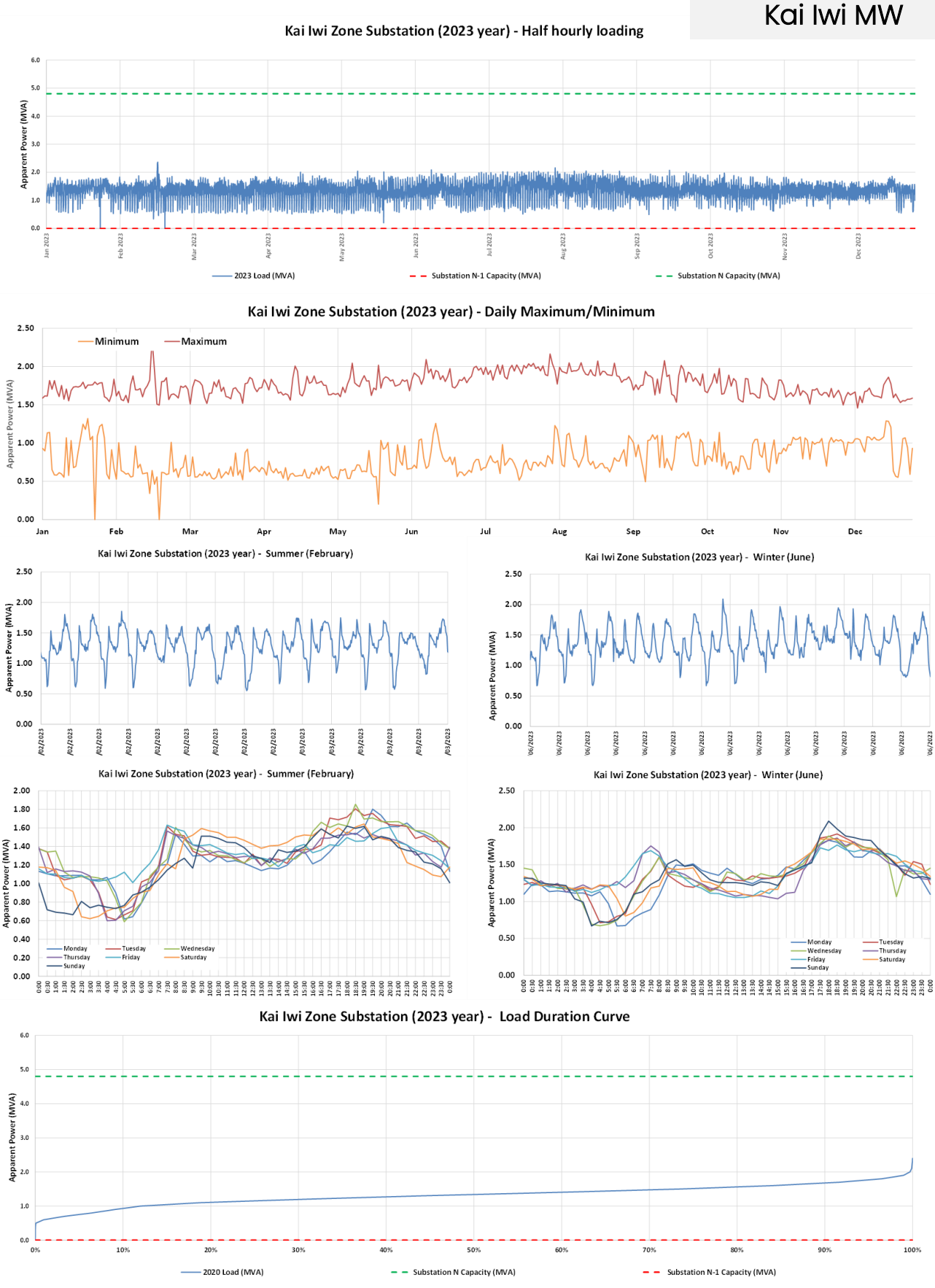


Figure 47. Kai Iwi 33/11 kV zone substation: Real power (MW) load characteristics.

Peat St MW

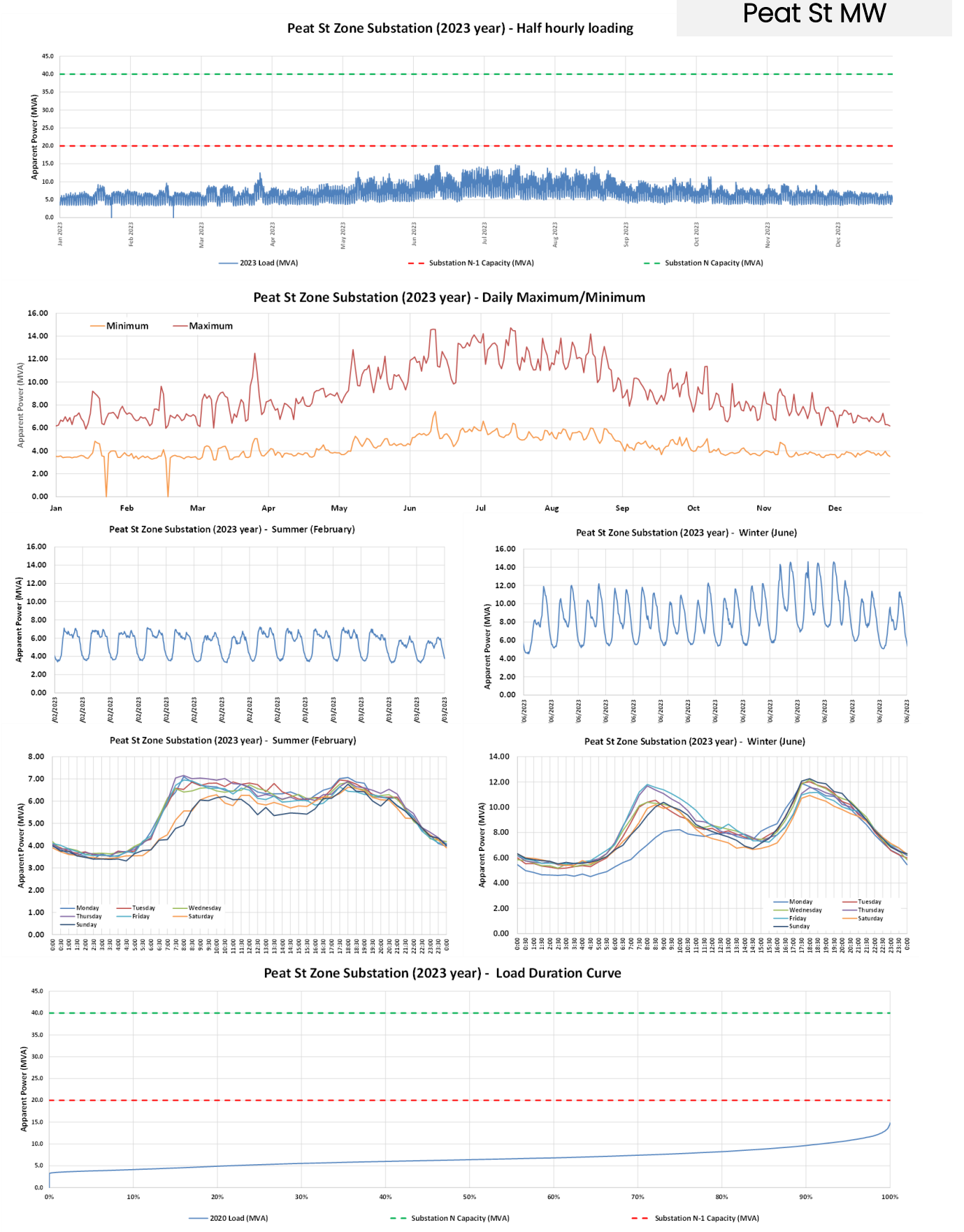


Figure 48. Peat St 33/11 kV zone substation: Real power (MW) load characteristics.

Roberts Ave MW

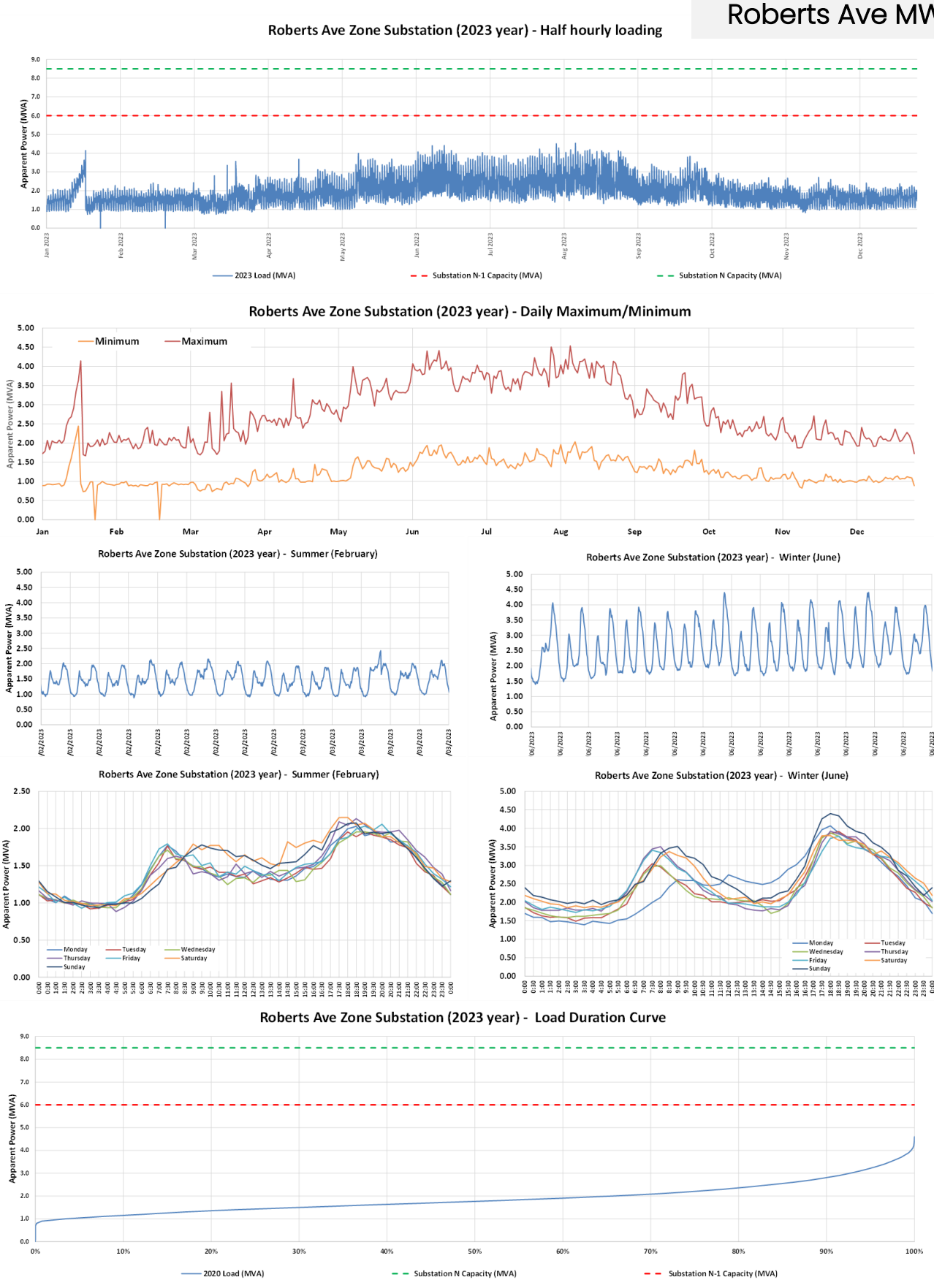


Figure 49. Roberts Ave 33/11 kV zone substation: Real power (MW) load characteristics.

Taupō Quay MW

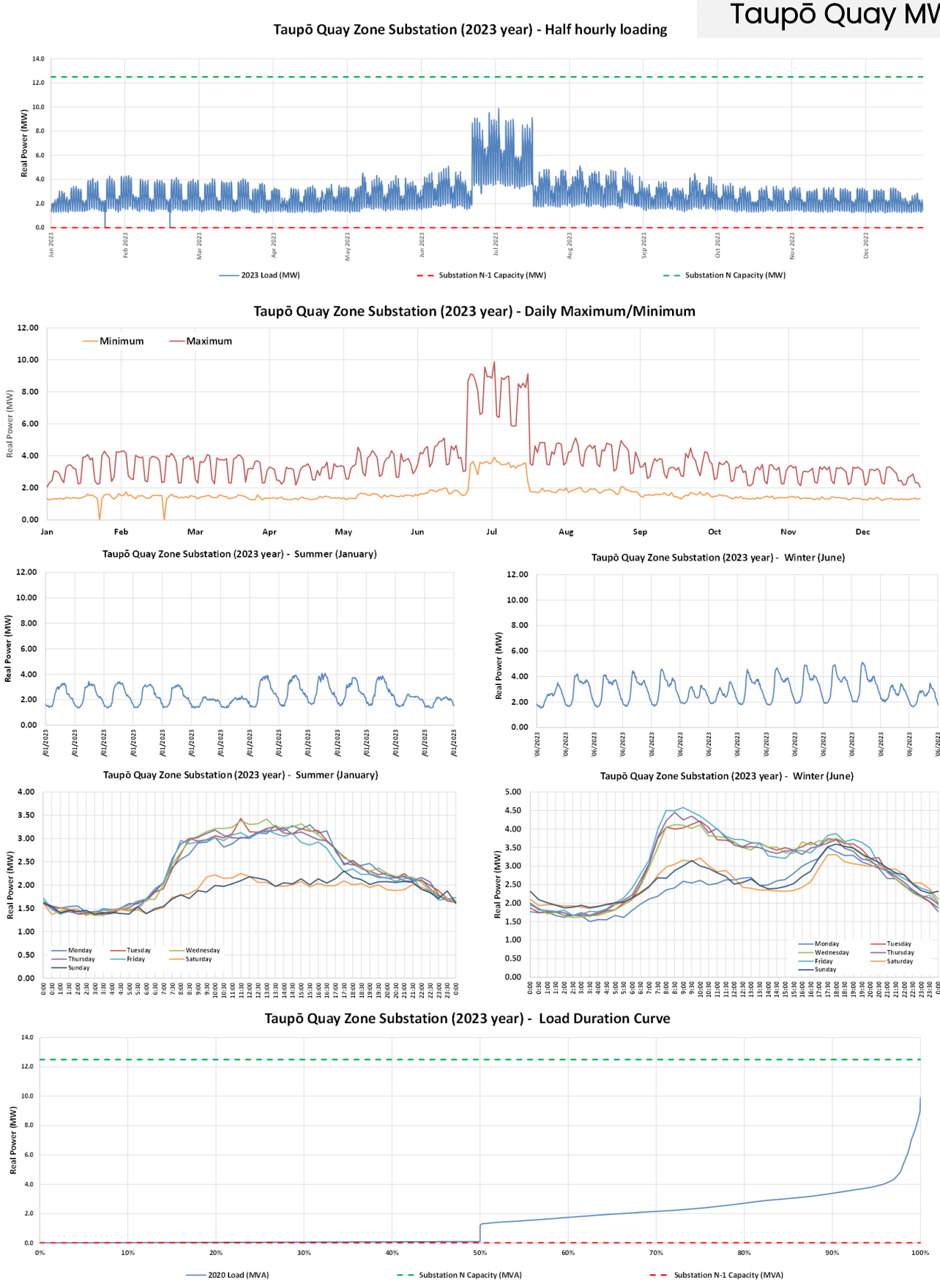


Figure 50. Taupō Quay 33/11 kV zone substation: Real power (MW) load characteristics.

Castlecliff MW

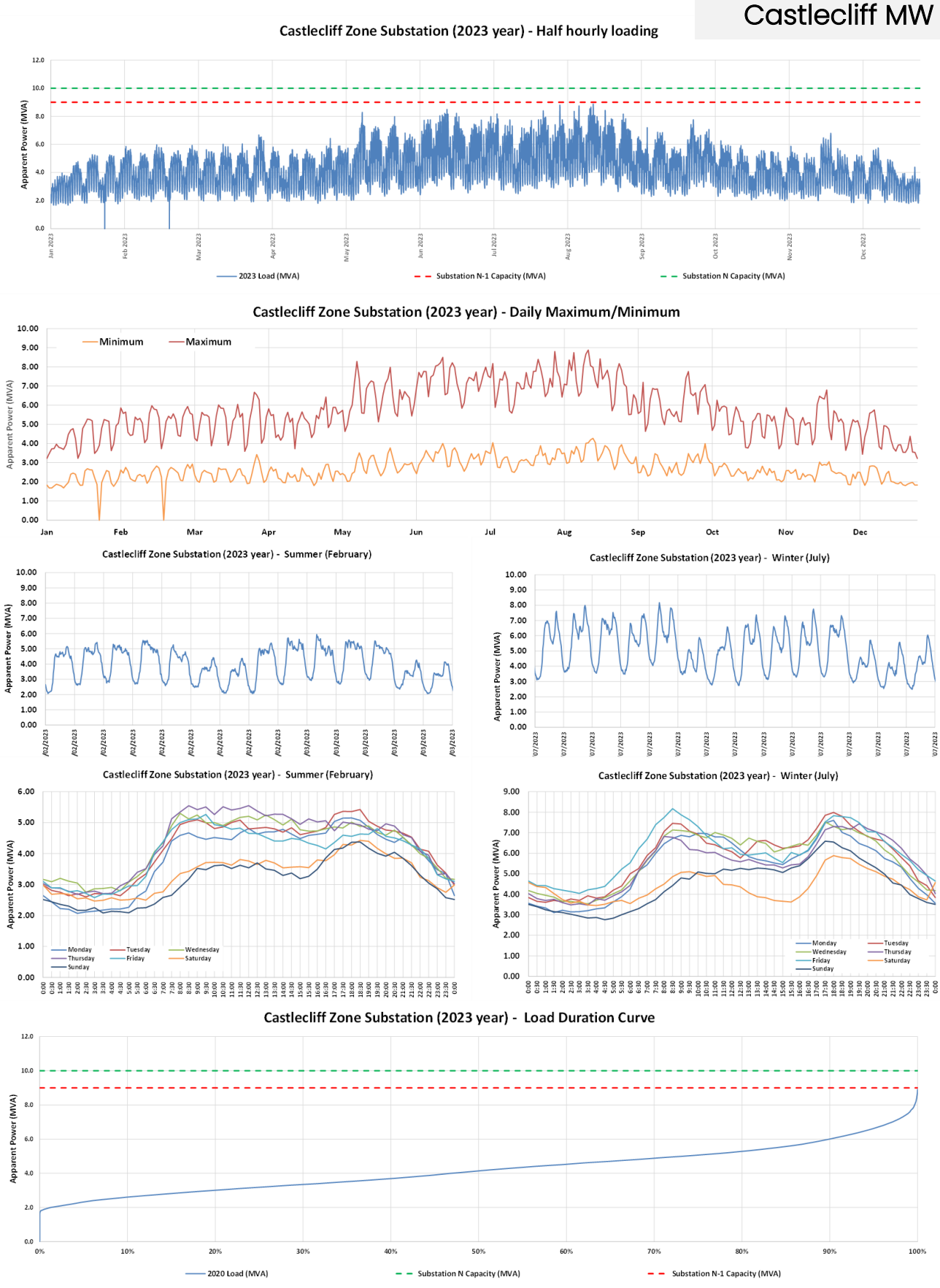


Figure 51. Castlecliff 33/11 kV zone substation: Real power (MW) load characteristics.

Beach Rd MW

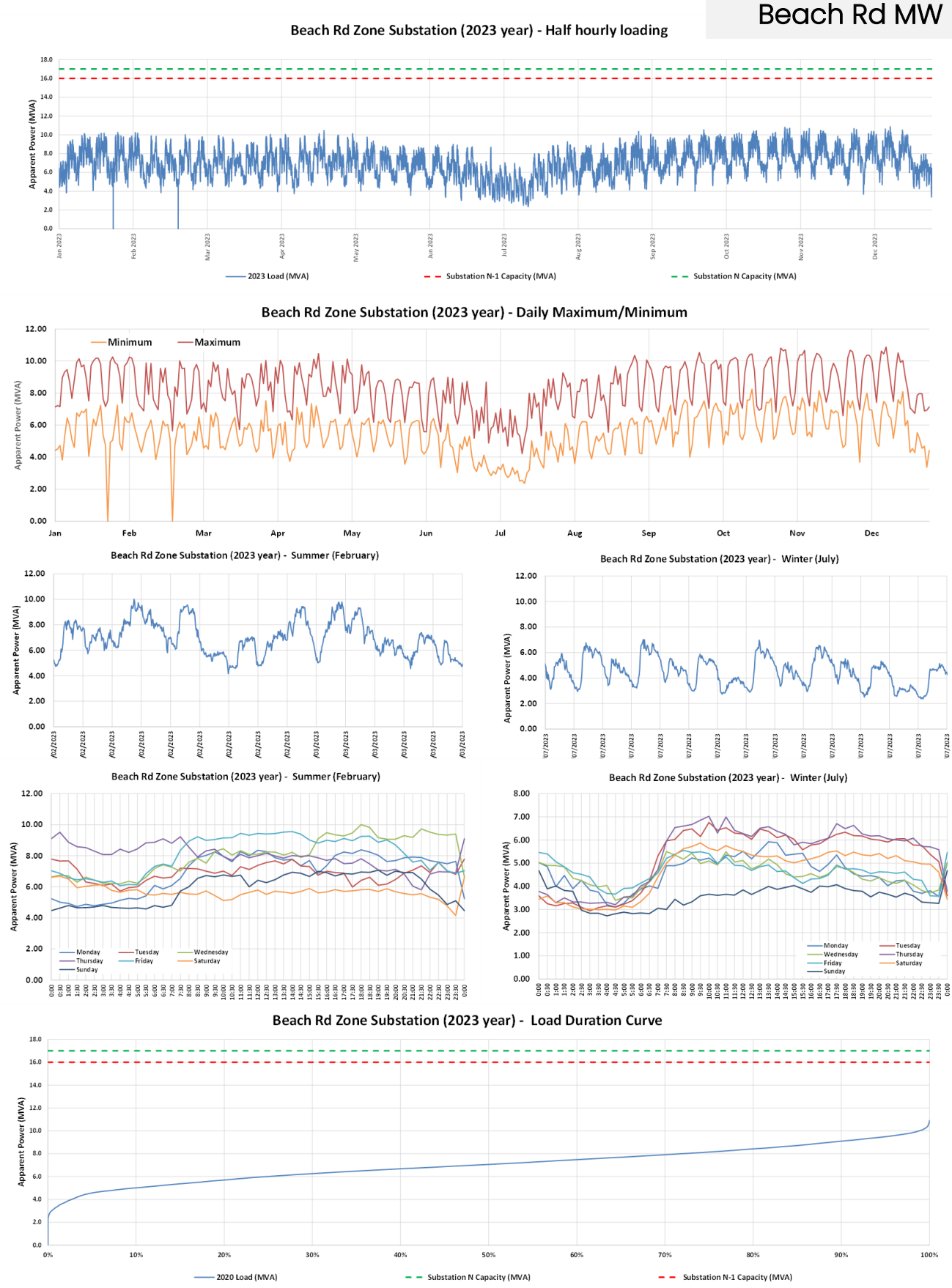


Figure 52. Beach Rd 33/11 kV zone substation: Real power (MW) load characteristics.

Hatricks Wharf MW

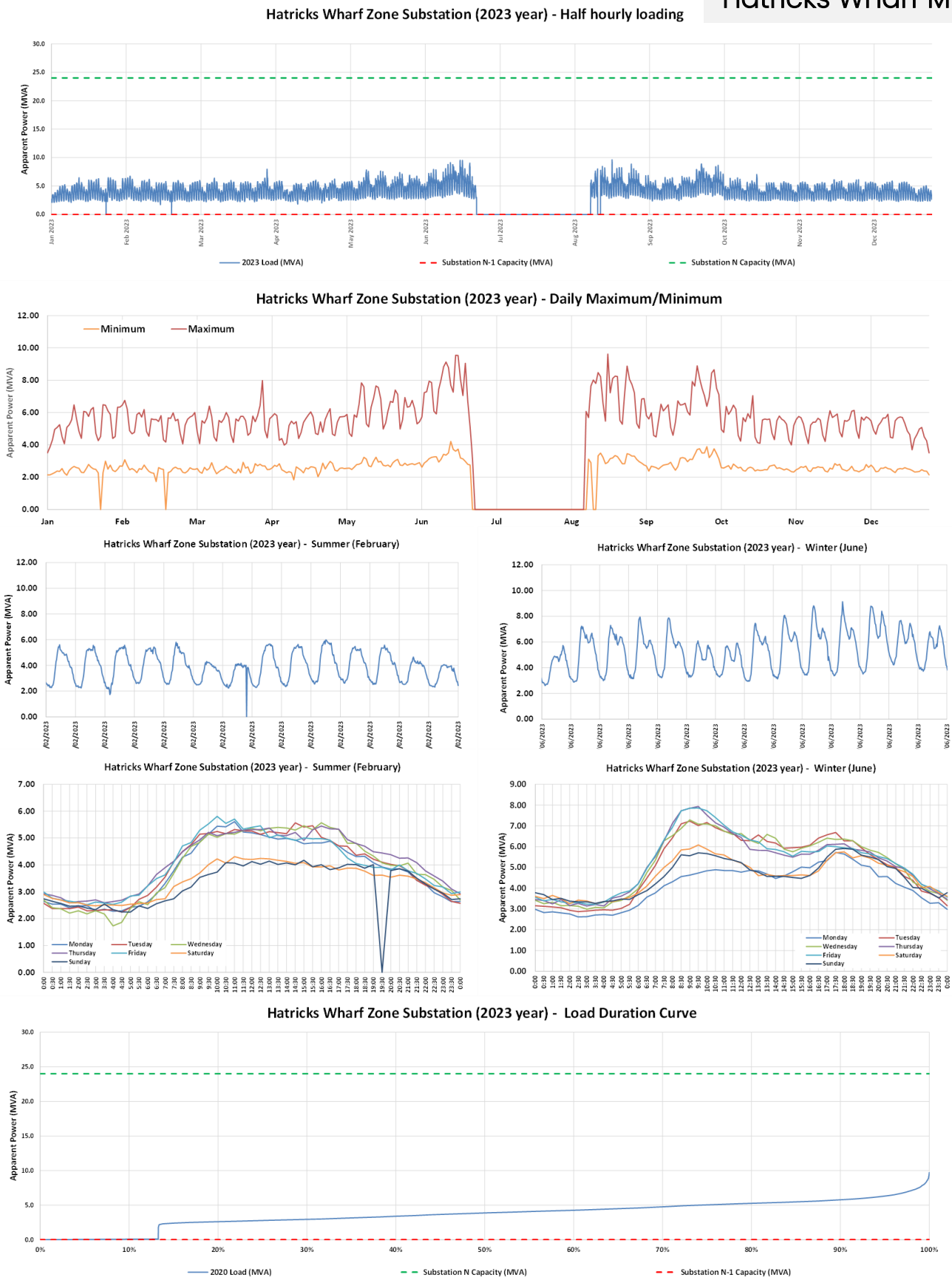


Figure 53. Hatricks Wharf 33/11 kV zone substation: Real power (MW) load characteristics.

Wanganui East MW

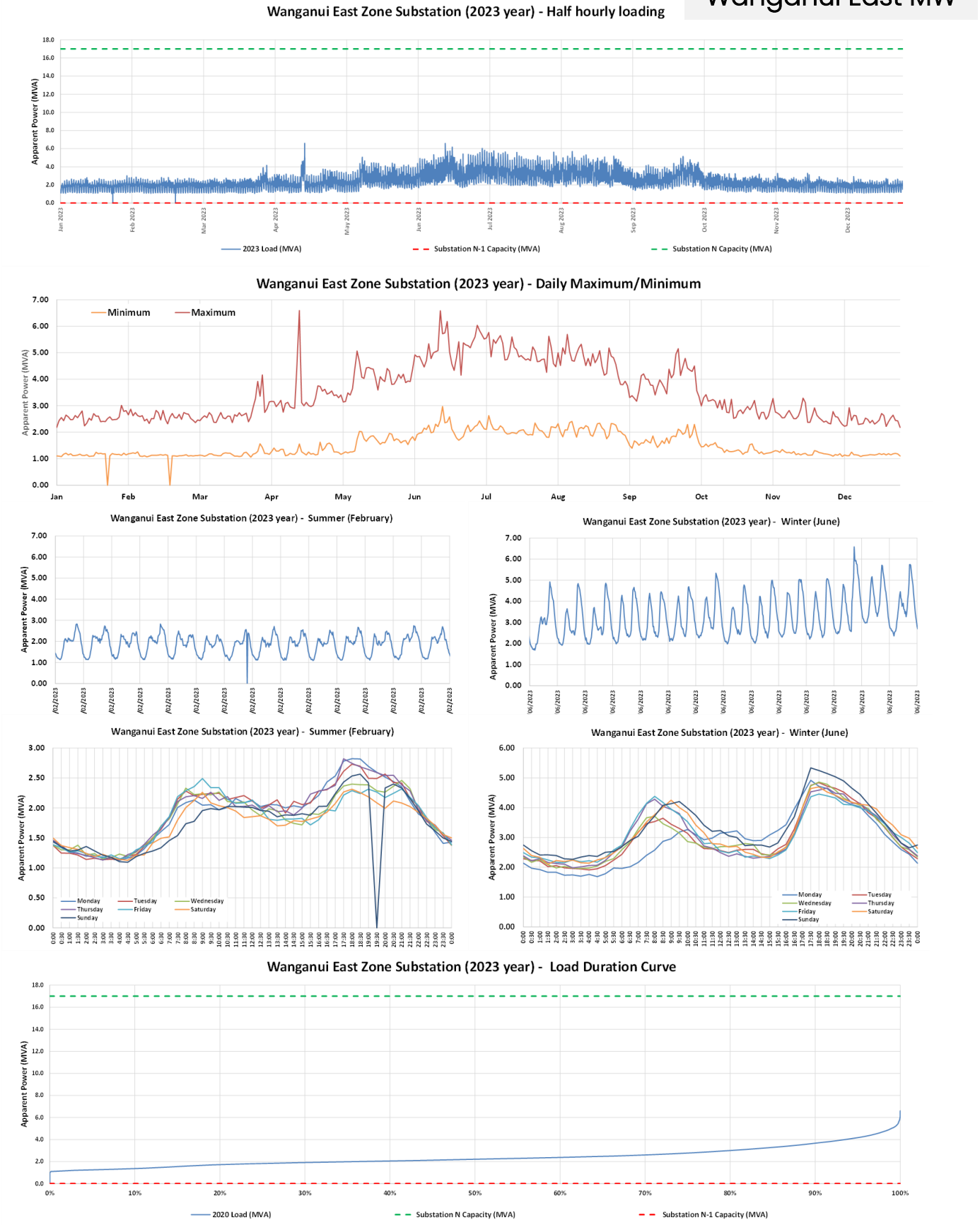


Figure 54. Wanganui East 33/11 kV zone substation: Real power (MW) load characteristics.

Waiouru MW

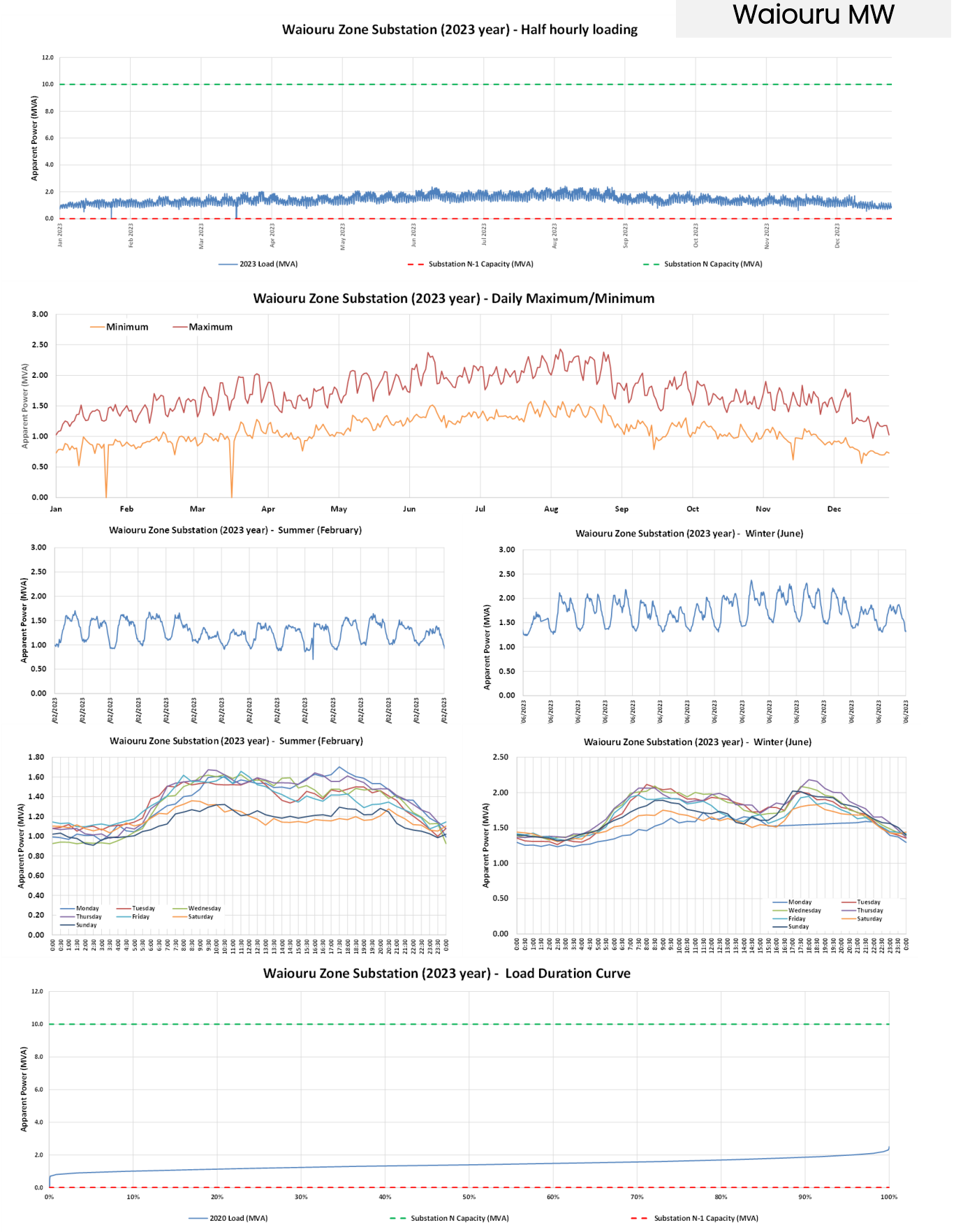


Figure 55. Waiouru 33/11 kV zone substation: Real power (MW) load characteristics.

Taihape MW

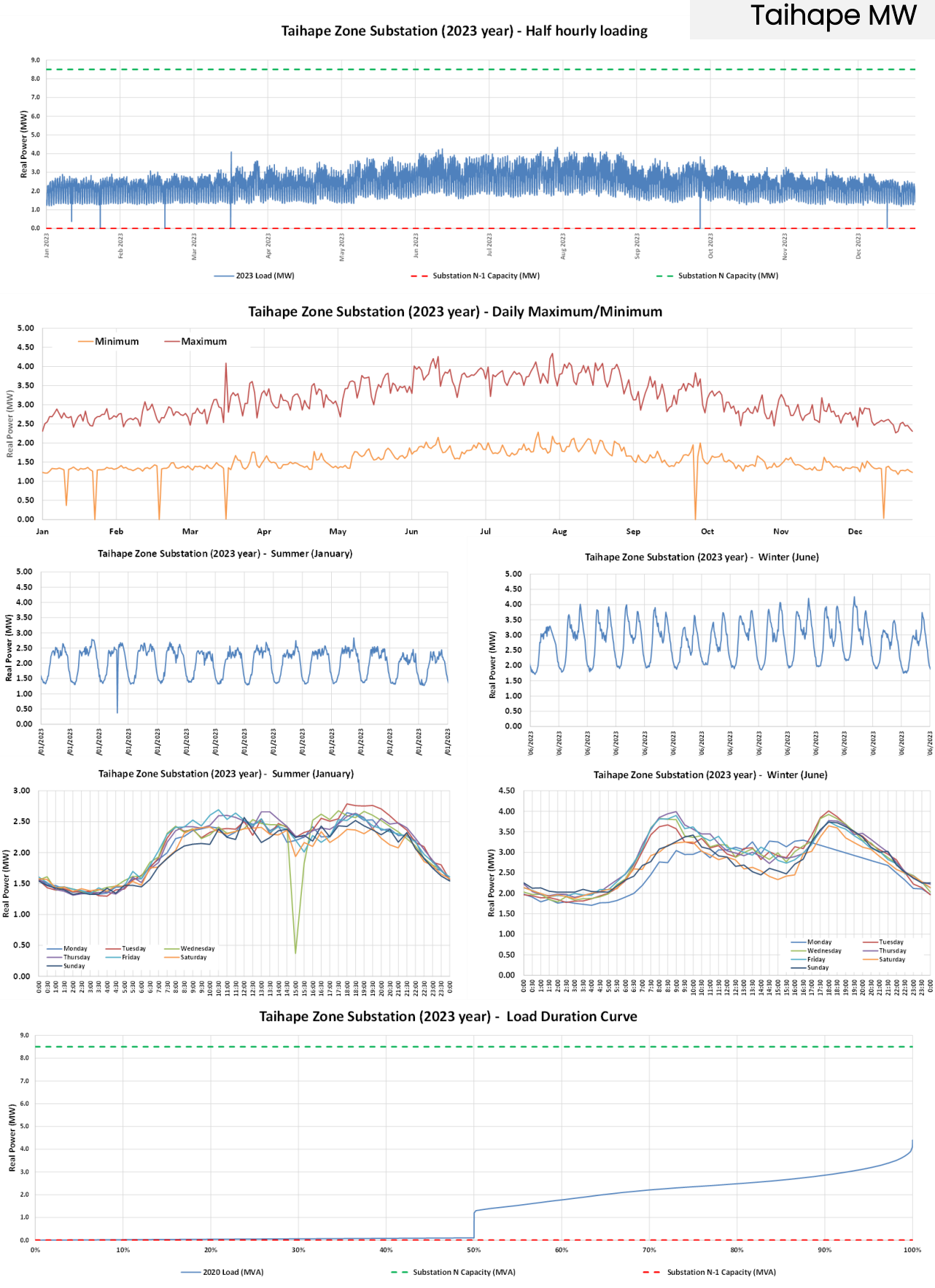


Figure 56. Taihape 33/11 kV zone substation: Real power (MW) load characteristics.

Rata MW

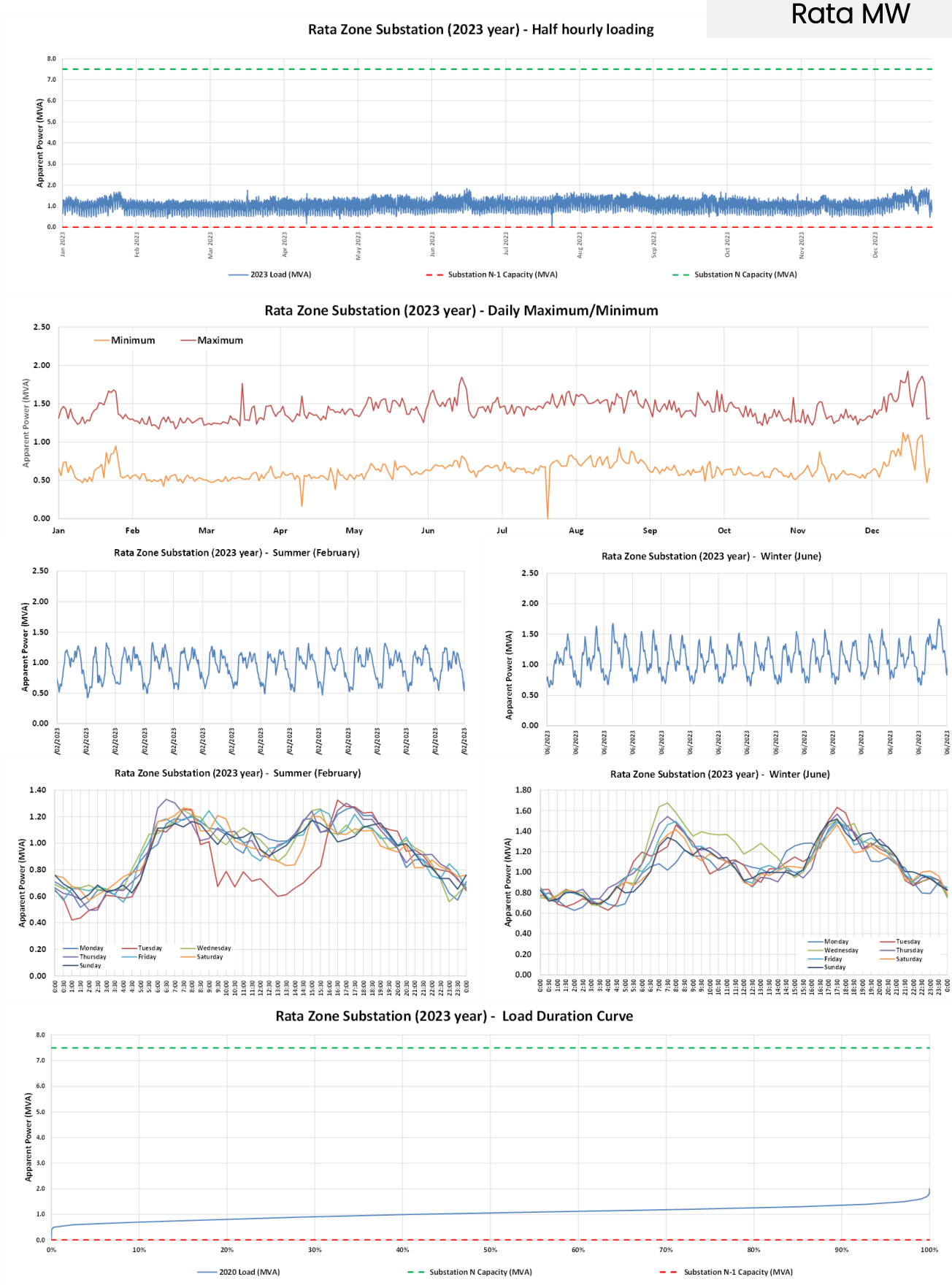


Figure 57. Rata 33/11 kV zone substation: Real power (MW) load characteristics.

Arahina MW

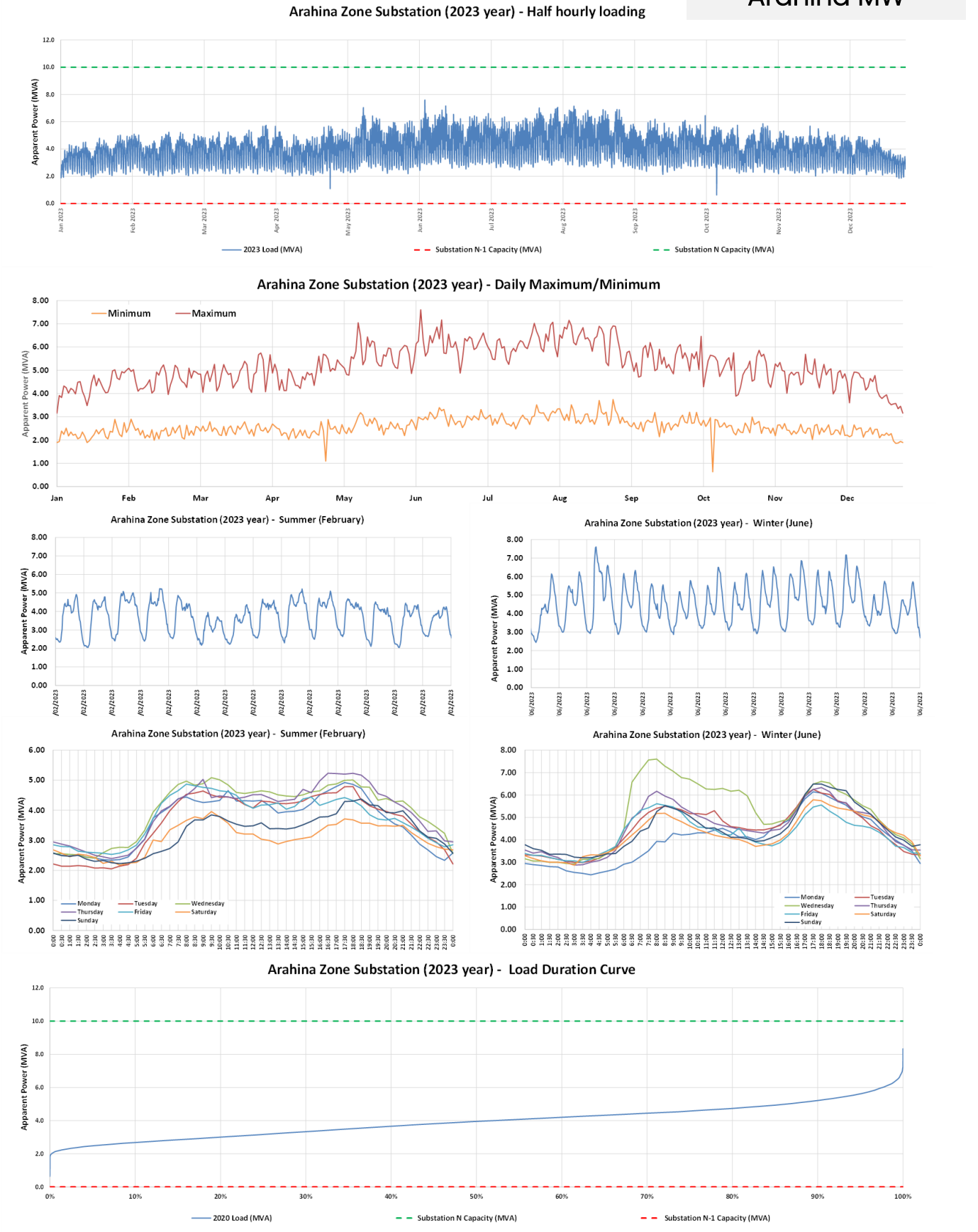


Figure 58. Arahina 33/11 kV zone substation: Real power (MW) load characteristics.

Pukepapa MW

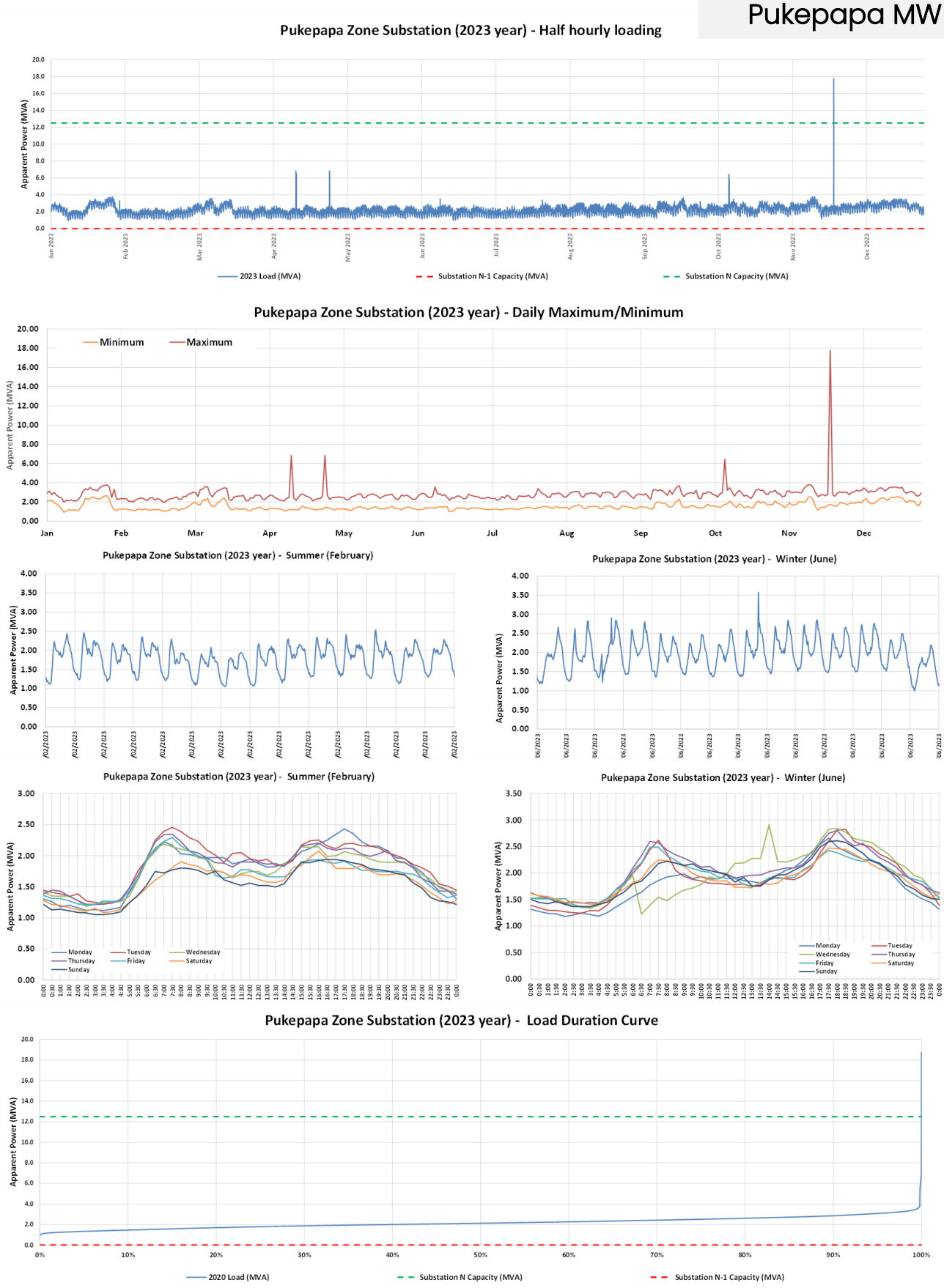


Figure 59. Pukepapa 33/11 kV zone substation: Real power (MW) load characteristics.

Bulls MW

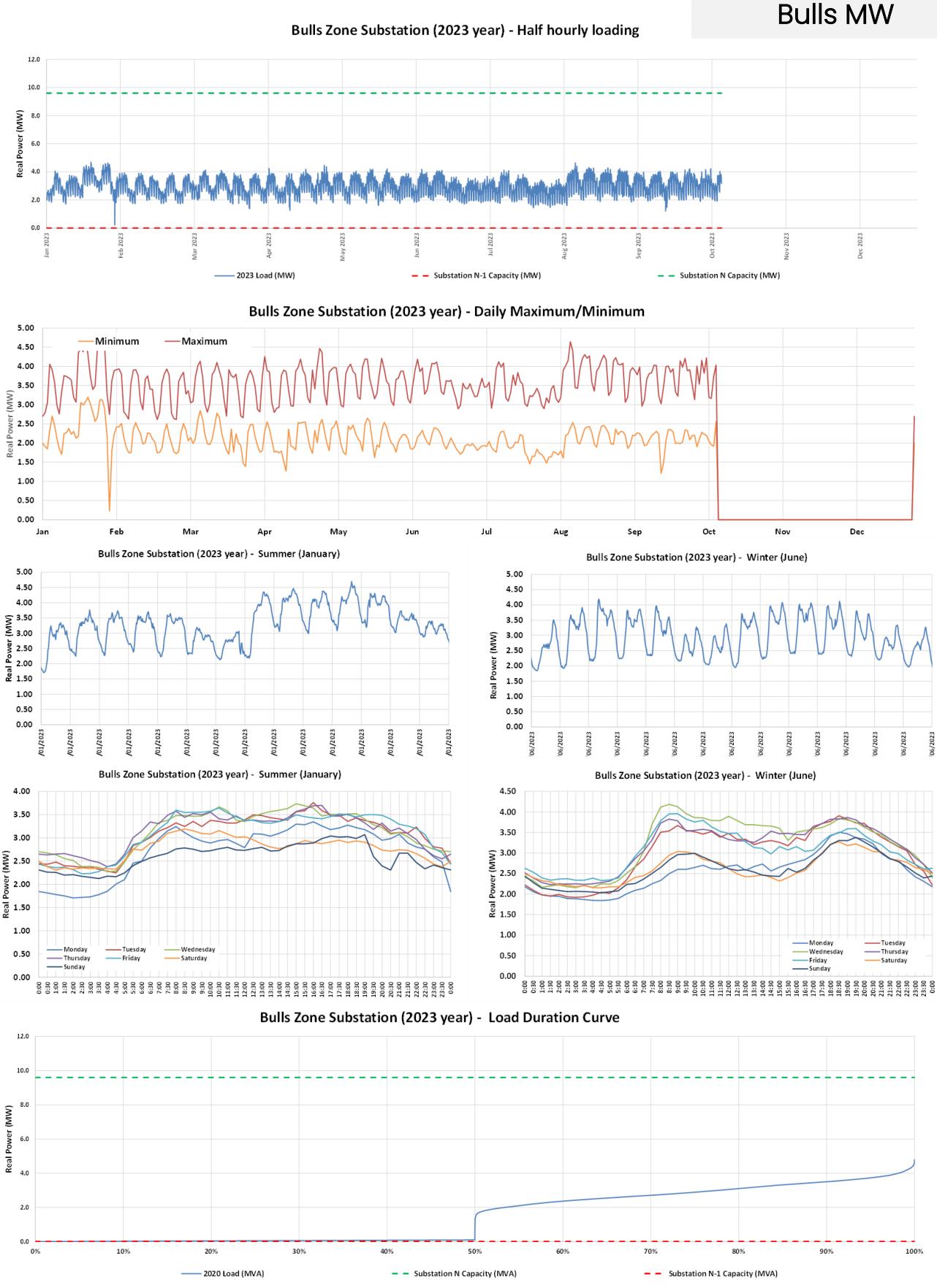


Figure 60. Bulls 33/11 kV zone substation: Real power (MW) load characteristics.

Fielding MW

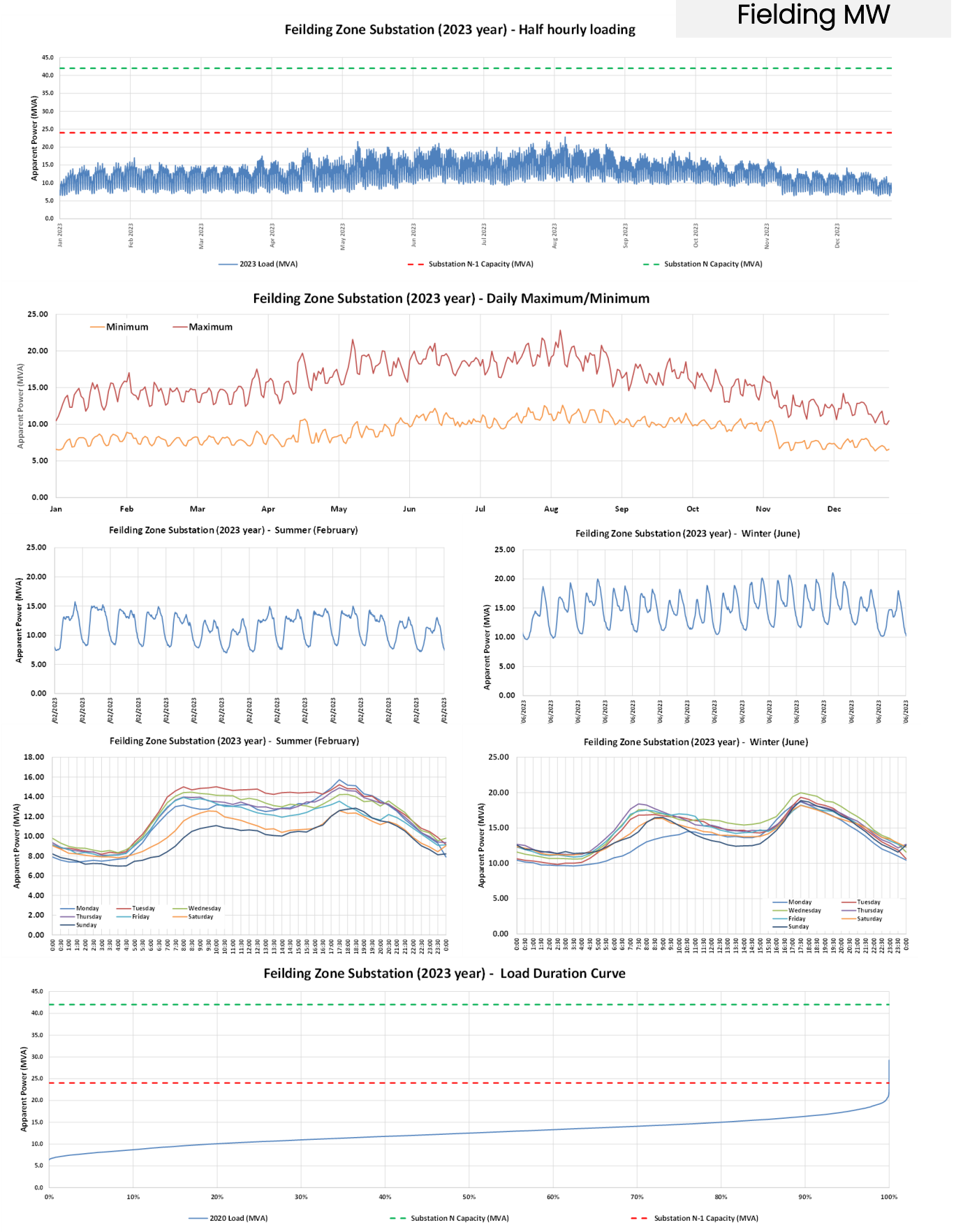


Figure 61. Fielding 33/11 kV zone substation: Real power (MW) load characteristics.

Ferguson St MW

Figure 62. Ferguson St 33/11 kV zone substation: Real power (MW) load characteristics.

Kairanga MW

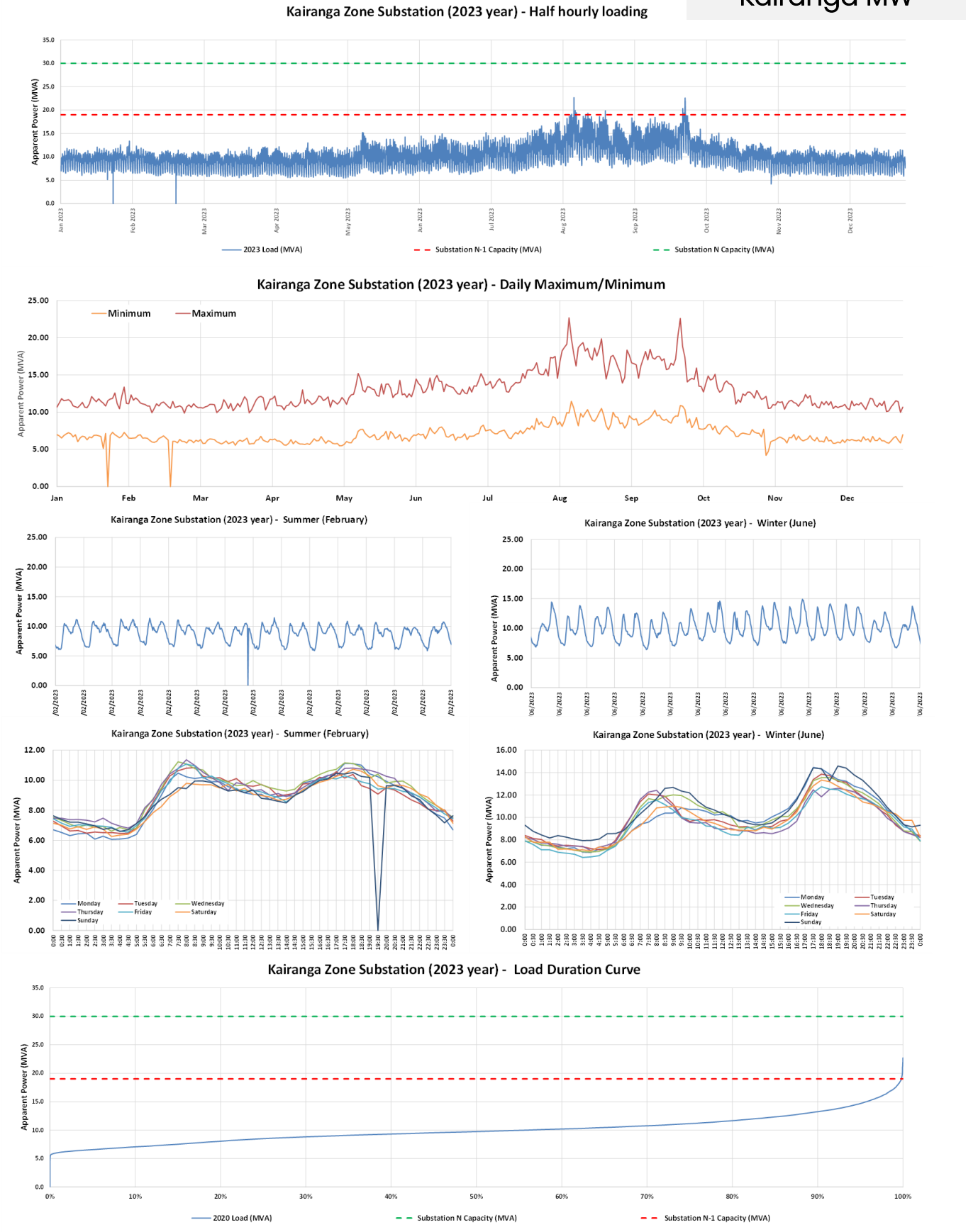


Figure 63. Kairanga 33/11 kV zone substation: Real power (MW) load characteristics.

Keith St MW

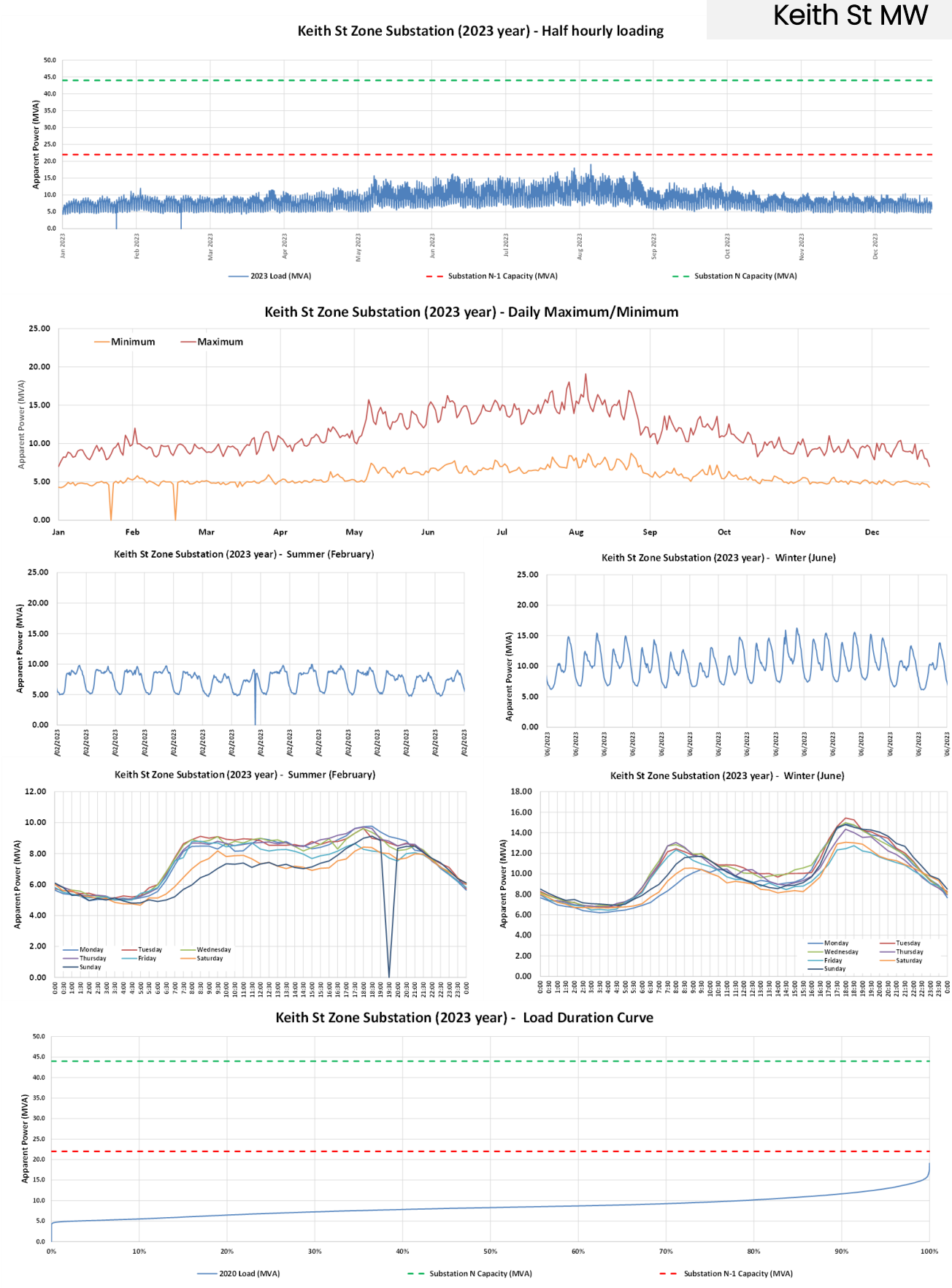


Figure 64. Keith St 33/11 kV zone substation: Real power (MW) load characteristics.

Kelvin Grove MW

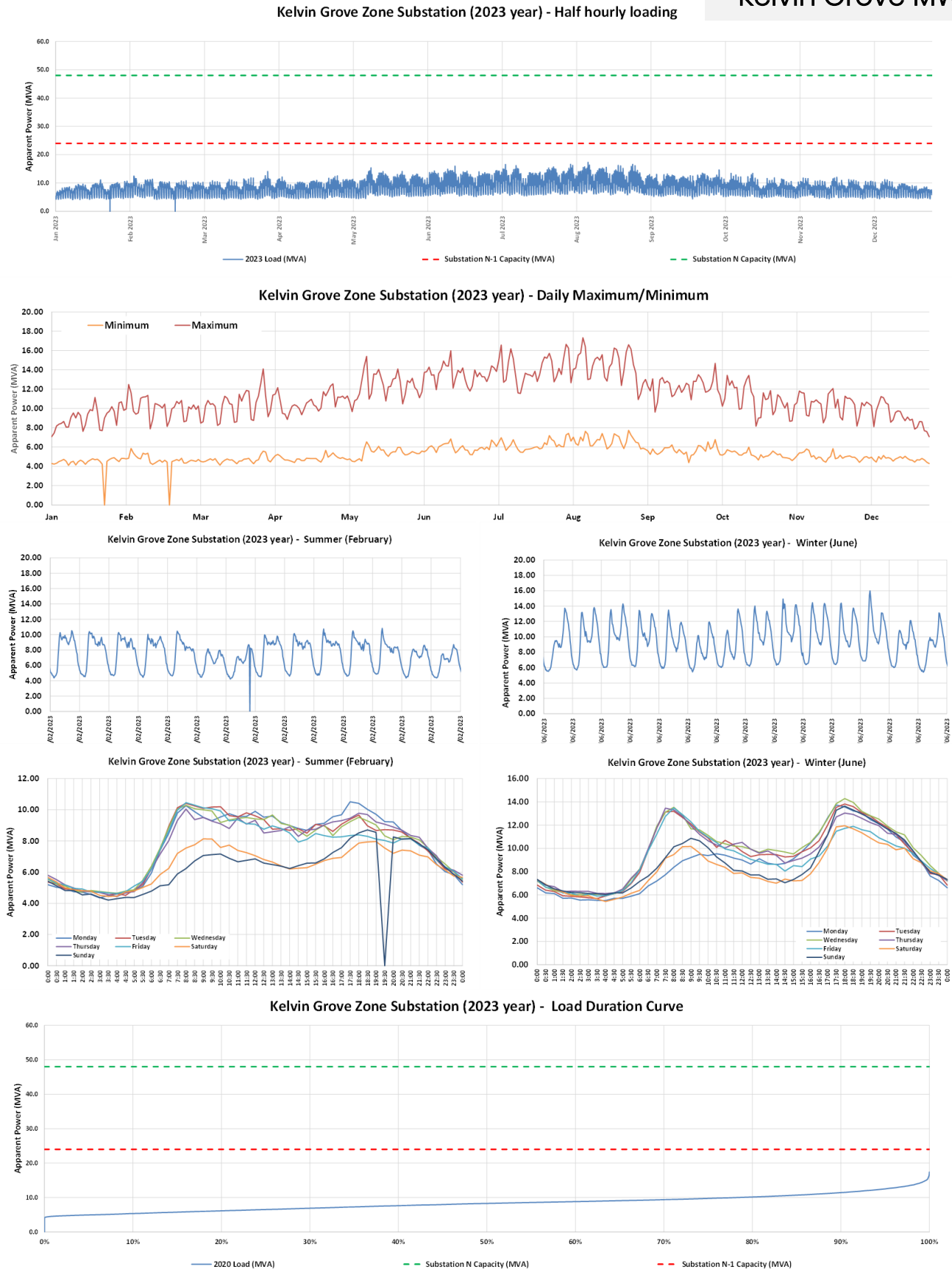


Figure 65. Kelvin Grove 33/11 kV zone substation: Real power (MW) load characteristics.

Kimbolton MW

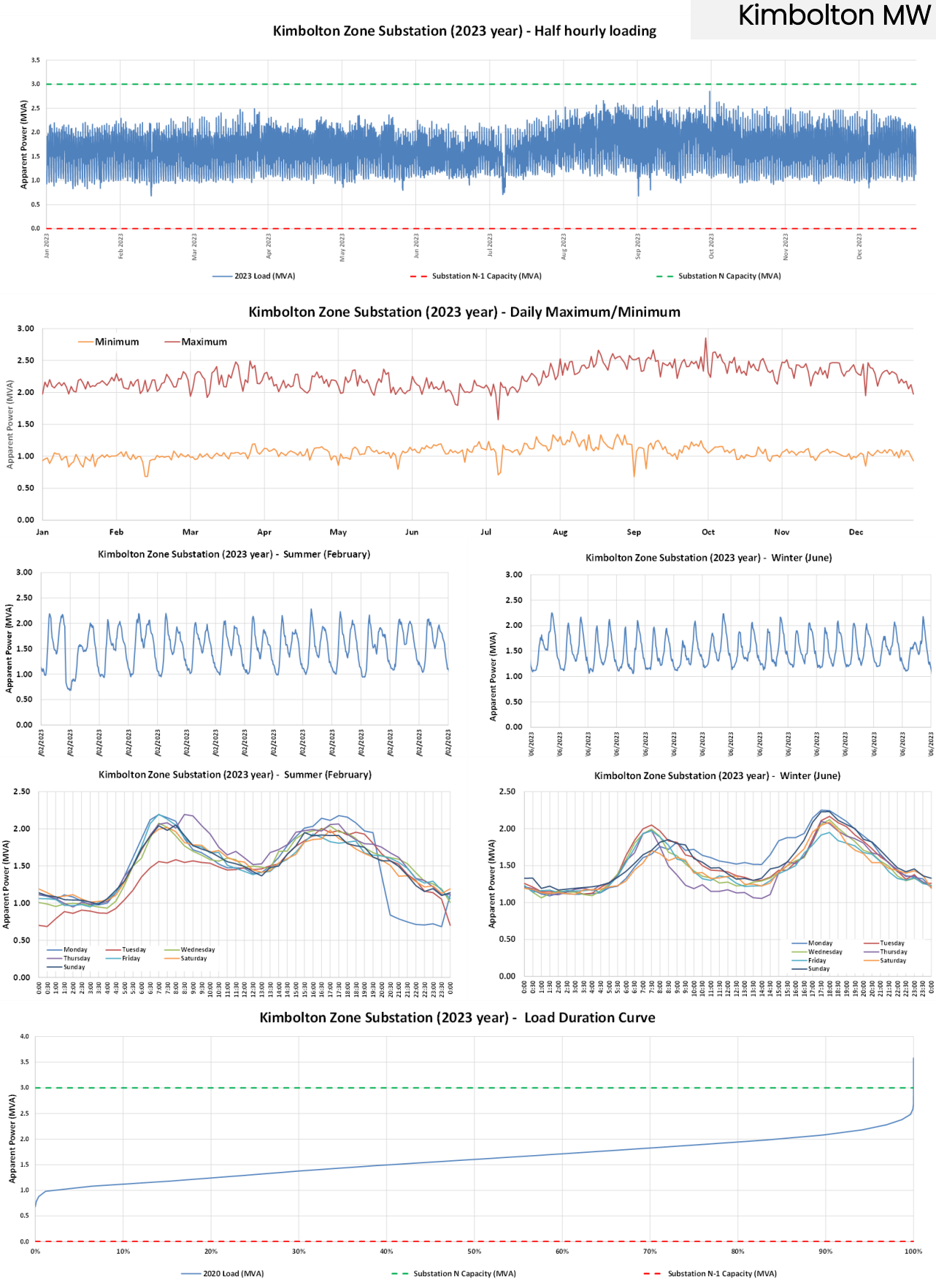


Figure 66. Kimbolton 33/11 kV zone substation: Real power (MW) load characteristics.

Main St MW

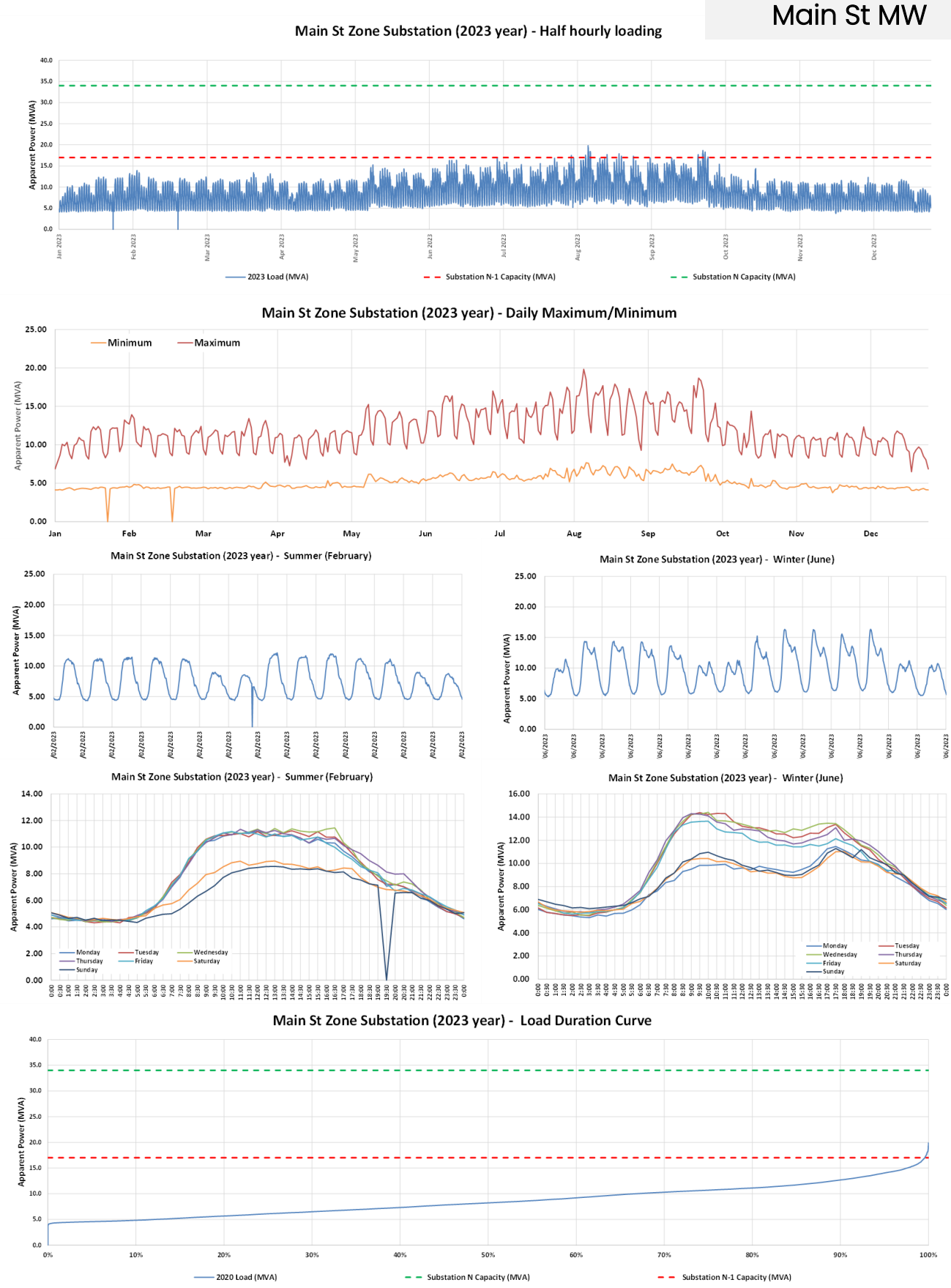


Figure 67. Main St 33/11 kV zone substation: Real power (MW) load characteristics.

Milson MW

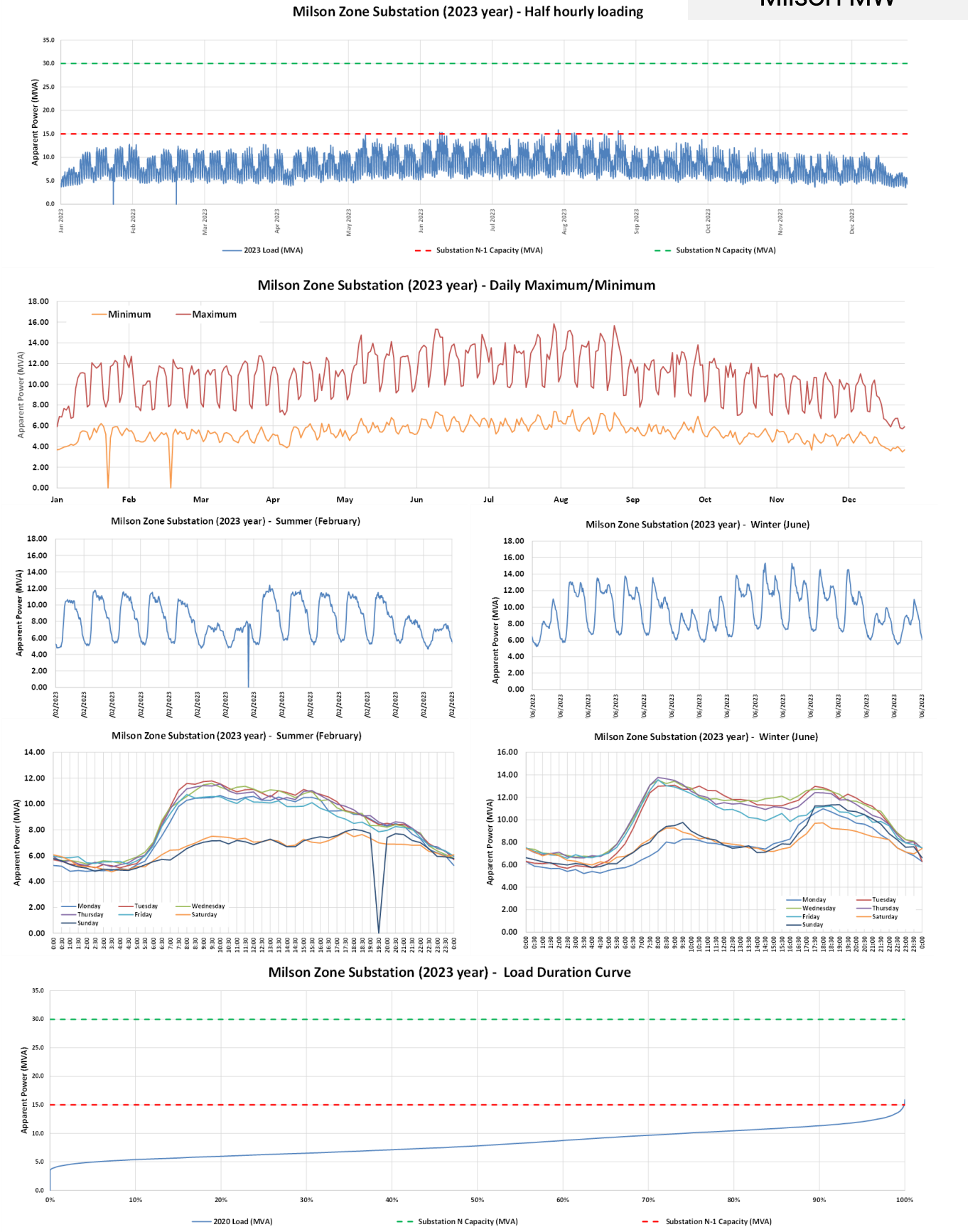


Figure 68. Milson 33/11 kV zone substation: Real power (MW) load characteristics.

Ōhakea MW

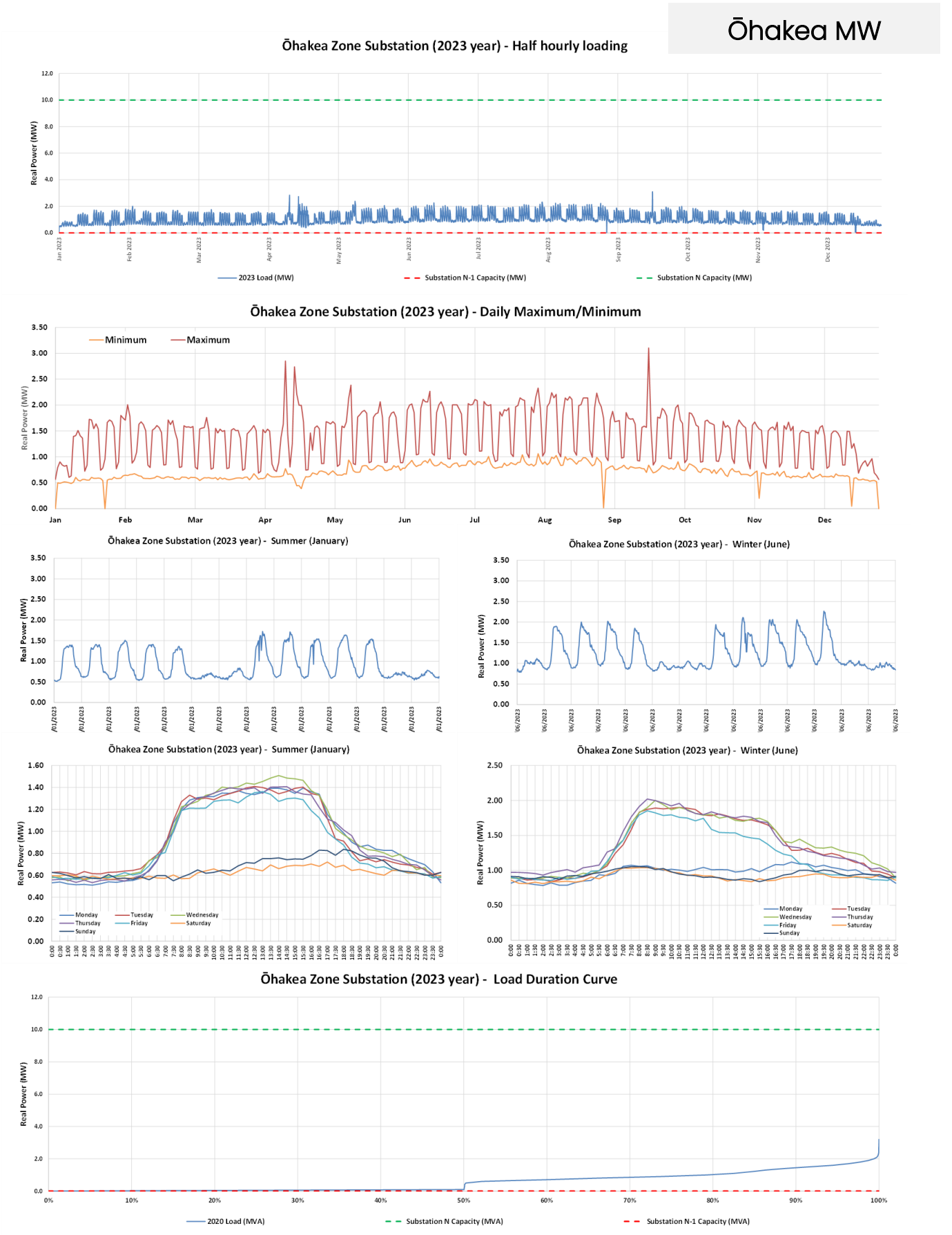


Figure 69. Ōhakea 33/11 kV zone substation: Real power (MW) load characteristics.

Pascal St MW

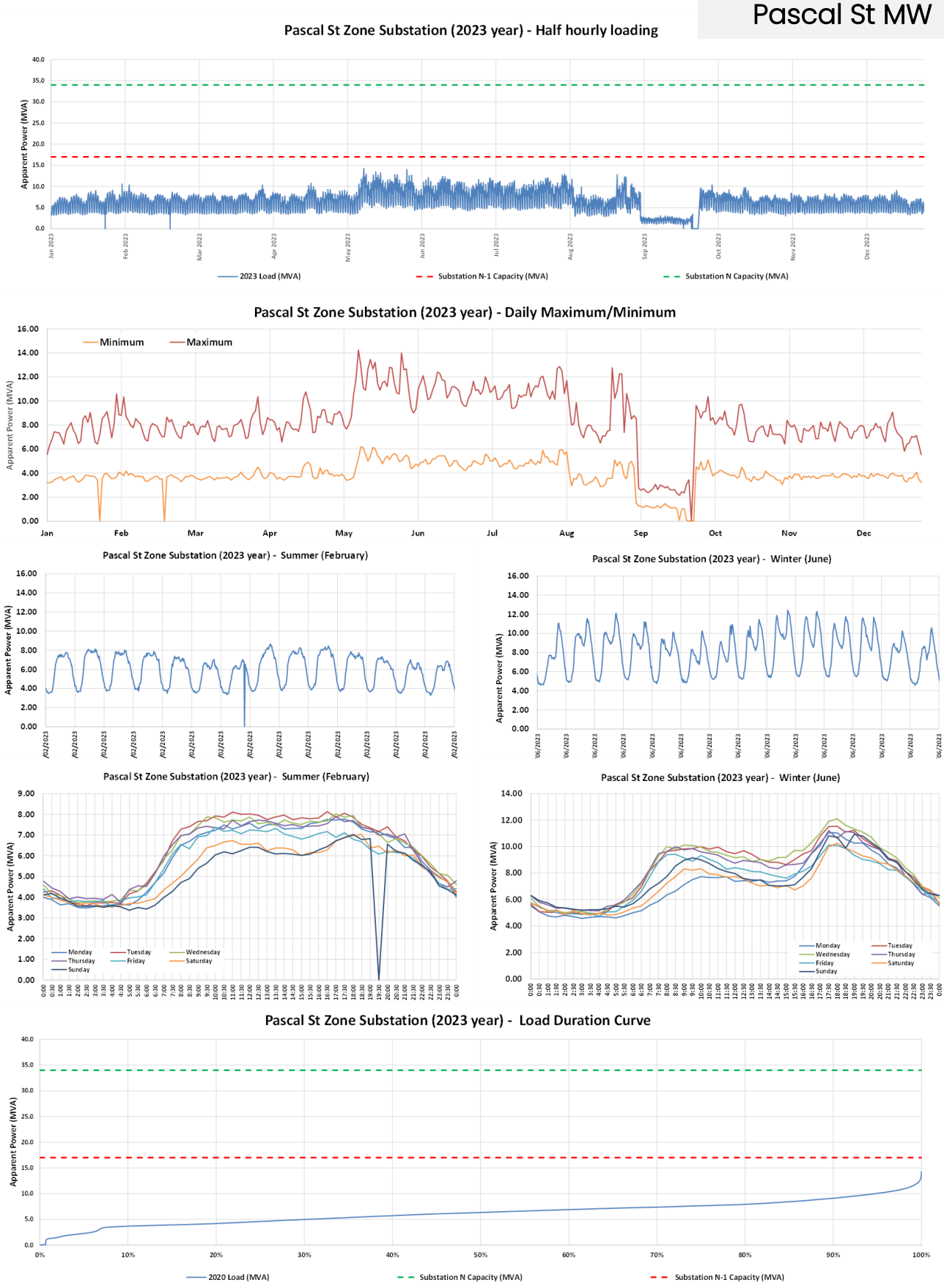


Figure 70. Pascal St 33/11 kV zone substation: Real power (MW) load characteristics.

Sanson MW

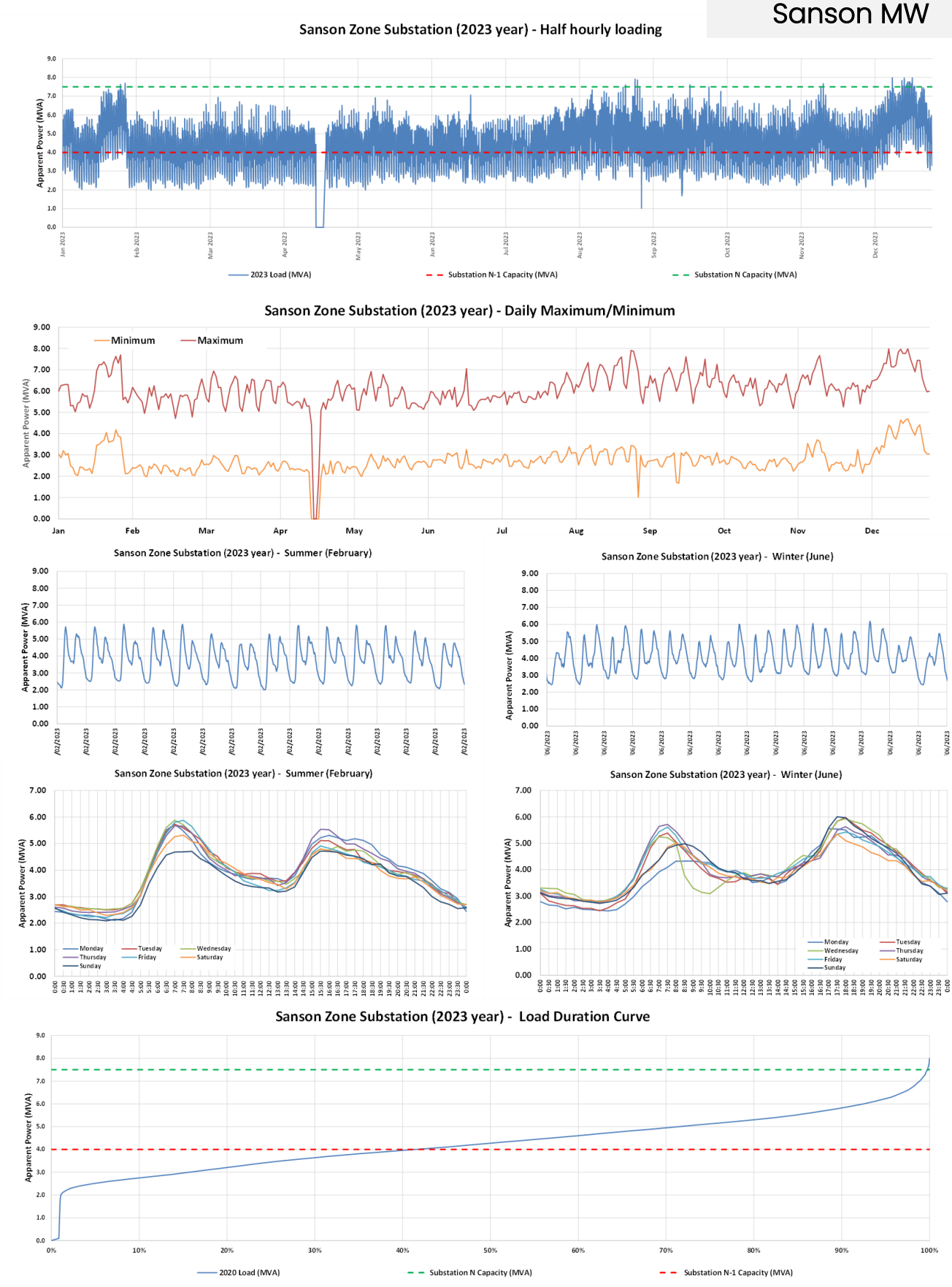


Figure 71. Sanson 33/11 kV zone substation: Real power (MW) load characteristics.

Turitea MW

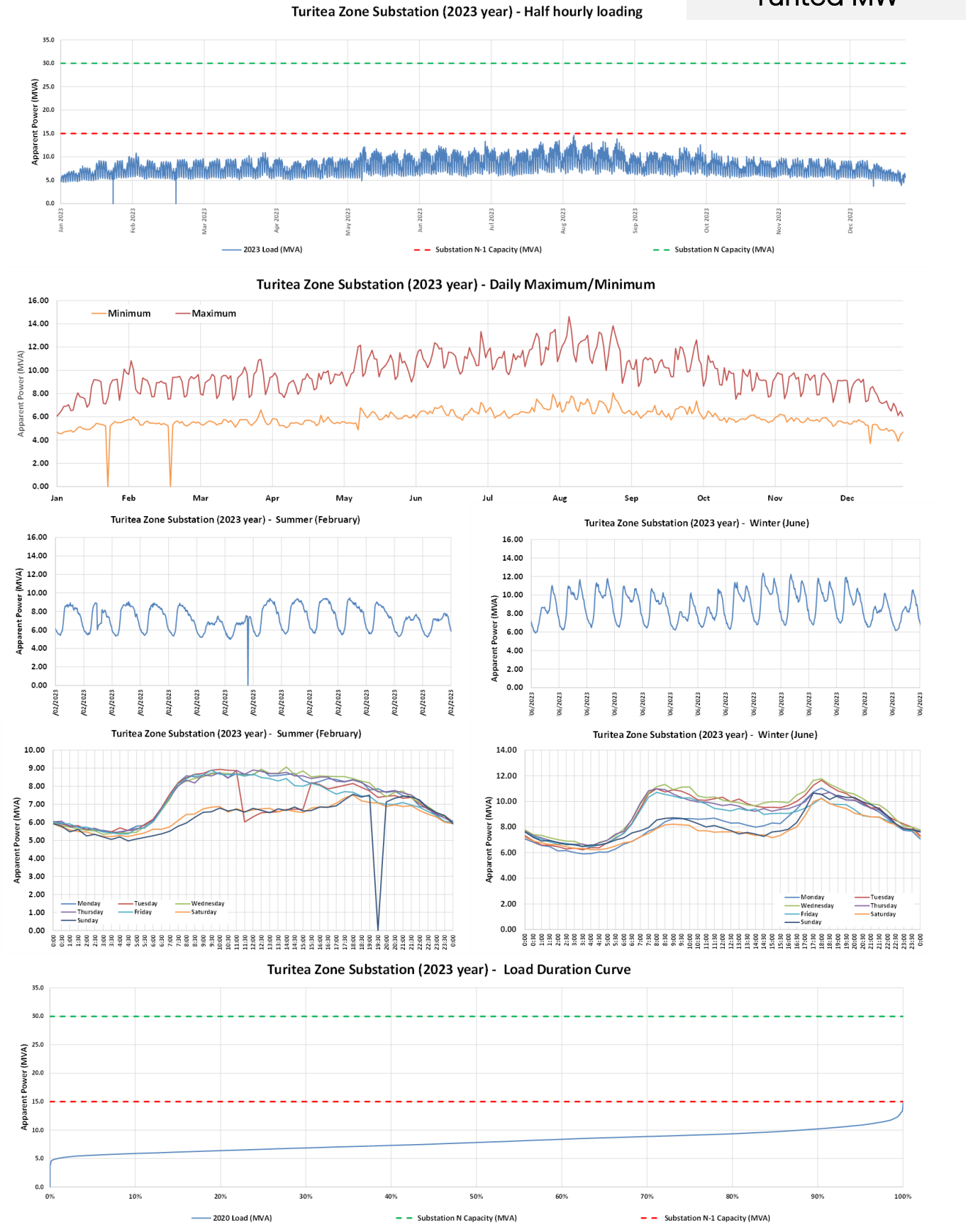
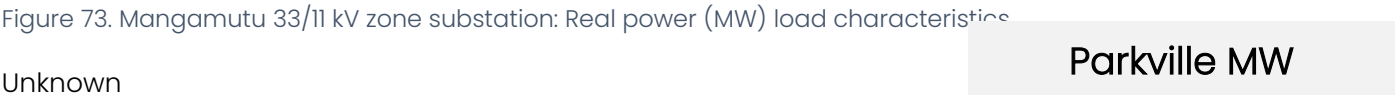


Figure 72. Turitea 33/11 kV zone substation: Real power (MW) load characteristics.

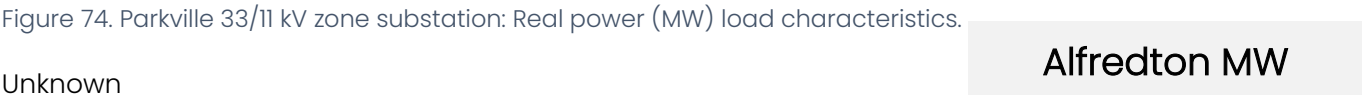
Unknown

Figure 73. Mangamutu 33/11 kV zone substation: Real power (MW) load characteristics.



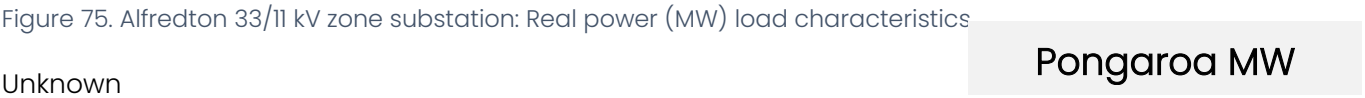
Unknown

Figure 74. Parkville 33/11 kV zone substation: Real power (MW) load characteristics.



Unknown

Figure 75. Alfredton 33/11 kV zone substation: Real power (MW) load characteristics.



Unknown

Figure 76. Pongaroa 33/11 kV zone substation: Real power (MW) load characteristics.

3.4 Scanpower

Scanpower does not presently own subtransmission assets or zone substations, and it takes supply at 11 kV from the two GXPs in the area (Dannevirke and Woodville). As such, no load characteristics are shown for Scanpower assets. Refer to the GXP graphs in Section 2 for these loads.