



# North Canterbury Network

## Supplementary Information - Substation Load Characteristics

**EECA**

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CONSULTING

**Document history and status**

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**Revision details****Revision Details**

A Supplementary document created to reduce size of overall “spare capacity and load conversion opportunity report”

B Revised document for updated Orion and Mainpower substation loadings

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## 1. Introduction

The following figures illustrate the characteristics of the major electrical substations (both GXPs and Zone Substations) in the North Canterbury Region. This document supplements the main report titled “North Canterbury Network – Spare Capacity and Load Conversion Opportunity Report”.

For each GXP, the January 2022 through December 2022 apparent (MVA) and reactive loadings (MVAr) are presented. For each Zone Substation, the apparent (MVA) 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:

- **Arthur's Pass GXP**
  - Figure 1 Arthur's Pass: Apparent power (MVA) load characteristics
  - Figure 2 Arthur's Pass: Reactive power (MVAr) load characteristics
- **Ashley GXP**
  - Figure 3 Ashley: Apparent power (MVA) load characteristics
  - Figure 4 Ashley: Reactive power (MVAr) load characteristics
- **Bromley GXP**
  - Figure 5 Bromley: Apparent power (MVA) load characteristics
  - Figure 6 Bromley: Reactive power (MVAr) load characteristics
- **Castle Hill GXP**
  - Figure 7 Castle Hill: Apparent power (MVA) load characteristics
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- **Coleridge GXP**
  - Figure 9 Coleridge: Apparent power (MVA) load characteristics
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- **Culverden 33kV GXP**
  - Figure 11 Culverden 33kV: Apparent power (MVA) load characteristics
  - Figure 12 Culverden 33kV: Reactive power (MVAr) load characteristics
- **Culverden 66kV GXP**
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- **Hororata GXP**
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- **Islington 33kV GXP**
  - Figure 17 Islington 33kV: Apparent power (MVA) load characteristics
  - Figure 18 Islington 33kV: Reactive power (MVAr) load characteristics
- **Islington 66kV GXP**
  - Figure 19 Islington 66kV: Apparent power (MVA) load characteristics
  - Figure 20 Islington 66kV: Reactive power (MVAr) load characteristics
- **Kaiapoi GXP**
  - Figure 21 Kaiapoi: Apparent power (MVA) load characteristics
  - Figure 22 Kaiapoi: Reactive power (MVAr) load characteristics
- **Kimberley GXP**
  - Figure 23 Kimberley: Apparent power (MVA) load characteristics
  - Figure 24 Kimberley: Reactive power (MVAr) load characteristics
- **Southbrook GXP**
  - Figure 25 Southbrook: Apparent power (MVA) load characteristics
  - Figure 26 Southbrook: Reactive power (MVAr) load characteristics
- **Waipara GXP**
  - Figure 27 Waipara: Apparent power (MVA) load characteristics
  - Figure 28 Waipara: Reactive power (MVAr) load characteristics

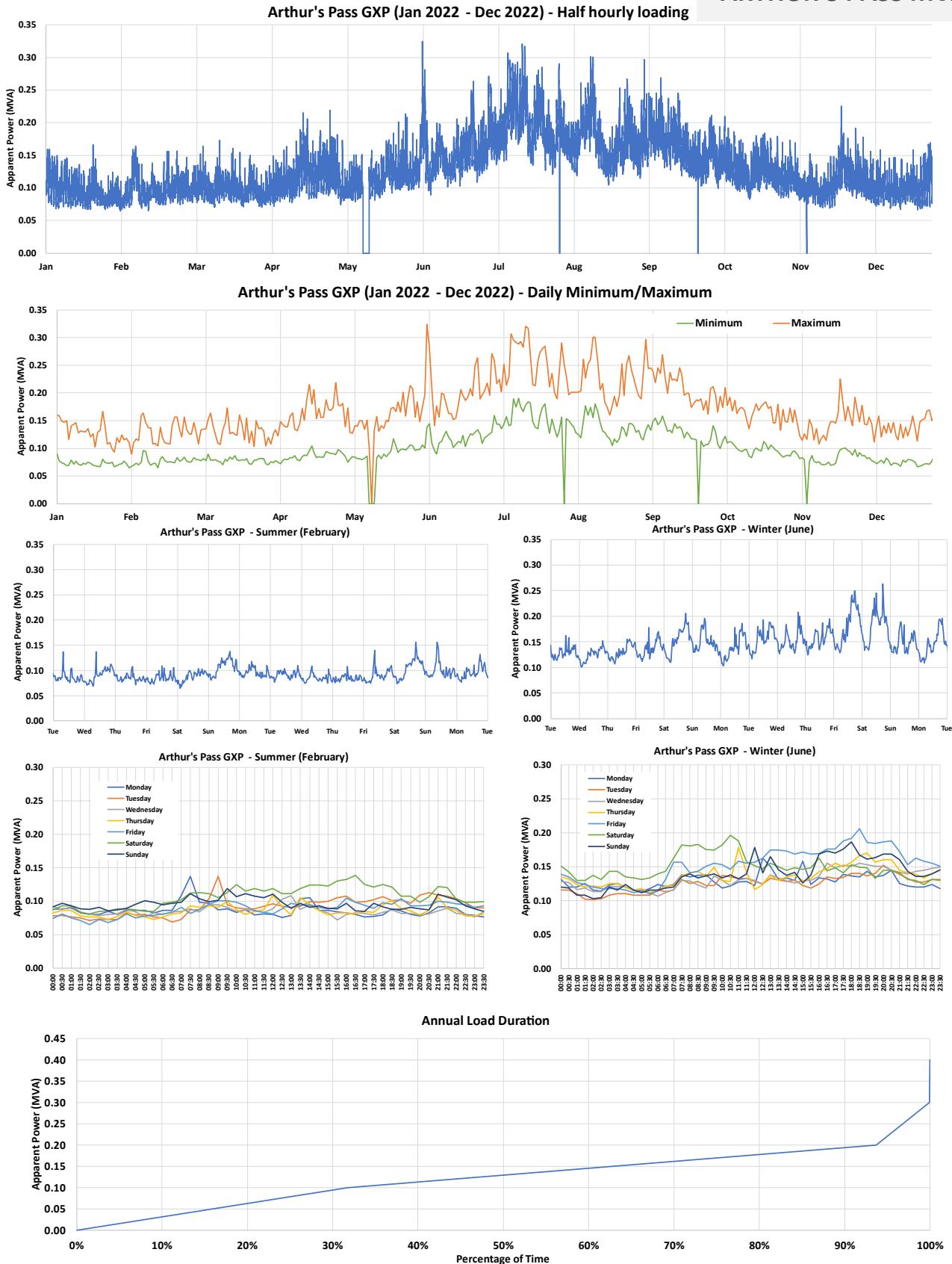
**ARTHUR'S PASS MVA**


Figure 1 Arthur's Pass: Apparent power (MVA) load characteristics

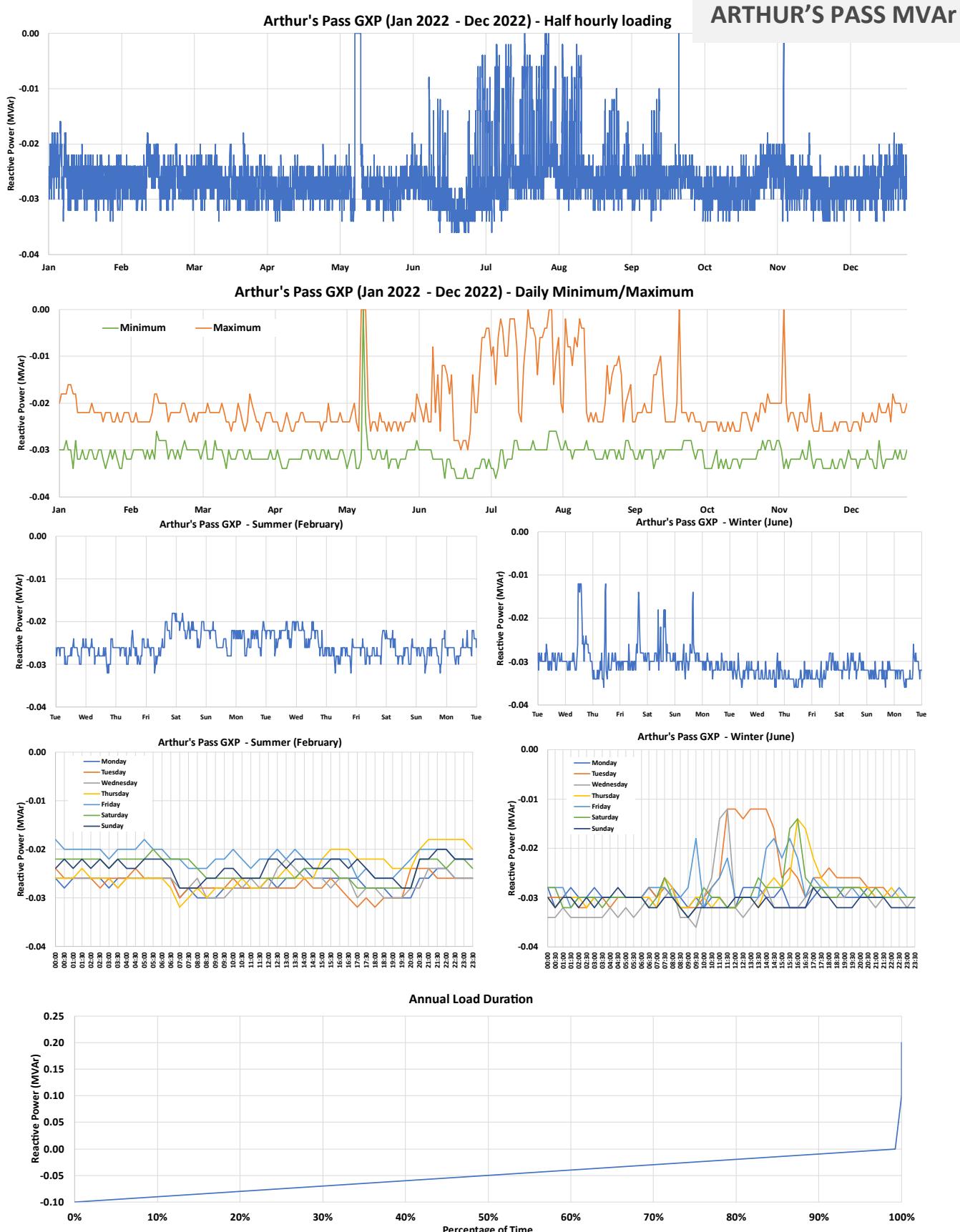


Figure 2 Arthur's Pass: Reactive power (MVAr) load characteristics

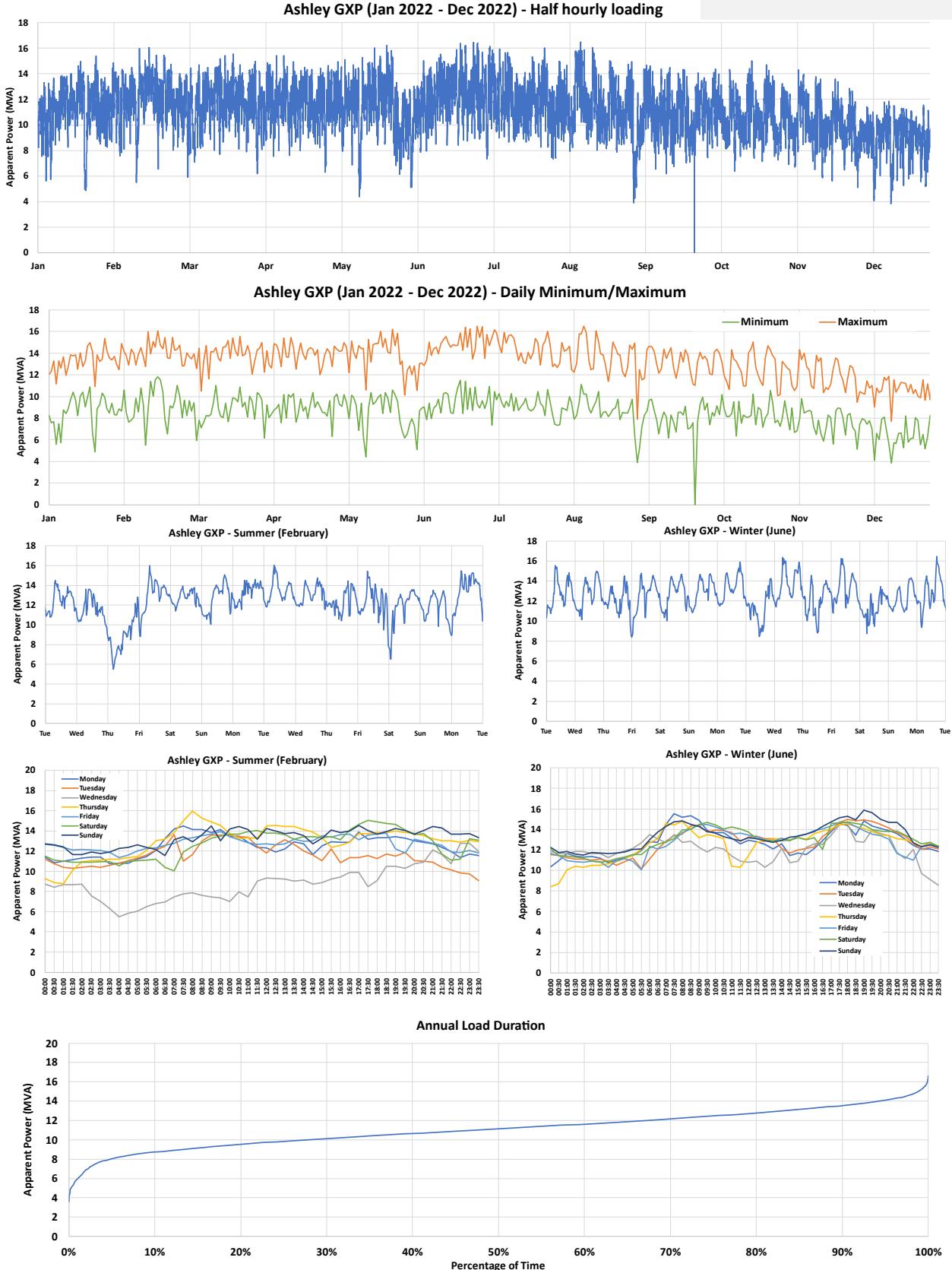
**ASHLEY MVA**


Figure 3 Ashley: Apparent power (MVA) load characteristics

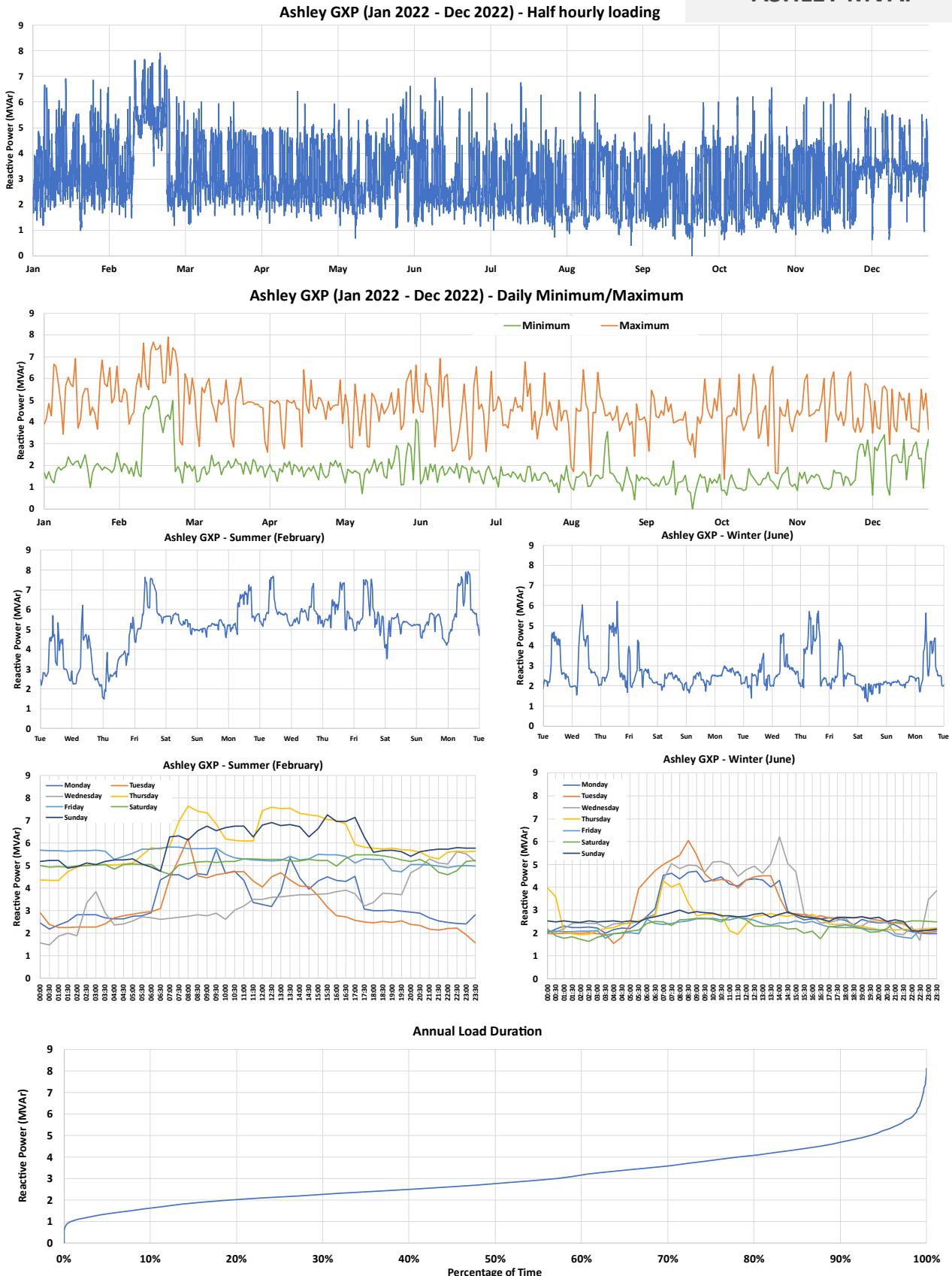
**ASHLEY MVAr**


Figure 4 Ashley: Reactive power (MVAr) load characteristics

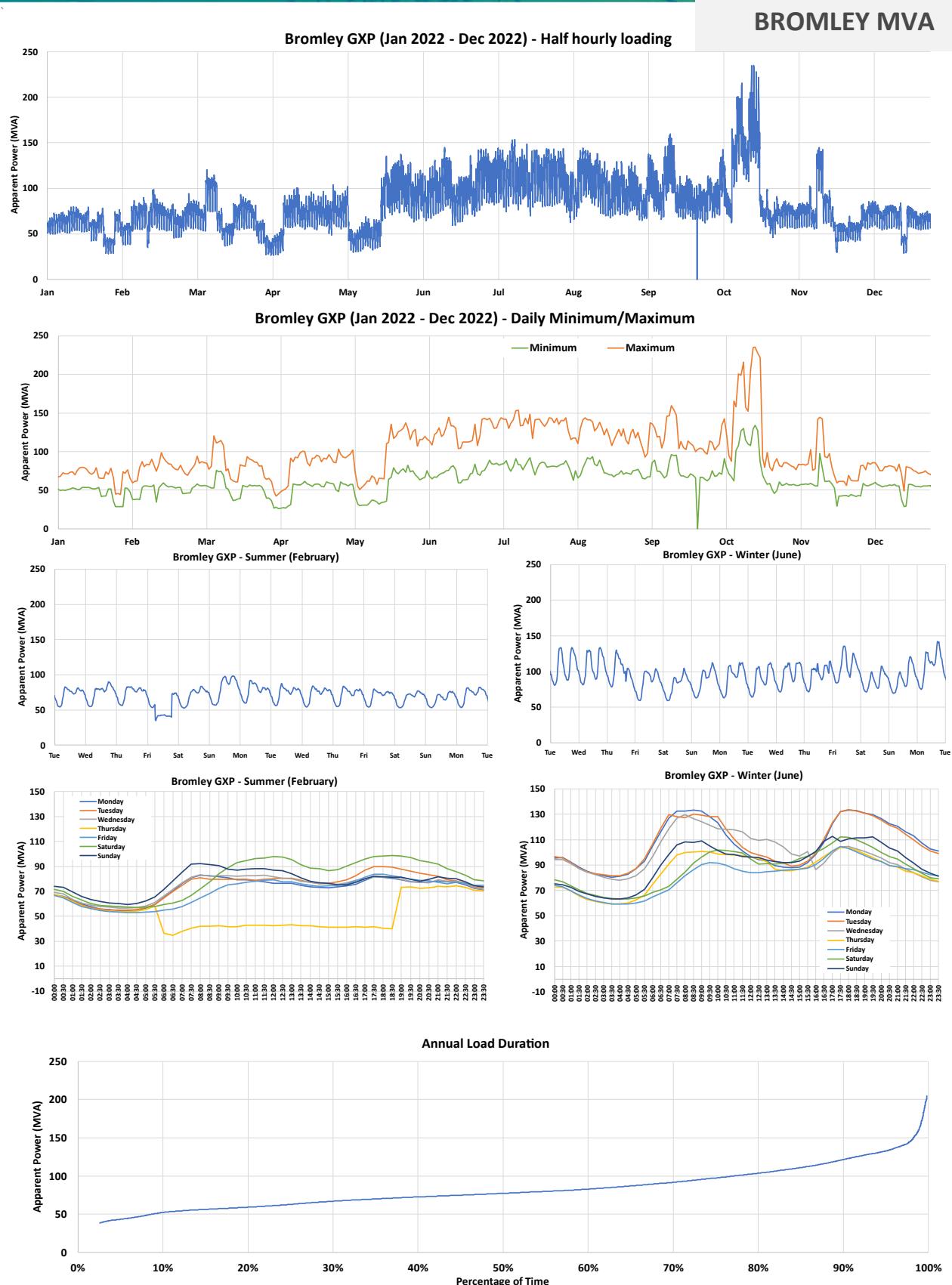


Figure 5 Bromley: Apparent power (MVA) load characteristics

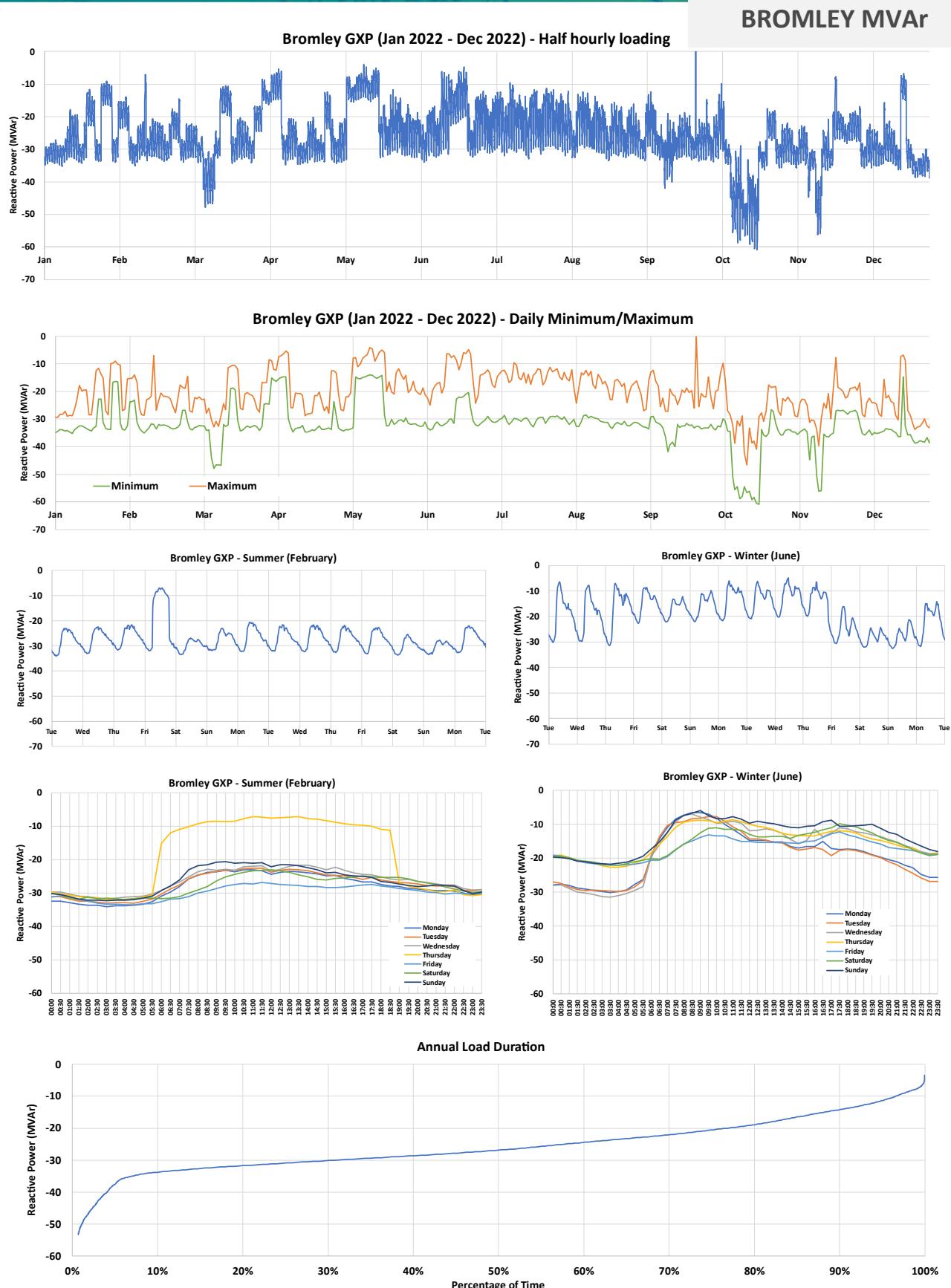


Figure 6 Bromley: Reactive power (MVAr) load characteristics

## CASTLE HILL MVA

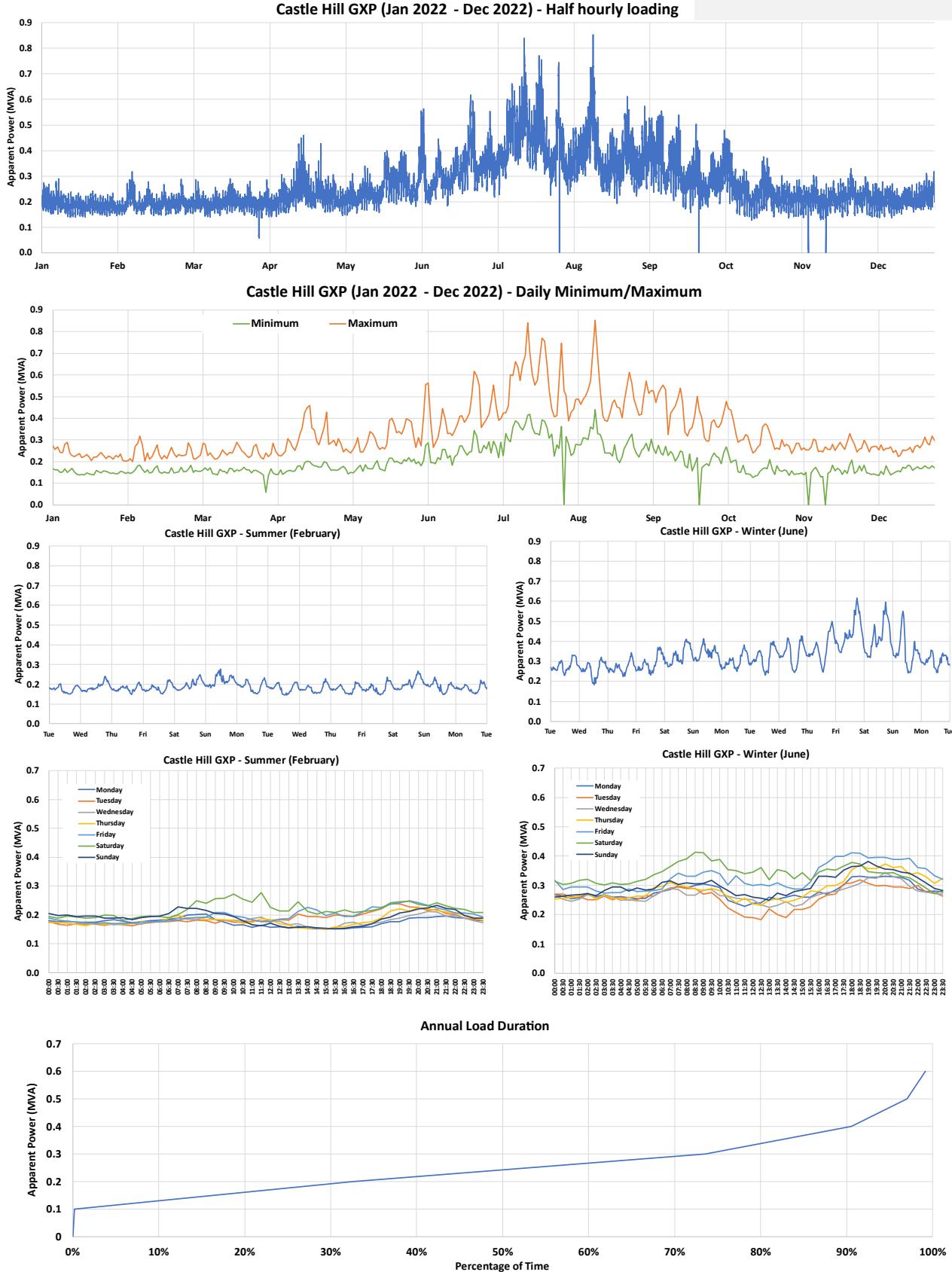


Figure 7 Castle Hill: Apparent power (MVA) load characteristics

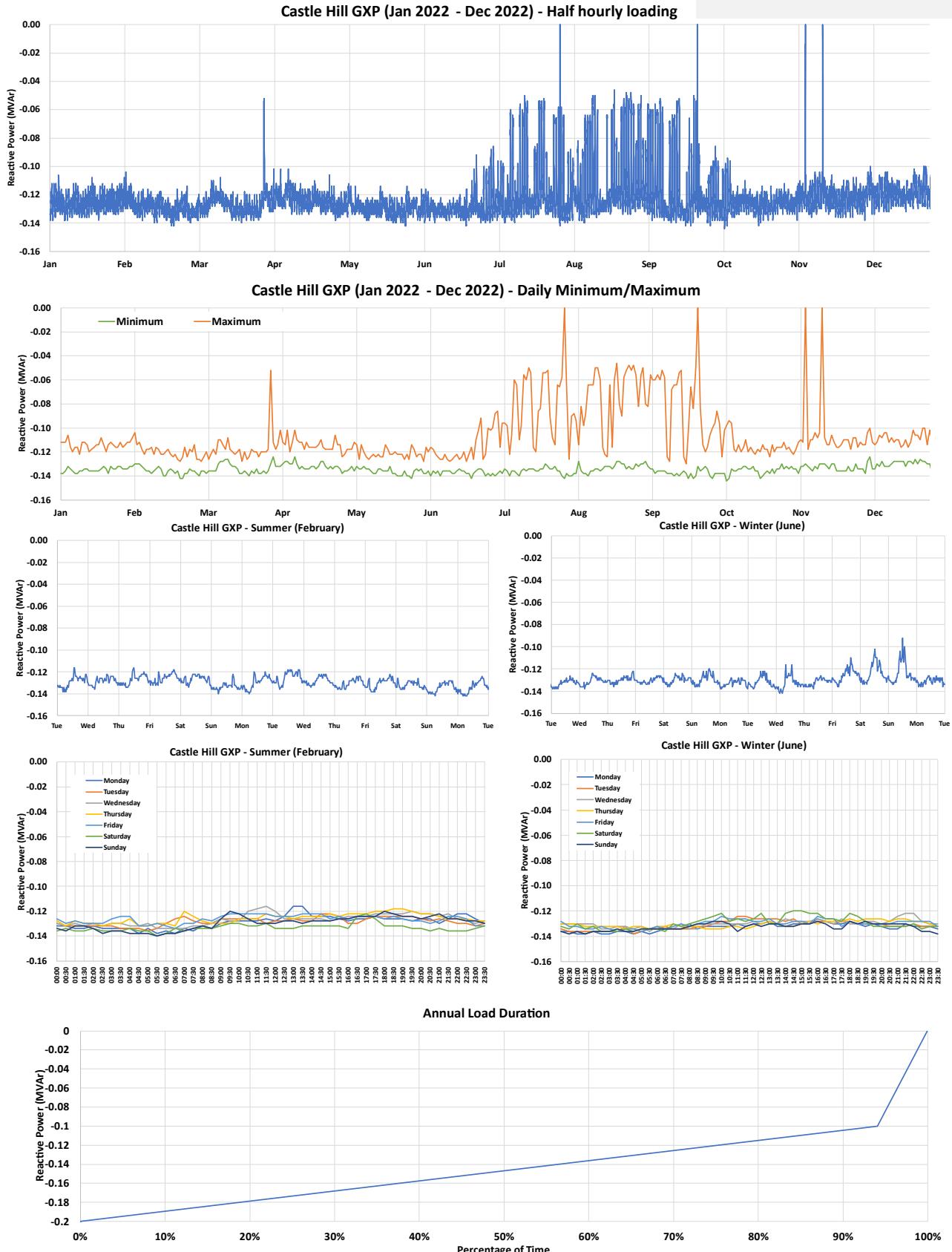
**CASLTLE HILL MVar**


Figure 8 Castle Hill: Reactive power (MVAr) load characteristics

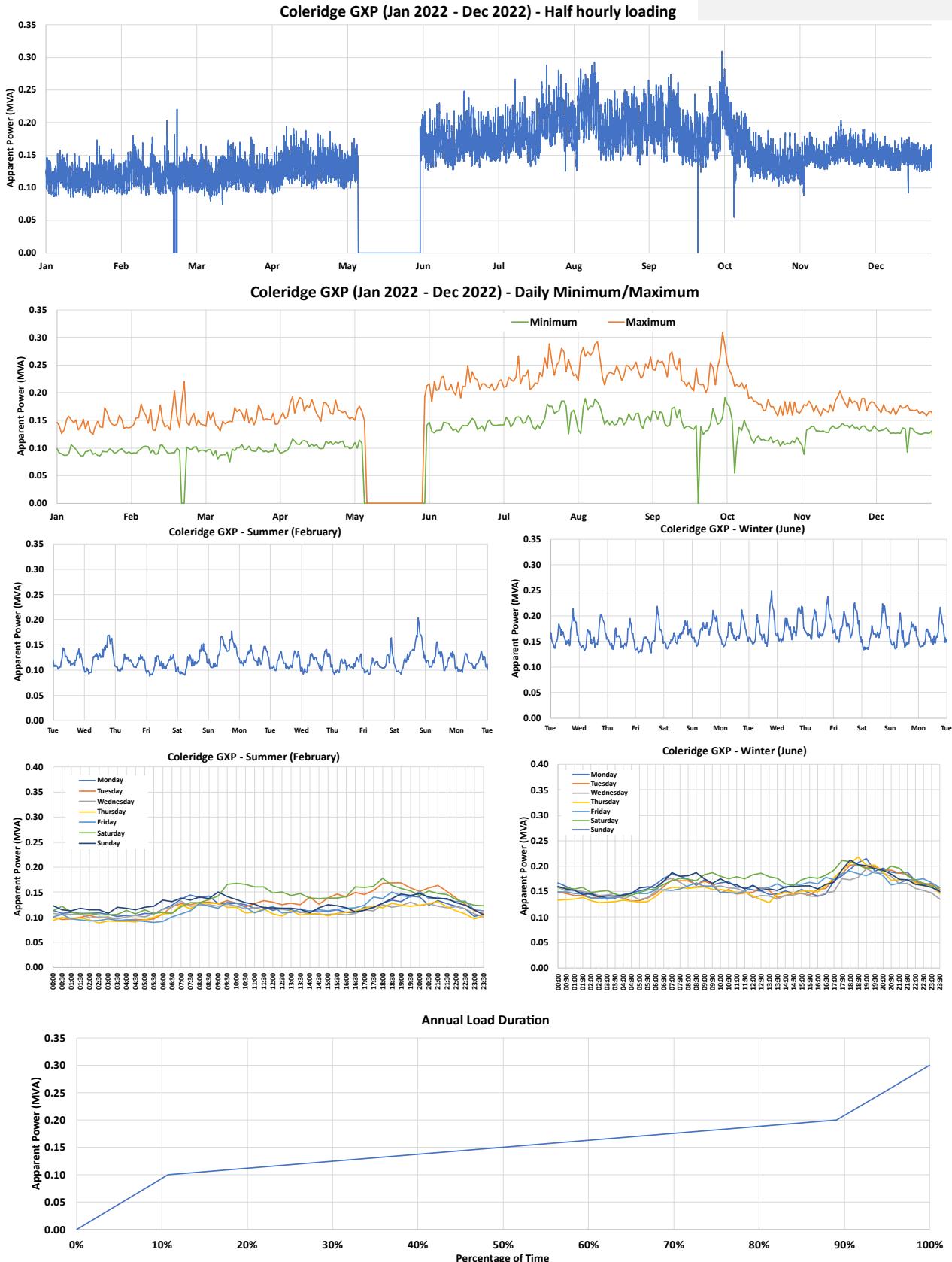
**COLERIDGE MVA**


Figure 9 Coleridge: Apparent power (MVA) load characteristics

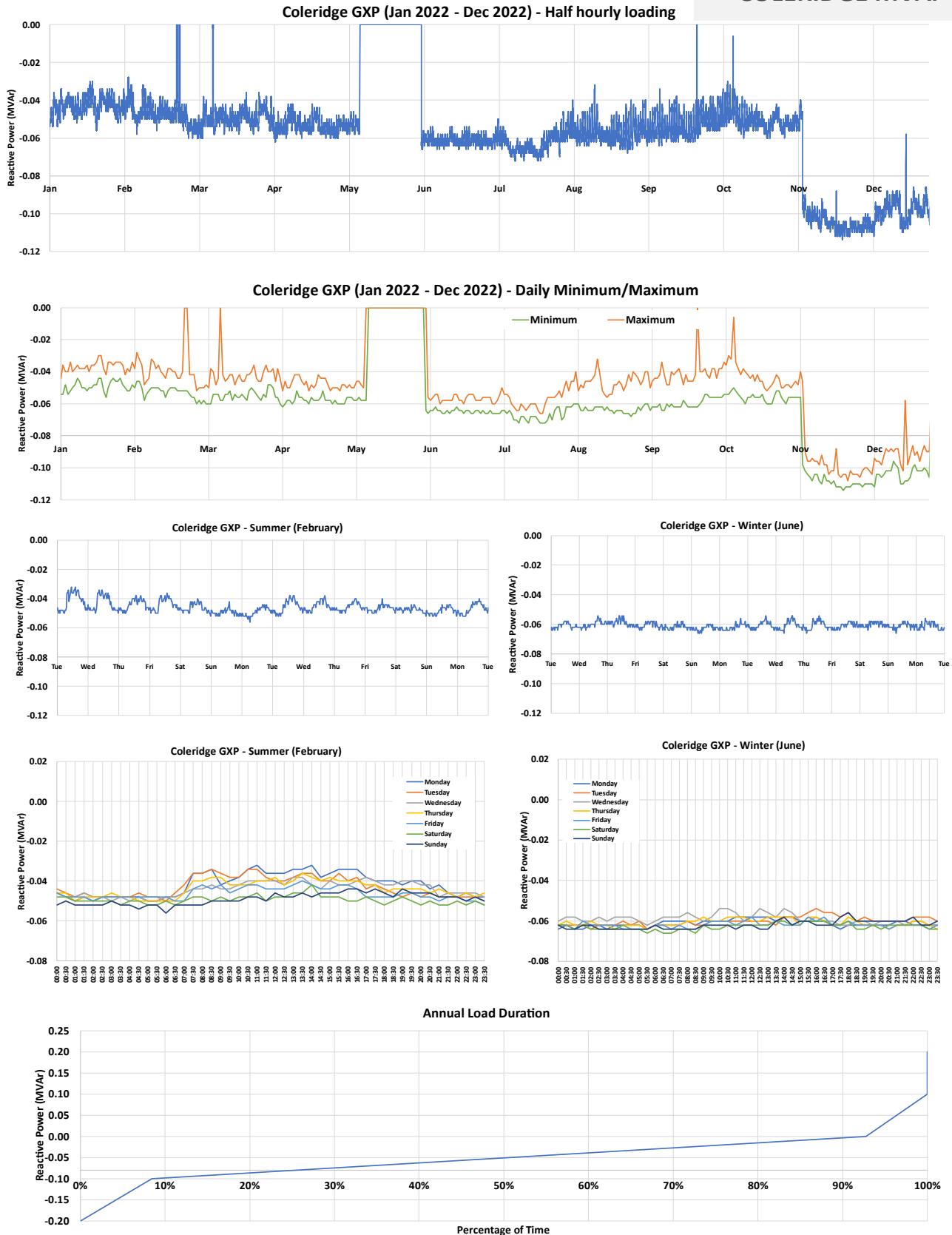
**COLERIDGE MVar**


Figure 10 Coleridge: Reactive power (MVAr) load characteristics

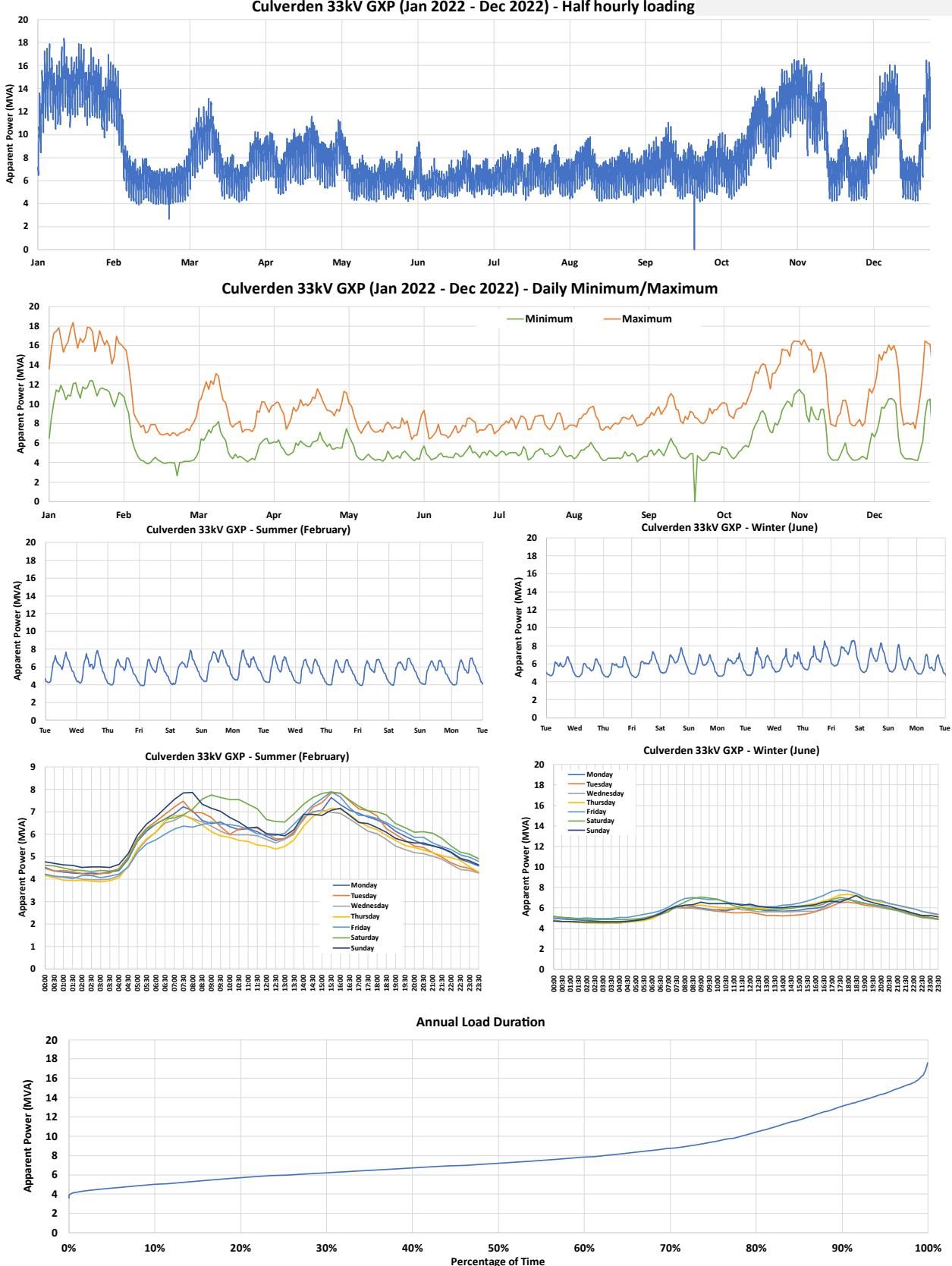
**CULVERDEN 33kV MVA**


Figure 11 Culverden 33kV: Apparent power (MVA) load characteristics

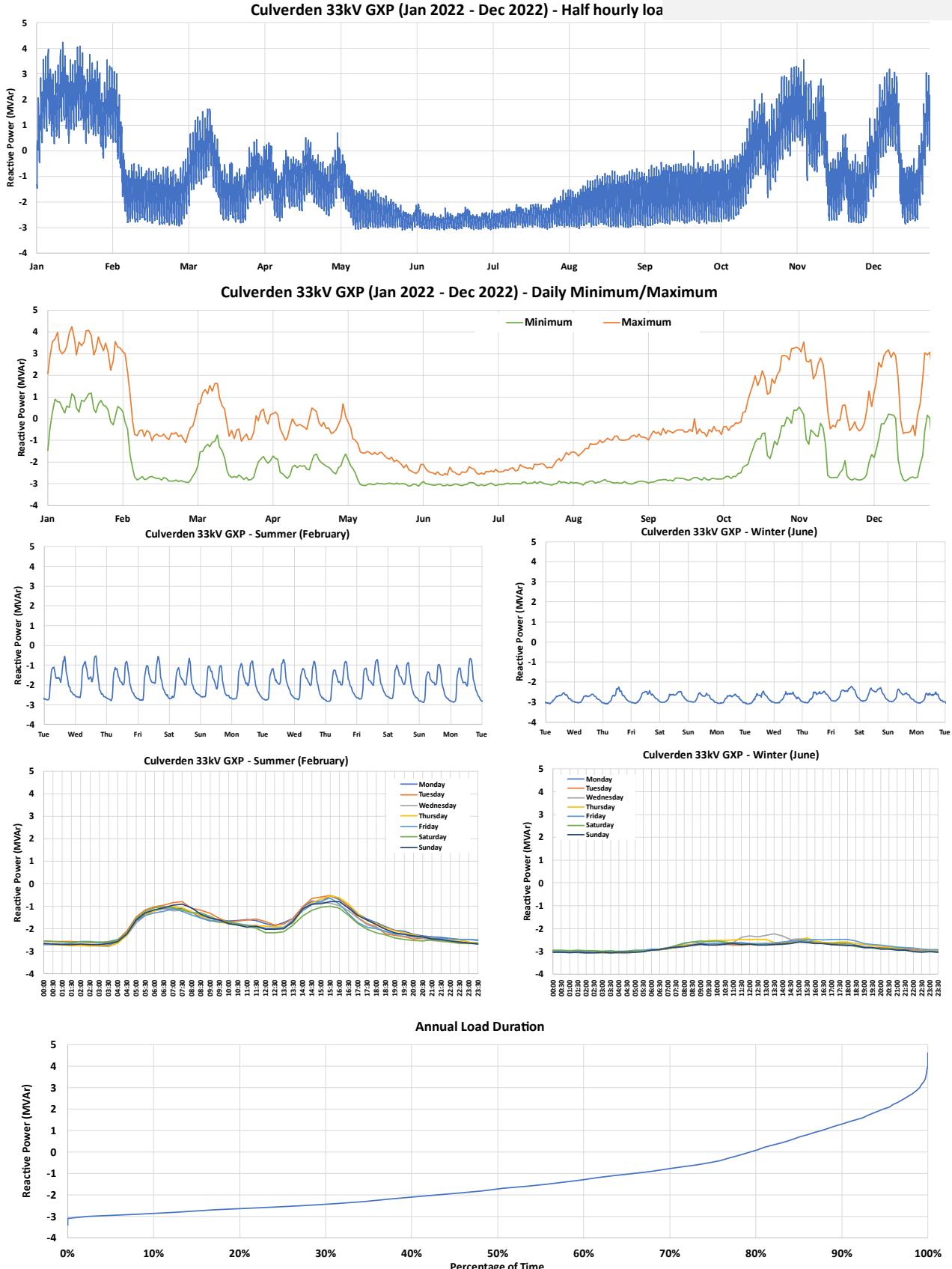
**CULVERDEN 33kV MVA<sub>R</sub>**


Figure 12 Culverden 33kV: Reactive power (MVA<sub>R</sub>) load characteristics

## CULVERDEN 66kV MVA

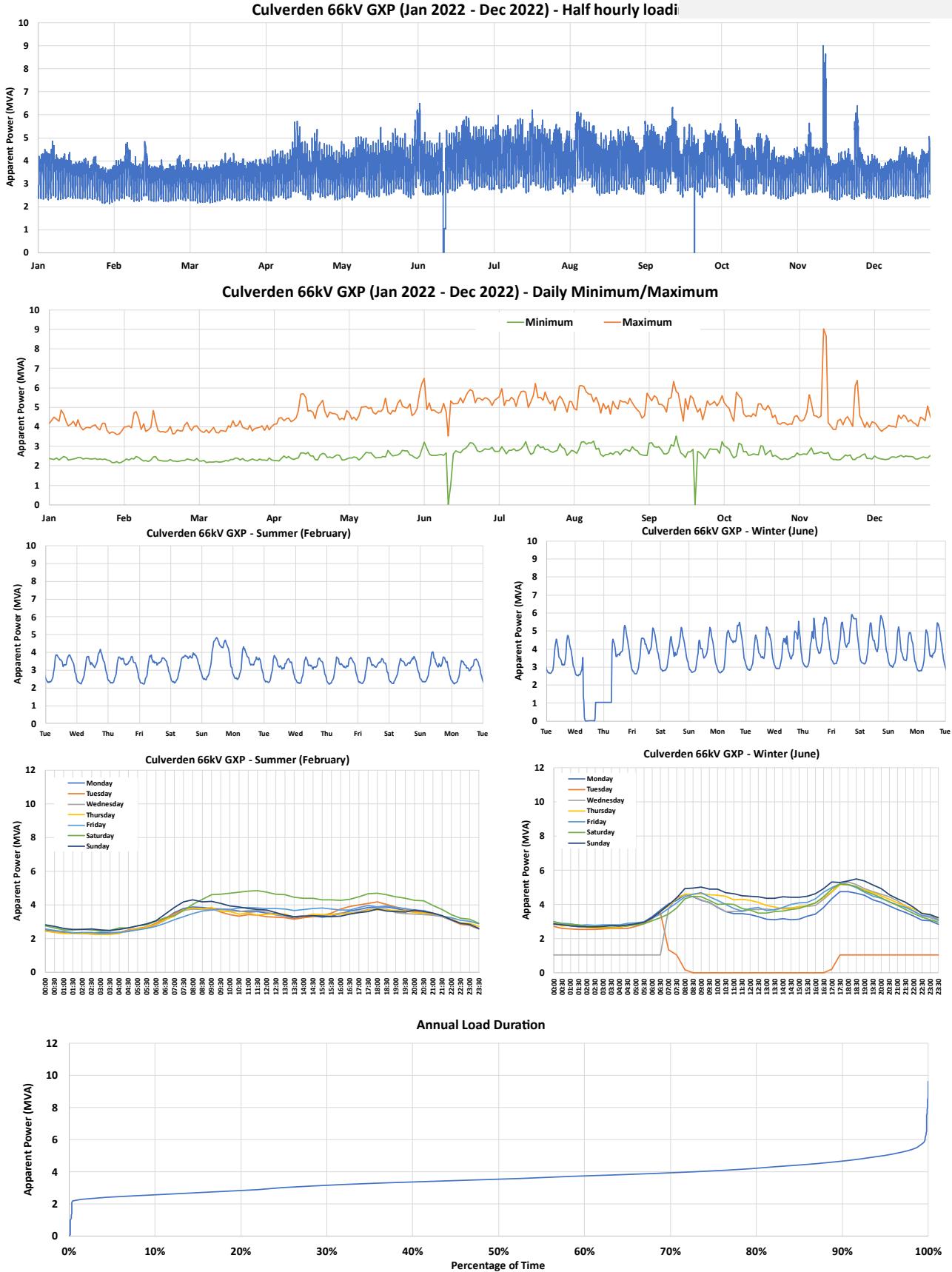


Figure 13 Culverden 66kV: Apparent power (MVA) load characteristics

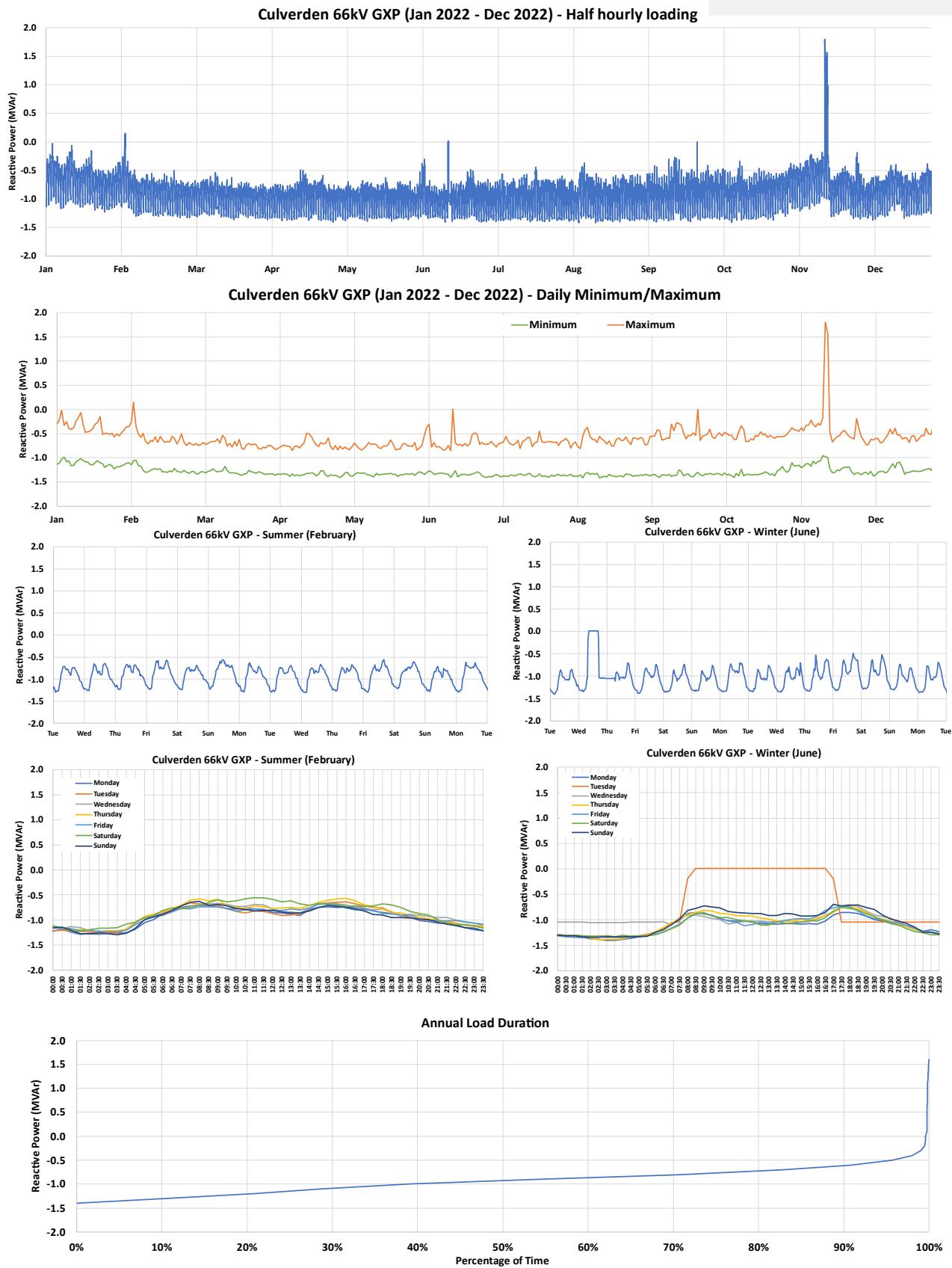
**CULVERDEN 66kV MVar**


Figure 14 Culverden 66kV: Reactive power (MVA) load characteristics

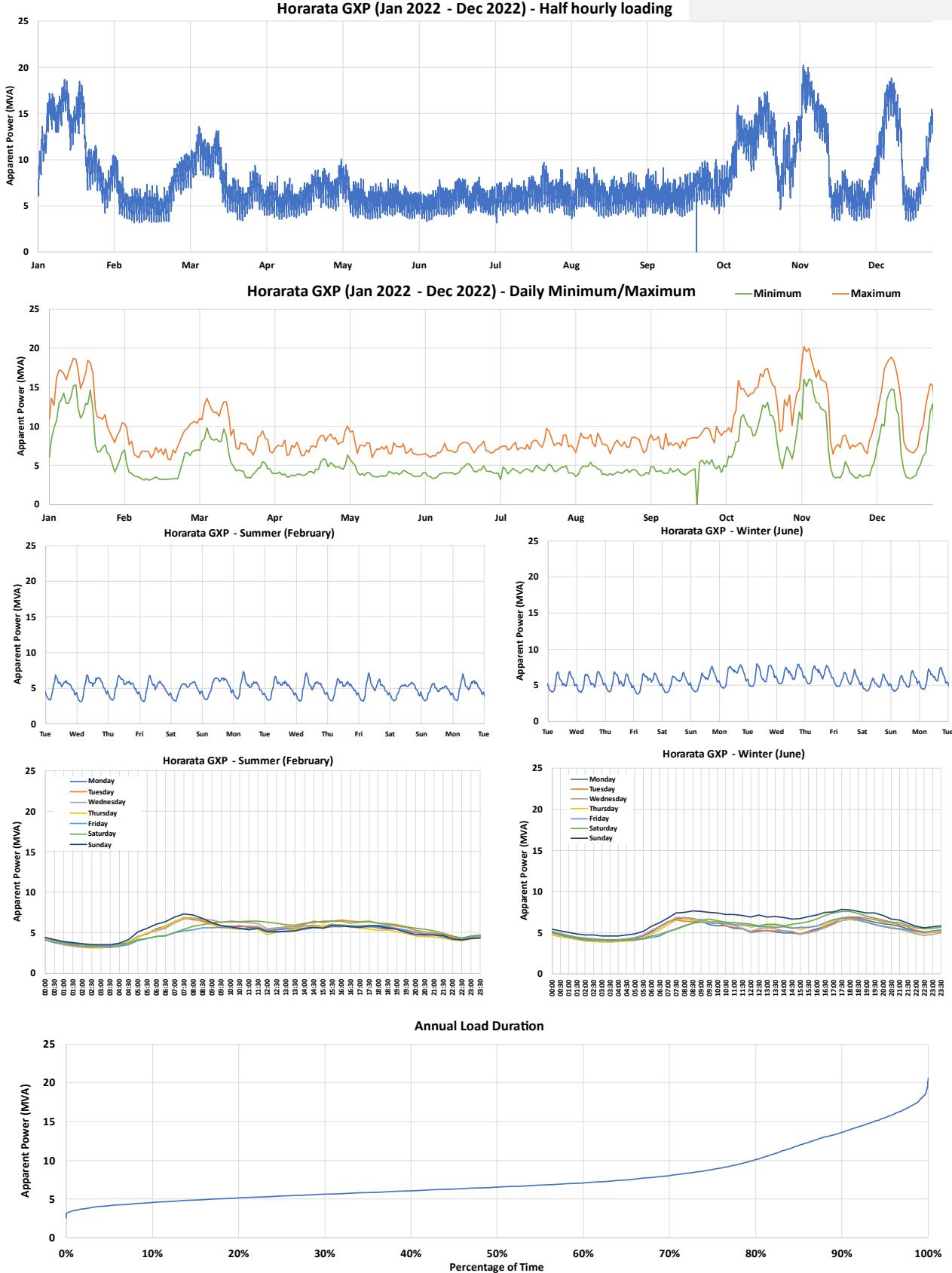
**HORORATA MVA**


Figure 15 Hororata: Apparent power (MVA) load characteristics

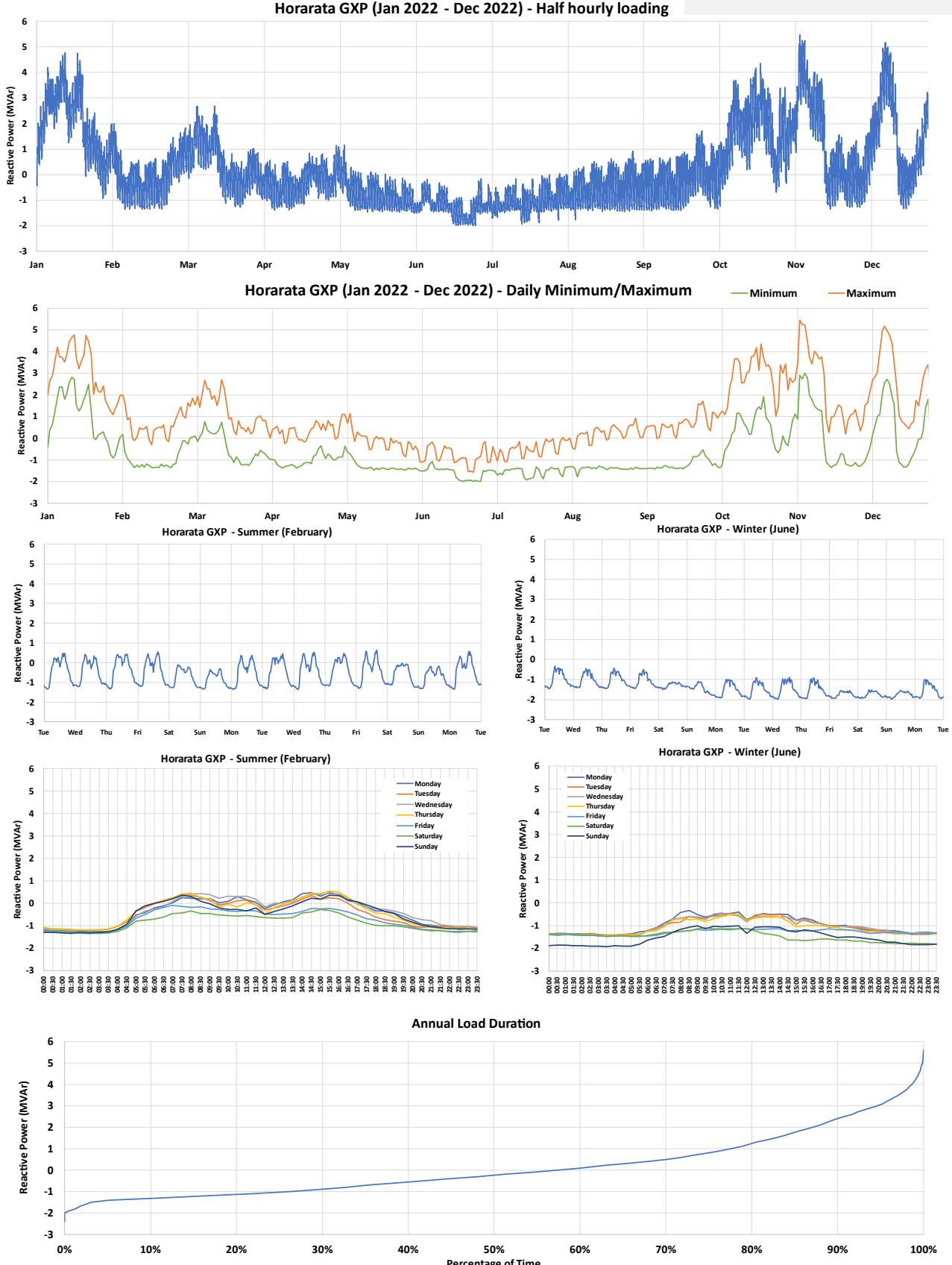
**HORORATA MVar**


Figure 16 Hororata: Reactive power (MVA) load characteristics

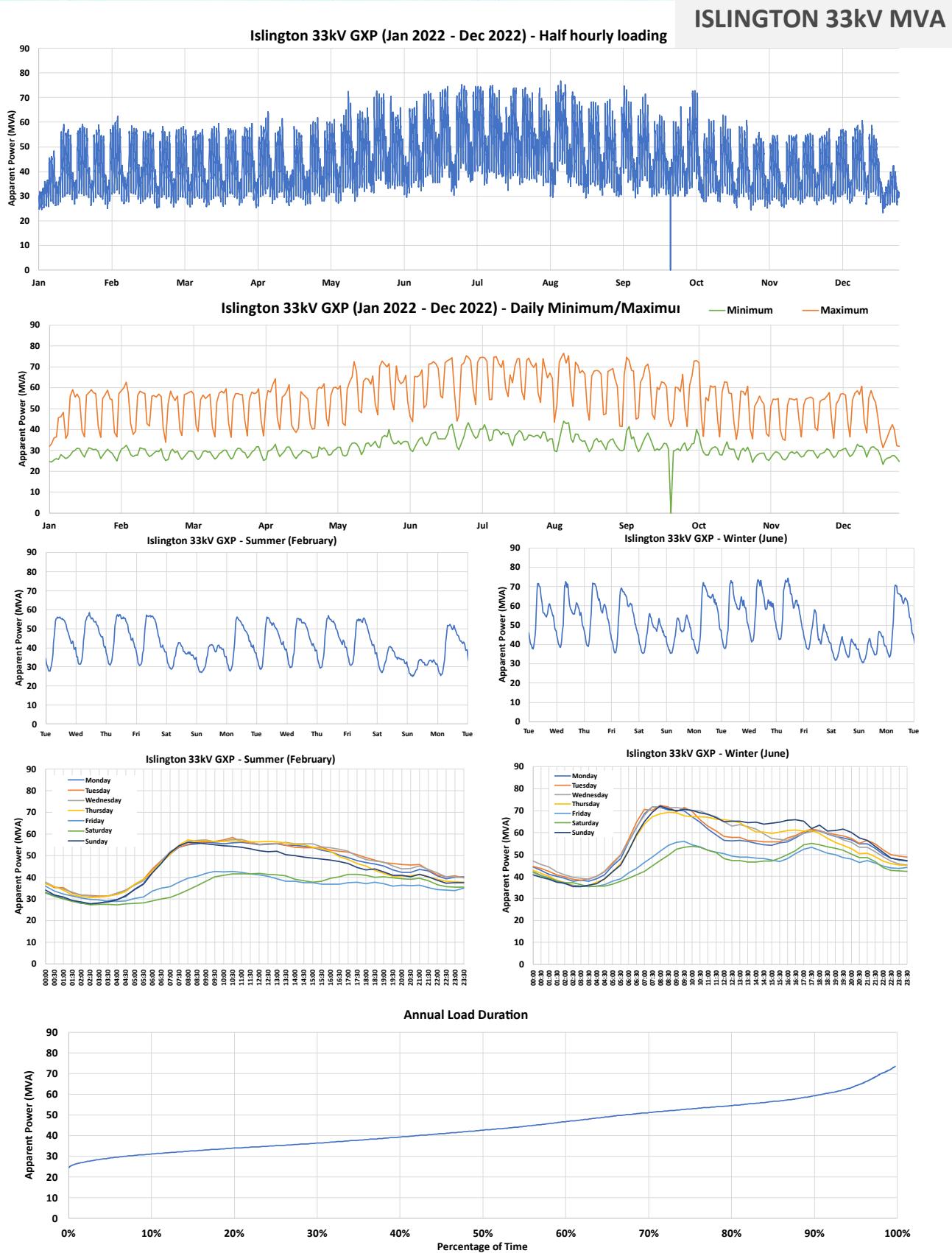


Figure 17 Islington 33kV: Apparent power (MVA) load characteristics

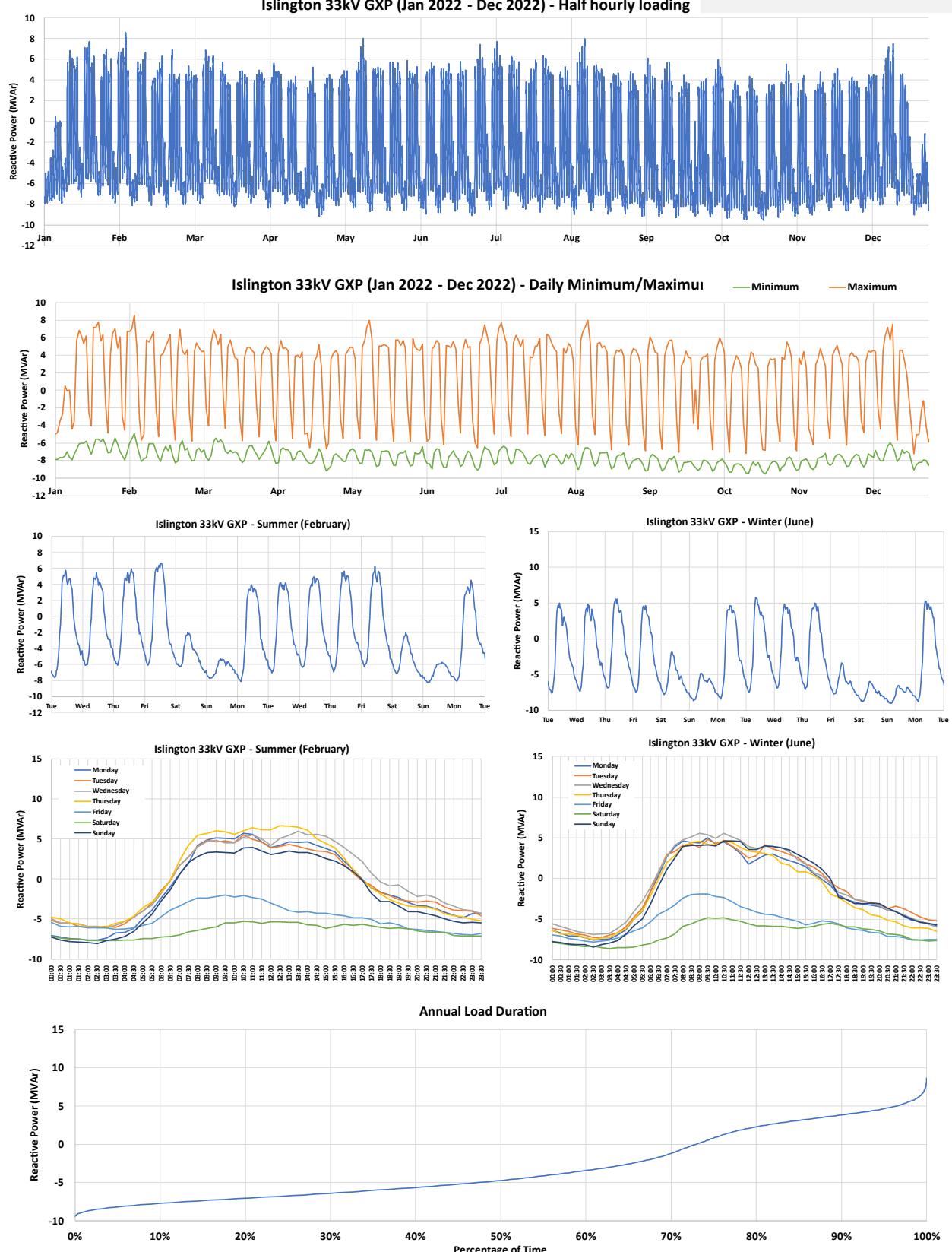
**ISLINGTON 33kV MVAr**


Figure 18 Islington 33kV: Reactive power (MVAr) load characteristics

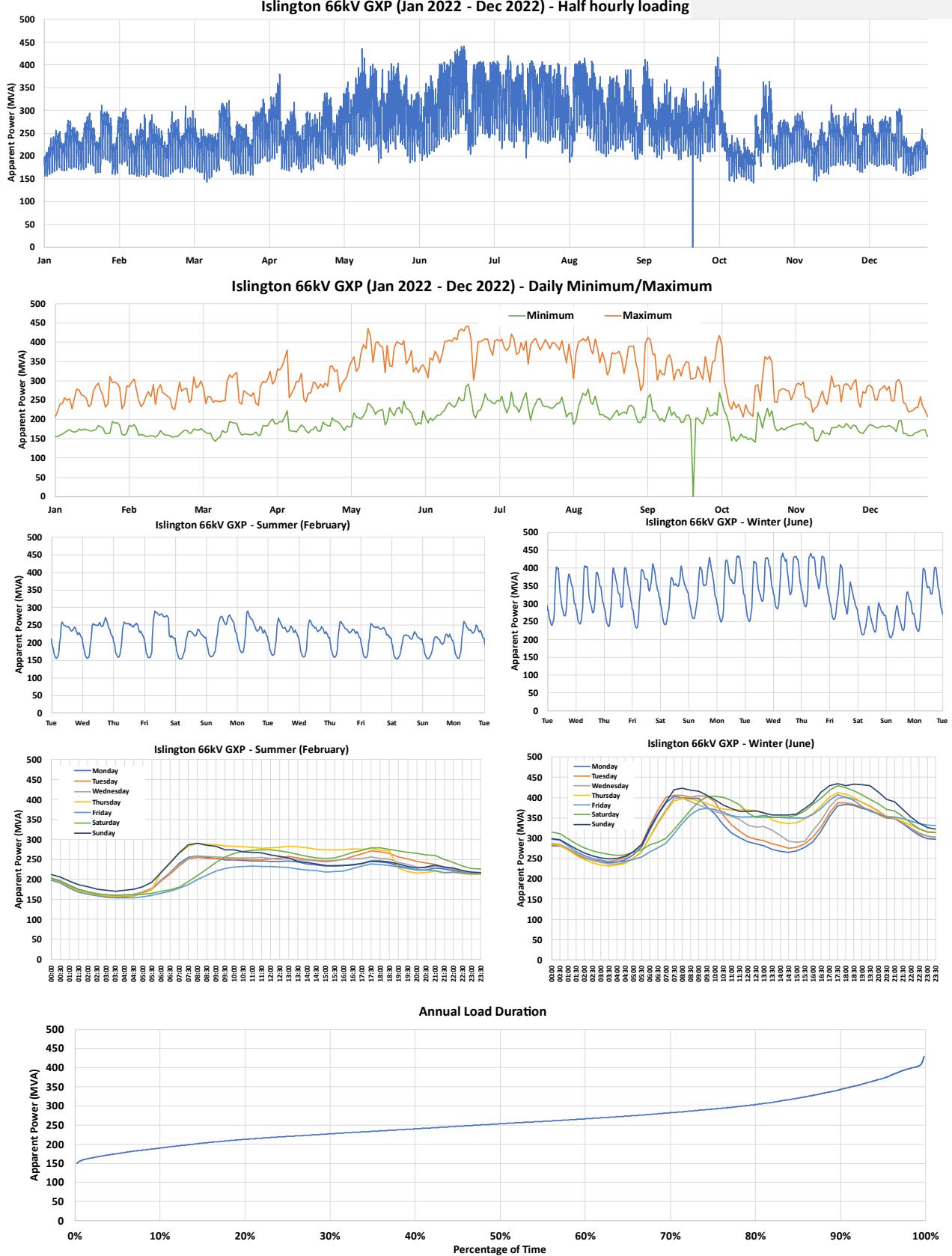
**ISLINGTON 66kV MVA**


Figure 19 Islington 66kV: Apparent power (MVA) load characteristics

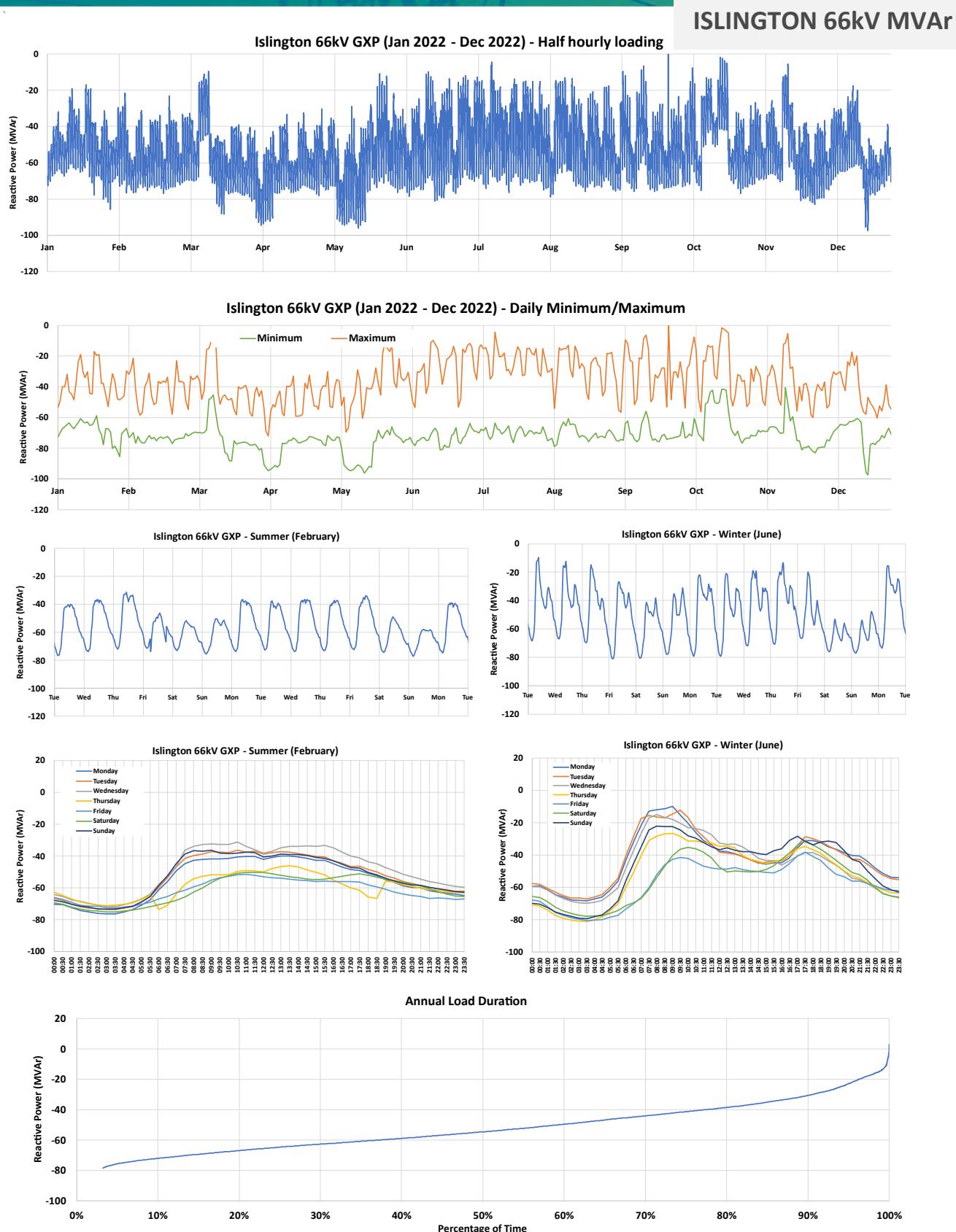


Figure 20 Islington 66kV: Reactive power (MVA) load characteristics

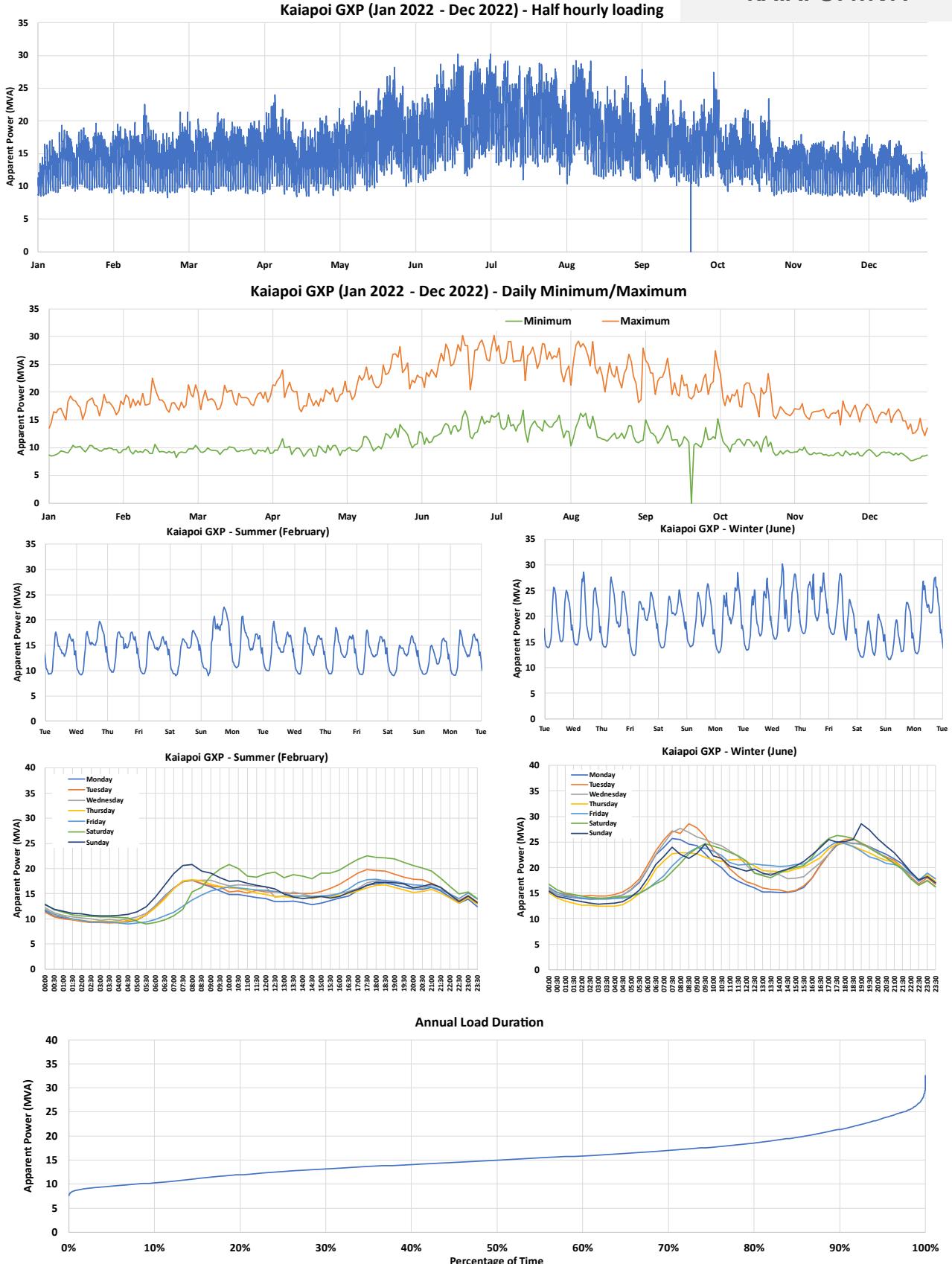
**KAIAPOI MVA**


Figure 21 Kaiapoi: Apparent power (MVA) load characteristics

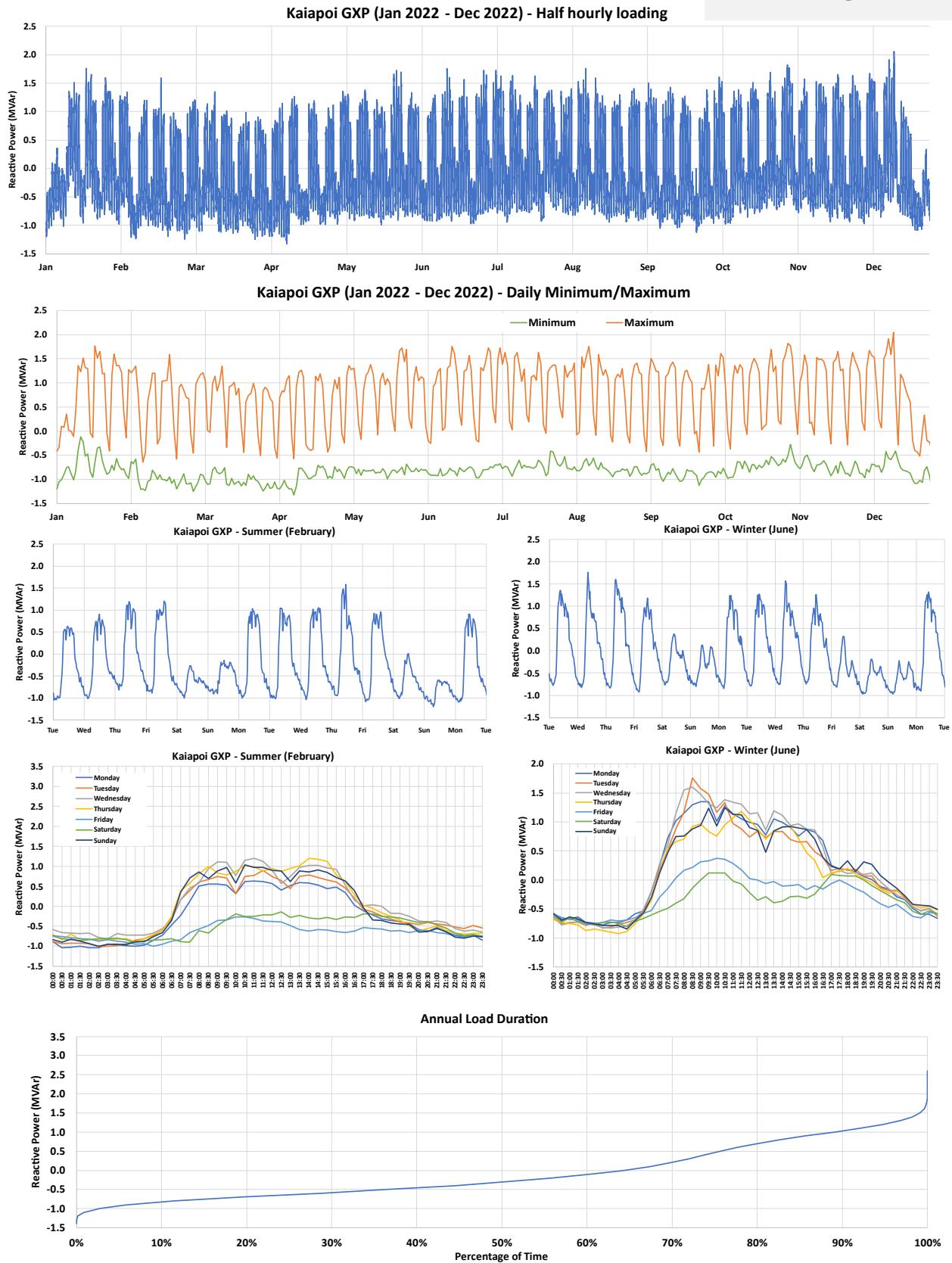
**KAIAPOI MVAr**


Figure 22 Kaiapoi: Reactive power (MVAr) load characteristics

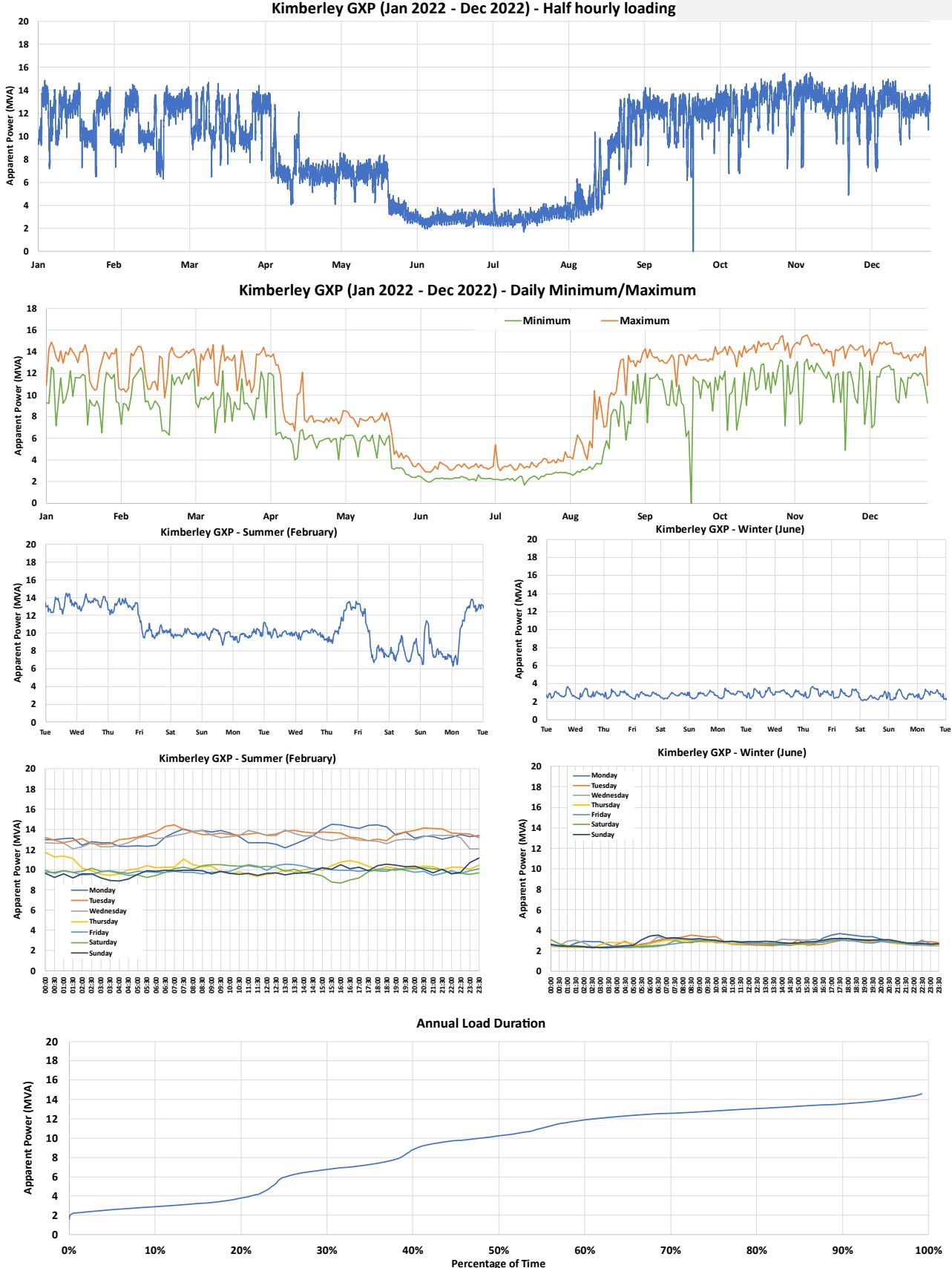
**KIMBERLEY MVA**


Figure 23 Kimberley: Apparent power (MVA) load characteristics

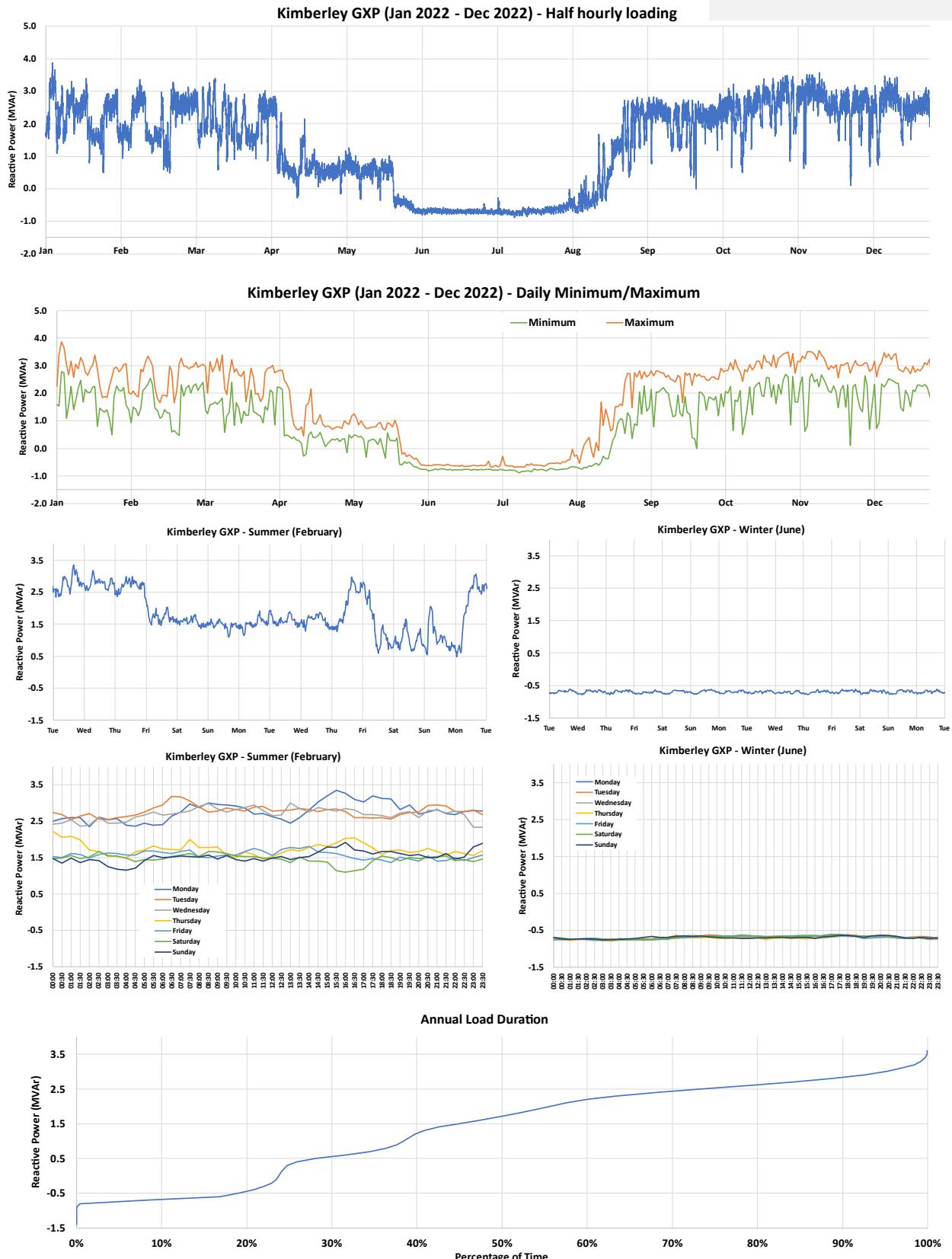
**KIMBERLEY MVAr**


Figure 24 Kimberley: Reactive power (MVAr) load characteristics

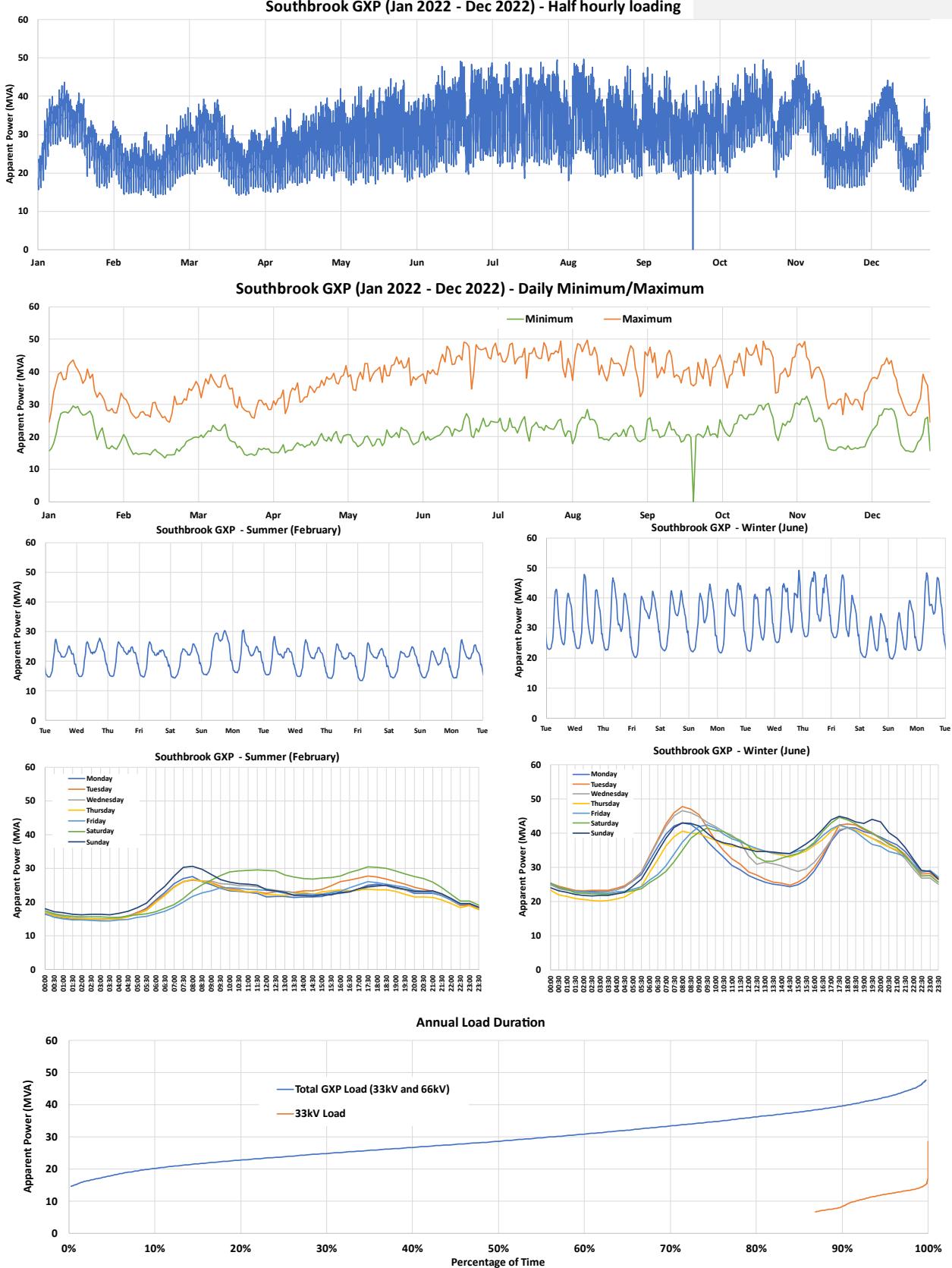
**SOUTHBROOK MVA**


Figure 25 Southbrook: Apparent power (MVA) load characteristics

## SOUTHBROOK MVA<sub>r</sub>

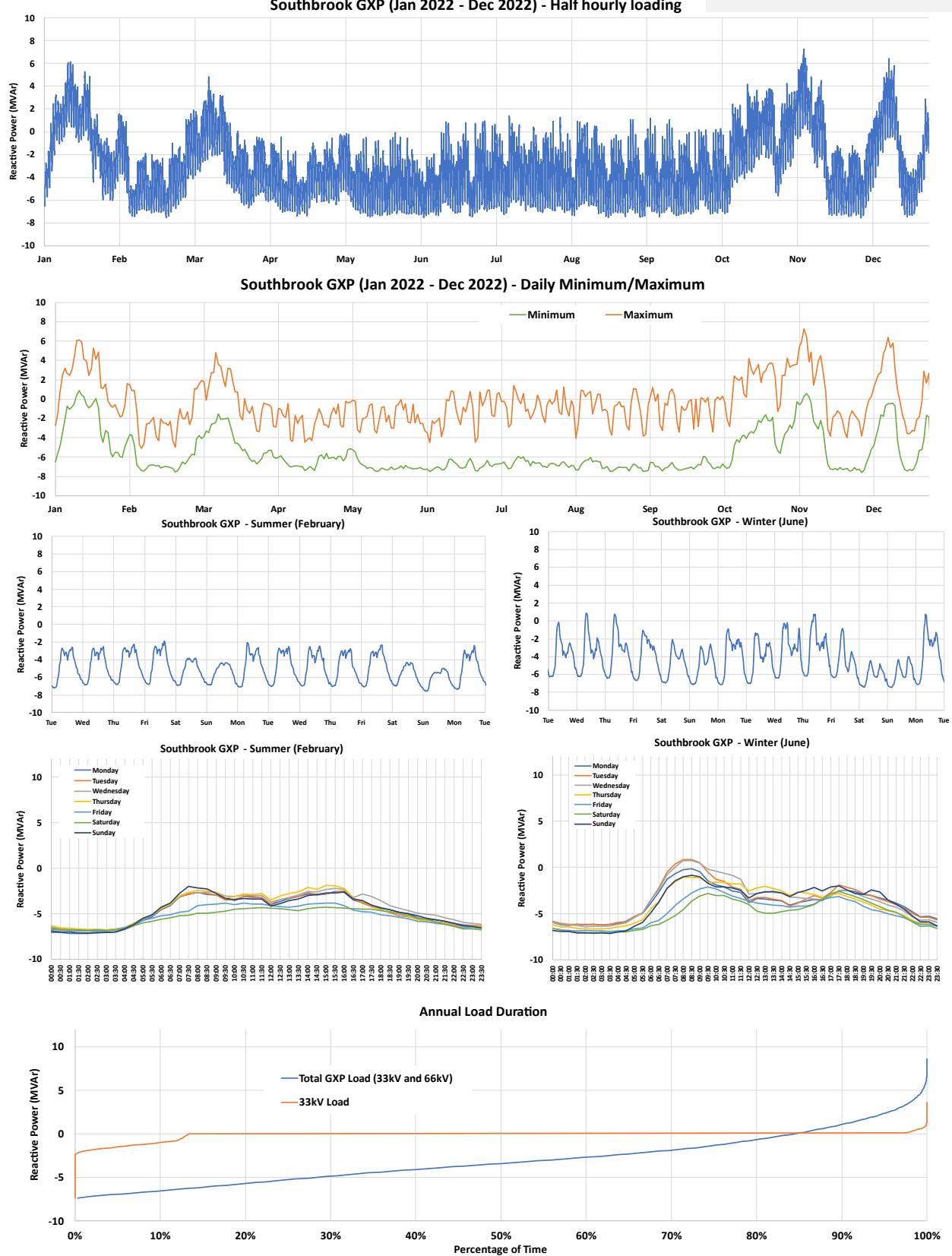


Figure 26 Southbrook: Reactive power (MVAr) load characteristics

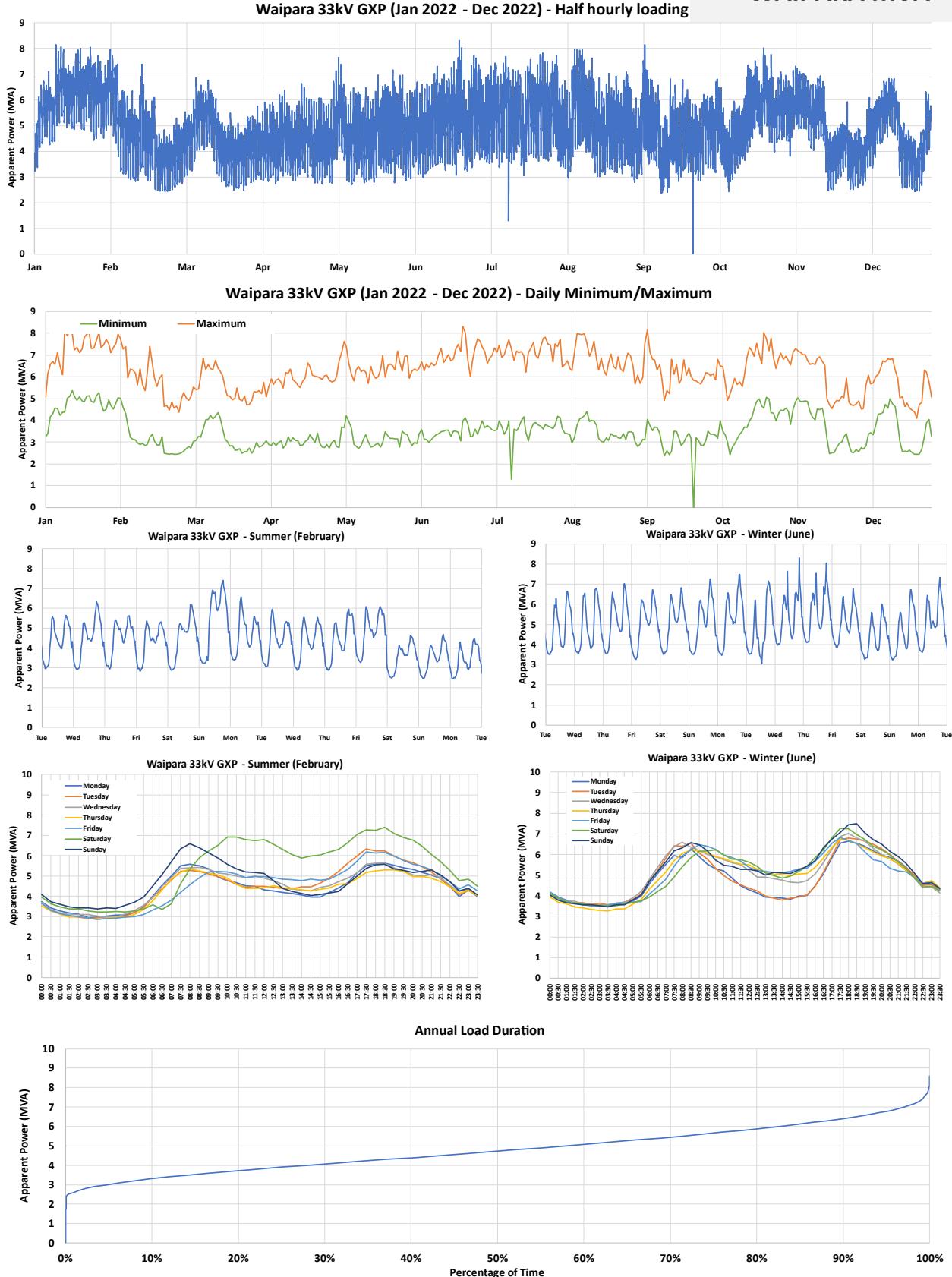
**WAIPARA MVA**


Figure 27 Waipara: Apparent power (MVA) load characteristics

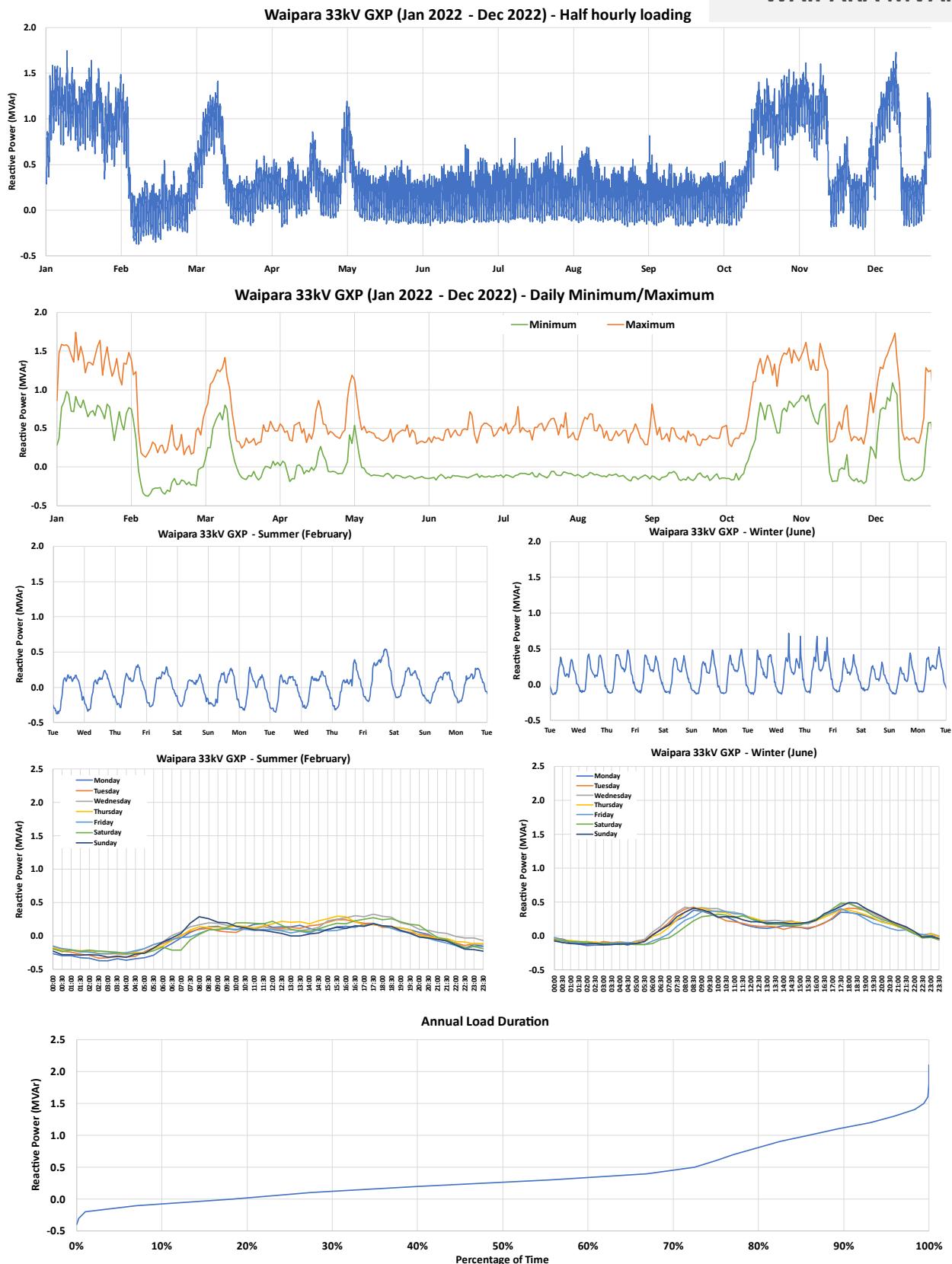
**WAIPARA MVAr**


Figure 28 Waipara: Reactive power (MVAr) load characteristics

### 3. Zone Substations

#### 3.1 Mainpower

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

- [Figure 29](#) Amberley 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 30](#) Burnt Hill 66/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 31](#) Cheviot 66/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 32](#) Greta 66/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 33](#) Hanmer 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 34](#) Hawarden 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 35](#) Leader 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 36](#) Lochiel 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 37](#) Ludstone 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 38](#) Mackenzies Rd 66/11kV zone substation: Apparent power (MVA) load characteristics
- [Figure 40](#) Mouse Point 33/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 41](#) Oarao 33/11kV zone substation: Apparent power (MVA) load characteristics
- [Figure 42](#) Southbrook 66/11kV zone substation: Apparent power (MW) load characteristics
- [Figure 39](#) Marble Quarry 33/11kV zone substation: Apparent power (MVA) load characteristics
- [Figure 43](#) Swannanoa 33/11kV zone substation: Apparent power (MW) load characteristics

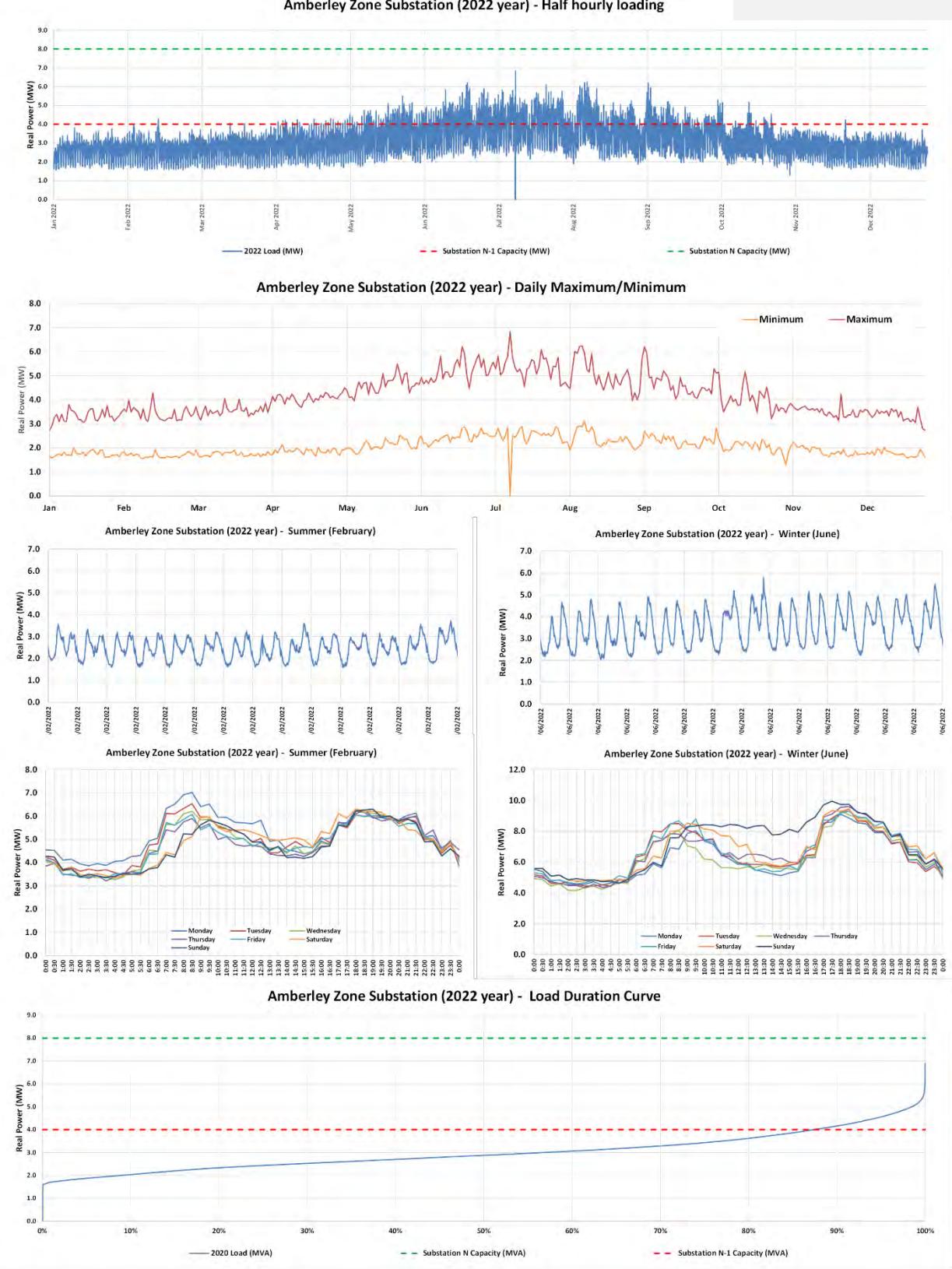
**AMBERLEY MW**


Figure 29 Amberley 33/11kV zone substation: Apparent power (MW) load characteristics

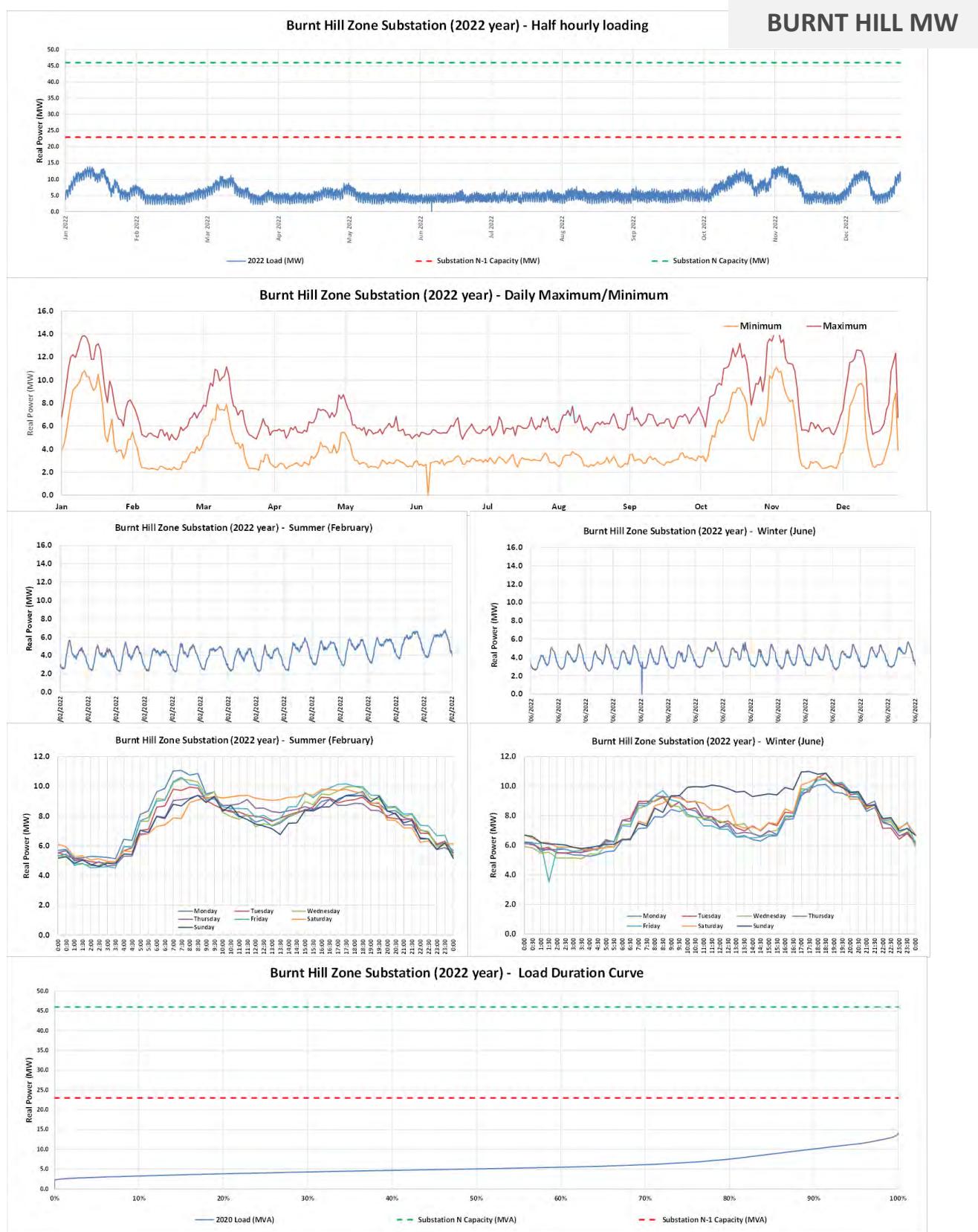


Figure 30 Burnt Hill 66/11kV zone substation: Apparent power (MW) load characteristics

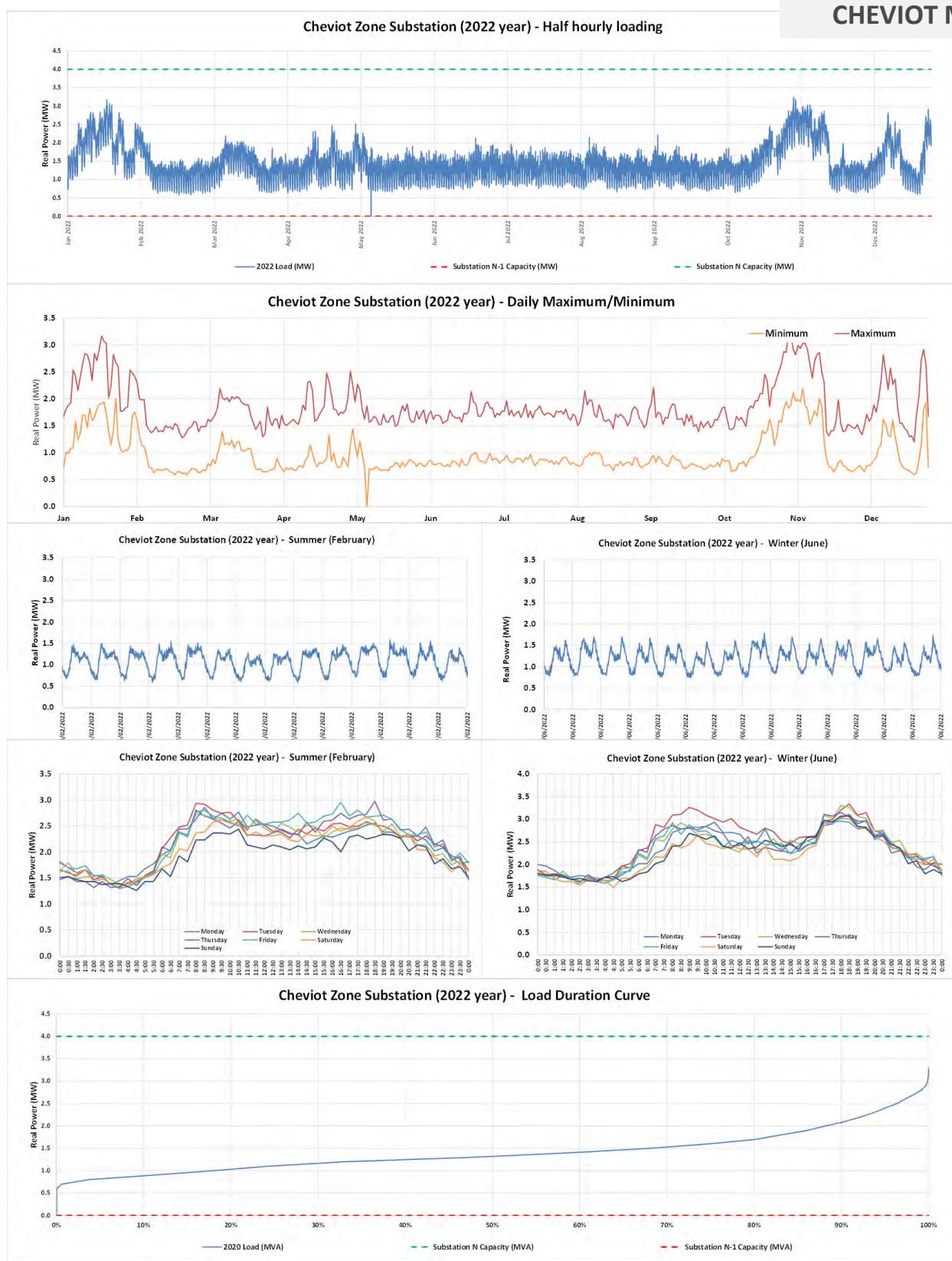
**CHEVIOT MW**


Figure 31 Cheviot 66/11kV zone substation: Apparent power (MW) load characteristics

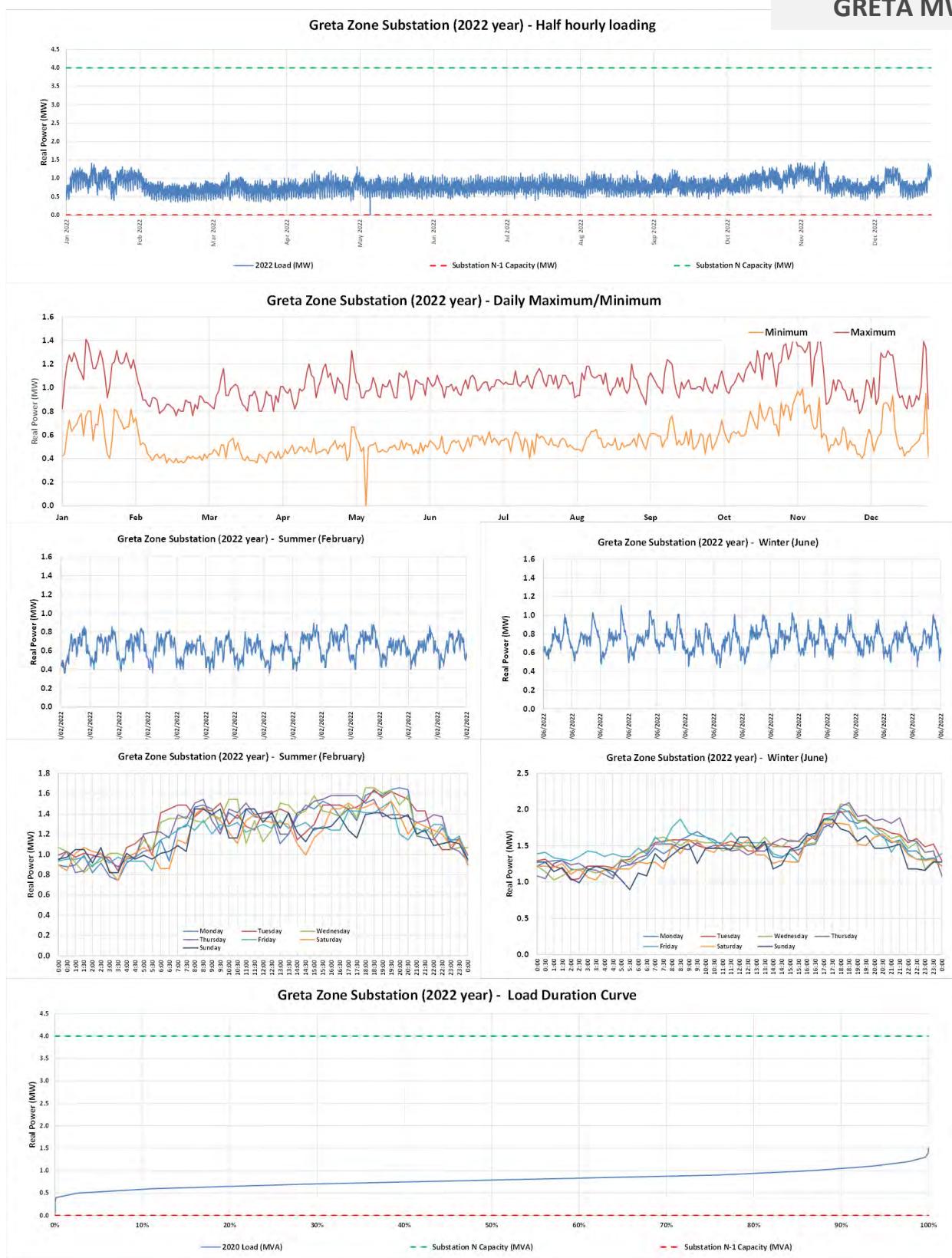
**GRETA MW**


Figure 32 Greta 66/11kV zone substation: Apparent power (MW) load characteristics

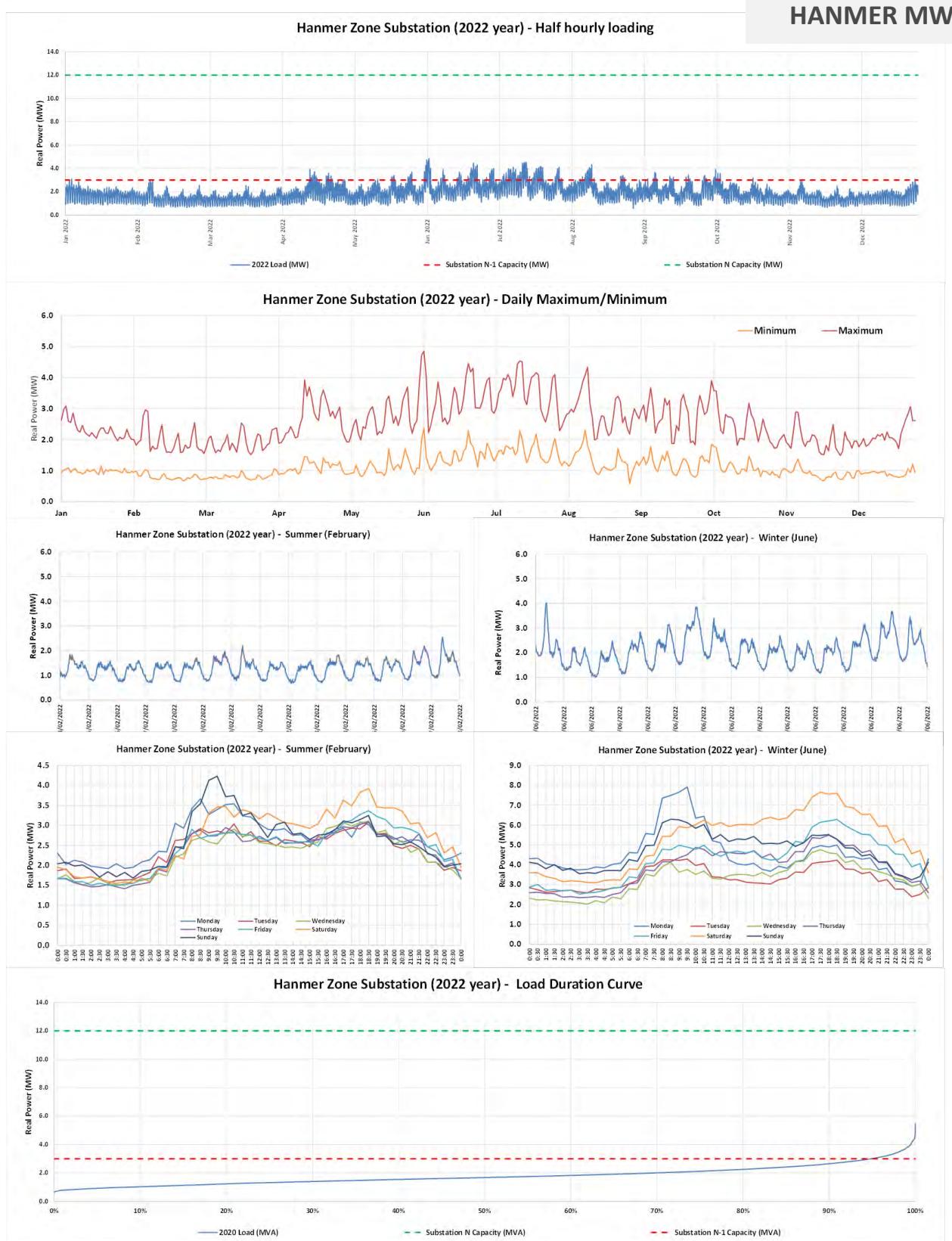


Figure 33 Hanmer 33/11kV zone substation: Apparent power (MW) load characteristics

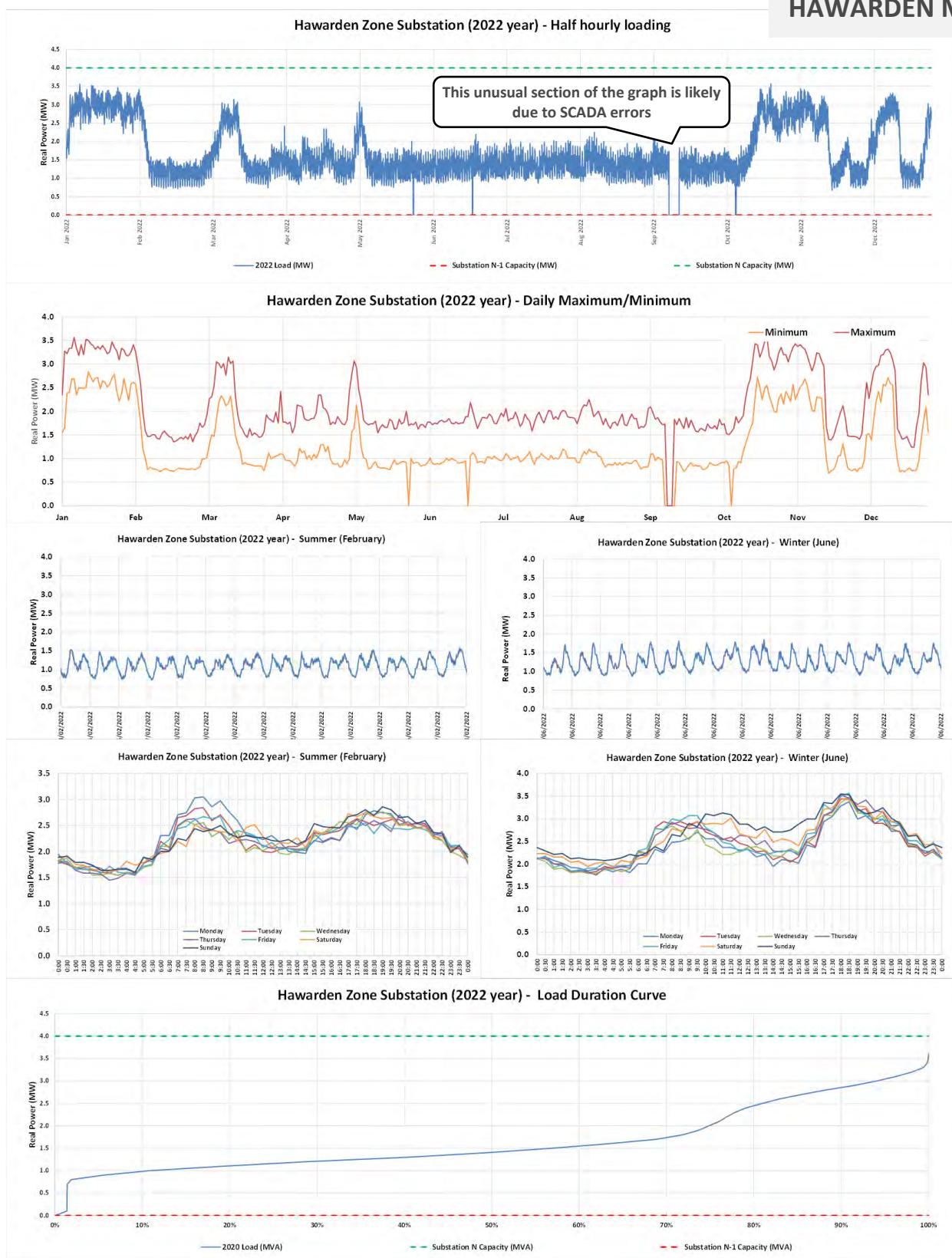
**HAWARDEN MW**


Figure 34 Hawarden 33/11kV zone substation: Apparent power (MW) load characteristics

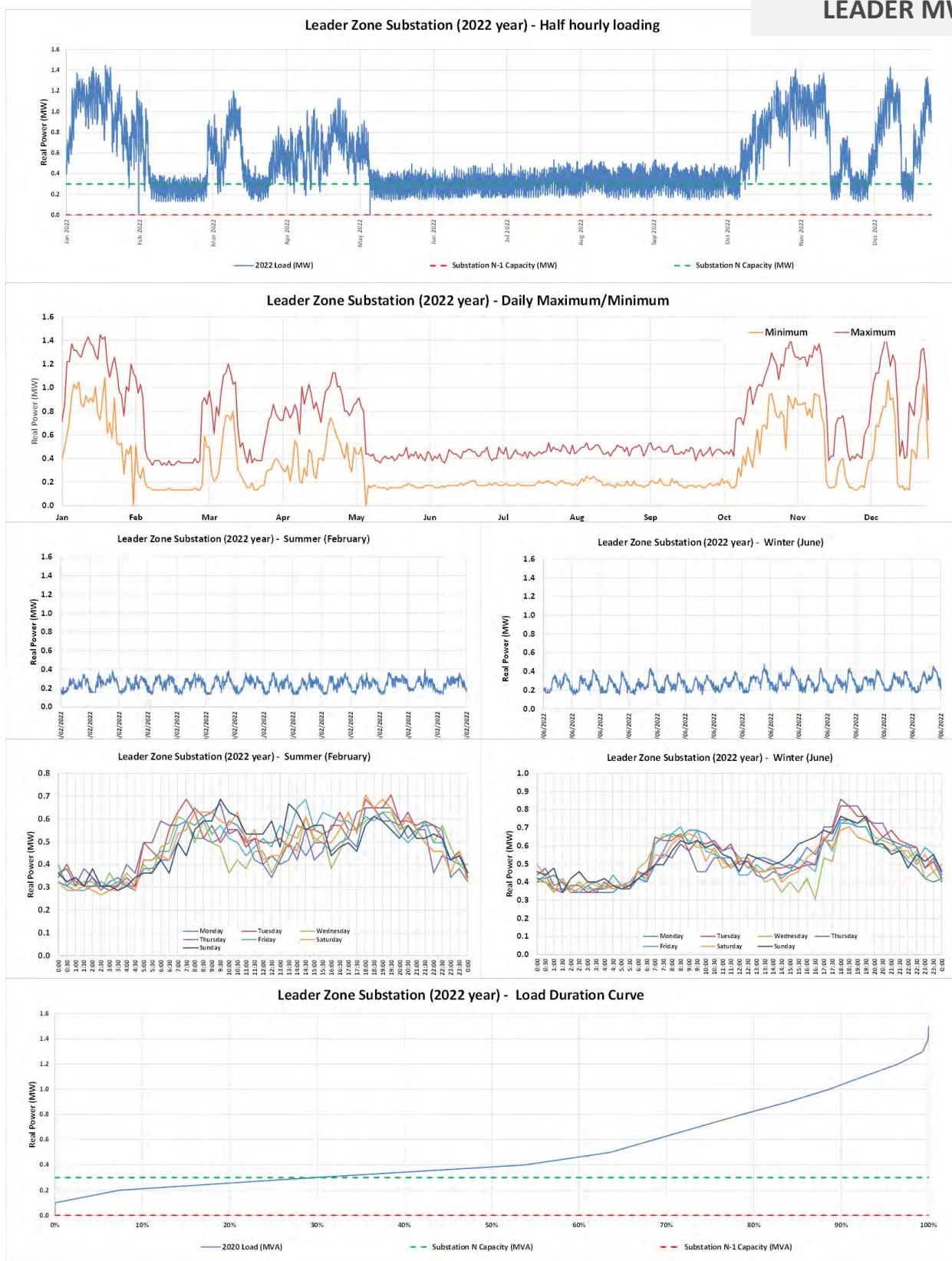
**LEADER MW**


Figure 35 Leader 33/11kV zone substation: Apparent power (MW) load characteristics

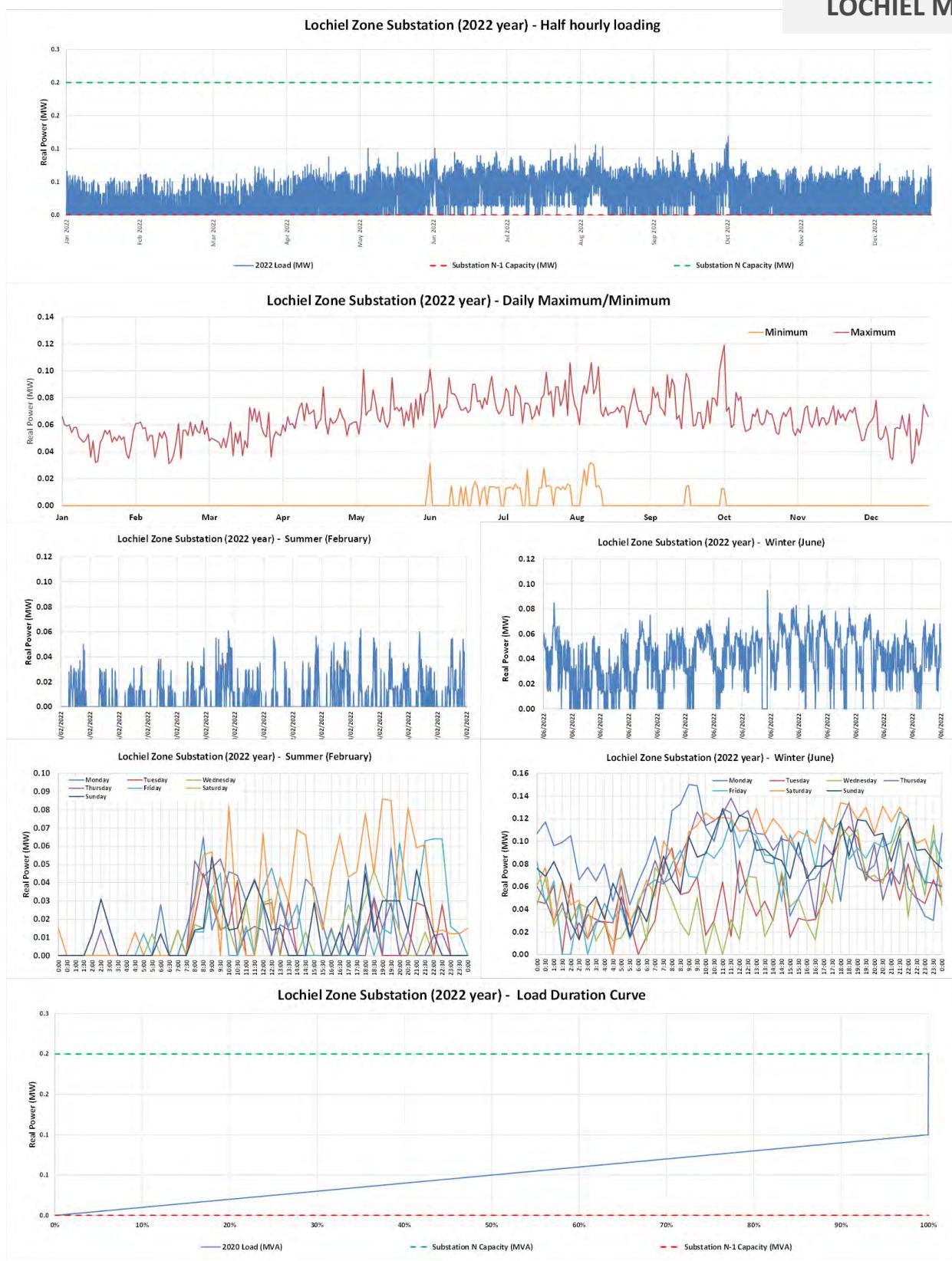


Figure 36 Lochiel 33/11kV zone substation: Apparent power (MW) load characteristics

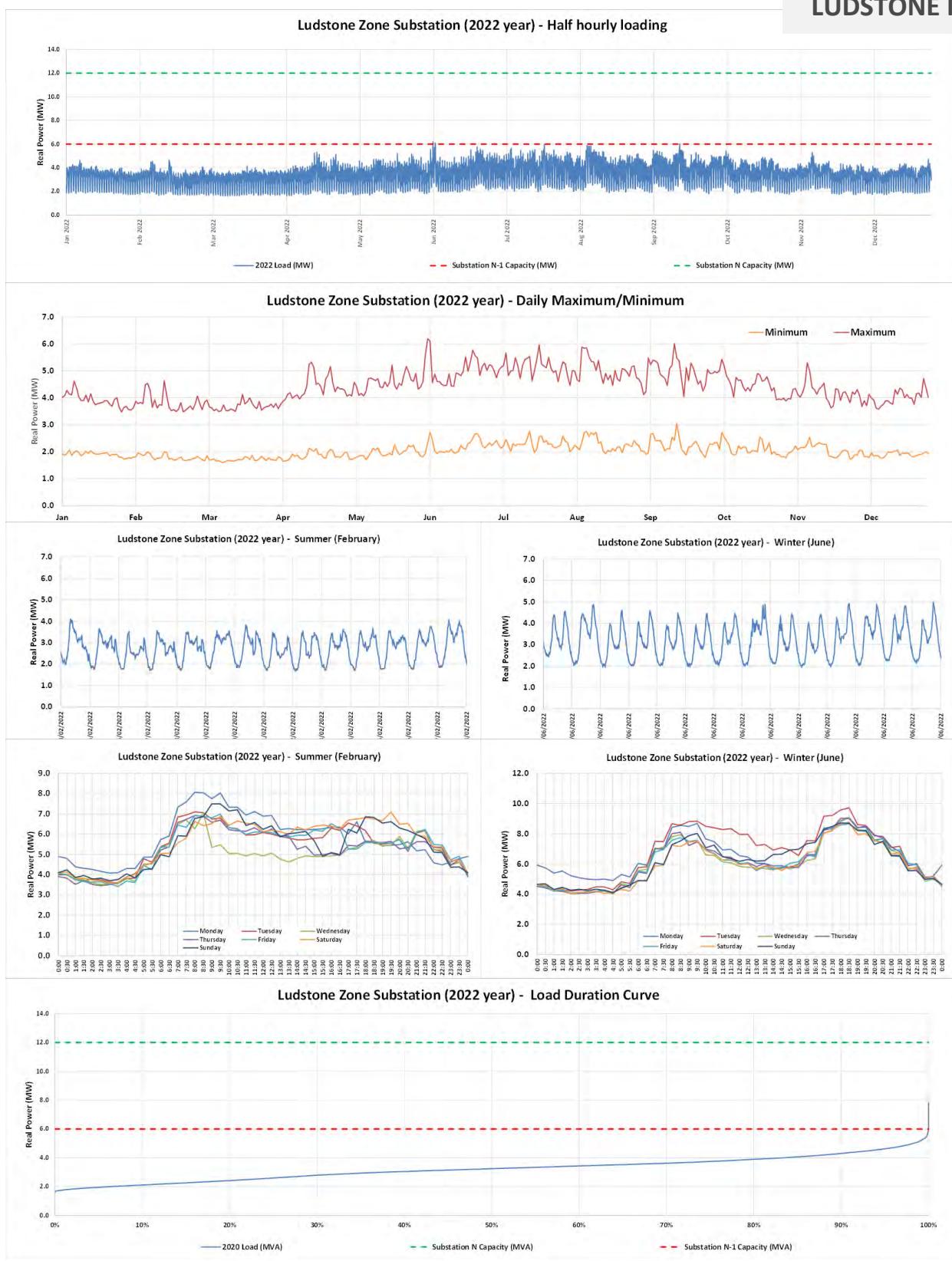
**LUDSTONE MW**


Figure 37 Ludstone 33/11kV zone substation: Apparent power (MW) load characteristics

YET TO BE SUPPLIED

Figure 38 Mackenzies Rd 66/11kV zone substation: Apparent power (MVA) load characteristics

**MARBLE QUARRY MVA**

YET TO BE SUPPLIED

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

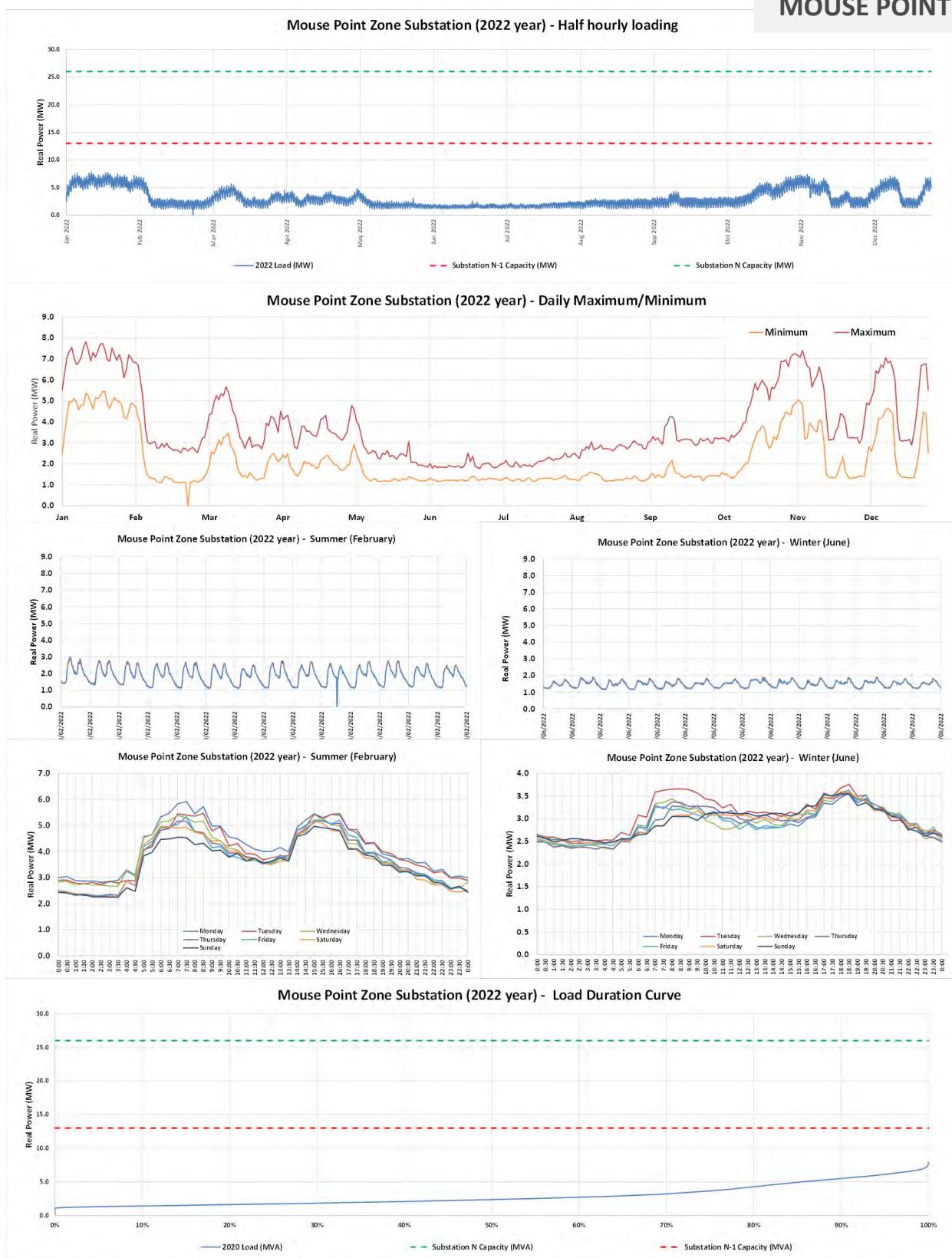
**MOUSE POINT MW**


Figure 40 Mouse Point 33/11kV zone substation: Apparent power (MW) load characteristics

YET TO BE SUPPLIED

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

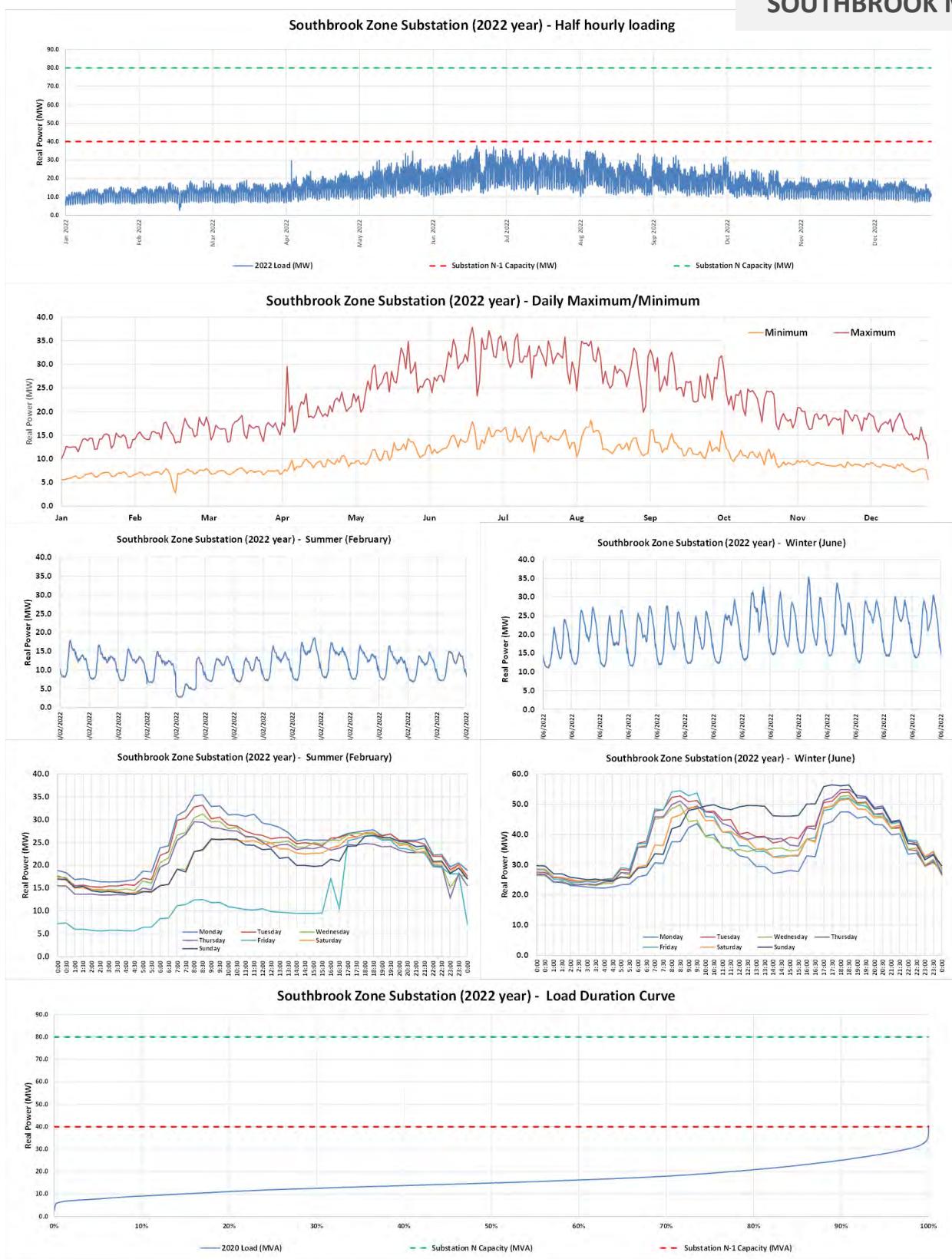
**SOUTHBROOK MW**


Figure 42 Southbrook 66/11kV zone substation: Apparent power (MW) load characteristics

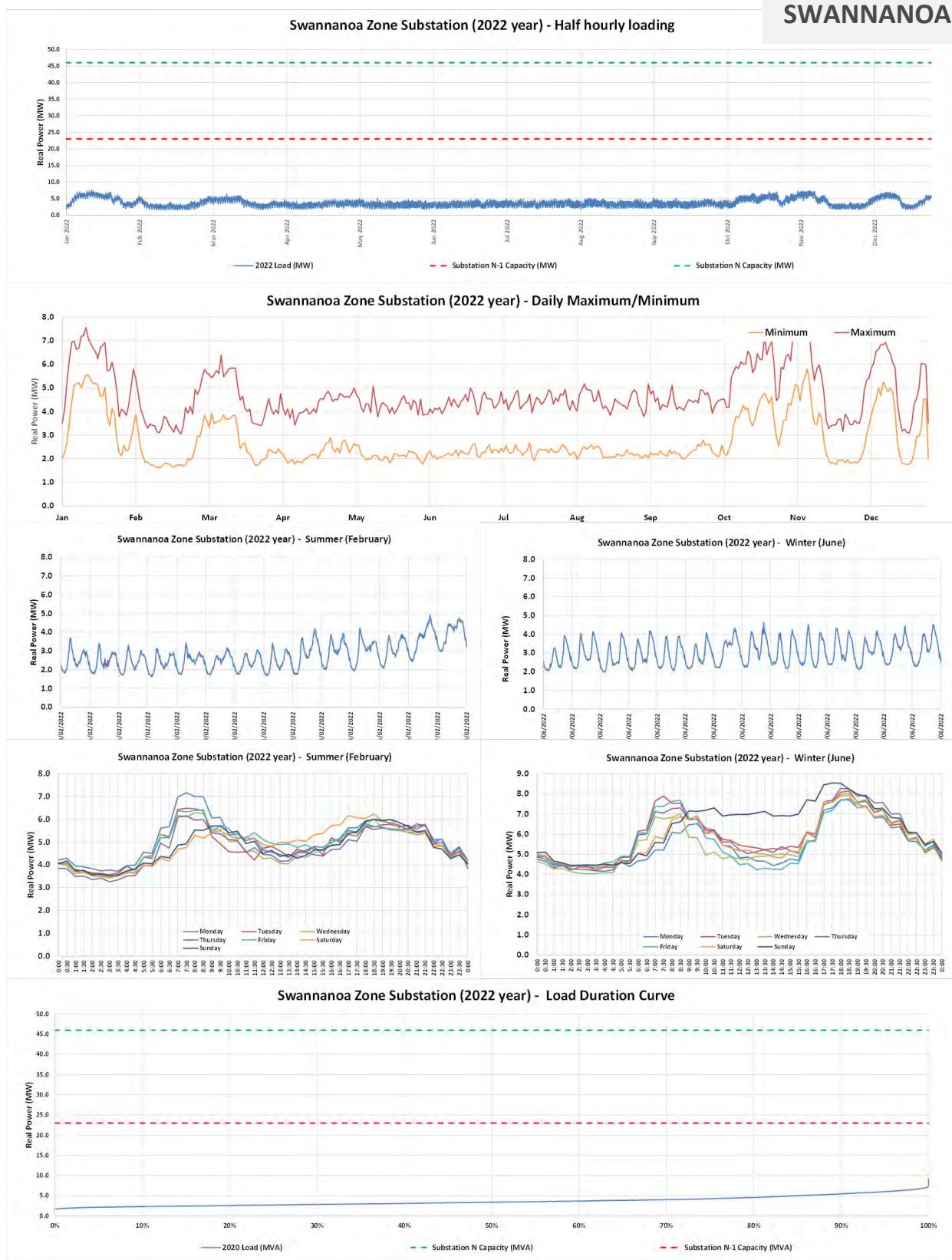
**SWANNANOA MW**


Figure 43 Swannanoa 33/11kV zone substation: Apparent power (MW) load characteristics

### 3.2 Orion

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

- **Figure 44** Addington 11kV #1 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 45** Addington 11kV #2 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 46** Armagh 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 47** Barnet Park 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 48** Bromley 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 49** Dallington 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 50** Fendalton 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 51** Halswell 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 52** Hawthonrden 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 53** Heathcote 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 54** Hoon Hay 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 55** Hornby 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 56** Ilam 11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 57** Lancaster 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 58** McFaddens 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 59** Middleton 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 60** Milton 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 61** Moffett 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 62** Oxford Tuam 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 63** Papanui 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 64** Prebleton 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 65** Rawhiti 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 66** Shands 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 67** Sockburn 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 68** Waimakariri 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 69** Annat 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 70** Bankside 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 71** Brookside 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 72** Darfield 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 73** Diamond Harbour 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 74** Dunsandel 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 75** Duvauchelle 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 76** Greendale 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 77** Highfield 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 78** Hills 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 79** Hororata 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 80** Killinchy 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 81** Kimberley 66/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 82** Larcomb 66/11kV zone substation: Apparent power (MVA) load characteristics

- **Figure 83** Lincoln 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 84** Little River 33/11kV zone substation: Apparent power (MVA) load characteristics
- **Figure 85** Motukarara 33/11kV zone substation: Apparent power (MVA) load characteristics

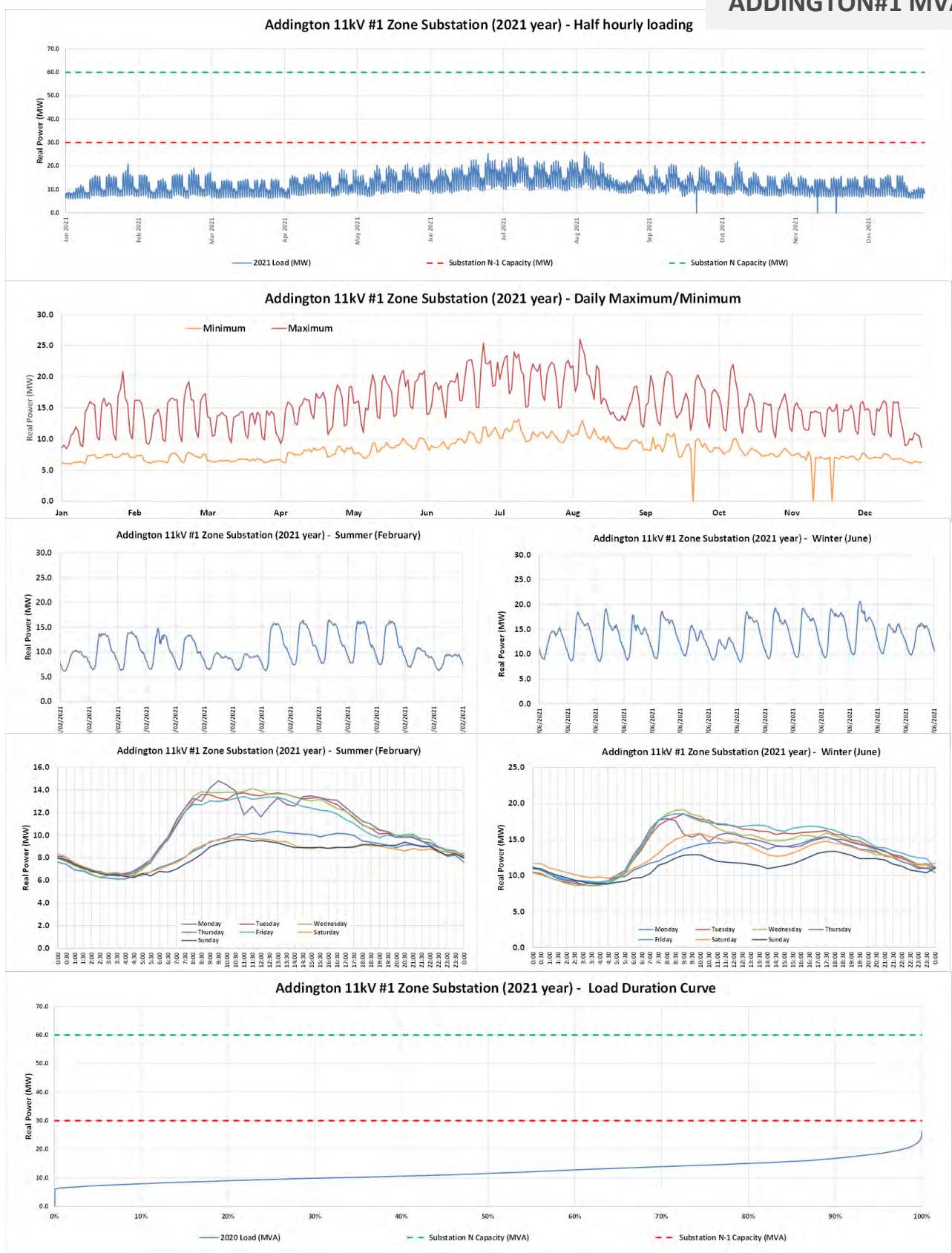
**ADDINGTON#1 MVA**

Figure 44 Addington 11kV #1 66/11kV zone substation: Apparent power (MVA) load characteristics

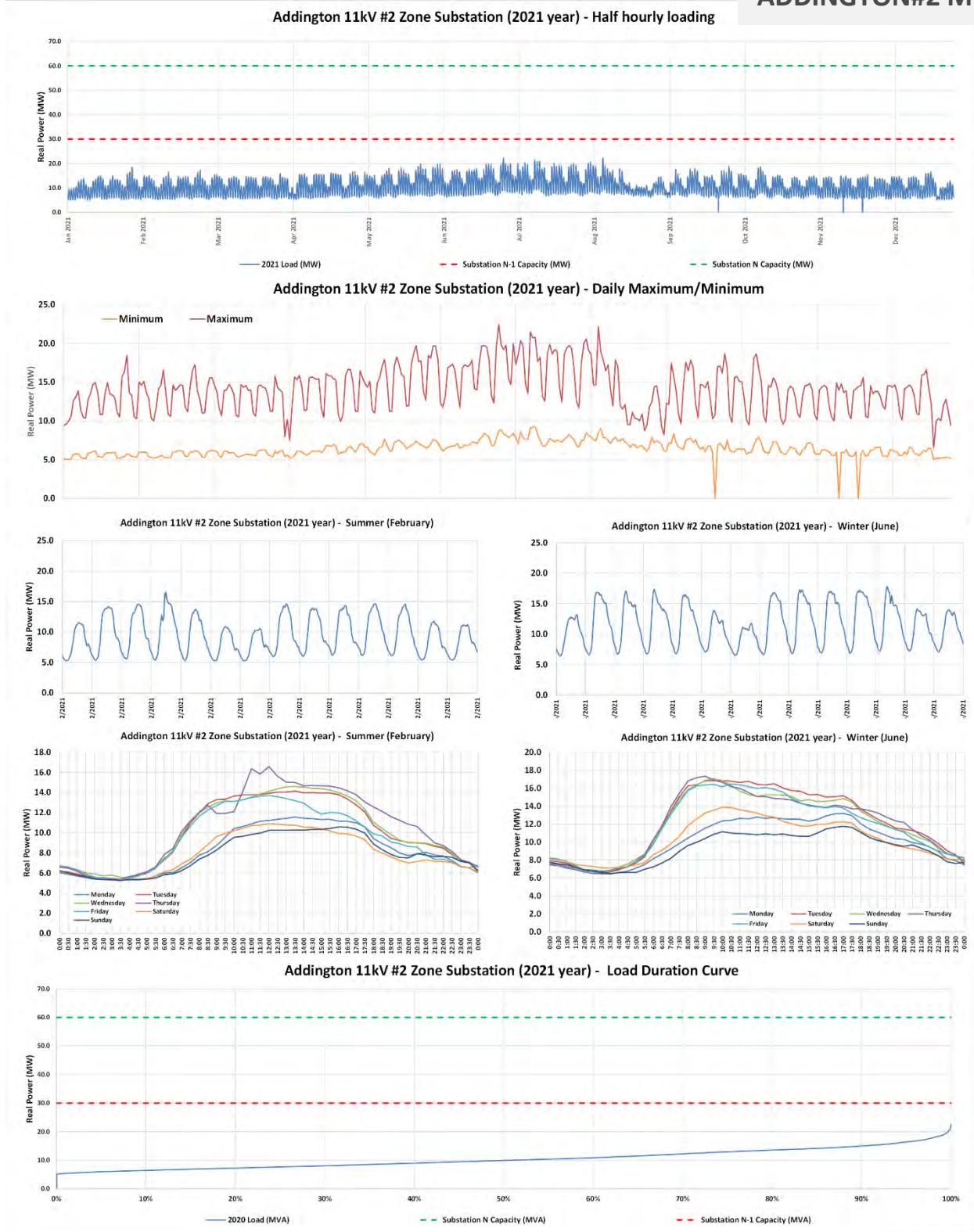
**ADDINGTON#2 MVA**


Figure 45 Addington 11kV #2 66/11kV zone substation: Apparent power (MVA) load characteristics

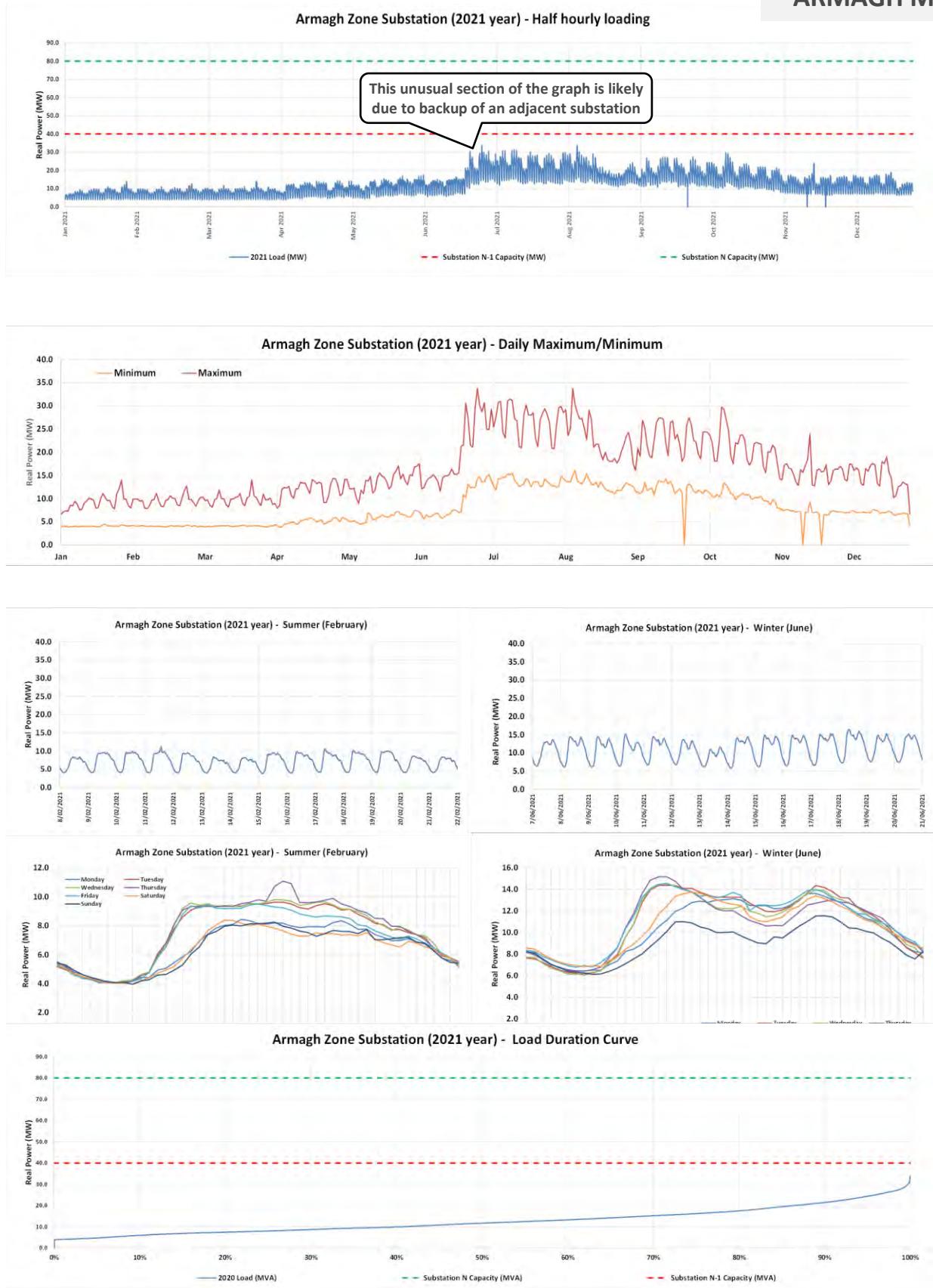
**ARMAGH MVA**


Figure 46 Armagh 66/11kV zone substation: Apparent power (MVA) load characteristics

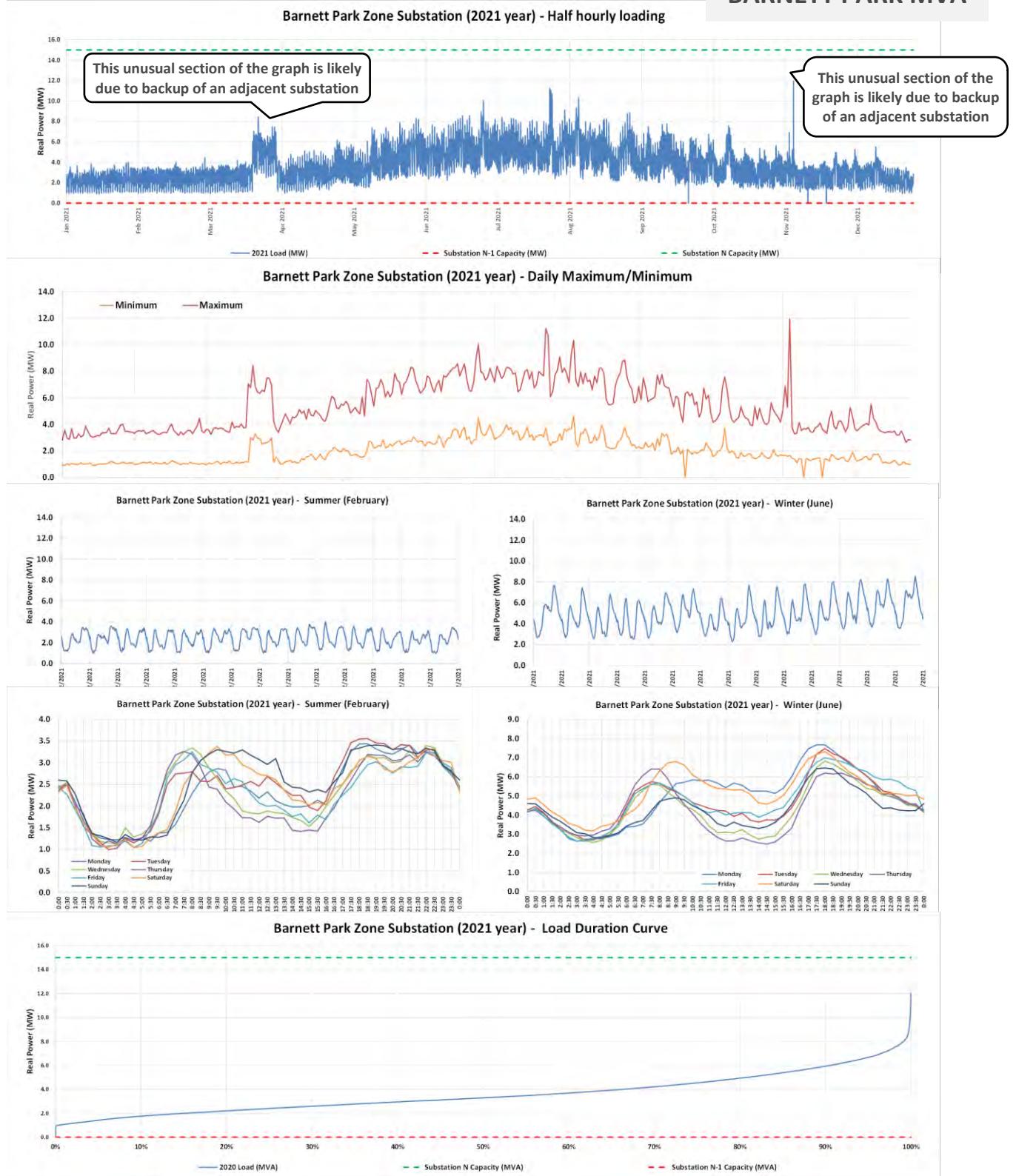
**BARNETT PARK MVA**


Figure 47 Barnet Park 66/11kV zone substation: Apparent power (MVA) load characteristics

## BROMLEY MVA

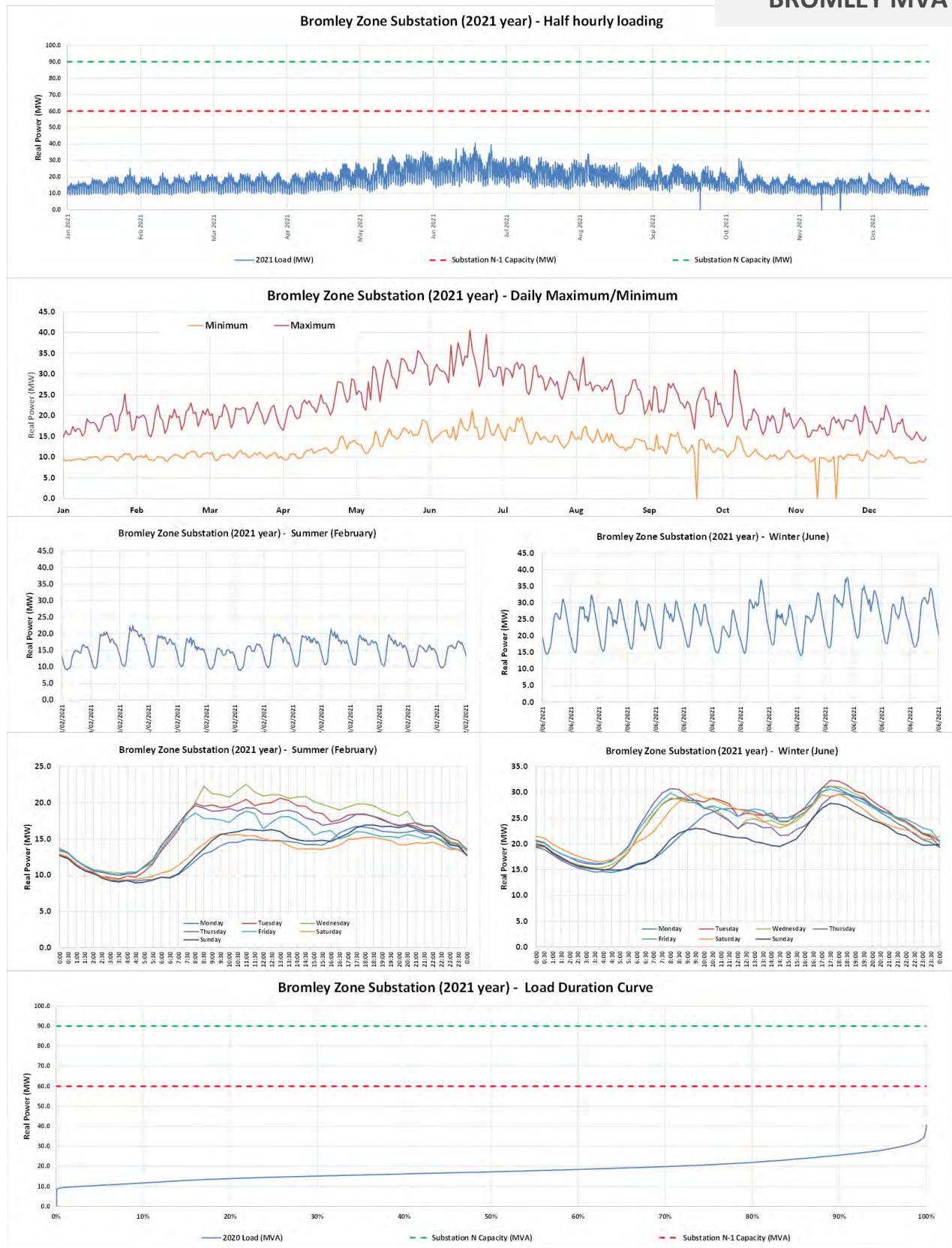


Figure 48 Bromley 66/11kV zone substation: Apparent power (MVA) load characteristics

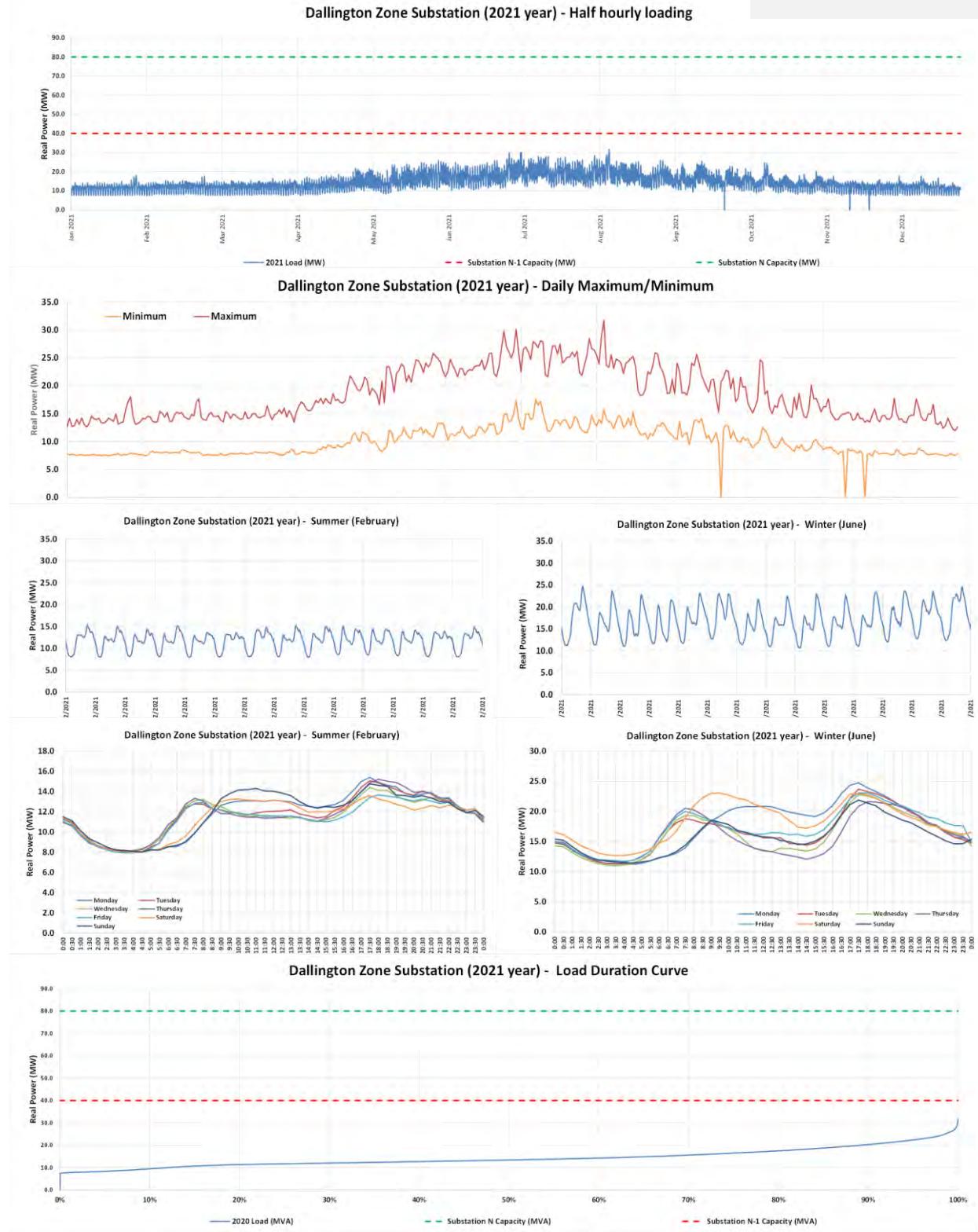
**DALLINGTON MVA**

Figure 49 Dallington 66/11kV zone substation: Apparent power (MVA) load characteristics

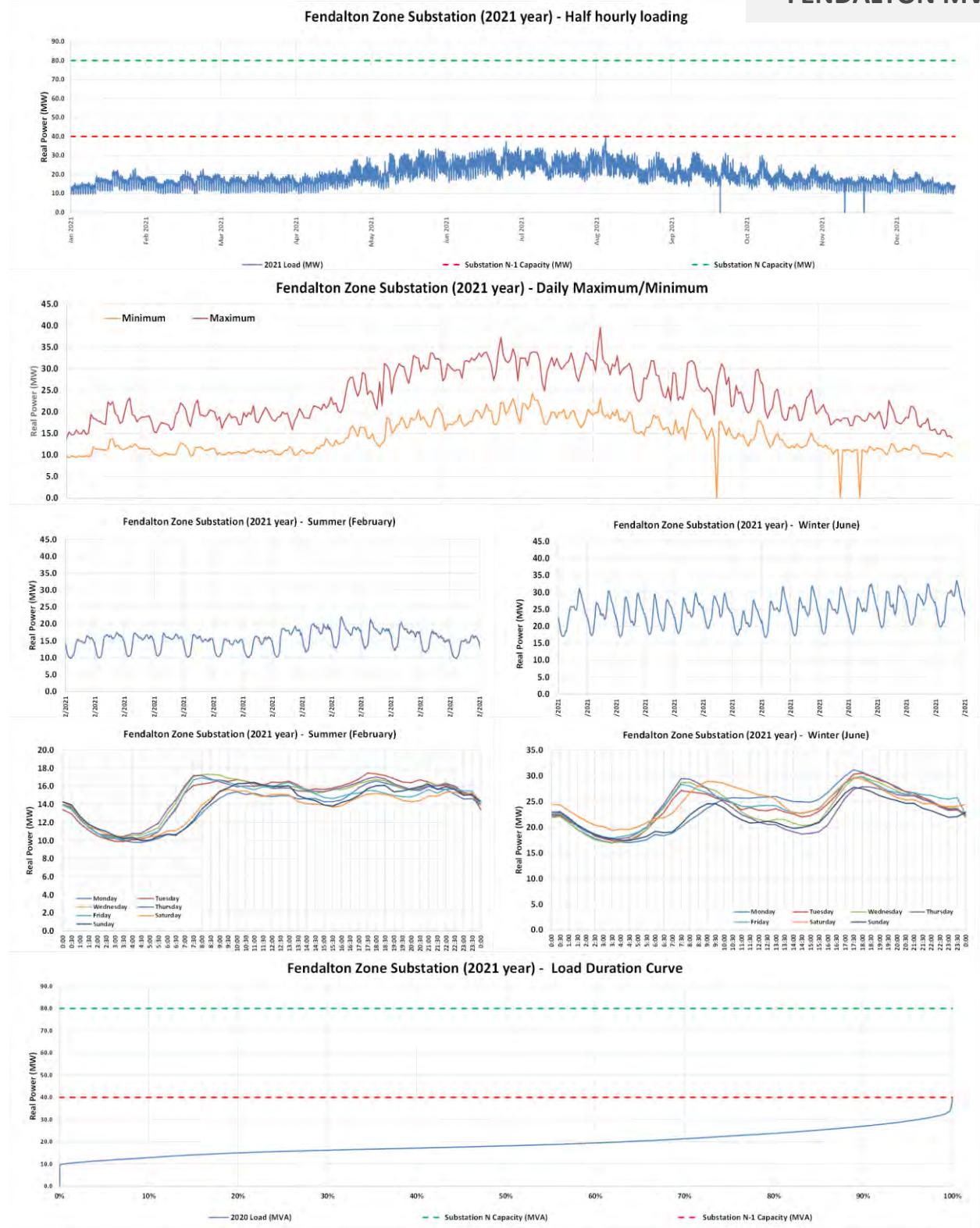
**FENDALTON MVA**


Figure 50 Fendalton 66/11kV zone substation: Apparent power (MVA) load characteristics

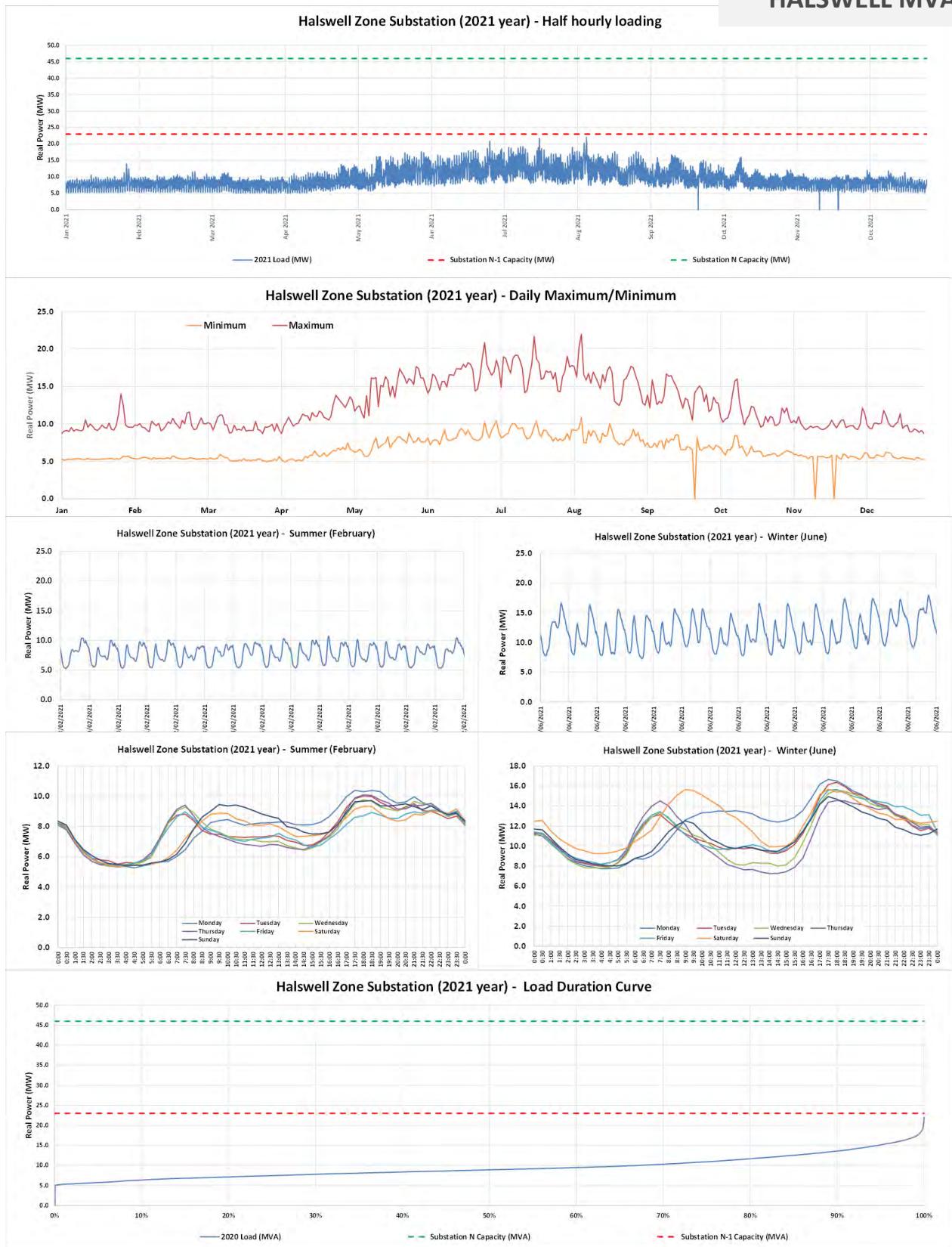
**HALSWELL MVA**


Figure 51 Halswell 66/11kV zone substation: Apparent power (MVA) load characteristics

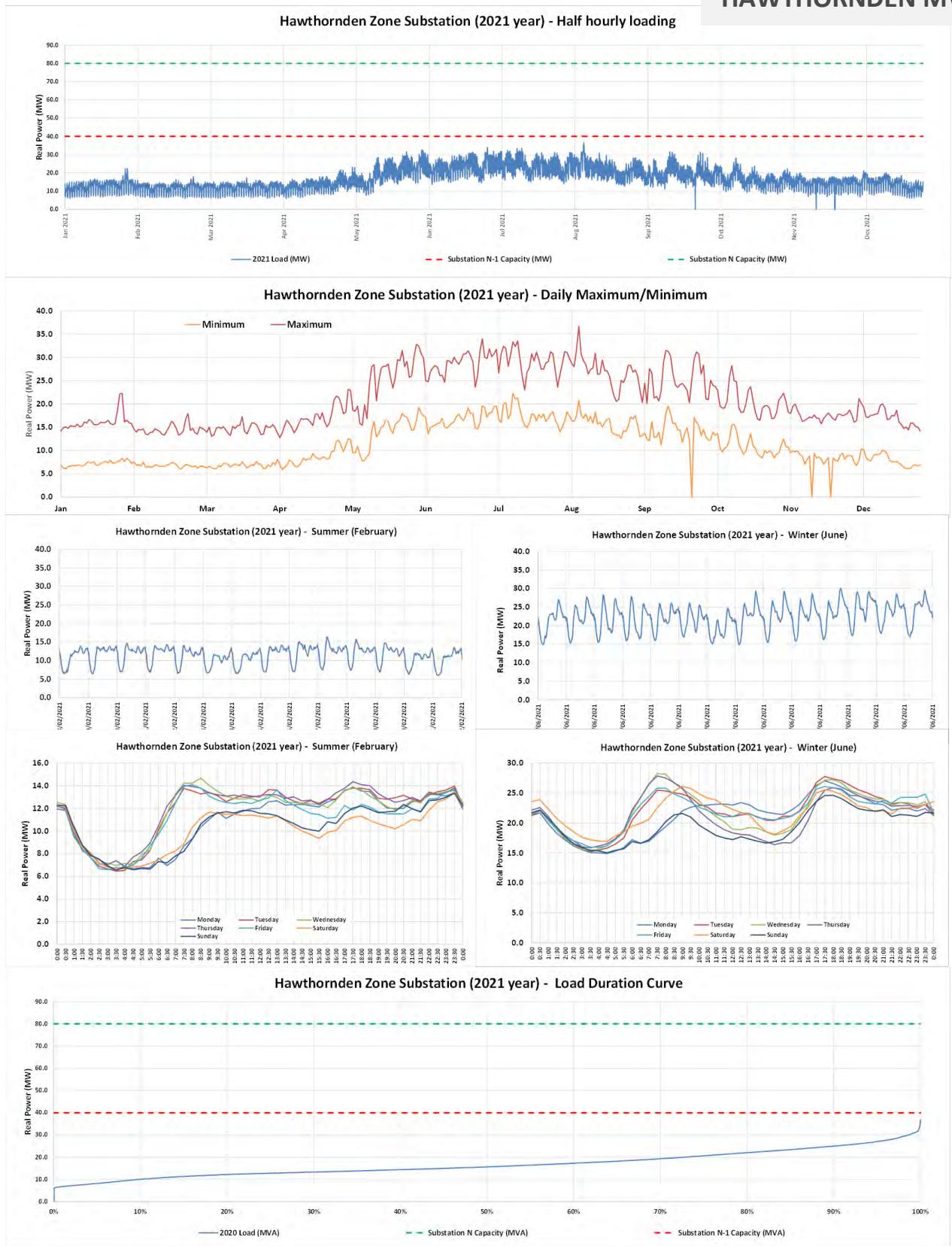
**HAWTHORNDEN MVA**


Figure 52 Hawthornden 66/11kV zone substation: Apparent power (MVA) load characteristics

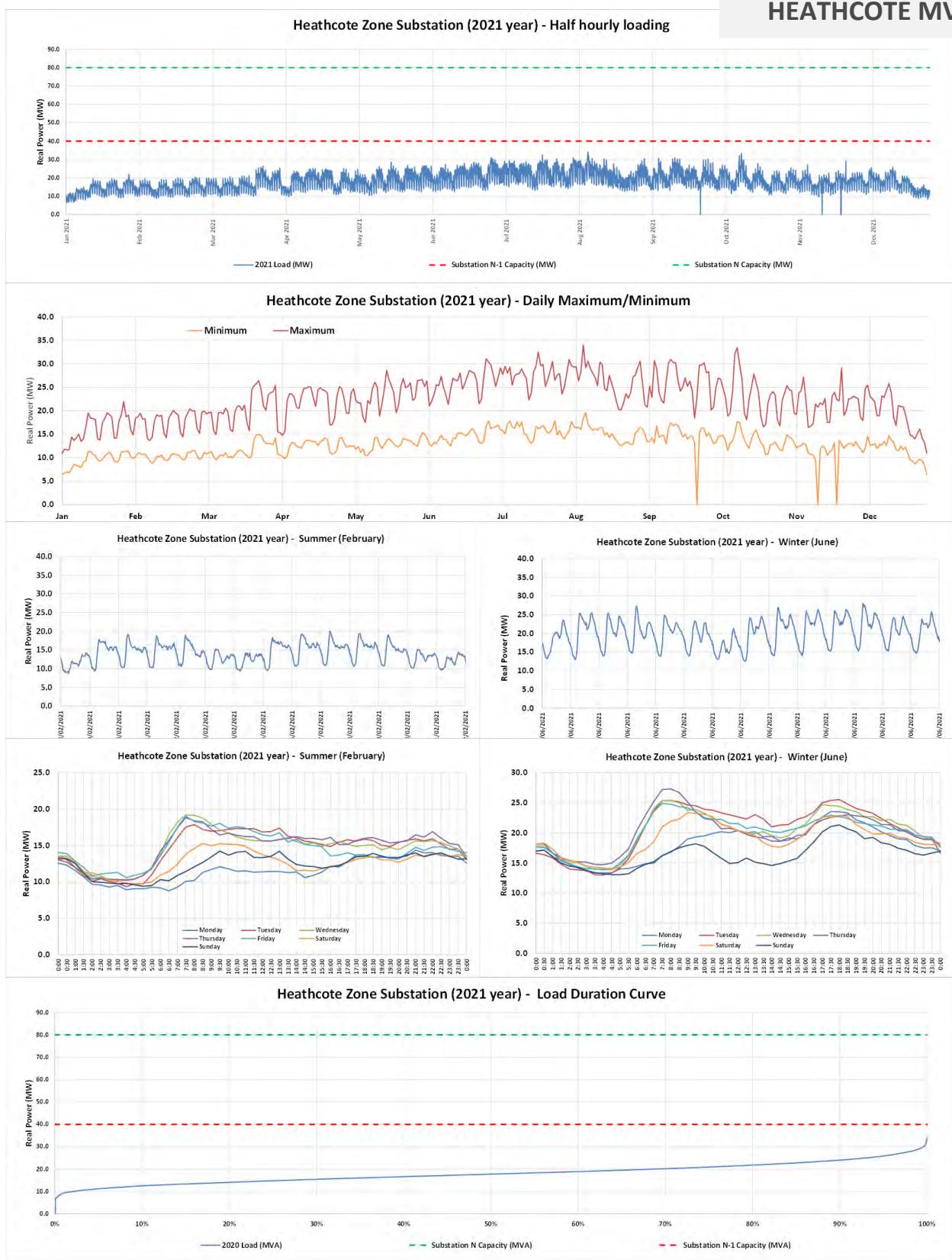
**HEATHCOTE MVA**


Figure 53 Heathcote 66/11kV zone substation: Apparent power (MVA) load characteristics

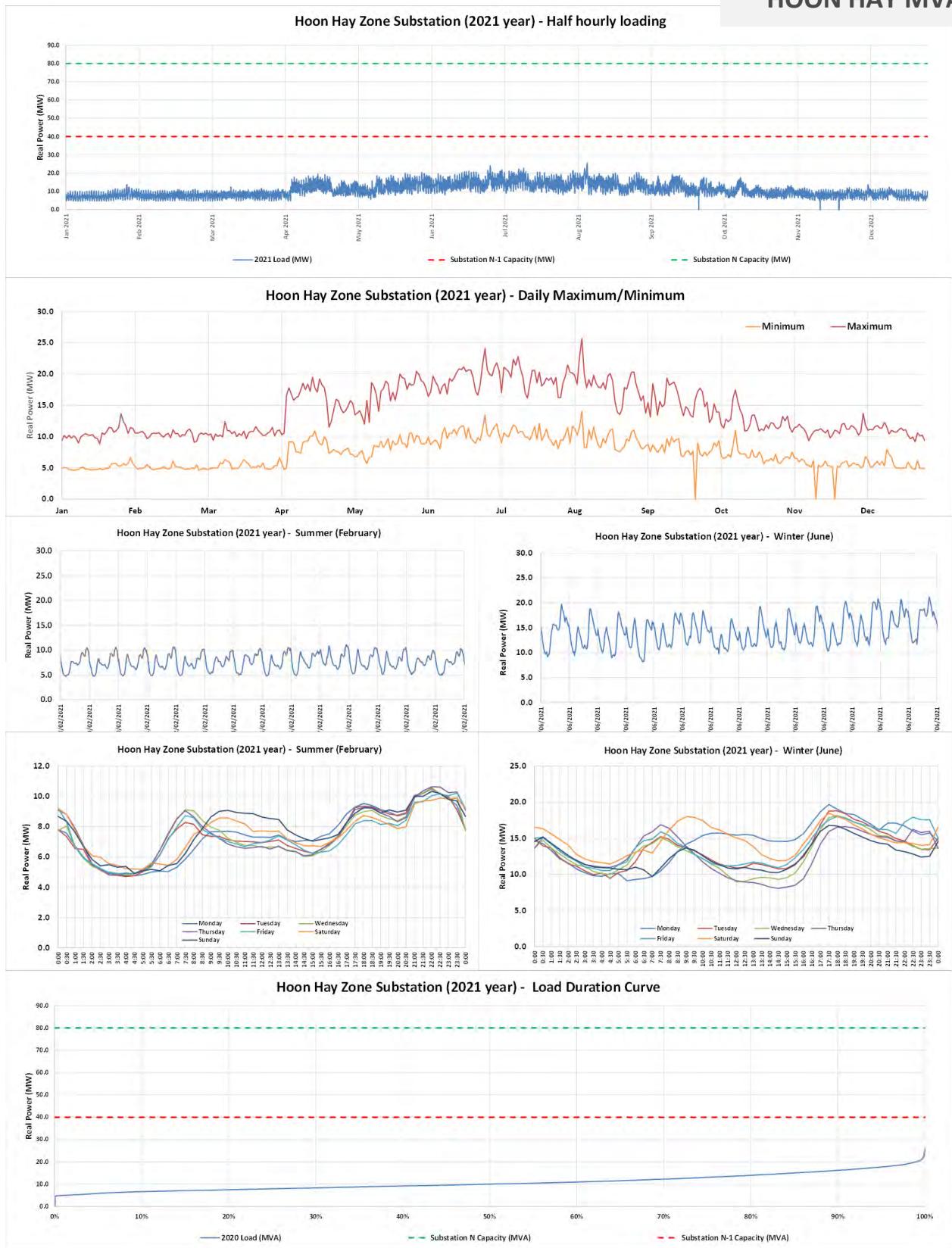
**HOON HAY MVA**


Figure 54 Hoon Hay 66/11kV zone substation: Apparent power (MVA) load characteristics

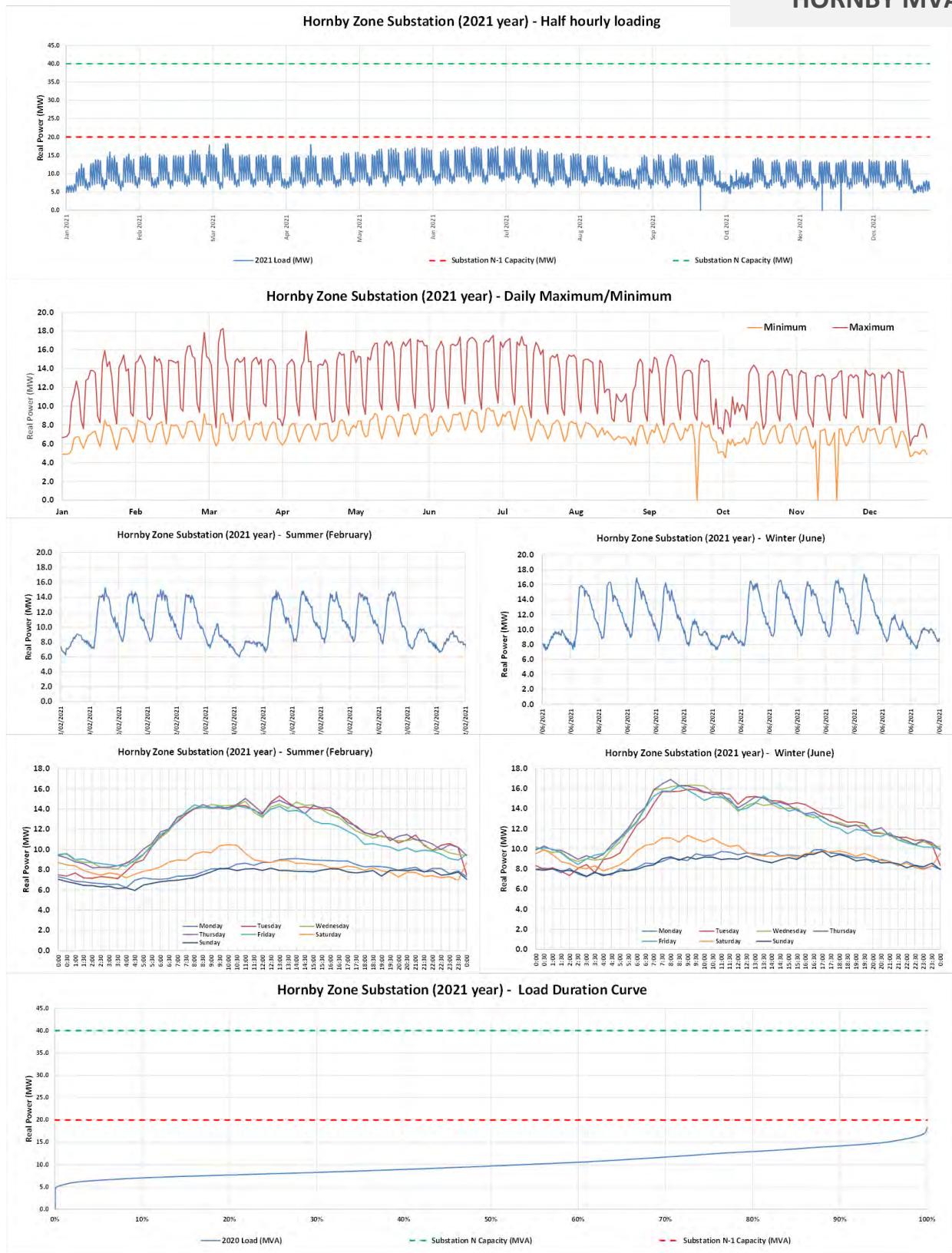
**HORNBY MVA**


Figure 55 Hornby 33/11kV zone substation: Apparent power (MVA) load characteristics

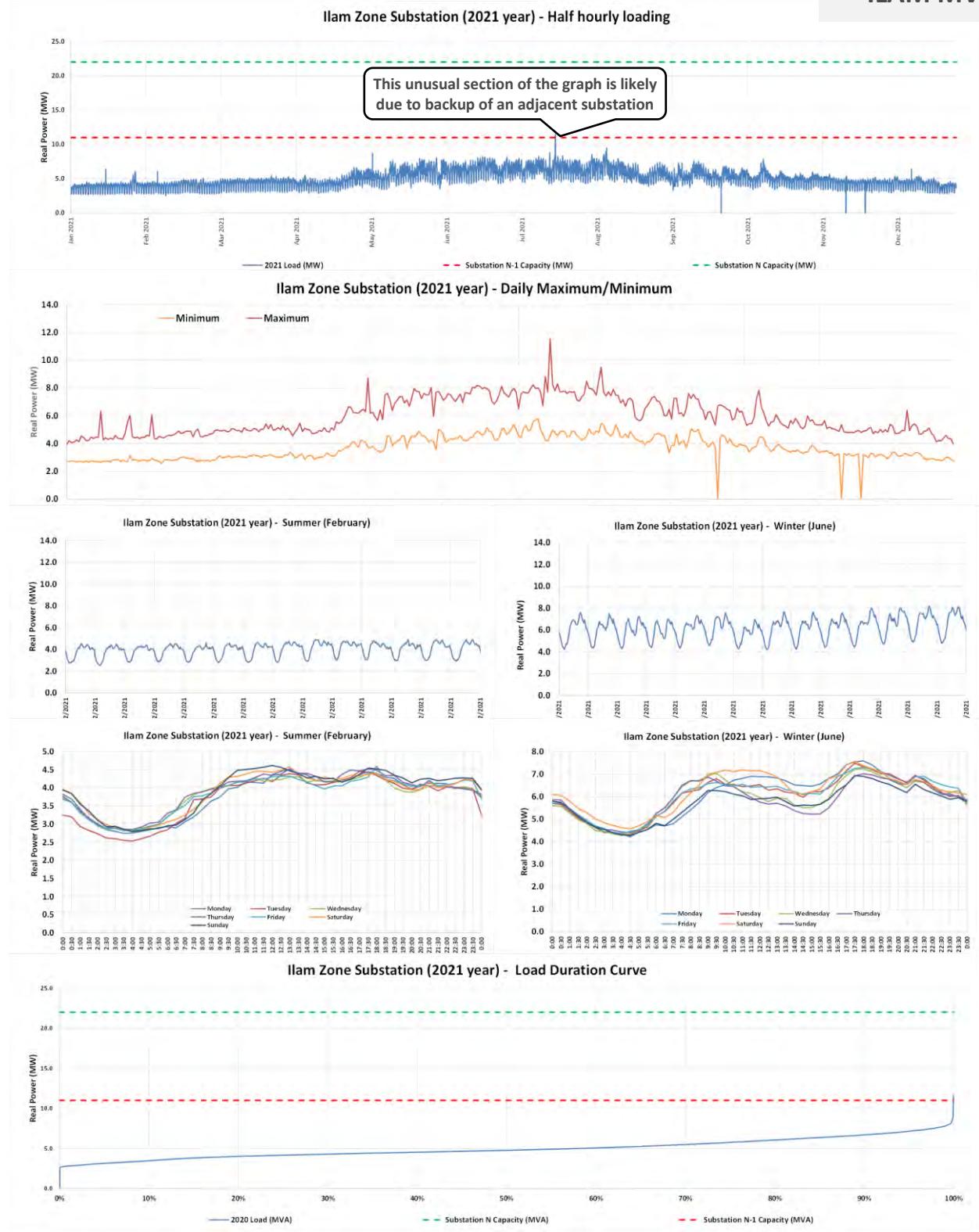


Figure 56 Ilam 11kV zone substation: Apparent power (MVA) load characteristics

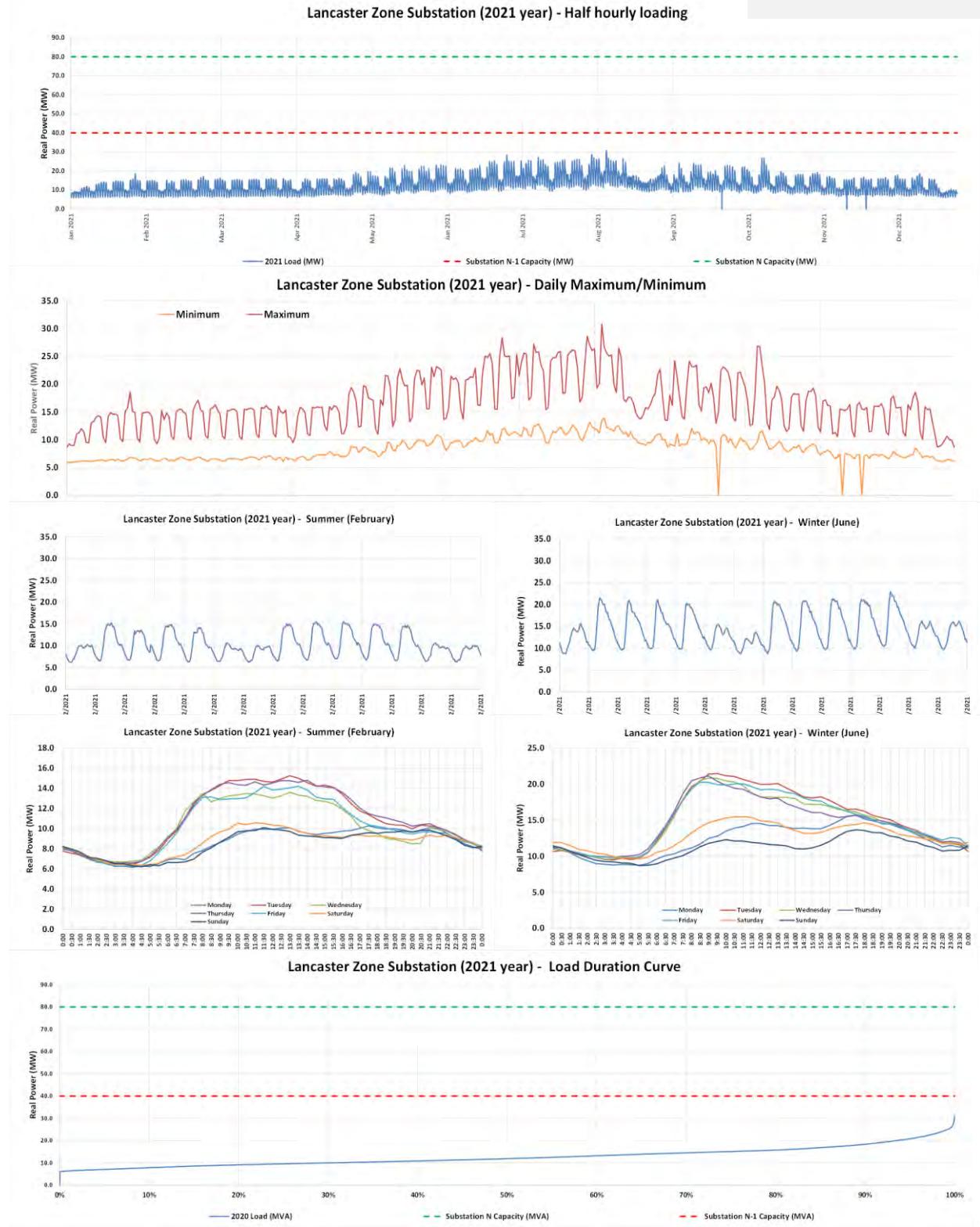
**LANCASTER MVA**


Figure 57 Lancaster 66/11kV zone substation: Apparent power (MVA) load characteristics

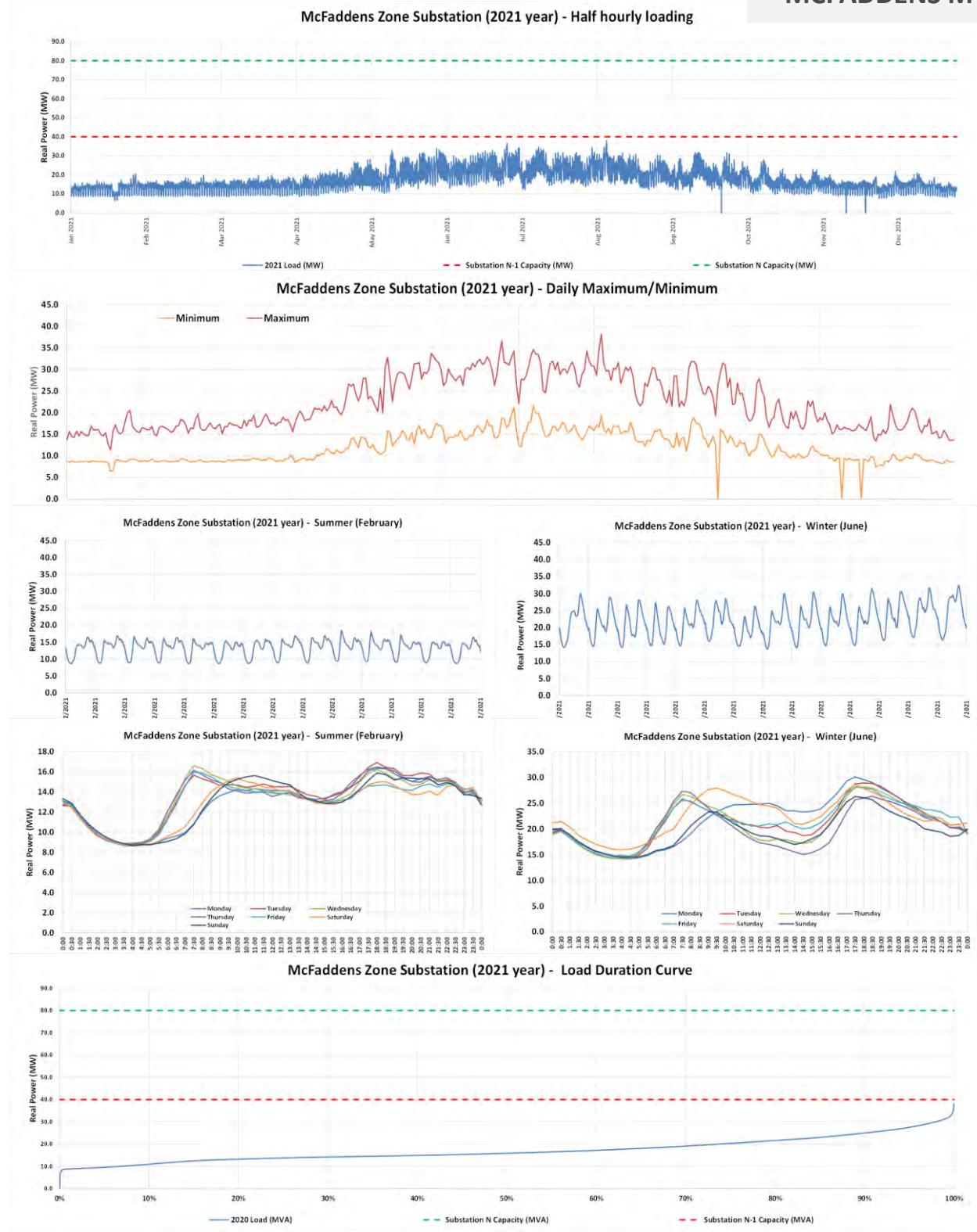
**MCFADDENS MVA**


Figure 58 McFaddens 66/11kV zone substation: Apparent power (MVA) load characteristics

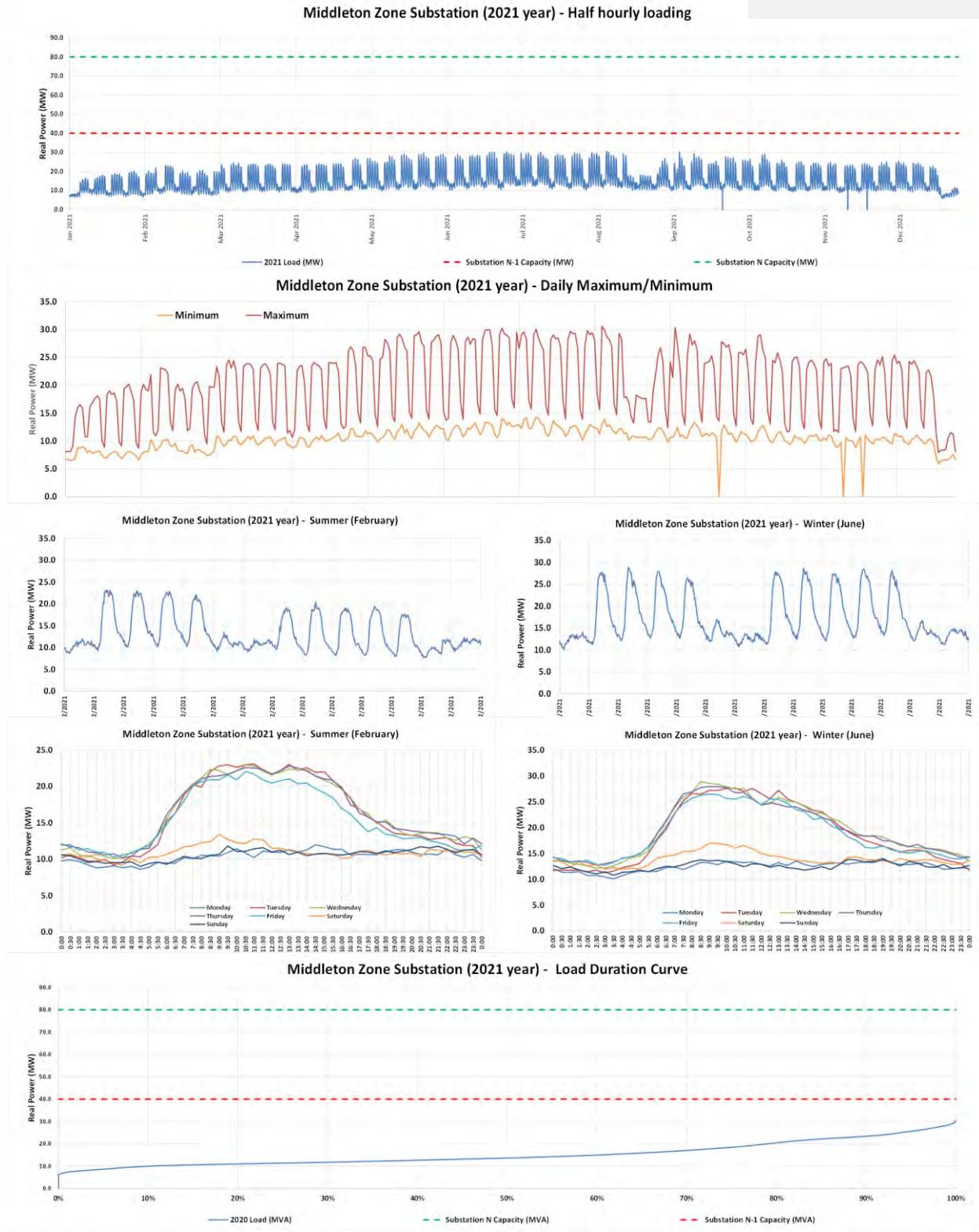
**MIDDLETON MVA**


Figure 59 Middleton 66/11kV zone substation: Apparent power (MVA) load characteristics

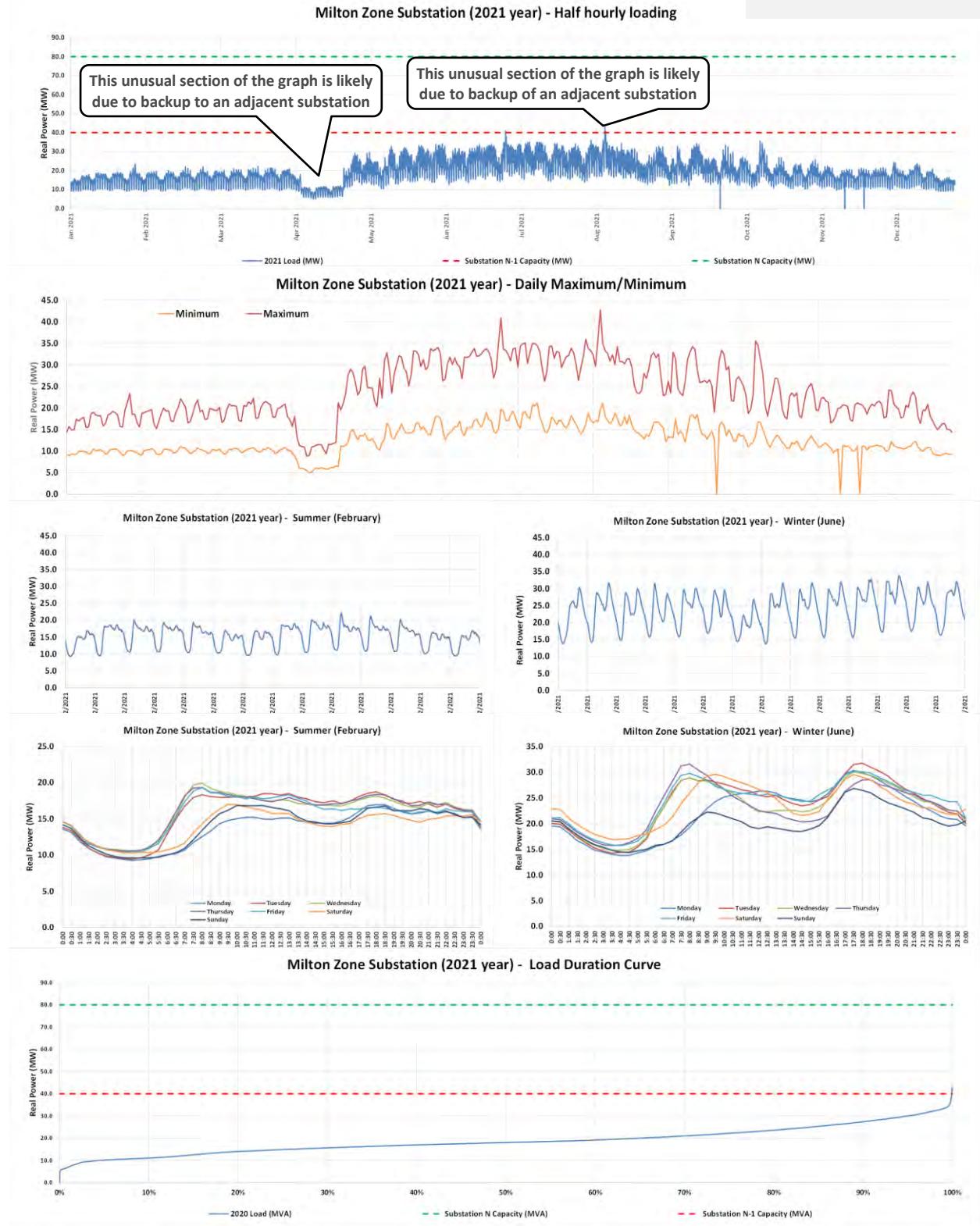
**MILTON MVA**

Figure 60 Milton 66/11kV zone substation: Apparent power (MVA) load characteristics



Figure 61 Moffett 33/11kV zone substation: Apparent power (MVA) load characteristics

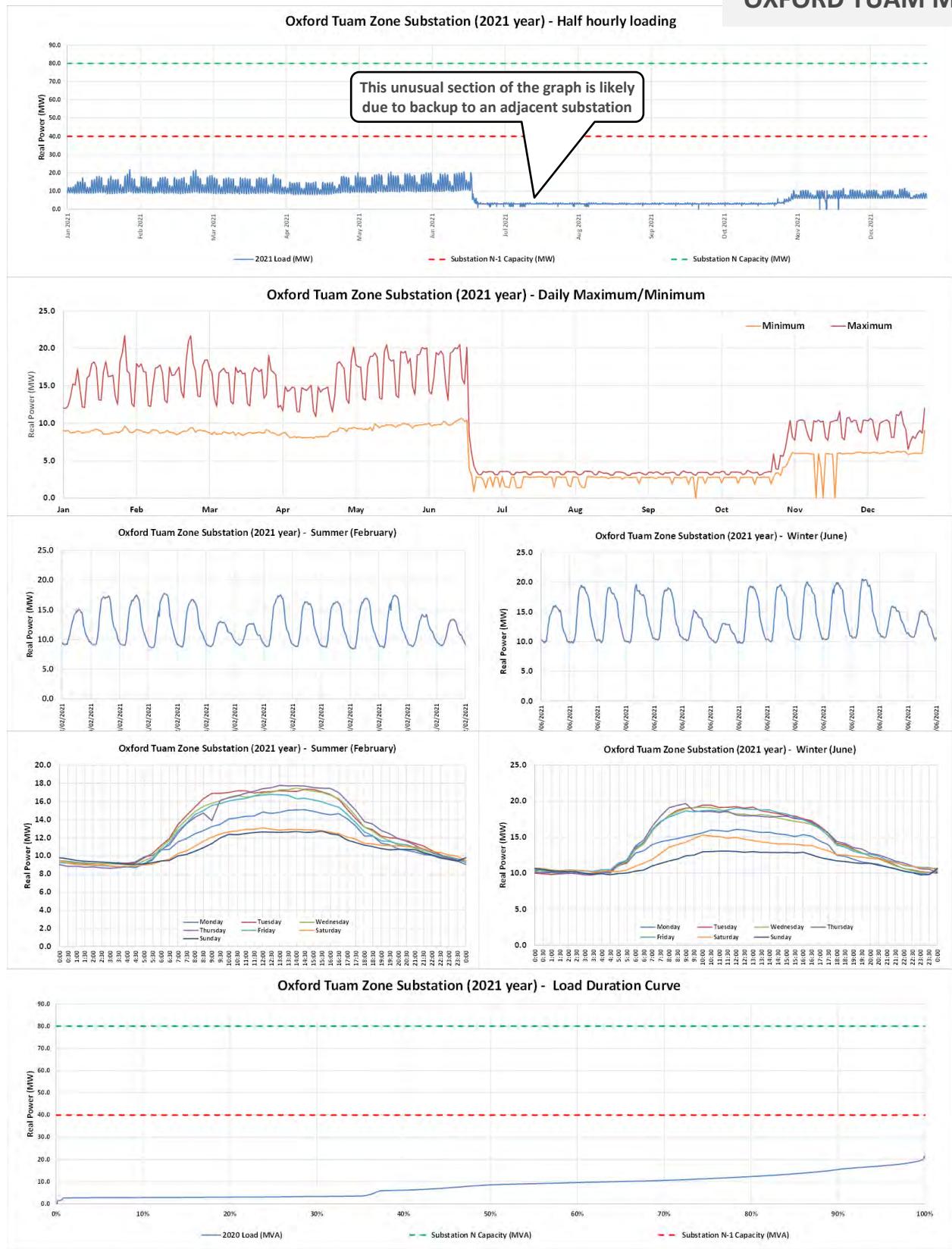
**OXFORD TUAM MVA**


Figure 62 Oxford Tuam 66/11kV zone substation: Apparent power (MVA) load characteristics

## PAPANUI MVA

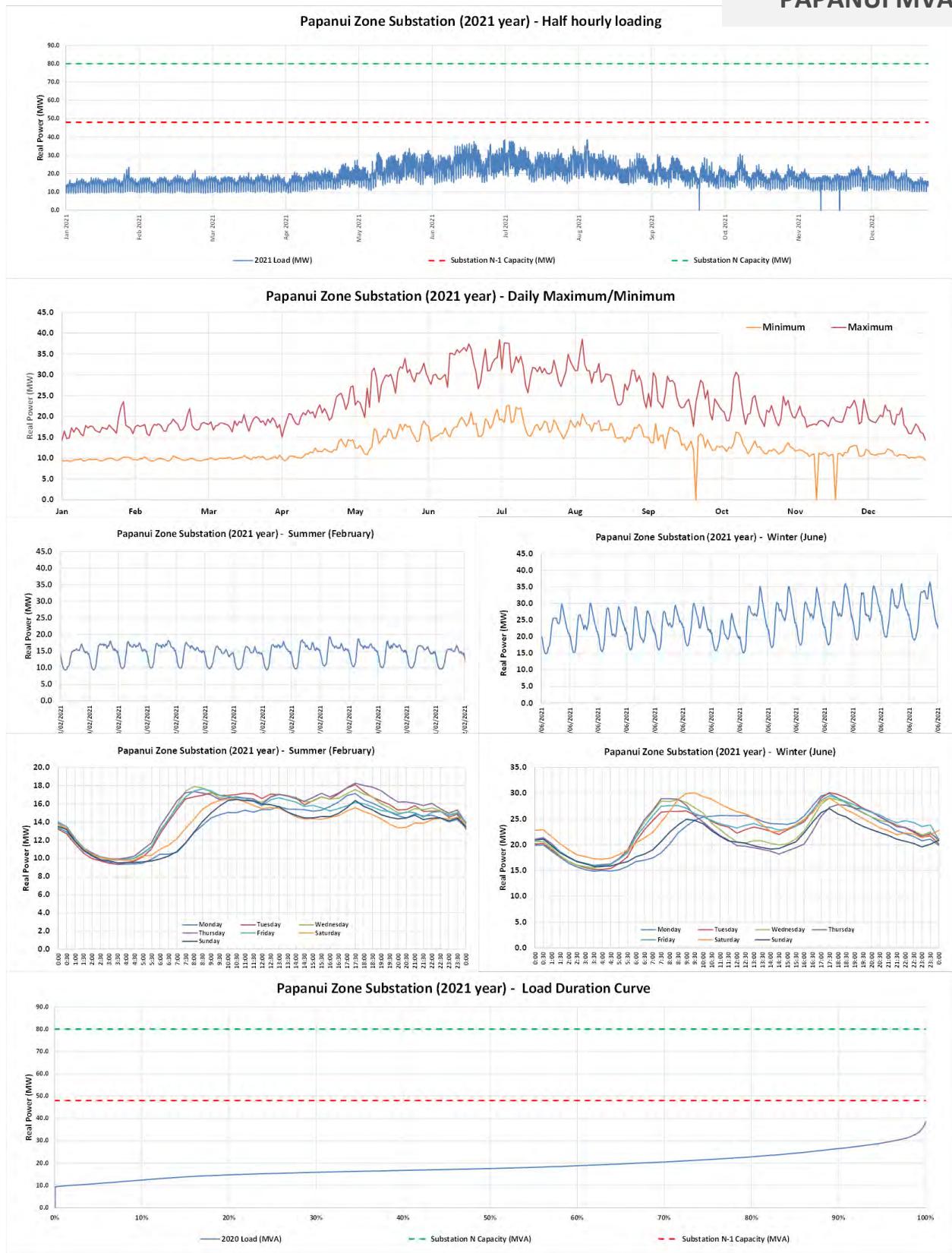


Figure 63 Papanui 66/11kV zone substation: Apparent power (MVA) load characteristics

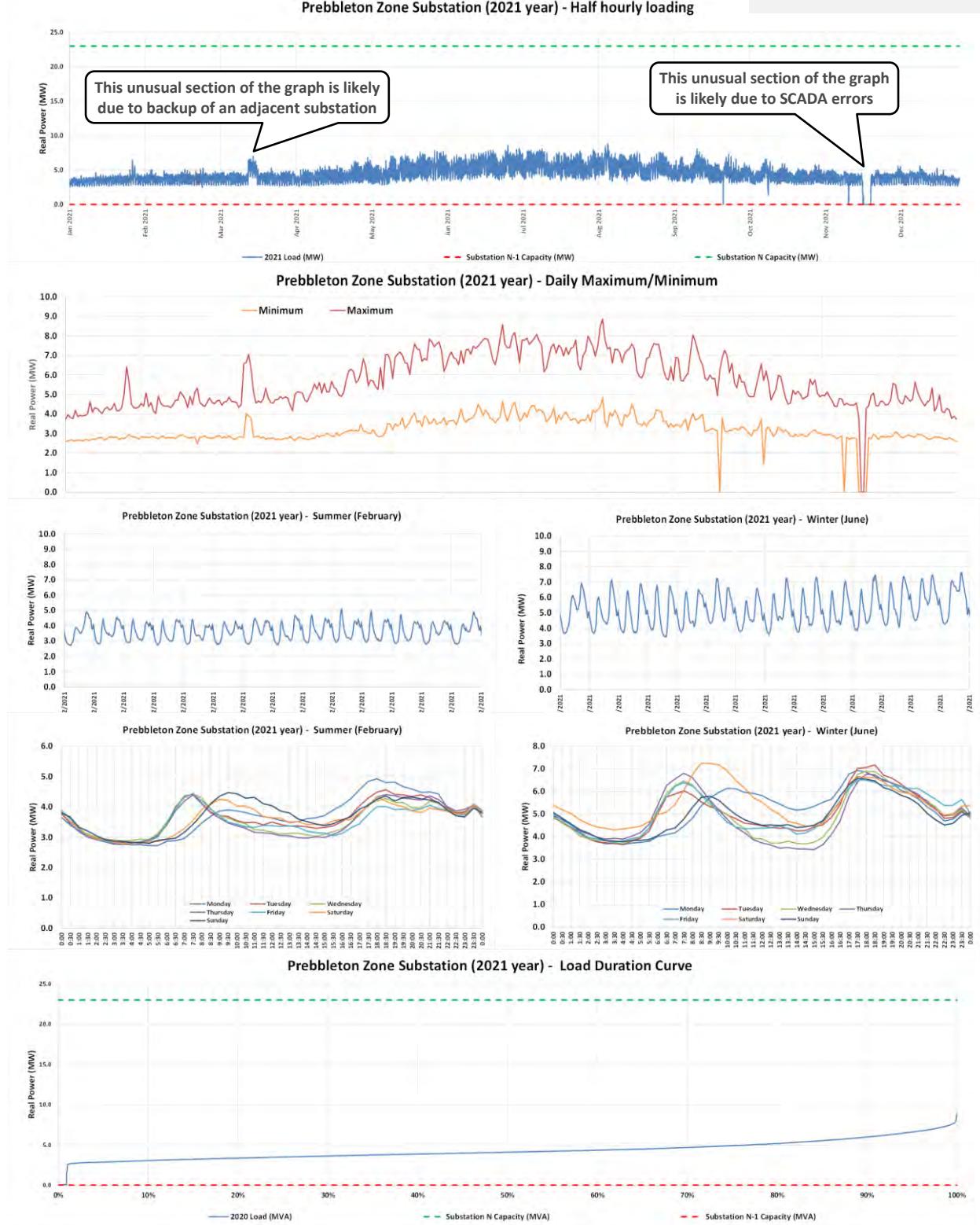
**PREBBLETON MVA**

Figure 64 Prebleton 33/11kV zone substation: Apparent power (MVA) load characteristics

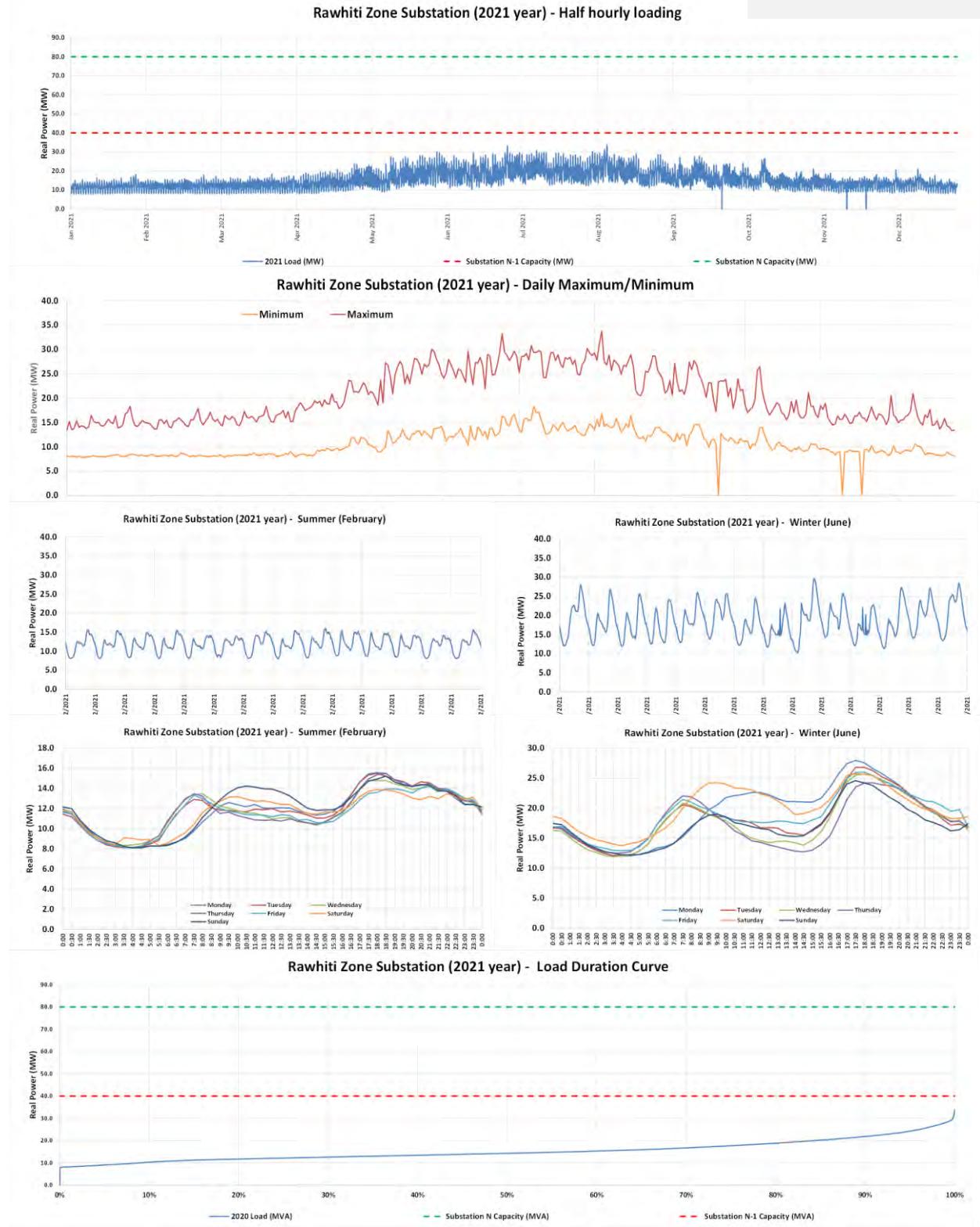
**RAWHITI MVA**


Figure 65 Rawhiti 66/11kV zone substation: Apparent power (MVA) load characteristics

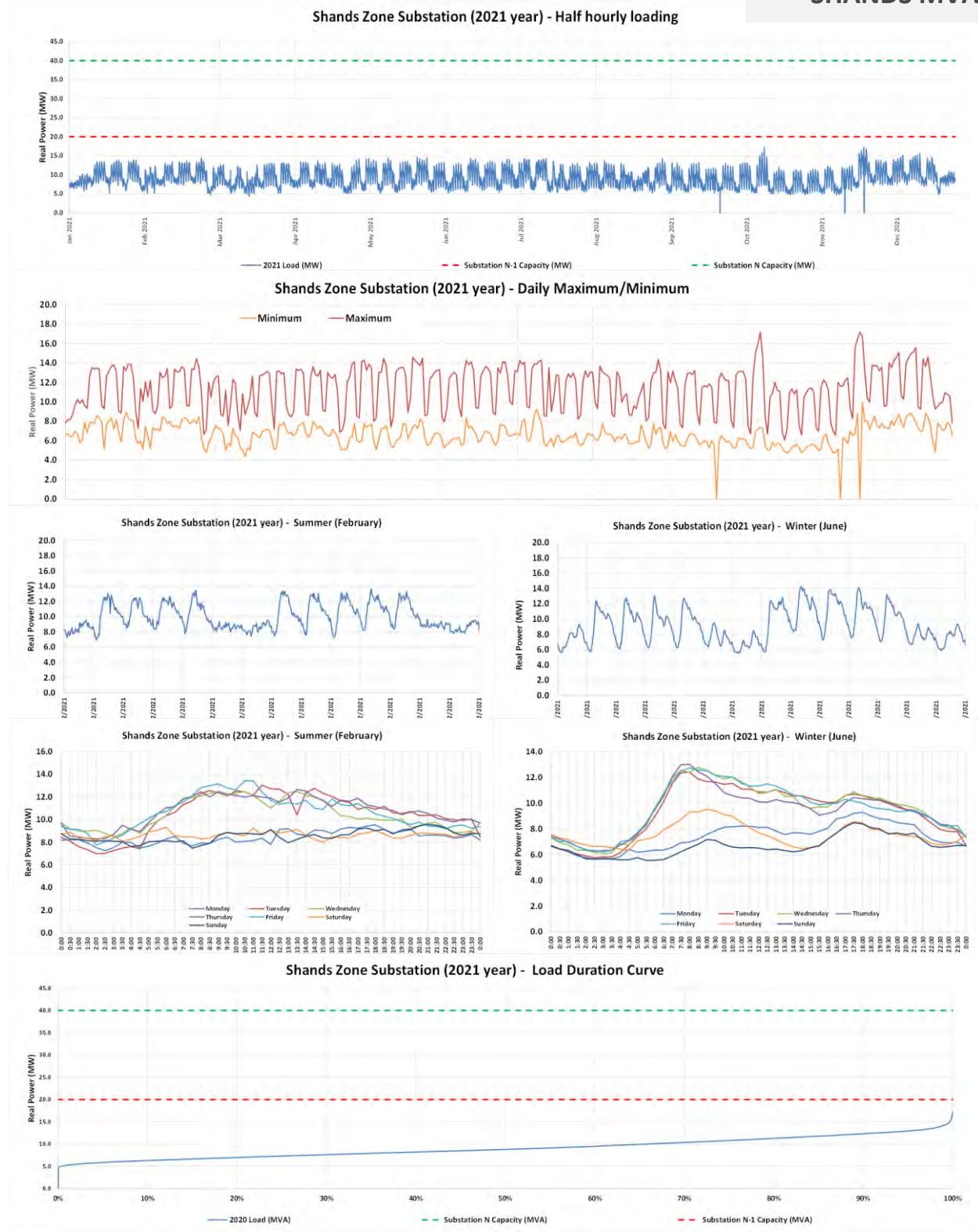
**SHANDS MVA**


Figure 66 Shands 33/11kV zone substation: Apparent power (MVA) load characteristics

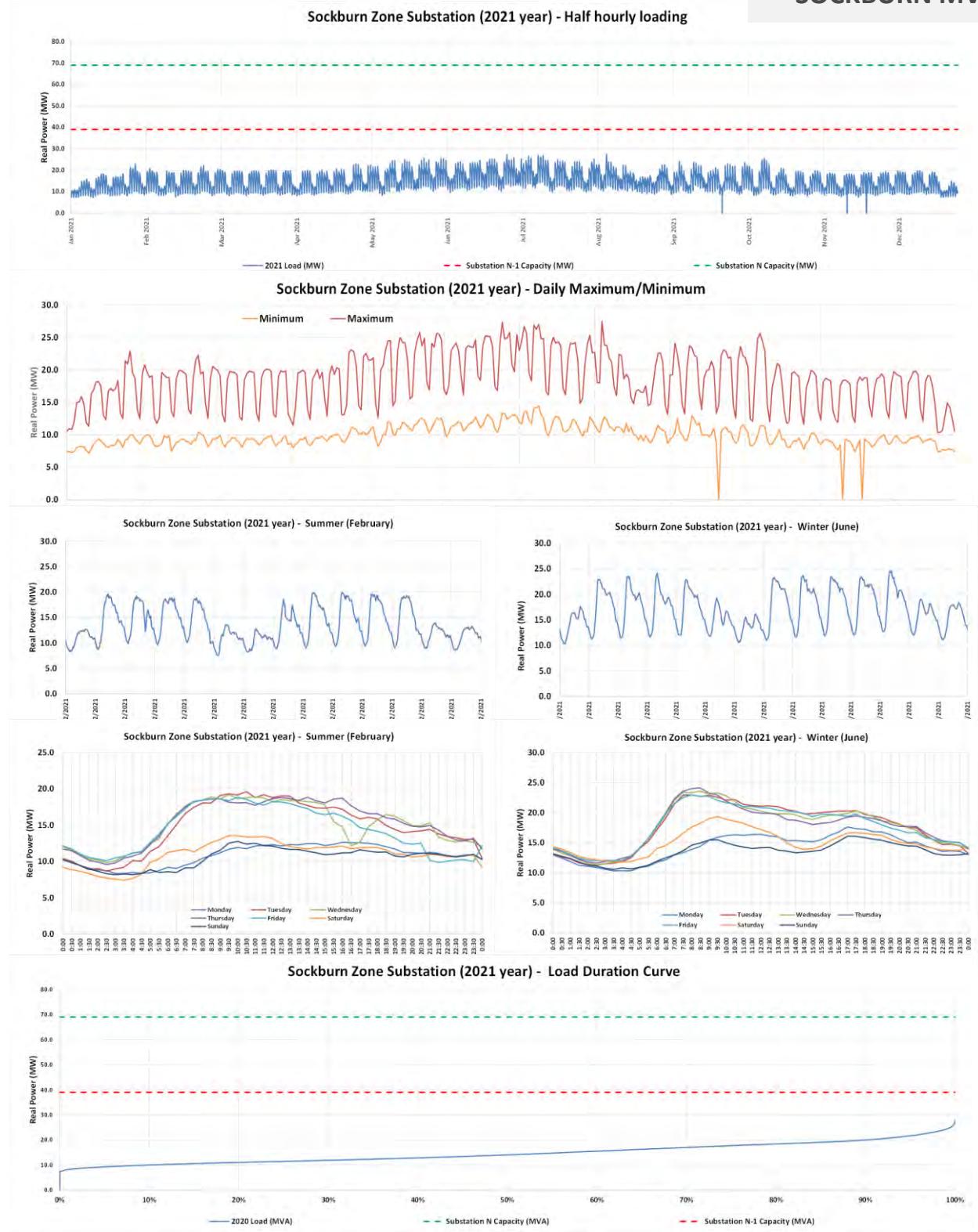
**SOCKBURN MVA**


Figure 67 Sockburn 33/11kV zone substation: Apparent power (MVA) load characteristics

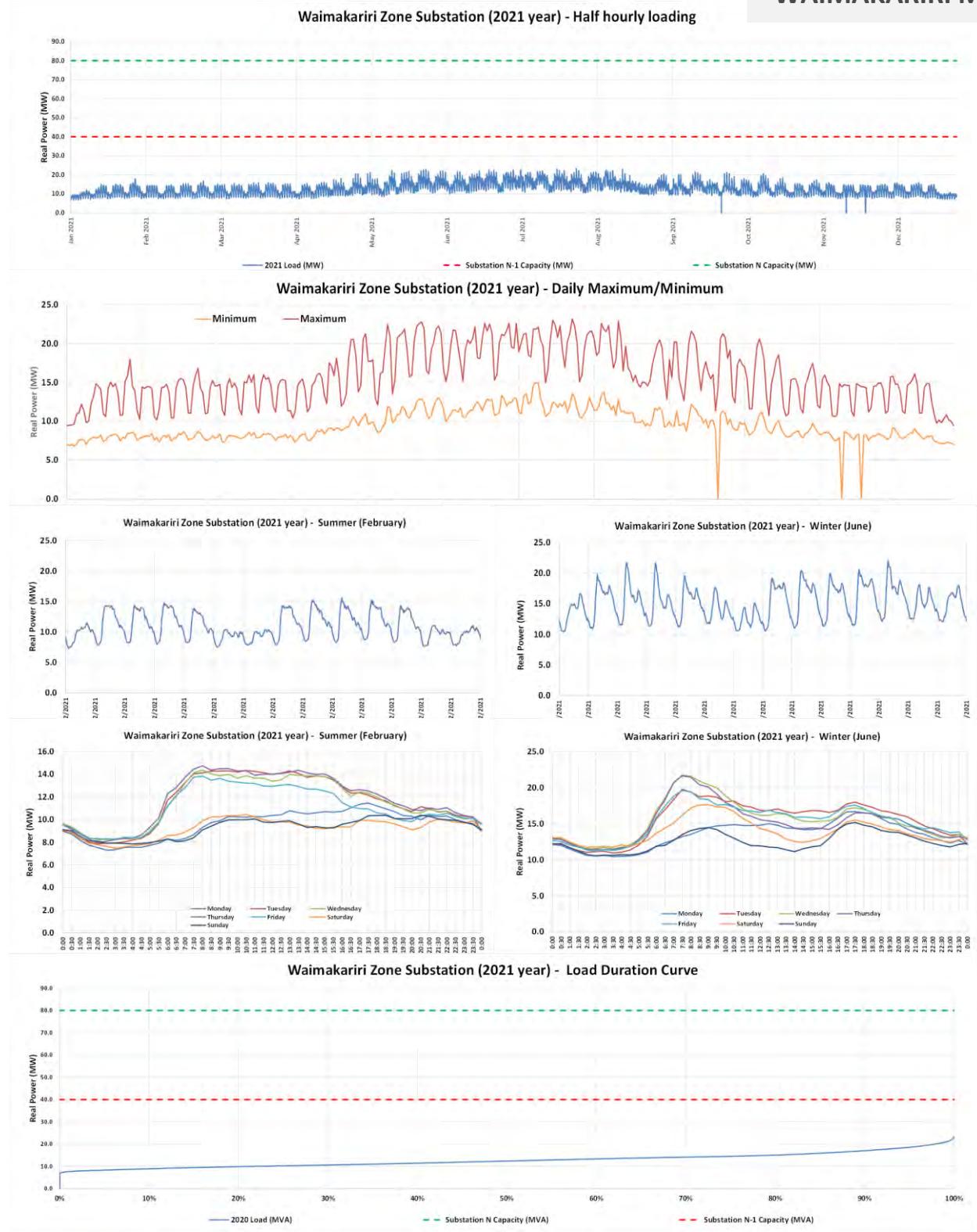
**WAIMAKARIRI MVA**


Figure 68 Waimakariri 66/11kV zone substation: Apparent power (MVA) load characteristics

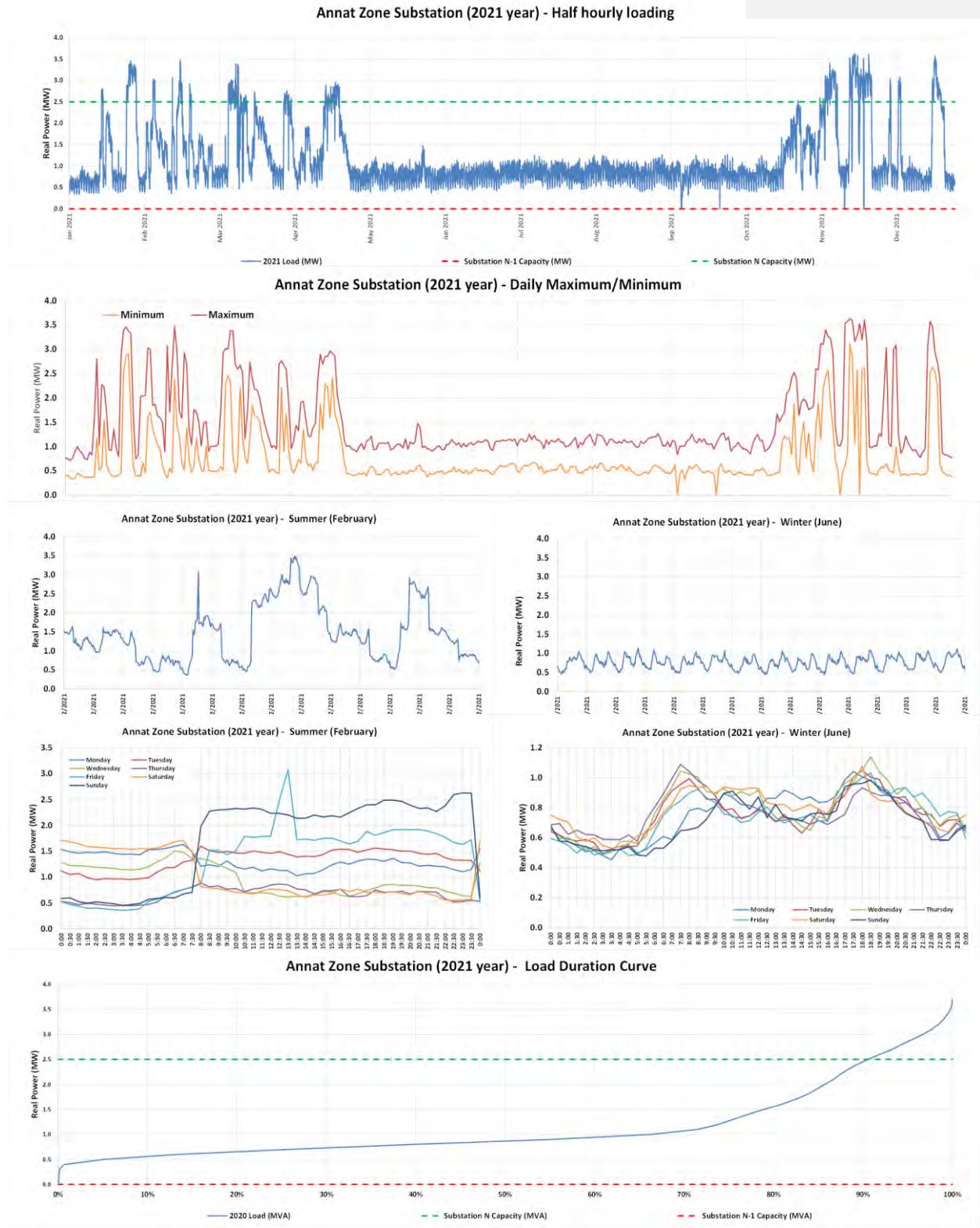
**ANNAT MVA**


Figure 69 Annat 33/11kV zone substation: Apparent power (MVA) load characteristics

## BANKSIDE MVA

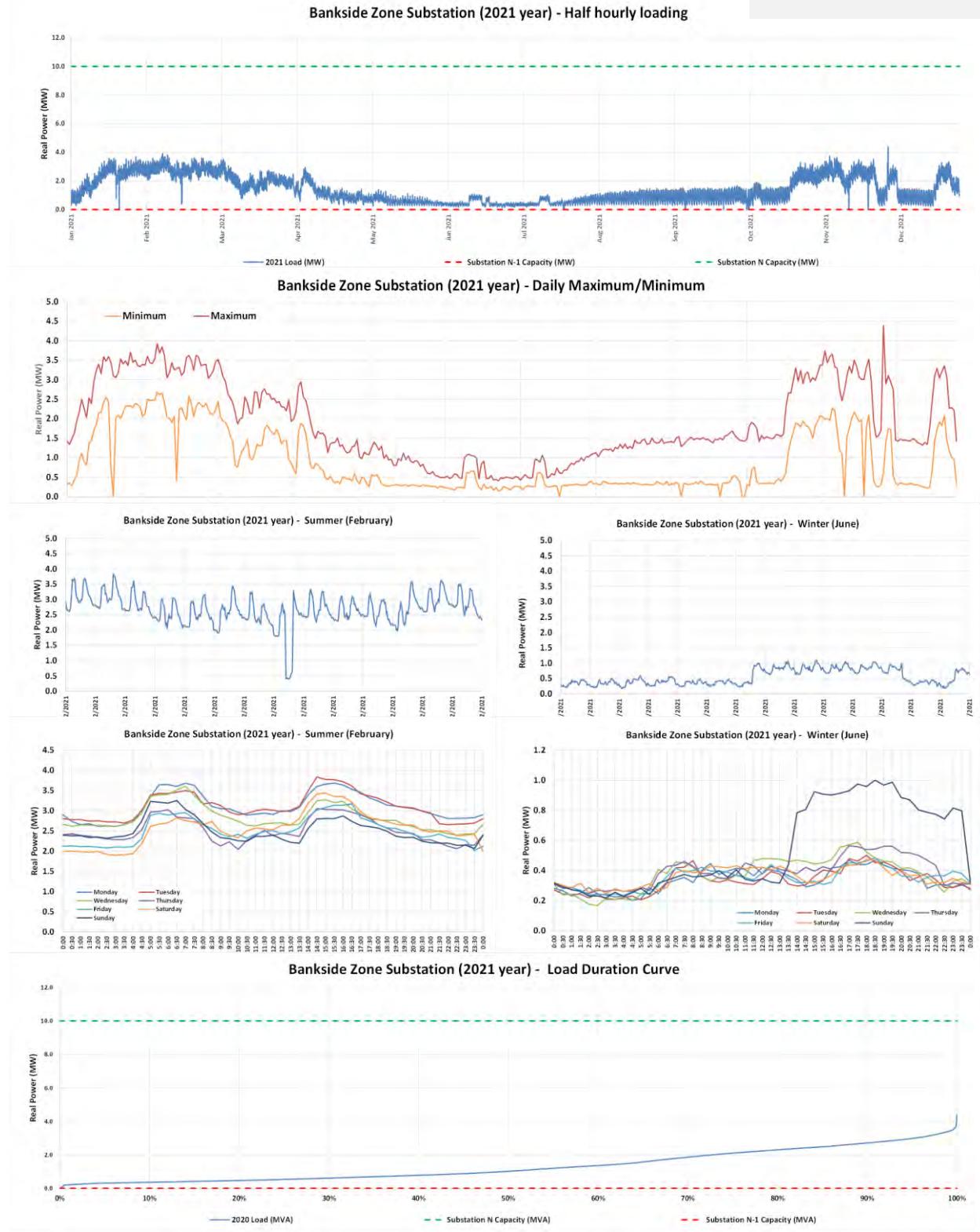


Figure 70 Bankside 33/11kV zone substation: Apparent power (MVA) load characteristics

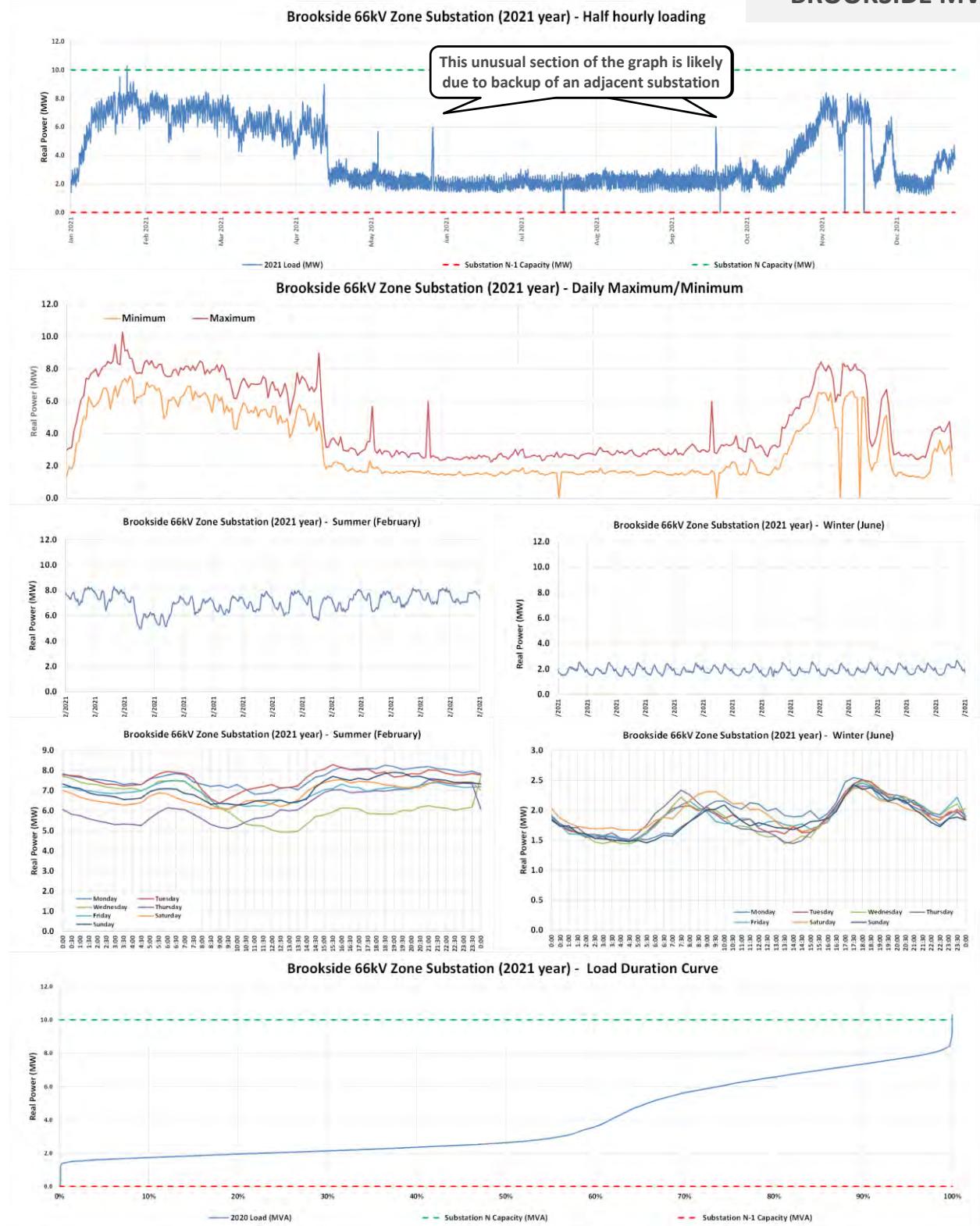
**BROOKSIDE MVA**

Figure 71 Brookside 66/11kV zone substation: Apparent power (MVA) load characteristics

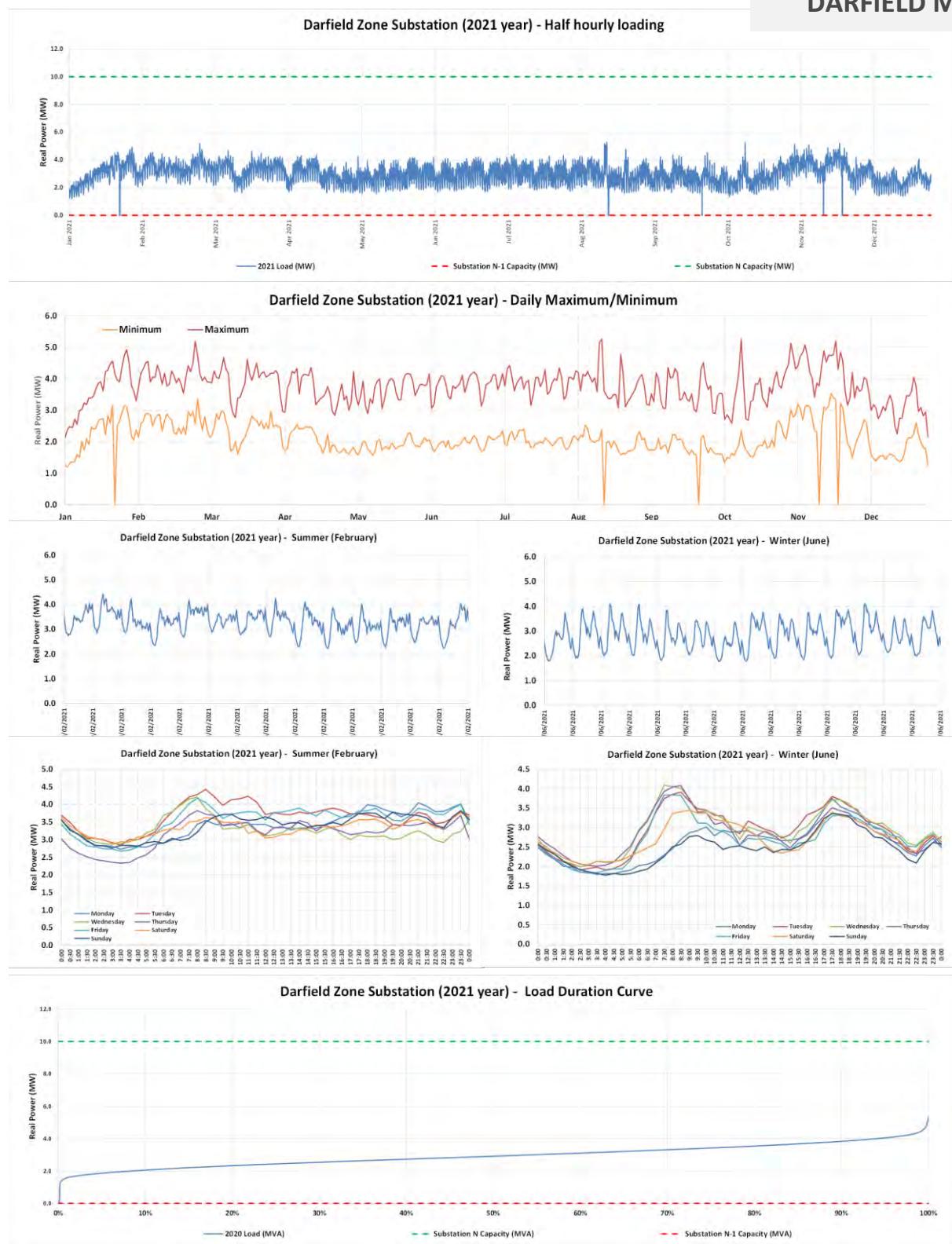
**DARFIELD MVA**


Figure 72 Darfield 33/11kV zone substation: Apparent power (MVA) load characteristics

## DIAMOND HARBOUR MVA

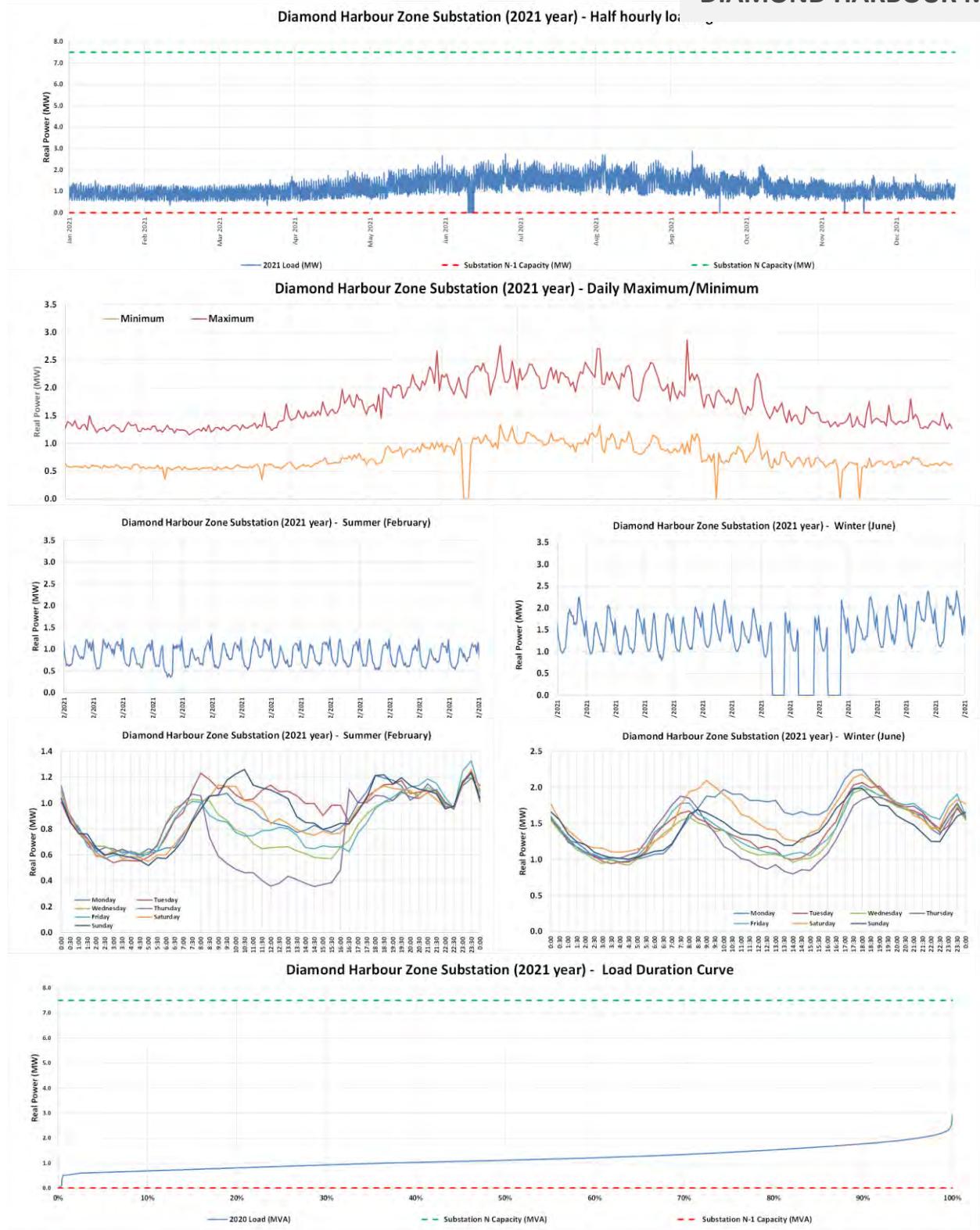


Figure 73 Diamond Harbour 66/11kV zone substation: Apparent power (MVA) load characteristics

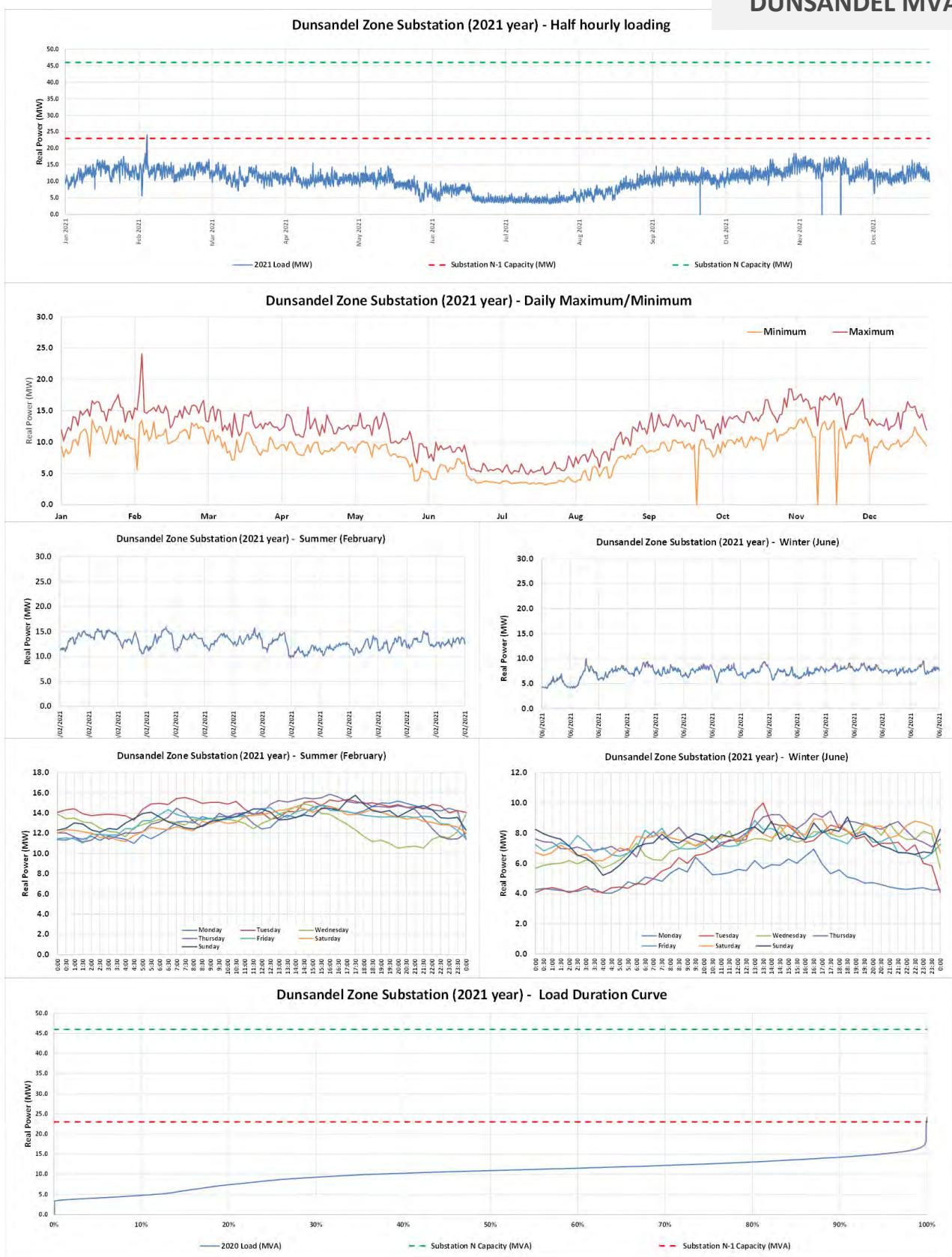
**DUNSANDEL MVA**


Figure 74 Dunsandel 33/11kV zone substation: Apparent power (MVA) load characteristics

## DUVAUCHELLE MVA

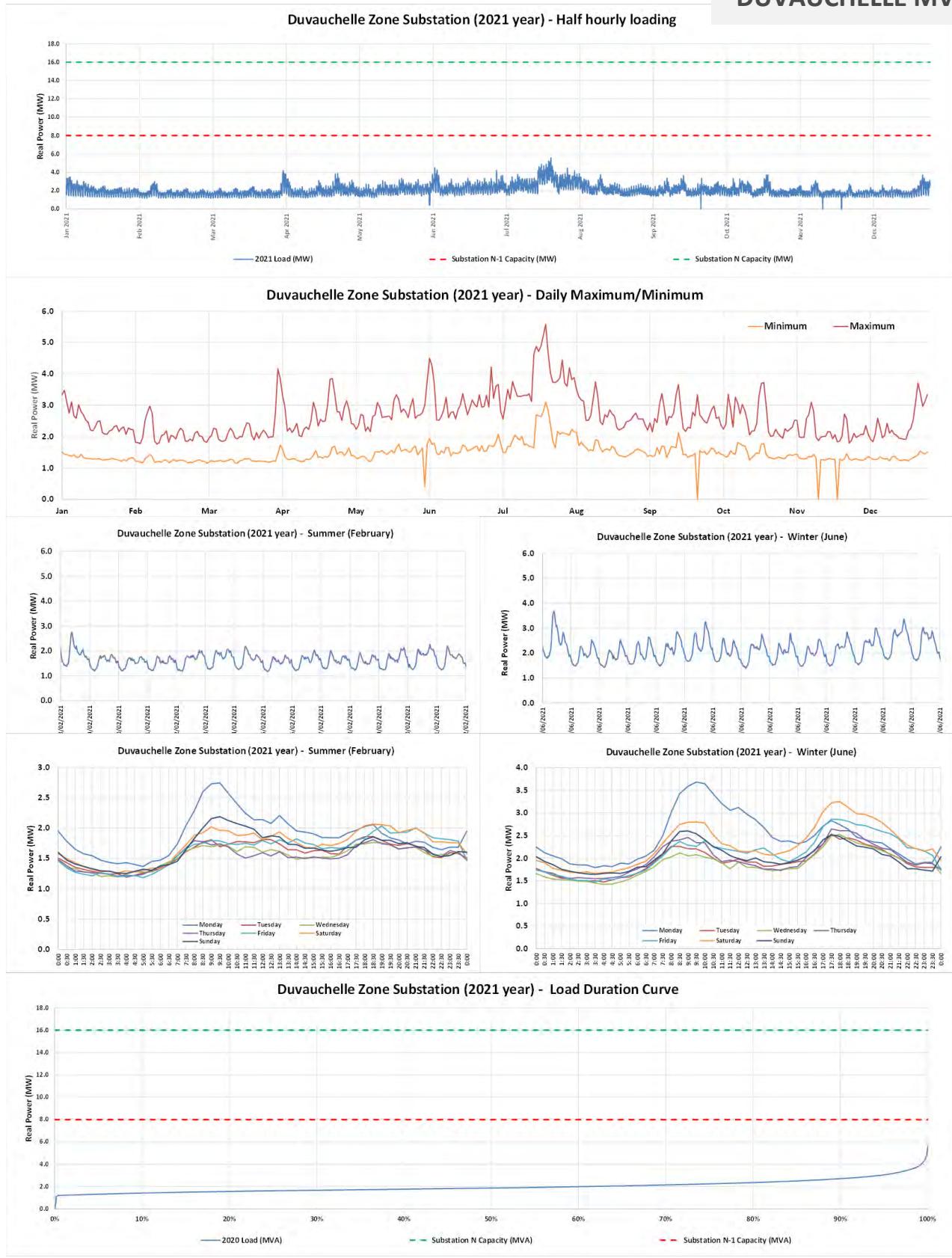


Figure 75 Duvauchelle 33/11kV zone substation: Apparent power (MVA) load characteristics

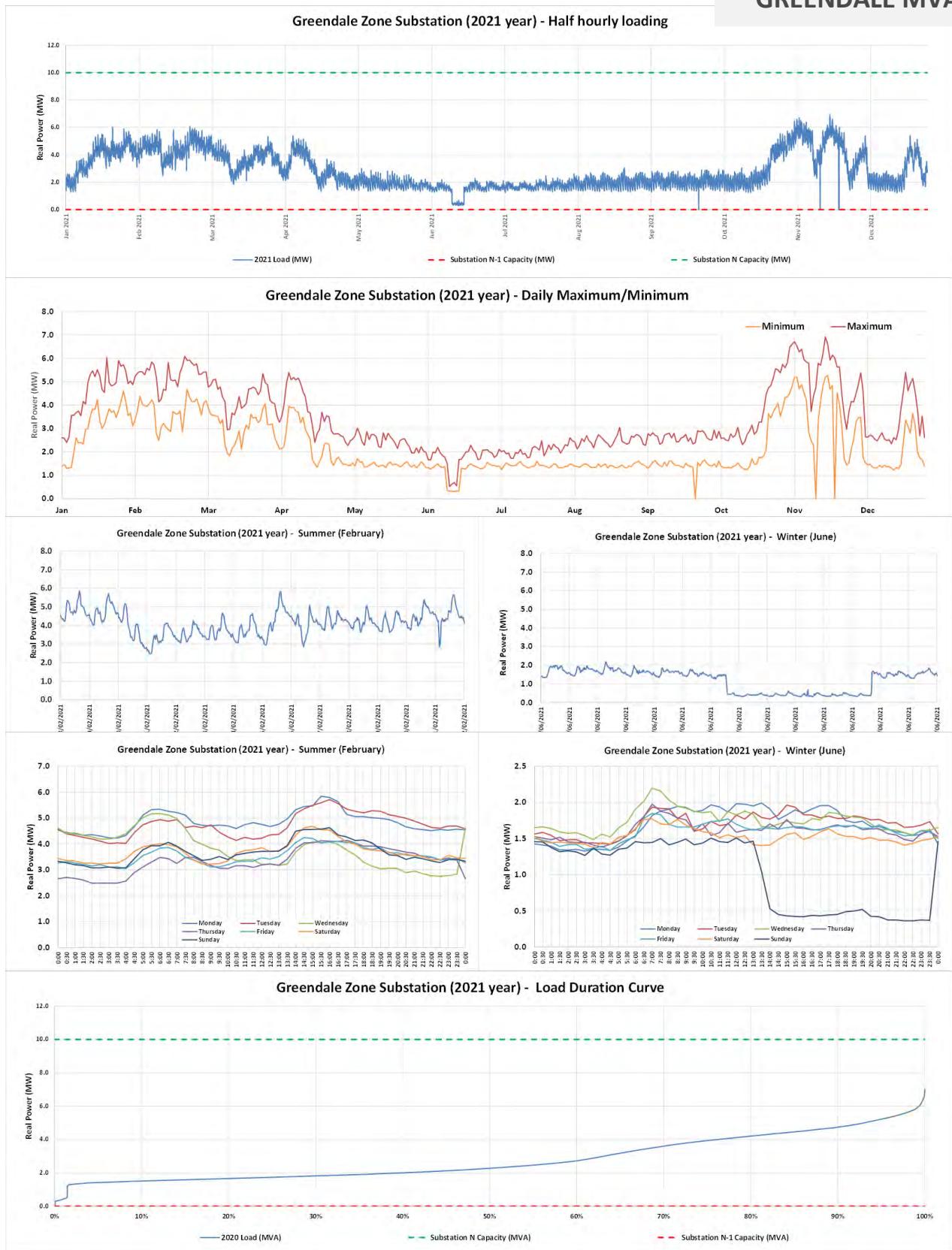
**GREENDALE MVA**

Figure 76 Greendale 66/11kV zone substation: Apparent power (MVA) load characteristics

## HIGHFIELD MVA

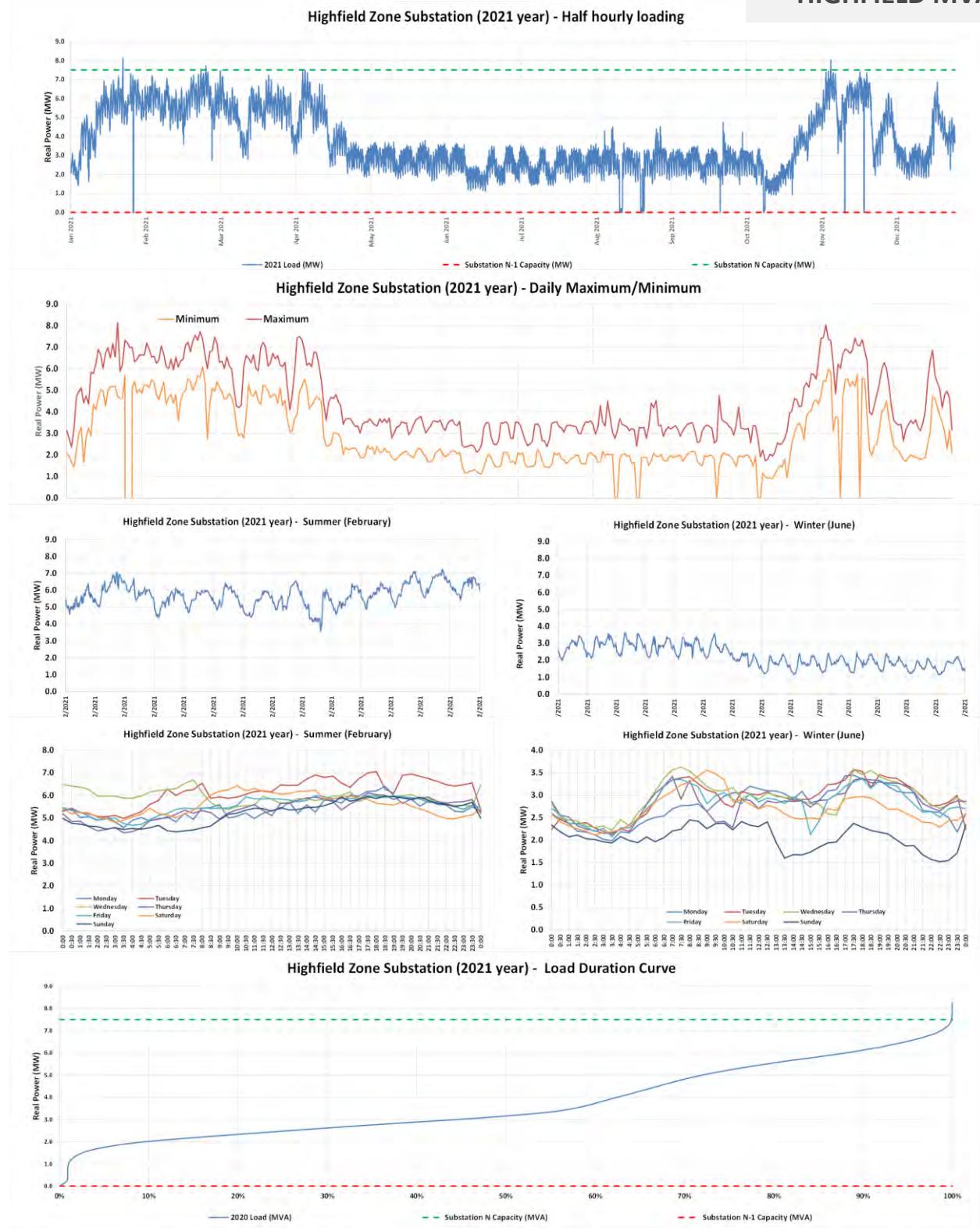


Figure 77 Highfield 33/11kV zone substation: Apparent power (MVA) load characteristics

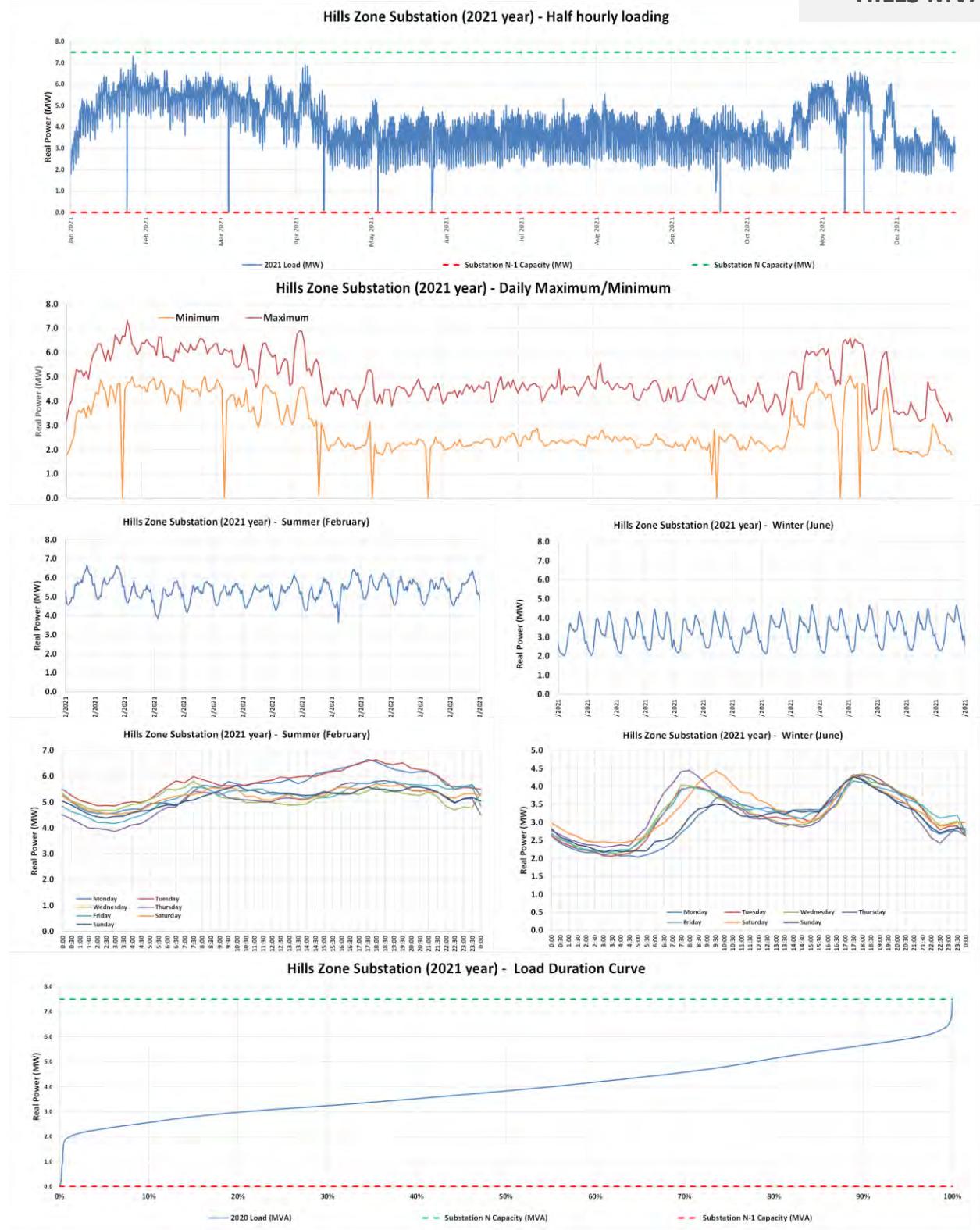
**HILLS MVA**


Figure 78 Hills 33/11kV zone substation: Apparent power (MVA) load characteristics

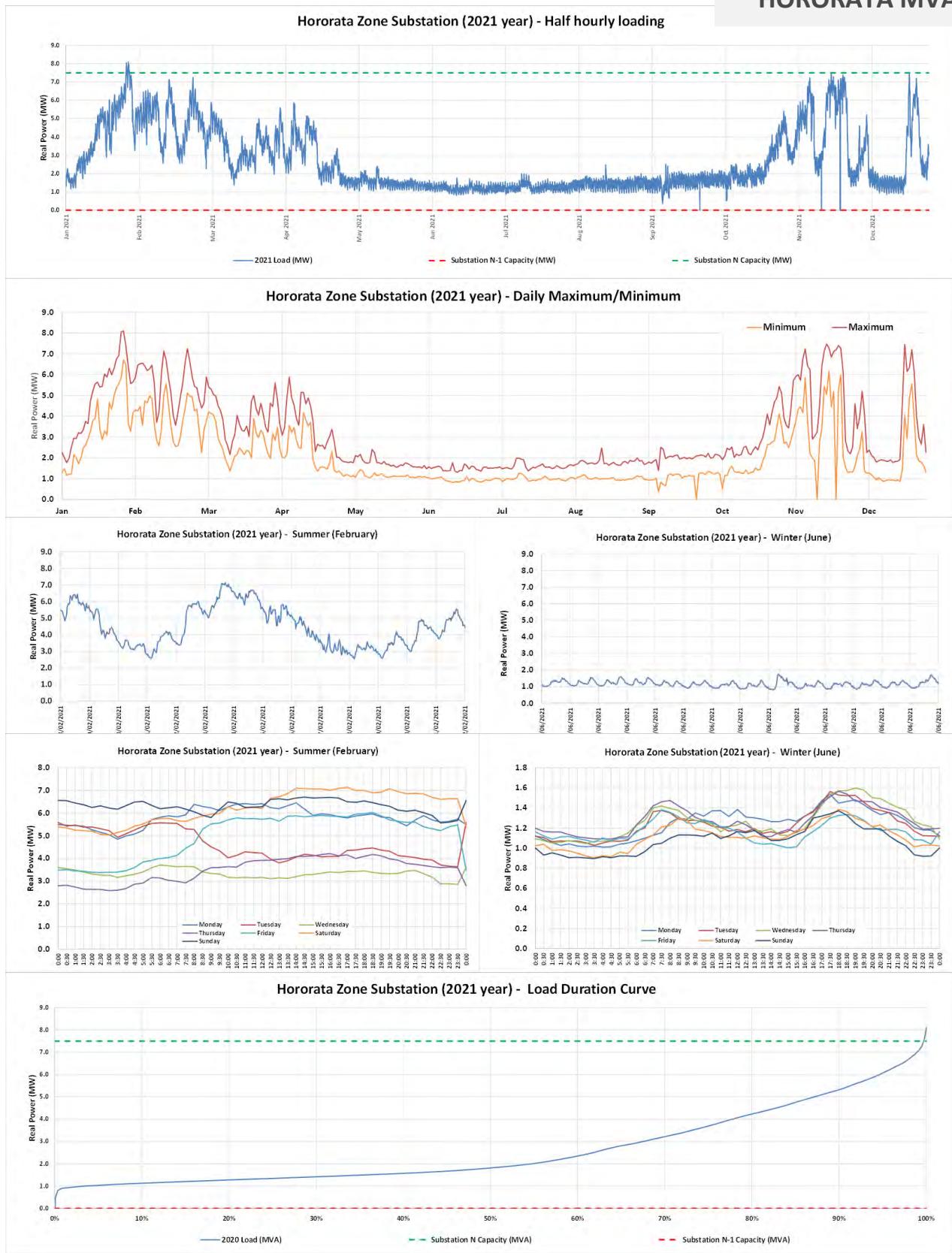
**HORORATA MVA**


Figure 79 Hororata 33/11kV zone substation: Apparent power (MVA) load characteristics

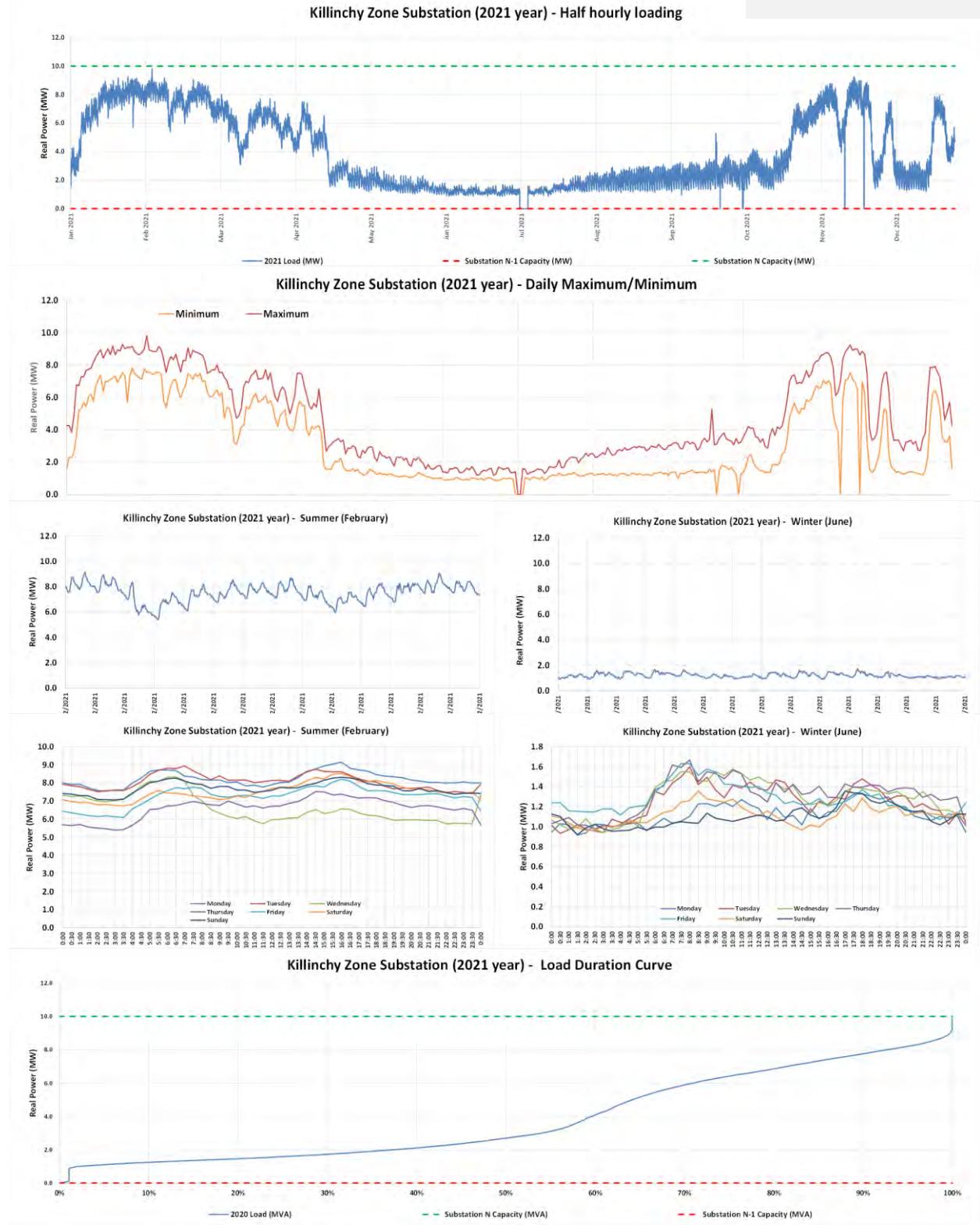
**KILLINCHY MVA**

Figure 80 Killinchy 66/11kV zone substation: Apparent power (MVA) load characteristics

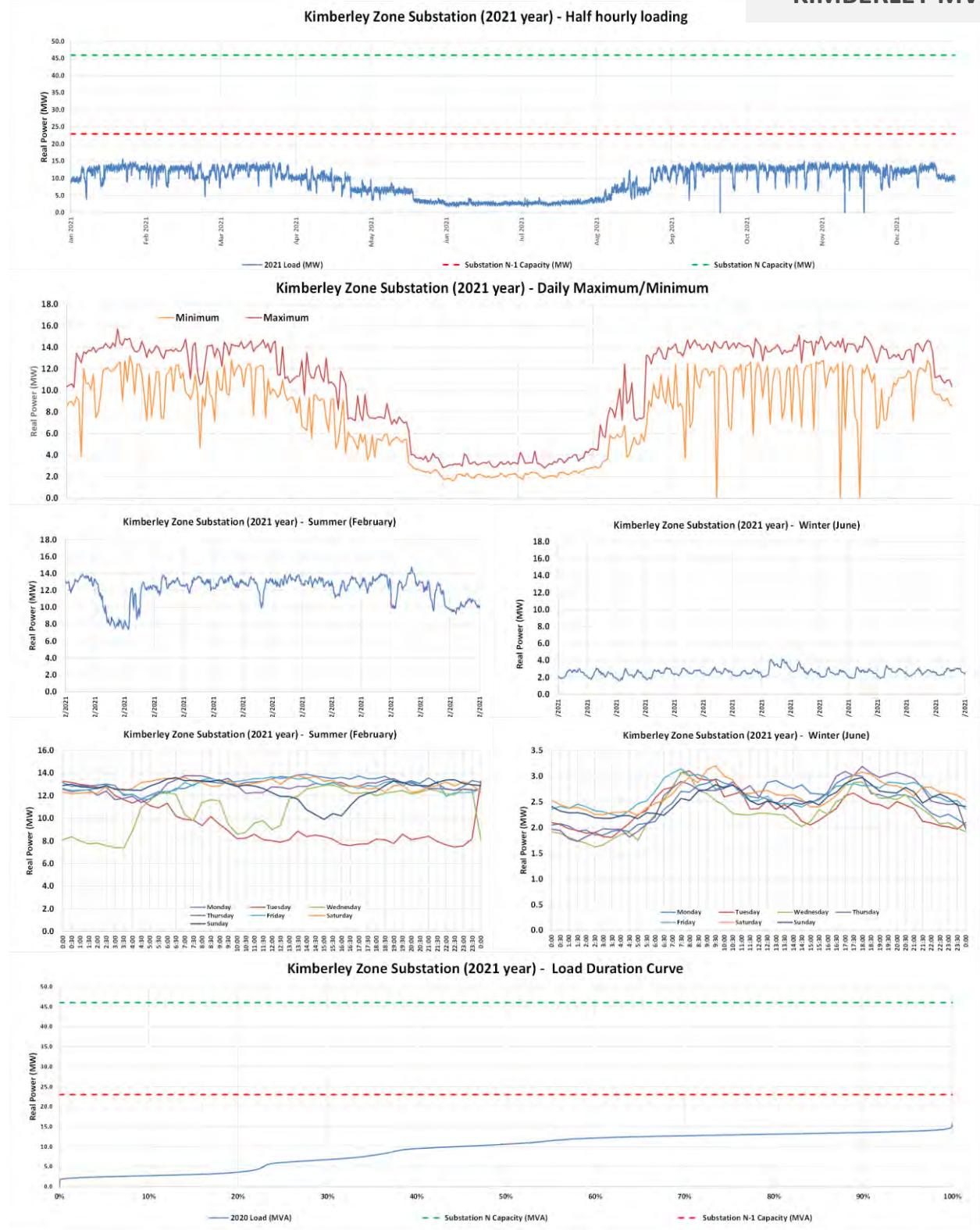
**KIMBERLEY MVA**

Figure 81 Kimberley 66/11kV zone substation: Apparent power (MVA) load characteristics

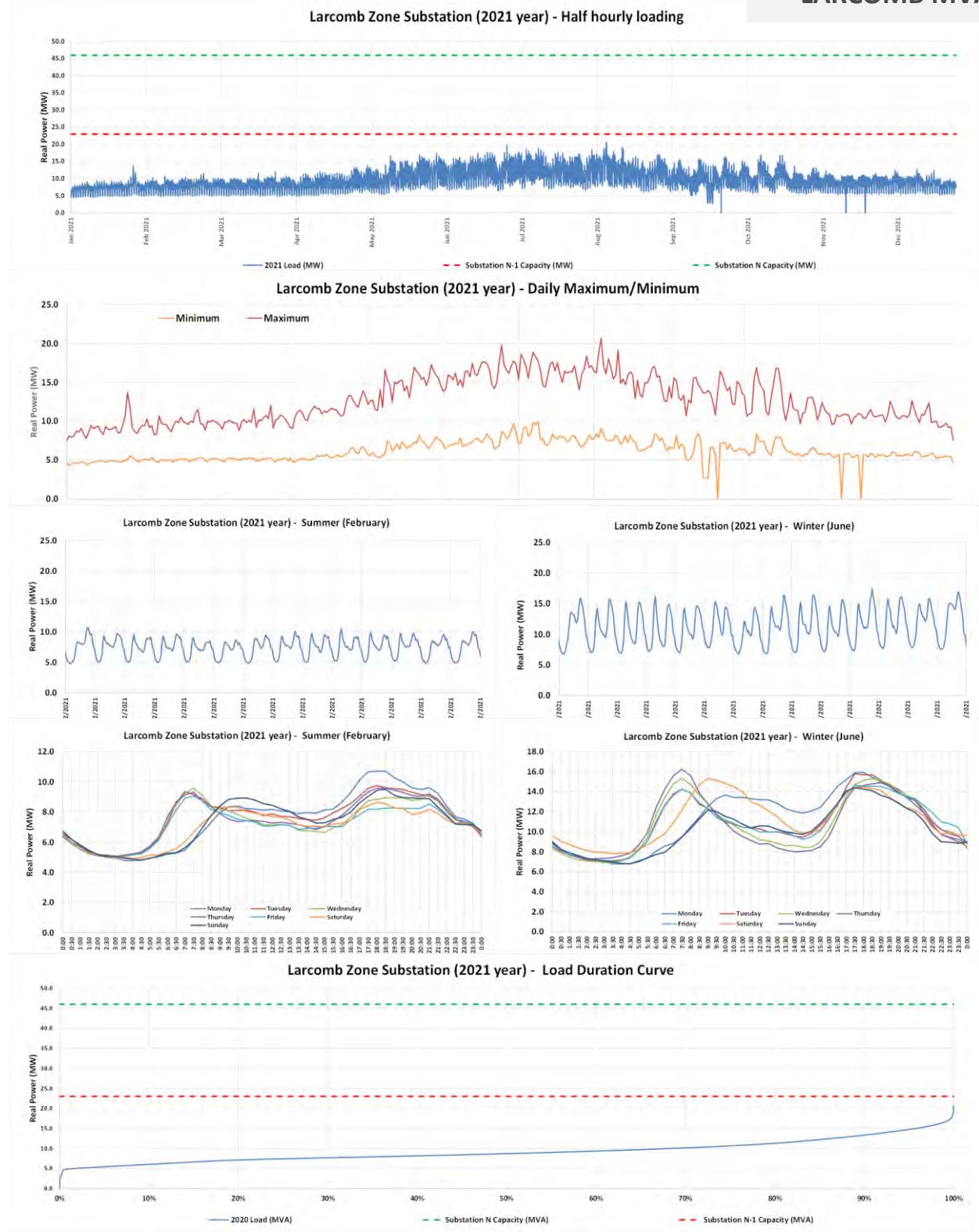
**LARCOMB MVA**

Figure 82 Larcomb 66/11kV zone substation: Apparent power (MVA) load characteristics

## LINCOLN MVA

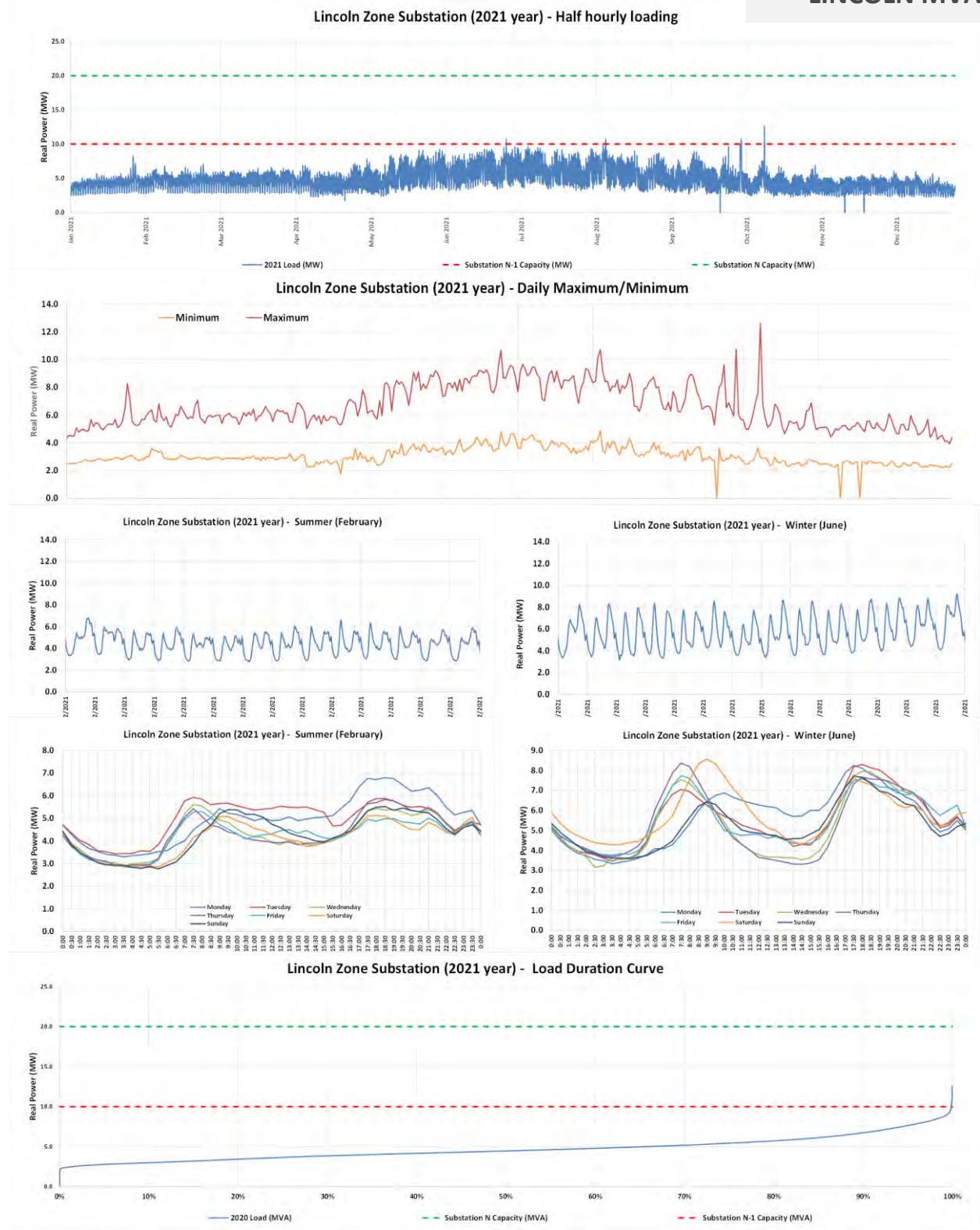


Figure 83 Lincoln 33/11kV zone substation: Apparent power (MVA) load characteristics

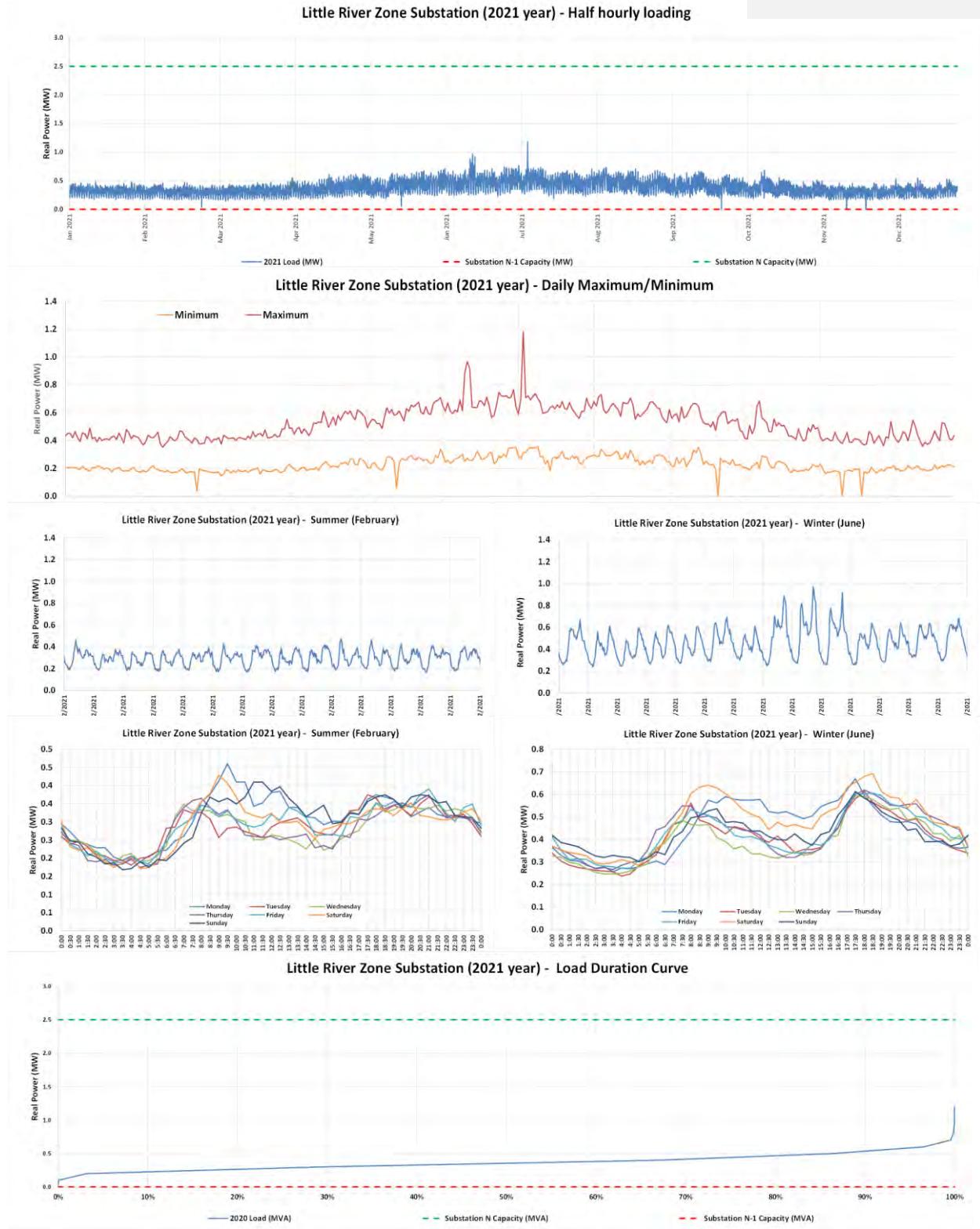
**LITTLE RIVER MVA**


Figure 84 Little River 33/11kV zone substation: Apparent power (MVA) load characteristics

## MOTUKARARA MVA

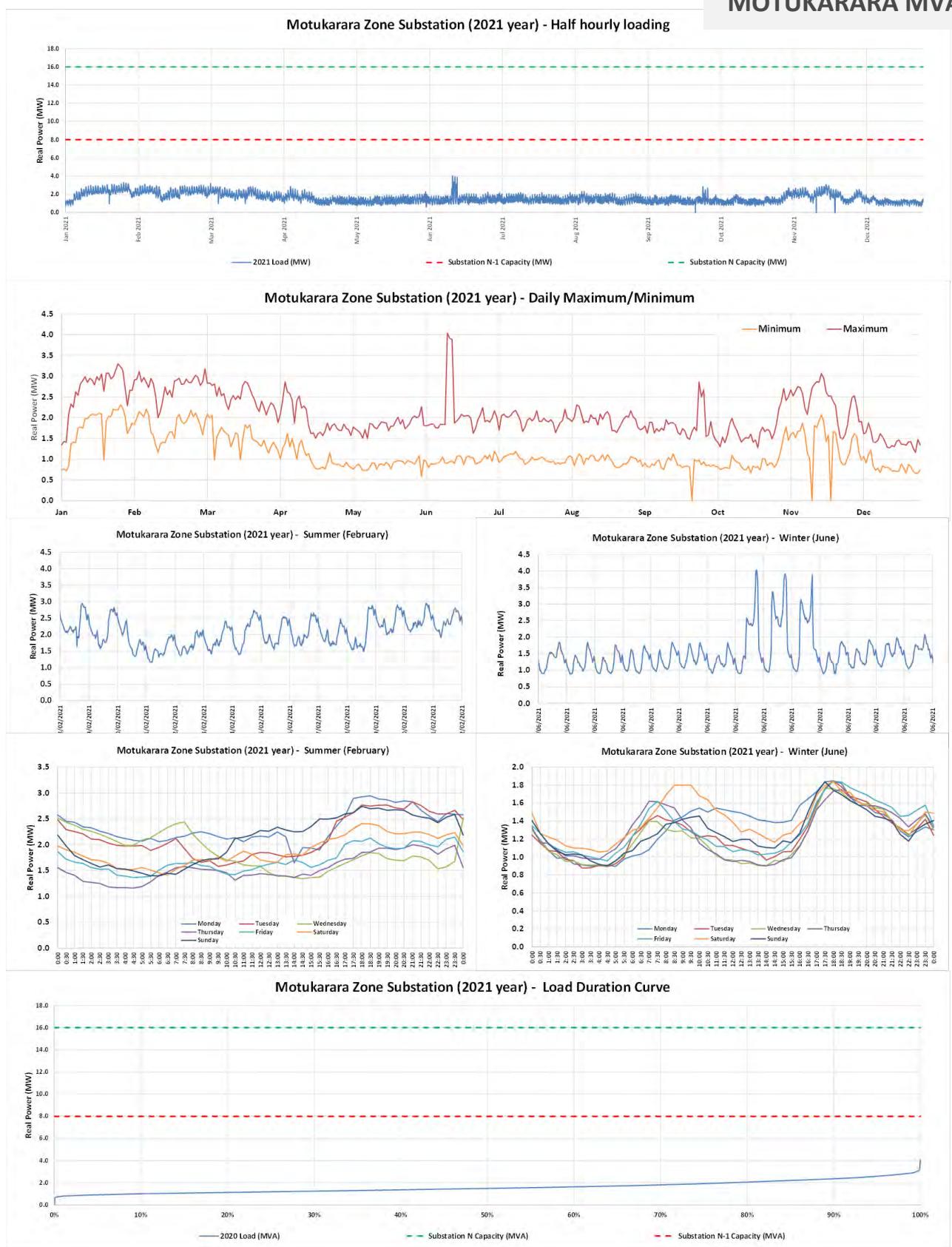


Figure 85 Motukarara 33/11kV zone substation: Apparent power (MVA) load characteristics

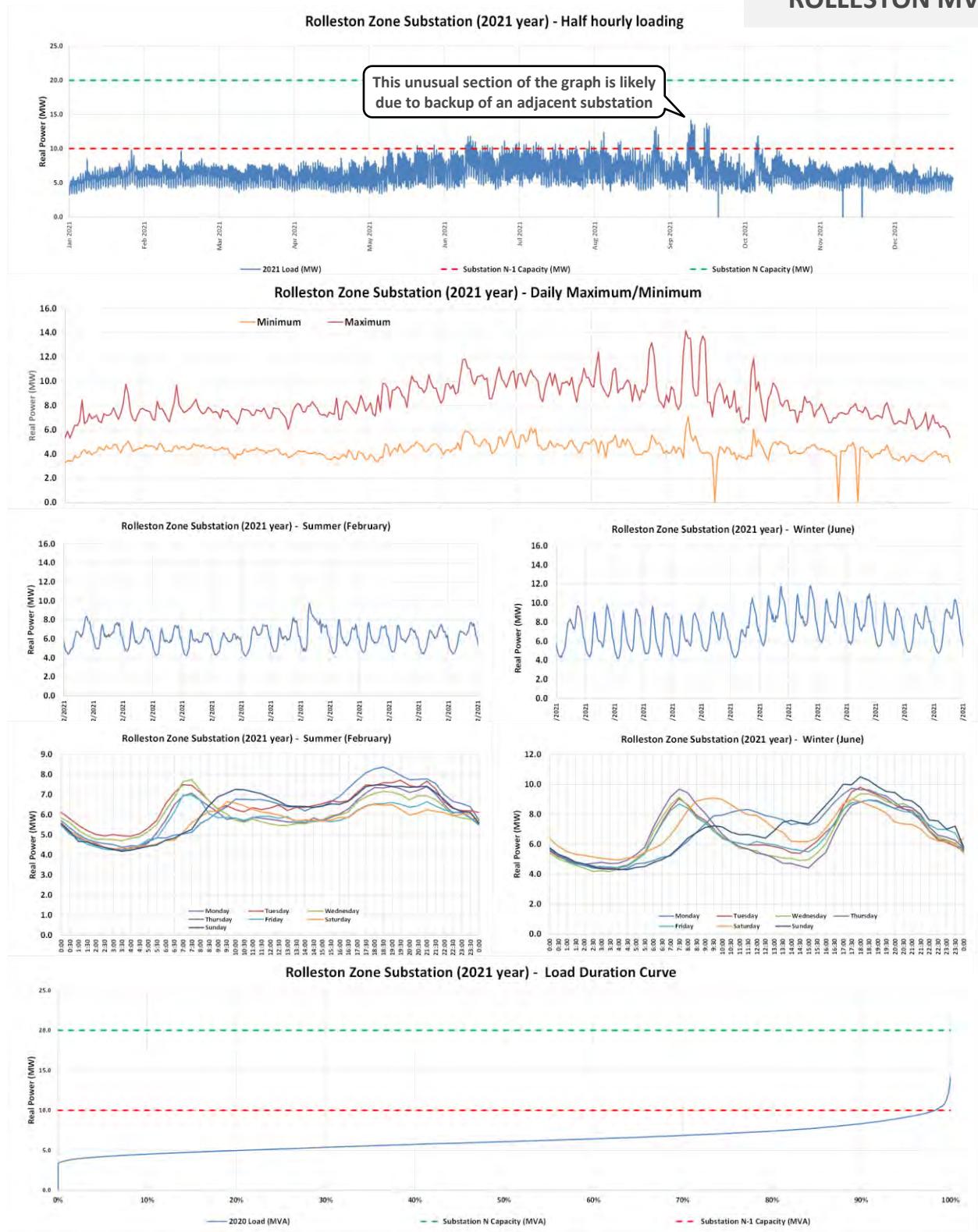
**ROLLESTON MVA**


Figure 86 Rolleston 33/11kV zone substation: Apparent power (MVA) load characteristics

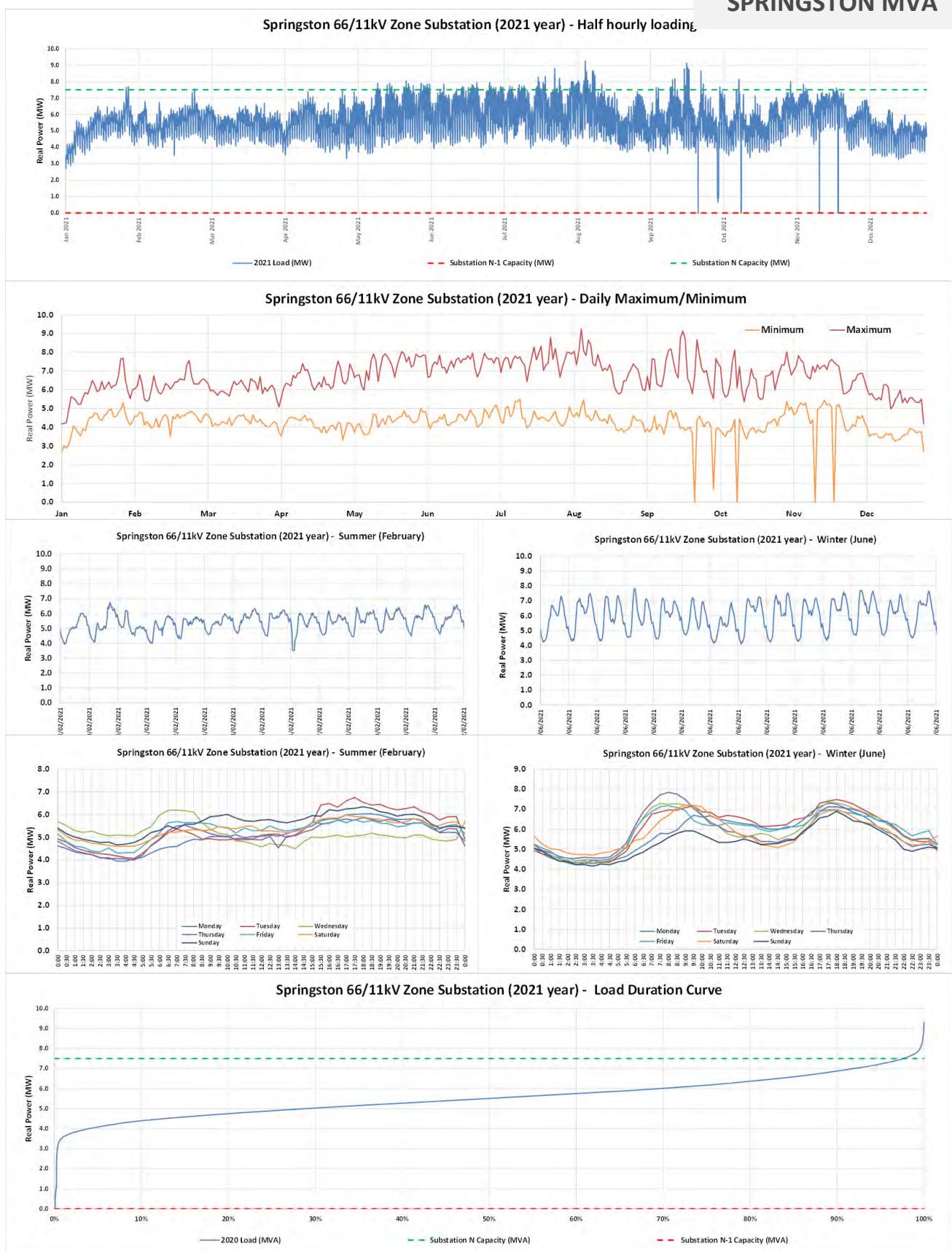
**SPRINGSTON MVA**


Figure 87 Springston 33/11kV zone substation: Apparent power (MVA) load characteristics

## TE PIRITA MVA

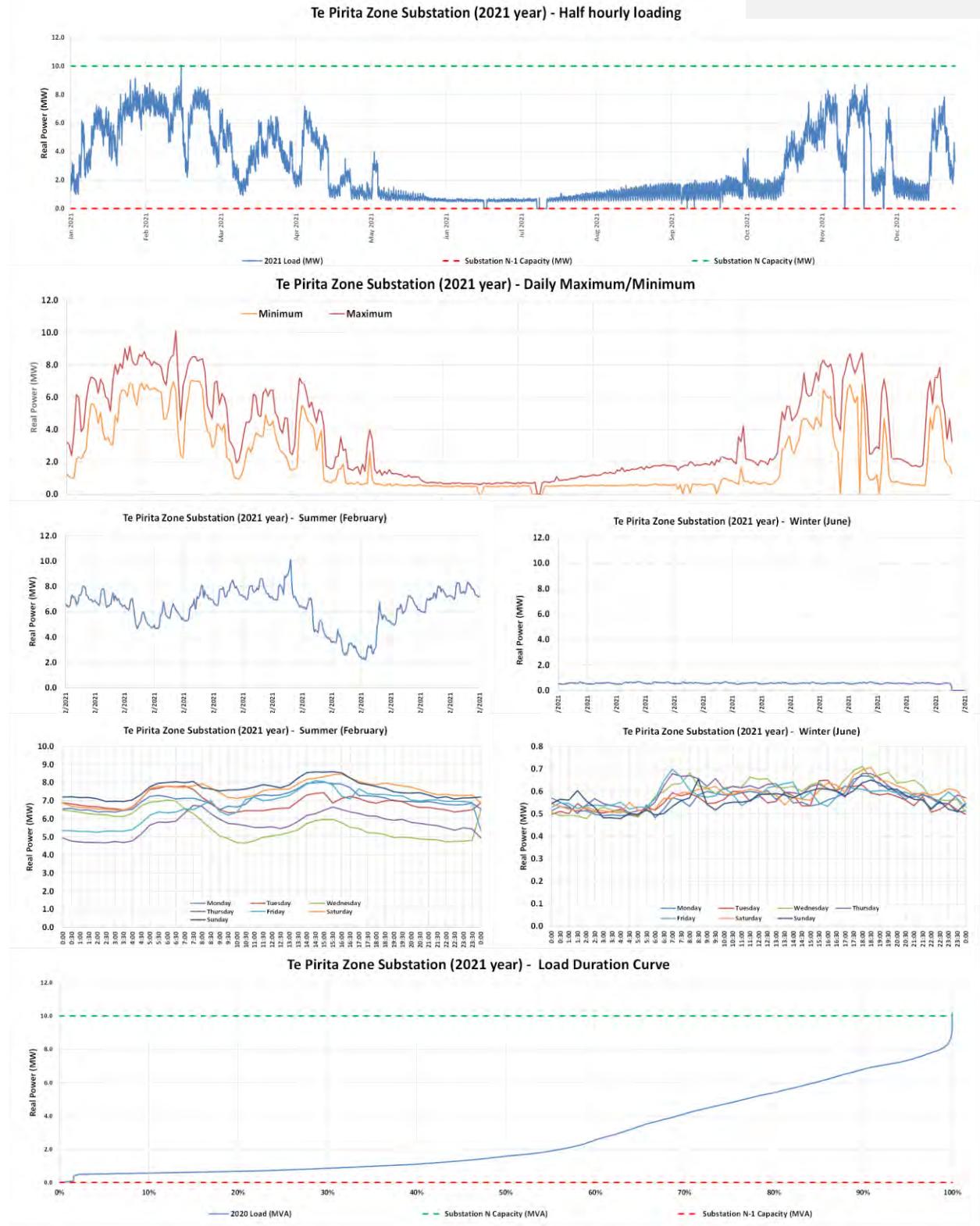


Figure 88 Te Pira 66/11kV zone substation: Apparent power (MVA) load characteristics

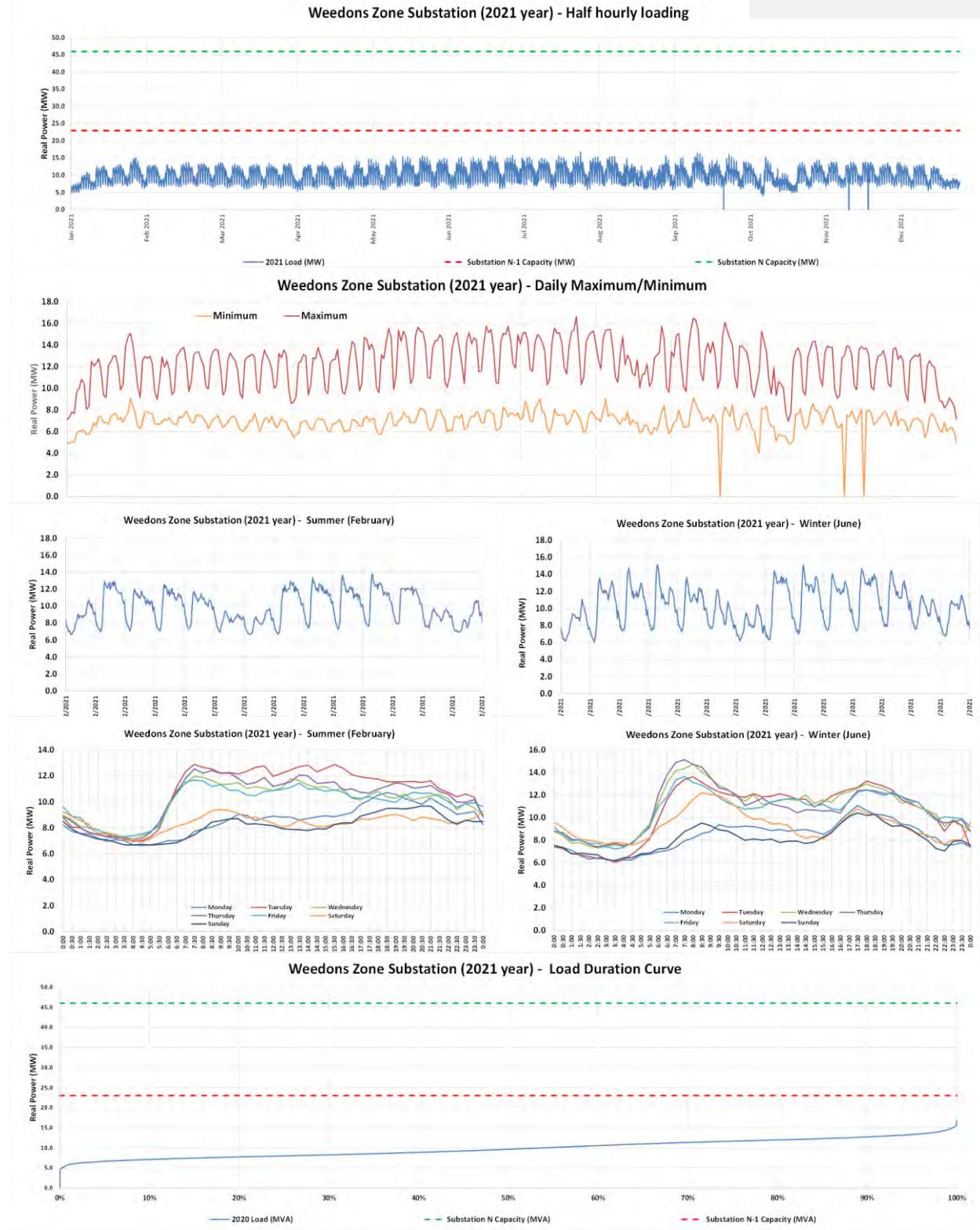
**WEEDONS MVA**


Figure 89 Weedons 66/11kV zone substation: Apparent power (MVA) load characteristics