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ELECTRICITY DISTRIBUTION

# Distribution System

## Capability Statement (2025-2027)

DELIVER

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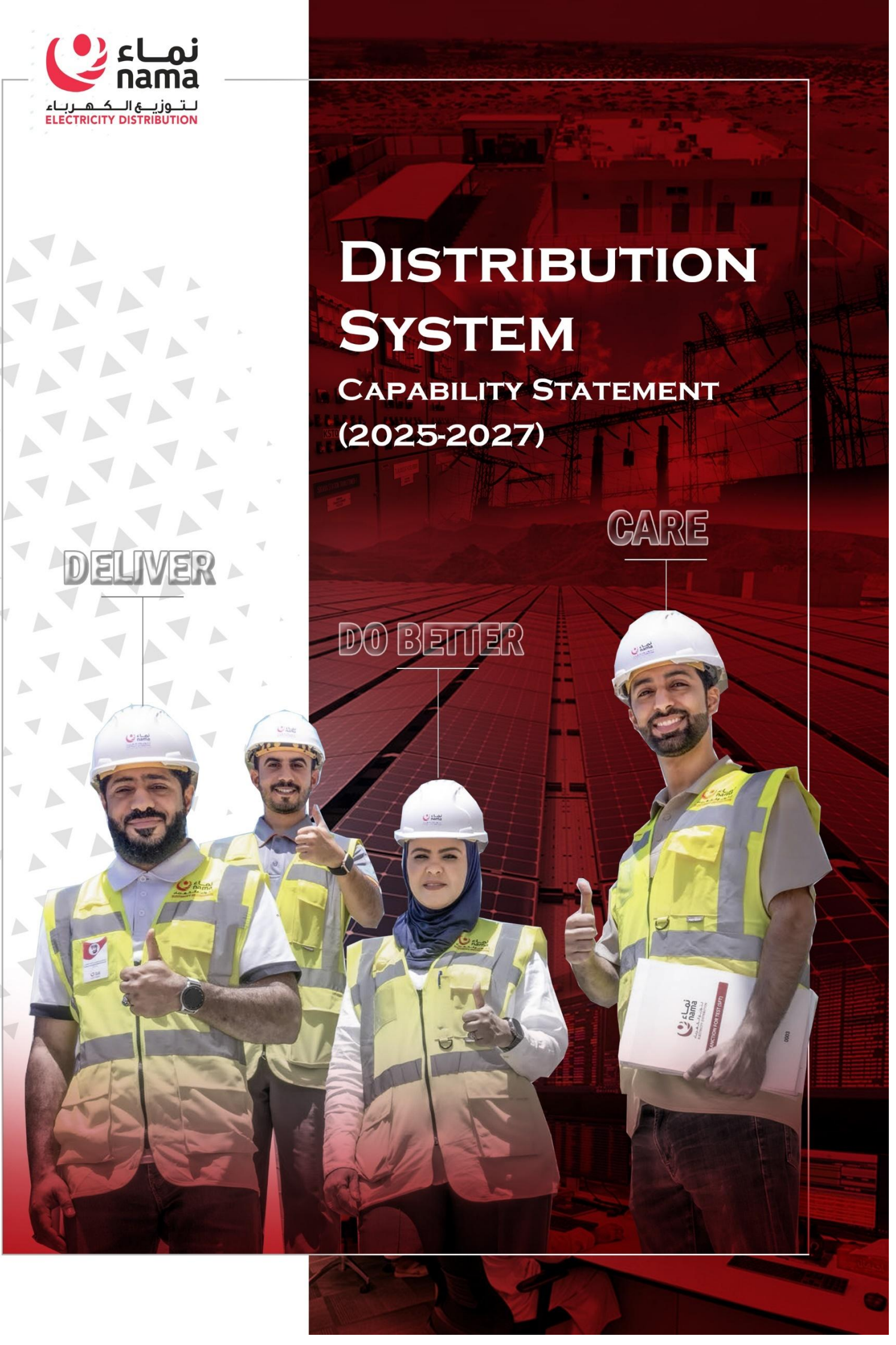

## PREFACE

This Distribution System Capability Statement (DSCS) is provided by Nama Electricity Distribution Company (NEDC) to fulfil its regulatory obligations under Condition number 33 of the NEDC Distribution Licence as well as the Oman Distribution Planning Code 4.4.

NEDC is distributing electricity to customers throughout the Sultanate of Oman excluding Dhofar Governorate as the owner and operator of its electricity distribution system originating from the 33kV busbars at 132/33kV grid substations owned by Oman Electricity Transmission Company down to the final customer's point of connection, which incorporates 33kV, 11kV and Low Voltage (LV) distribution system voltage levels and associated assets.

The aim of this DSCS is to provide an up-to-date distribution system capability for the next three years (2025-2027) along with data to enable customers in identifying parts of the system, which offer opportunities for future connections or upgrading of existing connections to the NEDC system and where constraints currently exist or potentially could exist in future.

In addition to the required data made available annually as part of DSCS; NEDC additionally has provided improved detailed system connectivity and additional technical data of assets, impact analysis of Cost Reflective Tariff (CRT) on NEDC customers and an overview of the technologies contributing to Oman's net zero target by 2050, particularly the increasing penetration of photovoltaic (PV) systems in the NEDC distribution network, which is gaining momentum in our licensed area. These additions are expected to provide customers and other stakeholders with a transparent understanding of NEDC distribution system and operational overview, sufficient technical parameters to undertake initial system capabilities assessment and the overall distribution system development.

NEDC have determined this three-year plan to clarify and highlight NEDC's key priorities over the DSCS planning period. The plan will form the basis for the company's investments to provide economic and efficient system development along with serving to inform NEDC's contributions to the Oman electricity sector and in turn aligning with the Oman Vision 2040 goals.

Eng. Ala Hassan Al Lawati

Chief Executive Officer

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## LIST OF ABBREVIATIONS

APSR Authority for Public Services Regulation (formerly known as AER - Authority for Electricity Regulation)

| | |
|---|---|
| CAGR | Compound Annual Growth Rate |
| CRT | Cost Reflective Tariff |
| DCC | Distribution Connection Code |
| DIgSILENT | Digital Simulation and Electrical Network calculation program |
| DNS | Demand Not Secured |
| DPC | Distribution Planning Code |
| DSCS | Distribution System Capability Statement |
| DSSS | Distribution System Security Standard |
| D&SL | Distribution & Supply Licence |
| DL | Distribution Licence |
| ETAP | Electrical Transient and Analysis Program |
| EV | Electrical Vehicles |
| GSS | Grid Substation |
| IEC | International Electro Technical Commission |
| NEDC | Nama Electricity Distribution Company |
| OES | Oman Electrical Standards |
| OETC | Oman Electricity Transmission Company |
| PCR-5 | Price Control Review-5 (2018-2021) |
| PCR-6 | Price Control Review-6 (2022-2025) |
| PSS | Primary Substation |
| PSS®SINCAL | Power System Simulator® Siemens Network Calculation |
| PV | Photovoltaic |
| SCADA | Supervisory Control and Data Acquisition |

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# 1. INTRODUCTION

## 1.1. Who We Are & What We Do

The electricity sector in the Sultanate of Oman has been extensively restructured following the law's implementation to regulate and privatize the electricity and related water sector ("**The Sector Law**"). Royal Decree 78/2004 promulgated the Law for the Regulation and Privatisation of the Electricity and Related Water Sector. Article 90 of the DL places an obligation on Distribution Companies to undertake financing, operation, maintenance, development, and expansion of the distribution system in a safe, economic and efficient manner and in accordance with the relevant performance and security standards.

In 2022 a direction has been taken to marge all Distribution Companies (excluding Dhofar Governorate). In June 2023 Nama Electricity Distribution Company (NEDC) has been established and it is under the umbrella of the Nama with an obligation to undertake financing, operation, maintenance, development, and expansion of the distribution system in a safe, economic and efficient manner.

The company offers a diverse and comprehensive portfolio of services aimed at ensuring the seamless operation, expansion, and maintenance of the electricity network, as well as delivering exceptional customer support. These services include strategic planning and the development of new electricity infrastructure to meet growing demand. The company facilitates connections for newly built properties to the grid and manages the integration of additional loads for existing properties to accommodate upgrades or increased energy requirements.

In line with supporting renewable energy adoption, the company processes applications for solar projects, ensuring compliance with technical and regulatory standards. It also handles various requests related to operational work on the electricity network, providing timely and effective solutions. Electrical design approvals are offered for new developments to ensure they align with safety and performance standards.

The company plays an active role in maintaining and upgrading customer infrastructure by conducting inspections, replacements, and relocations of electricity meters for existing properties. To enhance network reliability, it oversees both scheduled and emergency outage management, keeping customers informed of power disruptions and restoration timelines.

As part of its commitment to service quality, the company tests and certifies electrical technicians, issuing licenses to ensure a skilled workforce. It also manages a wide range of customer interactions by receiving and addressing requests, inquiries, and complaints related to network operations. Additionally, the company responds promptly to customer queries regarding electricity outages, ensuring transparent communication and support throughout the resolution process. The Figure 1 shows the authorized area for NEDC.

NEDC to achieve the above services, it set vision, mission and values which are:

- **Vision:** Nama Distribution company is a leading reference for electricity services excellence in the Region.
- **Mission:** Empower Oman through safe, reliable, sustainable, economic and customer focused electricity.
- **NEDC Value:** Care, Deliver and Do Better.

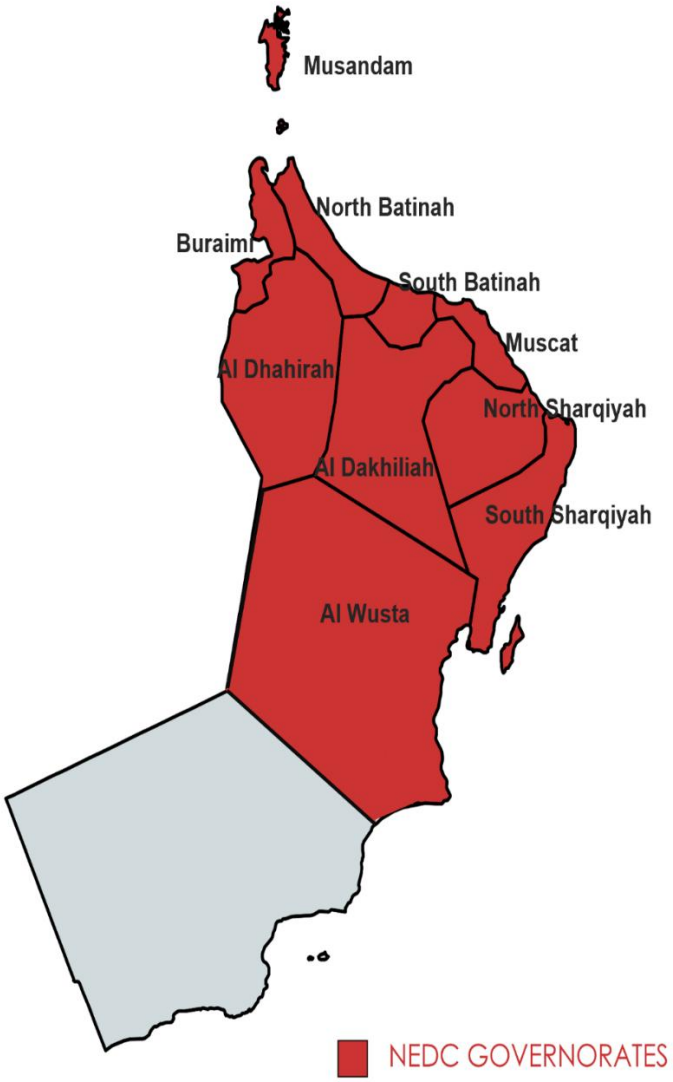


**Figure 1: NEDCs Licenses Area**

## 1.2. NEDC Key Statistical Data

The key statistical figures related to the existing electricity distribution network are enumerated in Table 1 below:

**Table 1: NEDC key statistical data**

| Asset Type | Overhead line (All voltage levels) | Underground Cable (All voltage levels) | Distribution Substation (11/0.415 kV) | Primary Substation (33/11 kV) | Grid Station (220/132/33 kV) | Customer Number | Licensed Area |
|---|---|---|---|---|---|---|---|
| **Unit** | **km** | **km** | **No.** | **No.** | **No.** | **No.** | **km2** |
| **Dakhiliah** | 7,533.39 | 6,252.43 | 7,270 | 93 | 9 | 154,839 | 31,900 |
| **North Sharqiyah** | 7,274.35 | 3,774.66 | 5,234 | 48 | 6 | 92,491 | 21,136 |
| **South Sharqiyah** | 3,758.60 | 3,548.26 | 3,080 | 48 | 4 | 93,512 | 12,000 |
| **South Batinah** | 6,815.93 | 9,502.81 | 8,088 | 78 | 14 | 200,528 | 3,500 |
| **Al Wusta** | 3,114.54 | 2,014.07 | 1,727 | 49 | 4 | 18,665 | 79,700 |
| **North Batinah** | 6,207.46 | 7,640.27 | 2,236 | 110 | 14 | 179,962 | 12,500 |
| **Muscat** | 2,537 | 13,670.90 | 9,183 | 186 | 39 | 458,542 | 3,500 |
| **Dhahirah** | 4,801.93 | 3,119.37 | 3,367 | 41 | 6 | 69,631 | 37,000 |
| **Musandam** | 725.49 | 1,135.34 | 791 | 17 | 3 | 17,192 | 1,800 |
| **Buraymi** | 2,255.42 | 1,694.74 | 2,090 | 28 | 5 | 42,417 | 7,000 |
| **NEDC Total** | **45,024.12** | **52,352.85** | **43,066.00** | **698** | **104** | **1,327,779** | **210,036** |

## 1.3. Purpose of Statement

The information in the Distribution System Capability Statement (DSCS) is published annually to fulfil NEDC regulatory obligation under Condition 33 of its Distribution Licence (DL) and Distribution planning code 4.4 of the Oman Distribution Code.

This DSCS is intended to provide an understanding of NEDC's 33kV, 11kV and LV distribution system along with presenting NEDC's development plans for the 33kV and 11kV distribution system for the years 2025-2026. This statement includes power system data for the primary substation loads, overhead lines, cable circuits, transformers, switchgear, and capacitors which forms the NEDC distribution system and used in the preparation of distribution system models for the power system studies. The results of load flow, short circuit studies and system technical losses are presented thereby providing an assessment of the capability of the distribution system.

Implementation of the system development plans is necessary to meet future forecast demand growth, maintain and/or improve the capability in the distribution system to meet the system growth and to address the issues of actual or forecast non-compliance with the Distribution System Security Standard (DSSS). Implementation of these plans will enhance the available system capacity as well as potentially

increase the number of 33/11.5kV primary substations (PSS) providing enhanced opportunities for new and increased customer connections.

The impact of NEDC's forecast demand growth and distribution system development plans on the Transmission System, which is owned and operated by Oman Electricity Transmission Company (OETC), has been fully assessed in the development of NEDC's development plans. Where appropriate 33kV load transfers from one 132/33kV grid substation (GSS) to another are feasible they have been considered and where this option is not feasible; applications for additional 132/33kV GSS capacity have been submitted to OETC, resulting in OETC plans to construct and build additional 132/33kV GSS capacity within the NEDC licence area.

### 1.4. Structure of this DSCS

The following summarises the structure of this Distribution System Capability Statement:

- **Chapter 1 - Introduction:** An overview of the NEDC area, the main function, and the statement's purpose. Moreover, it presents the key statistical data of NEDC to date.
- **Chapter 2 - Planning philosophy and Practices:** This chapter presents the governing standard that NEDC follows in planning, designing, operating, and maintaining the network. And it illustrates the asset characteristic, configuration, selection, and details of asset data.
- **Chapter 3 - Planning Drivers:** this chapter provides the overall distribution system connectivity in each governorate with future indications projects per wilayat.
- **Chapter 4 - NEDC Distribution System:** provides a summary view of the distribution system, together with details of the 2024 demand profile along with projected demand forecast, CRT impact analysis of NEDC system, system constraints, a summary of the required technical power system analysis of the distribution system. Furthermore, this chapter presents the power flow results for NEDC networks by listing the study methodology and data considered. In addition, it shows the technical losses percentage.
- **Chapter 5 - Challenges and Opportunities within the System:** This chapter presents the future Low Carbon technologies that going to affect directly in the power system such as PV solar systems, Electric vehicles, and the ambition plan of Oman for zero carbon.
- **Chapter 6 - Investment Plan:** The future projects, Network Suitability for New Connections and system constraints are presented in section Six.

# 2. PLANNING PHILOSOPHIES AND PRACTICES

## 2.1. Governing Standard

NEDC has an operating philosophy that underlies the development of the distribution system at the three-voltage level 33, 11, and 0.415 kV and potentially would introduce new 66kV system for some of rural areas that mandate long distribution network. Furthermore, it ensures that the whole distribution system satisfies the following fundamental design criteria throughout the planning period:

- Sector Law Royal Decree 78/2004: Enabling legislation that established the Oman Electricity and Water Sectors. Article 90 obligates Distribution Companies to finance, operate, maintain, develop and expand the Distribution System safely and under the relevant performance and security standards.
- NEDC's license conditions 4, 32, and 33.
- Distribution Code Version 1.1 (April 2020).
- Grid Code Version 3.0 (August 2020).
- Oman Electrical Standard (OES) and international standards.
- Distribution System Security Standard (APSR letter 2008).
- Connection Statement Version 1 (October 2006).
- Electrical Safety Rules.

Copies of the above standards and codes are available on APSR's website (https://apsr.om/en/home). Moreover, the distribution system must also be capable of being operated, maintained, repaired, extended and replaced as necessary during its life without exceeding design levels of risk to the customers it serves.

## 2.2. System Characteristic

NEDC designs its electricity distribution system based on several technical characteristics to fulfil the requirements of the regulations and standards. System fundamental characteristics are described below:

2.2.1 System Parameters: NEDC will ensure that the Distribution System complies with the following technical, design, and operational criteria concerning the Distribution System at the Connection Site with a Distribution System User. System parameters are briefed in the following Table 2:

**Table 2: System Parameter**

| No. | Parameter | Unit | Distribution System Voltage (KV) | | |
|---|---|---|---|---|---|
| | | | LV | 11 | 33 |
| 1 | Nominal Voltage | kV | 0.415 | 11 | 33 |
| 2 | Rated Frequency | Hz | 50 | 50 | 50 |
| 3 | Short Circuit Level | kA | 40 | 18.4[1] | 25[2] |
| 4 | Harmonic Level | % | 2.5 | 2 | 2 |
| 5 | Voltage fluctuations | % | 3 | 3 | 3 |

[1] There are different short circuit level 25 kA and 31.5 kA based on Substation design requirements.
[2] There are different short circuit level 31.5 kA based on Substation design requirements.

2.2.2 Voltage regulation: The voltage on the 33 kV and 11 kV sides of Distribution transformers at Connection Sites with Distribution System Users shall typically be controlled within limits $\pm 6\%$ of the nominal value.

**Table 3: Voltage Regulation**

| Nominal Voltage Level | Tolerance | |
|---|---|---|
| | +6% | -6% |
| 33kV | 34.98kV | 31.02kV |
| 11kV | 11.66kV | 10.34kV |
| 415V | 439.90V | 390.10V |
| 240V | 254.40V | 225.60V |

2.2.3 Frequency Deviation: During normal operating conditions, the nominal System Frequency of the Transmission and Distribution Systems will be 50.00 Hz and usually will be controlled by Oman Electricity Transmission Company (OETC) between 49.95Hz and 50.05Hz. During exceptional steady-state conditions, Frequency deviations will not exceed 49.90Hz to 50.10Hz unless disturbed circumstances prevail. Under disturbed conditions, System Frequency could rise transiently to 51.50 Hz or fall to 48.00 Hz.

2.2.4 Voltage Waveform Quality: The maximum total levels of harmonic distortion on the Distribution System at 33 kV and 11 kV, from all sources under both normal, planned outage and fault outage conditions, shall not exceed a total harmonic distortion of 2.0 % with no individual harmonics greater than 1.5 % unless abnormal conditions prevail. At LV, the maximum levels of harmonic distortion from all sources shall not exceed a total harmonic distortion of 2.5 %.

The maximum negative phase sequence component of the phase voltage on the Distribution System should remain below 1.0 % unless abnormal conditions prevail. A maximum value of 2.0 % is permitted for phase unbalance.

2.2.5 Voltage Fluctuation: Voltage fluctuations arising from fluctuating Demands Connected at a Connection Point to the Distribution System shall not exceed 1.0% of the voltage level for step changes that may occur repetitively. Any large voltage excursions other than step changes may be allowed up to a level of 3.0%, provided this does not constitute a risk to the Distribution System or any Distribution System User.

2.2.6 Distribution System Security Standard (DSSS): After the approval of Distribution System Security Standards in November 2008, as shown in Table 4 below, NEDC is obliged to comply with the Planning requirements of Security Standards. Since NEDC's Distribution License grant, NEDC has started planning its distribution network to comply with simple planning principles to supply its customers with high-quality products.

Table 4: Distribution System Security Standards DSSS

| Class | Demand Group | First Outage | Second Outage |
|---|---|---|---|
| **A** | Less than 2 MW | Repair Time | No Requirement |
| **B** | 2MW to 6MW | 3 Hours[3] | No Requirement |
| **C** | 6MW to 20MW | Within 15 minutes | Restoration time of planned outage |
| **D** | 20MW to 100MW | Immediately | Restoration time of planned outage |
| **E** | Greater than 100MW | Immediately | Immediately, 2/3 of demand |

According to the Security Class, a 33 kV feeder is considered not complying with the standards if, upon a fault on the feeder, the Demand Group cannot be supplied within the prescribed period. A portion of the feeder cannot be fed back, and the feeder is considered and classified as non-compliant.

For the 33/11 kV substations, two situations are of interest. In the first case, if two transformers are installed in a substation but the total load is greater than the capacity of one transformer, then the substation is considered non-compliant. The second situation is where only one transformer is installed, and there is no link to a nearby substation that can take the affected demand group, then the substation is considered non-compliant. It is worth mentioning that non-compliance is only during the summer period. For most of the year, many feeders and substations comply with the DSSS except the radial feeders, T-Offs, and substations with only one installed transformer. All investments in NEDC Network are to make all substations comply with DSSS.

## 2.3. System Configuration

2.3.1 33 kV system: The 33 kV System of NEDC serves a distribution role between the OETC and the 11 kV system as direct 132/11 kV transformation is also in use. The System consists mainly of 33 kV feeders, 33/11kV primary substations, and 33/0.415 kV transformers installed on some feeders where it is not feasible to develop an 11 kV network due to limited demand. The 33 kV feeders from the 132/33 kV grid stations supply the 33/11 kV primary substations.

Primary substations are of two types, namely indoor and outdoor. Indoor primary substations are mainly 2x10 MVA, 2x20 MVA and 3x20 MVA with 33 kV outdoor/indoor circuit breakers and 11 kV indoor switchgear panels. Indoor primary substations are proposed to be constructed during the coming years to supply highly growing areas. Outdoor primary substations are installed throughout the ten governorates of NEDC in urban and rural areas where demand usually is less than 6 MW. The regular

[3] For 11kV networks in remote areas this restoration time may be extended by the time it reasonably takes for a repair crew to reach the area with the outage as long as the total restoration time will not exceed 6 hours.

practice is to supply each primary substation with two 33 kV feeders; each feeder feeds one transformer and serves as an alternative supply for the whole substation if the other feeder fails.

Along with the 33 kV feeders, Tees are used to connect primary substations. The entire network is interconnected, except in a few situations where radial feeders without interconnections with other feeders feed primary substations. The number of 33/11 kV substations and transformers in the System up to September 2024 is shown in Table 5.

**Table 5: Number of 33/11 kV transformers**

| Power Transformer Size | Governorate | | | | | | | | | | NEDC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Muscat** | **Dhakliyah** | **Dhahirah** | **Wusta** | **North Sharqiyah** | **South Batinah** | **South Sharqiyah** | **North Batinah** | **Buraymi** | **Musandam** | |
| 1 MVA | 1 | | 2 | 4 | | | 2 | | 1 | 5 | **15** |
| 2 MVA | | | | 1 | | | | | | 1 | **2** |
| 3 MVA | 7 | 7 | | 16 | 8 | 1 | 2 | 6 | 2 | 7 | **56** |
| 5 MVA | 4 | | 10 | | | | | | | | **14** |
| 6 MVA | 49 | 81 | 29 | 21 | 61 | 61 | 40 | 50 | 18 | 7 | **417** |
| 10 MVA | 10 | 8 | 11 | 12 | 2 | 3 | 9 | 13 | 5 | 4 | **77** |
| 15 MVA | | | | 1 | | | | | | | **1** |
| 16 MVA | 16 | | | | | | | | | | **16** |
| 20 MVA | 331 | 98 | 37 | 28 | 32 | 86 | 44 | 157 | 24 | 8 | **845** |
| 31.5 MVA | 2 | | | | | | | | | | **2** |
| 40 MVA | | | | 1 | | | | | | | **1** |
| **Total** | **420** | **194** | **89** | **84** | **103** | **151** | **97** | **226** | **50** | **32** | **1446** |

The 33 kV indoor switchgear is a single bus bar, totally enclosed metal-clad type with withdrawable circuit breakers or metal-clad SF6 insulated with vacuum or SF6 circuit breakers. 11 kV and 33 kV current ratings of the bays are shown in Table 6.

**Table 6: Current Ratings of Bus Bar, Bus-section, Transformer, and Feeder Bays**

| Rating[4] | 11 kV at Primary Substations | 33 kV |
|---|---|---|
| Bus-bar | 2000 A | 2000A |
| Bus-Section | 1200 A | 1200A |
| Transformer | 1200 A | 600A |
| Feeder | 400 A | 600A |

Most of NEDC's primary substations are standard two transformers with two separate 33 kV and 11 kV busbars. In some cases where demand is much less than the capacity of two transformers, which is expected in remote rural areas, primary substations with only one 33/11 kV transformer are installed. The 33 kV network is designed and will be developed to meet its customer's satisfaction and comply with the Distribution System Security Standards (DSSS).

[4] There are special cases where the thermal rating may vary.

2.3.2 11 kV System: The main purpose of the 11 kV systems is to distribute electricity into and around local urban and rural areas in an economical, efficient, safe and secure manner while meeting customers' needs. The general design principle for configuring the distribution system is based on primary substations, indoor and outdoor, with mainly two transformers and 11 kV busbars, providing a continuous firm 11 kV supply.

The 11 kV feeders from the 33/11 kV indoor and outdoor primary substations are overhead lines or underground cable feeding the distribution transformers. 11 kV circuit breakers are provided at all indoor primary substations, whereas 11 kV Auto-Reclosers are provided at the outdoor primary substations. Regular practice is usual when connecting feeders from the same primary substation or different primary substations through Ring Main Units (RMU), Air Break Switches (ABS), and Open Jumpers.

These 11 kV feeders are generally operated as radial feeders, with the open point selected for ease of operational access to minimize customer minutes lost while considering the need to meet security requirements and reduce system losses and voltage drops.

Distribution substations are of two types, ground-mounted and pole-mounted. One transformer with a rated capacity of 500 kVA or higher is commonly used for ground-mounted distribution substations, whereas those transformers with ratings less than 500 kVA are installed on H-Pole structures. Both substations are fed directly from the 11 kV feeders with jumpers (Pole-Mounted) or through 11 kV cables (Ground-Mounted). Expulsion fuses protect both substations on the high voltage side, and HRC fuses on the low-tension side. However, Ground-mounted transformers connected through HFU are protected by HRC fuses of 125 A, 63 A and 31.5 A for 2000 kVA, 1000 kVA & 500 kVA, respectively.

NEDC has already started implementing two smaller ratings, 25 and 50 kVA, to minimize transformer losses arising from higher ratings for loads far away less than the capacity of the transformer. The number of distribution substations in the system up to September 2024 is shown in the below table.

Table 7: Number of distribution transformers

| Distribution Transformer Size | Governorate | | | | | | | | | | NEDC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Muscat** | **Dhakliyah** | **Dhahirah** | **Wusta** | **North Sharqiyah** | **South Batinah** | **South Sharqiyah** | **North Batinah** | **Buraymi** | **Musandam** | |
| 16 KVA | 2 | | | 1 | | | | | | | 1 |
| 25 KVA | 2 | 59 | 3 | 1 | 23 | 7 | 7 | | | | 38 |
| 50 KVA | 20 | 135 | 42 | 5 | 426 | 86 | 129 | 94 | 44 | 4 | 788 |
| 100 KVA | 569 | 2395 | 1340 | 764 | 2128 | 1386 | 779 | 1499 | 808 | 218 | 7582 |
| 200 KVA | 241 | 492 | 315 | 129 | 458 | 745 | 229 | 641 | 205 | 87 | 2494 |
| 250 KVA | 8 | | | | | | | | | | 0 |
| 315 KVA | 503 | 1588 | 943 | 121 | 937 | 1398 | 526 | 2281 | 295 | 44 | 5602 |
| 500 KVA | 1174 | 949 | 321 | 352 | 644 | 2464 | 552 | 853 | 264 | 330 | 5459 |
| 630 KVA | 1 | 1 | | 3 | | | | | | | 3 |
| 750 KVA | 2 | | | 2 | | | | | | | 2 |
| 800 KVA | 3 | 1 | 11 | | 1 | | | | | | 1 |
| 1000 KVA | 7557 | 1683 | 802 | 400 | 660 | 2163 | 800 | 1755 | 632 | 221 | 6631 |
| 1250 KVA | 17 | | | 4 | | 4 | | | | 2 | 10 |
| 1500 KVA | 18 | | | 1 | 2 | | | 21 | | 4 | 28 |
| 1600 KVA | 222 | 10 | 1 | 1 | | 5 | 1 | 13 | | | 20 |
| 2000 KVA | 1929 | 76 | 4 | 39 | 19 | 152 | 107 | 182 | 1 | 3 | 503 |
| 2500 KVA | 35 | | | 3 | | | | 6 | 3 | | 12 |
| **NEDC Total** | **12303** | **7389** | **3782** | **1826** | **5298** | **8410** | **3130** | **7345** | **2252** | **913** | **29174** |

2.3.3 Low Voltage System: The main purpose of the LV distribution system is to distribute electricity in local urban or rural areas and deliver it to customers' LV entry points in an economical, efficient, safe and secure manner. The LV system will generally be developed as a network of taped radial mains supplied from a distribution substation near the load Centre.

NEDC's low-tension network is designed and will be developed to meet its customer's satisfaction and comply with the approved Distribution System Security Standards.

2.3.4 Small Scale Grid Connected Solar PV Systems: The minimum technical specifications and connection methodologies for installation of small-scale grid connected Solar PV systems within Oman are specified in the Technical and Connection Guidelines published by APSR in May 2017; these shall be adhered by PV system installers and users for PV system installations. Furthermore, other national & international standards, network codes, and other specific technical requirements of NEDC may apply to solar PV generating plants and therefore shall be complied with.

2.3.5 Electric Vehicles (EV) Charging Technical Requirements: In July 2023, APSR published the EV Charging Technical Requirements Guidelines. The guidelines include the required technical specifications and connection methodologies for installation of EV charging within Oman. NEDC is in process of setting up the code of practice and the policy to be followed for EV applications.

## 2.4. Selection of Asset

The choice of network assets suitable to connect a specific demand is subject to many factors, including the following:

- Geographical location.
- Size and nature of the demand.
- Available network voltage level within the vicinity of the demand area.
- Spread of demand distribution (load density).

Based on NEDC technical specifications, standards, and regulations, the size and rating of network assets have been determined and can be summarized network common assets as per below Table 8:

**Table 8: Standard Substation Size and Rating**

| Voltage Level (kV) | Equipment | Size/Type |
|---|---|---|
| 33 | Over Headline ACSR Conductor | 200 Sq.mm (panther) |
| | Under Ground XLPE Insulated Copper Cable | 3C X 300 Sq.mm |
| | Power Transformer | 20 MVA |
| | | 16 MVA |
| | | 10 MVA |
| | | 6 MVA |
| | | 5 MVA |
| | | 3 MVA |
| | | 1 MVA |
| | Switchgear | SF6 GIS |
| | | AIS |

| Voltage Level (kV) | Equipment | Size/Type |
|---|---|---|
| 11 | Over Headline ACSR Conductor | 150 Sq.mm (wolf) |
| | | 100 Sq.mm (dog) |
| | Under Ground XLPE Insulated Copper Cable | 3C X 240 Sq.mm |
| | | 3C X 185 Sq.mm |
| | Distribution Transformer | 2000 KVA |
| | | 1000 KVA |
| | | 500 kVA |
| | | 315 kVA |
| | | 200 kVA |
| | | 100 kVA |
| | | 50 kVA |
| | | 25 kVA |
| | Switchgear | Oil RMU |
| | | SF6 RMU |
| 0.415 | Over Headline XLPE Covered Aluminium Conductor | 120 Sq.mm |
| | | 70 Sq.mm |
| | Under Ground XLPE Insulated Copper Cable | 4C X 240 Sq.mm |
| | | 4C X 185 Sq.mm |
| | | 4C X 120 Sq.mm |

### 2.5. Details Asset Data

NEDC detailed assets list and evolution in Appendixes B.1, B.2, B.3, B.4 and B.5, while the below link presents the geographical maps of the 10 governorates under NEDC service area showing the locations of Interface points with OETC, NEDC primary substations, 11 kV feeders, and distribution transformers.

Geographical map link:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/index.html?id=dfb78b59fc294e3082ed3c213ee360e4[5]

[5] The Username and password to be provided upon request.

# 3. PLANNING DRIVERS

## 3.1. Background

NEDC's electricity distribution system serves around 1,327,779 customers as per end of September 2024 cover Muscat, South Batinah, Dakhiliah, North Al Sharqiyah, South Al Sharqiyah, Al Wusta, North Batinah, Musandam, Al Buraymi and Al Dhahirah Governorates. The characteristics of the distribution system within the NEDC licence areas differ mainly because of three major parameters:

1. The load density.
2. The type and usage pattern of the customer.
3. The majority type of feeder circuits (i.e., overhead, or underground).

The 2024 maximum demand recorded for NEDC MIS system was 7,326.6 MW[6] (on Thursday – 26th June 2024 at 14:43 Hrs) and Musandam Area was 100.87 MW[7] on Sunday 23rd June 2024 at 13:16. For Al Wusta Area the Non-coincident peak was 137.33 MW.

As of 2024 peak period, the total existing number of 132/33kV grid substations is 104, 33/11.5kV primary substations connected to the NEDC distribution system is 698 with a Total Firm Capacity of 11,400.5 MVA. The tables identifying each Primary Substation capacity and current demand can be found in Appendix B.

The sections remaining from this chapter provide the following:

1. A summary of the individual Governorate built up and the planning drivers for each Governorate.
2. It also provides an overview of the complete current NEDC system connectivity including governorate classification of the primary substation.

[6] MIS Transmission peak excluding of transmission technical losses and Grid Stations auxiliary load
[7] Including 7 MW of isolated Madha load

## 3.2. Muscat Governorate

The Muscat Governorate includes Wilayat Muscat, Muttrah, Amerat, Quriyat, Bousher and Seeb. The number of customers served in the Muscat Governorate region is 458,542 which is approximately 35% of the total customer population within NEDC. **Error! Reference source not found.** shows all existing primary substations with their installed and firm capacity within Muscat Governorate.

### 3.2.1. Wilayat Muscat

Wilayat Muscat is considered as one of the saturated areas within Muscat Governorate except Yitti Area. The Yitti Tourism Development is one of the major projects. Moreover, the plan is to construct two numbers of PSSs; one is in energization stage, and the other one is in the planning Stage.

### 3.2.2. Wilayat Muttrah

Wilayat Muttrah has circa zero growth for the last two years. There is one potential project for Mutrah Development as bulk load customer, and it is still within the planning stage.

### 3.2.3. Wilayat Amerat

Amerat has seen the highest demand growth for the last 5 years within Muscat Governorate validating for a significant demand growth forecasted for the current planning horizon.

### 3.2.4. Wilayat Quriyat

Quriyat has an average of 2.6% load growth for the next three years and there is no major project in the area.

### 3.2.5. Wilayat Bousher

Bousher Height Smart City is one of the biggest projects in Wilayat Bousher. As load demand the area has low growth with an average of 2.1%.

### 3.2.6. Wilayat Seeb

Seeb has experienced increasing demand over the past five years within Muscat Governorate specially Mabelah area. Moreover, Mabelah area is one of the largest commercial and residential areas. Adding the new development for Sultan Haitham City.

**Table 9: Muscat Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Falaj[G23] GSS** | | | |
| Falaj | P178 | 2 x 16 | 16 |
| Darsait | P018 | 2 x 20 | 20 |
| Mutrah Store | P085 | 2 x 20 | 20 |
| Jibrooh | P041 | 3 x 20 | 40 |
| Sea Port | P086 | 2 x 6 | 6 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| P.D.O | P144 | 3 x 20 | 40 |
| **Mutrah[G21] GSS** | | | |
| C.B.D | P173 | 2x10 and 1x16 | 20 |
| Ruwi Office | P108 | 2 x 20 | 20 |
| Bait Al Falaj | P142 | 3 x 20 | 40 |
| Riyam | P099 | 2 x 20 | 20 |
| **Wadi Al Kabir[G19] - A GSS** | | | |
| M.B.D South | P075 | 2 x 20 | 20 |
| Qasr Al Alam | P090 | 2 x 20 | 20 |
| Waljah | P130 | 2 x 20 | 20 |
| Sidab | P119 | 2 x 6 | 6 |
| Wadi Al Kabir Workshop | P126 | 2 x 6 | 6 |
| Wadi Al Kabir Housing | P127 | 1 x 6 | - |
| Ali Shihani | P125 | 2 x 20 | 20 |
| Majlis Oman | P066 | 2 x 20 | 20 |
| **Wadi Al Kabir[G19] - B GSS** | | | |
| Ruwi Valley | P174 | 2 x 20 | 20 |
| Ruwi Market | P076 | 2 x 20 | 20 |
| Old Airport | P107 | 2 x 20 | 20 |
| Wadi Al Kabir Height | P128 | 2 x 20 | 20 |
| **Wadi Adai[G22] GSS** | | | |
| Amerat 1 | P005 | 2 x 16 | 16 |
| Al Bustan Palace | P017 | 2 x 16 | 16 |
| Al Hamryah | P035 | 2 x 20 | 20 |
| Wadi Adai | P175 | 2 x 20 | 20 |
| Wattaya | P131 | 2 x 20 | 20 |
| Khoula Hospital | P132 | 3 x 20 | 40 |
| Al Mahaj | P136 | 2 x 6 | 6 |
| **Jahloot[G03] GSS** | | | |
| Sawaqim 1 | P112 | 2 x 6 | 6 |
| Sawaqim 2 | P113 | 1 x 6 | 0 |
| Tunis Heium | P137 | 1 x 6 | 0 |
| Jahloot | P040 | 2 x 6 | 6 |
| Siya | P120 | 2 x 6 | 6 |
| Barr Al Jissah | P044 | 2 x 20 | 20 |
| Amerat Jahlut [Al Masarat] | P068 | 2 x 10 | 10 |
| Al Hajir | P031 | 2 x 20 | 20 |
| Wadi Al Mayh | P129 | 1 x 3 | 0 |
| Hussan Yiti | P169 | 2 x 6 | 6 |
| ROP Al Saleel | P162 | 2 x 6 | 6 |
| Al Atkiya | P182 | 1 x 6 | 0 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Water Pumping | P193 | 2 x 6 | 6 |
| Arqi | P121 | 1 x 3 | 0 |
| **Yiti[G08] GSS** | | | |
| Al Khairan | P045 | 1 x 6 + 1 x 3 | 3 |
| Yenket | P133 | 1 x 1 + 1 x 3 | 1 |
| Saraya Bander | P145 | 3 x 20 | 40 |
| Jabal Al Sifah | P159 | 3 x 20 | 40 |
| Yiti | P134 | 2 x 3 | 3 |
| Muscat Yankit | P199 | 1 x 6 | 0 |
| Al Salam Yiti | P135 | 1 x 6 | 0 |
| **Quriyat[G05] GSS** | | | |
| Quriyat | P091 | 2 x 20 | 20 |
| Al Shahbari | P092 | 2 x 20 | 20 |
| Dhagmar 1 | P021 | 4 x 6 | 18 |
| Debah | P114 | 1 x 6 | 0 |
| Dhabab | P019 | 2 x 6 | 6 |
| Hail Al Ghaf | P036 | 2 x 6 | 6 |
| Al Mazara | P074 | 2 x 6 | 6 |
| Wadi Al Arbyeen | P124 | 1 x 6 | 0 |
| Street Light | P020 | 1 x 6 | 0 |
| RoyalCamp | P170 | 1 x 3 | - |
| **Amerat[G10] - A GSS** | | | |
| Post Office | P150 | 3 x 20 | 40 |
| Amerat Heights | P152 | 3 x 20 | 40 |
| Amerat 3 | P179 | 3 x 20 | 40 |
| **Amerat[G10] - B GSS** | | | |
| Al Nahdah | P006 | 3 x 20 | 40 |
| Seih Dhabi | P118 | 2 x 20 | 20 |
| Madinat Al Nahdah | P065 | 2 x 20 | 20 |
| Al Jufaina | P194 | 1 x 6 | 0 |
| Amerat Amerat [Amerat 4] | P180 | 3 x 20 | 40 |
| **Ghubrah 2[G09] GSS** | | | |
| Azaibah North 2 | P012 | 2 x 20 | 20 |
| Ghubrah North 2 | P149 | 3 x 20 | 40 |
| Ghubrah North 1 | P023 | 3 x 20 | 40 |
| Diplomatic City | P022 | 3 x 20 | 40 |
| Ghubrah GPS | P166 | 2 x 16 | 16 |
| **MSQ[GP06] - A GSS** | | | |
| Al Khuwair North | P054 | 3 x 20 | 40 |
| MSQ Grid | GP06 | 2 x 20 | 20 |
| Royal Office | P097 | 2 x 20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Intercontinental | P109 | 2 x 20 | 20 |
| Information City 2 | P038 | 1 x 5 | - |
| Sarooj -Shati Al Qurum | P110 | 2 x 20 | 20 |
| **MSQ[GP06] - B GSS** | | | |
| Al Khuwair 25 | P053 | 2 x 20 | 20 |
| Al Khuwair School | P146 | 3 x 20 | 40 |
| MSQ 1 | P083 | 2 x 20 | 20 |
| ROP -Shati Al Qurum | P111 | 2 x 20 | 20 |
| Digital TV Studio | P039 | 2 x 20 | 20 |
| **Qurum[G06] GSS** | | | |
| Information City 1 | P037 | 2 x 20 | 20 |
| Qurum 1 | P093 | 2 x 20 | 20 |
| Qurum 2 | P094 | 2 x 20 | 20 |
| Lulai | P095 | 2 x 20 | 20 |
| MSQ 2 | P155 | 3 x 20 | 40 |
| Rabiat Al Qurum | P096 | 2 x 20 | 20 |
| **Bousher [GP02] - A GSS** | | | |
| Bousher Grid | GP02 | 2 x 20 | 20 |
| Al Khuwair South | P052 | 3 x 20 | 40 |
| Al Khuwair 17/1 | P050 | 2 x 20 | 20 |
| **Bousher [GP02] - B GSS** | | | |
| Azaibah North 1 | P011 | 2 x 20 | 20 |
| Bousher 2 | P163 | 3 x 20 | 40 |
| Holiday Inn | P051 | 3 x 20 | 40 |
| Al Muna | P084 | 2 x 20 | 20 |
| Tilal Al Khuwair | P055 | 3 x 20 | 40 |
| **Ghala Heights[G24] -A GSS** | | | |
| Al Ansab 1 | P007 | 2 x 20 | 20 |
| Azaibah South 1-A | P014 | 2 x 20 | 20 |
| Ghubrah South 1 | P026 | 3 x 20 | 40 |
| **Ghala Heights[G24] -B GSS** | | | |
| Mall Of Oman | P171 | 3 x 20 | 40 |
| Azaibah South 1-B | P147 | 3 x 20 | 40 |
| Royal Hospital | P024 | 3 x 20 | 40 |
| **Ghala[G11] - A GSS** | | | |
| ROP Hospital | P172 | 3 x 20 | 40 |
| Oman Exhibition | P165 | 3 x 20 | 40 |
| Ghala 1 | P015 | 3 x 20 | 40 |
| MOD Al Ansab | P167 | 2 x 10 | 10 |
| Al Ansab STP | P009 | 2 x 20 | 20 |
| **Ghala[G11] - B GSS** | | | |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Ghala 2 | P156 | 3 x 20 | 40 |
| Al Ansab 2 | P008 | 2 x 20 | 20 |
| **Airport Heights [G01] - A GSS** | | | |
| Airport Height 2 | P002 | 2 x 20 | 20 |
| Airport Height 1 | P001 | 2 x 20 | 20 |
| Airport Height 5 | P151 | 2 x 20 | 20 |
| MOD Technical College | P081 | 2 x 20 | 20 |
| Airport Height 3 | P003 | 2 x 20 | 20 |
| Airport Height 4 | P004 | 2 x 20 | 20 |
| **Airport Heights [G01] - B GSS** | | | |
| Azaibah North 3 | P013 | 3 x 20 | 40 |
| Seeb Airport Heights | P195 | 2 x 20 | 20 |
| **Rusail Industry[G13]-A GSS** | | | |
| SQU 1 | P122 | 3 x 16 | 32 |
| SQU 2 | P123 | 2 x 16 | 16 |
| Rusail Industrial 1 | P103 | 2 x 16 | 16 |
| Rusail Industrial 2 | P104 | 2 x 20 | 20 |
| Al Jifnain | P042 | 1 x 6 | 0 |
| Al Jifnain 2 | P196 | 1 x 6 | 0 |
| Seeb Muaskar Murtafiah [AFH] | P204 | 2 x 20 | 20 |
| Cement Housing | P088 | 2 x 5 | 5 |
| **Rusail Industry[G13]-B GSS** | | | |
| Rusail Industrial 3 | P105 | 2 x 20 | 20 |
| Rusail Housing | P056 | 2 x 20 | 20 |
| Rusail08(KOM) | P164 | 3 x 20 | 40 |
| ROP Al Khoudh | P161 | 2 x 20 | 20 |
| Rusail Private Factory | P106 | 2 x 20 | 20 |
| Rusail Industrial 4 | P158 | 3 x 20 | 40 |
| SQU 3 | P160 | 3 x 20 | 40 |
| **Misfah[G04] GSS** | | | |
| Al Misfah | P080 | 3 x 20 | 40 |
| Al Awabi | P139 | 3 x 20 | 40 |
| Orpic | P192 | 2 x 6 | 6 |
| Cement Factory 1 | P079 | 2 x 31.5 + 3x20 | 91.5 |
| **Barka[G02] GSS** | | | |
| Manomah | P067 | 2 x 20 | 20 |
| **Mabelah [GP04] GSS** | | | |
| Mabelah Grid | GP04 | 2 x 20 | 20 |
| Sur Al Hadid | P116 | 3 x 20 | 40 |
| Botanic Garden | P016 | 2 x 20 | 20 |
| ROP Dog Kennel | P183 | 2 x 6 | 6 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Mabelah STP | P140 | 2 x 10 | 10 |
| **Al'Salam [G12] - A GSS** | | | |
| Mabelah C | P064 | 3 x 20 | 40 |
| Mabelah South PH-4 | P062 | 3 x 20 | 40 |
| PalmMall | P168 | 3 x 20 | 40 |
| **Al'Salam [G12] - B GSS** | | | |
| Mabelah Shabiya | P060 | 3 x 20 | 40 |
| Seeb Mabelah South [PH-6] | P185 | 3 x 20 | 40 |
| Seeb Mabelah South [Pumping] | P198 | 2 x 20 | 20 |
| Seeb Mabelah South | P061 | 3 x 20 | 40 |
| **Mabelah Industrial[G26] - A GSS** | | | |
| Old Mabelah | P059 | 2 x 20 | 20 |
| Palace Communication | P033 | 1 x 6 | 0 |
| RGO Halban Camp | P034 | 1 x 5 | 0 |
| Mabelah South 9 | P184 | 3 x 20 | 40 |
| **Mabelah Industrial[G26] - B GSS** | | | |
| Mabelah South PH-8 | P157 | 3 x 20 | 40 |
| Mabelah South PH-7 | P141 | 3 x 20 | 40 |
| Mabelah A | P063 | 3 x 20 | 40 |
| **Seeb [GP08] - A GSS** | | | |
| Al Khoudh Shabiya [A] | P046 | 3x20 | 40 |
| Wadi Bahayis (RGO) | P098 | 2 x 20 | 20 |
| Wadi Al Aresh | P115 | 2 x 20 | 20 |
| Wadi Al Lawami | P117 | 3 x 20 | 40 |
| **Seeb [GP08] - B GSS** | | | |
| Seeb Grid | GP08 | 2 x 20 | 20 |
| Sultan School | P029 | 2 x 20 | 20 |
| Al Hail South 2 | P153 | 3 x 20 | 40 |
| New Al Khoudh | P047 | 2 x 20 | 20 |
| Boulevard Mall | P186 | 3 x 20 | 40 |
| **Mawaleh South [GP05] - A GSS** | | | |
| Al Hail North 2 | P028 | 2 x 20 | 20 |
| Mawaleh South Grid | GP05 | 2 x 20 | 20 |
| Mawaleh C | P072 | 2 x 20 | 20 |
| Rusail B | P101 | 2 x 10 | 10 |
| Royal Flight | P100 | 2 x 20 | 20 |
| **Mawaleh South [GP05] - B GSS** | | | |
| Mawaleh B | P071 | 3 x 20 | 40 |
| Al Khoudh PH-6 | P049 | 2 x 20 | 20 |
| Al Hail South 1 | P030 | 2 x 20 | 20 |
| Seeb Muaskar Murtafiah [MOD] | P203 | 3 x 20 | 40 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Mawaleh South 5 | P148 | 3 x 20 | 40 |
| **Al Khoudh[G25]- A GSS** | | | |
| Mawaleh A | P070 | 3 x 20 | 40 |
| Al Khoudh PH-3 | P048 | 2 x 20 | 20 |
| Seeb Muaskar Murtafiah [Al Bander] | P197 | 3 x 20 | 40 |
| Seeb Khoudh [Al Khoudh Shabiya (B)] | P187 | 2 x 20 | 20 |
| **Al Khoudh[G25]- B GSS** | | | |
| Al Khoudh PH-7 | P154 | 3 x 20 | 40 |
| **Mawaleh North [GP01] GSS** | | | |
| Al Hail North 1 | P027 | 3 x 20 | 40 |
| Mawaleh North | P069 | 3x20 | 40 |
| Mawaleh North Grid | GP01 | 3 x 20 | 40 |
| City Centre | P073 | 2 x 20 | 20 |
| **Dhagmar [GP11] GSS** | It is 132/11 kV Grid Station. So, no PSS is connected in this Grid. | | |

### 3.3. South Al Batinah Governorate

South Batinah Governorate and Suawiq Area includes Barka, Musanah, Nakhal, Rustaq, Wadi Mawel, and Awabi. The number of customers served in South Batinah Governorate is 200,528. There are 14 Grid stations (132/33 & 220/33 kV), 78 primary substations (33/11 kV) are feeding the South Al Batinah governorate. Barka area has the largest growth among other areas in South Batinah governorate and there are many NEDC Investments in the area to cover the need of load demand. One of the major projects is new primary substation in Khazaen Economic City which is part of Oman Vision 2020-2040.The below table provides a list of primary substations in the South Al Batinah Governorate and Suawiq Area. Table 10 shows all existing primary substations with their installed and firm capacity within South Al Batinah Governorate.

**Table 10 : South Al Batinah Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Rustaq Grid** | | | |
| Dahas | DAHASP01B | 2x20 | 20 |
| Hazim | HAZIMP01B | 2x20 | 20 |
| Hoqain | HOQAINP01B | 2x6 | 6 |
| Iraqi | IRAQIP01B | 2x20 | 20 |
| Kahaf | KAHAFP01B | 2x6 | 6 |
| Maksofah | MAKSOFAHP01B | 2x6 | 6 |
| Marji | MARJIP01B | 2x6 | 6 |
| Musanah Air Base-2 | MSNABASEP02B | 1x3 | 0 |
| Rustaq Grid | RSQGRIDP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Rustaq Hospital | RSQHSPTLP01B | 2x6 | 6 |
| Rustaq Ind. | RSQINDP01B | 2x6 | 6 |
| Rustaq Roual Camp | RSQRCAMPP01B | 1x6 | 0 |
| Rustaq | RUSTAQP01B | 2x20 | 20 |
| Tabaqah | TABAQAHP01B | 1x6 | 0 |
| Tawi Bado | TAWIBADOP01B | 1x6 | 0 |
| Tikhah | TIKHAHP01B | 2x6 | 6 |
| Wadi Sahtan | WDISAHTNP01B | 2x6 | 6 |
| Wishayl | WISHAYLP01B | 2x20 | 20 |
| Rustaq Al Bashair | RSQBSHIRP01B | 2x20 | 20 |
| **Wadi Bani Auf Grid** | | | |
| Awabi | AWABIP01B | 2x20 | 20 |
| Kasfah | KASFAHP01B | 2x20 | 20 |
| Wadi Bani Awf | WDIBAWFP01B | 2x20 | 20 |
| Wadi Bani  Kharous | WDIBKROSP01B | 2x6 | 6 |
| **Nakhal Grid** | | | |
| Abyad | ABYADP01B | 3x6 | 12 |
| Afi | AFIP01B | 2x20 | 20 |
| Halban | HALBANP01B | 1x6 | 0 |
| Modern Poultry Farms | MODERNPFP01B | 2x6 | 6 |
| Nakhal | NAKHALP01B | 2x20 | 20 |
| Khazaen PSS | KHAZAENP02B | 3x6 | 12 |
| Subaikha Temp | SUBAIKHAP01B | 1x6 | 0 |
| Taww | TAWWP01B | 2x6 | 6 |
| TurKi | TURKIP01B | 1x6 | 0 |
| Tuwayah | TUWAYAHP01B | 1x6 | 0 |
| Wadi Mstal | WDIMSTALP01B | 2x6 | 6 |
| Wadi Maawil ROP | WDIMLROPP01B | 2x6 | 6 |
| **Barka Grid** | | | |
| Aman Camp | AMANCAMPP01B | 2x20 | 20 |
| Filayj Village PSS | FLAYJVLGP01B | 1x6 | 0 |
| Filayj Ind Area-1 Temp | FLAYJINDP01B | 1x6 | 0 |
| Filayj Ind Area-2 Temp | FLAYJINDP02B | 1x6 | 0 |
| German University | GERMNUNIP01B | 2x20 | 20 |
| Madeena Logistics | MDENALOGP01B | 1x6 | 0 |
| Rumays | RUMAYSP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Rumays Tmp | RUMAYSP01B | 1x6 | 0 |
| Sandan | SANDANP01B | 3x6 | 12 |
| Shakakit | SHAKAKITP01B | 3x20 | 40 |
| Sultan Special Force | SSFORCEP01B | 2x6 | 6 |
| **Barka-3 PS** | | | |
| Barka IWP 1 | BARIWPP01B | 2x20 | 20 |
| Barka IWP 2 | BARIWPP02B | 2x20 | 20 |
| Barka-5 IWP | BARIWPP03B | 2x20 | 20 |
| Hay Asim Temp | N/A | 1x6 | 0 |
| **Madinat Barka-A** | | | |
| Barka Town | BARTOWNP01B | 3x20 | 40 |
| Salahah | SALAHAHP01B | 2x20 | 20 |
| Saqsuq | SAQSUQP01B | 3x20 | 40 |
| Sumhan North | SUMHANNRP01B | 2x20 | 20 |
| **Madinat Barka-B** | | | |
| Aqir | AQIRP01B | 2x20 | 20 |
| Atyab Bakery | ATYBBKRYP01B | 2x6 | 6 |
| Haram | HARAMP01B | 3x20 | 40 |
| Khuwyrat | KHUWYRATP01B | 3x20 | 40 |
| Sumhan South | SUMHANSUP01B | 2x20 | 20 |
| **MIS** | | | |
| Hatheeb | HATHEEBP01B | 2x20 | 20 |
| Khabah | KHABAHP01B | 3x20 | 40 |
| Said Bin Sultan Naval Base | SBSNBASEP01B | 2x20 | 20 |
| Tharmad Temp-1 | THARMADP02B | 2x6 | 6 |
| Tharmad Temp-2 | THARMADP03B | 1x6 | 0 |
| Widam Sahil | WDMSAHILP01B | 2x10 | 10 |
| Widam Sahil Temp | WDMSAHILP02B | 1x6 | 0 |
| **Muladah-A** | | | |
| Musanaah Air Base | MSNABASEP01B | 2x10 | 10 |
| Musanaah Ind Area | MSNINDP01B | 2x20 | 20 |
| Muladah | MULADAHP01B | 3x20 | 40 |
| Musanaah | MUSANAHP01B | 2x20 | 20 |
| Saih Muladah | SIHMLDHP01B | 1x6 | 0 |
| Sport City | SPRTCITYP01B | 2x20 | 20 |
| Tharmad | THARMADP01B | 1x6 + 1x10 | 6 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Muladah-B** | | | |
| Maghsar South | MAGHSRSUP01B | 2x6 | 6 |
| Maharah | MAHARAHP01B | 3x20 | 40 |
| Uwayd | UWAYDP01B | 3x20 | 40 |
| Jamma Temp | JAMMAP02B | 1x6 | 0 |
| AL Hazam Water | HZMPUMPSP01B | 2x6 | 6 |
| **Blue City** | | | |
| Barka New | BARNEWP01B | 2x20 | 20 |
| Barka Sahil | BARSAHILP01B | 3x20 | 40 |
| Billah | BILLAHP01B | 2x20 | 20 |
| Billah Wadi | BILAHWDIP01B | 1x6 | 0 |
| Blue City | BLUECITYP01B | 2x6 | 6 |
| Hay Sharq Temp | HAYSHARQP02B | 1x6 | 0 |
| Hufri | HUFRIP01B | 2x20 | 20 |
| Musanaah Sahil | MSNSAHILP01B | 3x20 | 40 |

### 3.4. Al Dakhiliah Governorate

Al Dakhiliah Governorate includes Sumail, Izki, Nizwa, Bahla, BidBid, Manah, Hamra, Jabal Akhader and Adam. The number of customers served in the Al Dakhiliah Governorate region is 154,839. There are 9[8] Grid stations (132/33 & 220/33 kV) and 93 primary substations (33/11 kV) are feeding the governorate. Table 11 below provides list of primary substations in Al Dakhiliah Governorate.

**Table 11: Al Dakhiliah Governorate- Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Adam Grid** | | | |
| Adam Grid | ADMGRIDP01B | 2x20 | 20 |
| Zoubar | ZOUBARP01B | 2x20 | 20 |
| Adam Air Base | ADMABASEP01B | 2x10 | 10 |
| Adam Bashair | ADMBSHIRP01B | 2x6 | 6 |
| Mitan | MITANP01B | 2x6 | 6 |
| **Bahla Grid** | | | |
| Bahla Grid | BHLGRIDP01B | 2x20 | 20 |
| Bilad Sayt | BLADSAYTP01B | 2x6 | 6 |

[8] The GSS counted as number in Muscat Governorate

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Hamra | HAMRAP01B | 2x20 | 20 |
| Hamra 2 | HAMRAP02B | 3x20 | 40 |
| Tanuf | TANUFP01B | 2x6 | 6 |
| Mamorah | MAMORAHP01B | 2x20 | 20 |
| Buwaydah | BUWAYDAHP01B | 2x6 | 6 |
| Sint | SINTP01B | 2x3 | 3 |
| **Jabrin Grid** | | | |
| Bidoou | BIDOOUP01B | 2x20 | 20 |
| Bisya | BISYAP01B | 2x6 | 6 |
| Ghafat | GHAFATP01B | 2x20 | 20 |
| Habbi | HABBIP01B | 2x20 | 20 |
| Jabrin | JABRINP01B | 2x20 | 20 |
| New Bahla | NEWBHLP01B | 2x20 | 20 |
| Wadi Qurayat | WDIQRYATP01B | 2x20 | 20 |
| ROP Academy 2 | ROPACDMYP02B | 2x20 | 20 |
| Saih Shamakhat | SIHSHMKTP01B | 1x3 | 0 |
| ROP College | ROPCOLEGP01B | 3x20 | 40 |
| **Nizwa Grid** | | | |
| Farq | FARQP01B | 3x20 | 40 |
| Hisn Shmoukh | HSNSHMUKP01B | 3x20 | 40 |
| Izz | IZZP01B | 2x20 | 20 |
| Hay Al Tourath | HAYTRATHP01B | 2x20 | 20 |
| Karsha | KARSHAP01B | 3x6 | 12 |
| Maara Temp | MAARAP01B | 1x6 | 0 |
| Mamad | MAMADP01B | 1x6 | 0 |
| Manah | MANAHP01B | 2x20 | 20 |
| Oman Across Age Museum | OMAAMUSMP01B | 2x20 | 20 |
| Oman Across Age Museum Temp | OMAAMUSMP02B | 1x6 | 0 |
| Nizwa Grid | NZWGRIDP01B | 2x20 | 20 |
| Nizwa Ind Area | NZWINDP01B | 2x20 | 20 |
| Nizwa RDC Temp | NZWRDCP02B | 1x3 | 0 |
| Nizwa Stadium | NZWSTDUMP01B | 3x6 | 12 |
| Nizwa University 2 | NZWUNIP02B | 2x20 | 20 |
| ROP Academy | ROPACDMYP01B | 3x6 | 12 |
| ROP Cadet Academy Temp | ROPCADETP02B | 1x6 | 0 |
| Taymsa | TAYMSAP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Madinat Nizwa Grid** | | | |
| Kamah | KAMAHP01B | 2x20 | 20 |
| Marfa Daris | MRFADARSP01B | 3x6 | 12 |
| Hay Ayn | HAYAYNP01B | 3x6 | 12 |
| Madinat Nizwa | MDINTNZWP01B | 3x20 | 40 |
| Nizwa Town | NZWTOWNP01B | 2x20 | 20 |
| **Izki Grid** | | | |
| Afiyah | AFIYAHP01B | 2x20 | 20 |
| Birkat Mawz | BRKTMAWZP01B | 2x6 | 6 |
| Birkat Mawz 2 | BRKTMAWZP02B | 2x20 | 20 |
| Humaydah | HUMAYDAHP01B | 3x6 | 12 |
| Izki Grid | IZKGRIDP01B | 2x20 | 20 |
| Jabal Akhdar | JBLAKDARP01B | 2x6 | 6 |
| Jabal Akhdar 2 | JBLAKDARP02B | 2x20 | 20 |
| Nizwa ROP | NZWROPP01B | 2x6 | 6 |
| Nizwa University | NZWUNIP01B | 3x6 | 12 |
| Wadi Maydin | WDIMAYDNP01B | 1x6 | 0 |
| Sayma | SAYMAP01B | 2x6 | 6 |
| Sumrah | SUMRAHP01B | 3X6 | 12 |
| Wadi Mahram | WDIMAHRMP01B | 2x6 | 6 |
| Wusad | WUSADP01B | 2x6 | 6 |
| **New Izki Grid** | | | |
| Aqil | AQILP01B | 2x6 | 6 |
| Izki Heights | IZKHIGHTP01B | 3x20 | 40 |
| MOD Shafa | MODSHAFAP01B | 1x20 | 0 |
| Qalat Awamir | QLTAWAMRP01B | 2x20 | 20 |
| **Samail A Grid** | | | |
| Heel | HEELP01B | 3x20 | 40 |
| Hub Water Pump | HUBWPUMPP01B | 2x6 | 6 |
| Samail | SAMAILP01B | 3x20 | 40 |
| Jaylah | JAYLAHP01B | 1x6 | 0 |
| Manal Water Pump | MANALWPP01B | 2x6 | 6 |
| Saih Rasiyat | SIHRASYTP01B | 1x3 | 0 |
| **Samail B Grid** | | | |
| Bidbid | BIDBIDP01B | 2x6 | 6 |
| Central Prison | CNTPRSONP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Fanja Water Pump | FANJAWPP01B | 3x6 | 12 |
| Fayha | FAYHAP01B | 2x6 | 6 |
| Hassas | HASSASP01B | 2x20 | 20 |
| Hassas 2 | HASSASP02B | 2x6 | 6 |
| Khubar | KHUBARP01B | 3x6 | 12 |
| MOD Bidbid | MODBIDP01B | 1x6 | 0 |
| Multaqa Crusher Temp | MULCRSHRP01B | 1x3 | 0 |
| Fanja | FANJAP01B | 2x20 | 20 |
| OMPC | OMPCP01B | 2x20 | 20 |
| Saih Maydin | SIHMAYDNP01B | 2x20 | 20 |
| Sumail Ind Zone 1 | SMLINDP01B | 3x20 | 40 |
| Sumail Ind Zone 2 | SMLINDP02B | 2x20 | 20 |
| Stadly Temp | STADLYP01B | 1x6 | 0 |
| Surur | SURURP01B | 2x6 | 6 |
| Wadi Saygani | WDISYGNIP01B | 3x6 | 12 |
| Hub Water Pump 2 | NEWAINP01B | 2x10 | 10 |
| Fanja Water Pump 2 (New Hamem) | NEWHAMEMP01B | 2x20 | 20 |
| Ain Water Pump | NEWHOUBP01B | 2x10 | 10 |
| **Rusail Ind Grid[9]** | | | |
| Fanja 2 | FANJAP02B | 2x20 | 20 |
| Saih Ahmer | SIHAHMERP01B | 2x6 | 6 |

## 3.5. North Al Sharqiyah Governorate

The North Al Sharqiyah Governorate includes Mudhaibi, Ibra, Dima Wa Taiyyin, Wadi Bani Khalid, Qabil and Bidiyah. The number of customers served in the North Al Sharqiyah Governorate region is 92,491. There are 6 Grid Station (132/33 & 220/33 kV) and 48 primary substations (33/11 kV) are feeding the governorate. Table 12 below provides a list of primary substations in North Al Sharqiyah Governorate.

**Table 12 :North Al Sharqiyah Areas – Power Plant, Grid, PDO and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Samad Grid** | | | |
| Samad | SAMADP01B | 2x20 | 20 |
| Samad 2 | SAMADP02B | 2x20 | 20 |
| Khadra Bani Dafaa 2 | KDRABDFAP02B | 2x20 | 20 |

[9] The GSS counted as number in Muscat Governorate

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Mudhaibi Grid** | | | |
| Aflaj | AFLAJP01B | 3x6 | 12 |
| Hadeetha | - | 3x6 | 12 |
| Khadra Bani Dafaa | KDRABDFAP01B | 3x6 | 12 |
| Khashbah | KHASHBAHP01B | 3x6 | 12 |
| Lizq | LIZQP01B | 3x6 | 12 |
| Mudhaibi Grid | MDBGRIDP01B | 2x20 | 20 |
| Saih Al Nama | SIHNAMAP01B | 2x20 | 20 |
| Mudhaibi Royal Camp PSS | MDBRCAMPP01B | 1x3 | 0 |
| **Sinaw Grid** | | | |
| Jaza | JAZAP01B | 3x3 | 6 |
| Quwayaah | QUWAYAAHP01B | 2x6 | 6 |
| Sinaw | SINAWP01B | 2x20 | 20 |
| Sinaw 2 | SINAWP02B | 2x20 | 20 |
| Sinaw 3 | SINAWP03B | 3x20 | 40 |
| Uyun | UYUNP01B | 3x6 | 12 |
| Zain Poultry Farms | ZAINPFP01B | 1x6 | 0 |
| **Mudhairib Grid** | | | |
| Dhabahah | DHABAHAHP01B | 1x6 | 6 |
| MOD Ibra | MODIBAP01B | 1x6 | 0 |
| Feshgah | FESHGAHP01B | 1x6 + 1x3 | 3 |
| Masrun 2 | MASRUNP02B | 2x6 | 6 |
| Hayal | HAYALP01B | 2x6 | 6 |
| Ibra ROP | IBAROPP01B | 2x6 | 6 |
| Ibra Hospital | IBAHSPTLP01B | 2x10 | 10 |
| Maghsar | MAGHSARP01B | 2x3 | 3 |
| Masrun | MASRUNP01B | 2x6 | 6 |
| Mudhairib Grid | MDRBGRIDP01B | 2x20 | 20 |
| Shanah | SHANAHP01B | 1x3 | 0 |
| Sooqah | SOOQAHP01B | 2x6 | 6 |
| Wadi Nam | WDINAMP01B | 3x6 | 12 |
| **Ibra Grid** | | | |
| Ghayadah | GHAYADAHP01B | 3x6 | 12 |
| Ghubbrat Tam | GBRATTAMP01B | 2x6 | 6 |
| Hajer | HAJERP01B | 2x6 | 6 |
| Haymah | HAYMAHP01B | 2x6 | 6 |
| Ibra 1 | IBRAP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Ibra 2 | IBRAP02B | 2x20 | 20 |
| Khanadiq | KHANADIQP01B | 2x6 | 6 |
| Sharqiya University | SHARQUNIP01B | 2x6 | 6 |
| Wadi Tayin | WDITAYINP01B | 2x20 | 20 |
| Yahmadi | YAHMADIP01B | 2x6 | 6 |
| Yahmadi 2 | YAHMADIP02B | 2x20 | 20 |
| **Bidiyah Grid** | | | |
| Liwariyah | LIWARIYHP01B | 2x6 | 6 |
| Mintrib | MINTRIBP01B | 3x20 | 40 |
| Shariq | SHARIQP01B | 2x20 | 20 |
| Tawi Salim | TWISALIMP01B | 2x6 | 6 |
| Wasil | WASILP01B | 2x6 | 6 |
| Wadi Bani Khalid | WDIBKHLDP01B | 3x6 | 12 |

### 3.6. South Al Sharqiyah Governorate

The South Al Sharqiyah Governorate includes Sur, Jalan Bani Bu Hassan, Kamil wa Wafi, Musirh and Jalan Bani Bu Ali. The number of customers served in the North Al Sharqiyah Governorate region is 93,512. There are 4 Grid Station (132/33 & 220/33 kV) and 48 primary substations (33/11 kV) are feeding the governorate. Jalan Bani Bu Ali and Jalan Bani Bu Hassan areas have the highest growth in the governorate, two 2x20 MVA primary substations are in commission stage and two 3x20 MVA primary substation are in design & survey stage. Table 13 provides a list of existing primary substations in South Al Sharqiyah Governorate.

**Table 13:South Al Sharqiyah Areas – Power Plant, Grid, PDO and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Sur Grid** | | | |
| Ayjah | AYJAHP01B | 3x6 | 12 |
| Filayj Water Pump | FILAYJWPP01B | 2x6 | 6 |
| Hay Sharooq | HAYSHROQP01B | 2x10 | 10 |
| Jenah | JENAHP01B | 2x10 | 10 |
| MOD Sur | MODSURP01B | 1x6 | 0 |
| Musfayyah | MUSFAYAHP01B | 3x20 | 40 |
| Qalhat | QALHATP01B | 1x6 | 0 |
| Qawda | QAWDAP01B | 1x1 | 0 |
| Shariya | SHARIYAP01B | 2x20 | 20 |
| Sur Filayj | SURFLAYJP01B | 1x6 + 1x6 | 6 |
| Sur Grid | SURGRIDP01B | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Sur Ind Area | SURINDP01B | 2x20 | 20 |
| Sur IWP | SURIWPP01B | 2x20 | 20 |
| Sur IWP 2 | SURIWPP02B | 2x20 | 20 |
| Sur ROP | SURROPP01B | 3x6 | 12 |
| Tiwi | TIWIP01B | 2x6 | 6 |
| **Ayjah Grid** | | | |
| Ayjah Heights | AYJHIGHTP01B | 2x20 | 20 |
| Ras Had | RASHADP01B | 2x6 | 6 |
| Shamah | SHAMAHP01B | 1x1 | 0 |
| Shiyaa | SHIYAAP01B | 1x6 | 0 |
| Skaykrah | SKAYKRAHP01B | 3x20 | 40 |
| Sur Hospital | SURHSPTLP01B | 2x10 | 10 |
| Sur Stadium | SURSTDUMP01B | 2x20 | 20 |
| Sur Town | SURTOWNP01B | 2x20 | 20 |
| TV Heights | TVHEIGHTP01B | 2x6 | 6 |
| Diar Ras Had | DIRASHADP01B | 2x20 | 20 |
| **JBB Ali Grid** | | | |
| Ashkharah | ASHKHARHP01B | 2x20 | 20 |
| Asilah IWP | ASILAIWPP01B | 2x20 | 20 |
| Asilah IWP Temp | ASILAIWPP02B | 2x6 | 6 |
| BBC | BBCP01B | 1x10 | 0 |
| JBB Ali Grid | JBAGRIDP01B | 2x20 | 20 |
| JBB Ali Royal Camp | JBARCAMPP01B | 1x3 | 0 |
| JBB Ali | JBBALIP01B | 3x20 | 40 |
| JBB Ali 2 Temp | JBBALIP11B | 2x6 | 6 |
| Qarhah Temp | QARHAHP01B | 1x6 | 0 |
| Ras Had Airport | RASHADAPP01B | 2x10 | 10 |
| Rumaylah | RUMAYLAHP01B | 1x6 | 0 |
| Saih Ramath | SIHRAMTHP01B | 3x6 | 12 |
| Saih Ula | SIHULAP01B | 3x20 | 40 |
| Wadi Batha Temp | WDIBATHAP01B | 1x3 | 0 |
| Wadi Sal | WDISALP01B | 3x6 | 12 |
| **JBB Hassan Grid** | | | |
| JBB Hassan | JBBHASANP01B | 2x20 | 20 |
| Hadri Bilad | HDRIBLADP01B | 2x6 | 6 |
| JBB Hassan 2 | JBBHASANP02B | 3x20 | 40 |
| Kamil | KAMILP01B | 3x20 | 40 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| Kamil Water Pump | KAMILWPP01B | 2x6 | 6 |
| Tawi Aishah | TWIAISHAP01B | 2x6 + 1x6 | 12 |
| Wafi Temp | WAFIP11B | 2x6 | 6 |

### 3.7. AL Wusta Governorate and Surrounding Areas.

The Al Wusta Governorate and its Surrounding areas are supplied with power from various sources, including PDO, Diesel Power Plants, and Marafiq. These power sources serve the entire Al Wusta Governorate as well as the rural areas in Al Dhahirah and South Sharqiyah Governorates. However, those systems are scattered through areas isolated from each other with long-distance separation, with limited or no interconnection between them. The total number of customer services in these areas amounts to approximately 18,665. Table 14 shows all existing primary substations with their installed and firm capacity within Al Wusta Governorate.

**Table 14 : AL Wusta Governorate and Surrounding Areas – Power Plant, Grid, PDO and Primary Substations Connectivity**

| PSS | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|
| **Duqum Grid-Duqm North Switching Station (DNSS1)** | | |
| Duqum Old Powerhouse | 1x 6 | 0 |
| Duqum Town 1 | 2X20 | 20 |
| Duqum Town 2 | 2X20 | 20 |
| Duqum Beach | 2X20 | 20 |
| Duqum South | 3X10 | 20 |
| Duqum Port 1 | 2X20 | 20 |
| Duqum Frontier Town | 2X20 | 20 |
| Duqum Port 2(CQPS) | 2X20 | 20 |
| **Duqum Grid-Duqm North Switching Station (DNSS1)-Duqm South PSS** | | |
| Duqum Airport | 2X10 | 10 |
| **Duqum Grid-Duqm North Switching Station (DNSS1)-Duqum Port 1 PSS** | | |
| Duqum Dry Dock | 1X40+1x15 | 15 |
| **Duqum Grid-Duqm Switching Station (DSS2)** | | |
| Duqum PSS | 1x6 | 0 |
| Duqum Fishery (Ind 5) | 2x6 | 6 |
| Duqum IND1 (DILIC) | 2x20 | 20 |
| Duqum IND 2 (KARWA PS) | 3X20 | 40 |
| Duqum IND 3 | 2x20 | 20 |
| **Duqum Grid-Duqm Switching Station (DSS2)- Duqum IND 2 PSS** | | |
| Duqum IND 4 | 3X20 | 40 |
| **Duqum Grid-Duqm Switching Station (DSS2)- Duqum IND 4-Duqum Gantry SS** | | |

| PSS | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|
| GALONI/AJAIZ | 2x3 | 3 |
| Dahar PSS | 2X3 | 3 |
| **Duqm Grid-Duqm Switching Station (DSS2)- Duqum IND 4-Duqum Gantry SS-Dahar PSS** | | |
| Rasmadraka PSS | 2x3 | 3 |
| **Masirah Power Plant** | | |
| Dawwah primary Station | 3X6 | 12 |
| Al Nahdah Primary Substation | 2 X 10 | 10 |
| Ras Hilf Primary Substation | 2 X 10 | 10 |
| MOD Primary Substation | 2 X 20 | 20 |
| **Mahout Grid** | | |
| New Jouba | 2x6 | 6 |
| Hijj | 2x6 | 6 |
| New Hijj PSS | 2x6 | 6 |
| Mahout Ind | 1x6 | 0 |
| Mudairah | 2x6 | 6 |
| Najdah | 2x3 | 3 |
| Khaloof | 2x3 | 3 |
| Dhafrat | 2x3 | 3 |
| **NUHAIDAH PDO** | | |
| Nuhaidah | 2x3 | 3 |
| A waifiah | 2x3 | 3 |
| Al Orf | 2x1 | 1 |
| **NATIH PDO** | | |
| HAMRA AL DRO | 2x10 | 10 |
| ZUBRA | 1x1 | 0 |
| **YIBAL PDO** | | |
| AL ROB'A AL KHAL | 2x10 | 10 |
| **GNS RACK PDO** | | |
| GHABET AL HAQF | 1x3 | 0 |
| **BURHAN PDO** | | |
| BURHAN | 1x1 | 0 |
| **KAUTHER PDO** | | |
| AL ZAHIAH | 1x1 | 0 |
| **Ghaba North** | | |
| BUTHAILA | 1x1 | 0 |
| **Hima Grid (Suwaihat PDO 132/33)** | | |

| PSS | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|
| New Sahma bus 1 | 2x20 | 20 |
| Sahma SS buss F 1 | 2x6 | 6 |
| Haima Bus 1 | 3x10 | 20 |
| Haima ROB Bus 1 | 2x20 | 20 |
| MOD bus 1 | 1x6 | 0 |
| **Ghafteen PDO (Sayyala switch rack) Tapping Point** | | |
| Ghafteen | 1x3 | 0 |
| **Saih Nihayda PDO-Qara Alam** | | |
| Al Zamaim | 1x3 | 0 |
| **BAHJA PDO** | | |
| MOD | 1x6 | 0 |
| **Ghobrah North PDO** | | |
| Ghobrah North | 1x3 | 0 |
| **Runib P-SS-PDO** | | |
| Goubrah South | 1x2 | 0 |
| **Al-khadrah Power Plant** | | |
| Lakhbi load | 2x6 | 6 |
| AL Khadra 11KV load | 5x12 | 8 |

### 3.8. Al Buraymi Governorate

Al Buraymi Governorate includes Wilayat Al Buraymi, Mahadah and Sunaynah. The number of customers served in Al Buraymi Governorate region is 42,417 which is approximately 3% of the total customer population within NEDC. There are 5 Grid Station (132/33 kV), and 28 primary substations (33/11 kV) are feeding the governorate. Table 15 provides a list of existing primary substations in AL Buraymi Governorate.

**Table 15 : Al Buraymi Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **Buraimi_A GSS** | | | |
| AL KHADRA B6 01 | KDRB01 | 2x20 | 20 |
| AL BURAIMI 01 | BRMI01 | 2x20 | 20 |
| HAMASSA 01 | HMSA01 | 2x20 | 20 |
| SA'ARA AL JADIDA 02 | SARJ02 | 2x20 | 20 |
| **Buraymi_B Tx1 & Tx2 GSS** | | | |
| AL KHDRAH AL JADIDA 01 | KDRJ01 | 2x20 | 20 |
| AL KHDRAH AL JADIDA 02 | KDRJ02 | 2x20 | 20 |
| MAHDAH 04 | MHDA04 | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| MAHDAH 03 | MHDA03 | 1x6 | 0 |
| AL BURAIMI IND. EST 01 | BRIE01 | 2x6 | 6 |
| AL BURAIMI IND. EST 02 | BRIE02 | 2x20 | 20 |
| **Buraymi_B Tx3 & Tx4 GSS** | | | |
| ARDH JAW 01 | ARJW01 | 2x20 | 20 |
| HAY AL-NAFAHAT 01 | HNFT01 | 2x20 | 20 |
| SA'ARA AL JADIDA 01 | SARJ01 | 2x20 | 20 |
| AL ZAROUB 02 | ZRUB02 | 2x6 | 6 |
| **MAHDAH GSS** | | | |
| AL AFRADH 01 | AFRD01 | 2x6 | 6 |
| AL RABI 01 | RABI01 | 2x6 | 6 |
| AL JUWAIF 01 | JWIF01 | 1x3 | 0 |
| AL KHADRA 01 | KDRA01 | 1x3 | 0 |
| AL MADAM 01 | MDAM01 | 2x10 | 10 |
| AL ARHAMIYH 01 | ARHM01 | 2x6 | 6 |
| AL ZAROUB 01 | ZRUB01 | 2x6 | 6 |
| AL JEL[1] | AJEL01 | 2x10 | 10 |
| AL GINENA 01 | GNNA01 | 1x1 | 0 |
| **WADI SAA GSS** | | | |
| RADAT SA'A 01 | RDSA01 | 2x6 | 6 |
| HAFEET 01 | HFIT01 | 2x10 | 10 |
| SELLAHEYYAH 01 | SLHY01 | 1x6 | 0 |
| Saih AL Nafahat | SFNT01 | 1x6 | 0 |
| SELLAHEYYAH 02 | SLHY02 | 2x20 | 20 |

### 3.9. Al Dhahirah Governorate

Al Dhahirah Governorate includes Wilayat Ibri, Dank and Yanqul. The number of customers served in Al Dhahirah Governorate region is 69,631which is approximately 5% of the total customer population within NEDC. There are 6 Grid Stations (132/33 & 220/33 kV) and 41 primary substations (33/11 kV) are feeding the governorate. Table 16 shows all existing primary substations with their installed and firm capacity within Al Dhahirah Governorate.

**Table 16: AL Dhahirah Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **DANK GSS** | | | |
| AL-MASSRAT 02 | MSRT02 | 1x3 | 0 |
| ABU KRABAH 01 | AKRB01 | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| AL-BUSAILI 01 | BSLI01 | 2x6 | 6 |
| DOWT 01 | DOWT01 | 2x10 | 10 |
| AL-MAZEM 01 | MZEM01 | 1x6 | 0 |
| AL RAYHANI 01 | RYHN01 | 2x6 | 6 |
| HAY AL BARAKAH 01 | HBRK01 | 2x20 | 20 |
| AL-MAZEM 02 | AL MAZEM02 | 2x6 | 6 |
| AL SUBAIKI | SBKH01 | 2x6 | 6 |
| **ALHAIL GSS** | | | |
| ALAYAT FIDAH 01 | AFDA01 | 2x6 | 6 |
| AL-MAHUL 01 | MHUL01 | 3x6 | 12 |
| SAFALAT FIDAH 01 | SFDA01 | 2x6 | 6 |
| **DREEZ GSS** | | | |
| ABLH 01 | ABLH01 | 2x20 | 20 |
| BAAT 01 | BAAT01 | 2x6 | 6 |
| AL-DREEZ 01 | DREZ01 | 2x20 | 20 |
| AL-BANAH 01 | BANH01 | 2x20 | 20 |
| MAQNYAT 01 | MQNT01 | 2x20 | 20 |
| AL-NUJAYD 01 | NJYD01 | 2x6 | 6 |
| AL-ARED 01 | ARID01 | 2x20 | 20 |
| QARN AL-KABSH 01 | QRKB01 | 2x3 | 3 |
| AL TAYYEB INDUSTRIAL 01 | TYBI01 | 2x20 | 20 |
| HUGERMAT 01 | HGMT01 | 2x10 | 10 |
| KAHANAT 01 | KHNT01 | 2x6 | 6 |
| **IBRI Old Tx3 & Tx4 GSS** | | | |
| AL-ARAQI 01 | ARQI01 | 2x20 | 20 |
| AL-MURTAFA 01 | MRTF01 | 2x20 | 20 |
| AL-EYNIN 01 | ANIN01 | 2x20 | 20 |
| **IBRI Tx1 & Tx2 GSS** | | | |
| AL-AKHDAR 01 | AKDR01 | 2x10 | 10 |
| AL-SANAEYYAH 01 | SNEY01 | 3x20 | 40 |
| KUBARAH 01 | KBRH01 | 2x20 | 20 |
| MINISTRY OF DEFENSE 01 | MODF01 | 1x3 | 0 |
| SWAIDA ALMA 01 | SWMA01 | 2x6 | 6 |
| MAZER'A BIN KHATER 01 | MKTR01 | 2x20 | 20 |
| AL-SULAIF 01 | SLIF01 | 2x20 | 20 |
| HAI AL SAADAH 01 | HSAD01 | 2x20 | 20 |
| AL-MASSRAT 01 | MSRT01 | 1x10 | 0 |
| Al-Massarat 3 | MSRT03 | 1x6 | 0 |
| **YANQUL GSS** | | | |
| AL-SAWADER 01 | SWDR01 | 2x20 | 20 |
| AL RAKEI 01 | RAKE01 | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| AL-WAQBAH 01 | WQBA01 | 2x6 | 6 |
| AL-SHWAYAH 01 | SHWY01 | 2x6 | 6 |
| AL-MUREE 01 | MURY01 | 1x3 | 0 |
| TAWI AL NAWAMEYA 01 | TNWM01 | 1x3 | 0 |

## 3.10.North Al Batinah Governorate

North AL Batinah Governorate includes Wilayat Shinas, Liwa, Sohar, Saham and Al Khabourah. The number of customers served in North AL Batinah Governorate region is 179,962 which is approximately 14% of the total customer population within NEDC There are 14 Grid Station (132/33 & 220/33 kV) and 83 primary substations (33/11 kV) are feeding the governorate. Table 17 shows all existing primary substations with their installed and firm capacity within North AL Batinah Governorate.

### 3.10.1. Wilayat Shinas

Shinas has average of 3% load growth for the next three years and there one major project.

### 3.10.2. Wilayat Sohar

Sohar has seen growing with demand for the last 5 years within North AL Batinah Governorate where Sohar downtown area is one of the largest commercial and residential areas. In addition, Sohar Free Zone, Sohar Industrial Port and Sohar Industrial Estate area are earmarked for some significant development projects.

### 3.10.3. Wilayat Saham

Overall load growth in Saham remains constant with an average growth of 4%. There is one major project in Saham

### 3.10.4. Wilayat Al Khabourah

Overall load growth in Al Khabourah remains constant with average growth of 3%. there is one a major project.

**Table 17: North AL Batinah Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **SHINAS_B GSS** | | | |
| FIZAH 01 | FIZH01 | 2x20 | 20 |
| SUR AL BALOOSH 01 | SURB01 | 2x20 | 20 |
| AL RUMAILAH 01 | RMLH01 | 2x20 | 20 |
| NABER 01 | NABR01 | 2x20 | 20 |
| NABER 02 | NABR02 | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| GHADAFAN 02 | GDFN02 | 3x6 | 12 |
| TEMPORARY-GHADFAN-03 | TEMP03 | 1x6 | 0 |
| SUR AL ABRI 01 | SABR01 | 2x20 | 20 |
| **MD SHINAS GSS** | | | |
| TARIF AL MAKAMRAH 01 | TRMK01 | 2x20 | 20 |
| AJEEB 01 | AJEB01 | 2x6 | 6 |
| AL WAJAJAH 01 | WJAJ01 | 2x3 | 3 |
| KHADRAWEEN 01 | KDWN01 | 3x20 | 40 |
| AL UQR 01 | AUQR01 | 2x20 | 20 |
| AL GHURIFAH 01 | GURF01 | 3x20 | 40 |
| **LIWA Tx1 & Tx2 GSS** | | | |
| AL JUFFRAH 01 | JFRH01 | 2x20 | 20 |
| FALAJ AL QABAIL 03 | FAQB03 | 2x20 | 20 |
| GHADAFAN 01 | GDFN01 | 2x20 | 20 |
| LIWA AL JADIDAH 01 | LIWJ01 | 2x20 | 20 |
| AL KHUWAYRIYAH 01 | KWRH01 | 3x20 | 40 |
| **LIWA Tx3 & Tx4 GSS** | | | |
| Airport | SAPT01 | 2x10 | 10 |
| SOHAR INDUSTRIAL ESTATE 01 | SIET01 | 3x20 | 40 |
| SOHAR INDUSTRIAL ESTATE 02 | SIET02 | 3x20 | 40 |
| SOHAR INDUSTRIAL ESTATE 03 | SIET03 | 2x20 | 20 |
| SOHAR INDUSTRIAL ESTATE 04 | SIET04 | 2x20 | 20 |
| SOHAR INDUSTRIAL ESTATE 05 | SIET05 | 2x20 | 20 |
| **SOHAR SFZ Tx1 & Tx2 GSS** | | | |
| LIWA 01 | LIWA01 | 2x20 | 20 |
| SOHAR FREE ZONE 01 | SFZN01 | 2x20 | 20 |
| **SOHAR SFZ Tx3 & Tx4 GSS** | | | |
| FALAJ AL QABAIL 02 | FAQB02 | 2x20 | 20 |
| WADI AL OWAINAH 01 | WOWN01 | 2x10 | 10 |
| FALAJ AL SUQ 01 | FASQ01 | 2x6 | 6 |
| **SOHAR Industrial Port GSS** | | | |
| AL GHUZIL 01 | GUZL01 | 2x6 | 6 |
| FALAJ AL QABAIL 01 | FAQB01 | 2x20 | 20 |
| SOHAR INDUSTRIAL PORT 01 | SIPT01 | 2x20 | 20 |
| SOHAR INDUSTRIAL PORT 02 | SIPT02 | 2x20 | 20 |
| SOHAR INDUSTRIAL PORT 03 | SIPT03 | 2x20 | 20 |
| SOHAR INDUSTRIAL PORT 04 | SIPT04 | 2x20 | 20 |
| **SOHAR Tx1 & Tx2 GSS** | | | |
| AL HOJRAH 01 | HJRH01 | 3x20 | 40 |
| AL WOQAIBAH 01 | WQIB01 | 2x20 | 20 |
| AL HUMBAR 01 | HMBR01 | 3x20 | 40 |
| SOHAR HOSPITAL 01 | SHOS01 | 2x10 | 10 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **SOHAR Tx3 & Tx4 GSS** | | | |
| AL MULTAQA 01 | MLTQ01 | 3x20 | 40 |
| AL TAREEF 01 | TREF01 | 3x20 | 40 |
| AL MUWAILH 03 | MWLH03 | 2x20 | 20 |
| WADI SALLAN 01 | WSLN01 | 2x20 | 20 |
| FALAJ AL-OUHI 01 | FOHI01 | 2x20 | 20 |
| AL GHUSHBAH 01 | GSHB01 | 2x10 | 10 |
| **UWAYNAT Tx1 & Tx2 GSS** | | | |
| OUTAB 01 | OUTB01 | 2x20 | 20 |
| MAJAZ AL KUBRA 01 | MJKU01 | 2x20 | 20 |
| AL KHISHDAH 01 | KSDH01 | 2x20 | 20 |
| AL UWAINAT 01 | UWNT01 | 2x20 | 20 |
| **UWAYNAT Tx3 & Tx4 GSS** | | | |
| PALM GARDEN 01 | PGRD01 | 2x20 | 20 |
| AL MUWAILH 02 | MWLH02 | 2x20 | 20 |
| Al SUWAIHRAH 01 | SWHR01 | 2x20 | 20 |
| HIL AL ASHKAREEN 01 | HASK01 | 2x3 | 3 |
| WADI AHIN 01 | WAHN01 | 2x6 | 6 |
| HAY AL-REFAAH 01 | HRFA01 | 2x6 | 0 |
| Wadi Al Halti | WHLT01 | 2x6 | 6 |
| **SAHAM GSS** | | | |
| AL HUWAIL 02 | HUWL02 | 2x20 | 20 |
| AL HUWAIL 01 | HUWL01 | 2x20 | 20 |
| SAHAM INDUSTRIAL 01 | SHMI01 | 2x20 | 20 |
| AL FALAIJ 01 | FLAJ01 | 2x20 | 20 |
| AL MAHAB 01 | MHAB01 | 2x6 | 6 |
| MUKHEILIF JADIDAH 01 | MKLJ01 | 2x20 | 20 |
| HILLAT AL SUQ 01 | HLTS01 | 2x20 | 20 |
| WADI HIBI | WHBI01 | 2x10 | 10 |
| **DAS GSS** | | | |
| MUKHEILIF 01 | MKLF01 | 2x20 | 20 |
| DIL AL ABDASALAM 01 | DASL01 | 2x20 | 20 |
| UMM AL JARIF 01 | JARF01 | 2x20 | 20 |
| HAFEET 01 | HFET01 | 2x20 | 20 |
| HAFEET 02 | HFET02 | 2x20 | 20 |
| AL HEJARI 01 | HJRI01 | 2x20 | 20 |
| **KHABOURAH GSS** | | | |
| AL KHABOURAH 01 | KHBR01 | 2x20 | 20 |
| AL KHABOURAH 02 | KHBR02 | 2x20 | 20 |
| QASBIYAT AL HAWASINAH 01 | QHWS01 | 2x20 | 20 |

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| AL BREIK 01 | BREK01 | 2x20 | 20 |
| AL LEHBAN 01 | LHBN01 | 2x6 | 6 |
| SANA BANI GAFER 01 | SBGF01 | 2x6 | 6 |
| WADI BANI OMAR 01 | WBOM01 | 2x6 | 6 |
| AL HAILASHI 01 | HLSH01 | 2x3 | 3 |
| AL KASF 01 | KASF01 | 2x20 | 20 |
| AL KASF 02 | KASF02 | 2x6 | 0 |
| **Khadra-A** | | | |
| Badi Amoud | BADIAMODP01B | 2x20 | 20 |
| Bidayah | BIDAYAHP01B | 3x20 | 40 |
| Diyan | DIYANP01B | 2x20 | 20 |
| Khadra | KHADRAP01B | 2x20 | 20 |
| Suwaiq Shabiyah | SWQSHBYHP01B | 1x6 + 1x6 | 6 |
| Suwaiq ROP | SWQROPP01B | 2x6 | 6 |
| **Khadra-B** | | | |
| Alam | ALAMP01B | 2x6 | 6 |
| Khadra Bu Reshaid | KBRSHAIDP01B | 2x20 | 20 |
| Nasr Marble Factory-1 | NSRMRBLFP01B | 2x6 | 6 |
| Nasr Marble Factory-2 | NSRMRBLFP02B | 2x6 | 6 |
| Saih Rahamat | SIHRHMATP01B | 1x6 | 0 |
| Uriq | URIQP01B | 3x20 | 40 |
| Wadi Haimly | WDIHIMLYP01B | 2x6 | 6 |
| Wadi Jahawer | WDIJHAWRP01B | 2x6 | 6 |
| Bidayah Ind Area | BDAYHINDP01B | 1x6 | 0 |
| Bidayah Souq | BDAYHSUQP01B | 2x6 | 6 |
| **Suwaiq** | | | |
| Bathaa | BATHAAP01B | 3x20 | 40 |
| Subaykhi | SUBAYKHIP01B | 3x20 | 40 |
| Suwaiq | SUWAIQP01B | 2x20 | 20 |
| Suwaiq Ind Area | SWQINDP01B | 2x6 | 6 |

### 3.11. Musandam Governorate

Musandam Governorate includes Wilayat Khasab, Madha, Dibba and Bakha. The number of customers served in Musandam Governorate region is 17,192 which is approximately 1 % of the total customer population within NEDC. Musandam Governorate's overall demand growing slowly until recently when development in the major cities of Khasab, Bakha and Dibba have seen steadily increasing growth in

the form of new residential and commercial loads. Table 18 shows all existing primary substations with their installed and firm capacity within Musandam Governorate.

**Table 18: Musandam Governorate - Grid and Primary Substations Connectivity**

| PSS | PSS Code | Installed Capacity (MVA) | Firm Capacity (MVA) |
|---|---|---|---|
| **KHASAB GSS** | | | |
| KHASAB 01 | KHSB01 | 4x20 | 60 |
| LIMA 01 | LIMA01 | 2x6 + 1X3 | 6 |
| MAHAS 01 | MHAS01 | 2x20 | 20 |
| SIBI 01 | SIBI01 | 2x3 | 3 |
| SAWI 01 | SAWI01 | 2x6 | 6 |
| WADI BANA 01 | WBNA01 | 2x1 | 1 |
| QUADA 01 | QUDA01 | 1x2 + 1x3 | 2 |
| AL HARF 02 | HARF02 | 1x1 | 0 |
| AL HARF 01 | HARF01 | 2x20 | 20 |
| AL HABALIN 01 | HBLN01 | 1x1 | 0 |
| KUMZAR 01 | KMZR01 | 2x6 | 6 |
| **TIBAT GSS** | | | |
| KHASAB INDUSTRIAL AREA 01 | KSBI01 | 1x6 | 0 |
| WADI MAWA 01 | WMWA01 | 1x1 + 1x3 | 1 |
| GHUMDHA 01 | GMDH01 | 2x10 | 10 |
| AL JERY 01 | JERY01 | 2x10 | 10 |
| MOD - BUKHA 01 | MODB01 | 2x6 | 6 |
| **DIBBA GSS** | It is 132/11 kV Grid Station. So, no PSS is connected in this Grid. | | |
| MADHA (Isolated) | MDHA01 | 11.3 MW (D.G) | 11.3 |

# 4. NEDC DISTRIBUTION SYSTEM

## 4.1. Introduction

NEDC is authorized to undertake all regulated activities of electricity distribution business at 33kV and below across the whole area of Sultanate of Oman excluding Dhofar Governate.

The distribution system has three nominal voltages, i.e., 33kV, 11kV and 415V. Most customers connect at LV (415 Volt) and there are bulk customers connected at 11kV and 33kV.

During 2024, the total Firm capacity for all governorates is circa 11,400.5 MVA, where the maximum load (non-coincident) is around 8,116 MVA which is 71% utilization of the firm Capacity. The below table and figure present these data.

**Table 19: Summery of Firm Capacity and Max Load per Governorate**

| Governorate Name (2024) | Max Load (MVA) | Firm Capacity (MVA) | Utilization % |
|---|---|---|---|
| **Muscat** | 3,082 | 4,279.5 | 72% |
| **Buraymi** | 221 | 312 | 71% |
| **Al Dhahirah** | 389 | 497 | 78% |
| **North Batinah** | 1,441 | 1,915 | 75% |
| **Musandam** | 92 | 151 | 61% |
| **Dakhiliah** | 862 | 1,345 | 64% |
| **South Batinah** | 917 | 1,120 | 82% |
| **North Sharqiyah** | 444 | 566 | 78% |
| **South Sharqiyah** | 497 | 660 | 75% |
| **Wusta** | 170 | 555 | 31% |
| **Total** | 8,116 | 11,400.5 | 71% |

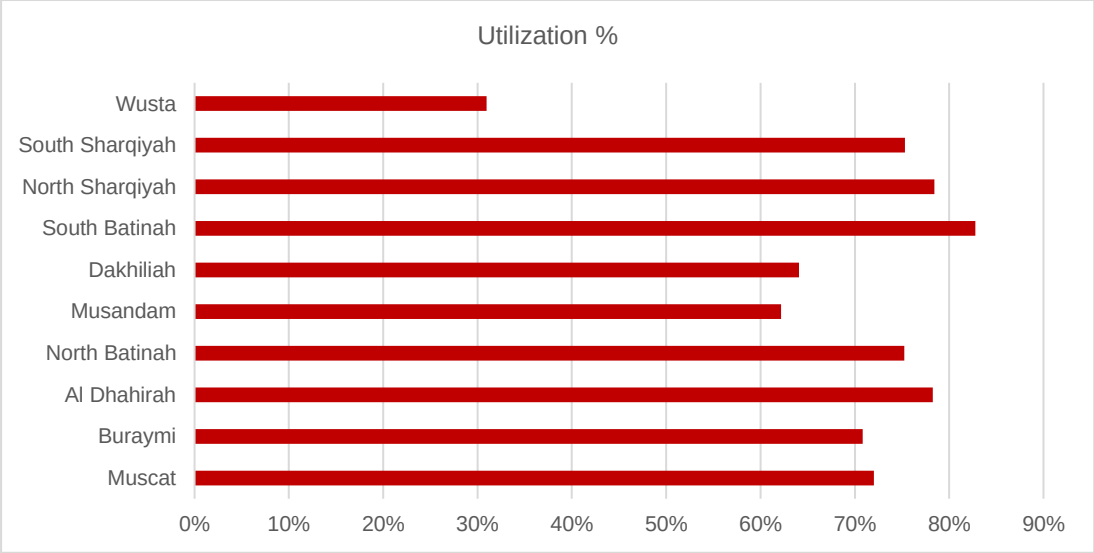


**Figure 2: Utilization % from Firm Capacity per Governorate**

System maximum demand is occurring generally during summer period; although there seems to be no exact corelation on the exact timing as expected. There are various parameters which affect the occurrence of the system maximum demand hence the future forecast; we expect more parameters in the upcoming future especially due to the macro-economic condition of the Oman economy and due to the developments in newer technologies. Few of the significant parameters which have impacted NEDC distribution system growth in 2024 and future are:

- Temperature and Humidity.
- Customer numbers and types of customer's growth.
- Socio-economic factors like state of economy due to oil prices.
- Implementation of CRT and the continuous effect.
- Introduction of Tariff reforms for all.

This can result in a lack of consistent predictability as to the precise date of future system peaks, although provides a good indication in general of the period and pattern. For this reason, associated demand transfers are operationally planned to occur before May period each year to ensure NEDC are in the best position possible to meet regulatory requirements and ensure quality and security of supply to consumers.

## 4.2. System Demand and Load Duration

Figure 3 below shows the historical data [2018-2024]; the system MIS maximum demand and % growth excluding Al Wusta and Musandam. In addition, Al Wusta and Musandam Governorate historical data are illustrated in Figure 4 and Figure 5.

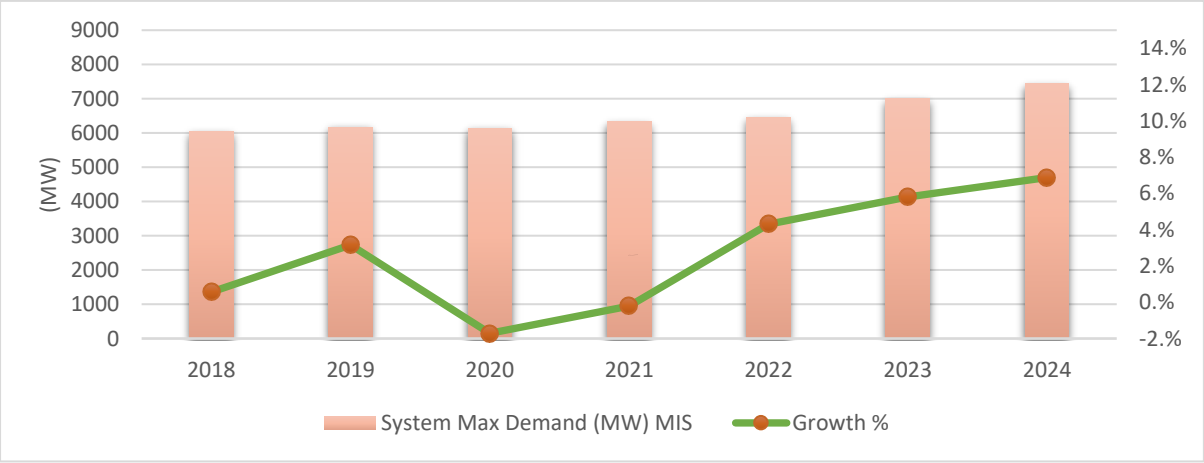


**Figure 3: System Max Demand (MW) MIS**

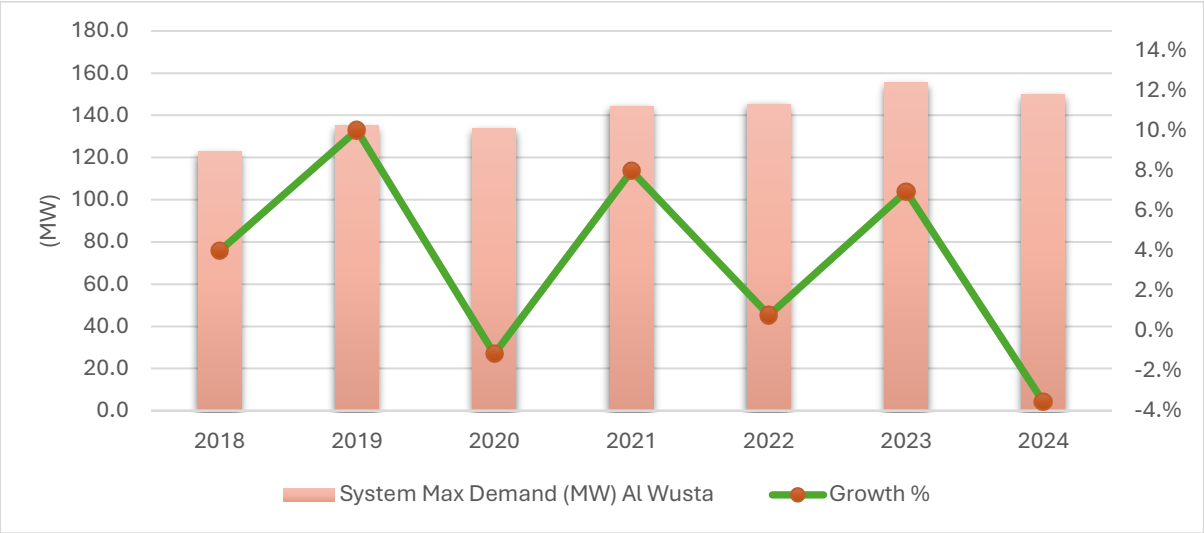


**Figure 4: System Max Demand (MW) Al Wusta**

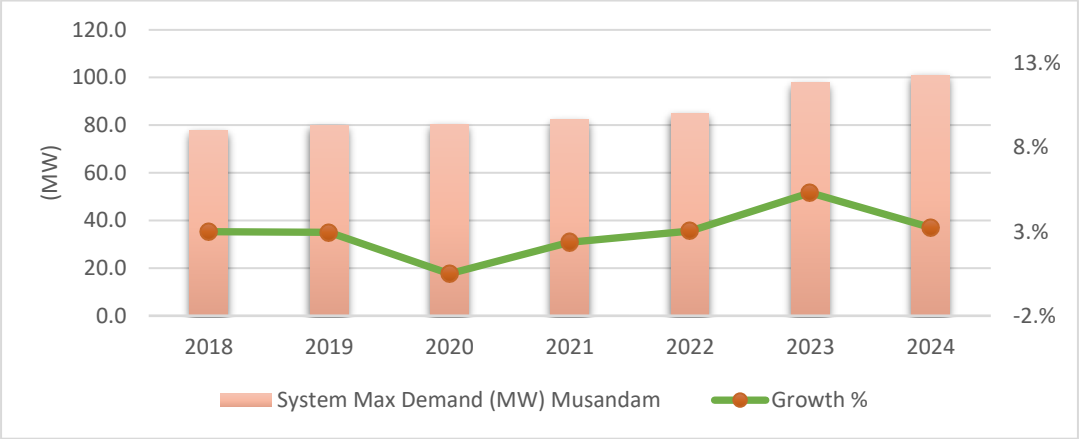


**Figure 5: System Max Demand (MW) Musandam**

The Maximum and Minimum Demand for the NEDC distribution systems in 2024 is illustrated in Figure 6 and Figure 7 below. This shows that the 2024 minimum demand is circa 36% of the 2024 maximum demand for the MIS NEDC system.

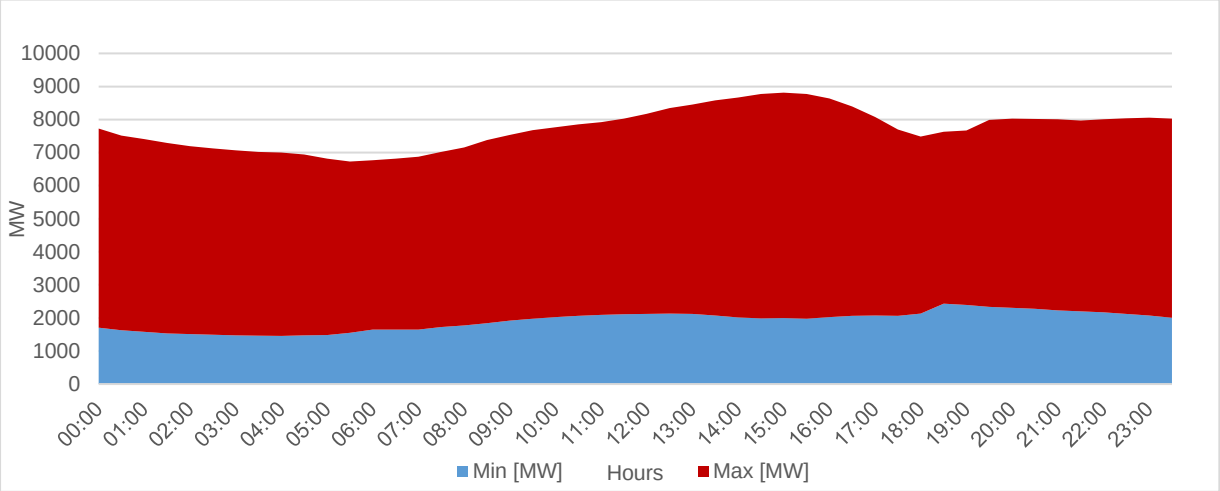


**Figure 6 : Hourly Demand – MIS System Maximum and Minimum Day Profile**

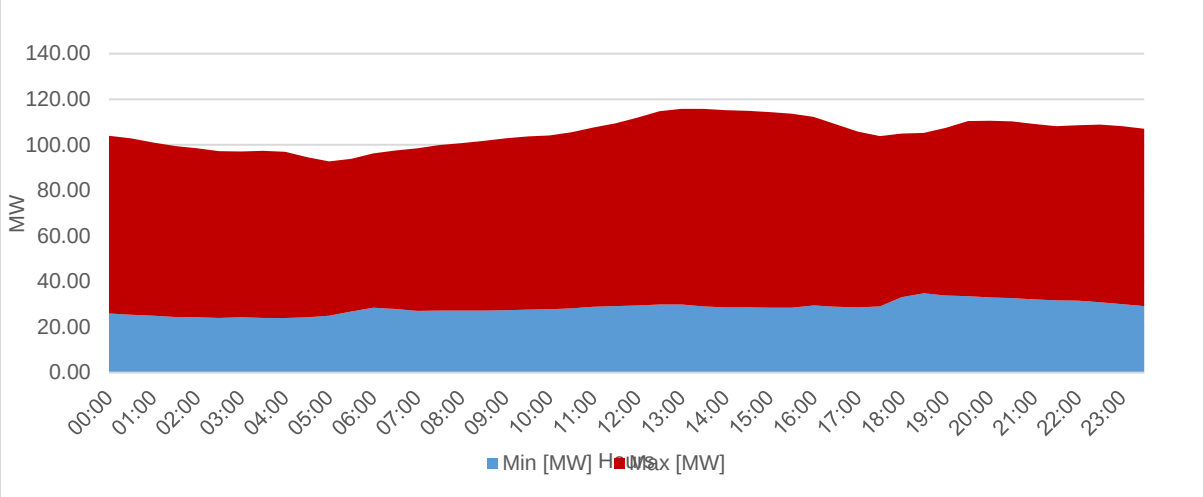


**Figure 7 : Hourly Demand – Musandam System Maximum and Minimum Day Profile**

The Maximum load profiles for NEDC taken on Thursday, 26th June 2024, the day of NEDC Peak, were plotted and presented in Figure 6. The highest load was reached at 14:43 hours; on this day, the load recorded was 7,326.6[10].

### 4.3. Cost Reflective Tariff (CRT)

In October 2016, The Regulator announced that the Council of Ministers had approved the introduction of a new tariff for high value customers called the Cost Reflective Tariff (CRT) and implemented fully in 2017. The new tariff is designed to reflect the actual costs of providing a supply of electricity more accurately to large government, commercial and industrial customers without government subsidy. Till 2020 the approval for CRT implementation is for application only to the high value customers who consume 150 MWh and above in a year, for the above-mentioned customer categories.

[10] MIS Transmission peak excluding of transmission technical losses and Grid Stations auxiliary load

In 2021, CRT was revised, and the current approval is for application to the high value customers who consume 100 MWh and above in a year and the new tariff is designed to all the customer category except residential customers.

As the full 2024 cycle hasn't been completed yet, an impact analysis was undertaken on 2023 NEDC customers base to understand the full year impact of CRT on the NEDC distribution system and described as below.

The number of CRT customers in 2024 was 19,317, circa 1.5% of the total connected customers. **Error! Reference source not found.** below shows some of high consumption customers load profiles during peak day and the direct effect of CRT tariff during 2024 peak hours.

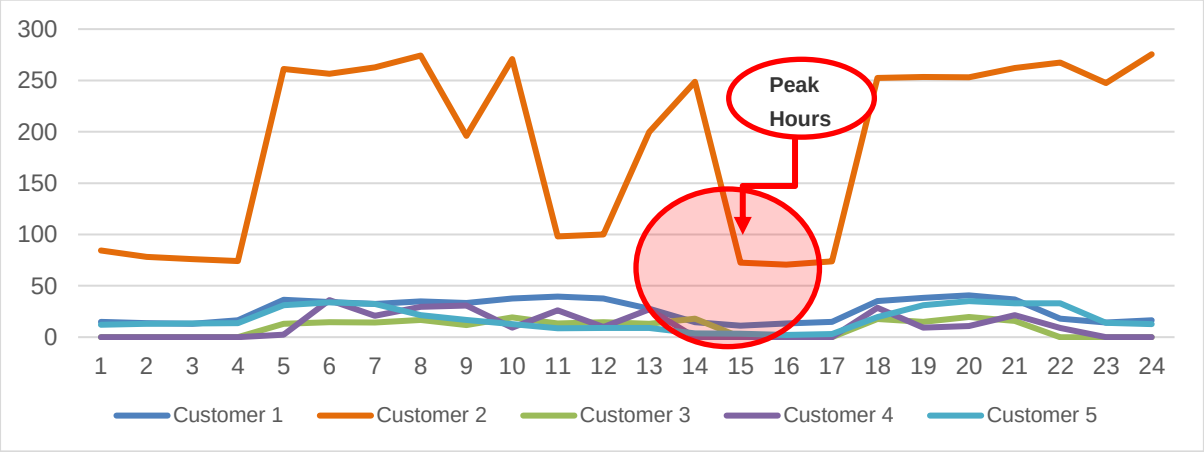


**Figure 8: CRT Customer During System Peak 26 Jun 2024**

## 4.4. Demand Not Secured (DNS)

As per the licence condition, NEDC is obliged to comply with the DSSS and moreover one of our major investment drivers for the CAPEX programme is to meet the N-1 operational capability for each Primary Substation.

Figure 9 below provides a trend of the NEDC Demand Not Secured (DNS) MVA performance as a measure to show DSSS compliance improvement along with number of Primary Substations contributing to the DNS. The audited 2023 DNS is 431.7 MVA which is a circa 26.9 % higher compared to 2022 DNS value of 340.3 MVA and this due to delay in some project which was expected to be energize before summer 2023.

NEDC distribution system is mixed of urban dense interconnected network and rural areas. Therefore, for urban areas the network design optimum effort is made to maintain that level of interconnection leading to majority of the 11kV feeders except minor rural feeders having no single but multiple interconnections. Hence majority of the 11kV feeders will come under the Class A and Class B

categories. Typically, with the assistance of these 11kV interconnections, the supply can be generally restored within the allowed DSSS time frame. However, for the rural area feeders the automation and fast isolation of faulty section will play an important role in optimizing the operation of the 11kV network.

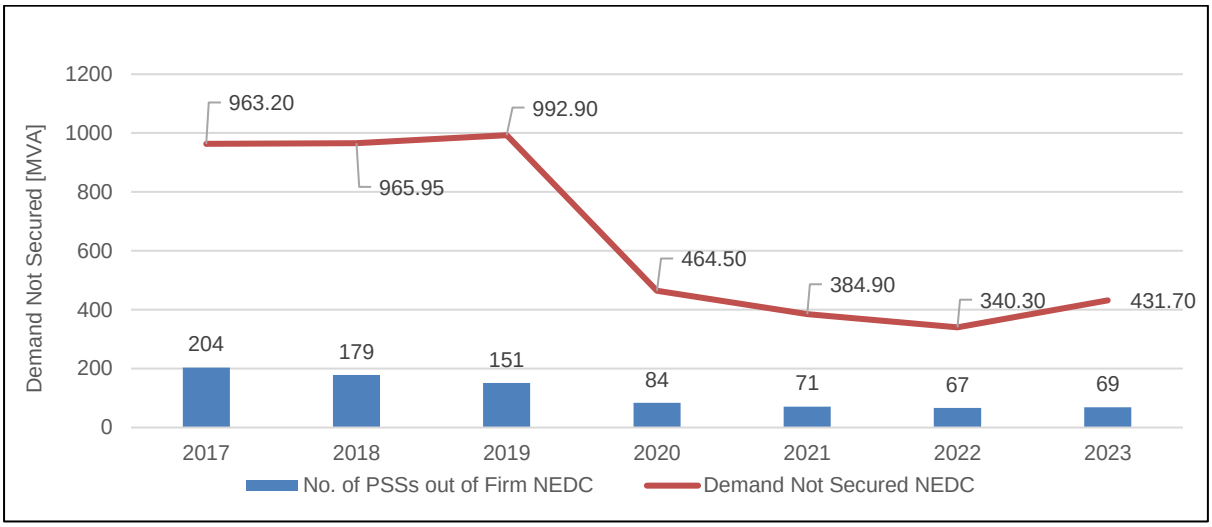


**Figure 9 : History of NEDC Demand Not Secured and Out of Firm PSS**

## 4.5. 11kV Feeder Loadings

As detailed in the Appendix B-5, 45 number 11kV feeders were observed in 2024 which exceeded the derated thermal loading limit under normal operational configuration; these will be solved by appropriate 11kV load transfers, projects schemes in 2025 and 2026 itself shown in Table 20 below. The maximum loadings of all the 11kV feeders are attached in Appendix B-5.

**Table 20: 11kV Highly Loaded feeder Plan**

| PSS Name | Plant Code | Feeder Code | Feeder Rated Capacity [Amp] | Feeder De-rated Capacity [Amp] | Actual Load Amps 2024 [Amp] | Plan |
|---|---|---|---|---|---|---|
| **Muscat Governorate** | | | | | | |
| **Quriyat[G05]** | | | | | | |
| **Quriyat** | P091 | KLN06 | 400 | 350 | 356 | 50% of the load will be transferred to Al Shahbari KLN04 |
| **Amerat[G10] - A** | | | | | | |
| **Amerat Heights** | P152 | KLN04 | 400 | 350 | 384 | New feeder from Amerat Amerat 4 PSS will share the load before summer 2025 |
| **Amerat Heights** | P152 | KLN07 | 400 | 350 | 371 | New fresh feeder from the same PSS |
| **Amerat 3** | P179 | KLN11 | 400 | 350 | 367 | New fresh feeder from the same PSS |
| **MSQ[GP06] – B** | | | | | | |
| **MSQ 1** | P083 | KLN05 | 400 | 350 | 373 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Bousher[GP02] - B** | | | | | | |
| **Bousher 2** | P163 | KLN08 | 400 | 350 | 368 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Bousher 2** | P163 | KLN11 | 400 | 350 | 379 | New feeder from same PSS will share the load and the effect will be before summer 2026 |

| PSS Name | Plant Code | Feeder Code | Feeder Rated Capacity [Amp] | Feeder De-rated Capacity [Amp] | Actual Load Amps 2024 [Amp] | Plan |
|---|---|---|---|---|---|---|
| **Al Muna** | P084 | KLN06 | 400 | 350 | 371 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Ghala Heights[G24] A** | | | | | | |
| **Al Ansab 1** | P007 | KLN06 | 400 | 350 | 370 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Ghala Heights[G24] B** | | | | | | |
| **Azaibah South 1-B** | P147 | KLN03 | 400 | 350 | 376 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Ghala[G11] - B** | | | | | | |
| **Ghala 2** | P156 | KLN02 | 400 | 350 | 378 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Ghala 2** | P156 | KLN05 | 400 | 350 | 358 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **Al Ansab 2** | P008 | KLN09 | 400 | 350 | 356 | Internal load shifting |
| **Misfah[G04]** | | | | | | |
| **Al Misfah** | P080 | KLN09 | 400 | 350 | 368 | New fresh feeder from the same PSS in 2026 |
| **Al Awabi** | P139 | KLN11 | 400 | 350 | 350 | New fresh feeder from the same PSS in 2026 |
| **Mabelah[GP04]** | | | | | | |
| **Mabelah Grid** | GP04 | KLN05 | 400 | 350 | 363 | New fresh feeder from the same PSS in 2026 |
| **Sur Al Hadid** | P116 | KLN01 | 400 | 350 | 379 | New Feeder from Sur Al-Haid P116 in 2025 |
| **Botanic Garden** | P016 | KLN02 | 400 | 350 | 385 | New fresh feeder from ROP P161 to connect with existing Cable from DSS 132 RMU in 2025 |
| **Mabella 2[G12] - A** | | | | | | |
| **Mabelah C** | P064 | KLN12 | 400 | 350 | 396 | New fresh feeder from the same PSS in 2026 |
| **Mabelah South PH-4** | P062 | KLN04 | 400 | 350 | 376 | New feeder from Seeb Mabelah South P185 in 2026 |
| **PalmMall** | P168 | KLN11 | 400 | 350 | 356 | New feeder from Seeb Mabelah South P198 in 2026 |
| **Mabella 2[G12] - B** | | | | | | |
| **Mabelah Shabiya** | P060 | KLN15 | 400 | 350 | 374 | Internal load shifting |
| **Seeb Mabelah South [PH-6]** | P185 | KLN06 | 400 | 350 | 359 | New Feeder from Seeb Mabelah South P198 |
| **Mabelah Industrial[G26] A** | | | | | | |
| **Mabelah South PH-8** | P157 | KLN01 | 400 | 350 | 362 | Internal load shifting |
| **Mabelah South PH-8** | P157 | KLN13 | 400 | 350 | 370 | Internal load shifting |
| **Mabelah South PH-7** | P141 | KLN02 | 400 | 350 | 352 | New fresh 11 kV feeder to take some load of both feeders KLN02 and KLN05 in 2026 |
| **Mabelah South PH-7** | P141 | KLN05 | 400 | 350 | 362 | New fresh 11 kV feeder to take some load of both feeders KLN02 and KLN05 in 2026 |
| **Mabelah South PH-7** | P141 | KLN13 | 400 | 350 | 354 | New fresh feeder from the same PSS in 2026 |
| **Seeb[GP08] - A** | | | | | | |
| **Al Khoud Shabiya** | P046 | KLN07 | 400 | 350 | 374 | New fresh feeder from the same PSS in 2026 |
| **Mawaleh South[GP05] A** | | | | | | |
| **Al Hail North 2** | P028 | KLN09 | 400 | 350 | 363 | Internal load shifting |

| PSS Name | Plant Code | Feeder Code | Feeder Rated Capacity [Amp] | Feeder De-rated Capacity [Amp] | Actual Load Amps 2024 [Amp] | Plan |
|---|---|---|---|---|---|---|
| **Mawaleh South Grid** | GP05 | KLN01 | 400 | 350 | 354 | New Feeder from Seeb Muskar Murtafiah P197 in 2025 |
| **Mawaleh South[GP05] B** | | | | | | |
| **Al Khoud PH-6** | P049 | KLN02 | 400 | 350 | 366 | New fresh 11 kV feeder to take some load of both feeders KLN02 and KLN03 in 2026 |
| **Al Khoud PH-6** | P049 | KLN10 | 400 | 350 | 382 | New feeder from ROP AL-Khoudh P161 & Seeb Mabelah South P198 in 2025 |
| **Al Khoudh[G25] A** | | | | | | |
| **Mawaleh A** | P070 | KLN09 | 400 | 350 | 356 | New fresh feeder from the same PSS in 2026 |
| **Al Khoud PH-3** | P048 | KLN06 | 400 | 350 | 351 | Internal load shifting |
| **Seeb Khoudh [Al Khoud Shabiya (B)]** | P187 | KLN09 | 400 | 350 | 381 | New fresh feeder from the same PSS |
| **Al Khoudh[G25] B** | | | | | | |
| **Al Khoud PH-7** | P154 | KLN01 | 400 | 350 | 390 | New feeder will share the load from same PSS and the effect will be before summer 2026 |
| **Al Khoud PH-7** | P154 | KLN02 | 400 | 350 | 393 | New feeder will share the load from same PSS and the effect will be before summer 2026 |
| **Al Khoud PH-7** | P154 | KLN06 | 400 | 350 | 388 | New feeder from ROP AL-Khoudh in 2025 |
| **South Batinah Governorate** | | | | | | |
| **Madinat Barka-A** | | | | | | |
| **Saqsuq** | SAQSU QP01B | 33L5 | 400 | 350 | 389 | New feeder from same PSS will share the load and the effect will be before summer 2025 |
| **Dakhiliah Governorate** | | | | | | |
| **Jabrin Grid** | | | | | | |
| **Bidoou** | BIDOO UP01B | 23L5 | 400 | 350 | 354 | Some load will be transferred to new Bahla PSS before summer 2025 |
| **Nizwa Grid** | | | | | | |
| **Manah** | MANAH P01B | 27L5 | 400 | 350 | 378 | New feeder from same PSS will share the load and the effect will be before summer 2026 |
| **North Sharqia Governorate** | | | | | | |
| **SAMAD GRID** | | | | | | |
| **Samad** | SAMAD P01B | 28L5 | 400 | 350 | 358 | Internal load shifting |
| **Sinaw Grid** | | | | | | |
| **Sinaw 2** | SINAW P02B | 25L5 | 400 | 350 | 356 | Some load will be transferred to Sinaw 3 PSS before summer 2025 |
| **North Batinah Governorate** | | | | | | |
| **LIWA TX.1 & TX.2** | | | | | | |
| **LIWA AL JADIDAH 01** | LIWJ01 | KLN02 | 400 | 350 | 356 | New fresh feeder from same PSS will share the load - 11kV projects 2024 |

## 4.6. System Demand Forecast

Accurate and realistic load demand forecasting is critical for the effective operation of the distribution system and is the principal driver for capital expenditure. Realistic assumptions must be made for inherent uncertainties in forecasting and the underlying socio-economic factors, such as the sustained low oil price, population growth and impact of Oman wide customer tariff reforms.

Load growth can vary from year-to-year and is not uniform across the whole system. It is not unusual to find parts of the system growing at significantly higher rates than the system, while other parts of the system can experience periods of low growth or demand reduction.

The forecast model has inputs data from different sources as follows:

- Population data for the area served by NEDC has been taken from data published by the Oman Information and Statistics Centre.
- Data and projections on Oman's GDP economic development are taken from the International Monetary Fund published in its World Economic Outlook Database.
- GIS (Geographic Information System) and CRM (Customer Relationship Management) provide customer account details internally in the company. These two systems offer the customer account numbers with the connected demand and the primary substations connected to these accounts.
- SCADA provides internally the primary substation's peak loads (Supervisory Control and Data Acquisition).

Then the model will have several calculations using the input data to reach the load growth of each primary substation applied in this capability statement.

NEDC considers the following features are necessary to produce an accurate demand forecast in line with best practice:

- Accurate and unbiased actual demand data – careful management of data and forecasting model construction based on sound theoretical grounds that closely fits the sample data.
- Transparency and repeatability – as evidenced by good documentation, including documentation of the use of judgment, which ensures consistency and minimizes subjectivity in forecasts.
- NEDC also considers the following elements to be relevant to maximum demand forecasting:
    - Independent forecasts – spatial (bottom up) forecasts should be validated by independent system level (top down) forecasts and both spatial and system level forecasts should be prepared independently of each other. The impact of macroeconomic and demographic trends is better able to be identified and forecasted in system level data, whereas spatial forecasts are needed to capture underlying characteristics of specific areas within the system. Generally, the spatial forecasts should be constrained (or reconciled) to system level forecasts;

- Adjusting for temporary transfers – spatial data is adjusted for historical spot loads arising from peak load sharing and maintenance, before historical trends are determined;
- Adjusting for discrete block loads – large new developments, such as shopping centres and housing developments, are incorporated into the forecasts, taking account of the probability that each development might not proceed. Only block loads exceeding a certain size threshold are included in the forecasts, to avoid potential double counting, as historical demands incorporate block loads and general demand growth.

At the time of writing this DSCS, the volume of grid connected PV systems is expected to make minor impact at system level forecast (including future years as it stands); hence the impact of PV systems is not included in the forecast for this DSCS. With the development of our new regression-based Load Forecasting tool, NEDC will monitor the uptake of all low carbon technologies including PV and include the impact of these on forecast in future appropriately.

### 4.6.1. Load Forecasting

To address the various uncertainties impacting the forecasting in recent times and going forward as mentioned above; NEDC has an econometric forecast modelling tool rather than historically used Compound Annual Growth Rate (CAGR%) method. The model uses regression analysis to identify relationships between historic system data and historic economic variables. The primary economic variables considered are population growth and the growth in GDP (broken down by economic activity).

These two drivers are commonly accepted as being key descriptive drivers of future growth in underlying RUD and CA and by combining the historic regression-based relationship data to forecasts of the economic variables, projections of CA growth and RUD growth can be made (with average consumption per customer also identified).

Moreover, the tool can capture the Low Carbon Technology (LCT) impacts on load growth; these will be considered in future forecasts as these impacts on system demand become significant in future. In addition to the above, the impact of individual large investment projects is also considered separately. These projects are projected to bring around a one-off increase in demand, which is not captured by the economic forecast model. By undertaking sensitivity analysis, the model provides a complete envelope of extremes for the forecasted parameters rather than relying on one-point values.

### 4.6.2. System Demand Growth

Historical data indicates that the demand rate of growth across NEDC distribution system has slowed in recent years. This is mainly attributed to the sustained low price, general macro-economic factors and exceptional events around the world. The average load growth for the forecasted three years, using the Regression model, is 5.9%. Table 21 shows the actual and forecasted NEDC expected peak demand including and excluding the direct connected customer load.

Table 21 : NEDC Non-Coincidence Forecast with Growth

| Year | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|
| Total NEDC Connected to MIS (MW) | 6,878 | 7,303 | 7,705 | 8,070 |
| AL Wusta connected to MIS (MW) | 75.0 | 79.9 | 154.9 | 177.1 |
| Al Wusta D.G and PDO (MW) | 73 | 71 | 42 | 41 |
| Musandam (MW) | 93.3 | 97.7 | 102.6 | 108.3 |
| Madha (MW) | 8 | 8 | 9 | 9 |
| Ground Total (Excluding Grid Connected Customers (MW)) | 7,127 | 7,560 | 8,013 | 8,406 |
| Yearly Growth % | 6.8% | 6.1% | 6.0% | 4.9% |

Figure 10 shows the historical trend in NEDC system maximum demand with the forecast maximum demand over the period 2025 to 2027. Despite the general slowing in demand growth at the system level, there are areas within the system where maximum demand is forecast to grow well beyond the system average level, while other parts of the system are forecast to experience no load growth or a small reduction in maximum demand.

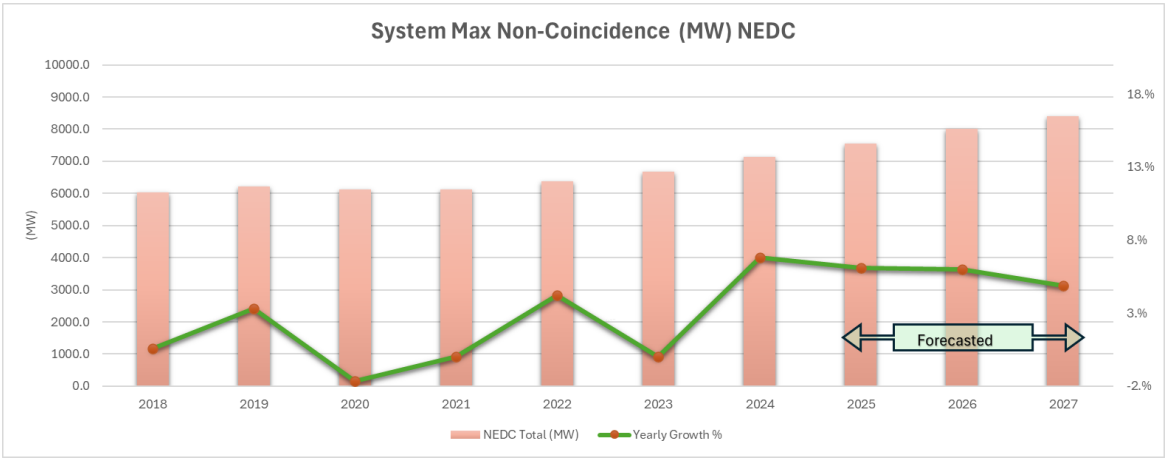


Figure 10 : Historical Trend in NEDC System Maximum Demand with Three Years Forecast

The peak load of NEDC increases gradually, but the growth changes from year to year depending on the situation of each year. Figure 10 indicates that from the historical and forecast data [2018-2027]; NEDC demand growth expected to continue growing with average rate of 6% for the next three coming years. This expected growth driven by a considerable number of governmental investments in tourism projects, infrastructure projects, industrial projects, and private sector investments accompanying them.

There are two sperate networks In Musandam Governorate: Main network which consists of three Grid Stations (Tibat, Khasab and Dibba Grid Stations). This network is supplying around 99% of Musandam Governorate. The second network is Madha network. Madha is a small Wilayat surrounded by the UAE therefore the power system there consists of 6-11kV diesel generators (with total capacity of 11.3 MW) located in Madha Primary Substation. In 2024 summer, recorder peak load of Madah substation was around 7.6 MW and it is forecasted to remain almost the same for the period of 2025 to 2027 as there

is no expectation for new major development in Madha. Overall Musandam load growth expected to grow within the limit of 5.2% as seen in Figure 11 below.

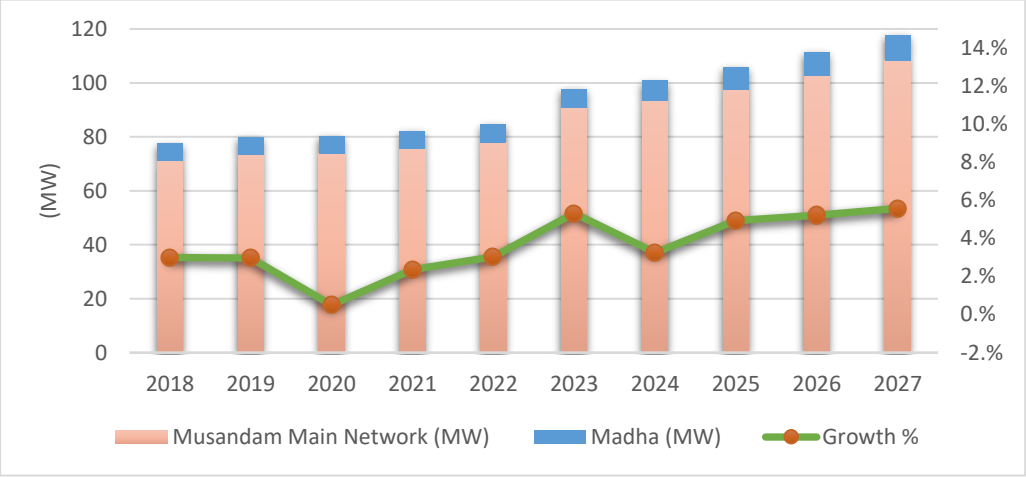


**Figure 11 : Musandam 2018-2026 Peak Load with Growth percentage**

Currently, most of the distribution networks in the Al Wusta Governorate and rural areas in other governorates are powered by diesel-fuelled power plants, which operate as isolated systems in different areas. There are 12 power plants distributed throughout the whole of Al Wusta and surrounding areas. NEDC has a plan to reconfigure these networks' power sources to be connected to the Main Interconnection System (MIS) and align with the OETC Interconnection Plan in the Phases I & II of “Rabt” project. Table 22 below displays the NEDC plan and the target date for the interconnection with MIS.

**Table 22: Al Wusta Diesel Plants**

| Power Plant | Target Date |
|---|---|
| Masirah | Q4,2026 |
| Hijj | Completed |
| Al-Khuwaima | Q4,2026 |
| Dhafrat | Completed |
| Khalouf | Q2,2026 |
| Najdah | Q2,2026 |
| Sarab | Q2,2027 |
| Duqm | Completed |
| Masrooq | Q2,2029 |
| Khadra | Q2,2028 |
| Hitam | Q2,2028 |
| Wadi Aswad (Nuhaidah & Hamara AL Droua areas) | Q2,2028 |

In 2024, The peak load in the Al Wusta Governorate and its surrounding areas has reached 150 MW, including the PDO source connections; Al Wusta system maximum demand continues rising compared to the previous years in 2026 by around 30%. This high growth increase can be referring to the new bulk load that intended to be connected in AL Duqum (29 MW of Cement factory). Similarly in 2027, 15 MW will be connected as new bulky loads for the new EZAD industrial area in Ibri. Overall, Al Wusta load

growth expected to be within 14.3% between 2025 to 2027 including the bulky load connections as seen in Figure 12 below.

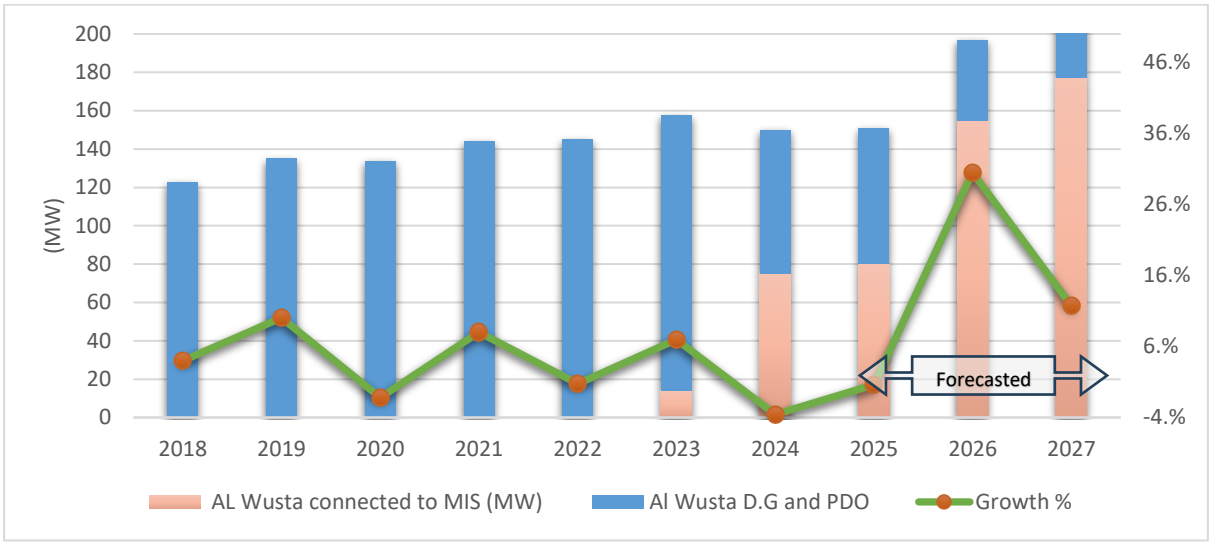


**Figure 12 : Al Wusta 2018-2026 Peak Load with Growth percentage**

## 4.7. Distribution System Modelling and Analysis

NEDC maintains up-to-date models of its power system for assessing distribution system performance via power system studies, bulk loads modelling, and undertaking customer connection studies where required; to ensure the distribution system operates in a safe and an efficient manner along with providing the required security of supply to its connected customers.

### 4.7.1. Power System Models

The planning tool utilised for system modelling and studies are PSS®SINCAL (Power System Simulator® Siemens Network Calculation), ETAP (Electrical Transient and Analysis Program) and DIgSILENT (Digital Simulation and Electrical Network calculation program). The models for each grid substation with their respective connected primary substations are established by representing the 33kV system on an electrical connectivity basis. The system models contain network topology and details in terms of nameplate data for transformers and their tap changers, capacitor banks and their controllers, conductor types along with associated lengths and parameters and the non-coincident demand data on individual primary substations.

The load demands are modelled as lumped loads connected to the main 11kV bus bars and segregated into motoric and non-motoric load types for load flow and fault current calculations. Likewise, the existing connected solar PV plants are also modelled as lumped generation on 11kV bus bars from this year onwards. The recorded maximum (summer) demands on each primary substation; derived from NEDC SCADA system as of 2024 have been used to update the power system models on non-coincidental load basis. Forecasting principles for load determination as mentioned in the previous sections have been adopted to forecast the future year (2025-2027) maximum demands.

### 4.7.2. Load Flow Analysis

Load flow analysis is undertaken for maximum demand scenarios to define the performance of NEDC distribution system. The analysis determines the active and reactive power flows in the system, percentage loadings for transformers and 33kV circuits along with the voltage profile at the 11kV and 33kV busbars of the primary substations under normal circuit operation. Simulations are carried out for the existing (2024) and future 3 years (2025-2027) for system maximum loadings. All short circuit results have been listed in a downloadable excel sheet files as following:

- Primary Substations Loading in Appendix B-1.
- 33kV feeders loading in Appendix B-2.
- Non-compliance Bus-Voltages in Appendix B-3.
- Short Circuit Fulat Results in in Appendix B-4
- 11kV feeders Loading in Appendix B-5.

From the studies, it is possible to identify where the system is strong and has spare capacity and conversely, where additional mitigation and/or reinforcement, before new connections, potentially needs be considered. The maximum demand case for instance; identifies where there is a risk of overloading, of operation above firm capacity, or of system voltages falling below the voltage limits.

The power factor values for maximum demand scenarios have been determined based on the actual available information from NEDC SCADA. For maximum demand conditions, the actual recorded power factor data is employed, where available. For the remaining substations, where power factor values are not available via SCADA, a calculated system average is considered for maximum demand scenarios in accordance with the company's defined practice.

The load flow study results are summarised in tabular form in Appendix B-1 and available in a downloadable excel files that supplements this Distribution System Capability Statement.

The simulation results demonstrate the following within the period of this DSCS:

- Voltage drop under maximum demand scenario remains within the statutory limits of - 6% on all 33kV busbars/nodes.
- Voltage drop under maximum demand scenario remains within the statutory limits of - 6% on all 11kV busbars/nodes.
- 33kV circuit loadings assessed for the worst-case maximum demand scenario; across the system are within the acceptable circuit ratings.

From the results it can be observed that 38 primary substations are facing voltage drop in 2024 below the statutory limit of -/+6% at the 33kV busbars. However, the 11kV busbars are complying with the statutory voltage limits with consideration of operating the capacitor banks and the transformer tap-changer at the suitable tap position except 3 PSS. By 2027, the number of primary substations facing voltage drop at the 33kV busbar will be reduced to 31 as a results of network expansion where new

33kV lines will be introduced in the system. NEDC will continue monitoring these primary substations to ensure keeping the 11kV network within statutory voltage limit of -/+6% . Moreover, NEDC and will keep in consideration to improve the 33kV voltage through providing new 33kV lines or installing new Grid connection points whenever is possible.

### 4.7.3. Short Circuit Analysis

NEDC carries out short circuit calculation studies to establish the capability of equipment to withstand three phase maximum prospective fault current levels. All short circuit results have been listed in excel sheet file in Appendix B-4.

The principal source of fault currents is the generation assets connected to the transmission system with the fault current contribution onto the NEDC distribution system via the 132/33kV GSS transformers. The fault current infeed from the OETC source have been updated in our power system models according to the data provided by the OETC's 2024 Capability Statement which covers up the transmission system developments up to 2027.

The system configurations modelled for short circuit studies in each year, to represent the maximum prospective fault current levels, while also reflecting the realistic operational arrangement are based on the following principles:

- All existing and new 2x20 MVA PSSs are simulated for operation with the 11kV bus-section circuit breaker in the "normally closed" position[11].
- All existing and new 3x20 MVA PSSs are simulated for operation with one 11kV bus-section circuit breaker as "normally closed" and one as "normally opened" (i.e., in N or N-1 scenario, it represents a 4 out of 5 'normally closed' circuit breakers scenario) with an auto transfer scheme (ATS)[12].
- All existing 2x20 MVA PSSs and 3x20 MVA PSSs are simulated for operation of 33kV bus-section circuit breakers within the PSSs (wherever present)[13] as "normally open".
- All existing and new outdoor primary substations (3x6MVA, 2x6 MVA, 2x3 MVA and 2x1 MVA) are simulated for operation with the 11kV bus-section circuit breaker in the "normally open" position.

[11] Except for few locations where the 33kV feeders for the individual transformers are connected from two different GSSs in which case, the 11kV bus-section circuit breaker is kept "normally open" for the respective year(s).

[12] If the fault levels are within limits for this worst-case scenario's then on bus-coupler open scenarios of existing primaries the fault level's will be even lower.

[13] For new PSS, the 33kV configuration excludes the 33kV bus-section circuit breakers at the PSS.

The design short circuit breaking ratings of the 11kV switchgear component a new and upgraded primary substations are designed to 18.4 kA or higher based on short circuit requirement to comply with system requirements.

Currently, in the absence of accurate fault level contribution data from low voltage (LV) side, a worst-case allowance is made for LV motor fault contribution majorly due to the nature of the air conditioning load prevalent across the NEDC's distribution system. A motoric to static load type ratio of 80/20 (in percentage) is considered using the system maximum demand values. System modelling for fault current calculations have been performed in accordance with the principles of the "IEC 60909-Short Circuit Currents in 3 Phase AC Systems" standard.

The maximum prospective fault current values are tabulated in the tables in Appendix B-4. The calculation of maximum prospective fault current is compared against the rated breaking capability of the primary equipment.

The maximum prospective (initial symmetrical) fault current is calculated to be still under but approaching (i.e., >95% and <100%) the rated breaking capacity of the primary 33kV equipment (switchgear) at the following primary substations:

- Wadi Adai-P175 (24.18 kA in 2024, then within 95% and 23.91 kA by 2027)
- Bousher G-GP02 (23.81 kA in 2024, 24.19 kA by 2025 and 24.2kA in 2026 & 2027)
- Seeb Grid-GP08 (23.84 kA in 2026 and 2027)
- Mawaleh South Grid-F1-GP05 (25.7 kA in 2024, 26.1 kA by 2025, 26.5kA in 2026 and 26.9 kA 2027)
- Mawaleh North Grid-GP01(24.461 kA from 2026 to 2027)
- Barka-5 IWP (24.24kA from 2025 to 2027)
- Barka Pumping Station PSS (26.09 kA by 2027)
- Sur IWP 2 (23.43 kA in 2024)
- Rusail Industrial 1-P103 (24.066 kA in 2024)
- Rusail Private Factory-P106 (24 kA from 2024 to 2027)
- Mabelah Grid-GP04 (23.96kA in 2027)
- MSH02-P00X (24.952kA in 2027)
- Sur IWP (23.98 kA from 2024 to 2027)
- Hay Sharq Temp (24.36 kA by 2024 )

However, at the following primary substation(s), minor excursions beyond the rated breaking capacity of the 33kV equipment (switchgear) are observed:

- MSQ Grid-GP06 (25.2 kA by 2024 (101% of 25 kA rating))
- Rusail Ind 4-P158 (25.934 kA by 2024 (104% of 25 kA rating))
- Rustaq Grid (41.946 kA by 2024 (168% of 25 kA rating))
- Nizwa Grid (29.9 kA in 2024 and 27.49 kA by 2027 (113% of 25 kA rating))

- Izki Grid (28.104 kA in 2024 and 24.8 kA by 2026 (99.9% of 25 kA rating))
- Sur Grid (26.22 kA from 2024 and 26.51 by 2027 (106% of 25 kA rating))
- Mudhairib Grid (26.6384 kA in 2025 and 28.13163kA by 2027 (113% of 25 kA rating))
- Nizwa ROP (24.83 kA in and 24.66 by 2027)

Where it marginally exceeds above the switchgear rating; hence NEDC shall monitor this PSS closely and create mitigation plans in form of operational restrictions if required based on the monitoring results.

It is to be noted that all the above primary substations are in close electrical vicinity of the grids substations where these results are based on non-coincident maximum demand fault contributions to represent worst case scenarios of the connected PSSs.

The maximum prospective (initial symmetrical) fault current levels at 11kV busbars of all the primary substations are within their rated breaking capacities except for the following primary substations:

- Billah (18.63 kA in 2024 (101% of 18.4 kA rating)
- Royal Hospital-P024(20.8 kA in 2024,21.1kA from 2025 to 2027 (104%> of 20 kA rating)

### 4.7.4. Technical Losses Assessment

The technical losses in the NEDC distribution system are a factor of the configuration of the system, type and specification of equipment, percentage utilisation of assets and customer energy consumption. Technical losses are attributed to load and no-load losses in the 33kV feeders and 33/11.5kV primary transformers, 11kV feeders and distribution transformers and the LV distribution system. In line with standard international practice for utilities where the distribution system is not fully modelled, we calculate the losses for specific network elements (transformers, overhead lines and cables) across the different voltage levels (33kV, 11kV and LV) and then summate the total losses to obtain a percentage technical loss for each primary substation.

The percentage technical losses are then apportioned according to the proportion of total system energy supplied by each substation. A summation of all apportioned technical losses is then presented as the system percentage technical losses. The summated technical losses based on the 2024 distribution system operation is calculated to be 4.86%. The breakdown of technical losses by voltage level is shown in Table 23 below.

**Table 23 : Technical Losses**

| System Component | Zone 1 | Zone 2 | Zone 3, Musandam & Al Wasta | % Total |
|---|---|---|---|---|
| 33 KV OHL, UGC & PT Losses | 0.68% | 1.63% | 1.35% | 1.17% |
| 11 KV OHL & UGC Losses | 0.42% | 1.05% | 1.22% | 0.84% |
| 11/ 0.415kV Distribution Tx Losses | 1.57% | 2.22% | 1.63% | 1.80% |
| LT OHL & UGC Losses | 1.38% | 0.93% | 0.69% | 1.05% |
| Total | 4.06% | 5.84% | 4.89% | 4.86% |

# 5. CHALLENGES AND OPPORTUNITIES WITHIN THE SYSTEM

## 5.1. Meeting Oman's Net-Zero 2050

Meeting Oman's Net-Zero 2050 by implementation of Low carbon technologies (LCTs) like Solar PV, Electrical Vehicles (EV), energy efficiency and battery storage are few of the major LCTs successfully being implemented around the globe to achieve sustainability of natural resources and protect the environment. This philosophy is also the cornerstone for Oman as demonstrated in the Oman Vision 2040 Environment and Natural Resources and Oman's Net-Zero 2050 Objective[14]. To achieve the above and other sustainable goals of the Sultanate National Energy Strategy for 2040 recommended that around 30% of Oman's generation mix should come from renewable energy sources (RES)—primarily onshore wind and solar—by 2030[15]. Lastly the CRT and customer tariff reforms introduced by Oman 2017 onwards are accelerating the adoption of these LCTs.

NEDC recognises that the nature of electricity generation and use is changing. We envisage that recent policy initiatives will result in an increase in photovoltaic (PV) generation on our distribution system. Unlike other utilities in different regions, Oman has not seen significant uptake in electric vehicle charging thus, the associated demand characteristics for electric vehicles (EV) are not considered to be a contributing factor to our system planning in the short-term planning horizon. However, this will be closely monitored to check the penetration rate of EV and PV in general.

### 5.1.1. Photovoltaic (PV) connections

In accordance with the above, the LCT with significant impact to the NEDC system as of 2024 is Solar PV. In 2017, Authority for Public Services Regulation (APSR) revised the existing regulatory framework to facilitate the adoption of small-scale grid connected solar PV systems by customers in Oman. The PV guidelines detail the following:

- Establishing the minimum technical standards required for small scale grid connected PV systems.
- Detailing the connection process including the installation, metering and operation/maintenance.
- Allowing the distribution companies to act as agents for OPWP (the current single buyer of electricity) to buy PV-generated electricity from customers.

With the introduction of Sahim-I initiative by the APSR since May 2017, there has been an increasing uptake of small grid connected PV systems for households and business as evident from the PV connections list in Appendix B. NEDC does foresee challenges and opportunities in the way we will plan

[14] https://isfu.gov.om/2040/Vision_Documents_En.pdf

[15] https://www.apsr.om/en/renewableenergy

and operate our system. Whilst PV may have the impact of reducing transmission and distribution congestion; we do envisage that challenges in terms of power quality, reverse power flow and operating within voltage limits will need to be addressed if PV uptake is significant.

NEDC is responsible for ensuring power quality according to the regulations under which we operate. However, with the addition of intermittent, consumer-owned and non-dispatchable PV units, current standard procedures for guaranteeing power quality might not be as effective as they are without PV.

Overvoltage is one of the main reasons for limiting the capacity (active power) of non-dispatchable PV; that can be connected to a low voltage Distribution System. During high PV generation and low load periods; there is a possibility of reverse power flow and consequently voltage rise in the HV & LV feeder. We envisage that this will be most prominent during the winter period. For this reason, NEDC believe that if uptake is significant, it will impact investment decision making for reinforcement and asset replacement. Consideration of tap range, optimum dispatch of capacitor banks and conductor sizing may be necessary should PV penetration become high.

NEDC continues to experience a surge in applications for connecting solar PV systems of various sizes. As of September 30, 2024, a total of 614 PV systems are connected to the NEDC grid, contributing a combined generation capacity of 59.56 MW. Of these, 166 systems were newly energized in 2024, adding 12.86 MW to the year-to-date total. Additionally, the total number of received applications as of September 2024 has reached 831, representing a total requested generation capacity of 91.37 MW.

Table 24 and Figure 13 and Figure 14 below shows these customer classifications for the applications in the category.

**Table 24: 2024 PV connection Applications with total installed PV capacity**

| Sr. | Category | No. of Connected Applications | | Connected Generation [MW] | | Total Applications | |
|---|---|---|---|---|---|---|---|
| | | YTD 2024 | As End Sep, 2024 | YTD 2024 | As End Sep 2024 | No of applications As End Sep, 2024 | Requested Generation As End Sep, 2024 |
| **1** | Commercial | 25 | 119 | 8.97 | 37.94 | 169 | 57.94 |
| **2** | Government | 21 | 82 | 2.37 | 15.08 | 109 | 22.13 |
| **3** | Residential | 66 | 336 | 0.84 | 4.14 | 471 | 5.85 |
| **4** | Agricultural | 54 | 77 | 0.67 | 2.40 | 82 | 5.45 |
| **Total** | | **166** | **614** | **12.86** | **59.56** | **831** | **91.37** |

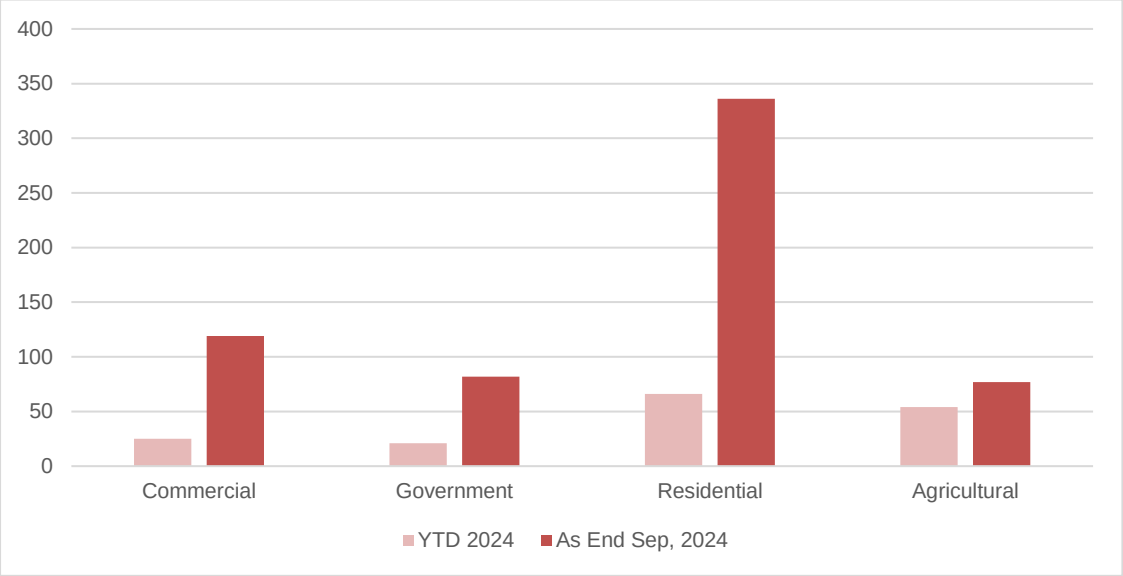


**Figure 13: Number of PV Applications**

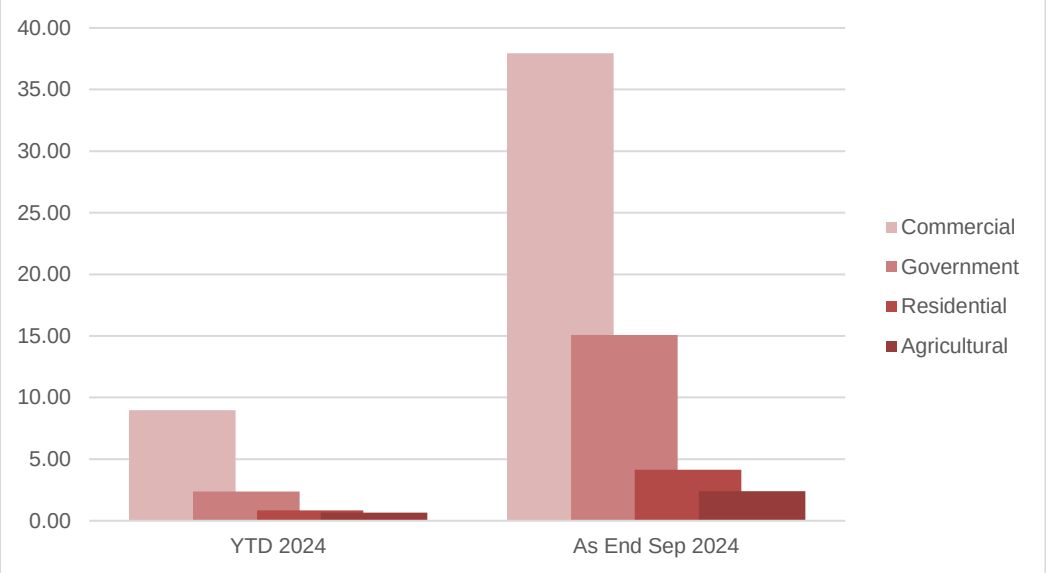


**Figure 14: Connected Generation from PV [MW]**

In accordance with the current Oman regulations the solar PV systems are required to be firstly installed for self-consumption basis before any excess generation is exported to the distribution system for the consumption of other customers. Net metering allows Residential, Government and Commercial customers who generate their own electricity from solar power, to sell the surplus electricity back into the grid.

# 6. THE INVESTMENT PLAN

## 6.1. Future System Development Plans

NEDC has prepared a plan for the new investments required in 2025-2027 to reinforce the 33 kV network and ensure compliance with the security standards. Many substations and feeders will start moving toward compliance situation. However, the NEDC investment plan updates annually to cover other substations and feeders that need more investments. NEDC has taken various steps to tackle any bottlenecks in the project management cycle, and with these interventions, our capabilities to deliver all the required capital expenditures will undoubtedly improve.

Table 25 show the summary of planned 33 kV projects in the NEDC network per governorate in the different stages, the details are illustrated in Appendix C.

**Table 25: A summary of the 33 kV Expansion Plan**

| Governorate | NEDC Investment Planning Stage | NEDC Investment Designing Stage | NEDC Investment Tendering Stage | NEDC Investment Execution stage | NEDC Investment Completed |
|---|---|---|---|---|---|
| **Muscat** | 1 | 5 | 3 | 7 | 6 |
| **Dakhiliah** | 0 | 0 | 0 | 7 | 0 |
| **South Sharqiyah** | 0 | 6 | 1 | 4 | 0 |
| **North Sharqiyah** | 0 | 0 | 0 | 1 | 0 |
| **South Batinah** | 0 | 0 | 0 | 6 | 0 |
| **North Batinah** | 3 | 2 | 0 | 2 | 0 |
| **DHAHIRAH** | 3 | 1 | 0 | 5 | 0 |
| **Buraimi** | 0 | 0 | 0 | 0 | 0 |
| **Musandam** | 0 | 2 | 0 | 1 | 0 |
| **Wusta** | 1 | 1 | 0 | 3 | 0 |
| **NEDC** | **8** | **17** | **4** | **36** | **6** |

Moreover, Table 26 show the summary of sponsored projects in the NEDC network per governorate in the different stages, the details are illustrated in Appendix D.

**Table 26: A summary of the Sponsored Projects**

| Governorate | Sponsored Investment Planning Stage | Sponsored Investment Designing Stage | Sponsored Investment Tendering Stage | Sponsored Investment Execution stage | Sponsored Investment Completed |
|---|---|---|---|---|---|
| Muscat | 0 | 0 | 0 | 1 | 0 |
| Dakhiliah | 0 | 0 | 0 | 1 | 4 |
| North Sharqiyah | 0 | 0 | 0 | 0 | 1 |
| South Batinah | 0 | 0 | 0 | 0 | 2 |
| **Total** | **0** | **0** | **0** | **2** | **7** |

## 6.2. Network Suitability for New Connections

Since January 2024 up to end of September NEDC connected 34,472 applications with worth of 1,871 MW for both simple and complex connections. The table below shows the statistic for all governorates for both connections. From the table below it was noted that the for the simple connection the average connected load per customer is 0.03 MW. For the complex connection, there two major customers who Sultan Hiatham City and Aida Yitti project with 269.69 MW and 206.99 MW respectively. Therefore, for the remaining customers, the average connected load per customer for the complex customer is around 7.8 MW.

**Table 27: Summary of Connected Customer during 2024**

| Type of Applicant | No. of Applications | Connected load [MW] |
|---|---|---|
| **Simple connection** | 34,439 | 1119 |
| **Complex Connection** | 33 | 702.6 |
| **Total** | 34,472 | 1821.6 |

These connections already implemented in the load forecast and power system analysis. All reinforcement or investment have been considered in the future investment plan as illustrated in the previse sections.

## 6.3. System Constraints

Load related system constraints fall into one of two categories:

- Current constraints that can be considered DSSS obligations.
- Load related constraints based on current load growth forecasts.

The required reinforcements and equipment loadings are shown in Appendixes C, D and E give a clear picture of the anticipated constraints that may be imposed on the 33 kV network. The load flow results shown for the years 2025, 2026, and 2027 were obtained assuming that the current ongoing projects (CWIP) are expected to be completed on time and that the planned reinforcements are financed to bring them into operation. Failure to fund these reinforcements or delay in timely completion will constrain the network for three years.

## APPENDIX A: DISTRIBUTION LICENCE CONDITION 33: DSCS

1. The licensee shall, within 12 months of the grant of this licence, and thereafter, on an annual basis, prepare a statement, in a form approved by the authority, showing, in respect of each of the three succeeding financial years, circuit capacity, forecast power flows and loading on each part of its distribution system and fault levels for each transmission node, together with:
    - information on the status of distribution circuit capacity and the anticipated future requirements of such capacity, including (i) applications for new Connections; and (ii) applications to Connect Generation capacity to its Systems;
    - a commentary prepared by the Licensee indicating the Licensee's views as to those parts of its Distribution System most suited to new Connections and Distribution of further quantities of electricity
    - information on what constraints are foreseen on the Licensee's Distribution System and where;
    - information relating to progress of ongoing investment in its Distribution System;
    - such further information as shall be reasonably necessary to enable any Person seeking to Connect to or use the Licensee's Distribution System to identify and evaluate the opportunities for so doing;
    - an assessment of technical losses from the Licensee's Distribution System; and
    - such other matters as shall be specified in directions issued by the Authority from time to time for the purposes of this Condition,
    - provided that the Authority may, upon application of the Licensee, relieve the Licensee from the obligation to prepare any such statement in respect of any period and any part or parts of its Distribution System specified in directions issued to the Licensee by the Authority from time to time for the purposes of this Condition.
2. The Licensee shall include in every statement prepared in accordance with paragraph 1 above the information required by that paragraph except that the Licensee may with the prior consent of the Authority omit from any such statement any details as to the capacity, flows, loading or other information, disclosure of which would, in the view of the Authority, seriously and prejudicially affect the commercial interests of the Licensee or any third party.
3. The Licensee may periodically revise the information set out in and, with the approval of the Authority, alter the form of the statement prepared in accordance with paragraph 1 and shall, at least once in every year this Licence is in force, revise such statement in order that the information set out in the statement shall continue to be accurate in all material respects.
4. The Licensee shall, when preparing the statement referred to in paragraph 1 of this Condition, ensure that the statement takes due account of information required to be provided to it by Persons bound by the Distribution Code.
5. The Licensee shall send a copy of the statement prepared in accordance with paragraph 1 and of each revision of such statement in accordance with paragraph 3 to the Authority. Each such revision shall require to be approved by the Authority and shall not become effective until approved by the Authority.
6. The Licensee shall, subject to paragraph 6, give or send a copy of the statement prepared in accordance with paragraph 1 or (as the case may be) of the latest revision of such statement in

accordance with paragraph 3 approved by the Authority pursuant to such paragraph to any Person who requests a copy of such statement.

7. The Licensee may make a charge for any statement given or sent pursuant to paragraph 4 of an amount reflecting the Licensee's reasonable costs of providing such a statement which shall not exceed the maximum amount specified in directions issued by the Authority from time to time for the purposes of this Condition.

# APPENDIX B: SYSTEM STUDY RESULTS

Appendix B presents the following series of tables, for each grid substation power system model, which show the expected performance of the distribution network under maximum demand for each year from 2024 to 2027.

**1. Primary Substations Maximum Demand and Percentage Loading**

The maximum demand with real and reactive power loads at the PSS individual peak time in 2024 planning cycle and as accordingly forecasted for the period from 2025 to 2027. Percentage loading is calculated based on the Firm Capacity of the PSS. This data was used in the load flow and fault level studies for maximum demand scenario presented in this section of this DSCS. Below web link drives directly to all Primary Substations Maximum demand tables:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/CapabilityStatment2025-2027.xlsx

**2. 33kV Feeder Loads**

The resulting maximum demand in MVA on 33kV circuits/feeders, calculated for the individual non-coincident maximum loads of the PSS(s) connected to these feeders for the period 2024 to 2027. Percentage loading is calculated based on the de-rated capacity of the circuits. Below web link drives directly to all 33kV feeders loading tables:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/33kVFeedersLoading2024to2027.xlsx

**3. Primary Substations Bus Voltages**

The resulting voltage value (expressed in percentage of the nominal 33kV and 11kV) on the busbars of the PSSs, corresponding to maximum and minimum demand scenarios. Below web link drives directly to the voltage non-compliance tables:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/PrimarySubstationsBusVoltages_2024-2027.xlsx

**4. Primary Substation 3-Phase Fault Current Levels (kA)**

The resulting 3 phase maximum fault current level on the busbars of the PSSs, corresponding to maximum demand scenarios. The rated breaking fault ratings of the switchgear are also specified. Below web link drives directly to all Primary Substation 3-Phase Fault Current Levels tables:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/ShortCircuitLevels(kA)_SimulationResults.xlsx

**5. 11kV Feeder Loads**

Below web link drives to the actual maximum demand in (Amp) on 11kV circuits/feeders for 2024 tables:

https://mzgisportal.mzec.co.om/portal/apps/webappviewer/11kVFeedersLoad2024-CS.xlsx

**Explanatory Notes:**

1. **1TX** in Firm Capacity means primary substation has single 33/11 kV transformer (i.e., zero N-1 capacity and firm capacity equivalent to 11kV interconnection capacity);
2. **Standby PSS** means primary substation having 33kV and 11kV busbars energized with 11kV outgoing feeders (i.e., loads) disconnected. The load on these PSSs is expected to be connected occasionally, depending on requirement.

In the above-mentioned tables, a **"-"**(dash) appears in relevant years due to any of the following reasons, as may be applicable:

- The primary substation is shifted (i.e., connected) to another grid station.
- The primary substation, or any of its capacity enhancement project, is planned to be energized/commissioned in the future.
- There are no 11kV busbars (rather a different voltage level exists e.g., 6.9kV for a private customer, operated and maintained by the customer);
- NEDC doesn't own/have the information of the network below 33kV level.
- An "Outage" / "Out of Service" condition exists on concerned 33kV circuit / 33kV busbar at the day/time of the declared maximum demand of the PSS.

# APPENDIX C: FUTURE SYSTEM DEVELOPMENT PLANS

| No. | PIAD No. | Project Name | Wilayat | Expected Completion Year | Project Status | Project Purpose |
|---|---|---|---|---|---|---|
| **Muscat** | | | | | | |
| 1 | D/06/2019 | New Mabelah South 9 – [P184] | Seeb | 2024 | Completed | To relieve loads from Mabelah Area |
| 2 | D/02/2021 | New Airport Height 6 PSS [P195] | Bousher | 2024 | Completed | To relieve loads from Airport Height area and accommodate the new load |
| 3 | MEDC/AMD/2/2018 | Replacement of al Hamriyah PSS [P035] | Al Hamriyah | 2024 | Completed | Old asset replacement |
| 4 | D/07/2019 | Upgrading Al Hail North 1 [P027] | Seeb | 2024 | Completed | To relieve loads from Al Hail Area and accommodate the new load |
| 5 | D/03/2021 | Installation of 33Kv Capacitor Bank in different Grids locations | Different Locations | 2024 | Completed | Enhance the Network reliability and efficiency |
| 6 | D/05/2018 | Madinat Al Nahdha PSS - 33kV Load Shifting to Amerat Grid from Jahloot Grid | Amerat | 2024 | Completed | Balance the load between the GSS and making the two 33kV feeders from the same GSS |
| 7 | D/01/2020 | Upgrading Sarooj Shati Al Qurum [P110] | Bousher | 2024 | Execution stage | To relieve loads from Al Sarooj - Al Qurum Area |
| 8 | PIAD/REP/2019/1/1 | Construction of 2X20MVA Ruwi Valley [P174] | Muttrah | 2025 | Execution stage | Old asset replacement and upgrading the PSS to relieve loads from the area |
| 9 | PIAD/REP/2022/2 | Asset Replacement at Rusail Industrial 1 [P103] | Seeb | 2025 | Execution stage | Old asset replacement |
| 10 | D/03/2022 | Upgrading Al Hail North 2 Upgrade [P028] | Seeb | 2025 | Execution stage | To relieve loads from Al Hail Area and accommodate the new load |
| 11 | D/06/2022 | 11kV Capacitor Banks at Primary Substations | Different Locations | 2026 | Tendering Stage | Enhance the Network reliability and efficiency |
| 12 | PIAD/REP/2022/4 | Aziba South-1A P014 replacement of 11kV SWG | Bousher | 2026 | Designing Stage | Old asset replacement |
| 13 | - | Muttrah Store P085 replacement of 33kV SWG | Muttrah | 2026 | Tendering Stage | Old asset replacement. |
| 14 | D/02/2024 | Upgrading Al Shahbari [P092] 3x220MVA | Quriyat | 2026 | Designing Stage | To relieve loads from Quriyat Area and accommodate the new load |
| 15 | D/01/2024 | New Misfah Phase 2 PSS 3x20MVA [ P200] | Seeb | 2026 | Designing Stage | To relieve loads from Misfah Area |
| 16 | D/03/2024 | Upgrading Yenket [P133] PSS | Quriyat | 2026 | Designing Stage | To relieve loads from Yenket Area |
| 17 | - | MSH01 PSS | Seeb | 2026 | Execution Stage | To relieve loads for Madinat Al Sultan Haitham |
| 18 | - | MSH02 PSS | Seeb | 2026 | Execution Stage | To relieve loads for Madinat Al Sultan Haitham |
| 19 | - | MSH02 PSS | Seeb | 2026 | Execution Stage | To relieve loads for Madinat Al Sultan Haitham |

| No. | PIAD No. | Project Name | Wilayat | Expected Completion Year | Project Status | Project Purpose |
|---|---|---|---|---|---|---|
| 19 | D/04/2022 | Bousher Ansab Height [P202] PSS | Bousher | 2027 | Tendering Stage | To relieve loads from AL Ansab Area |
| 20 | - | New Mabelah South 10 PSS | Seeb | 2027 | Planning Stage | To relieve loads from Mabelah Area |
| 21 | - | New Ghala 3 PSS | Bousher | 2027 | Designing Stage | To relieve loads from Ghala Area |
| **Al Batinah South** | | | | | | |
| 1 | SB-07/2013 | Construction of 3x20MVA PSS (Hay Asem) with 33kV & 11kV feeders | Barka | 2024 | Execution stage | To relieve loads from Rumais Primary Substation |
| 2 | TS-SB 3/2021 | Upgradation Of Tekha Pss From 1X6 Mva To 2X6 Mva | Rustaq | 2024 | Execution stage | To relieve loads from Wadi Sahtan Primary Substation |
| 3 | SB 01/2019 | Construction Al Sawadi 2x20 MVA substation with two 33 kV feeders from Blue City grid | Barka | 2025 | Execution stage | To relieve loads from Billah Primary Substation |
| 4 | SB-04/2013 | Construction of 2x20 MVA PSS Shuaybah South at Al Musanah in Batinah South with 33 kV and 11 kV feeders. | Musanah | 2025 | Execution stage | To relieve loads from Jamma Temp Primary Substation |
| 5 | SB 02/2022 | Construction of 2X20 MVA PSS (Khazaen) with 33&11kV feeders | Nakhal | 2025 | Execution stage | To provide power supply in Khazaen Economic City |
| 6 | SB 01/2022 | Construction of 2X20 MVA PSS (Al Wasit) with 33&11kV feeders | Nakhal | 2025 | Execution stage | To relieve loads from Afi Primary Substation |
| **Al Dakhiliah** | | | | | | |
| 1 | DH-07/2013 | Construction of Adam Bashaer 33 kV feeder from Adam grid station to supply Adam Bashaer primary substation | Nizwa | 2025 | Execution stage | To secure the 33 kV supply for Adam Bashaer primary substation |
| 2 | DH 06/2012 | Construction of Sumail Industrial 132/33 kV grid station 2x125 MVA with 33 kV feeders | Sumail | 2025 | Execution stage | Relieve the load form existing Sumail New grid station |
| 3 | DH-08/2013 | Construction of Birkat Al Mouz 132/33 kV grid station 2x125 MVA with 33 kV feeders | Nizwa | 2025 | Execution stage | Relieve the load form existing Izki and Nizwa grid stations |
| 4 | DH-02/2013 | Construction of Jabel Al Akhder one 33 kV feeder from Izki grid station to supply Jabal Al Akhdher New primary substation | Nizwa | 2025 | Execution stage | To secure the 33 kV supply for Jabel Al Akhder primary substation |
| 5 | ASS-DK 1/2022 | Construction of New 33 kV feeder from Samad Grid station to Sumrah 3x6 MVA primary substation | Mudhaibi-Sumail | 2025 | Execution stage | Feeder Sumrah PSS from Samad Grid |
| 6 | | Upgrading Of Basher Primary Substation From 2X6MVA to 3X6MVA with 33KV & 11KV Feeders | Adam | 2025 | Execution stage | Relieve the load form Basher Primary Substation |
| 7 | DH 01/2019 | Construction of Maemeer 2x20 MVA Substation in Nizwa | Nizwa | 2026 | Execution stage | Relieve the load form existing Karsha, Maara temp and Mamad primary substations |
| **North Sharqiyah** | | | | | | |
| 1 | NSH 01/2019 | Construction of Al Dreez 2x20 MVA substation with two 33 kV feeders interlink with Mudhairib-3 and Mudhairib-4 | Ibra | 2024 | Execution stage | Relieve the load from existing Al Mudhairib primary substation |
| **South Sharqiyah** | | | | | | |

| No. | PIAD No. | Project Name | Wilayat | Expected Completion Year | Project Status | Project Purpose |
|---|---|---|---|---|---|---|
| 1 | SSH 01/2016 | Construction of Wafi 2x20 MVA primary substation | Jalan Bani Bu Hassan | 2025 | Execution stage | Relieve the load from existing Tawi Aishah, Hadri Bilad and Kamil Water Pump primary substations |
| 2 | SH 01/2012 | Construction of JBB Ali-2 2x20 MVA primary substation | Jalan Bani Bu Ali | 2025 | Execution stage | Relieve the load from existing Jalan Bani Bu Ali grid and Jalan Bani Bu Ali primary substations |
| 3 | SSH 02/2019 | Construction of Jawabi Grid 33 kV busbar and 33 kV switchgear | Jalan Bani Bu Ali | 2025 | Execution stage | Relieve the load from existing Jalan Bani Bu Ali Grid Station |
| 4 | SSH 03/2016 | Construction of Al Ashkhara-2 2x 20 MVA substation with two 33 kV incomers from BB Hassan Grid Station | Jalan Bani Bu Ali | 2025 | Execution stage | Relieve the load from existing Ashkhara primary substations |
| 5 | TS-SSH 2/2022 | Modification of Sur Filayj 1x6 + 1x6 MVA substation to 2x6 MVA with additional 33 kV Tapping from feeder 15L5 Sur Grid Station | Sur | 2026 | Designing Stage | To comply with DSSS |
| 6 | PIAD-SSH 1/2023 | Construction of Qarah 3 x 20 MVA substation with 33 kV and 11 kV feeders | Jalan Bani Bu Ali | 2027 | Designing Stage | Relieve the load from existing JBBA and Sauh Ramath and Qarah temp primary substations |
| 7 | D/05/2024 | Construction of AL Falah Hospital 3 x 20 MVA substation with 33 kV and 11 kV feeders | Jalan Bani Bu Hassan | 2027 | Designing Stage | Relieve the load from existing JBBH-a primary substations and power supply to Al Falah Hospital |
| 6 | - | Constructing one 33KV circuit from JBB. Hassan to Tahaim area | JBB. Hassan | 2025 | Tendering Stage | Power Supply to Tahaim area |
| 7 | - | Constructing of 33KV and 11KV to overcome non-compliance of Nahddah and Ras Helf PSS | Masirah | 2025 | Designing Stage | To comply with DSSS |
| 8 | - | Interconnection of the Masirah distribution system with MIS by interlinked Switching Station to the Masirah Grid. | Masirah | 2026 | Designing Stage | Shutdown the Masirah Power Plant and reduce the OPEX cost |
| 9 | - | Interconnection of the Khuwaima distribution system with MIS by constructing 2x20MVA | Khuwaima | 2026 | Designing Stage | Shutdown the Khuwaima Power Plant and reduce the OPEX cost |
| **Al Wusta** | | | | | | |
| 1 | Tanweer 10/2022 | Constructing a new (132/33) kV Grid Station in Khuwaima area with new 33kV lines to connect Khuwaima and Juwairah Primary Substations. | Mahout | 2025 | Execution stage | To feed Hijj area from the Mahout Grid |
| 2 | - | Constructing a new (132/33) kV Grid Station in Khuwaima area with new 33kV lines to connect Khuwaima and Juwairah Primary Substations. | Mahout | 2026 | Execution stage | Shutdown Khuwaima Power Plant and reduce the OPEX cost |
| 3 | RE-WS 02/2024 | Construction of 2x6 MVA PSS and 33 & 11KV Feeders (Interlinking Najdha Network to MIS) at Wilayat Mahout in Al Wusta Governorate | Mahout | 2026 | Designing Stage | Shutdown Najdha Power Plant and reduce the OPEX cost |

| No. | PIAD No. | Project Name | Wilayat | Expected Completion Year | Project Status | Project Purpose |
|---|---|---|---|---|---|---|
| 4 | - | Interconnection of the Khaloof distribution system with MIS by constructing one 33KV circuit from the Mahout network and 2x3 MVA PSS in the Khaloof area. | Mahout | 2026 | Execution stage | Shutdown Khloof Power Plant and reduce the OPEX cost |
| 5 | - | Extension of 33KV feeder to Um Qurshreb Village. | Mahout | 2026 | Planning Stage | Power Supply to Um Qurshreb Village. |
| **AL Dhahirah** | | | | | | |
| 1 | 2017-01 | Reconstruction of 33 kV Portion of Ibri Old Grid Station- 33kV Feeders Interlinks | IBRI | 2025 | Execution stage | Replacing old assets and managing load between grid stations |
| 2 | 2021-2 | Construct New Hilat Al Nahdha PSS 3X20 with 33kV feeder from Ibri Grid | IBRI | 2025 | Execution stage | Cover the new loads and to relieve loads from Mazra Bani Khater Primary Substation |
| 3 | 2021-5 | Upgrading Baat PSS from 2X6 MVA to 2X20 MVA with 33kV feeder from Dreez Grid | Dreez | 2025 | Execution stage | Cover the new loads |
| 4 | 2021-6 | Rearrangement of 33kV network between Dreez & AL Hail Grid Stations (transfer Hugermat & Kahant to AL Hail Grid & Provide second feeding source to AL Mahual & Kahanat PSS) | IBRI | 2025 | Execution stage | To manage Grid Stations loading and provide second 33kV feeding source to AL Mahual and Kahanat PSSs |
| 5 | 2022-1 | Construction of Ibri Industrial 2x6 MVA Primary Substation | IBRI | 2025 | Execution stage | Providing secure supply to new Industrial Area |
| 6 | 2021-2 | Upgrade AL Akhdar PSS from 2x10 to 2x20 and Shift from Ibri TX1 & TX2 Grid Station to IBRI Old Tx3 & Tx4 | IBRI | 2025 | Designing Stage | Cover the new loads |
| 7 | - | Upgarding of Hugermat from 2X10 MVA to 2x20 MVA Primary Substation | Dreez | 2027 | Planning Stage | To relieve load from Hugermat, Maqnyat and Substations |
| 8 | D/04/2024 | Construction of Mashrooh 2x6 MVA Primary Substation | DANK | 2027 | Planning Stage | To relieve load from Al Rayhani |
| 9 | - | Construction of Maskin 2x6 MVA Primary Substation | DREEZ | 2027 | Planning Stage | To relieve load from Al Nujayd |
| **North Batinah** | | | | | | |
| 1 | 2021-1 | Upgrade Sana Bani Gafer PSS From (2 x 6 MVA) to (2 x 20 MVA) with 33KV feeder interlinks to S.B.G PSS and AL Lehban PSS | Al Khabourah | 2025 | Execution stage | Cover the new loads |
| 2 | Business Case (2022-02) | 33kV feeder interlinks to provide second feeding source for Wadi Ahin, Hail Al Asskareen , wadi Al Hilti and Hay Al Rafaa PSSs. | Sohar | 2025 | Execution stage | Providing second feeding source to comply with DSSS |

| No. | PIAD No. | Project Name | Wilayat | Expected Completion Year | Project Status | Project Purpose |
|---|---|---|---|---|---|---|
| 3 | 2021-4 | Upgrading AL Wajajah PSS from 2X3 MVA to 2X6 MVA with connect new 33kV feeder from MD Shinas Grid | Shinas | 2026 | Designing Stage | Cover the new loads |
| 4 | Business Case (2024-3) | Transferring and Converting Falaj AL Qbail 1 PSS 33kV feeders from Suhar Industrial Port Grid to SFZ Grid | Sohar | 2026 | Planning Stage | Load Managing between Grid Stations |
| 5 | 2024-2 | Construct New SIET-6 (Phase 7) PSS 3X20 MVA | Sohar | 2027 | Designing Stage | Providing secure supply to Sohar Industrial Estate phase 7 |
| 6 | - | Upgrade of Al Huwail 1 from 2 x 20 MVA to 3x20 MVA | SAHAM | 2027 | Planning Stage | To relieve load from Mukhalif Jadeedah, Al Huwail 2 and Hilat al Suq |
| 7 | - | Construction of Murtfaat Al Hambar 3x20 MVA Primary Substation | Sohar | 2027 | Planning Stage | To relieve load from Al Muwailh 2 and Palm Garden Substations |
| **Musandam** | | | | | | |
| 1 | 2019-4 | Upgrading Siwi PSS from 2X6 MVA to 2X20 MVA with installing new 33kV feeder from Khasab Grid Station | Khasab | 2025 | Execution stage | Cover the new loads |
| 2 | - | Modification to secure Musandam Network | Khasab | 2026 | Designing Stage | Securing Khasab loads |
| 3 | - | New Khasab Port PSS (2X20 MVA) with Two 33kV Feeders | Khasab | 2026 | Designing Stage | Securing Khasab loads |

## APPENDIX D: SPONSORED PEOJECTS

| No. | Reference No. | Project Name | Wilayat | Expected Completion Year | Project Status | Purpose |
|---|---|---|---|---|---|---|
| **Muscat** | | | | | | |
| 1 | - | Improve Reliability at MOD MAM-B PS By Adding One New 33kV Feeder | Seeb | 2025 | Execution stage | The connection will be made by tapping on the existing 33kV cables passing near the AFH which are fed from Rusail Industry Grid(G13) and feeding Rusail B PSS and adding circa 1km of new 33kV sections form the tapping points. |
| **Al Batinah South** | | | | | | |
| 1 | CC/5/2017 | Construction of Al Hazam Water Pump 2x6 MVA substation with 33 kV feeders from Muladah Grid | Musanah | 2024 | Completed | To meet Customer load required |
| 2 | CC/2/2018 | Construction of Hay Al Sharq 2x20 MVA substation | Barka | 2024 | Completed | To meet Customer load required |
| **Al Dhakilyah** | | | | | | |
| 1 | CC/20/2018 | Construction of 3x20 MVA ROP College primary substation | Nizwa | 2024 | Completed | To meet Customer load required |
| 2 | CC/10/2018 (CC/26/2017) | Construction of 2x10 MVA Al Ain Water Pump primary substation | Samail | 2024 | Completed | To meet Customer load required |
| 3 | CC/11/2018 (CC/27/2017) | Construction of 2x10 MVA Hub 2 Water Pump primary substation | Samail | 2024 | Completed | To meet Customer load required |
| 4 | CC/9/2018 (CC/25/2017) | Construction of 2x20 MVA Hameem Water Pump primary substation | Samail | 2024 | Completed | To meet Customer load required |
| 5 | MZ23IC03209-ND/D/1081/2023 | Construction of 2x33 kV feeder from Samail Industrial 132/33 kV grid station 2x125 MVA for Al Thail Metal Recycling LLC | Samail | 2025 | Execution stage | To meet Customer load required |
| **North Sharqiyah** | | | | | | |
| 1 | MZ191C03217 | Construction of Al Hadeetha 2x20 MVA with two 33 kV feeders | Mudhaibi | 2024 | Completed | To supply the requested load of Al Wadi Endam Mine project |