OMAN POWER AND WATER PROCUREMENT CO. (SAOC)

Member of Nama Group

الشركة العمانية لشراء الطاقة والمياه (ش.م.ع.م)

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OPWP's 7-YEAR STATEMENT

(2022 – 2028)

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GLOSSARY

APSR	Authority for Public Services Regulation, Oman
ASA	Ancillary Services Agreement
BST	Bulk Supply Tariff
BTU/scf	British thermal units per standard cubic foot
CCGT	Combined-cycle gas turbine
COD	Commercial operation date
CRT	Cost reflective tariff
CSP	Concentrated Solar Power
DISC	Dhofar Integrated Services Company
DR	Demand Response
DPS	Dhofar Power System
EE	Energy Efficiency
ESCO	Energy Services Company
EWEC	Emirates Water and Electricity Company
GCCIA	Gulf Cooperation Council Interconnection Authority
HHV	Higher Heating Value
IPP	Independent power project
IWP	Independent water project
IWPP	Independent water and power project
kWh	Kilowatt hour(s)
KSA	Kingdom of Saudi Arabia
LOLH	Loss of load hours
m^3	Cubic metre(s)
m^3/d	Cubic metres per day
MEDC	Muscat Electricity Distribution Company (SAOC)
MEM	Ministry of Energy and Minerals
MIGD	Million imperial gallons per day
MIS	Main Interconnected System
MISC	Majis Industrial Services Company (SAOC)
MJEC	Majan Electricity Company (SAOC)
MMS	Market Management System
MSF	Multi-stage flash (desalination technology)
MW	Megawatt(s)
MZEC	Mazoon Electricity Company (SAOC)
MPS	Musandam Power System
OCGT	Open-cycle gas turbine
OETC	Oman Electricity Transmission Company (SAOC)
OPWP	Oman Power and Water Procurement Company (SAOC)
OWWSC	Oman Water & Wastewater Services Company
PDO	Petroleum Development Oman (LLC)
PPA	Power purchase agreement
PSPA	Power Supply Purchase Agreement
PWPA	Power and water purchase agreement
PV	Photovoltaic
RE	Renewable Energy
RFP	Request for Proposal
RFQ	Request for Qualification
RO	Reverse osmosis (desalination technology)
SAC	Sohar Aluminium Company
Sm^3	Standard cubic metre(s)
Sm^3/d	Standard cubic metres per day
SMP	System Marginal Price
TWh	Terawatt hour(s)
WRA	Wind Resource Assessment

OVERVIEW

Introduction

This statement provides a 7-year outlook for power in the main power systems of Oman: the Main Interconnected System (MIS), the Duqm Power System, the Dhofar Power System (DPS), and the Musandam Power System (MPS). The 7-Year Statement also provides an outlook for desalinated water supply in the Main Interconnected System, the Sharqiyah Zone, and the Dhofar Zone.

Over the next seven years, OPWP is committed to achieve ambitious goals to diversify the sources of electricity generation. New solar and wind projects are projected to contribute almost 11% of electricity production by 2025, and efficient utilisation of gas consumption will continue to improve over the planning horizon. In early 2022, OPWP launched the region's first wholesale electricity spot market. It will drive further efficiency improvements and provide a means for generation capacity that is not contracted to OPWP to sell power into the national grid.

OPWP prepares the 7-Year Statement annually in accordance with Condition 5 of its license. This is Issue 16, for the period 2022 to 2028; previous issues and additional information are available on the OPWP website at www.omanpwp.com

Demand for Electricity

In the MIS, peak demand is expected to grow at about 3% per year on average, from 6,473 MW in 2021 to 8,110 MW in 2028. Most of this growth is expected to occur in the near term from 2022 to 2024, as the economy recovers from the effects of the COVID-19 pandemic.

High and Low Case scenarios are also considered. The Low Case projects 1% annual growth in peak demand, reaching 7,140 MW in 2028, 970 MW below the Expected Case. The High Case projects 5% annual growth in peak demand at 9,080 MW by 2028, exceeding the Expected Case by 970 MW.

In the Dhofar Power System, peak demand is expected to grow at 5% per year, from 537 MW in 2021 to 739 MW in 2028. The Low Case projects 3% growth, reaching 650 MW by 2028, by 89 MW below the Expected Case. The High Case, on the other hand, projects 6% growth in peak demand, reaching 829 MW by 2028, exceeding the Expected Case by 90 MW.

Power Generation Requirements

In the MIS, the major developments include the start of the Spot Market in 2022, completion of the 400 kV North-South Interconnect to the Duqm Power System in 2023, and the continuing push for RE projects to reduce energy costs, driven by economics. The North-South Interconnect will stimulate development of the Special Economic Zone of Ad Duqm and development of RE projects in Al Wusta. In addition, it is expected to expand the North-South interconnector further to DPS by 2026.

Project developments in the MIS are expected to include: (1) procurement of capacity via a combination of uncontracted contributions from the Spot Market and dedicated, contract-based procurement rounds (Power 2024 and Power 2028, to the extent required); (2) completion of phase 2 of the Wind Resource Assessment by Q4 2022; (3) Manah I & II Solar IPPs to commence operation in 2025 ; (4) an additional Solar IPP with capacity

of 500 MW planned for COD in 2025 (5) a wind IPP of around 100 MW planned for COD in 2025 and to be located in the Sharqiyah region; and (6) Development of Waste-to-Energy project for COD in 2028.

In the Duqm Power System, OPWP plans to develop 100 MW Wind IPP project to be available in 2026. OPWP also plans to prepare a feasibility study of Concentrated Solar Power (CSP) project with thermal storage, potentially located near to Ad Duqm, which may be considered for procurement during the forecast period.

In the Dhofar Power System, OPWP seeks to develop an additional Wind IPP with a capacity of around 100 MW and to be located adjacent to the existing project in Harweel.

Fuel Requirements

The planned solar and wind projects are forecasted to contribute about 11% of total electricity production by 2025. This percentage is anticipated to increase further to around 24% by 2028.

In the MIS and DPS, the contributions of RE are expected to reduce fuel requirements by 3% per year on average through 2028, despite the similar level of annual growth in electrical energy requirements. Average gas utilisation by the generation fleet (sm^3 per MWh produced) is projected to improve by 20% from 2022 to 2028. From 2022 onwards, the main improvements will be due to the introduction of solar and wind IPPs.

Desalinated Water Requirements

Peak water demand in the MIS is projected to increase at 4% per year, from 1,103 thousand m^3/d in 2021 to around 1,461 thousand m^3/d in 2028. In the Sharqiyah Zone, peak water demand is expected to increase at 5%, from 144 thousand m^3/d in 2021 to 198 thousand m^3/d in 2028.

In the MIS, developments include: (1) addition of Barka V IWP (100,000 m^3/d, 22 MIGD) in 2024; (2) Development of North Batinah IWP (full capacity of 150,000 m^3/d, 33 MIGD) in Batinah region for early water supply (50,000 m^3/d, 11 MIGD) in 2028; (3) addition of Ghubrah III IWP capacity (300,000 m^3/d, 66 MIGD) in 2026; and (4) replacement desalination capacity (120,000 m^3/d, 26.4 MIGD) in the Barka Zone in 2024.

In the Sharqiyah Zone, the major development is the addition of Aseelah IWP (80,000 m^3/d, 18 MIGD) in 2022.

In Dhofar, water demand is projected to grow at 7%, and peak water demand to increase from 159,000 m^3/d in 2021 to 284,000 m^3/d in 2028. The main development is the addition of the Dhofar Water IWP (150,000 m^3/d, 33 MIGD) in 2027.

Procurement Activities

The main procurement activities for power projects in 2022 include: (1) completion of Manah Solar I & II IPPs procurement; and (2) procurement commencement of MIS Solar IPP 2025, Duqm Wind IPP 2025, Jalaan Bani bu Ali Wind IPP 2025, Dhofar II Wind IPP 2026, and Waste to Energy IPP. Beyond 2022, future procurement initiatives include additional RE IPPs, and potentially a Power 2024 and 2028 procurement rounds.

The main procurement activities for water projects in 2022 include: North Batinah IWP and Dhofar Water IWP.

SECTION 1 POWER

MAIN INTERCONNECTED SYSTEM and AD DUQM SYSTEM

The MIS extends throughout the Governorates of Muscat and Buraymi, and most of the Governorates of Al Batinah North, Al Batinah South, Ad Dakhiliyah, Ash Sharqiyah North, Ash Sharqiyah South and Ad Dhahirah, serving 1,148,950[1] electricity customers.

The MIS comprises ten power generation facilities (eight of which are operational and provides capacity contribution to the system, two of which are contracted to provide only ancillary services to the system), owned and operated by separate companies; the 400/220/132 kV transmission grid, owned and operated by Oman Electricity Transmission Co. (OETC); and three distribution networks, owned and operated by Muscat Electricity Distribution Co. (MEDC), Mazoon Electricity Co. (MZEC) and Majan Electricity Co. (MJEC). The three distribution network operators also act as licensed electricity suppliers, supplying existing and new electricity customers in their respective service areas. The MIS is interconnected with the power system of Petroleum Development Oman (PDO), and with the power system of the Emirate of Abu Dhabi and other Member States of the GCC Interconnection Authority via the Abu Dhabi Interconnect.

OPWP's role is to aggregate the power and desalinated water requirements of licensed electricity suppliers and water companies, and to economically procure the required power and desalinated water in bulk from generation/production facilities connected to the MIS and water transmission systems. OPWP is required to ensure that sufficient power generation resources are available to meet licensed electricity suppliers' demands. Wherever beneficial, OPWP co-procures desalinated water to meet the needs of water departments in joint power-water facilities and procures stand-alone desalinated water facilities upon the direction of OWWSC in accordance with Article 78 of the Sector Law.

The North-South Interconnect project is under construction by OETC and is expected to connect the Ad Duqm Power System to the MIS in 2023. Following this connection, Ad Duqm demand may be served mainly by lower cost generation in the MIS.

Ad Duqm is located on the eastern coastline of the Al Wusta region, approximately halfway between the MIS and the DPS. The latest population data from the National Centre for Statistics & Information reports that the total population in Wilayat Al Duqm, as of 2020, is 19,249[2]. This figure represents 20% growth when compared against 2019 population and is linked to the rapid developments of a new economic and industrial centre.

The Ad Duqm region is currently served by a relatively small integrated generation and distribution system, owned and operated by Tanweer, the Rural Areas Electricity Company. Tanweer owns and operates a 67 MW diesel-fuel fired power plant for supply to this grid area. Tanweer also has supply contract with Marafiq, the operator of the generator serving OQ Duqm Refinery, for surplus capacity. Tanweer is the sole licensed electricity supplier within the service area covered by the system, supplying existing and new electricity customers.

[1] APSR Annual Report 2020

[2] National Centre for Statistics & Information (2021) Data Portal - Population.

1.1.a Demand for Electricity

OPWP evaluates electricity demand at the system level, including transmission and distribution system losses with consumer-level loads. This must be secured by the total output capacity of power generation plants at the power system delivery points, excluding the internal power consumption of auxiliary systems.[3]

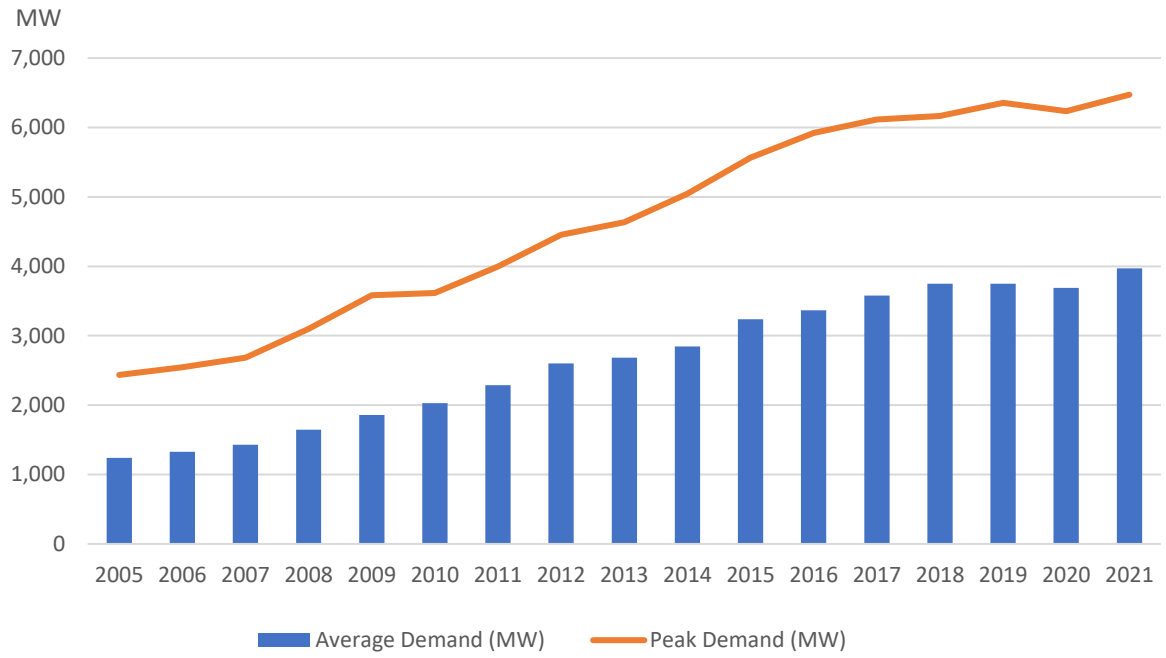
MIS Historical Demand

In 2021, electricity demand was higher than what was expected under OPWP's previous forecast. The average demand shows 7.6% growth over 2020 demand, which is consistent with the below-normal temperature profile in 2021. Peak demand grew by about 3.8% to 6,473 MW and the average demand increased to 3,971 MW (corresponding to 34.8 TWh of energy).

Over the last 7-year period (2014-2021), peak electricity demand in the MIS grew at an average annual rate of about 4%, from 5,047 MW in 2014 to 6,473 MW in 2021. Energy consumption and average demand grew by about 5% annually during the same period. Single year growth rates have fluctuated widely, influenced strongly by weather and economic growth: annual peak demand growth has ranged from a low of -1.8% to a high of 15.6% since 2006.

Figure 1 illustrates the growth in peak and average demand in the MIS from 2005 to 2021.

Figure 1 MIS Historical Electricity Demand – MIS



[3] This approach assures equivalence toward planning the generation supply required to meet consumer demand. However, from the perspective of power system operations, electricity demand and output are monitored at available metering points located at substations and power plants. The system "gross demand" at any point in time is the sum of the metered output at all power generators, although a portion of that generator output must be consumed by plant auxiliary systems. System peak demand is considered as net of plant auxiliaries and any exports to other power systems. The hourly consumption of plant auxiliary systems is not measured directly at some plants and in these cases must be estimated. Consequently, there may be differences in peak demand reports, depending on how auxiliary consumption at each plant is estimated.

	Average Demand (MW)	*Growth (%)*	Peak Demand (MW)	*Growth (%)*
2005	1,240	-	2,435	-
2006	1,329	*7.2%*	2,544	*4.5%*
2007	1,430	*7.6%*	2,682	*5.4%*
2008	1,646	*15.1%*	3,100	*15.6%*
2009	1,859	*12.9%*	3,581	*15.5%*
2010	2,028	*9.1%*	3,613	*0.9%*
2011	2,285	*12.7%*	4,000	*10.7%*
2012	2,599	*13.7%*	4,455	*11.4%*
2013	2,684	*3.3%*	4,634	*4.0%*
2014	2,845	*6.0%*	5,047	*8.9%*
2015	3,237	*13.8%*	5,565	*10.3%*
2016	3,364	*3.9%*	5,920	*6.4%*
2017	3,578	*6.4%*	6,116	*3.3%*
2018	3,748	*4.8%*	6,168	*0.9%*
2019	3,748	*0.0%*	6,353	*3.0%*
2020	3,690	*-1.6%*	6,237	*-1.8%*
2021	3,971	*7.6%*	6,473	*3.8%*
Average Growth (%)		***7.7%***		***6.4%***

MIS Demand Projections

OPWP's 7-year electricity demand projections cover energy, average demand, and peak demand requirements. Peak demand is the most relevant parameter for purposes of assessing capacity expansion requirements. The projections of energy demand are necessary to identify fuel requirements over the forecast period, which is illustrated further in the Fuel section.

The demand projections for the MIS have been developed on the basis of: (1) quantitative analyses of weather, macroeconomic, and demographic demand drivers; (2) assessment of demand drivers' uncertainty (3) consultations with the electricity distribution companies and other relevant entities such as large industries; (4) historical growth trends; and (5) assessment of past forecasts against out-turns.

Energy demand is modelled separately for the residential and non-residential sectors. The residential demand projections are derived from population growth scenarios while the non-residential demand projections are derived principally from scenarios of economic growth in the Sultanate, using an econometric model of the relationship of electricity demand to real Gross Domestic Product (GDP) over a recent period, with adjustments for weather and price. Economic growth has been relatively slow since oil prices fell in 2014 and 2015, and has been affected by the impacts of the COVID-19 pandemic in 2020. The most recent GDP growth estimates for 2021 and 2022 are 3% and 3.4% respectively.[4]

OPWP demand scenarios reflect the assessment of uncertainty in several factors such as: GDP forecast, population forecast, econometric model coefficients, energy efficiency programs, tariff reform, CRT impact, and development of rooftop solar and other private solar PV installations. Based on the associated risk of the factors, OPWP developed a range determining the Low, Expected, and High Case scenarios for electricity demand projections. These influences on the demand projections are described further as follows:

GDP Forecast. The forecast model for peak demand and non-residential energy demand uses a GDP forecast as the main influence. The GDP forecast is subject to error, and the forecast uncertainty considers the historical record of forecast vs. out-turn GDP for the Sultanate.

[4] The World Bank, Global Economic Prospect, January 2022.

CRT Impact. Many large customers shifted their demand away from the peak period following the introduction of the Cost Reflective Tariff (CRT) in 2017. OPWP expects further demand shifts in response to tariff changes as the CRT develops and consumers shift consumption to periods of lower cost. In 2022, due to the 2021 start of Ibri II Solar IPP, the 2022 BST has been revised such that the afternoon tariff is reduced, and the night tariff has increased compared to 2021. The tariffs now are nearly equal. By 2025, the afternoon tariff level is expected to be similar to the current off-peak tariff, while the night-time tariff will increase further. OPWP expects that many CRT consumers will revert to pre-CRT consumption profiles benefiting from low afternoon tariffs and the initial CRT impact on peak demand may reverse.

In 2021, APSR introduced a second CRT option, a flat seasonal tariff available to all CRT customers. It is a single charge differentiated for summer and winter periods, with no time-of-day differentiation. A third CRT option was introduced in 2022: an annual flat tariff with no seasonal differentiation. These flat tariff options, and the changes occurring in the time-pattern of prices of CRT option 1, are affecting the demand profile. OPWP has observed a shift of at least 200 MW back to the afternoon peak period in 2021. The distribution companies report that as of 2022, around 50% of CRT customers have shifted to the new flat tariff CRT options, where the magnitude of the demand shift remains to be seen. OPWP is tracking these developments, incorporating them into the demand forecast.

Permitted Tariff Reform. A tariff reform policy has been initiated in 2021 aiming to remove the subsidies in residential and small commercial tariffs completely by 2030. Consumers are expected to modify their consumption behaviour accordingly which will reduce the demand. OPWP assessed the scope for demand reduction on the basis of electricity price elasticity, energy efficiency improvement potential, and development of rooftop solar for these customers.

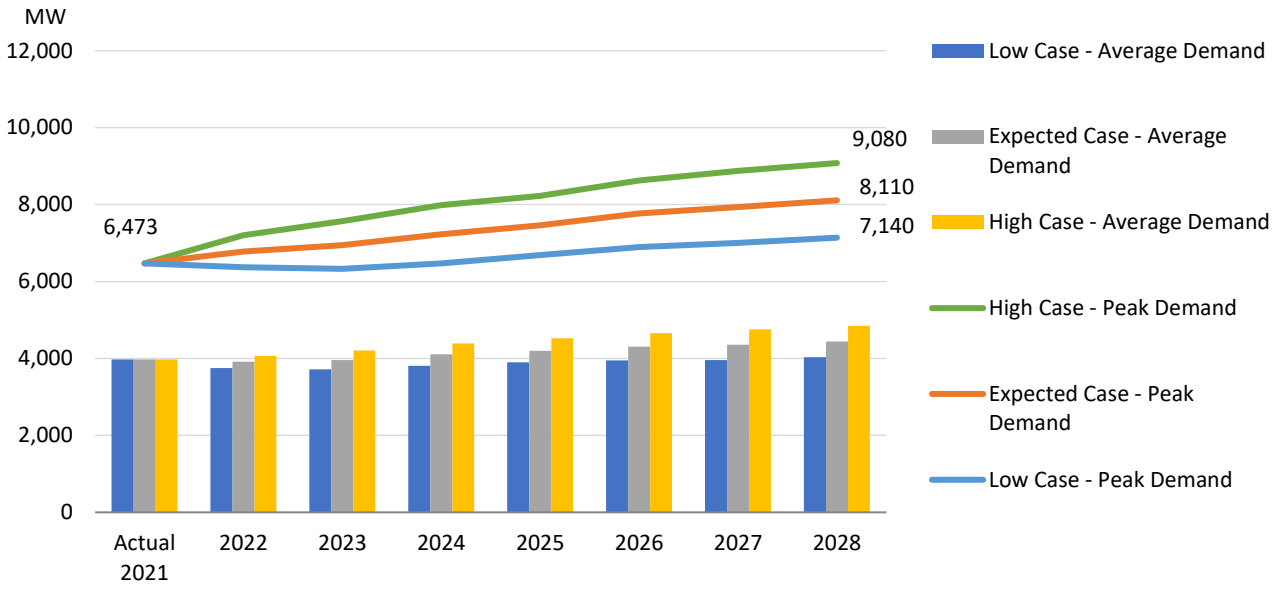
Private Solar PV Development. While the level of rooftop solar PV and industrial solar PV is currently modest, the demand forecast considers that the growth rate may accelerate rapidly, particularly once public policies are defined with respect to electricity market evolution, transmission wheeling charges, etc. Private Solar PV development is considered as an offset to energy and peak demand requirements that need to be met by the power system.

Energy Efficiency Policy Initiatives. OPWP expects that energy efficiency (EE) promotion and appliance standards programs will reduce the demand in the coming period. The Ministry of Commerce, Industry and Investment Promotion has launched an electronic system for issuing energy efficiency cards for air conditioners (ACs) in 2019 / 2020 that assist consumers in choosing more efficient models. The forecast considers energy efficiency impacts to occur gradually, mainly as the equipment asset base is replaced by more efficient devices, such as LED lamps and efficient AC units.
The projections are then aligned with analyses of distribution system demands, which are assessed on a “macro” basis by distribution company zone, and certain bulk loads that are assessed on a specific customer basis. Distribution system demand is comprised mainly of residential, service sector (including government and commercial buildings, tourism facilities), and small- to medium- scale industrial demand in all MIS regions.

The growth in demand from very large loads (generally large industries and infrastructure projects) comprises both new projects and expansion of existing industrial plants. Industrial projects are located mainly in the Sohar Industrial Port and Sohar Free Zone. Infrastructure projects include, for example, the desalination plants and airports.

The projections are presented as a range bounded by Low Case and High Case scenarios, and a central Expected Case forecast. These are summarized in Figure 2.

Figure 2 Electricity Demand Projections – MIS



	Actual 2021	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Case	2021								
Average Demand (MW)	**3,971**	**3,920**	**3,960**	**4,110**	**4,200**	**4,310**	**4,360**	**4,440**	**2%**
Distribution Loads	3,192	3,080	3,090	3,170	3,230	3,310	3,340	3,410	1%
Directly-Connected Loads	780	840	870	940	970	1,000	1,020	1,030	4%
Annual Energy (TWh)	**35**	**34**	**35**	**36**	**37**	**38**	**38**	**39**	**2%**
Peak Demand (MW)	**6,473**	**6,780**	**6,950**	**7,230**	**7,460**	**7,770**	**7,940**	**8,110**	**3%**
Change from 2021-2027 Statement (MW)	*-187*	*-430*	*-690*	*-730*	*-560*	*-430*	*-430*		
Low Case									
Average Demand (MW)	**3,971**	**3,750**	**3,720**	**3,810**	**3,900**	**3,950**	**3,960**	**4,030**	**0.2%**
Distribution Loads	3,192	2,970	2,920	2,980	3,020	3,040	3,030	3,090	-0.5%
Directly-Connected Loads	780	780	800	830	880	910	930	940	3%
Annual Energy (TWh)	**35**	**33**	**33**	**33**	**34**	**35**	**35**	**35**	0.2%
Peak Demand (MW)	**6,473**	**6,370**	**6,330**	**6,470**	**6,690**	**6,900**	**7,000**	**7,140**	**1%**
Change from 2021-2027 Statement (MW)	*203*	*-390*	*-810*	*-790*	*-400*	*-260*	*-130*		
High Case									
Average Demand (MW)	**3,971**	**4,070**	**4,210**	**4,390**	**4,520**	**4,660**	**4,760**	**4,850**	**3%**
Distribution Loads	3,192	3,180	3,270	3,380	3,470	3,590	3,670	3,750	2%
Directly-Connected Loads	780	890	940	1,010	1,050	1,070	1,090	1,100	5%
Annual Energy (TWh)	**35**	**36**	**37**	**39**	**40**	**41**	**42**	**43**	3%
Peak Demand (MW)	**6,473**	**7,200**	**7,570**	**7,990**	**8,230**	**8,630**	**8,880**	**9,080**	**5%**
Change from 2021-2027 Statement (MW)	*-787*	*-470*	*-580*	*-680*	*-730*	*-610*	*-730*		

The Expected Case scenario projects 2% annual growth in energy demand (i.e., average demand). Peak demand is projected to increase at an annual average of 3% per year, from 6,473 MW in 2021 to 8,110 MW in 2028 growing along with the economy. In the expected case scenario, peak demand is projected to register high growth in 2022, considering the increase in oil prices and world recovery from Covid-19.

The addition of solar projects in 2021 and 2025 will affect the CRT. CRT consumers are expected to begin reacting to changes in CRT by shifting their demand back to the afternoon period. The CRT would change further in 2025 once the Manah solar projects begin operation. These shifts toward the peak period may occur gradually in response to the CRT changes but are expected to represent a persistent increase in peak demand for the remainder of the period. The aggregate impact is about 300 MW in the Expected Case.

The Low Case scenario projects peak demand growth at an average of 1% per year, from 6,473 MW in 2021 to 7,140 MW in 2028. Annual average demand under this scenario is expected to have slight growth of 0.2% per year. This follows an assumption of lower economic growth than the Expected Case scenario, a higher consumer response to CRT changes, EE program and tariff reform policy.

The High Case scenario projects peak demand to grow at 5% annually, to 9,080 MW by 2028. The total energy growth rate is projected to grow at a slightly lower rate, at 3% per year. These higher growth rates correspond to lower demand reduction through energy efficiency program and tariff reform policy. From 2023 onwards it is assumed that CRT consumers responses to change in BST will be larger than the Expected Case Scenario.[5]

The three demand projections are reference scenarios assuming normal weather conditions. Extreme weather may occur in any year, potentially increasing or decreasing demand relative to the projected peak demand. These potential fluctuations are not shown in the demand forecast, as they do not affect the underlying multi-year trend. However, they are taken into account in the assessment of capacity requirements, though with low probability of occurrence.

Ad Duqm Historical Demand

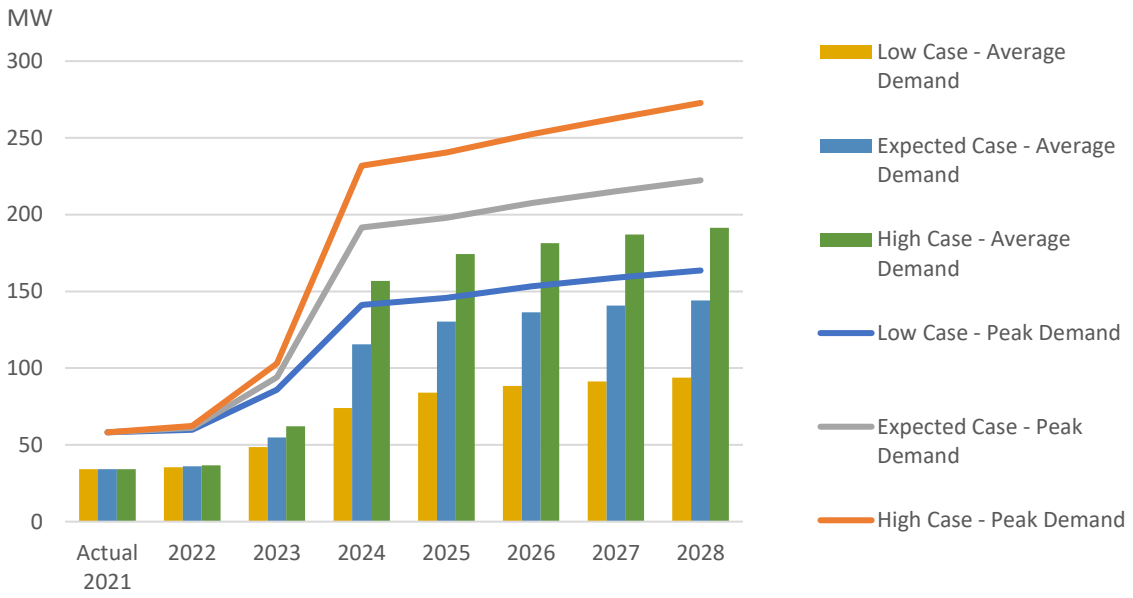
Historically, all requirements to meet electricity demand in Ad Duqm has been within the jurisdiction of Tanweer. However, Duqm is currently experiencing ongoing development of large commercial, tourism, and industrial projects. In addition, the grid will expand further as new demand centres are connected such as Mahout.

Ad Duqm Demand Projections

For the purposes of electricity demand projections, OPWP reports demand projections as provided by Tanweer up to the year 2023. These demand projections reflect domestic and industrial/commercial developments as received by Tanweer in the form of applications for new connections. From 2024 towards the end of the forecast period, OPWP has included additional bulk customers in all scenarios assuming different growth pace for the low and high case scenarios.

[5] There is a further possibility that the shift in BST prices will attract demand from industries that currently self-supply using their own generators, because afternoon CRT rates may be below their cost of generation.

Figure 3 Electricity Demand Projections – Ad Duqm Power System



	Actual 2021	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Case									
Average Demand (MW)	**34**	**36**	**55**	**115**	**130**	**136**	**141**	**144**	**23%**
Annual Energy (TWh)	**0.30**	**0.31**	**0.48**	**1.01**	**1.14**	**1.19**	**1.23**	**1.27**	**23%**
Peak Demand (MW)	**58**	**61**	**94**	**192**	**198**	**208**	**215**	**222**	**21%**
Change from 2021-2027 Statement (MW)	*-18*	*-59*	*-66*	*10*	*5*	*7*	*3*	-	
Low Case									
Average Demand (MW)	**34**	**35**	**49**	**74**	**84**	**88**	**91**	**94**	**15%**
Annual Energy (TWh)	**0.30**	**0.31**	**0.42**	**0.65**	**0.74**	**0.77**	**0.80**	**0.82**	**16%**
Peak Demand (MW)	**58**	**60**	**86**	**141**	**146**	**153**	**159**	**164**	**16%**
Change from 2021-2027 Statement (MW)	*-7*	*-15*	*-14*	*33*	*31*	*33*	*30*	-	
High Case									
Average Demand (MW)	**34**	**37**	**62**	**157**	**174**	**181**	**187**	**192**	**28%**
Annual Energy (TWh)	**0.30**	**0.32**	**0.54**	**1.38**	**1.53**	**1.59**	**1.64**	**1.68**	**28%**
Peak Demand (MW)	**58**	**62**	**103**	**232**	**240**	**252**	**263**	**273**	**25%**
Change from 2021-2027 Statement (MW)	*-27*	*-96*	*-100*	*-4*	*-17*	*-16*	*-20*	-	

Under the Expected Case scenario, peak demand is expected to grow at an average rate of 21% per year, from 58 MW in 2021 to 222 MW in 2028. Average demand is expected to grow from 34 MW in 2021 to 144 MW in 2028 (corresponding to 1.27 TWh annual energy) with an average increase of 23% per year. The Expected Case scenario accounts for historical demand and normal population growth within the area, the inclusion of interlinked and new demand areas, and demand related to committed and ongoing industrial and infrastructure projects within the Ad Duqm area. Following the completion of the North-South Interconnect project to the MIS

in 2023, demand in Mahout is expected to be absorbed by the system, and as such, is included in the demand projections. The area is expected to be connected to Ad Duqm in Q3 2022, accounting for the most growth shown in 2023.

The growth in 2024 is mainly due to the additional of new industrial projects. These projections do not include uncommitted projects in the industrial area, i.e., the potentially large influx of industrial demand associated with SEZAD development plans. SEZAD plans large-scale industrial projects, diverse economic developments, and associated residential and commercial requirements over the next 30 years Accordingly, the demand growth rate within the zone is expected to accelerate rapidly as key projects are established. OPWP will attend closely to the development pace and implications for electricity demand. The High Case scenario assumes that more of the prospective projects become committed. This scenario anticipates an average growth rate of 25% in peak demand, increasing from 58 MW in 2021 to 273 MW in 2028. The annual average demand is projected to grow at 28% per year. This also includes a higher growth scenario in Mahout demand area.

Alternatively, the Low Case scenario assumes a slower rate of materialisation in prospective projects in Ad Duqm region, in addition to possible delays in major projects such as Duqm cement and lower growth rate of demand in Mahout following its interconnect in the year 2023. The Low Case scenario anticipates an average growth rate of 16% in peak demand, increasing from 58 MW in 2021 to 164 MW in 2028. Moreover, the average demand in the low case scenario is expected to grow from 34 MW in 2021 to 94 MW in 2028 with an average rate of 15% per year.

1.1.b Power Generation Resources

Sources of Power

OPWP purchases power from a number of sources via power purchase agreements (PPAs), power and water purchase agreements (PWPAs) and other similar agreements. The contractual arrangements for power delivery under these agreements may be differentiated as firm capacity, reserve-sharing, non-firm capacity, and energy-only. These terms are relevant for generation planning purposes.

All of the main power plants in the MIS are contractually committed to provide a specific generation capacity (in MW) upon demand, to be dispatched by the OETC, and to maintain specific availability levels. These are firm capacity contracts, also termed **“contracted capacity”**.

OPWP also purchases power from a number of sources where the contractual arrangements do not provide a guaranteed level of capacity upon demand. They may be termed collectively as **“non-firm resources”**. They currently include: (1) reserve-sharing arrangements with other power systems via international interconnection agreements; (2) capacity exchanges/energy purchases from industries with captive power generation facilities, where such industries use their embedded generators mainly for self-supply; and, (3) renewable energy (RE) projects from intermittent sources, such as solar PV (without storage) and wind. Collectively, non-firm resources provide reliability benefits to the MIS, and that capacity is generally available according to pre-arranged schedules or during contingency events. Accordingly, a portion of this capacity can be considered to provide contributions towards meeting peak demand requirements.

Based on the 2040 vision, the renewables target is to reach 35-39% of total generation by 2040. A key objective of this target is to release domestic gas committed to the power sector, to be available to stimulate industrial and economic development. OPWP has embraced this target and expects to reach 24% renewable energy generation, within the sector, by 2028 as low costs are now driving RE development on their economic merits alone. Solar and wind projects are non-firm resources to the extent that their energy output is intermittent and non-dispatchable. OPWP has estimated the energy production and expected contribution to system reliability standards of RE projects on the basis of power system simulations using ground measurement data collected over a number of years and correlations with satellite data where no such ground measured data is available.

Once specific projects are under development, and later in operation, OPWP will look to re-assess these estimates on the basis of specific locations, technology being deployed, and production out-turns.

Contracted Capacity

OPWP's present portfolio of contracted capacity for electricity generation in the MIS comprises ten P(W)PAs. A summary of these contracted capacities can be found in Table 1.

A summary of the generation capacity that is expected to be provided under these P(W)PAs over the 2022-2028 period is set out in Figure 4[6]. This shows total contracted capacity of 7,511 MW in 2022, which then steadily decreases to 5,291 MW by 2028. The reduction in contracted capacity is due to a number of contract expirations during the period as detailed amongst the following main developments:

Barka II IWPP: Contracted capacity of 688 MW at 45°C. The P(W)PA is scheduled to expire on 31st March 2024.

Rusail IPP: Contracted capacity of 192 MW at 45°C. The PPA is scheduled to expire on 31st March 2022. A new contract signed with Rusail IPP based on OETC request until the end of October 2022 for ancillary services only.

Sohar IWPP: Contracted capacity of 597 MW at 45°C. The PWPA is scheduled to expire on 15th May 2022.

Barka III IPP: Contracted capacity of 766 MW at 45°C. The PWPA is scheduled to expire in April 2028.

Sohar II IPP: Contracted capacity of 766 MW at 45°C. The PWPA is scheduled to expire in April 2028.

Table 1 Details of PPAs/PWPAs – MIS

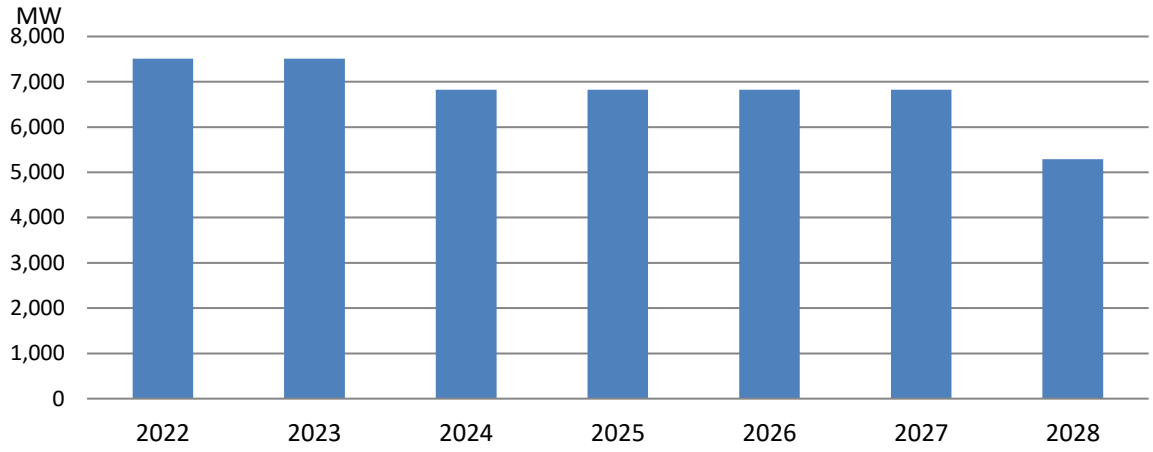
Project Name	Contracted Capacity [a]	Contract Type	Project Company	Project Status	Technology	Contract Expiry
Barka II IWPP	688 MW	PWPA	SMN Barka Power Co. (SAOC)	Operational	CCGT Natural gas fired Fuel oil as back-up	2024
Barka III IPP	766 MW	PPA	Al Suwadi Power Co. (SAOG)	Operational	CCGT Natural gas fired Fuel oil as back-up	2028
Ibri IPP	1,537 MW	PPA	Ad-Dhahirah Generating Co. (SAOC)	Operational	CCGT Natural gas fired Fuel oil as back-up	2034
Ibri II Solar IPP	500 MW	PPA	Shams Ad-Dhahirah Generating Co. (SAOC)	Operational	Solar PV - Tracking	2035
Rusail IPP	192 MW	ASA	Rusail Power Co. (SAOC)	Operational (for ancillary services only)	OCGT Natural gas fired Fuel oil as back-up	2022
Manah IPP	179 MW	ASA	United Power Co. (SAOG)	Operational (for ancillary services only)	OCGT Natural gas fired Fuel oil as back-up	2024

[6] While RE projects are to be contracted under a PPA, they are classified as a non-firm resources, and so are represented in Table 2 (Non-Firm Contracts).

Sohar IWPP	597 MW	PWPA	Sohar Power Co. (SAOG)	Operational	CCGT Natural gas fired Fuel oil as back-up	2022
Sohar II IPP	766 MW	PPA	Al Batinah Power Co. (SAOG)	Operational	CCGT Natural gas fired Fuel oil as secondary fuel and back-up	2028
Sohar III IPP	1,741 MW	PPA	Shinas Generating Co. (SAOC)	Operational	CCGT Natural gas fired Fuel oil as back-up	2034
Sur IPP	2,018 MW	PPA	Phoenix Power Co. (SAOG)	Operational	CCGT Natural gas fired Fuel oil as back-up	2029

[a] Contracted capacities are shown as of summer 2022 at 45°C, adjusted from the reference condition of 50°C using contractually agreed upon correction factors and as reported as net of plant auxiliaries.

Figure 4 Contracted Generation Capacity – MIS



	2022	2023	2024	2025	2026	2027	2028
Contracted Capacity	**Net MW [a]**						
Sohar IWPP	-	-	-	-	-	-	-
Barka II IWPP	688	688	-	-	-	-	-
Sohar II IPP	766	766	766	766	766	766	-
Barka III IPP	766	766	766	766	766	766	-
Sur IPP	2,018	2,018	2,018	2,018	2,018	2,018	2,018
Ibri IPP	1,535	1,535	1,535	1,535	1,535	1,535	1,535
Sohar III IPP	1,738	1,738	1,738	1,738	1,738	1,738	1,738
Total	**7,511**	**7,511**	**6,823**	**6,823**	**6,823**	**6,823**	**5,291**

[a] All capacities are rated on a net basis (i.e. after allowing for auxiliary consumption inside the plants) at 45°C ambient temperature.

In addition to the contracted generation capacities presented above, OPWP also currently maintains a contract with Manah and Rusail Power Plants to provide ancillary services to the system. The term of the contract for Manah Power Plant is from 2020 until the end of 2024. While the term of contract for Rusail Power Plant (GT7&8) is for seven months only from first of May 2022 to the end of October 2022.

Non-Firm Contracts

OPWP has contracts with other generation sources where the contractual commitment is not for firm capacity. They include the following and are summarised in Table 2:

- The 220 kV interconnect with the GCCIA via the UAE (Abu Dhabi) power system at Mahadha;
- The interconnect with the PDO power system; and,
- The surplus generation of industries that have captive power generation facilities.

Table 2 Non-Firm Contracts - MIS

	2022	2023	2024	2025	2026	2027	2028
Non-Firm Contracts - Others	MW						
SAC[a]	180	-	-	-	-	-	-
GCCIA Interconnection	200	200	200	200	200	200	200
Total	**380**	**200**	**200**	**200**	**200**	**200**	**200**

[a] The agreement with SAC is scheduled to expire in December 2022.

GCCIA Interconnect: A 220 kV interconnection between Oman (MIS) and the GCCIA power systems, via the UAE (Abu Dhabi) has been commercially operational since 2012. Oman has been a member of the GCCIA since December 2014 and has access to the other five Member State power systems via this link. Benefits of the interconnection include firm support during emergencies, and opportunities to trade electricity and coordinate both planning reserves and operating reserves.

The interconnection is a double circuit link that supports reliable transfers of up to 400 MW and can carry up to 800 MW in emergencies. The link has provided emergency reserves on a number of occasions, preventing power failures in the MIS. In 2016, APSR approved OPWP's recognition of the interconnect's assessed capacity benefit of reserve-sharing arrangements and contribution to planning reserve requirements of 200 MW. This is based on its record of performance and the contractual obligations with the GCCIA to provide reserves support. The capacity benefit associated to this resource may vary over the 7-year period. This would be influenced by a number of different factors, including the demand profile, the amount of reserve capacity in the system, amount of renewable energy resources, and trade transactions with neighbouring power systems. OPWP will re-assess the capacity contribution from time to time in consideration of developments in the power system.

GCCIA conducted a detailed study of a second interconnection to connect Oman directly from Ibri to Salwa (KSA). The proposed link is a 400 kV DC link of about 700 km. The study's outcomes indicated that the net transfer capacity to Oman would increase from 400 MW to about 1,600 MW. Accordingly, it is expected that the two interconnects would contribute more to the planning reserve requirements. Following approval and a confirmed development timetable, the expanded interconnect capacity would be included in OPWP's 7-year resource planning.

Interconnect with the PDO Power System. The construction of Phase 1 of the North-South Interconnect has enhanced the transfer capacity between the MIS and PDO power systems. Previously, the systems were connected at Nizwa via a 132 kV link with transfer capacity of 60 MW. The current phase of the 400 kV North-

South Interconnect has established a new connection point at Nahadha, with transfer capacity of around 1000 MW. Two additional connection points are scheduled for completion in 2022 via new grid substations at Barik and Suweihat in Al Wusta Governorate. Energy transfers between the two systems are enabled via a Power Supply Purchase Agreement (PSPA) between OPWP and PDO.

Phase 1 of the North-South Interconnect is scheduled for completion in June 2023, linking the MIS to PDO via the three grid substations noted above, then on to Duqm and Mahout. The interconnect enables supply from the MIS to Tanweer distribution zones within the PDO Concession Area that are currently supplied by PDO. It also enhances the sharing of spinning reserves between MIS and PDO, reducing costs on both systems.

Surplus Generation: OPWP has an agreement with Sohar Aluminium Co. (LLC), whereby Sohar Aluminium exports up to 180 MW to the MIS during the summer and imports similar amounts of energy during the winter on an annually determined schedule. The schedule and operations are managed to assure that energy exports balance with energy imports. This arrangement benefits both parties: Sohar Aluminium is better able to schedule the maintenance of its generating units and gain reliability of supply, while OPWP gains an efficient generating resource during the summer and improves the system load factor. The current agreement with Sohar Aluminium will expire at the end of 2022.

Resource Development Plan

The resource development plan comprises new capacity contracts, renewable energy contracts and capacity contributions from other non-firm resources. New capacity contracts and Spot Market resources are considered as flexible resources, where the amount of capacity made available from these resources can closely match capacity needs as the demand forecast changes throughout the years.

Renewable Energy (RE) Development Plan

OPWP's renewable energy development plan currently comprises solar, wind, and waste to energy projects. OPWP plans to procure around 2,640 MW of RE IPPs in the MIS and Ad Duqm by 2028, in addition to the 500 MW Ibri II IPP. Additional RE IPPs are being planned for other systems and are reported later in this publication. Table 3 summarizes the plan through 2028. The locations and type of future RE projects depend on demand growth, approval of transmission projects and site allocations. Procurement timelines may be amended following demand forecast updates.

OPWP's currently contracted renewable energy projects are described as follows:

- **Ibri II Solar IPP:** The 500 MW Solar PV project (Ibri II Solar IPP) began commercial operation in July 2021. It is owned and operated by Shams Ad Dhahira Generating Company under a PPA with OPWP. The project is configured with single-axis tracking and bi-facial PV panels.

OPWP's plans for solar and wind development are described as follows:

- **Manah I Solar and Manah II Solar IPPs:** OPWP began procurement of its second and third solar IPPs in 2019. The RFQ process is complete, and the RFP was completed in 2020 for award in 2023. The projects are located on adjacent sites in Ad-Dakhiliyah. It is a single procurement process, in which there will be separate single awards for each site, to different developers. Each project will have contracted maximum offtake capacity of around 500 MW using PV technology. The two projects have different COD schedules, Q1 2025 and Q2 2025, respectively. This site has different terrain than the Ibri site, and may only accommodate a fixed tilt PV panel configuration rather than a tracking system.

- **MIS Solar IPP 2025:** The site for the fourth solar IPP is currently under review, following completion of a site assessment study in December 2019. Candidate sites include a previously defined site at Adam and a site near the Ibri II Solar IPP. This project is expected to use PV technology, with capacity around 500 MW. The RFQ is planned for release in Q4 2022, and the project will have the COD scheduled in Q1 2026.

- **Jalaan Bani bu Ali Wind IPP:** OPWP plans to develop a wind power project in the MIS for COD in Q1 2026. OPWP has reserved a site at Jalan Bani bu Ali in North Sharqiyah Governorate and is currently undertaking a pre-feasibility of developing a Wind IPP at the site. As part of OPWP's Wind Resource Assessment Campaign (WRA), two 100-metre-tall wind masts were installed in February 2020 and collected wind resource data until November 2021 (the data collected is made available to the public via OPWP's website). OPWP plans to issue the RFQ in Q4 2022 and the RFP in Q3 2023. The installed capacity is nominally estimated at around 100 MW but will be confirmed following assessment of the measured wind data and farm layout optimization analyses.

- **MIS Solar IPP 2027:** OPWP plans to develop a fifth utility-scale solar PV project for 2027 COD. This project may be located in the Al Wusta region with a capacity of around 500 MW. OPWP notes that both the capacity and the location of the project may be amended in future iterations of the 7 Year Statement as more assessments are carried out. The procurement activities related to this project may not commence until 2024. This solar IPP assumed in our analysis that it will have similar technology as Ibri II Solar IPP.

- **WTE IPP:** In 2018, OPWP completed a feasibility study of a waste-to-energy (WTE) project, for a project at Barka to be supplied by municipal waste collected from Muscat and South Batinah Governorates with a capacity between (130-140 MW). OPWP plans to issue the RFP in 2023.

- **Duqm Wind IPP:** OPWP plans to develop a wind power project in the Duqm region for COD in Q1, 2026 OPWP has access to a site in SEZAD and is currently undertaking a pre-feasibility of developing a Wind IPP at the site. As part of OPWP's Wind Resource Assessment Campaign (WRA), two 100 metre wind masts were installed in February 2020, and collected wind data until November 2021 (the data collected is available to the public via OPWP's website). OPWP plans to issue the RFQ in Q4 2022 and the RFP in Q2 2023. The installed capacity is nominally estimated at around 200 MW but will be updated following assessment of the measured wind data and wind farm layout optimization analyses.

- **Ras Madrakah Wind IPP[7]:** OPWP plans to develop a second wind power project at Ras Madrakah in the Duqm region for COD in 2027. The site is approximately 60 kilometres from the city of Duqm, with sufficient area to develop a utility-scale wind power project with a capacity of at least 200 MW. The wind masts from the Duqm Wind site have been relocated to the Ras Madrakah site, and data collection is in progress. OPWP plans to have collected at least 1 year of ground-measurement data from this site by Q3 2022 and will proceed with a feasibility study that will reconfirm the expected capacity. Until then, this Wind IPP is assumed to have a similar capacity as Duqm Wind IPP above.

[7] In 7 Year Statement, issue 15 the project was named Duqm II Wind IPP 2027. OPWP has renamed the project after acquiring the land Kuroki.

Table 3 Renewable Energy Development Plan – MIS and Duqm

	2022	2023	2024	2025	2026	2027	2028
				MW			
Contracted Projects							
Ibri II Solar IPP	500	500	500	500	500	500	500
Total Contracted	**500**	**500**	**500**	**500**	**500**	**500**	**500**
Planned Projects							
Manah I Solar IPP				500	500	500	500
Manah II Solar IPP				500	500	500	500
MIS Solar IPP 2025					500	500	500
Jalaan Bani bu Ali Wind IPP 2025[b]					100	100	100
Duqm Wind IPP [b]					200	200	200
Ras Madrakah Wind IPP [b]						200	200
MIS Solar IPP 2027						500	500
WTE IPP							140
Total Planned	-	-	-	**1,000**	**1,800**	**2,500**	**2,640**
RE Day Peak Contribution[a]	**460**	**460**	**460**	**1,250**	**1,819**	**2,413**	**2,540**
RE Night Peak Contribution	-	-	-	-	**165**	**287**	**414**

[a]RE Day Peak Contribution: Solar PV IPP will have a greater contribution during the day time peak. The estimated capacity contribution will vary according to the proposed locations and the assumed technology. For Ibri site it has been assumed that the capacity credit will reach up to 92% during the day time peak. While for Manah, it is expected to have lower contribution to about 79% due to the site conditions which may not be suitable for tracking technology.

[b] Wind IPP generation is generally expected to vary throughout the day and the year. However, wind data support that average output during the day peak and night peak periods are quite consistent. The average contribution is assessed at about 40% for the Jalaan Bani bu Ali wind project and about 67% for the Duqm wind projects.

The lower portion of Table 3 indicates three measures of the aggregate capacity or output levels for the renewable energy projects. These measures recognize that generation output from solar and wind projects varies throughout the day according to the availability of the respective resources. The measures are: Total Planned Capacity (maximum contractual output to the grid), RE Day Peak Contribution, and RE Night Peak Contribution. The MIS has two peak periods during the summer season that are both relevant to capacity planning. The day peak is highest, generally occurring between 2pm and 3pm after rising steadily from mid-morning, then dropping off sharply until the early evening. The night peak is in the range of 300 to 400 MW less than the day peak, typically occurring between 1am and 2am, but demand is relatively high on either side of this peak for an extended period.

The values for RE Day Peak Contribution and RE Night Peak Contribution correspond to the expected generation output from the RE plants at the time of these peak periods. OPWP has assessed the values based on several years of hourly weather data at each RE site, and simulated hourly generation output using expected technology configurations. OPWP expects to adjust the assessed peak contributions as operational data from the planned RE plants becomes available. The Day Peak and Night Peak contributions corresponding to the projects listed in Table 3 are assessed as follows in table 4, in terms of the proportion of contracted maximum output to the grid:

Table 4 RE Capacity Contribution

Project	Day Peak	Night Peak
Ibri II Solar IPP	92%	0%
Manah I Solar IPP	79%	0%
Manah II Solar IPP	79%	0%
MIS Solar IPP 2025	79%	0%
Jalaan Bani bu Ali Wind IPP	40%	43%
Duqm Wind IPP	67%	61%
Ras Madrakah Wind IPP	67%	61%
MIS Solar IPP 2027	92%	0%
WTE IPP	91%	91%

Private Solar Projects and Demand Response

OPWP continues to project the scale of private solar PV development for its impact on the power system, but the assessed system impact is now embedded within the demand forecast (rather than being treated as an explicit supply resource). Rooftop solar projects and other private solar PV developments are expected to grow steadily.

Demand Response (DR) can provide a significant and cost-effective resource toward reducing capacity requirements. OPWP had planned to conduct a study of DR potential and develop a roadmap, however this has been postponed. OPWP has proposed to take up this activity in 2023, beginning with a study of DR potential prior to committing to project development.

Capacity Transactions with Other Power Systems

Energy trades and firm capacity transactions with neighbouring power systems are important potential resources. Firm capacity exchanges have taken place between OPWP and EWEC in 2016 and 2018, and OPWP exported capacity to EWEC during the 2020 and 2021 summer periods. Having finalized arrangements with GCCIA in 2021, OPWP is now also able to conduct energy and capacity trades with other GCCIA Member States.

OPWP is currently exploring a number of potential transactions with other power systems, and has submitted proposed capacity exports in 2022, 2023, 2024 and subsequent years which are currently under evaluation by counterparties. Future 7-Year Statements would include such transactions in the capacity plan if they were finalized. Capacity exports represent additional demand on the MIS, which OPWP expects to accommodate mainly via the Spot Market.

A direct 400 kV interconnect from Ibri to the Kingdom of Saudi Arabia (KSA) and linking to GCCIA has also been evaluated and is in the planning process. This project would provide direct access to all GCCIA Member States and would enhance the benefits in stability, generation planning, and trade opportunities relative to the existing 220 kV link via UAE.

The 400 kV North-South Interconnect project is currently on schedule for completion in 2023. OPWP and Tanweer have coordinated supply plans accordingly for Duqm, Mahout, and the MIS. These systems will be fully integrated and power flows between them will not be considered as capacity transactions.

The 400 kV connection with the PDO system at Nahadah enables large-scale capacity transactions and operational integration with PDO. No specific transactions have yet been planned, but OPWP and PDO are currently integrating resource plans relevant to the MIS and northern PDO system.

Procurement Plans and Spot Market

Considering the contracted firm and non-firm resources, capacity impacts of the RE development program, trade transactions with other power systems, and other initiatives such as Demand Response, OPWP plans to meet the remaining capacity and energy needs via the Spot Market and dedicated procurement rounds (i.e., long-term contracts). The annual capacity needs remaining to be addressed by PPA procurement rounds and the Spot Market are indicated in Table 5 below. The aggregate requirement for capacity is discussed further in the following Section 1.1.c, Resource Adequacy and Mitigation Plans.

Current plans for procurement rounds and Spot Market initiatives are described below:

- **Electricity Spot Market:** The Spot Market is now in live operation. The first effective Trading Day was 1st January 2022.OPWP is purchasing electricity on a daily basis via the Spot Market. The electricity Spot Market is operating alongside the existing system of long-term P(W)PAs.

  Considering the uncertainty about the level of market participation by uncontracted generators, OPWP has not yet assigned a value to their expected capacity contributions. This value will be assessed and updated in future 7 Year Statements once more information can be made available.

- **Power 2024:** The target for procurement through the Power 2024 is dependent upon the review of capacity procurement framework and the capacity target for procurement through the Spot Market. This procurement should provide sufficient amount to cover the need up to 2027.

- **Power 2028:** At the time of preparing this publication and in alignment with OPWP intent to review procurement needs for long-term contracts every two years, Power 2028 is maintained as a potential round for procurement that may materialize following the outcome of Power 2024 and if OPWP identifies a need for capacity that was not met by Power 2024 nor procured through the Spot Market. This procurement will be necessary to cover the need after Barka III and Sohar II expiration.

Table 5 summarizes the capacity expectations from these resources.

Table 5 Procurement Plans and Spot Market - MIS

	2022	2023	2024	2025	2026	2027	2028
	MW						
Power 2024			TBD	TBD	TBD	TBD	TBD
Spot Market			TBD	TBD	TBD	TBD	TBD
Power 2028							TBD
Total Capacity Needs[a]		**-**	**569**	**842**	**871**	**942**	**2,544**

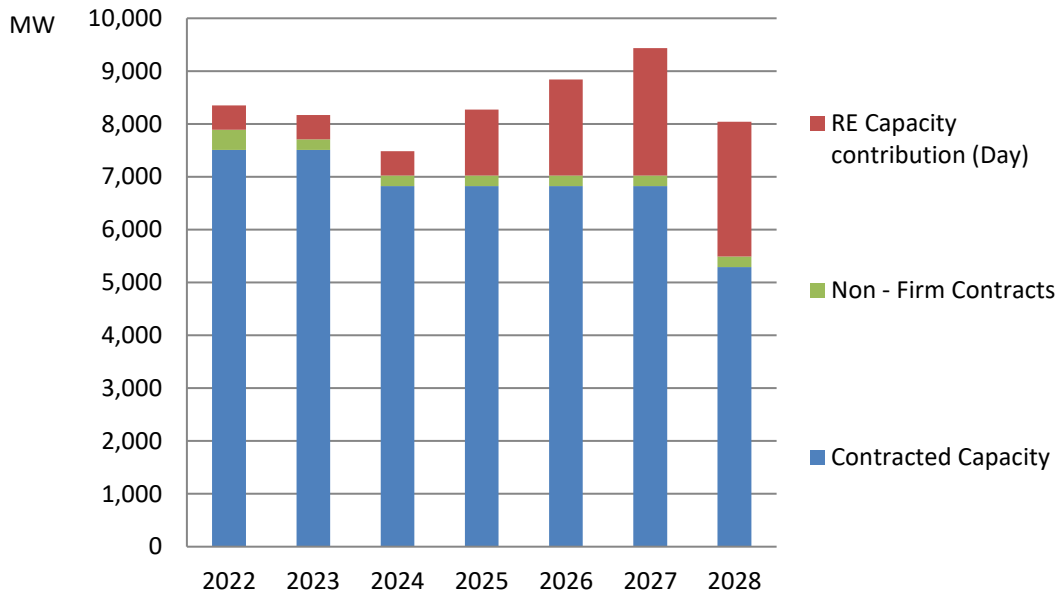
[a] Total Capacity Need represents amount of capacity required to achieve targeted reserve margins. The main driver for the capacity needs from 2025 onwards is the shift of the peak demand towards the night; hence the capacity needs will be higher during the night peak to maintain the LOLH security standard.

Summary

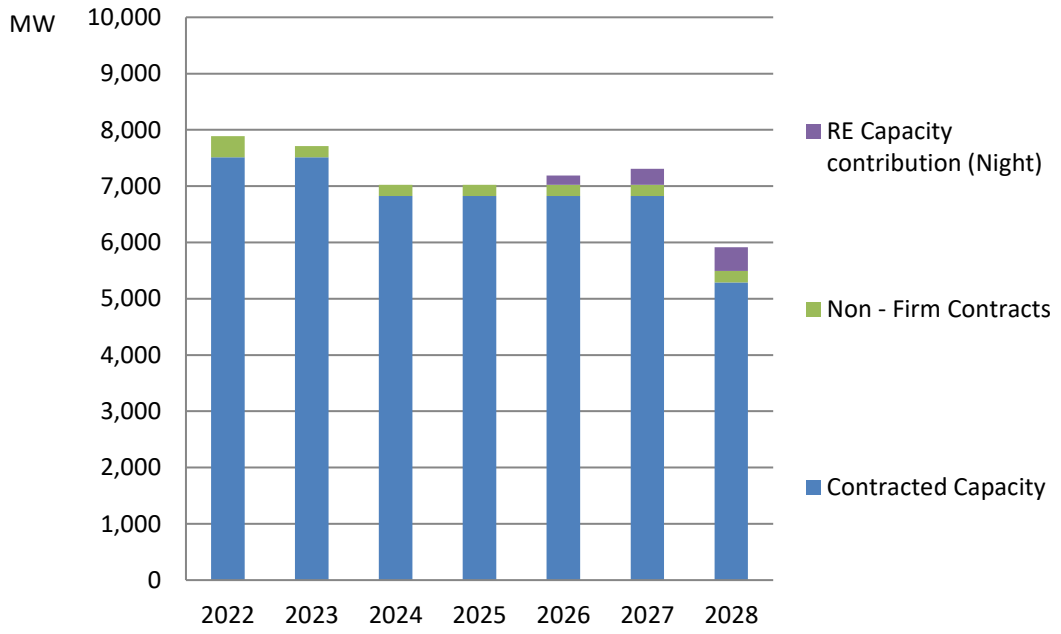
Figure 5 provides a summary of OPWP's current plans for generation capacity and resource development in the MIS for the period 2022 to 2028. The capacity indicated for each year corresponds to the quantity available as of the onset of the summer peak.

Figure 5 Capacity Contributions from Generation Resources MIS

RE Day Contribution:



RE Night Contribution:



	2022	2023	2024	2025	2026	2027	2028
	MW						
Contracted Capacity	**7,511**	**7,511**	**6,823**	**6,823**	**6,823**	**6,823**	**5,291**
Capacity Contributions from:							
Non - Firm Contracts	380	200	200	200	200	200	200
RE Capacity Contribution (Day)	460	460	460	1,250	1,819	2,413	2,540
RE Capacity Contribution (Night)	-	-	-	-	165	287	414
Procurement Plans and Spot Market	-	-	569	842	871	942	2,544
Total Capacity Available during Day Peak	**8,351**	**8,171**	**8,052**	**9,115**	**9,713**	**10,378**	**10,576**
Total Capacity Available during Night Peak	**7,891**	**7,711**	**7,592**	**7,865**	**8,059**	**8,252**	**8,450**

1.1.c Resource Adequacy and Mitigation Plans

Statutory and Regulatory Requirements

OPWP is required by the Sector Law and its license to ensure the adequacy of generation resources to meet future power demands. The Sector Law establishes OPWP's general responsibility to secure sufficient generation resources to meet the aggregated demands of licensed electricity suppliers. Further to this, the license issued to OPWP by APSR stipulates a specific generation security standard for the MIS that OPWP must comply with.

The generation security standard sets the target for the aggregate duration of power outages for the system, termed Loss-of-Load Hours (LOLH). OPWP must enter into agreements for enough production capacity to ensure that expected demand does not exceed expected available capacity for more than 24 hours in any year. This LOLH measure considers relevant uncertainties such as the reliability of generation units, the availability of non-firm generation resources, and the level of demand. On a short-term basis, OPWP must demonstrate to the APSR that sufficient supply agreements are in place to meet the 24 LOLH standard. On a long-term basis, OPWP must demonstrate that it has credible plans to put such agreements in place (via the procurement of new capacity or otherwise).

OPWP conducts computer simulations of power system performance to assess LOLH under a wide range of conditions that fluctuate randomly. The simulations are the basis for determining the expected level of LOLH and the adequacy of generation to meet the statutory standard. Generally, the number and type of generating units and the demand profile affect the expected LOLH level, which may also be sensitive to generation technology and other factors.

Resource Adequacy in the Expected Demand Scenario

During the 7-year planning horizon OPWP commits to meeting the minimum reliability standard of 24 LOLH. The capacity plan is developed to ensure that, after accounting for demand variability, potential forced outages from generators, and RE generation fluctuations, the potential occurrences of insufficient supply are expected to be less than 24 hours in each year.

Over the next 7 years, capacity requirements to meet the 24 LOLH standard are expected to change, because demand is projected to grow, the load profile is expected to evolve as consumers respond to tariff changes, and new intermittent RE resources are planned toward reducing the cost and gas consumption of power generation. This is evident in Figure 6, which shows the capacity target during the day and night peaks that is required to meet the security standard under the Expected Demand scenario.

Currently contracted resources are expected to be sufficient in 2022 and 2023, with some surplus. APSR is leading the efforts for the development of bilateral agreements as an alternative framework to facilitate direct-sales arrangements between generators and certain customers.

The capacity needed to meet the security standard is equivalent to a reserve margin of about 7.2% during both day and night peaks in 2022 and 2023. This is slightly higher than the 6.5% margin reported in the previous 7 Year Statement, equivalent to about 50 MW. This is due to a combination of the output intermittency of the Ibri II Solar IPP during the hours around the day peak period in the afternoon, and the emergence of the night peak as a more critical and longer duration period of reserve needs.

In June 2023, it is anticipated that the first phase of the North-South Interconnect project (including from Izki to Nahadah in the PDO system, Barik and Suweihat in the PDO system and then to the Duqm Power System, and on to Mahout) will be completed. Figure 6 accounts for the additional demand requirements of the Duqm Power System (Expected Case) that can be met by utilising capacity in the MIS.

In 2024, Barka II IWPP will reach the end of its P(W)PA term. Additional resources are required via the Spot Market and potential Power 2024 procurement round to meet capacity needs due to load growth and the expiry of the Barka II P(W)PA. The procurement target and timeline for a possible Power 2024 is dependent upon the conclusions from the review of the capacity procurement framework and the capacity target for procurement through the Spot Market.

In 2024 and 2025, reserve margin requirements to meet the security standard also increase to manage the increasing importance of the broad, night peak period. In 2025, the Manah I and II Solar projects (1000 MW) are expected to be operating before the summer season. They create a surplus over capacity requirements during the afternoon, but make no contribution to the night peak. From 2025 onwards, night peak demand will be the main driver for capacity requirements. Figure 6 shows this change as the planned capacity level at night meets the capacity target, whereas there is surplus during the day peak period. It is these developments that drive the procurement plan described in Table 4 of Section 1.1.b.

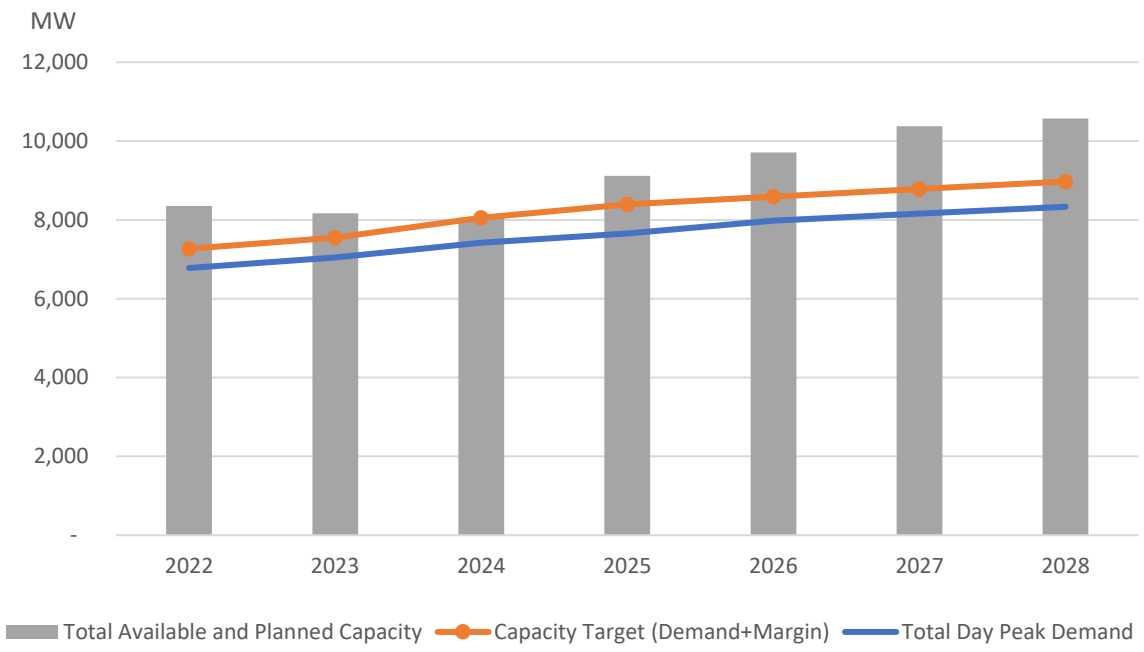
From 2026 to the end of the 7-year planning period, the reserve margin requirement drops to about 7.7%, partly in response to new wind resources beginning operation and also stabilization of the load profile following tariff reform. In future, as OPWP investigates the impact of new technologies, the assessment of loss-of-load incidence may change. This may be expected as RE projects are defined following project award and start of operations, and energy storage options are evaluated or introduced.

In 2028, PPAs with Sohar II and Barka III will expire, reducing contracted capacity by around 1,530 MW. OPWP expects to launch a Power 2028 procurement round, to address the capacity needs that emerge at that time through a potential combination of new PPAs and Spot Market resources.

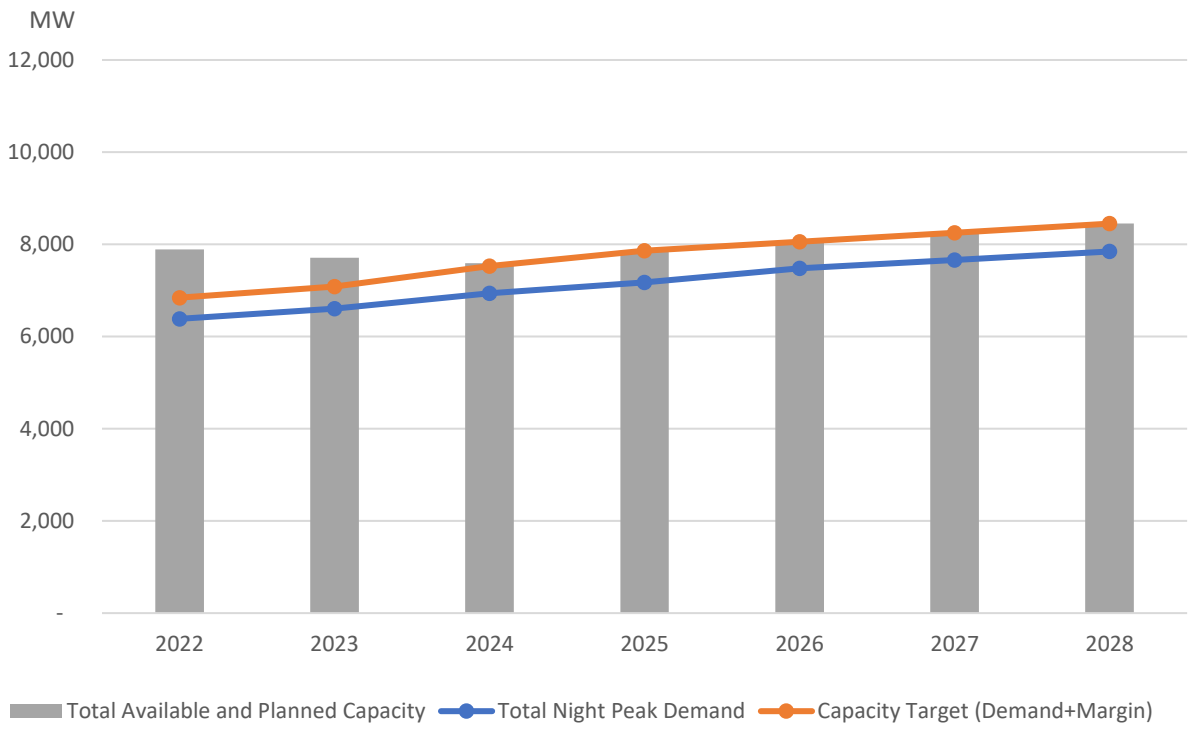
The resource development plan is developed to provide sufficient capacity to meet the generation security standard for the Expected Demand scenario, with allowances for feasible mitigations that address requirements of the Low and High Demand scenarios. Figure 6 compares planned capacity with the capacity target under the Expected Demand scenario. The resource development plan provides sufficient capacity to exceed the capacity target in every year, as described below.

Figure 6 Resource Adequacy - Expected Demand Scenario- MIS + Duqm

Day Peak Resources:



Night Peak Resources:



	2022	2023	2024	2025	2026	2027	2028
Total Day Peak Demand	**6,780**	**7,044**	**7,422**	**7,658**	**7,978**	**8,155**	**8,332**
Capacity Target (Demand+Margin)	7,268	7,552	8,052	8,393	8,592	8,783	8,974
Total Available and Planned Capacity	8,351	8,171	8,052	9,115	9,713	10,378	10,576
Additional Capacity required for Day Peak	-	-	-	-	-	-	-
Total Night Peak Demand	**6,384**	**6,606**	**6,939**	**7,177**	**7,482**	**7,662**	**7,846**
Capacity Target (Demand+Margin)	6,844	7,082	7,529	7,865	8,059	8,252	8,450
Total Available and Planned Capacity	7,891	7,711	7,592	7,865	8,059	8,252	8,450
Additional Capacity required for Night Peak	-	-	-	-	-	-	-

Mitigation Options for the High Case Demand Scenario

In the High Case demand scenario, the capacity requirement in 2024 is about 674 MW higher than under the Expected Case scenario, and about 916 MW higher in 2028. Similar to the Expected Case above, the High Case also accounts for supply requirements to the Duqm Power System, also under the High Case for that demand area. The High Case is a plausible, upper-bound demand scenario: it is possible but unlikely that demand would exceed this level. But it is also quite likely that demand will be between the High Case and Expected Case scenarios. The following paragraphs consider options to mitigate capacity needs in the range between these two demand scenarios.

Figure 7 illustrates resource adequacy for this scenario. in 2024 there is a deficit of nearly 674 MW. This deficit increases to almost 916 MW by 2028. Contingency options to cover these potential deficits if demand trends against the High Case, are illustrated in described below:

Power 2028 Procurement Round. OPWP has considered the potential for the next round of procurement to be in 2028, depending on the need for capacity. The amount of capacity may be adjusted in consideration of needs in 2028, existing contract expirations in those years, the competition process to be developed for the procurement round, and developments in the Spot Market. As per current forecasts of the High Case Demand scenario, an additional 1000 MW of Capacity through a Power 2028 Procurement Round would be required to cater the need because of the expiration of Barka III and Sohar II IPP's.

Spot Market Capacity. The largest of the contingency options is our assessment of spot market resources, comprising plants that represent generators with expiring P(W)PAs or captive generators and may participate in the Spot Market as uncontracted generation. OPWP anticipates that up to 1,475 MW may be available from the Spot Market in 2022. The feasibility to extend permits or other necessary conditions for plant operation would alter this assessment accordingly, as would changes in the assessment of market prices.

GCC Interconnection Exchange. OPWP notes that the interconnection with the GCCIA is a double circuit link that support reliable transfers of up to 400 MW. This transfer of energy has already been demonstrated in the recent years and, accordingly, OPWP is able to rely on potentially cost-effective exchanges across the GCCIA to secure an additional 200 MW (200 MW is in addition to the 200 MW already accounted for under the Expected Case for a total of 400 MW). OPWP reviews these opportunities and the economic benefits of conducting an exchange across the GCCIA on an annual basis. In case OPWP is committed to an export transaction via GCCIA than this mitigation capacity will not be avaiable.

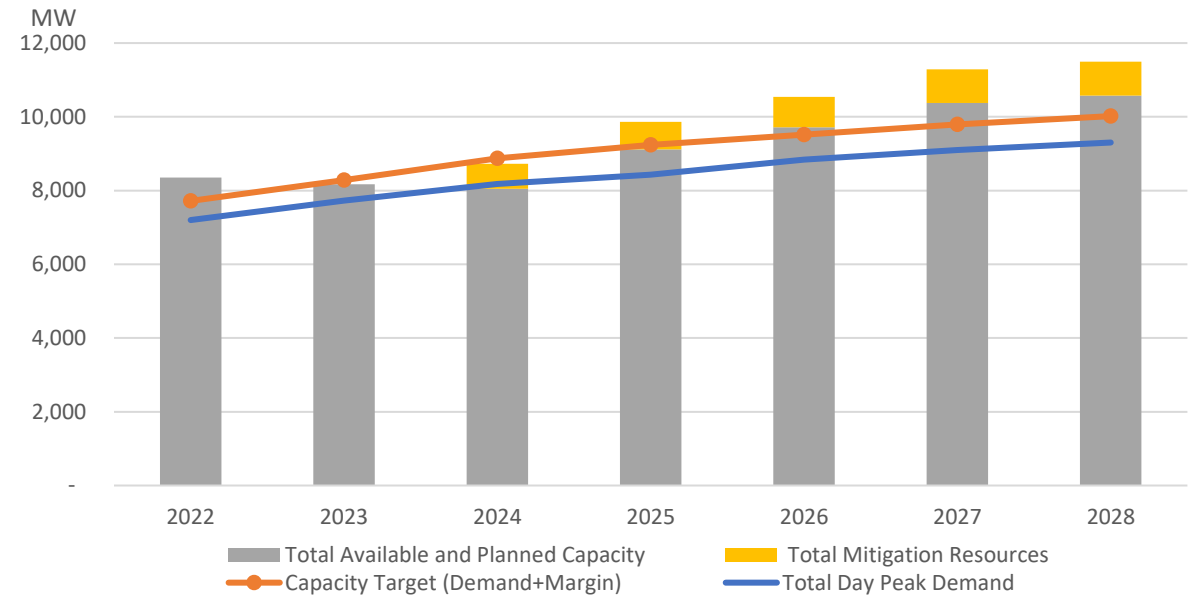
Demand Response. Under a High Case Demand Scenario, Demand Response may become a useful contingency resource due to its ability to directly incentivize a reduction in demand during specific periods in the year and

during specific periods in the day. This would allow OPWP to directly reduce peak demand requirements for a given year. While this option still requires further research, study, and approvals to be implemented, OPWP recognizes its potential cost-effective application in certain circumstances.

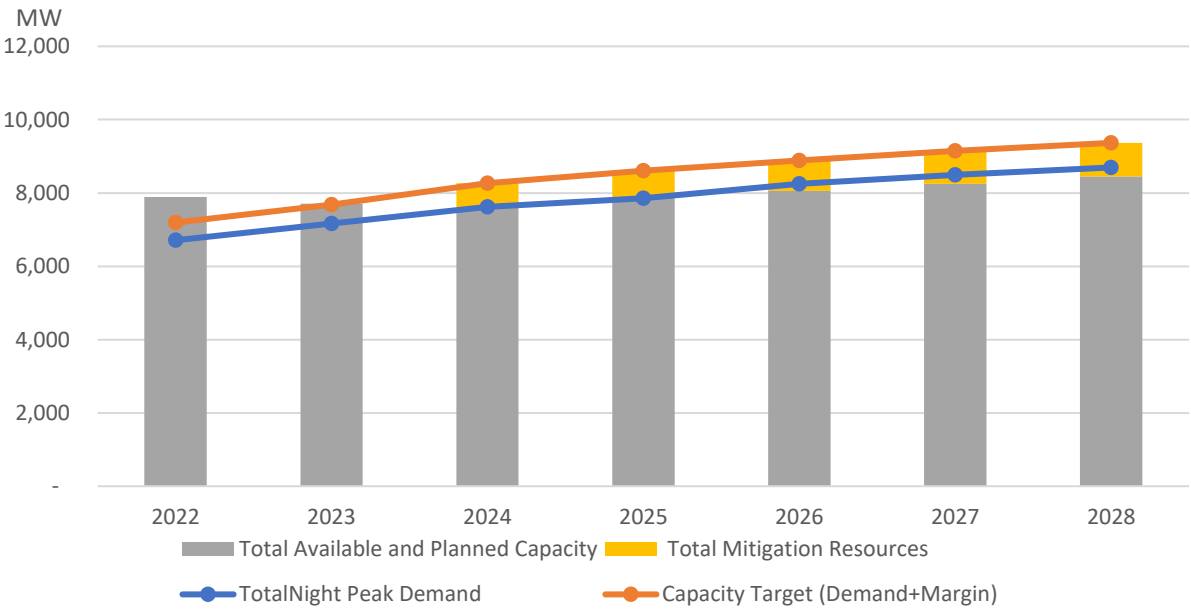
These mitigation options confirm OPWP's ability to respond to a surge in demand beyond our Expected Demand forecast. This is important considering the Sultanate's aspirations to stimulate economic growth, and particularly to attract investment in the new industrial hub of Ad Duqm and other industrial zones.

Figure 7 Adequacy and Mitigation Options -High Case Demand Scenario –MIS +Duqm

Day Peak Resources:



Night Peak Resources:



	2022	2023	2024	2025	2026	2027	2028
Total Day Peak Demand	**7,200**	**7,724**	**8,182**	**8,428**	**8,838**	**9,095**	**9,302**
Capacity Target (Demand+Margin)	7,718	8,281	8,877	9,237	9,518	9,796	10,019
Exports to DPS (North-South Interconnect)						89	45
Total Available and Planned Capacity	8,351	8,171	8,052	9,115	9,713	10,378	10,576
Additional Capacity required for Day Peak	**-**	**110**	**-**	**121**	**-**	**-**	**-**
Total Night Peak Demand + Exports	**6,710**	**7,163**	**7,619**	**7,857**	**8,248**	**8,493**	**8,696**
Capacity Target (Demand+Margin)	7,193	7,678	8,266	8,611	8,883	9,147	9,366
Total Available and Planned Capacity	7,891	7,711	7,592	7,865	8,059	8,252	8,450
Additional Capacity required for Night Peak	**-**	**-**	**674**	**746**	**824**	**895**	**916**
Mitigation Plan for Deficit							
Remaining Potential Spot Market Capacity	-	-	474	546	624	695	716
2028 Procurement Target							TBD
GCCIA Interconnection Purchase			200	200	200	200	200
Captive Power Plants			TBD	TBD	TBD	TBD	TBD
Demand Response				TBD	TBD	TBD	TBD
Total Mitigation Resources[a]	-	-	674	746	824	895	916
Total Available and Mitigation Resources for Day Peak	**8,351**	**8,171**	**8,726**	**9,861**	**10,537**	**11,273**	**11,492**
Total Available and Mitigation Resources for Night Peak	**7,891**	**7,711**	**8,266**	**8,611**	**8,883**	**9,147**	**9,366**
[a] The mitigation plan is determined to meet the night peak requirements.							

Mitigation Options for the Low Case Demand Scenario

In the Low Case demand scenario, the capacity target is around 1,600 MW less than in the Expected Demand scenario by 2028. In order to minimize capacity surpluses in case of low demand growth, OPWP would implement mitigation options such as reducing capacity procurement targets and improving capacity utilisation via exports. Mitigation options are described below, and shown with their impacts in Figure 8:

Adjust Procurement Round and Spot Market Targets. The capacity requirement in 2024 is currently planned to be met through a combination of Spot Market contributions and new contracts via the possible Power 2024, with an increased reliance on Spot Market contributions throughout to 2028. The amount from possible Power 2024 will be assessed prior to the launch of the procurement activities. If demand were to track the current Low Case, the capacity requirement for the Spot Market and possible Power 2024 may be less, and the procurement target would be adjusted accordingly. The values presented here reflect the inverse of the Procurement Plans and Spot Market, and represent the upper end of possible reductions in procurement activities, whether through long term contracts or via the Spot Market.

GCCIA Interconnection Export. The GCCIA interconnect via UAE will accommodate up to 400 MW of capacity export. OPWP would explore export contracts with GCC Member States, provided they would cover generation costs and the economic value of gas supply as defined by MEM. OPWP exported 400 MW to one of the Member States in 2021 and OPWP explores the possible trading opportunities with other GCC member state.

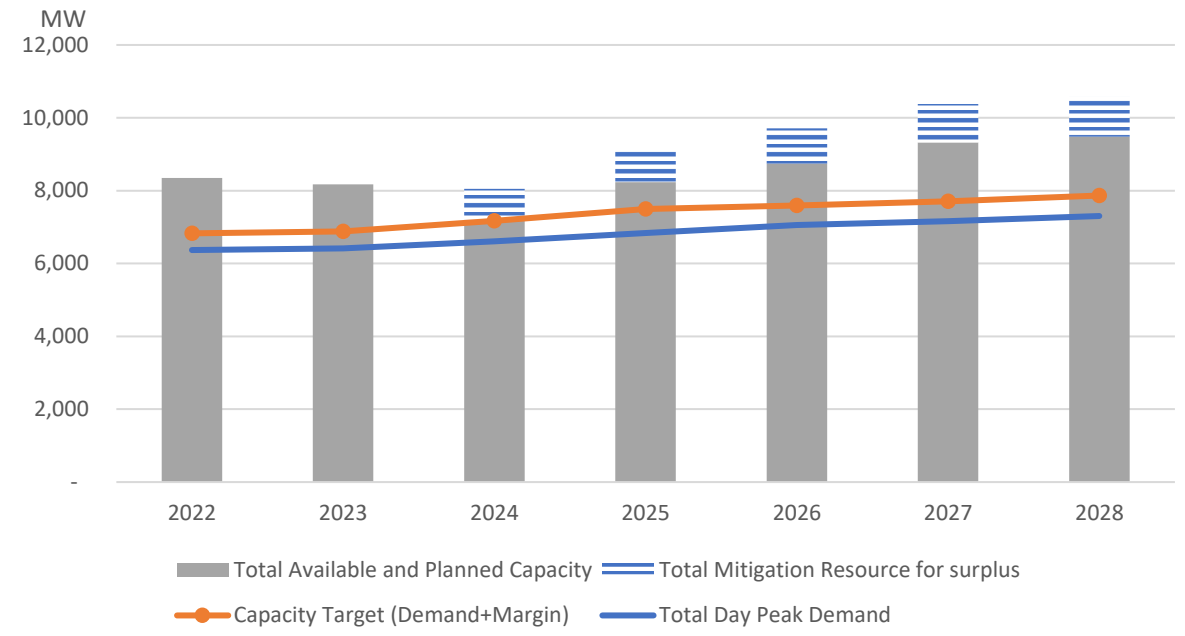
PDO (and other oil developers) Export. The North-South Interconnect will permit increased levels of energy trading with PDO mid of 2023. The potential for export to PDO is currently uncertain. A large share of PDO generation is dedicated to steam generation for oilfields, with electricity as a by-product, and cannot be displaced. Other generators would be candidates for displacement by lower cost energy imports. However, PDO and the other oil developers are also currently considering development of solar PV plants to offset thermal generation. OPWP currently coordinates resource development plans with PDO. Exports to PDO as a capacity

mitigation option by OPWP would be explored if needed through this coordination. PDO can import at least 100 MW using the new North-South Interconnector without major system modification.

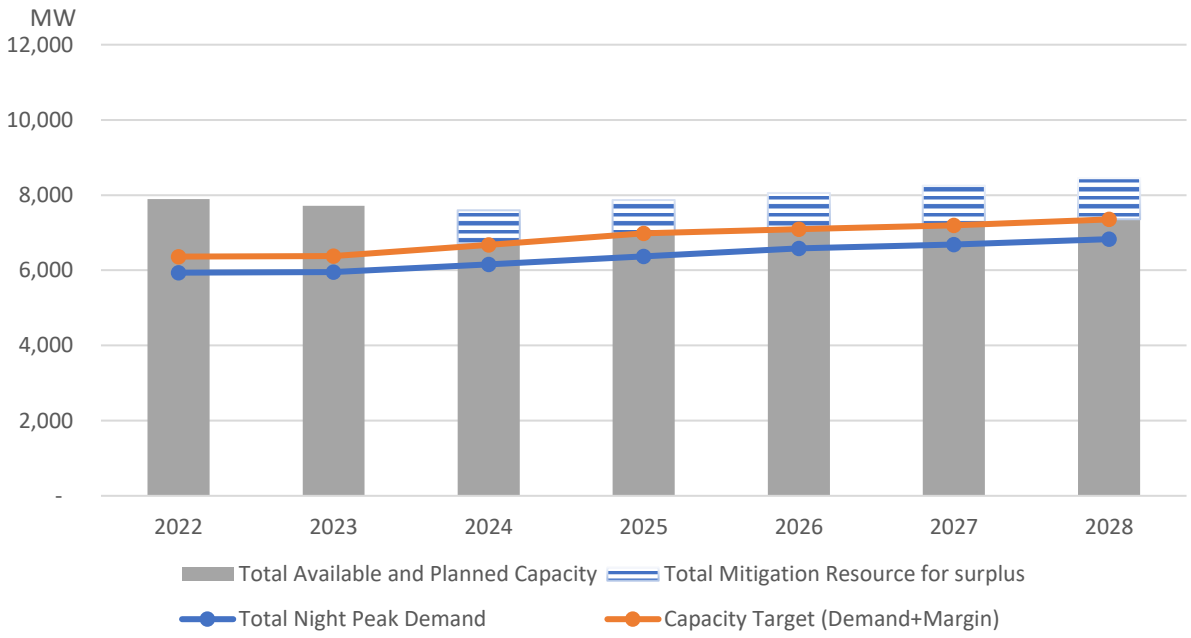
Figure 8 demonstrates that, under a low demand scenario, OPWP has options available to minimize the potential for capacity surpluses and thereby manage costs.

Figure 8 Adequacy and Mitigation Options -Low Case Demand Scenario – MIS + Duqm

Day Peak Resources:



Night Peak Resources:



	2022	2023	2024	2025	2026	2027	2028
Total Day Peak Demand	6,370	6,416	6,611	6,836	7,053	7,159	7,304
Capacity Target (Demand+Margin)	6,829	6,878	7,173	7,492	7,596	7,710	7,866
Total Available and Planned Capacity	8,351	8,171	8,052	9,115	9,713	10,378	10,576
Surplus over Capacity	**1,522**	**1,293**	**879**	**1,624**	**2,116**	**2,668**	**2,710**
Total Night Peak Demand	**5,937**	**5,949**	**6,156**	**6,373**	**6,583**	**6,685**	**6,828**
Capacity Target (Demand+Margin)	6,364	6,378	6,680	6,985	7,089	7,200	7,353
Total Available and Planned Capacity	7,891	7,711	7,592	7,865	8,059	8,252	8,450
Surplus over Capacity	**1,527**	**1,333**	**913**	**881**	**969**	**1,037**	**1,096**
Mitigation Plan for Surplus							
Adjust Procurement Round and Spot Market Targets	-	-	-569	-842	-871	-942	-1,096
Other Mitigation Resources:			-310	-38	-99	-110	-
GCC Interconnection Export			TBD	TBD	TBD	TBD	TBD
Export to Displace Captive Power Generation			TBD	TBD	TBD	TBD	TBD
PDO and Other Oil Developer Export			TBD	TBD	TBD	TBD	TBD
Total Mitigation Resources	-	-	-879	-881	-969	-1,052	-1,096
Total Available and Mitigation Resources for Day Peak	**8,351**	**8,171**	**7,173**	**8,235**	**8,743**	**9,326**	**9,479**
Total Available and Mitigation Resources for Night Peak	**7,891**	**7,711**	**6,713**	**6,985**	**7,089**	**7,200**	**7,353**

[a] The mitigation plan is determined to meet the night peak requirements.

DHOFAR POWER SYSTEM

The Dhofar Power System (DPS) covers the city of Salalah and surrounding areas in the Governorate of Dhofar, serving around 124,257[8] electricity customers.

The DPS comprises three generation facilities, the 132 kV transmission grid that is owned and operated by OETC, and the distribution network which is owned and operated by the Dhofar Integrated Services Company (DISC). DISC also acts as the supplier of electricity for consumers in the DPS.

The DPS is interconnected with the Petroleum Development Oman (PDO) power system via a 132 kV link between Thumrait and Harweel, with transfer capacity up to 150 MW. This interconnection provides important reliability benefits through the sharing of generation reserves. The North-South Interconnect is expected to be extended to Dhofar in 2026.

OPWP's role in the DPS is similar to its role in the MIS, which is to economically procure power required by DISC, respectively, in bulk from generation/production facilities connected to the DPS. OPWP is required to ensure that sufficient power generation resources are available to meet DISC electricity demand. If assessed to be beneficial, OPWP is also required to co-procure desalinated water with power generation in joint facilities.

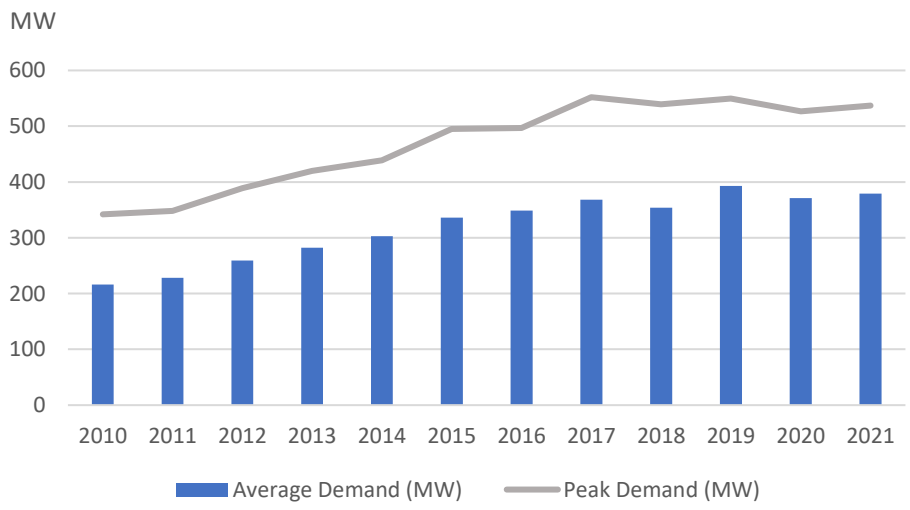
1.2.a Demand for Electricity

Historical Demand

Average electricity demand in 2021 is higher than 2020 by 2.6%. The average demand increase to 381 MW (corresponding to 3.3 TWh) in 2021. Peak demand increase by 2% to 537 MW when compared against the 2020 peak demand. OPWP notes that the increase in demand is likely due to a combination of factor including the weather condition, oil price and world recovery from Covid-19. In addition, the pandemic is believe had greater impact on demand as travel and entry to Salalah was open during Kharif period.

Figure 9 shows that the average growth rate in annual average demand over the past seven years has been 3.4%, while single-year growth has reached as high as 11.1%. In addition, peak demand in the DPS has grown at an annual average of 3.1% over the same period.

Figure 9 Historical Electricity Demand – DPS



[8] APSR Annual Report 2020

	Average Demand (MW)	Growth (%)	Peak Demand (MW)	Growth (%)
2010	216		342	
2011	228	5.6%	348	1.8%
2012	259	13.6%	389	11.8%
2013	282	8.9%	420	8.0%
2014	303	7.4%	439	4.5%
2015	336	10.9%	495	12.8%
2016	349	3.9%	497	0.4%
2017	368	5.4%	552	11.1%
2018	354	-3.8%	539	-2.4%
2019	393	11.1%	549	1.9%
2020	371	-5.6%	527	-4.2%
2021	381	2.6%	537	2.0%
Average Growth (%)		**5.4%**		**4.3%**

Demand Projections

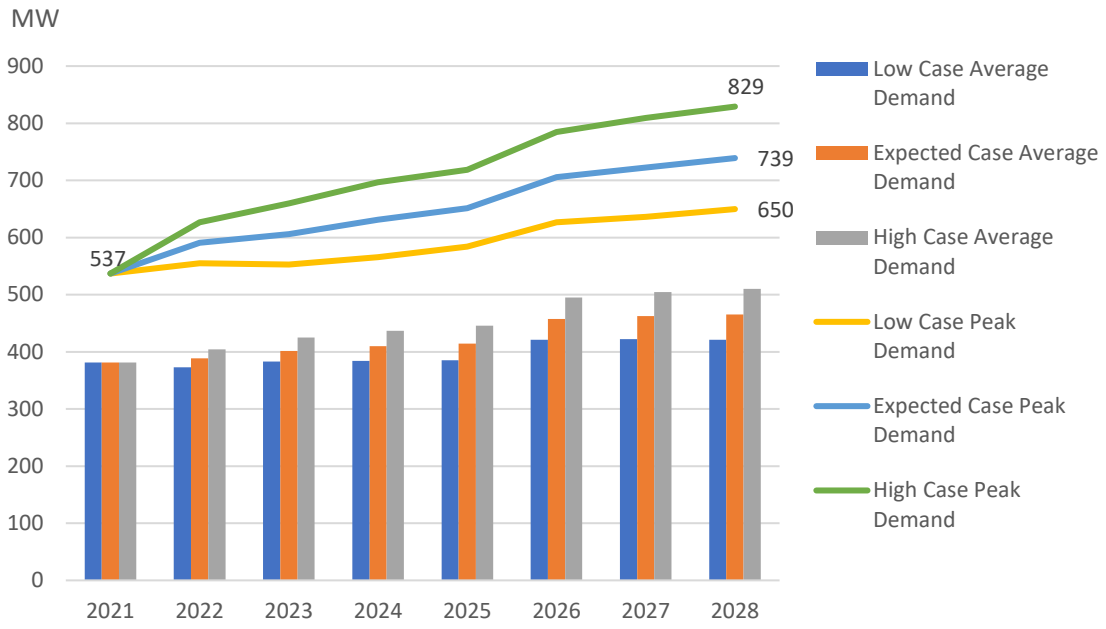
Demand projections represent the "net system demand", in that they are inclusive of assumed transmission and distribution system losses but exclude the internal auxiliary consumption of power and desalination plants. The methodology for demand forecasts assesses the influences of macroeconomic growth in addition to a separate analysis of underlying demand and certain bulk loads, comprising mainly industrial demands, which are assessed on a customer-specific basis.

The projections in Figure 10 are presented as a range including Low Case, High Case and central Expected Case scenarios. All scenarios are based on an assumption of normal weather. The Low Case and High Case scenarios assume contrasting growth levels, with the same growth assumptions used for the MIS projections.

Consistent with growth assumptions used for the MIS, the Expected Case scenario, peak demand increases at about 5% per year, from 537 MW in 2021 to 739 MW in 2028. Energy consumption is projected to grow from 3.3 TWh (corresponding to 381MW average demand) in 2021 to 4.1 TWh (465MW average demand) in 2028, with an average increase of 3% per year. Peak demand projections are higher than previous 7 Year Statement projections (5% vs 4%). In 2022 Saih Al Kahirat, which is currently supplied by Tanweer will be connected to the DPS. Also, areas of AlMazyounah, Mudhai and Shahb Asaib will be connected to DPS by 2026. The impacts of confirmed bulk load projects are included in the years that they expected to occur.

The High Case scenario projects growth in annual energy demand at 4% per year and peak demand at 6% per year whereas the Low Case scenario project an annual energy demand growth of 1% and peak demand growth of 3%.

Figure 10 Electricity Demand Projections – DPS



	Actual 2021	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Case									
Average Demand (MW)	**381**	**389**	**401**	**410**	**415**	**458**	**463**	**465**	**3%**
Underlying Demand	255	230	239	243	247	266	269	271	1%
Bulk Loads	126	159	162	167	168	191	194	194	6%
Annual Energy (TWh)	**3.3**	**3.4**	**3.5**	**3.6**	**3.7**	**3.9**	**4.0**	**4.1**	**3%**
Peak Demand (MW)	**537**	**591**	**606**	**631**	**651**	**705**	**722**	**739**	**5%**
Change from 2021-2027 Statement (MW)	*-34*	*-18*	*-39*	*-41*	*-26*	*13*	*16*		
Low Case									
Average Demand (MW)	**381**	**373**	**383**	**384**	**385**	**421**	**422**	**421**	**1%**
Underlying Demand	255	221	229	227	226	241	242	240	-1%
Bulk Loads	126	152	154	158	159	180	181	181	5%
Annual Energy (TWh)	**3.3**	**3.3**	**3.3**	**3.4**	**3.5**	**3.6**	**3.6**	**3.7**	1%
Peak Demand (MW)	**537**	**555**	**552**	**566**	**584**	**627**	**636**	**650**	**3%**
Change from 2021-2027 Statement (MW)	*8*	*-16*	*-51*	*-47*	*-14*	*23*	*34*		
High Case									
Average Demand (MW)	**381**	**405**	**425**	**437**	**446**	**495**	**505**	**510**	**4%**
Underlying Demand	255	236	251	259	267	292	297	303	2%
Bulk Loads	126	168	174	178	179	204	207	207	7%
Annual Energy (TWh)	**3.3**	**3.5**	**3.7**	**3.9**	**4.0**	**4.3**	**4.4**	**4.5**	4%
Peak Demand (MW)	**537**	**627**	**660**	**697**	**719**	**784**	**809**	**829**	**6%**
Change from 2021-2027 Statement (MW)	*-76*	*-21*	*-28*	*-35*	*-38*	*5*	*-2*		

1.3.b Power Generation Resources

Contracted Capacity and Non-Firm Energy

OPWP's generation portfolio in the DPS includes the two plants that provide guaranteed capacity and a PPA with the wind farm to provide non-firm energy. They are described in Table 6 and are as follows:

- **Salalah IWPP:** Contracted capacity of 445 MW. The Salalah IWPP is a CCGT plant comprising of five gas turbines and two steam turbines. It is located in the Mirbat/Taqah region and achieved COD in 2012. The P(W)PA is scheduled to expire in 2027.
- **Salalah II IPP:** Contracted capacity of 717 MW. Located in Raysut, the facility comprises eight OCGT units with a total capacity of 273 MW and six CCGT units (two blocks of 2 GTs and 1 ST each) with a total capacity of 444 MW.
- **Dhofar I Wind IPP:** The wind farm located in Harweel has an installed capacity of 49.4 MW, comprising of 13 x 3.8 GE wind turbines. Following a similar methodology used for the Solar IPPs, OPWP has estimated a provisional capacity contribution value of 50% following the results of analyses that looked at both correlation between wind speed and demand profile, and the expected impact and contributions towards meeting LOLH requirements whilst adopting a new approach that better reflects the variability in resource availability. OPWP will continue to monitor and analyse relevant data to update capacity contribution estimates, if needed.

Table 6 Contracted Capacities (PPAs/PWPA) - DPS

Project Name	Contracted Capacity	Contract Type	Project company	Project status	Technology	Contract Expiry
Salalah IWPP	445 MW [a] 68,000 m³/d	PWPA	Sembcorp Salalah Power & Water Co. (SAOC)	Operational	CCGT Natural gas fired Fuel oil as back-up	2027
Salalah II IPP	717 MW [a]	PPA	Dhofar Generating Co. (SAOC)	Operational	OCGT CCGT Natural gas fired Fuel oil as back-up	2033
Dhofar I Wind IPP	49.4 MW	PPA	Tanweer	Operational	Wind Turbine	2034

[a] Capacities are rated on a net basis (i.e. after allowing for auxiliary consumption inside the plants) at 35°C ambient temperatures output.

Resource Development Plan

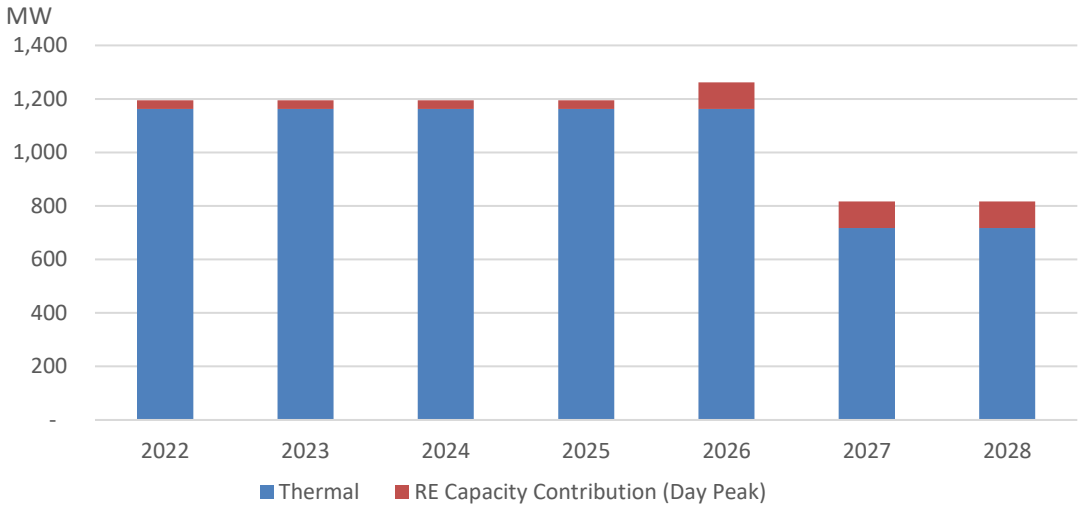
OPWP has no plans to procure new gas-fired generation capacity for the DPS but plans additional RE development. The Dhofar region has excellent potential for wind energy development, consequently, OPWP has plans to develop a second wind energy farm, currently estimated at 100 MW for 2026 COD. Both wind resource and land are available for the power project, Dhofar II Wind IPP, which is expected to be developed adjacent to the existing Dhofar I Wind IPP. This project is anticipated to be competitively tendered. The final capacity of this project may vary slightly from the value mentioned here and is subject to wind farm layout optimization analyses. OPWP further notes that when the North-South Interconnect project is completed to Dhofar, OPWP expects to develop more renewable energy projects in the DPS.

Furthermore, OPWP assumed and based on the discussion with OETC that the North-South Interconnector all the way to Dhofar will be available by 2026. Accordingly, the estimated capacity to be exported to Dhofar region via this link about 800 MW. This value will be revised according to the project progress and demand development.

Summary

Figure 11 presents the capacity contributions from power generation resources in the DPS.

Figure 11 Capacity Contributions from Generation Resources During the Day Peak– DPS



	2022	2023	2024	2025	2026	2027	2028
Contracted Capacity - Thermal	Net MW [a]						
Salalah I IWPP	445	445	445	445	445		
Salalah II IPP	717	717	717	717	717	717	717
Total - Thermal	**1,162**	**1,162**	**1,162**	**1,162**	**1,162**	**717**	**717**
Non-Firm Contracts							
Dhofar I Wind IPP	49	49	49	49	49	49	49
Dhofar II Wind IPP					100	100	100
Sadah Wind IPP							100
Total - RE Capacity Contribution (Day Peak) [b]	**33**	**33**	**33**	**33**	**100**	**100**	**100**
Total - RE Capacity Contribution (Night Peak) [b]	**30**	**30**	**30**	**30**	**91**	**91**	**152**
Total Capacity Contribution to Day Peak Demand	**1,195**	**1,195**	**1,195**	**1,195**	**1,262**	**817**	**884**
Total Capacity Contribution to Night Peak Demand	**1,192**	**1,192**	**1,192**	**1,192**	**1,253**	**808**	**869**

[a] All capacities are rated on a net basis (i.e. after allowing for auxiliary consumption inside the plants) at 35°C ambient temperature.
[b] Capacity contribution of 67% during the Day Peak and 61% during the night Peak is currently assumed for Dhofar I, Dhofar II, and Sadah Wind IPPs.

The main changes in the capacity plan compared to last issue 15 of the 7 Year Statement as follow:

- The capacity contribution from Wind Resources assumed to be different during the day peak than the night peak. Even though they are very close to each other as the wind profile is very consistent during the day and night. The assumed capacity contribution is about 67% during the day peak and about 61%

during the night peak. This is assumed for both Dhofar I Wind IPP and Dhofar II Wind IPP as assumed they will be developed in the same site (Harweel).

- This year we assumed that the reserve margin required for DPS system to fulfil the 24 hours LOLH will be similar to MIS from 2026 onwards (about 7.7%) assuming the north south interconnector will be available by 2026.
- The north south interconnector assumed to be available by 2026 and it will contribute to the capacity need to meet the high case. The assumed capacity to be exported from MIS to DPS about 800 MW.

1.2.c Resource Adequacy and Mitigation Plans

Statutory and Regulatory Requirements

OPWP is required by the Sector Law and its license to ensure the adequacy of generation resources in the DPS to meet future power demands. The Sector Law establishes OPWP's general responsibility to secure sufficient generation resources to meet demand and the OPWP License establishes the generation security standard as 24 LOLH.

OPWP has concluded that, on the basis of simulation studies of the DPS, a reserve margin of about 12% over peak demand is necessary to achieve the 24 LOLH standard, considering the size of the system, characteristics of generation resources, and limited access to security reserves. This sets the capacity target for each of the three demand scenarios over the 7-year planning horizon, shown in Figure 12.

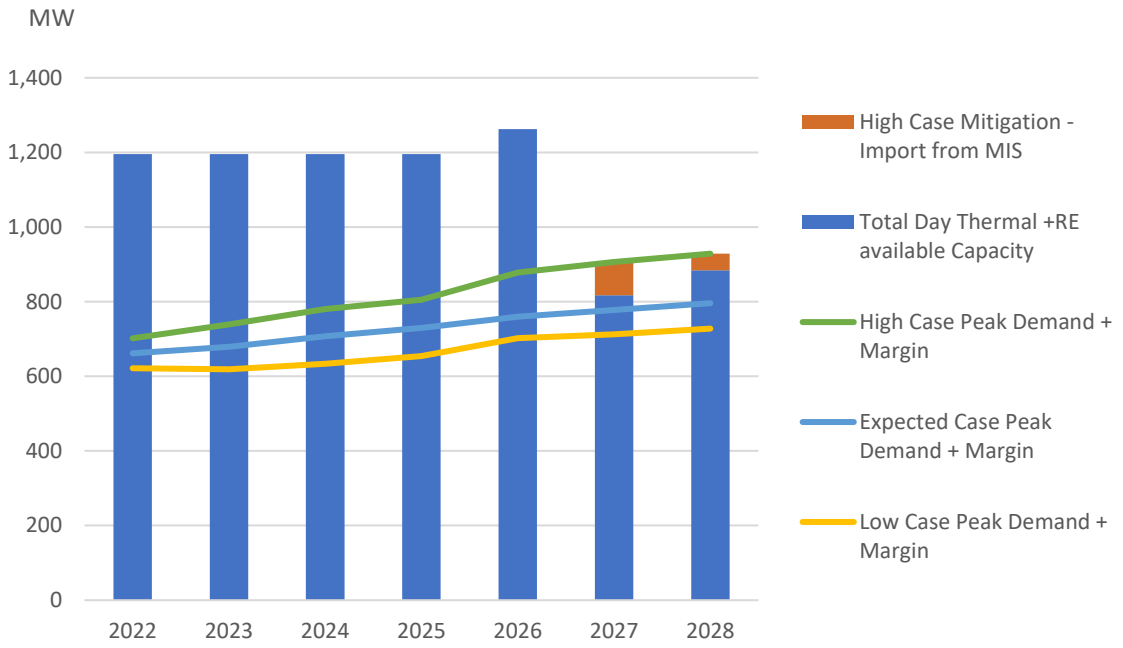
Subject to the success of the North-South Interconnect project from MIS to Ad Duqm Power System in 2023 and to the outcomes of a feasibility study, OPWP anticipates that the interconnection may then be extended to the DPS. Subsequently, planning and operations of the DPS, PDO System, and MIS will be fully integrated. It is assumed that the interconnect to the DPS is expected to be complete by 2026. OPWP expects that the reserve margin requirement for the DPS would be reduced at that time from 2026 onwards, aligning with that of the MIS. The reserve margin assumed to drop to about 7.7% from 2026 onwards after the North-South Interconnector constructed.

Resource Adequacy and Mitigation Plans

OPWP projects contracted capacity to be sufficient to meet the capacity targets associated with all three demand scenarios throughout the seven-year planning period There is a net reduction in the available contracted capacity in 2027 due to the expiration of Salalah IWPP before the 2027 peak demand period. This results in a shortfall in high case of around 89 MW and 45 MW in 2027 and 2028, respectively. Figure 12 and the accompanying table indicate capacity surpluses that reduce gradually with demand growth.

OPWP notes that the PWPA for Salalah IWPP is scheduled to expire in 2027. OPWP assessed the procurement requirement in 2027 in consideration of the updated demand forecast and potential timing for the North-South Interconnect to the DPS, and it is concluded that with the available assumed capacity there is no need for new procurement to replace Salalah IWPP.

Figure 12 Resource Adequacy – DPS



	2022	2023	2024	2025	2026	2027	2028
Generation Resources	Net MW [a]						
Total Day Thermal +RE available Capacity	1,195	1,195	1,195	1,195	1,262	817	884
Expected Case Demand							
Peak Demand	591	606	631	651	705	722	739
Peak Demand + Margin	662	679	707	730	760	778	796
Additional Capacity Required	-	-	-	-	-	-	-
High Case Demand							
Peak Demand	627	660	697	719	784	809	829
Peak Demand + Margin	702	739	781	805	879	906	929
Additional Capacity Required- Import from MIS	-	-	-	-	-	89	45
Low Case Demand							
Peak Demand	555	552	566	584	627	636	650
Peak Demand + Margin	621	619	633	654	702	713	728
Additional Capacity Required	-	-	-	-	-	-	-

MUSANDAM POWER SYSTEM

The Musandam Governorate is located in the northern-most region of the Sultanate of Oman and extends into the Strait of Hormuz. The Musandam Governorate is an exclave of Oman, separated from the rest of the country by the United Arab Emirates. The latest population data from the National Centre for Statistics & Information reports that the total population is estimated at around 49,457[9] which is expected to grow steadily over the coming years.

1.3.a Demand for Electricity

Demand Projections

The pace of demand growth in Musandam is driven by distribution level load and projects that aim to boost tourism, economic, and commercial activities. The Expected, Low, and High Case peak demand scenarios for the Musandam Power System have been prepared by Tanweer.

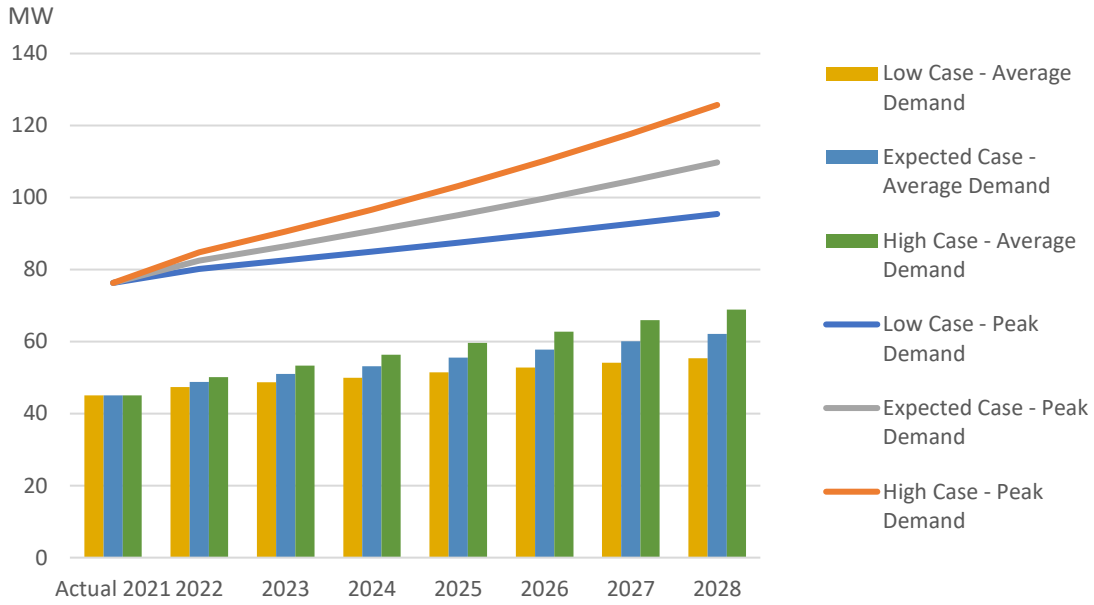
Similar to the demand forecasts presented for the other power systems, the different cases represent alternate assumptions of annual growth rates for underlying demand and materialisation of identified bulk consumers. These three demand scenarios are shown in Figure 13. Across all three scenarios, the growth projections are slightly lower than those in the previous 7-Year Statement. Further, the differences between the High and Low peak demand cases reflects the greater uncertainty currently observed with local and global economic trends.

Under the Tanweer Expected Demand forecast, peak demand is expected to grow from 83 MW in 2022 to 110 MW in 2028, an average increase of 5% per year. The Low Case scenario assumes a growth rate of 3% for peak demand, increasing only to 95 MW by 2028. The High Case scenario assumes a larger growth of population as well as increased tourism and fishery activities. Peak demand is projected to grow by an average of 7% per year to reach 126 MW in 2028.

As it is shown in Figure 13 The Average Demand growth is expected to grow from 49 MW in 2022 to 62 MW in 2028, with an average increase of 5% per year for the Expected Case. The Low Case scenario considers a growth rate of 3% per year for the average demand, increasing from 47 MW in 2022 to 55 MW in 2028. The High Case Scenario assumes a larger growth rate of 6% per year, increasing from 50 MW in 2022 to 69 MW in 2028.

[9] National Centre of Statistics & Information *Data Portal, – Musandam total population registered in November 2021*

Figure 13 Electricity Demand Projections – Musandam Power System



	Actual 2021	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Case									
Average Demand (MW)	**45**	**49**	**51**	**53**	**56**	**58**	**60**	**62**	**5%**
Annual Energy (GWh)	**0.40**	**0.43**	**0.45**	**0.47**	**0.49**	**0.51**	**0.53**	**0.55**	**5%**
Peak Demand (MW)	**76**	**83**	**87**	**91**	**95**	**100**	**105**	**110**	**5%**
Change from 2021-2027 Statement (MW)	*-9*	*-6*	*-7*	*-7*	*-7*	*-8*	*-8*	-	
Low Case									
Average Demand (MW)	**45**	**47**	**49**	**50**	**51**	**53**	**54**	**55**	**3%**
Annual Energy (GWh)	**0.40**	**0.42**	**0.43**	**0.44**	**0.45**	**0.46**	**0.47**	**0.49**	**3%**
Peak Demand (MW)	**76**	**80**	**83**	**85**	**87**	**90**	**93**	**95**	**3%**
Change from 2021-2027 Statement (MW)	*-6*	*-5*	*-5*	*-5*	*-5*	*-5*	*-5*	-	
High Case									
Average Demand (MW)	**45**	**50**	**53**	**56**	**60**	**63**	**66**	**69**	**6%**
Annual Energy (GWh)	**0.40**	**0.44**	**0.47**	**0.49**	**0.52**	**0.55**	**0.58**	**0.61**	**6%**
Peak Demand (MW)	**76**	**85**	**91**	**97**	**103**	**110**	**118**	**126**	**7%**
Change from 2021-2027 Statement (MW)	*-11*	*-8*	*-9*	*-9*	*-10*	*-11*	*-12*	-	

1.3.b Power Generation Resources

Sources of Power

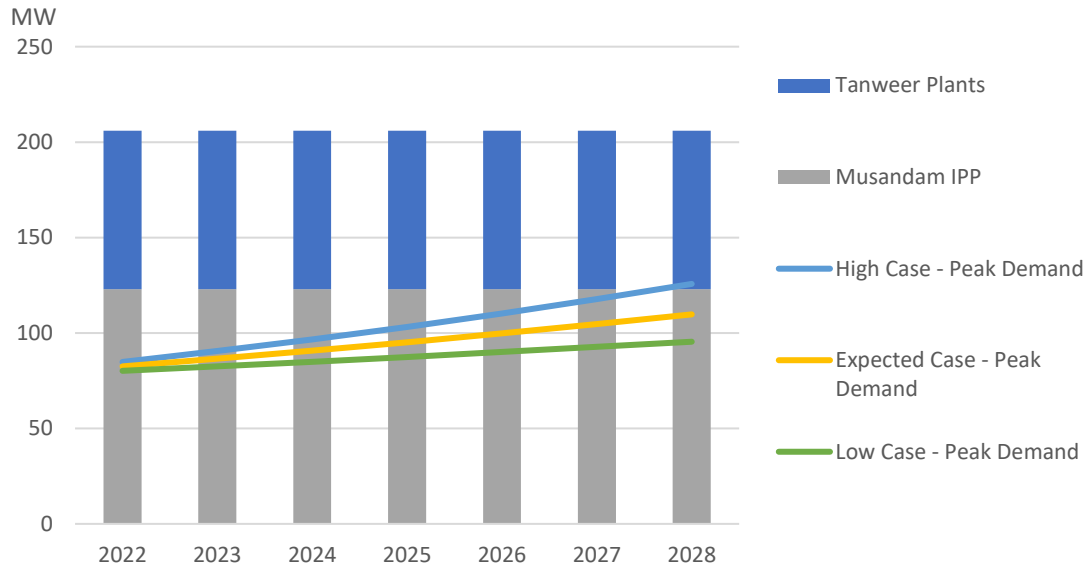
Tanweer owns and operates power stations distributed near load centres in the Musandam Governorate. They are all diesel-fired generators, with a combined installed capacity of about 83 MW – this figure includes additional capacity that was added in 2018.

Musandam IPP commenced operation in 2017 operated by a consortium led by OQ under a PPA with OPWP. The IPP provides firm capacity of 123 MW using reciprocating engines fuelled primarily by natural gas.

Resource Development Plan

Figure 14 illustrates Musandam's supply/demand balance. The Musandam IPP provides sufficient capacity to meet electrical energy requirements across all the Low and Expected Case demand scenarios over the coming 7-year planning horizon. It is not anticipated to require Tanweer Diesel generator to meet the expected demand. Tanweer diesel generator will continue to be available to provide additional capacity or as a contingency resource if needed throughout the 7-year planning horizon. It might be needed if the demand evolves towards the high case specifically in 2028. No further resources are required during this time period.

Figure 14 Future Power Generation Expansion Plans - Musandam Power System



	2022	2023	2024	2025	2026	2027	2028
Peak Demand				**MW**			
Expected Case	83	87	91	95	100	105	110
Low Case	80	83	85	87	90	93	95
High Case	85	91	97	103	110	118	126
Contracted Capacity							
Tanweer Plants	83	83	83	83	83	83	83
Musandam IPP [a]	123	123	123	123	123	123	123
Total Contracted Capacity	**206**	**206**	**206**	**206**	**206**	**206**	**206**

[a]The MW figures are at 45°C

Alternative Supply Options

Even though as presented above the installed capacity is sufficient to meet Musandam demand; OPWP in coordination with other stakeholders i.e. OETC and OQ exploring several alternative supply options such as:

Transmission interconnection with UAE:

Recently with coordination between OETC and TAQA (UAE) a consultancy techno economics study to analyse the technical and economic viability of two new interconnections between UAE & Oman. The new

interconnections will facilitate the integration of two isolated Omani power systems, namely Musandam and Madha, with the transmission interconnected system of UAE. Consequently, the grid impact of these new interconnectors in Musandam, Madha and Northern Emirates will be also explored. The study will investigate different options and will propose the best solution from techno-economic perspective. Moreover, recommendations about the commercial and operational framework of the new interconnections will be provided. The study will take up to 6 months after award.

Renewable Energy Options:

OPWP, in coordination with OQ, exploring several sites within Musandam to develop wind and solar IPP. A high-level screening for solar and wind lands were initiated by OQ and several sites were proposed for MoHUP. OPWP will continue further investigation to resolve the concern parties concerns in order to secure the lands.

SECTION 2 FUEL

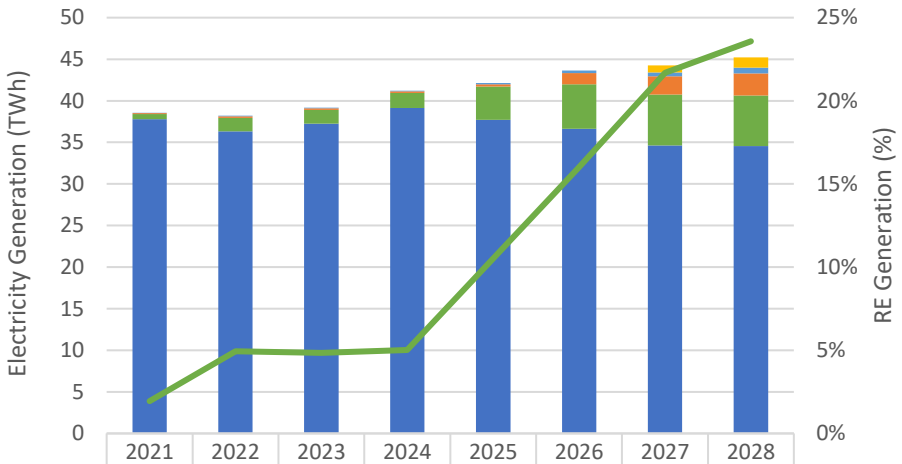
OVERVIEW

Fuel Diversification Policy

Following vision 2040 target to have 35-39%% renewable generation by 2040, OPWP continuing to develop renewable projects. The favourable economic costs of wind and solar PV technologies are driving renewable projects development. As of Q2 2022, OPWP has total contracted capacity of 550 MW of RE (Ibri II Solar IPP and Dhofar I Wind IPP) and plans to develop another 2,840 MW by 2028. Furthermore, OPWP continues to support improvements in efficient gas utilisation in the sector.

Figure 15 shows our projection of energy generation shares by fuel type among OPWP-contracted generators. By 2025, about 11% of generation will be provided by renewable energy sources, primarily solar energy. By 2028, the renewables share, within the sector, will reach 24%.

Figure 15 Fuel Shares in Electricity Generation



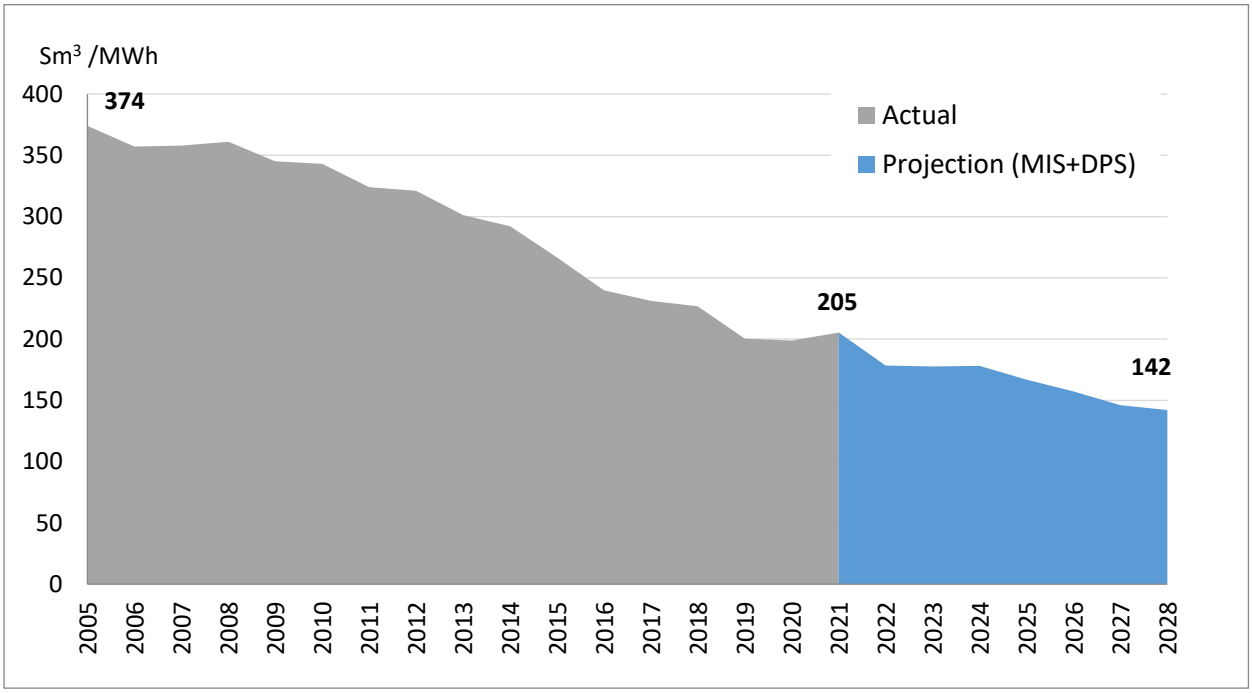
	2021	2022	2023	2024	2025	2026	2027	2028
Waste to Energy	-	-	-	-	-	-	0.8	1.2
Private Solar PV Initiatives	0.0	0.1	0.1	0.1	0.2	0.3	0.5	0.7
Wind	0.1	0.2	0.2	0.2	0.2	1.4	2.2	2.7
Solar PV	0.6	1.6	1.6	1.8	4.0	5.3	6.1	6.1
Gas-fired Plants	37.8	36.3	37.3	39.2	37.7	36.7	34.6	34.6
RE Generation (%)	2%	5%	5%	5%	11%	16%	22%	24%

Efficiency in Fuel Utilisation

Since 2005, through the introduction of progressively more efficient generation plants, OPWP has achieved a 46% reduction in the gas required per unit of electricity production, from 374 Sm^3/MWh in 2005 to 202 Sm^3/MWh in 2021. In 2021 alone, improvements in gas utilisation (when compared against gas utilisation rates in 2005) suggest savings in excess of OMR 300 million. This is driven by OPWP's procurement of new state-of-the-art CCGT plants in 2019, and new water desalination plants that shift water production from energy-intensive MSF technology to efficient RO technology.

After 2021, with the introduction of solar, wind, and waste to energy plants alongside with the MIS to DPS interconnection in 2026, OPWP expects that the gas requirements for electricity generation will fall to around 142 Sm^3/MWh by 2028 onward, or 62% less than that required in 2005.

Figure 16 Gas Required per Unit of Electricity Generation – MIS + DPS



MAIN INTERCONNECTED SYSTEM and DHOFAR POWER SYSTEM

2.1.a 2021 Fuel Consumption

Total gas consumption at the MIS and DPS power and water plants in 2021 was about 7.7 billion Sm^3, equivalent to 21.1 million Sm^3/d, about 9% more than in 2020. This was due to the increase in the energy demand in 2021 by 7% compared to 2020.

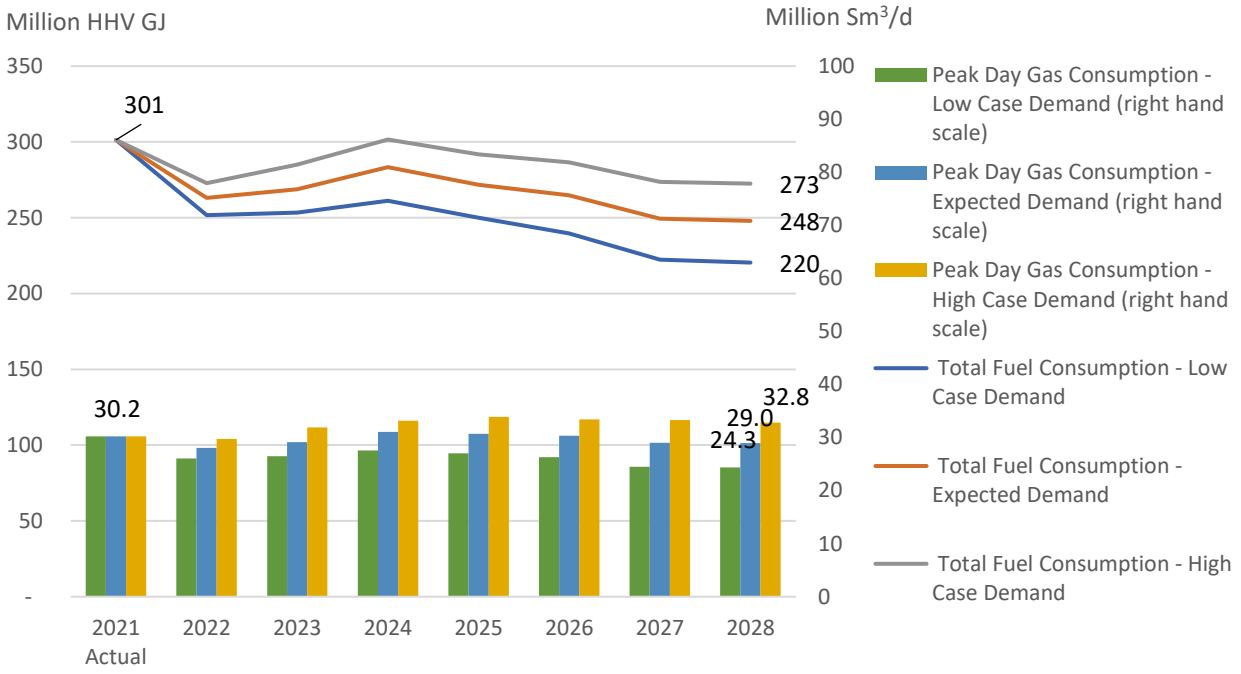
2.1.b Projected Fuel Requirements

OPWP projects total annual fuel requirements to decrease by around 3% per year from 2022 to 2028 under the Expected Case. This scenario, in addition to the Low Case and High Case scenarios, are illustrated in Figure 17.

Under the Low Case demand scenario, total fuel consumption would decrease at an average of 4% per year. In the High Case demand scenario, total fuel consumption would increase at an average rate of 4% per year.

Figure 17 shows MIS and DPS fuel requirements. The two system are expected to be interlinked upon the completion the North-South interconnection in 2026 which will play an important role in improving the gas utilization. The average gas consumption of 18.5 million Sm3/d in 2022, is less than 2021 consumption by 12%. This is mainly due to the retirement of number of plants, and full year operation of Ibri II Solar IPP. The energy demand growth and the interconnection to Duqm impact on fuel consumption can been seen in gas consumption increase in 2024. The gas requirement is then expected to drop from 2025 onwards in all cases as more RE projects are being develop.

Figure 17 Projected Fuel Requirements – MIS + DPS



	2021 Actual	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Demand									
Gas Consumption (million Sm³/d)									
Annual Average	21.1	18.5	18.9	19.8	19.1	18.6	17.5	17.3	-3%
Peak Day	30.2	28.0	29.2	31.1	30.7	30.3	29.0	29.0	-1%
Total Fuel Consumption (million HHV GJ)[a]	**301**	**263**	**269**	**283**	**272**	**265**	**249**	**248**	**-3%**
Low Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	21.1	17.7	17.8	18.3	17.5	16.8	15.6	15.4	-4%
Peak Day	30.2	26.1	26.5	27.5	27.0	26.3	24.5	24.3	-3%
Total Fuel Consumption (million HHV GJ)[a]	**301**	**252**	**253**	**261**	**250**	**240**	**222**	**220**	**-4%**
High Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	21.1	19.1	20.0	21.1	20.5	20.1	19.2	19.1	4%
Peak Day	30.2	29.7	31.9	33.2	33.9	33.4	33.3	32.8	6%
Total Fuel Consumption (million HHV GJ)[a]	**301**	**273**	**285**	**302**	**292**	**287**	**274**	**273**	**-1%**

[a] Based on natural gas HHV of 1050 BTU/scf

MUSANDAM POWER SYSTEM

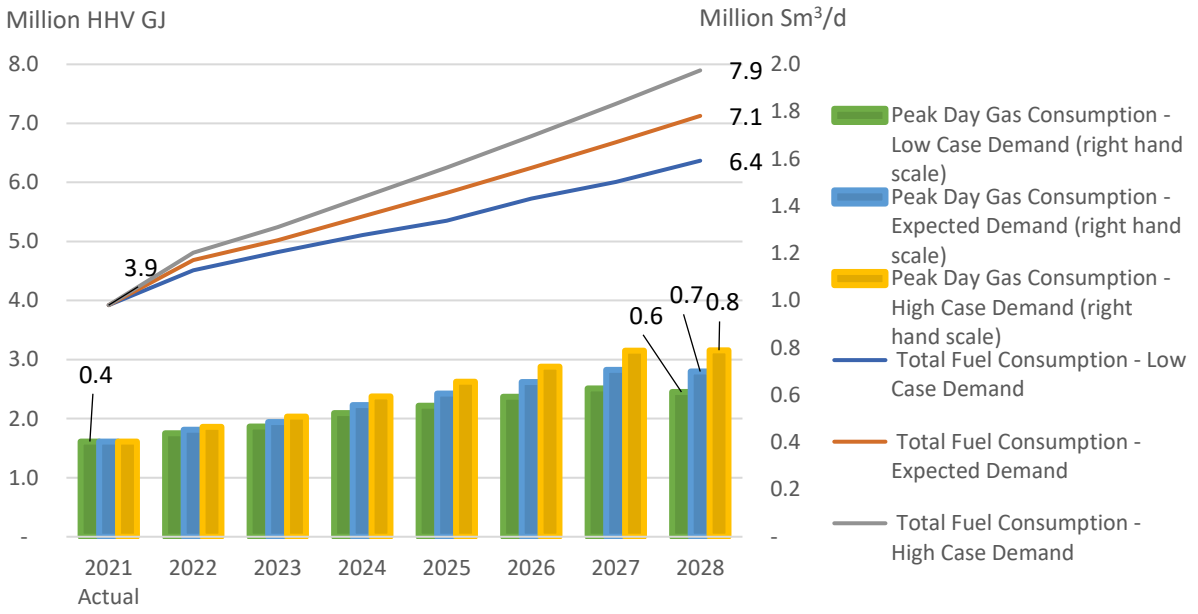
2.2.a 2021 Fuel Consumption

Gas consumption in 2021 was 100.4 million Sm^3 (equivalent to 0.28 million Sm^3/d), about 4% higher than in 2020. Peak daily natural gas consumption was 0.4 million Sm^3 in 2021, which is lower than 2020 peak by 3%.

2.2.b Projected Fuel Requirements

Fuel requirements projections for each of the three demand scenarios are illustrated in Figure 18. Total fuel consumption is expected to increase at an annual average of around 9% under the Expected Demand scenario, and by 10% and 7% under the High and Low Case scenarios, respectively. The projections shown assume Musandam IPP will be fully operating on fuel gas.

Figure 18 Projected Fuel Requirements – Musandam Power System



	2021 Actual	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Expected Case Demand									
Gas Consumption (million Sm^3/d)									
Annual Average	0.28	0.33	0.35	0.38	0.41	0.44	0.47	0.50	9%
Peak Day	0.40	0.45	0.49	0.56	0.61	0.65	0.71	0.70	8%
Total Fuel Consumption (million HHV GJ)[a]	**3.92**	**4.69**	**5.02**	**5.42**	**5.82**	**6.25**	**6.68**	**7.13**	**9%**
Low Case Demand									
Gas Consumption (million Sm^3/d)									
Annual Average	0.28	0.32	0.34	0.36	0.38	0.40	0.42	0.45	7%
Peak Day	0.40	0.44	0.47	0.52	0.56	0.59	0.63	0.61	6%
Total Fuel Consumption (million HHV GJ)[a]	**3.92**	**4.51**	**4.82**	**5.11**	**5.35**	**5.73**	**6.01**	**6.37**	**7%**
High Case Demand									
Gas Consumption (million Sm^3/d)									
Annual Average	0.28	0.34	0.37	0.40	0.44	0.48	0.51	0.55	10%
Peak Day	0.40	0.47	0.51	0.59	0.66	0.72	0.79	0.79	10%
Total Fuel Consumption (million HHV GJ)[a]	**3.92**	**4.81**	**5.25**	**5.75**	**6.25**	**6.79**	**7.33**	**7.90**	**11%**

[a] Based on natural gas HHV of 1,050 BTU/scf

SECTION 3 WATER

3.1 MAIN INTERCONNECTED SYSTEM

The MIS serves the largest population area and the greatest demand for potable water in the Sultanate of Oman. OPWP provides desalinated water to the Oman Water and Wastewater Services Company (OWWSC) [10] and its responsible for potable water supply to consumers. The MIS is an integrated network that currently serves potable water requirements of the Governorates of Muscat, Batinah South, Batinah North, Ad Dakhiliyah, and Al Buraymi. The MIS will be expanded to include supply to the Governorate of Ad Dhahirah upon completion of a new transmission pipeline in 2022.[11]

The MIS consists of three supply Zones, each of which has sources of desalinated water under contract to OPWP, other OWWSC water supply sources, and transmission facilities that allow water transfer between Zones under the management of OWWSC. The supply Zones are as follows:

Muscat Zone includes water demands of the Governorate of Muscat. The current sources of desalinated water for this Zone are Ghubrah II IWP, Qurayyat IWP, and transfers from Barka Zone. In addition, Ghubrah temporary RO considered one of OWWSC sources which expected to be in operation by 2022 with a desalinated water capacity of about 20,000 m3/d.

Barka Zone includes water demands of the Governorates of Batinah South and Ad Dakhiliyah. The current sources of desalinated water for this Zone are Barka IWPP, Barka II IWPP, Barka IV IWP with the possibility of transfers from Sohar Zone.

Sohar Zone includes water demands of the Governorates of Batinah North and Al Buraymi, with the additional water demand from the Governorate of Ad Dhahirah from 2022 onwards. The current sources of desalinated water for this Zone are Sohar IWPP, Sohar IV IWP, and transfers from Barka Zone. In addition, OWWSC has a long-term contract with Majis Industrial Services Company (MISC) to supply OWWSC with a desalinated water capacity of about 11,000 m^3/d.

3.1.a Demand for Water

OWWSC has provided OPWP with projections of average and peak water demand for MIS Zone, shown in Figure 19. Peak demand represents the average daily demand (including network losses) during the week on which the highest demand of the year is present.

OWWSC medium case scenario is driven fundamentally by population growth, distribution network expansion, and growth in per-capita water consumption. OWWSC demand forecasts are based on the official NCSI population forecast for the Sultanate of Oman until 2040 as published in March 2017 and updated with information from the NCSI census 2020 data [12].

The medium case scenario projects an average annual growth of about 4% over the forecast horizon to 2028. This is higher than the previous year's OWWSC forecast, which presented 3% annual growth to 2027. Out-turn demand in 2021 was 21,000 m^3/d less than the forecasted average demand. This may be attributed to the effect of the economic downturn and Covid-19 pandemic, which affected tourism, industries, businesses, and other sectors. But in view of the global expectations regarding the increase on oil prices which will lead to the national economy recovery, OWWSC expects an increase in water demand in the coming years compared to those

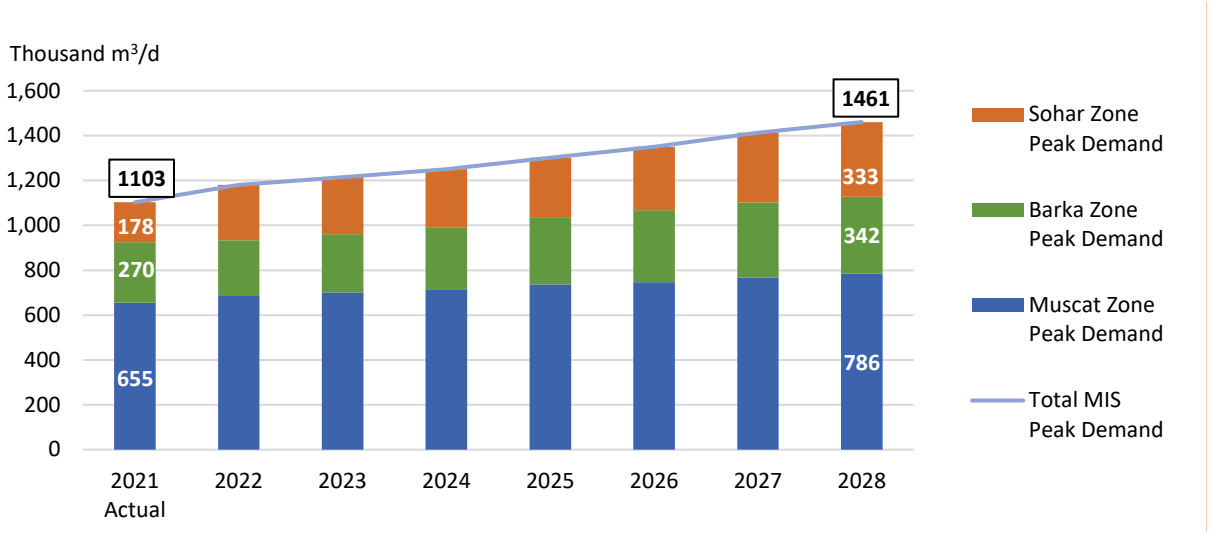
[10] Accordance to the Royal Degree No. (131/2020) issued on 09th December 2020, Oman Water and Wastewater Service Company (OWWSC) was established as a company integrating water (Public Authority for Water, Diam) and wastewater (Haya Water) services in the Sultanate of Oman excluding Dhofar Governorate.

[11] The current scenario considers the MIS connection to Ad Dhahirah in 2022.

[12] National Centre for Statistics and Information, Population Projections in the Sultanate of Oman, March 2017, this scenario is based on the medium fertility rate 3.3 for the Omanis and the expatriate to Omani ratio is declining to 33% in 2040.

forecasts in the previous statement, and this increase in the average water demand is expected to reach 83,000 m^3/d in 2027.

Figure 19 Water Demand Projections – MIS



	2021[a]	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
	Thousand m^3/d								
Muscat Zone									
Peak Demand	655	686	701	715	737	747	766	786	3%
Average Demand	575	602	616	629	648	657	674	691	3%
Barka Zone									
Peak Demand	270	248	260	274	296	321	336	342	3%
Average Demand	239	219	230	242	261	282	294	300	3%
Sohar Zone[b]									
Peak Demand	178	246	253	261	268	282	312	333	5%
Average Demand	154	214	220	227	234	246	271	289	5%
Total MIS									
Peak Demand	**1,103**	**1,180**	**1,214**	**1,251**	**1,301**	**1,350**	**1,413**	**1,461**	**4%**
Change from 2021-2027 Statement	*-24*	*6*	*-12*	*-21*	*1*	*29*	*72*	-	
Average Demand	**968**	**1,035**	**1,066**	**1,098**	**1,143**	**1,184**	**1,239**	**1,280**	**4%**
Change from 2021-2027 Statement	*-21*	*47*	*37*	*23*	*28*	*45*	*83*	-	

[a] The Average Demand is based on 2021 outturns (desalination and underground water supply) while the Peak Demand is estimated using peak factor.
[b] From mid-2022 onwards, the water demand of Adh Dhahirah Governorate is added to the total demand of the Main Interconnected System. Therefore, the demand growth represents the years from 2022 to 2028.

3.1.b Water Supply Sources

The sources of water supply include the existing water desalination plants, new desalination plants (under development or construction phases), and OWWSC sources. The water desalination sources that are under contract with OPWP in the MIS are summarized in Table 7.

OPWP's contracted sources of desalinated water in the MIS are classified by Zones as follows:

Muscat Zone:

Ghubrah II IWP. Owned by Muscat City Desalination Company and operated under a WPA with OPWP, the plant has a contracted desalination capacity of 191,000 m^3/d (42 MIGD) using RO technology.

Qurayyat IWP. Owned by Qurayyat Desalination Company and operated under a WPA with OPWP, Qurayyat IWP has a contracted desalination capacity of 200,000 m^3/d (44 MIGD), using RO technology. Qurayyat IWP is currently operated as "pre-COD" water production of 180,000 m^3/d (40 MIGD), until it achieves its Commercial Operation Date (COD), which is expected in 2024.

Ghubrah III IWP. Awarded in November 2020 to Capital Desalination Company, and to be operated under a WPA with OPWP. The plant is under construction, with a contracted desalination capacity of 300,000 m^3/d (66 MIGD) using RO technology.

Barka Zone:

Barka IWPP. Owned by ACWA Power Barka and operated under a PWPA with OPWP, the Barka IWPP was originally contracted with a desalination capacity of 91,200 m^3/d (20 MIGD) using MSF technology and has added RO capacities of 45,000 m^3/d (10 MIGD) in 2014 and 57,000 m^3/d (12.5 MIGD) in 2016. The PWPA for Barka IWPP is scheduled to expire in February 2022[13]. However, the WPA of the RO plants only has been extended until 31st March 2024, to provide desalinated capacity of 45,000 m^3/d (10 MIGD) and 57,000 m^3/d (12.5 MIGD).

Barka II IWPP. Owned by SMN Power Barka and operated under a PWPA with OPWP, the Barka II IWPP has a capacity of 120,000 m^3/d (26 MIGD) using RO technology. The PWPA will expire in March 2024.

Barka IV IWP. Owned by Barka Desalination Company and operated under a WPA with OPWP, Barka IV IWP utilises RO technology with a contracted capacity of 281,000 m^3/d (62 MIGD).

Barka V IWP. Awarded in November 2020 to GS Inima Barka 5 Desalination Company and operated under a WPA with OPWP. The project is under construction, with a contracted capacity of 100,000 m^3/d (22 MIGD), using RO technology. The SCOD is in July 2024.

Sohar Zone:

Sohar IWPP. Owned by Sohar Power Company and operated under a PWPA with OPWP, Sohar IWPP has a desalination capacity of 150,000 m^3/d (33 MIGD), using MSF units. The PWPA for Sohar IWPP is scheduled to expire in May 2022[14].

Sohar IV IWP. Owned by Myah Gulf Desalination Company and operated under a WPA with OPWP, Sohar IV IWP utilises RO technology with a contracted capacity of 250,000 m^3/d (55 MIGD).

[13] The contract expired in December 2021, but due to Force Majeure claims the PWPA is extended till February 2022.

[14] The contract expired in March 2022, but due to Force Majeure claims the PWPA is extended till May 2022.

Table 7 Water Desalination Plants – MIS

Project	Contracted Capacity	Contract Type	Plant Owner	Plant Status	Technology	Contract Expiry
Barka IWPP	91,200 m³/d	PWPA	ACWA Power Barka (SAOG)	Operational	MSF	2022
	45,000 m³/d	WPA		Operational	RO	2024
	57,000 m³/d	WPA		Operational	RO	2024
Barka II IWPP	120,000 m³/d	PWPA	SMN Barka Power Co. (SAOC)	Operational	RO	2024
Barka IV IWP	281,000 m³/d	WPA	Barka Desalination Co. (SAOC)	Operational	RO	2038
Barka V IWP	100,000 m3/d	WPA	GS Inima Barka 5 Desalination Company	Under construction	RO	2043
Ghubrah II IWP	191,000 m³/d	WPA	Muscat City Desalination Co. (SAOC)	Operational	RO	2034
Ghubrah III IWP	300,000 m³/d	WPA	Capital Desalination Company	Under construction	RO	2046
Qurayyat IWP	200,000 m³/d	WPA	Qurayyat Desalination Co. (SAOC)	Under construction	RO	2037
Sohar IWPP	150,000 m³/d	PWPA	Sohar Power Co. (SAOG)	Operational	MSF	2022
Sohar IV IWP	250,000 m³/d	WPA	Myah Gulf Desalination Co. (SAOC)	Operational	RO	2038

In addition to the sources that are under contract to OPWP, OWWSC operates wellfields at several locations in the MIS that offset the need for water desalination capacity. The production capacities needed from these sources are shown in aggregate by year in Figures 20, 21, and 22. It was noticed that in 2021, the wellfields extraction rate has grown significantly despite the availability of sufficient capacity from the desalination plants, this is due to the need for such sources to cover water demand in rural areas.

3.1.c Resource Adequacy and Development Plan

The expansion plan for water desalination capacity aims to meet water peak demand plus a reserve margin (the headroom factor) to meet the security of supply requirements. In 2019 PAW (now OWWSC) re-assessed the reserve margin required to meet the level of service target, considering uncertainty in the demand forecast and operational outages. A factor of 8% was considered as a reserve margin target for the first four years period (2022 – 2025) followed by 9% factor for the following years of the forecast period.

OPWP's assessment of resource adequacy and development plans is presented by the supply Zone. It shows the extent of transfers between Zones, inter-zonal reserve sharing, and constraints that are otherwise not evident in a summary presentation of the MIS.

Muscat Zone

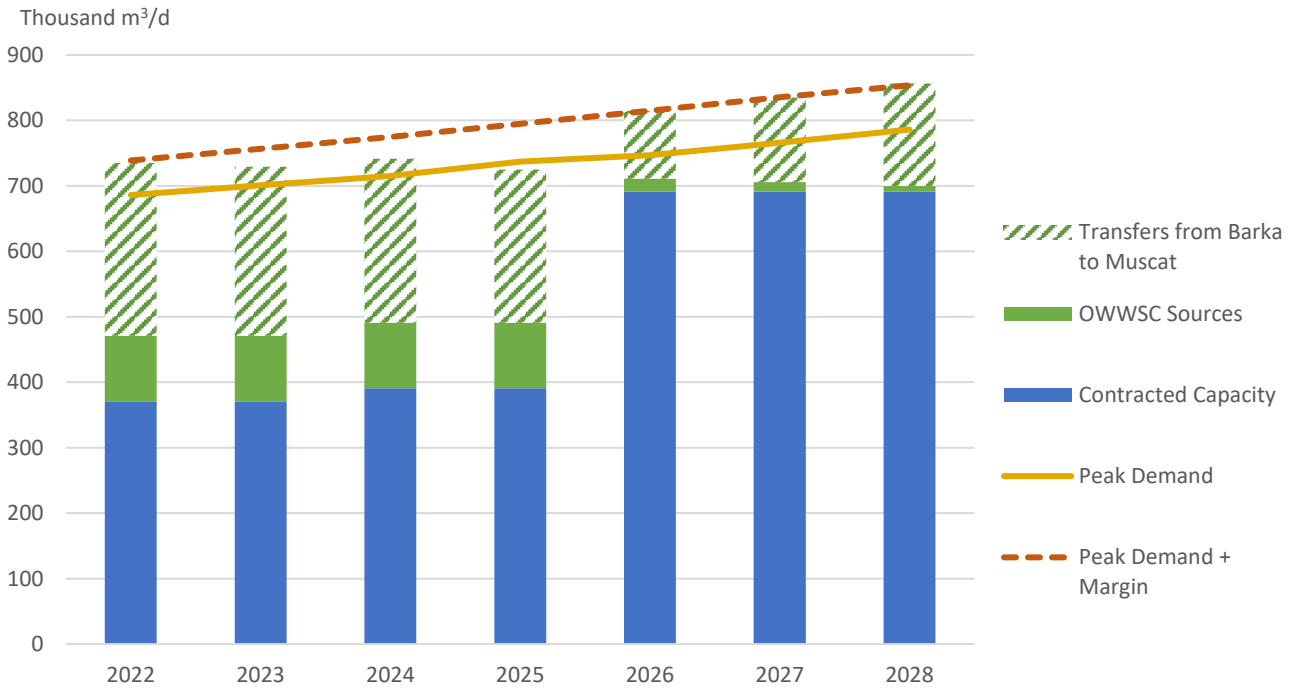
The Muscat Zone is currently supplied by Ghubrah II IWP, Qurayyat IWP, OWWSC wellfields resource, and transfers from Barka Zone. Qurayyat IWP is currently delivering commercial water as "pre-COD" until its Commercial Operation Date (COD) is achieved, which is expected in 2024. The local sources within the Muscat Zone are not sufficient to meet the forecasted demand and therefore water transfers from Barka Zone are required to provide for the balance.

The transmission facilities relevant to transfers from Barka Zone are currently undergoing a multi-year reinforcement and capacity expansion program. The existing transmission line capacity from Barka to Al Seeb and Ad Dakhiliyah is 320,000 m^3/d. In 2022, the reinforcement will increase the total capacity transfer from Barka to Seeb (in Muscat Zone) by 100,000 m^3/d. Reinforcement of Al Khoud Main Pumping Station is scheduled for completion in 2023, increasing transfer capacity to Ad Dakhiliyah to above than 207,000 m^3/d (46 MIGD) by 2028. The resulting additional water flow to Ad Dakhiliyah reduces the maximum available transfer capacity from Barka to Seeb. This transfer capacity reduces steadily from 264,000 m^3/d in 2022 to about 234,000 m^3/d in 2025 as water demand in Ad Dakhiliyah grows. In 2026 Ghubrah III IWP will be available with a capacity of 300,000 m^3/d to cover the peak demand with margin in Muscat Zone.

Figure 20 provides a summary of annual water supply requirements and supply sources in the Muscat Zone. For the Muscat Zone, the Barka transfers are required to meet the peak demand plus margin. In the years 2022-2025, the limitation of the water availability in Muscat Zone and transfer capacity from Barka Zone causes a supply shortfall in Muscat Zone of about 4,000 m^3/d in 2022 and increasing to 70,000 m^3/d in 2025m^3/d against peak demand plus reserve margin. It is also expected that there will be a supply shortfall in Muscat Zone of about 12,000 m^3/d in 2025. OPWP will work closely with OWWSC to minimize this shortfall through exploring supply options and resources.

Ghubrah III IWP is expected to reach COD in Q2, 2026, contributing to 2026 demand requirements. The Wadi Dhayiqah IWP scheme was intended to be used for supplying irrigation water in the local vicinity through a dedicated distribution system, as well as for supplying potable water to the Muscat Region during emergencies. The Ministry of Agriculture, Fisheries Wealth and Water Resources requested new plant for Wadi Dhayiqah in 2027 with capacity of 65,000 m^3/d.

Figure 20 Resource Adequacy and Development Plan – Muscat Zone



	2022	2023	2024	2025	2026	2027	2028
Muscat Zone	Thousand m³/d						
Average Demand	602	616	629	648	657	674	691
Peak Demand	686	701	715	737	747	766	786
Peak Demand + Reserve Margin	739	757	774	795	815	835	854
Contracted Capacity							
Ghubrah II IWP	191	191	191	191	191	191	191
Qurayyat IWP[a]	180	180	200	200	200	200	200
Ghubrah III IWP	-	-	-	-	300	300	300
Prospective Capacity							
Wadi Dhayiqah[b]	-	-	-	-	-	-	-
OWWSC Sources							
Required Wellfields Sources[c]	80	80	80	80	0	15	9
Ghubrah Temporary	20	20	20	20	20	0	0
Planned Transfers							
Transfers from Barka to Muscat [d]	264	258	250	234	104	129	156
Total Muscat Zone Capacity +/- Planned Transfers	**735**	**729**	**741**	**725**	**815**	**835**	**856**
Reserve including Planned Transfers over Peak Demand (shortfall)	49	28	26	-12	68	69	70
Reserve including Planned Transfers over Peak Demand + Reserve Margin (shortfall)	-4	-28	-33	-70	0	0	3

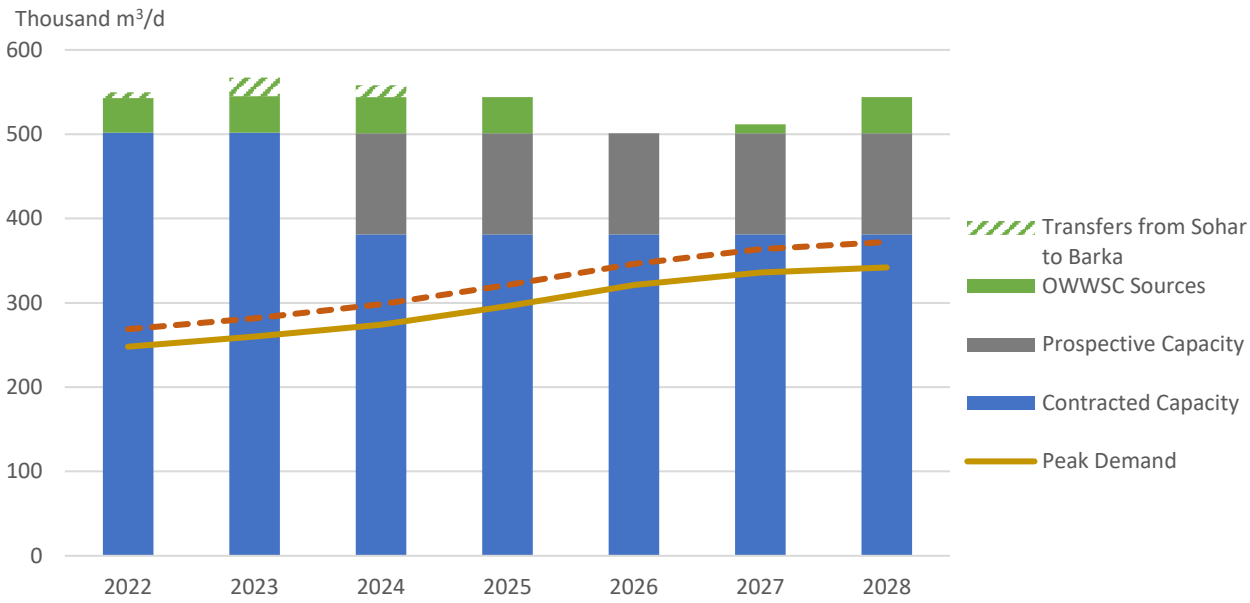
[a] Expected to achieve the full-capacity of 200,000 m³/d before summer 2024.
[b] Ministry of Agriculture, Fisheries Wealth and Water sources requested new plant for Wadi Dhayiqah in 2027 with capacity 65,000 m³/d.
[c] The wells will be used up to the maximum capacity during peak demand periods when the desalination capacity is not sufficient to meet the demand. OWWSC is responsible of maintaining and operating these wells to overcome supply deficit.
[d] From 2022 to 2025 represent the maximum transfers capacity to Muscat Zone.

Barka Zone

The Barka Zone is currently supplied by Barka IWPP (ROs, MSF-standby), Barka II IWPP, Barka IV IWP, and OWWSC -operated wellfields source. These sources currently exceed the demand requirements within the Barka Zone and enable transfers to support the needs of the Muscat Zone and Sohar Zone.

Figure 21 provides a summary of annual water supply requirements and supply sources in the Barka Zone. Barka V IWP, which is under construction, will be available by Summer 2024 to provide a capacity of 100,000 m^3/d (22 MIGD), contributing to 2024 peak demand requirements. OPWP will procure additional water desalination capacity within the Barka Zone: Barka Water 2024 IWP. This procurement is expected to secure sufficient capacity to meet targets at a reasonable cost and provide for demand growth in this supply Zone.

Figure 21 Resource Adequacy and Development Plan – Barka Zone



	2022	2023	2024	2025	2026	2027	2028
Barka Zone	Thousand m^3/d						
Average Demand	219	230	242	261	282	294	300
Peak Demand	248	260	274	296	321	336	342
Peak Demand + Reserve Margin	269	282	298	321	346	364	372
Contracted Capacity							
Barka I IWPP (ROs)[a]	101	101	-	-	-	-	-
Barka II IWPP[b]	120	120	-	-	-	-	-
Barka IV IWP	281	281	281	281	281	281	281
Barka V IWP	-	-	100	100	100	100	100
Prospective Capacity							
Barka 2024 IWP	-	-	120	120	120	120	120
OWWSC Sources							
Required Wellfields Supply[c]	41	43	43	43	0	11	43
Planned Transfers							
Transfers from Barka to Muscat	-264	-258	-250	-234	-104	-129	-156
Transfers from Barka to Sohar	0	0	0	-10	-19	-19	-15
Transfers from Sohar to Barka	7	22	14	0	0	0	0
Total Barka Zone Capacity +/- Planned Transfers	**286**	**309**	**308**	**300**	**378**	**364**	**373**

Reserve including Planned Transfer over Peak Demand (shortfall)	38	49	34	4	57	28	31
Reserve including Planned Transfer over Peak Demand+ Reserve Margin (shortfall)	17	28	9	-21	32	0	1

[a] Barka I IWPP was scheduled to expire in February 2022. However, Barka IWPP RO plants extended until 31st March 2024.
[b] Barka II IWPP will expire on 31st March 2024.
[c] The wellfields will be used up to the maximum capacity during peak demand periods when the desalination capacity is not sufficient to meet the demand.

Sohar Zone

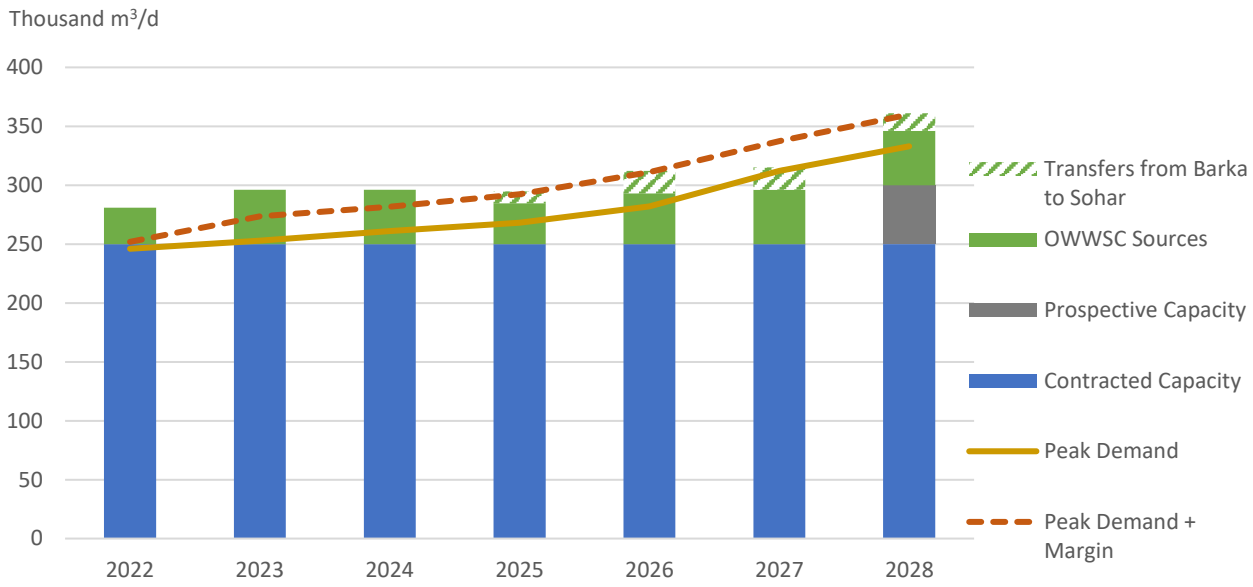
The Sohar Zone is currently supplied by the existing Sohar IWPP, Sohar IV IWP and OWWSC sources which include wellfields supply and an RO plant operated by MISC under contract to OWWSC.

The Sohar IWPP PWPA expires in May 2022. The remaining sources have sufficient capacity to meet water requirements until 2026. OPWP is planning to procure North Batinah IWP with early water of 50,000 m3/d (11 MIGD) in 2028, and to reach the full capacity of 150,000 m^3/d (33 MIGD) in 2029. OWWSC wellfields capacities are needed to meet the peak demand plus reserve margin.

While initially planned with a COD in 2023, the North Batinah IWP COD was rescheduled at OWWSC 's request to achieve COD in Q2, 2026. The peak demand in Sohar Zone during the years 2026 and 2027 can be met with the existing capacities, and the procurement ofNorth Batinah IWP full capacity can be postponed beyond the forecast period. In 2028, an additional capacity of only 50,000 m^3/d (11 MIGD) will be adequate to meet the peak demand plus the margin. OPWP plans to contract for the same as an early water capacity from North Batinah IWP.

Data further indicates that a surplus in the Barka Zone of up to 19,000 m^3/d can be transferred to Sohar Zone, subject to the interconnection capacity between the two Zones. Figure 21 indicates the development of the supply balance and resource adequacy. In 2027 there will be a lack of reserve over peak demand plus margin until the completion of the North Batinah IWP. Then reserves meet the planning target for the remainder of the forecast period.

Figure 22 Resource Adequacy and Development Plan – Sohar Zone



	2022	2023	2024	2025	2026	2027	2028
Sohar Zone	Thousand m³/d						
Average Demand	214	220	227	234	246	271	289
Peak Demand	246	253	261	268	282	312	333
Peak Demand +Margin	252	274	282	292	311	337	360
Contracted Capacity							
Sohar IV IWP	250	250	250	250	250	250	250
Prospective Capacity							
North Batinah IWP	-	-	-	-	-	-	50
OWWSC Sources							
Required Wells Supply[a]	20	35	35	24	32	35	35
Sohar RO MISC	11	11	11	11	11	11	11
Planned Transfers							
Transfers from Barka to Sohar	0	0	0	10	19	19	15
Transfers from Sohar to Barka	-7	-22	-14	0	0	0	0
Total Sohar Zone Capacity +/- Planned Transfers	**274**	**274**	**282**	**295**	**312**	**315**	**361**
Reserve including Planned Transfer over Peak Demand (shortfall)	28	21	21	27	30	3	28
Reserve including Planned Transfer over Peak Demand +Margin (shortfall)	22	0	0	2	1	-22	1

[a] The wellfields will be used up to the maximum capacity during peak demand periods when the desalination capacity is not sufficient to meet the demand includes Batinah North wells, Buraymi wells, and Dhahirah wells. OWWSC is responsible of maintaining and operating these wells to overcome supply deficit.

Summary

The supply plan meets peak demand and margin requirements in the MIS across the forecast period to a very good instant. However, a shortfall against the margin target in Muscat Zone in the period between 2022 to 2025. Muscat Zone depends on transfers from Barka Zone to meet peak demand until the early water capacity of Ghubrah III IWP becomes available in Q4, 2025. Margins in certain years may appear caused by delays in the development of planned projects, such that contingency plans need to be available.

OWWSC has created and is developing a transmission system capability tool, the purpose of this tool is to provide an annual assessment of the capacity of the transmission system compared to the growth in the demand for water and used to consider the expected availability of existing production capacities of OPWP and OWWSC, and technical constraints related to transmission capacities between Sohar, Barka and Muscat Zones.

OPWP and OWWSC will continue to work together to anticipate potential difficulties and to develop supply mitigation plans as necessary.

3.2 SHARQIYAH ZONE

Sharqiyah Zone includes the water demands of the Sharqiyah North and Sharqiyah South Governorates excluding Wilayat Musairah. The Zone is not connected with the MIS. Currently, OPWP supplies desalinated water to OWWSC from two plants Sur II IWP and Aseelah IWP.

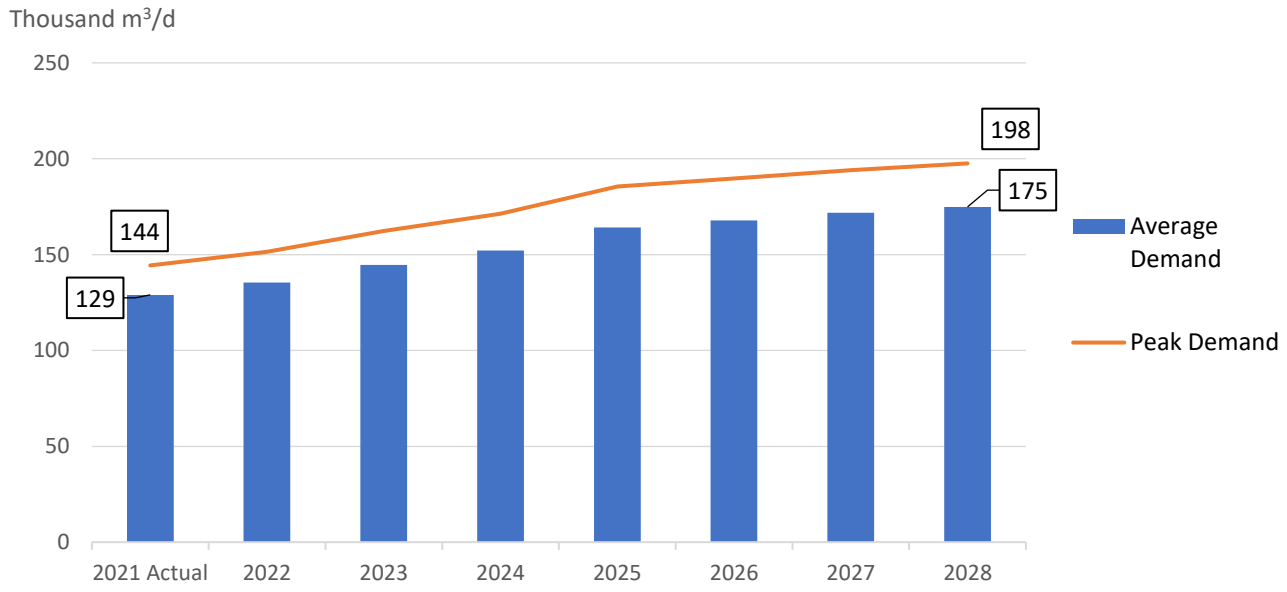
3.2.a Demand for Water

Figure 23 below shows OWWSC water demand forecast for Sharqiyah Zone. Sharqiyah Zone served by Sharqiyah Water Network that is or will be connected to water desalination plants under contract with OPWP.

The average actual water consumption in Sharqiyah Zone for 2021 is lower by 7,000 m^3/d compared with the last 7 Year Statement projections, bringing the average consumption to about 129,000 m^3/d and the peak consumption to 144,000 m^3/d.

OWWSC projects average growth for peak and annual average demand at 5% and 4% respectively over the 7-year period. The annual average growth is not constant, as it varies from year to another. In pace with the Zone developments, the peak demand increases within a range of 5%-8% in the earlier period, while it increases by only 2% from 2026 to 2028.

Figure 23 Water Demand Projections – Sharqiyah Zone



	2021[a]	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
	Thousand m^3/d								
Peak Demand	**144**	**151**	**162**	**171**	**185**	**190**	**194**	**198**	**5%**
Change from 2021-2027 Statement	*-8*	*-11*	*-7*	*-2*	*8*	*0*	*-9*	-	
Average Demand	**129**	**135**	**145**	**152**	**164**	**168**	**172**	**175**	**4%**
Change from 2021-2027 Statement	*-7*	*-9*	*-6*	*-2*	*7*	*0*	*-8*	-	

[a] The Average Demand is based on 2021 outturns (desalination and underground water supply) while the Peak Demand is estimated using peak factor.

3.2.a Water Supply Sources

The supply sources presented to meet water demand include existing water desalination plants and OWWSC sources. The sources that are under contract with OPWP in Sharqiyah Zone are indicated in Table 8 and described as follows:

Sur II IWP. Owned and operated by Sharqiyah Desalination Company under a WPA with OPWP, Sur II IWP has contracted capacity of 131,837 m^3/d (29 MIGD), using RO technology.

Aseelah IWP. Owned and operated by Al Aseelah Desalination Company under a WPA with OPWP, the plant has reached the Commercial Operation Date in January 2022, the contracted capacity is 80,000 m^3/d (18 MIGD), using RO technology.

In addition to the capacity under contract to OPWP, OWWSC has wellfields resource located in several locations. They may be utilised, to a limited degree, for water supply when desalinated water capacity is not sufficient to meet the peak demand plus margin in the Sharqiyah Zone. As per the data provided by OWWSC for this statement the maximum capacity of the wells forecasted to be utilised in 2027 and 2028 is around 21,000 m^3/d.

Table 8 Water Desalination Plants – Sharqiyah Zone

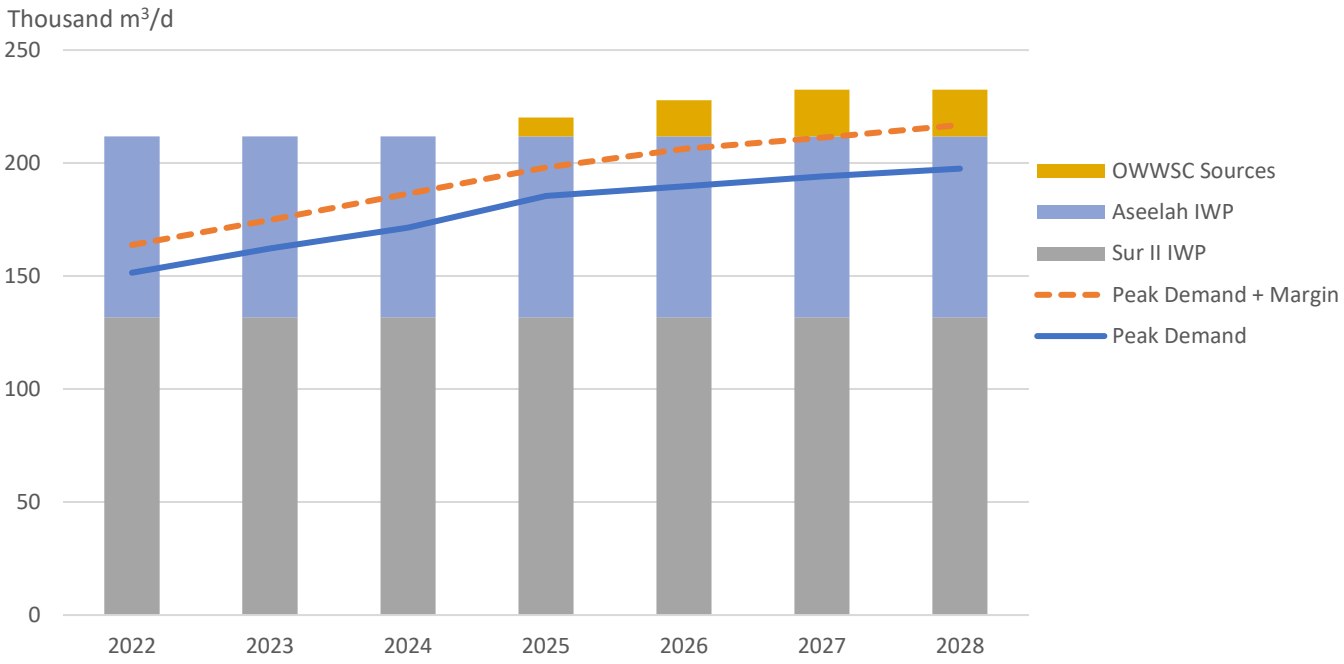
Project Name	Contracted Capacity	Contract Type	Project Company	Project Status	Technology	Contract Expiry
Sur II IWP	131,837 m^3/d	WPA	Sharqiyah Desalination Company (SAOG)	Operational	RO	2029
Aseelah IWP	80,000 m^3/d	WPA	Al Asilah Desalination Company (SAOC)	Operational	RO	2041

3.2.b Resource Adequacy and Development Plan

The forecasted capacity target (peak demand plus margin) for the Sharqiyah Zone has increased up to 7% in the years 2022 to 2024, and the growth rate has decreased to 3% in 2028 and the lowest was in 2027 with about 2% annual growth rate.

Figure 24 below shows the contracted capacity is sufficient to meet the capacity target until 2027. However, it is important to note that OWWSC is currently working on the development of its transmission and distribution in Sharqiyah Zone. OWWSC progress on the water connection to Aseelah IWP and expected to be available by 2022. OWWSC plans to use wells to meet the demand shortfall until the water network connection is operational.

Figure 24 Resource Adequacy and Development Plan – Sharqiyah Zone



	2022	2023	2024	2025	2026	2027	2028
Supply Requirements	Thousand m³/d						
Peak Demand	151	162	171	185	190	194	198
Peak Demand + Margin	164	175	186	198	206	211	217
Contracted Capacity							
Sur II IWP	132	132	132	132	132	132	132
Aseelah IWP	80	80	80	80	80	80	80
Prospective Capacity							
	-	-	-	-	-	-	-
OWWSC Sources							
Required Wells Supply[a]	0	0	0	8	16	21	21
Total Sharqiyah Zone Capacity including OWWSC Sources	**212**	**212**	**212**	**220**	**228**	**232**	**232**
Reserve over Peak Demand (Shortfall)	**60**	**50**	**40**	**35**	**38**	**38**	**35**
Reserve over Peak Demand +Margin (Shortfall)	**48**	**37**	**25**	**22**	**21**	**21**	**16**

[a]OWWSC wells or tankers supply are considered only as an emergency supply.

3.3 DHOFAR ZONE

DISC[15] is responsible for potable water supply to consumers, and for the development, operation, and maintenance of the Dhofar Water Network. OPWP supplies water to DISC from Salalah IWPP and Salalah III IWP.

[15] Previously Directorate General for Water, Dhofar Integrated Services Company (DISC) was established under Royal Decree No. 131/2020 of December 9, 2020

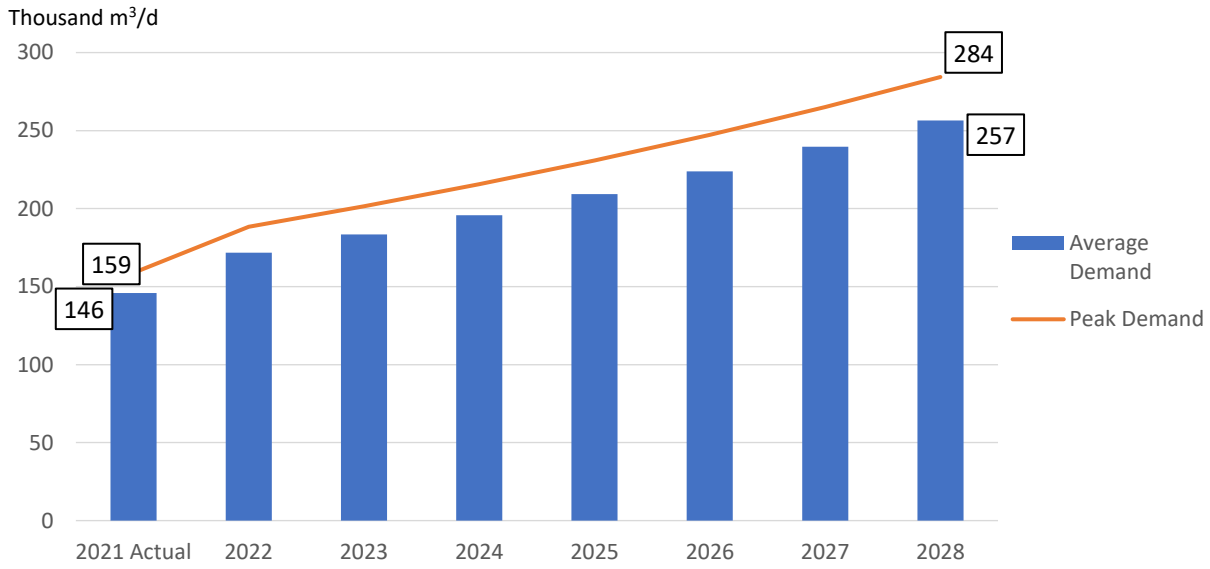
3.3.a Demand for Water

The water demand projections for Dhofar water network as provided by DISC, shown in Figure 25. It includes the aggregated potable water demands of Wilayats Salalah, Taqah and Mirbat.

The forecast demand is consisted of two parts: (1) Cities of Salalah, Taqah, and Mirbat, which comprise demand served by the existing water distribution network; and (2) Jabal, which represents the demand in Jabal areas that are partially connected to the network. At present, the Jabal demand is mainly served by local wellfields. DISC plans to expand its network to supply the Jabal communities during the forecast period. DISC has a plan to expand the existing water network to include all areas in the Jabal (mountain), in addition to studying the possibility of expanding the network to some neighbouring Wilayat as (Thumrait and Sadah). However, the water supply plan considers a scenario in which the development occurs.

The average actual water consumption for 2021 was lower by 18,000 m^3/d compared to the projections provided in the previous 7 Year statement, Issue 15. The accumulated reduction in average demand and peak demand for 2027 is about 23,000 m^3/d and 20,000 m^3/d respectively.

Figure 25 Water Demand Projections – Dhofar Zone



	2021[a]	2022	2023	2024	2025	2026	2027	2028	Average Growth (%)
Peak Demand				Thousand m^3/d					
Cities	113	134	142	150	159	168	177	187	7%
Jabal	46	54	59	66	72	79	88	97	11%
Total	**159**	**188**	**201**	**216**	**231**	**247**	**265**	**284**	**9%**
Change from 2021-2027 Statement	*-20*	*-4*	*-6*	*-9*	*-12*	*-16*	*-20*	-	
Average Demand									
Cities	105	121	127	134	141	149	157	165	7%
Jabal	41	51	56	62	68	75	83	91	12%
Total	**146**	**172**	**183**	**196**	**209**	**224**	**240**	**256**	**8%**
Change from 2021-2027 Statement	*-18*	*-5*	*-8*	*-11*	*-14*	*-18*	*-23*	-	

[a] The Average Demand is based on 2021 outturns (desalination and underground water supply) while the Peak Demand is estimated using peak factor.

3.3.b Water Supply Sources

The sources of water supply include water desalination plants under contract to OPWP and groundwater sources operated by DISC. OPWP has two water desalination plants under contract for water supply to DISC. They are described in Table 9 and as follows:

Salalah IWPP. Owned and operated by Sembcorp Salalah Power and Water Company under a PWPA with OPWP, Salalah IWPP has a capacity of 68,190 m^3/d (15 MIGD), using RO technology, and was commissioned in 2012.

Salalah III IWP. Owned by Dhofar Desalination Company under a WPA with OPWP, Salalah IWP has a capacity of 113,650 m^3/d (25 MIGD), using RO technology, and was commissioned in 2021.

In addition to the above desalination capacity, DISC uses a network of groundwater sources to meet the balance of water demand. The groundwater supplies are required to have an estimated capacity of up to 85,000 m^3/d. DISC plans to utilise desalinated water to meet average and peak demand requirements, and to utilise groundwater from wells only as a reserve for emergency supply. This is also consistent with the national policy to limit ground well production to replenish aquifers.

Table 9 Water Desalination Plants – Dhofar Water Network

Project Name	Contracted Capacity	Contract Type	Project Company	Project Status	Technology	Contract Expiry
Salalah IWPP	68,190 m^3/d	PWPA	Sembcorp Salalah Power & Water Company (SAOC)	Operational	RO	2027[a]
Salalah III IWP	113,650 m^3/d	WPA	Dhofar Desalination Company (SAOC)	Operational	RO	2040

[a] The contract expiry date for Salalah IWPP is in April 2027.

3.3.c Resource Adequacy and Development Plan

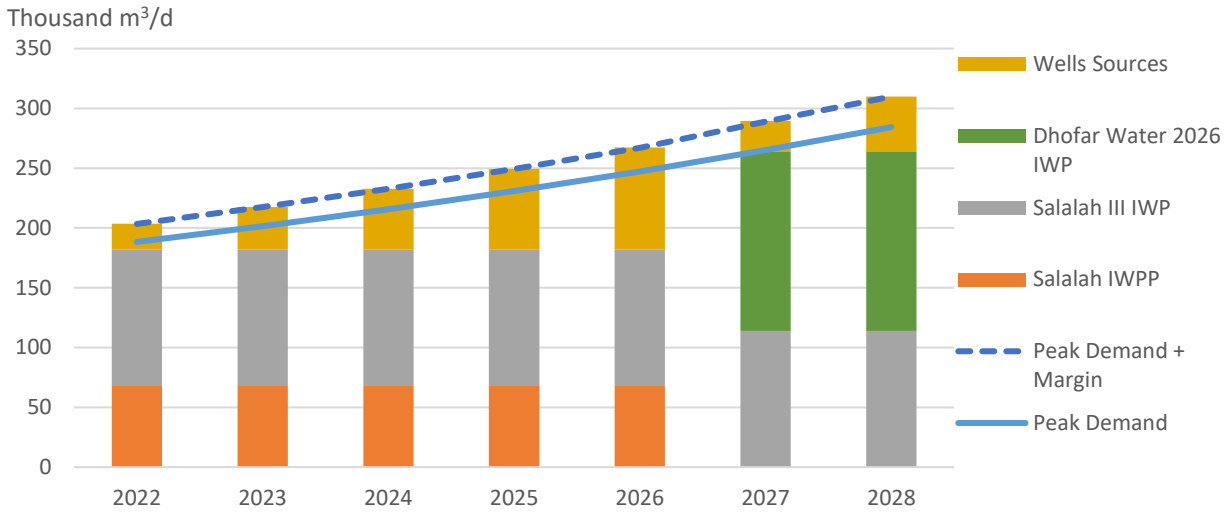
The resource adequacy addresses Dhofar Cities' and Jabal demand, which corresponds to DISC's proposed network expansion plan. The capacity target assumes the same reserve margin standard as the MIS and Sharqiyah Zone in the northern regions of the Sultanate. Figure 28 shows the demand-supply balance, considering network expansion to include water demand in the Jabal areas. It demonstrates that from 2023, groundwater supply would be required in every year to supplement desalinated water supply, unless additional desalination capacity becomes available.

DISC has requested OPWP to procure new desalination capacity of 150,000 m^3/d (33 MIGD) to begin operation in 2026. To provide greater supply security via geographical diversity, it was proposed to establish this new plant on the western side of Salalah (Raysut area). However, OPWP expect the commercial operation for the project is in 2027, due to the site availability challenges and other project development process requirements.

The desalinated water from Salalah IWPP, Salalah III IWP, and the prospective Dhofar Water IWP would be sufficient to meet the network's total water demand needs through to the year 2027, as shown in Figure 26. As noted above, DISC plans to use wellfields sources up to 85,000 m^3/d.

Due to the expiry of the Salalah IWPP contract in 2027, DISC is expected to review its water demand forecasts and verify the need to replace this capacity. OPWP will work together with DISC to develop procurement plan either by extending the current contract or replacing it with another desalination plant.

Figure 26 Resource Adequacy and Development Plan – Dhofar Cities and Jabal



	2022	2023	2024	2025	2026	2027	2028
Supply Requirements				Thousand m³/d			
Peak Demand - Cities	134	142	150	159	168	177	187
Peak Demand - Jabal	54	59	66	72	79	88	97
Total Peak Demand	**188**	**201**	**216**	**231**	**247**	**265**	**284**
Total Peak Demand + Margin	**203**	**218**	**233**	**249**	**267**	**289**	**310**
Contracted Capacity							
Salalah IWPP	68	68	68	68	68	-	-
Salalah III IWP	114	114	114	114	114	114	114
Prospective Capacity							
Dhofar Water IWP 2026[a]	-	-	-	-	-	150	150
DISC Sources							
Required Wells Supply [b]	21	36	51	67	85	25	46
Total Dhofar Zone Capacity including DISC Sources	**203**	**218**	**233**	**249**	**267**	**289**	**310**
Reserve over Peak Demand (Shortfall)	15	16	17	18	20	24	26
Reserve over Peak Demand + Margin (Shortfall)	0	0	0	0	0	0	0

[a] DISC requested the capacity in 2026. However, due to the project development process, the required capacity is expected to be available in 2027.
[b] Capacity requirement expected to be supplied by DISC to meet the Peak Demand + Margin.

SECTION 4
PROCURMENTACTIVITIES

POWER PROJECTS

OPWP's current and near-term procurement activities for power projects include the following, and are summarized in Table 10:

Manah I and II Solar IPPs. OPWP is procuring two solar PV projects at a site in Manah via a single RFP process. Both projects will have installed capacity of 1000 MW. The RFQ was issued in Q3 2019, and the RFP was released in Q3 2020. The projects will have successive scheduled CODs in Q1 and Q2 2025 respectively.

Wind IPPs 2025. OPWP plans to commence the procurement of two wind IPPs in different locations in the beginning of 2022 (RFQ to be released in Q4), to achieve commercial operation in 2026. The expected locations for these two projects are in Duqm and in Jalaan Bani Bu Ali (MIS). Both IPPs are expected to have a combined installed capacity of 300 MW.

MIS Solar IPP 2025. OPWP plans to launch the RFQ process for the third of the series of solar IPP procurements in Q4 2022, to achieve commercial operation in 2026. This project may also have installed capacity of 500 MW or more, subject to site and market evaluations.

Power 2024. OPWP currently plans to initiate a procurement round for new PPAs that would begin operating in 2024. Existing generators with expiring or expired P(W)PAs and participants in the Spot Market may be eligible to participate in this competition, subject to qualification. The total capacity requirement in 2024 and procurement timeline will be determined following the outcome of the review of the capacity procurement framework, demand developments, and considerations for supply via the Spot Market.

Power 2028. In-line with assessing the procurement needs for long-term contracts every two years, OPWP has identified the possibility to initiate a procurement round for new PPAs that would begin operating in 2028. Similar to Power 2024, existing generators with expiring or expired P(W)PAs and participants in the Spot Market may be eligible to participate in this competition, subject to qualifications. The overall capacity need for this procurement round will only be determined at a later point in time and following the outcome of the capacity procurement framework review, the possible Power 2024, demand developments, and considerations for supply via the Spot Market.

Dhofar II Wind IPP. OPWP plans to procure a wind project of about 100 MW in Harweel, adjacent to the existing Dhofar Wind IPP in the DPS. The RFP expected to be released by Q2 2023, to achieve commercial operation in 2026.

WTE IPP. OPWP completed a feasibility study for a Waste-to-Energy plant, in preparation for procurement. The facility will utilize municipal waste collected by Be'ah from Muscat and South Batinah areas and will be located near Barka. The facility is expected to produce between (130-140) MW under a PPA with OPWP. OPWP expects to issue the RFQ in Q4 2022, RFP in Q2 2023, and to award the project in Q2 2024. The operation of this plant is expected in Q2 2028.

OPWP also considers solar CSP with energy storage to be a promising technology solution. Ground-source data collection is currently being planned to commence in 2021, to support a feasibility assessment to be completed in 2022. The previous 7-Year Statement included a solar CSP project, Duqm Solar IPP 2026, which this feasibility assessment would support. Once the project has been deemed viable, OPWP will revise its incorporation into the development plan and the 7 Year Statement.

Table 10 Procurement Activities in 2022-2023 – Power Projects

	System	Capacity	RFQ	RFP	Bids Due	Award Anticipated	SCOD
Dhofar II Wind IPP 2026	Dhofar	100 MW	Q4, 2022	Q2, 2023	Q4, 2023	Q2, 2024	Q1, 2026
Duqm Wind IPP 2025[a]	Duqm	200 MW	Q4, 2022	Q2, 2023	Q4, 2023	Q2, 2024	Q1, 2026
Jalaan Bani bu Ali Wind IPP 2025[a]	MIS	100 MW	Q4, 2022	Q2, 2023	Q4, 2023	Q2, 2024	Q1, 2026
Manah I Solar IPP	MIS	500 MW	Completed	Completed	Q3, 2022	Q1, 2023	Q1, 2025
Manah II Solar IPP	MIS	500 MW	Completed	Completed	Q3, 2022	Q1, 2023	Q2, 2025
MIS Solar IPP 2025	MIS	500 MW	Q4, 2022	Q3, 2023	Q1, 2024	Q2, 2024	Q1, 2026
Power 2024	MIS	TBD	2023	2023	2023	2024	Q2, 2024
WTE IPP	MIS	130-140 MW	Q4, 2022	Q2, 2023	Q1, 2024	Q2, 2024	Q2, 2028

[a] Project procurement is subject to the outcomes of a feasibility study.

Future Procurement Activities

From 2022 to 2028, OPWP plans to continue to procure new solar and/or wind IPPs on an annual basis. The RE development plan includes three Solar PV projects, five wind projects and Waste to Energy project. The future planned projects in addition to the above listed projects are: MIS Solar IPP for COD in 2027, Ras Madrakah Wind IPP for COD in 2027, and Sadah Wind IPP for COD in 2028.

Depending upon demand growth and other factors, a third procurement round for existing generator contract renewals or new-build thermal projects may be initiated for operational start in 2028. If the need for additional capacity should arise, or according to opportunity, OPWP may also procure short-term capacity or energy via transactions with neighboring power systems, or initiate development of a Demand Response program in which demand reductions will be contracted with participating electricity customers.

WATER PROJECTS

Current/Near-Term Procurement Activities

OPWP's current and near-term procurement activities for water projects include the following, and are summarized in Table 11:

North Batinah IWP. OPWP initiated the procurement process in 2018 for new IWP capacity of 150,000 m^3/d (33 MIGD). The prequalification process for the project was achieved in 2018. The project was suspended pending confirmation of the demand as well as the site allocation. As per the latest forecast, it is expected that around (11 MIGD) of water is required by 2028 and the SCOD for the full capacity is planned for 2029.

Dhofar Water IWP 2026[16]**.** OPWP initiated the procurement process for this project in Q3 2019 for a capacity of 150,000 m^3/d (33 MIGD). Release of the RFP is planned for Q2 2023 and is subject to confirmation of site allocation and other approvals.

Barka Water IWP 2024. Following the expiration of Barka II PWPA in 2024, OPWP notes that additional capacity will be required to cover the resulting deficit. Accordingly, OPWP will follow the approved procurement strategy by the Authority to procure a capacity between 100,000 – 120,000 m^3/d for COD in Q2 2024 to prevent any production gap after the expiration of Barka II IWPP.

The Wadi Dayqah dam and water treatment plant as a source will not be suitable to secure any firm capacity. Where OWWSC scheme was intended to be used for supplying irrigation water in the local vicinity through a dedicated distribution system, as well as for supplying potable water to the Muscat Region during emergencies.

Table 11 Procurement Activities in 2022-2023 – Water Projects

	System	Capacity	RFQ	RFP	Bids Due	Award Anticipated	SCOD
North Batinah IWP[a]	MIS	33 MIGD	1st Round Completed	Q2, 2023	Q4, 2023	Q1, 2024	Early Water Q1, 2028 (11 MIGD) Full Capacity Q1, 2029 (33 MIGD)
Dhofar Water IWP 2026[a]	Dhofar Zone	33 MIGD	Q4, 2022	Q2, 2023	Q4, 2023	Q1, 2024	2027

[a] Subject to confirmation of site allocation and other approvals.

Future Procurement Activities

In 2024, OPWP may procure additional water desalination capacity. The analysis in section 3.1.C, Resource Adequacy and Development Plan, suggests there may be a need for additional capacity in the Muscat Zone around 24,000 m3/d and Barka Zone around 20,000 m^3/d. In Dhofar Zone network, OPWP may procure additional water desalination capacity to meet the demand and reducing the consumption of ground water for the upcoming year.

[16] The project was called Dhofar Water 2025 in previous issue.