OPWP SEVEN YEAR STATEMENT

2015 - 2021 | ISSUE 9

الشركة العمانية لشراء الطاقة والمياه (ش.م.ع.م)
OMAN POWER AND WATER PROCUREMENT CO. (SAOC)

Member of Nama Group

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OPWP'S 7 Year Statement 2015-2021

Approved by the Authority for Electricity Regulation Oman
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HIS MAJESTY
SULTAN QABOOS BIN SAID

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GLOSSARY

AER	Authority for Electricity Regulation, Oman
BTU/scf	British thermal units per standard cubic foot
CCGT	Combined-cycle gas turbine
DGC	Dhofar Generating Company
DGW	Directorate General of Water (in the Office of the Minister of State and Governor of Dhofar)
DPC	Dhofar Power Company (SAOC)
DPS	Dhofar Power System
GJ	Gigajoule(s)
GPDC	Al Ghubrah Power and Desalination Company (SAOC)
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)
LOLH	Loss of load hours
m^3	Cubic metre(s)
m^3/d	Cubic metres per day
MEDC	Muscat Electricity Distribution Company (SAOC)
MIGD	Million imperial gallons per day
MIS	Main Interconnected System
MISC	Majis Industrial Services Company (SAOC)
MJEC	Majan Electricity Company (SAOC)
MOG	Ministry of Oil and Gas
MSF	Multi-stage flash (desalination technology)
MW	Megawatt(s)
MZEC	Mazoon Electricity Company (SAOC)
OCGT	Open-cycle gas turbine
OETC	Oman Electricity Transmission Company (SAOC)
OPWP	Oman Power and Water Procurement Company (SAOC)
PAEW	Public Authority for Electricity and Water
PDO	Petroleum Development Oman (LLC)
PPA	Power purchase agreement
PWPA	Power and water purchase agreement
RAEC	Rural Areas Electricity Company (SAOC)
RO	Reverse osmosis (desalination technology)
Sm^3	Standard cubic metre(s)
Sm^3/d	Standard cubic metres per day
TWh	Terrawatt hours

OVERVIEW

This Statement provides a 7-year outlook for power and desalinated water supply in the two main systems of Oman – the Main Interconnected System (MIS) and the Dhofar Power System. It also addresses OPWP's anticipated activities with respect to Ad Duqm and Musandam during this period. OPWP prepares the 7-Year Statement annually in accordance with Condition 5 of its license. This is Issue 9, for the period 2015 to 2021; previous issues and additional information are available on the OPWP website at **www.omanpwp.com**

DEMAND FOR ELECTRICITY

In the MIS, under the Expected Demand forecast, peak demand is expected to grow at about 9% per year, from 5122 MW in 2014 to 9530 MW in 2021. Energy consumption is expected to grow from about 25 TWh in 2014 to 47 TWh in 2021, also an average annual increase of 9% (corresponding to growth in average demand from 2852 MW to 5373 MW). Increasing personal income, housing starts, and continuing government investment in infrastructure projects are major contributors to continued high growth in electricity demand.

Two additional demand scenarios are considered: the Low Case projects 7% annual growth and peak demand at 8372 MW in 2021, nearly 1200 MW below Expected Demand. The High Case projects 11% annual growth and peak d mand at 10329 MW in 2021, exceeding Expected Demand by about 800 MW.

In Dhofar, peak demand is expected to grow at 10% per year, from 439 MW in 2014 to 839 MW in 2021. The Low Case considers 8% growth, reaching 729 MW by 2021, about 110 MW below Expected Demand. The High Case considers higher growth across all economic sectors, with peak demand increasing at 12% per year to 965 MW in 2021, exceeding Expected Demand by about 130 MW.

POWER GENERATION REQUIREMENTS

In the MIS, the major expected developments through 2021 include: (1) addition of two new IPPs at Ibri and Sohar, with aggregate capacity in the range of 2850 to 3150 MW to be in service in 2018 (Ibri early power) and 2019 (full power at both sites), (2) expected extension of contracts at Al Kamil and Barka I to 2020, (3) retirement of the Ghubrah and Wadi Jizzi plants, and (4) creation of a spot market for electricity trade in 2018. The 2000 MW Sur IPP was recently commissioned in 2014 and is fully operational.

In Dhofar, both the sale of the Raysut NPS and award of the Salalah 2 IPP are expected to be complete by March 2015. Salalah 2 IPP will provide about 445 MW upon completion in 2018.

OPWP is also assisting RAECO with the procurement of an IPP in Musandam with net firm capacity of about 100 MW, for operation in 2016. The EPC contract has been awarded and construction will begin shortly.

DESALINATED WATER REQUIREMENTS

Water demand in the northern region (the Interconnected Zone and Sharqiyah Zone) is projected to increase by 6% per year, from 226 million m^3 in 2015 to 328 million m^3 in 2021.

In the Interconnected Zone, peak water demand is projected to increase by as much as 540,000 m^3/d (119 MIGD) by 2021.The principal project developments include: (1) addition of 57,000 m^3/d (12.5 MIGD) at Barka I in Q3 2015; (2) addition of the Muscat City Desalination Plant, at Ghubrah, with capacity of 191,000 m^3/d (42 MIGD) in Q3 2015; (3) addition of a new desalination plant at Qurayyat at 200,000 m^3/d (44 MIGD) in 2017; (4) addition of new desalination plants in 2018 at Barka with capacity 281,000 m^3/d (62 MIGD) and at Sohar with capacity 250,000 m^3/d (55 MIGD); and (5) expiration of PWPAs at Barka I and remaining units at the Ghubrah desalination plant in 2018. OPWP is considering the potential for contract extension of the Barka I desalination plant, and the need for a further new IWP in 2021 with capacity up to 300,000 m^3/d (66 MIGD). In 2015, two projects are expected to begin commercial operation - the second phase capacity addition at Barka I (12.5 MIGD) and the Muscat City Desalination plant (42 MIGD) at Ghubrah - and the Qurayyat IWP (44 MIGD) was recently awarded.

In the Sharqiyah Zone, the principal developments include: (1) addition of 48,000 m^3/d (10.6 MIGD) at the Sur IWP, which is under construction for COD in Q3 2016, and (2) procurement of a new Sharqiyah IWP with capacity of about 55,000 m3/d (12.1 MIGD) for service in 2019.

In Dhofar, DGW projects water demand to grow at 8%, and peak water demand to increase from 88,000 m3/d in 2015 to 143,000 m^3/d in 2021. OPWP plans to begin procurement of a new IWP with capacity in the range of 80,000 to 100,000 m^3/d (18-22 MIGD) to be in service in 2019.

OPWP is also in consultation with PAEW to finalize plans for procurement of desalination capacity to serve Ad Duqm and Musandam. The Duqm IWP is being considered for 2019 with capacity of up to 60,000 m^3/d (13 MIGD), depending on the extent to which industrial demands must be served. The Musandam IWP is being considered at Khasab with capacity of about 13,000 m^3/d (3 MIGD).

PROCUREMENT ACTIVITIES

In 2015, OPWP expects the following procurement activities for the MIS: (1) to complete contract extension negotiations with the owners of the Al Kamil, Barka I, Wadi Jizzi, and Ghubrah power plants for all or a portion of capacity associated with expiring contracts; (2) to issue tenders and award of the two new IPPs at Ibri and Sohar; (3) to issue tenders and award of the two new IWPs at Barka and Sohar; (4) to issue tender documents for the new Sharqiyah IWP. Procurement of a solar plant may commence in 2015 pending government approval.

In Dhofar, OPWP expects to begin procurement of a new IWP in 2015 with capacity in the range of 18-22 MIGD to be in service by 2019. OPWP also expects to execute a PPA with RAECO for a 50 MW wind farm being developed in Harweel in association with MASDAR of Abu Dhabi.

OPWP also expects to procure new IWPs at Khasab in Musandam (13,000 m^3/d, or 3 MIGD) and Ad Duqm (potentially up to 60,000 m^3/d (13 MIGD), although the respective capacity levels and timing have yet to be confirmed with PAEW.

— Qurayyat IWP

FUEL REQUIREMENTS

In the MIS, efficiency improvements in the generation fleet are expected to limit growth in fuel requirements to 4% per year through 2021, despite 9% growth in electricity production. Average gas utilization by the generation fleet (Sm^3 consumed per MWh produced) is projected to improve by 27% from 2014 to 2021.

In Dhofar, gas requirements are projected to increase at 6% per year, as power requirements grow rapidly at about 10% per year. Average gas utilization in the Dhofar power system is projected to improve by about 28% during this period.

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MAIN INTERCONNECTED SYSTEM

The Main Interconnected System (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 around 754,000 electricity customers.

The MIS comprises a number of power generation facilities, owned and operated by various companies; a single 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 presently interconnected with the power systems of Petroleum Development Oman (PDO), the Emirate of Abu Dhabi and other Member States of the GCC Interconnection Authority.

Several of the power generation facilities connected to the MIS produce desalinated water in conjunction with electricity, to meet the regional requirements of "water departments" responsible for supplying water to customers (including the Public Authority for Electricity and Water (PAEW) and Majis Industrial Services Co. (MISC)). Several water-only desalination plants also supply these water departments.

OPWP's role is to aggregate the power and desalinated water requirements of licensed electricity suppliers and water departments, 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 PAEW in accordance with Article 78 of the Sector Law.

1.1 DEMAND FOR ELECTRICITY

OPWP evaluates electricity demand at the system level, including transmission and distribution system losses with consumer-level loads. This equates with the output of power generation plants at the delivery point(s) to the power system, excluding the internal power consumption of auxiliary systems.[1] OPWP follows a similar approach with respect to estimating water demand, the output of desalinated water plants, and the consumption of auxiliary systems of combined power and water plants.

Historical Demand

The power demand in MIS increased significantly in 2014. Peak demand increased by about 15% to 5122 MW, while average demand increased by 10% to 2852 MW (corresponding to 25 TWh of energy).

Looking back over the last 8 years, peak electricity demand in the MIS grew at an average annual rate of about 9%, from 2544 MW in 2006 to 5122 MW in 2014. Energy consumption (and average demand) has grown by about 10% annually during the same period. Single year growth rates show wide fluctuations during this period, influenced strongly by weather and economic growth: peak demand growth has ranged from a low of 2% to a high of 15% during this period.

Demand Projections

OPWP's 7-year electricity demand projections for the MIS have been developed on the basis of: (1) consultations with the electricity distribution companies and other relevant entities such as large industries; (2) historical growth trends in aggregate and in distribution areas; (3) assessment of past forecasts against out-turns; and (4) econometric analysis of weather and macroeconomic effects. The projections cover both energy (also shown as average demand) and peak demand. The latter is most relevant for purposes of assessing capacity requirements. This accords with the basis on which OPWP transacts with power and desalination plants. Energy projections are necessary towards securing the fuel requirement for power generation.

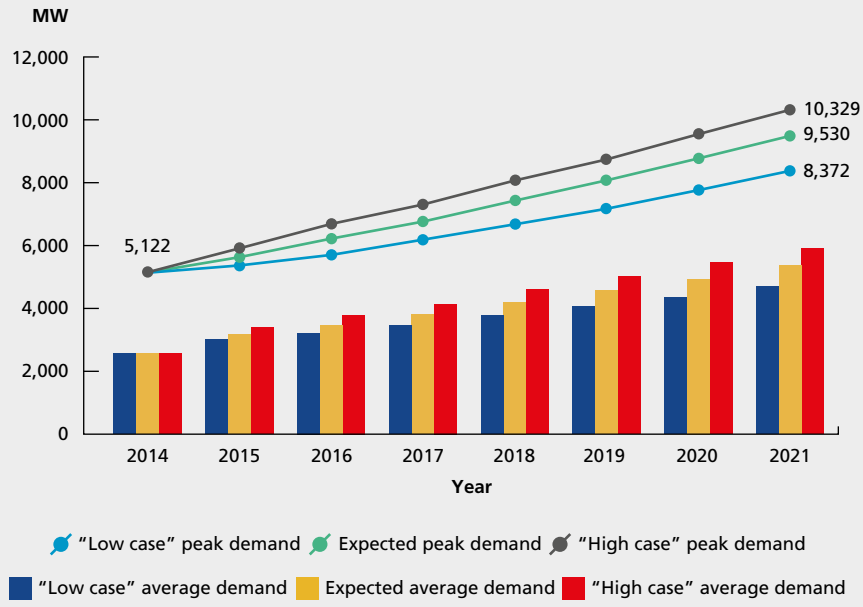
The projections are built up from separate analyses of distribution system demands, which are assessed on a "macro" basis by distribution company zones, and certain bulk loads that are connected directly to the transmission system and which are assessed on a specific customer basis. Distribution system demand is comprised mainly of residential, service sector (including government and commercial buildings, tourism facilities), and small-to medium-scale industrial demands in all MIS regions. The principal growth drivers include population growth, household formation, general economic development and infrastructure expansion.

The growth in demand from grid-connected 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, and to a lesser extent at Sur. Infrastructure projects include, for example, the stand-alone desalination plants and international airports.

The projections are presented as a range bounded by Low Case and High Case scenarios, and a central, Expected Demand forecast. They are summarized in Figure 1 on the next page.

[1] 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.

Figure 1 **Electricity Demand Projections – MIS**



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Expected Demand									
Average Demand (MW)	2,852	3,176	3,483	3,808	4,213	4,577	4,948	5,373	9%
- Distribution Loads	*2,574*	*2,838*	*3,069*	*3,339*	*3,625*	*3,939*	*4,271*	*4,659*	*9%*
- Directly-Connected Loads	*277*	*338*	*414*	*469*	*587*	*638*	*678*	*714*	*14%*
Annual Energy (TWh)	**25.0**	**27.8**	**30.6**	**33.4**	**36.9**	**40.1**	**43.5**	**47.1**	**9%**
Peak Demand (MW)	**5,122**	**5,653**	**6,225**	**6,797**	**7,464**	**8,076**	**8,775**	**9,530**	**9%**
Change from 2014-2020 Statement (MW)	*-195*	*-233*	*-296*	*-360*	*-310*	*-357*	*-358*	-	-
Low Case Demand									
Average Demand (MW)	2,852	3,012	3,224	3,470	3,775	4,066	4,363	4,717	7%
- Distribution Loads	*2,574*	*2,697*	*2,858*	*3,091*	*3,344*	*3,620*	*3,903*	*4,254*	*7%*
- Directly-Connected Loads	*277*	*315*	*366*	*380*	*431*	*446*	*460*	*463*	*8%*
Annual Energy (TWh)	**25.0**	**26.4**	**28.3**	**30.4**	**33.1**	**35.6**	**38.3**	**41.3**	**7%**
Peak Demand (MW)	**5,122**	**5,340**	**5,714**	**6,166**	**6,675**	**7,183**	**7,726**	**8,372**	**7%**
Change from 2014-2020 Statement (MW)	*-529*	*18*	*-16*	*-52*	*-9*	*37*	*12*	-	-
High Case Demand									
Average Demand (MW)	2,852	3,392	3,797	4,152	4,607	5,019	5,472	5,911	11%
- Distribution Loads	*2,574*	*2,971*	*3,281*	*3,563*	*3,872*	*4,211*	*4,603*	*4,993*	*10%*
- Directly-Connected Loads	*277*	*421*	*516*	*588*	*734*	*808*	*869*	*918*	*19%*
Annual Energy (TWh)	**25.0**	**29.7**	**33.4**	**36.4**	**40.4**	**44.0**	**48.1**	**51.8**	**11%**
Peak Demand (MW)	**5,122**	**5,952**	**6,679**	**7,308**	**8,041**	**8,724**	**9,537**	**10,329**	**11%**
Change from 2014-2020 Statement (MW)	*-529*	*-534*	*-752*	*-1,025*	*-1,446*	*-1,613*	*-1,747*	-	-

Under the Expected Demand scenario, peak demand is expected to grow at about 9% per year, from 5122 MW in 2014 to 9530 MW in 2021. Energy consumption is expected to grow at about the same rate, from 25 TWh in 2014 to 47 TWh in 2021 (in average demand terms, from 2852 MW to 5373 MW). This growth projection is broad-based, as distribution companies report robust development of housing, commercial projects, government facilities, and small to large industry.

This forecast shows significant reductions relative to the last 7-Year Statement, particularly with respect to peak demand in the Expected Demand and High Case scenarios. This follows from analysis of recent growth trends, weather impacts, and load profiles of large industries. The Sultanate now has greater diversity and numbers among its grid-connected customers. Our analysis of their historical hourly load data concluded that they contribute less to peak demand than previously thought: their individual peak demands occur at a different time than the system peak. Furthermore, we have moderated the continuing high growth forecasts provided by large customers in all sectors, using weather-normalized historical growth trends. They demonstrate the dampening effect of mobilization constraints and infrastructure capabilities relative to customer growth plans.

National economic forecasts suggest that over the next two years GDP growth may be similar to recent years, whereas the view is more uncertain beyond that, considering oil price uncertainty and the impact of the oil price level on the national economy. The Expected Demand scenario does not reflect sustained low oil prices or their potential effect on the national economy. Recent public announcements suggest that the pace of infrastructure projects will not slow in the near term, and industries have not downgraded their demand growth projections. In coming years we will monitor macro-economic forecasts and consider them toward developing our Expected Demand projections in future 7-Year Statements. At present, the Low Case forecast scenario is suggestive of a slower demand trend.

The High Case scenario reflects the possibility of stronger than-expected economic growth, and represents a contingency case for OPWP's provision of adequate generation capacity. This scenario considers peak demand and energy growth over the 7-year horizon at the high end of recent sustained growth trends. It also considers the possible impact of hot weather in consecutive seasons: there is a "bulge" of high demand growth in 2015 and 2016 for underlying load (not grid-connected loads), dropping afterwards to recognize that weather impacts are not sustained but tend to be cyclical. The High Case has average annual growth of 11%, but somewhat higher growth in the initial years and lesser growth in the latter years. The high growth period is consistent with short periods of very high growth in past years.

The High Case scenario is considered unlikely but represents a plausible planning scenario toward managing the risk of insufficient generation capacity.

The Low Case scenario is constructed as a mirror image of the High Case, with respect to underlying load, around Expected Demand over the forecast period. It also depicts an inverse "bulge" of low demand in the initial years, representing below-normal weather. Bulk loads also reflect a slower development pace for projects that are not yet committed. This scenario generally reflects the possibility of weaker than expected economic growth. Peak demand and energy growth under this scenario are at 7% per year.

Whilst considered much less likely than the Expected Demand scenario, the Low Case and High Case scenarios are intended to represent the range of potential future demand paths around the Expected Demand projection. The requirements for generation resources need to be assessed against all three scenarios to develop an appropriate generation procurement strategy. In particular, OPWP has to balance the need to have a feasible plan to meet High Case demands at reasonable cost should these arise (taking into account the lead times associated with procuring capacity), whilst at the same time minimizing the risks of finding itself over-committed to costly generation capacity in the event of demand following the Low Case path.

Trade and Reserves Sharing with Interconnected Systems

The MIS is interconnected with the PDO power system at Nizwa through a 132 kV link, and with the power system of the Emirate of Abu Dhabi through a 220 kV link at Mahadha. These interconnections provide reliability benefits through the sharing of generation reserves. Oman also joined the GCC Interconnection Authority (GCCIA in December 2014, enabling access to the power systems of other Member States via the UAE interconnect. GCCIA membership provides access to generation and operating reserves, with tangible benefits to Oman both for planning and operations. The GCCIA is also developing mechanisms for commercial power trading among Member States. OPWP intends to participate in pilot trades in 2015 toward developing capabilities and assessing the benefits of this prospective resource. The current MIS demand projections do not include power exports or imports, comprising only the native demands of the MIS.

1.2 POWER GENERATION RESOURCES

Sources of Power

In order to meet demand for electricity in the MIS, 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 (and desalination) 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"** Temporary generation also belongs with this group.

OPWP also purchases power from a number of sources where the contractual arrangements do not provide sufficient reliability for resource adequacy plans. These may be termed collectively as **"non-firm resources".** They currently include reserve-sharing arrangements with other power systems via interconnection agreements, and capacity exchanges or energy purchases from industries with captive power generation facilities used mainly for self-supply. In these cases no specific capacity is committed to OPWP, and the availability of capacity for use by OPWP at any particular time will generally be subject to the other party's first use. These resources provide reliability benefits to the MIS, in that capacity is generally available according to pre-arranged schedules (though not committed as dispatch-able capacity). Importantly, some of these resources may represent prospective contractual opportunities for firm, dispatch-able capacity (such as the interconnects) in the future.

In addition to the resources currently under contract, there are **"prospective resources"** that are under consideration by OPWP. For example, certain power generation units among the currently contracted plants will fall out of contract during this seven-year period, and OPWP must consider whether to allow these units to retire, to extend the term of the contract, or to contract for refurbishment or performance related modifications of the units. This category also includes resources that are under evaluation or for which the tendering process has begun but is not complete.

— Barka I and Barka II Power and Water Desalination Plants

Contracted Capacity

OPWP's present portfolio of contracted capacity in the MIS comprises eleven P(W)PAs. Summary details are shown in Table 1 below.

Table 1 **Details of P(W)PAs – MIS**

Plant	Contracted Capacity [a]	Contract	Plant Owner	Plant Status	Plant Type	Contract Expiry [b]
Ghubrah	430MW [c] 167,000 m³/d	PWPA	Al Ghubrah Power and Desalination Co. (SAOC)	Operational	OCGT/Steam MSF Desalination Natural gas fired (Fuel oil as back-up)	2018
Rusail	665 MW	PPA	Rusail Power Co. (SAOC)	Operational	Natural gas fired (Fuel oil as back-up)	2022
Wadi Jizzi	325 MW	PPA	Wadi Al-Jizzi Power Co. (SAOC)	Operational	OCGT Natural gas fired (Fuel oil as back-up)	2020
Manah	254 MW	PPA	United Power Co. (SAOG)	Operational	OCGT Natural gas fired (Fuel oil as back-up)	2020
Al Kamil	271 MW	PPA	Al Kamil Power Co. (SAOG)	Operational	OCGT Natural gas fired (Fuel oil as back-up)	2017
Barka I	427 MW 91,000 m³/d	PWPA	ACWA Power Barka (SAOG)	Operational	CCGT MSF Desalination Natural gas fired (Fuel oil as back-up)	2018
	45,000 m³/d	WPA	ACWA Power Barka (SAOG)	Operational	RO	2018
	57,000 m³/d	WPA	ACWA Power Barka (SAOG)	Under construction	RO	2018
Sohar I	585 MW 150,000 m³/d	PWPA	Sohar Power Co. (SAOG)	Operational	CCGT MSF Desalination Natural gas fired (Fuel oil as back-up)	2022
Barka II	677 MW 120,000 m³/d	PWPA	SMN Barka Power Co. (SAOC)	Operational	CCGT RO Desalination Natural gas fired (Fuel oil as back-up)	2024
Sohar II	741 MW	PPA	Al Batinah Power Co. (SAOC)	Operational	CCGT Natural gas fired (Fuel oil as secondary fuel and back-up)	2028
Barka III	741 MW	PPA	Al Suwadi Power Co. (SAOC)	Operational	CCGT Natural gas fired (Fuel oil as secondary fuel and back-up)	2028
Sur	2000 MW	PPA	Phoenix Power Co. (SAOC)	Operational	CCGT Natural gas fired (Fuel oil as back-up)	2029

[a] Contracted capacities are shown as of summer 2014, at reference condition 50°C.The contracted capacities are reported as net of plant auxiliaries except for Ghubrah, Rusail, and Wadi Jizzi which are contracted at gross capacity. Plant capacities are shown elsewhere in this report as evaluated at 45°C, which is more in line with peak demand conditions, and as net output rather than gross output.
[b] In all cases the contracts expire prior to the summer period of the year indicated.
[c] GT1-11 & ST4 at Ghubrah were retired prior to summer 2014.

A summary of the generation capacity that is expected to be provided under these P(W)PAs over the 2015-2021 period is set out in Figure 2. This shows total contracted capacity of 6876 MW in 2015 before falling back to 5728 MW by 2021 due to contract expirations. The main developments over the 7-year period are:

- **Ghubrah:** The PPA contract of a number of the older generation units expired in September 2014, resulting in a reduction of 213 MW. The remaining units at Ghubrah will fall out of contract in March 2018, resulting in a further reduction of 256 MW if the contract is not renewed.

- **Wadi Jizzi:** Contracts for GTs 3 to 8 at Wadi Jizzi also expired in September 2014, comprising about 160 MW. Subsequent contract expirations include GT 9 (33 MW) in September 2017, GT 10 (33 MW) in September 2018, and the remaining GTs (101 MW) in March 2020. OPWP is currently negotiating with the owner toward potential extensions for some of these units.

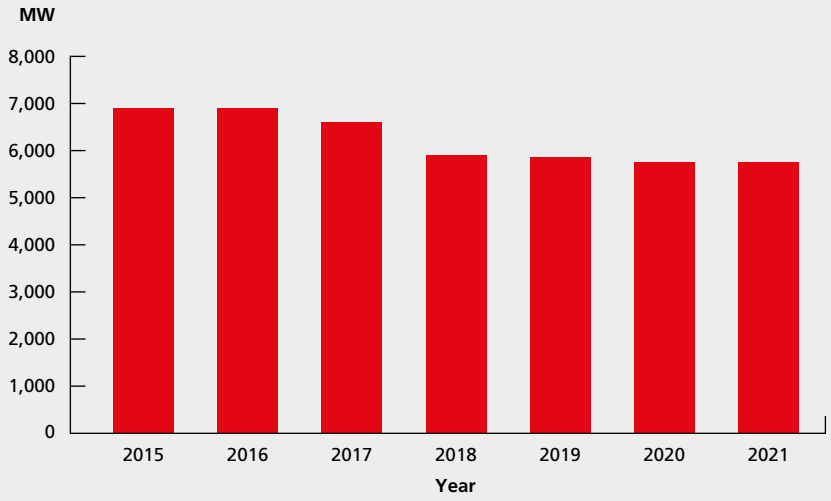
- **Al Kamil:** The PPA is due to expire in April 2017, though the contract may be extended. If not renewed, this will result in a reduction of 280 MW of capacity in 2017.

- **Barka I:** The PWPA is due to expire in April 2018, though the contract may be extended. If not renewed, this will result in a reduction of 435 MW of capacity in 2018.

As indicated above, a number of generating units will reach the end of their current contract terms by 2018. OPWP has initiated a process with the plant owners to extend contract periods through 2020, provided that the plants are technically sound and able to provide guaranteed firm capacity throughout the extension period at economic prices.

— Barka II Power and Water Desalination Plant

Figure 2 **Contracted Generation Capacity – MIS**



	2015	2016	2017	2018	2019	2020	2021
Capacity as Currently Contracted				Net MW [a]			
Ghubrah	256	256	256	-	-	-	-
Rusail	689	689	689	689	689	689	689
Wadi Al Jizzi	167	167	167	134	101	-	-
Manah	264	264	264	264	264	264	264 [b]
Al Kamil	280	280	-	-	-	-	-
Barka I	435	435	435	-	-	-	-
Sohar I	597	597	597	597	597	597	597
Barka II	688	688	688	688	688	688	688
Sohar II	754	754	754	754	754	754	754
Barka III	754	754	754	754	754	754	754
Sur	1,992	1,988	1,985	1,983	1,982	1,982	1,982
TOTAL	**6,876**	**6,872**	**6,589**	**5,863**	**5,829**	**5,728**	**5,728**

[a] Net MW. All capacities are rated on a net basis (i.e. after allowing for auxiliary consumption inside the plants) at 45°C ambient temperature.
[b] The contract with the current owner will expire at the end of 2020, when ownership of the plant transfers to the Government.

Non-Firm Resources under Contract

In addition to the contracted capacity described above, OPWP has contracts with a number of other generation sources, although these contracts are not for firm capacity commitments. They include:

- the 220 kV interconnect with the Abu Dhabi power system at Mahadha;
- the 132 kV interconnect with the PDO power system at Nizwa; and
- the surplus generation of industries (and other parties) with captive power generation facilities used mainly for self-supply.

A 220 kV interconnection between the Oman (MIS) and UAE (Abu Dhabi) power systems was commissioned in 2011 and has been commercially operational since May 2012. In December 2014 Oman officially joined the GCCIA, accessed via this link. Several benefits can be realized from the interconnector and GCCIA membership:

1. Reduced Planning Reserve Requirements, potentially allowing the MIS to maintain a lower demand to meet its statutory reliability standard;
2. Reduced Operating Reserve Requirements, allowing fewer units to be in standby operation or maintaining spinning reserves and thus allowing the power system to operate more efficiently in dispatch;
3. Firm support during emergencies up to 6 hours for each incident and up to 18 hours in a year.
4. Opportunities for trading power with other member states, including firm capacity contracts which may be considered for example as an alternative to temporary diesel generation. There may also be opportunities for firm capacity exchanges, exploiting differences in seasonal peak periods between Oman and the other member states.

The existing double circuit link currently supports reliable transfers of up to 400 MW. It is technically capable to carry up to 800 MW in emergencies, and has proven this latter capacity during performance tests. The link is being utilized actively to provide emergency reserves support to the benefit of Oman, the UAE, and other GCCIA member countries.

The MIS is connected with the power system of PDO at Nizwa via a single 132 kV link with a nominal transfer capacity of around 60 MW. The main purpose of this interconnect is to support reserve sharing between the MIS and the PDO system, providing improved reliability in both systems by allowing each system access to unused reserve in the other system in contingency scenarios. Thus, subject to the availability of surplus generation in the PDO system at the time required, up to around 60 MW of support can be provided to the MIS to help manage contingencies.

Several industries with captive power plants are connected with the MIS and have surplus power that is purchased by OPWP. Chief among these is OPWP's agreement with Sohar Aluminium Co. (LLC), whereby Sohar Aluminium exports up to 300 MW to the MIS during the summer, and imports a like amount of energy from OPWP 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 gains reliability of supply, while OPWP gains an efficient generating resource during the summer and improves the system Load Factor. The agreement with Sohar Aluminium (300 MW) was renewed in 2013 for three years and is expected to be renewed again subject to mutual agreement.

Access to captive power generation resources is useful in two respects. Firstly, these contracts provide a source of contingency reserve for the MIS, over and above the reserve margin provided by OPWP's portfolio of contracted capacity. And secondly, they provide an economical source of energy – by providing low cost energy to the MIS in place of higher cost energy from contracted generation capacity, the overall cost of energy for the MIS can be reduced. The agreements in place with the respective parties are specifically designed to allow both of these benefits to be obtained.

Prospective Resources

Toward considering how to meet generation capacity requirements as projected power demand overtakes contracted capacity, OPWP assesses various prospective resources. These resources include the following:

- Contract extensions, such as for generation units that are scheduled to fall out of contract
- Planned capacity additions, not yet contracted
- Temporary generation from rented, mobile generators
- Capacity purchases from interconnected power systems or industrial self-generation

Prospective contract extensions correspond to capacity that is scheduled to fall out of contract, but that may be offered to OPWP by the plant owner for extension of the contract term (subject to satisfaction of relevant regulatory requirements and commercial terms being agreed). OPWP considers such extensions alongside options to contract for new capacity.

In 2014, OPWP initiated discussions with the owners of the plants at Ghubrah, Wadi Jizzi, Al Kamil and Barka I, to extend contracts to 2020. Extensions are being negotiated only on a guaranteed capacity basis at economic commercial terms, and all plants have completed independent technical evaluations to confirm the capacity on offer.

As of February 2015, none of the contract extensions have been finalized, but all are expected to be resolved within a short time. For planning purposes, OPWP has estimated the amount of capacity that is likely to be extended in Table 2 below. Currently, it is expected that the majority of the Ghubrah units, for which contracts expired in 2014, may be extended from 2016 to 2018, and that two further units expiring in early 2018 may be extended through the summer of that year. It appears unlikely that the contracts for Wadi Jizzi units 3-8 would be extended beyond 2018. The contract extensions for Al Kamil and Barka I are expected although commercial negotiations are still in progress. None of the prospective extensions shown in Table 2 may be considered as secure until negotiations are concluded and the agreements are executed.

Table 2 **Prospective Contract Extensions**

	2015	2016	2017	2018	2019	2020
			Net MW [a]			
Ghubrah [b]	-	149	149	341	-	-
Wadi Al Jizzi [c]	57	160	160	160	-	-
Al Kamil	-	-	280	280	280	280
Barka I	-	-	-	435	435	435
TOTAL	**57**	**309**	**589**	**1,216**	**715**	**715**

[a] All capacities are rated on a net basis (i.e. after allowing for auxiliary consumption inside the plants) at 45°C ambient temperature.
[b] GTs 1, 2, 3, 4, 6, 7, 9 and 10 at Ghubrah are potentially available from 2016 to 2018, and GTs 12 and 13 in 2018
[c] GTs 4 & 5 may be extended in 2015 to meet OETC request for local voltage support. All of GTs 3 to 8 may be extended through 2018.

OPWP has recently issued tender documents to procure two new IPPs for the MIS at Ibri and Sohar, with aggregate capacity in the range of 2907 MW to 3213 MW. The Ibri IPP will include an early power phase of about 1000 MW from April to October 2018, and full power COD in April 2019 with capacity up to 1530 MW.[2] The Sohar IPP will provide full power COD in January 2019 with capacity up to 1683 MW. Both contracts are planned for award by the end of 2015.

The Sultanate has significant opportunity to develop renewable energy resources, particularly solar and wind energy. Several small-scale projects are already operational or under development in rural areas, displacing diesel generation. OPWP expects the Government to define its renewable energy policy in the near future to include large-scale, grid connected projects. Subject to the Government providing a final go-ahead, OPWP expects to procure around 200 MW of solar generation capacity for the MIS, potentially to be in service by 2019. OPWP is currently collecting data from two instrumentation stations to support this endeavor. Whilst this capacity is expected to be committed to OPWP via a PPA, the inherent intermittency risk associated with solar generation may lead to the effective capacity of the plants – for resource adequacy purposes – being considered as somewhat less than the nominal capacity. Until proven as peak capacity, we show this resource in the category of contingency reserves, although we expect such resources to contribute to peak capacity to some degree.

Electricity Spot Market

OPWP has obtained approval from the AER to develop a spot market for electricity, to be introduced around 2018. The spot market for electricity would operate alongside and in conjunction with the existing system of long-term PPAs and PWPAs. It would provide an alternative way for producers to sell power to OPWP. The objective is that in cases where generators have capacity that is not obligated as guaranteed capacity under a PPA or PWPA, they may be able to offer that capacity on the spot market and receive prices determined on a day-to-day basis in accordance with specified market rules. The market rules will be generally modelled on those that have been developed in other countries with certain modifications relevant to Oman.

The spot market is expected to increase the potential for competition in Oman's power generation market, and to provide a mechanism to make available additional capacity that might otherwise not be readily accessible. This may include capacity associated with generators whose long-term supply contracts have expired, or capacity in excess of contractually guaranteed capacity that plant owners have built into their facilities or that may be available under certain operating conditions. At present OPWP has not assessed any value to potential additional peak capacity that may be made available via the spot market.

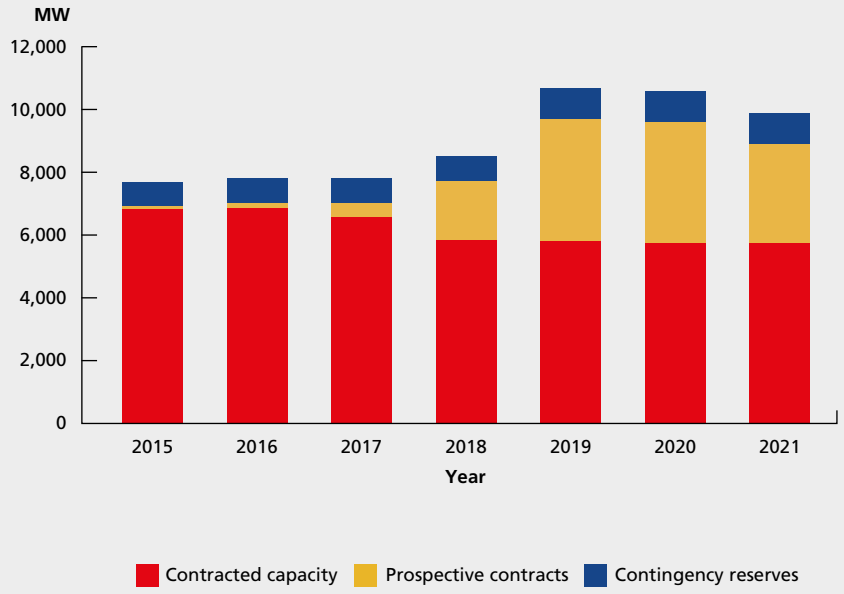
Summary

Figure 3 provides a summary of OPWP's current plans for generation resources in the MIS for the period 2015 to 2021, including contracted capacity, prospective contracts, and contingency reserves. As described above, contracted capacity in each year considers only current resources up to the end of their current contracts, while prospective resources include both planned new capacity and expiring contracts that are expected to be extended. Contingency reserves comprise the non-firm resources, including the interconnects, industrial surplus generation, and the prospective solar project. The capacity indicated for each year corresponds to the quantity available as of the onset of the summer peak season in May.

This chart suggests a reduction in available generation resources in 2021, due to contract expirations, because the current negotiation process seeks contract extensions only to the end of 2020. In 2021, OPWP plans to adopt a new capacity procurement process that will allow existing generators with expiring contracts to compete directly with new project bidders for long-term contracts. In parallel, OPWP is also developing an electricity spot market to allow generators with surplus capacity (i.e., capacity in excess of contractual guarantees), or generators without long-term contracts, to sell power into the power system on an hourly basis at a market clearing price. In 2021, the plants with contracts expiring in 2020 will have the opportunity to compete for new long-term contracts or to participate in the spot market.

[2] The capacity ranges included in tender documents are somewhat lower, in the range of 2850 MW to 3150 MW in aggregate, because they are cited at reference conditions. In this Statement, the values are adjusted to capacity available at 45°C, which is comparable to peak demand conditions.

Figure 3 **Total Power Generation Resources – MIS**



	2015	2016	2017	2018	2019	2020	2021
Contracted Capacity				Net MW [a]			
Currently Contracted Capacity	6,876	6,872	6,589	5,863	5,829	5,728	5,728
Prospective Capacity Contracts							
Contract Extensions	57	309	589	1,216	715	715	-
New Ibri/Sohar IPPs [b]	-	-	-	1,000	3,213	3,213	3,213
Total – Contracted + Prospective	**6,933**	**7,181**	**7,178**	**8,079**	**9,757**	**9,656**	**8,941**
Contingency Reserves (non-firm)							
Solar Project(s)	-	-	-	-	200	200	200
Reserve-Sharing Agreements							
- PDO Interconnection	60	60	60	60	60	60	60
- GCC Interconnection	400	400	400	400	400	400	400
Reserve-Sharing Agreements							
- Sohar Aluminum Co.	300	300	300	300	300	300	300
- Oman Mining Co.	20	20	20	20	20	20	20
Total Contingency Reserves	**780**	**780**	**780**	**780**	**980**	**980**	**980**
All Resources	**7,713**	**7,961**	**7,958**	**8,859**	**10,737**	**10,636**	**9,921**

[a] all the figures are in Net MW at 45°C
[b] shown at the maximum of the prospective range from 2,907 MW to 3,213 MW, distributed as 1,530 MW at Ibri and 1,683 MW at Sohar3

— Al Kamil Power Plant

— Sur Power Plant

1.3 ADDITIONAL POWER GENERATION REQUIREMENTS

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 the Authority for Electricity Regulation, Oman (AER) stipulates a specific generation security standard for the MIS that OPWP must comply with.

The generation security standard stipulated by the AER sets a maximum duration of power outage for the system, termed Loss-of-Load Hours ("LOLH"). OPWP must enter into agreements for enough contracted capacity to ensure that expected demand does not exceed available contracted capacity for more than 24 hours in any year. This LOLH measure considers relevant uncertainties such as the reliability of generation units. On a short-term basis, OPWP must demonstrate to the AER that such agreements are in place. 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).

It is important to note that for purposes of the 24-hour LOLH standard, only contracted capacity is considered. Other resources, such as the surplus generation of industries and reserve sharing arrangements with interconnected systems, provide a degree of reserve margin and will generally contribute to reliability of supply. However, they are not considered for purposes of meeting the 24-hour LOLH standard and are viewed instead as providing security against contingencies.

Capacity Requirements

During the 7-year planning horizon, the 24-hour LOLH standard corresponds to a reserve margin requirement of about 4.5% in the MIS. That is, in each year OPWP should have sufficient contracted capacity to exceed peak demand by at least 4.5%. Figure 4 compares generation resources to capacity targets (peak demand plus 4.5%) associated with each of the three demand scenarios. The table associated with Figure 4 indicates whether additional capacity is needed to meet the target, in the rows marked "Deficit (Additional Capacity Required)".

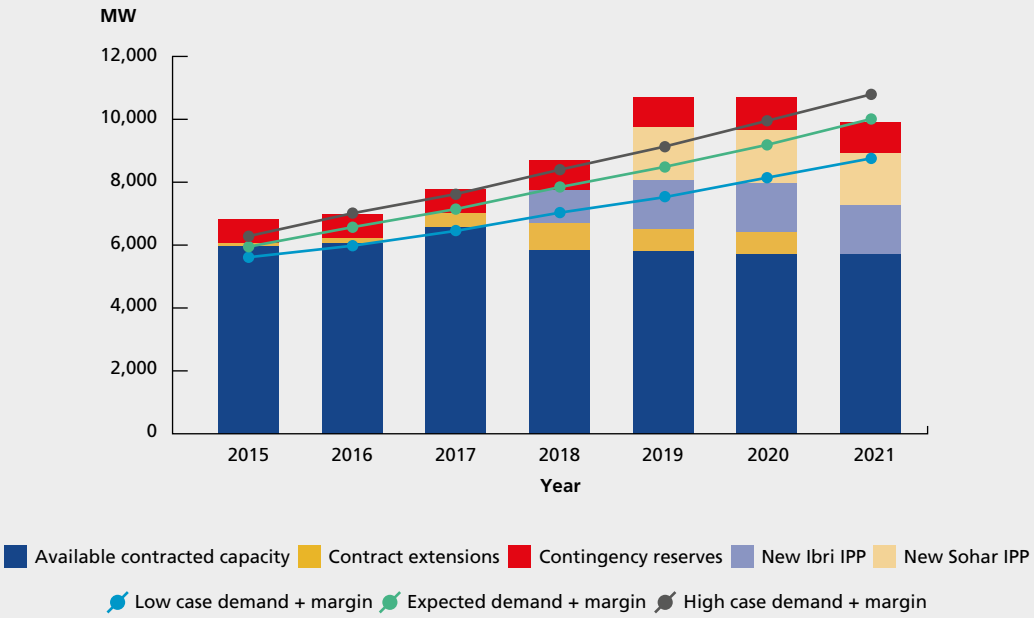
Under the Expected Demand scenario, contracted capacity should exceed the sum of peak demand and the margin required to meet the 24 LOLH standard (i.e., the capacity requirement). A deficit implies a need to acquire additional resources. Non-firm contracted resources are not considered in assessing available capacity to meet Expected Demand.

2015 Capacity Balance

No additional capacity is required to meet the capacity target in 2015. However, although OPWP has contracted capacity of 6876 MW, only 5984 MW is available due to a temporary constraint in transmission capacity that prevents dispatch of the full capacity of the Sur IPP. The full capacity will become available when OETC completes the 400 kV transmission line from Sur and its terminal grid substation at Izki. This is currently scheduled for completion in June 2016, such that the constraint on Sur persists into the 2016 summer peak season.

Under the High Case scenario, there remains a net deficit of 179 MW after consideration of expected contract extensions. However, for planning purposes, we consider that the High Case is a contingency scenario and that contingency reserves are sufficient to address this deficit situation. In this case the contingency reserves include both the UAE and PDO interconnects, and the exchange arrangement with Sohar Aluminium.

Figure 4 **Future Power Generation Capacity Requirements – MIS**



— Barka I Power and Water Desalination Plant

	2015	2016	2017	2018	2019	2020	2021
Generation Resources				MW			
Contracted Capacity	6,876	6,872	6,589	5,863	5,829	5,728	5,728
Constraints on Sur Power Evacuation	-892	-788	-	-	-	-	-
Available Contracted Capacity	5,984	6,084	6,589	5,863	5,829	5,728	5,728
Prospective Contract Extensions	57	309	589	1216	715	715	-
Prospective Ibri and Sohar IPPs	-	-	-	1,000	3,213	3,213	3,213
Reserves (non-firm)	780	780	780	780	980	980	980
Total – Contracted + Prospective	**6,041**	**6,393**	**7,178**	**8,079**	**9,757**	**9,656**	**8,941**
Total - All Resources	**6,821**	**7,173**	**7,958**	**8,859**	**10,737**	**10,636**	**9,921**
Expected Demand Scenario							
Peak Demand	5,653	6,225	6,797	7,464	8,076	8,775	9,530
Total Capacity Required	5,910	6,500	7,100	7,800	8,440	9,170	9,960
Deficit (Additional Capacity Required):							
Above Current Contracts	-	*416*	*511*	*1,937*	*2,611*	*3,442*	*4,232*
Above Current + Extensions	-	*107*	-	*721*	*1,896*	*2,727*	*4,232*
Above Current + All Prospective	-	*107*	-	-	-	-	*1,019*
Above Current + All Prospective + Reserves	-	-	-	-	-	-	*39*
Low Case Scenario							
Peak Demand	5,340	5,714	6,166	6,675	7,183	7,726	8,372
Total Capacity Required	5,580	5,970	6,440	6,980	7,510	8,070	8,750
Deficit (Additional Capacity Required):							
Above Current Contracts	-	-	-	*1,117*	*1,681*	*2,342*	*3,022*
Above Current + Extensions	-	-	-	-	*966*	*1,627*	*3,022*
Above Current + All Prospective	-	-	-	-	-	-	-
High Case Scenario							
Peak Demand	5,952	6,679	7,308	8,041	8,724	9,537	10,329
Total Capacity Required	6,220	6,980	7,640	8,400	9,120	9,970	10,790
Deficit (Additional Capacity Required):							
Above Current Contracts	*236*	*896*	*1,051*	*2,537*	*3,291*	*4,242*	*5,062*
Above Current + Extensions	*179*	*587*	*462*	*1,321*	*2,576*	*3,527*	*5,062*
Above Current + All Prospective	*179*	*5,87*	*462*	*321*	-	*314*	*1,849*
Above Current + All Prospective + Reserves	-	-	-	-	-	-	*869*

Capacity Balance from 2016 to 2017

Rising demand and the constraint on Sur IPP power evacuation in 2016 leave a deficit of 107 MW in the Expected Demand scenario. The gap could be as much as 416 MW if the expected level of contract extensions is not available. OPWP expects to address the deficit either by import of firm capacity from a GCCIA member state or by procurement of temporary rental diesel generation. For this reason, OPWP plans a trial import or exchange with a GCCIA partner in 2015, in order to confirm procedures for transmission access and contractual arrangements, as well as operating arrangements. In 2017, no deficit is anticipated under Expected Demand.

In the High Case scenario, both years show deficits, but considering the mitigations noted above for the Expected Demand scenario in 2016, contingency reserves are considered sufficient to counter the remaining deficit amounts.

Capacity Balance from 2018 to 2020

The new IPPs at Ibri and Sohar are being procured to meet capacity requirements in this period. In 2018, the Ibri IPP will be contracted to provide early power capacity of about 1000 MW throughout the summer peak period. This capacity, and that expected from contract extensions at Ghubrah, Wadi Jizzi, Al Kamil, and Barka I, is shown to meet 2018 capacity requirements under the Expected Demand scenario. The High Case scenario provides a capacity deficit of 321 MW, less than in 2016 and 2017, and contingency reserves are likewise sufficient to address this risk.

In 2019, both new IPPs will be contracted to be in service at full capacity. Under the Expected Demand scenario, there is no capacity deficit in either 2019 or 2020. Under the High Case scenario, there is no capacity deficit in 2019, whereas a deficit of 314 MW emerges in 2020. This is well within the range of available contingency reserves.

Additional Capacity Requirement in 2021

A significant capacity deficit arises in 2021 under the Expected Demand scenario: 1019 MW. OPWP expects to contract for additional capacity to be available at that time, sufficient to meet capacity needs for several years beyond. The procurement process would likely be initiated in 2017, and the required capacity will be defined at that time on the basis of new assessments of demand growth. As mentioned in Section 1.2, OPWP plans to procure this capacity using a new competitive process in which both existing plants (those out of contract) and bidders for new plant(s) at new site(s) may participate. Considering Figure 4, although prospective contract extensions are shown as dropping from 715 MW in 2020 to zero in 2021, when the contracts will have expired for the respective plants, the owners of these plants may bid for further contract extension in this competitive procurement.

Low Case Scenario

The Low Case scenario shows no capacity deficit throughout the forecast horizon. Should demand begin to track this scenario, there may be no need for short-term capacity mitigation in the coming years before COD of the new IPPs, and there may be a substantial surplus at the time of COD in 2019. This is currently considered as quite unlikely, but in the event OPWP would consider cost-saving mitigations.

1.4 DESALINATED WATER REQUIREMENTS

In the northern regions of the Sultanate, OPWP provides desalinated water to two "water departments": PAEW and MISC. Their respective service areas and requirements for desalinated water are defined as follows:

- PAEW – in respect of the demand for potable water in the Governorates of Muscat, Al Buraymi, Al Batinah North, Al Batinah South, Ad Dakhiliyah, Ad Dhahirah, Ash Sharqiyah North and Ash Sharqiyah South; and

- MISC – in respect of backup supply to the MISC desalination plant, for process water used by industry in the Sohar Industrial Port area.

PAEW and MISC provide the water demand projections in respect of the following geographic zones:

- The **"Interconnected Zone"** includes the potable water demands of the Governorates of Muscat, Al Batinah North, Al Batinah South, Buraymi, Ad Dakhiliyah, and Ad Dhahirah[3] which are served by PAEW, and the process water demand of the Sohar Industrial Port area which is served by MISC[4]. The existing principal sources of desalinated water for this zone are Ghubrah Power and Desalination Plant, Barka I and Barka II Power and Desalination Plants, and Sohar I Power and Desalination Plant.

- The **"Sharqiyah Zone"** includes the potable water demands of the Ash Sharqiyah North and Ash Sharqiyah South Governorates excluding Masirah wilayat. The existing principal source of water for this zone is the Sur Desalination Plant.

Interconnected Zone – Demand for Water

The projected peak water demand for the Interconnected Zone is shown in Figure 5. Peak demand represents the average daily demand (inclusive of network losses) during the week of highest demand of the year. PAEW has provided two demand scenarios – Base and High – which together capture uncertainty in demand growth.

Both forecast scenarios reflect the impact of 2014 population statistics and updated forecasts by the National Center for Statistics and Information (NCSI), and the impact of updates to PAEW plans for network expansion.

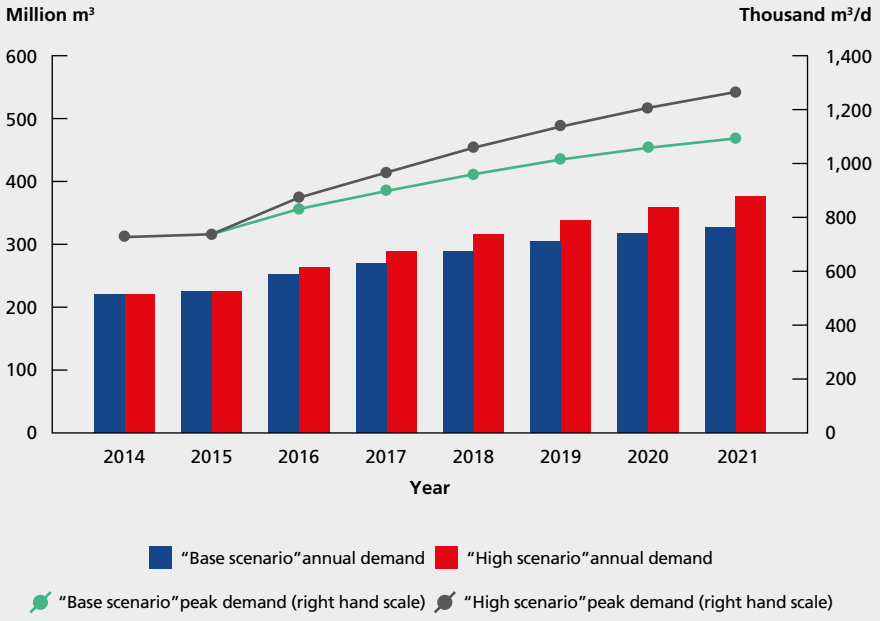
The Base and High scenarios differ primarily in the near-term pace of population growth, and the related effect on water demand. The Base scenario reflects demand following the 2014 NCSI population projection, which projects a relatively low growth rate compared to actual growth over the past five years from 2009 to 2014. Considering the NCSI population forecast, network expansion plans and identified special projects, PAEW's Base scenario projects an average growth rate of about 6% from 2014 to 2021.

The High scenario assumes that population continues to grow according to the 2009-2014 trend, until around 2020, then tapers off to realign with the NCSI projection by the late 2030s. Apart from the population trend, the assumptions for network expansion and special projects are similar to the Base scenario. The High scenario projects an average growth in water demand of about 8% over the forecast horizon to 2021.

The High scenario is relevant considering the repeated upward revisions to water demand forecasts in recent years, as actual demand has outstripped previous projections. This has been due to a combination of unexpectedly high population growth and accelerated network expansion by PAEW in response to requests from wilayats for network water supply. The High scenario aims to establish a plausible upper bound to water demand in order to plan for adequate supply.

[3] The current scenario considers a connection to Dhahirah by 2018 and it is considered to be supplied from the Interconnected Zone area of supply, while keeping limited production from the Masarrat well field, when both the new Sohar-Dhahirah transmission and new Sohar plant come in operation.
[4] MISC has provided OPWP with a demand projection through 2021. MISC is currently supplying its customers from its own RO plant which was commissioned in December 2011. During the 7-year period from 2015 to 2021, OPWP is requested to provide desalinated water to Majis customers in case of planned or unplanned plant outage at the Majis RO plant.

Figure 5 **Water Demand Projections – Interconnected Zone**



	2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Peak Water Demand					Thousand m³/d				
Base scenario	**720**	**736**	**829**	**895**	**961**	**1,014**	**1,055**	**1,092**	**6%**
Change from 2014-2020 Statement	*-48*	*-96*	*-28*	*-35*	*-26*	*-18*	*-9*	-	-
High scenario	**720**	**736**	**870**	**965**	**1,056**	**1,136**	**1,203**	**1,263**	**8%**
Change from 2014-2020 Statement	*-48*	*-96*	*13*	*35*	*69*	*104*	*139*	-	-
Total Annual Demand					Million m³				
Base scenario	**221**	**226**	**251**	**269**	**288**	**304**	**317**	**328**	**6%**
High scenario	**221**	**226**	**262**	**289**	**315**	**339**	**358**	**376**	**8%**

Interconnected Zone – Water Supply Sources

The supply sources available to meet water demand include existing water desalination plants, new desalination plants under construction or procurement, and PAEW sources. They are described below. Figure 6 shows the output capacity of all contracted and planned sources in comparison to peak demand and capacity targets.

OPWP's contracted sources of desalinated water for the Interconnected Zone include the following:

- **Ghubrah Power and Desalination Plant,** owned and operated by GPDC under a PWPA with OPWP. The Ghubrah Desalination Plant comprises five MSF units with a current capacity of 140,000 m^3/d (31 MIGD). The PWPA will expire in March 2018, before the peak season, and all desalination units are expected to be decommissioned at that time.

- **Barka I Power and Desalination Plant,** owned by ACWA Power Barka and operated under a PWPA with OPWP. The Barka I plant was originally contracted with a desalination capacity of 91,200 m^3/d (20 MIGD) using MSF technology. Additional capacity of 45,000 m^3/d (10 MIGD) using RO technology became available in May 2014. A second capacity addition of 57,000 m^3/d (12.5 MIGD), also RO units, is under construction and scheduled to come into service in phases: 7.5 MIGD in July 2015, 10 MIGD in October 2015 and full contracted capacity of 12.5 MIGD in January 2016. The PWPA for Barka I will expire in April 2018, such that the entire Barka I desalination capacity (193,000 m^3/d in total, or 42 MIGD) will be unavailable unless the contract is extended.

- **Barka II Power and Desalination Plant,** owned by SMN Power Barka and operated under a PWPA with OPWP. The Barka II plant has a capacity of 120,000 m^3/d (26 MIGD) using RO technology.

- **Sohar I Power and Desalination Plant,** owned by Sohar Power Company and operated under a PWPA with OPWP. Sohar I has a desalination capacity of 150,000 m^3/d (33 MIGD), using MSF units.

- **Muscat City Desalination Plant,** owned by Muscat City Desalination Company and currently under constrution, to be operated under a WPA with OPWP. The plant has contracted desalination capacity of 191,000 m^3/d (42 MIGD) using RO technology, and is expected to begin commercial operation in August 2015.

- **Qurayyat Desalination Plant,** awarded in December 2014 to the Hyflux Consortium, will be operated under a WPA with OPWP with contracted capacity of 200,000 m^3/d (44 MIGD), using RO technology, with scheduled commercial operation to begin in May 2017.

In addition to the foregoing sources that are under contract to OPWP, PAEW has its own sources of water available in the Interconnected Zone that offset the need for water desalination capacity. These include (1) well fields in Muscat and other regional wells[5], (2) a mobile RO plant that is currently located at Ghubrah, with capacity of 23,000 m^3/d (5 MIGD)[6], (3) a contract for supply of 11,000 m^3/d from the MISC RO plant in Sohar, from 2015 to 2017, (4 Al Masarrat well field which is expected to supply 10,000 m^3/d beginning in 2018, and (5) the Wadi Dayqah surface water reservoir, which is expected to provide capacity of 67,000 m^3/d (15 MIGD) beginning in 2019[7]. The production capacity from these sources is shown in aggregate by year in Figure 6.

In addition to these contracted resources, OPWP is in the process of procuring two new water desalination plants to be located in Barka and Sohar. The Barka III IWP is planned to have capacity of 281,000 m^3/d (62 MIGD), and the Sohar II IWP is planned to have capacity of 250,000 m^3/d (55 MIGD). Both are planned to be available for commercial operation in time for the peak demand season of 2018, and are expected to utilize RO technology.

[5] Well production from these sources is projected to be reduced from 99,500 m^3/d in 2014 to 42,000 m^3/d by 2019 in line with national policy to provide for the recharge of aquifers. These capacities refer to peak yields. Production from wells is less during non-peak periods.

[6] This RO plant is owned by PAEW.

[7] The Wadi Dayqah project has peak capacity of 90,000 m^3/d, but average capacity is assessed at 67,000 m^3/d. A portion of the project is intended for agricultural use. In an emergency, the peak capacity may be utilized for potable water, but normal operation even during peak demand periods considers the capacity at 67,000 m^3/d for potable water demand.

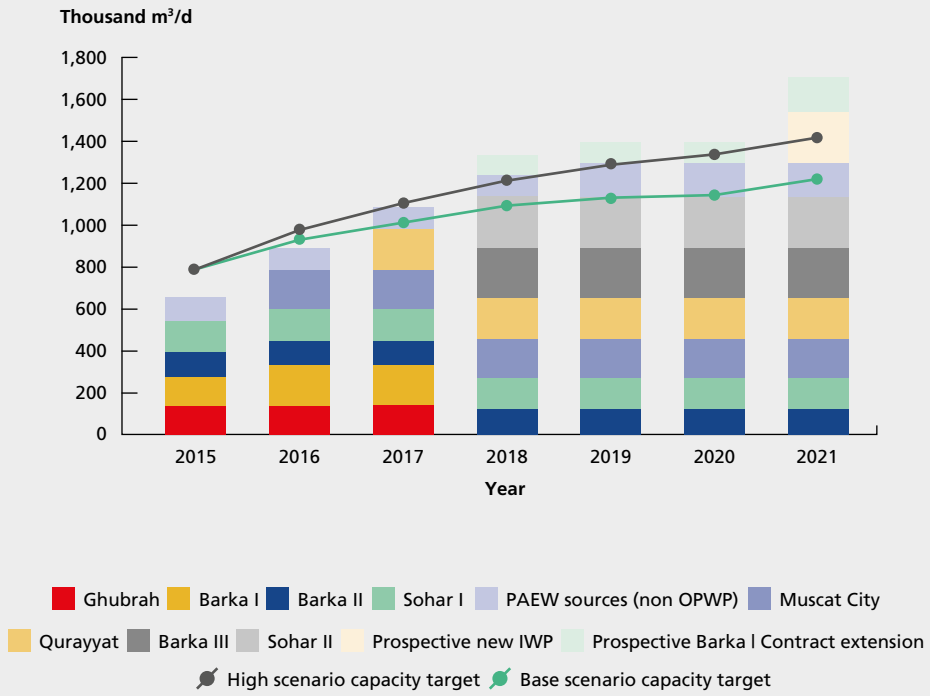
Interconnected Zone – Capacity Target and Prospective Resources

The expansion plan for water desalination capacity aims to meet peak demand, plus a 14% margin for supply security. The purpose of the reserve margin is to provide additional water capacity for recovery of the transmission and distribution networks in the event of a failure of the networks or a failure of supply from a desalination plant[8]. This represents a system security measure that is analogous to the generation security standard used to assess power generation capacity requirements.

After an emergency, the water volumes in the PAEW reservoirs may be at a low level and will need to be replenished. Therefore, the capacity available to be drawn from desalination plants must be higher than normal demand, to allow for reservoir replenishment in the event of an emergency.

Figure 6 provides a year by year summary of water supply requirements in the Interconnected Zone, and the supply sources planned to meet them. Available sources of supply are considered in the context of peak demand (Base and High Scenarios), and in the context of capacity targets (peak demand plus reserve margin for both scenarios).

Figure 6 **Future Desalinated Water Capacity Requirements – Interconnected Zone**



[8] PAEW established the security standard, in accordance with international practice, to be that the 24-hour peak demand on the system should be available for supply within a 21-hour period. The 24-hour peak capacity requirement available in a 21-hour period corresponds to (24/21) x peak demand = 1.143 x peak demand, hence a 14.3% reserve margin.

	2015	2016	2017	2018	2019	2020	2021
Supply Requirements				Thousand m^3/d			
Base Scenario Peak Demand	736	829	895	961	1,014	1,055	1,092
High Scenario Peak Demand	736	870	965	1,056	1,136	1,203	1,263
Base Scenario Capacity Target	841	948	1,023	1,098	1,159	1,206	1,248
High Scenario Capacity Target	841	995	1,103	1,207	1,298	1,375	1,443
Contracted Desalination Capacity							
Ghubrah Power and Desalination Plant	140	140	140	-	-	-	-
Barka I Power and Desalination Plant	136	193	193	-	-	-	-
Barka II Power and Desalination Plant	120	120	120	120	120	120	120
Sohar I Power and Desalination Plant	150	150	150	150	150	150	150
Muscat City Desalination Plant	- [a]	191	191	191	191	191	191
Qurayyat Desalination Plant	-	-	200	200	200	200	200
Total Contracted Capacity	**546**	**794**	**994**	**661**	**661**	**661**	**661**
Projects under Procurement							
Barka III IWP	-	-	-	281	281	281	281
Sohar II IWP	-	-	-	250	250	250	250
Peak Yield of PAEW Sources (Non OPWP)	111	101	101	100	119	119	119
Total Contracts & Projects under Procurement	**657**	**895**	**1,095**	**1,292**	**1,311**	**1,311**	**1,311**
Reserve over Base Capacity Target (shortfall)	-185 [a]	-54	72	194	152	105	63
Reserve over High Capacity Target (shortfall)	-185 [a]	-101	-9	85	13	-64	-132
Prospective Capacity Contracts							
Barka I Contract Extension (MSF)	-	-	-	91	91	91	91
Barka I Contract Extension (RO)	-	-	-	102	102	102	102
New IWP	-	-	-	-	-	-	300

[a] The Muscat City Desalination plant is expected to begin commercial operation in August 2015. It will contribute to the network, at times at or near its full capacity, during its commissioning and testing phase earlier in the summer, though not on a consistent basis.

— Muscat City IWP

Comparing Capacity Targets to Total Contracts and Projects under Procurement in the table on the previous page, the Reserve over Base and High Capacity Targets establish the need for additional capacity. In 2015 and 2016, supply sources fall short of both capacity targets. In 2015, available capacity is not sufficient to meet peak demand during the first part of summer, until the Muscat City IWP begins operation in August. The plant's 191,000 m^3/d capacity is sufficient to cover peak demand and most of the capacity target. In 2016, contracted capacity is sufficient to meet peak demand in both scenarios, but not to meet the target reserve margin. PAEW has the institutional responsibility to provide for water demand requirements, and plans to manage the identified supply deficits with contingency sources.

From 2017 to 2019, new capacity at Qurayyat, Barka and Sohar is sufficient to meet targets despite retirement of the old Ghubrah units and contract expiration at Barka I, but for a modest deficit against the High scenario capacity target in 2017.[9] Then in 2020, a deficit in reserves again emerges in the High demand scenario, though not in the Base scenario.

OPWP is considering two options to address the additional capacity requirement that emerges around 2020: a prospective contract extension at Barka I and a new IWP in 2021. Negotiations are ongoing in 2015 for extension of the Barka I contract.

In general, economic assessments and recent procurement experience demonstrate the substantial cost advantage of RO over MSF desalination technology. Considering objectives to reduce costs and improve gas utilization in electricity production, OPWP and PAEW expect RO to have an increasing share of aggregate water desalination capacity. Existing MSF units are expected to be retired, shifted to standby mode or to a reduced operation schedule when supported by a cost-benefit and technical analysis, as system capacity and contractual conditions allow.

A new IWP is also being considered for 2021 with notional capacity of about 300,000 m^3/d, which would be sufficient to cover several years of demand growth. Procurement activities would begin around 2017, which allows several years to assess demand growth trends and contractual developments at existing plants before committing to the capacity requirement. Several potential sites are under evaluation.

[9] During this period, the positive reserve balance reflects aggregate supply across the Interconnected Zone. PAEW plans to develop additional transfer capacity between demand areas, such as between Sohar and Barka for example, to address imbalances or transfer bottlenecks if they should arise such as in emergency situations. Currently, PAEW does not anticipate any imbalances provided the proposed capacity additions become available as planned.

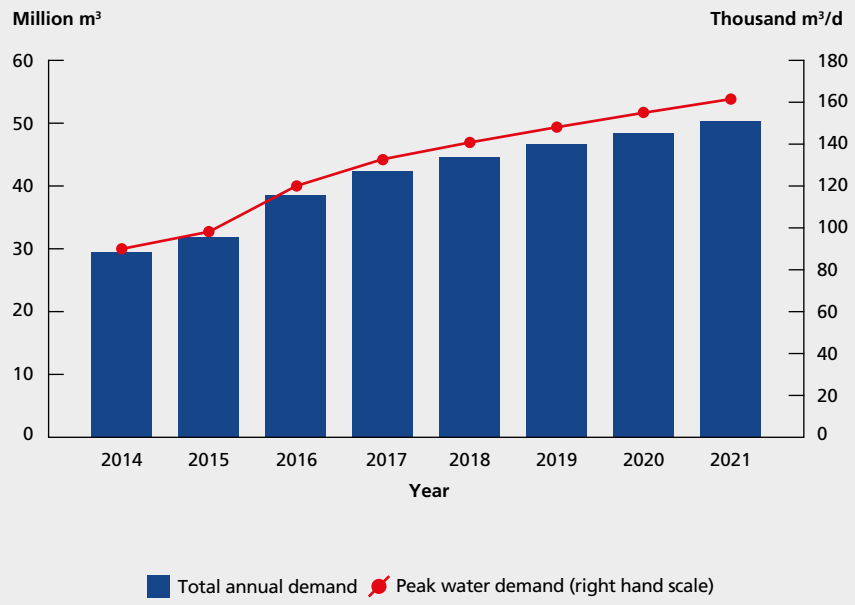
Sharqiyah Zone – Demand for Water

The Sharqiyah Zone has seen extraordinary growth in water demand since 2009 when the Sur desalination plant began operation. Per capita consumption has increased more than expected, and extensions to the water network connected to the Sur plant have been extensive, occurring on a faster schedule than originally planned. PAEW now projects that the high growth rate in this region will continue until 2017, and then begin to decline. Recently, per capita consumption appears to have stabilized. The current PAEW projection assumes no further increase, and existing private networks will have been connected to the network by 2017.[10]

PAEW expects water peak demand to increase at an average rate of about 9% per year over the seven-year horizon. The highest year-to-year increases occur in the next few years, and growth is expected to slow to about 4% by 2021. This compares to the 6% average growth rate assumed in last year's forecast. Most of the incremental growth relative to the previous forecast occurs by 2017.

PAEW has not provided a High demand scenario for the Sharqiyah zone. PAEW's High demand scenario analysis, based on recent trends and the 2014 NCSI populationforecast, did not support a higher population trend scenariofor wilayats of the Sharqiyah Zone. On this basis, PAEW's forecast included only a Base scenario.

Figure 7 **Water Demand Projections – Sharqiyah Zone**



	2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Peak Water Demand	Thousand m³/d								
Base Scenario	**90**	**98**	**119**	**132**	**140**	**147**	**154**	**160**	**9%**
Change from 2014-2020 Statement	*10*	*6*	*19*	*29*	*34*	*36*	*41*	-	-
Total Annual Demand	Million m³								
Base Scenario	**29**	**32**	**38**	**42**	**44**	**46**	**48**	**50**	**8%**
Change from 2014-2020 Statement	*3*	*1*	*6*	*10*	*11*	*12*	*13*	-	-

[10] PAEW cites projects in Sinaw, Ibra, Al Qabil, and Sur that are due for completion by 2016. More projects will follow shortly thereafter in Bidiyah, Mudaybi, Dama we At Taiyyin, Wadi Bani Khalid, and extensions in Kamil and Jaalan.

Sharqiyah Zone – Water Supply Sources and Desalination Capacity Requirement

The Sharqiyah Zone currently has one source of desalination capacity, the Sur Desalination Plant. It is owned by Sharqiyah Desalination Company and operates with a capacity of 83,000 m³/d (19 MIGD), using RO technology, under a WPA with OPWP.[11] PAEW has additional local well sources to address temporary peaking requirements if required.

Additional capacity of 48,000 m³/d (10.6 MIGD) is currently under construction at the Sur Desalination Plant by the owner, contracted by OPWP in response to a request from PAEW. The additional capacity was planned to address the rapid near-term demand growth and is expected to be available in 2016.

Figure 8 on the following page provides a summary of the desalinated water requirements in Sharqiyah Zone during the 2015-2021 period. It considers the same capacity target of 14% over peak demand as applied for the Interconnected Zone.

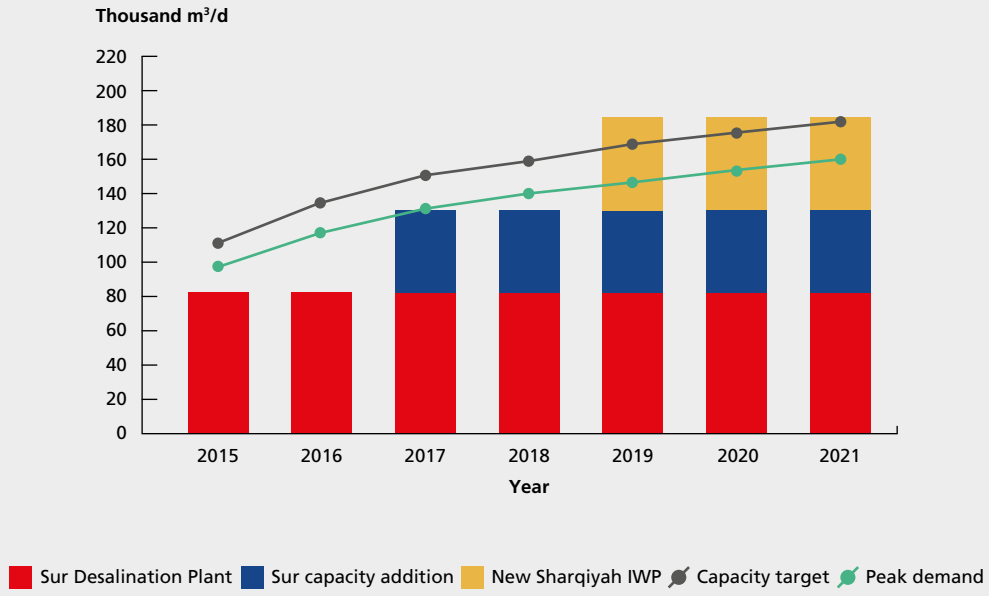
Current supply capacity is not sufficient to meet peak demand requirements in 2015 or 2016, and will need to be supplemented by PAEW groundwater sources. Considering the increased level of demand in the current forecast, the capacity addition expected in late 2016 is no longer expected to be sufficient to meet 2017 peak demand, by a small margin, although it substantially narrows the supply gap evident in 2016. PAEW groundwells or other contingency sources will continue to be utilized to meet the supply deficit until additional permanent capacity is available. PAEW has the institutional responsibility to provide for water demand requirements, and plans to manage the identified supply deficits with contingency sources.

OPWP plans to begin procurement of a new IWP in 2015, for service in 2019 to address the capacity deficit. The new plant is expected to have capacity of about 55,000 m³/d (12.1 MIGD) in order to meet the projected capacity target at least through 2021. Sites are currently being evaluated.

— RO membranes

[11] The plant previously operated under a WPA with PAEW, but the contract was novated to OPWP in December 2014.

Figure 8 **Future Desalinated Water Capacity Requirements– Sharqiyah Zone**



	2015	2016	2017	2018	2019	2020	2021
Supply Requirements				Thousand m³/d			
Peak Water Demand	98	119	132	140	147	154	160
Capacity Target	111	136	151	160	169	176	183
Contracted Desalination Capacity							
Sur Desalination Plant	83	83	83	83	83	83	83
Sur Capacity Addition	-	-	48 [a]	48	48	48	48
Total Contracted Capacity	**83**	**83**	**131**	**131**	**131**	**131**	**131**
Reserve over Capacity Target (shortfall)	-28	-53	-20	-29	-38	-45	-52
Reserve over Peak Demand (shortfall)	-15	-36	-1	-9	-16	-23	-29
Prospective Capacity Contracts							
New Sharqiyah IWP	-	-	-	-	55	55	55
All Resources	**83**	**83**	**131**	**131**	**186**	**186**	**186**
Reserve over Capacity Target (shortfall)	-28	-53	-20	-29	17	10	3

[a] COD for the Sur capacity addition is expected in 2016, but after the summer peak period.

1.5 COMBINING POWER GENERATION AND WATER DESALINATION

In developing its plans for procuring power generation resources, OPWP is required to consider the opportunity for combining power generation with water desalination so as to benefit from economies of co-location and co-procurement. The most recent examples of combined development of power and desalination capacity are the Salalah IWPP in Dhofar and the Barka II Power and Desalination Plant in the MIS. In both cases, bidders proposed to use RO rather than MSF technology for water desalination, although the procurement specifications did not specify the technology to be used. OPWP expects that future plants will also be proposed to use RO technology due to its economic advantage.

For the current major procurement projects – IPPs at Ibri and Sohar, IWPs at Barka and Sohar – OPWP considered options for combining the projects at a single site at Suwaiq as well as other locations. However, land constraints at the selected sites, particularly with respect to access corridors needed for electricity, water, and gas transmission, prevented combined power and water development within the required timeframe (i.e., by 2018/2019).

1.6 PROCUREMENT ACTIVITIES

OPWP's current and near-term procurement activities for the MIS include the following projects, summarized in Table 3 on the following page:

- **I(W)PP Contract Extensions.** OPWP is in discussions with the owners of the Ghubrah, Wadi Jizzi, Al Kamal, and Barka I plants toward extending contracts for guaranteed capacity to 2020. Contract agreements are expected to be executed by mid-2015.

- **Ibri and Sohar 3 IPPs.** Two new power generation facilities are being procured with aggregate capacity in the range of 2850-3150 MW[12] for commercial operation in 2018/2019. The total capacity will be distributed among two sites, at Ibri and Sohar. The project is in the tendering process and is expected to be awarded by the end of 2015. At least 1000 MW is to be in service by summer 2018 (on an early power basis) and the balance in 2019.

- **New Barka and Sohar IWPs.** Two new water desalination plants are planned for commercial operation in 2018, at Barka and Sohar, with capacity of 281,000 m^3/d (61.8 MIGD) and 251,000 m^3/d (55 MIGD) respectively. They are also in the tendering process and are expected to be awarded by the end of 2015.

- **Sharqiyah IWP.** A new desalination plant is planned for the Sharqiyah region with capacity of 55,000 m^3/d (12.1 MIGD) for service in 2019. The project is expected to be tendered in 2015 for award in 2016. Prospective sites are currently under review.

OPWP has also recently completed procurement of several projects which are now under construction. They include the expansion of Sur IWP (10.6 MIGD), the Phase 2 extension at Barka I (12.5 MIGD), and the Qurayyat IWP (44 MIGD).

[12] As noted earlier, this is the range at reference conditions. At typical peak demand conditions, 45°C, the capacity would be higher, shifting the range to about 2907 to 3213 MW.

Table 3 **MIS Procurement Activities in 2015**

	Ibri & Sohar3 IPP	Sohar IWP	Barka IWP	Sharqiyah IWP
Capacity	2850-3150 MW	55 MIGD	61.8 MIGD	12.1 MIGD
RFQ	Q2 2014	Q1 2015	Q1 2015	Q4 2015
RFP	Q1 2015	Q1 2015	Q1 2015	Q1 2016
Bids Due	Q3 2015	Q3 2015	Q3 2015	Q2 2016
Award Anticipated	Q4 2015	Q4 2015	Q4 2015	Q4 2016
COD	EP: Q2 2018 (for Ibri) SCOD: Q1 2019 (for Sohar) Q2 2019 (for Ibri)	Q2 2018	Q2 2018	Q1 2019

Future Procurement Activities

From 2016 to 2021, OPWP anticipates the following procurement actions for the MIS:

- **Solar IPP.** One or more solar plants with aggregate capacity up to 200 MW are expected to be developed. Subject to government approval, the procurement may be initiated in 2015 or 2016 for 2019 operation, at prospective sites near Adam or Manah;

- **New MIS IPP(s).** OPWP expects that additional electricity capacity will be required in 2021, and that procurement activities for this would begin around 2017. Existing plants with contract expirations at the end of 2020 may also offer capacity under this procurement, for contract from 2021 onwards.

- **Electricity Spot Market.** OPWP's spot market initiative will create a new mechanism for procuring electricity. The market rules and enabling infrastructure are expected to be developed from 2015 to 2017, toward launch of the spot market in 2018.

- **New MIS IWP(s).** Additional desalination capacity may also be required for operation in 2021 for the Interconnected Zone. Initial activities to secure the site(s) would start no later than 2016 to enable commencement of procurement activities in 2017. Similarly, additional capacity for the Sharqiyah Zone may be required around 2022 or 2023, which would imply procurement activities should start around 2018.

These projects will be defined further in time, particularly depending on developments in demand growth and system requirements, as well as depending on the Government's evolving renewable energy development policy.

Long-Term Considerations

OPWP works closely with the Government toward developing a coordinated long-term strategy for electricity and water supply. Progress in the following areas is expected in 2015 and 2016:

- **Fuel Security and Diversity of Supply:** OPWP has worked closely with PAEW and other stakeholders on the National Energy Strategy Study, which is scheduled for completion in mid-2015. Important expected outcomes of this study include the basis to establish national policy with respect to renewable energy and alternative fuel supply for power generation;

- **Demand Side Management:** OPWP plans to initiate demand management initiatives with several large industrial customers in 2015, and to develop options for further demand management among other customer groups for the years ahead. This work builds upon the Master Plan for Energy Conservation which PAEW prepared in 2013; and

- **Realization of GCCIA membership benefits:** OPWP participates in the Planning and Operations Committees of the Gulf Cooperation Council Interconnection Agency (GCCIA), which Oman joined officially as a Member State in 2014. OPWP plans to coordinate with OETC and AER in 2015 to realize the prospective benefits of access to GCCIA capacity reserves and spinning reserves. OPWP also plans to test the potential for energy and capacity trading with GCCIA partners in 2015, toward enabling this option as a confirmed alternative to current contingency resources such as temporary diesel generation, for example.

1.7 FUEL REQUIREMENTS

2014 Fuel Usage

The primary fuel resource for power generation and associated water production in the MIS is natural gas, supplied to power and desalination plants by the Ministry of Oil & Gas (MOG). Total gas consumption at the main power and desalination plants in 2014 was about 7.1 billion Sm^3, equivalent to 19.5 million Sm^3/d, about 6.6% more than in 2013. The peak daily gas consumption in 2014 was 27.9 million Sm^3, an increase of 15% over 2013. These increases were due to significant growth in electricity demand and late completion of the Sur IPP, requiring additional use of older generation plants during the summer.

Temporary generation facilities were connected to the MIS during the summer of 2014 as standby capacity to secure electricity supply. No outage incidents occurred that would have required their support, and consequently they produced electricity only during their testing period, using a negligible quantity of diesel fuel which shows as zero in Figure 9 below.

Projected Fuel Requirements

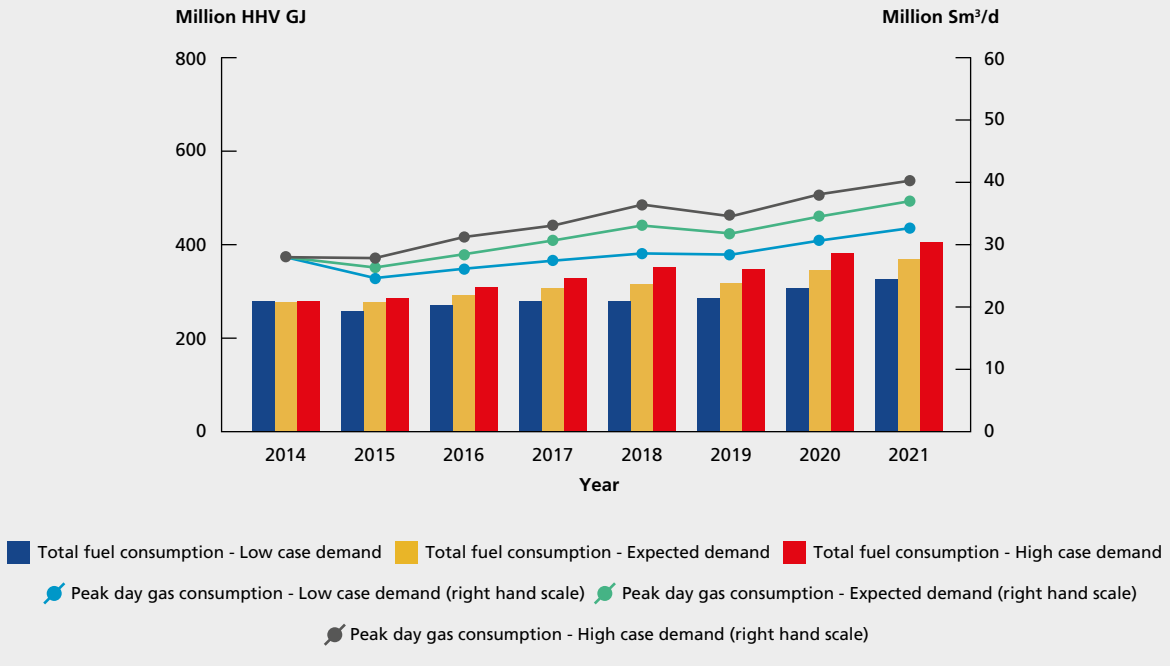
OPWP has projected fuel requirements of the MIS over the 2015-2021 forecast horizon for each of the three demand scenarios, as shown in Figure 9 below. The projections make the following key assumptions:

- all generation is assumed to be gas-fueled other than the prospective solar plant(s);
- solar plant(s) are assumed to have a capacity factor of about 25%, such that they provide around 50 MW on average over a day (representing about 1-2% of total MIS gas requirements) from 2019 onwards; and
- Ibri and Sohar IPPs, coming into service in 2018 and 2019, are assumed to have fuel efficiency comparable to CCGT technology available in today's market.

Overall fuel consumption is expected to increase at an average rate of about 4% per year over the next seven years, lower than the growth rate projected in the last 7-Year Statement due to a reduced electricity demand projection. Availability of the Sur IPP throughout 2015 is expected to contribute to zero growth in total fuel consumption and a reduction in peak day gas consumption in 2015 relative to 2014.

Under the Low Case demand scenario, fuel consumption increases at an average of 2% per year, whilst in the High Case demand scenario, it grows at an average rate of 6% per year – in both cases below the rate of growth of electricity demand.

Figure 9 **Projected Fuel Requirements – MIS**



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Expected Demand									
Gas Consumption (million Sm³/d)									
Annual Average	19.5	19.5	20.4	21.6	22.2	22.4	24.2	26.0	4%
Peak Day	27.9	26.3	28.3	30.5	33.0	31.7	34.4	36.9	4%
Diesel Fuel Consumption (million litres)	-	-	-	-	-	-	-	-	-
Total Fuel Consumption (million HHV GJ) [a]	**278**	**277**	**292**	**308**	**317**	**319**	**345**	**371**	**4%**
- Gas	*278*	*277*	*292*	*308*	*317*	*319*	*345*	*371*	*4%*
- Diesel Fuel	-	-	-	-	-	-	-	-	-
Low Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	19.5	18.0	18.8	19.5	19.5	20.0	21.4	22.9	2%
Peak Day	27.9	24.7	26.1	27.1	28.5	28.4	30.5	32.6	2%
Diesel Fuel Consumption (million litres)	-	-	-	-	-	-	-	-	-
Total Fuel Consumption (million HHV GJ) [a]	**278**	**257**	**268**	**278**	**279**	**285**	**306**	**327**	**2%**
- Gas	*278*	*257*	*268*	*278*	*279*	*285*	*306*	*327*	*2%*
- Diesel Fuel	-	-	-	-	-	-	-	-	-
High Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	19.5	20.1	21.8	23.1	24.8	24.5	26.7	28.5	6%
Peak Day	27.9	27.6	31.1	32.8	36.4	34.3	37.9	40.2	5%
Diesel Fuel Consumption (million litres)	-	0.27	5.56	1.21	0.02	0.16	-	-	-
Total Fuel Consumption (million HHV GJ) [a]	**278**	**287**	**311**	**329**	**353**	**349**	**381**	**407**	**6%**
- Gas	*278*	*287*	*311*	*329*	*353*	*349*	*381*	*407*	*6%*
- Diesel Fuel	-	-	-	-	-	-	-	-	-

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

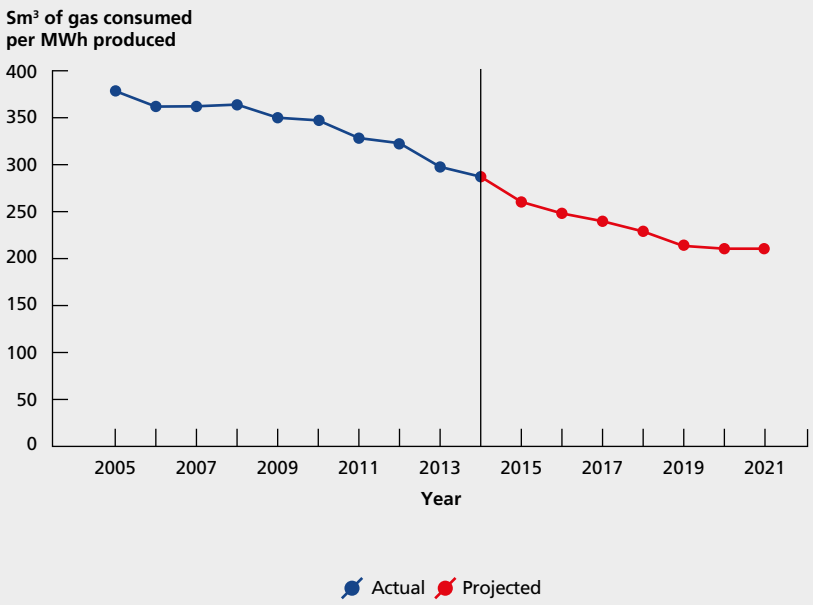
Gas Utilization

Continuing improvements in the efficiency of power supply have held back the growth rate in fuel requirements. Since 2005, through the introduction of progressively more efficient generation plants, the average fuel consumption per unit of electricity production in the MIS has dropped from 374 Sm^3/MWh to 285 Sm^3/MWh in 2014, an improvement of 24%. Over the next seven years, OPWP expects that an increasing share of power generation will be provided by the most efficient plants - Sohar II, Barka III and Sur in the near term, and then the new Ibri and Sohar plants – contributing to a further 27% improvement in MIS gas utilization as indicated by Figure 10 below. Another significant contributor is the shift from MSF to RO technology for water desalination.

This is expected to allow some of the combined power and water plants to be operated less intensively in favor of the newer and more efficient power-only IPPs.

OPWP and OETC also plan to cooperate in 2015 toward developing generation dispatch procedures that take full advantage of both GCCIA operating reserves and the newer generation plants while honoring the network security constraints that assure reliable power supply. OETC is in the process of developing a 400 kV transmission backbone and new dispatch control technology that together will support more efficient dispatch, while OPWP will contribute advanced system simulation to support economic dispatch decision-making.

Figure 10 **Improvement in Gas Utilization – MIS**



Gas Availability

OPWP consults with MOG on a regular basis, in order to confirm the future availability of gas for power generation (and associated water production) and to co-ordinate planning.

MOG has indicated that future gas supply is constrained, but with assurances that the power sector has a priority for future gas allocations. While MOG has committed to gas supply for the planned capacity additions in Salalah, Ibri and Sohar for 2018/2019, gas availability for later plants is not assured.

Should further required gas allocations not be available to the power and water sector, then (in addition to pursuing fuel-efficiency improvement options) OPWP would likely need to:

- bring forward plans to procure new generation capacity based on a fuel other than gas;
- discuss with the Government the feasibility of importing gas specifically for use in power generation (and associated water production); and/or
- make use of optional arrangements included in the Barka III and Sohar II PPAs for dispatch on liquid fuel instead of gas.

OPWP will continue to consult closely with MOG with regard to all of these matters.

02

DHOFAR POWER SYSTEM

The Dhofar Power System covers the city of Salalah and surrounding areas in the Governorate of Dhofar, serving around 85,000 electricity customers.

The Dhofar Power System comprises two generation facilities, the 220 kV/132 kV transmission grid that is owned and operated by Oman Electricity Transmission Company (OETC), and the distribution network which is owned and operated by Dhofar Power Company (DPC).

The Dhofar Power System is interconnected with the power system of Petroleum Development Oman (PDO) 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 Directorate General of Water (DGW) is the principal entity responsible for potable water supply and distribution in the Governorate of Dhofar, apart from small, private networks. A single water desalination plant is the principal source of water supply to the DGW transmission system, although DGW also has significant groundwater resources available with sufficient capacity to meet the majority of water requirements if necessary.

OPWP's role in the Dhofar Power System is similar to its role in the MIS, which is to procure economically the power and desalinated water required by DPC and DGW, respectively, in bulk from generation/production facilities connected to the Dhofar Power System. OPWP is required to ensure that sufficient power generation resources are available to meet DPC electricity demands. OPWP is also required to procure bulk water supply at the request of water departments including DGW, and, wherever beneficial, to co-procure desalinated water with power generation in joint facilities.

2.1 DEMAND FOR ELECTRICITY

Historical Demand

Electricity demand growth in 2014 was somewhat lower than the forecast of the last 7-Year Statement. Average demand increased by 7% to 303 MW (corresponding to 2.65 TWh). The peak demand was 439 MW,[13] an increase of 4.5% over the 2013 peak demand.

The average annual growth rate in peak demand over the past 5-7 years has been between 9% and 10%, while single-year growth has reached as high as 15%. The ten-year average growth rate is also about 9%. This rapid development rate has been common among all principal consumer sectors.

Demand Projections

OPWP's 7-year electricity demand projections for the Dhofar Power System have been developed in a similar manner as for the MIS: (1) the projected demands 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; (2) the Expected Demand scenario is based on an assumption of "normal" weather; (3) they are built up from separate analyses of underlying demand, and certain bulk loads, comprising mainly industrial demands, that are assessed on a specific load-wise basis; and (4) they are presented as a range with a Low Case, High Case and central, Expected Demand forecast, in which the Low Case and High Case scenarios provide for different average growth rates over the forecast horizon as well as the potential effects of weather conditions on demand in the near term.

The projections are summarized in Figure 11 on the following page.

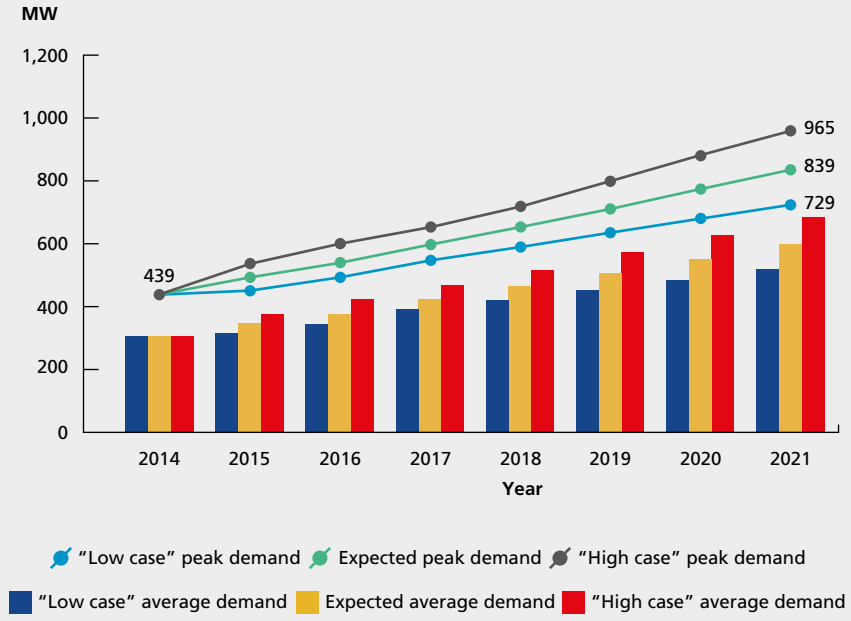
Under the Expected Demand scenario, peak demand is expected to grow at about 10% per year, from 439 MW in 2014 to 839 MW in 2021. Energy consumption is projected to grow from 2.65 TWh (corresponding to 303 MW average demand) in 2014 to 5.22 TWh (595 MW) in 2021, also an average increase of around 10% per year.

The demand drivers in the Dhofar Power System include population-driven residential growth, construction of commercial and government buildings, infrastructure development such as the new Salalah airport, tourism projects, and industrial growth in designated economic zones. All sectors are expected to grow rapidly.

The Expected Demand forecast, as well as the other scenarios, is only marginally changed from the last Seven-Year Statement: very slightly reduced. It is grounded in historical trends. Growth in Bulk Loads – primarily industrial projects – is limited to committed projects in the near term, and in the medium term as a conservative assessment of the likely realization of identified, prospective projects. Total demand growth over the forecast horizon is constrained at about the middle of the range of historical growth rates considering the past 5-10 years. Underlying demand, being total demand less bulk loads, is assumed to grow steadily throughout the forecast period.

[13] DPC reported the net peak demand for the Dhofar Power System as 439 MW at 24:00 pm (midnight) on Monday, June 16th, 2014.

Figure 11 **Electricity Demand Projections – Dhofar Power System**



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Expected Demand									
Average Demand (MW)	303	345	379	426	464	505	551	595	10%
- Underlying Demand	*231*	*251*	*273*	*298*	*325*	*355*	*385*	*421*	*9%*
- Bulk Loads	*72*	*94*	*106*	*128*	*138*	*150*	*166*	*174*	*13%*
Annual Energy (TWh)	**2.65**	**3.03**	**3.33**	**3.73**	**4.06**	**4.42**	**4.84**	**5.22**	**10%**
Peak Demand (MW)	**439**	**492**	**539**	**600**	**653**	**711**	**776**	**839**	**10%**
Change from 2014-2020 Statement (MW)	*-29*	*-18*	*-23*	*-28*	*-32*	*-37*	*-24*	-	-
Low Case Demand									
Average Demand (MW)	303	319	343	390	419	451	485	519	8%
- Underlying Demand	*231*	*232*	*253*	*276*	*295*	*316*	*337*	*362*	*7%*
- Bulk Loads	*72*	*87*	*91*	*114*	*123*	*135*	*148*	*157*	*12%*
Annual Energy (TWh)	**2.65**	**2.79**	**3.01**	**3.41**	**3.67**	**3.95**	**4.26**	**4.54**	**8%**
Peak Demand (MW)	**439**	**454**	**491**	**550**	**590**	**635**	**682**	**729**	**8%**
Change from 2014-2020 Statement (MW)	*-2*	*-16*	*-12*	*-13*	*-15*	*-14*	*6*	-	-
High Case Demand									
Average Demand (MW)	303	377	424	466	514	570	628	682	12%
- Underlying Demand	*231*	*271*	*294*	*322*	*357*	*397*	*439*	*489*	*11%*
- Bulk Loads	*72*	*106*	*130*	*144*	*156*	*173*	*189*	*194*	*15%*
Annual Energy (TWh)	**2.65**	**3.30**	**3.73**	**4.08**	**4.50**	**4.99**	**5.52**	**5.98**	**12%**
Peak Demand (MW)	**439**	**534**	**597**	**654**	**721**	**800**	**885**	**965**	**12%**
Change from 2014-2020 Statement (MW)	*-63*	*-26*	*-41*	*-54*	*-59*	*-66*	*-55*	-	-

The High Case scenario assumes a higher growth rate for Underlying Demand, consistent with high growth periods of the recent past but assuming they might be sustained for somewhat longer periods. Bulk Loads are assumed to have a somewhat higher realization rate than in the Expected Demand scenario. This scenario provides for 12% growth in both peak demand and energy.

The Low Case scenario considers lower growth in Underlying Demand, at 8% annual growth in average demand. This scenario also takes a more cautious outlook on Bulk Loads, considering the possibility that even some committed projects may not materialize due to unanticipated difficulties. These assumptions result in an aggregate growth rate of 8% in both peak demand and energy.

As in the case of the MIS, the Low Case and High Case scenarios are intended to represent the range of plausible future demand paths around the expected demand projection, against which the requirements for generation resources need to be assessed and an appropriate generation procurement strategy developed.

2.2 POWER GENERATION RESOURCES

Sources of Power

The Dhofar Power System has two sources of contracted generation capacity and one source of contingency reserves. OPWP issued a tender in 2014 for a third generation plant to begin operation in 2018, which is expected to be awarded in the first quarter of 2015.

Contracted Capacity

The Dhofar Power System is comprised of the following power generation resources which are contracted capacity:

- Raysut New Power Station (NPS), operated by the owner, Dhofar Generation Company (DGC), under a PPA with OPWP. The NPS is located in Raysut and comprises eight OCGT units with a total net capacity of 273 MW. The tender process for the Salalah 2 IPP includes the acquisition of DGC, and thus the Raysut NPS, by the winning bidder.

- Salalah IWPP, operated by the owner, Sembcorp Salalah Power and Water Company, under a PWPA with OPWP. The Salalah IWPP is a CCGT plant comprising five gas turbines and two steam turbines with combined net capacity of 445 MW. It is located in Taqa and began full-scale operation in 2012.

Prospective Contracts

OPWP issued tender documents for the Salalah 2 IPP in the second quarter of 2014. It is expected to be awarded by March 2015 with capacity of about 400 MW. The plant will be located in Raysut at a site adjacent to the NPS. It is scheduled to begin commercial operation in January 2018.

RAECO is in the process of tendering a 50 MW wind farm project, in partnership with MASDAR of Abu Dhabi, which will operate under a PPA with OPWP. The project, comprising an array of wind turbines, will be located near Harweel, and is expected to be operational by early 2017. Considering the potential intermittency of this resource, only a portion of the total installed capacity may be considered as a firm resource. For this reason, it is not currently considered as a prospective firm capacity, although this position may be altered with experience of the project's electricity output. OPWP is evaluating hourly wind data being collected at the site, toward simulating the project's likely production profile and contribution to the Dhofar Power System.

Contingency Reserves

An interconnection with the PDO Power System (via a 132 kV link between Thumrait and Harweel) was completed in 2012. Its purpose is to support reserve-sharing between the two systems, providing improved reliability by allowing each system access to unused reserve in contingency scenarios.

The nominal transfer capacity of the interconnection is around 150 MW. The transfer capacity of the interconnection is not considered for resource adequacy purposes (such as LOLH calculations), but rather as contingency reserves.

Figure 12 provides a summary of currently contracted capacity and prospective contracts for the Dhofar Power System.

Figure 12 **Total Power Generation Resources – Dhofar Power System**

	2015	2016	2017	2018	2019	2020	2021
Contracted Capacity				Net MW [a]			
Raysut New Power Station (DGC)	273	273	273	273	273	273	273
Salalah IWPP	445	445	445	445	445	445	445
Total – Contracted Capacity	**718**	**718**	**718**	**718**	**718**	**718**	**718**
Prospective Capacity Contracts							
Salalah 2 IPP	-	-	-	445	445	445	445
Total – Contracted + Prospective Capacity	**718**	**718**	**718**	**1,163**	**1,163**	**1,163**	**1,163**
Contingency Reserves (non-firm)							
Wind project	-	-	50	50	50	50	50
PDO Interconnect [b]	150	150	150	150	150	150	150
Total – Contingency Reserves	**150**	**150**	**200**	**200**	**200**	**200**	**200**
All Resources	**868**	**868**	**918**	**1,363**	**1,363**	**1,363**	**1,363**

[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] Provisional import capability

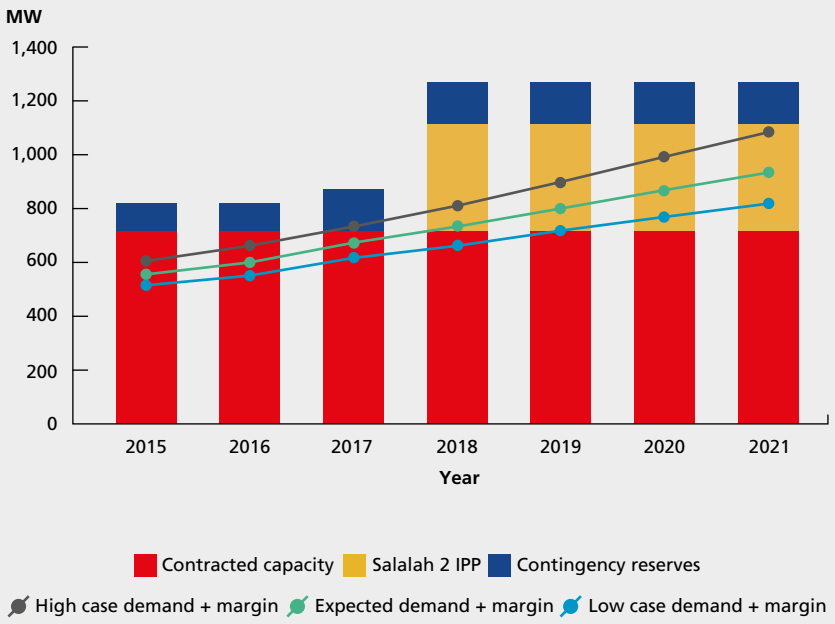
2.3 ADDITIONAL POWER GENERATION REQUIREMENTS

Statutory and Regulatory Requirements

Similarly to its role in the MIS, OPWP is required by the Sector Law and its license to ensure the adequacy of generation resources in the Dhofar Power System 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 Dhofar Power System, 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 establishes the capacity target for each of the three demand scenarios over the 7-year planning horizon, shown in Figure 13.

Figure 13 **Future Power Generation Capacity Requirements – Dhofar Power System**



	2015	2016	2017	2018	2019	2020	2021
Generation Resources				MW			
Contracted Capacity	718	718	718	718	718	718	718
Prospective Salalah 2 IPP	-	-	-	445	445	445	445
Contingency Resources (non-firm)	150	150	200	200	200	200	200
Expected Demand							
Peak Demand	492	539	600	653	711	776	839
Total Capacity Required	551	604	672	731	796	869	940
Deficit (Additional Capacity Required):							
Above Current Contracts	-	-	-	*13*	*78*	*151*	*222*
Above Current + Prospective	-	-	-	-	-	-	-
High Case Demand							
Peak Demand	534	597	654	721	800	885	965
Total Capacity Required	598	669	732	808	896	991	1,081
Deficit (Additional Capacity Required):							
Above Current Contracts	-	-	*14*	*90*	*178*	*273*	*363*
Above Current + Prospective	-	-	*14*	-	-	-	-
Above Current + Prospective + Reserves	-	-	-	-	-	-	-
Low Case Demand							
Peak Demand	454	491	550	590	635	682	729
Total Capacity Required	509	550	616	661	711	764	816
Deficit (Additional Capacity Required):							
Above Current Contracts	-	-	-	-	-	*46*	*98*
Above Current + Prospective	-	-	-	-	-	-	-

Capacity Balance from 2015 to 2017

Currently contracted capacity is projected to be sufficient to meet the capacity target associated with Expected Demand throughout this period. The need for new capacity does not emerge until 2018. Under the High Case scenario, there is a modest deficit of 14 MW in 2017. Contingency reserves via the PDO interconnect and Harweel wind farm are sufficient to address this requirement should it arise, or alternatively temporary diesel generators could be rented for a short period.

Capacity Balance from 2018 to 2021

Salalah 2 IPP is scheduled to begin commercial operation in January 2018, with sufficient capacity to meet the capacity target through 2021 under the Expected Demand scenario. The scheduled completion date in January aims to manage potential risk of delay, to assure the project is operational before the onset of the peak demand season.

The Salalah 2 IPP also secures the capacity target through 2021 under the High Case scenario.

Therefore no further IPPs are currently anticipated for the Dhofar Power System until after 2021. The next plant addition would likely be required in 2023 or 2024, depending upon demand growth.

2.4 DESALINATED WATER REQUIREMENTS

Demand for Water

The Directorate General of Water (DGW) in the Office of the Minister of State and Governor of Dhofar has provided OPWP with water demand projections for the Governorate of Dhofar, shown in Figure 14. Desalinated water is expected to supply the aggregated potable water demands of the main towns in Salalah, Taqa and Mirbat wilayats.[14]

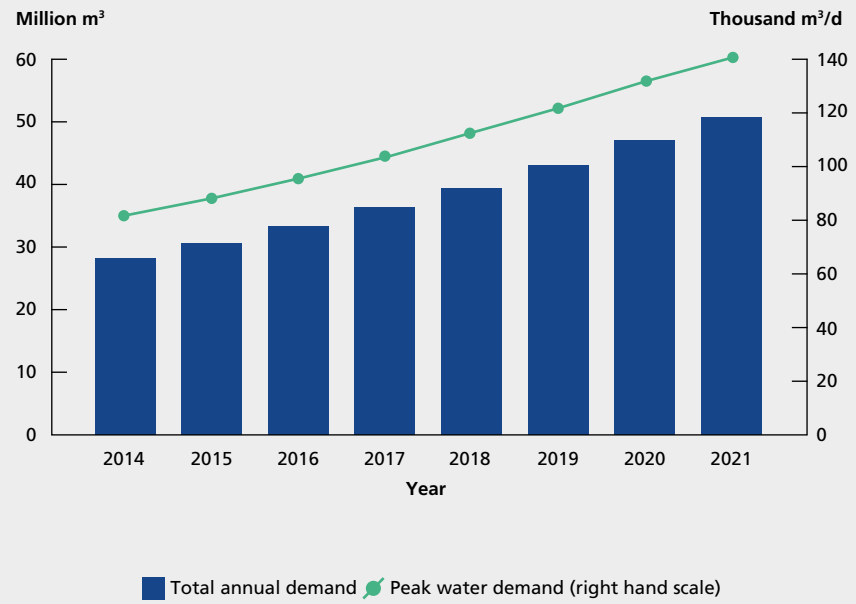
Over the 7-year horizon, DGW expects peak water demand to increase at an average annual rate of 8.4%, and total annual demand to increase at 9% per year. These projections are unchanged relative to the forecasts provided by DGW for the previous 7 Year Statement (2014-2020).

Salalah City has by far the largest share of demand in the Dhofar water system, as well as the highest growth rate. The aggregate projection shown above is comprised of separate projections for each of the wilayats of Salalah, Mirbat and Taqah. Their respective growth rates are 9.3%, 5%, and 4.8% per year during this period.

The assessment of demand growth is affected by uncertainty in the development pace of projects in the free zone, new industrial projects, and tourism sites. The growth rates are based on actual average demand growth experienced during the 4-year period from 2010 to 2013 for peak and average water demand growth rates. The projections are also broadly consistent with a population-driven demand growth model developed by OPWP.

[14] According to DGW, some areas of the wilayats of Salalah, Taqah, and Mirbat, and other wilayats of Dhofar, are located outside the main water supply network, such as mountainous regions. They are expected to be served from local groundwater sources, and are not included in the water demand projections. DGW is currently studying the expansion of the existing water supply network to cover these areas.

Figure 14 Water Demand Projections – Dhofar (Salalah/Taqa/Mirbat)



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Peak Water Demand					Thousand m³/d				
Base Scenario	**81**	**88**	**96**	**104**	**112**	**122**	**132**	**143**	**8%**
Change from 2014-2020 Statement	*-1*	*-1*	-	-	-	-	-	-	-
Total Annual Demand					Million m³/d				
Base Scenario	**28**	**30**	**33**	**36**	**39**	**43**	**47**	**51**	**9%**
Change from 2014-2020 Statement	-	-	-	-	-	-	-	-	-

Water Supply Sources

The Salalah Power and Water Desalination plant (Salalah IWPP), owned by Sembcorp Salalah Power and Water Company and operated under a PWPA with OPWP, is the only source of desalinated water for the Dhofar water system. The Salalah IWPP has a capacity of 68,190 m^3/d (15 MIGD), using RO technology, and was commissioned in March 2012. The plant began supplying water in January 2013 upon completion of the DGW interconnection facility, and from that time forward it has been producing almost continuously at peak capacity, exceeding expectations. Prior to this, Dhofar's demand for potable water was supplied by groundwater resources.

DGW continues to maintain its groundwater supply network, which is capable of supplying more than 60,000 m^3/d. However, consumers prefer the desalinated water supply, and DGW plans to limit its use of wells to quantities required when demand exceeds available supply of desalinated water. This is also consistent with national policy to limit groundwell production in order to replenish aquifers.

Desalination Capacity Requirement

Figure 15 provides a summary of the demand/supply balance in the Salalah/Taqa/Mirbat area during the 2015 - 2021 period. In the last OPWP 7-Year Statement, the demand for water was expected to exceed the available capacity supply of Salalah IWPP in 2014, which did occur. Current water demand exceeds desalination capacity, and the supply gap rises rapidly over the forecast horizon. Although groundwell capacity is sufficient to meet demand requirements in excess of desalination capacity, DGW has requested OPWP to procure additional desalination capacity to bridge the supply gap as soon as possible.[15]

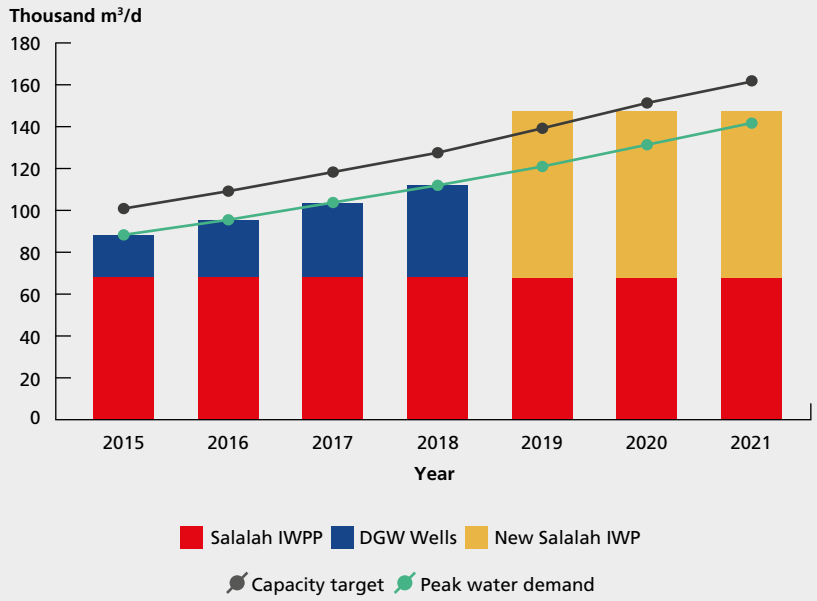
Figure 15 shows both peak demand and a capacity target developed using the same reserve margin standard as applied to plan water supply for the Interconnected Zone and Sharqiyah Zone in the northern regions of the Sultanate.

OPWP estimates that the earliest that a new IWP may be brought to commercial operation is 2019, assuming that procurement activities start promptly in 2015. The capacity of the new IWP is being considered in the range of 80,000 to 100,000 m^3/d (18-22 MIGD). This would provide sufficient capacity to meet demand requirements for about three years, deferring the need for a subsequent IWP until around 2022. Two sites are being considered, one at Raysut and the other adjacent to the existing Salalah IWPP site near Taqa.

OPWP is also considering an option to add desalination capacity at the Salalah IWPP. It appears that, through modifications to existing equipment and adaptations to meet Oman's recently revised water quality specifications, Salalah IWPP may be able to provide additional capacity of 2.3 MIGD in a relatively short period. Considering the current need for additional capacity, If this project proves to be technically feasible, economical and timely, OPWP may contract for the capacity accordingly, in which case the capacity requirement for the new IWP may be somewhat reduced.

[15] DGW has a large supply of groundwater available. As recently as 2012, groundwells provided for all of water demand, in excess of 60,000 m^3/d at that time. Consumers prefer the consistent high quality of desalinated water, and government policy aims to minimize reliance on wells. For these reasons, DGW plans to save groundwell supply capacity for contingency reserves, such as in case of outages in desalination units, and for the planning reserve margin over peak demand. Until additional water desalination capacity may be acquired, 2019 as shown in Figure 15, DGW will access groundwell supply to meet the supply gap. Thereafter, the intention is to maintain sufficient water desalination capacity to meet peak demand and to use groundwell resources only for planning and contingency reserves.

Figure 15 **Future Desalinated Water Capacity Requirement – Dhofar (Salalah/Taqa/Mirbat)**



	2015	2016	2017	2018	2019	2020	2021
Supply Requirements				Thousand m³/d			
Peak Water Demand	88	96	104	112	122	132	143
Capacity Target	101	109	118	128	139	151	163
Contracted Desalination Capacity							
Salalah IWPP	68	68	68	68	68	68	68
Reserve over Target Capacity (Shortfall)	-33	-41	-50	-60	-71	-83	-95
Prospective Capacity Contracts							
New Salalah IWP	-	-	-	-	80	80	80
All Water Desalination Resources	**68**	**68**	**68**	**68**	**148**	**148**	**148**
Reserve over Demand (Shortfall)	-20	-28	-36	-44	26	16	5
Reserve over Target Capacity (Shortfall)	-33	-41	-50	-60	9	-3	-15

2.5 COMBINING POWER GENERATION AND WATER DESALINATION

As in the MIS, OPWP is required to consider the opportunity for combining power generation with water desalination in the Dhofar Power System, so as to benefit from economies of co-location and co-procurement. An assessment of these potential benefits led to the decision by OPWP to proceed with the Salalah IWPP – the first combined power and desalination plant to be developed in the Dhofar Power System.

OPWP considered the Salalah 2 IPP tender as a potential opportunity for combining power generation and water desalination at one site. However, DGW advised in 2013 that it was too soon to commit to additional desalination capacity, and therefore OPWP proceeded with the project on a power-only basis.

As needs for additional water desalination and power generation capacity are confirmed, OPWP will continue to assess the potential for economic benefit that may result from co-location and co-procurement.

2.6 PROCUREMENT ACTIVITIES

Current Projects

OPWP issued a tender in the second quarter of 2014 for the Salalah 2 IPP at Raysut, and expects to award the contract by March 2015. This tender for new capacity also included acquisition of DGC, which owns and operates the existing NPS (273 MW). The new plant is expected to have capacity of about 445 MW, and scheduled COD in January 2018.

OPWP expects to issue a request for qualifications in Q4 of 2015 for a new IWP with capacity in the range of 80,000 to 100,000 m^3/d (18-22 MIGD). Two sites are currently being evaluated, one at Raysut and the other adjacent to the Salalah IWPP near Taqa. OPWP's current timeline is to issue the request for proposal in Q1 2016, with bids due in Q2 and award anticipated in Q4 2016. Scheduled COD would be in Q1 2019.

RAECO is developing a 50 MW wind farm at Harweel with MASDAR of Abu Dhabi, and procurement of the EPC contractor is expected in 2015. OPWP is not managing the procurement project, but is preparing a PPA with RAECO, which will be the owner/operator upon COD in 2017.

Future Procurement

Two further potential procurement activities may be anticipated later in the forthcoming seven year period:

- Desalination Capacity. A third water desalination plant may be required around 2022, depending upon demand growth and the ultimate capacity of the Salalah IWP discussed above. Procurement activities for an IWP for COD in 2022 would begin around 2017.
- Power Generation Capacity. The Salalah 2 IPP is expected to provide sufficient capacity to meet the generation security standard until around 2022 or 2023, depending upon demand growth. Procurement activities to meet the next plant, nominally the Salalah 3 IPP (or potentially IWPP), may be expected to begin around 2018.

2.7 FUEL REQUIREMENTS

2014 Fuel Usage

Both power generation plants in the Dhofar Power System use natural gas. Total gas consumption in 2014 was about 780 million Sm^3 (equivalent to 2.15 million Sm^3/d), about 7.5% greater than in 2013, which was about the same as the growth in electricity production. The peak daily gas consumption was 3.1 million Sm^3 in 2014, compared to 2.4 million Sm^3 in 2013. The increase is due to the effect of transmission constraints and gas supply interruptions affecting generation from the Salalah IWPP, with result that the NPS open cycle gas turbines were required to operate more than had otherwise been anticipated.

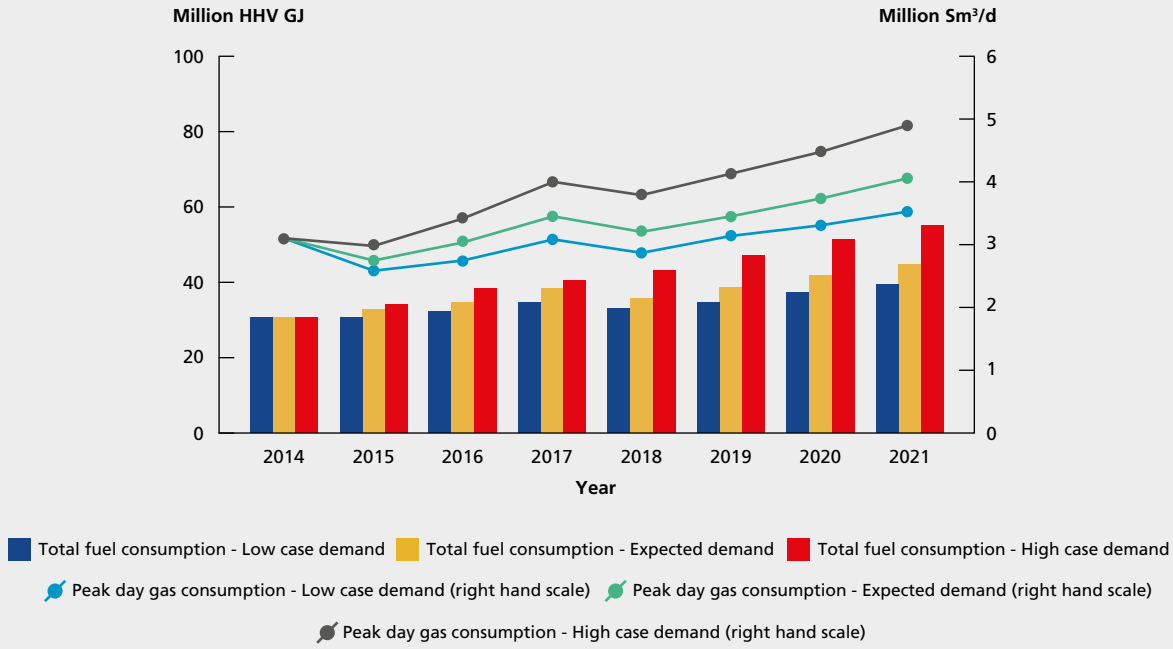
Projected Fuel Requirements

OPWP has prepared projections for the fuel requirements of the Dhofar Power System over the 2015-2021 period in Figure 16 for each of the three demand scenarios. The projections are based on the following key assumptions:

- Salalah 2 IPP is assumed to begin commercial operation in 2018, with a similar fuel efficiency to the Salalah IWPP;
- a 50 MW wind farm at Harweel is expected to begin commercial operation in 2017, with an average daily yield factor of about 30%; and
- no "commercial" imports or exports over the PDO interconnection are assumed to occur.

The projections are shown in Figure 16.

Figure 16 Projected Fuel Requirements – Dhofar Power System



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Expected Demand									
Gas Consumption (million Sm³/d)									
Annual Average	2.2	2.3	2.4	2.7	2.5	2.7	2.9	3.1	6%
Peak Day	3.1	2.7	3.0	3.5	3.2	3.5	3.7	4.1	4%
Total Fuel Consumption (million HHV GJ) [a]	**31**	**32**	**35**	**38**	**36**	**38**	**42**	**45**	**6%**
Low Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	2.2	2.1	2.3	2.4	2.3	2.4	2.6	2.8	4%
Peak Day	3.1	2.6	2.7	3.1	2.9	3.1	3.3	3.5	2%
Total Fuel Consumption (million HHV GJ) [a]	**31**	**31**	**32**	**35**	**33**	**35**	**37**	**39**	**4%**
High Case Demand									
Gas Consumption (million Sm³/d)									
Annual Average	2.2	2.4	2.7	2.8	3.0	3.3	3.6	3.9	9%
Peak Day	3.1	3.0	3.4	4.0	3.8	4.1	4.5	4.9	7%
Total Fuel Consumption (million HHV GJ) [a]	**31**	**34**	**38**	**41**	**43**	**47**	**51**	**55**	**9%**

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

Overall fuel consumption is expected to increase at an average rate of about 6% per year in the Expected Demand scenario – substantially lower than the expected growth rate of electricity demand of about 10% per year. Under the Low Case demand scenario, fuel consumption increases at an average of 4% per year, whilst in the High Case demand scenario, it grows at an average rate of 9% per year – in both cases below the growth rate of electricity demand.

The lower growth rates in fuel consumption relative to electricity demand are mainly attributable to the addition of CCGT plants in the Dhofar Power System. The impact of the addition of the Salalah 2 IPP in 2018 is particularly evident in all scenarios.

Gas Availability

OPWP consults with MOG on a regular basis, in order to confirm the future availability of gas for power generation (and associated water production) and to co-ordinate planning. In respect of the rapid growth rate in Salalah, and projected needs for the Salalah 2 IPP and later plants, it is particularly vital to secure future gas supply or identify a need for other fuel options.

03

AD DUQM AND MUSANDAM

Ad Duqm

Ad Duqm is located on the eastern coastline of the Al Wusta region, approximately halfway between the Main Interconnected System (MIS) and the Salalah System. Current population is estimated at 8,559[16], and is expected to grow rapidly due to the development of a new economic and industrial center.

The Ad Duqm region is currently served by a relatively small integrated generation and distribution system, owned and operated by Rural Areas Electricity Company (RAECO)RAECO owns and operates a 67 MW diesel-fuel fired power plant for supply to this grid area, and plans to add another 80 MW in 2017. RAECO is the sole licensed electricity supplier within the service area covered by the system, supplying existing and new electricity customers.

RAECO also provides for the potable water needs of Ad Duqm and the surrounding area with sources that include a small desalination plant and several wells.

OPWP's role in Ad Duqm came under government request to review options for development of an IPP or IWPP to accommodate plans for rapid development of electricity and water demand in the area.

Musandam

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. Current population is estimated at around 39,813, which is expected to grow steadily over the coming years.

The relatively small integrated generation and distribution system currently in place in the Musandam Governorate is owned and operated by RAECO. Generation requirements are met by a number of small diesel generators located near load centers. OPWP is currently assisting RAECO with the procurement of a new 100 MW electricity generation plant.

[16] National Center for Statistics & Information – Population Statistics Bulletin (Issue 4 – 2014) Mid – Years Data

3.1 DEMAND FOR ELECTRICITY

Historical Demand

Historically, all requirements to meet electricity demands in Ad Duqm, Musandam, and their respective surrounding areas, has been within the jurisdiction of RAECO. Considering the relatively small energy requirements of these areas, they have been met most economically by utilizing diesel-fired generators, located close to the areas of consumption.

Historical demand in these two regions has been mostly due to residential and small commercial applicatons. This trend is expected to change significantly due to the recent and continuing introduction of larger commercial, tourism, and industrial projects.

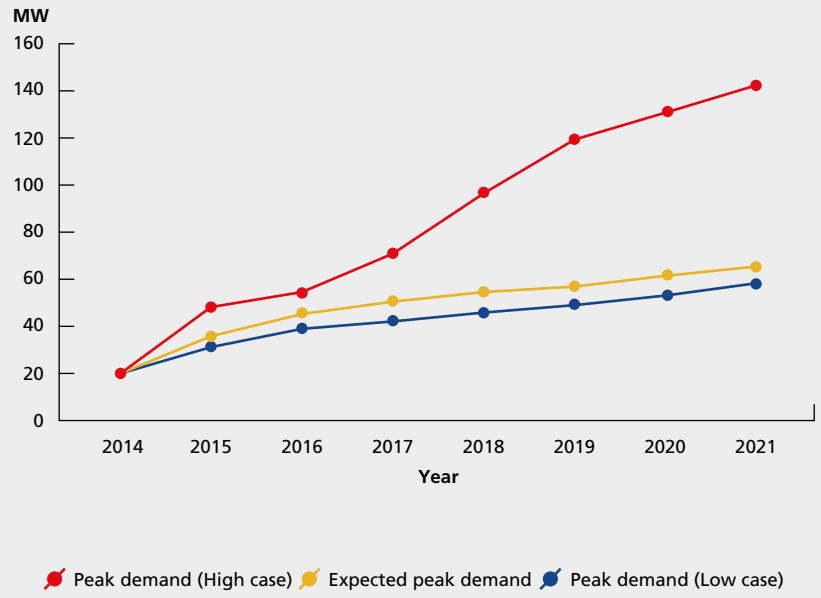
Demand Projections - Ad Duqm

The development of the Special Economic Zone (SEZ) would see substantial economic growth in Ad-Duqm as well as population growth over and above the average for the area. As a result, the demand for electricity in Ad-Duqm is likely to grow significantly over the coming years. However, the pace of growth is highly uncertain and depends on many factors related to global markets, investment levels, and government incentives.

Several entities have prepared development forecasts for Ad Duqm, with widely divergent results. For the purposes of electricity demand projections, OPWP has published here the demand projections obtained from RAECo relating to domestic, and small industrial/commercial development. This is portrayed in three different scenarios.

The Low Case, Expected Demand, and High Case scenarios are based on the expectations of growth and materialization of customers and small industrial applications, and is illustrated in Figure 17 below.

Figure 17 **Electricity Demand Projections – Ad Duqm**



	Actual 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Peak Demand					MW				
RAECO: Expected Case	19	35	44	50	54	57	61	65	19%
RAECO: Low Case	19	30	38	41	45	48	52	57	17%
RAECO: High Case	19	47	54	70	97	119	130	142	33%

Under the Expected Demand scenario, peak demand is expected to grow at an average of 19% per year, from 19 MW in 2014 to 65 MW in 2021. The Expected Demand scenario is developed from a consideration of expected general residential and commercial demand generated by population growth and development in the area.

The High Case scenario reflects (1) a higher than expected rate of growth associated with general and commercial demands, (2) higher materialization of customer applications relating to small-medium commercial and industrial applications, and (3) transmission connection to Haima in 2018, which adds demand associated with the Haima grid area. The other scenarios do not include grid connection to Haima within the forecast time period. The High Case scenario anticipates an average growth rate of 33% in peak demand, increasing from 19 MW in 2014 to 142 MW in 2021.

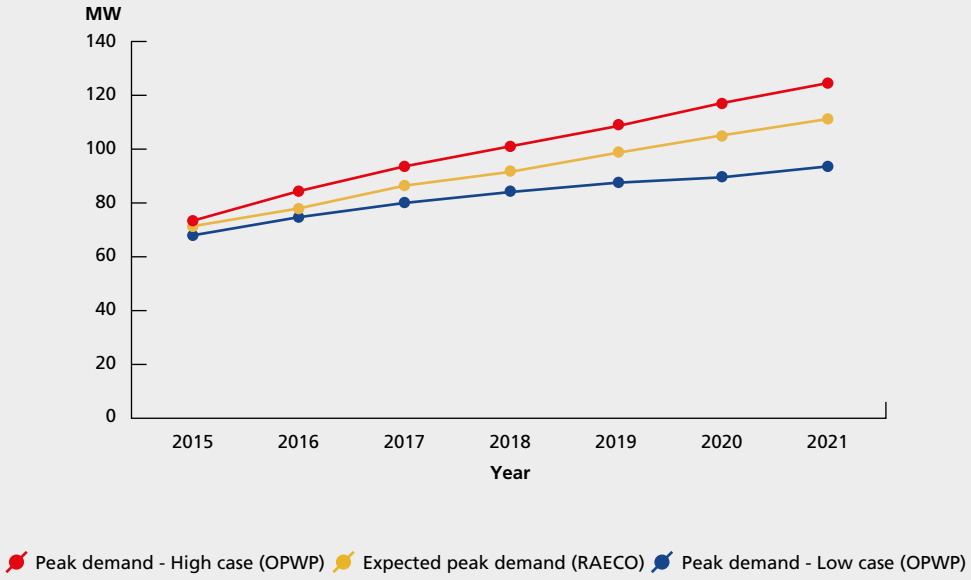
The Low Case scenario assumes a lower rate of growth associated with general residential and commercial demand, and assumes a lower materialization rate of small/medium industries of customer applications. This scenario has an average growth rate in peak demand of 17%, from 19 MW in 2014 to 57 MW in 2021.

These projections do not include the large influx of industrial demand that has in the past been associated with Ad Duqm development, and was included to some degree in the last OPWP 7-Year Statement. It is currently anticipated that the refinery and petrochemical complex being developed by Oman Oil Co. and others will include captive power generation to serve their own requirements. However, other aspects of the industrial development at Ad Duqm, in particular industries requiring electricity supply from the power grid, are no longer included because MOG has informed OPWP that there is not sufficient gas supply available for development of an IPP. The rapid growth of electricity demand evident in the RAECO projections however is thought to be supported by the residential and commercial requirements associated with the petrochemical and port projects and other economic developments. Further industrial development on a scale that requires a large power station may be taken up somewhat later as new gas supplies become available or as other fuels may be considered for power supply.

Musandam

The Musandam Governorate expects future developments aimed to boost touristic, economic, and commercial activities. The Expected Demand scenario as shown below was developed by RAECO. OPWP prepared Low Case and High Case scenarios on the basis of alternate assumptions of annual growth rates for underlying demand, materialization of identified bulk consumers, and expectations for the coincidence of bulk consumers' peak demand with the peak demand on the Musandam power system. Observation of out-turns against these forecasts, and further details of specific projects, are expected to allow refinement of the forecast methodology in future OPWP Statements. The three demand scenarios are shown in Figure 18 below.

Figure 18 **Electricity Demand Projections – Musandam**



	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Peak Demand				MW				
RAECO Expected Case	72	78	86	92	99	105	112	8%
Change from 2014-2020 Statement (MW)	*2*	*3*	*6*	*6*	*7*	*7*	-	-
OPWP Low Case	68	75	80	83	87	90	94	5%
Change from 2014-2020 Statement (MW)	*2*	*6*	*7*	*7*	*7*	*6*	-	-
OPWP High Case	74	84	94	101	109	117	125	10%
Change from 2014-2020 Statement (MW)	*2*	*7*	*9*	*9*	*10*	*10*	-	-

Under the Expected Demand forecast obtained from RAECo, peak demand is expected to grow from 65 MW in 2014 to 112 MW in 2021, an average increase of 8% per year.

The High Case scenario assumes a quicker materialization of bulk consumers, as well as increased tourism and fishery activities. Peak demand is projected to grow by an average of 10% per year, from 65 MW in 2014 to 125 MW in 2021. The Low Case scenario assumes a growth rate of 5% for peak demand, increasing only to 94 MW in 2021.

3.2 POWER GENERATION RESOURCES

Sources of Power

Ad Duqm Zone

The RAECO system serving Ad Duqm and its surrounding areas is currently supplied by the Ad Duqm power station, a 67 MW diesel-fired power plant which is also owned and operated by RAECO.

Musandam

RAECO owns and operates six power stations distributed near to load centers in the Musandam Governorate. They are all diesel-fired generators, with combined installed capacity of about 96 MW. The largest plant is located at Khasab City, and has installed capacity of about 58 MW plus an additional 8 MW due to the recent completion of an expansion at the Khasab Power Station.

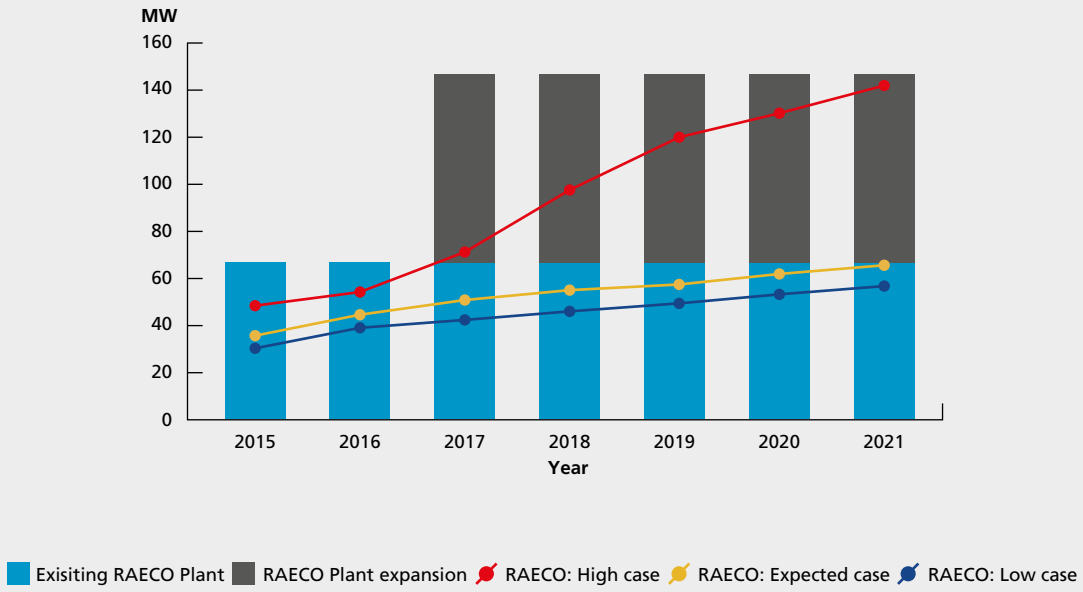
Prospective Contracts and Additional Requirements

Ad Duqm Zone

In addition to the 67 MW diesel-fired plant owned and operated by RAECO at Ad Duqm, RAECO plans to add around 80 MW of additional capacity by 2017. Figure 19 below demonstrates that the combined capacity, 147 MW, would be sufficient to meet Ad Duqm demand through 2021 under the High Case scenario.

— Civil works for Musandam IPP

Figure 19 **Future Power Generation Expansion Plan - Ad Duqm**



	2015	2016	2017	2018	2019	2020	2021
Contracted Capacity				MW			
Existing RAECO Plant	67	67	67	67	67	67	67
Prospective Capacity							
RAECO Plant Expansion	-	-	80	80	80	80	80
Total Contracted Capacity + Prospective	**67**	**67**	**147**	**147**	**147**	**147**	**147**
Peak Demand							
Expected Demand	35	44	50	54	57	61	65
High Case	47	54	70	97	119	130	142
Low Case	30	38	41	45	48	52	57

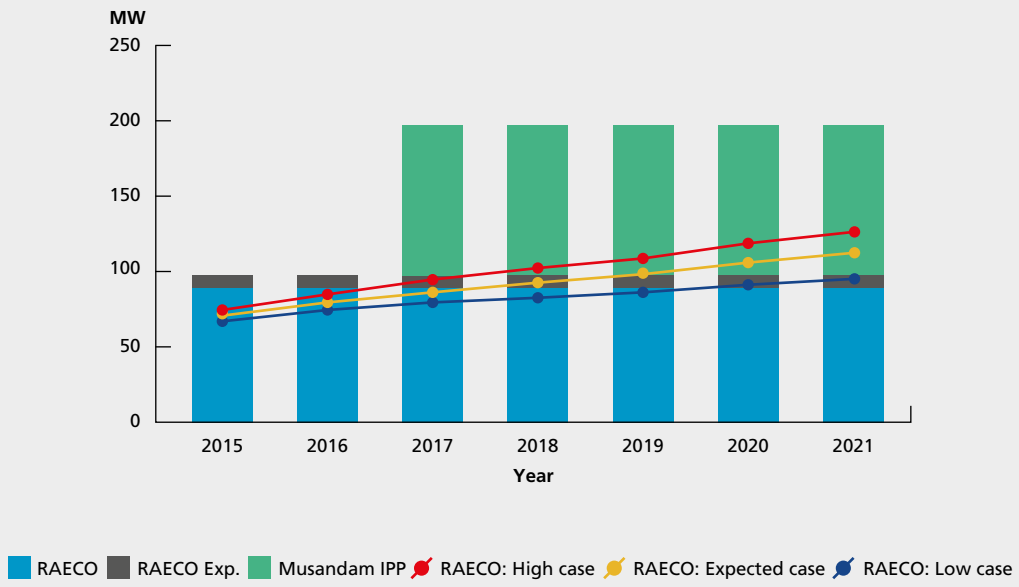
Since issuing the last 7 Year Statement, OPWP had studied the prospects of initiating the procurement process required to begin development of a 300-400 MW gas-fired plant to assist with meeting future high industrial applications expected to be introduced in Ad Duqm. However, OPWP has recently been informed by MOG that there is not sufficient gas supply for the anticipated Duqm IPP. Although it appears likely that certain projects that already have committed gas supply may go forward on schedule, such as the refinery and petrochemical complex, other projects needing power supply from the electricity grid may need to wait until alternative fuel supplies may be arranged for development of a large electricity generation project.

Musandam

In addition to the 58 MW diesel-fired plant owned and operated by RAECO at the Khasab Power Station, RAECO has recently finalized its expansion plan to include an additional 8 MW of diesel-fuelled generators.

OPWP is currently finalizing the contractual arrangements for a new IPP in Musandam utilizing dual-fuel fired reciprocating engines. The project will be fueled by natural gas from a processing plant being developed by Oman Oil Company (OOC), and the IPP is owned by a consortium led by OOC. The project will operate under a PPA with OPWP, for supply to RAECO. The IPP will provide a minimum net firm capacity of 100 MW, with expected COD during the fourth quarter of 2016. This scale of plant capacity, in combination with RAECO's current diesel generators and planned expansions, would meet requirements under the High Case scenario through 2021. Figure 20 below illustrates the Musandam capacity expansion plan.

Figure 20 **Future Power Generation Expansion Plan - Musandam**



	2015	2016	2017	2018	2019	2020	2021
Contracted Capacity				MW			
Existing RAECO Plant	88	88	88	88	88	88	88
RAECO Plant Expansion	8	8	8	8	8	8	8
Prospective Capacity							
Musandam IPP	-	-	100	100	100	100	100
Total Contracted Capacity + Prospective	**96**	**96**	**196**	**196**	**196**	**196**	**196**
Peak Demand							
Expected Demand	72	78	86	92	99	105	112
High Case	74	84	94	101	109	117	125
Low Case	68	75	80	83	87	90	94

3.3 DESALINATED WATER REQUIREMENTS

Demand for Water – Ad Duqm Zone

PAEW has provided OPWP with the water demand projections for the Ad Duqm Zone, based on estimates made by the Special Economic Zone Authority of Duqm (SEZAD) for industrial demand, domestic demand within the zone, and residential demand in the area surrounding the zone. The projections are shown in Figure 21 below. The SEZAD projections were prepared after discussions with PAEW toward aligning their forecast methodologies.

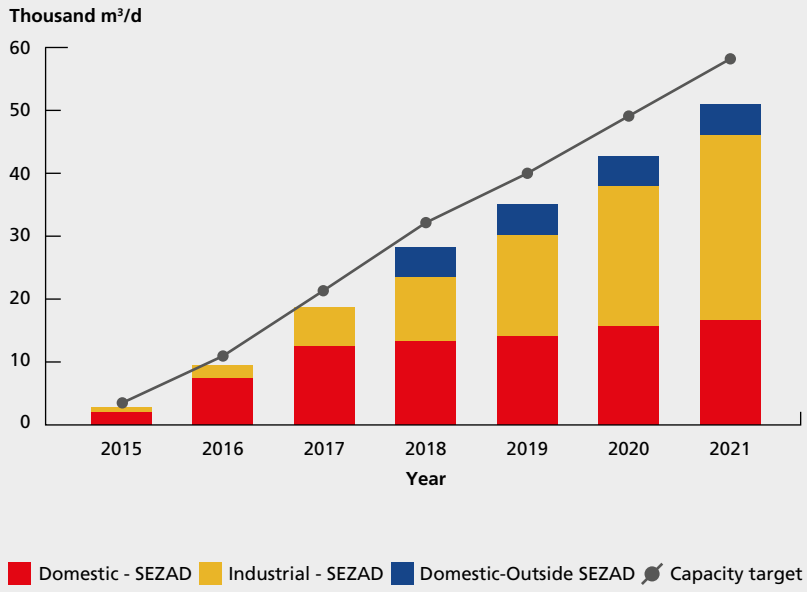
In OPWP's previous 7-Year Statement, PAEW's forecast included only the demand for potable water by the non-industrial sectors that comprise the existing and new Duqm town, the new airport, tourism projects, and supplies to Haima, considering that Royal Decree 79/2013 establishes the responsibilities for the Duqm Authority to include supply of industrial water. However, PAEW's responsibilities for water supply are now considered to extend into the Special Economic Zone (SEZ), such that industrial water demand is included in the projection toward determining water supply requirements.[17]

The SEZAD projection for domestic demand include the town of Duqm. Domestic demand outside of Duqm is the responsibility of PAEW. A transmission pipeline is planned to connect Haima with the Duqm water supply. The projection for domestic demand outside of Duqm includes water demand from Haima and communities along the length of the pipeline including Abu Madhabi and Al Ajaiz. This water demand must be addressed by water sources in Duqm when the transmission pipeline is commissioned, which is expected in 2018.

Figure 21 shows the water demand forecast for Ad Duqm Zone separated into the three demand sectors (Domestic- SEZAD, Industrial SEZAD, and domestic demand outside SEZAD area). The largest contribution to water demand growth is from the industrial projects within the Special Economic Zone, although domestic demand is projected to grow most rapidly in the near term.

[17] The boundaries of PAEW's reach into the SEZ remain undefined in the long term, in particular with respect to industrial demand. For the purposes of OPWP's Statement, the SEZAD water demand through 2021 is considered as part of the overall water demand to be addressed by PAEW supplies. The water demand of the oil refinery and related petrochemical projects are not included, as they are expected to develop their own water supply capacity.

Figure 21 Water Demand Projections - Ad Duqm



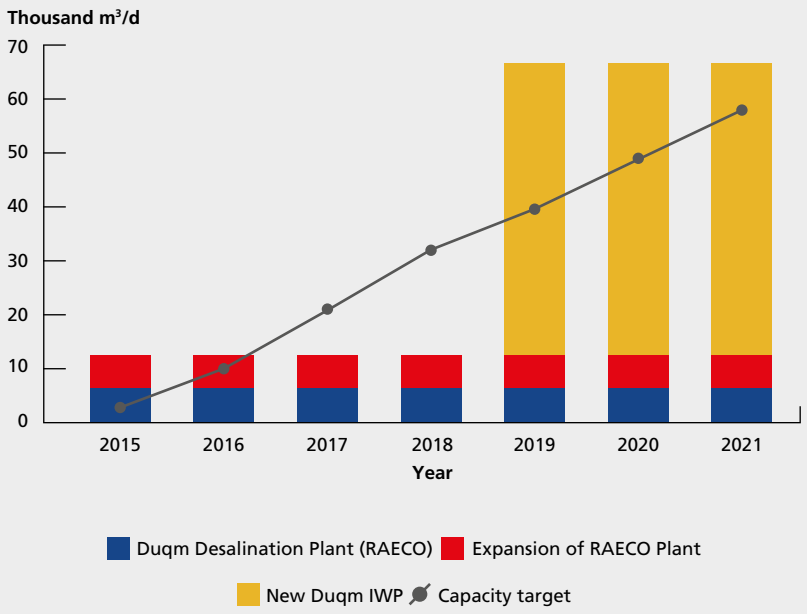
	2015	2016	2017	2018	2019	2020	2021
Demand Projections				Thousand m³/d			
Peak Water Demand	**3**	**10**	**19**	**28**	**35**	**43**	**51**
Domestic- SEZAD	2	8	13	13	14	16	17
Industrial- SEZAD	0.7	2	6	11	16	22	30
Domestic- Outside SEZAD	-	-	-	5	5	5	5
Capacity Target (Peak Demand + Margin)	**3**	**11**	**21**	**32**	**40**	**49**	**59**
Change from 2014-2020 Statement	*-3*	*-1*	*4*	*9*	*12*	*18*	-

Water Sources and Desalination Capacity Requirement – Ad Duqm Zone

The Ad Duqm Zone is currently served by a 6,000 m³/d (1 MIGD) desalination plant owned by RAECO in Ad Duqm town and a number of local water sources. RAECO expects to expand the plant to produce an additional 6,000 m³/d (1 MIGD) in 2015. Figure 22 compares the desalination capacity target with available water sources, demonstrating that the planned 2015 expansion of the RAECO plant will only meet the capacity target through 2016, and that a supply deficit emerges in 2017. The principal source of growth in this period is in domestic demand. For the previous 7-Year Statement, PAEW indicated that a temporary RO plant may be made available in 2017 and 2018, to be moved from its current location at Ghubrah. Additional supplies may need to be made available if the anticipated demand growth is to be met.

OPWP expects to initiate procurement for a new Duqm IWP to be commissioned in 2019, which is the earliest achievable COD for a procurement starting in 2015. The capacity is not yet finalized, but is being considered in the range of 55,000 to 60,000 m³/d (12-13 MIGD), which would be sufficient to meet demand and reserve margin through 2021. The capacity is expected to be finalized considering the extent that PAEW needs to address future industrial demand in the SEZ.

Figure 22 **Water Supply and Demand Balance - Ad Duqm**

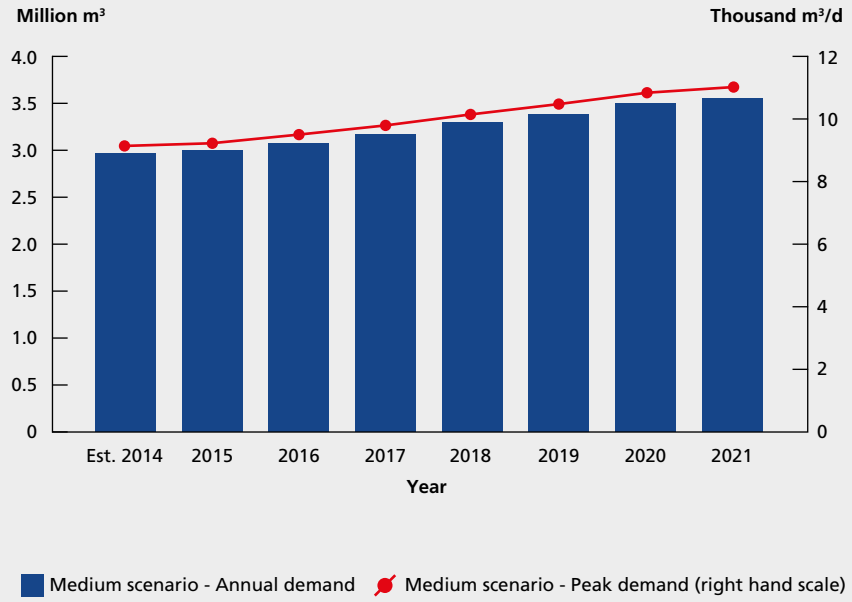


	2015	2016	2017	2018	2019	2020	2021
Supply Requirements				Thousand m³/d			
Peak Water Demand	3	10	19	28	35	43	51
Capacity Target	3	11	21	32	40	49	59
Change from 2014-2020 Statement	*-3*	*-1*	*4*	*9*	*12*	*18*	-
Contracted Desalination Capacity							
Duqm Desalination Plant (RAECO)	6	6	6	6	6	6	6
Expansion of RAECO Plant	6	6	6	6	6	6	6
Prospective Capacity							
New Duqm IWP					55	55	55
All Resources	**12**	**12**	**12**	**12**	**67**	**67**	**67**
Reserve over Target Capacity (Shortfall)	9	1	-9	-20	27	18	8

Demand for Water – Musandam Zone

PAEW has provided OPWP with the water demand projections for the Musandam Zone, based on a study made in January 2014. The projections of the Medium Scenario are shown in Figure 23 below.

Figure 23 Water Demand Projections - Musandam



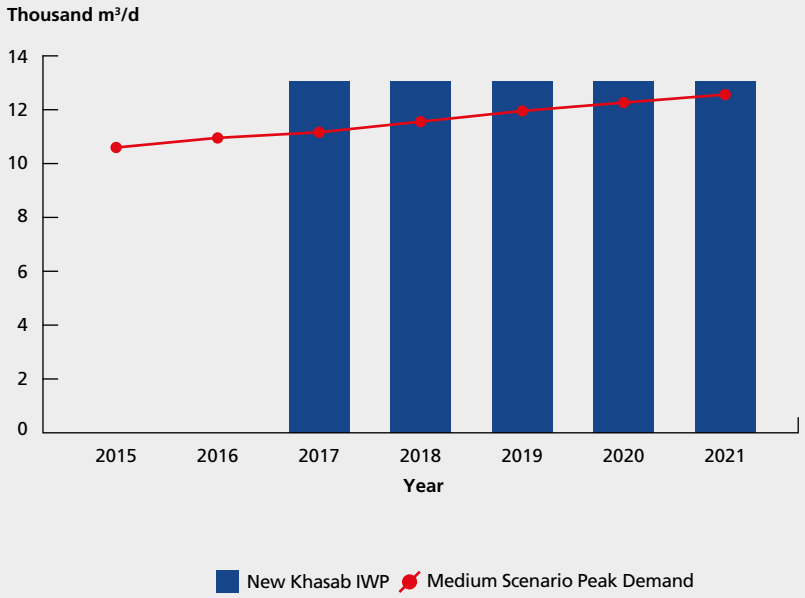
	Est. 2014	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Demand Projections					Thousand m³/d				
Peak Water Demand	9.1	9.2	9.5	9.8	10.1	10.4	10.8	11	3%
					Million m³				
Annual Demand	3	3	3.1	3.2	3.3	3.4	3.5	3.6	3%

Desalination Capacity Requirement – Musandam

The Musandam Zone is currently served by small desalination plants, one in Kumzar (450 m³/d) that is owned and operated by RAECO, and three PAEW plants with combined capacity of about 3,500 m³/d. PAEW has requested OPWP to initiate procurement for a new IWP to serve Khasab City, with capacity of about 13,000 m³/d (3 MIGD). Procurement of the IWP is expected to begin soon pending resolution of the site location.

Figure 24 compares the desalination capacity target with the prospective capacity water sources. The prospective IWP would have sufficient capacity to meet demand and reserve margin through 2021.

Figure 24 Water Supply and Demand Balance – Musandam



	2015	2016	2017	2018	2019	2020	2021	Ave.% Growth
Supply Requirements								
Peak Water Demand	9.2	9.5	9.8	10.1	10.4	10.8	11.0	3%
Capacity Target	**10.5**	**10.9**	**11.2**	**11.6**	**11.9**	**12.3**	**12.5**	**-**
Prospective Capacity								
New Khasab IWP	-	-	13.0	13.0	13.0	13.0	13.0	-
Reserve over Capacity Target (Shortfall)	10.5[a]	10.9[a]	1.8	1.4	1.1	0.7	0.5	-

[a] The network to be supplied by the Khasab IWP is currently being supplied by groundwells, which provide for the shortfall indicated in 2015 and 2016.

3.4 PROCUREMENT ACTIVITIES

OPWP expects to procure desalinated water facilities for operation in Ad Duqm and both power generation and desalinated water facilities in the Musandam Governorate in the near future. These projects include the following:

- Musandam IPP, with net firm capacity of 100 MW utilizing dual fuel engines. The IPP will be owned by a consortium led by Oman Oil Company, and operated under a PPA with OPWP for supply to RAECO. The EPC tender was issued in the first quarter of 2014, with anticipated COD in the fourth quarter of 2016.

- Khasab IWP, with capacity in the range of 13,000 m^3/d (3 MIGD) using RO technology, for supply to PAEW. Khasab IWP is anticipated to reach COD in 2017.

- Duqm IWP, with capacity in the range of 55,000 to 60,000 m^3/d (12 to 13 MIGD) using RO technology. This is expected to be commissioned and reach COD in 2019.

— Civil works for Musandam IPP

The Oman Power and Water Procurement Company (OPWP) is responsible for ensuring that there is sufficient electricity and water production capacity available at the lowest cost to meet the growing demands in the Sultanate of Oman

الشركة العمانية لشراء الطاقة والمياه (ش.م.ع.م)
OMAN POWER AND WATER PROCUREMENT CO. (SAOC)

Member of Nama Group

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