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POWER & WATER PROCUREMENT

OMAN ELECTRICITY MARKET

ANNUAL REPORT 2022

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OMAN POWER &
WATER PROCUREMENT

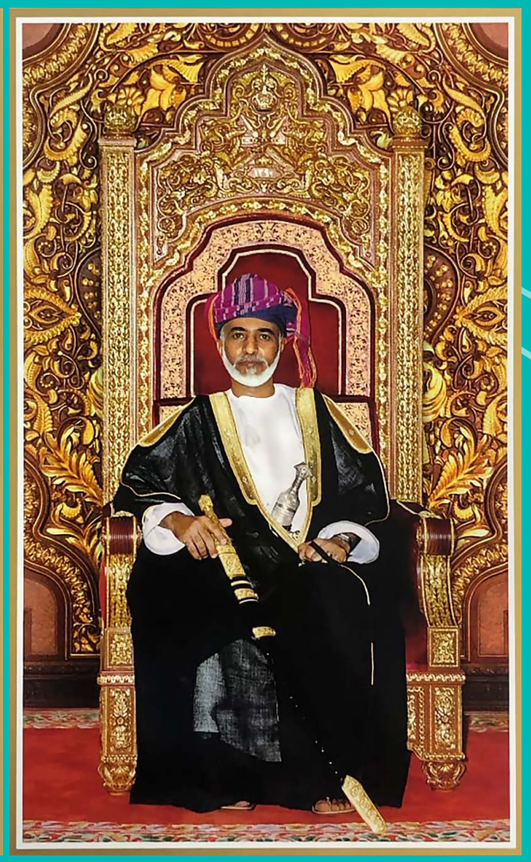
Post Box: 1388, PC: 112
Ruwi, Sultanate of Oman

Tel: +968 2450 8400

Fax: +968 2439 9946

www.oemo.om

His Majesty
Sultan Haitham bin Tarik Al Said
- May Allah protect Him -



The Late
Sultan Qaboos bin Said
- May Allah rest His soul in peace -

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TIMING CONVENTIONS

The Market Rules uses the following main timing conventions (Section I.5 of Market Rules Document):

- **Trading Period:**
  means a period of 30 minutes commencing on the hour or half-hour.
- **Trading Day:**
  means a period of 24 hours commencing at [00:00] on any day.
- **Time Zone:**
  Gulf Standard Time (GST) which is UTC + 4:00
- **Gate Closure:**
  means for any Trading Day is at [10:00] on the day prior to the Trading Day.
- **Ex-Ante:**
  means the period after Gate Closure but before the start of the Trading Day.
- **Ex-Post:**
  means the period after the end of the Trading Day.

GLOSSARY

CCGT
Closed Cycle Gas Turbine

LDC
Load Dispatch Center

MWh
Megawatt Hour

MAC
Market Advisory Committee

MMS
Market Management System

OMR
Omani Rail

OCGT
Open Cycle Gas Turbine

PWP
Oman Power & Water Procurement Company

P(W)PA
Power (Water) Purchase Agreement

PSU
Pool Scheduling Unit

SMP
System Marginal Price

SP
Scarcity Price

TWh
Terawatt Hour

CEO'S FOREWORD

Dear Industry Members,

The commencement of the Oman Electricity Market on January 1st, 2022 is a remarkable milestone for the electricity sector in the Sultanate of Oman. It was very challenging during COVID-19 to complete the project along with the Market Management System. Nonetheless, the market was launched successfully in January 2022 to start this new journey for the energy sector in the Sultanate of Oman as the energy sector plays a vital role in a country's economy.

Being the first wholesale electricity market in the region, the Oman Electricity Market required the support and cooperation of different stakeholders. A new function in the name of the Market Operator has been created under Oman Power and Water Procurement Company (PWP). The Market also required greater communication and transparency between those stakeholders.

During a partial blackout in September, Oman Electricity Market came under strain, and it was delightful to note that the Market Management System provided an appropriate price signal. In the first year of operation, many challenges have been experienced which was resolved effectively with the support of all the stakeholders.

We would like to congratulate the relevant stakeholders and all Participants for the successful launch of the Oman Electricity Market and their persistence and commitment leading up to the launch. With the launch of the Market, the Market Advisory Committee (MAC) was formally established, and we would like to thank all the members for their vital contribution towards successfully completing of one year of operation. The successful launch and operation of the Market could only be achieved with the exceptional guidance and support provided by the Authority of Public Services Regulatory (Authority) team. We take this opportunity to thank all the members of the Market Operator, Power Procurer, Transmission Company and the Authority for their hard work and relentless support.

Looking at the future ahead, the Market faces several challenges as it continues to evolve and mature. We are confident that the Market structure, Market Rules and Market Management System provide a healthy platform for an efficient transition to the Market. We look forward to leveraging the Oman Electricity Market benefits and its contribution towards the effective liberalization journey of the electricity sector.

Yaqoob bin Saif Al Kiyumi
Chief Executive Officer

SUMMARY OF KEY MARKET DATA

Yearly Average SMP:
8.100 OMR/MWh

Yearly Average Scarcity Price:
0.841 OMR/MWh

Total System Demand in the Year:
31.787 TWh

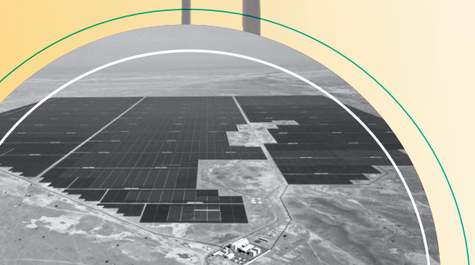
Renewable Energy Utilization in Oman Electricity Market Pool: 4.61%
Average System Available

Average System Available Capacity per Trading Period for the Year:
3356.16 MWh

Maximum System Available Capacity reached in a Trading Period in the Year:
4226.29 MWh

Average System Demand per Trading Period for the Year:
1781.29 MWh

Maximum System Demand reached in a Trading Period in the Year:
3,195.40 MWh



MARKET OVERVIEW

Market History

As per the Sector Law, the PWP is the single buyer of power in the Sultanate Oman. ensures that the need for power in the Sultanate of Oman is satisfied, at all times, at an economic basis. Power is purchased by from the Generators and then sold in bulk to the Licensed Supplier, which are responsible for supplying the electricity to the end consumers. Energy in the Main Interconnected System is transmitted from the Generators to the Licensed Distribution System Operator through a transmission system that is owned and operated by the Oman Electricity Transmission Company (the Transmission Company). The Transmission Company is also responsible for the economic dispatch of the system.

The electricity and related water sector (the Sector) is regulated by the Authority for Public Services Regulation (the Authority), which ensures compliance of all entities in the Sector with the Sector Law and the relevant government policies. The Authority issues a License or an Exemption for any entity seeking to perform any of the regulated activities under the Sector Law. The regulated activities include desalination of water, generation, transmission, distribution, supply, and dispatch of electricity, in addition to certain functions for which is licensed.

The procurement of electricity by PWP had been done through Power (and Water) Purchase Agreements (the P(W)PA) that are valid for a contracted period of 15 years for an independent power project. Since the early P(W)PA got closer to the end of their terms, the question as what to do with them was raised. A study conducted by PWP concluded that the optimal way to move forward entails having a revised tendering process in addition to introducing the Oman Electricity Market. Under the Oman Electricity Market, expiring P(W)PA can submit cost reflective offers for energy on a daily basis, and they are all paid the same price (System Marginal Price). The benefits of introducing the Oman Electricity Market include increasing the residual value of the plants after their P(W)PAs expire and ensuring that plants with higher efficiency

are prioritized in dispatch. In contrast, the Market would have PWP purchasing some electricity through a short-term market run each day, with prices for each half hour set each day based on what Generators have offered to sell.

Generators holding P(W)PA's, when the Market operations are initiated, are also required to submit offers into the Market. However, they are settled and invoiced as per P(W)PAs. In order to enforce participation in the Market, the Authority have modified the Licenses (or Exemptions) of the Parties under the Market Rules to include terms that require agreeing to the Market Rules Document, the Market Rules Procedures and Approved Methodologies. The Market Rules provide details that regulate all parts of the Market including the obligations on all Parties involved in the Market.

Industry Structure

The Original Parties to the Market Rules have signed a Framework Agreement as per the Market Rules requirements. In order for other Generators to participate in the Pool, they must become a Party to the Market Rules by registering its Production Facility and signed the Accession Agreement according with Market Rules.

All Generators in the Main Interconnected System of the Sultanate of Oman, are required to become a Party to the Market Rules and the arrangements therein (the Pool).

The Parties to the Market Rules are:

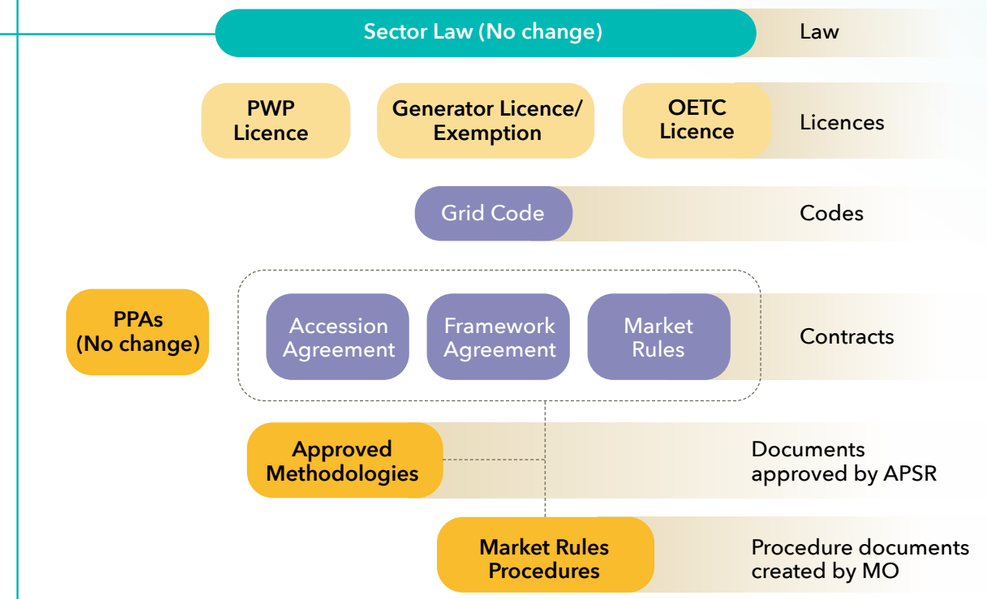
- The Generators
- PWP in its Capacity as Power Procurer
- PWP in its Capacity as Market Operator
- Oman Electricity Transmission Company in its Capacity as Transmission Company.

The Authority is not a Party to the Market Rules but is assigned certain functions under the Market Rules as prescribed under the Sector Law.

Any decisions rendered by the Authority in relation to the Market Rules are issued in accordance with the Authority's regulatory authority under the Sector Law and are therefore binding in nature.

The legal architecture of the market is shown in figure 1 below.

Figure 1: Market Legal Architecture



Market Operation

The Market processes occur in a daily cycle, with Generator offers submitted a day ahead. An Ex-Ante Market Schedule is produced by the Market Operator a day ahead, then Load Dispatch Centre (LDC) operated by the Transmission Company manages scheduling and dispatch of the Generators. The Market Rules does not include these LDC processes, which will continue to be governed by the Grid Code. There will be information flows including forecasts and generation schedules between the Market Operator and LDC. Final prices are calculated Ex-Post, with a single published energy price for each Trading Period within the day, based on the price of the marginal Generator.

Settlement will occur monthly. Market settlement amounts will be calculated for all Generators, but it is important to note that Settlement for Generators with current P(W) PAs will be excluded from actual Market settlement payments. These Generators will continue to be settled under the terms of their P(W)PAs, with the same P(W)PA prices and conditions, not under Market prices. Generators without P(W)PA will be paid based on Market prices. In the future there is potential for Generators with new forms of purchase agreement to have contracts that do not cover 100% of the plant output – they would then be paid partly under the purchase agreement, with the rest paid under the Market.

PWP acting as the Power Procurer will be the sole purchaser in the Market. In addition, electricity retail related issues such as consumer meter aggregation, profiling etc. are not part of the Market design.

The Market design uses complex Generator offers, with No Load Costs, and technical characteristics of the plant such as ramp-rates and minimum on and off times. Offers may also take into account CCGT configuration, and transitions between operating configurations. Offers are adjusted to reflect specified Economic Fuel Price, for ambient temperature, and for capacity used to provide ancillary services. Offers are submitted once a day, in the morning of the day ahead of the Trading Day. In exceptional circumstances (e.g. fuel supply outage) a Generator can update their offer. Generators will be required to submit offers that reflect their short run marginal costs, which for Generators with P(W)PAs will consist of prices consistent with their P(W)PA. Intermittent Generators will register as price-taker plant and submit a forecast of their output. The Market Operator will use all of the available offers, from Generators with and without P(W)PAs, to form the Market Schedule and prices, and will pass this information to LDC.

Along with energy payments, Generators may receive a Scarcity Price payment. This price is based on a defined amount of money allocated across the Trading Periods, reflecting the reserve margin (so Trading Periods when the System is tight will have higher payments). Money which is not paid out during the year may be available in an end of year reconciliation. Generators with current P(W)PAs will continue to be paid under the terms of their contract and will not be eligible for Scarcity price payments.

Transmission losses and constraints are not included in the Market. Ancillary services are not traded in the Market, though, as noted above, a Generator's energy offer may be adjusted to reflect capacity used to provide spinning reserve.

PWP acting as the Power Procurer will manage Market offers for contracted demand side management resources and is also responsible for demand adjustments in the Market to represent international power flows via interconnectors.

Market Operator Costs & Supporting Commentary

PWP has two distinct roles in the Oman Electricity Market: Market Operator and Power Procurer›s role. The Market Operator's part is as a service provider, administering the Market Rules and providing the platform for trading. The purchase of power under the Market Rules would remain the responsibility of in its Power Procurer role. There is regulatory «ring-fencing» between the two roles via the license and the Market Rules. has implemented the ring-fencing requirements to effectively separate the Market Operator from Power Procurer's.

The Market Operator costs are related to administering and operating the Market. There will be no power purchases or sales under the Market Operator as it does not take title to or pay for power under the Market Rules. Instead, the purchase of electricity under the Market will remain with the existing part of , the Power Procurer.

The Market Operator has dedicated staff and separate IT systems for operating the Market. The board, the chief executive officer, human resource and support services, finance, legal and regulatory compliance, and other functions of support the Market Operator.

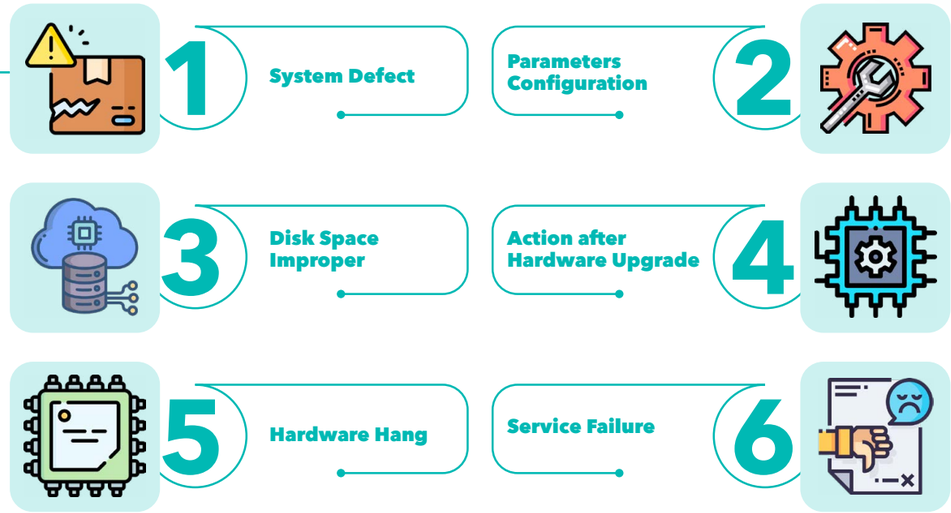
The Market Operator business has invested about RO 4.8 million in developing and implementing the Market Management System (MMS).

The Market Operator operating costs largely comprise staffing costs, training and travel expenses, internet and hosting services, third-party consultancy services, maintenance of the IT systems, depreciation of MMS, furniture, and equipment, and a share of allocation of the overall Power Procurer›s operating costs.

During 2022, the Market Operator incurred the operating expenses of OMR 1.8 million which includes direct operating expenses of OMR 0.6 million, depreciation and amortization OMR 1 million and common cost allocation of OMR 0.2 million.

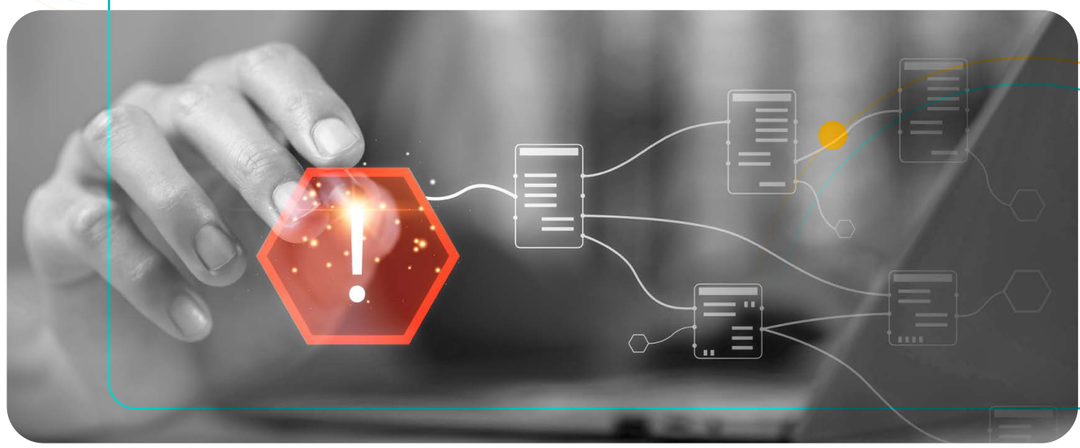
MMS Technical Overview

During the year 2022, technical issues related to the MMS were experienced. During such technical issues, all or some of the Parties could not access the MMS. The technical issues can be classified as:



Many corrective actions were implemented to prevent such issues in the future. This includes establishment of a planned outage form which lists all activities that are related to the outage and the tasks to be performed to make sure that the MMS is up and running. For the system defects, the Market Operator worked with the MMS supplier to deliver a new release in 2023 and did the required testing.

Also, preventive tasks have been introduced to mitigate the risk of issues.



MARKET GOVERNANCE

Market Advisory Committee (MAC)

The Market Advisory Committee (MAC) was established in the first quarter of 2022 for the purposes provided in the Market Rules Section C.5.

Specifically, the MAC aims to:

- Act (through a sub-committee established) as Dispute Review Committee in connection with a Settlement Dispute.
- Provide such advice or opinions as the Market Operator may (in its discretion) request in connection with any decision or action which the Market Operator proposes to take in accordance with the Market Rules.
- Co-ordinating the efficient consideration and discussion by Parties and any Prospective Parties of each Modification Proposal to facilitate the development and processing of that Modification Proposal.
- Assessing Modification Proposals and their impact on the Market Rules.

- Co-ordinating the efficient processing of Modification Proposals with proposed modifications of other industry documents (including the Grid Code), or with modifications of the Sector Law proposed by the Government and requesting that Modification Proposals are made by the Market Operator in order to reflect any changes that have been or are so proposed to be made to those documents.
- If requested, advising on whether Modification Proposal received are or are not compliant with the requirements of the Market Rules for Modification Proposals or are tenuous;
- Consulting on Modification Proposals as required.
- Compiling reports on Modification Proposals for the Market Operator.
- Recommending any changes that may need to be made to the Grid Code following a Modification Proposals.
- Identifying any related or consequential changes to the Market Rules Procedures (or any other procedures agreed in accordance with these Market Rules) which do not in themselves constitute Modifications that should be considered in respect of any Modification Proposal.

The current MAC members are:

Name	Entity
Mr. Talal Al Mahrouqi	MO Chair of MAC
Ms. Jehad Alghufaili	MAC Secretariat
Mr. Hassan Taqi	Authority
Mr. Sultan Al Rawahi	Transmission Company
Mr. Said Al Abri	Power Procurer
Mr. Yousuf Al - Waili	Al Batinah Power Company
Mr. Srinivas Vadlamani	Ad'Dhahirah Generation Comapny
Mr. Yaqoob Al - Harthi	Sohar Power Co

As per the Market Rules, Generators were provided with opportunity to elect their three representatives. Then final approval was obtained from the Authority. Other nominees were proposed by their respective organizations.

During 2022, four MAC meetings have been conducted:

Date

March 22, 2022	September 28, 2022
June 15, 2022	December 20, 2022

During these meetings several topics were discussed. Including:

- Introduction about Market, Market Rules, MAC roles & responsibilities and relevant business processes.
- MMS overview and architecture
- Rules governance and Modifications process
- Disputes resolution and sub-committees
- Challenges and incidents
- Direct sale framework

However, during 2022 there was no Modification Proposal or material Settlement Disputes raised to the Dispute Review Committee.

Decisions made by the authority in the year.

- Provided Parameter values to be used for 2022.
- Approval For Version Four (4) of the Market Rules and the associated Approved Methodology used to commence live operation of the Pool.
- A temporary derogation lasting one year from the requirement to develop the Economic Fuel Price Calculation Methodology and submit it to the Authority for approval.
- A temporary derogation to Power Procurer from Reserve Holding Adjustment Methodology up to October 2023.
- Approval for the proposed MAC members.
- The Authority provided the updated value of the Annual Scarcity Credit Cap (ASCC) and Reliability Price based on MO request in August 2022.

Pool Participants

The following table provides the details of participants in the Pool.

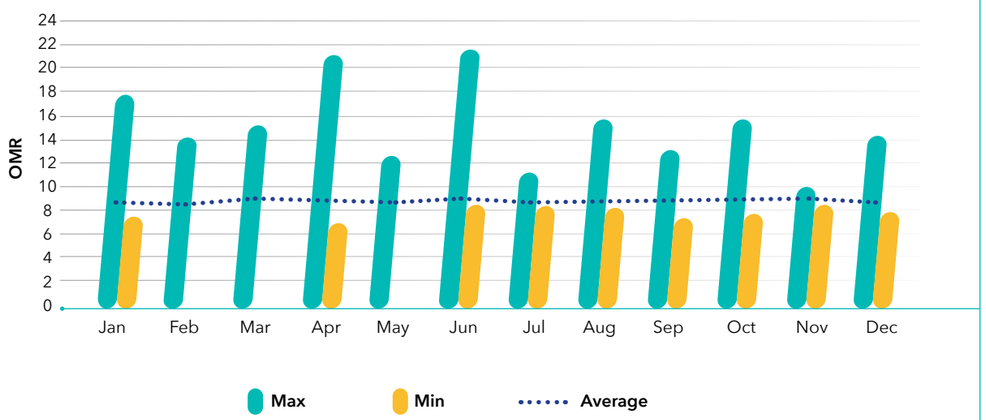
Project / Market Party Name	Project / Company Name	Role	Registered Capacity* (MW)	Registration	Withdrawal
				Effective Date	Effective Date
Barka II	SMN Barka Power Co. (SAOG)	Generator	708.97	1/1/2022	
Barka III	Al Suwadi Power Co. (SAOG)	Generator	736.53	1/1/2022	
Rusail 1	Rusail Power Co. (SAOG)	Generator	184.97	1/1/2022	10/31/2022
Sohar II	Al Batinah Power Co. (SAOG)	Generator	736.53	1/1/2022	
Sohar III	Shinas Power Company	Generator	1710.00	1/1/2022	
Ibri1	Ad-Dhahirah Generation Company	Generator	1509.00	1/1/2022	
PDO	Petroleum Development Oman	Auto-generator	150.00	1/1/2022	
Ibri2	Shams Ad Dhahira Generating Company SAOC	Generator	500.00	1/1/2022	
Sur1	Phoenix Power Co. (SAOG)	Generator	1981.80	6/7/2022	
Barka I	ACWA Power Barka (SAOG)	Generator	412.00	1/1/2022	2/8/2022
Sohar I	Sohar Power Co. (SAOC)	Generator	585.00	1/1/2022	5/15/2022

Overview of the year

By the end of 2022 the Registered Capacity in the Oman Electricity Market was 8,032.83 MW. Total energy generated in the Oman Electricity Market was 31.787 TWh, out of this around 4.61% was renewable energy specifically solar photovoltaic power. As of the 31st December 2022, there were seven (7) Generators and one (1) Auto-generator registered in the Oman Electricity Market. Note that the calculations are made in MWh per Trading Period of thirty (30) minutes commencing on the hour or half-hour.

Phoenix Power Company SAOG Joined the Oman Electricity Market on 07 June 2022 by singing the Accession Agreement to the Market Rules.

System Marginal Price



- SMP is calculated in each Trading Period to reflect the cost of the marginal MWh required to meet Pool Demand in a Trading Period within the context of an unconstrained schedule.
- Average SMP is almost constant throughout the year around 8.100 OMR/MWh which is an indication that demand is mostly met by the high efficient CCGT Pool Scheduling Units, low prices in Price Quantity pairs.
- Maximum SMP for the month of June is due to an Open Cycle Gas Turbine (OCGT) Production Facilities being scheduled at full offered capacity for a few Trading Periods with the maximum SMP reaching 21.884 OMR/MWh.

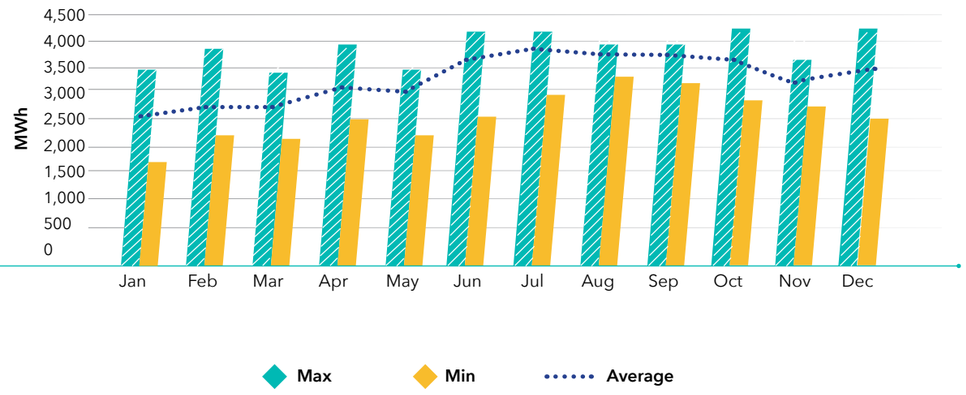
Scarcity Price

Scarcity Price payments are made on the basis of Availability of Certified Units and Metered Quantity for non-Certified units. The mechanism is intended to provide the highest Scarcity Charges to available units at periods with tightest margin between available capacity and the required capacity, in order to value the supply of capacity appropriately and incentivize Availability.

The Scarcity Price provides a spot value for capacity in each Trading Period expressed in OMR/MWh. The Scarcity Price is derived based on Reliability Price, Annual Scarcity Credit Cap and Scarcity Factor tables.

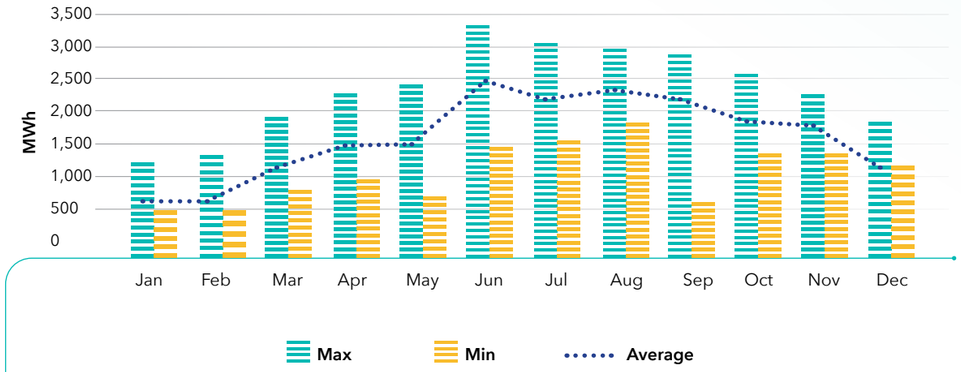
- Note that some Generators entered / exit the market during 2022 which affected the overall Scarcity Price average.
- The spikes from May to August and from October to November are within expected ranges due to the summer peak and for annual Production Facilities maintenance during October and November
- The higher average Scarcity Price in August is credited to the forced outage incidents occurred during the month
- The maximum Scarcity Price in July 2022 is due to a forced outage occurred for 3 generators concurrently.

System Available Capacity



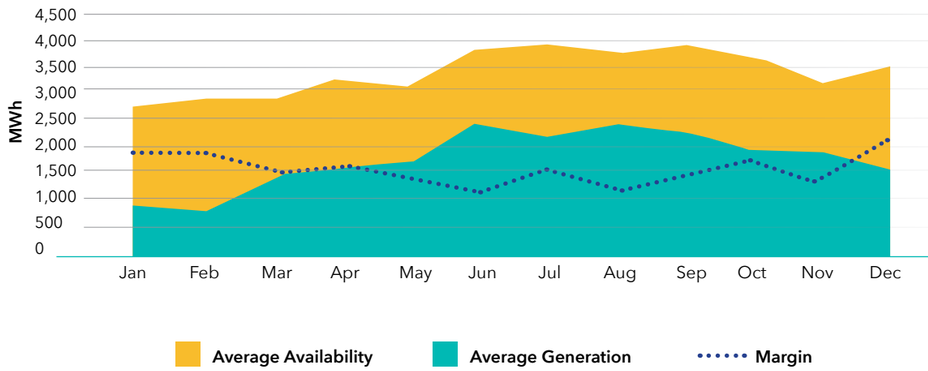
- System Available Capacity is the total Actual Availability of all Pool Participants at any Trading Period.
- The increase in the average system available capacity during the month of June 2022 is due to the joining of new Production Facility into the Pool.
- A minor decrease in System Available Capacity can be observed in October and November due to Production Facility annual maintenance.

System Requirements



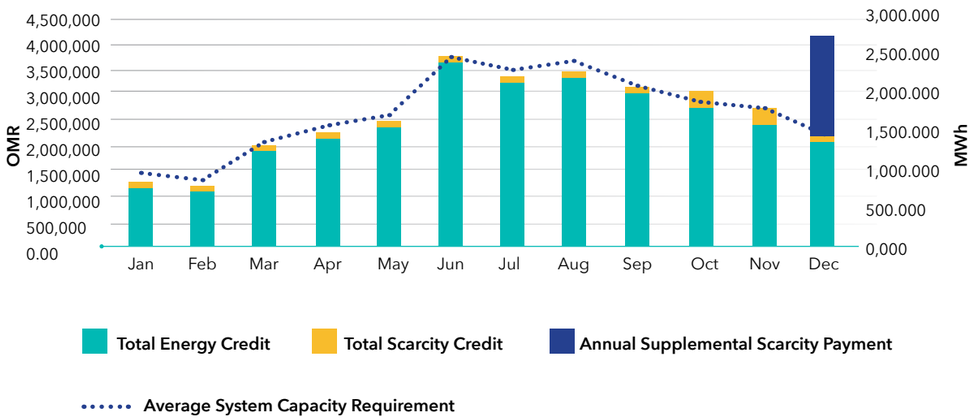
- System requirements is the amount of energy that is required for the System demand including the System reserve energy.
- The System capacity requirements increase during the summer months as expected.

System Margin



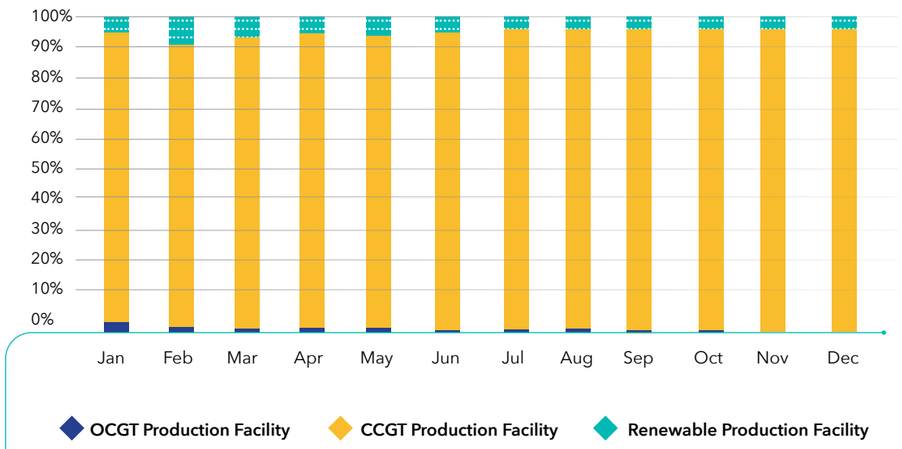
- The System margin is the proportion by which the total expected available generation exceeds the maximum expected level of electricity demand at each Trading Period. This margin is important as an insurance against occasional unexpected losses of power or surges in demand and is also used in the calculation of the Scarcity Price.

System Capacity Requirement & Total Cost



- The large jump in June for total Credit and Average Pool Demand is credited to the introduction of Phoenix Power Company on 07/06/2022.
- The increase of Scarcity Credit starting in September is due to the update of the Annual Scarcity Credit Cap in return increasing the payments given.

Monthly & Yearly Generation Mix



All production facilities in the Oman Electricity Market are conventional gas fired plants (OCGT and CCGT) except for Ibri II Solar. OCGT capacity is contributed by Al-Rusail.

*This Report is prepared and provided for general information purposes only. Oman Electricity Market does not represent that the information in this Report is accurate or complete and it should not be relied upon as such. In the presentation of charts, certain assumptions were made which may not be stated therein. As such, Oman Electricity Market assumes no responsibility or liability for any consequences, financial or otherwise, from matters where information in this report may be relied upon.

If you have any specific inquiries about this report or its contents, you should contact us at mo.support@omanpwp.nama.om

**OMAN POWER &
WATER PROCUREMENT**

Post Box: 1388, PC: 112
Ruwi, Sultanate of Oman

Tel: +968 2450 8400

Fax: +968 2439 9946

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