



OMAN POWER AND WATER PROCUREMENT COMPANY (SAOC)

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



15-5-5

TRAINING RIVE





DISCLAIMER

The Oman Electricity Market Annual Report 2023 is intended to provide an overview of the Oman Electricity Market (Market) activities and performance during the year 2023 (Market Annual Report). It does not form part of the Market Rules, nor does it create any rights or obligations related to the Market Rules. This Annual Report shall not substitute the provisions of the Market Rules.

The Market Annual Report should be read in conjunction with the Market Rules and any person that is a Party or seeks to become a Party to the Market Rules must refer to the Market Rules and the Electricity Sector Law to understand their obligations and provisions.

Capitalised terms used in the Market Annual Report 2023 shall have the same meaning as set in the Market Rules.

Where there are any discrepancies between the Market Annual Report and the Market Rules, the provisions of the Market Rules shall prevail. Also, in the case of discrepancies between the Market Annual Report and any published data on the Oman electricity market website, the provisions of the website data shall prevail.

Oman Electricity Market Annual Report 2023 is prepared based on version 4 of the Market Rules.



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 d 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.





Ahmed bin Salim Al Abri Acting Chief Executive Officer

CEO'S FOREWORD



Dear Industry Members,

The Oman Electricity Market has successfully concluded the second year of operations. The Market Operator function within PWP streamlined all the day to day market operation requirements and activities. The market continued to provide trust and confidence and to provide a base to support liberalisation journey of Oman electricity sector. Moreover, the market contributes to the enhancement of availability signals, dispatch efficiency, transparency and provides more efficient operation incentives. Furthermore, the market can play a role into the efficient integration of renewables and demand side resources in future. The market also provides the generator with greater transparency in the treatment of expiring P(W)PAs.

The Market has performed well with steady growth in the local economy, the market peak demand closed 3.3% higher than 2022. Also, there is a significant increase in total Pool Demand in the market compared to 2022. During 2023, the average SMP has slightly increased by 3.9% compared to 2022 to reach a value of 8.4 OMR/MWh which is an indication that the demand is mostly met by the high efficient CCGT Pool Scheduling Units. However, there has been quite a significant increase in Scarcity Prices in 2023 due to several reasons explained in the report.

In the operating year 2023 all the market participants have built better capabilities and experience to fulfill the operational requirements of the market. Also, there has been an increase in the available information and data provided to market participants, investors and consumers, which can be utilized in future studies and decisions. Moreover, the Market Scheduling Software was certified by a third party, proving its sophistication and accuracy of scheduling and settlement results. This certification will provide more confidence to market participants and future prospective parties.

In 2023 OEM continued to play an important role in ensuring competitiveness in Oman Energy sector by encouraging real-time efficient operation. The competitiveness of the market encourages Generators to minimize their operational costs and to ensure correct decisions are made to enhance efficiency in the future.

PWP leadership team will continue the support to OEM to accelerate transition to the market, resolve all the challenges and also to leverage more benefits out of the market.

SUMMARY OF KEY MARKET DATA





MARKET HISTORY

The Oman Power and Water Procurement Company SAOC (PWP) is responsible for procuring new capacity for power and water in the Sultanate of Oman in accordance with the requirements of the law for the regulation and privatization of the electricity and related water sector promulgated by Royal Decree 78/2004 (Sector Law) as amended and PWP License. PWP ensures that the need for power in the Sultanate of Oman is satisfied, at all times, at an economic basis. Power is purchased by PWP from the Generators and then sold in bulk to the Licensed Suppliers, which are responsible for supplying the electricity to the end consumers.

The electricity and related water sector (the Sector) are regulated by the Authority, which ensures compliance of all entities in the Sector with the Sector Law and the relevant government policies. The Authority issues a Licence 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 PWP is licensed.

The procurement of electricity by PWP had been done through Power and WaterPurchase Agreements (the P(W)PA) that are valid for a contracted period of 15-20 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. The introduction of the Oman Electricity 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

The benefits of introducing the Oman Electricity Market includes

- **Improve dispatch efficiency:** increasing transparency and highlighting situations where the dispatch of generators diverges from an unconstrained optimal dispatch. This will result in reducing the consumption of fuel for power generation, reducing the variable operation and maintenance cost and improving network utilization.
- **Base for future market liberalization:** functioning wholesale market would support / expedite liberalization activities of Oman electricity sector.
- Enhance residual values and transparency of the treatment of expiring P(W)PAs: the market would further clarify post contract revenue opportunities for generators and lower the prices offered by generators in PWP procurement for new capacity.
- Provide a vehicle for uncontracted and unconventional capacity including back-up GTs, demand response, renewable, generation facility which cannot participate in PWPs regular project development tenders and excess emergency level capacity to contribute to meeting demand and operating reserve requirements and would provide flexibility for new entrants to develop the most efficient new plant.
- **Real time operation:** The market would incentivize generators to operate in response to real time system needs as opposed to only meeting contractual responsibilities, resulting in more efficient asset utilisation.
- Improve Availability signals: decease in forced outage rates overall or during critical peak periods which will eventually enable Oman to maintain the same level of reliability with a lower reserve margin.
- More efficient operation incentives: relaxing operating constraints (such as minimum run and minimum down times). Improve response to market signals and adjust operation.
- **Greater flexibility offered to potential new IPP developers** e.g. larger eventual plant size, if IPP is unsuccessful in tender, it can consider other options (new technology, co-generation, etc).

Generators holding P(W)PA's and connected to MIS, are also required to submit offers into the Market. However, they are settled as per P(W)PAs. To enforce participation in the Market, 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 of all Parties involved in the Market.

INDUSTRY STRUCTURE

The 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 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 do 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 as Ex-Post step, 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 the actual Settlement for Generators with current P(W)PAs will be managed via PPA payment not via 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 consider CCGT configuration, and transitions between operating configurations. Offers are adjusted to reflect specified Economic Fuel prices, 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 with very controlled process (e.g. fuel supply outage) a Generator can only update their offer after gate closure. 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 AND 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 PWP in its Power Procurer role. There is regulatory "ring-fencing" between the two roles via the PWP license and the Market Rules. PWP 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 PWP, 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 PWP 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 2023, the Market Operator incurred 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 2023, three releases have been deployed for the Market Management System (MMS) to address and fix some defects that have been highlighted. There were three IT failures that affected the availability of the MMS. The main causes of these defects are server hang, third-party certificate expiration and loss of communication between internal services.

Many corrective actions were implemented to prevent reoccurrence of such issues in the future. This includes the 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. Also, preventive tasks have been introduced to mitigate the risk of issues.

Robinson Bowmaker Paul (RBP) was engaged by PWP to act as an independent market auditor to review and certify the Market Scheduling Software; verifying compliance with the Market Rules and also the compliance with the Scope of Work (SOW) between PWP and the MMS supplier.

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. MAC continue to proceed their role and contribution to the Market.

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.

Name	Representation		
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	Generators		
Mr. Srinivas Vadlamani	Generators		
Mr. Yaqoob Al - Harthi	Generators		

The current MAC members for the period of 2024-2025 are:

The process of selecting new MAC members for the period of 2024-2025 started by the 4th quarter of 2023. So, as per the Market Rules, Generators were provided with the opportunity to elect their three representatives. Then final approval was obtained from the Authority. Other nominees were proposed by their respective organizations.

During 2023, four MAC meetings have been conducted as per the following dates:



DECISIONS MADE BY THE AUTHORITY IN THE YEAR

- Provided Annual Market Parameter Values to be used for the year 2024.
- Approval of the Nominated Members for Market Advisory Committee Years 2024-2025.
- Authority's approval in relation to the vendor of the annual market audit.
- Authority's approval in relation to performing the Additional Pool Run.

MARKET PERFORMANCE & POOL PARTICIPANTS

POOL PARTICIPANTS

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

Project / Market Party Name	Project / Company Name	Role in MR	Registered Capacity* (MW)	Registration	Withdrawal
				Effective Date	Effective Date
Barka II	SMN Barka Power Co. (SAOG)	Generator	708.97	01/01/2022	
Barka III	Al Suwadi Power Co. (SAOG)	Generator	736.53	01/01/2022	
Sohar II	Al Batinah Power Co. (SAOG)	Generator	736.53	01/01/2022	
Sohar III	Shinas Power Company	Generator	1710.00	01/01/2022	
Ibri I	Ad'Dhahirah Generation Company	Generator	1509.00	01/01/2022	
PDO	Petroleum Development Oman	Autogenerator	150.00	01/01/2022	14/05/2023
Ibri II	Shams Ad Dhahira Generating Company SAOC	Generator	500.00	01/01/2022	
Sur I	Phoenix Power Co. (SAOG)	Generator	1981.80	07/06/2022	



OVERVIEW OF THE YEAR

By the end of 2023 the Registered Capacity in the Oman Electricity Market was 7,882.83 MW. Total energy generated in the Oman Electricity Market was 36.37 TWh, out of this around 4.3% was renewable energy specifically solar photovoltaic power. As of the 31st December 2023, there were seven (7) Generators 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.



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 monthly SMP is almost constant throughout the year around 8.4 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. This year Average SMP is higher than 2022 by 3.9% due to increase in demand and Economic Gas Price increase as well.
- Maximum SMP observed on March, June, October and November due to the many reasons and main factors due to a gas turbine at a Production Facility being scheduled at full offered capacity for one Trading Period due to a quick increase in demand for a few Trading Periods, force outage in two big plants and also due to the planned outage during October and November.



SCARCITY PRICE

Scarcity Price payments are made based on 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 System Capacity Requirement, 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. Nevertheless, all these parameters are published in the Market website in yearly basis.

- Note that compared to the previous year, all Generators have their Availability certification as per the Availability Certification Methodology, allowing them to receive the full Scarcity payments. Accordingly, this has significantly affected the Scarcity payment of last year and henceforth this can not be compared with this year due to the different approach which has been adopted.
- 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 high demand and outage that occurred during the month.
- The maximum Scarcity Price in June 2023 is due to a forced outage of a large CCGT power plant during peak demand in the day. In regard to October and November, forced outages occurred during planned outages causing the high maximum Scarcity pricing.



SYSTEM AVAILABLE CAPACITY



- System available capacity is the total Actual Availability of all production Blocks at any Trading Period.
- A minor decrease in System Available Capacity can be observed in January, February, October, November, and December is due to Production Facility annual maintenance. Annual maintenance is done in the cold months, winter period, as expected demand is lower than the rest of the year.



SYSTEM CAPACITY REQUIREMENT & TOTAL COST

- System Capacity Requirement is the amount of energy that is required to meet the System demand excluding the System Export.
- The System Capacity Requirement increase during the summer months as expected.





• 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, (i.e., total system availability minus Pool Demand). This margin is important to cater for occasional unexpected losses of power or surges in demand. The system margin also used in the calculation of the Scarcity Price, the tighter the system margin is, the higher the Scarcity Price is exponentially.







- The large jump in Scarcity Credit during the second half of the year is due to tighter supply and demand during summer months and Planned outages from October until the end of the year.
- The increase of Scarcity Credit starting this year is due to all Pool Participants being fully certified for their availability as per the Availability Certification Methodology. Last year their Scarcity payments were based on meter data output rather than their actual availability as they were not certified.



MONTHLY AND YEARLY GENERATION SHARE

All production facilities in the Oman Electricity Market are conventional gas fired plants (OCGT and CCGT) except for Ibri2 Solar.



- The Generation share represents the Market Schedule Quantities and not the actual power units generation.
- The share of Ibri 2, solar plant, is almost same as the previous year. Sohar3 had slight increase in share compared to last year. Sohar2 had less share for 2023 compared to last year.
- As expected, the most efficient Production Facilities with best technical and commercial offer parameters get the highest share.

OMAN POWER AND WATER PROCUREMENT COMPANY (SAOC)

Principal place of Business

Muscat Grand Mall, Tilal Complex, 5th Floor Al Khuwair, Muscat, Sultanate of Oman.