

OMAN ELECTRICITY TRANSMISSION COMPANY SAOC.

Member of Nama Group

OETC-Spot Market Methodology- 001 Curtailed Quantity Methodology

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Document Information

Document Title	Curtailed Quantity Methodology		
Document Number	OETC-Spot Market Methodology-001	Revision Number	1
Document Originator	Load Dispatch Center (OETC)		
Review Frequency	Whenever change request is approved	Effective Date	09-07-2025

Document Authorisation

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Approval APSR	(Reference Letter)		

Document Revision History

Revision Number	Revision Date	Revision Description
Draft	15/04/2018	Draft prepared for OETC internal review Discussed with OPWP on 12/5/2018
Draft	28/8/2018	Revised based on comments. Sept 2018 sent to AER for comments.
Draft	1/3/2020	Revised based on AER comments received Nov 2019.
Draft	1/5/2020	Revised further based on comments from AER and OPWP.
Final	15/10/2020	Revised further based on OPWP comments and Grid Code ver-3
Rev.1	23-06-2025	Revised based on Market Audit 2024

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1. PURPOSE

This document is the Curtailed Quantity Methodology prepared by the Oman Electricity Transmission Company (OETC) in accordance with Section [K.2.3.1] of the Market Rules and approved by the Authority of Electricity Regulation (AER).

Section K.2.3.1 of the Rules for Electricity Market of Oman (the Market Rules) requires the Oman Electricity Transmission Company (OETC) to prepare, as an Approved Methodology, a methodology for the purpose of determining a value for the Curtailed Quantity of a Price Taker Production Unit for each Trading Period h of a Trading Day d for the purpose of the Ex-Post Market Schedule Runs for Trading Day d .

2. MARKET RULES PROVISION

Interested parties should read this statement in conjunction with the Market Rules and in particular Section K. This Approved Methodology has been produced in accordance with the provisions of the Market Rules. In the event of an inconsistency between the provisions of this Statement and the Market Rules, the provisions of the Market Rules shall prevail.

3. REVIEW PROCEDURE

OETC may review this Approved Methodology from time to time and make changes, subject to the AER approval in accordance with Market Rules Section C.7.3.

4. DEFINITIONS AND INTERPRETATION

Save as expressly defined, words and expressions defined in the Market Rules shall have the same meanings when used in this Approved Methodology. The rules of interpretation set out in Section B.3 of the Market Rules shall apply in the interpretation of this Approved Methodology.

References to particular sections relate internally to this Approved Methodology unless specifically noted. References to Market Rules sections are to the relevant sections of the Market Rules.

Abbreviation	Expansion	Reference
OETC	Oman Electricity Transmission Company	
LDC	Load Dispatch Centre	
SCADA	Supervisory Control and Data Acquisition System	
CQ _{uh}	Curtailed Quantity of Pool Scheduling Unit u in Trading Period h	Market Rules B 5.2.1 & K 2.3
SOP	System Operation Procedure	
SDC	Scheduling and Dispatching Code	Grid Code

Term	Definition	Reference
Curtailed Quantity	means, in relation to a Price Taker Production Unit in a Trading Period h, the quantity of Output which the Transmission Company estimates in accordance with the Curtailed Quantity Methodology could have been Generated if its operation was unconstrained	
Curtailed Quantity Instruction	An instruction issued by LDC to a Price Taker Production Unit to reduce output by a specific quantity, specified in MW output.	
Price Taker	A Production Unit is a Price Taker if any of the GenSets comprised in the Production Unit is not Fully Dispatchable	Market Rules E 2.7.2
Fully Dispatchable	means subject to the procedure of Central Dispatch by the issue of Dispatch Instructions of the kind which may require a change in "the Active Power or Reactive Power Output of a Synchronous Centrally Dispatched Generating Unit including a Desalination Unit" as provided for in SDC2.4.2 of the Grid Code.	Market Rules B 2.1.1
Trading Period	A Trading Period is a period of 30 minutes commencing on the hour or half-hour.	Market Rules I 5.3.1
Optimisation Horizon	In respect of a Trading Day d, the Optimisation Horizon is the time period from 00:00 on the Trading Day d up to 03:00 on the subsequent Trading Day d+1 over which a Market Schedule Run is performed	Market Rules I 5.2.1

Deemed Energy (MWH)	is the energy that would have been produced by the Price Taker if it hadn't been curtailed by OETC and it's calculated by the factor of irradiance in a function that's agreed between the Price Taker and the Power Procurer in PPA.	
Plant capped energy	is the maximum energy contractually that can be produced by the price taker in Trading Period (TP)	

5. COMPLIANCE WITH APPROVED METHODOLOGY

Compliance with this Approved Methodology is required under the terms as set out in the Market Rules. This Approved Methodology does not create any additional rights or obligations.

6. SCOPE

This methodology applies to the following parties (as per the Market Rules)

Party	Scope	Remarks / Market Rule ref.
Oman Electricity Transmission Company (OETC) (Transmission Company)	Preparation of this methodology for approval Review and revision as per approved procedures	Ref. C 7.3
	Issuing curtailment instruction as part of dispatch process, in accordance with Grid Code	As per SDC 2 of the Grid Code. Not covered under this methodology.
	Maintaining Curtailment records	As per internal business procedures and tools
	provide the quantity of Curtailed Quantity (CQ_{uh}) in each Trading Period h in Optimisation Horizon o , associated with Trading Day d , by 12:00 one day after Trading Day d to the Market Operator	Calculation based on this methodology Ref. K.2.3.2

Market Operator-MO (Oman Power and Water Procurement Company)	Consultation with OETC on the methodology	Ref. C.7.3.4
Market Operator (Oman Power and Water Procurement Company)	Receive data on the Curtailment Quantity (CQ _{uh}) provided by Transmission Company	Ref. K.2.3.2
Authority for Electricity Regulation-Oman	Approve this methodology, issue directions for any review or modifications	Ref C 7.3
Power Procurer-OPWP		

Specifically, Load Dispatch Centre (LDC) of OETC is responsible for operational implementation of this methodology.

7. IMPLEMENTING CURTAILMENT INSTRUCTIONS

OETC schedules and dispatches generation units in the system in accordance with Scheduling and Dispatch Code (SDC1,2 &3) of the Grid Code.

SDC 1 deals with Generation and Desalination Scheduling

SDC 2 deals with Generation and Desalination Dispatching

SDC 3 deals with Frequency Control.

In particular, SDC 2.4.2 of Grid Code version 3 (Current version) states that

Dispatch Instructions relating to the **Schedule Day** shall be issued at any time during the period beginning immediately after the issue of the **Generation Schedule** and **Desalination Schedule** in respect of that **Schedule Day**.

A **Dispatch Instruction** given by **OETC** may require:

- a change in
 - the **Active Power** or **Reactive Power Output** of a **Synchronous Centrally Dispatched Generating Unit** including a **Desalination Unit**;
 - the **Reactive Power Output** of an **Wind Farm Power Production Facility** or **Solar Power Production Facility**;
 - the mode of **Operation** or an instruction to provide an **Ancillary Service** by a specific **Centrally Dispatched Generating Unit** or a **Wind Farm Power Production Facility** or **Solar Power Production Facility**; or
- an instructed reduction in, or cessation of, **Output** from a **Wind Turbine Generating Unit** or **Solar Generating Unit**.

The Grid Code version 3 does not mention "Price Taker" units. However, SDC 1.1 states that

For the avoidance of doubt, **OETC** does not intend to **Schedule** or fully **Dispatch Wind Farm Power Production Facilities** or **Solar Power Production Facilities** but requires to be informed on an exceptions basis if part or all of the **Plant** is not **Available** for reasons other than climatic conditions. Specific reporting forms for each installation will be agreed between **OETC** and the **Power producer**. The timing will follow that set out in Appendix A to this **SDC1**.

- The dispatch instructions will be issued as per SDC 2.4.2
- LDC issues instructions to Price Taker Production Units to reduce or cease outputs of such Production Units in special circumstances (example: high frequency or transmission constraints). Such instruction is interpreted as “Curtailed Quantity Instruction” for the purpose of this methodology.

A Curtailed Quantity Instruction is issued to a Price Taker Unit. Typical format given below.

Curtailed Quantity Instruction no.	
Date:	
Time:	
From:	OETC LDC
To:	Price Taker Production Unit (Name)
Applicable for the period	From: To:
Applicable for the Unit	
Maximum generation output in MW	
Reason	
Time of instruction issued	
Time of instruction cancelled	
Instruction issued by LDC Control engineer	Name: Signature:
Compliance confirmation from Price Taker Unit	Complied from ---- to --- Name: Signature:

The instructions (both start and end of curtailment periods) are issued by phone and recorded in Electronic Dispatch Logger Price Taker. Confirmation by e-mail is required as soon as possible, usually expected within an hour after the cancellation of the instructions.

8. CALCULATION OF CQ_{uh} FOR EACH TRADING PERIOD

The Market Rules require that CQ_{uh} should be calculated for each trading period in MWh.

CQ_{uh} = Curtailed Quantity of Pool Scheduling Unit (u) in Trading Period (h) in Optimization Horizon (o) associated with Trading Day (d).

Projected Net Power Output **Deemed Energy (MWH)** is the energy that would have been produced by the Price Taker if it hadn't been curtailed by OETC and it's calculated by the factor of irradiance in a function that's agreed between the Price Taker and the Power Procurer in PPA.

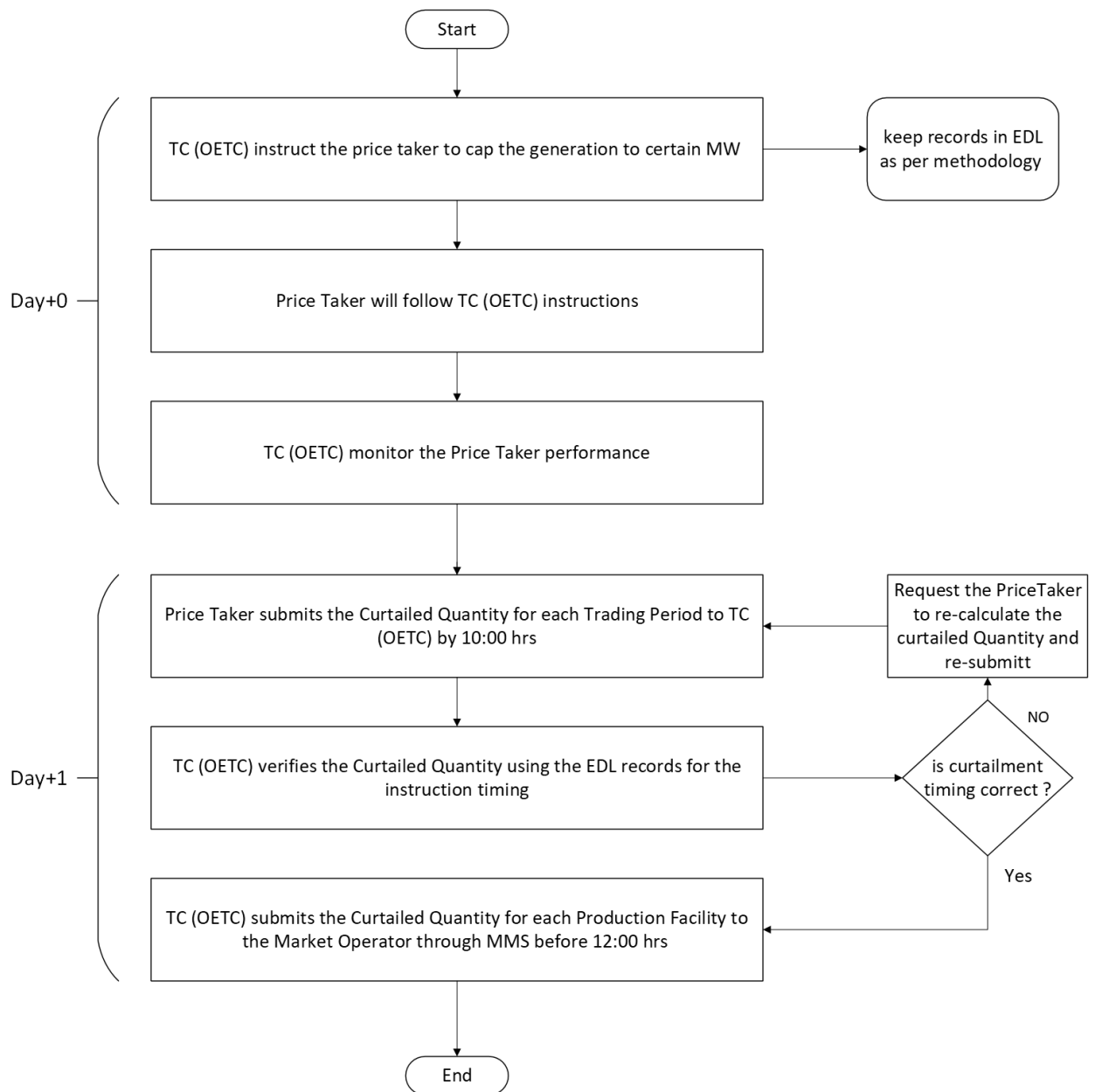
The following procedure applies for calculating CQ_{uh} .

- At this stage, each Price Taker Unit is considered as one unit, but the methodology can be modified to add further units.
- The Curtailed Quantity in MWh is calculated by the Price Taker for each Trading Period as per **Deemed Energy** calculation.
- The production facility (Price Taker) is to consider Transmission Company (OETC) instruction timing and their curtailment quantity calculation.
- For each Trading Period, the Price Taker is to obtain its Curtailed Quantity from the Deemed Energy MWH (Deemed Energy) Meter Quantity MWH

$$CQ_{uh} = \text{Deemed Energy (MWH)} - \text{Meter Quantity MWH}$$

- D+1 each Price Taker submits the Curtailed Quantity for each Trading Period to TC (OETC) by 10:00 Hrs.
- D+1 Transmission Company verifies the Curtailed Quantity using the EDL records for the timing instruction (start and end time) and the (Meter Quantity MWH + Curtailed energy) is less than or equal the Plant capped energy.
- D+1 Transmission Company submits the Curtailed Quantity for each Production Facility to the Market Operator through MMS before 12:00 hrs.

9. FLOW CHART



Example of Curtailment implementation of Price Taker plant with a registered capacity of 500 MW. This is typically based on logbook records (EDL).

Maximum output instruction is to be as follows:

Time	Dispatch instruction
(08:09 - 08:56) hrs	Maximum output 200 MW
(08:56 - 11:07) hrs	Maximum output 250 MW
(11:07 - 11:59) hrs	Maximum output 300 MW
(11:59 - 12:42) hrs	Maximum output 350 MW
(12:42 - 13:44) hrs	Maximum output 400 MW

The table below shows the plant submission to OETC describing the plant availability (total energy produced in MWH), Deemed Energy and curtailed Energy.

Time Stamp	Deemed Energy (MWH)	Capped Deemed Energy (MWH)	Meter Quantity (MWH)	Curtailed Energy (MWH)
6:30	0.00000	0.00000	0.00000	0.00000
7:00	43.06000	43.06000	41.22000	0.00000
7:30	114.98000	114.98000	113.38000	0.00000
8:00	188.16000	188.16000	185.22000	0.00000
8:30	239.69000	239.69000	170.41000	69.28000
9:00	256.37000	250.00000	101.88000	148.12000
9:30	266.25000	250.00000	125.63000	124.37000
10:00	270.65000	250.00000	125.59000	124.41000
10:30	277.23000	250.00000	125.78000	124.22000
11:00	278.33000	250.00000	126.13000	123.87000
11:30	279.72000	250.00000	143.09000	106.91000
12:00	280.31000	250.00000	150.59000	99.41000
12:30	276.31000	250.00000	173.31000	76.69000
13:00	277.46000	250.00000	187.50000	62.50000
13:30	275.37000	250.00000	200.09000	49.91000
14:00	277.91000	250.00000	217.28000	32.72000
14:30	275.91000	250.00000	252.91000	0.00000
15:00	262.65000	250.00000	253.31000	0.00000

Time Stamp	Deemed Energy (MWH)	Capped Deemed Energy (MWH)	Meter Quantity (MWH)	Curtailed Energy (MWH)
15:30	267.25000	250.00000	252.78000	0.00000
16:00	251.73000	250.00000	245.63000	0.00000
16:30	235.13000	235.13000	228.28000	0.00000
17:00	181.37000	181.37000	173.09000	0.00000
17:30	106.58000	106.58000	102.00000	0.00000
18:00	38.66000	38.66000	37.50000	0.00000
18:30	0.00000	0.00000	0.00000	0.00000

10. REFERENCES

- Grid Code
- Market Rules

**Meter
Quantity
(MWH)**