Chapter 3

Open Access Scenario

3.1 Introduction

As per the Indian Electricity Act 2003, the term Open Access is defined as [5] "*the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the appropriate commission*".

Concept behind Open Access is to provide reliable and quality power supply by offering competitive environment in energy market and giving freedom to the consumers to select the energy supplier. Open Access by the way of intra and inter-state power purchases, when availed on short term basis, becomes the way of balancing surplus and scarcity of electricity. The categories of Open Access transactions are: Long Term Open Access (LTOA), Medium Term Open Access (MTOA) and Short Term Open Access (STOA) [83]. Power Trading Corporation (PTC) of India is functional for long term open access (LTOA) since long. The energy exchanges namely Indian Energy Exchange (IEX) and Power Exchange of India Limited (PXIL)

are operational since 2008 for STOA [84]-[85]. All the power supplying and consuming entities can take part in energy market trading by the way of either bilateral or collective transactions.

Open Access is granted in phase wise manner in India. In phase one, consumers having contracted demand more than 5 MW had been given permission for trading [53]. In phase two, consumers with more than 1 MW contracted demand are granted permission. Considering the case of Gujarat state, the consumers having demand above 100 kVA have been given supply at 11 kV. As the maximum capacity of 11 kV feeders is 4 MVA (it is said to be 3.2 MW at 0.8 power factor), the consumers having demands above 4 MVA are connected to 66 kV. Hence, the consumers having connection at and above 11 kV i.e. 11 kV, 66 kV or 132 kV are given permission for Open Access considering the phase 2 condition of Open Access regulation [70]. At these voltage levels, only industrial and few commercial consumers are connected.

3.2 Open Access Charges

The Open Access consumers are from industrial category as they only have contracted demand more or equal to 1 MW. Such consumer pay more Average Billing Rate (ABR) than the actual Cost-of-service (CoS) [70]. Due to open market option, such highly charged consumers deviate from Discom supply for availing cheaper electricity. Due to such voyage, utility faces revenue loss. To compensate for such loss, Open Access consumers are levied upon various charges to utilize the existing network for having electricity access [53]-[54]. It is mandatory for the utility to reduce such charges to boost the open market as per the provisions of National Tariff Policy [3] and

hence, consumers have to bear these charges for time being.

The various Open Access charges levied on consumers are divided as per:

- Point of Connection (PoC) and State T&D loss
- Network Usage & System Operation
- Cross Subsidy Surcharge (CSS)
- Renewable Purchase Obligation (RPO)

3.2.1 Point of Connection, State T&D loss

The PoC losses and corresponding charges are modified on quarterly basis by the central authority [86]. The state T&D losses are also to be shared "in kind" by the buyers and sellers [83]. Table 3.1 shows the average PoC loss and state T&D loss for last 4 years for Gujarat state [87]-[88]. As the PoC component of Short Term Open Access has been separated from Long Term Open Access and Medium Term Open Access in recent few years, no past data prior to 2014 has been shown. Depending upon the percentage loss component, the amount gets reflected in [56] to calculate corresponding Open Access charges.

3.2.2 Network Usage and System Operation

Transmission charges are considered as the carriage charge. The wheeling charges are levied on the consumers for utilization of the distribution network when power is purchased from supplier other than utility. They are mentioned in the tariff orders passed by the state electricity regulatory commission on yearly basis [87].

Table 3.1: Losses in network as per various voltage levels in Gujarat state

Loss due to	**2014**	**2015**	**2016**	**2017**
PoC	1.7%	1.7%	1.8%	1.8%
State Transmission	4%	4%	4%	3.66%
Wheeling, 400 V	16.45%	15.98%	15.98%	14.24%
Wheeling, 11 kV	10%	10%	10%	10%
Wheeling, 66 kV and above	0	0	0	0

The consumers have to take prior permission from the concerned authority as per inter and/or intra-state Open Access regulations. They have to pay certain amount in form of application fee, network usage charge and daily charges of operation to SLDC, RLDC and NLDC as applicable. Commission is to be paid to energy exchange for energy trading.

The additional surcharge is levied on consumers to recover the cost of long term Power Purchase Agreement (PPA) contracts made by utility. It is modified on half yearly basis.

3.2.3 Cross Subsidy Surcharge

When high end consumers deviate to open market, Discom loses the cross subsidy component availed from them. This subsidy amount pays a major role in Discom revenue. To compensate for the same, cross subsidy surcharge is levied on the consumers who opt for Open Access. Amount of this surcharge has been derived using the formula given in eq.(3.1) [3]-[70].

$$S = T - \frac{C}{1 - L/100} + D \tag{3.1}$$

Where,

S Surcharge to be paid by the consumer category under consideration

T Average Discom Tariff for the category of consumer

C Weighted Average cost of power purchase considering top 5% of power excluding liquid fuel based generation

L Percentage loss of the network applicable at specific voltage level

D Wheeling charges for utilization of network

As per [3], it had been proposed to progressively reduce the Cross Subsidy Surcharge to enhance market completion by reducing burden of surcharge payment on consumers. But looking to the past few years' trend, the surcharge is increased. From the tariff orders of MGVCL [87], it has been observed that the value of Cross Subsidy Surcharge calculated was very high for 2016 and 2017. Hence, the surcharge was set 20% of the value when Open Access started. Table 3.2 shows the various Cross Subsidy Surcharge applicable to the HT consumers of Gujarat state from 2013 to 2017 [87].

Table 3.2: Cross Subsidy Surcharge for HT consumers

Year	**2013**	**2014**	**2015**	**2016**	**2017**
Cross subsidy surcharge, Rs/kWh	0.45	0.39	0.59	1.45	1.44

3.2.4 Renewable Purchase Obligation

As per the Electricity Act 2003 and National Action Plan for Climate Change (NAPCC), it was mandatory for all the State Electricity Regulatory Commissions (SERC) to made Renewable Purchase Obligation (ROP) and Renewable Energy Certificate (REC) framework to promote renewable energy

generation [89]. Under this framework, it was mandatory for all the distribution licensees, captive plant users having no renewable generation and all the Open Access consumers to purchase REC based on the defined percentage of energy consumption [90]. The per unit cost of two types of RPO i.e. Solar and non-Solar, is included in the overall Open Access charge calculation [84].

Table 3.3 shows the net open access charges levied on a buyer on day ahead basis for the state of Gujarat [56].

Table 3.3: Net Open Access charges for 3 MW load at 11 kV for 24 hr of trading on Day-Ahead basis

Open Access charges for April-2017	**Rs/kWh**
PoC	0.24
State transmission	0.34
Distribution	0.14
Cross subsidy surcharge	1.44
Additional surcharge	0.49
RPO (NS)	0.12
RPO (S)	0.06
IEX charges	0.02
NLDC, SLDC application etc	0.04
Net charges	**2.89**

3.3 Effective Cost-of-Supply to the Consumer

The effective price / landed cost is the summation of market price, net Open Access charges and the loss component "in kind" [83] which is calculated based on the supply/energy injection voltage level as mentioned in Table 3.1 [87]. Accordingly, the cost of electricity (landed cost) offered to the buyer availing Short Term Open Access (STOA) having load of 3 MW and 25 MW for 24 hour trading has been shown in Table 3.4. The data corresponding to LCC parameters has been collected from tariff orders [87], POSOCO website [88] and the market prices are assumed to be Rs 2.5 (average) and 3.5 (on higher side) per unit.

The state transmission charge has been changed from per MW per Day basis to per kWh basis for STOA from April 2017 [91] and it is 0.33 Rs/kWh for FY 2017-18. For calculation purpose, the transmission charges prior to April 2017 were converted to per kWh basis from per MW per day basis i.e. for the year FY 2016-17, transmission charge of 2854 Rs/MW/Day was converted to 0.14 Rs/kWh [92]. The voltage levels considered herein are 11 kV and 66 kV. The consumers at and below 11 kV level are charged "in kind" for both the transmission as well as distribution loss. The consumers at 66 kV and above are charged only for transmission loss.

3.4 Cost Benefit Analysis of STOA Consumers

Table 3.4 shows that for the given sample market rates of Rs. 2.5 and 3.5 per unit, the landed cost has been increased from FY 2014 to 2017. The Table 3.5 shows that there is a considerable reduction in the market price of electricity which is beneficial to the consumers. Still the landed cost has increased which indicates that the Open Access charges have increased which

Table 3.4: Landed cost in Rs/kWh to the consumers availing STOA at various voltage levels

FY	**2014**	**2015**	**2016**	**2017**		**2014**	**2015**	**2016**	**2017**
	3 MW at 11 kV					**25 MW at 66 kV**			
Market price 2.5 Rs/kWh									
Loss in kind	0.44	0.44	0.44	0.44		0.15	0.15	0.15	0.15
Open Access Net charge	1.65	2.02	3.17	3.29		1.23	1.59	2.74	2.86
Landed cost at IEX	4.15	4.52	5.67	5.79		3.73	4.09	5.34	5.36
Market price 3.5 Rs/kWh									
Loss in kind	0.62	0.62	0.62	0.62		0.21	0.21	0.21	0.21
Open Access Net charge	1.83	2.2	3.35	3.47		1.29	1.65	2.8	2.92
Landed cost at IEX	5.33	5.7	6.85	6.97		4.79	5.15	5.51	6.42

Table 3.5: Yearly average IEX rate in Rs/kWh for W-2 region

2008	**2009**	**2101**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017***
7.5	5.34	3.54	3.38	3.17	2.47	3.19	2.49	2.25	2.56

*Till May

Table 3.6: Average DISCOM tariff for the consumers in Rs/kWh

FY	**2014**	**2015**	**2016**	**2017**
Industrial	7.02	7.41	7.26	7.22
Commercial	6.49	6.85	6.83	6.83

is against the proposal of reduction in Open Access charges for maintaining the market competition [3]. Table 3.6 shows no considerable rise in discom tariff compared to rise in landed cost of electricity in the open market. This indicates that it is needed to take necessary steps in near future to limit the rise in Open Access charges else the motivation behind open market concept will get hampered if landed cost comes in line with the Discom rates.

In prevailing scenario, evaluation of per unit gain/loss to Open Access consumer has been presented in Table 3.7 by taking a case of 20% of Open Access consumption for 25 MW of contract demand by taking reference of [83] and [92]. It has been assumed that the load scheduling is consistent with no gaming environment. The monthly consumption (total 30 days) by 25 MW load for 24 hr of continuous operation comes out to be 18000000 units. Considering billing rate of 7 Rs/unit, billing amount of 12,60,00,000/- is required to be paid to Discom by the consumer. This amount has been shown by B in Table 3.7. The billing of 20% of Open Access consumption

Table 3.7: Amount of gain/loss for 25 MW load in Rs/kWh

Monthly Units	**Discom rate 7 Rs/kWh, 20 % Open Access for 24 hr**	
	Formula	**Amount, Rs.**
A=25000*24*30=18000000.00		
Discom total bill	B=A*7	126000000.00
IEX total to be deducted	C=A*0.20*7	25200000.00
After deduction, payment to Discom	D=B-C	100800000.00
Payment to IEX at 4 Rs/kWh	E=A*0.20*4	14400000.00
Final payment	F=D+E	115200000.00
Difference:With no Open Access - With Open Access	G=B-F	10800000.00
per unit gain /loss (Rs/kWh)	H=G/A	0.6

Table 3.8: Gain in Rs/kWh for HT consumer at 66KV

Year-Month	**Rs/kWh**	**% Open Access availed**
2015-July	1.36	62.0
2015-August	1.64	84.0
2015-September	0.64	69.0
2015-October	1.37	89.0
2015-November	1.71	89.0
2015-December	1.94	93.0
2016-January	1.83	90.9
2016-February	1.97	89.8
2016-March	1.57	84.5
2016-April	0.61	67.5
2016-May	0.96	83.7
2016-June	0.80	81.2
2016-July	0.95	85.6
2016-August	1.03	85.9
2016-September	0.64	79.9
2016-October	1.03	90.6
2016-November	1.22	90.3
2016-December	1.30	91.87
2017-January	1.11	92.4
2017-February	1.08	93.6

is required to be deducted as per [83] and [92]. Hence, the final billing amount after deduction has come out as Rs. 10,08,00,000/- which is shown by *D*. Considering the IEX charge of 4 Rs/unit, the 20% of Open Access consumption has been billed as 1,44,00,000/- which is shown by *E*. Hence, the final payment to be made by the consumer comes out to be summation of *D* and *E*. The difference in billing amount due to availing Open Access consumption has come out as Rs. 1,08,00,000/- which is shown by *G*.

Looking to the total gain of Rs. 1,08,00,000/-, it is very clear that the installation cost of approximately Rs 6,00,000.00/- for the Availability Based Tariff (ABT) mechanism compatible energy meter is also getting recovered in a year with the consistent trading in Open Access. Further it can be inferred that even if the trading is not consistent and performed only say for day time, then also the installation cost of energy meter will not be a burden to the consumers. In support to this calculation, Table 3.8 shows actual gain obtained by a pharmaceutical company getting supply at 66 kV over the period of 20 months.

3.5 Step Ahead

In Table 3.6, the second category of consumers is the commercial consumers. Considering the heavy load of upcoming multi storied, centrally air conditioned commercial entities like business parks, shopping malls with multiple movie theaters functioning for more than 12 hrs a day, they have been given supply at 11 kV voltage level. If such consumers develop interest into energy trading, the said case also would be of interest for cost benefit analysis.

Moreover, since April 2016, Time-of-Use tariff is also changed to motivate the consumers to utilize night hours. If commercial entities also take advan-

tage of lesser tariff and lesser market price at night hours, they can avail more financial gain. The simplest example utilizing electricity at night hours is the Thermal storage system [93]-[94] which is becoming very popular due to its cost effective results to the consumers. The commercial entities having heavy lighting and cooling load, can operate their chiller plants/thermal storage system during night hours and can considerably reduce their cooling load during day time. Additionally, the market rates are also lesser during night hours and hence, they can utilize benefit with Open Access also.

3.6 Conclusion

The results show a considerable saving in billing due to availing Open Access in the case of High Tension industrial consumers. As the load demand of commercial hubs is increasing with the development of urban areas, if commercial entities also take part into energy trading using Open Access, the Discom will again suffer in revenue realizations. Thus, it is clear that Open Access promotion results into tragic condition for Discom operation and this leads to opening a pathway for rationalized tariff mechanism.