NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
ISLAMIC REPUBLIC OF PAKISTAN

PERFORMANCE EVALUATION REPORT

OF

THERMAL POWER PLANTS

For

FY 2021-22

Under

NEPRA PERFORMANCE STANDARDS (GENERATION) RULES, 2009

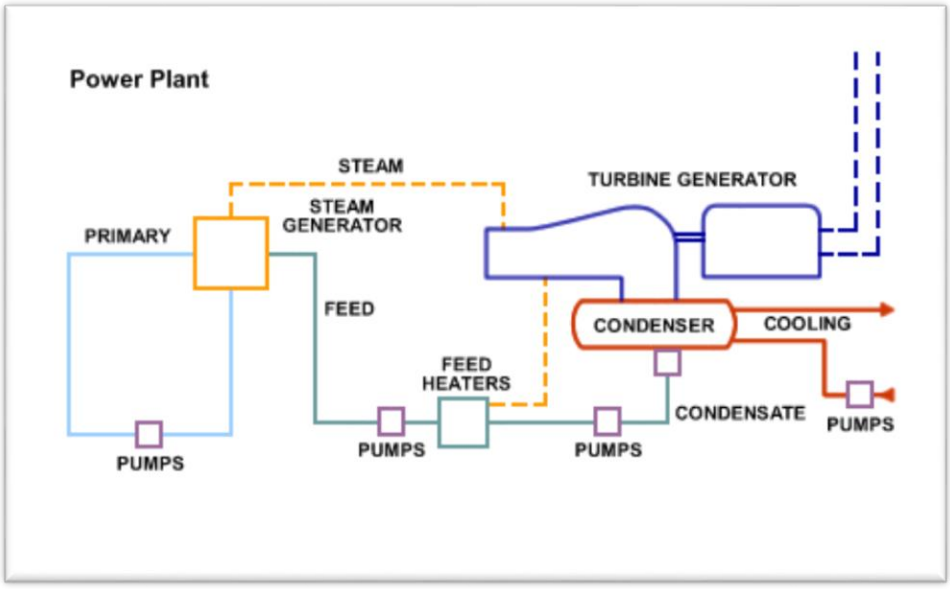


Table of Contents

EXECUTIVE SUMMARY

National Electric Power Regulatory Authority (NEPRA) regulates the power sector in Pakistan and protects the interests of consumers and companies providing electric power services. As such, apart from monitoring the performance of transmission and distribution licensees, NEPRA also monitors the performance of generation licensees.

NEPRA framed Performance Standards (Generation) Rules (PSGR) back in 2009. Under the PSGR, each generation company is required to submit a quarterly report to NEPRA on regular basis, particularly with respect to parameters such as Installed Capacity, Reference Capacity, Net Generation, Service Hours, Standby Hours, Planned Outage Hours, Unplanned Outage Hours, Availability Factor, Net Capacity Factor and Net Output Factor.

Accordingly, the quarterly reports submitted by thermal power plants for the FY 2021-22, under the NEPRA PSGR, 2009 have been reviewed and a comprehensive Performance Evaluation Report has been prepared. The report mainly highlights the following key findings:

1. **Installed Capacity:** The data submitted by thermal power plants for the FY 2021-22 shows that the share of RFO, RLNG, Coal and Natural Gas based power plants in the total installed capacity of the system (excluding KE) is 33%, 27%, 24% and 16% respectively.

2. **Reference Capacity:** Similarly, the data submitted by thermal power plants for the FY 2021-22 indicates that the share of RFO, RLNG, Coal and Natural Gas based power plants in the total reference capacity of the system (excluding KE) is 33%, 27%, 24% and 16% respectively.

3. **Net Generation:** The thermal power plants are despatchable plants and are operated upon instructions of the System Operator in accordance with the Economic Merit Order in order to meet the system load demand. In this regard, it is pertinent to highlight that NEPRA vigilantly monitors the operation of plants in accordance with the Economic Merit Order by the System Operator on monthly basis and takes action against the System Operator in case of any unjustified out of merit plant operation by the System Operator accordingly.

   The data submitted by thermal power plants for the FY 2021-22 also reveals that the Net Generation of most of the inefficient and expensive RFO based power plants remained less during the said period, however, since the tariff structure of these plants is on "Take or Pay" basis, therefore, the average per unit rate (CPP+EPP) of these plants remained considerably higher during the said period. For e.g. the average per unit rate of HUBCO, Saba, PakGen and Lalpir remained Rs. 44.14/kWh, Rs. 33.24/kWh, Rs. 31.12/kWh and Rs. 30.14/kWh respectively during the FY 2021-22.

4. **Service Hours:** Moreover, the data submitted by thermal power plants for the FY 2021-22 shows that most of the efficient and cheaper Natural Gas, RLNG & Coal based power plants remained in operation for most part of the year during the FY 2021-22. For e.g. Bhikki, Balloki, Haveli Bahadur Shah, Uch, Uch-II and Port Qasim remained in operation for more than 80% of the total time during the said period. Whereas, most of the

comparatively inefficient and expensive RFO based power plants remained in operation for less part of the year during the FY 2021-22. For e.g. TPS Muzaffargarh and TPS Jamshoro remained in operation for only 3% and 7.5% of the total time respectively during the said period.

5. **Standby Hours:** The data submitted by thermal power plants for the FY 2021-22 further indicates that most of the inefficient and expensive RFO based power plants remained on standby mode for most part of the year during the FY 2021-22. For e.g. TPS Jamshoro, TPS Muzaffargarh and Lalpir remained on standby mode for 89%, 87.9% and 49.8% of the total time respectively during the said period. Whereas, most of the comparatively efficient and cheaper Natural Gas, RLNG & Coal based power plants remained on standby mode for less part of the year during the FY 2021-22. For e.g. Bhikki, Balloki, Haveli Bahadur Shah, Uch, Uch-II, Port Qasim, Sahiwal Coal, CPHGC and Engro Thar remained on standby mode for less than 16% of the total time during the said period.

6. **Planned Outage Hours:** Furthermore, the data submitted by thermal power plants for the FY 2021-22 reveals that the planned outage period of almost all thermal power plants remained on the lower side i.e. less than one (01) month of the total time during the said period, except Haveli Bahadur Shah and Sahiwal Coal, whose planned outage period remained slightly higher than one (01) month.

7. **Unplanned Outage Hours:** In addition to this, the data submitted by thermal power plants for the FY 2021-22 shows that the unplanned outage period of TPS Guddu, Guddu 747, TPS Muzaffargarh, FKPCL, CPHGC and Engro Thar remained on the higher side i.e. more than two (02) months of the total time during the said period. Whereas, the unplanned outage period of remaining thermal power plants remained less than one (01) month during the FY 2021-22. In this regard, it is pertinent to highlight that each thermal power plant is allowed certain forced outage hours (varies from plant to plant) in an agreement year (different for each thermal power plant) in its Power Purchase Agreement. In case any thermal power plant exceeds the forced outage allowance as specified in its Power Purchase Agreement, Liquidated Damages are imposed by the Power Purchaser in accordance with the relevant provisions of the Power Purchase Agreement.

   NEPRA vigilantly monitors the forced outage hours availed by each thermal power plant in its agreement year. In case any thermal power plant exceeds the forced outage allowance as specified in its Power Purchase Agreement, NEPRA not only takes action against that plant but also takes up the matter with the Power Purchaser regarding imposition of Liquidated Damages in accordance with the relevant provisions of the Power Purchase Agreement on that plant. In case of non-imposition of Liquidated Damages by the Power Purchaser, NEPRA also takes action against the Power Purchaser accordingly.

8. **Availability Factor:** Likewise, the data submitted by thermal power plants for the FY 2021-22 indicates that the Availability Factor of TPS Guddu, Guddu 747, TPS Muzaffargarh, FKPCL, CPHGC and Engro Thar remained on the lower side i.e. less than 80% of the total time during the said period due to higher number of forced outage hours

availed by these plants. Whereas, the Availability Factor of remaining thermal power plants remained more than 80% during the FY 2021-22.

9. **Net Capacity Factor:** Also, the data submitted by thermal power plants for the FY 2021-22 reveals that the Net Capacity Factor of most of the inefficient and expensive RFO based power plants remained on the lower side during the said period since these plants remained on standby mode for most part of the year during the FY 2021-22. For e.g. the Net Capacity Factor of TPS Muzaffargarh, TPS Jamshoro and Lalpir remained only 2.3%, 4.2% and 33.4% respectively during the said period. Whereas, the Net Capacity Factor of most of the comparatively efficient and cheaper RLNG & Natural Gas based power plants remained on the higher side during the FY 2021-22 since these plants received despatch from the System Operator for most part of the year during the said period. For e.g. the Net Capacity Factor of Uch, Uch-II, Haveli Bahadur Shah and Balloki remained 89.2%, 89.2%, 72.7% and 70.4% respectively during the FY 2021-22.

10. **Net Output Factor:** The data submitted by thermal power plants for the FY 2021-22 shows that the Net Output Factor of most of the inefficient and expensive RFO based power plants remained on the lower side during the said period. For e.g. the Net Output Factor of TPS Jamshoro and Saba Power remained only 56.3% and 61.6% respectively during the FY 2021-22. This, prima facie, indicates that these plants received despatch on partial load from the System Operator for most part of their service period during the said period. Whereas, the Net Output Factor of most of the comparatively efficient and cheaper RLNG, Coal & Natural Gas based power plants remained on the higher side during the FY 2021-22. For e.g. the Net Output Factor of Uch-II, Uch, Engro Thar, Haveli Bahadur Shah and Balloki remained 96.9%, 95.1%, 92.6%, 86.4% and 85.4% respectively during the said period. This, prima facie, indicates that these plants received despatch on full load from the System Operator for most part of their service period during the FY 2021-22.

NEPRA PERFORMANCE STANDARDS (GENERATION) RULES, 2009

1. NEPRA Performance Standards (Generation) Rules, 2009

In exercise of the powers conferred by and Clause (k) of Section 46 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 read with Clause (c) of sub-section (2) of Section 7 and Section 34 thereof, NEPRA, with the prior approval of the Federal Government, made the Performance Standards (Generation) Rules back in 2009 to ensure that the electric generation facilities and power plants are efficiently operated to further ensure electrical service reliability and adequacy to the transmission and distribution service provider within prescribed parameters.

Quality of Supply - Rule 3 of the NEPRA PSGR, 2009 states that in order to maintain Performance Standards, the generation facilities are required to ensure that the voltage and frequency of electricity supplied to recipients shall be within normal operation limits contained in the applicable documents as defined in Clause (iv) of sub-rule 1 of Rule 2 of the NEPRA Licensing (Generation) Rules, 2000, Rules 7 & 8 of the NEPRA Performance Standards (Transmission) Rules, 2005 and Clauses (d) & (e) of the Rule 4 of the NEPRA Performance Standards (Distribution) Rules 2005.

Data Requirement - Rule 4 of the NEPRA PSGR, 2009 states that as part of Generator Performance Data System, the licensee shall calculate the following key indicators and others as indicated in Forms I and II to these rules for its generating facilities and submit on regular basis, a report to the Authority under sub-rule (2) of Rule 5.

Reporting Requirement - Rule 5(2) of the NEPRA PSGR, 2009 states that reports required for the key indicators under rule 4 shall be submitted on quarterly basis and the first report thereof shall be due after the publication of these rules in the official Gazette.

Compliance by Thermal Power Plants: In compliance with the abovementioned reporting requirement, all thermal power plants submitted the quarterly reports for the FY 2021-22 (except Lucky Electric, HUBCO, Engro Powergen Qadirpur, Altern Energy and Kohinoor Energy). The same have been reviewed and a comprehensive Performance Evaluation Report has been prepared.

ANALYSIS

3.1 Installed Capacity:

Installed Capacity is the unit's nameplate capacity.

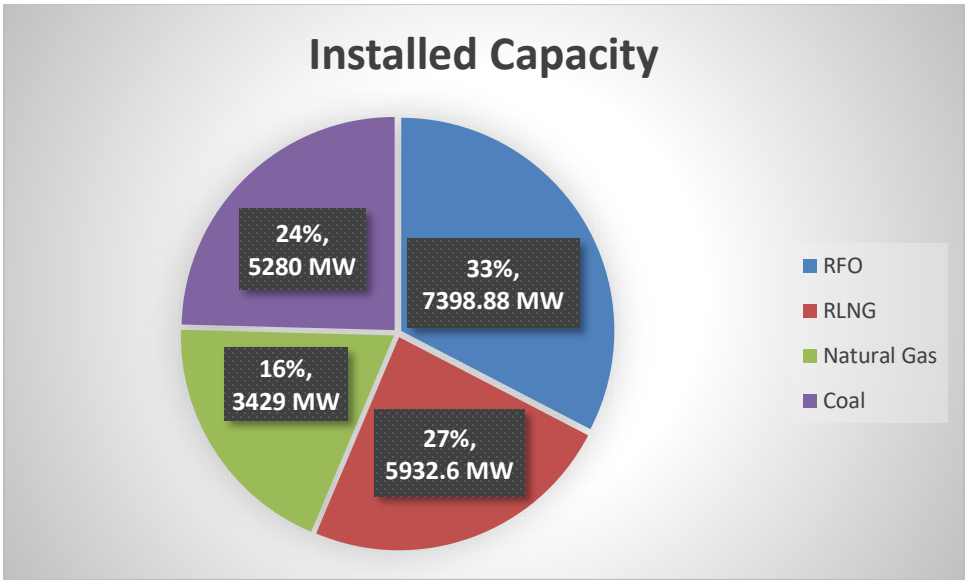
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Installed Capacity of different thermal power stations remained as follows:

S.No.	Power Plant	Fuel Type	Installed Capacity (MW)
1	Gul Ahmed	RFO	136.17
2	Liberty Power Tech	RFO	200.26
3	PakGen	RFO	350
4	Lalpir	RFO	350
5	Atlas Power	RFO	219.16
6	Nishat Power	RFO	202.18
7	Nishat Chunian	RFO	200
8	Saba Power	RFO	134
9	Hubco Narowal	RFO	219.16
10	Attock Gen	RFO	164.95
11	Bhikki	RLNG	1180
12	Balloki	RLNG	1275.5
13	Haveli Bahadur Shah	RLNG	1276.86
14	Foundation Power	Natural Gas	185
15	Sapphire Electric	RLNG	225
16	TNB Liberty Power	Natural Gas	235
17	Uch	Natural Gas	586
18	Uch-II	Natural Gas	404
19	Rousch	RLNG	450
20	FKPCL	RLNG	157
21	Orient	RLNG	223.8
22	Saif Power	RLNG	209.79
23	TPS Muzaffargarh	RFO/RLNG	1350
24	GTPS Faisalabad	RLNG	144
25	CCPP Nandipur	RLNG	565.65
26	TPS Guddu	Natural Gas	1015
27	Guddu 747	Natural Gas	747
28	TPS Jamshoro	RFO/RLNG	850
29	KAPCO	RFO/RLNG	1600
30	Engro Thar	Coal	660
31	Port Qasim	Coal	1320
32	Sahiwal Coal	Coal	1320
33	CPHGC	Coal	1320
34	Lucky Electric*	Coal	660
35	HUBCO*	RFO	1292
36	Engro Powergen Qadirpur*	Natural Gas	226
37	Altern*	Natural Gas	31

S.No.	Power Plant	Fuel Type	Installed Capacity (MW)
38	Kohinoor Energy*	RFO	131
39	Halmore	RLNG	225
Total			**22040.48**

*Data not received from these plants. Therefore, their Installed Capacity has been taken from State of Industry Report, 2022.

Graphical Illustration:



3.2 Reference Capacity:

According to the NEPRA PSGR 2009, Reference Capacity is the unit's maximum generating capacity based on Initial Dependable Capacity (IDC) or Annual Initial Dependable Capacity (AIDC) less any station service or auxiliary power requirements in MW utilized for that unit.

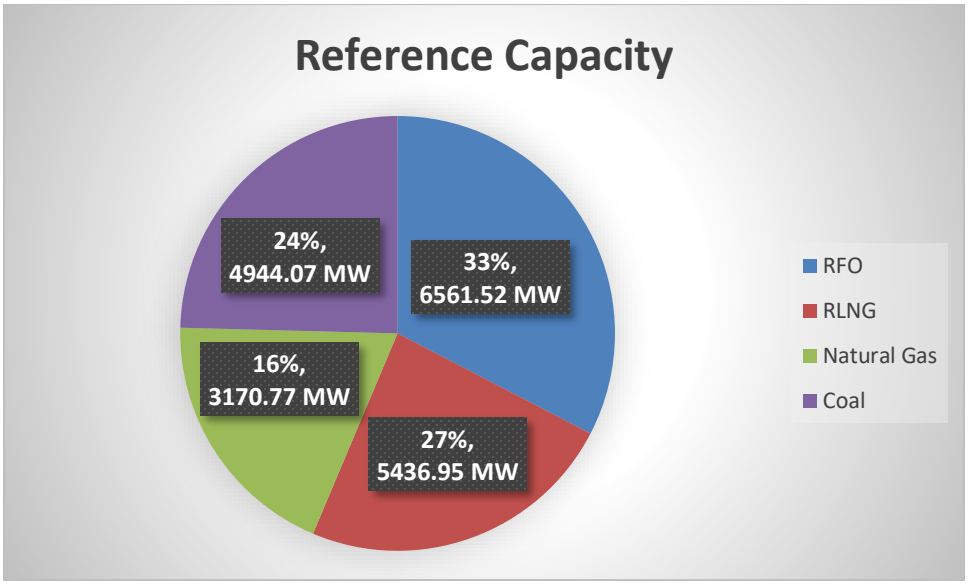
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Reference Capacity of different thermal power stations remained as follows:

S.No.	Power Plant	Fuel Type	Reference Capacity (MW)
1	Gul Ahmed	RFO	127.5
2	Liberty Power Tech	RFO	196.14
3	PakGen	RFO	350
4	Lalpir	RFO	350
5	Atlas Power	RFO	213.85
6	Nishat Power	RFO	200.02
7	Nishat Chunian	RFO	195.77
8	Saba Power	RFO	124.57
9	Hubco Narowal	RFO	213.82
10	Attock Gen	RFO	156.18
11	Bhikki	RLNG	1125.08
12	Balloki	RLNG	1164.61
13	Haveli Bahadur Shah	RLNG	1176.04
14	Foundation Power	Natural Gas	166.14
15	Sapphire Electric	RLNG	202.82
16	TNB Liberty Power	Natural Gas	211.92
17	Uch	Natural Gas	550.54
18	Uch-II	Natural Gas	362.17
19	Rousch	RLNG	395
20	FKPCL	RLNG	151.2
21	Orient	RLNG	203.94
22	Saif Power	RLNG	203.77
23	TPS Muzaffargarh	RFO/RLNG	1115.65
24	GTPS Faisalabad	RLNG	117
25	CCPP Nandipur	RLNG	500.49
26	TPS Guddu	Natural Gas	920
27	Guddu 747	Natural Gas	721
28	TPS Jamshoro	RFO/RLNG	649.02
29	KAPCO	RFO/RLNG	1345
30	Engro Thar	Coal	602.6
31	Port Qasim	Coal	1242.95
32	Sahiwal Coal	Coal	1243.52
33	CPHGC	Coal	1249
34	Lucky Electric*	Coal	606

S.No.	Power Plant	Fuel Type	Reference Capacity (MW)
35	HUBCO*	RFO	1200
36	Engro Powergen Qadirpur*	Natural Gas	212
37	Altern*	Natural Gas	27
38	Kohinoor Energy*	RFO	124
39	Halmore	RLNG	197
Total			**20113.31**

*Data not received from these plants. Therefore, their Reference Capacity has been taken from State of Industry Report, 2022.

Graphical Illustration:



3.3 Net Generation:

According to the NEPRA PSGR 2009, Net Generation is the unit's gross actual generation less any generation utilized for that unit's station service or auxiliary loads.

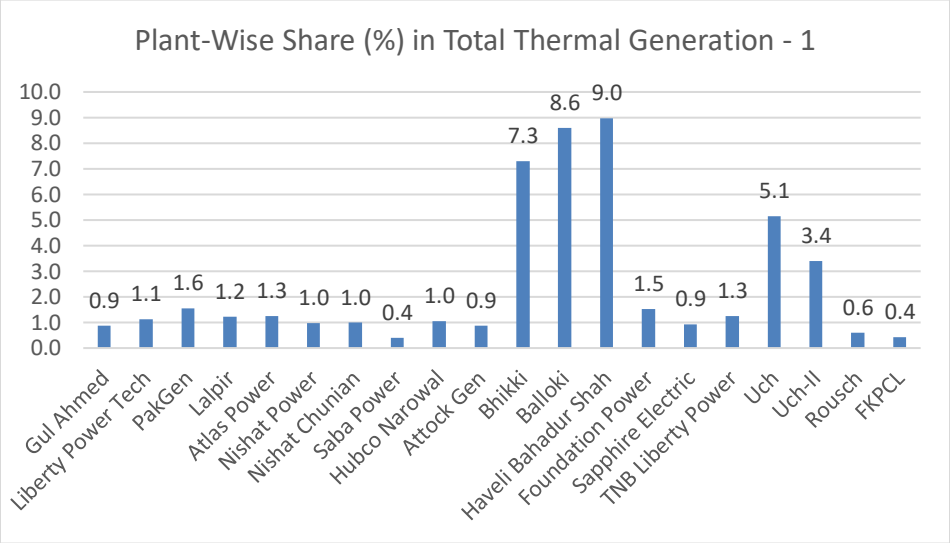
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Net Generation of different thermal power stations remained as follows:

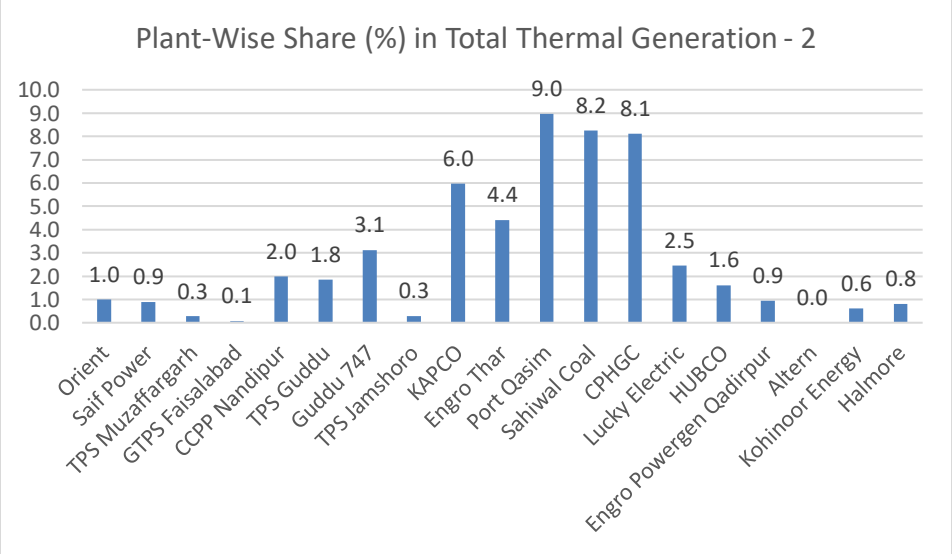
S.No.	Power Plant	Net Generation (MWh)	Capacity* Payments (Rs. Million)	Energy* Payments (Rs. Million)	Total Payments (Rs. Million)	Per Unit Rate (Rs./kWh)
1	Gul Ahmed	723774.3	-	-	-	-
2	Liberty Power Tech	945605.5	3674.65	23032.97	26707.62	28.24
3	PakGen	1304350	4311.02	36281.10	40592.12	31.12
4	Lalpir	1022671	3526.85	27300.90	30827.75	30.14
5	Atlas Power	1045235	3543.77	20722.56	24266.33	23.22
6	Nishat Power	816659.1	2904.35	16385.73	19290.08	23.62
7	Nishat Chunian	834961.8	2639.02	18071.26	20710.28	24.80
8	Saba Power	330847	2208.02	8790.09	10998.11	33.24
9	Hubco Narowal	867504	3935.30	18186.68	22121.98	25.50
10	Attock Gen	721819.7	2378.96	18569.22	20948.18	29.02
11	Bhikki	6090924.6	21383.22	110729.86	132113.10	21.69
12	Balloki	7186704	17746.73	126556.08	144302.80	20.08
13	Haveli Bahadur Shah	7488565	18489.23	127962.96	146452.20	19.56
14	Foundation Power	1276065.9	9727.85	2433.20	12161.05	9.53
15	Sapphire Electric	780500	1746.06	17866.76	19612.82	25.13
16	TNB Liberty Power	1054062.9	2212.53	14758.22	16970.75	16.10
17	Uch	4300520	6613.33	39859.71	46473.04	10.81
18	Uch-II	2829408	12722.15	22281.07	35003.22	12.37
19	Rousch	495897	12439.62	4607.02	17046.64	34.37
20	FKPCL	348306	1365.99	8640.11	10006.10	28.73
21	Orient	836380	3686.67	18907.47	22594.14	27.01
22	Saif Power	734993.6	2613.39	17436.07	20049.46	27.28
23	TPS Muzaffargarh	227620.4	13511.39	45432.17	58943.56	30.47
24	GTPS Faisalabad	58379.4				
25	CCPP Nandipur	1648608				
26	TPS Guddu	1534003	16645.11	30342.98	46988.09	11.34
27	Guddu 747	2609945				
28	TPS Jamshoro	238942	3381.92	7385.84	10767.76	45.06
29	KAPCO	4979779	1403.98	122082.19	123486.20	24.78
30	Engro Thar	3676979	33858.06	53736.75	87594.81	23.82
31	Port Qasim	7478631	61230.54	115217.07	176447.60	23.59
32	Sahiwal Coal	6882257	55710.15	135918.47	191628.60	27.84
33	CPHGC	6764898	58363.72	91686.70	150050.42	22.18
34	Lucky Electric*	2056360	7542.03	6744.26	14286.29	6.95
35	HUBCO*	1343330	25441.27	33848.46	59289.73	44.14
36	Engro Powergen Qadirpur*	788640	2161.21	6959.71	9120.92	11.57

S.No.	Power Plant	Net Generation (MWh)	Capacity* Payments (Rs. Million)	Energy* Payments (Rs. Million)	Total Payments (Rs. Million)	Per Unit Rate (Rs./kWh)
37	Altern*	800	-	-	-	-
38	Kohinoor Energy*	515810	1631.83	12731.17	14363	27.85
39	Halmore	675910	4612.32	16214.39	20826.71	30.81

*Data not received from these plants. Therefore, their Net Generation has been taken from State of Industry Report, 2022. Moreover, values of Capacity Payments and Energy Payments have also been taken from State of Industry Report, 2022.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the Net Generation of most of the inefficient and expensive RFO based power plants remained less during the said period, however, since the tariff structure of these plants is on "Take or Pay" basis, therefore, the average per unit rate (CPP+EPP) of these plants remained considerably higher during the said period. For e.g. the average per unit rate of HUBCO, Saba, PakGen and Lalpir remained Rs. 44.14/kWh, Rs. 33.24/kWh, Rs. 31.12/kWh and Rs. 30.14/kWh respectively during the FY 2021-22.

3.4 Service Hours:

According to the NEPRA PSGR 2009, Service Hours are the number of hours the unit was synchronized to the system.

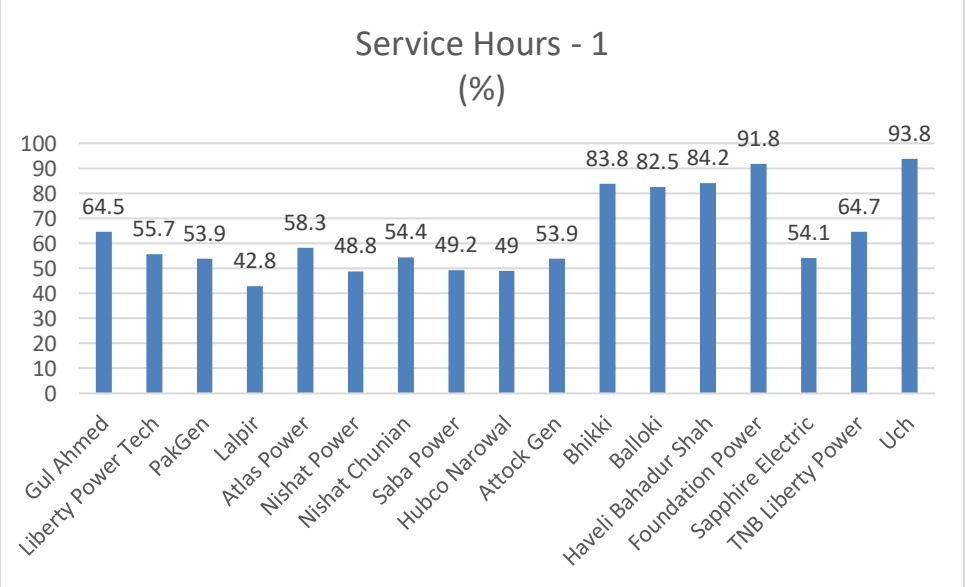
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Service Hours of different thermal power stations remained as follows:

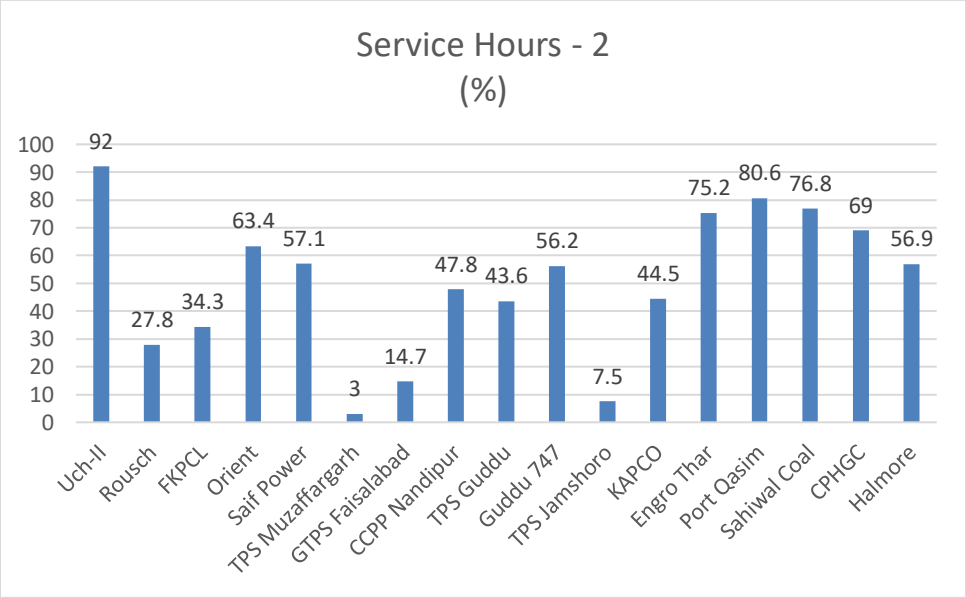
S.No.	Power Plant	Service Hours (in terms of)		
		Hours	Months	%
1	Gul Ahmed	5651.3	7.8	64.5
2	Liberty Power Tech	4881.5	6.8	55.7
3	PakGen	4722.9	6.6	53.9
4	Lalpir	3753.5	5.2	42.8
5	Atlas Power	5105.3	7.1	58.3
6	Nishat Power	4270.7	5.9	48.8
7	Nishat Chunian	4767.2	6.6	54.4
8	Saba Power	4313.4	6.0	49.2
9	Hubco Narowal	4292.5	6.0	49.0
10	Attock Gen	4725.9	6.6	53.9
11	Bhikki	7343	10.2	83.8
12	Balloki	7226	10.0	82.5
13	Haveli Bahadur Shah	7374	10.2	84.2
14	Foundation Power	8037.5	11.2	91.8
15	Sapphire Electric	4743	6.6	54.1
16	TNB Liberty Power	5663.7	7.9	64.7
17	Uch	8214.9	11.4	93.8
18	Uch-II	8058.3	11.2	92.0
19	Rousch	2438	3.4	27.8
20	FKPCL	3002.4	4.2	34.3
21	Orient	5554	7.7	63.4
22	Saif Power	5003.2	6.9	57.1
23	TPS Muzaffargarh	266.1	0.4	3.0
24	GTPS Faisalabad	1290.7	1.8	14.7
25	CCPP Nandipur	4188	5.8	47.8
26	TPS Guddu	3820.3	5.3	43.6
27	Guddu 747	4924.7	6.8	56.2
28	TPS Jamshoro	654.0	0.9	7.5
29	KAPCO	3896.4	5.4	44.5
30	Engro Thar	6590.6	9.2	75.2
31	Port Qasim	7058.7	9.8	80.6
32	Sahiwal Coal	6724.2	9.4	76.8
33	CPHGC	6046.5	8.4	69.0
34	Lucky Electric*	-	-	-
35	HUBCO*	-	-	-
36	Engro Powergen Qadirpur*	-	-	-

S.No.	Power Plant	Service Hours (in terms of)		
		Hours	Months	%
37	Altern*	-	-	-
38	Kohinoor Energy*	-	-	-
39	Halmore*	4983	6.9	56.9

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that most of the efficient and cheaper Natural Gas, RLNG & Coal based power plants remained in operation for most part of the year during the FY 2021-22. For e.g. Bhikki, Balloki, Haveli Bahadur Shah, Uch, Uch-II and Port Qasim remained in operation for more than 80% of the total time during the said period.

Whereas, most of the comparatively inefficient and expensive RFO based power plants remained in operation for less part of the year during the FY 2021-22. For e.g. TPS Muzaffargarh and TPS Jamshoro remained in operation for only 3% and 7.5% of the total time respectively during the said period.

3.5 Standby Hours:

According to the NEPRA PSGR 2009, Standby Hours are the sum of all hours the unit was available to the system but not synchronized for economy reasons.

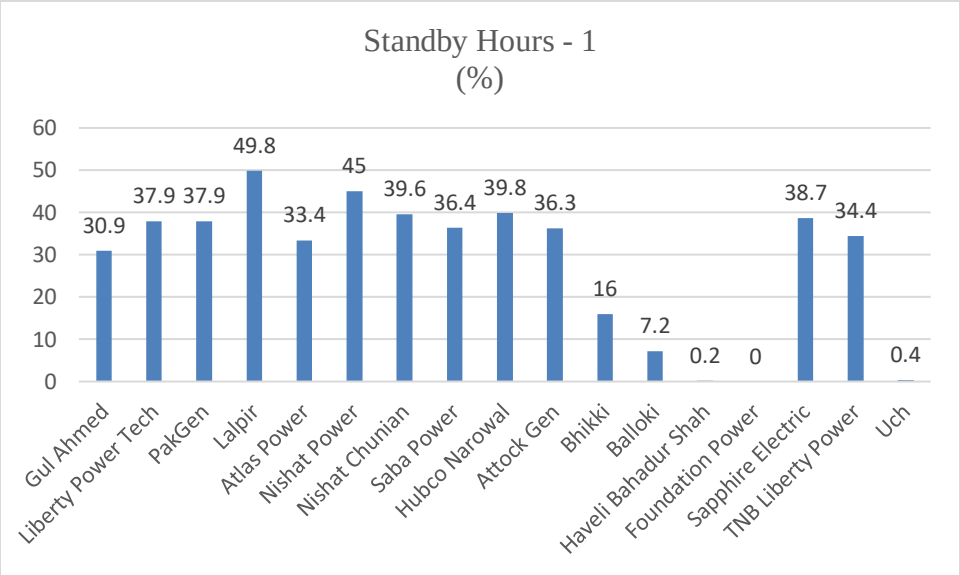
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Standby Hours of different thermal power stations remained as follows:

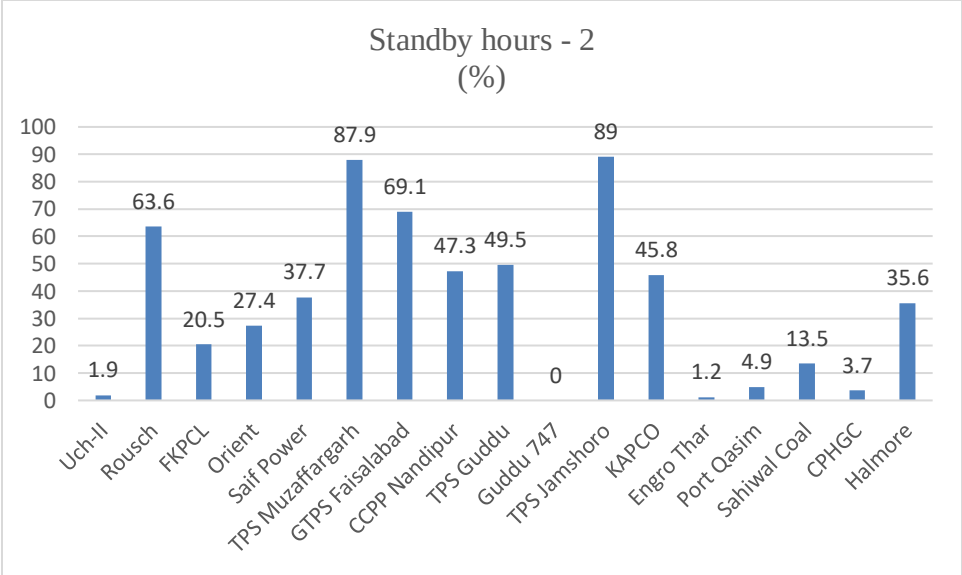
S.No.	Power Plant	Standby Hours (in terms of)		
		Hours	Months	%
1	Gul Ahmed	2710.6	3.8	30.9
2	Liberty Power Tech	3315.9	4.6	37.9
3	PakGen	3320.3	4.6	37.9
4	Lalpir	4359.5	6.1	49.8
5	Atlas Power	2924.6	4.1	33.4
6	Nishat Power	3937.7	5.5	45.0
7	Nishat Chunian	3470	4.8	39.6
8	Saba Power	3192	4.4	36.4
9	Hubco Narowal	3483	4.8	39.8
10	Attock Gen	3182.5	4.4	36.3
11	Bhikki	1402	1.9	16.0
12	Balloki	628	0.9	7.2
13	Haveli Bahadur Shah	15	0.0	0.2
14	Foundation Power	0	0.0	0.0
15	Sapphire Electric	3387	4.7	38.7
16	TNB Liberty Power	3010.9	4.2	34.4
17	Uch	36.6	0.1	0.4
18	Uch-II	166.2	0.2	1.9
19	Rousch	5569	7.7	63.6
20	FKPCL	1791.8	2.5	20.5
21	Orient	2403	3.3	27.4
22	Saif Power	3298.7	4.6	37.7
23	TPS Muzaffargarh	7699.3	10.7	87.9
24	GTPS Faisalabad	6049.3	8.4	69.1
25	CCPP Nandipur	4144	5.8	47.3
26	TPS Guddu	4332.7	6.0	49.5
27	Guddu 747	0	0.0	0.0
28	TPS Jamshoro	7792.3	10.8	89.0
29	KAPCO	4010.2	5.6	45.8
30	Engro Thar	108.8	0.2	1.2
31	Port Qasim	428.3	0.6	4.9
32	Sahiwal Coal	1185	1.6	13.5
33	CPHGC	326	0.5	3.7
34	Lucky Electric*	-	-	-
35	HUBCO*	-	-	-
36	Engro Powergen Qadirpur*	-	-	-
37	Altern*	-	-	-

S.No.	Power Plant	Standby Hours (in terms of)		
		Hours	Months	%
38	Kohinoor Energy*	-	-	-
39	Halmore	3115	4.3	35.6

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that most of the inefficient and expensive RFO based power plants remained on standby mode for most part

of the year during the FY 2021-22. For e.g. TPS Jamshoro, TPS Muzaffargarh and Lalpir remained on standby mode for 89%, 87.9% and 49.8% of the total time respectively during the said period respectively.

Whereas, most of the comparatively efficient and cheaper Natural Gas, RLNG & Coal based power plants remained on standby mode for less part of the year during the FY 2021-22. For e.g. Bhikki, Balloki, Haveli Bahadur Shah, Uch, Uch-II, Port Qasim, Sahiwal Coal, CPHGC and Engro Thar remained on standby mode for less than 16% of the total time during the said period.

3.6 Planned Outage Hours:

According to the NEPRA PSGR 2009, Planned Outage Hours are the sum of all hours the unit was offline due to planned or scheduled outages (outages planned well in advance such as annual overhauls).

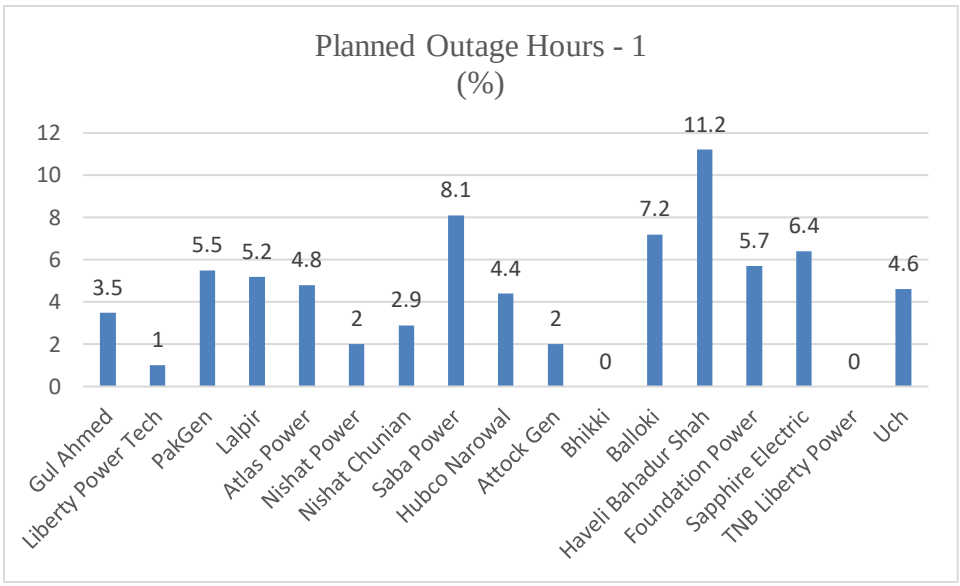
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Planned Outage Hours of different thermal power stations remained as follows:

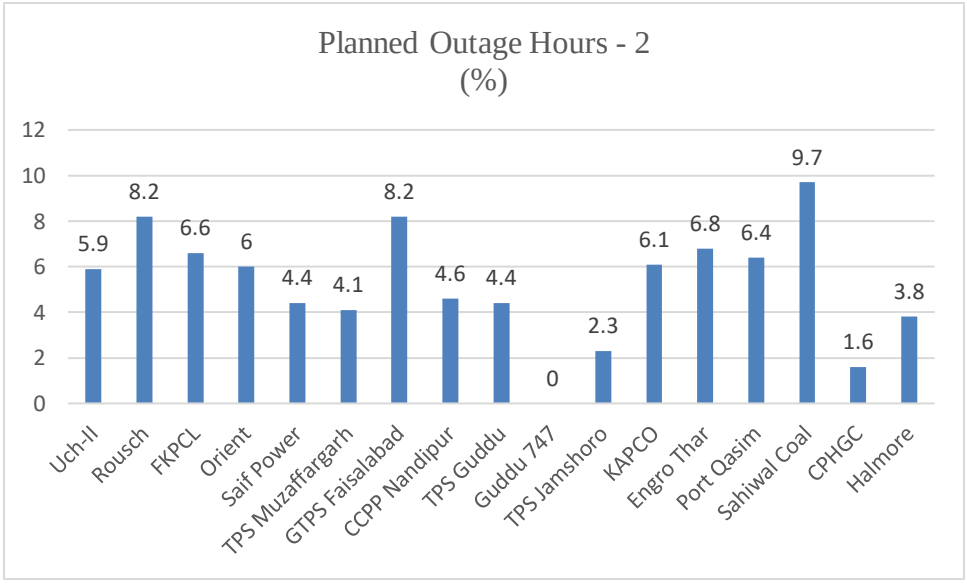
S.No.	Power Plant	Planned Outage Hours (in terms of)		
		Hours	Months	%
1	Gul Ahmed	304.5	0.4	3.5
2	Liberty Power Tech	88.4	0.1	1.0
3	PakGen	480	0.7	5.5
4	Lalpir	453	0.6	5.2
5	Atlas Power	424.1	0.6	4.8
6	Nishat Power	175.9	0.2	2.0
7	Nishat Chunian	256	0.4	2.9
8	Saba Power	706	1.0	8.1
9	Hubco Narowal	387.2	0.5	4.4
10	Attock Gen	177.2	0.2	2.0
11	Bhikki	0	0.0	0.0
12	Balloki	631	0.9	7.2
13	Haveli Bahadur Shah	982	1.4	11.2
14	Foundation Power	499.6	0.7	5.7
15	Sapphire Electric	560	0.8	6.4
16	TNB Liberty Power	0	0.0	0.0
17	Uch	404.6	0.6	4.6
18	Uch-II	516.6	0.7	5.9
19	Rousch	720	1.0	8.2
20	FKPCL	578.7	0.8	6.6
21	Orient	528	0.7	6.0
22	Saif Power	384	0.5	4.4
23	TPS Muzaffargarh	360	0.5	4.1
24	GTPS Faisalabad	720	1.0	8.2
25	CCPP Nandipur	403	0.6	4.6
26	TPS Guddu	383	0.5	4.4
27	Guddu 747	0	0.0	0.0
28	TPS Jamshoro	204.4	0.3	2.3
29	KAPCO	531.2	0.7	6.1
30	Engro Thar	600	0.8	6.8
31	Port Qasim	562.5	0.8	6.4
32	Sahiwal Coal	850.7	1.1	9.7
33	CPHGC	142	0.2	1.6
34	Lucky Electric*	-	-	-
35	HUBCO*	-	-	-

S.No.	Power Plant	Planned Outage Hours (in terms of)		
		Hours	Months	%
36	Engro Powergen Qadirpur*	-	-	-
37	Altern*	-	-	-
38	Kohinoor Energy*	-	-	-
39	Halmore	334	0.5	3.8

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the planned outage period of almost all thermal power plants remained on the lower side i.e. less than one (01) month of the total time during the said period, except Haveli Bahadur Shah and Sahiwal Coal, whose planned outage period remained slightly higher than one (01) month.

3.7 Unplanned Outage Hours:

According to the NEPRA PSGR 2009, Unplanned Outage Hours are the sum of all hours the unit was offline due to sudden, delayed, postponed, startup failure outages.

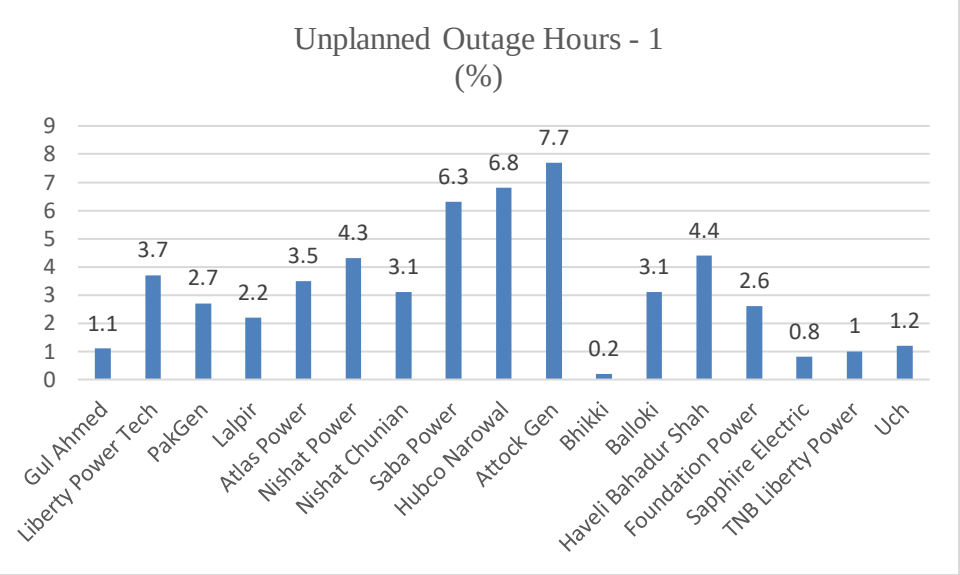
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Unplanned Outage Hours of different thermal power stations remained as follows:

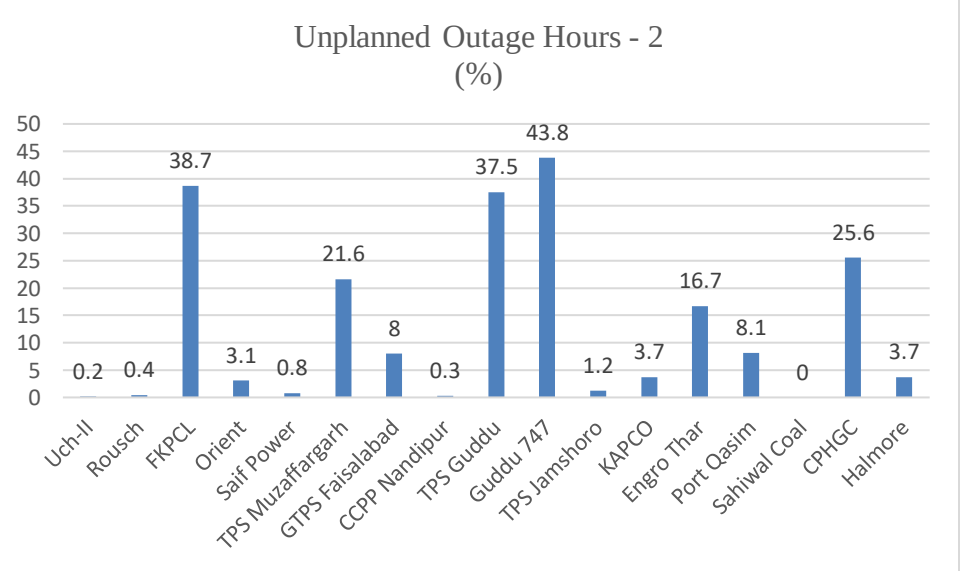
S.No.	Power Plant	Unplanned Outage Hours (in terms of)		
		Hours	Months	%
1	Gul Ahmed	93.6	0.1	1.1
2	Liberty Power Tech	322.4	0.4	3.7
3	PakGen	236.8	0.3	2.7
4	Lalpir	194.1	0.3	2.2
5	Atlas Power	306.1	0.4	3.5
6	Nishat Power	375.7	0.5	4.3
7	Nishat Chunian	271	0.4	3.1
8	Saba Power	548.6	0.8	6.3
9	Hubco Narowal	597.5	0.8	6.8
10	Attock Gen	674.4	0.9	7.7
11	Bhikki	15	0.0	0.2
12	Balloki	275	0.4	3.1
13	Haveli Bahadur Shah	388	0.5	4.4
14	Foundation Power	223.7	0.3	2.6
15	Sapphire Electric	70	0.1	0.8
16	TNB Liberty Power	85.4	0.1	1.0
17	Uch	103.8	0.1	1.2
18	Uch-II	18.9	0.0	0.2
19	Rousch	33	0.0	0.4
20	FKPCL	3387.1	4.7	38.7
21	Orient	275	0.4	3.1
22	Saif Power	74.1	0.1	0.8
23	TPS Muzaffargarh	1894.6	2.6	21.6
24	GTPS Faisalabad	699.9	1.0	8.0
25	CCPP Nandipur	24	0.0	0.3
26	TPS Guddu	3282.1	4.6	37.5
27	Guddu 747	3835.3	5.3	43.8
28	TPS Jamshoro	109.4	0.2	1.2
29	KAPCO	322.6	0.4	3.7
30	Engro Thar	1460.6	2.0	16.7
31	Port Qasim	710.5	1.0	8.1
32	Sahiwal Coal	0	0	0
33	CPHGC	2245.5	3.1	25.6
34	Lucky Electric*	-	-	-
35	HUBCO*	-	-	-

S.No.	Power Plant	Unplanned Outage Hours (in terms of)		
		Hours	Months	%
36	Engro Powergen Qadirpur*	-	-	-
37	Altern*	-	-	-
38	Kohinoor Energy*	-	-	-
39	Halmore	328	0.5	3.7

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the unplanned outage period of TPS Guddu, Guddu 747, TPS Muzaffargarh, FKPCL, CPHGC and Engro Thar remained on the higher side i.e. more than two (02) months of the total time during the said period. Whereas, the unplanned outage period of remaining thermal power plants remained less than one (01) month during the FY 2021-22.

3.8 Availability Factor:

According to the NEPRA PSGR 2009,

$$Avaiability\ Factor = \frac{Available\ Hours}{Period\ Hours}$$

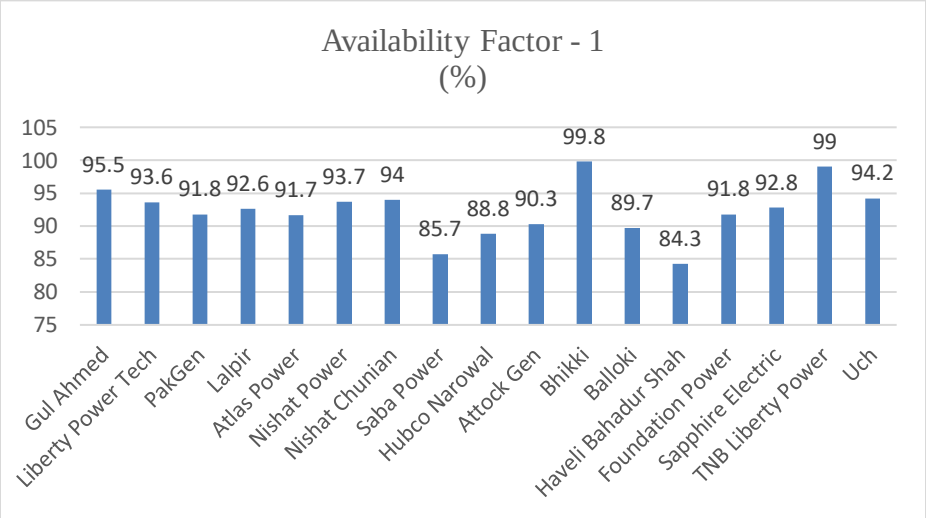
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Availability Factor of different thermal power stations remained as follows:

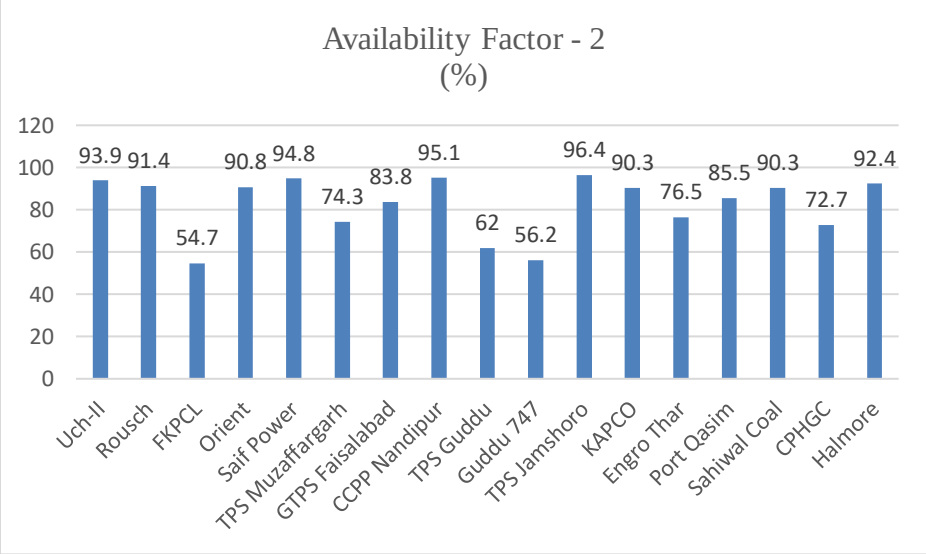
S.No.	Power Plant	Availability Factor (%)
1	Gul Ahmed	95.5
2	Liberty Power Tech	93.6
3	PakGen	91.8
4	Lalpir	92.6
5	Atlas Power	91.7
6	Nishat Power	93.7
7	Nishat Chunian	94.0
8	Saba Power	85.7
9	Hubco Narowal	88.8
10	Attock Gen	90.3
11	Bhikki	99.8
12	Balloki	89.7
13	Haveli Bahadur Shah	84.3
14	Foundation Power	91.8
15	Sapphire Electric	92.8
16	TNB Liberty Power	99.0
17	Uch	94.2
18	Uch-II	93.9
19	Rousch	91.4
20	FKPCL	54.7
21	Orient	90.8
22	Saif Power	94.8
23	TPS Muzaffargarh	74.3
24	GTPS Faisalabad	83.8
25	CCPP Nandipur	95.1
26	TPS Guddu	62.0
27	Guddu 747	56.2
28	TPS Jamshoro	96.4
29	KAPCO	90.3
30	Engro Thar	76.5
31	Port Qasim	85.5
32	Sahiwal Coal	90.3
33	CPHGC	72.7
34	Lucky Electric*	-
35	HUBCO*	-
36	Engro Powergen Qadirpur*	-

S.No.	Power Plant	Availability Factor (%)
37	Altern*	-
38	Kohinoor Energy*	-
39	Halmore	92.4

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the Availability Factor of TPS Guddu, Guddu 747, TPS Muzaffargarh, FKPCL, CPHGC and Engro Thar remained on the lower side i.e. less than 80% of the total time during the said period due to higher number of forced outage hours availed by these plants. Whereas, the Availability Factor of remaining thermal power plants remained more than 80% during the FY 2021-22.

3.9 Net Capacity Factor:

According to the NEPRA PSGR 2009,

$$Net\ Capacity\ Factor = \frac{Net\ Generation}{Net\ Capacity * Period\ Hours}$$

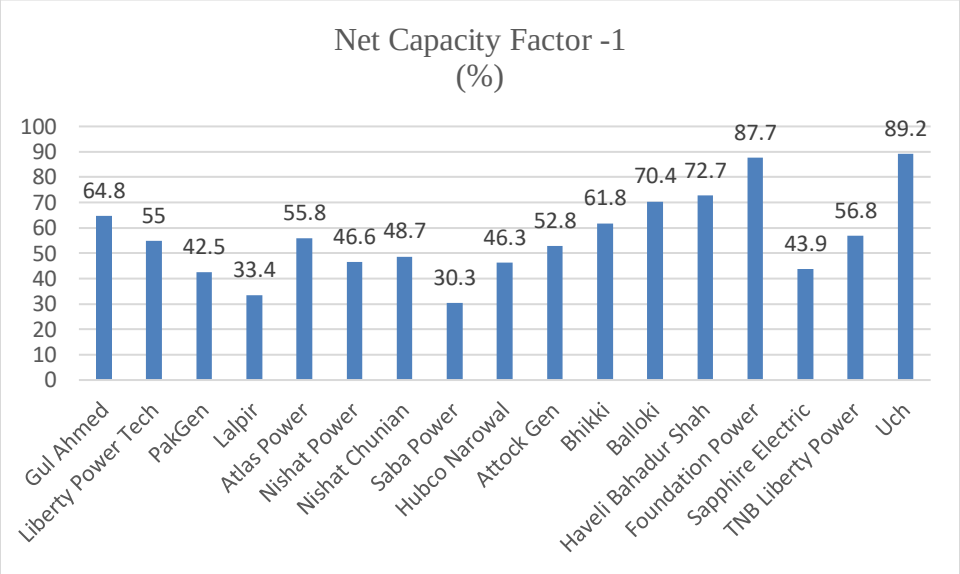
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Net Capacity Factor of different thermal power stations remained as follows:

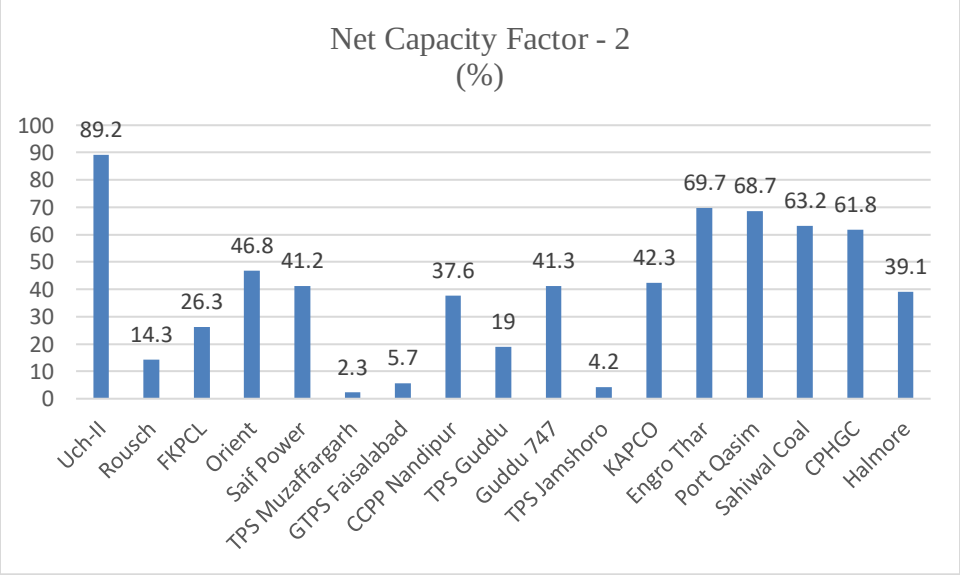
S.No.	Power Plant	Net Capacity Factor (%)
1	Gul Ahmed	64.8
2	Liberty Power Tech	55.0
3	PakGen	42.5
4	Lalpir	33.4
5	Atlas Power	55.8
6	Nishat Power	46.6
7	Nishat Chunian	48.7
8	Saba Power	30.3
9	Hubco Narowal	46.3
10	Attock Gen	52.8
11	Bhikki	61.8
12	Balloki	70.4
13	Haveli Bahadur Shah	72.7
14	Foundation Power	87.7
15	Sapphire Electric	43.9
16	TNB Liberty Power	56.8
17	Uch	89.2
18	Uch-II	89.2
19	Rousch	14.3
20	FKPCL	26.3
21	Orient	46.8
22	Saif Power	41.2
23	TPS Muzaffargarh	2.3
24	GTPS Faisalabad	5.7
25	CCPP Nandipur	37.6
26	TPS Guddu	19.0
27	Guddu 747	41.3
28	TPS Jamshoro	4.2
29	KAPCO	42.3
30	Engro Thar	69.7
31	Port Qasim	68.7
32	Sahiwal Coal	63.2
33	CPHGC	61.8
34	Lucky Electric*	-
35	HUBCO*	-

S.No.	Power Plant	Net Capacity Factor (%)
36	Engro Powergen Qadirpur*	-
37	Altern*	-
38	Kohinoor Energy*	-
39	Halmore	39.1

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the Net Capacity Factor of most of the inefficient and expensive RFO based power plants remained

on the lower side during the said period since these plants remained on standby mode for most part of the year during the FY 2021-22. For e.g. the Net Capacity Factor of TPS Muzaffargarh, TPS Jamshoro and Lalpir remained only 2.3%, 4.2% and 33.4% respectively during the said period.

Whereas, the Net Capacity Factor of most of the comparatively efficient and cheaper RLNG & Natural Gas based power plants remained on the higher side during the FY 2021-22 since these plants received despatch from the System Operator for most part of the year during the said period. For e.g. the Net Capacity Factor of Uch, Uch-II, Haveli Bahadur Shah and Balloki remained 89.2%, 89.2%, 72.7% and 70.4% respectively during the FY 2021-22.

3.10 Net Output Factor:

According to the NEPRA PSGR 2009;

$$Net\ Output\ Factor = \frac{Net\ Generation}{Net\ Capacity * Service\ Hours}$$

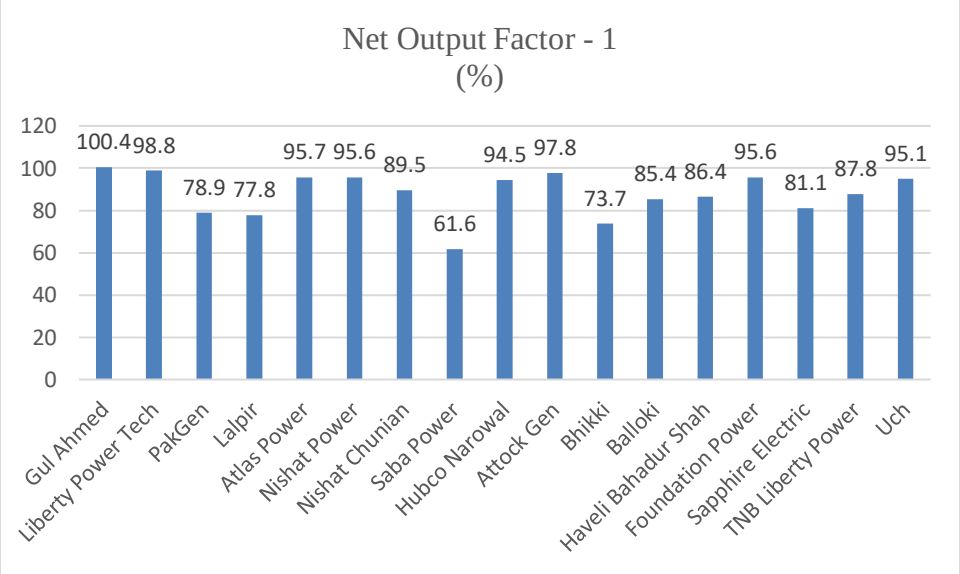
While reviewing the quarterly reports submitted by different thermal power stations for the FY 2021-22, under the NEPRA PSGR 2009, it has been observed that the Net Output Factor of different thermal power stations remained as follows:

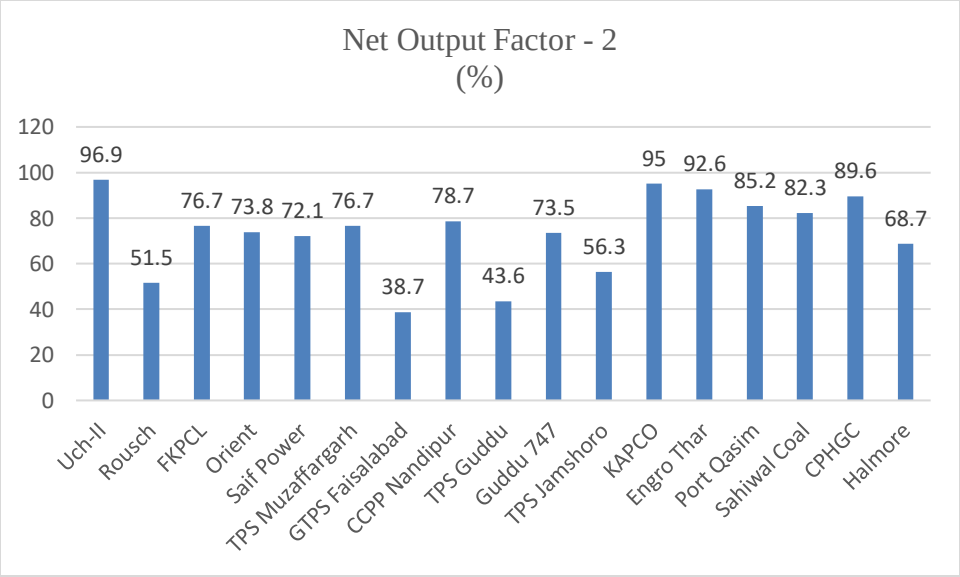
S.No.	Power Plant	Net Output Factor (%)
1	Gul Ahmed	100.4
2	Liberty Power Tech	98.8
3	PakGen	78.9
4	Lalpir	77.8
5	Atlas Power	95.7
6	Nishat Power	95.6
7	Nishat Chunian	89.5
8	Saba Power	61.6
9	Hubco Narowal	94.5
10	Attock Gen	97.8
11	Bhikki	73.7
12	Balloki	85.4
13	Haveli Bahadur Shah	86.4
14	Foundation Power	95.6
15	Sapphire Electric	81.1
16	TNB Liberty Power	87.8
17	Uch	95.1
18	Uch-II	96.9
19	Rousch	51.5
20	FKPCL	76.7
21	Orient	73.8
22	Saif Power	72.1
23	TPS Muzaffargarh	76.7
24	GTPS Faisalabad	38.7
25	CCPP Nandipur	78.7
26	TPS Guddu	43.6
27	Guddu 747	73.5
28	TPS Jamshoro	56.3
29	KAPCO	95.0
30	Engro Thar	92.6
31	Port Qasim	85.2
32	Sahiwal Coal	82.3
33	CPHGC	89.6
34	Lucky Electric*	-
35	HUBCO*	-

S.No.	Power Plant	Net Output Factor (%)
36	Engro Powergen Qadirpur*	-
37	Altern*	-
38	Kohinoor Energy*	-
39	Halmore	68.7

*Data not received from these plants.

Graphical Illustration:





Inference:

The data submitted by thermal power plants for the FY 2021-22 shows that the Net Output Factor of most of the inefficient and expensive RFO based power plants remained on the lower side during the said period. For e.g. the Net Output Factor of TPS Jamshoro and Saba Power remained only 51.5% and 61.6% respectively during the FY 2021-22. This, prima facie, indicates that these plants received despatch on partial load from the System Operator for most part of their service period during the said period.

Whereas, the Net Output Factor of most of the comparatively efficient and cheaper RLNG, Coal & Natural Gas based power plants remained on the higher side during the FY 2021-22. For e.g. the Net Output Factor of Uch-II, Uch, Engro Thar, Haveli Bahadur Shah and Balloki remained 96.9%, 95.1%, 92.6%, 86.4% and 85.4% respectively during the said period. This, prima facie, indicates that these plants received despatch on full load from the System Operator for most part of their service period during the FY 2021-22.