

In view of the above the energy requirement, PSPCL's own Generation availability and purchase (Net) required from outside sources submitted by PSPCL in the APR and approved by the Commission is as follows:

Table 88: Energy balance approved by the Commission for FY 2021-22 and FY 2022-23

MkWh

| Sr. No. | Particulars | FY 2021-22 | | FY 2022-23 | |
|---------|---------------------------|--------------------|------------------------------|--------------------|------------------------------|
| | | Submitted by PSPCL | Approved by the Commission** | Submitted by PSPCL | Approved by the Commission** |
| I | II | III | IV | V | VI |
| 1 | Energy requirement | 62708 | 62708 | 65015 | 65016 |
| 2 | i) PSPCL's Thermal Gen | 3328.00 | 3328 | 4430.00 | 4430 |
| | ii) PSPCL's Hydel Gen | 7141.69 | 7143 | 8257.33 | 8255 |
| | Total | 10469.69 | 10471 | 12687.33 | 12685 |
| 3 | Purchase (net) | 52389.38 | 52237 | 52504.29 | 52331 |

**Rounded off

Thus, the Commission approves the purchase (net) requirement of PSPCL as 52237 MkWh for FY 2021-22 and 52331 MkWh for FY 2022-23.

4.7 Norms of Operation for Own Thermal Generating Stations

PSPCL's submission:

PSPCL has reiterated the issue of part load operation in its submission in previous chapter for True-up regarding the Auxiliary Consumption, Station Heat Rate and Secondary Fuel Oil Consumption. PSPCL's own thermal Generating stations are to be operated as per the Merit Order Dispatch and thus remained under reserve outage/backing down for maximum time as per directions of Power Controller, Patiala. During frequent stop/start after reserve outage and running of units under backing down affects the performance of units.

Moreover, technical specification, aging, loading, etc. for PSPCL's Own Thermal Generating Stations are different from Generating Stations covered under CERC Tariff Regulations, 2019. Hence, it is important to consider the actual performance of GGSSTP and GHTP while deciding the norms for FY 2021-22 and FY 2022-23 respectively

Power availability from State's Own Thermal Generating Stations, GGSSTP and GHTP for FY 2021-22 and FY 2022-23 has been projected on the basis of aforesaid various parameters in line to relevant clause of PSERC MYT regulations, 2019. PSPCL submitted that Plant availability factor for H1 of FY 2021-22 as 93% for GGSSTP and 98% for GHTP. PSPCL has undertaken consistent & regular maintenance apart from timely renovation & overhaul of its units to sustain the generation from each of these power plants at the target output level set by the CEA. PSPCL has submitted the details of annual maintenance plan

for H2 of FY 2021-22 and FY 2022-23 in formats of this Petition.

PSPCL submitted that it has projected Plant availability of 99% for H2 of FY 2021-22 and 96% for FY 2022-23 for GGSSTP and Plant Availability of 90% of H2 of FY 2021-22 and 94% for FY 2022-23 for GHTP.

PSPCL added that it has considered the Auxiliary Consumption, Station Heat Rate and Secondary Fuel Oil Consumption based on the performance of H1 of FY 2021-22 and requested the Commission to approve Auxiliary Consumption, Station Heat Rate and Secondary Fuel Oil Consumption for GGSSTP and GHTP for FY 2021-22 and FY 2022-23 as submitted in the Petition.

As regards Transit Loss, PSPCL has considered transit loss of 0.8% as per PSERC MYT Regulations, 2019.

In view of this, PSPCL has considered the performance parameters as under:

Table 89: Performance Parameters submitted by PSPCL for FY 2021-22 and FY 2022-23

| Sr. No. | Particulars | FY 2021-22 | | | | FY 2022-23 | |
|---------|---|------------|-------|--------|-------|------------|-------|
| | | GGSSTP | | GHTP | | GGSSTP | GHTP |
| | | H1 | H2 | H1 | H2 | | |
| I | II | III | IV | V | VI | VII | VIII |
| 1 | Plant Availability | 93% | 99% | 98% | 90% | 96% | 94% |
| 2 | Auxiliary Consumption | 11% | 10% | 10% | 10% | 9% | 10% |
| 3 | Station Heat Rate (kCal/kWh) | 2733 | 2740 | 2612 | 2614 | 2739 | 2634 |
| 4 | Secondary Fuel Oil Consumption (ml/kWh) | 2.60 | 2.30 | 1.68 | 1.50 | 2.30 | 1.50 |
| 5 | Transit Loss | -1.23% | 0.80% | -1.31% | 0.80% | 0.80% | 0.80% |

Commission's Analysis:

The Commission observes that submissions made by PSPCL seeking relaxed norms for performance parameters i.e. auxiliary consumption, SHR, secondary fuel oil consumption and transit loss are same as submitted in the Chapter of True up, the same has been already discussed in detail under para 3.8 of this Tariff Order. Further, CERC finalizes the norms after considering the data of various plants of different capacities & vintages. After analyzing the same it specifies different norms for units of different capacities & vintages.

Regulation 35 of the PSERC MYT Regulations, 2019 specifies that norms for performance parameters shall be in accordance with CERC norms. **Thus, for the 2nd Control Period, the Commission decides to consider the normative performance parameters i.e., auxiliary consumption, SHR, secondary fuel oil consumption and transit loss as specified in CERC Tariff Regulations, 2019 as follows:**

Table 90: Performance Parameters considered by the Commission for FY 2021-22 and FY 2022-23

| Sr. No. | Parameters | | GGSTP | GHTP | |
|---------|-----------------------|-----------|-------|-------------|------|
| I | II | | III | IV | |
| 1. | Auxiliary Consumption | % | 8.50 | 8.50 | |
| 2. | Station Heat Rate | kCal/ kWh | 2430 | Unit: I-III | 2430 |
| | | | | Unit: IV | 2387 |
| 3. | Oil Consumption | ml/kWh | 0.50 | 0.50 | |
| 4. | Transit Loss | % | 0.80 | 0.80 | |

4.8 Fuel Cost

PSPCL's Submissions:

PSPCL submitted that as per Regulation 38 of PSERC MYT Regulations, 2019, the energy charges of thermal power plant shall be payable for the total energy scheduled at generation bus bar which includes primary fuel cost, secondary fuel cost and other associated costs to it.

PSPCL submitted that for computation of energy charge rate, PSPCL has considered actual data for H1 of FY 2021-22. The weighted average GCV as received of coal for FY 2021-22 at each thermal generating station has been considered. Considering the upward rise of price of coal, PSPCL has considered 5% escalation in price of coal.

PSPCL further submitted that any change in fuel cost from the level approved by the Commission shall be determined in accordance with the fuel cost adjustment (FCA) formula specified by the Commission in the Conduct of Business Regulations, and recovered from the consumers after following the procedure detailed in Conduct of Business regulations.

Also, PSPCL has considered the actual Fuel Cost for H1 of FY 2021-22 and projected the Fuel Cost for H2 of FY 2021-22 and FY 2022-23 based on actual weighted average Gross Calorific Value of Fuels and Price of Fuels for H1 of FY 2021-22.

As regards price of Oil, PSPCL submitted that it has taken into account increase in price of Oil. For GGSSTP, PSPCL has considered 5% escalation over actual price of Oil for H1 of FY 2021-22. For GHTP, PSPCL has considered the price of oil as Rs. 47,480/kL based on latest Oil stock. For GGSTP, PSPCL has considered the Oil price as Rs. 47,811/kL for FY 2022-23. Fuel costs submitted by PSPCL are given as under:

Table 91: Fuel Cost submitted by PSPCL for FY 2021-22 and FY 2022-23

| Particulars | FY 2021-22 | | FY 2022-23 |
|------------------------------|------------|------|------------|
| | H1 | H2 | Total |
| GGSTP | | | |
| Fuel Cost (Rs. Crore) | 354 | 310 | 913 |
| Cost of Generation (Rs./kWh) | 3.60 | 3.62 | 3.75 |
| GHTP | | | |
| Fuel Cost (Rs. Crore) | 429 | 239 | 973 |
| Cost of Generation (Rs./kWh) | 3.62 | 3.75 | 3.97 |

For computation of energy charge rate, PSPCL has considered actual data for H1 of FY 2021-22. The weighted average GCV as received of coal for FY 2021-22 at each thermal generating station has been considered. Considering the upward rise of price of coal, PSPCL has considered 5% escalation in price of coal. PSPCL has considered the actual Fuel Cost for H1 of FY 2021-22. PSPCL has projected the fuel cost for H2 of FY 2021-22 and FY 2022-23 based on actual weighted average Gross Calorific Value of Fuels and Price of Fuels for H1 of FY 2021-22. As regards price of Oil, PSPCL has considered increase in price of Oil. For GGSSTP, PSPCL has considered 5% escalation over actual price of Oil for H1 of FY 2021-22. The estimates of fuel cost by PSPCL are based on the following parameters:

Table 92: Cost Parameters submitted by PSPCL for FY 2021-22 and FY 2022-23

| Particulars | FY 2021-22 | | FY 2022-23 |
|------------------------|------------|-------|------------|
| | H1 | H2 | Total |
| GGSTP | | | |
| GCV of Coal (kCal/kg) | 3995 | 3995 | 3995 |
| Price of Coal (Rs./MT) | 5134 | 5134 | 5391 |
| GCV of Oil (kCal/kL) | 9900 | 9900 | 9900 |
| Price of Oil (Rs./kL) | 45534 | 45534 | 47811 |
| GHTP | | | |
| GCV of Coal (kCal/kg) | 4101 | 4100 | 4100 |
| Price of Coal (Rs./MT) | 5439 | 5711 | 5997 |
| GCV of Oil (kCal/kL) | 9500 | 9500 | 9500 |
| Price of Oil (Rs./kL) | 43065 | 45219 | 47480 |

Commission's Analysis:

Fuel cost being a major item of expense, the Commission thought it prudent to get the same validated for H1 of FY 2021-22. During validation, it was observed that PSPCL has also included the expenditure on coal handling contract cost in the fuel cost of GHTP. The Commission observes that the above cost does not form part of the fuel cost and the same has accordingly been considered as part of O&M expenses. Also, the GCV of coal has been considered on received coal as per CERC Tariff Regulations, 2019. The price/calorific value of oil & coal as per validation obtained by the Commission are indicated in para 3.9, The Commission decides to consider the same to determine the fuel cost for PSPCL's thermal Generating stations for H1 and H2 of FY 2021-22. In respect of cost of coal and oil for H2 of FY 2021-22, the Commission has considered the same cost as observed in H1 of FY 2021-22. In respect of cost of coal and oil for FY 2022-23, keeping in view the increasing trend of fuel and freight charges, the Commission has considered an increase of 2.00% over the respective costs for H1 of FY 2021-22 for GGSSTP and GHTP.

The Cost Parameters considered by the Commission for working out the fuel cost are as follows:

Table 93: Cost Parameters considered by the Commission for FY 2021-22 and FY 2022-23

| Sr. No. | Parameters | | GGSTP | GHTP |
|---------|---------------|------------|----------|----------|
| I | II | | III | IV |
| 1 | GCV of coal* | | 3911.00 | 3982.14 |
| 2 | CV of Oil | | 9705.00 | 9767.20 |
| 3 | Price of Oil | FY 2021-22 | 45534.83 | 43062.58 |
| | | FY 2022-23 | 46857.62 | 44313.55 |
| 4 | Price of coal | FY 2021-22 | 5135.26 | 5376.00 |
| | | FY 2022-23 | 5284.44 | 5532.17 |

**Weighted Average Gross calorific value of coal as received less 85 Kcal/Kg on account of variation during storage at generating station as per Regulation 40 and 43(2)(a) of the CERC Tariff Regulations, 2019*

Based on the above parameters, the fuel cost for FY 2021-22 has been worked out as follows:

Table 94: Fuel Cost for GGSSTP approved by the Commission for FY 2021-22

| Sr. No. | Item | Derivation | Unit | GGSSTP (FY 2021-22) | | |
|------------|---|---------------------------|----------------|---------------------|---------------|---------------|
| | | | | H1 | H2 | Total |
| I | II | III | IV | V | VI | V |
| 1. | Net Generation | A | MkWh | 880.68 | 770.40 | 1651.08 |
| 2. | Auxiliary Consumption | B | | 8.50% | 8.50% | 8.50% |
| 3. | Gross Generation | C | MkWh | 962.49 | 841.97 | 1804.46 |
| 4. | Heat Rate | D | kcal/kWh | 2430.00 | 2430.00 | 2430.00 |
| 5. | Specific oil consumption | E | ml/kwh | 0.50 | 0.50 | 0.50 |
| 6. | Calorific value of oil | F | kcal/litre | 9705.00 | 9705.00 | 9705.00 |
| 7. | Calorific value of coal | G | kcal/kg | 3911.00 | 3911.00 | 3911.00 |
| 8. | Overall heat | H= (C x D) | Gcal | 2338850.70 | 2045987.10 | |
| 9. | Heat from oil | I = (C x E x F) / 1000 | Gcal | 4670.48 | 4085.66 | |
| 10. | Heat from coal | J = (H-I) | Gcal | 2334180.22 | 2041901.44 | |
| 11. | Oil consumption | K= (Ix1000)/F | KL | 481.24 | 420.99 | |
| 12. | Transit loss of coal | L | (%) | 0.80% | 0.80% | |
| 13. | Total coal consumption excluding transit loss | M= (J*1000) /G | MT | 596824.40 | 522091.90 | |
| 14. | Quantity of Imported/ captive coal priced on FOR basis | N | MT | 0.00 | 0.00 | |
| 15. | Quantity of coal not priced on FOR basis | O=M-N | MT | 596824.40 | 522091.90 | |
| 16. | Quantity of coal not priced on FOR basis including transit loss | P=O/(1-L/100) | MT | 601637.50 | 526302.32 | |
| 17. | Total quantity of coal required | Q=N+P | MT | 601637.50 | 526302.32 | |
| 18. | Price of oil | R | Rs./KL | 45534.83 | 45534.83 | 45534.83 |
| 19. | Price of coal | S | Rs./MT | 5135.26 | 5135.26 | 5135.26 |
| 20. | Total Cost of oil | T=R x K / 10 ⁷ | Rs. Cr. | 2.19 | 1.92 | 4.11 |
| 21. | Total Cost of coal | U=Q x S/10 ⁷ | Rs. Cr. | 308.96 | 270.27 | 579.23 |
| 22. | Total Fuel cost | V=T+U | Rs.Cr. | 311.15 | 272.19 | 583.33 |
| 23. | Per unit Cost (gross) | W=V*10/C | Rs./kWh | 3.23 | 3.23 | 3.23 |
| 24. | Per unit Cost (Net) | X=V*10/A | Rs./kWh | 3.53 | 3.53 | 3.53 |

Table 95: Fuel Cost for GHTP approved by the Commission for FY 2021-22

| Sr. No. | Item | Derivation | Unit | GHTP (Unit I, Unit II & Unit III) | | GHTP (Unit IV) | | GHTP Total |
|------------|---|------------------------------------|---------------|-----------------------------------|---------------|----------------|--------------|---------------|
| | | | | H1 | H2 | H1 | H2 | |
| I | II | III | IV | V | VI | VII | VIII | IX |
| 1. | Net Generation | A | MkWh | 722.55 | 414.31 | 347.83 | 191.79 | 1676.48 |
| 2. | Auxiliary Consumption | B | | 8.50% | 8.50% | 8.50% | 8.50% | 8.50% |
| 3. | Gross Generation | C | MkWh | 789.67 | 452.79 | 380.14 | 209.61 | 1832.21 |
| 4. | Heat Rate | D | kcal/kWh | 2430.00 | 2430.00 | 2387.00 | 2387.00 | 2387.00 |
| 5. | Specific oil consumption | E | ml/kwh | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| 6. | Calorific value of oil | F | kcal/litre | 9767.20 | 9767.20 | 9767.20 | 9767.20 | 9767.20 |
| 7. | Calorific value of coal | G | kcal/kg | 3982.14 | 3982.14 | 3982.14 | 3982.14 | 3982.14 |
| 8. | Overall heat | $H = (C \times D)$ | Gcal | 1918898.10 | 1100279.70 | 907394.18 | 500339.07 | |
| 9. | Heat from oil | $I = (C \times E \times F) / 1000$ | Gcal | 3856.43 | 2211.25 | 1856.45 | 1023.65 | |
| 10. | Heat from coal | $J = (H-I)$ | Gcal | 1915041.67 | 1098068.45 | 905537.73 | 499315.42 | |
| 11. | Oil consumption | $K = (I \times 1000) / F$ | KL | 394.83 | 226.40 | 190.07 | 104.80 | |
| 12. | Transit loss of coal | L | (%) | 0.80% | 0.80% | 0.80% | 0.80% | |
| 13. | Total coal consumption excluding transit loss | $M = (J \times 1000) / G$ | MT | 480907.44 | 275748.20 | 227399.66 | 125388.65 | |
| 14. | Quantity of Imported/captive coal priced on FOR basis | N | MT | 0.00 | 0.00 | 0.00 | 0.00 | |
| 15. | Quantity of coal not priced on FOR basis | $O = M - N$ | MT | 480907.44 | 275748.20 | 227399.66 | 125388.65 | |
| 16. | Quantity of coal not priced on FOR basis including transit loss | $P = O / (1 - L/100)$ | MT | 484785.73 | 277971.98 | 229233.53 | 126399.85 | |
| 17. | Total quantity of coal required | $Q = N + P$ | MT | 484785.73 | 277971.98 | 229233.53 | 126399.85 | |
| 18. | Price of oil | R | Rs./KL | 43062.58 | 43062.58 | 43062.58 | 43062.58 | 43062.58 |
| 19. | Price of coal | S | Rs./MT | 5376.00 | 5376.00 | 5376.00 | 5376.00 | 5376.00 |
| 20. | Total Cost of oil | $T = R \times K / 10^7$ | Rs. Cr. | 1.70 | 0.97 | 0.82 | 0.45 | 3.94 |
| 21. | Total Cost of coal | $U = Q \times S / 10^7$ | Rs. Cr. | 260.62 | 149.44 | 123.24 | 67.95 | 601.25 |
| 22. | Total Fuel cost | V = T + U | Rs.Cr. | 262.32 | 150.41 | 124.06 | 68.40 | 605.19 |
| 23. | Per unit Cost (gross) | $W = V \times 10 / C$ | Rs./kWh | 3.32 | 3.32 | 3.26 | 3.26 | 3.30 |
| 24. | Per unit Cost (Net) | $X = V \times 10 / A$ | Rs./kWh | 3.63 | 3.63 | 3.57 | 3.57 | 3.61 |

Table 96: Fuel Cost for GGSSTP and GHTP approved by the Commission for FY 2022-23

| Sr. No. | Item | Derivation | Unit | GGSSTP | GHTP | | |
|------------|---|------------------------|----------------|---------------|---------------|---------------|---------------|
| | | | | | Units I-III | Unit IV | Total |
| I | II | III | IV | V | VI | VII | VIII |
| 1. | Net Generation | A | MkWh | 2212.00 | 1516.24 | 701.92 | 2218.16 |
| 2. | Auxiliary Consumption | B | | 8.50% | 8.50% | 8.50% | 8.50% |
| 3. | Gross Generation | C | MkWh | 2417.49 | 1657.09 | 767.12 | 2424.21 |
| 4. | Heat Rate | D | kcal/kWh | 2430.00 | 2430.00 | 2387.00 | |
| 5. | Specific oil consumption | E | ml/kwh | 0.50 | 0.50 | 0.50 | 0.50 |
| 6. | Calorific value of oil | F | kcal/litre | 9705.00 | 9767.20 | 9767.20 | 9767.20 |
| 7. | Calorific value of coal | G | kcal/kg | 3911.00 | 3982.14 | 3982.14 | 3982.14 |
| 8. | Overall heat | H= (C x D) | Gcal | 5874500.70 | 4026728.70 | 1831115.44 | |
| 9. | Heat from oil | I = (C x E x F) / 1000 | Gcal | 11730.87 | 8092.57 | 3746.31 | |
| 10. | Heat from coal | J = (H-I) | Gcal | 5862769.83 | 4018636.13 | 1827369.13 | |
| 11. | Oil consumption | K= (Ix1000)/F | KL | 1,208.74 | 828.55 | 383.56 | |
| 12. | Transit loss of coal | L | (%) | 0.80% | 0.80% | 0.80% | |
| 13. | Total coal consumption excluding transit loss | M= (J*1000) /G | MT | 1499046.24 | 1009164.47 | 458891.01 | |
| 14. | Quantity of Imported/ captive coal priced on FOR basis | N | MT | 0.00 | 0.00 | 0.00 | |
| 15. | Quantity of coal not priced on FOR basis | O=M-N | MT | 1499046.24 | 1009164.47 | 458891.01 | |
| 16. | Quantity of coal not priced on FOR basis including transit loss | P=O/(1-L/100) | MT | 1511135.32 | 1017302.89 | 462591.74 | |
| 17. | Total quantity of coal required | Q=N+P | MT | 1511135.32 | 1017302.89 | 462591.74 | |
| 18. | Price of oil | R | Rs./KL | 46445.53 | 43923.83 | 43923.83 | 43923.83 |
| 19. | Price of coal | S | Rs./MT | 5237.96 | 5483.52 | 5483.52 | 5483.52 |
| 20. | Total Cost of oil | T=R x K / 10^7 | Rs. Cr. | 5.61 | 3.64 | 1.68 | 5.32 |
| 21. | Total Cost of coal | U=Q x S/10^7 | Rs. Cr. | 791.53 | 557.84 | 253.66 | 811.50 |
| 22. | Total Fuel cost | V=T+U | Rs.Cr. | 797.14 | 561.48 | 255.34 | 816.82 |
| 23. | Per unit Cost (gross) | W=V*10/C | Rs./kWh | 3.30 | 3.39 | 3.33 | 3.37 |
| 24. | Per unit Cost (Net) | X=V*10/A | Rs./kWh | 3.60 | 3.70 | 3.64 | 3.68 |

The Commission, therefore, approves the fuel cost of Rs. 1188.52 Crore for PSPCL's own net thermal generation of 3327.56 MkWh for FY 2021-22, and fuel cost of Rs. 1613.96 Crore for PSPCL's own net thermal generation of 4430.16 MkWh for FY 2022-23.