

# **Annexure-1**

## Annual Report on Technical Performance of Khodri HEP

### 1.1 Overview

1.1.1 The petitioner in compliance of the relevant Regulations of UERC (Terms and Conditions for determination of Tariff) Regulations, 2011 & UERC (Terms and Conditions for determination of Multi Year Tariff) Regulations, 2015 is providing information with regard to the operational performance related to technical parameters of Khodri Hydro Power Station.

1.1.2 The information provided in this chapter relates to actual and expected performance in FY 2013-14, 2014-15, 2015-16, 2016-17, 2017-18 and 2018-19. The operational parameters considered are:

- (a) Gross generation
- (b) AUX (Auxiliary consumption and Transformation losses)
- (c) Plant Availability factor (PAF)

### 1.2 Power Station Description

1.2.1 The Khodri Power Station is a surface power station with installed capacity of 120 MW (4X30 MW) is located downstream of the Chibro Power Station. The Power Station draws water through a 6 km long and 7.5 m diameter head race tunnel directly from the collection gallery of the Chibro Power Station through a siphon tunnel under river Tons. HRT ends at 21 m dia. and 46 m high surge tank where the water is conveyed and distributed to two 5.5 m dia. and 85 m long pressure shafts and subsequently by four 4.1 m dia. and 24 m long penstocks to the generating units.

1.2.2 Khodri Power Station operates in tandem mode with Chibro Power Station, which means both Power Stations are laid out for same design flow and no intermediate water storage.

1.2.3 The Khodri Power Station comprising 4 units of 30 MW each with Francis turbines of 43,600 HP output is located on the banks of river Yamuna in Distt. Sirmaur of H.P. State and the tail water flows in river Yamuna, upstream of the Dakpathar Barrage. The Power Station's design head is of 57.9 m.

1.2.4 The operation of Chibro and Khodri Power Stations is another engineering marvel. The tandem control scheme between Chibro and Khodri Power Stations is in

operation since January, 1984 and is the first of its kind in the country which optimizes the utilization of water for generation besides maintaining the safety of both the plants in case of outages.

1.2.5 There are four generating units having vertical Francis turbine directly coupled with synchronous generator. The turbine output is 32.1 MW for a rated net head of 57.9 m. The generators are designed for a nominal output of 34 MVA with lagging power factor of 0.9 and class "B" insulation

1.2.6 This Power Station was commissioned in the year 1984. Due to operation of machines for more than past 32 years in silt laden water, efficiency of machines has substantially decreased and availability of machines has been adversely affected, in spite of best efforts and timely maintenance.

1.2.7 Though this Power Station has an installed capacity of 4x30 MW but due to constraints of water discharge limitations in HRT from collection gallery of Chibro maximum generating capacity is only 83 MW.

1.2.8 Salient features of the Power Station are provided in form F 2.3 of this petition.

### 1.3 Energy Generation

1.3.1 Actual/Expected/Projected Energy generation in FY 2013-14, 2014-15 & 2015-16, 2016-1, 2017-18 and 2018-19 is given in the table below:

**Table 1: Actual, Expected & Projected Energy**

| Particulars  | Norms                 | 2013-14<br>(A) | 2014-15<br>(A) | 2015-16<br>(A) | 2016-17<br>(A) | 2017-18<br>(E) | 2018-19<br>(P) |
|--|-----------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Design Energy/<br>Actual Generation<br>(MU)            | 345.00                | 435.79         | 406.86         | 376.32         | 333.27         | 371.58         | 383.41         |
| Auxiliary Cons. (%)                                    | 0.5%                  | 0.85%          | 0.85%          | 0.81%          | 0.81%          | 0.74%          | 0.7%           |
| Transformation/<br>other losses and<br>consumption (%) | 0.5 % (Tr.<br>losses) |                |                |                |                |                |                |
| Net Saleable Energy<br>(MU)                            | 341.55                | 432            | 403.41         | 373.27         | 330.59         | 368.82         | 380.73         |

1.3.2 From the above table it is evident that gross generation in each of the years under consideration is expected to be more than the design energy of the Power Station. The energy generation in FY 2016-17 is expected a little less as compared to previous years under consideration due to lesser discharge in river Tons.

1.3.3 The AUX (auxiliary consumption and transformation losses) in current control period are expected to be within the normative level

#### 1.4 Plant Availability Factor

1.4.1 The recovery of the Annual Fixed Charges is dependent on the Plant Availability achieved by the Power Station. The principle for recovery of fixed charges on the basis of the availability achieved by the plant has been introduced by the Hon'ble Commission by its regulations UERC (Terms and Conditions for Determination of tariff) Regulations, 2011 from the FY 2013-14. The petitioner has started computing this factor as per the provisions of the above regulations from the FY 2013-14.

**Table 2: Plant Availability Factor (Norm/Actual)**

| Particulars                 | Norms       | 2013-14<br>(A) | 2014-15<br>(A) | 2015-16<br>(A) | 2016-17<br>(A) | 2017-18<br>(E) | 2018-19<br>(P) |
|-----------------------------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|
| NAPAF /<br>PAFM (%)         | 57.23,57.23 | 59.35          | 60.73          | 62.24          | 58.96          | 57.65          | 57.65          |
|                             | 57.23       |                |                |                |                |                |                |
| Planned<br>Outages<br>(Hrs) | NA          | 3957           | 3419           | 3324           | 5791           | 3376           | 6528           |
| Forced<br>Outages<br>(Hrs)  | NA          | 186            | 4              | 42             | 0              | 135            | 59             |

1.4.2 **PAFM:** The Khodri Hydro Power Station is likely to achieve the normative plant availability factor determined by the Hon'ble Commission for the FY 2016-17 & 2017-18 as well.

The PAFM fixed by Hon'ble UERC during FY 2013-14, 2014-15 & 2015-16 could be achieved through optimum availability of water in the river and performance of




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Ichari dam and no major problems faced in the machines resulting in better availability of machines. The Petitioner does not seek any deviation in NAPAF for current control period from the norms as determined by Hon'ble Commission in its order.

**Table 3: PAFM Projections**

| Actual PAF from 2013-14 to Sept. 2017-18 and anticipated from October 2017 to March 2018 |         |       |       |       |       |       |       |       |       |       |       |       |       |         |
|--|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| Sl.No.   | Year    | Apr   | May   | Jun   | Jul   | Aug   | Sep   | Oct   | Nov   | Dec   | Jan   | Feb   | Mar   | Average |
| 1  | 2013-14 | 44.36 | 54.36 | 58.14 | 61.94 | 66.77 | 68.18 | 67.29 | 59.15 | 55.09 | 57.37 | 59.76 | 59.76 | 59.35   |
| 2  | 2014-15 | 59.71 | 60.63 | 61.28 | 66.36 | 69.62 | 64.76 | 64.30 | 67.34 | 59.00 | 51.70 | 43.77 | 60.31 | 60.73   |
| 3  | 2015-16 | 55.11 | 61.39 | 56.93 | 66.61 | 66.96 | 67.14 | 66.77 | 66.55 | 61.83 | 61.64 | 63.68 | 52.32 | 62.24   |
| 4  | 2016-17 | 58.56 | 61.45 | 62.85 | 64.11 | 66.04 | 67.56 | 67.34 | 62.63 | 58.79 | 43.39 | 43.77 | 51.05 | 58.96   |
| 5  | 2017-18 | 47.85 | 60.93 | 60.93 | 65.15 | 63.91 | 66.04 | 67.34 | 62.63 | 58.79 | 43.39 | 43.77 | 51.05 | 57.65   |
| 6  | 2018-19 | 47.85 | 60.93 | 60.93 | 65.15 | 63.91 | 66.04 | 67.34 | 62.63 | 58.79 | 43.39 | 43.77 | 51.05 | 57.65   |

1.4.3 **Outages:** Khodri Power Station is in the downstream of Chibro Power Station, so the reasons mentioned for the outages of Chibro Hydro Power Station equally apply to this Power Station too. The Petitioner too would continue to lay emphasis on preventive and planned maintenance for better power station availability in the FY 2018-19.


1.4.4 **Planned Outages:**

**Table 4: Planned Maintenance Plan**

| FY      | Unit   | From       | To         | No. Of Day | Outage Type |
|---------|--------|------------|------------|------------|-------------|
| 2018-19 | Unit 1 | 05-11-2018 | 04-12-2018 | 30         | AM          |
|         | Unit 2 | 10-12-2018 | 08-01-2019 | 30         | AM          |
|         | Unit 3 | 10-12-2018 | 09-06-2019 | 182        | CM          |
|         | Unit 4 | 15-01-2019 | 13-02-2019 | 30         | AM          |

AM- annual Maintenance, CM-Capital Maintenance

  
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