SANIMA MIDDLE TAMOR HYDROPOWER LTD.

MIDDLE TAMOR HYDROPOWER PROJECT (73 MW)

CONSTRUCTION PROGRESS REPORT (December 2023)

1 INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

The under construction Middle Tamor Hydropower Project (MTHP) is a run-of-river (RoR) project with an installed capacity of 73 MW with its headworks (HW) located in Phungling Municipality and Phaktanglung Rural Municipality, and the Powerhouse (PH) is situated in Mikwakhola Rural Municipality on the Tamor River in Taplejung district. The boundary coordinates of the project are 870 40' 01" E to 870 42' 40" E and 270 23' 29" N to 270 25' 19" N. The nearest black-topped approach road to the project site is at Bahanande, on the Mechi Highway (233 km from Charali in Jhapa), 7 km south of the district headquarters Phungling Bazar. From Phungling, the project Powerhouse (Thumba village) and Headworks (Mitlung village) sites are accessible via different earthen roads at a distance of 20km.

Sanima Middle Tamor Hydropower Ltd. (SMTHL) was established as a Special Purpose Vehicle (SPV) Company for the implementation and operation of the Middle Tamor Hydropower Project. The Generation License of the Project was initially obtained for 54 MW on June 5, 2017. Subsequently, the design was revised, and a generation license for the revised capacity of 73 MW was obtained on December 10, 2018. SMTHL has overseen the construction works through four major individual contract packages with various international and national contractors. The Main Civil, Hydro-Mechanical, Electro-Mechanical, and Transmission Line Contractors have all been involved in the construction process. Apart from these major contracts, pre-construction and preparatory works have been executed by SMTHL. These include the construction of access roads, upgrading of existing roads, slope protection works, construction of bridges, land acquisition, and other necessary arrangements.

Considering various technical factors affecting the overall progress of the Project and the construction of the transmission line being constructed by the Nepal Electricity Authority (NEA) from Dhunge Sanghu to Basantapur, the Employer and NEA agreed to extend the required commercial operation date (RCOD) until the completion of the construction of the above mentioned transmission line. Therefore, as per the second revision done on the Power Purchase Agreement (PPA) with NEA, the RCOD of the Project has been amended to a revised date of February 27, 2024 (Falgun 15, 2080).

Regarding technical features of the Project, the installed capacity is 73 MW, with a design discharge of 73.71 m^3/s, corresponding to 42.71% exceedance flow. The catchment area of the Project is 2,002 km^2, and the gross head is 132 m. The weir, 50 m long, has its crest level at 887 m above mean sea level (amsl). The maximum height of the weir crest from its original ground level is 10.5 m. It diverts the required flow to the Intake. The Intake has 6 openings to withdraw the design discharge. The flow from the Intake is conveyed to the gravel trap and then to the underground settling basin via a concrete-cased approach pipe of 281.52 m length. The three-chambered 100 m long underground settling basin, designed with 90% trap efficiency, passes the clean water into the headrace tunnel.

The headrace tunnel, approximately 3,367 m long and lined with concrete and shotcrete, carries the design discharge to the penstock. The proposed penstock starts with a diameter of 4.5 m until a branching length of about 264.66 m. After that, four penstock pipes with internal diameters ranging from 2.25 m to 4.5 m supply water to the powerhouse. The Powerhouse, measuring 56.5 m in length and 26 m in width, has a tailwater level at 755 m amsl. Four units of vertical axis Francis turbines, each with a capacity of 18.25 MW, are set to generate the designed output of 73 MW. After power generation, the tailwater is discharged back to the Tamor River through a 75 m long tailrace culvert. The generated electricity is supplied through an approximately 9 km long 220 kV double circuit transmission line to the Dhunge Sanghu substation of the Koshi Corridor, which is being constructed by Nepal Electricity Authority (NEA). The estimated annual energy generation as per the PPA is 429.409 GWh.

The general layout of the project is depicted in Figure 1.

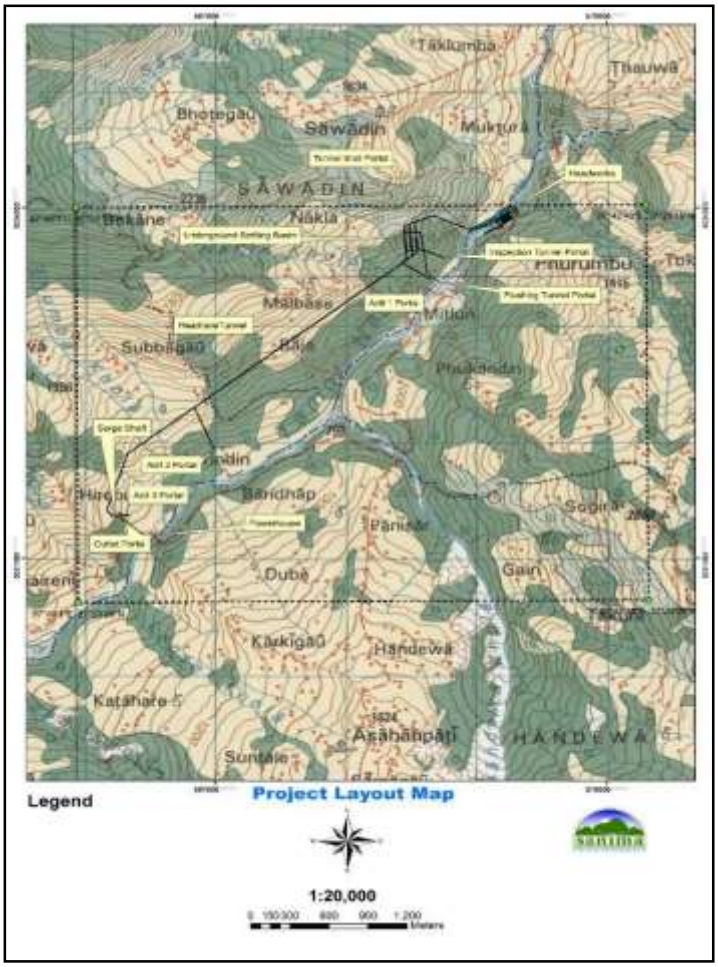


Figure 1-1: General layout of the Project Structures

1.2 PROJECT KEY INFORMATION

Project Key Data			
Project Name	Middle Tamor Hydropower Project		
Project Company Name	Sanima Middle Tamor Hydropower Limited		
Installed Capacity	73 MW	Annual generation	429.409 GWh
Location	Taplejung, Nepal	Main Civil Contract Award	12 April 2018
Date of Generation license	5 June 2017/10 Dec 2018	Date of PPA signing	10 Jan 2017/30 Nov 2018
Revised Project Cost (estimated total)	NPR 13,330 Million	Total equity required (estimated)	NPR 3,332.5 Million
Total debt required (estimated)	NPR 9,997.5 Million	Revised RCOD	Amended to 27 February 2024 (Falgun 15, 2080)
Lenders	NIBL – Lead, Nabil (Co-lead), Global IME (Co-lead), NMB, NCC, Laxmi, Nepal SBI, ADBL Banks	Consultant	Sanima Hydro and Engineering Pvt. Ltd. (SHE)
Main Civil Contractor	Zhejiang First Hydro and Power Construction Group Co. Pvt. Ltd., Zhejiang, China	Hydro-Mechanical Contractor	Machhapuchhre Metal and Machinery Works Pvt. Ltd., Pokhara, Nepal

1.3 SALIENT FEATURES OF THE PROJECT

Electro-Mechanical Contractor	Chongqing Water and Turbine Works Co. Pvt. Ltd. (CWTW), Chongqing,
Location	Phaktanglung Municipality, Phaktanglung Rural Municipality and Mikwa Khola Rural Municipality, Taplejung District, Koshi Province of Nepal
Transmission Line Contractor	Cosmic Electrical Engineering Associates
Purpose of Project:	To supply renewable energy for domestic use by connecting to national grid
Hydrology:	
Catchment Area	2,002.32 km²
Average flow	126.69 m³/s (minimum monthly flow 19.55 m³/s)
Design Flow	73.71 m³/s (42.71% exceedance flow)
90% Exceedance flow	17.98 m³/s
Design Flood (Q_{100})	2,791 m³/s
Diversion Dam:	
Type	Concrete gravity dam
Slope	Ogee-profile
Crest Elevation	887 m above msl
Max. Flood Level (100 years return)	895.4 m above msl
Crest Length	50 m
Maximum height	10.5 m (from the Original ground level)
Spillway/Undersluice:	
Type	Submerged with overflow spillway (2@ 5 m x 5 m)
Invert Elevation	874.50 m above msl
Size (B x H)	5.0 m x 5.0 m
Intake:	
Type	Submerged
Number of Orifices	6
Sill Elevation of Orifice	881 m above msl
Top Elevation of Orifice	885 m above msl
Size (B x H)	4.75 m x 4.0 m (each)
Gravel Trap:	
Type	Rectangular, RCC (Continuous)
Particle size to be settled	5 mm-100 mm
Number of Chambers	3
Width (each)	12.00 m
Height	11.85 m
Length	15.00 m
Approach Pipe	
Type	Concrete encased steel pipe
Number	1
Diameter	4.5 m
Total Length (Up to Inlet Portal)	281.52 m and 20 m inside tunnel including Bell-mouth
Longitudinal slope	1:1000 (V:H)
Underground Settling Basin:	
Type	Conventional flushing
Number of bay	3
Approach Tunnel length	360.244 m (average)
Transition length	35 m
Dimension (L x B)	100 m x 13 m (each)
Particle Trap efficiency	90% (for sediment particles equal to or larger than 0.2 mm)
Longitudinal slope	1:50
Length from transition up to outlet gate	22.75 m
Length from gate to vertical drop	30.26 m
Converging tunnel length from drop to main tunnel (Average of three)	109.622 m
Inspection Tunnel:	
Length	131.758 m
Excavation Diameter	4.9 m
	Inspection Tunnel 1 (to SB inlet):
Length	145.963 m (excluding common stretch)
Excavation Diameter	4.9 m
	Inspection Tunnel 2 (to SB outlet):
Length	289.524 m (excluding common stretch)
Excavation Diameter	4.9 m
Adit-1 (near Nakla Kholsi):	
Length	301.562 m
Excavation Diameter	4.9 m
Sediment flushing tunnel:	
Number	5
Length from inlet to common tunnel	28.72 m (each)
Size(B X H)	2.4 m x 2.4 m
Length of common tunnel up to portal	327.89 m
Slope of the tunnel	1:50
Size (B x H)	2.4 m x 2.9 m

Project Outputs:
Feedback
Agreement (PPA) with the Nepal Electricity Authority (NEA)

Length of culvert from portal to outlet	52.778 m
Slope of the culvert	1:50
Size of culvert (B X H)	2 m x 2.5 m
Total Sediment flushing length	409.388 m
Headrace Tunnel:	
Length (Excluding settling basin)	3,367 m (up to outlet portal)
Dimensions	Inverted U shape 6.5 m (Excavation Diameter)
Support System	Concrete lining and shotcrete
Surge Shaft:	
Type	Vertical, Underground circular section/ dome type
Height	79.93 m
Diameter	16.00 m (Excavation)
Ventilation tunnel for Surge shaft:	
Length	199.75 m
Size(B X H)	3.5 m X 3.75 m
Slope	1 in 8.69
Penstock:	
Length	264.66 m inclined length of 4.50 m diameter including Bell-mouth up to branching After branching, 11.54 m of 4.5 m diameter including transition 11.25 m of 3.9 m diameter including transition 11.47 m of 3.18 m diameter including transition 153.12m of 2.25 m diameter including transition 452.04 (Total Length)
Thickness	18 mm to 36 mm thickness
Grade	E-350 (IS 2062 or Equivalent)
Power Facilities:	
Powerhouse Type	Semi-surface
Dimensions (L x B)	56.5 m x 26 m
Gross Head	132 m (887.0 m – 755.0 m above msl)
Net Head	115.59 m
Installed capacity	73 MW (4 x 18.25 MW)
Dry energy	64.90 GWh
Wet energy	364.27 GWh
Annual Net Energy Output	429.409 GWh
Tailrace Culvert:	
Type	RCC, rectangular culvert (double chambered)
Length	75.00 m
Height	5.00 m
Width	4.75 m each
Longitudinal slope	1:500 (V:H)
Maximum Tail water level	755.00 m amsl
Transmission Facilities:	
Transmission line length	9 km
Voltage level	220 kV, Double circuit

1.4 PROJECT KEY DATES

The key dates for the project details are listed in the table below:

Survey License to SHEPL	: 2nd Falgun 2064 (14 Feb 2008)
EIA approval	: 10th Baisakh 2070 (23 Apr 2013)
SEIA approval for 73MW	: 6th Kartik 2075 (23 Oct 2018)
Grid Connection Agreement	: 25thFalgun 2071 (09 Mar 2015)
Generation license received	: 22nd Jestha 2074 (05 Jun 2017)
Power Purchase Aggreement for 54 MW (PPA)	: 26th Poush 2073 (10 Jan 2017)
Power Purchase Agreement (PPA) for additional 20.9 MW	: 14th Mangsir 2075 (30 Nov 2018)
Generation License received for 73 MW	: 24th Mangsir 2075 (10 Dec 2018)
Financial Closure	: 27th Magh 2075 (10 Feb 2019)
Main Civil Contract	: 29th Chaitra 2074 (12 Apr 2018)
Hydro-mechanical Contract	: 26th Ashad 2076 (11 July 2019)
ToR Approval for 220 kV TL Project	: 1st Bhadra, 2076 (18 Aug 2019)
Electro-mechanical Contract	: 7th Poush 2076 (23 Dec 2019)
Transmission Line Contract	: 25th Jestha, 2076 (07 June 2020)
IEE Approval for 220 kV TL Project	: 29th Aashad 2078 (13 July 2021)
Construction License received for 220 kV TL	: 19 Ashoj 2078 (05 October 2021)
Required Commercial Operation Date	: 26 Bhadra 2080 (11 September 2023)
Revised Required Commercial Operation Date	: 15 Falgun 2080 (27 February 2024)

1.5 MAJOR CONTRACT PACKAGES

Five different contract packages have been prepared for the Project's implementation.

S.N.	Package	Contract Name	Company name	Date of Award
1.	Package I	Main Civil Works	Zhejiang First Hydro & Power Construction Group Co., Pvt. Ltd., Hangzhou, China	April 12, 2018
2.	Package II	Hydro-mechanical Works	Machhapuchhre Metal and Machinery Works Pvt. Ltd., Nepal	April 12, 2018
3.	Package III	Electro-mechanical Works	Chongqing Water and Turbine Work Co. Pvt. Ltd., Chongqing, China	December 23, 2019
4.	Package IV	Transmission Line Works	Cosmic Electrical Engineering Associates Pvt. Ltd., Nepal	June 7, 2020

Besides, contract for preconstruction and preparatory works was awarded to Bavari Construction Pvt. Ltd.

2 PROGRESS UPDATE

The Engineer: Sanima Hydro and Engineering Private Limited (SHEPL) has been consistently overseeing the construction progress across Main Civil Works, Hydro-Mechanical Works, Electro-Mechanical Works, and Transmission Line Works at the Project site. The work progress achieved by the Project to date is described below.

2.1 PRE-CONSTRUCTION WORKS

2.1.1 ACCESS ROAD

A fully functional earthen access road, approximately 20 km in length, has been established leading to the construction site from the Mechi Highway junction (located at Bahanande). The majority of the access road sections have been built by the Project, which also involved upgrading existing village roads. The access road consists two river crossings: one at the Powerhouse location and another at the Headworks location. An alternative road route from Mitlung to Thumba, along with the installation of an additional Bailey bridge at Budidaha, is fully operational, with occasional maintenance efforts. The management remains fully cautious and prepared for any potential disruptions in transportation that may occur in monsoon season on the access roads.

2.1.2 CAMP FACILITIES

The construction of camp facilities in both the Headworks area (referred to as Simle Camp) and the Powerhouse area (known as Lorindin Camp) has been successfully completed, in accordance with the final phase plan. In Simle Camp, eight buildings have been constructed, and in Lorindin Camp, four buildings have been completed. Additionally, an Army Camp and Bunker at Sisne, situated near the Headworks, are operational, with regular maintenance and cleaning being carried out, but no major maintenance work has been required thus far.

2.1.3 CONSTRUCTION POWERLINE

The Nepal Electricity Authority (NEA) Substation (S/S) located at Phungling (Hiti) in Taplejung, which is connected to the national grid, has been the primary power source for the Project's construction. This power is delivered via a dedicated line originating from the nearby Hiti S/S, making it the most convenient source for the Project area.

The power requirements for the Project's construction, taking into account the load demands at the headworks, Adit-1, and the powerhouse, have been estimated at approximately 1.7 MVA. To transmit this power, a 17 km long 33 kV construction power line (currently operating at 11 kV) has been constructed, extending from the Hiti substation to both the powerhouse area and the headworks area. This construction power line has been operational since Mangsir 13, 2075 and has been maintained with minor interventions as needed.

Figure 2-1: Construction of new residential camp building at the powerhouse

2.2 MAIN CIVIL WORKS

The contract for the Main Civil Works was awarded to Zhejiang First Hydro and Power Construction Group Co. Ltd., China (referred to as 1st Hydro). The construction of the Main Civil Works commenced in March 2019, following the acquisition of the generation license and the successful financial closure achieved in February 2019.

At present, the Main Civil Contractor has completed the concreting activities at the major civil structures within the headworks, powerhouse and underground tunnel network, including the weir, stilling basin, undersluice, intake, intake canal, gravel trap, conveyance tank, head race pipe, settling basins, surge shaft, powerhouse main building, and tailrace section. Additionally, construction work is ongoing for remaining components, which include the valve house, concreting works of the approach tunnel, and the bulkhead gate region.

2.2.1 HEADWORKS

The Main Civil Contractor carried out concreting works at the headworks fronts through a number of Nepali sub-contractors and most of the structures have already been constructed. The construction of the weir, stilling basin, and the downstream floodwall has been successfully completed in June 2023. Additionally, the construction of the undersluice and the intake, two of the most crucial hydraulic structures of the Project, have been completed in February 2023, along with the construction of the fish ladder.

Furthermore, the completion of construction of the Intake canal was achieved in March 2023 with the gravel trap being completed in July 2023. In addition, the construction of upstream (u/s) floodwall has also been completed. Most notably, the first water filling test at the headworks was carried successfully on August 01, 2023. The construction of the conveyance tank has been completed. In the case of approach pipe encasing, the concreting works are going on simultaneously with the laying of approach pipes. Whilst most of the concrete casing of the approach pipes of the surface region has been completed, the concreting works for the underground portion (inside inlet tunnel) is in the final stages and is scheduled to be completed by the mid of January 2024. Moreover, the construction of headworks control building is also in the final stage of completion and will be made ready by the stipulated schedule.

2.2.1.1 INTAKE AND GRAVEL TRAP

The construction of the intake structure as well as gravel trap has been completed as of July 2023, with approximately 8,178 m^3 of concrete poured in the intake region and approximately 4,808.93 m^3 of concrete poured in the gravel trap. Furthermore, the construction of the intake canal was successfully finalized in March 2023, with the pouring of approximately 2,704.64 m^3 of concrete within the intake canal region.

2.2.1.2 WEIR AND STILLING BASIN

The construction of the stilling basin was successfully completed in May 2022, and the completion of the main body of the weir, in June 2022. Particularly, a considerable volume of concrete was poured in these structures: approximately 17,342 m^3 for the weir, 10,848 m^3 for the stilling basin, and 2,096 m^3 for the upstream slab and cutoff. In total, a significant 30,086 m^3 of concrete was used for the construction of the weir and stilling basin section. The curtain grouting works at the upstream slab of the weir and undersluice bed have already been completed, adding to the progress of the project.

Additionally, a small portion of the left bank floodwall, situated over the crest of the weir, has also been constructed. With the plugging of the weir openings being completed, the water filling test of the headworks region has been successfully conducted on August 01, 2023 by shutting down of all six intake gates and both the radial gates of undersluice. With this, a remarkable milestone of the Project has been achieved.

Figure 2-2: Aerial view of Headworks from the downstream (left) and A view of gravel trap and conveyance tank from upstream (right)

2.2.1.3 UNDERSLUICE

The construction of the undersluice has been successfully completed as of February 2023, along with the construction of the fish ladder. Throughout the construction process, approximately 19,327 m^3 of concrete has been poured into the undersluice portion.

Figure 2-3: An aerial view of weir with flow over the ogee crest (left) and Current view of headworks (right)

2.2.1.4 CONVEYANCE TANK

The construction of conveyance tank has been accomplished in June 2023. Up to the present date, approximately 8,022 m^3 of concrete has been poured at the conveyance tank region. The completion of conveyance tank marks a substantial progress achieved by the Project at the headworks region.

2.2.1.5 APPROACH PIPE

The concrete works at the approach pipe section, situated outside the inlet portal have already been completed in June 2023 up to the bend, whilst the concrete encasing works of the approach pipe section inside the tunnel is in progress. Out of the total length of the approach pipe, which is 282 meters, the Hydro-Mechanical Contractor has already laid out around 220 meters of pipe up to the inlet portal. Additionally, more than 210 meters of the approach pipe section located outside inlet portal has been encased in concrete. As of the current date, approximately 3,595 m^3 of concrete has been poured for the approach pipe section, which contributed to approximately 65% of the total concreting work planned for this area.

To sum up, the overall physical progress achieved at the headworks region is approximately 98%. The major construction works of the headworks region has been completed as of July 2023.

Figure 2-4: A view of conveyance tank (left) and Approach pipes installation completed upto inlet portal (right)

2.2.2 UNDERGROUNDS WORKS

The progress in tunnel excavation faced significant challenges due to the outbreak of COVID-19, which led to transportation difficulties, a shortage of explosives, and the deployment of government security agencies. The departure of Chinese workers from Nepal due to the pandemic prompted the Main Civil Contractor to continue the excavation of the Headrace Tunnel (HRT) and surge shaft through Nepali sub-contractors while implementing strict health and safety measures. The excavation and rock support work at the settling basin sites were also carried out by a Nepali subcontractor in an effort to mitigate the impact of the evacuation of Chinese workers and the COVID-19 pandemic, although the resulting delay was inevitable.

Despite these challenging circumstances, a significant achievement was reached as the breakthrough of the Headrace Tunnel (HRT) occurred on July 15, 2022. Additionally, the challenging task of completing the concrete lining works for the 80-meter-deep surge shaft and the full concrete lining works for the HRT has been accomplished. The excavation works for the flushing tunnel network have also been successfully completed. Most notably, the construction of the Settling basins, considered the most challenging aspect of the project, has been successfully completed in December 2023. Presently, most resources are dedicated towards the concrete lining of the approach tunnel to the Settling basins from the inlet region and the construction of outlet gate shafts. The vertical sections of the underground works: inlet and outlet gate shafts and flushing gate shafts are in the final stages of construction.

Regardless of the disruptions caused by the pandemic and occasional rock overbreaks in the caverns, leading to extensive and time consuming repair and maintenance, significant progress has been made in the underground works. Approximately 99% of the entire underground network has been excavated with about 6,615 meters of the total tunnel network excavated to date out of 6,626 meters.

2.2.2.1 APPROACH/INLET PORTAL

The length of Approach Tunnel 01, 02 and 03 is 186.33 meters, 148.17 m, and 166.50 m respectively which includes a 35-meter inlet transition zone in each. The excavation of Approach Tunnel 01 was successfully completed on February 11, 2020, covering a distance of 151.26 meters. The length of approach tunnel 02 is 148.17 m including 35 m long inlet transition zone 02. The excavation of all three approach tunnels has been completed in the month of February, 2020. The final lining shotcrete and rock bolt installation have already been carried out in all three sections of Approach Tunnels. Further, the final support measures have already been implemented in all three tunnels. This involved the installation of 50-75 mm thick shotcrete (sprayed concrete) and the placement of rock bolts. To provide the necessary structural integrity, a final layer of steel-reinforced shotcrete, 150 mm thick, has been applied. In addition to these, the concrete lining at the invert and walls of the Approach tunnel 02 has been completed where is in final stage of completion in Approach tunnels 01 and 03.

2.2.2.2 SETTLING BASINS

There are three settling basin bays in MTHP each 150 meters long, which includes a 35-meter-long inlet transition zone and a 15-meter-long outlet transition zone. The dimensions of the settling basin are 13.5 meters in width and 17.5 meters in height. The excavation of all three large settling basin caverns has been successfully completed on November 2023, with a total excavation volume of approximately 90,000 m^3.

The Contractor has already completed grouting works at the crown along with the final rock bolts installation and shotcrete application. Most notably, the concrete lining works at all three Settling Basin bays have been completed including inlet transition, main bay (hoppers, pier and walls) and outlet transition by December 2023. With this, the Contractor has completed the excavation and concreting works in all three settling basin bays. As of now, the concreting works are going on simultaneously in the approach tunnels and are expected to be completed by the second week of January.

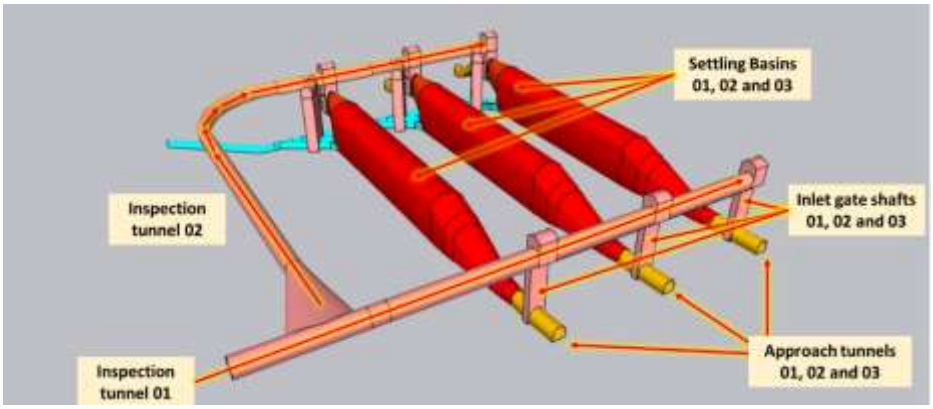


Figure 2-5: Schematic view of settling basins and associated tunnel network

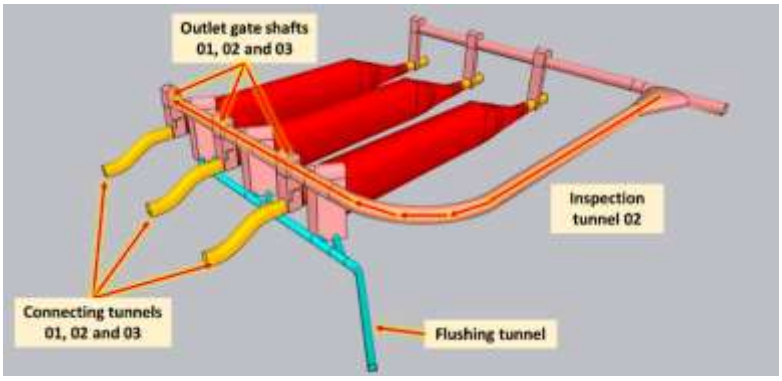


Figure 2-6: Schematic view of settling basins and associated tunnel network

Figure 2-7: A view of rebar layout and concreting works at SB 01

Figure 2-8: A view of SB 02 after the completion of concreting works (left) and a view of approach tunnel 02 (right)


Figure 2-9: A view of SB 03 during concrete works

2.2.2.3 CONNECTING TUNNELS FROM SETTLING BASIN TO HRT

Three number of connecting tunnels connects each settling basin bays at the outlet transition region to the head race tunnel. All three tunnels meet at the 0+000 chainage of the HRT at the junction point of HRT with the Adit tunnel. The concreting works on this front has also been completed in October 2023. With this, completion in one of the most challenging work fronts at the head race tunnel region has been achieved.

2.2.2.4 SETTLING BASIN: INLET/OUTLET GATE SHAFT

The Settling Basin consists of 3 inlet gate shafts at the junction of each approach tunnel with respective settling basins and 3 outlet gate shafts at the junction of each connecting tunnel with the settling basins. The Main Civil Contractor has completed the excavation works of the inlet gate shafts for all three settling basins. Further, the concrete works for SB 03 inlet gate shaft has already been completed as of December 2023, whereas, the concrete works for the inlet gates for SB 01, and SB 02 are in the final stage of construction and are scheduled to be completed soon.

Regarding the construction of outlet gate shafts, the excavation works and concreting works shall be carried out simultaneously and are scheduled to be completed by the end of January 2024.

2.2.2.5 HEADRACE TUNNEL (HRT)

The headrace tunnel, which spans a length of 3,367 meters, features an excavation size of 6.5 meters by 6.5 meters. It serves as a connecting passage that links the Connecting tunnels with the penstock pipe at the outlet region. A significant milestone was achieved with the breakthrough of the headrace tunnel on July 15, 2022, occurring at a chainage of 1+545.37 meters from the tunnel's starting point. This breakthrough represents a significant accomplishment in the construction of the tunnel. About 1,545.37 m was excavated from Adit-01 in the Headrace Tunnel section up to the breakthrough point whereas about 1,824.59 m was excavated from outlet site.

The full lining concreting works at the HRT have been successfully completed as of November 2023, covering the entire section, including the connecting tunnel to the Surge shaft and the connecting tunnels leading to each settling basin bay. In addition, the final shotcrete works has been successful completed throughout the length of the HRT by December 2023. Presently, the final inspection of HRT has already begun and cleaning works are also being carried out simultaneously. Currently, the focus has shifted towards the construction of bulkhead gate region (the junction of adit tunnel and HRT), which is the final work to be carried out at the HRT. The scheduled completion of HRT along with all associated works is January 30, 2024.

Figure 2-10: Full lining concrete at connecting tunnel junction


Figure 2-11: A section of HRT with concrete full lining from the adit region (left) and A completed section of rock trap (right)

2.2.2.6 SEDIMENT FLUSHING TUNNELS AND FLUSHING GATE SHAFTS

The excavation of 475 meters long sediment flushing tunnel has been completed in February 2023. Likewise, concrete lining works at the main flushing tunnel section along with its branches has been completed as of December 2023. Till date the invert concreting works has already been completed throughout the flushing tunnel network, whereas the full concrete lining works has been completed in 463 meters out of total 471 meters of flushing tunnel network.


Figure 2-12: A view of full concrete lining at the flushing tunnel (left) and Concreting works at flushing shaft 1'A' (right)

2.2.2.7 FLUSHING GATE SHAFT

A large network of flushing tunnel and shaft functions as a structure to divert the sediments trapped in each settling basin back to the river. Five number of flushing gate shafts, which are each about 25 meters high, opens from inspection tunnel all the way to the flushing tunnel that lies below the settling basin level. Each gate shafts comprises of operating and hoisting platform at the inspection tunnel and gates at the settling basin outlet region. During flushing, the gates will open and the sediments shall flush from the flushing tunnel network located below the settling basin level, all the way to flushing culvert which opens back to the river near the HRT adit portal region.

The successful breakthrough of all five flushing gate shafts have been achieved. In addition to this, the concreting works in 3 out of 5 flushing gate shafts have been completed. Presently, the concreting works of flushing gate shafts 01 'B' and 03 are being carried out simultaneously and is expected to be completed by the second week of January 2024. Out of total 122.2 meters stretch of 5 vertical gate shafts, the concreting works for approximately 93.3 meters have already been completed marking 73% construction completion on this front.

2.2.2.8 SURGE SHAFT AND VENTILATION TUNNEL

The Project consists of an 80-meters high vertical tunnel with design diameter of 16.4 meters. The excavation of the shaft was successfully completed as of June 2022 along with the application of temporary rock supports. Further, the concreting works for the shaft was finalized as of January 31, 2023, along its depth of approximately 80 meters. In addition, the full concrete lining works for the connecting tunnel that links the Headrace Tunnel (HRT) to the Surge shaft has also been completed as of July 2023.

The excavation of ventilation tunnel of 199.7 m has been completed in the month of March 2020. The ventilation tunnel opens at the crown level of the surge shaft and is located about 80 meters above the HRT invert at the point. About 50-75 mm thick shotcrete and rock bolt have been installed in all sections of ventilation tunnel as supports. The steel ribs have been installed as per site conditions.

Figure 2-13: A view of full lining concrete at connecting tunnel (left) and the junction of connecting tunnel and HRT (right)

2.2.3 POWERHOUSE AND PENSTOCK ALIGNMENT

To carry out excavation and concreting works at the Powerhouse area, the Main Civil Contractor, 1st Hydro, employed Nepali workers through a Nepali sub-contractor company. The progress achieved up to the present date includes the completion of concreting works at major structures within the Powerhouse area, such as the powerhouse main building (along with control bay), manifold block, anchor block, switchyard region, and the tailrace section, including all embedded concreting elements. Furthermore, the concreting works are taking place at the penstock protection valve (PPV) house. The concreting works at this front are expected to be completed by mid-January 2024.

2.2.3.1 PENSTOCK, ANCHOR BLOCKS AND SADDLE SUPPORT

The concreting works in the manifold region, including the necessary backfilling, have been successfully completed. Further, all the associated penstock slope stabilization works using geo-synthetic composite have been completed on the inclined section of the penstock on September 2023. The concrete works at the saddle supports and the penstock foundation at this inclined section has also been completed along with the penstock installation works inside the HRT. Moreover, the pouring of large portion of concrete in the anchor block has also been completed as of December 2023.

The resources are now focused on the concreting works for the valve house located just outside of the HRT outlet, and this work is progressing rapidly. As of the current date, a substantial amount of concrete, exceeding 9,000.00 m^3, has already been poured in the anchor block, saddle supports, PPV and manifold region. Most of the civil structures have already been constructed at this region.

2.2.3.2 POWERHOUSE AND CONTROL BAY

The construction of the main powerhouse building, as well as the ground floor of the auxiliary powerhouse building (control bay), has been successfully completed. Currently, the construction of the first floor of the control bay is going on. A significant volume of concrete, approximately 10,920 m^3, has been poured in the powerhouse and control bay building, marking 95% construction completion at this region. The concrete works for the generator casing of all four units have already been completed. Further, the front is currently being utilized by the Electro-Mechanical Contractor for the wiring and cable laying works. Additionally, various finishing works have been accomplished, including the completion of the roofing on the powerhouse, cladding on the side walls, and the installation of doors and windows. Currently the painting work in the interior walls of the powerhouse is being carried out.

2.2.3.3 VALVEHOUSE

The valve house, which houses the penstock protection valve (PPV), is located just outside the HRT outlet portal. This structure is another crucial civil structure of the Project incorporating the PPV, along with electric overhead travelling (EOT) crane of 100-tons capacity, control panels, etc. The construction of the valve house building is in full swing and is expected to be completed by the mid of January 2024. The civil construction works up to the crane beam level has been completed and necessary preparation for EOT crane installation is being made.

2.2.3.4 TAILRACE CHAMBER, TAILRACE FLOODWALL AND TAILRACE CULVERT

The tailrace section of the project comprises the tailrace chamber, tailrace culvert, and tailrace floodwall. The construction of the tailrace floodwall along with the tailrace chamber and tailrace culvert has been completed as of November 2022. Approximately 3,374 m^3 of concrete has been poured in the tailrace region.

2.2.3.5 SWITCHYARD

The Main Civil Works Contractor has successfully completed the civil works for the switchyard region along with the backfilling works, construction of retaining walls and transformer foundation. In addition, the Electro-Mechanical Contractor has already carried out the erection works of various Electro-Mechanical works at the switchyard region. The

installation of towers parts, and other accessories of the switchyard, commenced from the last week of September, has been completed as of December 2023. Further, the necessary drain and cable trench have already been constructed, where the EM Contractor is currently carrying out the final wire and cable assembly.

Overall, the construction works of main powerhouse building has been completed along with the switchyard and tailrace region, whereas, the progress is about 92% along the penstock alignment (including manifold, anchor block and saddle supports).


Figure 2-14: Aerial view of powerhouse and swtichyard region along with transmission line tower AP 01


Figure 2-15: A view of switchyard with 4 power transformers positioned (left) and construction of anchor block and valve house (right)


Figure 2-16: Anchor block and PPV region (left)and Interior view of powerhouse auxiliary building (right)

2.3 HYDRO-MECHANICAL WORKS

The Hydro-mechanical (HM) works contract was awarded to Machhapuchhre Metal and Machinery Works (P) Ltd, and these works commenced in August 2019, starting from the headworks of the construction area.

The fabrication of steel pipes at headworks (approach pipes) and powerhouse (penstock pipes, bifurcation and branch pipes) has been completed whereas, the fabrication of various gates and stop logs is being carried out at the Contractor's workshop at the Project site and at Pokhara workshop. The installation of approach pipes has been completed up to inlet portal bend at the headworks region. About 88 out of 96 approach pipes already erected, covering the expansion joint at the conveyance tank up to the anchor block. The installation of penstock pipes has been completed throughout the penstock alignment. Installation of all penstock pipes along the penstock alignment has been completed having varied thicknesses (32mm, 30mm, 28mm, 25mm, 20mm, and 18mm).

All associated steel lining works has been completed in the undersluice region, intake and bed-load sluice region along with embedded parts. The erection of both the radial gates and hoisting mechanisms has been completed, whereas the installation of stoplog along with gantry mechanism. The erection of all 6 vertical gates along with the hoisting mechanism has been completed. Similarly, the erection of all 6 trash racks completed at the Intake along with embedded parts of Trash Rack Cleaning Machine (TRCM), and railing at the top slab of the intake has also been completed. The erection of gates and stop log frames at the different locations of the settling basin (settling basin inlet gates, outlet gates and flushing gates) is ongoing according to the Civil Contractor work schedule. Similarly, necessary preparation for the erection of gravel flushing gates and stoplog has also been completed.

The trash rack frames erection at the conveyance tank has been completed. The installation for all three bifurcation units, including associated reducers, bends, and branch pipes has been completed at the manifold region. Further, the concreting of the manifold region has been completed. The fabrication and installation completed for all four-unit diffusers. This update highlights substantial progress in the HM works and the achievement of key milestones across various sections of the project.

2.3.1 APPROACH PIPES

S.N.	Particulars Diameter (m)	Thickness (mm)	Number of pipes	Length of each shell (m)	Total Length of section (m)	No. of pipes installed	Progress in meters	Progress %	Status
1	4.5	16 mm pipe	88	2.5	220	88	220	100%	
2	4.5	16 mm pipe (Cut Piece-01)	1	1.16	1.16	1	1.16	100%	Outside Approach Tunnel (All Complete)
3	4.5	16 mm pipe (Cut Piece-02)	1	1.2	1.2	1	1.2	100%	
4	4.5	16 mm pipe	11	2.5	27.5	0	0	0%	Inside Approach Tunnel
5	4.5	16 mm pipe (Cut Piece-03)	1	1.2	1.2	0	0	0%	Inside Approach Tunnel

Overall, the erection of 88 numbers of pipes has been completed along with welding and testing works. The fabrication of pipe for approach tunnel have been completed and erection will start once the Civil Contractor provide the work front. One remaining bend shall be erected at the end after the completion of all associated concrete works of approach tunnel.

Figure 2-17:Erection of trashrack frame and gate embedded parts at SB Outlet Gate-3 (left) and installation of head race bend (right)

2.3.2 PENSTOCK PIPES

The Hydro-mechanical (HM) Contractor has made significant progress in the erection of penstock pipes with various thicknesses at the penstock alignment. In total, the HM Contractor has successfully erected all penstock pipes covering a range of thicknesses from 32mm down to 18mm at the inclined section of the Penstock. The Contractor completed the installation of transition pipe (bell mouth) at the HRT outlet region on August 24, 2023. The bell mouth acts as a transition

of waterway form Inverted-D to circular shape. The installation of penstock pipes located inside HRT has already completed in October. This achievement marks a significant milestone in the installation of the penstock pipes. In addition, the Employer has begun the final inspection and testing of the hydro-mechanical components through a third party Consultant's engagement for quality assurance.

Table 2-1: Detail of work progress of Penstock Pipes and other pipes at the penstock alignment

S.N.	Particulars: Diameter (m)	Particulars: Thickness (mm)	Number of pipes	Length of each shell (m)	Total Length of section (m)	No. of pipes installed	Progress in meters	Progress %	Status
A	Penstock inside tunnel								
1	4.5	16 mm pipe	39	2.5	97.5	39	97.5	100%	Completed
2	4.5	16 mm pipe (Bend)	2			2		100%	Completed
3	4.5	16 mm pipe (Cut piece)	1	0.9	0.9	0	0	0%	This will be done while erecting PPV
		Total	42		98.4	41	97.5	99%	
B	Inclined section								
1	4.5	16 mm pipe (Bend)	6			6		100%	Completed
2	4.5	18 mm pipe	4	2.5	10	4	10	100%	Completed
3	4.5	20 mm pipe	11	2.5	27.5	11	27.5	100%	Completed
4	4.5	22 mm pipe	6	2.5	15	6	15	100%	Completed
	4.5	Cut piece	1	1.25	1.25	1	1.25	100%	Completed
5		25 mm pipe	9	2.5	22.5	9	22.5	100%	Completed
6	4.5	28 mm pipe	8	2.5	20	8	20	100%	Completed
7	4.5	30 mm pipe	7	2.5	17.5	7	17.5	100%	Completed
9	4.5	32 mm pipe	6	2.5	15	6	15	100%	Completed
10	4.5	36 mm pipe (Bend)						100%	Completed
		Total	58		128.75	58	128.75	100%	
C	Manifold block								
1	3.9	30 mm pipe	1	2.5	2.5	1	2.5	100%	Completed
		30 mm cut piece	1	2.47	2.47	1	2.47	100%	Completed
2	3.18	25 mm pipe	1	2.5	2.5	1	2.5	100%	Completed
		25 mm cut piece	1	1.76	1.76	1	1.76	100%	Completed
3	2.25	20 mm pipe	16	2.5	40	16	40	100%	Completed
4	2.00	20 mm pipe	22	2.5	53.18	21	52.5	99%	1 piece remaining
5	2.25 to 2.00	20 mm pipe (Reducer)	4					100%	Completed
		Total	46		102.41	41	101.73	99%	

Figure 2-18: Erection of penstock pipes (left) and the PPV locatio (right)

2.3.3 ADDITIONAL WORKS

In addition to the previously mentioned progress, a significant advancement has been made by adding flushing pipes at the weir section. Each flushing pipe unit has a length of 15.76 meters, and there are a total of 2 units of the weir flushing pipes. Both the fabrication and erection of the flushing pipes have been successfully completed. Similarly, pipe of diameter 4.0 m

and length 10.9m has been erected at the Adit Junction and fabrication of that pipe (Nos 4.5) has been completed and once the site is provided, the erection work will start. The fabrication of hold-down-straps, a bracing mechanism for further protection of the penstock pipes, has already begun and will be installed soon.

As a comprehensive summary, the overall physical progress achieved in the hydro-mechanical works of the Project is approximately 90%. The completion of key milestones, such as manifold, approach pipes, radial gates, intake gates, demonstrates the project's steady progression towards its completion.

Figure 2-19: Erection of radial gate at undersluice (left) and erection of embedded part of gate and stoplog at SBF-3 (right)

2.4 ELECTRO-MECHANICAL WORKS

The Electro-Mechanical (EM) works for the MTHP are being carried out by an experienced Chinese company: Chongqing Water Turbine Works Co. Ltd. (CWTW). Their responsibilities span the entire electro-mechanical aspect, encompassing the design, fabrication, assembly, supply, and installation of all relevant components from the end of the penstock to the pickup gantry of the switchyard accommodating four units of vertical Francis turbine with all corresponding generating units, control and protection systems, battery backups, internal power consumption transformers, power transformers, excitation transformers, SCADA and communication system as per NEA's grid code requirements, the overhead crane, Penstock protection valve (PPV), and main-inlet valves (MIV) for each unit feeding penstock.

The mobilization of manpower and resources for installation works of Electro-mechanical equipment commenced officially on February 09, 2021. Due to COVID-19's impact, the EM Contractor, being a Chinese company, encountered challenges in mobilizing their national workers at the site. To address this, they engaged a Nepali subcontractor, JADE Consultant, who smoothly carried out installation works for various parts.

S.N.	Particulars	Overall Progress till date	Status	Remarks
A	Overall Electro-mechanical Works	94%	In Progress	
1	Contract signing	100%	Completed	a. Contract awarded on 23rd December 2019 b. Design works completed
2	Fabrication of equipment	100%	Completed	a. Major equipment Generator/Turbine/Transformer/MIV completed b. Overall completed
3	Import/Delivery	95%	In Progress	a. All Generator/Turbine including its accessories delivered to site b. The 13th shipment containing PPV and communication system arrived Biratnagar and is being prepared for delivery to the Project site c. Approximately 95% completed
4	Installation	95%	In Progress	a. Generator installation completed in all four units b. Turbine installation completed in all four units c. MIV installation completed in all four unit d. Cable laying is in final stage e. PPV installation is remaining

CWTW has completed all associated fabrication works. This incorporates the design, fabrication, and testing of vital equipment like generator sets, runners, and shafts. To date, around 95% of the equipment has already been delivered, consisting turbine parts, generator components, control panels, cables, Electric Overhead Travel (EOT) crane and accessories, switchyard equipment and PPV accessories, and more. Regarding the delivery of the EM equipment, the 13th shipment consisting crucial components like the PPV and communication system have been dispatched from Biratnagar customs and is currently being transported to the Project site.

To date, the overall progress achieved by the Project in EM works is approximately 94%.

2.4.1 MANUFACTURING WORKS

The majority of the manufacturing works for the Electro-Mechanical equipment have been successfully completed at various factories in China. All turbine and generator sets, including spare runners, are currently in the final stage of installation. Overall, all the required Electro-Mechanical equipment have been manufactured. While the majority of the Electro-Mechanical equipment have been successfully delivered while the transformers and the PPV valve are in the process of being delivered to the Project site.

2.4.2 INSTALLATION WORKS

The Electro-Mechanical installation works are ongoing at a rapid pace after the completion of the powerhouse by the Civil Contractor. The installation of embedded parts and pipes for the turbine and generator has been aligned with the civil work, serving as the foundation for further EM activities. Additionally, the EOT crane installation, commissioning, and load testing, a crucial Electro-Mechanical milestone, have been successfully carried out. As of now around 95% of installation work has been completed.

Unit 1
- Turbine Installation- 100%
- Generator installation-100%
- Accessories installation-95%

Unit 2
- Turbine Installation- 100%
- Generator installation-100%
- Accessories installation-95%

Unit 3
- Turbine Installation- 100%
- Generator installation-100%
- Accessories installation-90%

Unit 4
- Turbine Installation- 100%
- Generator installation-100%
- Accessories installation-85%

2.4.2.1 EOT CRANE INSTALLATION

Upon the completion of roofing work in Bay 1, the electrical commissioning of the crane was conducted. The crane's functionality was thoroughly tested as it was driven from Bay 1 to Bay 5 at different speed levels, with a careful check of safety measures and connections. An essential step in validating the EOT (Electric Overhead Travel) crane's capabilities involved a successful load test, where a 66-ton dummy load was lifted to verify the crane's load capacity.

2.4.2.2 TURBINES AND GENERATORS INSTALLATION

The final installation of the turbine and generator has been successfully completed by mounting excitation system, the last component starting from bottom to vertically upwards. This complex process was carried out precisely, ensuring the GBT standards of machine safety and efficiency. One of the preliminary steps, the High Voltage Tests were carried out with both the stator and rotor of the generator as per GBT standard to verify their electrical insulation and safety. These tests ensure the generator's capability to withstand the high electrical loads efficiently. The turbine guide bearing (TGB) oil tank, Lower guide bearing (LGB) oil tank, combination of upper guide bearing (UGB) and thrust bearing oil tank underwent thorough kerosene leakage tests to ensure that these crucial components are free from any potential leaks.

The rotor braking mechanism and the cooling system of the LGB and UGB went through comprehensive pressure test to guarantee their reliability during operation. Ensuring that these systems can withstand the required pressures is vital for overall system safety. Various sensors and instruments are mounted to the turbine and generator to monitor and control their performance. These accessories play a crucial role in ensuring the efficient and safe operation of the system. The power and control cables are being carefully laid and connected to the generator and associated control systems.

2.4.2.3 MAIN INLET VALVE

All 4 units of the Main Inlet Valve have been successfully lowered into their respective positions. The downstream side welding of Unit 1 to Unit 4 is now completed. Meanwhile erection and welding works of bypass from Unit 1 to Unit 4 are ongoing, along with the erection and welding of the cut piece joining the Main Inlet Valve and Penstock of Unit 1, Unit 2, and Unit 3 at the upstream side have been now completed.


Figure 2-20: Rotor and stator coupling in unit 01 (left) and final installation of water guide mechanism along with monitoring sensors (right)


Figure 2-21: Brazing and lacing work of stator coils in Unit 02 (left) and run-out check of shaft Unit 03 (right)


Figure 2-22: Rotor lowering in unit 4 (left) and assembly of runner with main shaft (right)


Figure 2-23: Rotor lowering of unit 04 (left) and Unit 02 MIV valve assembly and erection (right)

2.4.2.4 CONTROL ROOM

The installation of all the embedded parts, pipes, ventilation fans, control panels, cable support bracket and auxiliary transformer of the control room have been completed and now the laying, dressing and termination work of power and control cables are ongoing.

Figure 2-24: Laying of control cables in control room (left) and laying of power and control cables in 11kV switchgear room (right)

2.4.2.5 SWITCHYARD AND VALVEHOUSE

Laying of earthing flats, embedded parts and pipes in switchyard as well as valve house simultaneously completed with the Main Civil works. Erection of gantry tower and other equipment posts are being ready in switchyard while valve house work is rapidly progressing.

Figure 2-25: Erection of gantry towers and final assembly of Transformer at switchyard

Figure 2-26: Power transformers placed at its position (left) and unloading of power transformers at the switchyard region (right)

2.5 TRANSMISSION LINE WORKS

For the construction of a 9 km long, 220 kV D/C transmission line, a contract was signed with Cosmic Electrical Engineering Associates Private Limited on June 07, 2020. This transmission line consists of 25 towers and originates from the switchyard of the Middle Tamor Hydropower Project, connecting with the interconnecting bay of the Dhunge-Sanghu sub-station in Taplejung, a Project being constructed by NEA as per the Connection Agreement.

The construction progress thus far has been substantial, with significant milestones being achieved, along with foundation concreting and stub erection completed at all 25 locations. Likewise, tower erection has been accomplished at 24 sites and ongoing at remaining 1 location i.e. AP17, approximately equivalent to 96% of the total erection works. The current focus of the Contractor centers on the stringing works for the transmission line conductor, following initial right-of-way clearance. Substantial progress has already been made with the stringing process completed from AP24 to AP18, AP13 to AP01. As of this date, the Contractor has completed more than 7.5 km of conductor stringing out of 9 km.

As per the Connection Agreement, power generated from Middle Tamor Hydropower Project has to be evacuated at Dhungesanghu substation. Currently 132 kV system at Dhungesanghu sub-station is near completion, however it has to be upgraded to a 220 kV system to be compatible with the power evacuation arrangement of MTHP. However, this upgradation is yet to be started by the NEA. This concern was raised during various meetings of the coordination committee with NEA, where it has been proposed to establish a contingency arrangement until 220 kV system is built at Dhungesanghu sub-station. This alternative evacuation arrangement involves the stringing of the second circuit from the Dhungesanghu substation to the Basantapur substation and an interconnection bay at Basantapur sub-station. This circuit will operate at 220 kV and will be exclusively dedicated to the Middle Tamor Hydropower Project for power evacuation to 220 kV bay at Basantapur sub-station. The Contract for stringing of the second circuit and the construction of the bay has already been awarded by NEA to a Contractor. The required manpower and equipment have already been deployed to the site by the Contractor and the construction of the bay is going on in a satisfactory pace.

The power evacuation of the MTHP entirely depends on the completion of the above mentioned contingency arrangement and NEA has informed Sanima Middle Tamor Hydropower Ltd. that the alternative arrangement is anticipated to be completed by February 27, 2024. Therefore, the RCOD of the Project will be aligned with the completion of the aforementioned contingency evacuation arrangement of 220 kV transmission line from the Basantapur to Dhungesanghu Substation on February 27, 2024 and its construction is being closely monitored by SMTHL

2.5.1 CONSTRUCTION WORKS

The Contractor has successfully finalized the foundation works and tower erection in all 25 tower locations. The current status of the transmission line project progress is detailed in the provided table. Additionally, the Contractor has accomplished the stringing works from AP24 to AP18 and from AP13 to AP1 continuing up to pick up gantry, resulting in approximately 7.5 kilometers of the conductor being strung, constituting about 83% completion of the total stringing work. Negotiations for the clearance of a number of Right of Way (RoW) locations is still underway, which is expected to be resolved by the end of January 2024.

Figure 2-27: Transmission line route map

Table 2-2: Summary of Transmission Line works progress

S.N.	Tower Works	Total	Completed	Units	Overall Progress till date	Status
A	Overall Transmission Line Works				95%	In Progress
1	Land Acquisition Works	25	25	Nos.	100%	Completed
2	Tower Foundation Works	25	25	Nos.	100%	Completed
3	Erection of Towers	25	24	Nos.	96%	In Progress
4	Stringing Works	9	7.5	km	83%	In Progress

This progress signifies a substantial step forward in the execution of the transmission line project. Overall, the construction progress of the Transmission line works is about 95% and is in line with our revised commercial operation date.

Figure 2-28: View of Conductor stringing from switchyard gantry to AP1 (left) and a view of stringing works (right)

Figure 2-29: Photographs showing stringing works (left) and erected last tower at AP24 and tower of NEA (right)

2.6 FINANCIAL PROGRESS TO DATE

The total revised cost of the Middle Tamor Hydropower Project is estimated to be NPR 13,330,000,000 (In words - NPR Thirteen Billion Three Hundred Thirty Million only). Within this project cost, the equity portion amounts to NPR 3,332,500,000, while the necessary debt is NPR 9,996,800,000. The promoter's equity share, representing 70% of the total equity (NPR 2,332,750,000), has been fully paid. Additionally, the public equity share, constituting 30% of the total equity or NPR 999,750,000, has also been completely paid with an arrear of 30 kittas of shares. The Company has been listed on the Nepal Stock Exchange with the stock symbol of 'TAMOR'. The debt portion has been arranged through a consortium of 8 commercial banks with Nepal Investment Mega Bank Ltd. leading the effort.

Regarding the Contract amount, 85% has been disbursed to the Main Civil Contractor up to the present date against the raised Interim Payment Certificates (IPCs) up to IPC 27 along with the expenditures made under contingencies. Likewise, 83% of the Contract amount has been paid to the Hydro-Mechanical Contractor (up to IPC 9), covering the design and procurement segment. The Employer has directly purchased all the necessary steel plates. Furthermore, 95% of the Contract amount has been provided to the Electro-Mechanical Contractor, covering the supply portion's bills for dispatch up to the 13th lot of EM equipment following their receipt on-site. Additionally, about 98% of the total Contract amount has been paid to the Transmission Line (TL) Contractor, incorporating bills up to IPC#08, which also includes all additional variations and advance payments.

Table 2-3: Financial Progress of Major Contract Packages Till Date

Major Contract Packages	Expense till date (%)	Remaining Budget (%)
Main Civil Works including contingencies	85%	15%
Hydro-Mechanical Works	83%	17%
Electro-Mechanical Works	95%	5%
Transmission Line Works	98%	2%

The total financial expenditure of the overall Project till date is about **89%** out of the total project cost of NPR. 13,330,000,000. In summary, the financial progress is in line with the physical progress achieved in the Project to date.

3 CONCLUSION

In summary, the Middle Tamor Hydropower Project has made significant progress on all active fronts of the construction. The Main Civil works are nearly 99% complete, while the completed portion of the Hydro-mechanical works is about 90%. Additionally, the progress in Electro-mechanical works is at 94%, and the Transmission Line works are also at 95%. This demonstrates substantial advancements in multiple key areas of the Project, despite the challenges faced, and reflects the dedication and efforts of all parties involved.

The construction faced unexpected geological issues during excavation of large caverns, limitations in cavern excavation due to frequent overbreaks requiring continuous repairs in challenging sections, and an extended tunnel excavation cycle, all of which affected the pace of work. In response to various challenges faced by the Project, the Employer has provided additional support to the Contractors, including mobilizing extra equipment such as boomers, batching plants, grouting machines, robotic shotcrete machines, generators, trucks, excavators, loaders, concrete pumps, jackhammers, water pumps and rollers as well as addressing their cash flow issues. In addition, on the recommendation of the Engineer, the Employer had to take over the actual construction works like shotcreting, rock bolts installation, penstock foundation, etc. through third party interventions in order to expedite the construction to meet the operation deadline. The management has been collaborating with various stakeholders, including the Engineer, Contractors, Subcontractors, Suppliers, Transporters, and government authorities at various levels to keep the construction environment smooth.

Obviously, the challenges posed by the global COVID-19 pandemic have had a significant impact on the construction timeline of the Middle Tamor Hydropower Project. Furthermore, the collapse of Hewa Khola bridge linking Phidim and Hilihang along the Mechi Highway on June 18, 2023 led to a complete disruption of all vehicular movement for almost a month. This, in turn, halted the transportation of construction materials like rebars, cements, admixtures and explosives as well as the movement of manpower for several weeks. During this period, the construction works at the site was being carried out using the construction materials that were stocked at the Project site, and only a limited quantity of materials transported via. alternative route. Unfortunately, the construction pace of the project was severely hindered during a critical phase of the Project. Additionally, the supply of explosives to the project was disrupted due to India halting the supply. This caused a disruption in the excavation works in critical areas such as settling basin benching, settling basin gate shafts, and flushing gates shafts for over two months. While the project managed to gradually arrange the required explosives through various alternative means in small quantities, the overall schedule for the excavation works was significantly delayed.

Recognizing the unforeseen disruptions caused by the COVID pandemic, the collapse of the Hewa bridge, the scarcity of explosives, extended treatment of geological overbreaks on the Settling Basins, and the transmission line from Dhunge Sanghu to Basantapur (being developed by the NEA) not being completed within the earlier RCOD- which resulted in the contingency evacuation plan for power transmission of the Project- the Employer, with the agreement of NEA, have extended the RCOD to mitigate the effects of the ongoing crisis. With this extension, the RCOD of the Project has been renewed until February 27, 2024 (Falgun 15, 2080) to align with the completion of the contingency evacuation arrangement of 220 kV transmission line from Dhungesanghu to Basantapur S/s. The Employer has been continuously monitoring the progress in

the evacuation arrangement being developed by the NEA and working proactively in achieving the successful completion of this Project by the above stated deadline.

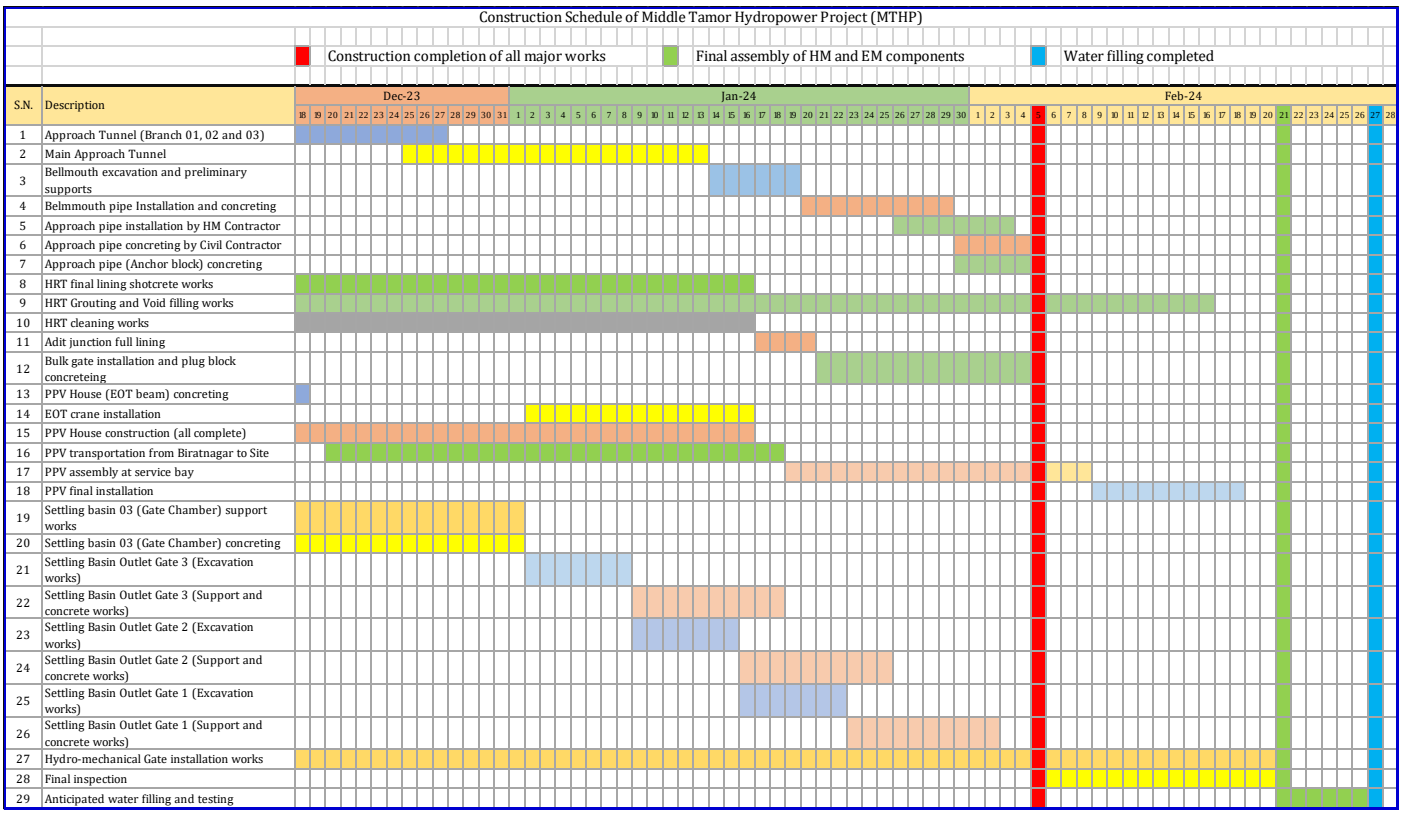
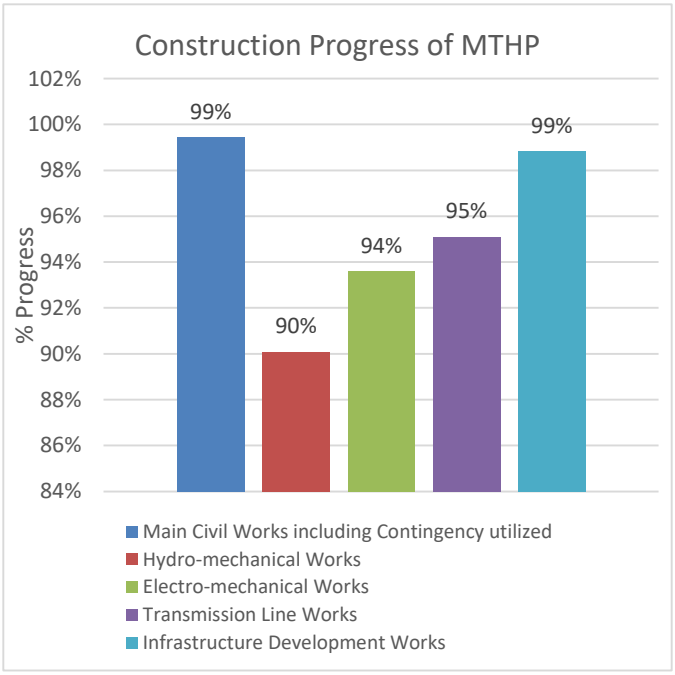


Figure 3-1: Conctruction schedule of MTHP

Table 3-1: Work progress summary chart

S.N.	Particulars	Construction Progress
1	Main Civil Works including Contingency utilized	99%
1.1	Headworks	98%
1.2	Underground Works (HRT)	100%
1.3	Underground Works (SB and others)	98%
1.4	Underground Works (Surge Shaft and ventilation)	100%
1.5	Powerhouse, Control bay and Tailrace	100%
1.6	Penstock and anchor block	95%
1.7	General items	100%
2	Hydro-mechanical Works	90%
3	Electro-mechanical Works	94%
4	Transmission Line Works	95%
5	Infrastructure Development Works	99%
	Overall Physical Progress	**98%**



This report summarizes the significant progress achieved by the Middle Tamor Hydropower Project across multiple work fronts in the face of the challenges and construction hurdles. Despite the considerable challenges brought about by the pandemic, the Middle Tamor Hydropower Project has achieved an approximately **98%** of the construction progress to date. Although the original goals were impacted due to the pandemic and extension of RCOD became unavoidable, the progress made in these challenging times is satisfactory and is in line with the revised RCOD of the Project. Currently, special attention has been given to outlet gate shafts construction, approach pipe installation, and smooth supply of construction materials during this critical phase of Project so as to achieve the targeted milestone of the revised RCOD.