

Nam Ngum 3 Dam below:



Steep and deep valley behind Nam Ngum 3 Dam below. The yellow line probably represents Full Supply Level of the reservoir.



Nam Ngum 3 is a 220 meter high dam located on the Nam Ngum (river) 10 km west of Ban Long Cheng, Lao PDR. The dam is one of the highest of its type in the world and the highest in Lao PDR.

Nam Ngum 3 catchment area is 3,769 sq km at the dam site. Nam Ngum 3 reservoir is narrow, long and deep. At Full Supply Level the surface area of the reservoir is 27.5 sq km and its length is about 55 km. The Minimum Operation Level is at 660 meters above sea level covering an area of 9.4 square km.

Nam Ngum 3 Hydropower Project was designed and contracted by Power Construction Corporation of China. Construction began in November 2015 and the Commercial Operation Date was planned to be in 2020. The project will operate under a concession period of 27 years.

Four companies are shareholders of the Nam Ngum 3 Power Company: GMS Lao (27%), Ratchaburi (25%), Axia Power Holdings B.V. (25%) and Lao Holding State Enterprise (23%).

The power station is planned to operate on a daily basis in intermittent mode. The production output will depend on the availability of water in the reservoir and transmissions requested by EGAT. From Monday through Saturday, Nam Ngum 3 is to provide energy to EGAT a minimum of 8 hours per day and maximum of 16 hours per day.

Water from the reservoir will be channelled by a 10.6 km diversion tunnel to the power station and then discharged back into the Nam Ngum River. In the wet season each year from August to October, spills over the dam will naturally occur.

An underground power station is located on the right bank of the Nam Ngum 15.5 km downstream of the dam along the river. The power station will have two vertical-axis Francis generating units with a rated capacity of 220 MW each. The average annual energy production is estimated to be 2,114 GWh. While the rated capacity is 440 MW, the power plant output will depend on the reservoir surface level and will vary between 357 MW at Minimum Operation Level to 464 MW at Full Supply Level. Minimum safe operation is 179 MW with one unit.

A 99 km long 500 kV double-circuit transmission line will connect the switchyard close to the power station to the Nabong substation. This Nam Ngum 3 transmission line will run parallel with the Nam Ngum 2 transmission line as it crosses the Phou Khao Khouay National park. At Nabong substation the power will be sent to Thailand along an existing 27 km long 500 kV double circuit transmission line.

**Table 1-1 Main Features of the NN3 Hydropower Project**

<b>Feature</b>	<b>Value</b>
<b>Dam</b>	
Height	220 m
Catchment Area	3,769 km <sup>2</sup>
Average River Discharge at Dam Site	96.5 m <sup>3</sup> /s
<b>Reservoir</b>	
Reservoir Filling Time	3 months
Full Supply Level (FSL)	723 masl
Minimum Operation Level (MOL)	660 masl
Surface Area at FSL	27.5 km <sup>2</sup>
Surface Area at MOL	9.5 km <sup>2</sup>
Mean Depth	51.3 m
Volume at FSL	1,411 MCM
Active Storage	1,070 MCM
Average Water Retention Time	4.2 months
Invert Level Hypolimnetic Withdrawal	645 masl
<b>Headrace Tunnel</b>	
Length from Dam to Power Station	10.6 km
<b>Power Station</b>	
Downstream Distance from Dam	15.5 km
Total Installed Capacity	440 MW
Average Annual Energy Production	2,128 GWh
<b>Transmission Lines</b>	
Length of 230 kV Transmission	Approx. 100 km
<b>Access Roads</b>	
Length from Public Road to Power Station	Approx. 12 km
Length from Public Road to Dam	Approx. 11 km
Commercial Operation Date	January 2020
Concession Period	27 Years

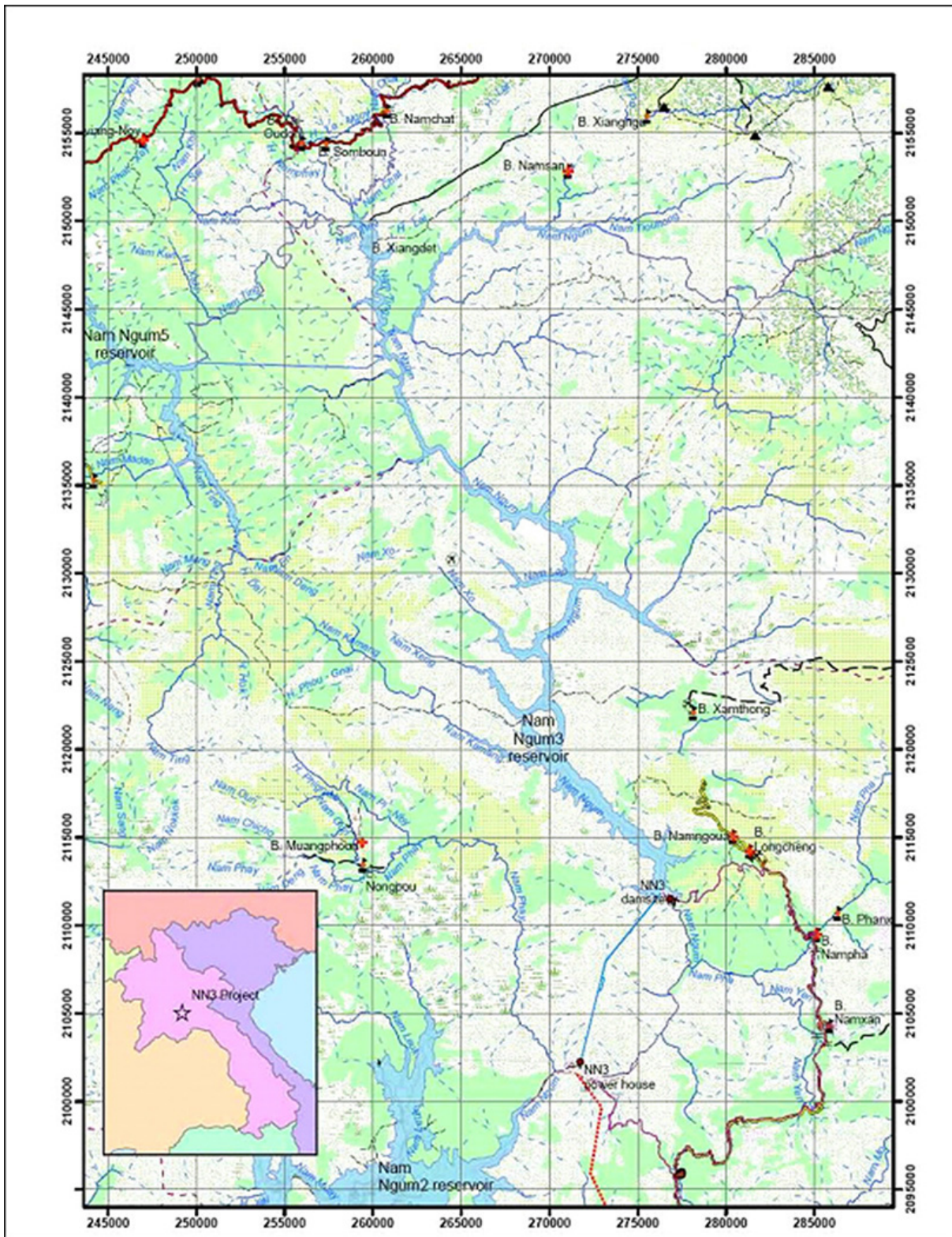
Nam Ngum 3 is located upstream of the Nam Ngum 2 Reservoir as shown below:





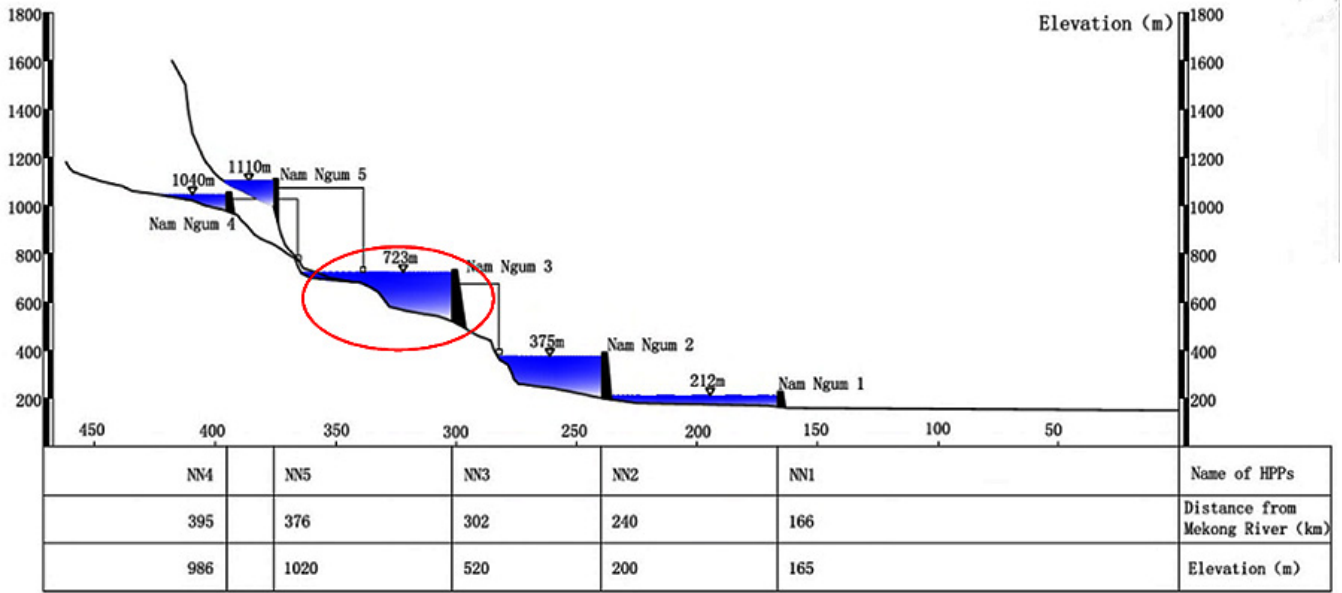
Figure 2-3 Public Road between Nam Ngone & Long Cheng and Access Roads to NN3 Power Station Site and NN3 Dam Site

Blue line near bottom of map below is 10.6 km underground headrace tunnel



Nam Ngum Dams cascade elevations below:





Nam Ngum 3 Dam shown in mid section of map below:



Project Cost	\$1,400 Million
Shareholder	CSE 55%, EDL 20%, EGAT 25%
Installed Capacity	480 MW
Average Annual Energy	2,345 GWh
Maximum Turbine Discharge	180 m <sup>3</sup> /s
Rated Head	301 m
Turbine Type	Vertical Francis x 3 Units
Offtaker	EDL

Catchment Area	3,913 Km <sup>2</sup>
Annual Average Rain Fall	2,593 mm
Annual Average Discharge	110 m <sup>3</sup> /s
Reservoir Storage Capacity	1,411 Million m <sup>3</sup>
Reservoir Surface Area	27.5 Km <sup>2</sup>
Full Supply Level	723 m a.s.l
Minimum Operating Level	670 m a.s.l

#### Main Dam

Type	Concrete Hyperbolic arch dam
Height	208m
Crest Length	395m
Crest Width	10m
Crest Level	729.50m

#### Headrace Channel

Type	
Length	
Longitudinal Gradient	

#### Penstock

Type	
Number of Pipe	
Diameter	
Length	
Longitudinal Gradient	

#### Spillway

Type	
Number of Gate	1/3 Nr (one set 2x800kN and Three sets 2x3200kN)
Design Flood Discharge	4860 m <sup>3</sup> /s

#### Headrace Tunnel

Type	Reinforced concrete
Design Discharge	179.6 (m <sup>3</sup> /s)
Diameter	9.1m – 8.1m – 8.5m
Length	1/10516.8 No./m

#### Tailrace Channel

Type	
Length	

#### Switchyard 115 kV

Elevation	
Dimension	

#### Powerhouse

Installed Capacity	480 MW
Number of Unit	3
Turbine Type	Vertical Pelton
Max Powerhouse Discharge	180 m <sup>3</sup> /s
Erection Floor Elevation	EL 354.70m to EL 400.50m of Rail top

#### 230KV Transmission Line

Substation	Ban Naphia ( Xieng khuang )
Length	110 Km
Circuit Type	Double Circuit
Conductor Size	