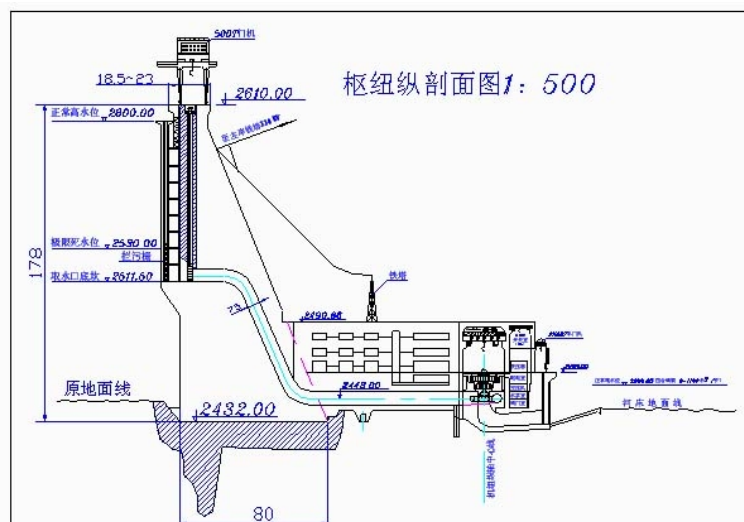


## Longyangxia Hydropower Project

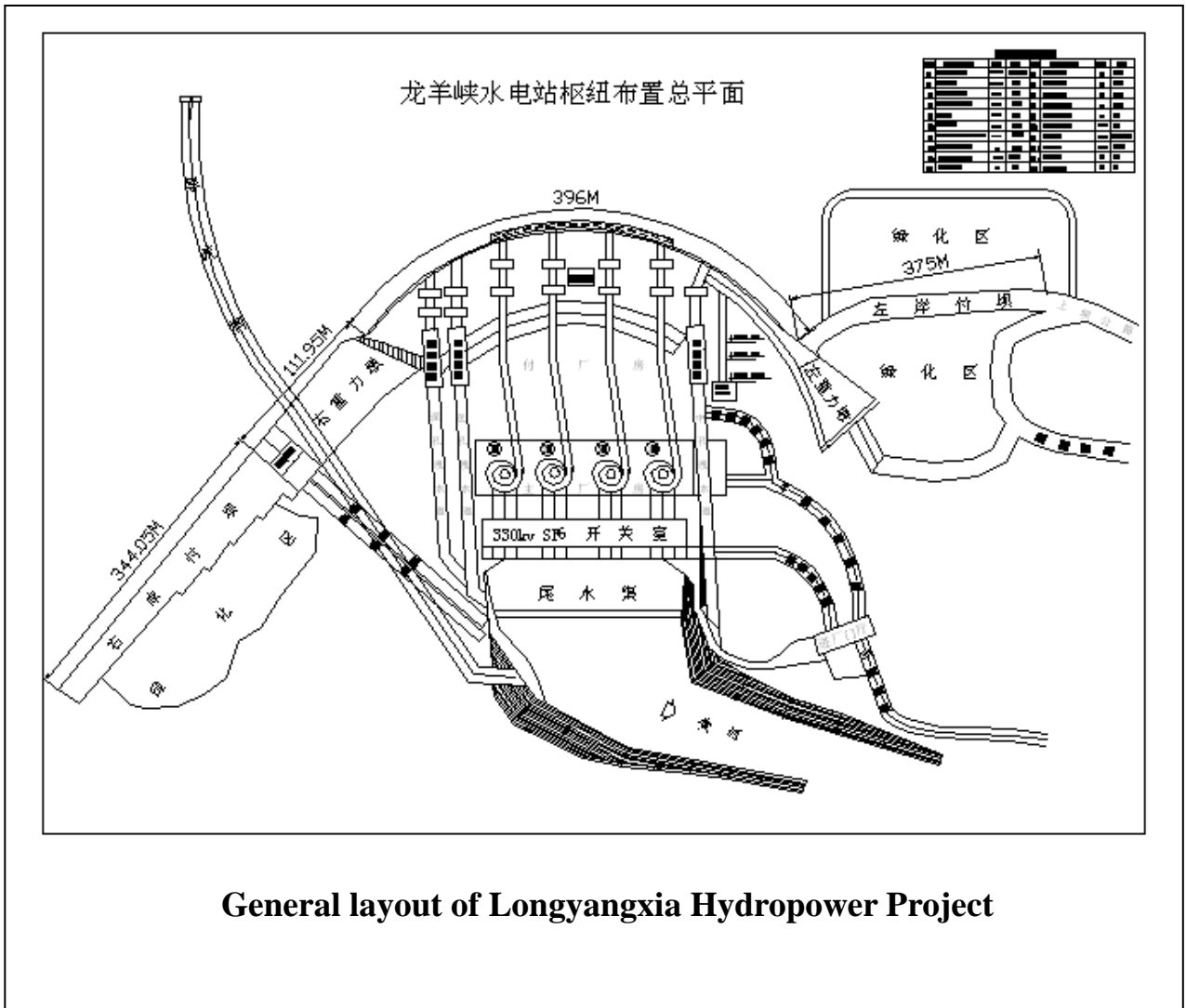


Longyangxia Hydropower Project is situated at the entrance of Longyangxia canyon in Qinghai province, the upper distance from the source of the Yellow River is 1648 km, the lower distance from entrance to the sea is 3778 km, the average elevation is 2700 m. The power plant has installed 4 single 320 MW units, the total installed capacity is 1280 MW, the annual energy output is 6 TWh. The Project consists of main dam, left and right gravity dams, left and right bank secondary dams, water release structure, water diversion structure, power house. The main dam is gravity arch dam, left and right secondary dams are concrete gravity dams. The total length of water retaining forward position is 1226 m and the length of main dam is 396m. The max dam height is 178m with the max bottom width of 80m. The elevation of construction foundation is 2432.0m and the elevation of dam crest is 2610m. The normal water level is 2600m with the reservoir storage of 24.7 billion m<sup>3</sup> and the area of 383 km<sup>2</sup>. The project is designed by 1000-year of flood, and checked by PMF. Water releasing structure arranged into surface, middle, deep, bottom layers.

Longyangxia Hydropower Project is the first cascaded project on the main reach of the upper part of the Yellow River. It has comprehensive functions, such as power generation, flood control, ice control and irrigation. It also is the first load peaking, frequency regulation power plant in electric network in Northwest China.



<p><b>1. Hydrology</b></p> <p><b>1.1 Catchment area:</b> 752443km<sup>2</sup> catchment area upper damsite: 131420km<sup>2</sup></p> <p><b>1.2 Characteristic value of runoff</b></p> <p>Mean annual flow: 647 m<sup>3</sup>/s Maxium observed flow: 5430 m<sup>3</sup>/s</p>	<p><b>4.3 Left and right bank secondary dam</b></p> <p>type: PG foundation characteristics: granodiorite max dam height left: 30m max dam height right: 43m leading edge length of crest left: 375m leading edge length of crest right: 341.05m crest width(solid component): 10(7)m max dam base width left: 18.4m max dam base width right: 30.9m</p> <p><b>4.4 Surface spillway</b></p> <p>Crest elevation: 2585.5m Number of openings and width: 2-12m Discharge conduit total length: 260, 280m Max flow velocity: 40m/s Working gate: cylinder hinge radial gate emergency repair gate: Sliding plane gate</p> <p><b>4.5 Middle outlet</b></p> <p>crest elevation: 2540m discharge conduit total length: 271m max flow velocity: 40m/s working gate: cylinder hinge radial gate emergency repair gate: fixed-blade plane gate</p> <p><b>4.6 Bottom outlet</b></p> <p>bottom sill elevation: 2505m the total length of discharge sluice: 223m max flow velocity: 40m/s working gate: cylinder eccentricity hinge radial gate emergency gate: caterpillar plane gate bulkhead gate: arch sliding gate</p>
<p><b>2. Reservoir</b></p> <p><b>2.1 W.L. of reservoir</b></p> <p>Check Flood W.L. 2607m Design Flood W.L. 2602.25 m Normal Storage W.L.: 2600m Flood Control W.L.: 2594m Ultimate Dead W.L.: 2530m</p> <p><b>2.2 Normal Storage Reservoir</b> 383km<sup>2</sup></p> <p><b>Area:</b></p> <p><b>2.3 Backwater length:</b> 107.8km</p>	<p><b>5. Project benefits</b></p> <p><b>5.1 Power generation benefits</b></p> <p>installed capacity: 1280 MW maximum power output: 1400 MW guaranteed output: 587-631 MW annual generating hours: 4640 h mean annual power generation: about 6 TWh net guaranteed output of cascade power plants: 254.8 MW mean annual net power generation of cascade power plants: 513 GWh</p> <p><b>5.2 Flood control benefits</b></p> <p>Liujiaxia Reservoir: enhancing flood control standard: from 3000-year , 5000-year to PMF Yanguoxia Reservoir: enhancing flood control standard: from near 1000-year to 2000-year in check flood. Bapanxia Reservoir: enhancing flood control standard: from near 300-year to 1000-year in check flood. Lanzhou City: enhancing flood control standard: Liujiaxia Reservoir 100-year flood discharge decreasing from 4770 m<sup>3</sup>/s current to 4290 m<sup>3</sup>/s</p> <p><b>5.3 Ice control benefits:</b> compensating lower cascade reservoirs' decreased output owing to ice defending.</p> <p><b>5.4 Irrigation benefits</b></p> <p>net increasing irrigation area: 1 million ha. net increasing irrigation water amount: 6.5×10<sup>9</sup>m<sup>3</sup> net increasing urban, industry water consumption: 470 million m<sup>3</sup></p>
<p><b>3. Main equipments</b></p> <p><b>3.1 Generator</b></p> <p>type: SF320-4.8/1280 0-G number : 4 capacity: 355600 KVA normal power: 320MW max capacity: 378400 KVA max power: 350000 KW normal voltage: 15.75kV normal frequency: 50Hz</p> <p><b>3.2 Hydro turbine</b></p> <p>number: 4 type: HLD06A-LJ-60 0 single power: 32.56/356.1MW rotational speed: 125/256rps max working water head: 148.5m min working water head: 75.5 m design working water head: 122m single flow discharge: 298 m<sup>3</sup>/s</p>	
<p><b>4. Main structures</b></p> <p><b>4.1 Main dam</b></p> <p>type: concrete gravity arch dam leading edge length: 396m max dam height: 178m crest elevation: 2610m dam foundation elevation: 2435m maximum width of dam 80m bottom: maximum crest width: 18.5m Outer radius: 265m</p> <p><b>4.2 left and right bank gravity pier</b></p> <p>type: gravity dam left max dam height: 30m right max dam height: 32m left leading edge length: 57.18m right leading edge length: 103.35m left gravity pier crest width: 31-54.01m right gravity pier crest width: 35m</p>	



General layout of Longyangxia Hydropower Project