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# ENGINEERING MARKET UPDATE

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# **CHINA'S HIMALAYAN MEGA HYDROPOWER PROJECT: OUTPUT, SCALE, AND DOWNSTREAM IMPLICATIONS**



China has initiated construction of an unprecedented hydropower system on the Yarlung Tsangpo River, aiming to become the largest and most powerful hydroelectric facility in history. The hydropower cascade will harness an extreme 2,000-metre drop in altitude along a high-altitude river gorge, reflecting one of the most complex energy infrastructure projects ever undertaken.



*Three Gorges Dam*

## **INVESTMENT AND TIMELINE**

- Estimated cost: ~US \$168 billion – among the most expensive infrastructure programs globally.
- Construction start: July 2025.
- Operational target: through the 2030s, with phased capacity coming online.

## **POWER OUTPUT & COMPARATIVE SCALE**

Planned.Capacity.<sup>™</sup>.Generation

- Installed capacity: ~60,000 MW (60 GW) – far exceeding most existing
- Estimated annual generation: ~300 billion kWh – about three times the electricity output of the current world's largest hydro facility.

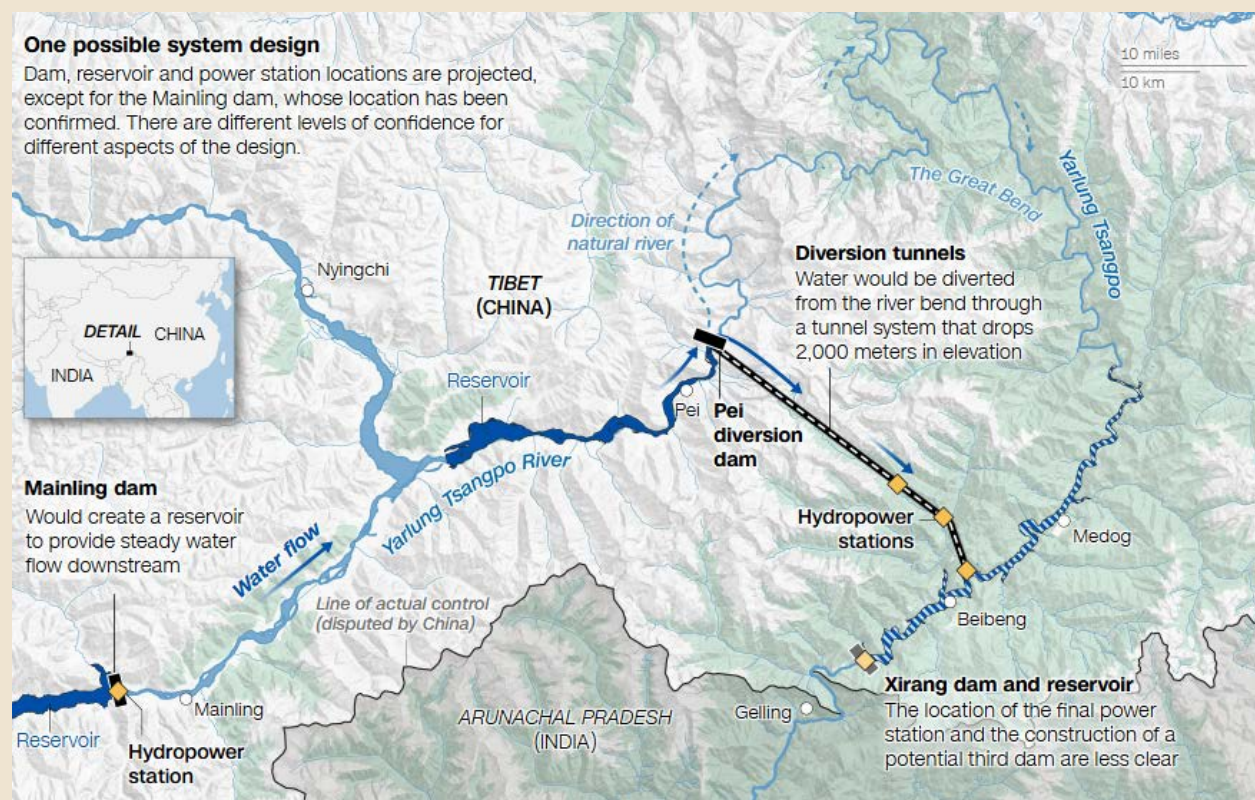




For context:

Three Gorges Dam, previously the world's largest hydropower station, has a capacity of about 22,500 MW and annual generation of ~100 billion kWh.

Taken together, the new system's projected output could supply electricity on a scale comparable to the annual consumption of a major industrialized country, underscoring its potential contribution to decarbonization and grid stability.



*The project is expected to include five cascade hydropower stations and a tunnel system that diverts a portion of the river, enabling it to lose some 2,000 meters of elevation over 50 kilometers and generate power via this swift elevation drop.*



## GEOGRAPHIC FOOTPRINT & POPULATION CONSIDERATIONS



### River.Basin.Reach.™.Downstream.Dependency

- The Yarlung Tsangpo forms the upper courses of a major transboundary river (later known under other names downstream), which supports tens of millions of people across multiple regions reliant on its seasonal flows for irrigation, fisheries, transport, and drinking water.
- Downstream communities — including large agricultural and urban areas — depend on the river's natural flow regime, making any upstream hydraulic changes consequential for river ecology and livelihoods.

### Ecosystem.™.Local.Impacts

The project area traverses ecologically sensitive terrain, intersecting biodiversity hotspots and indigenous habitations. The exact scale of displacement or ecological footprint remains subject to impact assessments,



but historical precedent from large dam programs suggests potential effects on local populations and riverine ecosystems.

#### Regional.Water.™.Security.Dimension

Because it lies on a major river that crosses international borders, the project's hydrological footprint carries wider water-security implications:

- Seasonal flow alterations could influence flood risks downstream or reduce flow during critical dry periods.
- Sediment transport, fishing habitats, and agricultural irrigation patterns depend on natural fluctuation in river levels; disruption to these patterns may affect millions whose livelihoods are tied to the river.

This underscores the importance of transboundary engagement and data sharing for downstream stakeholders in any major hydropower development on shared watercourses.

### **STRATEGIC TAKE**

The sheer scale and power potential of this hydropower project positions it as a cornerstone of future clean energy infrastructure. With the ability to generate ~300 billion kWh annually from 60 GW of capacity, it surpasses existing hydropower benchmarks and reflects a strategic drive toward renewable energy integration.

However, the broader implications for river ecology, downstream populations, and regional water security require data-driven impact assessment and sustained stakeholder engagement. Projects of this magnitude not only reframe national energy pathways but also carry externalities that transcend borders.



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