



Asia China

# Hunan Yuanshui River Basin Hydropower Development Project



Contributing to relieving the tight situation of power supply and demand by constructing hydropower plants in the Hunan Yuanshui River basin, which is rich in potential hydropower resources

### [External evaluator]

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### Rating

Effectiveness, Impact	a	Overall rating <b>A</b>
Relevance	a	
Efficiency	b	
Sustainability	a	

### Project Objectives

To enhance the balance of electric power demand and supply in the mid-western province of Hunan, which serves as a node between the coastal and inland regions of China and is thus strategically important for national economic development, by constructing two hydroelectric power plants with an installed capacity of 225 MW and 240 MW, respectively, with concrete gravity dams in the Yuanshui River basin, thereby contributing to the economic development of the province and the wider mid-western part of China.

### Outline of the Loan Agreement

- Loan amount / disbursed amount: 17,664 million yen / 8,857 million yen
- Loan agreement: December 1998
- Terms and conditions: 0.75% interest rate; 40-year repayment period (including a 10-year grace period); partially untied (or bilateral tied in parts)
- Final disbursement date: July 2006
- Executing agency: China Guodian Corporation
- Website URL: <http://www.cgdc.com.cn/web/guest/home>

### Effects of Project Implementation (Effectiveness, Impact)

The Hongjiang and Wanmipo plants are operated highly efficiently. The hydro utilization factor reached 99.2% (against the planned value of 80.0%) for Hongjiang and 99.4% (85.3%) for Wanmipo. However, most of the other indicators were slightly below the planned values. The output amounted to 852.7 GWh (970 GWh) for Hongjiang and 721.8 GWh (792 GWh) for Wanmipo. The capacity factor stood at 41.1% (49.2%) for Hongjiang and 37.7% (37.7%) for Wanmipo. Annual inflows totaled 16,210 million m<sup>3</sup> (22,200 million m<sup>3</sup>) for Hongjiang and 10,550 million m<sup>3</sup> (9,430 million m<sup>3</sup>) for Wanmipo.

The two plants have contributed to job creation and economic development. Local communities in their vicinity have benefited from the dam reservoirs by using them for aquaculture and tourism.

Yet employment opportunities created by the Wanmipo plant were inadequate. Some of the residents who have been resettled in connection with the dam construction have no other choice but to work far away from their home.

Therefore, project has largely achieved its objectives and its effectiveness is high.

### Relevance

This project has been highly relevant with China's national policies and development needs at the times of both appraisal and ex-post evaluation. At these points in time, power demand exceeded power supply in Hunan Province. Hydroelectric power generation in the Yuanshui River basin accounts for about 50% of the total power output in the province. There is therefore a considerable need for constructing hydropower plants that capitalize on the abundant potential hydropower resources in the basin.

### Efficiency

This project cost less than planned (67% of the planned cost) but took slightly longer (106% of the planned period); therefore, the evaluation for efficiency is moderate. The implementation was delayed chiefly because the bidding procedures took much time.

### Sustainability

No major problems have been observed in the capacity of the executing agency nor its operation and maintenance system of the executing agency; therefore, sustainability of this project is high.

### Conclusion, Lessons Learned, Recommendations

In light of the above, this project is evaluated to be highly satisfactory. The resettlement of residents in connection with the construction of hydropower plants deserves special attention. When no major industries have been established in the candidate areas for resettlement, a viable option may be to provide the residents to be resettled with vocational training and offer a destination that is more industrialized whenever possible. This option should be considered in developing and appraising any resettlement plan. Since the socioeconomic conditions for the resettled residents change over the long term, the project evaluation should preferably have a longer-term scope.

### Operation and output performance of the Jiujiang Thermal Power Plant Part III

Indicat	(Unit)	Target figures at the time of completion	2004		2005		2006		2007	
			Hongjiang	Wanmipo	Hongjiang	Wanmipo	Hongjiang	Wanmipo	Hongjiang	Wanmipo
Maximum output	(MW)	Hongjiang: 225.0 Wanmipo: 240.0	225.0	240.0	270.0	240.0	270.0	240.0	270.0	240.0
Net electric energy production	(GWh/year)	Hongjiang: 970.0 Wanmipo: 792.0	795.4	548.3	669.4	558.8	720.7	414.2	852.7	721.8
Capacity factor	(%)	Hongjiang: 49.2 Wanmipo: 37.7	40.7	40.0	31.6	26.8	30.9	19.9	41.1	37.7
Hydro utilization factor	(%)	Hongjiang: 80.0 Wanmipo: 85.3	96.0	97.8	92.0	95.2	98.1	97.3	99.2	99.4
Annual total inflows	(100 million m <sup>3</sup> /year)	Hongjiang: 222.0 Wanmipo: 94.3	212.2	98.3	148.1	73.2	137.5	54.3	162.1	105.5
Planned outage hours	(hrs./year)	N/A	2,187	258	2,333	1,337	4,254	843	4,357	957
Unplanned outage hours	Mechanical malfunctions	(hrs./year)	N/A	72	28	4	0	0	0	0
	Human error	(hrs./year)	N/A	0	0	0	0	0	0	0
	Floods, etc.	(hrs./year)	N/A	0	0	0	0	0	0	0

Source: Hunan Wuling Hydropower Development Co., Ltd.  
Notes: Capacity factor = (Net electric energy production) / (maximum output × number of hours a year) × 100  
Hydro utilization factor = (Net electric energy production) / (annual generating capacity in the year in question) × 100  
Annual total inflows = Annual total amount of the river inflow into the dam reservoir