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PROJECT PERFORMANCE ASSESSMENT REPORT



CHINA

Hubei Hydropower Development in Poor Areas Project

Report No. 127227

JUNE 18, 2018

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(IBRD-46660)

June 18, 2018

*Financial, Private Sector, and Sustainable Development
Independent Evaluation Group*

Currency Equivalents

(Average exchange rate during the life of the project, 2002–11)

Currency Unit = RMB Yuan

US\$ 1.00 = Y 7.87

Abbreviations and Acronyms

CAS	Country Assistance Strategy	IBRD	International Bank for Reconstruction and Development
CBDP	Community Benefit Development Plan		
CDCF	Community Development Carbon Fund	ICB	International Competitive Bidding
CDM	Clean Development Mechanism	ICR	Implementation Completion and Results Report
CPS	Country Partnership Strategy	IEG	Independent Evaluation Group
CRESP	China Renewable Energy Scale-up Program	ISR	Implementation Status Report
DRA	Debt Reserve Account	kW	Kilowatt
DSCR	Debt Service Coverage Ratio	kWh	Kilowatt-hour
EIA	Environmental Impact Assessment	kWp	Kilowatts-peak
EIRR	economic internal rate of return	M&E	monitoring and evaluation
EMP	Environmental Management Plan	MOF	Ministry of Finance
ERPA	Emission Reduction Purchase Agreement	MW	Megawatt (1,000 kilowatts)
FIRR	financial internal rate of return	MWh	Megawatt-hour
FMIS	financial management information system	NPV	net present value
FY	fiscal year	OD	Operational Directive
HPPC	Hubei Provincial Power Company	O&M	operations and maintenance
GDP	gross domestic product	OP	Operational Policy
GW	gigawatt (1,000 megawatts)	PAD	Project Appraisal Document
GWh	gigawatt-hour	PAP	project-affected people
		PDO	Project Development Objective
		PMO	Project Management Office
		POE	Panel of Experts (for Dam Safety)
		RAP	Resettlement Action Plan
		RMB	Renminbi (Chinese Yuan)
		VAT	Value Added Tax

Fiscal Year

Government: January 1 – December 31

Contents

1. Background and Context.....	1
2. Objectives, Design, and Their Relevance	3
Project Development Objectives.....	3
Relevance of Objectives	3
3. Implementation	5
4. Efficacy	11
5. Efficiency	15
6. Outcome	17
7. Risk to Development Outcome	17
8. World Bank Performance	18
9. Borrower Performance.....	19
Government Performance	19
Implementing Agencies Performance.....	20
10. Monitoring and Evaluation	20
11. Lessons.....	22

Tables

Table 4.1. Annual Electricity Generation for Guangrun Component: 2014–17.....	12
Table 5.1. Economic Internal Rates of Return (EIRR) at project closing (2012).....	15
Table 5.2. Feed-in Tariff and Sales for Hydropower Components visited by IEG	16

Appendixes

Appendix A. Basic Data Sheet.....	24
Appendix B. Results Framework	30
Appendix C: Interview Questions for Hubei Hydro Project Stakeholders	37
Appendix D. List of Persons Met	38

<p>This report was prepared by Andres Liebenthal (Consultant) under the supervision of Migara Jayawardena (Task Team Leader) and Midori Makino (Manager). The report was panel reviewed by Christopher Nelson and peer reviewed by Fernando Manibog. Richard Kraus provided administrative support.</p>

Principal Ratings

	ICR*	ICR Review*	PPAR
Outcome	Satisfactory	Moderately Satisfactory	Satisfactory
Risk to development outcome	Negligible to Low	Moderate	Moderate
Bank performance	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Borrower performance	Moderately Satisfactory	Moderately Unsatisfactory	Moderately Satisfactory

* The Implementation Completion and Results (ICR) report is a self-evaluation by the responsible World Bank global practice. The ICR Review is an intermediate Independent Evaluation Group product that seeks to independently validate the findings of the ICR. Note: PPAR = Project Performance Assessment Report.

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IEG Mission: Improving World Bank Group development results through excellence in independent evaluation.

About this Report

The Independent Evaluation Group (IEG) assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the World Bank's self-evaluation process and to verify that the World Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEG annually assesses 20–25 percent of the World Bank's lending operations through fieldwork. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or World Bank management have requested assessments; and those that are likely to generate important lessons.

To prepare a Project Performance Assessment Report (PPAR), IEG staff examine project files and other documents, visit the borrowing country to discuss the operation with the government, and other in-country stakeholders, interview World Bank staff and other donor agency staff both at headquarters and in local offices as appropriate, and apply other evaluative methods as needed.

Each PPAR is subject to technical peer review, internal IEG panel review, and management approval. Once cleared internally, the PPAR is commented on by the responsible World Bank country management unit. The PPAR is also sent to the borrower for review. IEG incorporates both World Bank and borrower comments as appropriate, and the borrowers' comments are attached to the document that is sent to the World Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the IEG Rating System for Public Sector Evaluations

IEG's use of multiple evaluation methods offers both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEG evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (additional information is available on the IEG website: <http://ieg.worldbankgroup.org>).

Outcome: The extent to which the operation's major relevant objectives were achieved, or are expected to be achieved, efficiently. The rating has three dimensions: relevance, efficacy, and efficiency. *Relevance* includes relevance of objectives and relevance of design. Relevance of objectives is the extent to which the project's objectives are consistent with the country's current development priorities and with current World Bank country and sectoral assistance strategies and corporate goals (expressed in poverty reduction strategy papers, Country Assistance Strategies, sector strategy papers, and operational policies). Relevance of design is the extent to which the project's design is consistent with the stated objectives. *Efficacy* is the extent to which the project's objectives were achieved, or are expected to be achieved, taking into account their relative importance. *Efficiency* is the extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared with alternatives. The efficiency dimension is not applied to development policy operations, which provide general budget support. *Possible ratings for Outcome:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Risk to Development Outcome: The risk, at the time of evaluation, that development outcomes (or expected outcomes) will not be maintained (or realized). *Possible ratings for Risk to Development Outcome:* High, Significant, Moderate, Negligible to Low, and Not Evaluable.

Bank Performance: The extent to which services provided by the World Bank ensured quality at entry of the operation and supported effective implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of supported activities after loan or credit closing, toward the achievement of development outcomes). The rating has two dimensions: quality at entry and quality of supervision. *Possible Ratings for Bank Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, and Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower (including the government and implementing agency or agencies) ensured quality of preparation and implementation, and complied with covenants and agreements, toward the achievement of development outcomes. The rating has two dimensions: government performance and implementing agency(ies) performance. *Possible ratings for Borrower Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, and Highly Unsatisfactory.

Preface

This is the Project Performance Assessment Report (PPAR) by the Independent Evaluation Group (IEG) of the World Bank Group on the China: Hubei Hydropower Development in Poor Areas Project (IBRD-46660). The project had three project development objectives:

- (a) to facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner;
- (b) to enhance the efficiency of the electricity sector in Hubei by commercializing county-level generation companies; and
- (c) to contribute to poverty alleviation efforts in poor communities in Hubei.

The project, as approved by the Board in June 2002, included four components in four poor counties of Hubei Province: (i) Dongping Hydroelectric Power Station (110 MW) in Xuanen County; (ii) Najitan Hydroelectric Power Station (36 MW) in Laifeng County; (iii) Songshuling Hydroelectric Power Station (50 MW) in Zhushan County; and (iv) Xiakou Hydroelectric Power Station (30 MW) in Nanzhang County. In order to utilize the substantial loan savings of about US\$16 million, a fifth component—the Guangrun Hydropower Development Project in Jianshi County (18 MW and 10 MW)—was added in 2006. The total project cost (US\$259 million at appraisal and US\$300 million at completion) was supported by a Bank loan of US\$105 million.

This report presents findings and suggests lessons based on a review of the project's Implementation Completion and Results Report dated June 14, 2012 and the subsequent IEG ICR Review; project and legal documents; prior World Bank sector studies and reviews; records on file; and other relevant materials. An IEG mission visited China in January 2017 and held discussions with government officials, participating power company officials, and other project stakeholders at the provincial level and in three of the five participating counties (see Appendix C).

This project was selected for a PPAR as it will contribute a valuable input to IEG's ongoing major Evaluation of the World Bank Group's Support to Electricity Supply from Renewable Energy Resources.

The assistance and contributions of all stakeholders, including World Bank staff in the China office and Washington, DC, are gratefully acknowledged. Comments received from Fernando Manibog (peer reviewer), Christopher Nelson (panel reviewer), Migara Jayawardena (task team leader), Lauren Kelly (Senior Evaluation Officer) and Midori Makino (manager) are particularly appreciated.

Following standard IEG procedures, the draft PPAR was shared with relevant government officials and agencies for their review and comment and no comments were received.

Summary

Since the early 1980s, China has been engaged in a major transformation of its power sector from a centralized government department to a decentralized structure with separate generation and transmission companies, and competitive market-based generation. By the early 2000s, the separation of transmission and generation had progressed to the county level with the provincial power companies taking over management of distribution and making substantial investments in their reinforcement and modernization. But the county-owned generation companies had been left virtually untouched. While there was nominal corporatization, corporate structures and responsibilities were unclear, and in practice the generation entities remained a part of local government at various levels. This affected their ability to efficiently manage existing capacity, and to raise finance to carry out economically justified rehabilitation, up-rating, and expansion.

Around the same time, from 2000, the government had embarked on the Western Region Development Program to reduce poverty and interregional inequality. Because a large proportion of China's energy resources, particularly hydropower, other renewables and gas, are located in the western areas, assistance in development of these resources would support the government's regional development strategy. Development of hydropower and other renewables would be particularly beneficial, because the resources were usually located in mountainous or remote areas, which typically also had a high prevalence of poverty.

The project—originally construction of four small to medium hydropower stations (extended to six during implementation) located in five poor counties in western Hubei Province—was designed to address the following key issues:

- *Weakness of local developers:* County and local governments were interested in developing their small hydropower resources, but the local generation companies lacked institutional and financial capacity and creditworthiness.
- *Cost-based generation tariff policy:* The low allowable returns on equity provided little incentive for the development of even economically feasible resources.
- *Limited interest and low priority:* Major power generation companies, commercial banks and other institutional investors that dominate the sector were not interested in relatively small projects, even if such projects yielded attractive rates of return.
- *High relative project development costs:* The need to attract and employ skilled managerial and technical staff to secure information, analyze design options, arrange financing, identify reliable suppliers, etc. increased project development costs.
- *Inappropriate benefit-sharing mechanisms:* Under the then-prevailing fiscal system, corporate income taxes accrued at the level of government that owned or registered the project developer.¹ This system tended to discourage the governments in the resource-rich western provinces—that often lacked the funds to develop their own energy resources—from allowing investors from outside the province to develop projects, because they would not receive the tax benefits.
- *Need for better targeting of poverty programs:* Increased fiscal revenue in resource-rich areas could be expected to stimulate economic development; however, better targeting these income streams was needed to ensure that they also benefited the residual pockets of poverty.

Given the above, the Hubei Hydropower Development in Poor Areas project was designed with three main objectives:

- (a) to facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner;
- (b) to enhance the efficiency of the electricity sector in Hubei by commercializing county-level generation companies; and
- (c) to contribute to poverty alleviation efforts in poor communities in Hubei.

Ratings

The relevance of project objectives is rated **high**. The project development objectives were and remain consistent with the country's energy priorities. China's 13th Five-Year Plan (2016–20) aims to reduce carbon intensity by 17 percent, and achieve the long-term goal of reducing the economy's carbon intensity by 40–45 percent during 2005 to 2020. Most recently, in 2017, the government committed to completing the eradication of rural poverty by 2020. The project's objectives are also aligned with two main areas of engagement highlighted in the Country Partnership Strategy (CPS) for FY2013–FY2016: (a) supporting greener growth by helping China shift to a more sustainable energy path; and (b) promoting more inclusive development.

Relevance of project design is rated **substantial**. The design of the project was clear and well defined. The project would help establish the required institutional capacity and appropriate commercial arrangements to provide the county-level hydropower companies with the necessary credibility with local commercial banks that were expected to become a source of finance for the project. Together, these actions would result in expanding power generation in an environmentally sustainable manner, contribute to economic growth, and provide revenue for poverty alleviation programs. The institutional strengthening program under the project was designed to ensure that, once the components were completed, the local hydropower companies would operate their assets efficiently. Technical assistance to strengthen county poverty alleviation programs was also included.

The efficacy of the project is rated **substantial**. By the time the project closed in 2011, it had fully achieved most of the intermediate and project development objective (PDO) indicators specified in the results framework. Six years after project closing, the only remaining shortfall is the lack of completion of the Guangrun component, added four years after appraisal to use \$16 million of savings from the four original components.² Otherwise, the participating generation companies have been successfully corporatized, were efficiently operated, and (except Guangrun) were financially viable. The project's fiscal and technical contributions to the local poverty alleviation programs are also highly appreciated by stakeholders. The host counties' income levels have greatly surpassed China's poverty benchmark. On the other hand, while the project contributed to increased incomes, the extent of attribution could not be established.

Efficiency is rated **substantial**. The economic value of the electricity generated is far higher than the tariff, as suggested by comparison with the prevailing coal-fired generation tariff in Hubei, and the average revenue from similar hydro projects in Zhejiang Province. The environmental and multipurpose benefits are in line with appraisal expectations. The Guangrun

component has experienced major cost overruns due to the materialization of unexpected geological and water dispute issues, but the project owner informed IEG that it is expecting to be able to complete the project in 2019, as the more important of the outstanding water disputes is on its way to resolution, and the remaining investments are expected to yield commensurate financial returns.

The project's outcome is rated **satisfactory**. The project's objectives were and remain relevant. The project has fully achieved the commercialization of the participating power companies and contributed to all the host counties' poverty reduction programs. The only significant gap relates to the completion of the Guangrun component, which continues to be affected by unexpected geological and water dispute issues. While this represents a continuing 5 percent generation shortfall for the whole project, most if not all of the shortfall is expected to be eliminated in less than two years.

The risk to development outcome is rated **moderate**. The four original components have been in production for more than 10 years and are operationally and financially sound. The expected outcome of the additional Guangrun component remains at risk pending (a) the resolution of water allocation disputes with two neighboring counties in Chongqing Municipality, which affects the feasibility of completing two water diversion tunnels, and in turn affects the need for the second stage leakage treatment for the (upstream) Hongwawu reservoir; and (b) the issuance of updated safety standards for construction scaffolds, which were being revised following a major scaffold collapse accident in another part of China, to enable the treatment of the right bank slope instability and installation of sluice gates for the (downstream) Zhamushui dam. As of January 2018, when IEG met with the Guangrun project company, the updated safety standards were being issued, and the more important of the two water allocation disputes appeared to be on its way to resolution.

World Bank Performance is rated **moderately satisfactory**. The World Bank recognized the government's strong commitment to reduce poverty as an opportunity to contribute in this area by integrating it as a major objective for a hydropower project. The preparation stage focused on addressing the weaknesses of the four original participating hydropower companies through extensive technical assistance and support for corporatization. A benefit-sharing scheme was designed to ensure that counties would earmark a share of their fiscal revenues from the project to poverty alleviation, and technical assistance was provided to strengthen the planning and implementation of county poverty alleviation programs. Resettlement arising from the project was also treated as a development opportunity for affected communities. For the Guangrun component, however, which came later to the project, the initial project sponsor's weak managerial and technical capacity, and lack of experience with hydropower projects, do not appear to have been adequately appraised and addressed, which may have contributed to the inadequate geological investigations and technical design challenges that have prevented its completion to date. However, the World Bank's facilitation of follow-on carbon financing for four of the five components enabled it to continue supervising the Guangrun component, with the expectation that it will be completed in less than two years.

Borrower Performance is rated **moderately satisfactory**. The Hubei provincial government provided strong support during project preparation and was proactive in using loan savings. However, subsidies promised by provincial and county authorities for the Xiakou component

were not granted, causing a financing gap which delayed construction. In addition, the Hubei provincial government was unwilling to adopt a two-part tariff for the project, which would have been consistent with the broad direction of China's power sector reform. As for the implementing agencies, all project companies experienced procurement delays except for Dongping. In the case of Guangrun, the very weak technical and managerial capacity of the initial project sponsor may have contributed to the inadequate geological investigations for the Hongwawu reservoir. These capacity issues were ultimately resolved when the initial sponsor was replaced by a larger and more experienced company, but the consequences of the initial shortcomings have continued to prevent the completion of the Guangrun component.

Lessons

The main lessons that emerge from the experience of this complex project are the following:

Integrating hydropower investments with institutional development and poverty alleviation can yield strong synergies. This project is a good example of what can be accomplished with the combination of hydropower development and local poverty alleviation in one package when projects are well designed with strong counterpart commitment and management during implementation:

- **The project-related tax revenues provided an opportunity to involve the World Bank in strengthening the local-level poverty alleviation programs.** The broader discussion of revenue management gave the World Bank a logical entry point for supporting the implementation of the local governments' poverty alleviation program.
- **The resettlement requirements were treated as a development opportunity** to improve the living standards of affected people, including additional benefits for the neighboring populations.

The rigorous quality and depth of appraisal for implementing agencies needs to be maintained throughout the project cycle, including project components added late. In this project, it soon became clear that the Guoxin company, which joined the project in 2005 (four years after appraisal) did not have adequate technical and managerial capacity to undertake the technically more complex Guangrun component comparable to that of the four original sponsors. This appears to have contributed to the inadequate geological investigations for the Hongwawu reservoir and the insufficient early-stage assessment of technical issues faced by the Zhamushui dam.

José Carbajo Martínez
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¹ I.e. taxes accrue to the national government or the province, district or county where a company is registered, rather than where the project is located.

² The \$16 million in loan savings were fully disbursed before the project closed in 2011.

1. Background and Context

1.1 Since the early 1980s China has been engaged in a major transformation of its power sector from a centralized government department to a decentralized structure with separate generation and transmission companies, and competitive market-based generation. Two decades later, by the time the project was appraised, the sector had been largely corporatized with mixed public and private ownership, subsidies had been eliminated, and electricity prices were in line with or above marginal supply costs in most areas. The core of the power system was formed by a national grid with provincial transmission companies and a small number of large generation companies.

1.2 By the early 2000s, the separation of transmission and generation had progressed to the county level with the provincial power companies taking over management of distribution and making substantial investments in their reinforcement and modernization. However, these reforms had not yet extended to the generation companies owned at the county level and below. From a technical perspective, with the increasing capacity of provincially managed transmission and dispatching, county-level generation offered a great potential for efficiency improvements. Many of the local hydropower plants had been developed with local resources and expertise, so that substantial output and efficiency increases could be expected with rehabilitation and up-rating.

1.3 Similarly, from the institutional perspective, the locally-owned generation companies had been left virtually untouched. Although there was nominal corporatization, corporate structures and responsibilities were unclear, and in practice, the generation entities remained a part of local government at various levels. This affected their ability to efficiently manage existing capacity, and to raise the necessary finance to carry out economically justified rehabilitation, up-rating, and expansion.

1.4 Around the same time, from 2000, the government had embarked on a Western Region Development Program to reduce poverty and interregional inequality. Because a large proportion of China's energy resources, particularly hydropower, other renewables and gas, are located in the western areas, assistance in development of these resources would support the government strategy. Development of hydropower and other renewables would be particularly beneficial because these resources were usually located in mountainous or remote areas, which typically also had a high prevalence of poverty.

1.5 The World Bank's Country Assistance Strategy (CAS) for 2003–05 was being prepared at the time of appraisal. Its overarching objective was to support China's transition from a rural, agricultural society to an urban, industrial society and from a centrally planned to a more globally integrated market-based economy—and to do it on a sustainable basis. Its three main objectives were: (a) improving the business environment and accelerating the transition to a market economy; (b) facilitating an environmentally sustainable development process; and (c) addressing the needs of the poorer and disadvantaged people and lagging regions.

1.6 The World Bank's energy sector strategy for China contributed to these three objectives by focusing on: (a) transitioning the state-owned energy sector to a diverse market-based

system; (b) conversion to clean fuels and increasing energy efficiency; and (c) raising incomes in poorer western areas by helping them to develop and export their energy resources.

1.7 The project—originally four (then extended to six during implementation) small to medium hydropower stations located in five poor counties in western Hubei Province—was designed to contribute directly to the World Bank’s three main objectives in the energy sector by addressing the following key issues affecting the development of hydropower resources and their contribution to poverty reduction:

- Weakness of local developers: County and local governments were interested in developing their small hydropower resources, but the local generation companies lacked institutional and financial capacity and creditworthiness.
- Cost-based generation tariff policy: The low allowable returns on equity provided little incentive for the development of even economically feasible resources.
- Limited interest and low priority: Major power generation companies, commercial banks, and other institutional investors that dominated the sector were not interested in relatively small projects, even if such projects yielded attractive rates of return.
- High relative project development costs: The need to attract and employ skilled managerial and technical staff to secure information, analyze design options, arrange financing, identify reliable suppliers, etc. increased project development costs.
- Inappropriate benefit sharing mechanisms. Under the then prevailing fiscal system, corporate income taxes accrued to the level of government that owned or registered the project developer. This fiscal system tended to discourage the governments in the resource-rich western provinces—that often lacked the financial resources to develop their energy resources—from allowing investors from outside the province to develop projects, as they would not receive the tax benefits.
- Need for better targeting of poverty programs. While increased fiscal revenue in resource-owning areas could be expected to stimulate economic development, better targeting these income streams was needed to ensure that they also benefited the residual pockets of poverty.

1.8 Western Hubei province, where the proposed hydropower stations were located, comprises mountainous areas that are topographically and culturally contiguous with the officially designated Western Region. This contiguity had been recognized by the central government through its designation of Enshi Autonomous Prefecture (the location of three of the project counties), as part of the officially designated Western Region. However, whether officially designated or not, all of western Hubei could be classified as a poverty area. Four of the five project counties were nationally designated poverty counties, and the fourth was a provincially designated poverty county.

1.9 The six hydropower stations are in the mountainous area of western Hubei, which contains most of Hubei's small and medium hydropower capacity and potential. Each component was to be developed by a newly organized limited liability company whose initial owner was a county-owned generation company.

1.10 Studies carried out during project preparation had already resulted in: (a) the corporate and financial restructuring and corporatization of county-owned generation companies in the

four original host counties; (b) changes in sponsorship and ownership structure of the four original project companies to ensure financial viability during project implementation; and (c) rigorous financial projections to ensure financial viability during operation. This restructuring of generation assets at the county level was expected to provide a model for replication throughout Hubei province. The same template was later applied for the Guangrun component, which was added in 2006 to use about \$16 million in loan savings.

2. Objectives, Design, and Their Relevance

Project Development Objectives

2.1 According to the Project Appraisal Document (PAD) and the Loan Agreement, the project had three project development objectives:

- (a) to facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner;
- (b) to enhance the efficiency of the electricity sector in Hubei by commercializing county-level generation companies; and
- (c) to contribute to poverty alleviation efforts in poor communities in Hubei.

2.2 Key progress indicators for monitoring and evaluating performance were:

- Increased renewable energy generation capacity;
- Corporatization of project companies;
- Improvement of living standards in the project counties (especially those resettled); and
- Improvement in the proportion of fiscal revenues generated by the project contributing to poverty alleviation in the project counties.

2.3 The Project Development Objectives (PDOs) and the key indicators were not revised during implementation, but the original targets were implicitly revised based on the amended legal documents in the first restructuring in July 2006 with the addition of the Guangrun component, which comprised two hydropower stations in Jianshi county. These implicitly revised targets have been used in this PPAR for the assessment of the entire Hubei Hydropower Development in Poor Areas Project, including the Guangrun component.

Relevance of Objectives

2.4 The project's objectives were consistent with the country's energy priorities, and remain so. China is highly dependent on fossil fuels, with (as of 2016) coal accounting for about 62 percent of primary energy consumption and only 13 percent of energy coming from non-fossil sources; shifting to a greener energy supply will benefit both China and the world. The 13th Five-Year Plan (2016–20) aims to reduce carbon intensity by 17 percent, and achieve the long term goal of the economy's carbon intensity by 40–45 percent during 2005 to 2020. Most recently, in 2017, the government is committed to completing the eradication of rural poverty by 2020.

2.5 In addition, the project's objectives were and remain consistent with the World Bank's Country Partnership Strategy (CPS) for China¹. The PDO is aligned with the main strategic areas of engagement highlighted in the CPS for FY2013–FY2016: (a) supporting greener growth by helping China shift to a more sustainable energy path; (b) promoting more inclusive development; and (c) advancing mutually beneficial relations with the world.

2.6 Finally, the project's objectives were and remain also consistent with the World Bank Group's energy strategy,² which commits the institution to: (a) focus on the poor; (b) accelerate efficiency gains; (c) expand renewable energy; (d) create an enabling environment; and (e) intensify global advocacy.

Relevance of project objectives is rated *high*.

Relevance of Design

2.7 The project, as approved by the Board in June 2002, included four components in four poor counties of Hubei Province:

a. Dongping Hydroelectric Power Station (110 MW) in Xuanen County (Cost: \$85.40 million at appraisal; \$102.82 million actual).

b. Najitan Hydroelectric Power Station (36 MW) in Laifeng County County (Cost: \$46.10 million at appraisal; \$49.26 million actual).

c. Songshuling Hydroelectric Power Station (50 MW) in Zhushan County County (Cost: \$46.10 million at appraisal; \$43.79 million actual).

d. Xiakou Hydroelectric Power Station (30 MW) in Nanzhang County County (Cost: \$34.80 million at appraisal; \$34.91 million actual).

Each component consisted of four activities, as follows:

a. Construction of a hydroelectric power station, including: (a) a single-purpose concrete arch dam; (b) a power house; (c) an associated step-up sub-station; and (d) a transmission line to connect the power station to the grid.

b. An institutional strengthening program, including: (a) development and implementation of organizational arrangements, staffing and information systems appropriate to the operational phase; and (b) training for project company staff in project management and hydropower station operation.

c. Development of a plan for enhancement of poverty alleviation efforts in the participating counties to be partially funded from the fiscal revenues accruing to the county from the project.

d. Compensation, resettlement, and rehabilitation of project-affected people.

Added Component

2.8 In order to utilize the substantial loan savings of about US\$16 million³, a fifth component—the Guanrun Hydropower Development Project—was added in 2006: it consists

of three activities similar to b, c, and d under the original four components, and two hydropower stations: (i) Hongwawu (18 MW) and Zhamushui (10MW), both located in Jianshi County. On this basis, the Loan Agreement was amended in July 2006 and a Project Agreement for the new Guangrun component was prepared in January 2007. Its cost was estimated at \$36.71 million at appraisal and the actual cost to date has been \$69.57 million.

2.9 At the detail level, the design of the project was clear and well defined in laying out its theory of change. The project would help establish the required institutional capacity and appropriate commercial arrangements to provide the county-level hydropower companies with the necessary credibility with local commercial banks that were expected to become a source of finance for the project. Together, these actions would result in expanding power generation in the project counties in an environmentally sustainable manner, contribute to economic growth, and provide revenue for poverty alleviation programs.

2.10 The institutional strengthening program under the project was designed to ensure that, once the components were completed, the local hydropower companies would operate their assets efficiently. Technical assistance to strengthen county poverty alleviation planning was also included.

2.11 Overall, the comprehensive design of the project, which encompassed the three-way integration of hydropower investments, institutional development and capacity building, and poverty reduction planning and monitoring, that mutually supported and reinforced each other, leads the relevance of project design to be rated *substantial*.

3. Implementation

Institutional Framework and Implementation Arrangements

3.1 **Provincial Project Management Office.** Hosted in the Hubei Provincial Finance Bureau, the Provincial Project Management Office (PPMO) was established in August 2001. Participating provincial government agencies included: the Hubei Provincial Planning and Development Commission (DRC), the Water Resources Bureau, the Environment Protection Bureau, the Resettlement Office, the Pricing Bureau, the Audit Bureau, and the Poverty Reduction Office. The Hubei Provincial Power Company (HPPC), a central government-owned enterprise and the future power purchaser, was also a member of the PPMO.

3.2 The PPMO initially focused on the coordination of project preparation for World Bank appraisal, and on local approval procedures. The PPMO continued to play a major role in project implementation, including necessary coordination with central and provincial government agencies, overall monitoring, financing arrangements, procurement, and financial management. It was also responsible for maintaining, monitoring, and reconciling the special account established for the project, and reviewing, verifying, and approving withdrawal applications prepared by the project companies before submission to the World Bank for disbursement processing. The PPMO also organized tariff-related studies, assisted in processing tariff applications through the provincial Pricing Bureau and DRC, and coordinated and supported the negotiation of power purchase agreements, facilitated by the fact that both the Pricing Bureau and the HPPC were represented in the PPMO.

3.3 County Project Management Offices. In each of the host counties, the county government

established a County Project Management Office (CPMO) with the same organizational structure of the PPMO, which greatly helped with the vertical coordination of project-related decision-making between the two government levels. The CPMO assumed similar functions at the county level to those assumed by the PPMO at the province level, except for procurement and special account management, which were exercised at the province level. However, officials of the municipal and county finance bureaus were appointed as supervisors for financial management during project implementation. In addition, the CPMOs were responsible for coordinating inputs to the Poverty Alleviation Planning studies carried out under the project.

3.4 Project Companies. Each of the host counties established a hydropower company to act as the component project's owner, developer, and operator. In each case, the sponsors were county-owned generation companies, while strategic shareholders at the provincial and prefecture levels were brought in to enhance the project company's creditworthiness and its capacity for project implementation and operation.

3.5 To manage the risks associated with the relative inexperience and limited capacity of the project companies, the major functions and responsibilities for project construction management—including project management, construction supervision and contract administration—were handed over to experienced firms employed as supervision engineers. The supervision engineers also managed the implementation of each project's Environmental Management Plans.

Implementation Experience

3.6 The implementation of the original four components progressed smoothly, with only moderate delays in procurement and commissioning. By the end of 2005, loan savings of US\$16 million were identified, and the Guangrun component was added to scale up the project's development impacts. However, the implementation of this incremental component encountered serious geological and water dispute issues which have greatly increased its construction costs and prevented its completion until the present, more than six years after the closing of the project in 2011. Nevertheless, the World Bank is continuing to monitor the implementation of the Guangrun component as part of the supervision of the follow-on Guangrun Community Development Carbon Fund (CDCF) project. Major factors that affected the project are summarized below.

Implementation factors that affected the project negatively:

- (a) Delays in commissioning** of 20 months for Najitan, 8 months for Songshuling, 16 months for Xiakou, and 8 years for Guangrun (which had not yet been fully completed as of January 2018) had a negative impact on the financial performance of the project companies.
- (b) Procurement delays (all components except Dongping).** A major cause of commissioning delays related to procurement. The original subprojects, except Dongping (for which all goods were not World Bank-financed), suffered from a seven-month delay in the procurement of the main turbine and generator contract (international competitive bidding

[ICB]) because of delays in the domestic approval process. This delay directly affected the construction progress of the three subprojects, because this equipment was needed to complete the powerhouses. In the case of Guangrun, procurement of the main civil works contract for the Zhamushui dam and powerhouse had to be cancelled because it could not be concluded within the bid validity period.

- (c) **Najitan capacity upgrade from 36 (3x12) MW to 51 (3x17) MW.** The original planned capacity (36 MW) was inadequate to reach the design plant capability of 149 GWh per year. To be in line with the three other subprojects in terms of average number of generation hours, Najitan's capacity was upgraded to 51 MW. This major design change added one full year to the delay associated with the main turbine and generator procurement.
- (d) **Reduction of Xiakou's flood control subsidy (originally: RMB 51.8 million, 18 percent of the subproject cost).** This subsidy was to be provided jointly by the Provincial Water Resources Bureau (with a share of 75 percent) and Nanzhang County (with a share of 25 percent). However, Nanzhang County provided less than a third of its commitment, and the Provincial Water Resources Bureau failed to provide any subsidy at all. This was due to a 2005 policy adjustment which lowered the priority of flood control subsidies for smaller rivers, such as the Juhe River, on which Xiakou was built, leaving this subproject with a large financing gap. Local banks were not willing to lend to the company unless it could show better prospective financial results. This financing issue was resolved by the project company's successful application for a Clean Development Mechanism (CDM) project, which helped restore its creditworthiness with the local banks.
- (e) **Weak capacity of the Guoxin Company, owner of the Guangrun component.** Guoxin was a trading company with very weak technical and managerial capacity for planning, building, and operating such a project. They had relied on outside experts and consultants for the technical work and were short of staff to manage the design and execution of the two hydropower stations (Hongwawu and Zhamushui) in the Guangrun watershed.
- (f) **Failure of government funding commitment in Guangrun.** The Jianshi county government failed to provide the financial support agreed at the appraisal of the Guangrun component in 2005. This issue was only resolved when Guodian became the principal shareholder of the company.
- (g) **Unforeseen geological conditions in Guangrun.** The Hongwawu reservoir and two powerhouses were completed and commissioned in 2009 and 2010. Soon after, leakage was found in the right abutment and reservoir bed, which has only been partially treated, mainly because of unresolved water dispute issues. The Zhamushui dam also faced technical difficulties, with two faults and one fracture zone discovered in the left abutment during excavation. While it was partially commissioned in 2012, the construction of two diversion channels and the installation of flood discharge gates have not been completed. As a result of the incomplete construction of these two hydropower stations, their power generation has only reached about half of design levels, resulting in a deteriorating financial position for the Guangrun hydropower company.
- (h) **Water dispute issues faced by Guangrun.** The construction and completion of two water diversion tunnels linked to the Hongwawu reservoir (which is upstream of the Zhamushui reservoir) has been stopped because of a water allocation dispute with neighboring counties

in Chongqing Province. This resolution of this dispute is awaiting arbitration by the Ministry of Water Resources. The project owner, in turn, is awaiting the results of arbitration before deciding on how to proceed with additional investments to complete these projects.

Implementation factors that affected the project positively:

- (g) **Carbon Credits.** Four of the five project companies successfully applied to the CDM for carbon credits (until end-2012 for three of them, and until 2017 for Guangrun). This generated additional revenues which contributed positively to the companies' financial performance and the local banks' willingness to lend to them. The existence of the follow-on Guangrun CDCF project has also enabled the World Bank to continue to monitor the implementation of the Guangrun component.
- (h) **Changes of shareholders.** In the four original project companies, the county-level shareholders had sold all their shares to provincial or national companies (except for Najitan, where the county has retained 5 percent of shares). Because the project companies were registered with the host counties, the county governments continue to collect fiscal revenues from the projects. In Guangrun (registered in Jianshi County), the original sponsor, the Guoxin Company, sold its 55 percent of shares to Guodian Company in May 2010. The withdrawal of county-level shareholders for the four original subprojects, and of Guoxin Company from Guangrun, and their replacement by provincial or national sponsors has substantially strengthened the project companies' technical, managerial, and financial capacity, and enabled county-level sponsors to re-invest their assets in other county development projects.
- (i) **Project timing.** The timing of the project, at an early stage of the national government's strong commitment to poverty reduction and power sector reform, which the project supported at the local level with specifically adapted design and implementation assistance, helped elicit the local government's support for the World Bank's involvement in the diagnostic assessment and strengthening of their poverty reduction programs.
- (j) **Resettlement expertise.** The World Bank's provision of international expertise and experience with resettlement highlighted the need for attention to restoring people's livelihoods through skills training, land-for-land compensation, and improved infrastructure, which made life easier for resettlers and other project-affected people, and served as a model for other projects.
- (k) **Low interest rates.** The World Bank's low interest rates in relation to other sources of finance made the participating companies eager to follow the World Bank's recommendations and requirements as to corporate organization and governance, procurement practices, and implementation of financial, operational, and environmental management systems and indicators.
- (l) **Carbon finance.** The World Bank's facilitation of access to CDM funds helped bridge the financing gaps for the Xiakou and Guangrun components, supported the Community Benefits Development Program for Guangrun, and improved the financial returns for four of the participating companies.

Comments on Project Costs, Financing, Borrower Contribution, and Timeline

3.7 Project Costs: As of early 2018, six years after project closing, the cumulative project costs have been US\$300.36 million, about 16 percent higher than the appraisal estimate. Actual

contract prices for the main civil works and equipment package costs for the original four components proved to be 13 percent lower than appraisal estimates, mainly because at appraisal in 2002, design institutes in China still used “norm” prices to prepare civil construction cost estimates, which tended to lag the decline in market prices. The resulting loan savings of about US\$15.97 million were allocated to the Guangrun component that was added to the project in 2006. However, as already noted, unforeseen geological conditions and water disputes have delayed the completion of both hydropower stations in the Guangrun component to this day, resulting to date in a cost overrun of US\$32.86 million for this component, mostly incurred after the Bank loan closed in 2011.

3.8 Consequently, the Guangrun component has exceeded its (2006) appraisal estimate by 90 percent, with construction still incomplete. As of January 2018, the following activities remained to be done: (a) for the Zhamushui hydropower station: right bank slope treatment and installation of sluice gates for crest spillway; and (b) for the Hongwawu hydropower station: construction of two water diversion tunnels and stage two treatment of the reservoir right bank. While the Zhamushui works are expected to be completed in the spring of 2019, the status of the Hongwawu items remains suspended pending resolution of two water allocation disputes with a neighboring province, of which the more important was already under way.

3.9 Financing and Borrower Contribution: The World Bank loan of \$105 million, which accounted for 35 percent of total project costs to date, was fully disbursed with the timely reallocation of loan savings of \$15.97 million to the Guangrun component. The Borrowers have contributed \$195.36 million to date, accounting for 65 percent of total costs, which was 27 percent higher than appraisal because of the cost overrun discussed above, the depreciation of the U.S. dollar against the Chinese RMB between 2006 and 2010, and the failure of the provincial and two county governments to honor their subsidy commitments.

3.10 Timeline: The closing date of the loan was extended twice to accommodate technical delays encountered by the Guangrun component: (a) An 18-month extension of the loan, from December 31, 2008 to June 30, 2010, was provided to finalize the Zhamushui station’s design and because of unexpected severe weather conditions (snowstorm and floods in 2008); and (b) in March 2010, the loan closing date was extended by another 18 months to remedy the financing gap arising from the withdrawal of promised financial support from the country government and enable the Zhamushui and Hongwawu works to be completed. In the absence of satisfactory progress, the World Bank closed the project on December 31, 2011 but is continuing to monitor the implementation of the Guangrun component as part of the supervision of the follow-on Guangrun CDCF project.

Fiduciary Management

3.11 Financial Management: The five project companies maintained dedicated accounts and prepared project and corporate financial statements on a regular basis. Annual audit reports were submitted in a timely manner and no significant issues were identified. Regular supervision missions included selective reviews of project accounts, documentation, and internal control procedures which confirmed that the management of project funds was sound and was acceptable to the World Bank.

3.12 *Procurement:* The project procurement packages covered civil works, electrical and mechanical equipment, and consulting services. These activities were effectively organized and carried out in accordance with World Bank guidelines, contributing to the procurement of goods and services at very competitive prices, as indicated by loan savings of about \$16 million which were allocated to the incremental Guangrun component. As already noted, however, three of the components experienced significant procurement delays because of delays in the domestic approval process. Six years after the project's closing, stakeholders interviewed by IEG appreciated the World Bank's training, professionalism, and consistent support in this area, while lamenting the required time and effort.⁴

Safeguards Compliance

3.13 *Environment:* This project was appropriately classified as a Category A project because of the construction of the dams and the scale of resettlement. Environmental Impact Assessments and Environmental Management Plans were prepared for the five components. These included the organizational setup, monitoring approach and methodology, and institutional strengthening and training to ensure smooth implementation and quality performance. For the four original components, monitoring results indicate that air, noise, and water pollution were adequately controlled and met the relevant national environmental standards and certification requirements.

3.14 The geological challenges encountered by the Guangrun component, on the other hand, and the still unfinished remedial construction works have resulted in several of the associated certification requirements remaining incomplete.

3.15 *Safety of Dams:* A Dam Safety Panel of Experts (POE) was appointed to carry out expert independent technical review throughout the preparation and implementation phases for all five components. Here again, the POE's work was satisfactorily completed for the four original components.

3.16 For the Guangrun project, however, the POE had not been closely involved and consulted from the start; consequently a few key activities are seriously delayed and remain to be completed.

3.17 *Resettlement:* Given the project's location in designated poverty areas, the preparation and design of the project involved a major effort to treat the resettlement arising from the components as a development opportunity to improve the living standards of the affected population. A total of 1,451 hectares were acquired and 4,062 people were resettled. Overall, 10,768 people were affected by land acquisition or physical relocation. Qualified consultants prepared a resettlement action plan for each of the five components and provided training to the county governments for their implementation. Beyond the requirements of World Bank policy, the project's resettlement program incorporated several additional features to support additional benefits for the resettlers:

- Compensation rates for three of the five subprojects (Dongping, Najitan, and Guangrun), accounting for 75 percent of project-affected people and resettlers under the project, were

substantially increased above the rates originally established in the Resettlement Action Plan.

- In addition to their annual income, all resettlers (only resettlers and not all other project-affected people) have been receiving an annual subsidy of RMB 600 from the Central Government for 20 years (until 2026) following national regulations on reservoir rehabilitation assistance.
- Before the start of the project, some resettlers did not have access to basic infrastructure services (road, water supply, and electricity). After the project, all resettlers had access to these basic infrastructure services.
- The houses provided through the resettlement program were new cement-brick houses with modern amenities of much better quality than the old homes, and often much larger, as shown to the IEG mission during its visit to two resettlement villages.

3.18 Follow-up statistical data indicate that average net annual per capita incomes of the project-affected people have greatly increased. Thus, for the four original components, the average net annual per capita income of project-affected people increased from 1,722 RMB (equivalent to \$0.57) in 2002 to 2,639 RMB (\$0.96) in 2007 and 4,566 (\$1.92) in 2011). For Guangrun, average incomes for project-affected people rose from 1,309 RMB (\$0.43) in 2002 to 1,931 RMB (\$0.70) in 2007 and 3,438 RMB (\$1.45) in 2011.

3.19 The IEG's discussions with officials in three participating counties and the two resettlement villages visited by the mission confirmed that the resettlement program had achieved the expected results and there were no outstanding issues.

3.20 *Indigenous Peoples:* Three of the components (Dongping, Najitan, and Guangrun) were located in the Enshi Tujia and Miao Autonomous Prefecture. The Najitan Project also involved some resettlement in Longshan County, in the Xiangxi Tujia Autonomous Prefecture in Hunan Province. In light of the presence of officially designated ethnic minorities in the project area, a Social Assessment by the World Bank's social staff carried out as part of the project's appraisal found a high degree of acculturation in the project counties as a whole and in the project-affected communities. Based on these findings, the World Bank determined that the designated minorities within the project area were not the intended targets of the World Bank's OP 4.10 - Indigenous Peoples, and that an Indigenous Peoples Development Plan was not required.

3.21 These findings are consistent with those of the IEG mission, which visited the three components and counties in Enshi Prefecture and discussed the status of ethnic minorities with local officials, most of whom were themselves members of ethnic minorities. On this basis, IEG confirmed that the ethnic minorities in the area have been almost fully assimilated into the majority population, as they no longer speak a distinct language or maintain separate economic or political institutions.

4. Efficacy

4.1 Overall, by the time the project closed in 2011, it had fully achieved most of the intermediate and PDO indicators specified in the results framework, as shown in Annex B.

Coming six years after project closing, the IEG mission focused on validating these results, and exploring the extent to which the impacts of the projects may have been sustained and extended.

4.2 Objective 1: Facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner. Rated Substantial. As of early 2018, all 271 MW of project-supported hydropower stations (242.6 MW for the original four components and 28.4 MW for Guangrun) were operating at full scale, which was 7 percent greater than the target of 254 MW (226 MW for the original four components and 28 MW for Guangrun), owing to the capacity upgrade of the Najitan component (from 36 MW to 51 MW), and ancillary units installed at Xiakou (1.6 MW) and Guangrun (0.4 MW).

For Guangrun, however, though the planned 28.4 MW capacity had been installed and commissioned by 2012, only about half (54 percent) of the designed energy output is being generated, because of the combined effects of reservoir leakage and delayed construction of two inflow water diversion tunnels (Table 1). The completion of the water diversion tunnels is suspended because of still unresolved water allocation disputes with two neighboring counties in Chongqing Municipality. As of January 2018, IEG was informed that agreement in principle had been reached on the more important of the two disputes, which was only awaiting the final approval and signature by the relevant parties, and would add about 41 percent of the designed energy generation of the Guangrun project. In the meantime, the 46 percent shortfall (38.5 GWh per year) for Guangrun amounts to a 5 percent shortfall in terms of achieving the target value of 801 GWh per year for the entire project.

Table 4.1. Annual Electricity Generation for Guangrun Component: 2014–17

	<i>Annual Electricity Generation (GWh)</i>	<i>Percentage of Designed Annual Output (83.9 GWh)</i>
2014	46.265	55%
2015	36.218	43%
2016	46.387	56%
2017	52.594	63%

4.3 The World Bank team proposed but was unable to induce the adoption of a two-part tariff for the projects, as would have been appropriate to recognize hydropower's economic value as a reliable peak power supplier to the grid. In the event, the five components negotiated tariffs ranging from RMB 0.341/kWh (Najitan) to RMB 0.4/kWh (Xiakou), with an average of RMB 0.364/kWh for the five components, which were fixed for the life of the projects. As of early 2018, these tariffs remain highly competitive in relation to the current coal-fired generation tariff of RMB 0.42/kWh in Hubei Province.

4.4 Aside from energy, the project generates significant local and global environmental benefits. These local and global benefits derive from avoided emissions of 3,370 of SO₂; 766 of TSP; 1,685 tons of NO_x; and 540,000 tons of CO₂ every year compared to the coalbased generation scenario. In addition, as mentioned earlier, the four original sub-projects met the official requirements for environmental acceptance. The Guangrun component, following extensive delays, has also met official acceptance requirements except for those associated with the dam safety panel and the still incomplete remedial works for Hongwawu and Zhamushui.

Objective 2: Enhance the efficiency of the electricity sector in Hubei by commercializing county-level generation companies. Rated Substantial.

4.5 The institutional strengthening program under the project was designed to ensure that once the components had been completed, the companies would operate their assets efficiently. It funded training by international consultants and study tours to North America, Europe and Australasia. The training and consulting services covered various design, procurement, and testing activities during project construction to familiarize staff with all facets of operation and maintenance (O&M). In parallel, the preparation of the O&M codes and operational procedures for the hydropower plants and reservoirs were completed. A complete set of monitoring equipment has been installed at each dam. There was a series of study tour/training programs to North America, Europe, and Australia.

4.6 At project closing, all five hydropower companies were corporatized and commercially operated. In the four original project companies, county-level shareholders have fully withdrawn (except for Najitan, where they have substantially withdrawn), and the shares were bought by private companies; In Guangrun (registered in Jianshi County), the main sponsor, the Guoxin Company, had sold its 55 percent of the shares to Guodian Company in May 2010, and the local government still retains the remaining shares.

4.7 **Financial Performance.** At project closing, in 2011, the four original project companies were financially viable, making a reasonable return on equity (with an average FIRR on equity investment of 8.6 percent). Six years after project closing, the Guodian Guangrun Company is still experiencing substantial operating losses, of RMB 8.7 million for 2017, because it has not yet completed the project in face of unresolved water disputes and attendant inability to generate the planned energy output.

4.8 **Plant Operation Performance.** The four original companies are running their hydropower plants efficiently, with operating costs that are quite competitive for hydropower plants of this type in China. Their staffing levels are quite low and efficient. Here again, the Guodian Guangrun Company is the exception, having been unable to operate its plants at more than about half of design output.

Objective 3: Contribute to poverty alleviation efforts in poor communities in Hubei. Rated Modest.

4.9 The project's poverty alleviation program was based on a three-pronged strategy: (a) the generation of additional fiscal revenues for the host counties'; (b) the generation of direct economic benefits; and (c) the strengthening of county poverty alleviation planning.

4.10 *Generation of additional fiscal revenues:* In line with China's fiscal policy, 17 percent of fiscal revenues generated by the project accrued to the counties (the remaining 83 percent accrue to the provincial and central levels). Over a five-year period (2007–11), this represented, for the four original subprojects combined, a total annual average of about RMB 6 million. As per the Project Agreement, 20 percent of this amount (the "World Bank project poverty earmarked funds") were allocated to county poverty alleviation programs. On this basis, the four original subprojects together generated RMB 1.2 million per year on average for the World

Bank project poverty earmarked funds. In the case of Guangrun, despite its financial difficulties the CDCF project facilitated by the World Bank generated RMB 3.1 million for a Community Benefit Development Plan for Jianshi County, which was implemented from 2012 to 2017.

4.11 The “World Bank project poverty earmarked funds” represented on average about 1.5 percent of the total funding for the counties’ poverty alleviation programs. However, since counties’ own contributions had been only 2 percent (with the bulk of the funds coming from the provincial and central levels), these additional revenues almost doubled counties’ own contributions to their poverty alleviation programs.

4.12 *Direct Economic Benefits:* In addition to fiscal revenues to the counties, the project brought significant economic benefits to the counties, aside from power generation. Based on information provided by the participating hydropower companies, the construction and operation of the hydropower stations and reservoirs contributed the following additional benefits: (a) construction of all-weather roads benefiting a population of 176,000; and (b) new jobs during the project’s construction period (estimated at 5,300) and operation period (181 staff). Other direct benefits include increased irrigation (due to conversion of land, upgrading of canals, reduced pumping costs, and increased reliability of flows); increased floating cage fishing, reduced flood damage, and reduced municipal and industrial water supply costs.

Strengthening of County Poverty Alleviation Planning:

4.13 The World Bank–financed technical assistance between 2002 and 2004 (delivering advisory services, training programs, and workshops) contributed to improving the poverty alleviation planning methodology of the project counties. Specifically, project-financed consultants:

- Helped introduce eight poverty indicators to identify and prioritize poor villages, and ensured their consistent application in each county.
- Provided advice on the content and methodology for piloting the first village-level poverty alleviation plans.
- Helped counties on a pilot basis with the monitoring and supervision of the implementation of village-level poverty alleviation plans by: preparing procedures for monitoring implementation based on a participatory process; and preparing and delivering training programs to pilot villages on monitoring and evaluation, on both implementation monitoring and poverty implementation evaluation.

4.14 The five project counties were all poor counties at the time of appraisal in 2002, four of them nationally designated, with annual net rural incomes around RMB 1,500 per capita (equivalent to US\$0.54 per day), and the fifth, Nanzhang, provincially designated with average annual net rural income of RMB 2,208 per capita. Between 2002 and the closing of the project in 2011, the socioeconomic conditions of the project counties had greatly improved, with average annual net rural incomes having reached RMB 4,349 per capita (equivalent to US\$1.83 per day). On this basis, each of the five counties had graduated from absolute poverty (defined by China’s government as below RMB 2,400 per year in 2012, equivalent to US\$0.60 per day). By 2016, the average annual net rural income in the participating counties had greatly increased again, reaching RMB 8,618 per capita (equivalent to US\$3.74 per day).

4.15 Based on IEG’s discussions with local government officials, it was concluded that many factors had contributed to poverty reduction and the extent of attribution to the project could not be established. Thus, the incremental funding provided by the “World Bank project poverty earmarked funds” had been subsumed into the much larger flow of poverty alleviation and infrastructural development funds from the central government. The attendant improved infrastructure, social services, and information flows brought about a transformation of rural livelihoods: a shift from reliance on subsistence crops (mainly corn and rice) to higher-value commercial tree crops (tea, tung oil, fruits) for which the terrain offered favorable conditions. The poverty monitoring indicators introduced by the project had been superseded by the results framework required to track the achievement of the national poverty alleviation plan targets, including relevant indicators for infrastructure access, income stability, health and education status, housing conditions, etc.

4.16 Nonetheless, key stakeholders still remembered and appreciated that the project’s capacity building had been focused on a comprehensive ex ante assessment of options for poverty alleviation and the identification of critical priorities based on citizen participation. This approach improved on the earlier top-down approach that was mainly driven by each sector agency’s own priorities. They also appreciated the priority the World Bank had given to skills training and land-for-land compensation, which had made life easier for resettlers and had been used for later hydropower projects in the participating counties. These World Bank–supported approaches had also been shared and discussed in district-level training seminars.

5. Efficiency

5.1 The preparation and appraisal of the project were supported by a comprehensive least-cost analysis model that compared the proposed hydropower developments with alternative coal and gas-fired units, and considered the seasonality of hydrological conditions. The analysis also appropriately included the multipurpose benefits of the dams (improved irrigation, flood control, and water supply). Finally, the stream of local and global environmental benefits—avoided atmospheric emission of SO₂, TSP, NO_x and CO₂, compared to coal-based generation—was also added by the model to estimate the economic internal rate of return (EIRR) of the five components. The same methodology was used for the Implementation Completion and Results Report (ICR), which estimated the EIRRs for each of the five components, as well as for the project as a whole. On this basis, as shown in table 2, the EIRR for the entire project was estimated at 16.0 percent, which is above the 12 percent hurdle rate used at appraisal. The EIRR for each of the individual components was also above the 12 percent hurdle rate, except for the Guangrun component with an EIRR of 9.1 percent.

Table 5.1. Economic Internal Rates of Return (EIRR) at project closing (2012)

Case	EIRR Entire Project (ICR)	EIRR Donping (ICR)	EIRR Najitan (ICR)	EIRR Songshuling (ICR)	EIRR Xiakou (ICR)	EIRR Guangrun (ICR)
Not including emission benefits	9.5%	11.9%	10.2%	10.7%	9.4%	2.7%

Including local emission benefits	11.0%	13.4%	11.7%	12.3%	10.9%	4.2%
Including local + global benefits	16.0%	18.4%	16.6%	17.2%	15.9%	9.1%

5.2 Six years after the project’s closing, IEG was not able to validate and recalculate these estimates, given the complexity of updating the economic model, including consideration of multiple environmental and multipurpose benefits. However, based on the findings of the mission with respect to the three visited project components, it is appropriate to observe the following:

- The economic value of the electricity generated is far higher than the average tariff of RMB 0.364/kWh obtained by the project. This is suggested by comparison with the current coal-fired generation tariff of RMB 0.42/kWh in Hubei Province, as well as with the two-part tariff adopted for World Bank–supported hydro projects in nearby Zhejiang Province—of RMB 0.58 peak and RMB 0.19/kWh off-peak, with an average value of RMB 0.48/kWh—at about the same time.⁵ But the Bank did not succeed in implementing this in Hubei.
- During the 2012–17 period the precipitation has been closer to the long-term average (than 2007–11), which has resulted in higher energy generation in Dongping, though not for Najitan and Guangrun, as shown on Table 3.
- The environmental and multipurpose benefits have not been specifically monitored, but are reported to have remained the same.
- From 2012–17, the Guangrun component has invested \$13 million to address the unforeseen geological challenges, and additional investments are awaiting the resolution of two water allocation disputes. The more important of the water disputes is expected to be resolved in 2018 and the remaining investments are planned to be completed in 2019. IEG was informed that the Guangrun project owner will only undertake the additional investments to complete the project and reduce most, if not all, of the generation shortfall, to the extent that it is expecting commensurate financial returns.

Table 5.2. Feed-in Tariff and Sales for Hydropower Components visited by IEG

<i>Component</i>	<i>Tariff (RMB/kWh)</i>		<i>Average Annual Generation/Sales (GWh)</i>	
	2012	2017	2007-2011	2012 - 2017
DONPING	0.367	0.367	249	292
NAJITAN	0.341	0.341	122	120
GUANGRUN	0.360	0.360	45	45

Source: IEG mission

5.3 With respect to administrative efficiency, as already noted, an important issue related to the procurement delays were experienced by all project companies except for Dongping, for which all goods were financed by non-World Bank sources. These delays affected progress on construction and commission of four components, and impacted their economic and financial returns.

5.4 Overall, however, given the continuing high economic value of the project’s generation and other benefits, , the efficiency of the project as a whole is rated **substantial**.

6. Outcome

6.1 The relevance of project objectives is rated **high** while the relevance of design is rated **substantial**. The project **substantially** achieved two of its three objectives: expanding electric power generation and enhancing the commercialization of the electricity sector. However, the third objective, contributing to poverty alleviation, is rated **modest** because of the difficulty of establishing the extent of attribution to the project. On balance, efficacy is rated **substantial**. Efficiency is also rated **substantial**, in the expectation that most if not all of the shortfall will be eliminated in about two years.

6.2 Given the underlying ratings for relevance, efficacy, and efficiency, the project's outcome is rated **satisfactory**.

7. Risk to Development Outcome

7.1 **Original four components.** At the time of IEG's mission the four original subprojects had been in production for more than 10 years and were operationally and financially sound. Given a growing demand for energy, and given a stable regulatory regime and tariffs, the main conditions for their continued successful operation are unlikely to change.

7.2 **Guangrun component.** The expected development outcome of the additional Guangrun component remains at risk because the following are uncompleted:

- Construction of two water diversion tunnels into the (upstream) Hongwawu reservoir, pending resolution of water allocation disputes with two neighboring counties in Chongqing Municipality;
- The second-stage leakage treatment of the right bank of the Hongwawu reservoir, which depends on the settlement of one of the above water allocation disputes, which could bring about an increase in the water level and trigger the need for the additional treatment;
- The treatment of the right bank slope instability for the (downstream) Zhamushui reservoir, whose timetable had been delayed while awaiting the issuance of updated safety standards for construction scaffolds, that were being revised following a major scaffold collapse accident in another part of China. This activity is now expected to be completed in the spring of 2019; and
- Installation of sluice gates for the crest spillway of the Zhamushi dam, that can only be done after the slope treatment has been completed.

7.3 As of January 2018, when IEG met with the Guangrun project company, the more important of the two water allocation disputes (in terms of its impact on the Hongwawu reservoir water level and power generation) appeared to be on its way to resolution, with agreement in principle having been reached, and only awaiting the final approval and signature by the relevant parties. As for the second dispute, a resolution had been delayed without a clear conclusion. In addition, the Guangrun component was still experiencing delays with the

installation of the dam safety monitoring system and instrumentation, which was expected to be completed in 2018.

7.4 Based on the above, the risk to the development outcomes of the project as a whole is rated **moderate**.

8. World Bank Performance

Quality at Entry

8.1 For the identification of the project, the World Bank recognized the government's strong commitment to reduce poverty and inter-regional inequality through the Western Region Development Program as an opportunity to contribute in this area by integrate it as a major objective for the project. The integration of poverty alleviation with hydropower development elicited strong support from local government at different levels, with the direct participation of the provincial planning commission and finance bureau. The project team took advantage of ongoing power sector reforms to align its institutional development activities, gave an early start to the procurement for major civil works; and undertook a power market study to confirm the demand for new generation capacity. Technical risks for the original four components were assessed through a Dam Safety Panel of Experts (POE) appointed and financed by the project to carry out independent technical reviews throughout the preparation and implementation phases, in line with the World Bank's policy on Safety of Dams.

8.2 Studies carried out during preparation had focused on the weaknesses of small hydropower companies—institutional, financial, and creditworthiness—and had resulted in: (a) the corporate and financial restructuring and corporatization of county-level generation companies in the host counties; and (b) changes in sponsorship and ownership structure of the project companies to ensure their financial viability during project implementation.

8.3 In support of poverty alleviation, a benefit sharing scheme was designed to ensure that counties would earmark 20 percent of their fiscal revenues from the project to poverty alleviation, and technical assistance was provided to strengthen the planning and implementation of county poverty alleviation programs. Additionally, resettlement arising from the project was treated as a development opportunity for affected communities.

8.4 For the Guangrun component, however, the following critical risks were not adequately considered during design and appraisal: First, the main project sponsor, Guoxin, was principally a trading company with no experience with small hydropower plant construction and operation. A more comprehensive technical assistance program could have been devised to remedy Guoxin's technical and managerial shortcomings. Second, thorough investigations were not carried out in the Hongwawu reservoir site to assess the possible presence of Karst caves (formed by underground water flows in limestone areas) that can cause water to leak from the reservoir. This, even though the feasibility study report and preliminary designs were prepared by the same design institute that prepared the original four components; and the Panel of Experts reviewed the preparation of this component and was consulted by the World Bank on technical aspects.

8.5 On balance, considering the shortcomings in the quality at entry of the Guangrun component, the quality at entry is rated **moderately satisfactory**.

Quality of Supervision

8.6 The World Bank regularly monitored compliance with its fiduciary and safeguards policies, including the implementation of the Resettlement Action Plan and the environmental management plan. About twice a year, supervision missions reviewed the financial statements and audit reports of the implementing agencies, monitored the various technical issues related to construction, installation, testing and commissioning, quality of work, and kept close tabs on remedial actions taken by suppliers and contractors. In 2007, the World Bank obtained a trust fund for a consultant to review, assess, and document the poverty alleviation impacts of the project. The utility of the study, however, was limited because some of the output and outcome indicators had not been adequately designed for tracking the attribution of poverty alleviation targets to project activities.

8.7 The Dam Safety Panel of Experts was closely involved throughout implementation of the four original components, and made several concrete recommendations at the final design and construction stages, which were taken into account. For the Guangrun component, however, the Panel of Experts was not closely involved and consulted from the start. Partly as a result, a few key activities were seriously delayed and the installation of the dam safety monitoring system and instrumentation had not yet been completed as of January 2018.

8.8 Following the closing of the project in 2011, the World Bank has continued to monitor the implementation of the Guangrun component, about once a year, as part of the supervision of the follow-on Guangrun CDCF project.

8.9 On this basis, the Quality of Supervision is rated **moderately satisfactory**.

8.10 Overall, World Bank Performance is rated **moderately satisfactory**.

9. Borrower Performance

Government Performance

9.1 The Hubei provincial government provided strong support during preparation and was proactive in using loan savings. However, about 90 percent of the promised flood control subsidy was not granted to the Xiakou Hydropower Company by provincial and county authorities, causing a financing gap which delayed construction. Construction stopped between September and November 2005 until this financing issue was resolved with the company's access to CDM revenues through a follow-on CDCF project. Local banks were then willing to lend to the company. In the case of Guangrun, the county government failed to provide the financial support agreed at appraisal in 2005. This issue was resolved only when Guodian became the principal shareholder of the company.

9.2 In addition, the Hubei provincial government was unwilling to adopt a two-part tariff for the project. Such an approach would have been consistent with the broad direction of China's

power sector reform by appropriately reflecting the economic value of hydropower as a reliable peak power supplier to the grid.

9.3 Given this, Government Performance is rated **moderately unsatisfactory**.

Implementing Agencies Performance

9.4 The implementing agencies consisted of the Hubei Provincial Project Management Office as the coordinating unit, and the project companies for Dongping, Najitan, Songshuling, Xiakou, and Guangrun .

9.5 Procurement delays were experienced by all project companies except for Dongping, for which all goods were financed by non-World Bank sources and were therefore not subject to the World Bank's procurement guidelines. These delays directly affected progress on construction of three of the original four subprojects.

9.6 In the case of Guangrun, the very weak technical and managerial capacity of the Guoxin company, the initial project sponsor, may have contributed to the inadequate geological investigations for the Hongwawu reservoir, which failed to identify the presence of Karst caves with the attendant potential for leaks. Similarly, the technical issues faced by Zhamushui dam might also have been better assessed at an early stage. These institutional issues were ultimately resolved with Guoxin being replaced by the larger and more experienced Guodian company (one of China's five major power generation state-owned enterprises) in 2010, but the consequences of the initial shortcomings have continued to prevent the completion of this component. Based on IEG's discussions in January 2018, the company has been actively addressing the remaining issues and is planning to complete the project in 2019 subject to the final resolution of the water allocation disputes and a confirmation of the financial returns of any incremental investments.

9.7 On this basis, the implementing agencies' performance is rated as **moderately satisfactory**.

9.8 Overall, Borrower Performance is rated **moderately satisfactory**.

10. Monitoring and Evaluation

10.1 *Monitoring Design* The M&E program was designed on a set of indicators corresponding to the three objectives (PDO indicators) and to the project's physical progress and financial performance (intermediate indicators). Overall, the target metrics were monitorable and appropriate to measure the project's objectives but, in hindsight, they could have been refined as follows:

- **First objective: facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner.** For Indicator 1.1 (increased renewable generation), the original target was appropriately adjusted to 801 GWh per year in the course of supervision and the ICR to reflect the actual generation capacity of the four original components (708 GWh) and the later addition of the Guangrun component (93 GWh). Indicator 1.2 (completion and implementation of Environmental

Management Plans) is simply a World Bank processing requirement and thus unnecessary. Indicator 1.3 (improvement of resettlers' living standards) should have been more appropriately included as an intermediate indicator. Finally, local and global environmental benefits (tons of SO₂, TSP, NO_x, and CO₂ avoided) compared to the coal-fired generation scenario could have been added as an indicator.

- **Second objective: enhance the efficiency of the electricity sector in Hubei by commercializing county-level generation companies.** Indicators 2.1 (legal arrangements for restructured companies) and 2.2 (audited financial statements) were appropriate to track the corporatization of the of the county-level generation companies. In addition, an efficiency indicator could have been added to measure the “enhanced efficiency of the electricity sector in Hubei,” such as the cost per kW capacity installed compared with generating units of similar size elsewhere in China.
- **Third objective: contribute to poverty alleviation efforts in poor communities in Hubei.** Indicators 3.1 (county-level living standards), 3.2 (proportion of county poverty program funds flowing to village group and household levels), 3.3 (proportion of county revenues devoted to poverty alleviation) and 3.4 (proportion of fiscal revenues generated by the project contributed to poverty alleviation fund) are relevant, but too general to enable the tracing of specific results to the project's poverty alleviation activities. The addition of more targeted indicators could have facilitated the attribution of specific poverty alleviation outputs and outcomes to the project's poverty alleviation activities.

M&E Implementation and Utilization

10.2 Implementation of the M&E system focused on regular reporting on the outcome and intermediate indicators, as well as feedback on issues and their resolution. Data were reported semi-annually in the project progress reports (physical progress and financial performance) and in external monitoring reports (for data relating to the improvement of living standards). Compliance with financial covenants was regularly monitored and utilized to assess the financial viability of the companies. Consultants were engaged to review, document, and assess the poverty alleviation impacts of the project, and to help counties with the monitoring and supervision of the implementation of the poverty alleviation plans. Following the closing of the project in 2011, each of the participating hydropower companies prepared a Project Completion Report with a detailed description of the approval, design, and implementation experience of the project, including lessons learned.

10.3 Six years after the closing of the project in 2011, the IEG mission confirmed that the project companies continue to track and maintain comprehensive records of their financial and operational performance, and to monitor their environmental and safety indicators. IEG also confirmed that the only poverty alleviation program that continued to be supervised after project closing—the 2005–17 Guangrun Community Benefit Development Plan funded by the follow-on CBOP project—had been fully reported and accounted for in late 2017. All the other county-level “World Bank project poverty earmarked funds” were no longer tracked; they had been subsumed into a much larger flow of poverty alleviation and infrastructure development programs mainly funded by the central government. The county governments also reported that the poverty indicators introduced by the project had been superseded by the results framework

used to track the achievement of national poverty alleviation targets. These indicators, including infrastructure access, income stability, health and education status, housing conditions, etc., were fully consistent with the objectives of the project-supported strengthening of the county-level poverty monitoring framework.

10.4 Overall, monitoring and evaluation quality is rated **Substantial**

11. Lessons

The main lessons that emerge from the experience of this complex project are the following:

- ***Integrating hydropower investments with institutional development and poverty alleviation can yield strong synergies.*** This project is a good example of what can be accomplished with the combination of hydropower development and local poverty alleviation in one package when projects are well designed with strong counterpart commitment and management during implementation:
 - **The project-related tax revenues provided an opportunity for involving the World Bank in strengthening the local-level poverty alleviation programs.** The broader discussion of revenue management gave the Bank a logical entry point for supporting the implementation of the local governments' poverty alleviation program.
 - **The resettlement requirements were treated as a development opportunity** to improve the living standards of affected people, including additional benefits for the neighboring populations.
- ***The rigorous quality and depth of appraisal for implementing agencies needs to be maintained throughout the project cycle, including components added late.*** In this project, it soon became clear that the Guoxin company, which joined the project in 2005 (four years after appraisal) did not have adequate technical and managerial capacity to undertake the technically more complex Guangrun component comparable to that of the four original sponsors. This appears to have contributed to the inadequate geological investigations for the Hongwawu reservoir and the insufficient early-stage assessment of technical issues faced by the Zhamushui dam.

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¹ World Bank (2012): *Country Partnerships Strategy for the People’s Republic of China for the Period FY2013-FY2016*. Report No. 67566, October 11, 2012.

² World Bank (2013): *Towards a Sustainable Energy Future for All: Directions for the World Bank Group’s Energy Sector*. Report No. 79597.

³ As discussed in para 3.7, actual contract prices for the main civil works and equipment package costs for the original four components proved to be 13 percent lower than appraisal estimates, mainly because at appraisal in 2002, design institutes in China still used “norm” prices to prepare civil construction cost estimates, which tended to lag the decline in market prices.

⁴ IEG’s mission interviews were structured around a standard interview questionnaire, shown in Appendix D.

⁵ Independent Evaluation Group (2017): *Project Performance Assessment Report: People’s Republic of China – Renewable Energy Scale-up Program (CRESP)*. Report No.:117156, Independent Evaluation Group, World Bank. Washington. DC.

Appendix A. Basic Data Sheet

PROJECT COSTS AND FINANCING

Table A1: Overall Project Cost by Component (in USD Millions)viii

Components (Hydroelectric Power Stations)	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. Dongping	95.40	102.82	108%
2. Najitan	46.10	49.26	107%
3. Songshuling	46.10	43.79	95%
4. Xiakou	34.80	34.91	100%
5. Guanrun (added in 2006)	36.71	69.57	190%
Total Financing Required	259.12	300.36	116%

Table A2: Bank Loan Contribution by Component (in USD Millions)

Components (Hydroelectric Power Stations)	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. Dongping	27.43	26.75	98%
2. Najitan	24.49	23.43	96%
3. Songshuling	24.29	22.21	91%
4. Xiakou	14.76	15.59	106%
5. Guanrun (added in 2006)	n/a	15.97	n/a
Unallocated	12.98	0.00	0%
Components (Hydroelectric Power Stations)	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Front-end fee IBRD	1.05	1.05	100%
Total Bank Loan Contribution	105.00	105.00	100%

Table A3: Bank Loan Contribution by Category (in USD Millions)

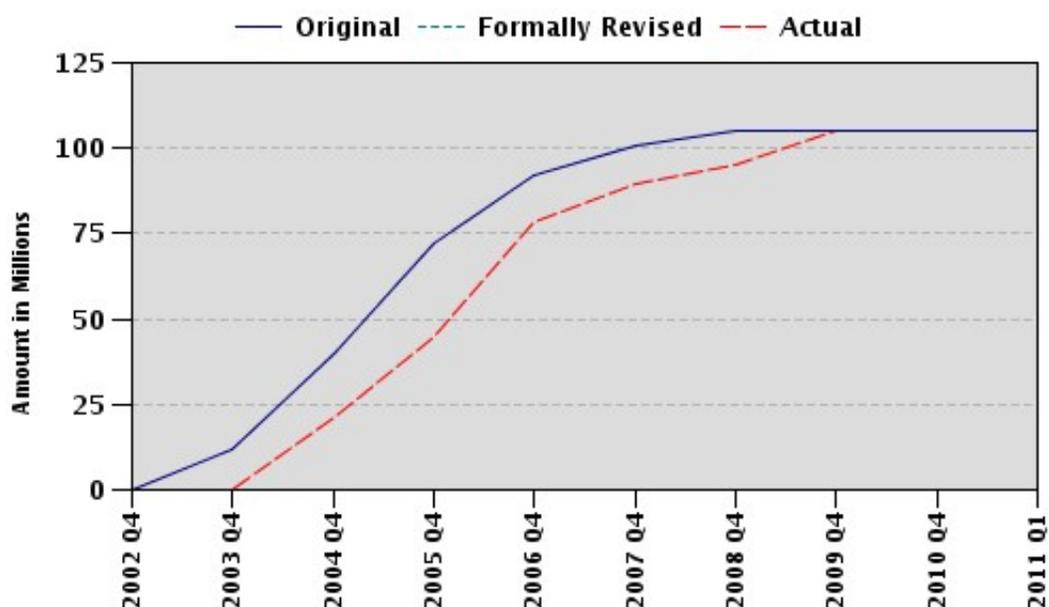
Category	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
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Works	54.35	62.98	116%
Goods	25.12	30.46	121%
Consulting Services	0.86	0.14	17%
Training / Study Tours	0.48	0.21	43%
Interest during Construction	10.16	10.16	100%
Unallocated	12.98	0.00	0%
Front-end fee IBRD	1.05	1.05	100%
Total Bank Loan Contribution	105.00	105.00	100%

Table A4: Source of Funds (in USD Millions)

Source of Funds	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrowers	154.12	195.36	127%
International Bank for Reconstruction and Development (US\$105 million loan)	105.00	105.00	100%
Total	259.12	300.36	116%

DISBURSEMENT PROFILE



PROJECT DATES

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	06/20/2000	Effectiveness:		07/14/2003
Appraisal:	11/15/2001	Restructuring(s):		07/31/2006 11/19/2008 06/30/2010 01/17/2011
Approval:	06/25/2002	Mid-Term Review (Pre-Appraisal of Guangrun Component):		06/06/2005
		Closing:	12/31/2008	12/31/2011

^{viii} Local costs have been converted to USD as follows: 1 USD disbursed at an average exchange rate of RMB 8.11 for the original four components (between 2002 and 2007) and at RMB 6.89 for the Guangrun component (between 2008 and 2017). These rates follow the disbursement rates of the Bank loan. USD appraisal estimates are from the PAD.

STAFF TIME AND COST

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY00	39	144.75
FY01	47	175.75
FY02	62	231.47
Total:	148	551.97
Supervision/ICR		
FY03	29	108.16
FY04	24	89.01
FY05	19	71.57
FY06	13	49.45
FY07	21	79.90
FY08	12	46.55
FY09	7	26.43
FY10	6	22.57
FY11	6	23.03
FY12	11	41.88
Total:	148	558.55

TASK TEAM MEMBERS

Names	Title	Unit	Responsibility/ Specialty
Lending			
Barry Trembath	Lead Power Engineer	EASEG	Power Engineering (TTL)
Jianping Zhao	Senior Energy Specialist	EASEG	Energy Sector (coTTL)
Yuling Zhou	Sr. Procurement Specialist	EAPCO	PIP / Cost Estimate
Dawei Yang	Procurement Specialist	EAPPR	Procurement
Chau-Ching Shen	Sr. Financial Management Specialist	EAPCO	Financial Management
Zong-Cheng Lin	Social Development Specialist	EASCS	Social
Clifford Garstang	Senior Counsel	LEGESHIS	Lawyer
Simon Bradbury	Lead Financial Officer	CTFRC	Disbursements
Scott Hanna	Consultant	EASEG	Environment
Youxuan Zhu	Consultant	EASEG	Social
Ximing Peng	Consultant	EASEG	Generation Planning
Wenjie Wang	Consultant	EASEG	Financial Analysis
Dennis Creamer	Consultant	EASEG	Hydropower Engineering
Teri Velilla	Program Assistant	EASEG	Team Assistant
Chunxiang Zhang	Program Assistant	EACCF	Team Assistant
Jie Tang	Young Professional	EASEG	Power Engineer
Supervision/ICR			
Yanqin Song	Energy Specialist	EASCS	TTL since Dec. 2009
Jie Tang	Senior Energy Specialist	EASIN	TTL Dec. 2003 – Dec. 2009
Barry Trembath	Lead Power Engineer	EASEG	TTL until Dec. 2003
Jian Xie	Sr. Environmental Specialist	EASER	
Emmanuel Py	Infrastructure Specialist	EASIN	
Yuling Zhou	Sr. Procurement Specialist	EAPCO	
Dawei Yang	Procurement Specialist	EAPPR	
Hongkun Yang	Consultant	EASCS	Procurement

Names	Title	Unit	Responsibility/ Specialty
Chau-Ching Shen	Sr. Financial Management Specialist	EAPCO	
Haixia Li	Sr. Financial Management Specialist	EAPFM	
James Orehmie Monday	Sr. Environmental Engr.	EASRE	
Yiren Feng	Environmental Specialist	EASCS	
Xin Ren	Environmental Specialist	EASCS	
Jun Zeng	Social Development Specialist	EASCS	
Youxuan Zhu	Consultant	EASCS	Social
Shuiying Zhong	Consultant	EASCS	Social
Teresita Ortega	Program Assistant	EASIN	
Melissa Ortega Sanchez	Program Assistant	EASIN	
Perry Lee Radford	Program Assistant	EASIN	
Cristina Hernandez	Program Assistant	EASIN	
Chunxiang Zhang	Program Assistant	EACCF	
Kun Cao	Program Assistant	EACCF	
Yunqing Tian	Program Assistant	EACCF	

Appendix B. Results Framework

Project Development Objectives (from Project Appraisal Document)

The project had three objectives: (a) facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner; (b) enhance the efficiency of the electricity sector in Hubei by commercializing county level generation companies; and (c) contribute to poverty alleviation efforts in poor communities in Hubei.

(a) PDO Indicators

Indicator	Baseline Value	Original Target Values ¹	Revised Target Values ²	Actual Value Achieved at Completion or Target Years
Indicator 1:	Facilitate economic growth in Hubei by expanding electric power generation capacity in an economically and environmentally sustainable manner.			
1.1	NA	Increased renewable generation of 604 GWh per year	801 GWh per year ³ .	Increased renewable generation of 757 GWh per year
1.2	NA	Successful completion of EMPs and acceptance by domestic authorities		EMPs completed and accepted by authorities: -in 2002 for original four components; -in 2005 for Guangrun component
1.3	Resettlers' average net per capita income: RMB 1,640 / year = S\$0.54/day. - Before the start of the project, some resettlers did not have access to basic infrastructure services (road, water supply, and electricity).	Resettlers' living standards improved.		Resettlers' average net per capita income: RMB 4,340 / year = US\$1.83/day. -In addition, all resettlers receive annual subsidy of RMB 600 (US\$92) from the Central Government for 20 years until 2026. -All resettlers have access to basic infrastructure services (road, water supply, and electricity).
Date achieved	06/30/2002	12/31/2008	12/31/2008	12/31/2011
Comments	92% achieved at project closing (end-2011).			

Indicator	Baseline Value	Original Target Values	Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 2:	Corporatization of County level generation companies in Hubei.			

2.1	NA	Legal arrangements of restructured companies.		Legal arrangements of restructured companies produced and found acceptable to the World Bank Task Team.
2.2	NA	Financial statements of project companies.		Audited financial statements of project companies reviewed annually by the World Bank Task Team and found satisfactory.
Date achieved	06/30/2002	12/31/2008		12/31/2011
Comments	Achieved.			

Indicator	Baseline Value	Original Target Values	Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 3:	Contribute to poverty alleviation efforts in poor communities in Hubei (in the five project counties).			
3.1	Standard of living indicators (in the project counties): -Average net annual rural per capita income: RMB 1,643 /year = US\$0.54/day. -1.3% of the population living in precarious housing conditions. -Access to basic infrastructure services: 44% of village groups did not have access to all weather roads; 31% of households did not have access to drinking water; 0.1% of village groups did not have access to electricity).	Standard of living indicators in poor villages of project counties defined in poverty alleviation plans developed under the project (no specific targets).		Standard of living indicators (in the project counties): -Average net annual rural per capita income: RMB 4,349 /year = US\$1.83/day. -All the population living in relatively decent housing conditions. -Access to basic infrastructure services improved: 7% of village groups do not have access to all weather roads; 18% of households do not have access to drinking water; and less than 0.1% of village groups do not have access to electricity.
3.2	Baseline not available.	Increased proportion of poverty program funds to village group and households level		All poverty program funds in project counties go to village group and households level.

3.3	County contribution to poverty alleviation: 2.0% of total county poverty alleviation funding (average for the project counties).	Increased proportion of county revenues devoted to poverty alleviation.		The WB project poverty earmarked fund enabled the county contribution to poverty alleviation to increase to 3.5% (an additional 1.5%) of total county poverty alleviation funding during the 5 years of project implementation.
3.4	NA	Proportion of fiscal revenues generated by the project contributed to poverty alleviation fund. The PAD target is: 3.4%. ⁴		3.4% of fiscal revenues generated by the project contributed to each project county's poverty alleviation fund.
Date achieved	06/30/2002	12/31/2008		12/31/2011
Comments	Achieved.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values	Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Hydropower plant in service on time, within budget and to high quality			
1.1	NA	Dongping (2x55=110 MW): <ul style="list-style-type: none"> Schedule: <ul style="list-style-type: none"> -1st unit: 01/31/06; -2nd unit: 03/31/06. Cost: within estimates (RMB 816 million = US\$95.4 million in 2002); Quality: <ul style="list-style-type: none"> -Acceptance by dam safety authorities; -Operation cost⁵: below RMB 0.0783 /kWh). 		Dongping (Actual: 2x55=110 MW): <ul style="list-style-type: none"> Schedule (actual date in service): <ul style="list-style-type: none"> -1st unit: 09/30/05; -2nd unit: 01/04/06. Cost: RMB 833.9 million. Quality: <ul style="list-style-type: none"> -Accepted by dam safety authorities; - Operation cost: RMB 0.0704 /kWh
1.2	NA	Najitan (3x12=36 MW): <ul style="list-style-type: none"> Schedule: <ul style="list-style-type: none"> -1st unit: 05/27/05; 		Najitan (Actual: 3x17=51 MW):

		<p>-2nd unit: 07/29/05; -3rd unit: 09/29/05.</p> <ul style="list-style-type: none"> • Cost: within estimates (RMB 394 million = US\$46.1 million in 2002); • Quality: -Acceptance by dam safety authorities; -Operation cost: below RMB 0.0783 /kWh 		<ul style="list-style-type: none"> • Schedule (actual date in service): -1st unit: 04/15/07; -2nd unit: 01/23/07; -3rd unit: 07/09/07. • Cost: RMB 399.5 million. • Quality: - Accepted by dam safety authorities; -Operation cost: RMB 0.0680 /kWh.
1.3	NA	<p>Songshuling (4x12.5 =50 MW):</p> <ul style="list-style-type: none"> • Schedule: • -1st unit: 02/28/05; -2nd unit: 03/31/05; -3rd unit: 04/30/05; -4th unit: 05/31/05. • Cost: within estimates (RMB 394 million = US\$46.1 million in 2002); • Quality: -Acceptance by dam safety authorities; -Operation cost (below RMB 0.0783 /kWh). 		<p>Songshuling (Actual: 4x12.5 =50 MW):</p> <ul style="list-style-type: none"> • Schedule (actual date in service): -1st unit: 09/29/05; -2nd unit: 12/10/05; -3rd unit: 01/02/06; -4th unit: 01/24/06. • Cost: RMB 355.2 million. • Quality: -Accepted by dam safety authorities; -Operation cost: RMB 0.0703 /kWh.
1.4	NA	<p>Xiakou (2x15=30 MW):</p> <ul style="list-style-type: none"> • Schedule: -1st unit: 04/30/05; -2nd unit: 06/30/05. Cost: within estimates (RMB 298 million = US\$34.8 million in 2002); • Quality: -Acceptance by dam safety authorities; -Operation cost: (below RMB 0.0783 /kWh). 		<p>Xiakou (Actual: 2x15+1.6=31.6 MW):</p> <ul style="list-style-type: none"> • Schedule (actual date in service): -1st unit: 12/01/06; -2nd unit: 09/06/06; -3rd unit: 02/13/07. • Cost: RMB 283.1 million. • Quality: -Accepted by dam safety authorities; -Operation cost: RMB 0.0702 /kWh.
1.5	NA		<p>Guangrun (8+2x10=28 MW):</p> <ul style="list-style-type: none"> • Schedule (powerhouses in service by): 	<p>Guangrun (Actual: 8+2x10=28 MW):</p> <ul style="list-style-type: none"> • Schedule (actual date in service): -1st (2x4MW):

			-1 st (2x4MW): 03/31/08; -2 nd (2+2x4MW): 04/30/08; -3 rd (2x5MW): 11/30/08. • Cost: within estimates (RMB 294 million = US\$36.7 million in July 2006); • Quality: -Acceptance by dam safety authorities; - Operation cost (below RMB 0.0783 /kWh).	11/23/10; -2 nd (2+2x4MW): 09/28/09; -3 rd (2x5MW): 08/29/12. • Cost to date: RMB 479 million. • Quality: -The two Guangrun hydropower stations are still incomplete due to unforeseen geological conditions and water dispute issues.
Date achieved	06/30/2002	12/31/2008	12/31/2008	12/31/2011
Comments	Partially achieved. The four original sub-projects, as a whole, are within appraisal estimates but the Guangrun component has already exceeded appraisal estimates by 90%. The four original hydropower plants all passed government acceptance procedures and were built to high quality standards. In the case of Guangrun, the two hydropower stations are still incomplete due to unforeseen geological conditions and water dispute issues.			

Indicator 2:	Same indicator as PDO indicator 1.2. - Successful completion of EMPs and acceptance by domestic authorities
Comments	Achieved.

Indicator 3:	Same indicator as PDO indicator 1.3. -Resettlers' living standard improved.
Comments	Achieved.

Indicator	Baseline Value	Original Target Values	Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 4:	Commercialization of power companies: • Implementation of FMIS systems and organization operations. • Financial performance indicator targets: -debt service coverage ratio (DSCR) not less than 1.2 for each year during the term of the debt. -debt equity ratio less than 80 to 20. -ratio of working expenses (i.e. excluding depreciation) to operating revenues not higher than 20%.			

4.1	NA	<p>Dongping:</p> <ul style="list-style-type: none"> • Implementation of FMIS systems and organization operations. • Financial performance indicators (see targets in the description of Indicator 4). 		<p>Dongping (with CDM revenues):</p> <ul style="list-style-type: none"> - FMIS systems and organization operations implemented. -DSCR (cumulative⁶): average (2006 - 2011): 2.1 (min: 1.8; max: 1.4). -Debt equity ratio: always less than 76%. -Ratio of working expenses to operating revenues: always less than 18%.
4.2	NA	<p>Najitan:</p> <ul style="list-style-type: none"> • Implementation of FMIS systems and organization operations. • Financial performance indicators (see targets in the description of Indicator 4). 		<p>Najitan (with CDM revenues):</p> <ul style="list-style-type: none"> - FMIS systems and organization operations implemented. -DSCR (cumulative): average (2006 - 2011): 2.0 (min: 1.0 only in 2006; max: 2.2). -Debt equity ratio: always less than 68%. -Ratio of working expenses to operating revenues: always less than 16%.
4.3	NA	<p>Songshuling:</p> <ul style="list-style-type: none"> • Implementation of FMIS systems and organization operations. • Financial performance indicators (see targets in the description of Indicator 4). 		<p>Songshuling (no CDM revenues):</p> <ul style="list-style-type: none"> -Implementation of FMIS systems and organization operations. -DSCR (cumulative): average (2006 - 2011): 1.5 (min: 1.4; max: 1.7). -Debt equity ratio: always less than 80%. -Ratio of working expenses to operating revenues: always less than 20%.
4.4	NA	<p>Xiakou:</p> <ul style="list-style-type: none"> • Implementation of FMIS systems and organization operations. • Financial performance indicators (see targets in the description of Indicator 4). 		<p>Xiakou (with CDM revenues):</p> <ul style="list-style-type: none"> -Implementation of FMIS systems and organization operations. -DSCR (cumulative): average (2006 - 2011): 1.6 (min: 1.3; max: 1.8). -Debt equity ratio: 83% in 2006, then always less than 80%. -Ratio of working expenses to operating revenues: always less than 17%.

Date achieved	06/30/2002	12/31/2008	12/31/2008	12/31/2011
4.5	NA		Guangrun: <ul style="list-style-type: none"> • Implementation of FMIS systems and organization operations. • Financial performance indicators (see targets in the description of Indicator 4). 	Guangrun (with CDM revenues): <ul style="list-style-type: none"> -Implementation of FMIS systems and organization operations. - The Guangrun hydropower company has reported an annual operating loss of RMB 8.7 million for 2017 mainly due to its inability to complete the project .
Comments	<p>Partially achieved. The implementation of FMIS systems and organization operations was completed. Two of the four original sub-projects (Najitan and Xiakou) did not fully meet some of the financial performance indicators temporarily because of delays in unit commissioning (respective average delays of 20 months for Najitan and 16 months for Xiakou). The Guangrun project's financial targets have not been met, with the company reporting an operating loss of RMB 8.7 million for 2017.</p>			

Appendix C: Interview Questions for Hubei Hydro Project Stakeholders

Date of Interview:

Respondent/Title:

Institutional Affiliation:

1. What has been the extent of your involvement with the CRESPI? Which specific activities are you familiar with?
2. What have been the main contributions of the project to the commercialization of county-level power companies in Hubei?
3. What is the current generation and financial performance of the companies supported by the project?
4. What have been the main contributions of the project to the formulation of feed-in tariffs for local power companies in Hubei?
5. What have been the main contributions of the project to the design, implementation and monitoring of county poverty alleviation plans in Hubei?
6. What do the monitoring indicators show about the current poverty status of the counties?
7. To what extent have these power company and county-level approaches been extended to other counties and power companies in Hubei and other provinces?
8. What factors in the design and implementation of the project were most helpful in enabling the achievement of the desired results?
9. What factors in the design and implementation of the project were least helpful for the achievement of the desired results?
10. To what extent are you satisfied with the quality of the support provided by the World Bank?
11. Any final comments or suggestions for this review?

Appendix D. List of Persons Met

Hubei Province Stakeholders

Mr. Zhang Qi, Deputy Director, Hubei Provincial Finance Bureau

Mr. Zhang Chaoxiong, Hubei Provincial Price Bureau

Ms. Yuan Na, Hubei Provincial Poverty Alleviation Office

Xuanen County Stakeholders

Mr. Li Hong, Deputy Director, Xuanen County Finance Bureau

Mr. Tang Huishu, Director, Xuanen County Resettlement Bureau

Mr. Yu Jianhua, General Manager, Dongping Power Station

Mr. Tian Yuanliang, Party Secretary, Zhongjianhe Village

Laifeng County Stakeholders

Mr. Wan, Vice Mayor, Laifeng County

Mr. Zhu Yuanzhong, General Manager, Najitan Hydropower Development Co.

Mr. Tang Tao, Laifeng County Poverty Alleviation Office

Mr. Xiang, Deputy Director, Village Committee, Nanhe Village

Mr. Chen Youping, Business Owner, Meizao Village

Jianshi County Stakeholders

Mr. Yao Daisong, Deputy Director General, Jianshi County Finance Bureau

Mr. Li Heping, Jianshi County Resettlement Bureau

Mr. Tang Junhua, Deputy Director, Jianshi County Poverty Alleviation Bureau

Mr. Chen Shibao, Asst. General Manager, Guodian Guangrun Co.

Mr. Duang Huaming, Director, Finance Dept., Guodian Guangrun Co.

Mr. Huang Song, Deputy Director, Engineering Planning, Guodian Guangrun Co.

Mr. Huang Wanqing, Deputy Director, Safety Production, Guodian Guangrun Co.

World Bank Project Team

Mr. Tang Jie, Practice Manager, CEE09 (Task Team Leader 2003-2009)

Mr. Song Yanqin, Task Team Leader (2009-2018)

Mr. Zhu Youxian, Consultant

Mr. Noureddine Berrah, Consultant

¹ Original target values from the PAD.

² **Restructuring on 07/31/2006:** reallocation of loan proceeds and addition of a fifth component (Guangrun) to use loan savings.

³ **Revised generation target value:** The target value for indicator 1.1 should have been formally revised following the addition of the Guangrun component, adding 92.7 GWh per year. The original target value (604 GWh) was not consistent with the generation capacity target of the four original hydropower stations in the PAD: 708 GWh as per Annexes 2 and 5 of the PAD. The revised target should have been $708 + 92.7 = 801$ GWh per year.

⁴ $3.4\% = 20\% \times 17\%$: 20% of the fiscal revenues accruing to the counties from the operation of the project x 17% (proportion of tax paid to the county government; the remainder, 83%, being paid to the provincial and central governments).

⁵ State Power corporation performance indicator for plant operation cost – for well-run hydropower plants of this type.

⁶ With the establishment of a Debt Reserve Account (DRA).