



# Report and Recommendation of the President to the Board of Directors

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Project Number: 44914  
September 2011

## Proposed Loan Patrind Hydropower Project (Pakistan)

In accordance with ADB's public communications policy (PCP, 2005) this abbreviated version of the RRP excluded confidential information and ADB's assessment of project or transaction risk as well as other information referred to in paragraph 126 of the PCP.

**Asian Development Bank**

## CURRENCY EQUIVALENTS

(as of 31 August 2011)

Currency Unit	–	Pakistan rupee/s (PRe/PRs)
PRe1.00	=	\$0.0115
\$1.00	=	PRs87.33

## ABBREVIATIONS

ADB	–	Asian Development Bank
Daewoo E&C	–	Daewoo Engineering and Construction Company Limited
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
EPC	–	engineering, procurement, and construction
IPP	–	independent power producer
KDS	–	KDS Hydro Private Limited
KESC	–	Karachi Electric Supply Company
K-water	–	Korea Water Resources Corporation
NEPRA	–	National Electric Power Regulatory Authority
NTDC	–	National Transmission and Despatch Company
O&M	–	operation and maintenance
PEPCO	–	Pakistan Electric Power Company
PPA	–	power purchase agreement
PPIB	–	Private Power and Infrastructure Board
Sambu	–	Sambu Construction Company Limited
SHPL	–	Star Hydro Power Limited
WAPDA	–	Water and Power Development Authority
WUA	–	water use agreement

## WEIGHTS AND MEASURES

ha (hectare)	–	10,000 square meters
km (kilometer)	–	1,000 meters
kV (kilovolt)	–	1,000 volts
kWh (kilowatt-hour)	–	1,000 watts times hours
m <sup>3</sup>	–	cubic meter
MW (megawatt)	–	1 million watts

## NOTES

- (i) The fiscal year (FY) of Pakistan ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2011 ends on 30 June 2011.
- (ii) In this report, “\$” refers to US dollars.

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## PROJECT SUMMARY

<b>Borrower</b>	Star Hydro Power Limited
<b>Classification</b>	Targeting classification: General intervention Sector (subsector): Energy (large hydropower) Themes (subthemes): <b>Economic growth</b> (promoting macroeconomic stability, promoting economic efficiency and enabling business environment); private sector development (public–private partnerships, private sector investment) Location (impact): National (high)
<b>Environmental and Social Safeguards Classification</b>	Environment: A Involuntary Resettlement: A Indigenous Peoples: C
<b>Project Description</b>	The construction and operation of a 147 megawatt run-of-river hydropower plant on a build-own-operate-transfer basis. The concession period will end 30 years after completion. The weir and water intake will be located near Patrind village on the Kunhar River. The power house will be located on the Jhelum River near Muzaffarabad.
<b>Impact, Outcome, and Beneficiaries</b>	The project will encourage private sector participation to alleviate a severe power shortage (estimated at over 4,200 megawatts peak deficit) that is adversely impacting the country's economic growth and poverty reduction efforts. The project will also realize environmental benefits through more efficient use of indigenous renewable energy resources and is expected to contribute to saving of greenhouse gas emissions by about 280,000 tons of carbon dioxide per year. As well as providing additional power generation capacity and reliable and affordable electricity, the project will stimulate the economy by purchasing local goods and services and creating jobs for qualified locals in the project area and in the country.
<b>Borrower/Sponsor</b>	The main sponsor is Korea Water Resources Corporation (K-water). The borrower is majority owned and controlled by K-water, a water management and energy company with extensive experience in developing and operating water resource projects. K-water is wholly owned by the Government of the Republic of Korea.
<b>Proposed ADB Assistance</b>	ADB will provide a loan of up to \$97 million from the ordinary capital resources

**Implementation Arrangements**

The engineering, procurement, and construction works will be performed by a consortium of Daewoo Engineering and Construction Company Limited and Sambu Construction Company Limited. Operation and maintenance (O&M) will be managed under an O&M agreement with K-water. After completion, the project will sell power pursuant to a power purchase agreement with the National Transmission and Despatch Company in its role as Central Power Purchasing Agency, and utilize water pursuant to water use agreements with the local government bodies. The Government of Pakistan will assume various key obligations to support the project under an implementation agreement.

**Justification/ADB Value-Added**

The project merits ADB support because (i) the project will add base load power generation capacity and help reduce load shedding in Pakistan; (ii) the project will promote energy security through diversification of the energy mix to renewable indigenous water resources; (iii) the project will generate clean electricity by saving greenhouse gas emissions as an alternative to thermal power generation, (iv) ADB's active participation and presence in the project will provide a degree of comfort to the sponsor and other lenders given ADB's strong track record and ongoing public and private sector operations in Pakistan's power industry; and (v) the proposed assistance to the project is aligned with the government's development plan and ADB's operational strategies including Strategy 2020, the country partnership strategy for Pakistan, and the Energy Policy.

## **I. THE PROPOSAL**

1. I submit for your approval the following report and recommendation on a proposed loan to Star Hydro Power Limited (SHPL) for the Patrind Hydropower Project. The design and monitoring framework is in Appendix 1 and the summary poverty reduction and social strategy is in Appendix 2.

## **II. BACKGROUND AND RATIONALE**

### **A. Project Identification and Selection**

2. As in most developing countries, energy deficits have been one of the major constraints and bottlenecks for efficient economic growth in Pakistan. To ensure a sustainable supply of energy, the Government of Pakistan launched an initiative for promotion of private sector participation in the country's infrastructure, including the power sector. As a part of these efforts, the Power Policy 1994 and the Hydel Policy 1995 were introduced, both of which were consolidated in the Power Policy 2002.

3. The project is one of the long-gestated independent power producer (IPP) projects whose site has been investigated extensively in the past. It was envisaged as one of the first seven prospective IPPs advertised by the Private Power Infrastructure Board (PPIB) in April 2005 for private sector investment.

4. In October 2005, based on the technical and financial criteria, the PPIB issued a letter of interest to the Emirates Trading Agency and TransAsia Gas International, both subsidiaries of the Al-Ghurair Group from the United Arab Emirates, requesting them to undertake a feasibility study of the project. Subsequently, SHPL was incorporated by the Emirates Trading Agency and TransAsia Gas International in April 2006, and the PPIB approved the project's feasibility study in July 2007.

5. Given the experience of the Asian Development Bank (ADB) in advising and financing Pakistan's first hydro IPP, the New Bong Escape Hydropower Project,<sup>1</sup> the relatively large size of the project's debt financing requirement, and the fact that the private banking market has been hesitant in providing limited recourse financing to projects in Pakistan, SHPL approached ADB in early 2008 for financing of the project.

6. In 2009, the consortium of the Korea Water Resources Corporation (K-water), Daewoo Engineering and Construction Company Limited (Daewoo E&C), and Sambu Construction Company Limited (Sambu) acquired SHPL fully through their special purpose vehicle, the KDS Hydro Private Limited (KDS). On 27 August 2009, the PPIB issued a no-objection letter to the proposed change of SHPL's ownership.

### **B. Sector Background**

#### **1. Demand and Supply Gap of Electricity**

7. Addition of power generation capacity in Pakistan is a matter of utmost urgency. Pakistan's power industry faces a major supply deficit that is constraining the country's already

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<sup>1</sup> ADB. 2005. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to Larail Energy Limited for the New Bong Escape Hydropower Project in Pakistan*. Manila.

fragile economic growth. As compared with 18,926 megawatts (MW) peak demand in mid-2010, the country had only 14,723 MW firm supply, resulting in a shortfall of 4,203 MW (or 22.2% of the country's peak electricity demand).<sup>2</sup> As of June 2010, the country's installed power generation capacity was 20,375 MW, of which about 55% was owned and operated by government entities and 45% by IPPs and/or majority private operators. Appendix 3 provides more details on Pakistan's power sector.

8. Although electricity sales and demand have risen by more than 40% from FY2004 to FY2009, investment in new generation capacity has lagged behind expectation. The resultant power shortage has led to ever-increasing incidents of brownouts and blackouts in all major urban centers. Measures to ration consumption are already being taken. The blackouts in rural areas are worse where some areas suffered 22 hours without electricity last summer. Even with the economic slowdown and dislocations caused by the flooding in 2010, power demand is expected to continue to increase, and latent demand is considered substantial. Left unattended, the country's power deficit will continue to worsen and will impact Pakistan's economy even more adversely.

## **2. Primary Energy and Fuel Mix**

9. Pakistan urgently needs to develop indigenous energy resources. The power industry in Pakistan is a mix of thermal, hydro, and nuclear power plants. Thermal power plants, which use imported fuel oil to meet almost 52% of their fuel needs (the balance is based on gas), account for 67.6% of installed capacity; hydro plants account for 30.3%, and nuclear plants provide the remaining 2%. Coal-fired thermal plants account for only 0.1%. Originally, the ratio of hydro to thermal installed generation capacity in the country was about 2:1 (in 1985). Over time, more thermal generation capacity was installed, leaving the country heavily dependent on imported oil for its primary fuel requirements. Rising oil imports have caused the country's current account deficit to increase. They have also caused considerable price escalation and volatility. High electricity tariffs are eroding the viability and affordability of the sector.

## **3. Financial Position**

10. The "circular debt problem" impedes the progress of power generation expansion and sours the mood of existing and potential investors in Pakistan's power industry. Circular debt is caused by nonpayment of subsidies by the Government of Pakistan to cover a shortfall that results from their notifying tariff charged to customers below the cost levels determined by the regulator. Distribution companies are not able to charge the full cost-recovery tariff determined by the National Electric Power Regulatory Authority (NEPRA). The government has insulated power consumers by providing subsidies to distribution companies, but there have been delays in government payments. This has resulted in revenue shortfalls for distribution companies and temporary deferment of payments to nearly all power plants in the system. Power generation companies have seen their receivables rise, and generation companies have been forced to stop, delay, or reduce payments to their fuel suppliers to balance their cash flows. This has caused delays in fuel supply to power generators and negatively impacted generation capacity. This issue is not new and has been partially mitigated in the past. However, it is once again becoming a growing problem that must be resolved if the potential of the private sector to address Pakistan's power deficit is to be unleashed. Measures are under way, but challenges remain.

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<sup>2</sup> Private Power and Infrastructure Board. <http://www.ppib.gov.pk/SupplyDemand.html>



#### 4. Response by the Government of Pakistan

11. To address the energy shortage and growing power crisis, the government has decided to implement several energy expansion initiatives, with an emphasis on developing indigenous resources. These initiatives include expanding thermal and hydropower generation capacity by IPPs under the government's Power Policy 2002, procuring power from rental power plants under short-term agreements, securing electricity and gas imports from regional projects, and tapping into the huge potential of renewable energy sources. The government is also exploring the possibility of using its domestic coal reserves, which are among the largest in the world (albeit low quality and remotely located). However, the time horizon for domestic coal-fired power generation is relatively long term. In the short to medium term, both conventional (i.e., thermal) and renewable energy—predominantly hydro and wind—are expected to be the mainstays of Pakistan's electricity supply. Simultaneously, improving transmission and distribution efficiency is a key area of focus, and ADB has been assisting the government's program through its public sector operations.<sup>3</sup>

12. The government has started efforts to resolve the circular debt problem by increasing consumer tariffs and by transferring the debt in the system to a newly established company outside of the energy sector. ADB continues to support the government's sector reform program under the Accelerating Economic Transformation Program.<sup>4</sup>

13. The reform and restructuring of the sector has been supported by major development partners such as ADB and the World Bank, but progress has been slow and protracted and many areas have lagged behind expectations.<sup>5</sup> The appointment of independent boards of directors is critical for autonomy and commercial discipline, and recently the new boards of eight distribution companies were appointed. An important measure required to move toward full commercialization of the power industry is to make the Central Power Purchasing Authority effective as an autonomous body to ensure financial transparency and accountability. Insufficient reform of end-consumer tariffs, delinquent customer accounts, and other institutional factors are major hurdles to reforming and improving the poor financial health of the sector.

#### 5. Private Sector Investment in Pakistan

14. Pakistan has undertaken wide-ranging reforms in the energy sector with the assistance of ADB and the World Bank. In the early 1990s, the government, recognizing that the required investment in the sector could not be provided by the public sector alone, restructured and opened Pakistan's energy sector to private investment. Since then, Pakistan has had a long history of private sector involvement in the energy sector, and IPPs provide about a third of

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<sup>3</sup> ADB. 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranchise Financing Facility to the Islamic Republic of Pakistan for the Power Transmission Enhancement Investment Program*. Manila; ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranchise Financing Facility to the Islamic Republic of Pakistan for the Power Distribution Enhancement Investment Program*. Manila; ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranchise Financing Facility and Administration of Cofinancing to the Islamic Republic of Pakistan for the Energy Efficiency Investment Program*. Manila.

<sup>4</sup> ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Program Cluster and Loans for Subprogram 1 to the Islamic Republic of Pakistan for the Accelerating Economic Transformation Program*. Manila; ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Program Cluster and Loans for Subprogram 2 to the Islamic Republic of Pakistan for the Accelerating Economic Transformation Program*. Manila.

<sup>5</sup> Friends of Democratic Pakistan Energy Sector Taskforce. 2010. *Integrated Energy Sector Recovery Report and Plan*. Brussels.

generation. Under the Power Policy 2002, 11 IPPs representing almost 2,200 MW of installed capacity have been commissioned or under construction.

15. ADB has taken the lead in supporting the government's initiative to attract private capital into the energy sector and has been instrumental in many pioneering transactions. ADB financed the first private hydropower project, the New Bong Escape Hydropower Project (footnote 1). This transaction set the precedent for many follow-on private hydropower projects in Pakistan including this project. ADB has also provided equity and a partial credit guarantee for a gas-fired combined cycle power project, the Daharki Power Project, using indigenous gas.<sup>6</sup> To encourage investment in the energy sector, the government has taken steps to privatize state-owned power companies—both generation plants and distribution networks. ADB helped the government privatize the Karachi Electric Supply Company, and provided a loan in 2007 for the privatized entity to expand its generation, transmission, and distribution infrastructure.<sup>7</sup> In 2010, ADB's Board of Directors approved a loan to support the Zorlu Enerji Power Project, which is the first wind power project to be undertaken by the private sector;<sup>8</sup> and a loan and political risk guarantee to support the Uch-II Power Project,<sup>9</sup> which uses a gas-fired combined cycle technology and indigenous gas.

## **C. Alignment with ADB Strategy and Operations**

### **1. Consistency with Strategy 2020**

16. The project is consistent with ADB's Strategy 2020, which emphasizes investment in infrastructure to achieve high sustainable economic progress, connect the poor to markets, and increase their access to basic productive assets, as part of ADB's support for achieving inclusive growth.<sup>10</sup> Strategy 2020 puts particular emphasis on expanding energy supplies and promoting energy efficiency through supply-side measures. Strategy 2020 also emphasizes, among five drivers of change: (i) private sector development and private sector operations, and (ii) partnerships. The proposed assistance will promote a larger role for the private sector in developing infrastructure through partnerships with multilateral development banks and a bilateral financing agency.

### **2. Consistency with the Country Strategy**

17. ADB's support for the project is in line with the country partnership strategy for Pakistan, 2009–2013, which emphasizes the importance of energy sector development, private sector participation in infrastructure development, and expansion of ADB's private sector operations in the energy sector.<sup>11</sup> The project is a logical continuation of ADB's development and reform efforts in Pakistan's energy sector, which have been designed to promote a well-regulated, market-oriented power industry. Energy infrastructure has featured prominently in ADB's private sector operations in Pakistan.

<sup>6</sup> ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Equity Investment and Guarantee for the Daharki Power Project (Pakistan)*. Manila.

<sup>7</sup> ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for KESC Post-Privatization Rehabilitation, Upgrade and Expansion (Pakistan)*. Manila.

<sup>8</sup> ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for the Zorlu Enerji Power Project (Pakistan)*. Manila.

<sup>9</sup> ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Partial Risk Guarantee for the Uch-II Power Project (Pakistan)*. Manila.

<sup>10</sup> ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

<sup>11</sup> ADB. 2009. *Country Partnership Strategy: Pakistan, 2009–2013*. Manila.

### 3. Consistency with the Energy Sector Strategy

18. The project is in line with ADB's Energy Policy, and is particularly consistent with one of the three pillars of that policy—maximizing access to energy for all.<sup>12</sup> Access to modern and reliable energy services fosters sustainable human development, economic growth, a higher quality of life, and improved delivery of social services. The project will add generation capacity and increase the reliability of electricity supplies in a country facing a severe power shortage. It will promote the use of indigenous water resources. Electricity supplied by the project will be more affordable than existing supplies, and will not be affected by the volatility of the international fuel market. By promoting the use of indigenous resources, the project will also contribute to the country's energy security. The project will be more environmentally friendly than conventional power plants that use fossil fuels, and will help ADB to meet its commitment to undertake clean energy investments of \$1 billion per year. It is also expected that the project will benefit from ADB's carbon market initiative for delivery of certified emission reductions.

## III. THE PROJECT

### A. Project Description

#### 1. The Borrower/Sponsor

19. SHPL is a special purpose vehicle created to implement the project and will be the borrower. SHPL was incorporated in Pakistan under the Companies Ordinance 1984. SHPL will be indirectly, wholly owned by K-water, Daewoo E&C and Sambu through KDS—a special purpose vehicle for the shareholders, registered in Singapore.

20. K-water, the main sponsor of the project, is a water management and energy company wholly owned by the Government of the Republic of Korea. K-water's capabilities range from research and development, through all aspects of engineering and design of water-related infrastructure, to operation and management of water supply services and renewable energy generation. Since its inception in 1967, K-water has been engaged in development of water resources and water-related infrastructure in the Republic of Korea. It has managed water resources for over 40 years, providing a stable source of water supply to populations in the Republic of Korea and operating multipurpose dams, which help prevent natural disasters such as floods and droughts. K-water has constructed and operated 26 hydroelectric power generation facilities, including 15 multipurpose dams. Current activities of K-water include operation and maintenance (O&M) of 15 multipurpose dams with an aggregate installed capacity of 1,017 MW, which is about 63.2% of the total installed hydropower capacity in the Republic of Korea. K-water is undertaking construction of three multipurpose dams and the world's largest tidal power plant (254 MW) in the Republic of Korea. K-water is constructing and managing a multiregional water supply system and an industrial water supply system. K-water had water supply capacity of 17.2 million cubic meters (m<sup>3</sup>) per day as of 31 December 2008, which accounted for 44.5% of the daily water supply capacity in the Republic of Korea. In addition, the Government of the Republic of Korea is implementing the Four River Restoration Project to increase water supply capacity by 1.3 billion m<sup>3</sup> and increase flood control capacity by 920 million m<sup>3</sup>. K-water is involved in the Four River Restoration Project—constructing, managing, and developing dams, reservoirs, and their surrounding areas, with an expected

<sup>12</sup> ADB. 2009. *Energy Policy*. Manila.

investment of about \$7 billion from 2009 to 2012. K-water is an active partner in ADB's Water for All initiative.

21. Daewoo E&C and Sambu have strong track records in Pakistan. Daewoo E&C, founded in 1973, is an engineering, procurement, and construction (EPC) contractor; and has extensive experience in engineering and construction of housing, dams, power plants, industrial plants, and liquefied natural gas facilities around the world. Daewoo E&C built the Lahore–Islamabad motorway in Pakistan. Sambu is also one of the leading EPC contractors in the Republic of Korea and was founded in 1948. Sambu is the first EPC license holder in the Republic of Korea with varied and extensive experience in building dams and hydroelectric power plants, ports and harbors, bridges, tunnels, and railroads in different Asian countries. Sambu is also the EPC contractor for the New Bong Escape Hydropower Project (footnote 1), the first hydro IPP in Pakistan.

## **2. Project Design**

22. The project involves construction and operation of a 147 MW run-of-river hydroelectric power generation facility between the Kunhar and Jhelum Rivers near Muzaffarabad, on a build-own-operate-transfer basis. The concession period is 30 years from the commercial operations date. The physical layout of the project extends from the location of the weir near Patrind village on the Kunhar River, through a 2.2 kilometers (km) headrace tunnel to the location of the power house on the Jhelum River at Lower Chattar in Muzaffarabad. The total catchment area measured at the weir site is 2,429 square kilometers.

23. The key components of the project include the weir, head pond, power intake, sand trap basin, headrace tunnel, and power house. The weir on the Kunhar River will divert flows from the Kunhar River to the Jhelum River through a system of power intake, sand trap, power shaft, and headrace tunnel. The project envisages the use of about net head of 108.1 meters between the water intake on the Kunhar River and the power house, accommodating three vertical Francis units, each of 50 MW capacity, to be built on the Jhelum River. The annual energy generation of the power plant, based on average historical hydrology, will be 632.6 gigawatt-hours, and the electricity will be fed into the network through a 132 kilovolt (kV) double-circuit transmission line, to be constructed by the power purchaser.

## **3. Project Outputs and Outcome**

24. The outcome of the project will be generation of additional electricity supply of 632.6 gigawatt-hours per year at lower cost. The project will generate electricity by using indigenous water resources, and the tariff for electricity supplied by the project will be lower than that for plants that use imported fuel. The project will also save greenhouse gas emission of 280,000 tons of carbon dioxide per year.

25. The outputs of the project are net additional installed capacity of 147 MW, which is equivalent to 3.5% of the current energy shortfall in the country. In addition, during construction, it is expected that locally purchased goods and services will amount to \$241 million, and 2,700 local jobs will be generated.

## **B. Development Impact**

### **1. Contribution to Economic Growth and Poverty Reduction through Private Sector Development**

26. The project will help alleviate Pakistan's severe power shortage, which is adversely impacting the country's economic growth and poverty reduction efforts. The project will incrementally increase access to energy for households, business, and industry. Use of indigenous natural resources will result in more affordable electricity and tariffs that are less susceptible to fluctuations in the international fuel market. Use of indigenous water resources will also relieve pressure on the country's balance of payments, assist in energy security, and add to diversification of the energy mix. The project will demonstrate the advantages of private sector participation in power generation, and may increase general investor and lender confidence in Pakistan. In the long run, the project will contribute to the reduction of power shortages and the development of indigenous power sources.

### **2. Economic Sustainability**

27. Economic benefits emanate from the willingness to pay for power revealed by the tariffs to be paid. Economic costs include the costs of preparatory work, capital expenditures, and operating costs. The base case economic internal rate of return of 14.2% exceeds the social discount rate of 10%.<sup>13</sup> The economic analysis is in Appendix 3.

## **C. Environment and Social Dimensions**

### **1. Environment**

28. The project is classified environmental category A, requiring an environmental impact assessment (EIA) in accordance with ADB's Safeguard Policy Statement (2009). The project's environmental and social impacts were assessed in the EIA report (2010) conforming to Pakistan's environmental rules and regulations. An addendum to the EIA, a detailed environmental management plan (EMP), a fish study, and a vegetation study—providing more environmental assessment and planning information as well as mitigation measures—were prepared to meet ADB safeguard requirements. The EIA report was disclosed on ADB's website on 16 July 2010 in accordance with ADB's Safeguard Policy Statement; the supporting studies and plans will also be posted on the website. The potential and adverse impacts will be minimized and mitigated as described in the EIA report, EMP, and supporting studies, with Star Hydro deemed to have sufficient capacity to manage environmental and social issues.

29. The most significant potential construction impact will arise from the generation and disposal of 1 million m<sup>3</sup> of spoil from tunneling and site preparation of the weir, power house, and switching yard. Spoil will be safely disposed of on low value and approved riverside land disposal sites. Other construction impacts include noise and dust generation, erosion and sedimentation, and those from the influx of construction workers and workers' health and safety. These impacts are considered manageable and will be addressed by the appropriate mitigation measures proposed in the EMP.

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<sup>13</sup> The Evaluation Cooperation Group's Good Practice Standards for Private Sector Investment Operations rates a project satisfactory if the economic internal rate of return is 10% or higher.

30. Potential adverse project operation impacts include a substantial reduction in Kunhar River flows from the weir downstream to the Jhelum River confluence (13.4 km) for 7.7 months of the year as a result of flow diversion to the power house. A 2 m<sup>3</sup> per second flow will be released from the weir to maintain a living aquatic ecosystem, equivalent to 1.3%–6.0% of average monthly stream flows. This flow will increase downstream as side stream flows enter the Kunhar River, but the overall flow reduction will degrade the aquatic habitat, and the weir will prevent the upstream migration of fish. However, the fish species' diversity and number in this section of the river are naturally low, partly because of the large temperature difference between the Kunhar and Jhelum Rivers. Given the relatively low fish habitat value of the affected downstream section of the Kunhar River, the proposed flow regime is expected to be adequate to address the potential impacts and not to compromise any habitat with significant aquatic ecological values. This section of the Kunhar is not used for domestic water supply or irrigation water; the only use is occasional noncommercial fishing. Because of this low usage and the availability of a far greater fishing resource in the nearby Jhelum River, the loss of fishing will have a relatively low impact.

## **2. Social Safeguards**

31. The project has been classified category A with respect to involuntary resettlement and category C with respect to the impact on indigenous peoples. The project will physically displace 28 households (comprised of 242 persons) and affect about 150 landowners as a result of permanent (about 40 hectares [ha]) and temporary (about 5 ha) acquisition of land for the reservoir impounding, weir structure, power house, surge chamber, access road, colony for construction staff, labor camp, and batching plant. The affected households/persons have been informed of and consulted regarding the project activities and impacts. Arrangements for the valuation of affected assets are participatory and include the formation of a land valuation committee made up of representatives of local government bodies, SHPL, and the affected households. A grievance redress committee was also set up with representation from district and local government bodies and the affected households. With respect to indigenous peoples, the project is not expected to affect such groups as the community is comprised of local people belonging to settled districts. Additional parcels of land are being considered for purchase as landowners interested in selling their land have approached SHPL. Appropriate mitigation measures are described in the draft resettlement plan, which will be revised based on the census of affected persons and 100% inventory of affected assets after the project final footprint is determined.

## **3. Social Dimensions**

32. Public consultation commenced in 2006 during the preliminary stage of project preparation. Concerns and issues raised included land acquisition, traffic hazards, employment, other project benefits, and cooperation with the community. The most recent consultation was conducted during the first quarter of 2011 to inform affected people about the updated project design and to listen to any comments and concerns, including a public hearing convened by the local government. A stakeholder engagement plan was also prepared, which provides details on public consultations and subsequent public hearings as well as arrangements to ensure the involvement of women. Apart from the land acquisition concerns, which will be addressed during implementation of the resettlement plan, other concerns will be addressed by instituting mitigating measures such as the installation of a traffic alarm system and signs before any construction starts. Qualified locals (both men and women) will be given equal job opportunities during project construction and operation, and SHPL will provide assistance in improving

schools, health clinics, local drinking water structures, and other communal facilities such as parks and playgrounds. The summary poverty reduction and social strategy is in Appendix 2.

## **D. Implementation Arrangements**

### **1. Construction Arrangements**

33. During construction, the project's technical team will be headed by a project manager who will coordinate with the EPC contractor, as well as with the owner's engineer and K-water's project management supervision team. The project manager will be experienced in power plant management and will be responsible for meeting the plant's pre-operation requirements. K-water's supervision will complement the role of owner's engineer, and will strengthen the overall project management capacity of SHPL.

34. The project will be constructed under a date-certain lump-sum fixed-price EPC contract. The EPC works will be performed by Daewoo Engineering & Construction Company Limited and Sambu Construction Company Limited.

### **2. Operations Arrangements**

35. K-water, the main sponsor of the project, will also carry out O&M of the project under an O&M agreement. SHPL will benefit from K-water's industry experience and best practices, and will be guided by K-water's policies, procedures, and standards—particularly in the areas of carrying out major maintenance and overhauls, O&M planning and budgeting, and capacity building—and will be subject to periodic audits to monitor compliance in these areas.

### **3. Water Use**

36. SHPL will enter into water use agreements (WUAs) with the local government bodies, which will allow SHPL to have an exclusive right to use water of Khunhar River for the purpose of power generation during the term of the power purchase agreement (PPA).

### **4. Power Offtake**

37. The National Transmission and Despatch Company (NTDC) is the power offtaker and will purchase electricity from the project under a 30-year take-or-pay PPA. The tariff payable by NTDC will be consistent with the tariff determined by NEPRA, and will have two components: a capacity charge and an energy charge. The capacity charge is based on the plant's available capacity and covers the fixed portion of the O&M costs, debt service, and a fixed return on the equity investment. NTDC will pay the capacity charge monthly to SHPL—regardless of whether electricity from the project is actually dispatched. The energy charge is based on the actual volume of electricity dispatch. It covers water use charges and variable components of the O&M costs. NTDC will pay the energy charge monthly to SHPL. Both the capacity and energy components of the tariff may be adjusted to account for inflation and fluctuations in foreign exchange and interest rates. Under the PPA, NTDC will also complete, operate, and maintain the interconnection facilities and the transmission lines.

### **5. Role of the Government of Pakistan**

38. The government plays a crucial role in the project as well as for other IPPs in Pakistan. Its obligations are set out under an implementation agreement with SHPL. Under the

implementation agreement, the government grants the company the exclusive right to develop, own, and operate the project, subject to applicable laws, regulations, and certain other obligations, for a period of 30 years. Among the principal functions of the implementation agreement is to provide a guarantee to the company, sponsors, and lenders that the various government entities and agencies will meet their contractual obligations—including paying amounts due on time.

## **6. Procurement**

39. The project developer was selected through international competitive bidding, and the PPIB issued a letter of interest to the Emirates Trading Agency and TransAsia Gas International, both subsidiaries of the Al-Ghurair Group from the United Arab Emirates based on the technical and financial criteria. In August 2009, the PPIB approved a change of SHPL ownership to the consortium of K-water, Daewoo E&C, and Sambu after conducting due diligence of the consortium on the same criteria as in the original developer bid. The EPC contract was tendered competitively.

## **7. Anticorruption Policy**

40. SHPL was advised of ADB's Anticorruption Policy (1998, as amended to date) and its Policy on Combating Money Laundering and the Financing of Terrorism (2003). Consistent with its commitment to good governance, accountability, and transparency, ADB will require SHPL to institute, maintain, and comply with internal procedures and controls following international best practice standards for the purpose of preventing corruption or money laundering activities or the financing of terrorism and covenant with ADB to refrain from engaging in such activities. The loan documentation between ADB and SHPL will further allow ADB to investigate any violation or potential violation of these undertakings.

## **8. Project Performance Monitoring, Reporting, and Evaluation**

41. SHPL will be required to submit quarterly unaudited financial statements, quarterly construction or operations reports, and annual operating budgets to ADB and the other lenders, and must report any material changes. The company will be required to hire an internationally reputable accounting firm (or its local affiliate) to audit its annual accounts in line with international financial reporting standards. ADB will monitor the project's construction progress and operational performance, using information from public sources, lender's advisors, and government statistics. The project will be evaluated on two levels: (i) the success of the project, including its completion, commissioning, and operation; and (ii) impacts beyond the project, including the country's economic growth and the increase of private sector participation in Pakistan's energy sector. The performance indicators are in the design and monitoring framework (Appendix 1).

# **IV. THE PROPOSED ADB ASSISTANCE**

## **A. The Assistance**

### **1. ADB Loan**

42. ADB will provide a loan of up to \$97 million will be provided from ADB's ordinary capital resources without government guarantee. The loan amount will not exceed 25% of the final total project cost approved by NEPRA upon completion. Proceeds of the loan will be used for eligible project costs.



## **B. Justification for ADB Assistance**

43. The proposed assistance by ADB to the project is justified for the following reasons:
- (i) The project will add base load power generation capacity, which will help reduce load shedding in Pakistan and strengthen the supply network and stabilize voltage of the local grid system.
  - (ii) The project will use indigenous water resources to supply affordable electricity and reduce reliance on expensive oil imports. This will significantly reduce the volatility of the project's electricity tariff compared with other types of fuel-based power projects and relieve stress on Pakistan's foreign exchange reserves. Furthermore, it will contribute to Pakistan's energy security.
  - (iii) The project will save greenhouse gas emissions through generating clean electricity to the grid and is likely to satisfy the eligible requirements for availing of the Clean Development Mechanism established under the Kyoto Protocol of the United Nations Framework Convention on Climate Change. Expected revenues from the sale of certified emission reductions credits, which is based on about 280,000 tons of carbon dioxide emission reductions per year, is anticipated to improve the project's cash flows. The project would also benefit from assistance from ADB's Carbon Market Initiative.
  - (iv) The project will create job opportunities for local people during construction and operation of the project, and will support socioeconomic advancement in a remote and economically deprived area.
  - (v) ADB's active participation and presence in the project will reassure the sponsors and other lenders that the government and government entities will continue to support the project. Given ADB's track record and ongoing engagement in Pakistan's energy sector—including policy dialogue, public sector reform programs, and recent financing of key IPPs through private sector operations—project participants will value ADB's role in mitigating risk, solving problems, and catalyzing financial resources to support private sector power projects in Pakistan.
  - (vi) ADB's assistance is considered indispensable to achieve financial close. The long-term financing that ADB will provide is essential to ensure successful implementation of the project, and would not otherwise be easily available from commercial sources under the present financial and country environment.
  - (vii) The proposed assistance to the project is aligned with the government's development plan and ADB's operational strategies as discussed in this report (paras. 16–18).

## **C. Assurances**

44. Consistent with the Agreement Establishing the Asian Development Bank (the Charter),<sup>14</sup> no funding will be disbursed until ADB is satisfied that the principles enumerated under Article 14 have been met. ADB will enter into suitable finance documentation, in form and substance satisfactory to ADB, following approval of the proposed assistance by the Board of Directors.

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<sup>14</sup> ADB. 1966. *Agreement Establishing the Asian Development Bank*. Manila.

## **V. RECOMMENDATION**

45. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of up to \$97,000,000 to Star Hydro Power Limited for the Patrind Hydropower Project from ADB's ordinary capital resources.

Haruhiko Kuroda  
President

14 September 2011

## DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
<b>Impacts</b> <p>Economic growth in Pakistan is less constrained by deficient power supply.</p> <p>Increased investments by the private sector in power generation projects in Pakistan</p>	<p>Peak shortages will be reduced by 11% by 2020 (FY2010 baseline: 22%)</p> <p>Private sector power generation will have increased by 50% by 2020 (FY2010 baseline: 48,997 GWh)</p>	Government and ADB statistics	<b>Assumptions</b> <p>The government continues to allow tariffs that provide reasonable returns to private investors.</p> <p>The policy framework for private sector hydropower projects remains stable.</p> <b>Risks</b> <p>Deterioration in macroeconomic and/or political climate in Pakistan</p> <p>Circular debt not resolved, forcing some shutdowns of existing capacity</p>
<b>Outcome</b> <p>Production of lower-cost, carbon efficient power</p>	<p>Project dispatches an estimated average annual production of 632.6 GWh</p> <p>Annual greenhouse gas emissions savings of 280,000 tons of CO<sub>2</sub>/year</p> <p>The net average tariff/kWh from the project is lower than for plants running on imported fuel from 2015 to 2045.</p>	Project reporting	<b>Assumptions</b> <p>Sufficient water resources, reliable transmission and distribution network</p> <p>Current tariff structure will continue or improve.</p> <b>Risk</b> <p>Circular debt not resolved, forcing some shutdowns of existing capacity</p>
<b>Outputs</b> <p>A 147-MW hydropower project financed, built, and commissioned by the private sector</p>	<p>Pakistan's electricity generation capacity increases by 147 MW (net) on commissioning</p> <p>Locally purchased goods and services amount to \$241 million by 2015</p> <p>2,700 people locally employed during construction by 2015</p>	Project reporting	<b>Assumptions</b> <p>The project is constructed and commissioned as scheduled.</p> <p>Qualifications of locals are matched with the employment requirements during construction.</p>
<b>Activities with Milestones</b> <ol style="list-style-type: none"> <li>1. Financial close by December 2011</li> <li>2. Construction for plant starting immediately after financial close</li> <li>3. Full commissioning 48 months after construction start, by December 2015</li> </ol>			<b>Inputs</b> <p>Funding from (i) ADB, (ii) other multilateral development banks and a bilateral agency, and (iii) shareholders.</p>

ADB = Asian Development Bank, CO<sub>2</sub> = carbon dioxide, GWh = gigawatt-hour, kWh = kilowatt-hour, MW = megawatt.  
 Sources: Star Hydro Power Limited and Asian Development Bank estimates.

## SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

Country:	Pakistan	Project Title:	Patrind Hydropower Project
Lending/Financing Modality:	Project loan	Department/ Division:	Private Sector Operations Department Infrastructure Finance Division 1

I. POVERTY ANALYSIS AND STRATEGY	
<b>A. Links to the National Poverty Reduction Strategy and Country Partnership Strategy</b>	
<p>The project is consistent with Strategy 2020 of the Asian Development Bank (ADB)<sup>a</sup> which emphasizes investment in infrastructure to achieve high sustainable economic progress, connect the poor to the markets, and increase their access to basic productive assets, as part of ADB's support for achieving inclusive growth. Strategy 2020 puts particular emphasis on expanding energy supplies and promoting energy efficiency through supply-side measures. Strategy 2020 also emphasizes private sector development and private sector participation. The project will fit with these priorities as it will add new electric generation capacity to the country through private sector participation in developing clean energy sources. The project remains fully consistent with ADB's Energy Policy,<sup>b</sup> under which support to renewable energy generation has been identified as a key priority. The project will indirectly contribute to poverty reduction by supporting economic development and providing critically needed power to support economic activities.</p>	
<b>B. Poverty Analysis</b>	<b>Targeting Classification:</b> General intervention
<p><b>1. Key issues.</b> The project will indirectly contribute to poverty reduction by supporting economic development of Pakistan and by providing critically needed power to support economic activities. Reliable power supply will contribute toward improvement of transportation, communication, education, and health services as well as encourage the establishment of livelihood enterprises and increase development opportunities for people of the area. On a localized level, the project will entail involuntary resettlement impacts such as loss of residential housing and acquisition of land (farmland, wasteland, and riverbed land). The mitigation and compensation arrangements of these impacts will be defined in the resettlement plan.</p> <p><b>2. Design features.</b> The project is designed primarily to promote sustainable economic growth by increasing the supply of energy to reduce a growing energy deficit, and enhance access to electricity for households, business, and industry. The development impact of the project also includes environmental benefits through more efficient use of indigenous and renewable energy resources.</p>	
II. SOCIAL ANALYSIS AND STRATEGY	
<b>A. Findings of Social Analysis</b>	
<p><b>Social safeguard planning.</b> Involuntary resettlement is the main social impact related to the project. The aspect of acquisition of land in terms of land area requirement and infrastructure falling within the project area was also investigated. This involved consultations and scoping sessions with primary and secondary stakeholders like landowners, local people, storekeepers, and religious community leaders. The cost of land, built-up property, economic trees, and others were discussed with the owners, local people, and revenue department staff. The draft resettlement plan prepared for the project reveals that about 40 hectares (ha) of land (farmland and/or wasteland and riverbed land) will be permanently acquired; about 5 ha will be temporarily acquired and used as area for the labor camp and use during the construction phase of the project; 28 households (comprised of 242 persons) will be displaced; a single commercial asset described as rudimentary water mill facility; and around 624 economic trees. The compensation for these assets, including livelihood restoration programs, will be governed by the entitlement matrix in the resettlement plan.</p> <p><b>Stakeholders engagement.</b> A stakeholders engagement plan was prepared to provide details on how public consultations and subsequent public hearings, as well as arrangements to ensure involvement of women, will be engaged and documented. During community consultations, the community raised concerns such as land acquisition, traffic hazards, employment, project benefits, and community engagement. The resolutions to these issues are mainly documented in the resettlement plan and other project agreement documents.</p>	

**Core labor standards.** The due diligence of Star Hydro Power Limited (SHPL) concludes that it will ensure fair, safe, and healthy working conditions in its operations and during construction through its contractors and subcontractors. It will also ensure that applicable national labor laws and regulation, consistent with the core labor standards, will be followed in its human resources dealings and in engaging contractors and subcontractors. The prevailing labor and industrial relations laws guaranteeing freedom of association, collective bargaining, nondiscrimination, individual worker grievance resolution, and arbitration of labor disputes, will apply.

**Corporate social responsibility.** SHPL will engage responsive corporate social responsibility programs. Initially identified are activities related to developing and improving the educational and health facilities near the project area. The land that will be temporarily acquired will later be turned into playground and community parks. Other activities will be implemented in consultation with the various community stakeholders.

## B. Consultation and Participation

1. Provide a summary of the consultation and participation (C&P) process during project preparation.

Community consultations were carried out in the project area through formal and informal meetings, focus group discussions, and interviews. The consultants and SHPL staff initiated the sessions by giving a brief, simple, and nontechnical description of the project providing an overview of all likely positive and negative impacts. This was followed by an open discussion in which all participants were encouraged to voice their concerns and opinions. Apart from consultations with the local community, consultations with public representatives concerned and officials of the relevant line government departments were also held.

2. What level of C&P is envisaged during the project implementation and monitoring?

☒ Information sharing ☒ Consultation ☐ Collaborative decision making ☐ Empowerment

3. Was a C&P plan prepared for project implementation? ☒ Yes ☐ No

SHPL prepared a stakeholders engagement plan detailing how public consultations and public hearing and other engagement with stakeholders will be engaged and documented.

## C. Gender and Development

**Gender Mainstreaming Category:** Some gender benefits

**1. Key issues.** Generally, the project will not cause any specific cultural or social impact on any distinct socioeconomic groups, including women, although the involuntary resettlement impacts of the project may directly affect households and landholdings headed or owned by women. This type of impact will be adequately mitigated based on the entitlement matrix and will be monitored to ensure that affected or displaced people are as good or even better after the project is constructed. On the corporate social responsibility front, programs will be designed and implemented by closely coordinating with community stakeholders including women's groups, if applicable. A program designed and implemented by the stakeholders is expected to solicit strong participation and generate positive results. On engaging local laborers, equal opportunity for qualified men and women will be observed. Fair, safe, and appropriate work conditions will be secured in recognition of women's distinct workplace requirements during construction and operation phases.

**2. Key actions.** Measures included in the design to promote gender equality and women's empowerment—access to and use of relevant services, resources, assets, or opportunities and participation in decision-making process:

☐ Gender action plan ☒ Other actions or measures ☐ No action or measure

SHPL will ensure equal employment opportunities for qualified men and women, provide necessary work conditions that will address women's distinct workplace requirements, and promote and implement corporate social responsibility programs that are gender inclusive.

## III. SOCIAL SAFEGUARD ISSUES AND OTHER SOCIAL RISKS

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
Involuntary resettlement	Significant. 28 households (comprised of 242 persons) will be displaced, land acquisition of about 45 ha, 1 commercial asset, and about 624 economic trees will be affected.	A resettlement plan was prepared to ensure adequate compensation will be delivered to the displaced and/or affected persons.	<input checked="" type="checkbox"/> Resettlement plan <input type="checkbox"/> Resettlement framework <input type="checkbox"/> Environmental and social management system arrangement <input type="checkbox"/> No action

Issue	Significant/Limited/ No Impact	Strategy to Address Issue	Plan or Other Measures Included in Design
Indigenous peoples	No impact. The project will not entail any impact to ethnic minority groups/community.		<input type="checkbox"/> Indigenous peoples plan <input type="checkbox"/> Indigenous peoples planning framework <input checked="" type="checkbox"/> No action
Labor <input checked="" type="checkbox"/> Employment opportunities <input type="checkbox"/> Labor retrenchment <input checked="" type="checkbox"/> Core labor standards	Limited. Job opportunities will be created during the construction and operation phase. Labor engagement will be ensured by following appropriate national labor laws and regulations consistent with core labor standards.	Priority will be given to qualified and skilled workers and employees.  SHPL will follow national labor laws and regulations and will stipulate in its contractors/subcontractors agreement to follow the same.	<input type="checkbox"/> Plan <input checked="" type="checkbox"/> Other action <input type="checkbox"/> No action
Affordability	Not relevant. Power will be made available through the grid. Pricing will be determined by the appropriate regulatory agency.		<input type="checkbox"/> Action <input checked="" type="checkbox"/> No action
Other risks and/or vulnerabilities <input type="checkbox"/> HIV/AIDS <input type="checkbox"/> Human trafficking <input type="checkbox"/> Others (conflict, political instability, etc.)	No impact. No other social risks are anticipated as a result of the project.	None.	<input type="checkbox"/> Plan <input type="checkbox"/> Other action <input checked="" type="checkbox"/> No action
<b>IV. MONITORING AND EVALUATION</b>			
<p>Are social indicators included in the design and monitoring framework to facilitate monitoring of gender and social development activities and/or social impacts during project implementation? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Social indicators will mainly be incorporated in the resettlement plan; in addition, corporate social programs will be monitored and reported.</p>			

<sup>a</sup> ADB. 2008. *Strategy 2020: The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020*. Manila.

<sup>b</sup> ADB. 2009. *Energy Policy*. Manila

Sources: Asian Development Bank and Star Hydro Power Limited.

## ECONOMIC EVALUATION

### A. Introduction

1. While electricity sales and demand increase by over 40% from FY2004 to FY2009, no additional generation capacity has been added. The gap resulted in a major power supply deficit. Many of Pakistan's rural areas do not have access to electric power and about half of the population is not connected to the grid. Among the electricity generated, conventional thermal plants using mainly oil and gas account for 64.2% of Pakistan's power generation capacity, with hydroelectricity contributing 33.4% and nuclear energy 2.4%. The initiatives undertaken by the Government of Pakistan include new or expanded generation capacities by thermal and hydro independent power producers under the Power Policy 2002, securing electricity and gas imports from regional projects, as well as tapping the huge potential renewable energy sources.

2. The project involves the construction and operation of a 147 megawatt run-of-river hydroelectric power generation facility between the Kunhar and Jhelum Rivers on a build-own-operate-transfer basis for a period of 30 years from the commercial operations date.

### B. Valuation of Economic Benefits and Costs

3. The economic analysis for the project was conducted in accordance with the Asian Development Bank's *Guidelines for the Economic Analysis of Projects*.<sup>1</sup> The values in the economic analysis reflect 2010 price levels. This economic analysis is carried out using the world price numeraire. Domestic resources and nontraded items are adjusted with the standard conversion factor of 0.91.<sup>2</sup> The economic internal rate of return is calculated from 2011, the starting year of construction of the facility, to 2045, the end of the concession period.

#### 1. Valuation of Economic Benefits

4. With Pakistan's energy supply deficit, the power produced by the plant is not expected to substitute away from existing generation capacity, thus the entire output of the plant is considered incremental. The tariff paid is considered the willingness to pay for this incremental power. Annual savings of carbon dioxide emissions are valued at \$10 per ton of carbon dioxide.

#### 2. Valuation of Economic Costs

5. Capital and operating costs exclude interest during construction, fees and taxes, and financing costs. Shadow prices for foreign and domestic resources are applied accordingly. All labor is considered skilled, since less than 2% of labor costs come from unskilled labor requirements. Environmental costs are included in the capital costs. Project preparatory costs are also included in the capital costs. About 70% of annual operating economic costs relate to the maintenance of the infrastructure, and is therefore fixed.

<sup>1</sup> ADB. 1997. *Guidelines for the Economic Analysis of Projects*. Manila.

<sup>2</sup> The reciprocal of the shadow exchange rate factor of 1.1.

**C. Calculation of Economic Internal Rate of Return**

6. The real economic internal rate of return of 14.2% exceeds the social discount rate of 10%.<sup>3</sup>

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<sup>3</sup> The Evaluation Cooperation Group's Good Practice Standards for Private Sector Investment Operations rates a project satisfactory if the EIRR is 10% or higher.