



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

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Project Number: 44444-013  
November 2014

## Proposed Loans, Grant, and Technical Assistance Grant Kingdom of Bhutan and Tangsibji Hydro Energy Limited: Second Green Power Development Project

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Asian Development Bank

## **CURRENCY EQUIVALENTS**

(as of 27 October 2014)

Currency unit – ngultrum (Nu)

Nu1.00 = \$0.0164

\$1.00 = Nu61.1075

## **ABBREVIATIONS**

ADB	–	Asian Development Bank
ADF	–	Asian Development Fund
BPC	–	Bhutan Power Corporation
CDM	–	Clean Development Mechanism
DGPC	–	Druk Green Power Corporation
GDP	–	gross domestic product
IMF	–	International Monetary Fund
IWRM	–	integrated water resources management
km	–	kilometer
km <sup>2</sup>	–	square kilometer
MW	–	megawatt
OCR	–	ordinary capital resources
PPP	–	public–private partnership
SBI	–	State Bank of India
TA	–	technical assistance
THyE	–	Tangsibji Hydro Energy Limited

## **NOTE**

- (i) In this report, "\$" refers to US dollars.

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## PROJECT AT A GLANCE

<b>1. Basic Data</b>		<b>Project Number: 44444-013</b>	
<b>Project Name</b>	Second Green Power Development Project	<b>Department /Division</b>	SARD/SAEN
<b>Country</b>	Bhutan	<b>Executing Agency</b>	Druk Green Power Corporation, Tangsibji Hydro Energy Limited
<b>Borrower</b>	Bhutan, and Tangsibji Hydro Energy Limited		
<b>2. Sector</b>	<b>Subsector(s)</b>	<b>ADB Financing (\$ million)</b>	
✓ <b>Energy</b>	Large hydropower generation		121.50
		<b>Total</b>	<b>121.50</b>
<b>3. Strategic Agenda</b>	<b>Subcomponents</b>	<b>Climate Change Information</b>	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Adaptation (\$ million)	2.00
Environmentally sustainable growth (ESG)	Global and regional transboundary environmental concerns	Mitigation (\$ million)	118.50
Regional integration (RCI)	Pillar 1: Cross-border infrastructure	CO <sub>2</sub> reduction (tons per annum)	459,734
		Climate Change impact on the Project	Medium
<b>4. Drivers of Change</b>	<b>Components</b>	<b>Gender Equity and Mainstreaming</b>	
Governance and capacity development (GCD)	Institutional development	Some gender elements (SGE)	✓
Knowledge solutions (KNS)	Application and use of new knowledge solutions in key operational areas		
Partnerships (PAR)	Commercial cofinancing		
Private sector development (PSD)	Private Sector Promotion of private sector investment		
<b>5. Poverty Targeting</b>		<b>Location Impact</b>	
Project directly targets poverty	No	Regional	High
<b>6. Risk Categorization:</b>	Complex		
<b>7. Safeguard Categorization</b>	<b>Environment: A Involuntary Resettlement: B Indigenous Peoples: C</b>		
<b>8. Financing</b>			
<b>Modality and Sources</b>		<b>Amount (\$ million)</b>	
<b>ADB</b>		<b>121.50</b>	
Sovereign Capacity development technical assistance: Technical Assistance Special Fund		1.00	
Sovereign Project grant: Asian Development Fund		25.25	
Sovereign Project loan: Asian Development Fund		25.25	
Sovereign Project loan: Ordinary capital resources		70.00	
<b>Cofinancing</b>		<b>58.82</b>	
Commercial Bank - International		58.82	
<b>Counterpart</b>		<b>18.86</b>	
Project Sponsor		18.86	
<b>Total</b>		<b>199.18</b>	
<b>9. Effective Development Cooperation</b>			
Use of country procurement systems		No	
Use of country public financial management systems		Yes	





## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on (i) a proposed loan; and (ii) a proposed grant to the Kingdom of Bhutan; and (iii) a proposed loan to Tangsibji Hydro Energy Limited (THyE), to be guaranteed by the Kingdom of Bhutan, for the Second Green Power Development Project.<sup>1</sup> The report also describes proposed technical assistance (TA) for Acceleration of Hydropower Trading Development, and if the Board approves the proposed loans and grant, I, acting under the authority delegated to me by the Board, approve the TA.

2. The project will finance the run-of-river Nikachhu hydropower plant, with 118-megawatt (MW) capacity. It is located on the Nikachhu River in Trongsa district in the central region of Bhutan. The project aims to export power to India through a public-private partnership (PPP) and the Clean Development Mechanism (CDM).<sup>2</sup> Its design follows the successful model of the Dagachhu hydropower plant (126 MW), which was financed by the Asian Development Bank (ADB) in 2008 under the Green Power Development Project.<sup>3</sup>

## II. THE PROJECT

### A. Rationale

3. **Overview.** Bhutan is currently the only South Asian country with a surplus of power for export. The country's installed generation capacity (1,614 MW) is significantly greater than its domestic demand (around 300 MW); hence Bhutan is a net power exporter. Of total power generated, about 75% is exported to India. Hydropower generation contributes to one-fifth of the country's gross domestic product (GDP). Power exports account for one-third of government revenue, and are the primary source for government spending on socioeconomic development for social services such as health, education, and rural development.<sup>4</sup> Hydropower development thus forms the foundation of the economy and social system in Bhutan.

4. Along with hydropower development, quality of life and overall socioeconomic status has significantly improved. Poverty decreased from 32% in 2003 to 12% in 2012. However, in spite of increasing public spending for social and rural development and an increase in per capita income (more than \$2,500 in 2012), Bhutan remains below the graduation threshold of least developed countries in terms of the human asset index and the economic vulnerability index as defined by the United Nations.<sup>5</sup>

5. The national electrification ratio has increased from 38% in 2003 to 98% in 2014; electricity for all is being achieved. In Bhutan, domestic power supplies are subsidized by hydropower exports. The government uses the energy royalty from hydropower generation to

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<sup>1</sup> The design and monitoring framework is in Appendix 1.

<sup>2</sup> ADB. 2011. *Technical Assistance to the Kingdom of Bhutan for Preparing the Green Power Development Project II*. Manila.

<sup>3</sup> ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Loans, Asian Development Fund Grant, Technical Assistance Grant, and Administration of Grant to the Kingdom of Bhutan for the Green Power Development Project*. Manila.

<sup>4</sup> Hydropower revenues have enabled high spending on social services (health and education) and renewable natural resources (agriculture, livestock, and forestry). Government spending in those areas has increased steadily, accounting for more than one-third of total government consumption and demonstrating the government's priority accorded to human development. This spending is among the highest level in South Asia.

<sup>5</sup> The human asset indicators are based on nutrition, health, and education including literacy. The economic vulnerability indicators include population size; remoteness; merchandise export concentration; and share of agriculture, forestry, and fisheries in gross domestic product.

reduce the domestic retail tariffs of the Bhutan Power Corporation (BPC), national transmission and distribution utility.<sup>6</sup> The benefits from power exports are thus redistributed to domestic electricity users through the regulatory tariff systems. However, electricity demand has been growing at around 10% per year since 2004, and is expected to double from 2013 to 2020. Continued hydropower development will be critical to contribute to export earnings and sustain the major government revenue, while keeping affordable electricity prices for households, businesses, and industries.

6. **Government initiatives.** In the Eleventh Five Year Plan (2013–2018), the government defines “inclusive green socioeconomic development.”<sup>7</sup> It states that the green economy can be driven by public and private investments that enhance economic growth while reducing carbon emissions, promoting efficient resource use, and increasing environmental quality and social inclusiveness. In developing hydropower projects, the plan requires optimizing approaches to enhance local development, private sector participation, employment opportunities, and alignment of the project’s corporate social responsibilities with local community needs. The government intends to use hydropower to promote inclusive development rather than simply generate electricity and revenue.

7. **ADB interventions.** The Green Power Development Project supported the Dagachhu hydropower plant and the rural electrification program. The Dagachhu plant, completed in August 2014, was developed through the first PPP for infrastructure in the country. To export power to India, a project special purpose company was established between the state-owned generation company, Druk Green Power Corporation (DGPC) and an Indian private partner, Tata Power Company.<sup>8</sup> Its subsidiary, Tata Power Trading Company, is an offtaker for the plant’s electricity. The project was registered as the world’s first cross-border CDM project. Bhutan’s clean power exports will foster regionwide climate change and economic cooperation.<sup>9</sup> The rural electrification programs have been supported by a series of ADB projects since 1995. The assistance has been sequenced to maintain continuity and take into account lessons from previous operations. ADB is a major contributor to the government’s 100% electrification target by enabling electricity access of more than 40% of rural households.

8. ADB also helped the government formulate the Sustainable Hydropower Development Policy (2008), which enables private participation and foreign direct investment in hydropower development. While the government has focused on bilateral projects with the Government of India for additional 10,000 MW capacity,<sup>10</sup> it intends to diversify through PPP and independent power producers.<sup>11</sup> Hydropower development and energy trade are consistent with ADB’s country partnership strategy, 2014–2018 for Bhutan.<sup>12</sup>

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<sup>6</sup> Based on the concept of an energy royalty, 15% of the power generated in Bhutan is given free to the government and sold from the government to BPC at regulated discount prices. As a result, electricity is supplied to domestic consumers at affordable tariffs, which are substantially cross-subsidized by power exports with higher prices.

<sup>7</sup> Government of Bhutan, Gross National Happiness Commission. 2013. *Eleventh Five Year Plan*. Thimphu.

<sup>8</sup> The project’s shares are held by DGPC (59%), the National Pension and Provident Fund of Bhutan (15%), and Tata Power Company (26%).

<sup>9</sup> Bhutan’s power supply is not merely a domestic issue but also a regional matter of using untapped clean energy resources; Bhutan will require a larger power supply market rather than its small domestic market.

<sup>10</sup> Based on the two governments’ agreement, three projects are under construction: Punatsangchhu I (1,200 MW), Punatsangchhu II (1,020 MW), and Mangdechhu (720 MW), which are expected to be commissioned during 2017–2018. Other projects are at various stages of preparation with the Indian government and its own enterprises.

<sup>11</sup> ADB. 2014. *Technical Assistance to the Kingdom of Bhutan for Promoting Clean Energy Development in Bhutan*. Manila. The prefeasibility and subsequent bid process is being supported to develop hydropower projects with PPP and/or independent power producers.

<sup>12</sup> ADB. 2014. *Country Partnership Strategy: Bhutan, 2014–2018*. Manila.

9. **Lessons.** In 2013, ADB provided additional financing to complete the Dagachhu hydropower development, which resulted in a cost overrun of about 17%.<sup>13</sup> This was mainly because underground tunneling excavations required extra reinforcement due to unexpected poor geological conditions, which raised the cost of civil works over time. The civil work costs were also increased by large escalations in labor and material prices. Considering Dagachhu's experience, appropriate contingency and implementation schedules are considered for the Nikachhu hydropower plant.

10. **Specific features.** Since 2010, in preparing the project, DGPC has conducted extensive geological investigations that found 80% of rock conditions tested to be in good order. The project site and design were determined among the alternatives based on social, environmental, geological, topographical, and hydrological assessments.<sup>14</sup> DGPC incorporated THyE as the project special purpose company. DGPC intends to dilute 26% of THyE to a private joint venture partner through an international competitive bidding process.<sup>15</sup> The offtaker has already been selected through a bidding process (para 18).<sup>16</sup> The project is proposed to be cofinanced with Indian commercial banks with Indian rupee terms as the first foreign commercial borrowing without government credit support for Bhutan's power sector. This arrangement will help mitigate the currency risk exposure.<sup>17</sup> It will also open a gateway to mix public sector finance with commercial project finance, which can be applied to subsequent hydropower projects with high capital investments.<sup>18</sup> To ensure inclusive social benefits and environmental conservation, the project will provide skills training for employment and income-generating activities, community development support, and environmental management plans.

## B. Impact and Outcome

11. The project's impact will be expanded cross-border power trading, and the outcome will be increased clean hydropower generation in Bhutan.

## C. Outputs

12. The outputs will be (i) a 118 MW hydropower generation plant constructed, (ii) DGPC and THyE project management and implementation capacity enhanced, and (iii) hydropower development and trading framework improved.

## D. Investment and Financing Plans

13. The project cost is estimated at the equivalent of \$198.18 million (Table 1). The financing plan is summarized in Table 2.

<sup>13</sup> ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing to the Kingdom of Bhutan for the Green Power Development Project*. Manila.

<sup>14</sup> Government of Bhutan. 2003. *Water Resource Management Plan and Update of the Power System Water Plan, Bhutan*. Thimphu. The project was identified at a strategic level with river-basin approaches and environmental assessments as integrated parts of the plan. ADB. 2009. *Technical Assistance for Capacity Building of the National Environment Commission in Climate Change*. Manila. The TA included study of water use and minimum environmental flow requirements for hydropower development using this project as a pilot case. Under the project preparatory TA, subbasin alternatives were further evaluated and the installed capacity was reduced from 210 MW to 118 MW for smaller safeguard impacts.

<sup>15</sup> The bid criteria will be the up-front premium, the value of which can be increased after the project's financial closure. DGPC is involved in the bid process to select the joint venture partner.

<sup>16</sup> The project's levelized tariff over 25 years was more than 50% higher than the Dagachhu's original tariff.

<sup>17</sup> The Bhutanese currency, the ngultrum is pegged with the Indian rupee in the exchange rate.

<sup>18</sup> This will be the first foreign commercial term loan to DGPC without credit support from the government; it will help DGPC gain experience with more commercial funding. The Dagachhu project was financed in parallel by the Austrian export credit agency with the sovereign guarantee, and a local financial institution.

**Table 1: Investment Plan**  
(\$ million)

Item	Amount
<b>A. Base cost<sup>a</sup></b>	
1. Hydropower plant (civil works and equipment) <sup>b</sup>	109.61
2. Associated facilities (transmission line and preparatory works)	16.92
3. Safeguards and administration	19.37
<b>Subtotal (A)</b>	<b>145.90</b>
<b>B. Contingencies<sup>c</sup></b>	<b>31.74</b>
<b>C. Financing charges during implementation</b>	<b>20.54</b>
<b>Total (A+B+C)</b>	<b>198.18</b>

<sup>a</sup> At 2014 prices.

<sup>b</sup> Any incidental expenditure relating to bank charges, local transport, freight, and insurance are eligible for Asian Development Bank (ADB) financing. Taxes and duties estimated at \$2.2 million will be included in ADB finance.

<sup>c</sup> Includes physical and price contingencies, which represent 22% of the base cost.

Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

**Table 2: Financing Plan**

Source	Amount (\$ million)	Share of Total (%)
<b>Asian Development Bank</b>	<b>120.50</b>	<b>60.80</b>
Asian Development Fund (grant)	25.25	12.74
Asian Development Fund (loan)	25.25	12.74
Ordinary capital resources (loan)	70.00	35.32
<b>Indian commercial banks<sup>a</sup></b>	<b>58.82</b>	<b>29.68</b>
<b>Druk Green Power Corporation</b>	<b>18.86</b>	<b>9.52</b>
<b>Total</b>	<b>198.18</b>	<b>100.00</b>

<sup>a</sup> The State Bank of India will lead the syndication.

Sources: Asian Development Bank, Druk Green Power Corporation, and Tangsibji Hydro Energy.

14. **ADB financing.** The government and DGPC have requested loans and a grant of \$120.5 million to help finance the project. It will comprise (i) \$50.5 million equivalent in various resources from Asian Development Fund (ADF) as a loan and a grant, each for \$25.25 million; and (ii) \$70.0 million from ADB's ordinary capital resources (OCR).<sup>19</sup> The ADF loan will have a 32-year term, including a grace period of 8 years, an interest rate of 1.0% per annum during the grace period and 1.5% per annum thereafter, and such other terms and conditions set forth in the draft financing and project agreements. The OCR loan will have a 30-year term, including a grace period of 5.5 years, an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility,<sup>20</sup> a commitment charge of 0.15% per year, and such other terms and conditions set forth in the draft legal agreements.

15. **Cofinancing.** A parallel loan to THyE is proposed for up to \$58.82 million equivalent in Indian rupees from a syndication of Indian commercial banks to be led by the State Bank of India (SBI), using a project finance approach without sovereign guarantee. The loan will have a maturity of 15 years including grace and moratorium periods of 5 years, and an interest rate and fees to be determined by the credit committee of each bank syndicated.<sup>21</sup> SBI has already provided its in-principle approval for its loan portion. ADB and SBI (representing the commercial banks) will enter into a separate collaborative cofinancing arrangement in the form of a memorandum of understanding to ensure the application of ADB policies and guidelines on safeguards, procurement, and anticorruption, and their related requirements. The government

<sup>19</sup> Financing Structure (accessible from the list of linked documents in Appendix 2). The government will relend the ADF grant and loan to DGPC, which will use the ADF resources for its equity to THyE. The OCR loan will be directly used for THyE's debt under the government's guarantee to ADB.

<sup>20</sup> The interest includes a maturity premium of 20 basis points given the borrowers' choice of repayment option.

<sup>21</sup> The pricing is proposed at the SBI base rate plus 225 basis points (i.e., current effective interest rate of 12.25%).

has requested a limited waiver of the negative pledge clause in (i) the financing agreement, and (ii) any existing and future loan and guarantee agreements between ADB and the government, such that the assets of THyE are not considered government assets for purposes of the negative pledge clause in such agreements.<sup>22</sup>

## E. Implementation Arrangements

16. DGPC and THyE will be the executing agencies. The implementation arrangements are described in detail in the project administration manual (PAM).<sup>23</sup>

**Table 3: Implementation Arrangements**

Aspects	Arrangements		
Implementation period	January 2015–December 2019		
Estimated completion date	31 December 2019		
<b>Management</b>			
(i) Oversight body	Ministry of Finance, Ministry of Economic Affairs, Druk Holding and Investments		
(ii) Executing agencies	DGPC, THyE		
(iii) Key implementing agency	THyE		
(iv) Implementation unit	THyE (80 staff), relevant transmission supervision to be in BPC (3 staff)		
Procurement	International competitive bidding	2 contracts	\$109.6 million (ADB and commercial finance)
	Bhutan international and national competitive bidding	5 main and other contracts <sup>a</sup>	\$26.13 million (DGPC and commercial finance)
Consulting services	Bhutan international and national competitive selection	300 person-months <sup>b</sup>	\$2.53 million (DGPC finance)
Retroactive financing and advance contracting	Advance contracting and retroactive financing will be allowed, subject to ADB policies and procedures.		
Disbursement	The loan and grant proceeds will be disbursed in accordance with ADB's <i>Loan Disbursement Handbook</i> (2012, as amended from time to time) and detailed arrangements agreed upon between the government and ADB.		

ADB = Asian Development Bank, BPC = Bhutan Power Corporation, DGPC = Druk Green Power Corporation, THyE = Tangsibji Hydro Energy.

<sup>a</sup> Include preparatory works.

<sup>b</sup> Include owner's engineers and safeguard specialists to be recruited on a firm or individual basis.

Source: Asian Development Bank.

17. **Implementation and procurement.** The project will be implemented over 5 years. After the preparatory works for access roads and bridges, two procurement packages will be provided for the main construction works: (i) civil works and hydromechanical equipment (part A) and (ii) electromechanical equipment (part B). ADB will finance both packages, following ADB's Procurement Guidelines (2013, as amended from time to time). Since the cofinanciers' resources are commingled with ADF resources for part A, universal procurement applies to this package. Since the OCR loan also finances the same package, a separate waiver of ADB's member country procurement eligibility restrictions is requested for the OCR loan. The government, DGPC, and THyE have requested ADB for advance procurement action and retroactive financing for the project.

18. **Other arrangements.** THyE has agreed to a power purchase agreement with Power Trading Corporation of India. The 25-year agreement follows a take-or-pay arrangement, appropriate penalty clauses, and an offtake payment security mechanism. THyE also contracted

<sup>22</sup> In line with project finance practice and in line with ADB's negative pledge requirements, THyE will grant equal and ratable security over its assets for the commercial loan and the OCR loan. However, THyE will not grant security over its assets for the ADF loan since it is used as DGPC's equity contribution to THyE.

<sup>23</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2).

with BPC to outsource supervision of the transmission line works. DGPC will disinvest THyE's minority share to bring private additional capital, expertise, and efficiency.

### III. TECHNICAL ASSISTANCE

19. To strengthen the key sector frameworks and systems, the project will be supported by capacity development TA for Acceleration of Hydropower Trading Development.<sup>24</sup> The TA is estimated to cost \$1,000,000 to be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF-V). It will strategically assess sector reforms for a functional segregation of distribution and transmission, an independent system operator, and a separate power trading entity to aggregate power trading from Bhutan. It will also help improve the current hydropower development policy and finalize a draft tariff policy to address long-term sustainable tariff and subsidy mechanisms. The TA will support project implementation by DGPC and THyE through equity financing from a joint venture's private partner, and safeguard strengthening and monitoring to assure project compliance.

### IV. DUE DILIGENCE

#### A. Technical

20. DGPC conducted project prefeasibility studies including geological investigations. These were upgraded to feasibility studies and a qualified and experienced engineering firm prepared a detailed project report. The project preparatory TA consultant conducted comprehensive due diligence studies, including extensive field and laboratory investigations such as hydrological, geotechnical, sedimentation, mechanical, and electrical requirements. Most of the project facilities except the dam, access roads, and transmission lines will require underground works.<sup>25</sup> The project is designed to generate 491.5 gigawatt-hours at a very conservative level of 90% dependability.<sup>26</sup> The plant is run-of-river, with a relatively small reservoir.<sup>27</sup> The transmission line to evacuate power from the plant will be connected to a substation being constructed by the Mangdechhu Hydroelectric Project Authority.<sup>28</sup> The project will help improve power supply reliability and efficiency in central and eastern Bhutan.

#### B. Economic and Financial

21. The economic internal rate of return is estimated at 17.31%.<sup>29</sup> Assuming the project will supply power to address India's energy deficit, the overall economic benefit to the Bhutan–India subregion is expected to be 21.70%. The project is financially viable with an expected financial internal rate of return of 5.94% in real terms, higher than the weighted average cost of capital (1.84%). The project will be self-sustaining to meet operating expenses and debt service, maintaining the minimum debt service coverage ratio of 1.2.<sup>30</sup>

<sup>24</sup> Attached Technical Assistance (accessible from the list of linked documents in Appendix 2).

<sup>25</sup> The project's accessibility to the highway and a substation is good; access roads will be increased by 16.5 kilometers (km) to help excavate a 12.2 km tunnel. The 132-kilovolt transmission line will be 18.6 km.

<sup>26</sup> More water is likely to be available for 90% of the operating time than designed with the hydrological data. An additional 323.8 gigawatt-hours of energy will be generated in a cascaded manner at the run-of-river Mangdechhu hydroelectric project (720 MW) in the downstream main river, since water discharged from the Nikachhu plant will be released into Mangdechhu reservoir. This additional output is not captured by THyE.

<sup>27</sup> The gross reservoir capacity is relatively small at 0.537 million cubic meters of the 0.046 square kilometers (km<sup>2</sup>) of the reservoir surface area.

<sup>28</sup> The authority was formed in 2010. Completion of the construction works is expected in 2017.

<sup>29</sup> Economic Analysis (accessible from the list of linked documents in Appendix 2).

<sup>30</sup> Financial Analysis; Currency Risk Assessment (accessible from the list of linked documents in Appendix 2). The project will fully service foreign debt of the OCR loan, which will cover 35% of the project cost, under the stress

22. The analysis of the government's debt sustainability used methodology defined by the International Monetary Fund (IMF) and the International Development Association.<sup>31</sup> The public debt to GDP ratio is high at 99.6%; a significant portion of the debt is related to the construction of several hydropower projects. In 2014, however, the IMF Article IV consultations concluded that Bhutan's risk of debt distress was moderate because of mitigation factors, including Bhutan's strong track record of project implementation, committed donor support, high amount of international reserves, strong energy demand from India, and the favorable financing terms of the Indian government-funded hydropower projects.<sup>32</sup> The IMF projects that the debt situation would be turned around when ongoing large hydropower projects financed by the government of India are commissioned, and that debt ratios would improve as foreign exchange revenues from the projects start flowing in 2017–2018 and onward with a beneficial impact on GDP, exports, and fiscal revenues. The debt ratios improve significantly when the Indian government-funded hydropower projects are excluded from the analysis by treating these loans as foreign direct investment, as suggested by the IMF. As a result, the ADB-financed projects would make no breach of debt thresholds in the baseline.

### C. Governance

23. DGPC and its subsidiaries have adopted comprehensive corporate policies and manuals on accounting and financial management, inventory and procurement management, internal audit, human resources, and safeguards. These improvements are supported by management information systems provided through an enterprise resource planning system package. DGPC also follows the corporate governance code developed on globally accepted corporate governance standards.<sup>33</sup> The external independent auditor reported that these entities have adequate internal control systems, suitable budgetary control systems, adequate bidding, and sufficient organizational system control to carry out their operations in an orderly and efficient manner.<sup>34</sup> ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government, DGPC, and THyE. The specific policy requirements and supplementary measures are described in the PAM (footnote 23).

### D. Poverty and Social

24. Based on social surveys and broad consultations with local community members, including farmers and women groups, THyE devised a community development plan designed to share project benefits with communities. They include (i) skill development training and livelihood support, including a program for women's groups to learn commercial weaving in collaboration with a nongovernment organization, project-related training for work, and development of a sales outlet for the community to sell farming and woven products for income-generating activities; (ii) the creation of 2,250 jobs for construction works; (iii) infrastructure, including access roads and blacktopped farm roads to improve accessibility to education, social, and economic activities; and improved grid connection in communities to provide a more stable supply of electricity; and (iv) school and health improvement by helping the community school

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tests assuming annual currency depreciation of (i) 3.5% from the past 10-year average currency depreciation and (ii) 7.0% from the purchasing power parity. THyE will adopt the foreign exchange fluctuation reserve, and the power purchase agreement has provision to sell partial power in foreign currency terms in case both parties mutually agree with its mechanism. THyE will be covenanted to have currency hedging or alternative arrangements to mitigate this risk, acceptable to ADB.

<sup>31</sup> Debt Sustainability Assessment (accessible from the list of linked documents in Appendix 2).

<sup>32</sup> India supported full project costs with a proportion of 30% grant and 70% loan. The first loan repayment is allowed only when the project is commissioned, regardless of delays, to mitigate construction risks. The power export tariff will be set on a cost plus basis to cover debt service and equity return to mitigate Bhutan's debt service risks.

<sup>33</sup> Based on the Organisation for Economic Co-operation and Development's corporate governance principles.

<sup>34</sup> Financial Management Assessment (accessible from the list of linked documents in Appendix 2).

construct an additional facility, making the construction camp health clinics accessible to communities, and improving community sanitation by supporting a garbage compactor truck and waste disposal site.

25. For the country, the project will help the promotion of inclusive growth. The energy royalty will help sustain affordable electricity prices particularly for rural households, and power exports will generate additional government resources to promote socioeconomic development.

## E. Safeguards

26. The project is classified category B for involuntary resettlement, category C for indigenous peoples, and category A for environment. The safeguard documents are prepared as per ADB's Safeguard Policy Statement (2009) to guide land acquisition, compensation, and environmental mitigation measures.<sup>35</sup>

27. **Resettlement.** No affected households will be physically displaced or relocated. The project will not affect any physical structure (e.g., homesteads, shops, cattle sheds, outhouses, water resources and irrigation channels, and religious and cultural structures). The construction of access roads will require the acquisition of 1.45 hectares of private land (dry land) from 12 affected households including a community primary school. An additional six households will be affected by the transmission tower footprint on 0.24 hectares of private land. In total, 18 households comprising 84 persons will be affected; private land acquisition will be 1.69 hectares of 119.38 hectares for the total project area (including government land). No indigenous peoples are in the project-affected areas.

28. **Environment.** More than half of Bhutan's territory is environmentally protected. The project area lies in a narrow V-shaped valley. The dam site is almost vertical on the right bank and inaccessible to people and most wildlife. This bank will be inundated partly in the buffer zone of the Jigme Singye Wangchuck National Park,<sup>36</sup> while the other park area will be undisturbed. A muck disposal site will be used temporarily along the national highway in part of a biological corridor, most of which is still available for wildlife movement between national parks.<sup>37</sup> While these legally protected spots are treated as critical habitat as per ADB's Safeguard Policy Statement, the project area itself is not considered a critical habitat for any threatened species supported by the park area. Based on the critical habitat assessments and some biodiversity experts' advice, it is considered that there are no measurable adverse impacts on high biodiversity value and functionality, and the project is not anticipated to lead to any reduction in their population. The main project facilities (e.g., tunnels, underground powerhouse, camps, and transmission line) will be on the opposite bank of the park area, which has already been degraded due to a national highway, cattle grazing, human settlements, and deforested dry land. In aquatic habitats, no endangered or migratory fish have been recorded due to a series of waterfalls in the downstream of the Nikachhu river. The minimum environmental flows will maintain at least 10% of the average lean seasonal flow, increasing to

<sup>35</sup> Environment Impact Assessment; Resettlement Plan (accessible from the list of linked documents in Appendix 2). The environment impact assessment was disclosed on 4 August 2014 and the resettlement plan on 5 August 2014.

<sup>36</sup> The park covers an area of 1,723 km<sup>2</sup>. It currently has about 6,000 residents in 31 villages within park boundaries, and another 15,000 within the buffer zone, which is 1–5 km wide on the periphery of the park. The buffer zone is considered as a legally protected cushion from the core zone, which is strictly protected. A small part of the park's buffer zone (0.024 km<sup>2</sup>) will be inundated behind a dam. It is a very small fraction of steep slope on the edge of the zone (20–30 meters wide x 800 meters long along the river) with 0.0014% of the park area.

<sup>37</sup> This biological corridor is already crossed by the national highway. Of the 5 km width area, 0.073 km<sup>2</sup> will temporarily be used for 1.5–2 years and revegetated rapidly afterward. Any construction activities in this area will be disallowed at night time to avoid disrupting wildlife movements, most of which occur in the dark. Wildlife in the area will still have access to wide swaths of their habitat for refuge and movement.



more than 20% in the downstream at the confluence of the main river of the Mangdechhu.<sup>38</sup> The environmental flows will continue to be monitored and reassessed during implementation to ensure the habitat requirements and integrated water resources management (IWRM) including relevant controls for plant operations in the river basin.<sup>39</sup> The project includes environmental mitigation plans, including continued surveys with internal and external monitoring and reporting.<sup>40</sup>

29. **Climate change.** Climate change modeling analyses used eight climate models from various organizations. They project long-term water flow increases in the Nikachhu watershed, which should increase generation.<sup>41</sup> The analyses show the project is hydrologically sound and its adaptation design (e.g., early warning systems) is effective. The project will have a positive climate change impact under the CDM, eliminating 459,734 tons of potential carbon dioxide emissions that would otherwise be produced each year in India by use of fossil fuels to generate the electricity equivalent to power export from Bhutan.

## F. Risks and Mitigating Measures

30. The overall project risk mitigations are adequately measured and incorporated. The integrated benefits and impacts are expected to outweigh the costs. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.<sup>42</sup>

**Table 4: Summary of Risks and Mitigating Measures**

Risks	Mitigating Measures
Construction	Time and cost overruns are related to geological surprises and/or unexpected price escalation. DGPC's geological investigations over more than 3.5 years found 80% of rock tested to be in good order. To mitigate the overrun risks, the project includes adequate contingencies (22% of the base cost). Contractual mitigations are also in engineering, procurement, and construction arrangements. The Dagachhu's experienced staff will support the project.
Operations	The plant's run-of-river hydropower operations are straightforward. THyE is staffed with experienced management and individuals from DGPC, which operates five plants in Bhutan. A reputed joint venture partner will provide additional support.
Offtake	A long-term power purchase agreement (PPA) was agreed with the largest power trader in India. The offtaker's credit risk is further mitigated in the PPA by adequate payment security mechanism.
Transmission	The nearest substation under construction is expected to be available in 2017 for an ongoing project. Once an 18.6 km transmission line is connected to this substation, the project's power can be evacuated at least to the existing grid connections to India.
Climate change	Climate change modeling analyses assess the Nikachhu watershed as hydrologically sound. Adaptation measures against disasters are reflected in the design.
Safeguard	Extensive consultations and mitigation plans have been provided. The grievance redress committee was formed and an independent panel of experts is to be established to ensure safeguard activities.
Currency	Cofinancing in Indian rupees will reduce the currency mismatch risk between the revenue and debt

<sup>38</sup> Twenty-nine major and minor perennial tributaries contribute to a significant increase of the downstream flows in around 10 km until the confluence with the Mangdechhu river; another 6–7 km downstream until the Mangdechhu plant's tailrace, the water flows will be increased to about 30% in the lean season as well.

<sup>39</sup> IWRM is provisioned in the Sustainable Hydropower Development Policy (2008) and the Water Act (2011). DGPC will establish its funding mechanisms and/or internal resources to implement sustainable IWRM for the Nikachhu and Mangdechhu hydropower plant operations, along with the attached TA. Countrywide IWRM is being supported by ADB. 2014. *Technical Assistance to the Kingdom of Bhutan for Adapting to Climate Change through Integrated Water Resources Management*. Manila.

<sup>40</sup> The environmental management plan includes biodiversity and wildlife conservation management, compensatory afforestation, and catchment area management, in collaboration with the national park, forestry offices, the biodiversity management committee, the catchment management committee, and external specialists to be hired. The attached TA will help implement the plan. The panel of experts will monitor safeguards and dam safety. DGPC demonstrated satisfactory plan implementation and compliance under the Dagachhu development.

<sup>41</sup> Climate Change Impact Assessment (accessible from the list of linked documents in Appendix 2).

<sup>42</sup> Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

Risks	Mitigating Measures
	services. The currency risk assessment indicates the project's robustness to meet the foreign debt services under severe stress tests. The risk will be further mitigated by foreign exchange fluctuations reserve, hedging, and/or the possible power sales in foreign currency terms when applicable.

DGPC = Druk Green Power Corporation, PPA = power purchase agreement, THyE = Tangsibji Hydro Energy.  
Source: Asian Development Bank.

## V. ASSURANCES AND CONDITIONS

31. The government, DGPC, and THyE have assured ADB that implementation of the project shall conform to all applicable ADB policies including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in detail in the PAM and loan documents. The government, DGPC, and THyE have agreed with ADB on certain covenants for the project, which are set forth in the loan and financing agreements, guarantee agreement, and project agreement. The effectiveness of these agreements is subject to a satisfactory subsidiary financing arrangement. Disbursement of ADB funds is contingent upon a satisfactory power purchase agreement, the loan effectiveness of Indian commercial banks, and a cofinancing arrangement with Indian commercial banks.

## VI. RECOMMENDATION

32. I am satisfied that the proposed loans would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve

- (i) the loan in various currencies equivalent to SDR16,987,000 to the Kingdom of Bhutan for the Second Green Power Development Project, from ADB's Special Funds resources, with an interest charge at the rate of 1.0% per annum during the grace period and 1.5% per annum thereafter; for a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft financing and project agreements presented to the Board;
- (ii) the grant not exceeding \$25,250,000 to the Kingdom of Bhutan, from ADB's Special Funds resources for the Second Green Power Development Project, on terms and conditions that are substantially in accordance with those set forth in the draft financing agreement presented to the Board;
- (iii) the loan of \$70,000,000 to Tangsibji Hydro Energy Limited, to be guaranteed by the Kingdom of Bhutan, for the Second Green Power Development Project, from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 30 years, including a grace period of 5.5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and guarantee agreements presented to the Board;
- (iv) the proposal in paragraph 15 of this report that assets of Tangsibji Hydro Energy Limited are not considered assets of the Kingdom of Bhutan for purposes of the negative pledge clause in existing and future financing, loan, and guarantee agreements between ADB and the Kingdom of Bhutan; and
- (v) the proposal in paragraph 17 of this report to permit the use of the loan from ADB's ordinary capital resources for procurement in nonmember countries of ADB of goods, works, and services produced in nonmember countries of ADB.

Takehiko Nakao  
President

## DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
<p><b>Impact</b> Expanded cross-border power trading</p>	<p>Power trading from Bhutan to India increased by at least 16,000 GWh<sup>a</sup> by 2025 (baseline 2013: 5,650 GWh)</p> <p>Investments from the public and private sectors to hydropower development for export from Bhutan increased by at least 4,400 MW<sup>b</sup> by 2025 (baseline 2013: 1,110 MW)</p>	<p>BPC's Power Data Book</p> <p>The government's five-year plans and economic reports</p>	<p><b>Assumption</b> Power trading with bilateral assistance and joint venture investments from India continues.</p> <p><b>Risk</b> Global or regional economic slowdown affects demand for energy.</p>
<p><b>Outcome</b> Increased clean hydropower generation in Bhutan</p>	<p>Clean power generated and supplied increased by 491.52 GWh by 2020 (baseline 2013: 7,530 GWh)</p> <p>459,734 tons CO<sub>2</sub> equivalent per annum of emission avoided as certified on the cross-border CDM by 2020</p>	<p>DGPC audited financial accounts and annual reports</p> <p>CDM project design document and monitoring reports</p>	<p><b>Assumption</b> The downstream Mangdechhu plant substation to supply generated power is operating before 2020.</p>
<p><b>Outputs</b> 1. Hydropower plant constructed</p> <p>2. DGPC and THyE project management and implementation capacity enhanced</p>	<p>118 MW run-of-river Nikachhu hydropower plant constructed through PPP by 2019</p> <p>18.6 km of 132 kV transmission line to evacuate to the grid system constructed by 2019</p> <p>DGPC's equity financing requirement raised through PPP by 2015</p> <p>THyE's and DGPC safeguard implementation and monitoring system in place by 2015</p> <p>Commercial weaving training provided to at least for 25 women under</p>	<p>DGPC quarterly project progress reports</p> <p>DGPC quarterly project progress reports</p> <p>THyE audited financial accounts and annual reports</p> <p>Safeguard monitoring reports</p> <p>Safeguard monitoring reports</p>	<p><b>Assumptions</b> Cofinancing from Indian commercial banks is available on time.</p> <p>DGPC mobilizes its counterpart funds and private partner's equity.</p> <p><b>Risks</b> Prices of construction materials increase more than provisioned.</p> <p>Natural disaster and geological conditions cause unexpected construction delays during implementation.</p>

Design Summary	Performance Targets and Indicators with Baselines	Data Sources and Reporting Mechanisms	Assumptions and Risks
3. Hydropower development and trading framework improved	<p>community development programs by 2019</p> <p>Study of functional segregation of transmission and distribution, system operation, and power trading of power entities submitted to the government by 2017</p> <p>Existing hydropower policy improvement and draft tariff policy finalized by the government by 2017</p>	<p>Assessment of unbundling of BPC distribution, transmission, and system operations</p> <p>Final documents of revised Sustainable Hydropower Development Policy, 2008 and Tariff Policy</p>	
<p><b>Activities with Milestones</b></p> <p><b>1. Hydropower plant constructed</b></p> <p>1.1 Procure 118 MW hydropower plant; float bid by Q4 2014, and award contract by the Q2 2015</p> <p>1.2 Acquire land and develop the site, including access roads, by Q2 2015</p> <p>1.3 Procure 132 kV transmission line; float bid and award contract by Q3 2016</p> <p>1.4 Full commissioning of 132 kV transmission line by Q4 2018</p> <p>1.5 Full commissioning of 118 MW hydropower plant by Q4 2019</p> <p><b>2. THyE project management and implementation capacity enhanced</b></p> <p>2.1 Start the selection process for a private joint venture partner by Q3 2014</p> <p>2.2 Complete the selection process for a private joint venture partner and sign a shareholders agreement by Q4 2015</p> <p>2.3 Conduct programs included in the EIA, EMP, and resettlement plan by 2020 and monitor thereafter</p> <p><b>3. Hydropower development and trading framework improved</b></p> <p>3.1 Assess revisions of the Hydropower Development Policy (2008) by Q4 2015</p> <p>3.2 Assess a draft tariff policy paper by Q4 2016</p> <p>3.3 Submit an assessment report of the sector's functional unbundling of BPC's distribution, transmission, system operations, and trading by Q1 2017</p>			<p><b>Inputs</b></p> <p><b>ADB Loans:</b> \$95.25 million</p> <p><b>ADB Grant:</b> \$25.25 million</p> <p><b>Cofinancier:</b> \$58.82 million</p> <p><b>DGPC:</b> \$18.86 million</p> <p><b>ADB Technical Assistance Grant:</b> \$1.00 million</p>

ADB = Asian Development Bank, BPC = Bhutan Power Corporation, CDM = Clean Development Mechanism, DGPC = Druk Green Power Corporation, EIA = environment impact assessment, EMP = environment management plan, GWh = gigawatt-hour, km = kilometer, kV = kilovolt, MW = megawatt, PPP = public-private partnership, Q = quarter, THyE = Tangsibji Hydro Energy.

<sup>a</sup> In a conservative manner, this accounts for the projects, including the Bunakha, Chamkacchu I, Kholongchhu, Mangdechhu, Nikachhu, Punatsangchhu I and II, and Wangchhu.

<sup>b</sup> Estimated on projected generation capacity and domestic demand in 2025.

Source: Asian Development Bank.

**LIST OF LINKED DOCUMENTS**

<http://adb.org/Documents/RRPs/?id=44444-013-3>

1. Financing Agreement: Special Operations
2. Loan Agreement: Ordinary Operations
3. Guarantee Agreement
4. Project Agreement
5. Sector Assessment (Summary): Energy
6. Project Administration Manual
7. Contribution to the ADB Results Framework
8. Development Coordination
9. Attached Technical Assistance
10. Financial Analysis
11. Economic Analysis
12. Country Economic Indicators
13. Summary Poverty Reduction and Social Strategy
14. Environmental Impact Assessment: Hydropower Plant Component
15. Environmental Impact Assessment: Transmission Component
16. Resettlement Plan
17. Risk Assessment and Risk Management Plan

**Supplementary Documents**

18. Financing Structure
19. Debt Sustainability Assessment
20. Currency Risk Assessment
21. Climate Change Impact Assessment
22. Financial Management Assessment