

**Attracting Private Investment to Hydropower Infrastructure
Projects in Tajikistan using a Public-Private Partnership Scheme**

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CERTIFICATION

I certify that this thesis titled, “Attracting private investments to hydropower infrastructure projects in Tajikistan by using Public-Private Partnership scheme” is my individual work under the supervision of Professor TSUKADA Shunso. Therefore, I have acknowledged all the sources that I used by following appropriate referencing method.

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LIST OF ABBREVIATION

PPP	Public-private partnership
BOT	Build Operate Transfer
BOOT	Build Operate Own Transfer
SPV	Special Purpose Vehicle
WACC	Weighted Average Cost of Capital
Equity IRR	Equity Internal Rate of Return
FIRR	Financial Internal Rate of Return
NPV	Net Present Value
PEC	Pamir Energy Company
PEP	Pamir Energy Project
NTPC	Nam Theun 2 Power Company
NT2	Nam Theun 2 Hydropower Project
GoT	Government of Tajikistan
GOL	Government of Laos
GBAO	Gorno Badakhshan Autonomous Oblast
EGAT	Electricity Generating Authority of Thailand
EDL	Electricity du Laos
ADB	Asian Development Bank
WB	World Bank
IDA	International Development Association
MIGA	Multilateral Investment Guarantee Agency
IFC	International Finance Cooperation
EIB	European Investment Bank
AKFED	Agha Khan Fund for Economic Development
MLA	Multilateral Agencies
IFIs	International Financial Institutions
ECAs	Export Credit Agencies
HPP	Hydropower Plant
IPP	Independent Power Producer
PPA	Power Purchase Agreement
CASAREM	Central Asia-South Asia Regional Electricity Market
USD	US dollar

TJS	Tajik somoni
THB	Thai baht
E&S	Environment and Social
O&M	Operation and maintenance cost
CAPEX	Capital expenditure

ABSTRACT

Water resources are abundant in Tajikistan. Tajikistan has great potential of hydropower generation. It is on the 8th place of possessing hydropower reserves in the world. Meanwhile Tajikistan households suffer from electricity shortages every year during autumn and winter seasons. Electricity deficit caused negative effect on environment, public health and people life condition. It led to more usage of traditional biomass fuels, such as wood, animal dung, crop wastes and coal by residents for heating and cooking. Thus deforestation process has increased, indoor air pollution related diseases spread, people life condition, children and women education declined. The reasons for power deficit are lowered generation capacities, depreciated hydropower infrastructure, faulty metering and billing system and accounting and financial flaw in hydropower system. In 2013 Tajikistan undertook PPP path to bring private expertise and finance for improving hydropower sector, constructing new generation capacities, hydropower facilities, rehabilitation of existing hydropower infrastructure and thus eliminating power deficit. The aim of this research is to learn and investigate the successful way of PPP application and efficient implementation of PPP projects in hydropower sector of Tajikistan. This research achieved those aims through an extensive study of relevant literatures and case studies of Nam Theun 2 Hydropower Project in Laos and Pamir Energy Project in Tajikistan. The case studies were analyzed in a systematic manner quantitatively and qualitatively. The analysis of projects' cash flow, financial structure, sensitivity and survey of project documents and reports has been carried out. This research produced a number of key findings: NT2 Project was successful because of robust financial structure, financing of the Project was 69% by debt and 31% by equity; 34% of debt was ensured by guarantee facilities from ADB, MIGA, IDA and ECAs, 16% of debt was provided by Multilateral and Bilateral Institutions, such as Proparco, AFD, NIB, ADB and Thai EXI and 50% of debt was mobilized from seven Thai commercial banks in Thai Baht denomination; 59.8% of the Project financing was arranged in foreign exchange and 40.2% in local currency that hedged the project from exchange rate risk; the Project keep viable even if its debt-equity ratio decrease by 29% (40/60 ratio), CAPEX by 15% and O&M cost by 140%; Pamir Energy Project's CAPEX and O&M cost are more sensitive, more than 11% increase in CAPEX and 18% in O&M make the Project unviable; however decrease in debt/equity ratio can be more significant, 32% decline or 23/77 ratio is the threshold; inclusion of USD 10 million IDA concessional loan and USD 5 million Swiss grant in financial structure made the PEP sustainable; additional fund was decided to allocate for tariff subsidy program from revenue generated from interest rate spread of IDA on-lent loan; it ensured enough cash stream for the

project; tariff subsidy scheme made the generated electricity available for poor households in GBAO region of Tajikistan. The main conclusions to be drawn from this research work are that in order the PPP scheme to be successfully applied in hydropower sector in Tajikistan the hydropower sector needs to be financially sustainable, the hydropower project to be financially viable, the financial structure of project to be robust and households' payment capability to be enhanced and supported; the PPP project in hydropower sector in Tajikistan has to be implemented in an environmental and social sustainable, efficient way by undertaking comprehensive impact mitigation measures and assuring transparency in project implementation. This thesis recommends that in order the financial viability and sustainability of a PPP project in hydropower sector in Tajikistan to be improved development partners, donors or public sector should provide concessional loan and subsidy to the project; the hydropower sector reform must be successfully completed in Tajikistan in order to bring competition, transparency, efficiency and financial sustainability in the sector; creation of the regional electricity market and power trade between Central Asian and South Asian states must be intensified.

Keywords: *PPP, hydropower sector, NT2, PEC, financial viability, S&E impact, IFIs, ECAs*

CHAPTER 1. INTRODUCTION

1.1 Background

The Republic of Tajikistan, former Soviet Republics is a mountainous landlocked country in Central Asia. Mountains occupy 93% of its territory and only 7% of the territory is arable land. Tajikistan is neighboring in the west with Uzbekistan (910 km), in the south with Afghanistan (1030 km), in the north with Kyrgyzstan (630 km) and in the east with China (430 km) (Oliya Maxudova, 2014). The climate of Tajikistan is continental. Tajikistan is rich of water resources originating from glaciers, lakes, rivers in the mountains. There are 947 rivers with total length of 28500 km within the territory of Tajikistan. Tajikistan is among top 10 countries with largest hydropower potential in the world. Its general potential reserves are 527 billion kWh per year; 4 % of the world hydropower potential is possessed by Tajikistan (Ministry of foreign affairs of the Republic of Tajikistan, 2016). More than 90% of the electricity in Tajikistan is generated by hydropower stations. (UNDP, 2012). Hydropower plants produce cheap source of energy, but they constantly need modernization and rehabilitation.

Despite possessing great potential of hydropower generation residents of Tajikistan suffer from electricity shortage during autumn and winter seasons. Deficit of electricity amounts 4-4.5 billion kWh in autumn and winter months. There are several reasons for deficit of electricity in cold seasons. At first, power generation at the main hydropower plants drop in autumn, winter seasons. According to ADB electricity generation drops by 30% or 1250 MW during winter in Tajikistan (2013). It is caused by decreasing water flow in rivers. Secondly, electricity consumption by residents increases in winter. There is no alternative source of energy for people and opportunity to import electricity from energy-rich neighbors. So, households use electricity energy for lighting, heating and cooking. Therefore demand for electricity increases, and supply cannot meet the demand. At third, most generated power is lost in the transmission and distribution lines due to technical and commercial reasons. Officially the level of losses in the grids is considered to be 20%, but unofficially it is quite high 40-50% (Media Group "Asia-plus", 2016). Losses related to technical reasons occur due to depreciated hydropower equipment, transmission lines and substations. The hydropower facilities were built in Soviet Union periods and they are more than 30 years old. Major hydropower plants were constructed 45-50 years ago and they haven't been rehabilitated in major so far. They are in urgent need for rehabilitation. Commercial related losses are associated with issues of faulty metering and billing system, electricity theft, accounting and financial flaw in electricity utility Barqi Tojik.

Electricity deficit in the country made people of Tajikistan especially in rural areas to use traditional biomass fuels (wood, animal dung, crop wastes) and coal for heating and cooking. People action of cutting trees for heating in rural Tajikistan led to deforestation. Nowadays people even cannot find the wood. Forest fields have significantly declined. According to the World Health Organization (WHO) data 48.42% of cooking fuels in rural area of Tajikistan is solid fuel (World Health Organization, 2010). Usage of solid fuel not only damaged environment but it also had great impact on public health. Indoor air pollution led to increase of such kind of diseases as acute lower respiratory infections, chronic obstructive pulmonary disease, lung cancer, asthma, tuberculosis and other illnesses. Several thousand of people die because of the diseases caused by indoor air pollution in Tajikistan every year. According WHO report in 2004 – 3300 people died because of indoor air pollution in Tajikistan (World Health Organization, 2004).

Furthermore electricity shortage in Tajikistan increased poverty and gender problems. Lack of fuel resources made poor households to spend their income on purchase of solid fuels. In this situation women and children suffer mostly. As most Tajik men go to Russia for labor migration women and children in rural areas have to spend their time for collecting fuels. As a result they lose opportunity to get education and thus remain illiterate. Therefore Tajik households need reliable and clean energy for their daily life. Reliable and clean energy is crucial for improving living environment, public health, gender issues and poverty reduction. In the circumstances of Tajikistan such kind of clean, reliable and affordable energy might be only hydropower because of its abundance. Development of hydropower sector in a sustainable manner can solve problem of electricity deficit and its effects for households in Tajikistan without bad circumstances for the environment and society. Moreover Tajikistan can earn foreign exchange for its social and economic development programs by selling its electricity to external markets.

For development of hydropower sector in Tajikistan private investments are needed. One of the effective ways of attracting private investments is Public-private partnership or PPP scheme. According to ADB definition PPP describes relationship between public and private entities in regard to providing infrastructure or other services (ADB, 2007). In PPP all tasks, obligations, risks of the project are allocated between public and private sectors. The mechanism of PPP is adopted for attracting private capital investment, increase efficiency and effective use of scarce resources; improve sectors by reallocating the role of public entity to private. The last decades the private sector participation in implementing infrastructure projects has increased in developing countries (ADB, 2007).

The last four years Tajikistan has made good progress on development of PPP mechanism in the country. The legal and institutional framework has been set up for delivering infrastructure projects through PPP scheme. Firstly Law on PPP was adopted in 2012 which provides legal basis

for implementing PPP projects; it stipulates all procedures for project implementations, interests of public and private sectors. Later in 2013 the PPP Center was established under the State Committee on Investments and State Property Management of Tajikistan. At the same year the PPP Council was established that is the key decision making body in PPP cycle. Also the focal points were identified in each government agencies. They promote PPP in their relevant sectors, propose, prepare and develop PPP projects. So far 8 sessions of the PPP Council has been held and 13 PPP projects were considered. Only 2 projects have been approved by the Council to implement through PPP scheme. They are Project Construction of power lines in the Free Economic Zone "Dangara" and Project Reconstruction and Management of the Kindergarten №133 in Dushanbe city.

1.2 Research Objectives

General

- Find the successful way of applying PPP scheme in hydropower sector of Tajikistan
- Explore the efficient method of implementing PPP projects in hydropower sector of Tajikistan
- Analyze the case studies of Pamir Energy Project and Nam Theun 2 Hydropower Project and drawing lessons from their experience for Tajikistan

Specific

- Analyze financial viability of the PPP projects
- Conduct projects' cash flow analysis
- Assess impact of IFIs' involvement in financial structure of PPP projects on improvement of projects bankability
- Examine current situation of hydropower sector and PPP arrangement in Tajikistan

1.3 Research questions

- How Government of Tajikistan could improve its PPP policy and performance in hydropower sector?
- What knowledge, lessons can the case of Pamir Energy Project give to Tajikistan?
- How can experience of NT2 Hydropower Project in Lao PDR be important for development of hydropower projects in Tajikistan through PPP scheme?

Sub questions:

- How the financial structure of PPP project should be arranged?

- By what means to improve bankability, financial viability and sustainability of PPP projects?
- What challenges and constraints can PPP projects face during implementation?
- How to mitigate the risks of the projects?

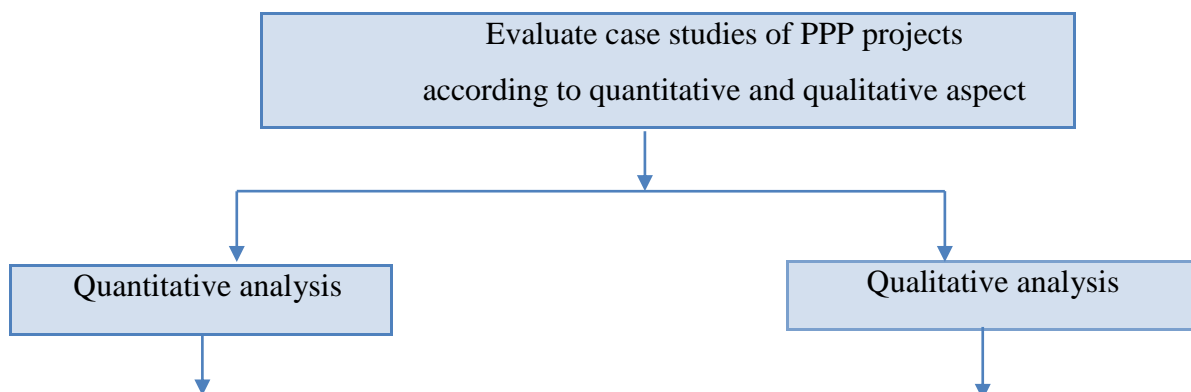
1.4 Significance of the study

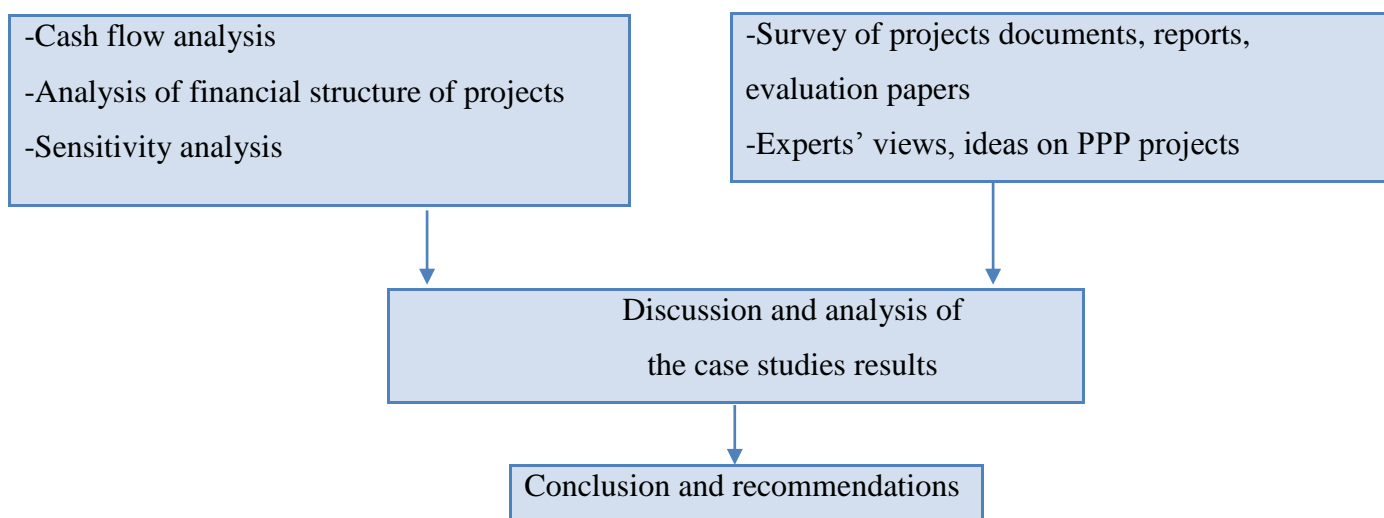
The outcomes of this research will be significant for successful applying PPP scheme in hydropower sector. It will enable efficient development of hydropower projects in Tajikistan through PPP scheme. The results of this research will contribute to the development of PPP scheme in hydropower sector research field. The benefit for the society of Tajikistan will be a reliable and sustainable power.

1.5 Research Method

This research has been carried out by case study research method. With objective to find successful and efficient way of implementing PPP project in hydropower sector of Tajikistan the cases of Nam Theun 2 Hydropower Project in Lao PDR and Pamir Energy Project in Tajikistan have been studied. The cases of 2 PPP projects were analyzed in systematic manner qualitatively and quantitatively. The quantitative aspect of the research includes cash flow analysis of the projects, analysis of financial structure of the projects and sensitivity analysis. In qualitative method the survey of project documents, reports, evaluation and assessment papers has been conducted (see Table 1).

Figure 1.1 Research implementation process





1.6 Limitation of the Study

The information on financial performance of Nam Theun 2 Project during operating period was in limited access. Actual financial data was not available on website of the Company. The researcher sent request to the NTPC for getting financial data, but the Company didn't provide data due to confidentiality matters. Despite that the research has been conducted based on the available data on websites of IFIs. The researcher analyzed financial performance, cash flow stream of the project based on forecasted data from project appraisal documents available on websites of WB and ADB. Some data has been built by the researcher based on the available information. Furthermore, this research considerably depends on secondary sources, such as books, reports, journals, newspaper, and internet. The researcher's lack of experience in conducting such kind of research was also a limitation of the research. Nevertheless, in spite of all the constraints, I wish this research will have contribution for successful and effective implementation of PPP projects in hydropower sector of Tajikistan.

1.7 Organization of the Thesis

This thesis consists of eight chapters. Chapter one gives brief introduction to hydropower sector and PPP arrangement in Tajikistan. Chapter two reviews the available past literatures on PPP, its concept, rationale for PPP, models and organization of financial structure of PPP projects. In Chapter three the overview of hydropower sector of Tajikistan is given. It explains the current situation of Tajikistan hydropower sector, its challenges, development opportunities and perspectives. Chapter four explains how PPP scheme is arranged in Tajikistan. The legal and institutional framework, PPP procedure and recent trends in PPP are presented. In chapter five detailed description and analysis of case study 1 Pamir Energy Project is presented from start to

present. Chapter six comprehensively analyzes the case of Nam Theun 2 Hydropower Project. The financial and contractual arrangement, social and environmental issues and their solution were studied in detail. Chapter seven discusses and evaluates the results of the case studies. Finally, in chapter eight a conclusion is drawn from analysis of case studies Nam Theun 2 Project and Pamir Energy Project and reviewing past literatures on PPP and hydropower sector in Tajikistan and policy recommendation is presented.

CHAPTER 2. LITERATURE REVIEW

2.1 The concept and definition of PPP

Public private partnership (PPP) is defined in various ways in different literature. One of the literature defines PPP as “a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance” by the PPP Knowledge Lab (World Bank, 2016). ADB (2007) describes PPP as a series of relationships between public and private bodies for the provision of infrastructure and other services. In other words, in a PPP arrangement, the public partners are government entities, i.e. ministries, state agencies, committees and departments. The private sector is represented by business entities, investors and non-governmental organizations. In PPP, the public and private partners share tasks, obligations and risks in an appropriate way (ADB, 2007). Yong (2010) defines PPP as a long-term contractual arrangement among public and private entities for public service provision, in which, unlike in purely private projects, risks are essentially shared between the two parties. The success of PPP depends on proper allocation of the risks. Therefore, the risk in a PPP project should be assigned to whichever partner can manage it in the best way.

The German Federal Department of Transportation, Construction and Real Estate gives the following definition of PPP:

“The term PPP refers to a long-term, contractually regulated cooperation between the public and private sector for the efficient fulfillment of public tasks in combining the necessary resources (e.g. know-how, operational funds, capital personnel) of the partners and distributing existing project risks appropriately according to the risk management competence of the project partners” (cited in Alfen et al., 2009).

In PPP, the private sector performs the public sector’s tasks for a certain period by taking all of the risks. The role of the public sector is limited to control over the performance of those tasks. The private sector has to manage the public facilities efficiently and gain return on its investments until the date of the end of the contract. To earn revenue, the private entity is given authority to charge for its services within the PPP contract. Thus, in a PPP arrangement each party has its own aims. The public sector pursues its socio-economic aims to provide high quality and affordable services to society and the private sector aims to earn high profits from its investments.

2.2 Rationale for PPP

Previous studies indicate that governments around the world select PPP for certain benefits that the model provides. First, the private sector possesses huge and available financial resources, while the public sector has an infrastructure gaps and budget constraints. Therefore, the public sector attracts private investments through PPP for infrastructure development. Yong (2010) stated that access to capital in the private sector is the main reason why most governments give their support to PPP. He also said that choosing PPP only to raise finance for infrastructure projects would be wrong; PPP can offer other, more important benefits such as value for money, and improved service quality and efficiency. PPP is encouraged not only by governments with budget constraints, but also by advanced states, which adopt PPP to benefit from efficiency, high quality services and innovation.

The next rationale for PPP is value for money. The private sector has more expertise and innovative ideas, and works more efficiently than the public sector. In PPP, most project risks are transferred to the private sector, so the private partner uses its expertise to reduce project risks and costs, and complete construction work on time and without cost overruns. According to ADB (2007), the private sector operator is motivated to increase efficiency in an infrastructure project, compared with the public sector, which has no incentive for efficiency. The private sector is incentivized to increase efficiency because its profit maximization mainly depends on increased efficiency of investment and operation. Improving efficiency also ensures sustainability and affordability of services for customers. ADB (2007) believes that this path will reduce government fiscal constraints and result in high quality and cheaper services for customers only if the PPP is well structured and properly implemented. Similarly, Yong (2010) argued that the PPP framework does not always bring about value for money or increase efficiency in infrastructure projects, and it may increase governments' costs of borrowing to insure investment returns. He believes that the correct qualified private partner should be selected in a competitive bidding process, and that proper incentives should be provided to the private sector for delivering the necessary efficiency gains.

Another rationale for PPP is that the private sector brings innovation and higher quality services. The private sector has skilled specialists who can bring new ideas and create new technologies for improving efficiency and service quality. According to Yescombe, "PPPs give private-sector bidders the opportunity to come up with a variety of different solutions, and so give the public sector the benefit of innovatory approaches, whether in design of the Facility or the method of delivering the service. This is linked to a key feature of PPPs, namely that the Public Authority usually specifies outputs rather than inputs when calling for private-sector bids – in other words the Public Authority specifies what is required, e.g. in terms of Facilities and service, but not how the service is to be delivered. Service Fees are then only made if output specifications are met.

It is the greater flexibility of output specifications which gives bidders the opportunity to come up with innovatory solutions” (Yescombe, 2007). Moreover, governments encourage PPP because it offers an opportunity to transfer skills and experience from the private sector to the public sector. Private sector involvement in PPP projects brings certain benefits to the public sector. The PPP Unit of South Africa (2007) stated that by engaging the private sector, the procuring institution benefits from skills relating to developing and upgrading infrastructure, project management, contract management and service provision (PPP Unit of the Department National Treasury of the Republic of South Africa, 2007). Therefore, the public sector specialists’ skills in delivering infrastructure projects will be improved.

2.3 PPP models/arrangements

According to literature, there are different kinds of PPP models, and each PPP model has its own structure and form. Yong (2010) stated that PPP arrangements are distinguished by two main factors: a) the degree to which risk is spread out between the public and private sectors and b) the contract tenure. In the core PPP arrangement, a substantial amount of the risk is transferred to the private sector. Therefore, core PPP models tend to be long-term so that the private sector can obtain returns on its investments within the contract term (Table 2.1).

Table 2.1. PPP models in infrastructure and their key features.

	Type of Model	Description	Level of risk for private sector	Contract tenure (# of years)	Capital Investment	Asset Ownership	Most common sector in developing countries
	Service contract	Contract for infrastructure support services such as billing	Low	1-3	Public	Public	-Water utilities -Railway services
Broad definition of PPPs	Management contract	Contract for management of a part/whole of the operations	Low/medium	2-5	Public	Public	-Water utilities
	Lease contract	Contract for management of operations and specific	Medium	10-15	Public	Public/private	-Water sector

			renewals					
Core PPPs	Build-operate-transfer contract	Contract for investment in and operation of a specific component of the infrastructure service	High	Varies	Private	Public/private	-Energy sector IPPs -Highways -Sanitations / desalination plants	
	Concession	Contract for financing and operations and execution of specific investments	High	25-30	Private	Public/private	-Airports/ports/rail -Energy networks	
	Divestiture/privatization	Contract of transfer of ownership of public infrastructure to the private sector	Complete	Indefinite	Private	Private	-Telecoms	

Source: (Yong, 2010)

According to Alfen (2009), many PPP arrangements are classified according to their privatization path; this can be formal, material or functional privatization (Alfen, 2009 in Karim 2012). The difference between these paths is in the duration of ownership. In the material path, the private sector ownership of the public facility is permanent, and in the functional path it is for a predetermined and mutually agreed time frame (Karim, 2012) (Table 2.2).

Table 2.2. PPP models

PPP [functional]		PPP [material]	
(D)BOT	(Design) Build (Finance) Operate Transfer Concession Model	(D)BOO	(Design) Build (Finance) Operate Own
(D)BOOT	(Design) Build Operate Own Transfer	BDBOO	Buy Design Build Operate Own
DBFO(T)	Design Build Finance Operate (Transfer) Availability Payments Model	DBROO	Design Build Rent Operate Own
(D)BOOT	(Design) Build Operate Own Transfer		
DBLOT	Design Build Lease Operate Transfer		
DBROT	Design Build Rent Operate Transfer Contracting Model		

Source: (Karim, 2012)

Cangiano M. (2006) discussed the basic features of PPP forms, and stated that under a typical PPP model of design-build-finance-operate (DBFO), the private sector provides services to the public sector in accordance with the requirements of the public sector: the private entity designs and builds a public asset, finances its construction, and operates the asset. By using the DBFO model, the government aims to gain efficiency in service delivery. Under the build-operate-transfer (BOT) model, the private partner builds and operates the asset, then transfers the asset to the public sector at the end of the operating contract. BOT is the most commonly used type of PPP. BOT and BOOT (build-own-operate-transfer) are similar schemes. Design-build-finance-operate (DBFO) is another form of PPP where the private sector takes responsibility for designing, constructing and financing the public asset, and the asset is transferred to the government after the end of the operating contract (Karim, 2012). Similarly, in the private finance initiative (PFI) model, the private sector is responsible for designing, constructing and operating the public facility and the public sector is obliged to pay the private partner for the service derived from the facility. In this model, ownership is also transferred to the public sector at the end of contract period (Quium, 2011). Figure 2.1 explains the basic features of PPP schemes.

Schemes	Modalities
Build-own-operate (BOO) Build-develop-operate (BDO) Design-construct-manage-finance (DCMF)	The private sector designs, builds, owns, develops, operates, and manages an asset with no obligation to transfer ownership to the government. These are variants of design-build-finance-operate (DBFO) schemes.
Buy-build-operate (BBO) Lease-develop-operate (LDO) Wrap-around addition (WAA)	The private sector buys or leases an existing asset from the government; renovates, modernizes, and/or expands it; and then operates the asset, again with no obligation to transfer ownership back to the government.
Build-operate-transfer (BOT) Build-own-operate-transfer (BOOT) Build-rent-own-transfer (BROT) Build-lease-operate-transfer (BLOT) Build-transfer-operate (BTO)	The private sector designs and builds an asset, operates it, and then transfers it to the government when the operating contract ends, or at some other prespecified time. The private sector partner may subsequently rent or lease the asset from the government.

Figure 2.1. PPP schemes and modalities

Source: (Cangiano, 2006)

The Canadian Council for Public–Private Partnerships discussed another approach to defining PPP arrangements, which uses privatization degree and risk allocation (cited by Karim, 2012). According to this approach, each PPP scheme is defined by a mixture of privatization level and the extent of risk allocated to the private sector (Figure 2.2).

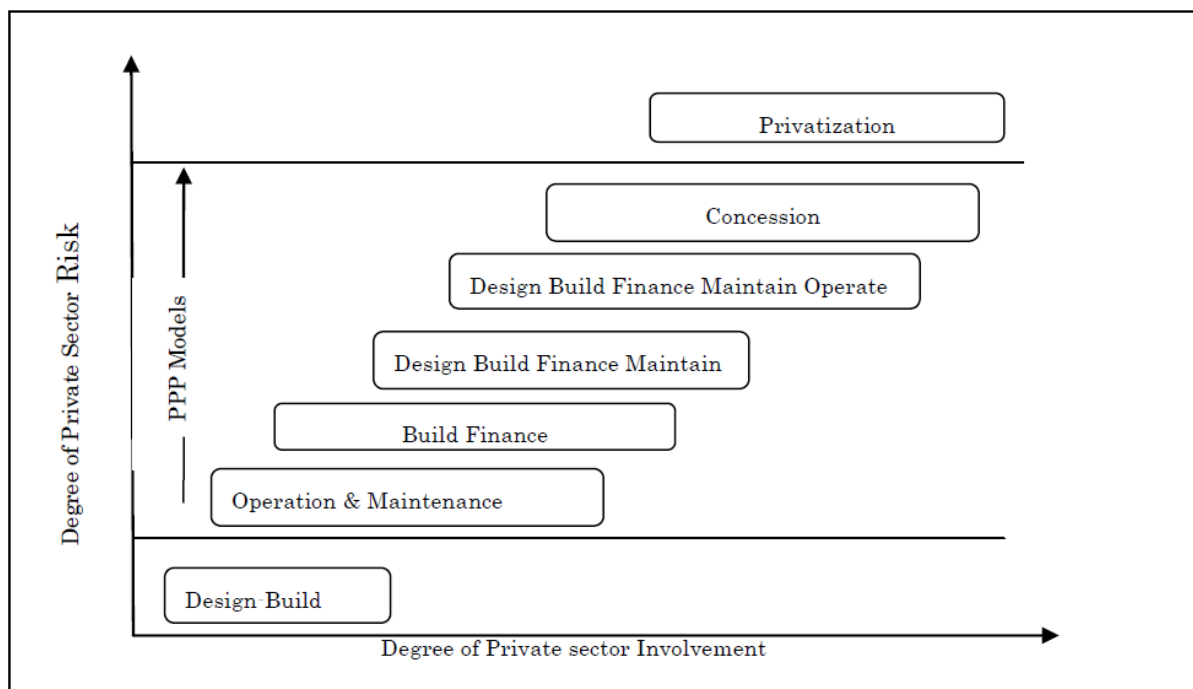


Figure 2.2. Forms of PPP arrangement according to degree of privatization and risk allocation to the private sector

Source: (Karim, 2012)

2.4 The financial structure of a PPP project

The financial structure of a PPP project consists of two units: equity and debt. The PPP project is financed by a mixture of equity and debt. The equity finance is provided by project shareholders. Project contractors, Operation and maintenance (O&M) operators and suppliers may also become equity providers. Equity financiers bear more loss in the project than lenders. They obtain their returns after the debt payment and all other payments. The risk for equity holders is the highest in the project; therefore, they expect higher returns (Malini, 2016). Unlike equity, project debt has the highest priority with regard to claims on the project assets. There are two types of debt provided to the project: senior debt and subordinated debt. Senior debt has a higher priority level for repayment; subordinated debt is ranked below the senior loan in terms of claims on assets. In the case of project failure, subordinated debt is paid after the senior debt is fully paid out. Senior debt is usually provided by commercial banks and financial institutions. In accordance with the level of risk, the provider of the subordinated debt expects a higher return and the provider of senior debt requires a lower rate. Mezzanine debt is another highest-risk debt, which complements subordinated debt. It is the most expensive type of debt. Project sponsors attract mezzanine loans to fill equity finance gaps or short-term financial shortages (Investopedia, 2016). The cost of capital (equity and debt) is significant in the financial structure of a PPP project. The viability of a PPP project mostly depends on reducing this cost. For project financiers, it is crucial to reduce the cost of capital. Reduction in the cost of capital can be assured by selecting the optimal financial structure for the project as well as finding cheap sources of finance.

The project sponsors establish a special purpose vehicle (SPV) or project company for managing and operating a PPP project. The SPV makes deals with many parties: sponsors and financiers, government agencies, construction contractors, O & M operators, off-takers, insurers and guarantors (Chowdhury, & et al., 2012). Funds for the PPP project are raised through the SPV, and it plays the central role in the financial structure of PPP (Figure 2.3). The SPV raises funds for the project financing against the project cash flow; it pays for debt and investors' dividends from the project revenue. The revenue of the project is generated from the fees charged for the service provided to either the public sector or civilians. PPP project finance is considered nonrecourse finance, which means that payment for debt comes from the project's profit, not from the asset. Therefore, sponsors should be assured that the project generates enough cash flow to serve debt and provide the required return to investors. An offtake agreement guarantees sponsors that the product or service they produce will be purchased. A credit guarantee facility insures payments to debt providers in case of default.

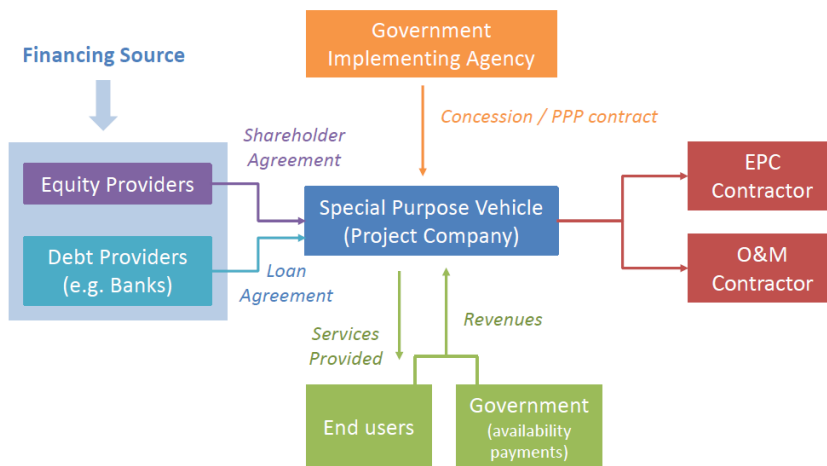


Figure 2.3. Basic PPP structure

Source: (Verougstraete, 2014)

Selecting an optimal debt-equity ratio or level of leverage is important for financing a PPP project. The project is considered highly leveraged when the share of debt is high in the financial structure of the project. The high proportion of debt in the capital structure of the project is favorable for investors because it increases investors' required returns. High leverage can also reduce the project weighted average cost of capital (WACC). Because the cost of debt is lower than the cost of investment, the high debt proportion reduces the project WACC and increases the project bankability (Figure 2.4). Most PPP projects are highly leveraged. However, a highly leveraged project becomes riskier as the default risk increases. As the project becomes riskier, lenders require higher rates. Ultimately, a rising share of debt in the capital structure becomes expensive, and a tradeoff between the cost of debt and equity extends to optimal (APMG International, 2016).

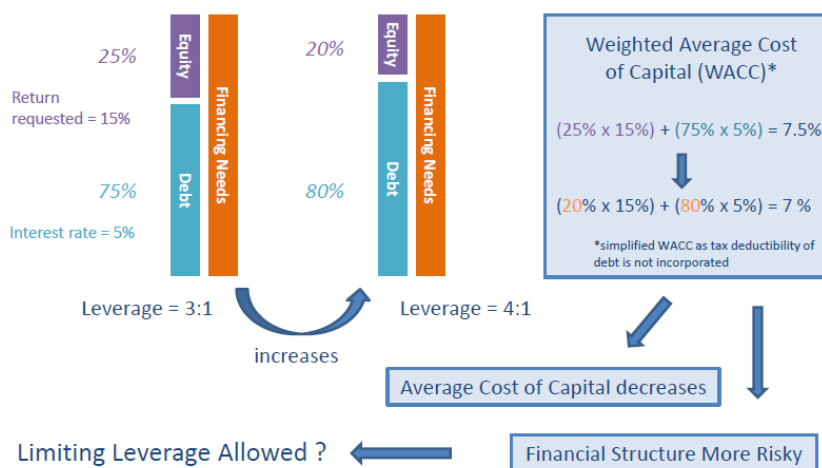


Figure 2.4. Tradeoff between risk, cost and bankability

Source: (Verougstraete, 2014)

The financial structure of PPP projects also includes government support in the form of soft loans, grants and credit enhancement facilities, and international finance institution (IFI) and export credit agency (ECA) credit guarantees, which are guarantees for political, commercial, and contractual risks that are provided to increase the bankability, financial feasibility and affordability of the project. First, governments provide grants or subsidies to projects that have affordability issues. The objective of providing a grant is to support socially and economically sensible infrastructure projects to remain commercially viable. APMG International (2016) explained that viability gap financing is provided to user-pays PPP projects that have substantial externalities and socio-economic benefits. These are mostly road infrastructure projects, bridges and tunnels. Government grants are crucial for these projects and can fill the feasibility gap in the projects. Yong (2010) stated that the affordability issue is an important constraint for PPP infrastructure projects in developing countries. Many people cannot afford high-tariff infrastructure services, especially in rural areas. Therefore, the government or donors provide subsidies in the financial structure of the project or in the form of shadow tolls, revenue guarantees or grants in accordance with the project contract. A good example of the initiation of “viability gap schemes” is in India, where the Viability Gap Fund was set up in 2006 (Yong, 2010). This provides financial support to economically essential projects to help them to remain commercially viable by satisfying their funding gap. An example of the successful use of shadow tolls is seen in the UK PFI projects. Under the PFI model, the private sector provides public services and the public sector makes payments to the private sector according to the contract. However, these schemes cannot be adopted in many developing countries because the governments have budget constraints and they are not able to make revenue payments.

Governments also exempt PPP projects from tax, and import and customs tariffs to boost their bankability. However, government institutions should carefully consider value for money when providing long-term tax exemptions to PPP projects. Providing more tax rebates in later years can decrease the private sector’s incentives for extra capital investment and potential revenue for the public sector (Cuttaree, Vickram; Mandri-Perrott, Cledan, 2011).

Second, national agencies, national development banks and financial institutions provide soft loans to PPP projects with favorable and below-market conditions to reduce the project WACC and improve its commercial viability. APMG International (2016) states that public debt increases the attractiveness of projects to commercial lenders. As an example, it cites the US Transportation Infrastructure Finance and Innovation Act scheme, under which the government provides a

subordinated loan covering up to 30 percent of the project finance. This loan provides advantages and reassurance to the project's private financiers. By providing loans to the project company, the public sector retains part of the project risk. Additional subordinated loans are provided by public departments and procurement agencies to fill feasibility gaps in the projects.

Another significant feature of government involvement in the financial structure of a PPP project is the government's equity participation in the project. APMG International (2016) stated that the purpose of government equity participation in a PPP project is to improve the commercial viability of the project, and thus facilitate private financing of the project. Public sector shareholding in the PPP project may reduce the project cost or increase private equity investors' earnings. For example, the government can give preference in dividends to a private equity partner, or the private party share can be made class A with voting power, while the public party share remains class B without voting power; it possesses only economic rights. There is also a concern that government equity holding in the project may cause concern among private partners because of possible conflicts of interest over control and management of the project, maintenance of information confidentiality, and issues regarding the government being the client and an equity holder at the same time. This might discourage private partners from equity participation in the project. APMG International (2016) suggested that to avoid conflicts of interest, the government should undertake equity participation through a trust fund.

Furthermore, to increase the bankability, commercial viability and affordability of PPP projects, particularly in developing countries, donors and IFIs provide subsidies, soft loans and debt guarantees to the project company. PPP projects in infrastructure need long-term finance. There is a lack of long-term finance in developing countries; therefore, PPP projects are backed by donor funds and IFI loans. IFIs provide loans to the project company on a long-term, low interest rate basis in foreign currency (US dollars or euros). IFIs offer subordinated loans to the project company on a limited-recourse basis to attract senior debt from the private sector. The development finance institutions providing long-term finance to PPP projects in developing countries are IFC, the German investment and development company DEG, and the French development company Proparco. There are also bilateral development banks providing long-term finance, such as the Japan Bank for International Cooperation and the German Development Bank (KfW), and multilateral development banks such as the World Bank, the International Bank for Reconstruction and Development, IDA and the European Investment Bank (EIB) (Yong, 2010).

To enhance the creditworthiness of investments to PPP projects, donors provide guarantee facilities to the project. They provide two main types of guarantee: credit guarantees and political risk guarantees. The credit guarantee facility ensures debt service in the event of default. ADB, the

African Development Bank and IFC mostly provide credit guarantees. Political risk guarantee is provided by WB, ADB, the Multilateral Investment Guarantee Agency (MIGA) and ECAs. The political risk guarantee facility covers investors' and lenders' losses that occur as a result of the political situation in the country. These facilities give the project company access to a long-term debt market with a low interest rate. They also facilitate equity investment for the project at a suitable cost (Yong, 2010). Accordingly, the project cost of capital decreases.

Finally, all of these finance facilities reduce project risks and make cheaper finance available for the project, and thus the project becomes financially robust. The project WACC is reduced, and the project IRR and equity IRR increased. As a result, the project becomes commercially viable and attractive to private investors.

CHAPTER 3. OVERVIEW OF THE HYDROPOWER SECTOR IN TAJIKISTAN

The hydropower sector is considered a priority sector in Tajikistan. Tajikistan has great potential for hydropower generation. The general potential reserves are 527 billion kWh per year, which places the country 8th in the world. Tajikistan possesses 4% of the world's hydropower potential (Ministry of foreign affairs of the Republic of Tajikistan, 2016). Hydropower generates over 90% of the electricity in Tajikistan (UNDP, 2012). The energy system in Tajikistan is divided into two separate parts: a western (main) part and an eastern (Pamir) part. The western part of the energy system is operated by the state-owned enterprise Barqi Tojik, but the eastern part is operated by a private company, Pamir Energy. Major hydropower plants (HPPs) have been built in the Vakhsh river (the largest river in Tajikistan). Around 95% of the electricity in the country is generated from this river (OSC "Sangtuda HPP-1", 2014). The largest HPP currently operating in Tajikistan is Nurek, which has a capacity of 3000 MWt and is owned by the state. The second largest operating HPP is Sangtuda 1, which has an installed capacity of 670 MWt. HPP Sangtuda 1 is jointly owned by the Russian energy company Inter RAO UES (75% ownership) and the government of Tajikistan (25% ownership) (OSC "Sangtuda HPP-1", 2014). Another HPP, Rogun, which will be the country's largest, is currently under construction and will have a capacity of 3600 MW (Table 1). With existing hydropower plants, Tajikistan currently produces 17 billion kWh per year (Geoportal of Tajikistan, 2016).

Table 3.1. Major HPPs in Tajikistan and their capacities

HPPs	Installed capacity, MW	Annual production (million kwt/h) as of 2014	Status (as of January 2015)
Rogun	3600	14 000 project	Under construction
Shurab	850	3 000 project	Feasibility Study is being done
Nurek	3000	13 757 – including some small HPPs	Launched in 1972
Baypazinsk	600		Launched in 1986

"Golovnaya" - Head	240	operated by Barqi Tojik	Launched in 1962
Sangtuda 1	670	1871	Launched in 2008
Sangtuda 2	220	626	Launched in 2011
Qairokkum	126	600-1000	Launched in 1956
Pamir (11 small and medium HPPs)	44	175	Pamir 1-1994, Khorog-1970, Namadgut-1974, Vanj-1968, Ak-Su-1964, Shujand - 1969, Tekharv - 1995, Andarbak-1999, Siponj-1991, Savnob-1989, Qalai-Khumb-1959

Source: OSC "Sangtuda HPP-1", 2014.

Most HPPs in Tajikistan were constructed during Soviet Union times. The state-owned enterprise Barqi Tojik owns most HPPs in the country. It has a monopoly in the country's energy market. It owns all of the grids in the country, except for those in the Pamir area, which are operated by the private company Pamir Energy. HPPs Sangtuda 1 and Sangtuda 2 are the only private power companies operating in the western energy system. Both of these IPPs operate based on a BOT-type contract. According to the contract, HPP Sangtuda 1 will be transferred to the government of Tajikistan in 20 years, and HPP Sangtuda 2 will be transferred after 12.5 years. The electricity generated by both IPPs is sold to Barqi Tojik based on a power purchase agreement (PPA). These companies are unable to sell the electricity that they generate directly to end users because all of the grids are owned by Barqi Tojik.

Table 3.2. Energy market share of companies in Tajikistan.

Enterprise	Annual production (m.kwt/h-2014)	Share of the market (%)	Ownership	Initial Investment (million USD)
Barqi Tojik	13 757	84	100% owned by State	N/A

Sangtuda 1	1 871	11	25% - Tajikistan 75%-Russian Energy Company – Inter RAO UES	720
Sangtuda 2	626	4	18%-Tajikistan 82%-Iran	220
Pamir Energy	175	1	70% - AKFED 30%-IFC	26,4

Source: OSC “Sangtuda HPP-1”, 2014.

3.1 Challenges of the hydropower sector in Tajikistan

The hydropower sector in Tajikistan is currently facing a range of challenges. One of the serious challenges is the electricity deficit that exists in autumn and winter. Despite the country possessing large hydropower potential reserves, 70% of the population suffers from an electricity deficit. The deficit amounts to 4-4.5 billion kWh during autumn and winter. It costs the economy of Tajikistan USD 200 million, or about 3% of GDP, yearly. Households mostly suffer because of a high dependence on electricity in daily life (ADB, 2013). The electricity shortage is due to several factors. First, low hydrology during winter reduces power generation in major HPPs. According to an ADB report, generation capacity decreases by 1250 MW in winter. The amount of energy generated in winter is approximately 70% of that generated in summer (ADB, 2013). Moreover, electricity consumption by residents rises in winter because electricity is the only source of heating during the harsh winters of Tajikistan. The electricity deficit started when Tajikistan was disconnected from the Central Asia Power System in 2009. The Central Asia Power System was developed in Soviet Union times and connected the power grids of five former Soviet republics: Kazakhstan, Turkmenistan, Uzbekistan, Kyrgyzstan and Tajikistan. It allowed Tajikistan to import power from neighboring countries in winter to cover power shortages. Cessation of gas supply by Uzbekistan in 2012 exacerbated the electricity deficit in Tajikistan. Second, losses in the energy system, which comprise both technical and commercial losses, are very high. According to official statistics, the level of loss is 20%, but unofficially it is 40%-50% (Media Group "Asia-plus", 2016). The technical reasons for the power losses are ageing and deteriorating generation, transmission and distribution infrastructure, and the commercial reasons are power theft, improperly working

metering systems, incorrect billing, and financial constraints and poor administration in the electricity utility, Barqi Tojik.

Most HPPs do not operate at full generating capacity because of old age and poor technical conditions. Most of the hydropower infrastructure in the country was constructed during the Soviet Union period. As mentioned in an ADB report, 74% of the generation assets are over 30 years old. Most of the HPPs have been in operation for 45-50 years without major rehabilitation (ADB, 2013). The hydropower infrastructure is in urgent need of rehabilitation. According to one estimate, investments of about USD 1.29 billion would be needed until 2020 to rehabilitate the existing HPPs. Moreover, according to another estimate conducted by the World Bank, 60% of the HPPs need to be rehabilitated by 2020 (at a cost of USD 1.1 billion) and 80% of assets need to be rehabilitated by 2030. Rehabilitation of HPPs is an urgent priority, and without it the available capacity could drop from 2100 MW to 760 MW by 2030 (ADB, 2013).

The next challenge is low electricity tariffs. This issue has created financial distress in the power sector. In general, prices for electricity remain lower than the cost required for full recovery. Low tariffs made the financial situation of Barqi Tojik worse. Different tariffs are applied for various categories of consumers. For example, the second largest power consumer, TALCO, pays a very low tariff of 0.9 US cents per kW/h during the summer, and another category of consumers - industrial and non-industrial - pay the highest tariff, 4.46 US cents (Table 3.3). This scheme of tariff structuring is known as cross-subsidizing tariff methodology. It is created to cover the low payments of one category of consumers at the expense of other consumers. This scheme does not work in the current conditions of electricity loss and theft, improper metering and billing, and corruption in the energy system. Generally, private enterprises and business entities that are supposed to pay the high tariff seek illegal ways of connecting to the electricity service. Electricity tariffs in Tajikistan are the lowest among CIS countries. Therefore, the government of Tajikistan is gradually increasing tariffs for different categories of consumers. In December 2008, the weighted average tariff was increased from 0.6 US cents/kWh to 1.5 US cents/kWh. Later, in 2012, it was further increased to 2 US cents/kWh (a 22% increase for households and a 25% increase for industry), with another 15% tariff increase in 2014 (ADB, 2014). Most recently, a tariff increase of 16.2% (from TJS 0.126 to TJS 0.146) has been implemented for residential consumers; and for water pumping and irrigation stations an increase of 100% (from TJS 0.0255 to TJS 0.051) for the period from April 1 to September 30 and of 53% (from TJS 0.0955 to TJS 0.146) for the period from October 1 to March 31 has been implemented (News Agency "Sputnik", 2016). The government plans to further increase tariffs in the future. According to conservative assumptions, the average billed tariff is to be brought to 4.3 US cents/kWh by 2020. This tariff level will be

sufficient to finance investments in the sector and guarantee Barqi Tojik’s cost-recovery by that time (World Bank, 2014).

Table 3.3. Electricity tariffs and consumption level of different categories of customers in Tajikistan (as of March 1, 2017)

№	Category of consumers	Tajik somoni per KWh	US cent equivalent ¹	Percentage of consumption
1	Residential consumers	0.1465	1.83	37.8%
2	State Unitary Enterprise “Tajik Aluminum Company” or TALCO	-0.0720 – during May-September -0.1180 – during October-April	- 0.90 - 1.47	23%
3	Water pumping and irrigation stations	-0.051 – between April and September; -0.1465 – between October and March	- 0.63 - 1.83	22.8%
4	Industrial and non-industrial consumers	0.3565	4.46	11.8%
5	Government organizations, public utilities and others	0.1465	1.83	4.5%

Note: ¹ Official FX rate from NBT website as of March 1, 2017 - 1 USD = 7.99 TJS

Source: (Decree of the Government of the Republic of Tajikistan on tariffs for usage of electricity and heat, 2016)

The most serious issues in the hydropower sector in Tajikistan are financial constraints and managerial failure in Barqi Tojik, including flawed billing, accounting and financial reporting, low collection rate, and increasing arrears and receivables. The financial position of Barqi Tojik has been badly affected by increasing receivables and reduced collection levels. At the end of 2016, Barqi Tojik’s receivables reached 1577 million somoni (equivalent to USD 197 million). The main debtors of Barqi Tojik are households, which owe 43.4% of receivables; the Agency for Land Utilization and Reclamation, which owes 24.8%; the State Unitary Enterprise of Housing Services and Utilities, which owes 6.7%; farms, which owe 5.2%; and other public and private enterprises, which owe 19.9% (News Agency of Asia-Plus, 2017). A more critical issue remains the increasing arrears of Barqi Tojik (BT), which reached 13 703 million somoni (equivalent to USD 1715 million) as of January 2017. BT mainly owes money to the Ministry of Finance of Tajikistan for interest on on-lent loans attracted from IFIs and bilateral institutions for investment projects in the hydropower sector. BT’s debt to the Ministry of Finance is 11 billion somoni (equivalent to USD 1.376 billion), or 80.3% of the total debt. The remaining 2.703 billion somoni (equivalent to USD 338 million), or 19.7% of the debt, is owed to Orienbank, HPPs Sangtuda 1 and Sangtuda 2, and the Tax Committee. The debt is tending to grow year by year. The reasons for the accumulating debt are, again, huge losses in transmission and distribution lines, improper billing and faulty metering,

low collection rates, and low tariffs. To reduce part of the debt owed by BT to HPP Sangtuda 1, the government of Tajikistan has written off the tax arrears of the IPP. Furthermore, the debt owed by BT to HPP Sangtuda 2 was written off in exchange for extending the concession period for 2 more years. This means that HPP Sangtuda 2 will be transferred to the government of Tajikistan after being utilized by the Iranian Public Company for 14.5 years instead of the original 12.5-year concession period. The problem of financial constraints in Barqi Tojik is complex and a comprehensive solution should be found. Therefore, the government of Tajikistan is currently making capital investments to modernize the hydropower infrastructure, rehabilitate existing HPPs, construct transmission and distribution lines, and install new meters and substations by attracting loans and grants from IFIs, bilateral institutions, donors, development banks and sovereign states. Furthermore, in 2011, the government of Tajikistan adopted a plan to restructure Barqi Tojik. According to this plan, Barqi Tojik should be completely privatized by 2018. It will be unbundled into three main departments: generation, transmission and distribution departments. The privatization plan envisages writing off the bad debts and arrears of Barqi Tojik and freeing it of all financial constraints. It is expected that privatization of Barqi Tojik will improve its management, provide financial and accounting transparency, improve billing systems and increase collection.

3.2 Investment projects in the hydropower sector in Tajikistan

To reduce energy losses, increase billing and collection rates and improve the financial condition of the hydropower sector, the government of Tajikistan has attracted capital investment from various sources, such as IFIs, international development banks, donor organizations and the state budget. Investments are made mainly for rehabilitation of HPPs, construction of transmission and distribution lines and substations, and installation of metering devices, among other things. Eleven investment projects of USD 1267 million are currently being implemented (Table 3.4). Investment projects primarily take the form of loans and grants provided by ADB, WB, EBRD, the European Commission, China Exim Bank, the government of the USA, and DFID, among others. The contribution of the government to these projects is small. These investments are expected to increase the financial stability and sustainability of the hydropower sector by modernizing the hydropower infrastructure, reducing losses, improving billing and collection rates and expanding electricity exports.

The major investment project in the hydropower sector in Tajikistan is the project to construct HPP Rogun. HPP Rogun is a mega project that requires huge capital investment. In 2014, international engineer-consultant companies completed a technical and economic assessment and an assessment of the social and environmental impact of the Rogun HPP Project, funded by the World

Bank. These studies concluded that construction of the Rogun dam is technically and economically feasible and its environmental and social impact can be minimized by careful mitigation measures. The project cost was estimated at USD 4.25 billion or 50% of Tajikistan's GDP in 2013 (Engineer-Consultant Companies of Coyne et Bellier, Electroconsult and IPA, 2014). Therefore, the international consultants warned of the financial and economic risk of the project for Tajikistan if the country self-financed the project. They concluded that Tajikistan would not be capable of implementing Rogun using the country's limited internal funds. To mitigate the financial costs, alternative financing options were recommended, such as organizing an international consortium financing structure, borrowing concessional loans from IFIs or export credit agencies, or issuing bonds. However, the government of Tajikistan is currently financing the construction of HPP Rogun from budget resources. In 2016, approximately 2 billion somoni (equivalent to USD 254 million) was assigned to financing the project; and in 2015 and 2014, 1.6 billion somoni (equivalent to USD 228 million) and 1.34 billion somoni (equivalent to USD 252 million) was allocated for this purpose, respectively. In 2016, the government of Tajikistan signed an agreement with an Italian construction company, Salini Impregilo, which won the international bid for construction of HPP Rogun. In accordance with this agreement, the government of Tajikistan will allocate USD 3.9 billion for the design, equipment purchase and construction of Rogun, to be carried out by the Italian company (Avesta Information Agency, 2016). Completion of HPP Rogun could end the electricity shortage in the country and increase the export of electricity to South Asian states, thus generating high revenue for the public. However, to construct Rogun, large investments are needed, and continuing to finance the project from the state budget is becoming hard in the current difficult economic conditions in Tajikistan.

Although the need for private financing for hydropower projects is high, the flow of private investment into the country is low. From 2007 to 2015, only USD 596.8 million of foreign direct investment was attracted to energy infrastructure projects (State committee on investments and state property management of the Republic of Tajikistan, 2015). As mentioned above, the major privately financed projects in the hydropower sector in Tajikistan are the HPP projects Sangtuda 1, Sangtuda 2 and Pamir Energy. The complex problems that exist in the hydropower sector have decreased the attractiveness of hydropower projects to private investors. Therefore, modernization of the hydropower infrastructure and improvement of the financial sustainability and viability of hydropower projects, along with further tariff increases, are desirable to increase the attractiveness of the hydropower sector to private financiers.

Table 3.4. Current investment projects in the hydropower sector in Tajikistan as of January 1 2016 (thousand USD)

№	Project name	Form of investments	Source of investments	Amount of Investment
1	Nurek 500kV Switchyard Reconstruction Project	Grant	ADB	54 770
		Others*	Others	12 200
		Total		66 970
2	Regional power transmission project	Grant	ADB	110 471,75
		Grant	ADB	11 528
		Total		121 999,75
3	Regar 500 kv Substation Reconstruction Project	Credit	China Exim Bank	35 043,32
		Others	Others	1 844,39
		Total		36 887,71
4	Sarband HPP Rehabilitation Project (capacity – 240 MWt)	Grant	ADB	136 000
5	Ravshan Substation Reconstruction project - 220/35/10kv	Credit	Islamic Development Bank	13 070
		Government	Government	1 450
		Total		14 520
6	Dushanbe-2 combined heat and power (CHP) plant Construction project	Credit	China Exim Bank	152 455,27
		Credit	China Exim Bank	178 969,22
		Government	Government	17 443,40
		Total		348 867,88
7	Wholesale metering and transmission reinforcement project	Grant	ADB	54 000
		Others	Others	13 000
		Total		67 000
8	Cross-border power trading project (CASA-1000)	Credit	Islamic Development Bank	70 000
		Credit	EBRD	110 000
		Credit	EIB	79 000
		Grant	World Bank	45 000
		Grant	USAID	7 500
		Grant	DFID	38 500
		Government	Government	15 000
Total		365 000		
9	Sugd - Energy loss reduction project	Credit	EBRD	10 150
		Credit	EIB	10 141,60
		Grant	European Commission	1 060,31
		Grant	European Commission	8 169,92
		Others	Others	1 450
		Total		30 971,83
10	Power supply in winter project	Credit	World Bank	5 000
11	Qairokkum HPP Rehabilitation Project	Credit	EBRD	50 000
		Credit	EBRD	10 000
		Grant	EBRD	13 932
		Total		73 932,79
Total				1 267 149,96

Source: (State committee on investments and state property management of the Republic of Tajikistan, 2015).

* Other investments include Barqi Tojik and local community shares, exchange rate differentiation, and accumulated interest in banks, among other things.

Institutional arrangement for implementing investment projects in hydropower sector in Tajikistan

Electricity sector is regulated by several institutions in Tajikistan. The main organization responsible for policy guidance and planning in energy sector is the Department of Industry and Energy in the Presidents' Office. Ministry of energy and water resources makes the policy in energy sector and supervises the public electric utility, Barqi Tojik; and Ministry of economic development and trade in coordination with Ministry of energy and water resources and Barqi Tojik develops investment plans for the energy sector. Like in other sectors tariffs in energy sector are regulated and approved by the Antimonopoly Committee in consultation with Ministry of energy and water resources and Department of Industry and Energy in the Presidents' Office.

The investment projects in hydropower sector are implemented only by two organizations: the state owned enterprise "Barqi Tojik" and Project management group for energy facilities construction under the President of Tajikistan. Project implementation monitoring is under supervision of the Ministry of finance and State Committee on investments and state property management. The Ministry of finance and Committee on investments are also responsible for public financing and attracting additional foreign investment to energy sector. Almost all hydropower projects in Tajikistan are financed by credits and grants from IFIs, Bilateral and Multilateral Institutions. Government of Tajikistan attracts funds from IFIs and on-lend it to Barqi Tojik (Figure 3.1).

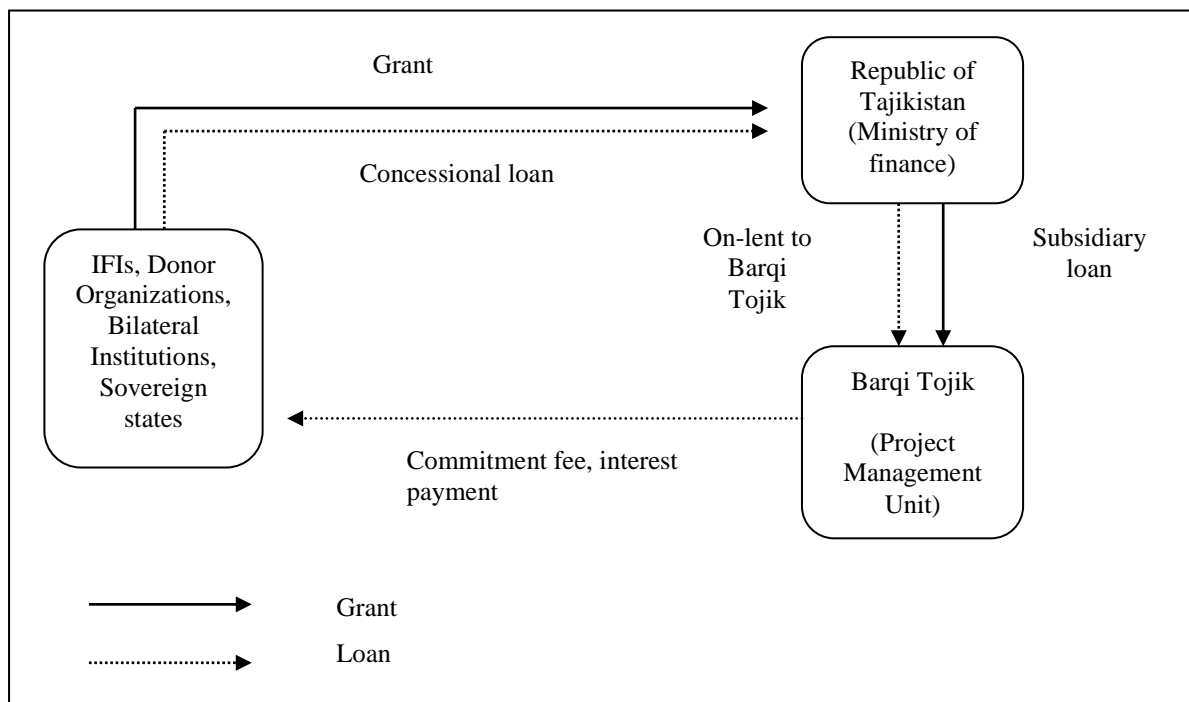


Figure 3.1. Funds flow arrangement to hydropower projects from external sources in Tajikistan.

Source: author modified from (ADB, 2014)

3.3 Electricity export markets and prospects of the hydropower sector in Tajikistan

In spring and summer, Tajikistan's hydropower plants generate more power as the water flow increases in rivers during this time. The electricity surplus during these seasons reaches about 4000 GWh. Currently, the electricity surplus is exported to neighboring Afghanistan, but several years ago, export of electricity to Afghanistan was not possible because sufficient transmission infrastructure did not exist. Therefore, Tajikistan's hydropower plants had to spill water. Every year, Tajikistan lost around USD 200 million because of water spilling (Information Agency "Regnum", 2013). The summer surplus reached 2700 million kWh in April 2009 after HPP Sangtuda 1 was put into operation. Building sufficient infrastructure for exporting surplus power to neighboring countries was necessary. Fortunately, in 2008, ADB provided loans and grants to both Tajikistan and Afghanistan to construct transmission lines and substations, and increase the generation capacity of hydropower plants in both countries to facilitate power trade between the two countries. As a result of the project implementation, 116.6 km of transmission lines, and new transformers and digital meters were constructed and installed in Tajikistan. The generation capacity of the Golovnaya, Centralnaya and Prepadnaya hydropower plants was increased by rehabilitation and dredging works in these power plants. Afterwards, Tajikistan expanded its power exports to Afghanistan. In 2012, the export of power to Afghanistan was 470.5 million kWh; and in

2013 it increased to 791.1 kWh. Power exports reached 1400 million kWh in 2016. Construction of transmission lines enabled power trade between the two countries (ADB, 2014).

Increasing demand and shortages of electricity in South Asian states such as Afghanistan and Pakistan, and electricity surplus and abundance in the Central Asian states of Tajikistan and the Kyrgyz Republic stimulated creation of a regional electricity market in the Central and South Asian region. This gave rise to the CASA-1000 project in 2014. The CASA-1000 project involves the construction of modern and efficient transmission lines between the Kyrgyz Republic, Tajikistan, Afghanistan and Pakistan to transfer electricity surplus from the Kyrgyz Republic and Tajikistan to Afghanistan and Pakistan. It will boost power trade between the four countries and is an important step toward creating a Central Asia-South Asia Regional Electricity Market (CASAREM). The CASA-1000 project comprises construction of a 477-km, 500-kV AC line from Datka (in Kyrgyzstan) to Sugd-500 (in Tajikistan), a 1300-megawatt AC-DC converter station at Sangtuda (in Tajikistan), a 750-km, high-voltage DC line from Sangtuda (in Tajikistan) to Nowshera (in Pakistan), and a 1300-megawatt DC-AC converter station at Nowshera (in Pakistan) (CASA-1000 Project , 2017). The total project cost was estimated at USD 1170 million at appraisal, including USD 921 million total base cost and USD 249 million in contingencies, taxes and interest during construction. The project will be funded by the four participating countries with assistance from IFIs, bilateral institutions and donor organizations. The multilateral and bilateral institutions and donors that provided credit and grants to the participating countries to implement the CASA-1000 project include the World Bank (IDA), the Islamic Development Bank (IsDB), the Arab Coordination Group (including the Saudi Fund for Development, the Kuwait Fund for Arab Economic Development, the Abu Dhabi Fund for Development, and the OPEC Fund for Development), EIB, EBRD, the government of the USA, the Afghanistan Reconstruction Trust Fund and other donors (World Bank, 2014). Each country will cover the cost of the project occurring within its territory. The Tajikistan component of the project costs USD 365 million, and is financed mainly by credit and grants from IsDB, EBRD, EIB, WB, USAID and DFID (Table 3.4). The project is ranked as high-risk mainly because of political instability and security issues in Afghanistan and the north-west part of Pakistan. However, the authorities of the participating countries are highly interested in the project, and pledged to guarantee the security of the project during the implementation and operation stages. The project has a high economic impact for the four countries. The CASA-1000 project is a very important project for Tajikistan in particular. It is a good source of revenue to invest in hydropower infrastructure modernization projects, increase the financial sustainability of the hydropower sector and finance government socio-economic programs. The CASA-1000 project will expand power export opportunities in Tajikistan.

Capital investment to modernize the hydropower infrastructure, rehabilitate hydropower plants, reduce loss, improve billing and collection systems, install new meters, and construct transmission and distribution facilities, along with tariff increases, will improve the financial viability and sustainability of the hydropower sector. Moreover, opening new export markets will increase the incentive to private investors to invest in hydropower projects in Tajikistan. Privatization of the state power utility Barqi Tojik will bring competition, transparency, and good management in the hydropower sector that will ensure the financial stability and viability of the hydropower projects. Therefore, the hydropower sector in Tajikistan has good prospects considering the investment projects being implemented in the sector and the expanding export opportunities of the country.

CHAPTER 4. THE ARRANGEMENT OF PPP IN TAJIKISTAN

Like any other country, Tajikistan pursues development of PPP to mobilize private finance for its infrastructure projects, thus improving the quality of public service delivery and increasing efficiency. Tajikistan's PPP development path started in 2012 when the Law of the Republic of Tajikistan "On PPP" was enacted. The PPP law was drafted with the technical support of WB (IFC) and embraced the international advanced experience in the PPP field. It provided a legal basis for the institutional arrangement of PPP and determined procedures and guidelines for implementing PPP projects. Prior to the PPP law, the Law of the Republic of Tajikistan "On Concession" was adopted in 2011. Several projects were implemented based on the Concession law, including the Pamir Energy Project, HPPs Sangtuda 1 and 2, and a toll road outside Dushanbe. To implement the PPP law, the PPP Center was established under the State Committee on Investments and State Property Management of Tajikistan in 2013. The specialists of the Center had no experience of preparing and implementing PPP projects. Therefore, in 2013, ADB provided technical assistance to Tajikistan for capacity building and establishing a PPP framework in Tajikistan. Later, the government of Tajikistan set up a cross-ministerial PPP Council that supervises the entire PPP process in the country.

4.1 The legal and institutional arrangement of PPP in Tajikistan

The legal and institutional arrangement of PPP in Tajikistan is regulated by the PPP law enacted in 2012. This determines the legal and institutional framework of PPP, the procedures for implementing PPP projects, and measures for protecting the interests of the private and public sectors. Additionally, in 2014, the following legal acts were adopted: guidelines for the preparation and implementation of PPP projects in Tajikistan, guidelines for setting up and identifying members and functions of the Commission for evaluation of bidding proposals for PPP projects, and guidelines for preparing feasibility reports on PPP projects in Tajikistan. These additional acts enhanced the process of preparation, procurement and implementation of PPP projects in Tajikistan.

According to the PPP law, the senior PPP body in Tajikistan is designated the PPP Council. The cross-ministerial Council is a key decision-making organ in the PPP process. It is authorized to supervise the activities of all ministries and local governments related to the development and implementation of PPP projects. Every single act in the PPP cycle has to be conducted with the

approval of the Council. The Council is chaired by senior government officials. The chairman of the Council is the first Deputy Prime Minister, and the chairman of the State Committee on Investments and State Property Management is the deputy chairman of the Council. The members of the Council are the ministers of justice, finance, economic development and trade, and the heads of the State Committee on Land and Geodesy and the Agency on Construction and Architecture. Heads of local governments also can be selected as temporary members of the Council. The Council holds a session every three months upon receiving project proposals. So far, seven sessions of the Council have been held and 14 projects have been reviewed by the Council.

The second supervising organ in the PPP field is the PPP Center under the State Committee on Investments and State Property Management of Tajikistan. The PPP Center is responsible for implementing state policy in the PPP field, preparing guidelines and standards for PPP projects, assisting public authorities in preparing PPP projects, conducting training and workshops for public and private partners, and consulting them in preparing feasibility study reports and reviewing preliminary initial project proposals and feasibility study reports. The Center also plays the role of secretary of the Council. It organizes the Council session and reviews the proposed projects, submits them to the Council and makes recommendations for their improvement. To build the capacity of the Center, ADB provided technical assistance to the Center. Within three years of the TA project implementation (2013-2016), international specialists assisted the Center in developing methodological tools and guidelines for preparing PPP projects, and conducting training, workshops and educational activities for government authorities, private partners, local entrepreneurs and the public.

To coordinate the activities of the government authorities in the PPP field, the focal points were identified in each ministry, committee, agency and local government. The focal points prepare PPP projects in their relevant sector and propose them to the PPP Center for review and further submission to the Council. Additionally, the Commission for evaluating bidding proposals for PPP projects was established, comprising representatives of relevant government authorities. The Commission organizes the bidding process, evaluates bidders, decides the winner of the bid and submits the result of the bidding process to the PPP Council for approval.

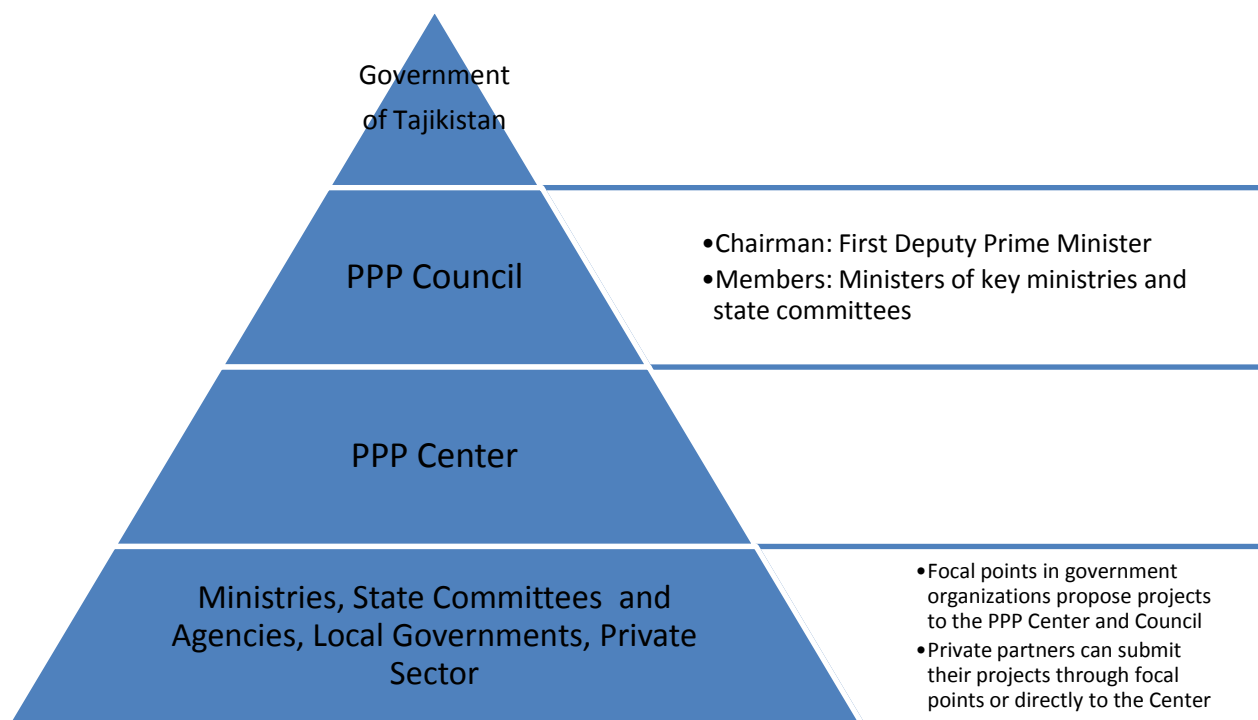


Figure 4.1. Institutional arrangement of PPP in Tajikistan

Source: (The Law of the Republic of Tajikistan on PPP , 2012)

4.2 PPP procedure in Tajikistan

The PPP procedure in Tajikistan consists of four main stages: project identification, preliminary selection, final selection, and agreement and signing of a contract. Each stage includes several steps.

Project identification stage

The first stage in the PPP procedure is the identification of a partnership project. In this stage, the project initiators, such as the government of Tajikistan, central and local governments, ministries, state agencies or committees, and private partners, apply to the PPP Center for permission to prepare a preliminary initial project proposal and feasibility study report. Afterwards, the project initiators develop a final feasibility study report in consultation with the Center and submit it to the PPP Council for review and approval. If the Council approves the feasibility study report, the project moves to the next stage.

Preliminary selection stage

After receiving consent from the Council, the project initiator (the contracting authority) sends a request to the PPP Center to obtain written permission to start an announcement and invitations or a call for bids on tender, and to begin pre-selection. The call for bids is announced after consent is

obtained from the Center. Afterwards, the bidders (the private partners) submit a call for expression of interest to the contracting authority and pass the pre-qualification procedure. The contracting authority evaluates each bidder's qualifications based on the criteria prescribed in the pre-qualification bidding documents and article 20 of the PPP law. The criteria for bidders to pass the pre-qualification procedure and be accepted are as follows:

- 1) Possess the professional and technical skills, and the human and material resources necessary to carry out the project;
- 2) Have managerial and organizational capacity, consistency and experience in executing partnership projects;
- 3) Have financial capability and expertise in organizing, financing and investing in partnership projects.

The result of the evaluation and pre-selection are submitted to the Center for consideration and acceptance of the results of the pre-selection. Soon after the contracting authority sends the request to the PPP Center, the secretary of the Council obtains the Council's consent to begin submission of project proposals by bidders.

Final selection stage

In this stage, first, the contracting authority sends a request to the pre-selected bidders asking them to submit their project proposals. The contracting authority considers and revises submitted proposals and collects all tender documents. Later, an Evaluating Commission is established from among the representatives of the contracting authority, the PPP Center, the local government and others to assess proposals tendered for the partnership project. Based on the results of this evaluation, the bidders' proposals are ranked. As a result of the evaluation, a report is prepared and submitted to the Council. After the Council approves the result of the Evaluating Commission's report, the winner of the tender is announced.

Agreement and signing of a contract

The final stage in the PPP procedure is agreement and signing of a contract. In this stage, the contracting authority sends a draft contract to the PPP Center and Council for approval. Finally, after obtaining Council's approval, the contracting authority and the private partner sign the partnership contract.

The PPP law of Tajikistan has a provision giving authority to the PPP Council to award a contract to a private partner without completing the competitive procedures. Article 22 of the Law

“On PPP” declares the circumstances allowing uncompetitive procurement. These include urgent need in ensuring delivery of a public service; if the project deals with matters of national defense and public security; when only one source can provide the required service, including services of intellectual property and trade secrets; cases in which none of bidders meet the evaluation criteria in the preliminary selection stage and fail; and for the sake of national, public and local governmental interests. UNECE specialists expressed concern regarding this provision of the law and stated that it can provide a large amount of freedom for non-transparent contractual operations (UNECE PPP Team of specialists on public-private partnership, 2013).

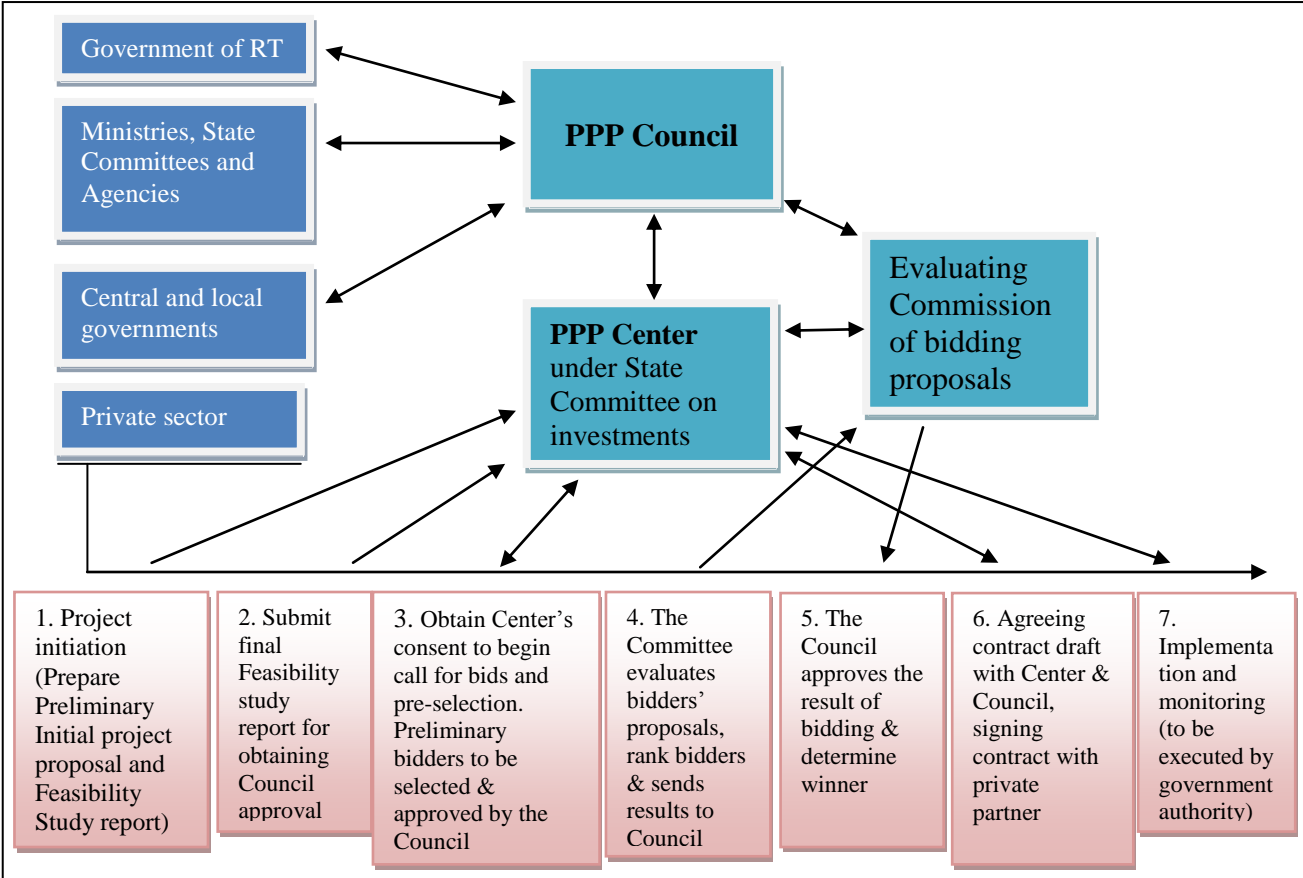


Figure 4.2. PPP cycle in Tajikistan

Source: Author from (The Law of the Republic of Tajikistan on PPP , 2012)

The contracting public authority monitors the project implementation. It reports on the project’s progress to the PPP Center and Council on a regular basis. According to the PPP law, the contracting authority may take over the partnership project if the private partner incurs material default or if it fails to fix a contract breach within a set time. In such cases, the authority may also replace the private partner with a new partner that is capable of proceeding with the financing of the partnership project.

4.3 Current situation of PPP in Tajikistan

Tajikistan has done much progress in PPP since 2013. Legal and institutional framework has been established in the country. Public awareness activities, including workshops, seminars and trainings on PPP were conducted among representatives of public and private sectors, civil society and business entities. The PPP Council has held 8 sessions so far. During these sessions 13 projects have been considered by the members of the Council (see table 4.1). The proposed projects are initiated by government agencies, local executive body of districts, cities and private sector. Out of 13 projects, 2 projects were approved by the Council: Construction of power lines in the Free Economic Zone "Dangara" and Reconstruction and Management of the Kindergarten №133 in Dushanbe city. Now these 2 projects are under implementation.

Table 4.1. PPP projects development status update (as of June 1, 2017)

#	Project name	Current status of the project	Organization-customer
1	Construction of power lines in the FEZ "Dangara"	<p>Feasibility study of the project as developed by IFC. ADB was advisor to the Ministry-Government.</p> <p>On 19 March 2016, at the 4th Extraordinary Meeting of the PPP Council, this project was considered and on 27 July a tender was announced. The PPP Council agreed to implement the project by the winner "Shanxi Coal Corporation" from China. Agreement was signed between the Ministry of Energy and Water resources and "Shanxi Coal Corporation" in 2017. The total amount of the project is \$ 22.8 million.</p>	Ministry of Energy and Water Resources
2	Reconstruction and Management of the Kindergarten №133	<p>Feasibility study was prepared by LLC "Boychechak" and a tender was announced. At the 5th meeting of the PPP Council the private partner was approved and on 22 September 2016, a contract for 10 years was signed between the Ministry of Energy and Water Resources and the private partner</p>	Ministry of Energy and Water Resources

		LLC "Boychechak".	
3	Construction of transport and logistics center (Turzunzade Logistics Center)	ADB awaiting information from the Ministry of Transport and ABBAT	Ministry of Transport (Initiator - ABBAT)
4	-Construction of primary infrastructure in the Sughd FEZ	For the feasibility study, Ministry of Economic Development and Trade and the Administration of FEZ "Sughd" started cooperation with companies "Rail Service" (Moscow), "Development Fund of railway transport" named after A.S Khoruzhiy and an Investment company « Original » (Beijing). Currently, the feasibility study "Construction of the railway from" Spitamen "station to the FEZ" Sughd " is being developed by" Rail Service "(Moscow) and Development Fund of railway transport.	Ministry of Economic Development and Trade (initiator: local executive body Sughd Oblast) (Admin, "Sughd FEZ")
5	- Construction of Railway-term branches in Sughd region		
6	- Restoration of the drinking water supply system in FEZ Sughd		
7	Reconstruction of the road "Takob-Safedorak"	under study	Ministry of Transport (initiator LLC "Safedarra")
8	Reconstruction and management of kindergarten in Gisar city	under study	Local executive body of the city Gisar
9	Management of mini-hydro power plant in Dusti district	Feasibility study is being developed by UNDP in Tajikistan	Local executive body of Dusti district (Initiator: UN Development Programme in Tajikistan)
10	Management of drinking water supply system in the Shahrituz city	under study	Local executive body Shahrituz city (Initiator: the UN Development Programme in Tajikistan Organization)
11	Construction of transport and logistics center "Nizhniy Panj"	For the development of the feasibility study, PPP Center is working with the World Bank.	Ministry of Transport
12	Establishment of the Center for combating hepatic viruses	Feasibility study is being prepared by the Ministry of Health and Social Protection of Population	Ministry of Health and Social Protection
13	Establishment of the Institution for the diagnosis and treatment of children with disabilities and orphans in the city of Istaravshan	under study	Ministry of Health and Social Protection

Source: (ADB, 2016)

In 2016 amendments to the Civil Code Part I, Land Code and Law on Privatization of State Property were adopted that enabled to make provisions of these legal acts compatible with PPP Law. For fixing problems, inconsistency and improvement of the PPP Law the PPP Center proposed amendments to the Law. The amendments included provision of state support and state guarantee in PPP projects. They introduce incentives for private partners to join PPP projects, such

as providing tax exemption, freeing from custom duties, state guarantee and other privileges. The amendments have not been passed by government yet. These amendments are very important for improving legislation base in PPP field.

Key issues in implementation of PPP projects

The capacity of the staff in PPP Center and Government Agencies is weak in preparing PPP projects. They need more training to further strengthen their capacities in preparing, evaluating and procuring PPP projects. For preparing PPP project and conducting feasibility study lots of efforts and resources are needed. For this purpose a Project Development Fund has to be established. The Government of Tajikistan is considering establishing such a Fund right now. However due to budget constraints the Government has not set up the Fund yet. Moreover the weak economic conditions in Tajikistan continue to be serious challenge for PPP project delivery. The small income of households, their low capacity for service payment and limited public budget affects viability of PPP projects in infrastructure. Most unsolicited projects submitted to the PPP Center were found to be unviable projects (ADB, 2016). The Projects cannot be brought to the market without subsidy from government or development partners.

CHAPTER 5. CASE-STUDY 1: PAMIR ENERGY PROJECT

5.1 Background of the project

Gorno Badakhshan Autonomous Oblast (GBO) is the most mountainous and poorest region in Tajikistan. During Soviet Union times, three-quarters of energy in the region was generated from imported diesel fuels. After the collapse of the Soviet Union, the GBO region faced serious power shortages as the supply of diesel fuels stopped. The electricity produced by local HPPs was not sufficient to cover the entire region. Among several micro-hydroelectric plants and eleven small and medium-sized hydroelectric plants, Pamir 1 and Khorog were the largest plants. These plants had installed capacities of 14 MW and 7.2 MW, respectively; they served 84% of installed capacity. Half of the hydropower infrastructure was destroyed during civil war. Because of a lack of capital investment in hydropower infrastructure, power plants and transmission and distribution lines deteriorated year by year. The electricity infrastructure was in poor condition and most parts of the transmission lines were not in service. Outages happened on a regular basis, particularly in winter. During winter, 43% of residents did not have access to electricity, and 10% did not have power during the entire year. People had no choice but to cut down trees and use coal for heating their houses and cooking food. This had a substantial impact on both the environment and public health (World Bank, 2011).

In 2002, the Pamir Energy Company (PEC) was set up to rehabilitate, operate and maintain hydropower facilities in the GBO region. PEC is an SPV operating hydropower facilities in the region for a 25-year period based on a concession agreement with the government of Tajikistan. The objective of the project was to supply reliable electricity to consumers in a financially, environmentally and socially sustainable way. The project would have a high impact on community development, but was also considered high-risk. The poor population of the region was not able to afford an expensive electricity service. The project developers, IFC and the Aga Khan Fund for Economic Development (AKFED), had to adjust their commercial goals to balance with the social objectives of the government. An affordable electricity service had to be provided to the poor population of the region while ensuring the viability of the project. An output-based aid scheme was combined with the project to provide aid (a USD 5 million grant) to the privately owned electricity service provider of PEC upon the delivery of an electricity service to the targeted beneficiaries (households). This scheme was introduced to solve the affordability issue. Additionally, a USD 4 million fund that arose from the interest rate gap on the on-lent IDA credit was allocated for a customer support program (WB and IFC, 2002).

Table 5.1. Pamir Energy Project information

Project starting date	2002
Construction period	5 years (2002-2006)
Initial project cost	\$ 26.4 mil.
Equity investors	AKFED - \$ 8.2 mil. IFC - \$ 3.5 mil.
Debt-providers	IFC – \$ 4.5 mil. IDA - \$ 10 mil.
Grants	Switzerland Government - \$ 5 mil. for subsidizing households' electricity fees
Concession period	25 years

Source: author (from information available in project documents)

5.2 Project description

After signing the Concession Agreement on May 24, 2002, all hydropower infrastructure facilities in the GBAO region transferred under the control of PEC including HPPs Pamir 1, Khorog, Vanj, and Namangut, substations, and transmission and distribution lines. There were 250 000 customers at that time. The entire power system was in poor condition and thus power loss in the system was very high. The electricity metering devices were exhausted and faulty, the collection rate was extremely low, and electricity theft was common. People got used to cheap and free electricity. Therefore, the project company had to recover the power generation, transmission, distribution and metering systems, reduce losses, increase collection rates, make the electricity utility operation transparent, build good community relations and change people's stereotypes.

During the construction phase, from 2002 through 2006, PEC increased the generation capacity of Pamir 1 HPP from 14 MW to its original 28 MW. This was achieved by installing units 3 and 4 by an associated regulating structure at Yashilkul Lake, rehabilitating units 1 and 2 of Pamir 1, Khorog, Vanj, and Namangut, and restoring and reinforcing substations and transmission and distribution lines. The cost of the project—including construction and installation, supply of equipment, consulting services and contingencies—was expected to be USD 24.4 million, plus USD 2 million interest during construction; thus, the total project cost amounted to USD 26.4 million. With the support of IDA, a remetering programme was started in 2003, and individual meters for consumers were purchased and installed. Moreover, the project company built good

relations with local people; they carried out public-awareness work and explanatory activities among households.

As a result of the investments in the hydropower system, power generation increased from 135 000 MWh/year in 2002 to 200 000 MWh/year in 2014 and 167 932 MWh/year in 2015. Total losses in the transmission and distribution network reduced from 39% in 2006 to 19.9% in 2010 and 13.38% in 2015 (Administration of GBAO region, 2015). Residents now have electricity for 22-24 hours per day in winter. Electricity sales increased from 119 000 MWh/year in 2003 to 167 932 MWh/year in 2015. The introduction of a new billing system by the project company brought transparency and increased customers' trust in their bills and their willingness to pay for the service. Thus, the collection rate jumped from 40% in 2002 to 106% in 2010 and 100% in 2015.

The project had a positive environmental impact as well. Residents obtained access to clean, renewable energy. Residents use electricity instead of wood, coal and diesel fuel for heating and cooking. The project eliminated the problem of trees being cut down, which damaged the environment and caused indoor air pollution. Public health has improved as people use less traditional fuel such as wood, animal dung, diesel fuel and coal. Public institutions, schools, hospitals and businesses obtained access to electricity all year round. Schools are open in winter now.

Tariff structure and social protection scheme

At the beginning of the project, residential consumers predominated in Pamir Energy; they represented 98% of total consumers and consumed 84% of the power. Most of these residents were poor and had incomes too low to afford an electricity service. Taking into account this aspect, the GoT and PEC agreed to adjust tariffs in to allow some returns to be provided to investors, and to repay debt and allow residential customers to afford to pay for the power service. To achieve these goals, first IDA provided a USD 10 million concessional loan to PEC, which reduced the project cost of capital and mitigated financial risks; thus, equity investors reduced the required return on their investments to 10%. Investors normally expect 25%-30% return in such a high-risk project. Then, residential customers were allowed to use a lifeline tariff, which lets residents receive 200 kWh per month in winter and 50 kWh in summer at lifeline rate of 0.25 US cents/kWh. The annual average tariff agreed by the government and PEC is shown in Table 5.2.

Table 5.2. Annual average tariffs agreed between GoT and PEC

Year	US cent/KWh	National Average Tariffs
2002	0.75	0.60
2003	0.88	0.702
2004	1.10	0.878
2005	1.37	1.097
2006	1.71	1.371
2007	1.97	1.508
2008	2.27	
2009	2.61	
2010 and beyond	3.00	

Source: (WB and IFC, 2002)

With the aim of providing social protection, the Government agreed on a gradual increase in tariffs for residential consumers over a number of years. The agreement stipulated keeping tariffs for all consumers in parallel with national tariffs up to 2007, reaching 3 US cents/kWh in 2010, and fixing the lifeline tariff at the lowest level (0.25 US cents/kWh) to allow the poorest consumers to be able to afford a minimum level of electricity. The cost of social protection over 10 years (from 2002 to 2012) was estimated at USD 9 million. The government had fiscal constraints on compensating social protection expenses. To meet this cost, IDA and the Swiss government assisted the GoT (Figure 5.1).

In 2013, the State Secretariat for Economic Affairs provided USD 3.5 million to PEC to continue helping customers to afford the electricity service. It is also expected that the GoT will allocate an additional USD 3.5 million for the social protection of GBAO residents until the end of the concession period. At the same time, PEC changed the customer support system. It was shifted to a winter-based and block tariff support system was increased; now subsidy is provided based on consumption level. According to the new tariff support system, residents who consume less electricity pay a low tariff, but residents who have high bills pay a higher tariff (Table 9). According to PEC, in 2016 30 455 households were provided with electricity in the GBAO region. In 2015, 53% of the households used the subsidized tariff (2016).

Table 5.3. New subsidized tariff system for residential consumers based on consumption level, effective after 2013 (only during winter)

	Level of consumption			
	Up to 190 KWh	Up to 220 KWh	Up to 360 KWh	Over 360 KWh
Tariff that residential consumers have to pay (US cent/KWh)	0.1	0.3	0.51	2.75

Source: (Pamir Energy Company, 2016)

Other, nonresident consumers such as budget organizations and business entities pay a higher tariff than residential consumers. According to Pamir Energy Company (2016), in 2016 the average tariff level was 3.25 US cents; but the tariff for residential consumers was 2.75 US cents and that for nonresident consumers is 5.16 US cents. Bills for electricity consumption by government organizations are supposed to be paid by the GoT to a special escrow account.

5.3 The financing structure of PEC and the financial viability of the project

PEC is an SPV set up to manage the project. PEC is financed 45% by equity and 55% by debt. AKFED holds 70% of the shares in the company, and IFC holds 30%. IFC contributed USD 3.5 million in equity, and the AKFED equity contribution is USD 8.2 million. The main debt-provider in the project is IDA, which provided USD 10 million of credit to the GoT that was on-lent to PEC. The second project debt-provider, IFC, directly lent USD 4.5 million to the project company (Figure 5.1). An additional USD 0.2 million fund was provided by the project’s internal cash generation.

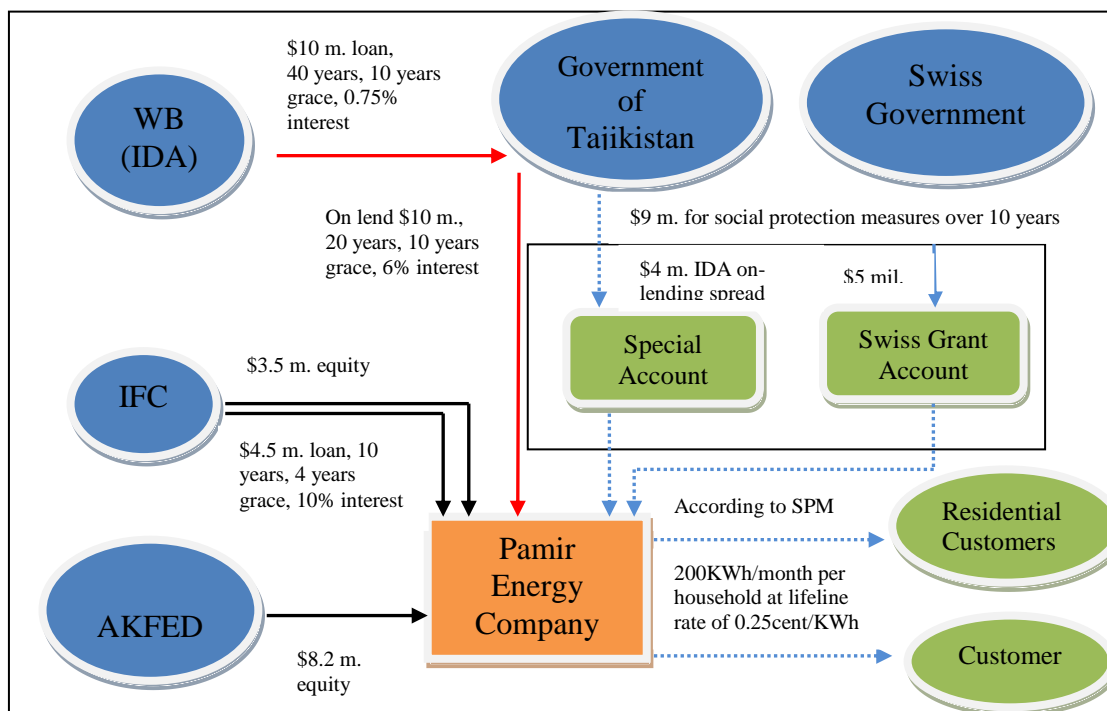


Figure 5.1. Financial structure of PEC

Source: author modified from (Jumaev, 2016)

Furthermore, USD 5 million from the Swiss Grant Fund and USD 4 million generated from interest rate spread (the interest rate gap between IDA credit to the GoT and GoT on-lent to PEC) were provided to the project company to support the affordability of the project.

The participation of multilateral financial institutions such as WB (IDA), IFC and a donor – the Swiss government - in the financial structure of the project played an important role in enhancing the project’s viability. IDA provided a concessional loan to the project with a low interest rate and for a long term, which reflected the country and project risk. The interest rate on the IDA credit was significantly lower than that on the commercial banks’ loans (Figure 5.1). Moreover, the decision to allocate revenue from the IDA credit on-lent interest spread to enhance the project affordability was a significant contribution of the GoT to the project. Additionally, a grant from the Swiss government guaranteed a future revenue stream for the project. Affordability gap financing provided affordable tariffs for residents, and concessional financing reduced the project cost of capital and ensured returns for investors.

Another comfort for project financiers was the fact that key elements of the concession agreement were approved by the parliament of Tajikistan. This gave a political risks guarantee to the project. Thus, it was a good incentive for investors to join the project.

The financial viability of the project

The financial mechanism and tariff structure improved the financial viability of the project. At the appraisal stage, the project's financial performance was expected to be high. The company was expected to have a positive cash flow from EBITDA (earnings before interest, taxes, depreciation and amortization) from 2004 onwards. It was projected that investors might get dividends after 2008. The project equity IRR was estimated at 9.9%, and the financial rate of return (FIRR) at 9.8% (WB and IFC, 2002). Additionally, the project WACC was calculated as 8.65%. IDA's participation in financing the project reduced the cost of capital. As shown in Table 10, IDA's percentage participation in financing the project is the largest among all of the sponsors, at 38.17%, and its cost of financing is the lowest – 6%. It enabled the project WACC to be reduced and improved the project bankability. The project equity IRR of 9.8% exceeded its WACC of 8.65%. This indicates that the project became commercially viable and attractive to investors. The WACC implies the minimum desired rate of return.

Table 5.4. Pamir Energy Project sponsors' share of participation and cost of capital

Source	Percent of participation (%)	Capital Cost (%)
Equity		
AKFED	31%	10%
IFC	13%	10%
Internal cash generation	1%	0%
Debt		
IFC	17%	11%
IDA	38%	6%*
Project WACC	8.65%	

Source: author (from project documents)

* Note: IDA fund was lent to GoT with 0.75% interest rate which was on-lent to the SPV with 6% interest rate

A tariff structuring and subsidizing scheme was also crucial to ensure project viability. The tariff level for purely commercial investments with a 50-50 debt-equity structure was assessed at 4.65 cents/kWh (Markandya, A. and Sharma, R., 2004). With this tariff, the project was not feasible because households were not able to afford it. To make the project viable, the tariff needed to be reduced to 2.1 cents/kWh (averaged over the concession period of 25 years). This was achieved via a concessional loan obtained from IDA, which allowed reduction of the capital cost and mitigation of risks, thus allowing a reduction in the investors' required return. Moreover, a long grace period

enabled a slower increase in tariffs. It was agreed that tariffs would increase gradually from 0.4 US cents to 3 US cents within a 10 year period, and that a lifeline rate would be set at 0.25 cents/kWh. The cost of the lifeline rate was covered by the Swiss Grant Fund and revenue raised from IDA-on-lent interest spread, and allowed poor people to afford electricity usage.

Sensitivity analysis of the project viability

The sensitivity of the project WACC and equity IRR to capital costs and tariff subsidies that impact the project viability was analyzed. First, the sensitivity of the project WACC to change in the cost of capital was analyzed (Table 11). For the purpose of the analysis, it was assumed that instead of a USD 10 million IDA concessional loan (with a 6% interest rate), a loan of USD 10 million was attracted from other sources with a higher cost (an 11% interest rate - similar to the IFC loan interest rate). The analysis shows that the effect of increasing capital cost is significant to the project WACC. If the cost of capital on the project loan increases from 6% to 11%, the project WACC becomes 10.55% instead of 8.65%. The project WACC increased by 22.08% as the cost of capital for the IDA loan increased from 6% to 11%. In this case, the project would have become unviable because the equity IRR, 9.8%¹, is less than the WACC, 10.55%. This demonstrates that the cheap IDA loan had a significant impact on the project viability.

Table 5.5. Sensitivity of the Pamir Energy Project’s WACC to capital cost

Source of capital:	Base case	\$10mil. loan attracted from other source with higher cost instead of IDA
	Cost of capital	
IDA_loan (\$10mil.)	6,00%*	11,00%
IFC_loan (\$4.5mil.)	11,00%	11,00%
IFC_equity (\$3.5mil.)	10,00%	10,00%
AKFED_equity (\$8.2mil.)	10,00%	10,00%
Result:		
WACC	8,65%	10,55%

Source: author (from project documents)

**Note: IDA fund was lent to GoT with 0.75% interest which was on-lent to the SPV with 6% interest rate*

Second, the sensitivity of the project equity IRR to tariff subsidy was analyzed. As shown in Table 12, the project equity IRR is very sensitive to tariff subsidy. The analysis shows that equity IRR with tariff subsidy is very high (11.08%²), but it reduces to 7.88% without tariff subsidy. The tariff subsidizing scheme has a huge impact on the equity IRR. In 2015, subsidies made up 18% of

¹ The equity IRR of 9.8% was estimated at the appraisal stage.
² The equity IRR of 11.08% is the current actual value. This is estimated by the author based on data provided by the project company.

payment collection (Pamir Energy Company, 2016). This highlights the importance of the tariff subsidizing scheme to improving the viability of the project.

Table 5.6 Sensitivity of the Pamir Energy Project's Equity IRR to tariff subsidy

Year:	Sales with tariff subsidy	Sales without tariff subsidy
2002	137	35
2003	1124	846
2004	1208	852
2005	1371	889
2006	1914	1525
2007	2289	1970
2008	3375	2601
2009	4172	3444
2010	4699	3846
2011	4984	4165
2012	5559	4694
2013	5790	5219
2014	5991	5528
2015	5898	5547
2016	6113	5763
2017	6777	6777
2018	7283	7283
2019	7929	7929
2020	8510	8510
2021	10034	10034
2022	9137	9137
2023	9281	9281
2024	9441	9441
2025	10559	10559
2026	10688	10688
2027	10817	10817
Result:		
Equity IRR	11,08%	7,88%

Source: author (from project documents)

5.4 The catastrophic flooding of 2007 and its impact on financial condition of PEC

On February 5, 2007, a catastrophic flood occurred at the project site and severely damaged the equipment and infrastructure of HPP Pamir 1. One turbine generator unit was fully destroyed and three others were partially damaged. This forced the plant to shut down, which brought about 67% energy losses in the main grid and left 18 000 residents without power in a harsh winter. The urgent restoration of the plant was necessary. To cover the cost of restoration, a grant of USD 2.5 million was provided by IDA, USD 4.4 million was covered by insurance, and USD 0.9 million was obtained from PEC's internal funds. In total, the urgent financial aid amounted to USD 7.8 million and only USD 4.95 million of it was actually spent on restoring the plant (World Bank, 2011). The facilities were restored in a sustainable and steady way to avoid such catastrophic accidents in future.

The natural disaster increased the cost of investment in the project by 19%, from USD 26.4 million to USD 31.35 million. The unanticipated cost overrun worsened the financial situation of the project company, which was not able to meet its financial obligations of serving debts and paying investors' dividends. To recover the financial situation of the company the stakeholders – AKFED, IFC, IDA and the GoT agreed on a financial restructuring of the company and an amendment of the IDA credit terms in June 2008. The financial restructuring plan and amendment of the IDA credit terms proposed: a) extending the IDA credit payment period from 10 years to 15 years, postponing accumulated interest on IDA on-lent credit, paying interest for the period from 2007 through 2011 during the period from 2012 through 2026, and reducing the interest rate for the period from July 1, 2008 through 2011 to 4.75%; b) converting the IFC senior loan to quasi-equity categorized as a non-interest-bearing and unsecured loan; c) cancelling all interest due and unpaid; d) converting AKFED subordinated debt into a non-interest bearing and unsecured loan without a fixed payment date; and e) writing off by the GoT of the project company's taxes and duties (World Bank, 2008). The IDA grant of USD 2.5 million was on-lent to PEC at a 0.75% interest rate for 20 years including a 10-year grace period. From this amount, the company actually used USD 1.3 million to fill the financial gap; the remaining USD 1.2 million was reimbursed to IDA (World Bank, 2010).

On December 11, 2013, IDA and the GoT agreed to further soften the terms of the IDA credit. In accordance with the Second Amendment to the Development Credit Agreement, the interest accrued and unpaid during the period from July 1, 2006 to September 1, 2012 was to be paid within the period from January 1, 2013 to December 31, 2020. The interest rate of on-lent

credit for the period from July 1, 2006 to June 30, 2008 was to be 5.25%; the rate for the period from July 1, 2008 to December 31, 2011 was to be 4.75%; the rate for the period from January 1, 2012 to September 1, 2012 was to be 6%; and the rate for the rest of the period, from September 1, 2012 to December 1, 2027, was to be 1.25% (World Bank, 2013).

The unexpected cost overrun due to the catastrophic floods significantly reduced the project profitability. If not for the financial restructuring and additional financing, the project company would have not met its financial obligations. This support revitalized the financial position of the company and enabled the project to remain viable.

5.5 Analysis of financial viability of the project at implementation stage. Challenges and prospects of the project company

The Pamir Energy Project was projected to be financially viable at the appraisal stage. The main driving forces for the viability of the project were its financial model, tariff structuring and service availability financing. However, the unexpected conditions during the implementation stage severely affected the project viability. Immediately after construction was completed in 2007, a catastrophic accident happened at the project site that severely damaged the facilities of PEC. The damages caused by this flooding increased the investment cost by 19%, or USD 4.95 million. The financial condition of the project worsened and it became unviable. The operating income and cash flow were negative. The project company was not able to meet its financial obligations. The financial condition of PEC improved after implementation of the financial restructuring plan in 2008, and later, in 2009, its operating income and cash flow became positive. However, in 2015 the project company suffered from two more natural disasters that occurred in the GBAO region. The first, a flood, occurred in July and August 2015 and caused huge damages to the infrastructure of the company. The flood damaged 10 km of 35/10/0.4 kV transmission and distribution lines and facilities at HPPs Pamir 1, Khorugh, Tekharv, Andarbek and Ak-Su. The total cost of damages was estimated at 3.99 million somoni (USD 571 000). To reconstruct the damaged facilities, 11.95 million somoni (USD 1.7 million) was needed. The second natural disaster, an earthquake, happened in December 2015 and caused damage in the small HPP Savnob. The earthquake destroyed 14.5 km of 10/0.4 kV transmission and distribution lines and three 10/0.4 kV substations. The total cost of the damage was USD 436 000 (Administration of GBAO region, 2015). As a result of these two catastrophic accidents in 2015, power generation dropped by 2%, electricity sales decreased by 1.4% and the company experienced a total financial loss of USD 2.13 million.

The project faced other challenges beside natural disasters. Electricity sales between 2003 and 2010 were 35%-40% lower than projected at appraisal. The low electricity sales partly occurred because of the impact of the global economic recession of 2008-09 (World Bank, 2011). Another, current issue is that tariff levels have remained unchanged since 2010. According to PEC, the current tariff for residents is 2.75 US cents/kWh and that for nonresidents is 5.16 US cents/kWh, and the average tariff is 3.25 US cents/kWh. However, the tariff levels had to be increased in accordance with the concession agreement. The average tariff is supposed to be 4.28 US cents instead of 3.25 US cents in 2016 (Pamir Energy Company, 2016). PEC has not increased tariffs because of the economic and financial situation of residents. Today, residents cannot afford even the subsidized tariffs. As the Asia-Plus News Agency reports, residents of the GBAO are complaining of electricity usage being expensive nowadays. Residents use electricity in limited amounts because it is expensive. They do not use electricity for heating their houses because the costs are high. Therefore, they use wood and coal for heating their houses. Electricity is used mostly for lighting houses and watching television (Asia-Plus News Agency, 2017).

In addition to low tariffs, the company is currently concerned about increasing receivables. As of the end of 2015, the total value of customers' unpaid bills was 2 367 675 Tajikistani somoni (USD 338 713), or 6% of total sales. Of that total, 637 273 somoni (USD 91 166) is owed by residents, 539 980 somoni (USD 77 248) is owed by government organizations and 1 190 422 somoni (USD 170 298) is owed by commercial organizations. Consequently, the collection rate in 2015 dropped to 98.09%, which was about 1% lower than in 2014. Rising debt negatively affects the financial position of the company, and the GoT should support the company in solving this problem. According to the concession agreement, the GoT is obliged at all times to hold funds in the established escrow account equal to the projected value of one and a half months' billings for electricity consumed by government organizations, but the GoT is not currently fulfilling its obligations. Among residents, incomes are too low to pay high electricity tariffs. In recent years, households' incomes have fallen because of the impact of the economic recession in Russia and a subsequent reduction in migrant laborers' remittances. Furthermore, remittance reduction has negatively affected the Tajikistani economy and national currency as well. According to the National Bank of Tajikistan, the Tajikistani somoni depreciated against the US dollar by 48% from 5.30 TJS/1 USD to 7.87 TJS/1 USD between January 2015 and January 2017 (The National Bank of Tajikistan, 2017). Depreciation of the somoni against the US dollar increases electricity tariffs in the local currency because the company charges customers in US dollars. Thus, customers' bills rise and it becomes difficult for them to pay the bills in the current difficult economic conditions.

The prospects of PEC (2016-2020)

Today, PEC has 11 small and medium HPPs in operation, which have 42 MW available capacity (see Figure 5.2). These HPPs do not operate at full capacity. Annual electricity generation is around 175 000 MWh, which is below the company’s target of 200 000 MWh. This low power generation is a result of of natural disasters, which have damaged the facilities of the company, and low water levels in rivers due to cold weather in recent years. Alongside this decreasing electricity generation, the demand for electricity is increasing in both Tajikistan and neighboring Afghanistan. Therefore, PEC is currently attracting more investment to expand generation capacity, and building new HPPs and transmission and distribution lines.

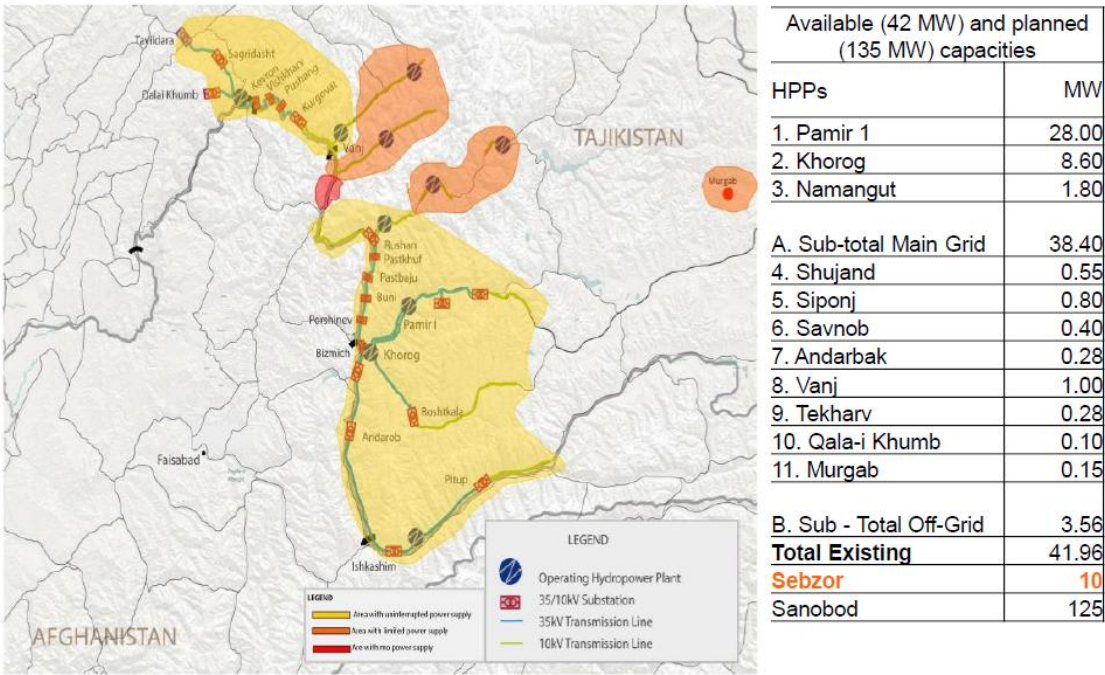


Figure 5.2. The Pamir Energy Company’s existing and projected HPPs and their capacities

(Source: (Jumaev, 2016)

PEC is currently implementing power infrastructure projects worth USD 15.06 million, funded by grants and contributions from international donor organizations such as USAID, the Aga Khan Foundation, the Ministry of Foreign Affairs of Norway, the Federal Foreign Office of Germany and the German KfW Development Bank (Table 13). The Shughnon-V project was completed in May 2016, and the other projects are currently under construction (USAID, 2016). The two major projects are the project to construct HPP Sebzor, which will have a 10-MWh capacity, and the project to construct HPP Sanobod, which will have a 125-MWh capacity. The construction of HPP Sebzor was launched in July 2015 and its completion by 2020 is planned. The project to construct HPP Sebzor is incorporated into the "long-term program of construction of

small hydropower plants in the cycle period of 2009-2020”, and a total of 180 million somoni (USD 22.5 million) is allocated for its construction (President of the Republic of Tajikistan, 2015). The second construction project, HPP Sanobod, is at the stage of undergoing feasibility studies, which begun last year.

These investments in increasing power generating capacity and building transmission and distribution lines will enable PEC to fully cover residents of the GBAO and increase the export of electricity to external markets such as Afghanistan and Pakistan. The company currently exports 2.13 million kWh to Afghanistan annually, equivalent to 2.38% of the total power generated in a year. The company currently has 3900 customers in Afghanistan, and this number is increasing every year.

Table 5.7. PEC’s current projects

Project Name	Source of investment	Project budget	Purpose and operation	Result
“Shughnon-V”	USAID and Aga Khan Foundation	\$ 1.46 million	-Two districts of neighboring Afghanistan – Dishor and Viriz are provided electricity -Construction of 9.3 км transmission line 20кV; 25 км transmission line 0.4кV and 5 км transmission line 35/110кV	416 residential, education, health care and commercial institutions
“Rushon-I”	Ministry of foreign affairs of Norway and Federal Foreign Office of Germany	\$ 8.1 mil.	-17 villages in Mohi Mai and 5 villages in districts of Rushon and Vanj for the first time get access to electricity -Construction of 32 км of electricity transmission line 35/110кV and distribution network of Vozdnavd – Dashti Yazgulom	More than 492 customers in Afghanistan and more than 150 consumers in Tajikistan

“Ak-su”	KfW Development Bank	\$ 5.5 mil.	-Rehabilitation of HPP “Ak-su” with capacity of 08 MB and rebuilding transmission lines 10/0.4 in Murgab district	More than 1100 households, education, health care and commercial institutions
In total		\$ 15.06 mil.		

Source: (Pamir Energy Company, 2016)

It is a very dynamic market. Moreover, exporting electricity to Afghanistan is more profitable for the company than domestic sales because electricity is sold at a higher tariff in Afghanistan: the price of electricity in Afghanistan is 16.8 US cents/kWh, which is five times the average price of electricity in the GBAO region of Tajikistan (3.25 US cents/kWh) (Doing Business Data of the World Bank, 2016). Successful realization of the investment projects mentioned above will enable the company to export more electricity to Afghanistan and Pakistan, which will help to compensate for low tariffs within the country and overcome other challenges. As a result, the project’s revenue will increase and its financial viability and sustainability will be improved.

Table 5.8 Pamir Energy Project sensitivity analysis of debt/equity ratio change

Debt/equity proportion	Change	WACC	IRR	IRR-WACC
Base case (55/45)	0%	8,65%	9,4%	1,15%
50/50	(-5%)	8,8%	9,4%	1,0%
45/55	(-10%)	8,9%	9,4%	0,9%
40/60	(-15%)	9,0%	9,4%	0,8%
23/77	(-32%)	9,4%	9,4%	0,0%

Source: author from project documents

Table 5.9 Pamir Energy Project sensitivity analysis of CAPEX and O&M cost

Change	NPV	IRR	IRR-WACC
Base case	2789	9,43%	0,78%
CAPEX increase by 5%	1479	9,05%	0,40%
8%	693	8,83%	0,18%
11%	0,00	8,65%	0,00%
15%	-1141	8,36%	-0,29%
O&M cost increase by 5%	2019	9,22%	0,57%
10%	1250	9,00%	0,35%
15%	480	8,79%	0,14%

18%	0,00	8,65%	0,00%
20%	-289	8,57%	-0,08%
25%	-1059	8,34%	-0,31%

Note: WACC as 8.65%

Source: author from project documents

CHAPTER 6. CASE-STUDY 2: NAM THEUN 2 HYDROPOWER PROJECT

6.1 Project background and objectives

Lao PDR is currently one of the fastest growing economies in the East Asia and Pacific region. The country's economic growth was 6.8% in 2016, and averaged 7% over the last decade. The poverty rate decreased to 23.2% of the population in 2012-2013. A decade ago, Lao PDR was among the least-developed countries globally, and 33.5% of its population lived in poverty (World Bank, 2017). Economic growth and poverty reduction in Lao PDR were driven by a growing number of newly constructed hydropower plants, residential and commercial buildings, and other facilities. The country has very large potential hydropower resources of 26 500 MW. The current installed capacity is 6300 MW (Phomsoupha, 2016). A large portion of the electricity generated is for export. Two-thirds of the country's generated electricity is exported to neighboring Thailand, Vietnam and Cambodia. The revenue generated from the export of electricity makes a significant contribution to economic growth and poverty alleviation. Increasing power generation capacity raised the country's electrification rate from 20% in 1995 to 90% in 2015.

The first memorandum of understanding with Thailand was signed in 1993 for the export of 1500 MW to Thailand. This memorandum was extended several times because of rising demand in Thailand. The recent power purchase agreements between the countries allow the export of 7000 MW to Thailand by 2020. Lao PDR entered into similar bilateral agreements with Vietnam and Cambodia to export 5000 MW and 200 MW respectively (International Hydropower Association , 2015). The high demand triggered the boom of hydropower plant building in Laos that has occurred since 1993 when the country opened its market to foreign investors. During the Asian financial crisis of 1997, the flow of investment into hydropower projects slowed down. After the crisis, the interest of foreign investors in hydropower projects in Lao PDR increased. The investors are mainly from Thailand, China, Vietnam, Russia and Malaysia (International Rivers, 2008). Lao's existing plants currently generate 6100 MW. The total capacity of the projects currently under construction is 4000 MW, and the projects being considered have a total capacity of 10 000 MW. Thus, Lao PDR plans to reach 20 000 MW installed capacity by 2025 by bringing 50 HPPs into operation.

The Nam Theun 2 Hydropower Project (NT2 Project) is one of the largest plants constructed using foreign investments and supported by IFIs in Lao PDR. The project has the objective of generating revenues from power export to alleviate poverty and improve environment management in Lao PDR. It is estimated that the project will generate about USD 2 billion revenue for the

government of Lao PDR (GOL) to finance priority poverty reduction and environmental management programs. The NT2 project implemented in an environmentally and socially sustainable way. The Nam Theun 2 Power Company (NTPC) shareholders are Électricité de France (40%), Lao Holding State Enterprise (25%) and the Electricity Generating Public Company Limited of Thailand (35%). The GOL's shareholding in the company is financed by IFIs. In total, USD 1.45 billion was invested in the project. The installed capacity of the project is 1070 MW; 995 MW (92%) of the power generated is for export to Thailand and 75 MW (7%) is for domestic use. Revenues generated from the project in form of taxes, royalties and dividends are allocated to poverty alleviation programs and for work towards the economic prosperity of rural areas in Lao PDR.

6.2 Project description

The NT2 Hydropower Project is the largest investment project in Lao PDR implemented using a PPP scheme (BOOT model). The project had a significant impact on the social and economic development of the country. It also had an adverse effect on the environment and local community. The project had to be implemented in an environmentally and socially sustainable way. A total of 27 parties were involved in financing and implementing the project, including international financial institutions such as the World Bank, ADB, export credit agencies, commercial banks and private investors.

The concession agreement between NTPC and the GOL on the design, construction and operation of the NT2 hydroelectric plant was signed on October 3, 2002, to run for 25 years excluding a 5-year construction period. Construction started in 2005 and was completed in November 2009. The NT2 Project involved the development, construction and operation of a 1070-MW trans-basin diversion power plant on the Nam Theun River in the Khammouane province of central Lao PDR, a 450-km² reservoir on the Nakai Plateau, a 39-meter-high dam at the northwest of the plateau, a 350-meter powerhouse of below the plateau, a regulation pond below the powerhouse and a 27-km channel from the regulating pond to the basin of the Xe Bang Fai river, a tributary of the Mekong river. The project also included construction of a 138-km, double circuit, 500-kV transmission line to the Thai grid and a 70-km single circuit 115-kV transmission line and 22-kV connections to the regional Lao grid (Figure 6.1).

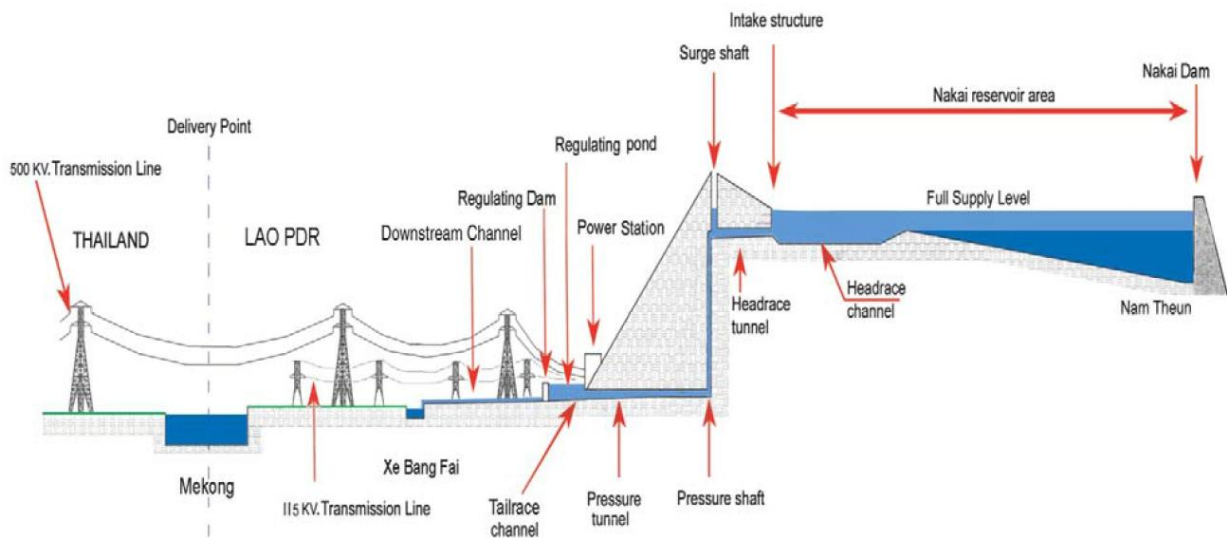


Figure 6.1. Schematic diagram of the Nam Theun 2 Hydropower Project

Source: (ADB, 2005)

Environment and social impact mitigation measures

Environmental and social effects were the main concerns related to the NT2 Power Project. Construction of the dam had a substantial impact on the environment and the community of the local area; a lot of resources and effort were expended by the project to mitigate its impact. Approximately 6200 people were displaced from the Nakai Plateau where the NT2 reservoir was formed. They were resettled in new villages along the edge of the reservoir by agreement. The displaced people received compensation for their lost property and were provided with infrastructure and services. Moreover, about 5800 people were affected as a result of land use change restricting access to natural resources that they depended on. The project company undertook measures and activities to conserve the watershed and natural resources, enhance sustainable use of land and other natural resources, and improve livelihoods, education and health services. In the downstream area, about 70 000 people residing along the Xe Bang Fai were affected by the project; their livelihoods were significantly affected by changes in the river flow regime and reduction of fisheries. About 90 households living in the area were displaced. The project's mitigation and compensation programs restored the assets of the affected people, recovered their livelihoods, and improved economic prospects for the residents.

To comprehensively and transparently monitor and evaluate the environmental and social impact mitigation programs, the following activities were undertaken:

- **Arranging control** over the physical implementation of the power project by a qualified engineering firm under an NTPC and GOL contract;

- **Hiring a lenders’ engineer** to monitor the construction project and the progress of the implementation of the environmental and social management plans, review reports, and make site visits;
- **Setting up a dam safety review panel** to provide technical advice on the construction, operation and safety of the dam;
- **Founding independent monitoring agencies** to monitor the progress of resettlement, and environmental impact mitigation and watershed management matters, and report to the GOL;
- **Establishing a panel of environmental and social experts**, which provides advice on environmental and social issues, reports to the GOL, and visits the project site twice per year;
- **Arranging an international advisory group** to advise the World Bank’s president on the project’s implementation, revenue management arrangements, and environmental and social aspects;
- **Organizing supervision of the project** by IFI and bilateral agency staff on a regular basis, for example through site visits, and management and technical missions.

The environmental and social (E&S) cost of the project was estimated at USD 90.5 million until the end of the concession period, or about 10% of the total project cost. Additionally, USD 5.1 million was allocated for external environmental and social monitoring, including expenses for the panel of experts, the dam safety review panel, and the lenders’ advisor (E&S component) (see Table 6.1).

Table 6.1. Environmental and social cost of the NT2 Project (million USD)

Program	Before Commercial Operation Date (2004-2009)	After Commercial Operation Date (2009-2034)	Total US\$
Environmental Management	2.9	0.9	3.8
Social Development-Plateau	28.4	10.8	39.2
Social Development – Downstream Area	8	8	16
Watershed Management	6.5	25	31.5
Total E&S measures	45.8	44.7	90.5

E&S external monitoring: Panel of Experts, Dam Safety Review Panel, Lender Advisor (E&S component)	3	2.1	5.1
Grand total	48.8	46.8	95.6

Source: (World Bank, 2005)

Cost of the project

The base cost of the project was USD 1250 million of which USD 711.5 million was construction costs, USD 213.4 million was development costs, USD 279.3 million was financing costs and USD 45.8 million was base contingencies (Table 15). The E&S mitigation cost during the construction phase was USD 48.8 million; the remaining USD 46.8 million will be financed out of revenue over the 25-year operating period. Additionally, the project includes USD 200 million of contingency costs. The total project cost includes a mixture of USD 912.3 million (63%) in foreign exchange costs (US dollar) and USD 537.7 million (37%) in local currency costs (Thai baht).

Table 6.2. NT2 Project costs (million USD)

Item	Foreign exchange	Local currency	Total
Construction cost	396.2	315.3	711.5
E&S mitigation cost	48.8	0	48.8
Development cost ¹	150.6	14	164.6
Financing cost ²	173	106.3	279.3
Base contingencies	27.1	18.7	45.8
Total Base costs	795.7	454.3	1250
Total contingent cost	116.6	83.4	200
Total costs	912.3	537.7	1450
	63%	37%	100

Note:

¹ Pre-operating costs, compensation to GOL (for its development expenses, loss of biodiversity, and in consideration for the grant of the concession to the company), NTPC administration, works and project preparation.

² Financing costs also include upfront and commitment fees, charges related to political risk guarantees extended by ADB, IDA, and Multilateral Investment Guarantee Agency (MIGA), and risk premium on export credit agency facilities.

Source: (ADB, 2005)

Contractual structure and framework

The NT2 Hydropower Project was arranged based on set of contractual agreements between multiple parties. The backbone of the project comprises the concession agreement between NTPC and the GOL that was signed on October 3, 2002, to run for 25 years from the commercial operation date (that is, 2010-2034). It includes detailed provisions relating to the rights and obligations of the parties, including provisions regarding the parties' default events, force majeure events, termination and a dispute resolution scheme, and applicable law. The other agreements signed between stakeholders directly involved in the financing, construction and operation of the NT2 Project are as follows:

- **Stakeholders' agreement** – signed between Électricité de France International (EDFI), the Electricity Generating Public Company Limited (EGCO, Thailand), the Italian-Tai Development Public Company Limited (ITD, Thailand) and the GOL on 19 September 2001, and consented to by NTPC later in September 2002. It outlines the rights and obligations of the shareholders, provisions regarding objectives, foundation, management and operation of NTPC and consent on articles of association of NTPC. This agreement is valid for 45 years from the date of signing;
- **Head construction contract (HCC)** – entered into by NTPC and EDF (head contractor or HC). Under the HCC, construction of the project was undertaken by NTPC through the HCC. The HCC is a turnkey, price-capped engineering, procurement, and construction contract. The construction works were subcontracted by the HC under five principal subcontracts: the civil works 1 (CW1), civil works 2 (CW2), civil works 3 (CW3), electromechanical 1 (EM1) and electromechanical 2 (EM2) packages.
- **PPAs with EGAT and EDL** – signed between NTPC, EGAT and EDL on November 8, 2003, to run for 25 years from the commercial operation date. Under the PPAs, EGAT and EDL are obliged to purchase a certain amount of power generated by the plant on agreed tariffs and assure a payment stream for the project.
- **GOL undertaking** – signed between the GOL and EGAT. This identifies and establishes parameters and a framework for all parties to accomplish a smooth transition of the project and project agreements in case of NTPC default or prolonged political force majeure in Lao PDR under the concession agreement and the EGAT PPA. Under the GOL undertaking, the GOL gives EGAT certain rights to step in and purchase the project, and enforce its security rights against the GOL under the EGAT PPA.

- **Technical services and personnel management contracts** – signed by NTPC with EDF and ESCO (the operational subsidiary of EGCO) to provide technical support and staffing, including for the operation and maintenance of the project. Operation of the project remains under the control of NTPC, but technical services and personnel management are provided by EDF and ESCO.

Moreover, on the financial side, NTPC entered into agreements with project lenders and financial institutions involved in financing and guaranteeing the project. Each IFI signed financial agreements and project agreements with NTPC and the GOL that specify terms and conditions for their respective credit, grants, guarantees and loans. The agreements also include provisions regarding environmental and social aspects.

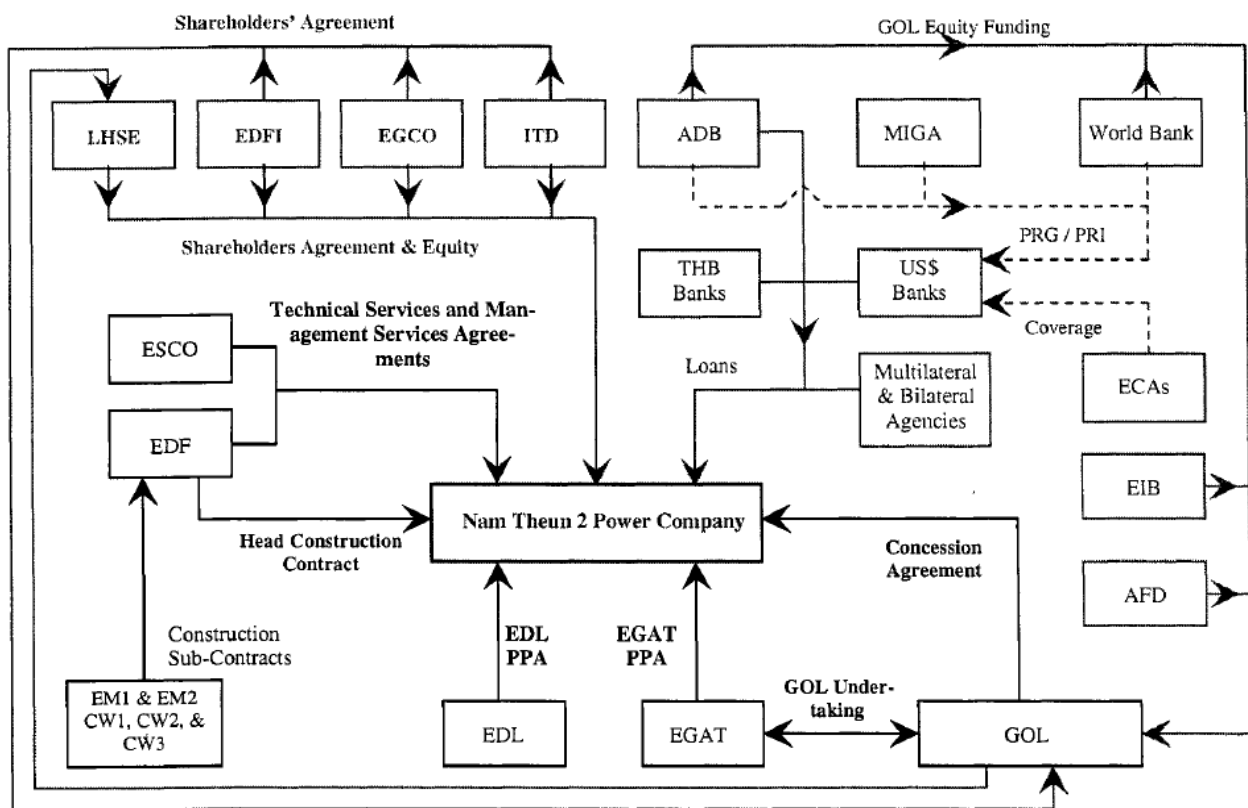


Figure 6.2. NT2 Project contractual structure

Source: (World Bank, 2005)

Power purchase agreements and tariff structures

On November 8, 2003, NTPC signed PPAs with EGAT and EDL to run for 25 years from the commercial operation date. Under these agreements, EGAT is obliged to purchase 5636 GWh (or 995 MW of the plant's generating capacity) and EDL has to acquire up to 200 GWh (75 MW generating capacity) from NTPC at an agreed tariff on a take-or-pay basis (Table 6.3). The EGAT

PPA includes provisions specifying the rights and obligations of EGAT and NTPC, including those regarding performance obligations, default events, force majeure events and termination. Under the EGAT PPA, a revenue stream is guaranteed to NTPC. EGAT provides cash securities in the form of cash deposits in Thai banks to meet its obligations in case of inability to pay NTPC. The EDL PPA stipulates the rights and obligations of both EDL and NTPC, including those regarding performance obligations, default events, and force majeure and termination events.

Table 6.3. Annual electricity sales plan of NT2 (GWh)

Purchaser	2009	2010	2011	2012	2013-2034
EGAT	808	5438	5354	5354	5354
EDL	24	165	178	192	200
Total	833	5603	5532	5546	5554

Source: (ADB, 2005)

Tariffs for electricity are fixed for each year of the concession according to the PPAs. The structure and rates of the tariffs applicable to sales to EGAT are different from those for sales to EDL. Under the EGAT PPA, three categories of energy on separate tariffs are supplied to EGAT. The first category is primary energy (PE), which is delivered to EGAT between 6 am and 10 pm from Monday through Saturday. The second category, secondary energy 1 (SE1), is delivered at any other time. Finally, the third category, secondary energy 2 (SE2), is energy transmitted in addition to that allocated to PE and SE1. The tariff plan for all of these categories of energy (PE, SE1 and SE2) during the entire period of operation is shown in Table 6.4. The tariffs for PE and SE1 increase annually by 1.4% on average. Conversely, the tariff for SE2 remains unchanged at THB 0.570/kWh until the end of the concession; and moreover, is priced only in Thai baht. The tariffs for sales to EDL are different from those for sales to EGAT. EDL receives only PE from NTPC. The annual tariff increase is 1.4% on average, the same as that applied for EGAT (Table 6.5).

The tariffs comprise a mixture of US dollars and Thai baht. This mixture is arranged in to match the project’s financing structure of equity and debt, and the project’s costs, which are denominated in a mixture of US dollars and baht. The project’s revenue from sales of electricity was estimated to be generated 51% in US dollars and 49% in Thai baht. This two-currency revenue stream corresponds to the calculated US dollar- and Thai baht-denominated debt service of the project. This hedges the project against the risk of exchange rate movement.

Economic analysis of the commercial sustainability of the NT2 PPA, the demand for electricity generated by NT2 and its least-cost advantage in the Thai market was carried out in the

appraisal stage. The results of the analysis showed that the capacity of NT2 would be needed in the Thai market by 2010 (the project's first commercial operating year). Both Thailand and Laos would have fully absorbed their taken share by that time. The demand risk for the project's generated electricity is low. Compared with alternative energy generating technologies, such as oil-fired steam, coal-fired steam, gas turbines and combined cycle gas turbines (CCGTs), wind, solar and other technologies, NT2 was considered the least-cost option for Thailand in the long term. The net present economic cost advantage of NT2 was expected to be USD 266 million at the discount rate of 10% (World Bank, 2005). Moreover, the economic rate of return of the project was estimated at 16.3%, which is a good indication of the project's economic profitability. Finally, the NT2 PPA was estimated to be commercially competitive with other power supply options in Thailand, considering the PPA prices and the future market prices calculated for energy from alternative sources. The present value-cost advantage of the NT2 PPA was estimated at USD 227 million. The results of the analysis showed that the NT2 PPA will maintain its competitiveness in the Thai energy market in the long term.

Table 6.4. Tariff under PPA with EGAT

Tariff Year	Start Date	Ending Date	Primary Energy		Secondary Energy 1		Secondary Energy 2		No. of Months
			¢/kWh	THB/kWh	¢/kWh	THB/kWh	¢/kWh	THB/kWh	
1	09-Nov-09	08-Dec-09	2.118	0.805	0.975	0.370	0.000	0.570	1
2	09-Dec-09	08-Dec-10	2.120	0.806	0.976	0.371	0.000	0.570	12
3	09-Dec-10	08-Dec-11	2.149	0.817	0.990	0.376	0.000	0.570	12
4	09-Dec-11	08-Dec-12	2.179	0.828	1.004	0.381	0.000	0.570	12
5	09-Dec-12	08-Dec-13	2.209	0.840	1.018	0.387	0.000	0.570	12
6	09-Dec-13	08-Dec-14	2.240	0.851	1.032	0.392	0.000	0.570	12
7	09-Dec-14	08-Dec-15	2.271	0.863	1.046	0.397	0.000	0.570	12
8	09-Dec-15	08-Dec-16	2.302	0.875	1.060	0.403	0.000	0.570	12
9	09-Dec-16	08-Dec-17	2.334	0.887	1.075	0.408	0.000	0.570	12
10	09-Dec-17	08-Dec-18	2.366	0.899	1.090	0.415	0.000	0.570	12
11	09-Dec-18	08-Dec-19	2.399	0.912	1.105	0.420	0.000	0.570	12
12	09-Dec-19	08-Dec-20	2.432	0.924	1.120	0.425	0.000	0.570	12
13	09-Dec-20	08-Dec-21	2.466	0.937	1.136	0.432	0.000	0.570	12
14	09-Dec-21	08-Dec-22	2.500	0.950	1.152	0.437	0.000	0.570	12
15	09-Dec-22	08-Dec-23	2.535	0.963	1.167	0.444	0.000	0.570	12
16	09-Dec-23	08-Dec-24	2.570	0.976	1.184	0.450	0.000	0.570	12
17	09-Dec-24	08-Dec-25	2.605	0.990	1.200	0.456	0.000	0.570	12
18	09-Dec-25	08-Dec-26	2.641	1.004	1.217	0.462	0.000	0.570	12
19	09-Dec-26	08-Dec-27	2.678	1.018	1.234	0.469	0.000	0.570	12
20	09-Dec-27	08-Dec-28	2.715	1.032	1.250	0.475	0.000	0.570	12
21	09-Dec-28	08-Dec-29	2.752	1.046	1.267	0.482	0.000	0.570	12
22	09-Dec-29	08-Dec-30	2.790	1.060	1.285	0.488	0.000	0.570	12
23	09-Dec-30	08-Dec-31	2.829	1.075	1.303	0.495	0.000	0.570	12
24	09-Dec-31	08-Dec-32	2.868	1.090	1.321	0.502	0.000	0.570	12
25	09-Dec-32	08-Dec-33	2.908	1.105	1.339	0.509	0.000	0.570	12
26	09-Dec-33	08-Nov-34	2.948	1.120	1.358	0.516	0.000	0.570	11

Source: (ADB, 2005)

Table 6.5. Tariff under PPA with EDL

Tariff Year	Year	¢/kWh	THB/kWh	No. of Months
1	2009	1.765	0.698	2
2	2010	1.767	0.699	12
3	2011	1.791	0.709	12
4	2012	1.816	0.718	12
5	2013	1.841	0.728	12
6	2014	1.867	0.737	12
7	2015	1.893	0.747	12
8	2016	1.919	0.757	12
9	2017	1.945	0.767	12
10	2018	1.972	0.777	12
11	2019	1.999	0.788	12
12	2020	2.027	0.798	12
13	2021	2.055	0.809	12
14	2022	2.084	0.819	12
15	2023	2.113	0.830	12
16	2024	2.142	0.841	12
17	2025	2.171	0.853	12
18	2026	2.201	0.864	12
19	2027	2.232	0.876	12
20	2028	2.263	0.888	12
21	2029	2.294	0.899	12
22	2030	2.325	0.911	12
23	2031	2.358	0.924	12
24	2032	2.390	0.936	12
25	2033	2.424	0.949	12
26	2034	2.457	0.961	10

Source: (ADB, 2005)

6.2 The financing, guarantee arrangements and financial viability of the NT2 Project

The NT2 Hydroelectric Project was financed 31% by equity (USD 450 million) and 69% by debt (USD 1000 million), including USD 200 million contingent equity and debt (USD 100 million equity contingent, USD 100 million debt contingent). Additionally, project bonding facilities amounted to USD 131.5 million, including USD 16.5 million E&S securities and USD 115 million PPA securities (Project Finance International, 2013). The project equity was provided by the following entities: EDFI – USD 157.5 million or 35% of the shares; EGCO, Thailand – USD 112.5 million (25%); Lao Holding State Enterprise (LHSE), an SPV created by the GOL to hold its equity in NTPC – USD 112.5 million (25%); and ITD, Thailand – USD 67.5 million (15%) (Figure 7). On

September 29, 2010, Thailand's ITD sold its 15% stake to EDFI and EGCO. This increased EGCO's share to 35% and EDFI's share to 40% (Renewables Now, 2010).

The project debt of USD 1000 million was lent by the following institutions:

- Multilateral and bilateral financial institutions, which provided USD 160 million of loans in total, including USD 45 million from ADB, USD 30 million from the Nordic Investment Bank (NIB), USD 30 million from the Agency de France Development (AFD), USD 30 million from Proparco and USD 25 million from the Export-import Bank of Thailand (Thai EXI);
- Thai commercial lenders - seven commercial banks provided the baht denominated debt equivalent to USD 500 million³;
- IFIs such as the World Bank Group (IDA and MIGA) and ADB, which provided political and commercial risk guarantees to international commercial dollar lenders to mobilize a debt package for the project – the total guaranteed loan was USD 135 million⁴;
- ECAs, including Compagnie Française d'Assurance pour le Commerce Extérieur (COFACE, a French company specializing in export credit insurance), the Guarantee Institute for Export Credits (GIEK, a Norwegian guarantee institute for export credits), and Exportkreditnämnden (EKN, the Swedish national export credits guarantee board), which also provided political risk guarantees of USD 205 million to commercial dollar lenders to mobilize the debt package.

The USD debt has a 17-year tenor and the baht loans have a 15.5-year tenor (Blott, 2014). In the overall capital structure, the US dollar share is 59.8% and the Thai baht share is 40.2%. The reason for denominating the project debt and equity in a mixture of dollars and baht was to match the dual currency project base cost. Thus, the project's US dollar costs were financed by dollar equity and debt whereas the baht costs were funded by baht equity and debt. It closely matched the combination of dollar and baht capital expenditure needed for project construction. The fifty-fifty combination of dollar and baht funding was arranged to match the USD/THB tariff structure. This approach decreased currency mismatch between the revenues received and the debt paid by the company, and thus mitigated the exchange rate risk.

³ The seven Thai commercial banks are Bangkok Bank, the Bank of Ayudhya, KASIKORNBANK, Krung Thai Bank, Siam City Bank, Siam Commercial Bank and the Thai Military Bank.

⁴ The nine international commercial USD lenders are ANZ Bank, BNP Paribas, the Bank of Tokyo Mitsubishi, Calyon, Fortis Bank, ING, KBC, SG and Standard Chartered.

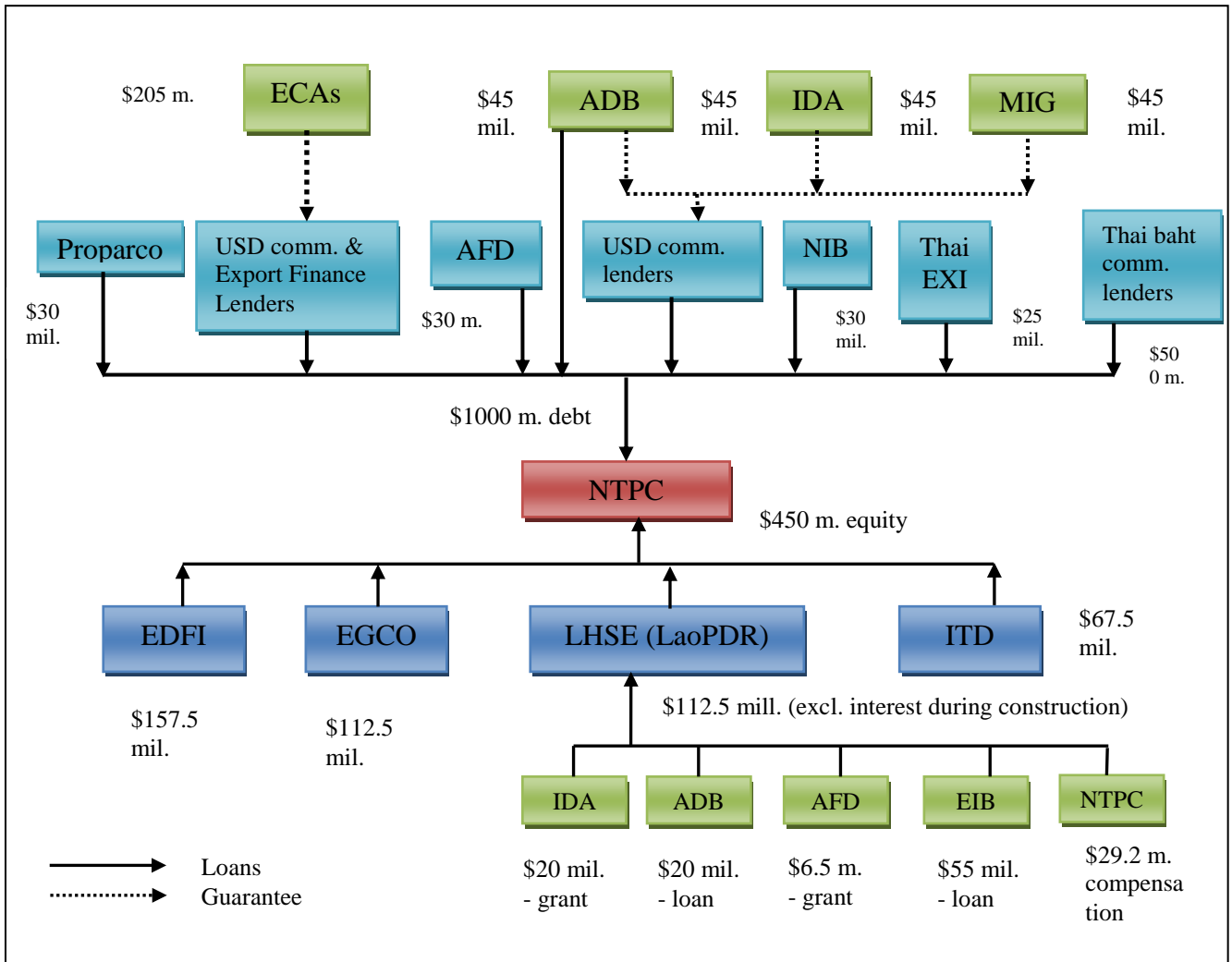


Figure 6.3. The financing structure of NTPC

Source: author modified from (ADB, 2005)

Lao Government equity contribution

The GOL’s equity injection into the project was financed by IFIs, including ADB, IDA, AFD and EIB, and NTPC compensation to the GOL. IDA provided USD 20 million and AFD gave a USD 6.5 million grant to the GOL for this purpose. ADB provided a public sector loan of USD 20 million for a 30-year term, including a 6-year grace period. EIB lent EUR 42 million (equivalent to USD 55 million) to the GOL with a 30-year term, including a grace period of 6 years (European Investment Bank, 2005). Furthermore, USD 29.2 million from NTPC compensation for loss of biodiversity was used to acquire an equity share in the project. The IFIs financed the GOL’s equity injection into NTPC on the condition that the project revenue transferred to the GOL would be spent on poverty alleviation, environmental preservation and economic prosperity in Lao PDR. Therefore, a special arrangement for revenue management was created that ensured transparency and accountability of spending. Under the revenue management arrangement, the project revenue is

to be allocated to poverty reduction priority programs; and these activities are subject to external supervision and audit. Moreover, to improve the transparency of the government investment, the government of Lao PDR established a special-purpose company, Lao Holding State Enterprise (LHSE), which is the nominated government shareholder in NTPC. It is 100% owned by the Ministry of Finance of Lao PDR.

Political risk mitigation and guarantee facilities

The cross-border nature of the project and the undeveloped regulatory framework in Lao PDR required political risk mitigation in both Thailand and Lao PDR. Therefore, under the EGAT PPA, Thai political risk was allocated to EGAT and under the concession agreement Laos’ political risk was assigned to the government of Lao PDR. The favorable tariff under the PPA, which benefited EGAT, further mitigated political risk in Thailand and thus reduced contract breach risk. Further assurance was provided by the 30-year history of constant power trade between Lao PDR and Thailand, a memorandum of understanding on power trade between the two countries, and participation of seven Thai commercial banks and the Thai EXIM bank in the project (Economic Research Institute for ASEAN and East Asia, 2015).

In addition to these reassurances, a consortium of nine international dollar lenders required political risk insurance in Lao PDR and Thailand. Therefore, NTPC and the GOL asked ADB, IDA and MIGA to provide risk mitigation instruments to sustain the international lending package. Additionally, ECAs such as COFACE of France, GIEK of Norway and EKN of Sweden provided political risk guarantees to international commercial banks. The guarantees of the IFIs and ECAs covered the risks of expropriation, contract breach, war and civil disturbance, and currency inconvertibility in Lao PDR and Thailand (Table 6.6).

Table 6.6. Guarantee facilities for mobilizing an international debt package for the NT2 Project

Guarantor	Guarantee facility	Risk coverage	Coverage period & guaranteed lenders/investors	Scope of debt/equity coverage	Guarantee related fees (to be paid by NTPC)
IDA	Partial risk guarantee (PRG)	-Political, regulatory, governmental performance in Lao PDR; -Debt service default occurred under control of	-16.5 years; -International commercial US\$ lenders.	- Any outstanding scheduled payment of principal and interest (excluding default interest	-Guarantee fee: 2% per annum (0.75% to be paid to IDA, 1.25% to be paid to GOL); -Standby fee: 0.25% per

		GOL, incl. expropriation, issuance and renewal of construction and operation's permits, changing legislation, taxes and duties and other specific Laos's sovereign obligations under CA and other associated agreements & considered important for obtaining finance, and natural force majeure circumstances that are beyond NTPC's control and that are not possible to insure in the public or private insurance market.		and breakage costs; -IDA gross exposure up to \$50 million	annum of aggregate undisbursed loan amount; -Initiation fee: one-time fee of \$100000; -Processing fee: one-time fee of \$5 million to be paid in 5 equal annual installments.
MIGA	Political risk guarantee (PRG)	-Expropriation, contract breach, transfer restrictions, war and civil disturbance risks in Laos and Thailand. Expropriation risk is not covered in Thailand, but in case EGAT (the off-taker) is privatized the breach of contract risk coverage will be replaced with expropriation risk coverage	-20 years; -International commercial US\$ lenders (political risks coverage in Lao PDR and Thailand); -Equity investor, EDF (a small portion of its investment against transfer restrictions risk in Lao PDR)	-Cover debt principal of US\$ lenders, including interest and interest rate hedging instruments; -EDF equity investment coverage (about \$10 million) -Gross exposure rise up to \$200 million for the project. MIGA's net exposure after reinsurance become \$100 mil.	-Premiums, standby fees, and other fees related to MIGA services ¹
ADB	Political risk guarantee (PRG)	-Cover political risk in Lao PDR and Thailand (expropriation, political violence, contract disputes,	- International commercial US\$ lenders (political risks coverage in Lao PDR and	-Outstanding principal and interest of the guaranteed loan -\$50 million	-Front-end fee: one-time fee -Guarantee fee: charged on the total of the guaranteed

		transfer restrictions)	Thailand)	aggregate maximum liability	percentage of the principal outstanding and the amount of interest to be paid for an agreed interest period -Standby fee: certain percentage of amount of undisbursed principal, but non-payment risk arise it is charged for accumulated interest ²
ECAs (Coface, GIEK, EKN)	Political risk guarantee	-Cover political risk in Lao PDR and Thailand	- International commercial US\$ lenders (political risks coverage in Lao PDR and Thailand)	-Primary insurer, Coface (\$140m.) -Reinsurers: GIEK (\$35m.), and EKN (\$30m.); -Gross exposure \$205 million	-Premiums for risk

Notes:

¹ From the MIGA website (Source: (MIGA, 2015).

² From the ADB website (Source: (ADB, 2012)

Source: author, from project documents.

Guaranteeing project debts against political and commercial risks significantly improved the creditworthiness of NTPC and Laos, and enabled mobilization of an international debt package for the project. The IFI and ECA guarantee facilities mitigated the risks of the project and improved its bankability. This enabled NTPC to attract increased commercial financing with favorable conditions, lower interest rates and longer maturity.

Improvement of the financial viability of the NT2 Project

The engagement of multilateral agencies (MLAs), such as the World Bank and ADB was crucial for improving the bankability and viability of the NT2 Project. The financial participation of MLAs enabled the involvement of European development finance institutions, such as AFD, EIB and ECAs, in the project. At the same time, the participation of MLAs and ECAs in the project attracted international commercial lenders to the project by mitigating political risks in Lao PDR and Thailand. Afterwards, Thai commercial banks joined the project. Guarantee facilities from IDA, MIGA, ADB and ECAs enabled mobilization of USD 340 million of debt from international dollar

lenders at better rates (Table 6.7). The interest rates of the international commercial banks were the lowest in the project (from 5.35% to 7.65%). Their share of participation was 23.45% in the project financing structure. They significantly contributed to reducing the project cost of capital. The project WACC was reduced to 10.1%.

Moreover, the multilaterals and bilaterals, including ADB, AFD, Proparco, NIB and Thai EXIM provided USD 160 million in direct loans to the project. The direct lending provision supported the extension of the tenors of loans from commercial banks. Inclusion of the World Bank, ADB, EIB, NIB, AFD and ECAs in the financing structure of the project mitigated project risk. Furthermore, the involvement of the government of Lao PDR as a 25% shareholder in the project gave comfort to private investors; it guaranteed fair and impartial participation of the GOL in the project. Additionally, the mobilization of USD 500 million of debt denominated in Thai baht from seven Thai commercial banks gave additional comfort to the nai-Thai parties (International Financing Review Asia, 2013).

Table 6.7. NT2 Project sponsors’ share of participation, cost of capital and debt tenor

Source	Capital investment (\$ mil.)	Percentage of participation (%)	Capital Cost (%)	Debt tenor (grace)
Equity	450	31%		
EDFI	157.50	10.86%	14.7%	
GOL	112.50	7.76%	14.7%	
EGCO	112.50	7.76%	14.7%	
ITD	67.50	4.66	14.7%	
Debt	1000	69%		
Thai commercial banks	500	34.48%	8.58% ¹	15 years (4.5 years)
International US\$ lenders	340	23.45%	6.80%	16.5 years (4.5 years)
Multilaterals & Bilaterals (ADB, AFD, Proparco, Thai Exim, NIB)	160	11.03%	8.25%	16.5 years (except for Thai EXIM – 15 years)
Project WACC	10.1%			

Notes:

¹ Average interest rate of lenders

Source: author, from project documents.

Tax-advantages provided to NTPC further contributed to improving its financial viability. According to this scheme, NTPC was exempt from income tax for the period 2009-2014. Over the remainder of the concession period, the following rates were to be paid: from 2015 to 2021, 5%;

from 2022 to 2027, 15%; and from 2028 to 2034, 30%. Royalties were to be paid as follows: 5.2% between 2009 and 2024; 15% between 2025 and 2029; and 30% to the end of the concession period. The tax and royalty rate increase was designed in line with the project’s debt repayment schedule. Thus, the tax and royalty rates will remain low until all of the project debt is repaid. For instance, the income tax rate will not increase from 5% to 15% until all of the project debt is repaid by the end of 2021.

6.4 NT2 Project financial viability analysis

Analysis of the financial viability of the NT2 Project was conducted at the appraisal. Based on that analysis, the project appeared to be financially viable. It is expected that NTPC will generate USD 6129 million revenue from electricity sales over the 25 years of the concession. The annual project EBITDA is calculated as USD 222.6 million on average. The project debt will be fully paid by 2021. The minimum annual debt service cover ratio (ADSCR) is estimated at 1.56%. Most importantly, the project is expected to generate USD 2834 million in cash flow as dividends for the shareholders over the 25-year concession period. The net present value (NPV) of that cash flow was estimated at USD 443.25 million and the financial internal rate of return (FIRR) on equity was 18.69% (Table 6.8).

The estimations and projections show that the project is expected to demonstrate good financial performance. The project minimum ADSCR of 1.56% exceeds the normally required minimum ADSCR of 1.2%. The 18.69% FIRR on equity exceeds 10.1% of the project WACC. This indicates that the project is financially viable and sustainable. It will generate enough cash flow to ensure debt repayment and returns to investors (ADB, 2005).

Table 6.8. Projected cash-flow for NTPC’s four shareholders (USD million)

Year	Capital Investment	O&M ¹	Costs				Total costs	EBITDA ²	Cash-flow for equity shareholders (dividend)
			Change in working capital & Interest earned from reserve	Royalty & Income Tax	Debt service payment (principal & interest)	Transfer to DSRA & MORA			
2005	-122.5						-122.5		-122.5
2006	-87.5						-87.5		-87.5
2007	-87.5						-87.5		-87.5
2008	-52.5						-52.5		-52.5

2009 / 2010		-28.6	-20	-12.5	-118.9	-58.4	-209.8	211.9	2.1
2011		-24.5	0.6	-10.9	-117.8	-2.4	-130.5	185.1	54.6
2012		-24.6	0.6	-11.1	-120.3	-2.8	-133.6	188.4	54.8
2013		-22.4	0.6	-11.2	-123	-3.1	-136.7	193.9	57.2
2014		-22.2	0.9	-11.4	-125.9	0.8	-135.6	197	61.4
2015		-26.5	1.1	-16	-126.9	-1.9	-143.7	202.8	59.1
2016		-20	0.4	-16.9	-127	-5.1	-148.6	205.3	56.7
2017		-20.7	0.8	-17.6	-128.6	-2.3	-147.7	207.7	60
2018		-19.7	0.8	-18.3	-130.5	-2.4	-150.4	211.9	61.5
2019		-20.8	1.1	-19	-131.7	-0.7	-150.3	214.1	63.8
2020		-28	0.8	-19.4	-100.7	29.7	-89.6	215.7	126.1
2021		-37.7	0.5	-19.6	-49.2	15.1	-53.2	222	168.8
2022		-25.3	-1.3	-36.3	0	-4.7	-42.3	224.1	181.8
2023		-25.2	-0.5	-37	0	-4.8	-42.3	227.7	185.4
2024		-23	-0.6	-38	0	-2.1	-40.7	230.5	189.8
2025		-23.4	-0.5	-59.8	0	-2.2	-62.5	233.8	171.3
2026		-23.7	-0.3	-60.8	0	-5.4	-66.5	234.8	168.3
2027		-32.7	0	-60.4	0	-5.4	-65.8	240.1	174.3
2028		-22.6	-1.1	-86	0	-0.8	-87.9	243	155.1
2029		-25.9	-0.3	-86.5	0	-0.8	-87.6	245.1	157.5
2030		-26.3	-0.4	-116.5	0	-1.7	-118.6	248.4	129.8
2031		-31.5	-0.1	-116.9	0	-6	-123	251.3	128.3
2032		-34.2	-0.3	-118	0	-6.2	-124.5	252.6	128.1
2033		-36.4	-0.5	-119.4	0	-10.9	-130.8	259	128.2
2034		-26.7	-0.7	-102.1	0	-6.5	-109.3	219.9	110.6
Total	-350	-652.6	-18.4	1221.6	1400.5	-91	-3081.5	5566.1	2834.6
								NPV of the cash-flow³	443.25
								FIRR on equity	18.69%

DSRA, debt service reserve account, MORA, major maintenance reserve account, EBITDA, earnings before interest, tax, depreciation, amortization.

Notes:

¹ Operating and maintenance (O&M) cost is separated from total cost for the purpose of calculation

² EBITDA is used instead of gross revenue for the purpose of accuracy of calculation

³ NPV was calculated at the WACC. The pre-completion WACC was estimated at 9.76%, based on the estimated rate of return on equity, sourced from (World Bank, 2005).

Source: author from project documents

Investment returns to the GOL. The project is expected to generate USD 1959 million in revenue for the GOL over the 25 years of the concession, including USD 709 million in the form of dividends, USD 783 million in resource usage charges, USD 438 million in income tax and USD 29.2 million for the GOL's biodiversity loss and development costs. The NPV of the GOL's cash

flow was estimated at USD 246 million. The FIRR on its equity investment was calculated as 21.6%. This compares favorably with the 6.9% WACC calculated for the GOL’s equity (ADB, 2005). The GOL’s investment costs are repayment of ADB and EIB loans and LHSE’s operating expenses. The NT2 project is expected to provide high returns to the GOL. Therefore, from the perspective of GOL as stated above, the investment is considered financially viable.

Table 6.9. Projected investment returns for equity shareholders (million USD)

	Four Shareholders	GOL	Private shareholders
Gross dividend	2834	709	2125
FNPV at 9.76% WACC	442	246	196
FIRR on equity investment (%)	18.69%	21.6%	<16%

Source: author from project documents

Investment returns to private investors. The cash outflow of the project private shareholders EDFI, EGCO and ITD comprised an equity injection of USD 337.5 million. Dividends are the only cash inflow to private shareholders paid by NTPC semiannually. The cash flow of USD 2125 million is expected to be transferred to the private sponsors as dividends over the course of the entire operating period. The financial NPV of the cash flow was estimated at USD 196 million. The FIRR on equity was calculated as below 16%, which is over 10.1% of the project WACC. Therefore, from the perspective of private shareholders, the project is also considered financially viable.

Financial performance of NTPC during the operating period from 2010 to 2016

NTPC began commercial operations on April 30, 2010. The commercial operation date was originally scheduled for December 2009, but it was delayed by about 5 months because of technical problems during the commissioning period. Despite the delay, NTPC displayed very good financial performance during operating period. The NT2 has generated a higher than originally expected level of revenue in its seven years of commercial operation. Since 2010, the power plant has generated and sold 41 313 million kWh of electricity to EGAT and EDL, which is 2416 million kWh or 6.21% more than projected (the projected electricity sales for 2009-2016 were 38 897 million kWh). The project provided high returns to investors during this period. In total, THB 13 982.8 million (equivalent to USD 424.29 million) of cash flow was distributed to equity shareholders as dividends between 2010 and 2016 (Table 7). This is USD 78.29 million or 22.62% more than the amount forecasted at appraisal (the projected dividend for 2009-2016 was USD 346 million). The project company showed good financial performance in 2011. The electricity output

increased by 828.84 million kWh (or 15%) more than projected, and dividends increased USD 69.56 million (or 127%) more than was forecasted.

Table 7. Financial performance of NTPC during operating period 2010-2016

Operating year	Generated and sold electricity to EGAT and EDL (mil. kWh)	Dividends distributed to shareholders ('000 THB)	USD equivalent ('000)
2010	4975,48	0	0
2011	6360,84	3928189	124264
2012	5770,44	1914046	62652
2013	6274,27	1670843	51041
2014	6283,39	2354714	71608
2015	5615,93	1977889	54938
2016	6032,99	2137143	59793
Total	41313,34	13982823	424296

Source: author from (EGCO, 2017)

During the operating period, NTPC paid royalties and dividends to the GOL. According to WB, in 2010 the NT2 paid USD 5.4 million to the GOL in royalties, in 2011 it paid USD 19 million to the government in royalties and dividends, and in 2012 USD 27 million was paid to the GOL (WB and ADB, 2011). NT2 revenues received by the GOL have been allocated to the education, health care and infrastructure sectors. The following activities have been financed so far: teacher training, provision of school textbooks, rural health services, and electrification of rural villages. The project is benefiting the local community. The project company conducts training among local residents to improve their farming and fishery skills and provides other employment opportunities to increase their incomes and livelihoods. The livelihoods of people in the community are being restored, people's living conditions are improving and their income is increasing. Thus, the project is enabling poverty reduction and economic development in rural areas of Lao PDR.

In the seven years of commercial operation since 2010, the NT2 Hydropower Project displayed quite good financial performance. The revenue from electricity sales exceeded the projected level. The financial obligations to lenders were fully met and investors received high returns. The NT2 revenue received by the government is enabling poverty alleviation and economic development in Lao PDR. The project has not been affected by any major challenges yet. It is expected that the NT2 will maintain its financial viability and sustainability in the long term.

Table 7.1 NT2's sensitivity analysis of debt/equity ratio change

Change in equity proportion	IRR	Change in WACC	IRR-WACC
Base case (69/31)	12,00%	10.03%	2.37%
54/46 debt/equity ratio (-15%)	12,00%	11.04%	1.36%
49/51 debt/equity ratio (-20%)	12,00%	11,38%	1,02%
44/56 debt/equity ratio (-25%)	12,00%	11,72%	0,68%
40/60 debt/equity ratio (-29%)	12,00%	12,00%	0,00%
34/66 debt/equity ratio (-35%)	12,00%	12,40%	-0,40%
30/70 debt/equity ratio (-39%)	12.00%	12.67%	-0.27%

Source: author project documents

Table 7.2 NT2 Project sensitivity analysis of CAPEX and O&M cost

Change	NPV	IRR	IRR-WACC
Base Case	190,79	12,0%	1,86%
2. CAPEX increase by 5%	128,29	11,3%	1,20%
- by 10%	65,79	10,7%	0,60%
- by 15%	0,00	10,1%	0,00%
- by 20%	-59,21	9,6%	-0,50%
1. O&M increase by 5%	184,00	11,9%	1,80%
- by 10%	177,22	11,8%	1,73%
- by 20%	163,65	11,7%	1,60%
- by 50%	122,93	11,3%	1,21%
- by 100%	55,07	10,6%	0,55%
- by 140%	0,00	10,1%	0,00%
- by 145%	-6,00	10,0%	-0,06%

Note: WACC as 10.10%

Source: author project documents

CHAPTER 7. DISCUSSION AND ANALYSIS OF THE CASE STUDY RESULTS

7.1 Findings from the Nam Theun 2 Hydropower Project case study

The NT2 Project is the largest investment project in the hydropower sector of Lao PDR. It is a typical PPP project with a complex financing structure involving 27 parties. Participation of Multilateral and Bilateral Agencies, ECAs in financial structure of the project enhanced financial viability of the Project. Debt guarantees provision from ADB, IDA and MIGA was the key contribution to the project success. The project had a significant environmental and social impact. Resettlement of households from reservoir territory, water quality and flow change, hydraulic and river morphology change resulting in fishery losses and erosion in downstream area were among the key impacts of the project. For mitigating the impacts NTPC and GOL developed Environmental management framework, Operational Plan and Resettlement Action Plan. Special Division and Units on E&S management were set up within the GOL and NTPC. Moreover external E&S monitoring Agencies, Panel of Experts, International Advisory Group and Project Supervision Group were established for comprehensive and transparent project supervision.

As a result of implementing E&S impact mitigation and compensation programs the 6300 people living in reservoir area were resettled to newly built houses in new villages. In these villages new water supply and sanitation system, roads, school, kindergarten, health clinics, electricity, microfinance Funds were provided to residents. People didn't have access to most of these services before the project. Now thanks to the Project local people have access to various services. Project provided technical and financial support to villagers to restore their livelihood. People restored their farming, cattle-breeding fishery, forestry activities that generate income for them. The improved road infrastructure allowed villagers to sell their products to external markets. The indicators of health, hygiene, nutrition and access to infrastructure have improved in the resettled villages. The affected community in the downstream area of Xe Bang Fai received equal compensation for livelihood impact.

For compensating and mitigating Environment impact NTPC has constructed water regulating and controlling structures in the downstream area of Xe Bang Fai to limit the impact of erosion and water quality change. The reservoir has been cleaned from biomass that minimized water quality decrease. For preserving biodiversity and wildlife in the Nakai Nam Theun National Protected Area that to some extent was inundated by reservoir the Project Company implemented

program on biodiversity and wildlife preservation program. Annually \$1 million is allocated for this program by the project. The Program enabled to mitigate impact on National Protected Area, rescue and recover endangered animals, Asian elephant, species, fish, and aquatic habitats. The Environment situation is regularly monitored and supervised by multiple parties and the impacts are mitigated on time.

The Project has given many benefits to the Lao PDR. GOL receives revenue from the project in three forms: taxes, royalties and dividend. According to financial forecasts the project will generate \$1.9 billion for the Government over 25 years operating. The NT2 revenue has given boost to education and health budget by 2012. Three times more budget was spent in the priority programs of teacher training, health services for poor, rural electrification over 2010 and 2012 in Laos (budget increase from \$5.4 mil. to \$15 mil.). One of the unique features of the Project was Government equity participation in the Project by financial support of the ADB, IDA, AFD, EIB and NTPC compensation. It enabled to generate additional revenue for financing poverty reduction programs and social, economic development in Lao PDR.

Result of sensitivity analysis of NT2 Project's debt/equity ratio, CAPEX, O&M cost

The analysis of NT2 project shows that the success of the Project was insured by high proportion of debt in its financial structure. At 69/31 debt/equity ratio the Project IRR was 12% which is 2.37% higher than the Project's WACC of 10%. The sensitivity analysis proved further lowering debt/equity ratio keep Project IRR higher than WACC. At 54/46 debt/equity ratio (15% lowering ratio) IRR is 1.36% higher than WACC. The debt/equity ratio reduction to 40/60 makes IRR equal to WACC (table 7.1). Sensitivity analysis of the Project's CAPEX proves that increase of capital expenditure by 5% and 10% keep NPV greater than zero and IRR higher than WACC. The CAPEX increase by 15% is the threshold that NPV equals zero and IRR equals WACC. However Project's O&M sensitivity analysis showed that O&M cost can be as high as 20%, 50%, even 100% while keeping NPV greater than zero and IRR higher than WACC. If O&M cost increases by 140% the Project's NPV remains equal to zero and IRR equal to WACC (Table 7.2). It is the threshold, and increasing O&M cost more than 140% makes NPV less than zero and IRR lower than WACC.

Financing of NT2 Project was arranged 69% by debt-raising and 31% by equity financing. USD 340 million or 34% of debt was mobilized from nine international commercial banks through provision of guarantee facilities by ECAs, ADB, IDA and MIGA. Another USD 160 million or 16% of debt was provided by Multilateral and Bilateral Agencies, including Proparco, AFD, NIB, ADB and Thai EXI. The remaining USD 500 million 50% of debt denominated in Thai Baht was lent by seven Thai commercial banks. Financing of the project was arranged 59.8% in US dollar

and 40.2% in Thai Baht in order to mitigate exchange rate risk. The project expenditures were also arranged to occur in mix of US dollar and Thai baht. The revenue generated from power sell is in mix of US dollar and Thai baht that allows repaying dollar and baht loans. The Project equity is provided 40% by EDFI, 35% by EGCO and 25% by Government of LaoPDR. The Government equity injection is financed by IDA grant, ADB loan, AFD grant, EIB loan and NTPC compensation.

7.2 Findings from the Pamir Energy Project case study

The Pamir Energy Project differs from a typical PPP project. The project concessionaires were not selected on a competitive procurement basis. The project initiators IFC and AKFED became project investors. Unlike NT2 the Pamir Energy Project was not viable without tariff subsidy provision. Customer support program that was financed by grant from Swiss Government made project affordable for residents. The financial structure of the Project included \$10 million concessional loan from IDA that reflected the country and project risk. It enabled reducing project risks and enhancing project bankability.

A catastrophic flooding that happened in the project site in 2007 has caused huge damage to infrastructure and equipment of the Pamir Energy Company (PEC). This accident led to investment cost overrun by 19%. The PEC became insolvent; and it was unable to cover its operating expenses and meet financial obligations of debt service, dividend payment. In such case PPP projects usually either go into bankruptcy or public sector take over the project. But the case of PEC was different from usual cases of dealing with PPP project in Force Majeure event. The Project's stakeholders provided assistance to PEC in overcoming the financial difficulties. The IDA provided \$2.5 million grant to PEC to fill financial gap and restore damaged facilities. Additionally \$4.4 million and \$0.9 million were allocated from Insurance Company and Project Internal Fund respectively. Moreover the Project's stakeholders agreed on Financial Restructuring of the Company that enabled improving financial situation in PEC.

The Pamir Energy Project has found high support from its sponsors, including IFIs, Donors and Government. The Project's stakeholders remained highly committed to success of the project. It became more socially-oriented project rather than commercial project. Pamir Project brought more benefit to the local community and environment. It enabled increasing electrification rate, improving environment and public health. Deforestation process has been mitigated and fossil fuels usage by residents for heating and cooking has significantly diminished.

Result of sensitivity analysis of Pamir Energy Project's debt/equity ratio, CAPEX, O&M cost

Sensitivity analysis of debt/equity ratio of PEP shows that the debt/equity portion can be lowered to 50/50, 45/55 and 40/60 while IRR being higher than WACC. However at 23/77 ratio level IRR equal WACC. It is the threshold. Exceeding this level IRR becomes less than WACC (Table 5.8). As regard to sensitivity of CAPEX the results of analysis shows that increase of Project's CAPEX by 5% and 8% leaves NPV greater than zero and IRR higher than WACC. If CAPEX increase by 11% NPV equals zero and IRR equals WACC. The 11% CAPEX rise is the project's threshold. PEP's O&M cost sensitivity analysis shows that O&M cost can be as high as 5%, 10% and even 15% while NPV to remain greater than zero and IRR higher than WACC. At 18% O&M cost increase NPV equals zero and IRR equals WACC (Table 5.9).

Financing of Pamir Energy Project is arranged 55% by debt and 45% by equity finance. Debt was provided by IDA - USD 10 million (69%) and IFC – USD 4.5 million (31%). Equity was provided by AKFED USD8.2 million (70%) and IFC USD3.5 million (30%). PEC's financing structure also includes grant from Swiss Government for tariff subsidy. At the first 10 years of operation (from 2002 to 2012) PEC received USD 5 million from Swiss Government for tariff subsidy. Later in 2013 Government of Switzerland provided additional USD 3.5 million to the Project Company for tariff subsidy till the end of the project. In addition to Swiss grant it was agreed to allocate USD 4 million for tariff subsidy from revenue generated from IDA on-lent credit interest spread. The tariff subsidy scheme made electricity affordable for poor households and generated cash stream for the project.

CHAPTER 8. CONCLUSION AND POLICY RECOMMENDATIONS

8.1 Conclusion

This research attempted to find a successful way of applying PPP scheme in the hydropower sector in Tajikistan. Through analyzing the case studies of the Pamir Energy Project and the Nam Theun 2 Hydropower Project and a literature review, it can be concluded that the successful application of PPP schemes in the hydropower sector of Tajikistan depends on a number of factors. First, the PPP projects must be affordable for customers. PPP projects in Tajikistan cannot become affordable by themselves. As the experience of Pamir Energy Project shows, the affordability constraints of the PPP project were solved by the support of donors and the public sector. Tariff subsidy made electricity usage affordable for poor residents. The tariff structure was adjusted to ensure sufficient cash flow was generated for debt repayment and investment returns, and to make electricity available for households. Second, the tariff structure should be adjusted in such a way that the electricity service is affordable for households and enough cash streams are generated for debt service and returns to investors. To achieve this, the project company has to have access to a long-term debt market and low interest rates with long grace periods. Additionally, the government or donors must provide subsidies to the project company to make the service affordable for poor residents. Third, the financial structure of PPP projects should encompass involvement of IFIs or the public sector. Concession loans provided by IFIs could reduce the project company's cost of capital and enhance its bankability. As the experience of PEC and NT2 proved, the involvement of IFIs in the financing structure of the project company reduced capital costs and thus increased the financial viability and sustainability of the project. The equity injection of the Lao government into the NT2 Project, which was financed by multilateral institutions, gave additional comfort to the project lenders and private investors. Finally, opening electricity export markets will make PPP projects successful in the hydropower sector in Tajikistan. Creating regional electricity markets such as CASAREM will increase the power export opportunities of Tajikistan. Opening new export markets along with modernizing the hydropower infrastructure, reducing loss in the power system, and improving billing and the financial and accounting conditions of Barqi Tojik will ensure successful application of PPP schemes in the hydropower sector in Tajikistan. Moreover, the unbundling and privatization of the state-owned electricity utility, Barqi Tojik, that is currently in progress will provide transparency, efficiency and competition in the electricity market and may eventually ensure the success of hydropower PPP projects in Tajikistan.

This research also intended to explore efficient ways of implementing PPP projects in the hydropower sector in Tajikistan. The analysis of the case study of NT2 Hydropower Project revealed the sustainable way of constructing hydropower plant. The Environment and social impact mitigation measures were undertaken by the Project Company. For E&S impact mitigation programs \$95 million was allocated by the Company. Internal and external monitoring units, division and agencies were set up to ensure comprehensive and transparent supervision of project implementation. People living in reservoir area were resettled to new houses; they received compensation for their lost property, their livelihood was restored and life conditions improved. New infrastructure services and facilities were provided to them, such as water and sanitation system, schools, health clinics, roads, electricity etc. The affected people in the downstream area received similar compensation for their lost livelihood. For mitigating and compensating impact on environment the Project implemented several programs for preserving biodiversity and wildlife; it constructed water regulating facilities along the river in the downstream to mitigate water quality change and erosion. As a result of those measures the adverse impact of the project on local environment and society was mitigated, resident's livelihood restored, they got access to education, health care, electricity and water services and their life standards have improved. Moreover the revenue generated from the Project for Government has increased financing poverty reduction programs in Lao PDR.

The analysis of the case study of Pamir Energy Project discovered that the private partner improves efficiency and reliability of public service delivery. The Project Company rehabilitated all hydropower infrastructure, increased billing and collection rate, improved financial sustainability of hydropower sector in GBAO region of Tajikistan. The Pamir Energy Project had positive impact on social and economic development, public health and environmental improvement in the region. It enabled public facilities, such as schools, hospitals to operate in all seasons of the year, improved environment and public health, reduced deforestation.

The conclusion that can be drawn from the case studies of NT2 and PEC in regard to efficient approach of implementing PPP project in hydropower sector in Tajikistan is that PPP project can be efficiently and sustainably implemented in hydropower sector by undertaking proper E&S impact mitigation and compensation measures. The legal and institutional framework has to be established for mitigating E&S impact. Furthermore provision of internal and external monitoring and supervision of the E&S impact ensures transparency and comprehensiveness in the project implementation.

This research was carried out to analyze the case studies of PEC and NT2, and to draw lessons for Tajikistan from their experiences. By studying the case of PEC, it can be concluded that

in the context of Tajikistan, implementing a PPP project in the hydropower sector is highly risky, and the public sector and project stakeholders must be highly committed for a project to be succeed. Specifically, the natural flooding catastrophe that happened at the Pamir Energy Project site led the investment costs to overrun by 19%. In that situation, the public sector and project sponsors were highly supportive of the project. To restore damaged facilities, fill the financial gap and ensure financial viability of the project, the sponsors agreed to financial restructuring that wrote off all unpaid interest and duties and provided additional financial support to the company. This helped to restore the damaged facilities and improve the viability of the company. Another important lesson of the PEC case for Tajikistan when implementing similar projects in other parts of the country would be tariff structuring and subsidies for poor consumers. Tariff subsidies made the electricity service affordable for poor residents of the GBAO. However, the current tariffs for residential customers remain low, which concerns the company. The Company cannot increase the tariff because of the low capability of residents to pay high tariffs. Export of electricity to neighboring countries is envisaged dynamic. For this purpose, the company is attracting investments to increase generating capacity and construct transmission facilities.

The investigation of the NT2 case revealed that guaranteed power purchase ensured the sustainability of the project. The financial stability of the off-taker, Thailand EGAT, guaranteed power sales. It can be concluded from the NT2 experience that Tajikistan can promote cooperation with neighboring countries in developing cross-border hydropower plants and power trade. The support of multilateral and bilateral institutions in implementing hydropower PPP projects can be gained by applying international environmental and social safeguards when constructing hydropower plants and ensuring transparent spending of revenues generated from electricity sales on socio-economic development and poverty reduction in the country. The multilateral and bilateral institutions' credit and guarantee facilities can enable the bankability of PPP projects in the hydropower sector of the country.

8.2 Policy recommendations

Based on the analysis of this research, the following policy recommendations can be drawn for the successful application of PPP scheme and efficient implementation of PPP projects in the hydropower sector in Tajikistan:

- ❖ Inclusion of financial aid or subsidy in financial structure of PPP projects in order to make the projects affordable in Tajikistan. Provision of tariff subsidy for poor households. Government must provide soft loans to PPP projects to reduce their cost of capital and improve their financial viability.
- ❖ Involving IFIs, Donors in financial structure of PPP projects in hydropower sector in Tajikistan. Concessional loans provision by IFIs will decrease projects' risks and make them feasible. It improves bankability of PPP projects and enhances their attractiveness.
- ❖ Establishing a Special Fund for developing PPP projects from state budget or developing partners. The Fund must provide financing of Feasibility Study of PPP projects.
- ❖ Developing Partners should provide technical assistance to Tajikistan for improving capacity building of public and private sectors in preparing, procuring and implementing PPP projects. Further studies and research works in PPP field have to be supported in Tajikistan.
- ❖ Government of Tajikistan should adopt amendments to the PPP law. The amendments must introduce provision of tax exemption, freeing from customs duties to PPP projects in order to enhance projects' financial viability. Additionally, new incentives, reassurances and state guarantee must be provided to private partners to enhance projects' attractiveness to private investors, commercial lenders.
- ❖ Enhancing cooperation on power trade with neighbors and expansion of electricity export opportunities by creating regional electricity market. Implementation of CASA-1000 project along with Kyrgyzstan, Afghanistan and Pakistan in order to facilitate power trade, increase electricity export to Afghanistan and Pakistan.
- ❖ Continuing reforming hydropower sector in the country. Privatization of Barqi Tojik must take place on competitive basis. Competent private entities should be selected to bring transparency, accountability and financial sustainability in hydropower sector of Tajikistan. A fair competition must be brought in hydropower sector in order to improve service quality, efficiency and reliability of power supply.
- ❖ Undertaking proper measures for mitigating E&S impact of hydropower projects. PPP projects in hydropower sector must be implemented in environmentally and socially sustainable way. The affected households in the project area should get full compensation and their livelihood must be restored. The impact on environment must be compensated and monitored. Independent external monitoring agencies should be set up to ensure transparency.

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