Financial Appraisal on a Hydropower Plant.
A Case Study in Albania.

Blerta Xhafa

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Approval of the Institute of Graduate Studies and Research

Prof. Dr. Elvan Yılmaz
Director (a)

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Banking and Finance.

Assoc. Prof. Hatice Jenkins
Chair, Department of Banking and Finance

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Banking and Finance.

Asst. Prof. Dr. Mustafa Besim
Supervisor

Examining Committee

1. Assoc. Prof. Dr. Hatice Jenkins
2. Asst. Prof. Dr. Mustafa Besim
3. Asst. Prof. Dr. Mete Feridun

ABSTRACT

Albanian rapidly growing economy requires additional electricity to ensure the well functioning of many industrial operations. The current energy situation in Albania is high demand for electricity and low domestic supply. The limited supply is due to the scarce funds for utilizable natural resources such as oil and gas and undiversified supply sector. Due to the favorable environmental factors as well as the low cost factor, renewable energy has been a target of the Albanian government. Hydropower has been the major source of energy generation for Albania.

A financial analysis was conducted in an 8 hydropower plant scheme project in Albania to look at the financial sustainability of the project. The analysis confirmed the viability of the project but pointed out some difficulties in the ability of servicing the debt.

The risk rose from the variability of the interest rate, electricity tariff and degree of utilization and pointed out some important issues and gave an enormous help in spotting the possible problems that the project may face which in turn, have an adverse impact on the financial feasibility. Various measures must be taken to reduce the exposure to these risks and to help future projects into a better and more improved project design.

Keywords: Hydropower Plant, Financial sustainability, Risk

ÖZET

Hızla büyüyen Arnavutluk ekonomisi, birçok endüstriyel etkinliğin iyi bir şekilde işlemesini garanti altına almak için ilave elektriğe ihtiyaç duymaktadır. Arnavutluk' taki mevcut elektrik koşulları, elektrik için yüksek talep ve düşük yerel arz şeklindedir. Kısıtlı arz, petrol ve doğalgaz gibi kullanılabilir doğal kaynaklara kısıtlı yatırım ve çeşitlendirilmemiş üretim sektöründen kaynaklanmaktadır. Düşük maliyet faktörünün yanı sıra lehte doğal faktörler nedeniyle yenilenebilir enerji Arnavutluk Hükümeti için bir hedef haline gelmiştir. Hidrolik enerji, Arnavutluk için temel bir enerji üretim kaynağı olmuştur.

Arnavutluk’ta, 8 hidroelektrik santrallik bir tasarı projesinde, projenin finansal sürdürülebilirliğine göz atmak için bir finansal analiz yürütülmüştür. Analiz; projenin finansal sürdürülebilirliğini doğrulamış, fakat borcu karşılama kabiliyetindeki bazı zorluklara da dikkat çekmiştir.

Bu çalışımada ayrıca projenin risk alalizi yapılmıştır.Faiz oranının değişkenliği, elektrik tarifeleri ve kullanım derecesinden kaynaklanan risk, projenin aldığı krediyi karşılamasında, zamanla finansal fizibilite üzerinde ters etki yaratabileceği, tespit edilmiştir. Bu risklere maruz kalma olasılığını azaltmak için çeşitli önlemler önerilmiştir.

Anahtar Kelimeler: Hidroelektrik Santrali, Finansal sürdürülebilirlik, Risk

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LIST OF ABBREVIATIONS

- AEA - Austrian Energy Agency
- ADSCR – Annual Debt Service Coverage Ratio
- BOT – Build Operate Transfer
- CBA- Cost Benefit Analysis
- CO2 – Carbon Dioxide
- CF – Cash Flow
- DSCR – Debt Service Capacity Ratio
- ERE -Electricity Regulatory Entity
- GW – Giga Watt
- HPP – Hydro Power Plant
- INSTAT – Instituti I Statistikave
- IRR – Internal Rate of Return
- KESH – Korporata Elektro Energjitike Shqipetare
- KW – Kilo Watt
- METE – Ministry of Economy, Trade and Energy of Albania
- MW – Mega Watt
- NPV – Net Present Value
- PV – Present Value
- TSO – Transmission System Operator

CHAPTER 1

INTRODUCTION

1.1 Background

Albania is a small country in south Eastern Europe. It is surrounded by Kosovo in north east, Montenegro in east side, and Greece in south east.

Albanian economy is growing at approximately 6% per year and together with the growing economy even the demand of energy is increasing. Under this emergent economy, the actual energy supply proved to be not capable in covering the existing domestic demand for energy, importing thus the remaining portion needed. Albania is famous for its enormous hydropower potential and is highly dependent on hydro power as a source of energy. According to the Ministry of Economy Trade and Energy of Albania almost 98% of the total production of electricity comes from hydropower generation. Even so, this potential hasn't been yet exploited fully. Until now only 35% of its hydropower potential has been exploited. The recent major priorities of the Albanian energy policies are the energy effectiveness and the encouragement of renewable energy. Hydropower plants are becoming thus nowadays an attractive alternative for both government and investors.

The government of Albania is currently encouraging private investors to invest in hydro electricity generation, though concession agreements and different type of contracts while guaranteeing the purchase of their output.

Recently, the Ministry of Energy announced that the government of Albania accepted the proposals for 20 new small hydropower plants, though a concession of 35 years and a state guarantee for energy purchase. One of these projects is the Zalla of Okshtun hydropower plant.

1.2 Aim of the study

The objective of this paper is to explore the feasibility of the hydropower plant to be built next to Drin River nearby the province of Dibra. This thesis examines the financial viability of the hydropower plant using the integrated appraisal structure which analyzes the project and its desirability in different prospective. The project attractiveness will be examined from the owner's points of view, which are the investors that placed their funds into the project and from the investors or bankers' point of view. At the end the risk analysis will be conducted through Monte Carlo Simulation. Some of the questions expected to be answered by the end of the study are:

1. What sources of financing will be used to cover the project's costs? What are the features of this kind of financing?
2. Is there any sufficient working capital in the project?
3. What is the contribution of the project to the investors?
4. What are the risks of the project and how can we mitigate it in order to guarantee the viability and sustainability of the project.
5. Is the project financially viable in terms of enough net cash flows or financial rate of return?

1.3 Method used in the study

1.3.1 Data Sources

The data used in this study has been taken from the project owners and their pre-feasibility study. The research is carried out by literature review obtained by different sources, through different virtual libraries, books, articles, lecture notes and worldwide web sources. For the assumptions made, the study made usage of different materials and information given from the competent governmental structures, agencies and organizations. The macroeconomic data and all the other necessary data were taken or referred to other similar projects with similar characteristics done by World Bank, European Bank for Development and Reconstruction or Ministry of Economy, Trade and Energy of Albania.

1.3.2 Study Approach

The method used to evaluate the viability of the project is the integrated financial appraisal analysis. The study will make usage of the data set, to find out the financial viability of the study. All the data, arranged in a spreadsheet, after the necessary adjustments made, will be taken into consideration to finalize the cash flows generated by the project through excel functions. At the end the net cash flows obtained will be used to find the Net Present Value (NPV) and Internal Rate of Return (IRR) of the project, both indicators of projects feasibility. At last, risk analysis is conducted through Monte Carlo simulation to identify the risky variables and their impact on the project output.

CHAPTER 2

ENERGY SECTOR

2.1 Energy sector in the World

The whole world is making usage of electricity for different fundamental purposes. If we think what will happen if electricity is not there for a while we can all imagine a total collapse. Almost everything needs the energy as a vital input. Households use energy for heat, lightening and other purposes as cooking or cleaning, where any of these are done through machineries that request electricity in order to work.

On the other side the commercial sector which includes industrial sector, businesses, institutions and other service providers also necessitate electricity for different operations related to the activity and their nature of commerce. Energy also is needed for various public services such as lightening or space heating and cooling for schools, hospitals, museums, banks, other government institutions and also support in water service and traffic lights.

“The greatest challenge facing the energy sector today is how to meet rising demand of energy while at the same time reducing our emissions of greenhouse gases. Climate change is undoubtedly an imperative which must be addressed with a sense of urgency. We need to find new and innovative ways of addressing mitigation of greenhouse gases as well as adapting to changes in the climate." (World Energy Council; 2007)

The type and amount of energy used differ from country to country. This is due to differences that exists in their income levels, climate, needs and of course in the natural resources that they posses. Energy can be generated from renewable or nonrenewable resources. Renewable energy category consists of energy created through:

A. Hydro
B. Biomass
C. Geothermal
D. Solar
E. Wind

In Non-Renewable energy is created through:

A. Coal
B. Fossil fuel power plant
C. Petroleum
D. Gas
E. Oil
F. Nuclear

2.1.1 Trends in Energy Production and Demand

Economic development together with the growth in population is shaping the demand and the production for the electricity. To support this growth other sectors will expand as well, such as need for educational, financial or health services. Economic growth will be also accompanied with the development of different industries and supplementary activities accessible though business sector. High levels of economy and of course high levels of income will lead to an increase in demand for agricultural products, house space, restaurants, leisure services and technological products. All these require energy in a way or another. Clearly economic or population growth go parallel with the energy demand. Widely accepted, economic growth is recognized as one of the most important factors in projecting the changes in the energy consumption. According to the Energy Information Administration (2006), China and India which are the fastest growing economies will be the largest world energy consumers in the future. The Figure 1 shows the historical consumption and the predictions for energy consumption from 1980-2030.

Figure 1: World Marketed Energy Consumption 1980-2030

Source: www.eia.doe.gov.iea

Also the predictions about increase and relatively high oil prices together with limited resources and being concerned with the environmental impacts of fossil fuel have made the rest of the world turning in the renewable energy production. The most used renewable energy production was the hydropower electricity. The figure 2 shows the historical world renewable electricity generation by source and the predictions about the future.

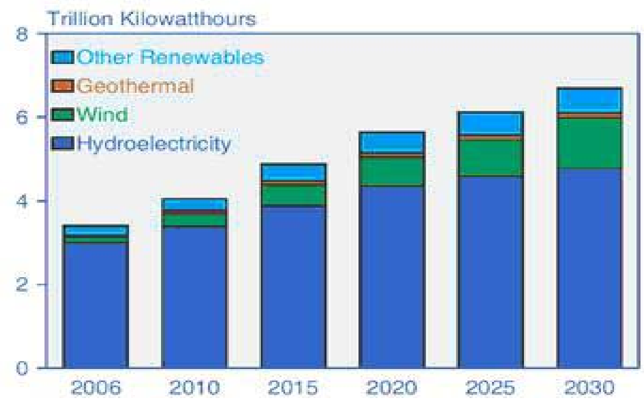

Figure 2: Worlds Renewable Electricity Generation by Source, 2006-2030

Source: www.eia.doe.gov.iea

Renewable energy proves to be appropriate for developing countries where transmission and distribution of energy generated through fossil fuel is expensive. Also for closed areas where the transmission and distribution of electricity is difficult, hydro energy is a viable solution where water sources are present, providing thus electricity to small communities and other schools or different institutions in that region.

2.1.2 Why Hydro Power Energy Generation

There are various reasons why Hydropower Energy is preferable to other forms of energy generation, either renewable or non-renewable.

- It is favorable if water sources are present since the hydro scheme can be used for other purposes as well such as irrigation.
- Well designed and planned schemes have little or no environmental impact with no pollution

- It is the cheapest source of electricity production among the others since it eliminates the cost of fuel, a limited resource
- Hydro plants have low operation cost

2.2 Background to Albanian Energy Sector

The Ministry of Economy, Trade and Energy of Albania (METE) is in charge of the energy sector. METE is the highest state authority responsible for energy policy-making. The National Energy Agency, which is under the Ministry patronage, advices and is responsible for the energy matters. The national energy strategy is prepared and supervised by the agency. The agency presents different proposals and examines studies undertaken in energy sector. The Electricity Regulatory Authority (ERE), which is an institution that operates as a separate legal public entity, officially established in May 1996 ,has the whole authority to set and regulate the electricity tariffs. Albanian power corporation, KESH, established in 1992, is responsible for the supply of electricity in Albania. KESH is a state- owned Monopoly Company, responsible for generation and transmission of electricity. The entity in charge for distribution is the Distribution System Operator, which operates as a separate legal entity, legally and financially from KESH. Transmission was separated from KESH and shifted to a new Transmission System Operator (TSO), registered later on as a joint-stock company on July 14, 2004 keeping KESH as the holding company.

Austrian Energy Agency (2006) states that “In the early 1990s, the country was virtually 100% electrified and was a net electricity exporter, with exports of around 20% of the domestic generation in 1991-1992” (p.17). Due to a diminishing industrial production from 1989, the demand of energy within Albania was declining. Since 1996, Albania turned out, to become, from a net exporter in electricity market, to a net importer.

According to Kamberi (2004) "Electricity sector from 1990-2000 in Albania has experienced a high growth rate of electrical consumption, averaging 8% per year. A large part of that growth has been artificially stimulated by extraordinary high rates of electricity theft, nonpayment of electricity bills and tariff rates below cost"(p.4). Consumption increased by the residential and commercial consumers.

KESH experienced financial problems caused by energy theft and unpaid electricity bills. Low collections rate were also experienced in Albania. The electricity tariffs set, being not cost-based, were a way too below the recovery price, since the electricity was largely subsidized by the government, and proved to be unable to cover KESH operational costs.

After that, in the following years, many laws came in force, aiming a restructure of the Albanian power sector. "In an attempt to address the fundamental issues affecting the energy sector, the Government of Albania and the Albanian Power Corporation initiated at the beginning of 2001 a Power Sector Action Plan focusing largely on improving KESH's financial performance through increasing collections, and reducing illegal use of electricity".(http://go.worldbank.org/00EQWW7GO0)

Considerable improvements in addressing these issues have been made since. The current energy situation in Albania is high demand for electricity and low domestic supply.

The limited supply is due to the scarce funds for utilizable natural resources such as oil and gas and undiversified supply sector, where almost 98% of total energy comes from hydro resources, which are highly reliant on weather factors. Also the limited technical capacity for importing adds up to this problem. Due to these transmission and also financial constrains, Albania can not import the whole electricity needed.

The high domestic demand is justified by consumers high usage of electricity for varies of household services such as cooking, lightening or heating and also lack of relatively high tariffs for other substitute uses of energy. A report done by Austrian Energy Agency (2006) identifies that approximately 60% of the produced electricity, in a typical Albanian family, goes for heating, cooking and lightening. Also part in this growth has the expansion of different economic sectors, being in a continuous need for energy. The consequences of these conditions presented above, can be exemplified by lack of energy and frequent blackouts.

2.3 Hydroelectricity

Hydropower is the energy that comes from the force of movement of water. Hydroelectricity is electricity generated by hydropower, the production of power through use of the gravitational force of falling or flowing water. This form of electricity generation is called renewable source since water is continuously replenished by precipitation. Once a hydroelectric complex is constructed, the project produces no direct waste, and has a considerably different output level of the greenhouse gas carbon dioxide (CO_2) than fossil fuel fossil powered energy plants (http://en.wikipedia.org/wiki/Hydroelectricity). According to the National Renewable Energy Laboratory, worlds hydropower plants put together have a total output of 675,000 megawatts, the energy equivalent of 3.6 billion barrels of oil. This kind of electricity production is one of the cheapest sources and the most cost effective energy solution as compared to other forms of energy generation.

2.3.1 Classification of Hydropower Plants

Hydroelectric power plants can be classified in different ways, resembling the output produced, according to the quality of water available to the dam or total head of water etc. Even though various definitions are given, according to the power output, the hydropower plants are categorized as:

1. **Large hydropower plants**

   These are the plants which amount of energy produced is 100MW and above. Usually these plants are feeding a large electricity grid.

2. **Medium hydropower plants**

   In this category fall all the plants that produce from 30 MW to 100MW feeding into an electricity grid.

3. **Small hydropower plants**

   Small hydropower plants are defined as plants which generate from 1MW to 30 MW. These kinds of facilities may be connected to a distribution grid or they can provide power only to an isolated community or a single home. Small hydro projects generally do not require the protracted economic, engineering and environmental studies associated with the large projects, and often can be completed much more quickly. A small hydro development may be installed along with a project for flood control, irrigation or other purposes, providing extra revenue for projects (http://en.wikipedia.org/wiki/Hydroelectricity).

An additional classification is done sometimes to the small hydropower plants into mini and micro hydro.

2.3.2 How does a Hydropower Work?

The concept of a hydropower is very easy to be understood. In simply term, the water is flowing through a dam turns a turbine, which turns a generator. The majority of hydro plants make usage of a damn that helps to hold back the water forming a reservoir. The gates on the dam open and drag the water through the pipeline which is linked to the turbine, which is also called penstock. The water reaches and turns the turbine which is attached to a generator. While the turbine blades turn the generator is activated to produce energy. The energy output depends mainly of the volume of water flow and the amount of hydraulic head. The head is the distance between the water surface and the turbines. To produce more electricity, the head and the flow as well must increase. Figure 2.3 gives an idea about how a hydropower plant looks like.

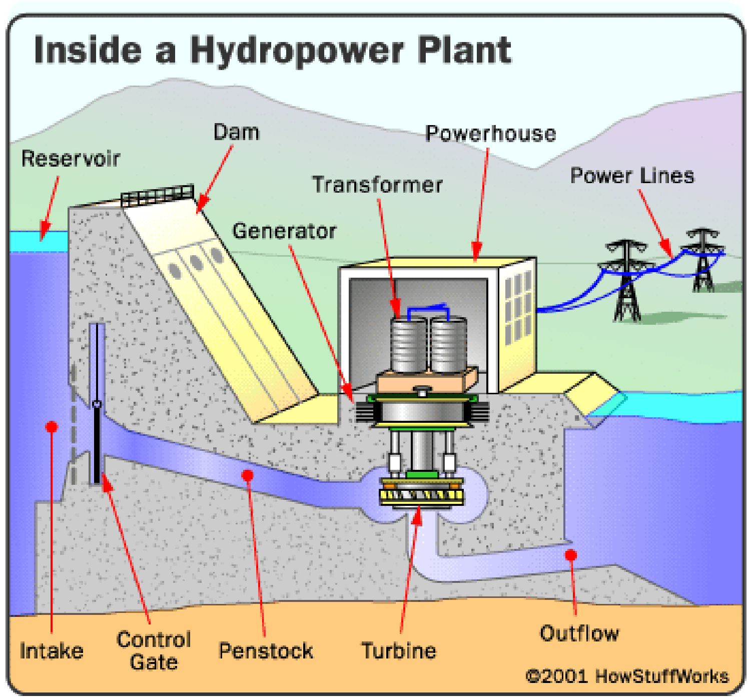

Figure 3: Hydropower Plant

Source: http://www.energymanagertraining.com/power_plants/Hydro_power.htm

Hydropower plants may be impoundment, pumped storage or run-of-river type.

The impoundment facility is the most frequent type pf hydropower plant. This type of facility is common for large hydropower's that use a damn and store the water in reservoir. They use the stored water to meet the electricity needs in the future. The pumped storage hydro has two reservoirs, the upper reservoir and the lower one. The water in the upper reservoir is stored to be used for energy generation. The water in the lower reservoir is talking the water from the upper reservoir, the water that in conventional hydropower plant is supposed to be released back in the river. The lower reservoir keeps the water to refill the upper reservoir. This water is pumped back to the upper reservoir through a reversible turbine so it can serve in off-peak hours. Run - of - river plants do not have a storage capacity. The water flows through a turbine, spins it, which in turn will activate the generator to produce electricity, and than the water re-enter in the river stream again. These systems have usually larger operational live than the other plants and they need minimum maintenance. Also the payback of these types of plants is another factor making these plants desirable. Generally these plants pay back themselves in a short period of time.

CHAPTER 3

PROJECT DATA AND METHODOLOGY

3.1 Project Description

Albanian rapidly growing economy requires additional electricity to ensure the well functioning of many industrial operations. Due to the favorable environmental factors as well as the low cost factor, renewable energy has been a target of the Albanian government. Hydropower has been the major source of energy generation for Albania. Since 2003 many laws were adopted to promote the electricity generation through hydro resources as well as laws for the concessions and tariff regulations.

The Albanian Power Corporation is responsible for power generation and transmission. The entity in charge for distribution is the Distribution System Operator, and Transmission System Operator (TSO) who is in charge of the transmission, under the KESH supervision. Energy Regulatory Entity (ERE) has the whole authority to set electricity tariffs.

Zalla of Okshtun hydropower plants are located in Dibra and in Zalla of Okshtun River. Zalla of Okshtun River is known of its unchangeable flows of water.

The project covers 8 small hydropower plants situated around the same area connected at the end of the construction period, at the same grid line. The project is a 35 year concession with a BOT contract type. The concessionaire company is composed by 6 companies: “PERXHOLA” sh.p.k which deals with construction of civil and industrial objects which is one of the best construction companies in Albania; “ALBADI” sh.p.k, “2T” sh.p.k, and “UNION DISTRIBUCION SERVICE ALBANIA” shp.k which all deal with construction as well as with infrastructure projects such as roads, dams etc; “ME”-AJ” energy company;” MIX-TECNICE” whose activity field is engineering consultancy and management of contraction of water supply systems and road sanitation.

The concession company aims through the project to produce renewable energy utilizing the hydro resources of Zalla of Okshtun River, at a cheap cost, by using modern equipments combined with the technical know-how of a qualified staff, in order to consolidate its position in the energy market of Dibra district.

With a capacity of about 30.650 KW/h the project is estimated to generate a power output at 154 GKW/h. The project will utilize 19 turbines installed, of 3 different types, Turgo, Frencis and Pelton. The graph of the 8 hydropower plants, Borova, Sebisht, Okshtun, Prodona 4, Prodona 5, Gjorice, Ternove and Lubanesh is given by Table 1 where the technical data is given for each of them. This table was constructed during the financial analysis done from the consortium group.

Table 1: The main Characteristics of the Hydropower Plants

HYDROPOWER PLANTS	INVESTMENT (EURO)	CAPACITY (kW)	PRODUCTION (kWH/h)	SPECIFIC COST (€/kW)
Hec Gjorice	5,910,160	3,200	21,062,367	1,847
Hec Borova	1,662,646	1,260	7,189,552	1,320
Hec Sebisht	3,866,020	2,500	12,380,981	1,546
Hec Okshtun	19,646,400	10,150	50,910,794	1,936
Hec Prodan 4	716,196	320	1,853,042	2,238
Hec Prodan 5	803,818	700	3,668,915	1,148
Hec Lubalesh	24,143,400	11,890	53,277,396	2,031
Hec Ternove 7	828,942	630	3,443,080	1,316
TOTAL	**57,577,582**	**30,650**	**153,786,127**	**1,879**

Source: Obtained by the technical study done for the project

The construction period for the proposed project Zalla of Okshtun is predicted to take 7 years. If the project has to start in September 2009, the hydropower plant will start operating in September 2016.

3.2 Projects Costs

The components of the project are:

1) Civil Works
2) Equipment
3) Connection to the Electrical Grid System
4) Contingency Fund

3.2.1 Civil works

Civil works will include the preparation of the site, the construction of access roads, the construction of spillway gates and the discharge structures. Also within this component we have the construction of the dams. The installation of turbines also falls under this unit.

3.2.2 Equipment

3.2.2.1 Hydro mechanical Equipment

Under this component we have the purchase of the hydraulic materials for the construction of intake gates, spillways and the purchase of the large pipes which are also called penstock.

3.2.2.2 Electromechanical Equipment

The turbines used by the project falls under this category. Also the different valves, generators, transformers and control system are part of this component.

Powerhouse as well is classified as part of the electromechanical equipment.

3.2.3 Connection to Electrical Grid System

Describes the costs implied with the connection of the electricity to the national Grid.

3.2.4 Contingency Fund

A contingency fund is set apart as a one of the requests that the bank who will provide the loan negotiated. This will serve as an escrow fund so that it can serve to the project in case of cash shortages. The fund will be 16 % of initial investment.

3.3 Total Investment Costs

The land that will be used to accommodate the hydro plants of the project is subsidized by the government. The today price of the land is €1.000.000. The price of it is taken into consideration while calculating the total investment cost even though no direct payment from the concessionaire company was made. Even though so, that cost is part of the investment cost, which is why it is placed in the investment table. The value of the land will be considered as an outflow during the financial analysis and later on will be netted out in type of an inflow since it constitutes a subsidy from the government. The investment costs which are given in the table below are taking into account even the increase of inflation during the construction period.

Table 2: Investment Cost

Investment Table (Nominal Prices) In Millions(Euro)								
Year	**Total**	**0**	**1**	**2**	**3**	**4**	**5**	**6**
LAND	1.00	1.00						
CIVIL WORKS	32.5	2.4	5.5	4.1	3.9	5.8	9.3	1.5
EQUIPMENT	11.8		2.7	1.2	1.2	2.4	1.2	3.1
CONNECT.TO ELECT.GRID	3.6		0.8	0.8	0.5	30.5	0.4	0.6
CONTINGENCY FUND	9.6	0.7	1.7	1.0	0.9	1.8	1.7	1.8
TOTAL	**58.5**	**4.1**	**10.7**	**7.1**	**6.5**	**10.5**	**12.6**	**7.0**

Source: This table is obtained from the projections done for the necessary investment cost

3.4 Operating and Maintenance Costs

3.4.1 Labor Cost

The plant will need to employ a staff of 100 workers during the 35 years of concession. The project will employ 8 project managers (directors of the project) which will be paid € 950 monthly, twelve engineers and technicians that will have a monthly salary of € 667, 8 economists that will be paid €388 monthly, 19 maintenance specialists that will receive €292 monthly, 36 workers that will have a monthly salary of € 200 and 17 security personnel with a monthly salary of €150.

All the salaries declared above are in year 0 prices and they are expected to have a real growth of 3% starting form the sixth year of operation. The salaries and the assumption of the annual growth is done throughout a close observation from the INSTAT (Institute of Statistic in Albania) figures. These payments which will be presented briefly in the table below are also going to be adjusted for inflation.

Table 3: Staff Composition and Payment in Euro

Description	**Number Of Employees (€)**	**Salary Monthly (per employee/€)**	**Monthly Salary (€)**	**Annual Salary (€)**
Proj.Manager	8	950	7,600	**91,200**
Engineers	12	667	8,000	**96,000**
Economists	8	338	3,100	**37,200**
M.Specialsist	19	292	5,550	**66,600**
Workers	36	200	7,200	**86,400**
Guardians	17	150	2,550	**30,600**
TOTAL	**100**		**34,000**	**408,000**

Source: This table is build based on the needs of the project for operation

Also the payments made for the social contributions, considered as insurance cost, are included in the operational cost just below the labor cost. They are estimated to be 29% of the total salaries paid.

3.4.2 Maintenance and Miscellaneous Cost

The maintenance cost of the plant is estimated to be 1% of the total Investment Cost. This cost is paid every year and is adjusted also for Inflation. Other costs which include the miscellaneous costs such as transportation costs, telephone fees, insurance cost, workers outfits and marketing expenditure are predicted to be 0.5% of the total investment costs.

3.4.3 Contractual Fee

The last cost under operational costs is the contractual or the concession fee. This payment is to be given to the state as a form of concession fee. The charge of fee is considered to be 2% of the total annual production of electricity and is deducted as an operational cost after the computation of labor and maintenance cost.

3.5 Project Financing

The projected costs for the construction and operation of the hydropower plants incorporate a substantial amount of money. Usually these plants are characterized from a high capital cost and large investment period, which translates in late cash flows, which in turn means higher risk in terms of any repayment from the plant and consequently a higher risk premium charged by the lending institutions.

Most of these businesses are subject to many uncertainties that largely affect the costs and overall performance of the plants. Suspicions may rise as a result of different market circumstances, economic changes or even due to new laws and a regulation, which is even the case of Albania, since major energy restructures are taking place from 2001 till today.

- The total investment cost is € 58,577,582 where € 15,862,624 is the equity of the investors, and the rest € 41,714,958 is debt.

- The purchase of the land is one of the costs of our project which is subsidized. The government of Albania is going to cover the land cost by giving to the project a subsidy for a period of 35 years usage. The grand of land worth is €1.000.000 which is almost 1% of the overall cost.

- Civil works constitutes about 60% of the total investment cost over the period.

- The projects costs apart from the land are going to be financed partially by the project company capital, and the rest through a bank loan. The debt will cover almost 72.45% of the rest of the costs, accounting therefore the equity investment of 27.55 % of the total cost.

- The negotiated loan carries an interest rate of 7% in nominal terms, and a repayment period of 10 years.

- The loan of almost 42 million Euros will be disbursed during the first 5 years of construction period according to a pre specified schedule in terms of amounts disbursed, which matches to the amount needed to cover the construction cost for the same year .

- The payment of principal and the interest accrued will start in year 2, when the project will start generating revenues. During this period, according to the agreement with the lending financial institution, the project is obliged to retain a contingent fund for the seven years of construction, to ensure the operation and well functioning as projected.

- By the end of year 11 the project is expected to pay its debts in full.

- The minimum rate on return required by the investors on their equity is 7%. The discount rate is the opportunity cost of the investors in investing their funds elsewhere rather than in the given project. “The discount rate is a key variable in applying investment criteria in the project selection. Its correct choice is critical given the fact that a small variation in its value may significantly alter the results of the Analysis and affect the final choice of the project. In financial analysis, the discount rate depends upon the point of view of Analysis” (Jenkins et al.; 2004).

3.6 The Purchase of the Output

The consortium company has entered and negotiated the terms for a Power Purchase Agreement with well defined conditions with an electricity price fixed from ERE and KESH.

3.7 Methodology

Most of the large projects that involve a substantial amount of money require a very detailed feasibility study to assure the financial viability of the project. The main project variables and parameters are analyzed in detail and data is usually arranged in the so called “building blocks” which constitute the foundation of different types of analysis. A specific methodology is carried out while conducting the financial and risk analysis.

3.8 Financial Analysis

Financial Analysis of the project determines whether the project is financially sustainable. A financial analysis enables the project analyst to establish the financial sustainability of the project by identifying any financial shortfalls that are likely to occur during the investment and operating stages of the project, and thus by devising the necessary means for meeting these shortfalls (Jenkins et al.2004). The financial analysis will be done through the help of Excel software.

All the data collected and obtained concerning to financial, market and technical data will be placed in the table of parameters. In constructing and analyzing the project’s financial profile, we first identify the key variables and we construct the table of parameters as given in Table 1 in Appendix. A well designed table of parameters comprises the basis of a good financial analysis since any calculation of parameters will be liked to these variables and their respective assigned values.

The analysis starts with the electricity tariff calculations, projected volume of production, sales and investment. Then operating and maintenance costs are considered while taking into consideration accounts receivable, accounts payable and cash balances. All these data will be used in constructing the profit and loss statement.

The analysis is followed by the depreciation table and the loan schedule which outlines the outstanding debt at the end of each year together with the repayment of the loan. All these are done in order to forecast the revenues and expenditures over the life of the project. Changes in relative prices and inflation must be considered while getting the revenues and expenditures throughout years of project operation.

The nominal and real cash flow statement will follow the analysis from the different point of views.

1- Banker (Total Investment) point of view to inspect revenues and expenditures to assure if the net cash flow is adequate to cover interest payments as well as loan payments.
2- Owners point of view, who are the equity holders of the project that are concerned on the positive net cash flows enough to cover and exceed the cost of their investment.

The Net Present Value (NPV) of projects cash flows is thereafter calculated along with IRR. The evaluation criterion is to accept the project if generates a positive NPV and a higher IRR than the discount rate stated by the sponsors of the project. There are various criteria to be used in evaluating if an investment is financially viable or not. These methods include NPV, IRR, Pay-Back period, Benefit-Cost ratio. Brzozowska (2007) argues that the main problem in the most public projects appraisal is their uneconomic nature and impossibility to measure such data, like as turnover and current costs, necessary for NPV or IRR calculation. In such cases Cost – Benefit Analysis (CBA) has been applied. Bellot (2004) agree with the same statement and used also CBA in his evaluation of the pre feasibility study of a reverse Osmosis sea water desalination plant in North Cyprus. He states that CBA takes the project evaluation to a step further by taking into account the impact of the project on a society as a whole. Others state that NPV is the best alternative criteria in evaluating if an investment is financially sound or not. Harrison, Cooper and Chaperman (1988) undertook a study to appraise a hydropower plant in the River Stour for Canford School, Wimbourne, Dorset, England. They used the NPV to examine the financial feasibility and the economic desirability of the hydropower. They argue that "The method was chosen since it facilitates the sensitivity analysis and in that: This method was chosen because it facilitates sensitivity analysis and clarifies the effects of uncertainties in the limited cost data available at the feasibility stage of a project's life. Such projects, with long time-horizons and important sources of uncertainty, are particularly in need of systematic and consistent examination of sensitivity to parameter values (Harrison, Cooper, Chaperman; 1988). A similar study approach is used nowadays from World Bank projects and African Development Bank Projects. An example of such studies are the Appraisal of the Zambia smallholder agriculture production (Kabungo;2007) or the evaluation of the Olifants-Sand water transfer scheme in northern province of South Africa done be Klevchuk in 2002. All of these and other studies, used as a methodology in assessing the feasibility of the investment the integrated investment appraisal approach while calculating the NPV and using this figure in deciding if a project should be accepted or not. The Net Present Value criterion has been used by many projects and due to many advantages it has is the most popular of all other investment analysis techniques. According to Jenkins et al. 2004, even though the Benefit-Cost ratio, IRR, and Pay-Back period are popular they have some disadvantages as compared to NPV.

Table 4: Disadvantages of BC, IRR and Pay-Back period criteria

INVESTMENT TECHNIQUE	**DISADVANTAGE**
Benefit-Cost Ratio	Is sensitive to the definition of costs Wrong Ordering of mutually exclusive projects of different scale
IRR	May not be unique (Multiple IRR) Wrong Ordering of mutually exclusive projects of different scale Usually favors projects with shorter lives Generally misleading assessment if the project Cash flows are irregular
Pay-Back Period	Ignores the benefits and costs that accrue beyond the pay-back period

All these disadvantages are not present in NPV case. Therefore the NPV is recognized as the most reliable criteria in investments evaluation. Different studies with the same methodology are carried out

3.8 Sensitivity Analysis

Sensitivity or “what if” analysis follows the financial appraisal of the project. Through the help of excel functions we select and test all the parameters that are significant to the outcome of the project thus the variables that have a negative impact on the NPV and IRR. Still, this kind of analysis is taking in consideration a change of only one variable, while taking all the other variables constant and can not compute the change of some variables at a time. Also this analysis is ignoring any possible correlation between several risky variables. To complete this kind of analysis we compute the risk analysis that recognizes all these facts. In order to accomplish this we need to run a Monte Carlo Simulation.

3.9 Risk Analysis

The first step in conducting a risk analysis of the project is to identify the risk variables using sensitivity analysis. Once these variables are identified, an appropriate probability distribution and likely range of values should be assigned to these risky variables according to either past data or to expert opinions. A Monte Carlo simulation is used to generate a probability distribution of the outcome of the project through the help of Crystal Ball™ .This simulation is carried out over by conducting 10,000 trials. This type of analysis not only helps us to diminish the chance of undertaking a bad project and failing to accept a good one but also to go in profundity of the risk source and help in deciding a proper way of mitigating the risk that a project may face.

CHAPTER 4

FINANCIAL ANALYSIS

The financial appraisal assists in determining the viability of the project. The financial assessment shows in other words the projects potential for success or for failure. It gives us all the necessary information needed in decision making process for investors, in deciding whether the project is worth to be undertaken according to the given conditions or not, and also what adjustment can be made accordingly so that the project can become financially sustainable.

4.1 Parameters and Assumptions

- **Operational Life**

The project is a 35 year concession. The project starts operating after the second year of the construction, since 3 of the hydropower plants will be finished until then. The operational life of power plant is 33 years.

- **Capacity and the degree of utilization**

Capacity of the plant is 30650 KW and the degree of utilization is assumed to be 95%.

- **Electricity Production**

The project is presumed to produce annually, during the first two years of operation 28.3GW/h energy, the third year a gross energy of 43GW/h annually, the fourth and fifth year of operation an annual electricity production of 97.1GW/h and starting from the sixth year of operation until the end of the operational life, an annual gross electricity production of 153.79GW/h.

- **Electricity Price**

The price of electricity is €0.065/KWh in year zero prices (year 2009). This price is already adjusted for inflation the first 8 years and is expected to increase 3% annually. The price is set by the Power Sector Entity, ERE, according to the formula for the concession agreements.

- **Investment Cost**

Investment cost is calculated to be €58,577,882 and construction period is considered to take 7 years. The sources of funding are 27.55% by equity and 72.45% by a bank loan. Respectively, the own capital (Equity) will be at the amount of € 15,860,430 and the bank loan at the amount of € 41,717,151. The annual interest rate of the loan is 7%, a repayment period of 10 years and a grace period of 2 years. Figure 4 shows the construction period for each hydro; Figure 5 shows the investment founding source for each of the plants.

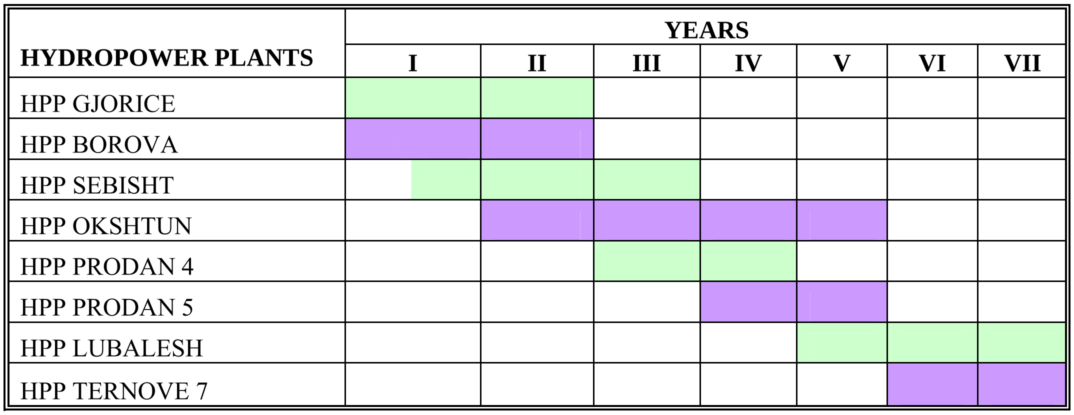

Figure 4: Hydropower Plants Schedule
Source: Attained from the pre-feasibility study done for the project

HYDROPOWER PLANT	EQUITY (EUR)	LOAN (EUR)	TOTAL
HPP GJORICE	1,858,803	4,051,357	5,910,160
HPP BOROVA	580,436	1,082,210	1,662,646
HPP SEBISHT	1,121,066	2,744,953	3,866,020
HPP OKSHTUN	5,689,245	13,957,155	19,646,400
HPP PRODAN 4	176,288	539,908	716,196
HPP PRODAN 5	197,161	606,657	803,818
HPP LUBALESH	6,031,860	18,111,540	24,143,400
HPP TERNOVE 7	205,572	623,370	828,942
TOTAL	**15,860,430**	**41,717,151**	**57,577,582**

Figure 5: Investment Funding Sources and by Hydropower Plant
Source: Attained from the pre-feasibility study done for the project

- **Operating Costs**

These Costs are given from the section 2.4 of this study**.**

- **Working Capital**

Accounts Receivable is 15 % of the total gross sales. Accounts Payable are counted as 10% of operating expenses , while the Cash Balance to be held stands at 2% of gross sales. The cash balance of 2% will be taken into consideration after the construction period.

- **Life of Assets and Residual Values**

The civil works are having 28 year tax depreciation while equipments are having 22 year tax depreciation. The equipments are going to be renewed at a cost of 60% of their value of equipment at approximately €14,803,847 at year 24.

- **Depreciation**

The straight line method depreciation is used.

- **Inflation Rate**

The inflation rate used is the inflation of the Euro zone which is assigned to be 4.2% and is assumed to be constant though out the time of the project.

- **Taxation**

The corporate income tax rate is 10% on the annual revenue. No taxes are paid unless the project generates profits (positive net cash flow) and no losses are incurred thought the years for the tax intention. The project is exempted from sales, V.A.T and Import taxes.

4.2 Financial Analysis Results

From the financial analysis we look at the project from two different points of views. The first one is the investment point of view or banker's point of view and the second one is the equity holder or owner's point of view.

4.2.1 Total Investment Point of View

The nominal cash flow statement from the investment point of view simply puts all the benefits that create inflows into a project and all the costs that create outflows. The real cash flow statement from investment point of view is the nominal cash flow statement divided by the inflation index. This cash flow statement is also helpful in assessing the capacity of the project to service its debt. Two important ratios are calculated in order to evaluate the ability of the project in repaying its debt:

1) Annual Debt Service Coverage Ratio (ADSCR)

$$ADSCR = \frac{\text{Annual Net Cash Flow (Real)}}{\text{Annual Debt Repayment (Real)}}$$

The ADSCR shows whether the project will be able to service its debt from its yearly cash flows. The ADSCR is ratio of the real annual net cash flow to the real annual debt repayment (Jenkins et al.2004). The calculation of ADSCR is on a year to year basis calculation and it starts from the beginning of the loan repayment until the last payment of the loan. The evaluation criteria for ADSCR is if ADSCR is greater than 1 then the project is able to service its debt, and if ADSCR ratio is smaller than 1 then the project will not be able to meet its debt obligations. In such situations the project should find other alternatives in order to improve this ratio. From the financial analysis we obtained the results given in the table below.

Table 5: ADSCR Results from Financial Analysis

Year	Annual Net Cash Flow (REAL)	Annual Debt Repayment (REAL)	ADSCR
2	-6,082,603	1,335,032	-4.56
3	-5,118,556	1,884,690	-2.72
4	-7,559,946	2,344,436	-3.22
5	-6,533,033	3,217,775	-2.03
6	-1,354,655	4,342,327	-0.31
7	6,328,472	4,759,331	1.33
8	9,348,274	4,179,752	2.24
9	10,103,543	3,648,190	2.77
10	10,377,802	3,144,752	3.30
11	10,664,863	2,437,582	4.38

As we can observe from the table above the ADSCR ratio is negative from year 2 to year 6. This is happening because the annual net cash flows generated from the project are negative and consequently not enough to service its debt. In year 7 this ratio improves considerably attaining a ratio of 1.33, though greater than 1 and it continues to progress in the following years.

This implies that the project under these conditions is going to face serious problems in repaying its debt. Modifications have to be done in order to improve this ratio in early years. The conditions set for the loan repayment are not favorable for a good ADSCR ratio. The project should strive to attain high ADSCR ratio using different methods. One of them is to restructure the debt and renegotiate for the payment of debt. They may ask to start repaying the debt after the project generates enough high positive cash flows. Another option is to increase the duration of loan repayment so that annual debt service obligation will fall. These will considerably improve the

ADSCR ratio and the ability of the project in paying the debt. If such changes will not be made the project will have serious financing problems and will not be acceptable for financing by any financial institution.

2) Debt Service Capacity Ratio

$$DSCR = PV\,(ANCF_{\text{end year of debt}})/PV\,(\text{Annual Debt Repayment}_{\text{end year of debt}})$$

The DSCR tells the banker if there is enough cash generated from the project so that bridge financing can be present and available for the project, in specific periods when there are inadequate cash flows to service the debt. It has to be noted that the present values are using the real interest rate being paid on the loan financing. From the financial analysis we obtained the results given in the table below.

Table 6: DSCR Results from Financial Analysis

Year	PV of Annual Cash Flow (Real)	PV of Annual Debt Repayment (Real)	DSCR
2	2,578,223	27,481,476	0.09
3	13,184,736	26,852,398	0.49
4	19,787,558	25,641,836	0.77
5	25,578,579	23,926,431	1.07
6	34,033,265	21,267,789	1.60
7	41,661,588	17,382,450	2.40
8	44,177,682	12,963,943	3.41
9	38,871,139	9,021,364	4.31
10	30,319,983	5,518,249	5.49
11	20,762,284	4,811,080	4.32

As we can examine from the table 6 DSCR ratio seems to be quite low the first 5 years. This implies there is likely for the project not to have adequate cash flows to safety repay the bridge financing required to cover the possible shortfalls during these years. This will be a reason for the banks not to provide bridge financing for the project during these years. The project may in this case be asked to build up a sinking fund for these first 5 years to cover the shortfalls. After the fifth year of repayment the DSCR ratio improves constantly all of them to become greater than 1.

4.2.2 Total Owner's Point of View

The owners of the project are the sponsors of the project. The cash flow statement form the owner's point of view help the owners of the project in the decision making process, telling them if a project worth to be undertaken or not. The owners of the project receive the net cash flow after paying all the expenses. Jenkins et al. (2004) state that; the cash flow statement from the owner's point of view will include the receipt of the loan as an inflow and all subsequent repayments of loan and interest as expenditures. If the project receives any grants or subsidies, these should included as receipts in the cash flow statement; and if the project pays taxes these should be included as cash outflow. From the net cash flows obtained, the Net Present Value (NPV) is calculated. According to Jenkins et al. (2004) the NPV is an algebraic sum of the present values of the incremental expected positive and negative net cash flows over a project's anticipated lifetime. (p.8)

$$NPV^{\text{year 0}} = \frac{(\Sigma \text{ of Cash flows in year t})}{(1 + r)^{t}}$$

Where "R" is the discount rate representing the discount rate equal to the cost of capital, in other words the rate of return that owners of the project expect to receive for investing their funds in the given project which in our case is 7%.

The NPV will serve us as criteria in deciding whether the project is attractive or not from the owner's point of view. If NPV>0, than the project if financially viable from the owner's point of view and the project should be accepted, since the project not only will recover owner's capital investment but also receive additional real net worth that equals to the positive amount of NPV. If NPV<0, than the project is not financially viable for the equity holders of the project, and the project should be rejected on the grounds that it does not provide the equity holders with the minimum return required.

Also in the cash flow statement from the owner point of view, Internal Rate of Return (IRR) is also taken in consideration. The IRR is the discount rate that sets the NPV=0 (Jenkins et al. 2004).

$$\Sigma \frac{\text{Cash Flows in year i}}{(1+\rho)^{I}} - I = 0$$

Where "I" is the Initial Investment and we have to solve for ρ which is IRR.

This is also another criteria in deciding if the project if financially viable or not. The project should be accepted if $\rho > r$, and rejected if $\rho < r$.

By discounting the incremental net cash flows we obtained from our financial model a NPV= € 77,383,621 and an IRR=23, 39%. These two ratios both indicate that the project is financially viable and worth to be undertaken.

4.3 Sensitivity Analysis

Belli (2007) explains that “Sensitivity analysis assesses risk by identifying the variables that most influence a project’s net benefits and quantifying the extent of their influence. It consists of testing the effects of variations in selected variables on the project IRR or NPV”. (p.85). The parameters tested are: Inflation, Electricity Tariff, Cost Overrun, Accounts Receivable, Increase in Real Wage, Change in Discount Rate and Degree of Utilization. From sensitivity analysis we choose the risky variables to be Inflation, Electricity Tariff and Degree of Utilization. The results of sensitivity analysis are:

- *Inflation*

Inflation is one of the parameters needed to be observed. A large increase in inflation may decrease the real cash flows which in turn will reflect a decrease in NPV as well. The impact of inflation was observed in NPV, IRR, ADSCR and DSCR.

Table 7: Results of Sensitivity Analysis (Inflation vs. NPV and IRR)

INFLATION	NPV	IRR
-4%	70,201,811	21.59%
-2%	74,466,577	22.35%
0%	76,855,230	22.85%
2%	77,770,236	23.18%
4%	77,481,236	23.38%
4.20%	77,383,621	23.39%
6%	75,867,949	23.46%
8%	72,538,973	23.44%
10%	66,734,063	23.28%

The results of sensitivity analysis of inflation changes impact on ADSR ratio is given from the table 8.

Table 8: Results of Sensitivity Analysis (Inflation vs. ADSCR)

Inflation	**ADSCR (2)**	**ADSCR (3)**	**ADSCR (4)**	**ADSCR (5)**	**ADSCR (6)**	**ADSCR (7)**	**ADSCR (8)**	**ADSCR (9)**	**ADSCR (10)**	**ADSCR (11)**
-4%	-7.09	-3.85	-4.25	-2.48	-0.27	1.61	1.36	1.24	1.20	1.14
-2%	-6.31	-3.51	-3.94	-2.34	-0.28	1.53	1.53	1.51	1.54	1.59
0%	-5.65	-3.21	-3.67	-2.22	-0.29	1.47	1.72	1.84	1.97	2.20
2%	-5.08	-2.96	-3.44	-2.12	-0.30	1.40	1.95	2.23	2.52	3.06
4%	-4.60	-2.74	-3.24	-2.04	-0.31	1.34	2.21	2.72	3.22	4.23
4.20%	-4.56	-2.72	-3.22	-2.03	-0.31	1.33	2.24	2.77	3.30	4.38
6%	-4.18	-2.55	-3.07	-1.97	-0.33	1.27	2.51	3.30	4.11	5.87
8%	-3.82	-2.38	-2.92	-1.91	-0.35	1.21	2.86	4.00	5.24	8.12
10%	-3.51	-2.24	-2.80	-1.86	-0.37	1.14	3.27	4.85	6.68	11.24

The table above confirms the fact that the increase in inflation decreases NPV as well as IRR due to the fact that it decreases the real cash flows. An increase in inflation by 2% decreases the NPV by almost €2,000,000. Therefore Inflation will be considered as one of our risky variables.

- *Electricity Tariff*

Another parameter tested in sensitivity analysis is also the Electricity Tariff, which is directly affecting the total inflow of the project. This resulted to be the main risky variable due to the fact that also this tariff is subsidized by the government. The results of sensitivity analysis are given in the table 9 and 10.

Table 9: Results of Sensitivity Analysis (Electricity Tariff vs. NPV and IRR)

E.Tariff	NPV	IRR
0.025	1,606,067	7.41%
0.035	20,599,110	11.84%
0.045	39,552,017	15.86%
0.055	58,467,819	19.67%
0.065	77,383,621	23.39%
0.075	96,299,422	27.05%
0.085	115,215,224	30.67%
0.095	134,131,026	34.26%
0.105	153,046,827	37.81%
0.115	171,962,629	41.34%
0.125	190,878,431	44.84%

Table 10: Results of Sensitivity Analysis (Electricity Tariff vs. ADSCR)

E.Tariff	ADSCR (2)	ADSCR (3)	ADSCR (4)	ADSCR (5)	ADSCR (6)	ADSCR (7)	ADSCR (8)	ADSCR (9)	ADSCR (10)	ADSCR (11)
0.025	-5.16	-3.23	-3.80	-2.93	-1.07	0.38	0.70	0.87	1.04	1.37
0.035	-5.01	-3.09	-3.66	-2.71	-0.87	0.62	1.08	1.35	1.60	2.12
0.045	-4.86	-2.97	-3.51	-2.48	-0.68	0.85	1.47	1.82	2.17	2.87
0.055	-4.71	-2.84	-3.37	-2.26	-0.49	1.09	1.85	2.29	2.73	3.62
0.065	-4.56	-2.72	-3.22	-2.03	-0.31	1.33	2.24	2.77	3.30	4.38
0.075	-4.41	-2.59	-3.08	-1.81	-0.13	1.57	2.62	3.24	3.87	5.13
0.085	-4.26	-2.47	-2.94	-1.58	0.05	1.81	3.01	3.72	4.43	5.88
0.095	-4.11	-2.34	-2.79	-1.35	0.23	2.04	3.39	4.19	5.00	6.63
0.105	-3.96	-2.21	-2.65	-1.13	0.42	2.28	3.77	4.67	5.56	7.38
0.115	-3.81	-2.09	-2.50	-0.90	0.60	2.52	4.16	5.14	6.13	8.13
0.125	-3.66	-1.96	-2.36	-0.68	0.78	2.76	4.54	5.62	6.70	8.88

From the tables above we can conclude that if the electricity tariff drops by 0.010 Euro, the NPV goes down by approximately € 20,000,000. Also the IRR drops by 4% at any decrease in electricity price. Even the ADSCR ratio falls considerably. If we consider the increase in the price of electricity we will observe that NPV, IRR and specially ADSCR will improve appreciably, reflecting thus a better capacity of the project to service its debt. All these significant changes in these ratios put in the picture the uncertain and risky nature of this parameter.

- *Degree of Utilization*

The degree of Utilization is the third risky variable. From the technical analysis the degree of utilization for our project was determined to be 95%. A closer observation of this variable is given from sensitivity analysis results of which are presented in tables below:

Table 11: Results of Sensitivity Analysis (Degree of Utilization vs. NPV)

Degree of Utilization	**NPV**
35%	-402,783
45%	12,607,565
55%	25,592,412
65%	38,556,449
75%	51,498,839
85%	64,441,230
95%	77,383,621

Table 12: Results of Sensitivity Analysis (Degree of Utilization vs. ADSCR)

Degree of Utilization	ADSCR (2)	ADSCR (3)	ADSCR (4)	ADSCR (5)	ADSCR (6)	ADSCR (7)	ADSCR (8)	ADSCR (9)	ADSCR (10)	ADSCR (11)
35%	-5.17	-3.24	-3.82	-2.95	-1.09	0.35	0.66	0.82	0.98	1.29
45%	-5.07	-3.15	-3.72	-2.80	-0.96	0.52	0.92	1.15	1.36	1.80
55%	-4.97	-3.06	-3.62	-2.65	-0.82	0.68	1.18	1.47	1.75	2.32
65%	-4.86	-2.97	-3.52	-2.49	-0.69	0.84	1.45	1.80	2.14	2.83
75%	-4.76	-2.89	-3.42	-2.34	-0.56	1.00	1.71	2.12	2.53	3.35
85%	-4.66	-2.80	-3.32	-2.18	-0.44	1.17	1.97	2.44	2.91	3.86
95%	-4.56	-2.72	-3.22	-2.03	-0.31	1.33	2.24	2.77	3.30	4.38

As the result of tables indicate, if the degree of utilization falls below 45% due to different technical problems or the utilization of the water due to unfavorable rainfalls the NPV of the project becomes a negative figure. This puts risk in the viability of the project and the overall sustainability. The other variables tested in sensitivity analysis, which were not identified as risky variables and were not taken into consideration in the risk analysis since no remarkable changes were observed, are shown in the appendix together with their results.

CHAPTER 5

RISK ANALYSIS

Most of the key variables and their values used in the financial analysis unlikely can be projected with certainty throughout the entire life of the project. Therefore, as a consequence the outcome of the project and the ratios evaluating these outcomes will be as well uncertain. According to Savvides (1994) "Risk analysis, or 'probabilistic simulation' based on the Monte-Carlo simulation technique is a methodology by which the uncertainty encompassing the main variables projected on a forecasting model is processed in order to estimate the impact of risk on the projected results. It is a technique by which a mathematical model is subjected to a number of simulation runs, usually with the aid of a computer. During this process, successive scenarios are built up using input values for the project's key uncertain variables which are selected at random from multi-value probability distributions"

5.1 How Risk Variables and Probabilities are selected

The first thing to be done, in order to conduct risk analysis is to select the risky variables of the project. These variables are obtained from the sensitivity analysis. These variables that are subject to a large extend of variation overtime and contribute significantly to the riskiness of the project. From the sensitivity analysis we selected 3 risky variables:

1. Inflation
2. Electricity Tariff
3. Degree of Utilization

5.1.1 Probability distribution Selection

“The preparation of a probability distribution for a selected risk variable involves setting up a range of values and allocating probability weights to it” (Savvides, 1994).The appropriate probability distribution and the possible range of values can be assigned while taking into consideration the historical values of the selected variable or by taking into consideration the experts’ opinion about it. The probability distributions for our values are as follow:

- INFLATION

Predicting the inflation is a complex and difficult task. It is almost impossible to forecast accurately the fluctuations of inflation. In our case a step custom (step) distribution was assigned to this parameter. This kind of distribution was constructed with the available historical data for the Euro zone available in Eurostat webpage.

Table 13: Frequencies and Probabilities

Range	Frequency	Probability
1.5% - 2%	1	9.09%
2% - 2.5%	4	36.36%
2.5% - 3%	2	18.18%
3% - 3.5%	1	9.09%
3.5% - 4%	2	18.18%
4% - 4.5%	1	9.09%
TOTAL	**11**	**100%**

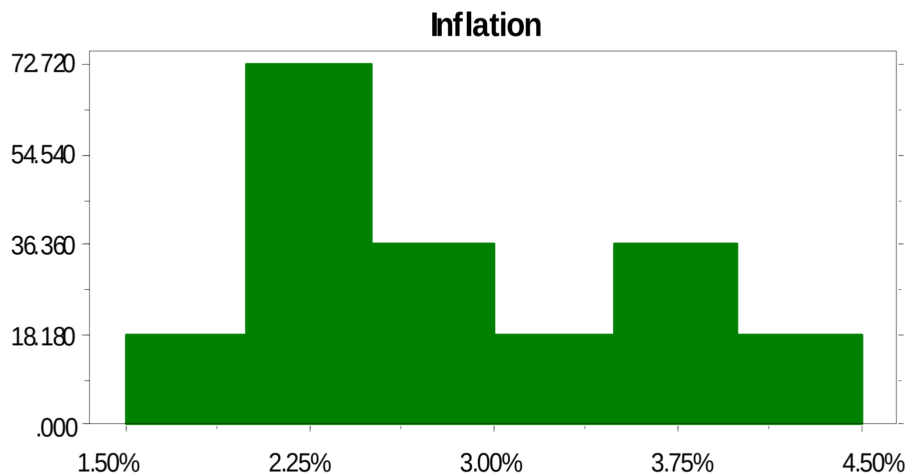

Figure 6: Custom (Step) Distribution for Inflation

- <u>Electricity Tariff</u>

Electricity tariff usually is under observation of the government and other responsible institutions and is managed to use to the purposes of different groups. This probability distribution assigned to this parameter is the normal distribution since the data about this variable generally clusters around an average price.

Table 14: Mean and Standard Deviation

Assumption: Electricity Tariff	
Normal distribution with parameters:	
Mean	0.085
Standard Dev.	0.010
Selected range is from -Infinity to +Infinity	

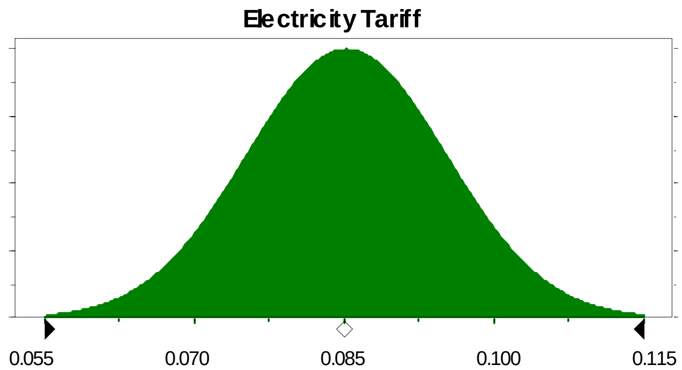

Figure 7: Normal Distribution for Electricity Tariff

- <u>Degree of Utilization</u>

This is the last risky variable chosen from the sensitivity analysis. The probability distribution assigned for this variable is the triangular distribution. From risk analysis we can find that in order to break even the degree of utilization should go to 35.5%. With these existing data we can construct the distribution.

Table 15: Minimum, Likeliest and Maximum for Degree of Utilization

Assumption: Degree Of Utilization	
Triangular distribution with parameters:	
Minimum	36%
Likeliest	95%
Maximum	100%
Selected range is from 36% to 100%	

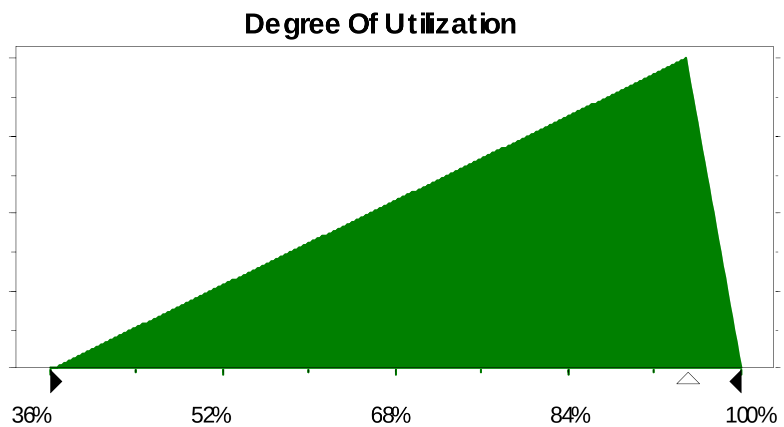

Figure 8: Triangular Distribution for Degree of Utilization

5.2 Results of Risk Analysis

After we identified and assigned the probability distributions for each of uncertain variables (Define the Assumptions), the next thing to do is to define the forecast. Defining forecast means selecting a variable to be tested in order capture its output result while taking into consideration the assumptions made. In our analysis we defined these forecast:

1. NPV
2. IRR
3. ADSCR Year 2 (First year of repayment)
4. ADSCR Year 3 (Second year of repayment)
5. ADSCR Year 4 (Third year of repayment)
6. ADSCR Year 5 (Forth year of repayment)
7. ADSCR Year 6 (Fifth year of repayment)
8. DSCR Year 2 (First year of repayment)
9. DSCR Year 3 (Second year of repayment)

10. DSCR Year 4 (Third year of repayment)

After defining the forecast we start to run the simulation and 10,000 trials of Monte-Carlo Simulation were performed using the Crystal Ball™ software and we obtained the output for each defined forecasts. The results of the simulation are as below:

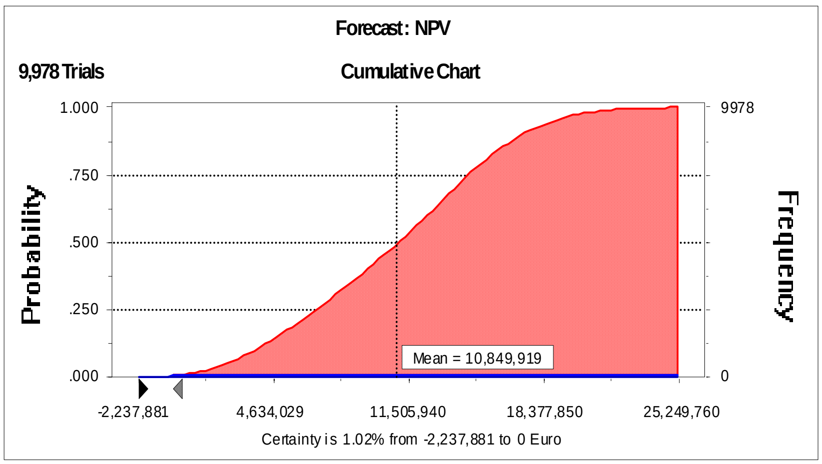

Figure 9: Forecast of NPV

After the 10,000 trials were performed the results show a mean of NPV equal to 10,849,919 € and a standard deviation of 5,153,868 €. The probability that the NPV will be between negative range and 0 is 1.02 %. This is a positive result, indicating that there is only a small chance that NPV will turn out to be below zero. This is beneficial and indicates that the project is safe to be undertaken.

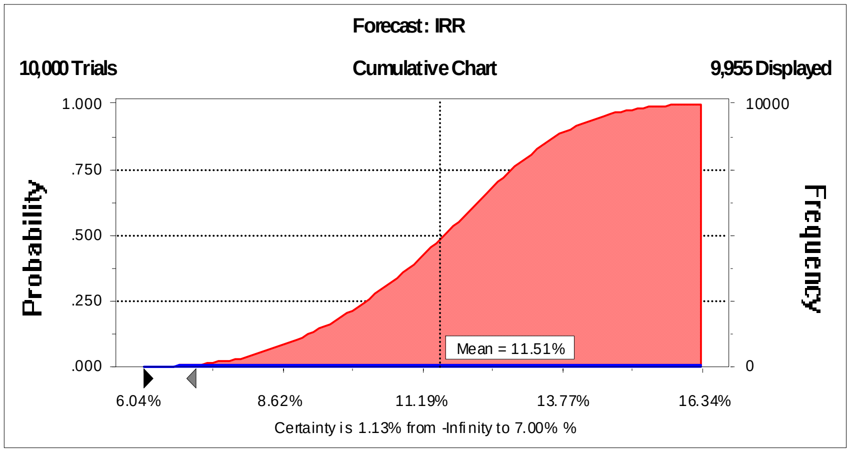

Figure 10: Forecast of IRR

The results form the simulation give as well optimistic outcome for IRR. The mean of IRR is 11.57% and a standard deviation of 1.95%.The certainty level is 1.13% for IRR to go below 7%.

The following graphs are the ADCSR forecast graphs following almost same pattern for the years observed.

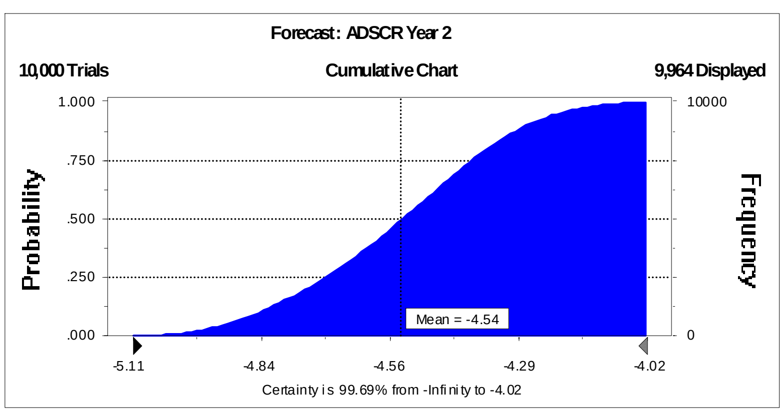

Figure 11: Forecast of ADSCR Year 2

Table 16: Statistic for ADSCR Year 2

Certainty Level is 99.69%			
Certainty Range is from -Infinity to -4.02			
Display Range is from -5.11 to -4.02			
Entire Range is from -5.13 to -3.87			
After 10,000 Trials, the Std. Error of the Mean is 0.00			
Trials			10000
Mean			-4.54
Median			-4.53
Mode			---
Standard Deviation			0.22

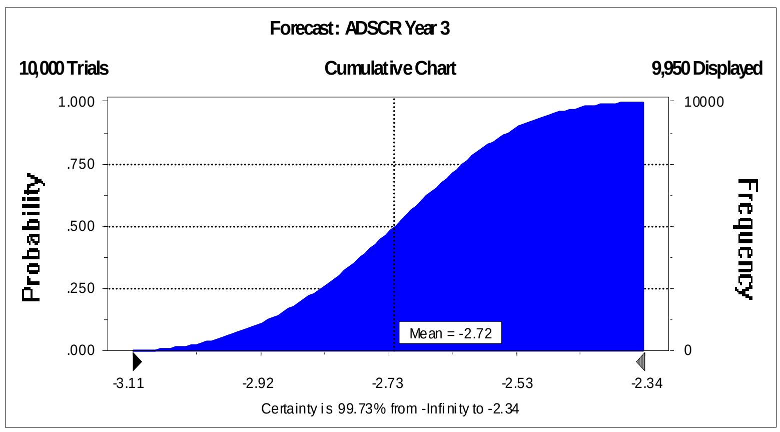

Figure 12: Forecast of ADSCR Year 3

Table 17: Statistics for ADSCR Year 3

Certainty Level is 99.73%			
Certainty Range is from -Infinity to -2.34			
Display Range is from -3.11 to -2.34			
Entire Range is from -3.18 to -2.22			
After 10,000 Trials, the Std. Error of the Mean is 0.00			
Trials			10000
Mean			-2.72
Median			-2.71
Mode			---
Standard Deviation			0.15

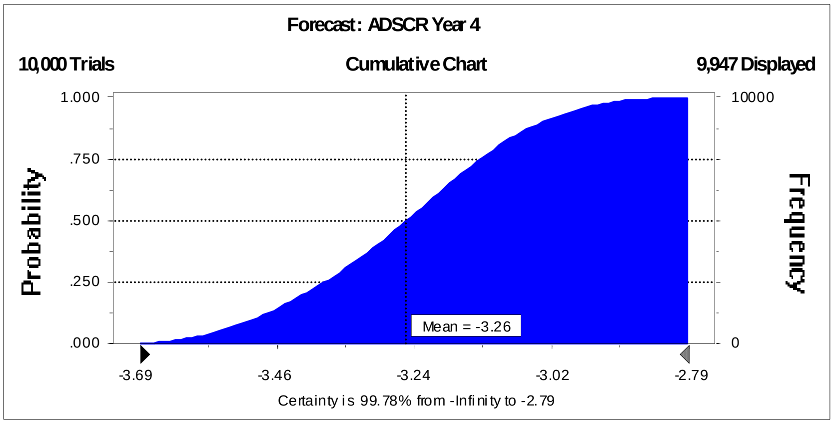

Figure 13: Forecast of ADSCR Year 4

Table 18: Statistic for ADSCR Year 4

Certainty Level is 99.78%				
Certainty Range is from -Infinity to -2.79				
Display Range is from -3.69 to -2.79				
Entire Range is from -3.78 to -2.61				
After 10,000 Trials, the Std. Error of the Mean is 0.00				
Trials				10000
Mean				-3.26
Median				-3.25
Mode				---
Standard Deviation				0.18

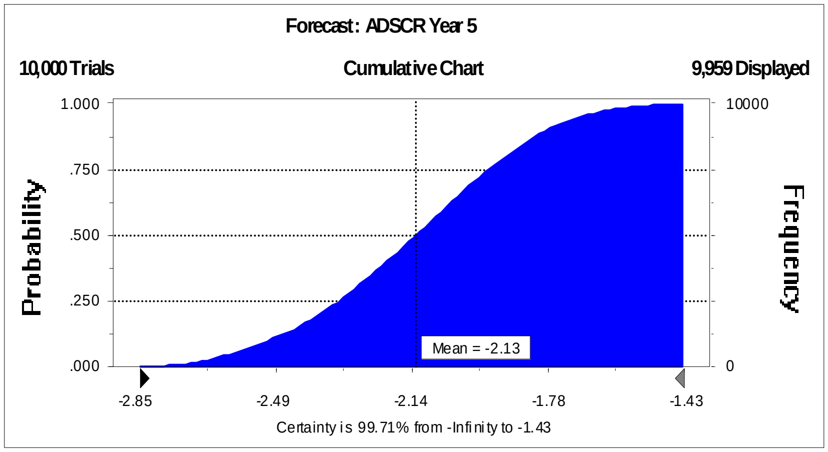

Figure 14: Forecast of ADSCR Year 5

Table 19: Statistic for ADSCR Year 5

Certainty Level is 99.71%				
Certainty Range is from -Infinity to -1.43				
Display Range is from -2.85 to -1.43				
Entire Range is from -2.96 to -1.06				
After 10,000 Trials, the Std. Error of the Mean is 0.00				
Trials				10000
Mean				-2.13
Median				-2.12
Mode				---
Standard Deviation				0.28

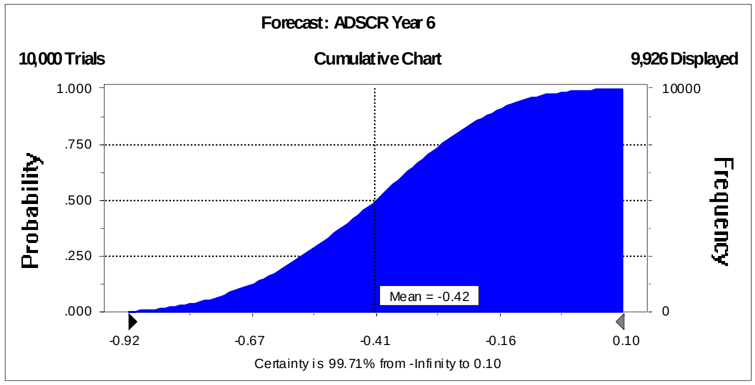

Figure 15: Forecast of ADSCR Year 6

Table 20: Statistic for ADSCR Year 6

Certainty Level is 99.71%				
Certainty Range is from -Infinity to 0.10				
Display Range is from -0.92 to 0.10				
Entire Range is from -1.04 to 0.32				
After 10,000 Trials, the Std. Error of the Mean is 0.00				
Trials				10000
Mean				-0.42
Median				-0.41
Mode				---
Standard Deviation				0.20

As we can see from the tables above and their results we can clearly say that during the first years of debt repayment the project has a high probability to fail in its ability to service the debt. The ADSCR ratio has a probability of 99,69% of being less than 1 in its first year of repayment and this probability increases to 99,73% in the second year and continues to increase even the third year of repayment by scoring 99,78% probability to be less than 1. Only in the forth year of repayment it starts decreasing by 0.007% a very small decrease. This again emphasizes the problem that the project has in financing. This ratio, apparently very important for the bank and other financial institutions providing the loan for the project, seems to have serious problems and precautions need to be taken in advance to improve this ratio.

The next graphs are DSCR forecast graphs.

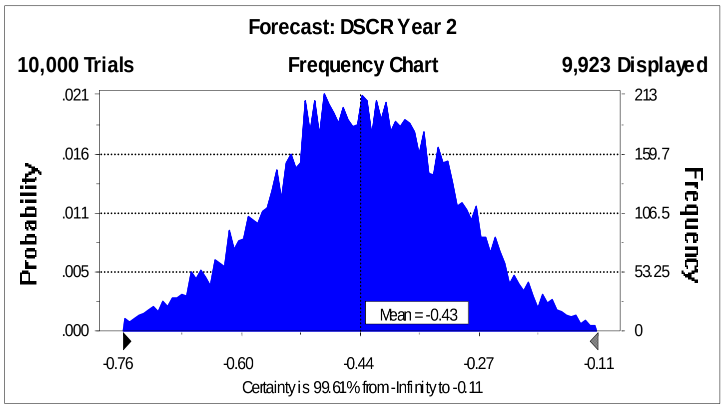

Figure 16: Forecast of DSCR Year 2

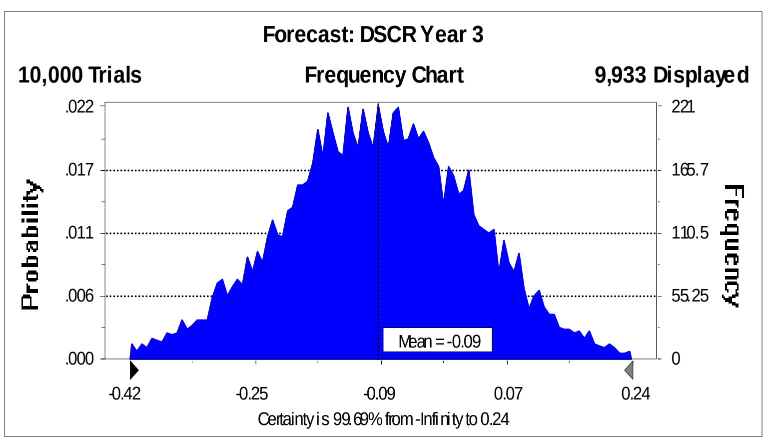

Figure 17: Forecast of DSCR Year 3

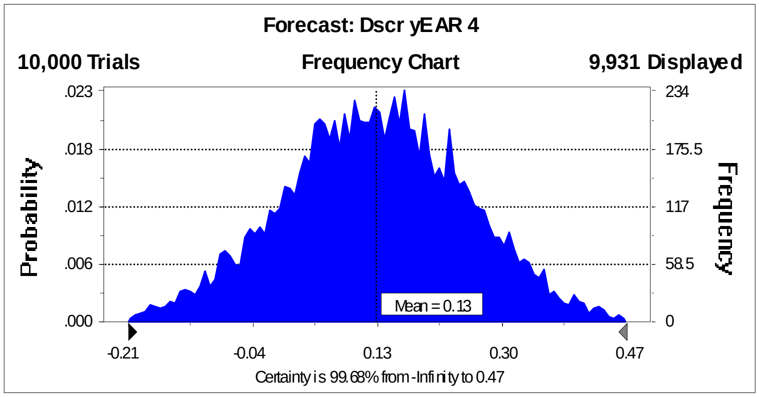

Figure 18: Forecast of DSCR Year 4

As indicated from the graphs above even DSCR seems to have high probability of experiencing a value less than 1.5. The first year of repayment DSCR has a probability of being less than 1.5 of 99, 61%. This percentage rise to 99, 69% in the second year of repayment and in the third year of repayment have a small drop, bringing thus the probability for being less than 1.5 to 99, 68%. This sustains the problem that we noticed before in ADSCR ratio forecast. With these predictions the project will not be able to qualify for bridge financing if needed especially during the first years of financing.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATTIONS

6.1 Conclusions

A comprehensive financial appraisal was conducted for an 8 hydro power plant scheme project in Albania. The data was obtained from the competent institutions available and related to the country profile and its energy sector. A well designed table of parameters was established and followed by the necessary calculations to reach the cash flow statements from different point of views. The NPV and IRR were obtained though the integrated analysis conducted though MS Excel operations. From the analysis we attain a NPV value of 77,383,621 €€ and an IRR of 23, 39%.

Part of financial analysis was the sensitivity analysis that threw light on the variables that may adversely affect the project outcome. The risky variables were inflation rate, electricity tariff and degree of utilization.

The same parameters identified from sensitivity analysis were used in risk analysis to carry out the Monte Carlo simulation through the use of Crystal Ball™ software. We tested various variables to see the impact of the risky variables on them. The variables tested were: NPV, IRR, ADSCR Year 2 (First year of repayment), ADSCR Year 3 (Second year of repayment), ADSCR Year 4 (Third year of repayment), ADSCR Year 5 (Forth year of repayment), ADSCR Year 6 (Fifth year of repayment), DSCR Year 2 (First year of repayment), DSCR Year 3 (Second year of repayment), DSCR Year 4 (Third year of repayment). The results of this analysis show that there is a probability that the NPV will be between negative range and 0 is 1.02 % and a probability of IRR of 1.13% to go below 7%. This confirms that the project is not risky and can be qualified to be undertaken. Even though so, serious problems were identified with the ADSCR and DSCR ratios, as even pointed out in financial analysis. The probability of not being able to service the debt is up to 99, 70%. These results indicated that the early years of repayment the cash flow generated from the energy sale, were not enough to cover its debt. The NPV results proved to be positive enough to qualify for a worthy project since the future cash flows in the continuous years of operation were high enough to offset the negative cash flows on the early years. Even if ADSCR and DSCR ratios improve on the last years of repayment it is important to emphasize that with such ratios on the first years of loan repayment, no financial institutions will be willing to lend to such a project. Different measures can be taken to improve this ratio and reduce the exposure to this risk.

1. The project owner's may renegotiate the terms of the loan repayment , so they can delay the first repayments of the loan at a later times, when the cash flows from the sales will be higher and sufficient to cover the debt.
2. Investors may also require a restructure term of a loan, toward lower interest rate on the loan so that the annual ratios look better and attractive to the banker t provide financing.
3. Another option may be for the investors to decrease the amount of debt financing and to add up more equity, so that the annual repayment of that

loan becomes smaller and the ability of the project to service the debt becomes much more certain.

One more alternative can be the bridge financing but this cannot be attained since the DSCR ratios are pretty much low as well. As the risk analysis indicates DSCR ratios are having a probability of 99, 65% of being less than 1.5. Unless the above actions are taken the project face serious problems in financing.

6.2 Recommendations

In order for the project to be undertaken the above actions should be taken so that the ADSCR and DSCR improve.

In future studies it is highly recommended to perform an economic analysis to determine the impacts of the project on the economy as a whole and among various stakeholders. The economic assessment of this project was not performed due to lack of necessary data related to the country or to any other region that might have been used as a proxy.

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APPENDIX

Table 21: Table of Parameters

Technical,Costs,Operating,Production

Energy generation			
No Turbines	19		
Installed Capacity	30650	KW	
Degree of Utilization	95%		
Maximum Operating Hours pe	5,282		
Net annual energy provided	153.79	GWh	
Maintainance Cost			
Maintainance Cost	1.00%	of construction cost	
Other Costs	1%	of construction cost	
Insurance Cost	29%	of annual salaries	
Contractual fee	2%	of total annual energy production	
Wages and Salaries(montl	**No of workers**	**Price Year 0**	
Project manager	8	950	
Engeeners and technicians	12	667	
Economists	8	388	
Maintainance Specialist	19	292	
Workers	36	200	
Guardian	17	150	
Increase in real growth of sala	3%		
WORKING CAPITAL			
Account Receivables	15%	Of gross sales	
Account Payable	10%	Of Oper.Exp	
Cash Balance	2%	Of gross sales	
LAND	EURO		
Land value	1,000,000		
Reinvested Equipment value	14,803,847		
DISCOUNT RATE			
Equity Holder Prospective	7%		

Financial

INVESTMENT COST								(REAL)	TOTAL
Year		**0**	**1**	**2**	**3**	**4**	**5**	**6**	
Land		1,000,000							1,000,000
Civil Works	(Year 0 €)	2,340,911	5,290,555	3,762,900	3,440,876	4,952,655	7,571,810	1,265,425	28,625,131
Equipment			2,523,033	1,038,255	1,093,103	2,068,907	1,021,820	2,419,395	10,164,513
Connection to electric grid system			823,175	726,069	416,875	397,301	312,603	496,504	3,172,527
Contingency Fund		792,152	1,623,123	1,031,448	835,510	1,433,869	1,366,528	1,311,448	8,394,078
Cost overrun		0%							51,356,249

FINANCING				
Debt financin	72%		Nominal IF	7%
Real Interest	2.70%		Equity	28%
Risk premium	0%			
No of Instaln	10			
Grace period	2			

Tax Depreciation and Economic Life				
	Tax.Depr		**Econ.Life**	
Civil Works	28	Yrs	50	yrs
Equipment	22	Yrs	22	
Reinvestment Equipment			23	

Electricity Tariff	Euro	
Price of Electricity	0.065	Euro per KW/h
Increase in the price	3.00%	annual

INFLATION		
Inflation rate for Albania	4.00%	
Inflation rate for EU	4.20%	
Exchange Rate	131	Lek/Euro

Taxation	
Corporate Income Tax Rate	10%

Table 22a: Energy Tariff

ELECTRICITY TARIFF														
[Nominal]														
Year			**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**33**	**34**	**35**
Electricity Tariff			0.065	0.067	0.069	0.071	0.073	0.075	0.078	0.080	0.082	0.172	0.178	0.183
Electricity Tariff	(Nominal)	euro/KWh	0.065	0.067	0.069	0.071	0.073	0.075	0.078	0.080	0.114	0.670	0.719	0.772
Electricity Tariff	Lek/KWh		8.52	8.75	9.00	9.25	9.51	9.78	10.05	10.33	14.76	82.40	88.26	94.55

Table 22b: Energy Sales

ENERGY SALES AND REVENUES FROM THE PROJECT												
Year		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**33**	**34**	**35**
Degree of Utilization		95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	
Maximum Operating Hours		0	0	962	962	1,477	3,331	3,331	5,282	5,282	5,282	
Gross Output	GWh	0	0	28	28	43	97	97	153.79	153.79	153.79	
Net Energy Generated	GWh	0	0	28	28	43	97	97	153.79	153.79	153.79	
Electricity Tariff	Euro/KWh	0.065	0.067	0.0690	0.0710	0.0732	0.0754	0.0776	0.0799	0.6702	0.7193	0
TOTAL REVENUES		**0**	**0**	**1,931,599**	**1,989,547**	**3,146,276**	**7,308,499**	**7,527,754**	**12,294,250**	**103,063,431**	**103,613,858**	**0**

Table 23: Investment Schedule

INVESTMENT SCHEDULE									
[Nominal in (€)]									
Year	**Total**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**24**
Land	1,000,000	1,000,000							
Civil Works	32,591,699	2,340,911	5,512,758	4,085,621	3,892,890	5,838,603	9,301,186	1,619,730	
Equipment	11,784,000	0	2,629,000	1,127,300	1,236,700	2,439,000	1,255,200	3,096,800	14,803,847
Connection to Electrical Grid System	3,605,618	0	857,748	788,340	471,638	468,372	384,000	635,520	
Contingency Fund	9,596,265	792,152	1,691,294	1,119,909	945,268	1,690,365	1,678,638	1,678,639	
TOTAL	58,577,582	4,133,063	10,690,800	7,121,170	6,546,496	10,436,340	12,619,024	7,030,689	
FINANCING									
Debt	41,714,958					3,165	3,331		
Equity	15,862,624								

Table 24: Loan Schedule

LOAN SCHEDULE	(In €)										
Year	**0**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**9**	**10**	**11**
Nominal Interest Rate		7%	7%	7%	7%	7%	7%	7%	7%	7%	7%
Terms of Loan	(No. Of Install) YRS		10								
Loan Disbursement	41,714,958	2,269,904	7,745,485	5,159,288	4,742,936	7,561,128	9,142,483	5,093,734			
Beginning Debt			2,269,904	10,174,586	13,884,344	16,495,007	21,292,319	26,482,097	13,861,070	8,577,993	3,832,694
Interest Accrued in year			159,197	713,584	973,765	1,156,861	1,493,315	1,857,295	972,132	601,609	268,802
Annual Repayment Installment				1,449,530	2,132,274	2,763,817	3,952,704	5,558,131	5,283,077	4,745,299	3,832,694
Principal Paid				735,945	1,158,509	1,606,956	2,459,389	3,700,836	4,310,945	4,143,690	3,563,892
Outstanding Debt at the end of the year		2,269,904	10,174,586	13,884,344	16,495,007	21,292,319	26,482,097	26,017,700	8,577,993	3,832,694	0
Loan Repayment in Real Terms				**1,335,032**	**1,884,690**	**2,344,436**	**3,217,775**	**4,342,327**	**3,648,190**	**3,144,752**	**2,437,582**

Table 25a: Operating and Maintenance Cost

Year			0	1	2	3	4	5	6	7	33	34	35
1 year=	12	months											
Project Manager													
No.Employed			8	8	8	8	8	8	8	8	8	8	0
Real yearly wage of project manager			11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	24,585	25,323	
Nominal Yearly wage of project mng.			11,400	11,879	12,378	12,898	13,439	14,004	14,592	15,205	95,567	102,568	
Total labor cost of Project Mng.**(EURO)**			91,200	95,030	99,022	103,181	107,514	112,030	116,735	121,638	764,535	820,545	0
Total labor cost of Project Mng.**(LEK)**			11,947,200	12,425,088	12,922,092	13,438,975	13,976,534	14,535,596	15,117,019	15,721,700	94,001,368	100,694,265	0
Engeeners and Technicians													
No.Employed			12	12	12	12	12	12	12	12	12	12	
Real Yearly wage of Enge.&Techn			8,004	8,004	8,004	8,004	8,004	8,004	8,004	8,004	17,261	17,779	
Nominal Yearly wage of Enge&Techn			8,004	8,340	8,690	9,055	9,436	9,832	10,245	10,675	67,098	72,014	
Total labor cost of Enge&Techn**(EURO)**			96,048	100,082	104,285	108,665	113,229	117,985	122,940	128,104	805,176	864,163	
Total labor cost of Enge&Techn**(LEK)**			12,582,288	13,085,580	13,609,003	14,153,363	14,719,497	15,308,277	15,920,608	16,557,433	98,998,283	106,046,960	
Economists													
No.Employed			8	8	8	8	8	8	8	8	8	8	
Real Yearly wage of Econom.			4656	4,656	4,656	4,656	4,656	4,656	4,656	4,656	10,041	10,342	
Nominal Yearly wage of Econom.			4,656	4,852	5,055	5,268	5,489	5,719	5,960	6,210	39,032	41,891	
Total labor cost of Econom**(EURO)**			37,248	38,812	40,443	42,141	43,911	45,755	47,677	49,679	312,252	335,128	
Total labor cost of Econom**(LEK)**			4,879,488	5,074,668	5,277,654	5,488,760	5,708,311	5,936,643	6,174,109	6,421,073	38,392,138	41,125,658	
Maintainance Specialists													
No.Employed			19	19	19	19	19	19	19	19	19	19	
Real Yearly wage of Maint.Special.			3504	3,504	3,504	3,504	3,504	3,504	3,504	3,504	7,557	7,783	
Nominal Yearly wage of Maint.Special.			3,504	3,651	3,805	3,964	4,131	4,304	4,485	4,673	29,374	31,526	
Total labor cost of M.Special **(EURO)**			66,576	69,372	72,286	75,322	78,485	81,782	85,217	88,796	558,111	598,998	
Total labor cost of M.Special **(LEK)**			8,721,456	9,070,314	9,433,127	9,810,452	10,202,870	10,610,985	11,035,424	11,476,841	68,620,999	73,506,814	

Table 25b: Operating and Maintenance Cost

Year			0	1	2	3	4	5	6	7	33	34	35
1 year=	12	months											
Workers													
No.Employed			36	36	36	36	36	36	36	36	36	36	
Real Yearly wage of workers			2400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	5,176	5,331	
Nominal Yearly wage of workers			2,400	2,501	2,606	2,715	2,829	2,948	3,072	3,201	20,119	21,593	
Total labor cost of workers **(EURO)**			86,400	90,029	93,810	97,750	101,856	106,133	110,591	115,236	724,296	777,358	
Total labor cost of workers **(LEK)**			11,318,400	11,771,136	12,241,981	12,731,661	13,240,927	13,770,564	14,321,387	14,894,242	89,053,927	95,394,567	
Guardian													
No.Empoyed			17	17	17	17	17	17	17	17	17	17	
Real Yearly wage of Guardians			1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	3,882	3,998	
Nominal Yearly wage of Guardians			1,800	1,876	1,954	2,036	2,122	2,211	2,304	2,401	15,090	16,195	
Total labor cost of Guardians**(EURO)**			30,600	31,885	33,224	34,620	36,074	37,589	39,168	40,813	256,522	275,314	
Total labor cost of Guardians**(LEK)**			4,008,600	4,168,944	4,335,702	4,509,130	4,689,495	4,877,075	5,072,158	5,275,044	31,539,933	33,785,576	
Total Labor Cost			408,072	425,211	443,070	461,679	481,069	501,274	522,328	544,266	3,420,892	3,671,507	
Insurance Cost (Employers)			118,341	123,311	128,490	133,887	139,510	145,370	151,475	157,837	992,059	1,064,737	0
Maintainance Cost	(€)		0	0	125,031	162,853	226,258	353,641	736,987	767,940	2,238,145	2,332,147	
Other Costs	(€)		0	0	312,578	325,707	339,386	353,641	368,493	383,970	1,119,072	1,166,073	
Contractual Fee	(€)		0	0	41,945	45,018	74,182	179,555	192,709	327,949	8,012,523	8,960,701	0
Maintainance Cost	(Lek)		0	0	16,316,289	21,211,176	29,412,831	45,884,016	95,438,753	99,256,303	275,185,100	286,192,504	
Other Costs	(Lek)		0	0	40,790,723	42,422,352	44,119,246	45,884,016	47,719,376	49,628,151	137,592,550	143,096,252	
Contractual Fee	(Lek)		0	0	41,945	45,018	74,182	179,555	192,709	327,949	8,012,523	8,960,701	0
Insurance Cost (Employers)Lek					16,767,672	17,438,379	18,135,914	18,861,351	19,615,805	20,400,437	121,975,928	130,660,614	
TOTAL OPERATING AND MAINTAINING CO			**0**	**0**	**479,555**	**533,578**	**639,826**	**886,836**	**1,298,189**	**1,479,859**	**11,369,740**	**12,458,921**	**0**
TOTAL OPERATING AND MAINTAINING CO			**0**	**0**	**63**	**69**	**83**	**115**	**168**	**191**	**1,398**	**1,529**	

Table 26: Working Capital

WORKING CAPITAL												
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**33**	**34**	**35**
Account Receivables	0	0	289,740	298,432	471,941	1,096,275	1,129,163	1,844,137	2,639,808	15,459,515	16,592,079	0
Change in A/R (INFLOW)	-	-	-289,740	-8,692	-173,509	-624,333	-32,888	-714,974	-795,670	-1,055,256	-1,132,564	16,592,079
Account Payable	0	0	47,955	53,358	63,983	88,684	129,819	147,986	168,945	1,136,974	1,245,892	0
Change in A/P (OUTFLOW)	-	-	-47,955	-5,402	-10,625	-24,701	-41,135	-18,167	-20,959	-98,317	-108,918	1,245,892
Cash Balance	0	0	0	0	0	0	0	245,885	351,974	2,061,269	2,212,277	0
Change in C/B (OUTFLOW)	0	0	0	0	0	0	0	245,885	106,089	140,701	151,009	-2,212,277

Table 27: Income Statement

Year	0	1	2	3	4	5	6	7	8	33	34	35
REVENUES												
Energy Sales	0	0	1,931,599	1,989,547	3,146,276	7,308,499	7,527,754	12,294,250	17,598,717	103,063,431	110,613,858	0
COSTS												
Total Operating and Maintainance cost	0	0					1,298,189	1,479,859	1,689,453	11,369,740	12,458,921	0
Depreciation	0	0					1,699,626	1,699,626	1,699,626	1,836,891	1,836,891	0
Reinvestment												
INCOME FROM OPERATIONS	0	0	1,931,599	1,989,547	3,146,276	7,308,499	4,529,939	9,114,765	14,209,638	89,856,799	96,318,045	0
Deduction of interest expense	0	0	713,584	973,765	1,156,861	1,493,315	1,857,295	1,824,725	1,379,532	0	0	0
PRE-TAX INCOME	0	0	1,218,015	1,015,782	1,989,415	5,815,184	2,672,644	7,290,039	12,830,106	89,856,799	96,318,045	0
TAXABLE INCOME	0	0	1,218,015	1,015,782	1,989,415	5,815,184	2,672,644	7,290,039	12,830,106	89,856,799	96,318,045	0
Income Tax Payments	0	0	121,801	101,578	198,942	581,518	267,264	729,004	1,283,011	8,985,680	9,631,805	0
NET INCOME AFTER TAX	**0**	**0**	**1,096,213**	**914,204**	**1,790,474**	**5,233,665**	**2,405,379**	**6,561,035**	**11,547,096**	**80,871,119**	**86,686,241**	**0**

Table 28: Nominal Pro Forma Financial Cash Flow Statement: Total Investment Prospective

Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**33**	**34**	**35**
Receipts												
Gross Sales	0	0	1,931,599	1,989,547	3,146,276	7,308,499	7,527,754	12,294,250	17,598,717	103,063,431	110,613,858	0
Change in A/R	-	-	-289,740	-8,692	-173,509	-624,333	-32,888	-714,974	-795,670	-1,055,256	-1,132,564	16,592,079
Land Grant	1,000,000											
Liquidation Values												
Civil Works												46,768,784
Equipment												31,240,268
TOTAL CASH INFLOW (+)	1,000,000	0	1,641,859	1,980,855	2,972,767	6,684,166	7,494,866	11,579,275	16,803,047	102,008,175	109,481,293	63,360,863
Expenditures												
Investment Cost												
Land	1,000,000											
Civil Works	2,340,911	5,512,758	4,085,621	3,892,890	5,838,603	9,301,186	1,619,730					
Equipment	0	2,629,000	1,127,300	1,236,700	2,439,000	1,255,200	3,096,800					
Connection to Electrica Grid Syster	0	857,748	788,340	471,638	468,372	384,000	635,520					
Contengcy Fund	792,152	1,691,294	1,119,909	945,268	1,690,365	1,678,638	1,678,639					
Reinvestment												
Operating Costs												
LABOR COST												
Project Manager			99,022	103,181	107,514	112,030	116,735	121,638	130,549	764,535	820,545	0
Engeeners and Technicians			104,285	108,665	113,229	117,985	122,940	128,104	137,489	805,176	864,163	0
Economists			40,443	42,141	43,911	45,755	47,677	49,679	53,319	312,252	335,128	0
Maintainance Specialists			72,286	75,322	78,485	81,782	85,217	88,796	95,301	558,111	598,998	0
Workers			93,810	97,750	101,856	106,133	110,591	115,236	123,678	724,296	777,358	0
Guardian			33,224	34,620	36,074	37,589	39,168	40,813	43,803	256,522	275,314	0
Insurance Cost(Employers)			128,490	133,887	139,510	145,370	151,475	157,837	169,400	992,059	1,064,737	0
Maintanance Costs	0	0	125,031	162,853	226,258	353,641	736,987	767,940	800,194	2,238,145	2,332,147	0
Other Costs	0	0	312,578	325,707	339,386	353,641	368,493	383,970	400,097	1,119,072	1,166,073	0
Contractual Fee	0	0	41,945	45,018	74,182	179,555	192,709	327,949	489,162	8,012,523	8,960,701	0
Change in A/P	-	-	-47,955	-5,402	-10,625	-24,701	-41,135	-18,167	-20,959	-98,317	-108,918	1,245,892
Change in CB	0	0	0	0	0	0	0	245,885	106,089	140,701	151,009	-2,212,277
TOTAL OUTFLOWS (-)	3,133,063	10,690,800	8,124,330	7,670,237	11,686,120	14,127,803	8,961,546	2,409,680	2,528,121	15,825,075	17,237,255	-966,385
NET CASH FLOW BEFORE TAX	-2,133,063	-10,690,800	-6,482,470	-5,689,383	-8,713,354	-7,443,637	-1,466,680	9,169,596	14,274,925	86,183,099	92,244,039	64,327,248
INCOME TAX	0	0	121,801	101,578	198,942	581,518	267,264	729,004	1,283,011	8,985,680	9,631,805	0
NET CASH FLOW AFTER TAX	**-2,133,063**	**-10,690,800**	**-6,604,272**	**-5,790,961**	**-8,912,295**	**-8,025,155**	**-1,733,944**	**8,440,592**	**12,991,915**	**77,197,419**	**82,612,234**	**64,327,248**

Table 29: Real Pro Forma Financial Cash Flow Statement: Total Investment Perspective

Year	0	1	2	3	4	5	6	7	33	34	35
Receipts											
Gross Sales	0	0	1,779,023	1,758,535	2,668,861	5,949,625	5,881,107	9,217,815	26,513,671	27,309,081	0
Change in A/R	0	0	-266,853	-7,683	-147,181	-508,251	-25,694	-536,064	-271,471	-279,615	3,931,250
Land Grant	1,000,000										
Liquidation Values											
Civil Works											2,625,523
Equipment											7,401,924
TOTAL CASH INFLOW (+)	1,000,000	0	1,512,169	1,750,852	2,521,680	5,441,374	5,855,413	8,681,751	26,242,201	27,029,467	6,556,772
Expenditures											
Investmen Costs											
Land	1000000										
Civil Works	2,340,911	5,290,555	3,762,900	3,440,876	4,952,655	7,571,810	1,265,425	0			
Equipments	0	2,523,033	1,038,255	1,093,103	2,068,907	1,021,820	2,419,395	0			
Conncetion to Electrical Grid System	0	823,175	726,069	416,875	397,301	312,603	496,504	0			
Contingency Fund	792,152	1,623,123	1,031,448	835,510	1,433,869	1,366,528	1,311,448	0			
Reinvestment											
Operating Costs											
LABOR COSTS											
Project Manager	0	0	91,200	91,200	91,200	91,200	91,200	91,200	196,681	202,582	0
Engeeners and Technicians	0	0	96,048	96,048	96,048	96,048	96,048	96,048	207,136	213,350	0
Economists	0	0	37,248	37,248	37,248	37,248	37,248	37,248	80,329	82,739	0
Maintainance Specialists	0	0	66,576	66,576	66,576	66,576	66,576	66,576	143,577	147,885	0
Workers	0	0	86,400	86,400	86,400	86,400	86,400	86,400	186,329	191,919	0
Guardian	0	0	30,600	30,600	30,600	30,600	30,600	30,600	65,992	67,971	0
Insurance Cost(Employers)	0	0	118,341	118,341	118,341	118,341	118,341	118,341	255,213	262,869	
Maintainance Costs	0	0	115,155	143,944	191,925	287,888	575,776	575,776	575,776	575,776	0
Other Costs	0	0	287,888	287,888	287,888	287,888	287,888	287,888	287,888	287,888	0
Contractual Fee	0	0	38,632	39,791	62,926	146,170	150,555	245,885	2,061,269	2,212,277	0
Change in A/P			-44,168	-4,775	-9,013	-20,108	-32,137	-13,621	-25,293	-26,890	295,196
Change in CB			0	0	0	0	0	184,356	36,196	37,282	-524,167
TOTAL CASH OUTFLOW (-)	3,133,063	10,259,885	7,482,592	6,779,625	9,912,872	11,501,011	7,001,266	1,806,697	4,071,093	4,255,648	-228,971
NET CASH FLOW BEFORE TAXES	-2,133,063	-10,259,885	-5,970,423	-5,028,773	-7,391,192	-6,059,637	-1,145,853	6,875,055	22,171,107	22,773,819	15,241,398
INCOME TAX	0	0	112,180	89,784	168,754	473,396	208,802	546,583	2,311,619	2,377,964	0
REAL NET CASH FLOW AFTER TAX (Year 0 Prices)	**-2,133,063**	**-10,259,885**	**-6,082,603**	**-5,118,556**	**-7,559,946**	**-6,533,033**	**-1,354,655**	**6,328,472**	**19,859,488**	**20,395,855**	**15,241,398**
REAL DEBT REPAYMENT CASH FLOW (Year 0 Prices)	0	0	1,335,032	1,884,690	2,344,436	3,217,775	4,342,327	4,759,331			
Annual Debt Service Coverage Ratio			**-4.56**	**-2.72**	**-3.22**	**-2.03**	**-0.31**	**1.33**			
Debt Service Capacity Ratio											
Discount Rate 2.70%											
Present Value of Net Cash Flow			2,578,223	13,184,736	19,787,558	25,578,579	34,033,265	41,661,588			
Present Value of Total Instalment			27,481,476	26,852,398	25,641,836	23,926,431	21,267,789	17,382,450			
Debt Service Capacity Ratio			**0.09**	**0.49**	**0.77**	**1.07**	**1.60**	**2.40**			

Table 30: Nominal Pro Forma Financial Cash Flow: Equity Holder's Perspective

Year	0	1	2	3	4	5	6	7	33	34	35
Receipts											
Gross Sales	0	0	1,931,599	1,989,547	3,146,276	7,308,499	7,527,754	12,294,250	103,063,431	110,613,858	0
Change In A/R	-	-	-289,740	-8,692	-173,509	-624,333	-32,888	-714,974	-1,055,256	-1,132,564	16,592,079
Loan Received	2,269,904	7,745,485	5,159,288	4,742,936	7,561,128	9,142,483	5,093,734				
Land Grant	1,000,000										
Liquidation Value											
Civil Works											46,768,784
Equipment											31,240,268
TOTAL CASH INFLOWS (+)	3,269,904	7,745,485	6,801,147	6,723,791	10,533,895	15,826,649	12,588,600	11,579,275	102,008,175	109,481,293	63,360,863
Expenditures											
Investment Cost											
Land	1,000,000										
Civil works	2,340,911	5,512,758	4,085,621	3,892,890	5,838,603	9,301,186	1,619,730	0			
Equipments	0	2,629,000	1,127,300	1,236,700	2,439,000	1,255,200	3,096,800	0			
Connection to Electrical Grid Syst	0	857,748	788,340	471,638	468,372	384,000	635,520	0			
Contingency Fund	792,152	1,691,294	1,119,909	945,268	1,690,365	1,678,638	1,678,639	0			
Reinvestment											
Operating Costs											
LABOR COST											
Project Manager	0	0	99,022	103,181	107,514	112,030	116,735	121,638	764,535	820,545	0
Engeeners and Technicians	0	0	104,285	108,665	113,229	117,985	122,940	128,104	805,176	864,163	0
Economists	0	0	40,443	42,141	43,911	45,755	47,677	49,679	312,252	335,128	0
Maintainance Specialists	0	0	72,286	75,322	78,485	81,782	85,217	88,796	558,111	598,998	0
Workers	0	0	93,810	97,750	101,856	106,133	110,591	115,236	724,296	777,358	0
Guardian	0	0	33,224	34,620	36,074	37,589	39,168	40,813	256,522	275,314	0
Insurance Cost (Employers)	0	0	128,490	133,887	139,510	145,370	151,475	157,837	992,059	1,064,737	
Maintainance Costs	0	0	125,031	162,853	226,258	353,641	736,987	767,940	2,238,145	2,332,147	0
Other Costs	0	0	312,578	325,707	339,386	353,641	368,493	383,970	1,119,072	1,166,073	0
Contractual Fee	0	0	41,945	45,018	74,182	179,555	192,709	327,949	8,012,523	8,960,701	0
Loan Repayment	0	0	1,449,530	2,132,274	2,763,817	3,952,704	5,558,131	6,347,752	0	0	0
Change in A/P			-47,955	-5,402	-10,625	-24,701	-41,135	-18,167	-98,317	-108,918	1,245,892
Change in CB			0	0	0	0	0	245,885	140,701	151,009	-2,212,277
TOTAL CASH INFLOW (-)	4,133,063	10,690,800	9,573,859	9,802,511	14,449,937	18,080,507	14,519,677	8,757,432	15,825,075	17,237,255	-966,385
NET CASH FLOW BEFORE TA	-863,159	-2,945,315	-2,772,712	-3,078,720	-3,916,042	-2,253,858	-1,931,077	2,821,844	86,183,099	92,244,039	64,327,248
INCOME TAX	0	0	121,801	101,578	198,942	581,518	267,264	729,004	8,985,680	9,631,805	0
NET CASH FLOW AFTER TAX	**-863,159**	**-2,945,315**	**-2,894,514**	**-3,180,298**	**-4,114,983**	**-2,835,377**	**-2,198,341**	**2,092,840**	**77,197,419**	**82,612,234**	**64,327,248**

Table 31: Real Financial Cash Flow: Equity Holder's Perspective

Year		0	1	2	3	4	5	6	7	33	34	35
Receipts												
Gross Sales				1,779,023	1,758,535	2,668,861	5,949,625	5,881,107	9,217,815	26,513,671	27,309,081	0
Change In A/R				-266,853	-7,683	-147,181	-508,251	-25,694	-536,064	-271,471	-279,615	3,931,250
Loan Received		2,269,904	7,433,287	4,751,758	4,192,221	6,413,805	7,442,615	3,979,513	0			
Land Grant		1,000,000										
Liquidation Value												
Civil Works												11,081,178
Equipment												33,413,198
TOTAL CASH INFLOWS (+)		3,269,904	7,433,287	6,263,927	5,943,073	8,935,485	12,883,990	9,834,927	8,681,751	26,242,201	27,029,467	15,012,427
Expenditures												
Investment Cost												
Land		1,000,000										
Civil works		2,340,911	5,290,555	3,762,900	3,440,876	4,952,655	7,571,810	1,265,425	0			
Equipments		0	2,523,033	1,038,255	1,093,103	2,068,907	1,021,820	2,419,395	0			
Connection to Electrical Grid System		0	823,175	726,069	416,875	397,301	312,603	496,504	0			
Contingency Fund		792,152	1,623,123	1,031,448	835,510	1,433,869	1,366,528	1,311,448	0			
Reinvestment												
Operating Costs												
LABOR COST												
Project Manager		0	0	91,200	91,200	91,200	91,200	91,200	91,200	196,681	202,582	0
Engeeners and Technicians		0	0	96,048	96,048	96,048	96,048	96,048	96,048	207,136	213,350	0
Economists		0	0	37,248	37,248	37,248	37,248	37,248	37,248	80,329	82,739	0
Maintainance Specialists		0	0	66,576	66,576	66,576	66,576	66,576	66,576	143,577	147,885	0
Workers		0	0	86,400	86,400	86,400	86,400	86,400	86,400	186,329	191,919	0
Guardian		0	0	30,600	30,600	30,600	30,600	30,600	30,600	65,992	67,971	0
Insurance Cost(Employers)		0	0	118,341	118,341	118,341	118,341	118,341	118,341	255,213	262,869	0
Maintainance Costs		0	0	115,155	143,944	191,925	287,888	575,776	575,776	575,776	575,776	0
Other Costs		0	0	287,888	287,888	287,888	287,888	287,888	287,888	287,888	287,888	0
Contractual Fee				38,632	39,791	62,926	146,170	150,555	245,885	2,061,269	2,212,277	0
Loan Repayment		0	0	1,335,032	1,884,690	2,344,436	3,217,775	4,342,327	4,759,331	0	0	0
Change in A/P		0	0	-44,168	-4,775	-9,013	-20,108	-32,137	-13,621	-25,293	-26,890	295,196
Change in CB				0	0	0	0	0	200,167	39,300	40,479	-569,121
TOTAL CASH INFLOW (-)		4,133,063	10,259,885	8,817,624	8,664,314	12,257,307	14,718,786	11,343,593	6,566,028	4,071,093	4,255,648	-228,971
NET CASH FLOW BEFORE TAXES		-863,159	-2,826,598	-2,553,697	-2,721,241	-3,321,823	-1,834,797	-1,508,667	2,115,724	22,171,107	22,773,819	15,241,398
INCOME TAX		0	0	112,180	89,784	168,754	473,396	208,802	546,583	2,311,619	2,377,964	0
NET CASH FLOW AFTER TAX		**-863,159**	**-2,826,598**	**-2,665,878**	**-2,811,025**	**-3,490,577**	**-2,308,193**	**-1,717,469**	**1,569,141**	**19,859,488**	**20,395,855**	**15,241,398**
NPV	**77,383,621**											
IRR	**23.39%**											

Table 32: Cost overrun

Cost Overrun				
	NPV			**IRR**
	77,383,621			23.39%
-10%	80,239,624		-10%	25.15%
-8%	79,668,423		-8%	24.78%
-6%	79,097,223		-6%	24.42%
-4%	78,526,022		-4%	24.07%
-2%	77,954,821		-2%	23.72%
0%	77,383,621		0%	23.39%
2%	76,812,420		2%	23.07%
4%	76,241,219		4%	22.75%
6%	75,670,019		6%	22.45%
8%	75,098,818		8%	22.15%
10%	74,527,617		10%	21.85%
12%	73,956,416		12%	21.57%
14%	73,385,216		14%	21.29%
16%	72,814,015		16%	21.02%
18%	72,242,814		18%	20.75%
20%	71,671,614		20%	20.49%

Table 33: Accounts Receivable

Accounts Receivable				
	NPV			IRR
	77,383,621			23.39%
0%	79,635,118		0%	24.37%
5%	78,884,619		5%	24.04%
10%	78,134,120		10%	23.71%
15%	77,383,621		15%	23.39%
20%	76,633,121		20%	23.08%
25%	75,882,622		25%	22.77%
30%	75,132,123		30%	22.46%
35%	74,381,624		35%	22.16%
40%	73,631,125		40%	21.87%
45%	72,880,626		45%	21.58%
50%	72,130,127		50%	21.29%

Table 34: Increase in Real Wage

Increase in Real Wage			
	NPV		**IRR**
	77,383,621		23.39%
-12%	81,296,889	-12%	23.76%
-9%	80,966,502	-9%	23.72%
-6%	80,508,834	-6%	23.66%
-3%	79,852,443	-3%	23.59%
0%	78,877,960	0%	23.50%
3%	77,383,621	3%	23.39%
6%	75,025,795	6%	23.24%
9%	71,216,763	9%	23.04%
12%	64,950,025	12%	22.75%

Table 35: Change in discount rate

Change in Discount Rate	
	NPV
	77,383,621
2%	232,141,428
3%	184,543,777
4%	147,503,471
5%	118,477,421
6%	95,575,336
7%	77,383,621
8%	62,838,740
9%	51,135,663
10%	41,661,331
11%	33,946,048
12%	27,627,785