

# Bien Hoa Power

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# Executive Summary

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## Project Background

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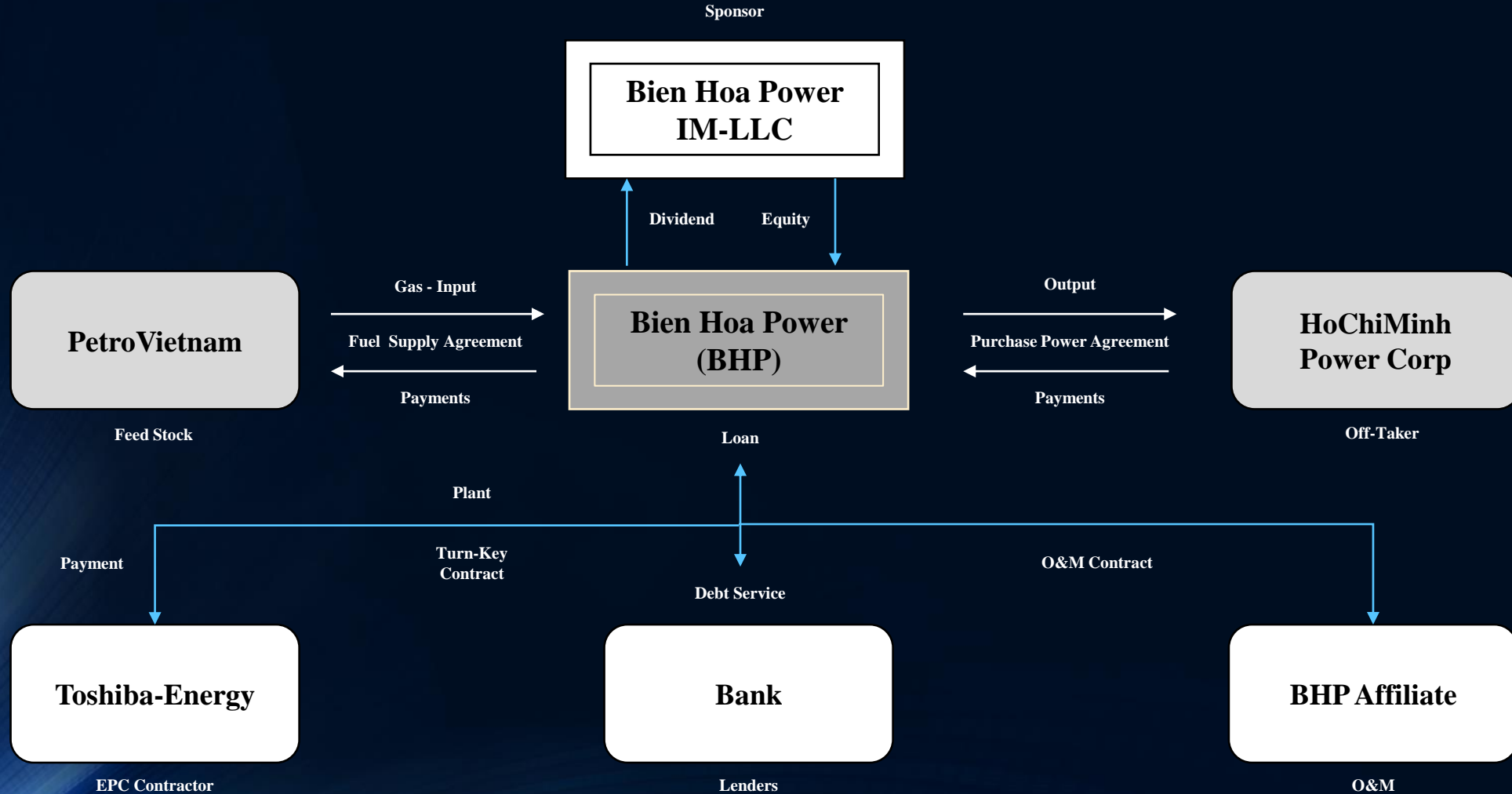
- Bien Hoa Power (BHP) is a promising gas-fired power plant in Vietnam, intended to be built in the Southern Mekong Delta region, outside of Ho Chi Minh City
- Vietnam's electricity market is nascent and electricity purchasers do not want to be in long-term contracts so BHP structured the project with a 7-year Power Purchase Agreement (PPA) which will be sold to a subsidiary of a state-owned Vietnamese Electricity company
- BHP has also entered into a Fuel Supply Agreement to deliver natural gas for 7 years and after the expiration of the Fuel Supply Agreement, BHP will purchase gas at spot prices.
- Toshiba-Energy will be constructing the plant in a turn-key contract with BHP and agreed to pay for its liquidated damages

## Duration of the Project

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- First loan disbursement occurs at the end of December 31<sup>st</sup>, 2022 and construction begins on January 1<sup>st</sup>, 2023 and is expected to last for 42 months.
- Commercial operations are to begin on July 1<sup>st</sup>, 2026

# Project Participants





# Project Participants

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## **Bien Hoa Power IM-LLC**

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**Bien Hoa Power IM-LLC** (BHP) is the project company, the SPV, that is intended to be a power plant, generating and supplying the electricity in Vietnam. BHP is determining whether the project of building the power plant is viable. In order to execute the project, it needs to involve itself with 4 different counterparties. Naturally, there are risks involved with a project like this, and having to deal with multiple counter-parties. **BHP** has entered into a Purchase Power Agreement of 7 years with **HoChiMinh Power Corporation** (HPC) to sell all its output to this state-owned entity. After the PPA, the output will then be sold to the wholesale market. With the commitment of selling its output, BHP has also entered into a Fuel Supply Agreement with **PetroVietnam**. BHP is committed to purchasing its gas from **PetroVietnam** on a monthly basis and at a nominal price. Lastly, BHP has entered into a partnership with an EPC contractor that will guarantee a plant, a turn-key contract, that will have a “new and clean” heat rate that will efficiently burn the fuel.

## **HoChiMinh Power Corporation (HPC)**

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HPC is a subsidiary of a state-owned enterprise called Vietnam Electricity. The role of this participant is to purchase the output that BHP intends to produce in two different payment types, in accordance with the PPA. HPC will purchase the energy in capacity and energy payments from the years 2026 to 2032. The Capacity Payments are driven by three things: Output Capacity, Availability Factor, and Capacity Tariffs. Under Energy Payments, it's driven by two factors: the amount of energy purchased and energy tariffs. After 2032, the contract is to be terminated.

# Project Participants - contd.

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## **PetroVietnam**

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PetroVietnam is an oil and gas company that has entered into a 7-year fuel supply agreement (FSA) with BHP. The oil and gas company agrees to supply natural gas to BHP from the Cuu Long Basin and later from its liquid natural gas (LNG) regasification and storage terminal outside of Ba Ria – Vung Tau. PetroVietnam will transport its gas to BHP using transport tankers on the Dong Nai River. After the contract ends, PetroVietnam will no longer supply gas to BHP.

## **Toshiba-Energy**

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Toshiba-Energy (TE) is an Engineer, Procurement, and Construction (EPC) contractor and has negotiated with BHP to enter into a turn-key contract. TE will guarantee BHP with a power plant that will generate a “new and clean” heat rate of 7,315 Btu/kWh and an initial net output of 305 MW, using its Toshiba “H-System” turbines in a combined cycle configuration. TE has also agreed that it will deal with any of the liquidated damages, which are fixed, if they do not happen to build the project in time.

## **Credit Committee**

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The Credit Committee plans on loaning a 16.5-year door-to-door loan detailing a 3.5 year construction period and a 13 operation period. During the construction period, all interest is to be capitalized and in the operation period, the loan will be amortized semi-annually in mortgage style payments. The committee intends to loan 80% of the total cost of the project.

# Background of Vietnam – Macroeconomics and Energy Sector

## Macroeconomics of Vietnam

- GDP of Vietnam is \$271.16 billion in 2020, according to the World Bank data, representing only 0.24% of the world GDP, and ranking #41
- Top 5 exports in Vietnam are:
  - Broadcasting Equipment, Telephones, Integrated Circuits, Textile Footwear, and Office Machine Parts.
  - Mainly exporting to the US, China, Japan, South Korea, and Hong Kong.

## Vietnam - Natural Gas Sector

- Vietnam has emerged itself in becoming the leading producer of oil and gas in South East Asia, ranking 29<sup>th</sup> in the world in proven gas reserves as of 2017 – 25 trillion cubic feet of proven gas reserves and equivalent to 86.5 times its annual consumption
- Half of these reserves are located in the northern deep waters of the Song Hong Basin
- Produced 375 billion cubic feet of dry natural gas in 2016, which has been all done domestically; Vietnam does not import natural gas



Figure 1: Annual Gas Production from 1981 - 2015

# Background of Vietnam – Sectors cont.

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## Liquid Natural Gas (LNG)

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- Vietnam government plans to import LNG in the southern parts of Vietnam to satisfy the growing demand and their inaction in importing natural gas
  - Plans to import 8 million tons per annum of LNG between 2024 - 2030
- PetroVietnam (PV) Gas and Son My LNG are designed and intended for LNG terminals in the Vung Tau province, southern Vietnam
  - Son My LNG is intended to serve as a new gas-fired power project in southern Vietnam

## Electricity

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- Of all energy modalities, hydroelectricity served as 44% of the main energy source – the rest were in natural gas and coal.
- Due to low prices of electricity, there have not been investments in new power plants

## Regulatory Framework

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- Electric Power is under the jurisdiction of the Ministry of Industry and Trade (MOIT) and is also responsible for overall energy planning and policy
- The Electricity Regulatory Authority of Vietnam (ERAV) is responsible for establishing and monitoring the power market, power planning, tariff regulation, and licensing
- Vietnam Electricity (EVN) is a state-owned enterprise and holds a monopoly on the transmission and distribution of electricity



# Economic Fundamentals – Energy Market

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## Governance

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Entering the energy industry in Vietnam has its obstacles. One is that it still remains a heavily state-dominated market mainly managed by the Ministry of Industry and Trade (MOIT). However, it has been very active in welcoming private players into the market, making that a priority – which was issued by the Prime Minister under Decree No. 1264/QĐ-TTg. So, as a result, this has increased investments, especially foreign investments, to enter the Vietnamese energy market normally under a BOT project.

## Increasing Demand & Lack of Supply

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With the growing population and economic activity in Vietnam, the consumption of energy has been increasing and the demand for more energy is necessary. In addition to the growing demand, the supply is limited since Vietnam does not import any of its energy. They are truly dependent on their own supply. So, as a result, it is important to implement this gas-fired plant by the largest city in Vietnam.

## Expected Cost of Power

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The expected cost of power in energy payments for Vietnam is to range from \$6.30 to 10.75 ¢ per kWh, depending on usage. Due to the dynamics of the industry in Vietnam, with regulations and input prices changing, a 3% increase in price inputs, can increase the energy prices by 10%. Despite the possibility of input prices increasing, energy prices are heavily regulated by the government and impose a uniform tariff across the country, which is low compared to other countries in South East Asia. To put things into perspective, the average nominal kWh rate is expected to be 14.26 ¢ per kWh. Vietnam's prices are lower because the energy industry is heavily subsidized.



# Risks and Mitigants

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## Country Risk

- **Probability: Medium**
- **Impact: Medium**

Vietnam is still considered to be a communist country and most businesses are managed at a state level, including the energy sector. In addition, the country is notorious for its weak legal infrastructure, financial unpredictability, and inconsistent bureaucratic decision-making. Corruption is also a huge obstacle to doing business, especially at a high level. With this project dealing with the government and its officials, the likelihood of facilitating payments with frontline civil servants is high. So, performing bribery to conduct business is likely. In addition to its suspects in legality, its bond rating is BB according to S&P in 2021. On a rating scale, the country is defined as speculative and has a substantial amount of credit risk. However, because the demand for energy has been increasing, there have been recent government decrees, 2020, in establishing the current national power development plan for the period 2021 – 2030. It aims to encourage the participation of all economic entities in electricity development, especially in private economic enterprises. Prime Minister's Decision No. 1264/QĐ-TTg acts as a mitigant, expressing strong needs for energy development. Another mitigant to these risks is the involvement of the World Bank. With these mitigants and possible risks that the project will face, country risk and its impact is **medium**.

## Construction Risk

- **Probability: Low**
- **Impact: Low**

The building of a power plant incurs a lot of risks and dangers. There are possibilities of going over the construction budget and/or delays. However, its track record in Vietnam for building gas-turbine plants has been a positive one. 27 gas-turbine projects have been announced and 16 of them have been pre-approved or operating; none have been canceled or delayed. To add, HPC has entered hired an EPC contractor with Toshiba-Energy. Toshiba-Energy has been delivering its first gas-fired turbine since 1927 and at a global level. Also, in this partnership between HPC and Toshiba-Energy, they have entered into a turn-key contract, acting as a mitigant to possibilities of construction risk. In the agreement, Toshiba-Energy will guarantee the plant in quality condition, along with incurring any liquidated damages if they fail to build the project on time. With a good track record of Toshiba-Energy and dealings in Vietnam dealing with gas-turbine plants, and with this turn-key contract, construction risk and its impact is **low**.

# Risks and Mitigants

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## Technology Risk

- Probability: High
- Impact: High

Toshiba-Energy has installed their turbines in the plant, and BHP will be using the Toshiba "H-System" turbines in a combined cycle configuration. The details of the turbines are that there will be output and heat degradation during each period of the operations. In addition, there will be major maintenance overhauls performed every 8<sup>th</sup> period. The turbines are to expect degradation, so the probability of the risk is high due to the nature of the technology. The mitigant against the degradation is the major maintenance that is performed to reduce the degradation of the turbines. However, in the sensitivity analysis, if the heat rate were to increase by 10%, this would negatively impact the project; the NPV of the project is to be projected negative and terminate the project. Therefore, although it is inevitable for the technology to degrade, these major maintenances increase the lifespan of these turbines, which is a key component of the revenues of the project, but not significant enough to have the project survive if the heat rate were to increase by 10%. The impact of the risk is high because increasing the heat rate would terminate the project.

## Currency Risk

- Probability: Low
- Impact: Low

The VND is weaker than the USD. So, if there was a currency devaluation of the VND, it would negatively affect the NPV of the project. According to the sensitivity analysis, if there was a currency devaluation, which is set at .75x in the short-term and .8x in the long-term, its forecasted to have very **low** impact to the NPV of the project. Historically, the exchange rate of the VND/USD has been stable, and almost unchanged since 2014, and the annual inflation rate of Vietnam has been steady as well. On the other hand, the US inflation rate has skyrocketed recently, which would grant more purchasing power to the VND. Therefore, with the steady VND exchange rates and the increase of inflation of the USD, the probability of currency risk is low. However, to mitigate against currency risk, executing currency future contracts. This would reduce the volatility of the USD.

# Risks and Mitigants

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## Fuel Price Risk

- Probability: Medium
- Impact: Low

The shock in fuel price is insignificant. If there was an increase in the Brent Crude price, from \$75 to \$93.75, the NPV decreases from \$8,578 to \$7,745. Therefore, the impact of the project is low if the fuel price is increased. Historically and at a macro scale, the prices of the Brent Crude have been increasing annually, with the exception of black swans such as COVID. However, because of the FSA, fuel prices are stable, reducing its volatility, but after the FSA is over, after 7 years, prices will be market price. For those reasons, the probability of this risk is medium. To mitigate against this risk, purchasing oil future contracts after the FSA, to secure a price in the future would reduce the volatility in prices.

## Fuel Interruption Risk

- Probability: Low
- Impact: Medium

Fuel interruption can be costly to the project and lead to an increase in liquidated damages. This would reduce the amount of energy generated which would affect the revenues of the project, consequently increasing the debt ratio. The period of not being able to receive fuel supply for three months is not significant enough for the project to be detrimental, but can still affect the debt ratio. There is a large amount of fuel in the market, and the likelihood of having an interruption in fuel is low, such that if there was a fuel interruption, it would be a black swan. As a mitigant against fuel interruption risk, entering into a fixed price, if possible, and supply contracts with suppliers, so that if a fuel interrupted risk were to happen, there is a reserved amount of fuel that can be supplied.



# Risks and Mitigants

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## Output Volume Risk

■ Probability: Medium

■ Impact: High

A negative 20% shock in the output volume of BHP Vietnam is detrimental to the project. During the PPA, this would reduce the dispatch factor of the project would decrease to 68.89% from 88.89%, affecting the revenues for the project significantly. The impact is so significant that it would force the project to be terminated. However, if the dispatch factor is not affected, the project can survive, even if there was a 20% decrease in energy volume being sold to the merchant market. Clearly, if both scenarios were to happen, the NPV of the project would then be negative again. Even if the dispatch factor would be maximized to 100%, running at full capacity, the shock would still cause the NPV of the project to be negative. Therefore, if this risk were to happen, this would be highly impactful to the project because after the PPA was to end, the volume would be subjugated to the market.

## Output Price Risk

■ Probability: Medium

■ Impact: High

A negative 20% shock to the capacity and energy tariff prices would negatively impact the NPV of the project – more so on energy tariff prices. The shock in capacity tariff prices would reduce the NPV of the project by 95%, from \$8,578 to 346. If there was a negative 20% shock on just energy tariff prices, the NPV of the project would go negative. However, due to the state-managed energy industry in Vietnam and the reliability of the country's supply, price movement can be volatile. Also, under the PPA, securing a price for 7 years reduces the volatility of the prices of the project. So, as a result, the probability of price shocks is defined as medium. However, if there were a price shock, in either case, capacity or energy tariffs, the NPV of the project enters into a very dangerous zone or becomes negative. Therefore, the impact of the negative shock for this risk scenario is high. To mitigate this risk further, purchasing oil derivatives would reduce the volatility of the prices of the oil.

# Risks and Mitigants

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## Credit Risk

- Probability: Low
- Impact: Low

The structure of the project is strong in the sense that there are government entities and experienced counterparties. According to the PPA, HPC will purchase all the energy that BHP will produce. HPC is a state-owned enterprise and for that reason, they are considered to be reliable and low risk. Another state-owned enterprise is PetroVietnam. They are the largest oil and gas producer in Vietnam, arguably a monopoly. Their ability to provide input for BHP will not be a gamble. They have a track record of performing well. Toshiba-Energy, the EPC contractor, has been installing turbines since 1927, globally. Especially since they will guarantee the functionality of the plant and incur the costs of liquidated damages and delays, this counterparty is also considered to be low risk. With all these counterparties involved, who are reputable and reliable, the probability and impact of credit risk is low.

## Operating Risk

- Probability: Low
- Impact: High

There are three factors that affect operating risk: heat rate, output, and degradation. In each scenario, with an increase of heat rate by 10%, decreasing the output by 10%, and increasing degradation rate by 2, the project becomes negative NPV. Therefore, the impact of the operating risk is high. However, because there is major maintenance conducted to ensure the plant's efficiency and reduce the nameplate capacity, this acts as a mitigant. To mitigate the assets further, purchasing insurance and/or a warranty on the turbines of the plant can decrease the operating risk. With these mitigants in place, the probability of the operating risk occurring is low.

# Risks and Mitigants

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## Financial Risk

- Probability: Low
- Impact: High

The total amount of debt without the financial shock is 509,215. With the SOFR spread increasing by 3%, the total amount of debt increases by 35%, 782,987. Consequently, this increases the debt payments. If debt payments are to increase and revenues maintaining constant, naturally, the NPV is to go down. With this financial shock of SOFR spread increasing by 3%, the NPV of the project is projected to be negative equating to -11,853. This shock can terminate the project. However, the probability of SOFR experiencing a 3% incremental spread shock is so low since SOFR is based on transactions made by Treasury, which assets are risk-free rate bonds. Historically, there has never been a moment where treasury bond rates have increased 300 bps overnight. So, the fact that SOFR is used, which is backed by US Treasury, and not LIBOR, which is market-determined, the financial transaction security between lenders is high, ensuring further that the financial impact of this risk is low. However, if this shock were to happen, this project would be terminated since the NPV of the project becomes negative, thus, making the impact of this risk high.



## Sponsor Case Financial Results – Base Case

Indicators	Results
Minimum DSCR ( with DSRA)	1
Average DSCR (with DSRA)	1.55
Leveraged NPV	\$8,578
Leveraged IRR	22%
Unleveraged NPV	\$25,063
Unleveraged IRR	12%
Average Loan Life	7.71 years
Return on Lender's Regulatory Capital	16.27%

**Figure 2:** Financial Results of Sponsor's Base Case

# Recommendation and Proposed Financial Structure

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	Base	Recommendation
Amortization Periods	26	30
Payment Style	Mortgage (80%)	Sculpted (75%)

**Figure 3:** Recommendations - increasing amortization periods and changing payment styles

## Recommendation

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- Increase Amortization Payment Periods from 26 to 30
- Change payment style from mortgage payment style to sculpted, by frontloading debt payments at the beginning of the period
  - 75% of the debt will be paid off during the PPA

## Results

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- By increasing the debt amortization payment periods, it grants more time to pay off the debt, thus retaining more cashflow
- Changing the payment style to sculpted helps increase the debt service coverage ratio

## Recommended

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Indicators	Base Results	Recommended Results
Minimum DSCR ( with reserves)	1.00	1.00
Average DSCR (with reserves)	1.55	2.30
Leveraged Valuation NPV	\$8,578	15,079
Leveraged IRR	22%	23%
Unleveraged NPV	\$25,063	\$25,063
Unleveraged IRR	12%	12%
Average Loan Life	7.71 years	5.63
Return on Lender's Regulatory Capital	16.27%	16.01%

**Figure 4:** The comparison of financial results between Base and Recommended





## Recommended Scenario - Sensitivities

Risks	Scenario	Leveraged NPV	IRR	Minimum DSCR (with reserves)	Average DSCR (with reserves)	Viability
Construction Cost Overrun	1.2x	\$-8,094	18%	1.00	2.02	✗
Fuel Price Risk	1.25x	\$7,745	21%	1.00	2.26	✓
Fuel Interruption	3 months	\$7,306	21%	1.00	2.33	✓
Output Volume – Merchant & PPA	All	\$-13,452	15%	1.00	1.85	✗
Output Price – Merchant & PPA	All	\$-41,547	0%	.47	1.10	✗
Operating Risk - Output	.9x	-\$1,611	19%	1.00	2.09	✗

**Figure 5:** Financial results of each risk sensitivity against the recommended scenario

## Recommended Scenario - Sensitivities

Risks	Scenario	Leveraged NPV	IRR	Minimum DSCR (with reserves)	Average DSCR (with reserves)	Viability
Operating Risk – Heat Rate	1.1x	\$-2,784	19%	1.00	1.91	
Operating Risk – Degradation	2x	\$3,479	21%	1.00	2.03	
Financial Risk	+300 BPS	-\$5,992	18%	1.00	2.04	
Currency Devaluation – ST Shock	.75x	\$14,003	23%	1.00	2.30	
Currency Devaluation – LT Differential	.8x	\$14,868	23%	1.00	2.29	

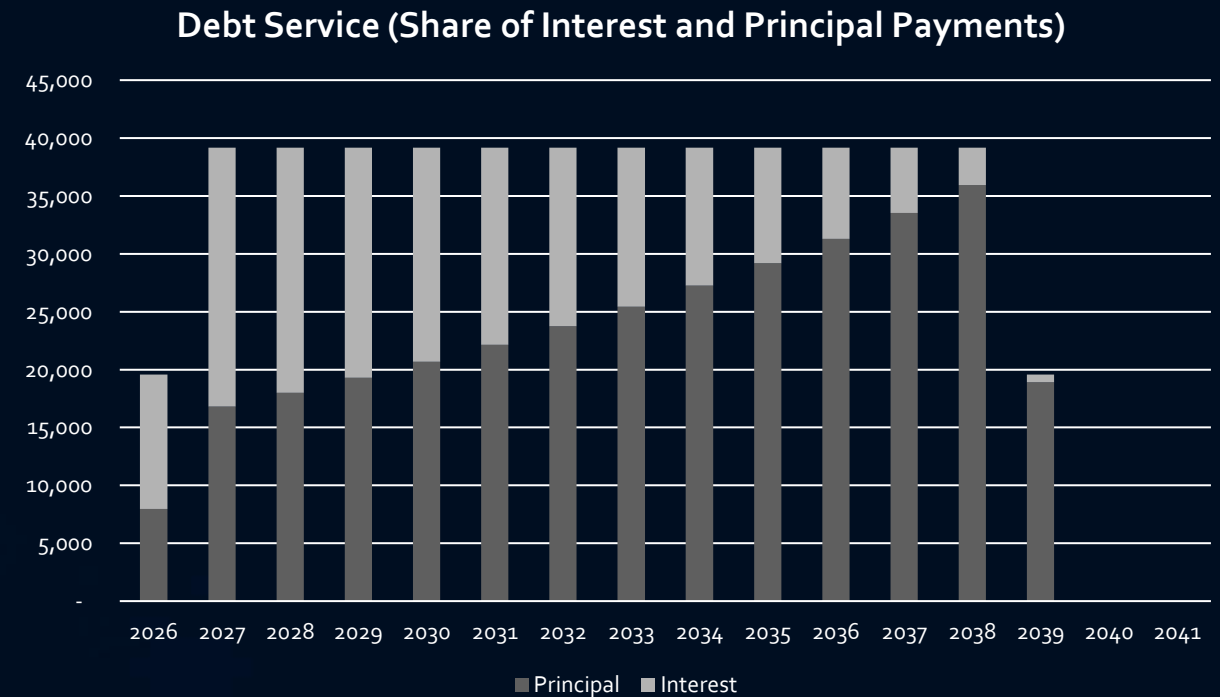
**Figure 6:** Financial results of each risk sensitivity against the recommended scenario

# RECAP - Base vs Recommended Scenario

## Base vs Recommended

With the increase of amortization periods from 26 to 30 and payment structure from mortgage style to sculpted, the financial structure of the project becomes stronger.

- Increase in NPV of the project
- Increase minimum and average DSCR (with reserves)
- Stronger IRR
- Average loan life is decreased by 2 years
- Return on lender's regulatory capital is virtually the same
- More "shock" resistant to external forces



**Figure 6:** Debt Service is front-loaded at the beginning of the PPA, 75% of the debt is paid off during the PPA



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